



Oracle VM VirtualBox®

Programming Guide and Reference

Version 3.2.14

© 2004-2011 Oracle Corporation

<http://www.virtualbox.org>

Contents

1	Introduction	13
1.1	Modularity: the building blocks of VirtualBox	13
1.2	Two guises of the same “Main API”: the web service or COM/XPCOM	14
1.3	About web services in general	15
1.4	Running the web service	16
1.4.1	Command line options of vboxwebsrv	16
1.4.2	Authenticating at web service logon	17
1.4.3	Solaris host: starting the web service via SMF	17
2	The object-oriented web service (OOWS)	18
2.1	The object-oriented web service for JAX-WS	18
2.1.1	Preparations	18
2.1.2	Getting started: running the sample code	18
2.1.3	Logging on to the web service	19
2.1.4	Obtaining basic machine information. Reading attributes	19
2.1.5	Changing machine settings. Sessions	20
2.1.6	Starting machines	20
2.1.7	Object management	21
2.2	The object-oriented web service for Python	21
2.3	The object-oriented web service for PHP	22
3	Using the raw web service with any language	23
3.1	Raw web service example for Java with Axis	23
3.2	Raw web service example for Perl	24
3.3	Programming considerations for the raw web service	24
3.3.1	Fundamental conventions	24
3.3.2	Example: A typical web service client session	25
3.3.3	Managed object references	26
3.3.4	Some more detail about web service operation	27
4	Using the Main API documentation to write web service clients	29
5	The VirtualBox COM/XPCOM API	30
5.1	Python COM API	30
5.2	Common Python bindings layer	30
5.3	C++ COM API	31
5.4	Event queue processing	32
5.5	Visual Basic and Visual Basic Script (VBS) on Windows hosts	33
5.6	C binding to XPCOM API	33
5.6.1	Getting started	33
5.6.2	XPCOM initialization	34
5.6.3	XPCOM method invocation	34
5.6.4	XPCOM attribute access	35
5.6.5	String handling	35
5.6.6	XPCOM uninitialization	36
5.6.7	Compiling and linking	36

6	The VirtualBox shell	37
7	Main API change log	39
7.1	Incompatible API changes with version 3.2	39
7.2	Incompatible API changes with version 3.1	40
7.3	Incompatible API changes with version 3.0	41
7.4	Incompatible API changes with version 2.2	42
7.5	Incompatible API changes with version 2.1	42
8	License information	44
9	Classes (interfaces)	45
9.1	IAppliance	45
9.1.1	Attributes	46
9.1.2	createVFSExplorer	47
9.1.3	getWarnings	47
9.1.4	importMachines	47
9.1.5	interpret	47
9.1.6	read	47
9.1.7	write	48
9.2	IAudioAdapter	48
9.2.1	Attributes	48
9.3	IBIOSSettings	48
9.3.1	Attributes	48
9.4	IConsole	50
9.4.1	Attributes	50
9.4.2	adoptSavedState	52
9.4.3	attachUSBDevice	52
9.4.4	createSharedFolder	52
9.4.5	deleteSnapshot	53
9.4.6	detachUSBDevice	54
9.4.7	findUSBDeviceByAddress	54
9.4.8	findUSBDeviceById	54
9.4.9	forgetSavedState	54
9.4.10	getDeviceActivity	55
9.4.11	getGuestEnteredACPIMode	55
9.4.12	getPowerButtonHandled	55
9.4.13	pause	55
9.4.14	powerButton	56
9.4.15	powerDown	56
9.4.16	powerUp	56
9.4.17	powerUpPaused	57
9.4.18	registerCallback	57
9.4.19	removeSharedFolder	57
9.4.20	reset	57
9.4.21	restoreSnapshot	58
9.4.22	resume	58
9.4.23	saveState	58
9.4.24	sleepButton	59
9.4.25	takeSnapshot	59
9.4.26	teleport	59
9.4.27	unregisterCallback	60
9.5	IConsoleCallback	60
9.5.1	onAdditionsStateChange	60

Contents

9.5.2	onCPUChange	61
9.5.3	onCanShowWindow	61
9.5.4	onKeyboardLedsChange	61
9.5.5	onMediumChange	62
9.5.6	onMouseCapabilityChange	62
9.5.7	onMousePointerShapeChange	62
9.5.8	onNetworkAdapterChange	63
9.5.9	onParallelPortChange	63
9.5.10	onRemoteDisplayInfoChange	63
9.5.11	onRuntimeError	64
9.5.12	onSerialPortChange	65
9.5.13	onSharedFolderChange	65
9.5.14	onShowWindow	65
9.5.15	onStateChange	66
9.5.16	onStorageControllerChange	66
9.5.17	onUSBControllerChange	66
9.5.18	onUSBDeviceStateChange	66
9.5.19	onVRDPServiceChange	67
9.6	IDHCPService	67
9.6.1	Attributes	67
9.6.2	setConfiguration	68
9.6.3	start	68
9.6.4	stop	68
9.7	IDisplay	68
9.7.1	completeVHWACommand	69
9.7.2	drawToScreen	69
9.7.3	getFramebuffer	69
9.7.4	getScreenResolution	70
9.7.5	invalidateAndUpdate	70
9.7.6	resizeCompleted	70
9.7.7	setFramebuffer	70
9.7.8	setSeamlessMode	71
9.7.9	setVideoModeHint	71
9.7.10	takeScreenShot	71
9.7.11	takeScreenShotToArray	72
9.8	IFramebuffer	72
9.8.1	Attributes	72
9.8.2	getVisibleRegion	74
9.8.3	lock	74
9.8.4	notifyUpdate	75
9.8.5	processVHWACommand	75
9.8.6	requestResize	75
9.8.7	setVisibleRegion	77
9.8.8	unlock	77
9.8.9	videoModeSupported	77
9.9	IFramebufferOverlay	78
9.9.1	Attributes	78
9.9.2	move	78
9.10	IGuest	79
9.10.1	Attributes	79
9.10.2	executeProcess	80
9.10.3	getProcessOutput	80
9.10.4	getProcessStatus	81

Contents

9.10.5	internalGetStatistics	81
9.10.6	setCredentials	82
9.11	IGuestOSType	82
9.11.1	Attributes	82
9.12	IHost	85
9.12.1	Attributes	85
9.12.2	createHostOnlyNetworkInterface	87
9.12.3	createUSBDeviceFilter	87
9.12.4	findHostDVDDrive	87
9.12.5	findHostFloppyDrive	87
9.12.6	findHostNetworkInterfaceById	87
9.12.7	findHostNetworkInterfaceByName	88
9.12.8	findHostNetworkInterfacesOfType	88
9.12.9	findUSBDeviceByAddress	88
9.12.10	findUSBDeviceById	88
9.12.11	getProcessorCPUIDLeaf	89
9.12.12	getProcessorDescription	89
9.12.13	getProcessorFeature	89
9.12.14	getProcessorSpeed	90
9.12.15	insertUSBDeviceFilter	90
9.12.16	removeHostOnlyNetworkInterface	90
9.12.17	removeUSBDeviceFilter	91
9.13	IHostNetworkInterface	91
9.13.1	Attributes	91
9.13.2	dhcpRediscover	92
9.13.3	enableDynamicIpConfig	92
9.13.4	enableStaticIpConfig	93
9.13.5	enableStaticIpConfigV6	93
9.14	IHostUSBDevice	93
9.14.1	Attributes	93
9.15	IHostUSBDeviceFilter	93
9.15.1	Attributes	94
9.16	IInternalMachineControl	94
9.16.1	adoptSavedState	94
9.16.2	autoCaptureUSBDevices	94
9.16.3	beginPowerUp	94
9.16.4	beginSavingState	94
9.16.5	beginTakingSnapshot	95
9.16.6	captureUSBDevice	95
9.16.7	deleteSnapshot	95
9.16.8	detachAllUSBDevices	96
9.16.9	detachUSBDevice	96
9.16.10	endPowerUp	96
9.16.11	endSavingState	97
9.16.12	endTakingSnapshot	97
9.16.13	finishOnlineMergeMedium	97
9.16.14	getIPCId	97
9.16.15	lockMedia	97
9.16.16	onSessionEnd	98
9.16.17	pullGuestProperties	98
9.16.18	pushGuestProperty	98
9.16.19	restoreSnapshot	98
9.16.20	runUSBDeviceFilters	99

Contents

9.16.21	setRemoveSavedState	99
9.16.22	unlockMedia	99
9.16.23	updateState	99
9.17	IInternalSessionControl	99
9.17.1	accessGuestProperty	100
9.17.2	assignMachine	100
9.17.3	assignRemoteMachine	100
9.17.4	enumerateGuestProperties	101
9.17.5	getPID	101
9.17.6	getRemoteConsole	101
9.17.7	onCPUChange	101
9.17.8	onMediumChange	102
9.17.9	onNetworkAdapterChange	102
9.17.10	onParallelPortChange	102
9.17.11	onSerialPortChange	102
9.17.12	onSharedFolderChange	103
9.17.13	onShowWindow	103
9.17.14	onStorageControllerChange	103
9.17.15	onUSBControllerChange	103
9.17.16	onUSBDeviceAttach	104
9.17.17	onUSBDeviceDetach	104
9.17.18	onVRDPsServerChange	104
9.17.19	onlineMergeMedium	105
9.17.20	uninitialize	105
9.17.21	updateMachineState	105
9.18	IKeyboard	106
9.18.1	putCAD	106
9.18.2	putScancode	106
9.18.3	putScancodes	106
9.19	ILocalOwner	106
9.19.1	setLocalObject	106
9.20	IMachine	107
9.20.1	Attributes	107
9.20.2	addStorageController	116
9.20.3	attachDevice	116
9.20.4	canShowConsoleWindow	117
9.20.5	createSharedFolder	117
9.20.6	deleteSettings	118
9.20.7	detachDevice	118
9.20.8	discardSettings	119
9.20.9	enumerateGuestProperties	119
9.20.10	export	119
9.20.11	findSnapshot	120
9.20.12	getBootOrder	120
9.20.13	getCPUIDLeaf	120
9.20.14	getCPUProperty	121
9.20.15	getCPUStatus	121
9.20.16	getExtraData	121
9.20.17	getExtraDataKeys	121
9.20.18	getGuestProperty	121
9.20.19	getGuestPropertyTimestamp	122
9.20.20	getGuestPropertyValue	122
9.20.21	getHWVirtExProperty	122

Contents

9.20.22	getMedium	122
9.20.23	getMediumAttachment	123
9.20.24	getMediumAttachmentsOfController	123
9.20.25	getNetworkAdapter	123
9.20.26	getParallelPort	124
9.20.27	getSerialPort	124
9.20.28	getSnapshot	124
9.20.29	getStorageControllerByInstance	124
9.20.30	getStorageControllerByName	125
9.20.31	hotPlugCPU	125
9.20.32	hotUnplugCPU	125
9.20.33	mountMedium	125
9.20.34	passthroughDevice	126
9.20.35	queryLogFilename	126
9.20.36	querySavedScreenshotPNGSize	127
9.20.37	querySavedThumbnailSize	127
9.20.38	readLog	127
9.20.39	readSavedScreenshotPNGToArray	127
9.20.40	readSavedThumbnailToArray	128
9.20.41	removeAllCPUIDLeaves	128
9.20.42	removeCPUIDLeaf	128
9.20.43	removeSharedFolder	128
9.20.44	removeStorageController	129
9.20.45	saveSettings	129
9.20.46	setBootOrder	129
9.20.47	setCPUIDLeaf	130
9.20.48	setCPUProperty	130
9.20.49	setCurrentSnapshot	130
9.20.50	setExtraData	131
9.20.51	setGuestProperty	131
9.20.52	setGuestPropertyValue	132
9.20.53	setHWVirtExProperty	132
9.20.54	showConsoleWindow	132
9.21	IMachineDebugger	133
9.21.1	Attributes	133
9.21.2	dumpStats	134
9.21.3	getStats	134
9.21.4	injectNMI	134
9.21.5	resetStats	135
9.22	IManagedObjectRef	135
9.22.1	getInterfaceName	135
9.22.2	release	135
9.23	IMedium	135
9.23.1	Attributes	140
9.23.2	cloneTo	144
9.23.3	close	145
9.23.4	compact	145
9.23.5	createBaseStorage	146
9.23.6	createDiffStorage	146
9.23.7	deleteStorage	146
9.23.8	getProperties	147
9.23.9	getProperty	147
9.23.10	getSnapshotIds	148

Contents

9.23.11	lockRead	148
9.23.12	lockWrite	149
9.23.13	mergeTo	149
9.23.14	refreshState	150
9.23.15	reset	151
9.23.16	resize	151
9.23.17	setProperties	151
9.23.18	setProperty	152
9.23.19	unlockRead	152
9.23.20	unlockWrite	152
9.24	IMediumAttachment	152
9.24.1	Attributes	153
9.25	IMediumFormat	153
9.25.1	Attributes	154
9.25.2	describeProperties	154
9.26	IMouse	155
9.26.1	Attributes	155
9.26.2	putMouseEvent	156
9.26.3	putMouseEventAbsolute	156
9.27	INATEngine	157
9.27.1	Attributes	157
9.27.2	addRedirect	158
9.27.3	getNetworkSettings	159
9.27.4	removeRedirect	159
9.27.5	setNetworkSettings	159
9.28	INetworkAdapter	159
9.28.1	Attributes	160
9.28.2	attachToBridgedInterface	161
9.28.3	attachToHostOnlyInterface	161
9.28.4	attachToInternalNetwork	161
9.28.5	attachToNAT	162
9.28.6	attachToVDE	162
9.28.7	detach	162
9.29	IParallelPort	162
9.29.1	Attributes	162
9.30	IPerformanceCollector	163
9.30.1	Attributes	164
9.30.2	disableMetrics	164
9.30.3	enableMetrics	164
9.30.4	getMetrics	165
9.30.5	queryMetricsData	165
9.30.6	setupMetrics	166
9.31	IPerformanceMetric	167
9.31.1	Attributes	167
9.32	IProgress	168
9.32.1	Attributes	168
9.32.2	cancel	170
9.32.3	setCurrentOperationProgress	170
9.32.4	setNextOperation	170
9.32.5	waitForCompletion	170
9.32.6	waitForOperationCompletion	171
9.33	IRemoteDisplayInfo	171
9.33.1	Attributes	171

Contents

9.34	ISerialPort	173
9.34.1	Attributes	173
9.35	ISession	174
9.35.1	Attributes	175
9.35.2	close	175
9.36	ISharedFolder	176
9.36.1	Attributes	177
9.37	ISnapshot	177
9.37.1	Attributes	178
9.38	IStorageController	180
9.38.1	Attributes	180
9.38.2	getIDEEmulationPort	181
9.38.3	setIDEEmulationPort	181
9.39	ISystemProperties	182
9.39.1	Attributes	182
9.39.2	getDeviceTypesForStorageBus	186
9.39.3	getMaxDevicesPerPortForStorageBus	186
9.39.4	getMaxInstancesOfStorageBus	186
9.39.5	getMaxPortCountForStorageBus	187
9.39.6	getMinPortCountForStorageBus	187
9.40	IUSBController	187
9.40.1	Attributes	187
9.40.2	createDeviceFilter	188
9.40.3	insertDeviceFilter	188
9.40.4	removeDeviceFilter	189
9.41	IUSBDevice	189
9.41.1	Attributes	189
9.42	IUSBDeviceFilter	190
9.42.1	Attributes	191
9.43	IVFSExplorer	192
9.43.1	Attributes	193
9.43.2	cd	193
9.43.3	cdUp	193
9.43.4	entryList	193
9.43.5	exists	193
9.43.6	remove	193
9.43.7	update	194
9.44	IVRDPServer	194
9.44.1	Attributes	194
9.45	IVirtualBox	195
9.45.1	Attributes	195
9.45.2	checkFirmwarePresent	197
9.45.3	createAppliance	197
9.45.4	createDHCPserver	198
9.45.5	createHardDisk	198
9.45.6	createLegacyMachine	198
9.45.7	createMachine	199
9.45.8	createSharedFolder	200
9.45.9	findDHCPserverByNetworkName	201
9.45.10	findDVDImage	201
9.45.11	findFloppyImage	201
9.45.12	findHardDisk	202
9.45.13	findMachine	202

Contents

9.45.14	getDVDImage	202
9.45.15	getExtraData	203
9.45.16	getExtraDataKeys	203
9.45.17	getFloppyImage	203
9.45.18	getGuestOSType	203
9.45.19	getHardDisk	204
9.45.20	getMachine	204
9.45.21	openDVDImage	204
9.45.22	openExistingSession	205
9.45.23	openFloppyImage	205
9.45.24	openHardDisk	206
9.45.25	openMachine	207
9.45.26	openRemoteSession	207
9.45.27	openSession	208
9.45.28	registerCallback	209
9.45.29	registerMachine	210
9.45.30	removeDHCPserver	210
9.45.31	removeSharedFolder	210
9.45.32	setExtraData	210
9.45.33	unregisterCallback	211
9.45.34	unregisterMachine	211
9.45.35	waitForPropertyChange	212
9.46	IVirtualBoxCallback	213
9.46.1	onExtraDataCanChange	213
9.46.2	onExtraDataChange	213
9.46.3	onGuestPropertyChange	214
9.46.4	onMachineDataChange	214
9.46.5	onMachineRegistered	214
9.46.6	onMachineStateChange	214
9.46.7	onMediumRegistered	215
9.46.8	onSessionStateChange	215
9.46.9	onSnapshotChange	215
9.46.10	onSnapshotDeleted	216
9.46.11	onSnapshotTaken	216
9.47	IVirtualBoxErrorInfo	216
9.47.1	Attributes	217
9.48	IVirtualSystemDescription	218
9.48.1	Attributes	218
9.48.2	addDescription	218
9.48.3	getDescription	218
9.48.4	getDescriptionByType	220
9.48.5	getValuesByType	221
9.48.6	setFinalValues	221
9.49	IWebSessionManager	221
9.49.1	getSessionObject	221
9.49.2	logout	222
9.49.3	login	222
10	Enumerations (enums)	223
10.1	AccessMode	223
10.2	AudioControllerType	223
10.3	AudioDriverType	223
10.4	BIOSBootMenuMode	223
10.5	CPUPropertyType	224

Contents

10.6	ClipboardMode	224
10.7	DataFlags	224
10.8	DataType	224
10.9	DeviceActivity	224
10.10	DeviceType	225
10.11	FirmwareType	225
10.12	FramebufferPixelFormat	225
10.13	HWVirtExPropertyType	225
10.14	HostNetworkInterfaceMediumType	226
10.15	HostNetworkInterfaceStatus	226
10.16	HostNetworkInterfaceType	226
10.17	KeyboardHidType	226
10.18	MachineState	227
10.19	MediumFormatCapabilities	229
10.20	MediumState	230
10.21	MediumType	230
10.22	MediumVariant	231
10.23	MouseButtonState	231
10.24	NATAliasMode	231
10.25	NATProtocol	231
10.26	NetworkAdapterType	232
10.27	NetworkAttachmentType	232
10.28	PointingHidType	232
10.29	PortMode	232
10.30	ProcessorFeature	233
10.31	Scope	233
10.32	SessionState	233
10.33	SessionType	233
10.34	SettingsVersion	234
10.35	StorageBus	234
10.36	StorageControllerType	234
10.37	USBDeviceFilterAction	235
10.38	USBDeviceState	235
10.39	VFSFileType	236
10.40	VFSType	236
10.41	VRDPAuthType	236
10.42	VirtualSystemDescriptionType	236
10.43	VirtualSystemDescriptionValueType	237
11	Host-Guest Communication Manager	238
11.1	Virtual Hardware Implementation	238
11.2	Protocol Specification	238
11.2.1	Request Header	238
11.2.2	Connect	239
11.2.3	Disconnect	240
11.2.4	Call32 and Call64	240
11.2.5	Cancel	241
11.3	Guest Software Interface	241
11.3.1	The Guest Driver Interface	241
11.3.2	Guest Application Interface	243
11.4	HGCM Service Implementation	244
12	RDP Web Control	245
12.1	RDPWeb features	245

Contents

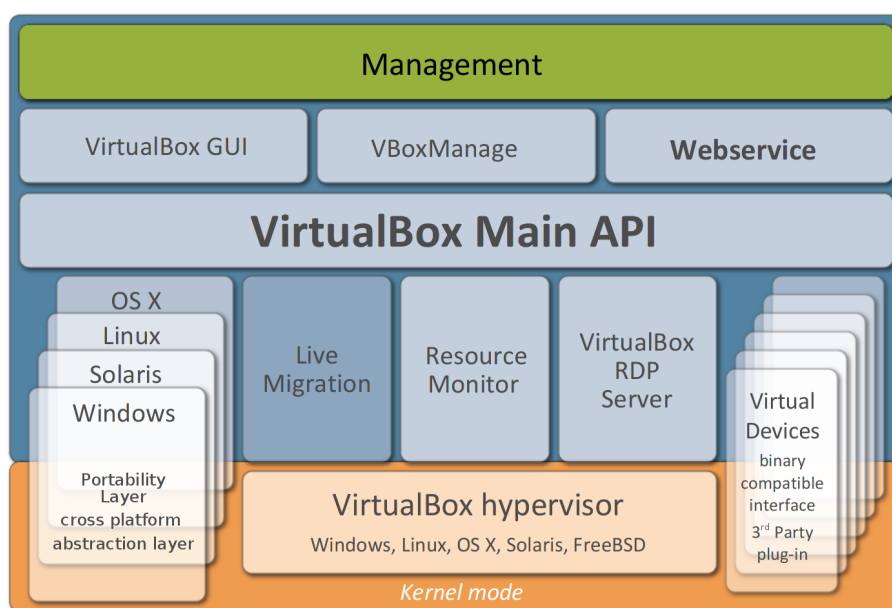
12.2	RDPWeb reference	245
12.2.1	RDPWeb functions	245
12.2.2	Embedding RDPWeb in a HTML page	246
12.3	RDPWeb change log	246
12.3.1	Version 1.2.28	246
12.3.2	Version 1.1.26	247
12.3.3	Version 1.0.24	247

1 Introduction

VirtualBox comes with comprehensive support for third-party developers. This Software Development Kit (SDK) contains all the documentation and interface files that are needed to write code that interacts with VirtualBox.

1.1 Modularity: the building blocks of VirtualBox

VirtualBox is cleanly separated into several layers, which can be visualized like in the picture below:



The orange area represents code that runs in kernel mode, the blue area represents userspace code.

At the bottom of the stack resides the hypervisor – the core of the virtualization engine, controlling execution of the virtual machines and making sure they do not conflict with each other or whatever the host computer is doing otherwise.

On top of the hypervisor, additional internal modules provide extra functionality. For example, the RDP server, which can deliver the graphical output of a VM remotely to an RDP client, is a separate module that is only loosely tacked into the virtual graphics device. Live Migration and Resource Monitor are additional modules currently in the process of being added to VirtualBox.

What is primarily of interest for purposes of the SDK is the API layer block that sits on top of all the previously mentioned blocks. This API, which we call the “**Main API**”, exposes the entire feature set of the virtualization engine below. It is completely documented in this SDK Reference – see chapter 9, *Classes (interfaces)*, page 45 and chapter 10, *Enumerations (enums)*, page 223 – and available to anyone who wishes to control VirtualBox programmatically. We chose the name “Main API” to differentiate it from other programming interfaces of VirtualBox that may be publicly accessible.

With the Main API, you can create, configure, start, stop and delete virtual machines, retrieve performance statistics about running VMs, configure the VirtualBox installation in general, and

more. In fact, internally, the front-end programs `VirtualBox` and `VBoxManage` use nothing but this API as well – there are no hidden backdoors into the virtualization engine for our own front-ends. This ensures the entire Main API is both well-documented and well-tested. (The same applies to `VBoxHeadless`, which is not shown in the image.)

1.2 Two guises of the same “Main API”: the web service or COM/XPCOM

There are several ways in which the Main API can be called by other code:

1. `VirtualBox` comes with a **web service** that maps nearly the entire Main API. The web service ships in a stand-alone executable (`vboxwebsrv`) that, when running, acts as an HTTP server, accepts SOAP connections and processes them.

Since the entire web service API is publicly described in a web service description file (in WSDL format), you can write client programs that call the web service in any language with a toolkit that understands WSDL. These days, that includes most programming languages that are available: Java, C++, .NET, PHP, Python, Perl and probably many more.

All of this is explained in detail in subsequent chapters of this book.

There are two ways in which you can write client code that uses the web service:

- a) For Java with JAX-WS as well as Python, the SDK contains easy-to-use classes that allow you to use the web service in an object-oriented, straightforward manner. We shall refer to this as the “**object-oriented web service (OOWS)**“.
The OO bindings for Java are described in chapter 2.1, *The object-oriented web service for JAX-WS*, page 18, those for Python in chapter 2.2, *The object-oriented web service for Python*, page 21.
 - b) Alternatively, you can use the web service directly, without the object-oriented client layer. We shall refer to this as the “**raw web service**“.
You will then have neither native object orientation nor full type safety, since web services are neither object-oriented nor stateful. However, in this way, you can write client code even in languages for which we do not ship object-oriented client code; all you need is a programming language with a toolkit that can parse WSDL and generate client wrapper code from it.
We describe this further in chapter 3, *Using the raw web service with any language*, page 23, with samples for Java and Perl.
2. Internally, for portability and easier maintenance, the Main API is implemented using the **Component Object Model (COM)**, an interprocess mechanism for software components originally introduced by Microsoft for Microsoft Windows. On a Windows host, `VirtualBox` will use Microsoft COM; on other hosts where COM is not present, it ships with XPCOM, a free software implementation of COM originally created by the Mozilla project for their browsers.

So, if you are familiar with COM and the C++ programming language (or with any other programming language that can handle COM/XPCOM objects, such as Java, Visual Basic or C#), then you can use the COM/XPCOM API directly. `VirtualBox` comes with all necessary files and documentation to build fully functional COM applications. For an introduction, please see chapter 5, *The VirtualBox COM/XPCOM API*, page 30 below.

The `VirtualBox` front-ends (the graphical user interfaces as well as the command line), which are all written in C++, use COM/XPCOM to call the Main API. Technically, the web service is another front-end to this COM API, mapping almost all of it to SOAP clients.

If you wonder which way to choose, here are a few comparisons:

Web service	COM/XPCOM
Pro: Easy to use with Java and Python with the object-oriented web service; extensive support even with other languages (C++, .NET, PHP, Perl and others)	Con: Usable from languages where COM bridge available (most languages on Windows platform, Python and C++ on other hosts)
Pro: Client can be on remote machine	Con: Client must be on the same host where virtual machine is executed
Con: Significant overhead due to XML marshalling over the wire for each method call	Pro: Relatively low invocation overhead

In the following chapters, we will describe the different ways in which to program VirtualBox, starting with the method that is easiest to use and then increase complexity as we go along.

1.3 About web services in general

Web services are a particular type of programming interface. Whereas, with “normal” programming, a program calls an application programming interface (API) defined by another program or the operating system and both sides of the interface have to agree on the calling convention and, in most cases, use the same programming language, web services use Internet standards such as HTTP and XML to communicate.¹

In order to successfully use a web service, a number of things are required – primarily, a web service accepting connections; service descriptions; and then a client that connects to that web service. The connections are governed by the SOAP standard, which describes how messages are to be exchanged between a service and its clients; the service descriptions are governed by WSDL.

In the case of VirtualBox, this translates into the following three components:

1. The VirtualBox web service (the “server”): this is the `vboxwebsrv` executable shipped with VirtualBox. Once you start this executable (which acts as a HTTP server on a specific TCP/IP port), clients can connect to the web service and thus control a VirtualBox installation.
2. VirtualBox also comes with WSDL files that describe the services provided by the web service. You can find these files in the `sdk/bindings/webservice/` directory. These files are understood by the web service toolkits that are shipped with most programming languages and enable you to easily access a web service even if you don’t use our object-oriented client layers. VirtualBox is shipped with pregenerated web service glue code for several languages (Python, Perl, Java).
3. A client that connects to the web service in order to control the VirtualBox installation.

Unless you play with some of the samples shipped with VirtualBox, this needs to be written by you.

¹In some ways, web services promise to deliver the same thing as CORBA and DCOM did years ago. However, while these previous technologies relied on specific binary protocols and thus proved to be difficult to use between diverging platforms, web services circumvent these incompatibilities by using text-only standards like HTTP and XML. On the downside (and, one could say, typical of things related to XML), a lot of standards are involved before a web service can be implemented. Many of the standards invented around XML are used one way or another. As a result, web services are slow and verbose, and the details can be incredibly messy. The relevant standards here are called SOAP and WSDL, where SOAP describes the format of the messages that are exchanged (an XML document wrapped in an HTTP header), and WSDL is an XML format that describes a complete API provided by a web service. WSDL in turn uses XML Schema to describe types, which is not exactly terse either. However, as you will see from the samples provided in this chapter, the VirtualBox web service shields you from these details and is easy to use.

1.4 Running the web service

The web service ships in an stand-alone executable, `vboxwebsrv`, that, when running, acts as a HTTP server, accepts SOAP connections and processes them – remotely or from the same machine.

Note: The web service executable is not contained with the VirtualBox SDK, but instead ships with the standard VirtualBox binary package for your specific platform. Since the SDK contains only platform-independent text files and documentation, the binaries are instead shipped with the platform-specific packages.

The `vboxwebsrv` program, which implements the web service, is a text-mode (console) program which, after being started, simply runs until it is interrupted with Ctrl-C or a kill command.

Once the web service is started, it acts as a front-end to the VirtualBox installation of the user account that it is running under. In other words, if the web service is run under the user account of `user1`, it will see and manipulate the virtual machines and other data represented by the VirtualBox data of that user (e.g., on a Linux machine, under `/home/user1/.VirtualBox`; see the VirtualBox User Manual for details on where this data is stored).

1.4.1 Command line options of `vboxwebsrv`

The web service supports the following command line options:

- `--help` (or `-h`): print a brief summary of command line options.
- `--background` (or `-b`): run the web service as a background daemon. This option is not supported on Windows hosts.
- `--host` (or `-H`): This specifies the host to bind to and defaults to “localhost”.
- `--port` (or `-p`): This specifies which port to bind to on the host and defaults to 18083.
- `--timeout` (or `-t`): This specifies the session timeout, in seconds, and defaults to 300 (five minutes). A web service client that has logged on but makes no calls to the web service will automatically be disconnected after the number of seconds specified here, as if it had called the `IWebSessionManager::logout()` method provided by the web service itself.

It is normally vital that each web service client call this method, as the web service can accumulate large amounts of memory when running, especially if a web service client does not properly release managed object references. As a result, this timeout value should not be set too high, especially on machines with a high load on the web service, or the web service may eventually deny service.

- `--check-interval` (or `-i`): This specifies the interval in which the web service checks for timed-out clients, in seconds, and defaults to 5. This normally does not need to be changed.
- `--verbose` (or `-v`): Normally, the `webservice` outputs only brief messages to the console each time a request is served. With this option, the `webservice` prints much more detailed data about every request and the COM methods that those requests are mapped to internally, which can be useful for debugging client programs.
- `--logfile` (or `-F`) `<file>`: If this is specified, the `webservice` not only prints its output to the console, but also writes it to the specified file. The file is created if it does not exist; if it does exist, new output is appended to it. This is useful if you run the `webservice` unattended and need to debug problems after they have occurred.

1.4.2 Authenticating at web service logon

As opposed to the COM/XPCOM variant of the Main API, a client that wants to use the web service must first log on by calling the `IWebSessionManager::logon()` API (see chapter 9.49.3, [logon](#), page 222) that is specific to the web service. Logon is necessary for the web service to be stateful; internally, it maintains a session for each client that connects to it.

The `IWebSessionManager::logon()` API takes a user name and a password as arguments, which the web service then passes to a customizable authentication plugin that performs the actual authentication.

For testing purposes, it is recommended that you first disable authentication with this command:

```
VBoxManage setproperty webservvauthlibrary null
```

Warning: This will cause all logons to succeed, regardless of user name or password. This should of course not be used in a production environment.

Generally, the mechanism by which clients are authenticated is configurable by way of the `VBoxManage` command:

```
VBoxManage setproperty webservvauthlibrary default|null|<library>
```

This way you can specify any shared object/dynamic link module that conforms with the specifications for authentication modules as laid out in section 9.3 of the VirtualBox User Manual; the web service uses the same kind of modules as the VirtualBox RDP server.

By default, after installation, the web service uses the `VRDPAuth` module that ships with VirtualBox. This module uses PAM on Linux hosts to authenticate users. Any valid username/password combination is accepted, it does not have to be the username and password of the user running the `webservice` daemon. Unless `vboxwebsrv` runs as root, PAM authentication can fail, because sometimes the file `/etc/shadow`, which is used by PAM, is not readable. On most Linux distribution PAM uses a `sudo` helper internally, so make sure you test this before deploying it. One can override this behavior by setting the environment variable `VBOX_PAM_ALLOW_INACTIVE` which will suppress failures when unable to read the shadow password file. Please use this variable carefully, and only if you fully understand what you're doing.

1.4.3 Solaris host: starting the web service via SMF

On Solaris hosts, the VirtualBox web service daemon is integrated into the SMF framework. You can change the parameters, but don't have to if the defaults below already match your needs:

```
svccfg -s svc:/application/virtualbox/webservice:default setprop config/host=localhost
svccfg -s svc:/application/virtualbox/webservice:default setprop config/port=18083
svccfg -s svc:/application/virtualbox/webservice:default setprop config/user=root
```

If you made any change, don't forget to run the following command to put the changes into effect immediately:

```
svcadm refresh svc:/application/virtualbox/webservice:default
```

If you forget the above command then the previous settings will be used when enabling the service. Check the current property settings with:

```
svccprop -p config svc:/application/virtualbox/webservice:default
```

When everything is configured correctly you can start the VirtualBox webservice with the following command:

```
svcadm enable svc:/application/virtualbox/webservice:default
```

For more information about SMF, please refer to the Solaris documentation.

2 The object-oriented web service (OOWS)

As explained in chapter 1.2, *Two guises of the same “Main API”: the web service or COM/XPCOM*, page 14, VirtualBox ships with client-side libraries for Java and Python that allow you to use the VirtualBox web service in an intuitive, object-oriented way. These libraries shield you from the client-side complications of managed object references and other implementation details that come with the VirtualBox web service. (If you do want to use the web service directly, have a look at chapter 3, *Using the raw web service with any language*, page 23).

We recommend that you start your experiments with the VirtualBox web service by using our object-oriented client libraries for JAX-WS, a web service toolkit for Java, which enables you to write code to interact with VirtualBox in the simplest manner possible.

2.1 The object-oriented web service for JAX-WS

JAX-WS is a powerful toolkit by Sun Microsystems to build both server and client code with Java. It is part of Java 6 (JDK 1.6), but can also be obtained separately for Java 5 (JDK 1.5). The VirtualBox SDK comes with precompiled OOWS bindings for both Java 5 and 6.

The following sections explain how to get the JAX-WS sample code running and explain a few common practices when using the JAX-WS object-oriented web service.

2.1.1 Preparations

Since JAX-WS is already integrated into Java 6, no additional preparations are needed for Java 6.

If you are using Java 5 (JDK 1.5.x), you will first need to download and install an external JAX-WS implementation, as Java 5 does not support JAX-WS out of the box; for example, you can download one from here: <https://jax-ws.dev.java.net/2.1.4/JAXWS2.1.4-20080502.jar>. Then perform the installation (`java -jar JAXWS2.1.4-20080502.jar`).

2.1.2 Getting started: running the sample code

To run the OOWS for JAX-WS samples that we ship with the SDK, perform the following steps:

1. Open a terminal and change to the directory where the JAX-WS samples reside.¹ Examine the header of `Makefile` to see if the supplied variables (Java compiler, Java executable) and a few other details match your system settings.
2. To start the VirtualBox web service, open a second terminal and change to the directory where the VirtualBox executables are located. Then type:

```
./vboxwebsrv -v
```

The web service now waits for connections and will run until you press Ctrl+C in this second terminal. The `-v` argument causes it to log all connections to the terminal. (See chapter 1.4, *Running the web service*, page 16 for details on how to run the web service.)

¹In `sdk/bindings/webservice/java/jax-ws/samples/`.

2 The object-oriented web service (OOWS)

3. Back in the first terminal and still in the samples directory, to start a simple client example just type:

```
make run16
```

if you're on a Java 6 system; on a Java 5 system, run `make run15` instead.

This should work on all Unix-like systems such as Linux and Solaris. For Windows systems, use commands similar to what is used in the Makefile.

This will compile the `clienttest.java` code on the first call and then execute the resulting `clienttest` class to show the locally installed VMs (see below).

The `clienttest` sample imitates a few typical command line tasks that `VBoxManage`, `VirtualBox`'s regular command-line front-end, would provide (see the `VirtualBox User Manual` for details). In particular, you can run:

- `java clienttest show vms`: show the virtual machines that are registered locally.
- `java clienttest list hostinfo`: show various information about the host this `VirtualBox` installation runs on.
- `java clienttest startvm <vmname|uuid>`: start the given virtual machine.

The `clienttest.java` sample code illustrates common basic practices how to use the `VirtualBox OOWS` for `JAX-WS`, which we will explain in more detail in the following chapters.

2.1.3 Logging on to the web service

Before a web service client can do anything useful, two objects need to be created, as can be seen in the `clienttest` constructor:

1. An instance of `IWebSessionManager`, which is an interface provided by the web service to manage “web sessions” – that is, stateful connections to the web service with persistent objects upon which methods can be invoked.

In the `OOWS` for `JAX-WS`, the `IWebSessionManager` class must be constructed explicitly, and a URL must be provided in the constructor that specifies where the web service (the server) awaits connections. The code in `clienttest.java` connects to “`http://localhost:18083/`”, which is the default.

The port number, by default 18083, must match the port number given to the `vboxwebsrv` command line; see chapter 1.4.1, *Command line options of vboxwebsrv*, page 16.

2. After that, the code calls `IWebSessionManager::logon()`, which is the first call that actually communicates with the server. This authenticates the client with the web service and returns an instance of `IVirtualBox`, the most fundamental interface of the `VirtualBox` web service, from which all other functionality can be derived.

If `logon` doesn't work, please take another look at chapter 1.4.2, *Authenticating at web service logon*, page 17.

2.1.4 Obtaining basic machine information. Reading attributes

To enumerate virtual machines, one would look at the “machines” array attribute in the `IVirtualBox` object returned by the `logon()` call mentioned above (see `IVirtualBox::machines`). This array contains all virtual machines currently registered with the host, each of them being an instance of `IMachine`. From each such instance, one can query additional information, such as the `UUID`, the name, memory, operating system and more by looking at the attributes; see the attributes list in the `IMachine` documentation.

Note that attributes are mapped to corresponding “get” and (if the attribute is not read-only) “set” methods. So when the documentation says that `IMachine` has a “name” attribute, this means you need to code something like the following to get the machine’s name:

```
IMachine machine = ...;
String name = machine.getName();
```

Boolean attribute getters can sometimes be called `isAttribute()` due to JAX-WS naming conventions.

2.1.5 Changing machine settings. Sessions

As said in the previous section, to read a machine’s attribute, one invokes the corresponding “get” method. One would think that to change settings of a machine, it would suffice to call the corresponding “set” method – for example, to set a VM’s memory to 1024 MB, one would call `setMemorySize(1024)`. Try that, and you will get an error: “The machine is not mutable.”

So unfortunately, things are not that easy. `VirtualBox` is a complicated environment in which multiple processes compete for possibly the same resources, especially machine settings. As a result, machines must be “locked” before they can either be modified or started. This is to prevent multiple processes from making conflicting changes to a machine: it should, for example, not be allowed to change the memory size of a virtual machine while it is running. (You can’t add more memory to a real computer while it is running either, at least not to an ordinary PC.) Also, two processes must not change settings at the same time, or start a machine at the same time.

These requirements are implemented in the Main API by way of “sessions”, in particular, the `ISession` interface. Each process has its own instance of `ISession`. In the web service, you cannot create such an object, but `vboxwebrv` creates one for you when you log on, which you can obtain by calling `IWebSessionManager::getSessionObject()`.

This session object must then be used like a mutex semaphore in common programming environments; in `VirtualBox` terminology, one must “open a direct session” on a machine before it can be modified. This is done by calling `IVirtualBox::openSession()`.

After the direct session has been opened, the `ISession::machine` attribute contains a copy of the original `IMachine` object upon which the session was opened, but this copy is “mutable”: you can invoke “set” methods on it.

Finally, it is important to never forget to close the session again, by calling `ISession::close()`. Otherwise, when the calling process ends, the machine will receive the state “aborted”, which can lead to loss of data.

So the sequence to change a machine’s memory to 1024 MB is something like this:

```
IWebSessionManager mgr ...;
IVirtualBox vbox = mgr.logon(user, pass);
...
IMachine machine = ...; // read-only machine
ISession session = mgr.getSessionObject();
vbox.openSession(session, machine.getId()); // machine is now locked
IMachine mutable = session.getMachine(); // obtain mutable machine
mutable.setMemorySize(1024);
mutable.saveSettings(); // write settings to XML
session.close();
```

2.1.6 Starting machines

To start a virtual machine, in `VirtualBox` terminology, one “opens a remote session” for it by calling `IVirtualBox::openRemoteSession()`. In doing so, the caller instructs the `VirtualBox` engine to start a new process with the virtual machine in it, since to the host, each virtual machine looks like a single process, even if it has hundreds of its own processes inside. (This new VM process in turn opens a direct session on the machine, thus locking it to prevent access from other processes; this is why opening another session will fail while the VM is running.)

Starting a machine looks something like this:

```
IWebSessionManager mgr ...;
IVirtualBox vbox = mgr.logon(user, pass);
...
IMachine machine = ...; // read-only machine
IProgress prog = vbox.openRemoteSession(oSession,
                                     machine.getId(),
                                     "gui", // session type
                                     ""); // possibly environment setting
prog.waitForCompletion(10000); // give the process 10 secs
if (prog.getResultCode() != 0) // check success
    System.out.println("Session failed!");
```

Note that no in-process (local) session object is needed here since we instruct VirtualBox to spawn a new process, which will have its own session object.

2.1.7 Object management

The current OOWS for JAX-WS has certain memory management related limitations. When you no longer need an object, call its `IManagedObjectRef::release()` method explicitly, which frees appropriate managed reference, as is required by the raw webservice; see chapter 3.3.3, *Managed object references*, page 26 for details. This limitation may be reconsidered in a future version of the VirtualBox SDK.

2.2 The object-oriented web service for Python

VirtualBox comes with two flavors of a Python API: one for web service, discussed here, and one for the COM/XPCOM API discussed in chapter 5.1, *Python COM API*, page 30. The client code is mostly similar, except for the initialization part, so it is up to the application developer to choose the appropriate technology. Moreover, a common Python glue layer exists, abstracting out concrete platform access details, see chapter 5.2, *Common Python bindings layer*, page 30.

As indicated in chapter 1.2, *Two guises of the same “Main API”: the web service or COM/XPCOM*, page 14, the COM/XPCOM API gives better performance without the SOAP overhead, enables certain features not possible via SOAP (e.g. callbacks) and does not require a web server to be running. On the other hand, the COM/XPCOM Python API requires a suitable Python bridge for your Python installation (VirtualBox ships the most important ones for each platform²), and you cannot connect to VirtualBox remotely. On Windows, you can use the Main API from Python if the Win32 extensions package for Python³ is installed.

The VirtualBox OOWS for Python relies on the Python ZSI SOAP implementation (see <http://pywebsvcs.sourceforge.net/zsi.html>), which you will need to install locally before trying the examples.

To get started, open a terminal and change to the `bindings/glue/python/sample` directory, which contains an example of a simple interactive shell able to control a VirtualBox instance. The shell is written using the API layer, thereby hiding different implementation details, so it is actually an example of code share among XPCOM, MSCOM and web services. If you are interested in how to interact with the webservices layer directly, have a look at `install/vboxapi/___init___py` which contains the glue layer for all target platforms (i.e. XPCOM, MSCOM and web services).

To start the shell, perform the following commands:

```
/opt/VirtualBox/vboxwebsrv -t 0
# start webservice with object autocollection disabled
```

²On Mac OS X only the Python versions bundled with the OS are officially supported. This means Python 2.3 for 10.4, Python 2.5 for 10.5 and Python 2.5 and 2.6 for 10.6.

³See http://sourceforge.net/project/showfiles.php?group_id=78018.

2 The object-oriented web service (OOWS)

```
export VBOX_PROGRAM_PATH=/opt/VirtualBox
    # your VirtualBox installation directory
export VBOX_SDK_PATH=/home/youruser/vbox-sdk
    # where you've extracted the SDK
./vboxshell.py -w
```

See chapter 6, *The VirtualBox shell*, page 37 for more details on the shell's functionality. For you, as a VirtualBox application developer, the vboxshell sample could be interesting as an example of how to write code targeting both local and remote cases (COM/XPCOM and SOAP). The common part of the shell is the same – the only difference is how it interacts with the invocation layer. You can use the connect shell command to connect to remote VirtualBox servers; in this case you can skip starting the local webserver.

2.3 The object-oriented web service for PHP

VirtualBox also comes with object-oriented web service (OOWS) wrappers for PHP5. These wrappers rely on the PHP SOAP Extension⁴, which can be installed by configuring PHP with `--enable-soap`.

⁴See <http://www.php.net/soap>.

3 Using the raw web service with any language

The following examples show you how to use the raw web service, without the object-oriented client-side code that was described in the previous chapter.

3.1 Raw web service example for Java with Axis

Axis is an older web service toolkit created by the Apache foundation. If your distribution does not have it installed, you can get a binary from <http://www.apache.org>. The following examples assume that you have Axis 1.4 installed.

The VirtualBox SDK ships with an example for Axis that, again, is called `clienttest.java` and that imitates a few of the commands of `VBoxManage` over the wire.

Then perform the following steps:

1. Create a working directory somewhere. Under your VirtualBox installation directory, find the `sdk/webservice/samples/java/axis/` directory and copy the file `clienttest.java` to your working directory.
2. Open a terminal in your working directory. Execute the following command:

```
java org.apache.axis.wsdl.WSDL2Java /path/to/vboxwebService.wsdl
```

The `vboxwebService.wsdl` file should be located in the `sdk/webservice/` directory.

If this fails, your Apache Axis may not be located on your system classpath, and you may have to adjust the `CLASSPATH` environment variable. Something like this:

```
export CLASSPATH="/path-to-axis-1.4/lib/*":$CLASSPATH
```

Use the directory where the Axis JAR files are located. Mind the quotes so that your shell passes the `""` character to the `java` executable without expanding. Alternatively, add a corresponding `-classpath` argument to the `java` call above.

If the command executes successfully, you should see an `org` directory with subdirectories containing Java source files in your working directory. These classes represent the interfaces that the VirtualBox web service offers, as described by the WSDL file.

This is the bit that makes using web services so attractive to client developers: if a language's toolkit understands WSDL, it can generate large amounts of support code automatically. Clients can then easily use this support code and can be done with just a few lines of code.

3. Next, compile the `clienttest.java` source:

```
javac clienttest.java
```

This should yield a `clienttest.class` file.

4. To start the VirtualBox web service, open a second terminal and change to the directory where the VirtualBox executables are located. Then type:

```
./vboxwebsrv -v
```

The web service now waits for connections and will run until you press Ctrl+C in this second terminal. The `-v` argument causes it to log all connections to the terminal. (See chapter 1.4, *Running the web service*, page 16 for details on how to run the web service.)

5. Back in the original terminal where you compiled the Java source, run the resulting binary, which will then connect to the web service:

```
java clienttest
```

The client sample will connect to the web service (on localhost, but the code could be changed to connect remotely if the web service was running on a different machine) and make a number of method calls. It will output the version number of your VirtualBox installation and a list of all virtual machines that are currently registered (with a bit of seemingly random data, which will be explained later).

3.2 Raw web service example for Perl

We also ship a small sample for Perl. It uses the SOAP::Lite perl module to communicate with the VirtualBox web service.

The `sdk/bindings/webservice/perl/lib/` directory contains a pre-generated Perl module that allows for communicating with the web service from Perl. You can generate such a module yourself using the “stubmaker” tool that comes with SOAP::Lite, but since that tool is slow as well as sometimes unreliable, we are shipping a working module with the SDK for your convenience.

Perform the following steps:

1. If SOAP::Lite is not yet installed on your system, you will need to install the package first. On Debian-based systems, the package is called `libsoap-lite-perl`; on Gentoo, it's `dev-perl/SOAP-Lite`.
2. Open a terminal in the `sdk/bindings/webservice/perl/samples/` directory.
3. To start the VirtualBox web service, open a second terminal and change to the directory where the VirtualBox executables are located. Then type:

```
./vboxwebsrv -v
```

The web service now waits for connections and will run until you press Ctrl+C in this second terminal. The `-v` argument causes it to log all connections to the terminal. (See chapter 1.4, *Running the web service*, page 16 for details on how to run the web service.)

4. In the first terminal with the Perl sample, run the `clienttest.pl` script:

```
perl -I ../lib clienttest.pl
```

3.3 Programming considerations for the raw web service

If you use the raw web service, you need to keep a number of things in mind, or you will sooner or later run into issues that are not immediately obvious. By contrast, the object-oriented client-side libraries described in chapter 2, *The object-oriented web service (OOWS)*, page 18 take care of these things automatically and thus greatly simplify using the web service.

3.3.1 Fundamental conventions

If you are familiar with other web services, you may find the VirtualBox web service to behave a bit differently to accommodate for the fact that VirtualBox web service more or less maps the VirtualBox Main COM API. The following main differences had to be taken care of:

- Web services, as expressed by WSDL, are not object-oriented. Even worse, they are normally stateless (or, in web services terminology, “loosely coupled”). Web service operations are entirely procedural, and one cannot normally make assumptions about the state of a web service between function calls.

In particular, this normally means that you cannot work on objects in one method call that were created by another call.

- By contrast, the VirtualBox Main API, being expressed in COM, is object-oriented and works entirely on objects, which are grouped into public interfaces, which in turn have attributes and methods associated with them.

For the VirtualBox web service, this results in three fundamental conventions:

1. All **function names** in the VirtualBox web service consist of an interface name and a method name, joined together by an underscore. This is because there are only functions (“operations”) in WSDL, but no classes, interfaces, or methods.

In addition, all calls to the VirtualBox web service (except for logon, see below) take a **managed object reference** as the first argument, representing the object upon which the underlying method is invoked. (Managed object references are explained in detail below; see chapter 3.3.3, *Managed object references*, page 26.)

So, when one would normally code, in the pseudo-code of an object-oriented language, to invoke a method upon an object:

```
IMachine machine;  
result = machine.getName();
```

In the VirtualBox web service, this looks something like this (again, pseudo-code):

```
IMachineRef machine;  
result = IMachine_getName(machine);
```

2. To make the web service stateful, and objects persistent between method calls, the VirtualBox web service introduces a **session manager** (by way of the [IWebSessionManager](#) interface), which manages object references. Any client wishing to interact with the web service must first log on to the session manager and in turn receives a managed object reference to an object that supports the [IVirtualBox](#) interface (the basic interface in the Main API).

In other words, as opposed to other web services, **the VirtualBox web service is both object-oriented and stateful.**

3.3.2 Example: A typical web service client session

A typical short web service session to retrieve the version number of the VirtualBox web service (to be precise, the underlying Main API version number) looks like this:

1. A client logs on to the web service by calling [IWebSessionManager::logon\(\)](#) with a valid user name and password. See chapter 1.4.2, *Authenticating at web service logon*, page 17 for details about how authentication works.
2. On the server side, `vboxwebsrv` creates a session, which persists until the client calls [IWebSessionManager::logoff\(\)](#) or the session times out after a configurable period of inactivity (see chapter 1.4.1, *Command line options of vboxwebsrv*, page 16).

For the new session, the web service creates an instance of [IVirtualBox](#). This interface is the most central one in the Main API and allows access to all other interfaces, either through attributes or method calls. For example, [IVirtualBox](#) contains a list of all virtual machines

3 Using the raw web service with any language

that are currently registered (as they would be listed on the left side of the VirtualBox main program).

The web service then creates a managed object reference for this instance of `IVirtualBox` and returns it to the calling client, which receives it as the return value of the `logon` call. Something like this:

```
string oVirtualBox;  
oVirtualBox = webservice.IWebSessionManager_logon("user", "pass");
```

(The managed object reference “`oVirtualBox`” is just a string consisting of digits and dashes. However, it is a string with a meaning and will be checked by the web service. For details, see below. As hinted above, `IWebSessionManager::logon()` is the *only* operation provided by the web service which does not take a managed object reference as the first argument!)

3. The VirtualBox Main API documentation says that the `IVirtualBox` interface has a `version` attribute, which is a string. For each attribute, there is a “get” and a “set” method in COM, which maps to according operations in the web service. So, to retrieve the “version” attribute of this `IVirtualBox` object, the web service client does this:

```
string version;  
version = webservice.IVirtualBox_getVersion(oVirtualBox);  
  
print version;
```

And it will print “3.2.14”.

4. The web service client calls `IWebSessionManager::logoff()` with the VirtualBox managed object reference. This will clean up all allocated resources.

3.3.3 Managed object references

To a web service client, a managed object reference looks like a string: two 64-bit hex numbers separated by a dash. This string, however, represents a COM object that “lives” in the web service process. The two 64-bit numbers encoded in the managed object reference represent a session ID (which is the same for all objects in the same web service session, i.e. for all objects after one `logon`) and a unique object ID within that session.

Managed object references are created in two situations:

1. When a client logs on, by calling `IWebSessionManager::logon()`.

Upon `logon`, the `websession` manager creates one instance of `IVirtualBox` and another object of `ISession` representing the web service session. This can be retrieved using `IWebSessionManager::getSessionObject()`.

(Technically, there is always only one `IVirtualBox` object, which is shared between all sessions and clients, as it is a COM singleton. However, each session receives its own managed object reference to it. The `ISession` object, however, is created and destroyed for each session.)

2. Whenever a web service clients invokes an operation whose COM implementation creates COM objects.

For example, `IVirtualBox::createMachine()` creates a new instance of `IMachine`; the COM object returned by the COM method call is then wrapped into a managed object reference by the web server, and this reference is returned to the web service client.

Internally, in the web service process, each managed object reference is simply a small data structure, containing a COM pointer to the “real” COM object, the web session ID and the object ID. This structure is allocated on creation and stored efficiently in hashes, so that the web service can look up the COM object quickly whenever a web service client wishes to make a method call.

The random session ID also ensures that one web service client cannot intercept the objects of another.

Managed object references are not destroyed automatically and must be released by explicitly calling `IManagedObjectRef::release()`. This is important, as otherwise hundreds or thousands of managed object references (and corresponding COM objects, which can consume much more memory!) can pile up in the web service process and eventually cause it to deny service.

To reiterate: The underlying COM object, which the reference points to, is only freed if the managed object reference is released. It is therefore vital that web service clients properly clean up after the managed object references that are returned to them.

When a web service client calls `IWebSessionManager::logoff()`, all managed object references created during the session are automatically freed. For short-lived sessions that do not create a lot of objects, logging off may therefore be sufficient, although it is certainly not “best practice”.

3.3.4 Some more detail about web service operation

3.3.4.1 SOAP messages

Whenever a client makes a call to a web service, this involves a complicated procedure internally. These calls are remote procedure calls. Each such procedure call typically consists of two “message” being passed, where each message is a plain-text HTTP request with a standard HTTP header and a special XML document following. This XML document encodes the name of the procedure to call and the argument names and values passed to it.

To give you an idea of what such a message looks like, assuming that a web service provides a procedure called “SayHello”, which takes a string “name” as an argument and returns “Hello” with a space and that name appended, the request message could look like this:

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:test="http://test/">
<SOAP-ENV:Body>
  <test:SayHello>
    <name>Peter</name>
  </test:SayHello>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

A similar message – the “response” message – would be sent back from the web service to the client, containing the return value “Hello Peter”.

Most programming languages provide automatic support to generate such messages whenever code in that programming language makes such a request. In other words, these programming languages allow for writing something like this (in pseudo-C++ code):

```
webServiceClass service("localhost", 18083); // server and port
string result = service.SayHello("Peter"); // invoke remote procedure
```

and would, for these two pseudo-lines, automatically perform these steps:

1. prepare a connection to a web service running on port 18083 of “localhost”;
2. for the `SayHello()` function of the web service, generate a SOAP message like in the above example by encoding all arguments of the remote procedure call (which could involve all kinds of type conversions and complex marshalling for arrays and structures);
3. connect to the web service via HTTP and send that message;
4. wait for the web service to send a response message;

5. decode that response message and put the return value of the remote procedure into the “result” variable.

3.3.4.2 Service descriptions in WSDL

In the above explanations about SOAP, it was left open how the programming language learns about how to translate function calls in its own syntax into proper SOAP messages. In other words, the programming language needs to know what operations the web service supports and what types of arguments are required for the operation’s data in order to be able to properly serialize and deserialize the data to and from the web service. For example, if a web service operation expects a number in “double” floating point format for a particular parameter, the programming language cannot send to it a string instead.

For this, the Web Service Definition Language (WSDL) was invented, another XML substandard that describes exactly what operations the web service supports and, for each operation, which parameters and types are needed with each request and response message. WSDL descriptions can be incredibly verbose, and one of the few good things that can be said about this standard is that it is indeed supported by most programming languages.

So, if it is said that a programming language “supports” web services, this typically means that a programming language has support for parsing WSDL files and somehow integrating the remote procedure calls into the native language syntax – for example, like in the Java sample shown in chapter 3.1, [Raw web service example for Java with Axis](#), page 23.

For details about how programming languages support web services, please refer to the documentation that comes with the individual languages. Here are a few pointers:

1. For **C++**, among many others, the gSOAP toolkit is a good option. Parts of gSOAP are also used in VirtualBox to implement the VirtualBox web service.
2. For **Java**, there are several implementations already described in this document (see chapter 2.1, [The object-oriented web service for JAX-WS](#), page 18 and chapter 3.1, [Raw web service example for Java with Axis](#), page 23).
3. **Perl** supports WSDL via the SOAP::Lite package. This in turn comes with a tool called `stubmaker.pl` that allows you to turn any WSDL file into a Perl package that you can import. (You can also import any WSDL file “live” by having it parsed every time the script runs, but that can take a while.) You can then code (again, assuming the above example):

```
my $result = servicename->sayHello("Peter");
```

A sample that uses SOAP::Lite was described in chapter 3.2, [Raw web service example for Perl](#), page 24.

4 Using the Main API documentation to write web service clients

As “interfaces”, “attributes” and “methods” are COM concepts, please read the documentation in chapter 9, *Classes (interfaces)*, page 45 and chapter 10, *Enumerations (enums)*, page 223 with the following notes in mind.

The **object-oriented web service for JAX-WS** attempts to map the Main API as closely as possible to the Java and Python languages. In other words, objects are objects, interfaces become classes, and you can call methods on objects as you would on local objects.

The main difference remains with attributes: to read an attribute, call a “getXXX” method, with “XXX” being the attribute name with a capitalized first letter. So when the Main API Reference says that `IMachine` has a “name” attribute, call `getName()` on an `IMachine` object to obtain a machine’s name. Unless the attribute is marked as read-only in the documentation, there will also be a corresponding “set” method.

With the **raw webservice**, due to the limitations of SOAP and WSDL lined out in chapter 3.3.1, *Fundamental conventions*, page 24, things are more complicated:

1. Any COM method call becomes a **plain function call** in the raw web service, with the object as an additional first parameter (before the “real” parameters listed in the documentation). So when the documentation says that the `IVirtualBox` interface supports the `createMachine()` method, the web service operation is `IVirtualBox_createMachine()`, and a managed object reference to an `IVirtualBox` object must be passed as the first argument.
2. For **attributes** in interfaces, there will be at least one “get” function; there will also be a “set” function, unless the attribute is “readonly”. The attribute name will be appended to the “get” or “set” prefix, with a capitalized first letter. So, the “version” readonly attribute of the `IVirtualBox` interface can be retrieved by calling `IVirtualBox_getVersion()`.
3. Whenever the API documentation says that a method (or an attribute getter) returns an **object**, it will returned a managed object reference in the web service instead. As said above, managed object references should be released if the web service client does not log off again immediately!

5 The VirtualBox COM/XPCOM API

If you do not require *remote* procedure calls such as those offered by the VirtualBox web service, and if you know Python or C++ as well as COM, you might find it preferable to program VirtualBox's Main API directly via COM.

COM stands for "Component Object Model" and is a standard originally introduced by Microsoft in the 1990s for Microsoft Windows. It allows for organizing software in an object-oriented way and across processes; code in one process may access objects that live in another process.

COM has several advantages: it is language-neutral, meaning that even though all of VirtualBox is internally written in C++, programs written in other languages could communicate with it. COM also cleanly separates interface from implementation, so that external programs need not know anything about the messy and complicated details of VirtualBox internals.

On a Windows host, all parts of VirtualBox will use the COM functionality that is native to Windows. On other hosts (including Linux), VirtualBox comes with a built-in implementation of XPCOM, as originally created by the Mozilla project, which we have enhanced to support interprocess communication on a level comparable to Microsoft COM. Internally, VirtualBox has an abstraction layer that allows the same VirtualBox code to work both with native COM as well as our XPCOM implementation.

5.1 Python COM API

On Windows, Python scripts can use COM and VirtualBox interfaces to control almost all aspects of virtual machine execution. As an example, use the following commands to instantiate the VirtualBox object and start a VM:

```
vbox = win32com.client.Dispatch("VirtualBox.VirtualBox")
session = win32com.client.Dispatch("VirtualBox.Session")
uuid = "uuid of machine to start"
progress = vbox.openRemoteSession(session, uuid, "gui", "")
progress.waitForCompletion(-1)
```

Also, see `/bindings/glue/python/samples/vboxshell.py` for more advanced usage scenarios. However, unless you have specific requirements, we strongly recommend to use the generic glue layer described in the next section to access MS COM objects.

5.2 Common Python bindings layer

As different wrappers ultimately provide access to the same underlying API, and to simplify porting and development of Python application using the VirtualBox Main API, we developed a common glue layer that abstracts out most platform-specific details from the application and allows the developer to focus on application logic. The VirtualBox installer automatically sets up this glue layer for the system default Python install. See below for details on how to set up the glue layer if you want to use a different Python installation.

In this layer, the class `VirtualBoxManager` hides most platform-specific details. It can be used to access both the local (COM) and the webservice-based API. The following code can be used by an application to use the glue layer.

5 The VirtualBox COM/XPCOM API

```
# This code assumes vboxapi.py from VirtualBox distribution
# being in PYTHONPATH, or installed system-wide
from vboxapi import VirtualBoxManager

# This code initializes VirtualBox manager with default style
# and parameters
virtualBoxManager = VirtualBoxManager(None, None)

# Alternatively, one can be more verbose, and initialize
# glue with webservice backend, and provide authentication
# information
virtualBoxManager = VirtualBoxManager("WEBSERVICE",
                                     {'url':'http://myhost.com::18083/',
                                      'user':'me',
                                      'password':'secret'})
```

We supply the `VirtualBoxManager` constructor with 2 arguments: style and parameters. Style defines which bindings style to use (could be “MSCOM”, “XPCOM” or “WEBSERVICE”), and if set to `None` defaults to usable platform bindings (MS COM on Windows, XPCOM on other platforms). The second argument defines parameters, passed to the platform-specific module, as we do in the second example, where we pass username and password to be used to authenticate against the web service.

After obtaining the `VirtualBoxManager` instance, one can perform operations on the `IVirtualBox` class. For example, the following code will start a virtual machine by name or ID:

```
vbox = virtualBoxManager.vbox
mgr = virtualBoxManager.mgr
print "Version is",vbox.version

def machById(id):
    mach = None
    for m in virtualBoxManager.getArray(vbox, 'machines'):
        if m.name == id or mach.id == id:
            mach = m
            break
    return mach

name = "Linux"
mach = machById(name)
if mach is None:
    print "cannot find machine",name
else:
    session = mgr.getSessionObject(vbox)
    # one can also start headless session with "vrdp" instead of "gui"
    progress = vb.openRemoteSession(session, mach.id, "gui", "")
    progress.waitForCompletion(-1)
    session.close()
```

This code also shows cross-platform access to array properties (certain limitations prevent one from using `vbox.machines` to access a list of available virtual machines in case of XPCOM), and a mechanism of uniform session creation (`virtualBoxManager.mgr.getSessionObject()`).

In case you want to use the glue layer with a different Python installation, use these steps in a shell to add the necessary files:

```
# cd VBOX_INSTALL_PATH/sdk/installer
# PYTHON vboxapisetup.py install
```

5.3 C++ COM API

VirtualBox ships with sample programs that demonstrate how to use the Main API to implement a number of tasks on your host platform. These samples can be found in the

/bindings/xpcom/samples directory for Linux, Mac OS X and Solaris and /bindings/mscom/samples for Windows. The two samples are actually different, because the one for Windows uses native COM, whereas the other uses our XPCOM implementation, as described above.

Since COM and XPCOM are conceptually very similar but vary in the implementation details, we have created a “glue” layer that shields COM client code from these differences. All VirtualBox uses is this glue layer, so the same code written once works on both Windows hosts (with native COM) as well as on other hosts (with our XPCOM implementation). It is recommended to always use this glue code instead of using the COM and XPCOM APIs directly, as it is very easy to make your code completely independent from the platform it is running on.

In order to encapsulate platform differences between Microsoft COM and XPCOM, the following items should be kept in mind when using the glue layer:

1. **Attribute getters and setters.** COM has the notion of “attributes” in interfaces, which roughly compare to C++ member variables in classes. The difference is that for each attribute declared in an interface, COM automatically provides a “get” method to return the attribute’s value. Unless the attribute has been marked as “readonly”, a “set” attribute is also provided.

To illustrate, the `IVirtualBox` interface has a “version” attribute, which is read-only and of the “wstring” type (the standard string type in COM). As a result, you can call the “get” method for this attribute to retrieve the version number of VirtualBox.

Unfortunately, the implementation differs between COM and XPCOM. Microsoft COM names the “get” method like this: `get_Attribute()`, whereas XPCOM uses this syntax: `GetAttribute()` (and accordingly for “set” methods). To hide these differences, the VirtualBox glue code provides the `COMGETTER(attrib)` and `COMSETTER(attrib)` macros. So, `COMGETTER(version)()` (note, two pairs of brackets) expands to `get_Version()` on Windows and `GetVersion()` on other platforms.

2. **Unicode conversions.** While the rest of the modern world has pretty much settled on encoding strings in UTF-8, COM, unfortunately, uses UCS-16 encoding. This requires a lot of conversions, in particular between the VirtualBox Main API and the Qt GUI, which, like the rest of Qt, likes to use UTF-8.

To facilitate these conversions, VirtualBox provides the `com::Bstr` and `com::Utf8Str` classes, which support all kinds of conversions back and forth.

3. **COM autpointers.** Possibly the greatest pain of using COM – reference counting – is alleviated by the `ComPtr<T>` template provided by the `ptr.h` file in the glue layer.

5.4 Event queue processing

Both VirtualBox client programs and frontends should periodically perform processing of the main event queue, and do that on the application’s main thread. In case of a typical GUI Windows/Mac OS application this happens automatically in the GUI’s dispatch loop. However, for CLI only application, the appropriate actions have to be taken. For C++ applications, the VirtualBox SDK provided glue method

```
int EventQueue::processEventQueue(uint32_t cMsTimeout)
```

can be used for both blocking and non-blocking operations. For the Python bindings, a common layer provides the method

```
VirtualBoxManager.waitForEvents(ms)
```


with similar semantics.

Things get somewhat more complicated for situations where an application using VirtualBox cannot directly control the main event loop and the main event queue is separated from the event queue of the programming library (for example in case of Qt on Unix platforms). In such a case, the application developer is advised to use a platform/toolkit specific event injection mechanism to force event queue checks either based on periodical timer events delivered to the main thread, or by using custom platform messages to notify the main thread when events are available. See the VBoxSDL and Qt (VirtualBox) frontends as examples.

5.5 Visual Basic and Visual Basic Script (VBS) on Windows hosts

On Windows hosts, one can control some of the VirtualBox Main API functionality from VBS scripts, and pretty much everything from Visual Basic programs.¹

VBS is scripting language available in any recent Windows environment. As an example, the following VBS code will print VirtualBox version:

```
set vb = CreateObject("VirtualBox.VirtualBox")
Wscript.Echo "VirtualBox version " & vb.version
```

See `bindings/mscom/vbs/sample/vboxinfo.vbs` for the complete sample.

Visual Basic is a popular high level language capable of accessing COM objects. The following VB code will iterate over all available virtual machines:

```
Dim vb As VirtualBox.IVirtualBox

vb = CreateObject("VirtualBox.VirtualBox")
machines = ""
For Each m In vb.Machines
    m = m & " " & m.Name
Next
```

See `bindings/mscom/vb/sample/vboxinfo.vb` for the complete sample.

5.6 C binding to XPCOM API

Note: This section currently applies to Linux hosts only.

Starting with version 2.2, VirtualBox offers a C binding for the XPCOM API.

The C binding provides a layer enabling object creation, method invocation and attribute access from C.

5.6.1 Getting started

The following sections describe how to use the C binding in a C program.

¹The difference results from the way VBS treats COM safearrays, which are used to keep lists in the Main API. VBS expects every array element to be a VARIANT, which is too strict a limitation for any high performance API. We may lift this restriction for interface APIs in a future version, or alternatively provide conversion APIs.

For Linux, a sample program is provided which demonstrates use of the C binding to initialize XPCOM, get handles for VirtualBox and Session objects, make calls to list and start virtual machines, and uninitialized resources when done. The program uses the VBoxGlue library to open the C binding layer during runtime.

The sample program `tstXPCOMGlue` is located in the `bin` directory and can be run without arguments. It lists registered machines on the host along with some additional information and ask for a machine to start. The source for this program is available in `sdk/bindings/xpcom/cbinding/samples/` directory. The source for the `VBoxGlue` library is available in the `sdk/bindings/xpcom/cbinding/` directory.

5.6.2 XPCOM initialization

Just like in C++, XPCOM needs to be initialized before it can be used. The `VBoxCAPI_v2_5.h` header provides the interface to the C binding. Here's how to initialize XPCOM:

```
#include "VBoxCAPI_v2_5.h"
...
PCVBOXXPCOM g_pVBoxFuncs = NULL;
IVirtualBox *vbox        = NULL;
ISession *session        = NULL;

/*
 * VBoxGetXPCOMCFunctions() is the only function exported by
 * VBoxXPCOMC.so and the only one needed to make virtualbox
 * work with C. This functions gives you the pointer to the
 * function table (g_pVBoxFuncs).
 *
 * Once you get the function table, then how and which functions
 * to use is explained below.
 *
 * g_pVBoxFuncs->pfComInitialize does all the necessary startup
 * action and provides us with pointers to vbox and session handles.
 * It should be matched by a call to g_pVBoxFuncs->pfComUninitialize()
 * when done.
 */

g_pVBoxFuncs = VBoxGetXPCOMCFunctions(VBOX_XPCOMC_VERSION);
g_pVBoxFuncs->pfComInitialize(&vbox, &session);
```

If either `vbox` or `session` is still `NULL`, initialization failed and the XPCOM API cannot be used.

5.6.3 XPCOM method invocation

Method invocation is straightforward. It looks pretty much like the C++ way, augmented with an extra indirection due to accessing the `vtable` and passing a pointer to the object as the first argument to serve as the `this` pointer.

Using the C binding, all method invocations return a numeric result code.

If an interface is specified as returning an object, a pointer to a pointer to the appropriate object must be passed as the last argument. The method will then store an object pointer in that location.

In other words, to call an object's method what you need is

```
IObject *object;
nsresult rc;
...
/*
 * Calling void IObject::method(arg, ...)
 */
rc = object->vtbl->Method(object, arg, ...);
...

```

```
IFoo *foo;
/*
 * Calling IFoo IObject::method(arg, ...)
 */
rc = object->vtbl->Method(object, args, ..., &foo);
```

As a real-world example of a method invocation, let's call `IVirtualBox::openRemoteSession` which returns an `IProgress` object. Note again that the method name is capitalized.

```
IProgress *progress;
...
rc = vbox->vtbl->OpenRemoteSession(
    vbox,          /* this */
    session,      /* arg 1 */
    id,           /* arg 2 */
    sessionType,  /* arg 3 */
    env,          /* arg 4 */
    &progress     /* Out */
);
```

5.6.4 XPCOM attribute access

A construct similar to calling non-void methods is used to access object attributes. For each attribute there exists a getter method, the name of which is composed of `Get` followed by the capitalized attribute name. Unless the attribute is read-only, an analogous `Set` method exists. Let's apply these rules to read the `IVirtualBox::revision` attribute.

Using the `IVirtualBox` handle `vbox` obtained above, calling its `GetRevision` method looks like this:

```
PRUint32 rev;

rc = vbox->vtbl->GetRevision(vbox, &rev);
if (NS_SUCCEEDED(rc))
{
    printf("Revision: %u\n", (unsigned)rev);
}
```

All objects with their methods and attributes are documented in chapter 9, *Classes (interfaces)*, page 45.

5.6.5 String handling

When dealing with strings you have to be aware of a string's encoding and ownership.

Internally, XPCOM uses UTF-16 encoded strings. A set of conversion functions is provided to convert other encodings to and from UTF-16. The type of a UTF-16 character is `PRUnichar`. Strings of UTF-16 characters are arrays of that type. Most string handling functions take pointers to that type. Prototypes for the following conversion functions are declared in `VBoxCAPI_v2_5.h`.

5.6.5.1 Conversion of UTF-16 to and from UTF-8

```
int (*pfnUtf16ToUtf8)(const PRUnichar *pszString, char **ppszString);
int (*pfnUtf8ToUtf16)(const char *pszString, PRUnichar **pppszString);
```

5.6.5.2 Ownership

The ownership of a string determines who is responsible for releasing resources associated with the string. Whenever XPCOM creates a string, ownership is transferred to the caller. To avoid resource leaks, the caller should release resources once the string is no longer needed.

5.6.6 XPCOM uninitialization

Uninitialization is performed by `g_pVBoxFuncs->pfnComUninitialize()`. If your program can exit from more than one place, it is a good idea to install this function as an exit handler with Standard C's `atexit()` just after calling `g_pVBoxFuncs->pfnComInitialize()`, e.g.

```
#include <stdlib.h>
#include <stdio.h>

...

/*
 * Make sure g_pVBoxFuncs->pfnComUninitialize() is called at exit, no
 * matter if we return from the initial call to main or call exit()
 * somewhere else. Note that atexit registered functions are not
 * called upon abnormal termination, i.e. when calling abort() or
 * signal(). Separate provisions must be taken for these cases.
 */

if (atexit(g_pVBoxFuncs->pfnComUninitialize()) != 0) {
    fprintf(stderr, "failed to register g_pVBoxFuncs->pfnComUninitialize()\n");
    exit(EXIT_FAILURE);
}
```

Another idea would be to write your own `void myexit(int status)` function, calling `g_pVBoxFuncs->pfnComUninitialize()` followed by the real `exit()`, and use it instead of `exit()` throughout your program and at the end of `main`.

If you expect the program to be terminated by a signal (e.g. user types CTRL-C sending SIGINT) you might want to install a signal handler setting a flag noting that a signal was sent and then calling `g_pVBoxFuncs->pfnComUninitialize()` later on (usually *not* from the handler itself.)

That said, if a client program forgets to call `g_pVBoxFuncs->pfnComUninitialize()` before it terminates, there is a mechanism in place which will eventually release references held by the client. You should not rely on this, however.

5.6.7 Compiling and linking

A program using the C binding has to open the library during runtime using the help of glue code provided and as shown in the example `tstXPCOMCGLue.c`. Compilation and linking can be achieved, e.g., with a makefile fragment similar to

```
# Where is the XPCOM include directory?
INCS_XPCOM = -I../include
# Where is the glue code directory?
GLUE_DIR   = ..
GLUE_INC   = -I..

#Compile Glue Library
VBoxXPCOMCGLue.o: $(GLUE_DIR)/VBoxXPCOMCGLue.c
    $(CC) $(CFLAGS) $(INCS_XPCOM) $(GLUE_INC) -o $@ -c $<

# Compile.
program.o: program.c VBoxCAPI_v2_5.h
    $(CC) $(CFLAGS) $(INCS_XPCOM) $(GLUE_INC) -o $@ -c $<

# Link.
program: program.o VBoxXPCOMCGLue.o
    $(CC) -o $@ $^ -ldl
```

6 The VirtualBox shell

VirtualBox comes with an extensible shell, which allows you to control your virtual machines from the command line. It is also a nontrivial example of how to use the VirtualBox APIs from Python, for all three COM/XPCOM/WS styles of the API.

You can easily extend this shell with your own commands. Create a subdirectory named `.VirtualBox/shexts` below your home directory and put a Python file implementing your shell extension commands in this directory. This file must contain an array named `commands` containing your command definitions:

```
commands = {
    'cmd1': ['Command cmd1 help', cmd1],
    'cmd2': ['Command cmd2 help', cmd2]
}
```

For example, to create a command for creating hard drive images, the following code can be used:

```
def createHdd(ctx,args):
    # Show some meaningful error message on wrong input
    if (len(args) < 3):
        print "usage: createHdd sizeM location type"
        return 0

    # Get arguments
    size = int(args[1])
    loc = args[2]
    if len(args) > 3:
        format = args[3]
    else:
        # And provide some meaningful defaults
        format = "vdi"

    # Call VirtualBox API, using context's fields
    hdd = ctx['vb'].createHardDisk(format, loc)
    # Access constants using ctx['global'].constants
    progress = hdd.createBaseStorage(size, ctx['global'].constants.HardDiskVariant_Standard)
    # use standard progress bar mechanism
    ctx['progressBar'](progress)

    # Report errors
    if not hdd.id:
        print "cannot create disk (file %s exist?)" %(loc)
        return 0

    # Give user some feedback on success too
    print "created HDD with id: %s" %(hdd.id)

    # 0 means continue execution, other values mean exit from the interpreter
    return 0

commands = {
    'myCreateHDD': ['Create virtual HDD, createHdd size location type', createHdd]
}
```

6 *The VirtualBox shell*

Just store the above text in the file `createHdd` (or any other meaningful name) in `.VirtualBox/shexts/`. Start the VirtualBox shell, or just issue the `reloadExts` command, if the shell is already running. Your new command will now be available.

7 Main API change log

Generally, VirtualBox will maintain API compatibility within a major release; a major release occurs when the first or the second of the three version components of VirtualBox change (that is, in the x.y.z scheme, a major release is one where x or y change, but not when only z changes).

In other words, updates like those from 2.0.0 to 2.0.2 will not come with API breakages.

Migration between major releases most likely will lead to API breakage, so please make sure you updated code accordingly. The OOWS Java wrappers enforce that mechanism by putting VirtualBox classes into version-specific packages such as `org.virtualbox_2_2`. This approach allows for connecting to multiple VirtualBox versions simultaneously from the same Java application.

The following sections list incompatible changes that the Main API underwent since the original release of this SDK Reference with VirtualBox 2.0. A change is deemed “incompatible” only if it breaks existing client code (e.g. changes in method parameter lists, renamed or removed interfaces and similar). In other words, the list does not contain new interfaces, methods or attributes or other changes that do not affect existing client code.

7.1 Incompatible API changes with version 3.2

- The following interfaces were renamed for consistency:
 - `IMachine::getCpuProperty()` is now `IMachine::getCPUProperty()`;
 - `IMachine::setCpuProperty()` is now `IMachine::setCPUProperty()`;
 - `IMachine::getCpuIdLeaf()` is now `IMachine::getCPUIDLeaf()`;
 - `IMachine::setCpuIdLeaf()` is now `IMachine::setCPUIDLeaf()`;
 - `IMachine::removeCpuIdLeaf()` is now `IMachine::removeCPUIDLeaf()`;
 - `IMachine::removeAllCpuIdLeaves()` is now `IMachine::removeAllCPUIDLeaves()`;
 - the `CpuPropertyType` enum is now `CPUPropertyType`.
 - `IVirtualBoxCallback::onSnapshotDiscarded()` is now `IVirtualBoxCallback::onSnapshotDeleted()`.
- When creating a VM configuration with `IVirtualBox::createMachine()` it is now possible to ignore existing configuration files which would previously have caused a failure. For this the `override` parameter was added.
- Deleting snapshots via `IConsole::deleteSnapshot()` is now possible while the associated VM is running in almost all cases. The API is unchanged, but client code that verifies machine states to determine whether snapshots can be deleted may need to be adjusted.
- The `IoBackendType` enumeration was replaced with a boolean flag (see `IStorageController::useHostIOCache()`).
- To address multi-monitor support, the following APIs were extended to require an additional `screenId` parameter:
 - `IMachine::querySavedThumbnailSize()`
 - `IMachine::readSavedThumbnailToArray()`
 - `IMachine::querySavedScreenshotPNGSize()`
 - `IMachine::readSavedScreenshotPNGToArray()`
- The `shape` parameter of `IConsoleCallback::onMousePointerShapeChange()` was changed from a implementation-specific pointer to a safearray, enabling scripting languages to process pointer shapes.

7.2 Incompatible API changes with version 3.1

- Due to the new flexibility in medium attachments that was introduced with version 3.1 (in particular, full flexibility with attaching CD/DVD drives to arbitrary controllers), we seized the opportunity to rework all interfaces dealing with storage media to make the API more flexible as well as logical. The `IStorageController`, `IMedium`, `IMediumAttachment` and `IMachine` interfaces were affected the most. Existing code using them to configure storage and media needs to be carefully checked.

All media (hard disks, floppies and CDs/DVDs) are now uniformly handled through the `IMedium` interface. The device-specific interfaces (`IHardDisk`, `IDVDImage`, `IHostDVDDrive`, `IFloppyImage` and `IHostFloppyDrive`) have been merged into `IMedium`; CD/DVD and floppy media no longer need special treatment. The device type of a medium determines in which context it can be used. Some functionality was moved to the other storage-related interfaces.

`IMachine::attachHardDisk` and similar methods have been renamed and generalized to deal with any type of drive and medium. `IMachine::attachDevice()` is the API method for adding any drive to a storage controller. The floppy and DVD/CD drives are no longer handled specially, and that means you can have more than one of them. As before, drives can only be changed while the VM is powered off. Mounting (or unmounting) removable media at runtime is possible with `IMachine::mountMedium()`.

Newly created virtual machines have no storage controllers associated with them. Even the IDE Controller needs to be created explicitly. The floppy controller is now visible as a separate controller, with a new storage bus type. For each storage bus type you can query the device types which can be attached, so that it is not necessary to hardcode any attachment rules.

This required matching changes e.g. in the callback interfaces (the medium specific change notification was replaced by a generic medium change notification) and removing associated enums (e.g. `DriveState`). In many places the incorrect use of the plural form “media” was replaced by “medium”, to improve consistency.

- Reading the `IMedium::state` attribute no longer automatically performs an accessibility check; a new method `IMedium::refreshState()` does this. The attribute only returns the state any more.
- There were substantial changes related to snapshots, triggered by the “branched snapshots” functionality introduced with version 3.1. `IConsole::discardSnapshot` was renamed to `IConsole::deleteSnapshot()`. `IConsole::discardCurrentState` and `IConsole::discardCurrentSnapshotAndState` were removed; corresponding new functionality is in `IConsole::restoreSnapshot()`. Also, when `IConsole::takeSnapshot()` is called on a running virtual machine, a live snapshot will be created. The old behavior was to temporarily pause the virtual machine while creating an online snapshot.
- The `IVRDP`Server, `IRemoteDisplayInfo` and `IConsoleCallback` interfaces were changed to reflect VRDP server ability to bind to one of available ports from a list of ports.

The `IVRDP`Server : :port attribute has been replaced with `IVRDP`Server : :ports, which is a comma-separated list of ports or ranges of ports.

An `IRemoteDisplayInfo` : :port attribute has been added for querying the actual port VRDP server listens on.

An `IConsoleCallback` : :onRemoteDisplayInfoChange() notification callback has been added.
- The parameter lists for the following functions were modified:
 - `IHost::removeHostOnlyNetworkInterface()`

- [IHost::removeUSBDeviceFilter\(\)](#)

- In the OOWS bindings for JAX-WS, the behavior of structures changed: for one, we implemented natural structures field access so you can just call a “get” method to obtain a field. Secondly, setters in structures were disabled as they have no expected effect and were at best misleading.

7.3 Incompatible API changes with version 3.0

- In the object-oriented web service bindings for JAX-WS, proper inheritance has been introduced for some classes, so explicit casting is no longer needed to call methods from a parent class. In particular, [IHardDisk](#) and other classes now properly derive from [IMedium](#).
- All object identifiers (machines, snapshots, disks, etc) switched from GUIDs to strings (now still having string representation of GUIDs inside). As a result, no particular internal structure can be assumed for object identifiers; instead, they should be treated as opaque unique handles. This change mostly affects Java and C++ programs; for other languages, GUIDs are transparently converted to strings.
- The uses of NULL strings have been changed greatly. All out parameters now use empty strings to signal a null value. For in parameters both the old NULL and empty string is allowed. This change was necessary to support more client bindings, especially using the webservice API. Many of them either have no special NULL value or have trouble dealing with it correctly in the respective library code.
- Accidentally, the [TSBool](#) interface still appeared in 3.0.0, and was removed in 3.0.2. This is an SDK bug, do not use the SDK for [VirtualBox 3.0.0](#) for developing clients.
- The type of [IVirtualBoxErrorInfo::resultCode](#) changed from `result` to `long`.
- The parameter list of [IVirtualBox::openHardDisk](#) was changed.
- The method [IConsole::discardSavedState](#) was renamed to [IConsole::forgetSavedState](#), and a parameter was added.
- The method [IConsole::powerDownAsync](#) was renamed to [IConsole::powerDown](#), and the previous method with that name was deleted. So effectively a parameter was added.
- In the [IFramebuffer](#) interface, the following were removed:
 - the `operationSupported` attribute;
(as a result, the `FramebufferAccelerationOperation` enum was no longer needed and removed as well);
 - the `solidFill()` method;
 - the `copyScreenBits()` method.
- In the [IDisplay](#) interface, the following were removed:
 - the `setupInternalFramebuffer()` method;
 - the `lockFramebuffer()` method;
 - the `unlockFramebuffer()` method;
 - the `registerExternalFramebuffer()` method.

7.4 Incompatible API changes with version 2.2

- Added explicit version number into JAX-WS Java package names, such as `org.virtualbox_2_2`, allowing connect to multiple VirtualBox clients from single Java application.
- The interfaces having a “2” suffix attached to them with version 2.1 were renamed again to have that suffix removed. This time around, this change involves only the name, there are no functional differences.

As a result, `IDVDImage2` is now `IDVDImage`; `IHardDisk2` is now `IHardDisk`; `IHardDisk2Attachment` is now `IHardDiskAttachment`.

Consequentially, all related methods and attributes that had a “2” suffix have been renamed; for example, `IMachine::attachHardDisk2` now becomes `IMachine::attachHardDisk()`.

- [VirtualBox::openHardDisk\(\)](#) has an extra parameter for opening a disk read/write or read-only.
- The remaining collections were replaced by more performant safe-arrays. This affects the following collections:
 - `IGuestOSTypeCollection`
 - `IHostDVDDriveCollection`
 - `IHostFloppyDriveCollection`
 - `IHostUSBDeviceCollection`
 - `IHostUSBDeviceFilterCollection`
 - `IProgressCollection`
 - `ISharedFolderCollection`
 - `ISnapshotCollection`
 - `IUSBDeviceCollection`
 - `IUSBDeviceFilterCollection`
- Since “Host Interface Networking” was renamed to “bridged networking” and host-only networking was introduced, all associated interfaces needed renaming as well. In detail:
 - The `HostNetworkInterfaceType` enum has been renamed to [HostNetworkInterfaceMediumType](#)
 - The `IHostNetworkInterface::type` attribute has been renamed to [IHostNetworkInterface::mediumType](#)
 - `INetworkAdapter::attachToHostInterface()` has been renamed to [INetworkAdapter::attachToBridgedInterface\(\)](#)
 - In the `IHost` interface, `createHostNetworkInterface()` has been renamed to [createHostOnlyNetworkInterface\(\)](#)
 - Similarly, `removeHostNetworkInterface()` has been renamed to [removeHostOnlyNetworkInterface\(\)](#)

7.5 Incompatible API changes with version 2.1

- With VirtualBox 2.1, error codes were added to many error infos that give the caller a machine-readable (numeric) feedback in addition to the error string that has always been available. This is an ongoing process, and future versions of this SDK reference will document the error codes for each method call.
- The hard disk and other media interfaces were completely redesigned. This was necessary to account for the support of VMDK, VHD and other image types; since backwards compatibility had to be broken anyway, we seized the moment to redesign the interfaces in a more logical way.

7 Main API change log

- Previously, the old `IHardDisk` interface had several derivatives called `IVirtualDiskImage`, `IVMDKImage`, `IVHDIImage`, `IISCSIHardDisk` and `ICustomHardDisk` for the various disk formats supported by VirtualBox. The new `IHardDisk2` interface that comes with version 2.1 now supports all hard disk image formats itself.
 - `IHardDiskFormat` is a new interface to describe the available back-ends for hard disk images (e.g. VDI, VMDK, VHD or iSCSI). The `IHardDisk2::format` attribute can be used to find out the back-end that is in use for a particular hard disk image. `ISystemProperties::hardDiskFormats[]` contains a list of all back-ends supported by the system. `ISystemProperties::defaultHardDiskFormat` contains the default system format.
 - In addition, the new `IMedium` interface is a generic interface for hard disk, DVD and floppy images that contains the attributes and methods shared between them. It can be considered a parent class of the more specific interfaces for those images, which are now `IHardDisk2`, `IDVDImage2` and `IFloppyImage2`.
In each case, the “2” versions of these interfaces replace the earlier versions that did not have the “2” suffix. Previously, the `IDVDImage` and `IFloppyImage` interfaces were entirely unrelated to `IHardDisk`.
 - As a result, all parts of the API that previously referenced `IHardDisk`, `IDVDImage` or `IFloppyImage` or any of the old subclasses are gone and will have replacements that use `IHardDisk2`, `IDVDImage2` and `IFloppyImage2`; see, for example, `IMachine::attachHardDisk2`.
 - In particular, the `IVirtualBox::hardDisks2` array replaces the earlier `IVirtualBox::hardDisks` collection.
- `IGuestOSType` was extended to group operating systems into families and for 64-bit support.
 - The `IHostNetworkInterface` interface was completely rewritten to account for the changes in how Host Interface Networking is now implemented in VirtualBox 2.1.
 - The `IVirtualBox::machines2[]` array replaces the former `IVirtualBox::machines` collection.
 - Added `IHost::getProcessorFeature()` and `ProcessorFeature` enumeration.
 - The parameter list for `IVirtualBox::createMachine()` was modified.
 - Added `IMachine::pushGuestProperty`.
 - New attributes in `IMachine`: `accelerate3DEnabled`, `HWVirtExVPIDEnabled`, `guestPropertyNotificationPatterns`, `CPUCount`.
 - Added `IConsole::powerUpPaused()` and `IConsole::getGuestEnteredACPIMode()`.
 - Removed `ResourceUsage` enumeration.

8 License information

The sample code files shipped with the SDK are generally licensed liberally to make it easy for anyone to use this code for their own application code.

The Java files under `bindings/webservice/java/jax-ws/` (library files for the object-oriented web service) are, by contrast, licensed under the GNU Lesser General Public License (LGPL) V2.1.

See `sdk/bindings/webservice/java/jax-ws/src/COPYING.LIB` for the full text of the LGPL 2.1.

When in doubt, please refer to the individual source code files shipped with this SDK.

9 Classes (interfaces)

9.1 IAppliance

Represents a platform-independent appliance in OVF format. An instance of this is returned by [IVirtualBox::createAppliance\(\)](#), which can then be used to import and export virtual machines within an appliance with VirtualBox.

The OVF standard suggests two different physical file formats:

1. If the appliance is distributed as a set of files, there must be at least one XML descriptor file that conforms to the OVF standard and carries an `.ovf` file extension. If this descriptor file references other files such as disk images, as OVF appliances typically do, those additional files must be in the same directory as the descriptor file.
2. If the appliance is distributed as a single file, it must be in TAR format and have the `.ova` file extension. This TAR file must then contain at least the OVF descriptor files and optionally other files.

At this time, VirtualBox does not yet support the packed (TAR) variant; support will be added with a later version.

Importing an OVF appliance into VirtualBox as instances of [IMachine](#) involves the following sequence of API calls:

1. Call [IVirtualBox::createAppliance\(\)](#). This will create an empty IAppliance object.
2. On the new object, call [read\(\)](#) with the full path of the OVF file you would like to import. So long as this file is syntactically valid, this will succeed and fill the appliance object with the parsed data from the OVF file.
3. Next, call [interpret\(\)](#), which analyzes the OVF data and sets up the contents of the IAppliance attributes accordingly. These can be inspected by a VirtualBox front-end such as the GUI, and the suggestions can be displayed to the user. In particular, the [virtualSystemDescriptions\[\]](#) array contains instances of [IVirtualSystemDescription](#) which represent the virtual systems (machines) in the OVF, which in turn describe the virtual hardware prescribed by the OVF (network and hardware adapters, virtual disk images, memory size and so on). The GUI can then give the user the option to confirm and/or change these suggestions.
4. If desired, call [IVirtualSystemDescription::setFinalValues\(\)](#) for each virtual system (machine) to override the suggestions made by the [interpret\(\)](#) routine.
5. Finally, call [importMachines\(\)](#) to create virtual machines in VirtualBox as instances of [IMachine](#) that match the information in the virtual system descriptions.

Exporting VirtualBox machines into an OVF appliance involves the following steps:

1. As with importing, first call [IVirtualBox::createAppliance\(\)](#) to create an empty IAppliance object.
2. For each machine you would like to export, call [IMachine::export\(\)](#) with the IAppliance object you just created. Each such call creates one instance of [IVirtualSystemDescription](#) inside the appliance.

3. If desired, call `IVirtualSystemDescription::setFinalValues()` for each virtual system (machine) to override the suggestions made by the `export()` routine.
4. Finally, call `write()` with a path specification to have the OVF file written.

9.1.1 Attributes

9.1.1.1 path (read-only)

`wstring IApliance::path`

Path to the main file of the OVF appliance, which is either the `.ovf` or the `.ova` file passed to `read()` (for import) or `write()` (for export). This attribute is empty until one of these methods has been called.

9.1.1.2 disks (read-only)

`wstring IApliance::disks[]`

Array of virtual disk definitions. One such description exists for each disk definition in the OVF; each string array item represents one such piece of disk information, with the information fields separated by tab (`\t`) characters.

The caller should be prepared for additional fields being appended to this string in future versions of VirtualBox and therefore check for the number of tabs in the strings returned.

In the current version, the following eight fields are returned per string in the array:

1. Disk ID (unique string identifier given to disk)
2. Capacity (unsigned integer indicating the maximum capacity of the disk)
3. Populated size (optional unsigned integer indicating the current size of the disk; can be approximate; -1 if unspecified)
4. Format (string identifying the disk format, typically “`http://www.vmware.com/specifications/vmdk.html#sparse`”)
5. Reference (where to find the disk image, typically a file name; if empty, then the disk should be created on import)
6. Image size (optional unsigned integer indicating the size of the image, which need not necessarily be the same as the values specified above, since the image may be compressed or sparse; -1 if not specified)
7. Chunk size (optional unsigned integer if the image is split into chunks; presently unsupported and always -1)
8. Compression (optional string equalling “`gzip`” if the image is gzip-compressed)

9.1.1.3 virtualSystemDescriptions (read-only)

`IVirtualSystemDescription IApliance::virtualSystemDescriptions[]`

Array of virtual system descriptions. One such description is created for each virtual system (machine) found in the OVF. This array is empty until either `interpret()` (for import) or `IMachine::export()` (for export) has been called.

9.1.2 createVFSExplorer

`IVFSExplorer` `IAppliance::createVFSExplorer(`
 [in] `wstring aUri`)

aUri The URI describing the file system to use.

Returns a `IVFSExplorer` object for the given URI.

9.1.3 getWarnings

`wstring[]` `IAppliance::getWarnings()`

Returns textual warnings which occurred during execution of `interpret()`.

9.1.4 importMachines

`IProgress` `IAppliance::importMachines()`

Imports the appliance into VirtualBox by creating instances of `IMachine` and other interfaces that match the information contained in the appliance as closely as possible, as represented by the import instructions in the `virtualSystemDescriptions[]` array.

Calling this method is the final step of importing an appliance into VirtualBox; see `IAppliance` for an overview.

Since importing the appliance will most probably involve copying and converting disk images, which can take a long time, this method operates asynchronously and returns an `IProgress` object to allow the caller to monitor the progress.

9.1.5 interpret

`void` `IAppliance::interpret()`

Interprets the OVF data that was read when the appliance was constructed. After calling this method, one can inspect the `virtualSystemDescriptions[]` array attribute, which will then contain one `IVirtualSystemDescription` for each virtual machine found in the appliance.

Calling this method is the second step of importing an appliance into VirtualBox; see `IAppliance` for an overview.

After calling this method, one should call `getWarnings()` to find out if problems were encountered during the processing which might later lead to errors.

9.1.6 read

`IProgress` `IAppliance::read(`
 [in] `wstring file`)

file Name of appliance file to open (either with an `.ovf` or `.ova` extension, depending on whether the appliance is distributed as a set of files or as a single file, respectively).

Reads an OVF file into the appliance object.

This method succeeds if the OVF is syntactically valid and, by itself, without errors. The mere fact that this method returns successfully does not mean that VirtualBox supports all features requested by the appliance; this can only be examined after a call to `interpret()`.

9.1.7 write

```
IProgress IAppliance::write(
    [in] wstring format,
    [in] wstring path)
```

format Output format, as a string. Currently supported formats are “ovf-0.9” and “ovf-1.0”; future versions of VirtualBox may support additional formats.

path Name of appliance file to open (either with an .ovf or .ova extension, depending on whether the appliance is distributed as a set of files or as a single file, respectively).

Writes the contents of the appliance exports into a new OVF file.

Calling this method is the final step of exporting an appliance from VirtualBox; see [IAppliance](#) for an overview.

Since exporting the appliance will most probably involve copying and converting disk images, which can take a long time, this method operates asynchronously and returns an [IProgress](#) object to allow the caller to monitor the progress.

9.2 IAudioAdapter

The [IAudioAdapter](#) interface represents the virtual audio adapter of the virtual machine. Used in [IMachine::audioAdapter](#).

9.2.1 Attributes

9.2.1.1 enabled (read/write)

```
boolean IAudioAdapter::enabled
```

Flag whether the audio adapter is present in the guest system. If disabled, the virtual guest hardware will not contain any audio adapter. Can only be changed when the VM is not running.

9.2.1.2 audioController (read/write)

```
AudioControllerType IAudioAdapter::audioController
```

The audio hardware we emulate.

9.2.1.3 audioDriver (read/write)

```
AudioDriverType IAudioAdapter::audioDriver
```

Audio driver the adapter is connected to. This setting can only be changed when the VM is not running.

9.3 IBIOSSettings

The [IBIOSSettings](#) interface represents BIOS settings of the virtual machine. This is used only in the [IMachine::BIOSSettings](#) attribute.

9.3.1 Attributes

9.3.1.1 logoFadeIn (read/write)

```
boolean IBIOSSettings::logoFadeIn
```

Fade in flag for BIOS logo animation.

9.3.1.2 logoFadeOut (read/write)

boolean IBIOSSettings::logoFadeOut

Fade out flag for BIOS logo animation.

9.3.1.3 logoDisplayTime (read/write)

unsigned long IBIOSSettings::logoDisplayTime

BIOS logo display time in milliseconds (0 = default).

9.3.1.4 logoImagePath (read/write)

wstring IBIOSSettings::logoImagePath

Local file system path for external BIOS splash image. Empty string means the default image is shown on boot.

9.3.1.5 bootMenuMode (read/write)

[BIOSBootMenuMode](#) IBIOSSettings::bootMenuMode

Mode of the BIOS boot device menu.

9.3.1.6 ACPIEnabled (read/write)

boolean IBIOSSettings::ACPIEnabled

ACPI support flag.

9.3.1.7 IOAPICEnabled (read/write)

boolean IBIOSSettings::IOAPICEnabled

IO APIC support flag. If set, VirtualBox will provide an IO APIC and support IRQs above 15.

9.3.1.8 timeOffset (read/write)

long long IBIOSSettings::timeOffset

Offset in milliseconds from the host system time. This allows for guests running with a different system date/time than the host. It is equivalent to setting the system date/time in the BIOS except it is not an absolute value but a relative one. Guest Additions time synchronization honors this offset.

9.3.1.9 PXEDebugEnabled (read/write)

boolean IBIOSSettings::PXEDebugEnabled

PXE debug logging flag. If set, VirtualBox will write extensive PXE trace information to the release log.

9.4 IConsole

The IConsole interface represents an interface to control virtual machine execution.

The console object that implements the IConsole interface is obtained from a session object after the session for the given machine has been opened using one of [IVirtualBox::openSession\(\)](#), [IVirtualBox::openRemoteSession\(\)](#) or [IVirtualBox::openExistingSession\(\)](#) methods.

Methods of the IConsole interface allow the caller to query the current virtual machine execution state, pause the machine or power it down, save the machine state or take a snapshot, attach and detach removable media and so on.

See also: [ISession](#)

9.4.1 Attributes

9.4.1.1 machine (read-only)

[IMachine](#) [IConsole::machine](#)

Machine object this console is sessioned with.

Note: This is a convenience property, it has the same value as [ISession::machine](#) of the corresponding session object.

9.4.1.2 state (read-only)

[MachineState](#) [IConsole::state](#)

Current execution state of the machine.

Note: This property always returns the same value as the corresponding property of the [IMachine](#) object this console is sessioned with. For the process that owns (executes) the VM, this is the preferable way of querying the VM state, because no IPC calls are made.

9.4.1.3 guest (read-only)

[IGuest](#) [IConsole::guest](#)

Guest object.

9.4.1.4 keyboard (read-only)

[IKeyboard](#) [IConsole::keyboard](#)

Virtual keyboard object.

Note: If the machine is not running, any attempt to use the returned object will result in an error.

9.4.1.5 mouse (read-only)

[IMouse](#) `IConsole::mouse`

Virtual mouse object.

Note: If the machine is not running, any attempt to use the returned object will result in an error.

9.4.1.6 display (read-only)

[IDisplay](#) `IConsole::display`

Virtual display object.

Note: If the machine is not running, any attempt to use the returned object will result in an error.

9.4.1.7 debugger (read-only)

[IMachineDebugger](#) `IConsole::debugger`

Note: This attribute is not supported in the web service.

Debugging interface.

9.4.1.8 USBDevices (read-only)

[IUSBDevice](#) `IConsole::USBDevices[]`

Collection of USB devices currently attached to the virtual USB controller.

Note: The collection is empty if the machine is not running.

9.4.1.9 remoteUSBDevices (read-only)

[IHostUSBDevice](#) `IConsole::remoteUSBDevices[]`

List of USB devices currently attached to the remote VRDP client. Once a new device is physically attached to the remote host computer, it appears in this list and remains there until detached.

9.4.1.10 sharedFolders (read-only)

[ISharedFolder](#) `IConsole::sharedFolders[]`

Collection of shared folders for the current session. These folders are called transient shared folders because they are available to the guest OS running inside the associated virtual machine only for the duration of the session (as opposed to [IMachine::sharedFolders\[\]](#) which represent permanent shared folders). When the session is closed (e.g. the machine is powered down), these folders are automatically discarded.

New shared folders are added to the collection using [createSharedFolder\(\)](#). Existing shared folders can be removed using [removeSharedFolder\(\)](#).

9.4.1.11 remoteDisplayInfo (read-only)

`IRemoteDisplayInfo IConsole::remoteDisplayInfo`

Interface that provides information on Remote Display (VRDP) connection.

9.4.2 adoptSavedState

```
void IConsole::adoptSavedState(
    [in] wstring savedStateFile)
```

savedStateFile Path to the saved state file to adopt.

Associates the given saved state file to the virtual machine.

On success, the machine will go to the Saved state. Next time it is powered up, it will be restored from the adopted saved state and continue execution from the place where the saved state file was created.

The specified saved state file path may be absolute or relative to the folder the VM normally saves the state to (usually, `IMachine::snapshotFolder`).

Note: It's a caller's responsibility to make sure the given saved state file is compatible with the settings of this virtual machine that represent its virtual hardware (memory size, storage disk configuration etc.). If there is a mismatch, the behavior of the virtual machine is undefined.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine state neither PoweredOff nor Aborted.

9.4.3 attachUSBDevice

```
void IConsole::attachUSBDevice(
    [in] uuid id)
```

id UUID of the host USB device to attach.

Attaches a host USB device with the given UUID to the USB controller of the virtual machine.

The device needs to be in one of the following states: `Busy`, `Available` or `Held`, otherwise an error is immediately returned.

When the device state is `Busy`, an error may also be returned if the host computer refuses to release it for some reason.

See also: `IUSBController::deviceFilters`, `USBDeviceState`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine state neither Running nor Paused.
- `VBOX_E_PDM_ERROR`: Virtual machine does not have a USB controller.

9.4.4 createSharedFolder

```
void IConsole::createSharedFolder(
    [in] wstring name,
    [in] wstring hostPath,
    [in] boolean writable)
```

name Unique logical name of the shared folder.

hostPath Full path to the shared folder in the host file system.

writable Whether the share is writable or readonly

Creates a transient new shared folder by associating the given logical name with the given host path, adds it to the collection of shared folders and starts sharing it. Refer to the description of [ISharedFolder](#) to read more about logical names.

If this method fails, the following error codes may be reported:

- **VBOX_E_INVALID_VM_STATE**: Virtual machine in Saved state or currently changing state.
- **VBOX_E_FILE_ERROR**: Shared folder already exists or not accessible.

9.4.5 deleteSnapshot

```
IProgress IConsole::deleteSnapshot(
    [in] uuid id)
```

id UUID of the snapshot to delete.

Starts deleting the specified snapshot asynchronously. See [ISnapshot](#) for an introduction to snapshots.

The execution state and settings of the associated machine stored in the snapshot will be deleted. The contents of all differencing media of this snapshot will be merged with the contents of their dependent child media to keep the medium chain valid (in other words, all changes represented by media being deleted will be propagated to their child medium). After that, this snapshot's differencing medium will be deleted. The parent of this snapshot will become a new parent for all its child snapshots.

If the deleted snapshot is the current one, its parent snapshot will become a new current snapshot. The current machine state is not directly affected in this case, except that currently attached differencing media based on media of the deleted snapshot will be also merged as described above.

If the deleted snapshot is the first or current snapshot, then the respective [IMachine](#) attributes will be adjusted. Deleting the current snapshot will also implicitly call [IMachine::saveSettings\(\)](#) to make all current machine settings permanent.

Deleting a snapshot has the following preconditions:

- Child media of all normal media of the deleted snapshot must be accessible (see [IMedium::state](#)) for this operation to succeed. In particular, this means that all virtual machines, whose media are directly or indirectly based on the media of deleted snapshot, must be powered off.
- You cannot delete the snapshot if a medium attached to it has more than once child medium (differencing images) because otherwise merging would be impossible. This might be the case if there is more than one child snapshot or differencing images were created for other reason (e.g. implicitly because of multiple machine attachments).

The virtual machine's [state](#) is changed to "DeletingSnapshot", "DeletingSnapshotOnline" or "DeletingSnapshotPaused" while this operation is in progress.

Note: Merging medium contents can be very time and disk space consuming, if these media are big in size and have many children. However, if the snapshot being deleted is the last (head) snapshot on the branch, the operation will be rather quick.

If this method fails, the following error codes may be reported:

- **VBOX_E_INVALID_VM_STATE**: The running virtual machine prevents deleting this snapshot. This happens only in very specific situations, usually snapshots can be deleted without trouble while a VM is running. The error message text explains the reason for the failure.

9.4.6 detachUSBDevice

```
IUSBDevice IConsole::detachUSBDevice(  
    [in] uuid id)
```

id UUID of the USB device to detach.

Detaches an USB device with the given UUID from the USB controller of the virtual machine. After this method succeeds, the VirtualBox server re-initiates all USB filters as if the device were just physically attached to the host, but filters of this machine are ignored to avoid a possible automatic re-attachment.

See also: `IUSBController::deviceFilters`, `USBDeviceState`

If this method fails, the following error codes may be reported:

- **VBOX_E_PDM_ERROR**: Virtual machine does not have a USB controller.
- **E_INVALIDARG**: USB device not attached to this virtual machine.

9.4.7 findUSBDeviceByAddress

```
IUSBDevice IConsole::findUSBDeviceByAddress(  
    [in] wstring name)
```

name Address of the USB device (as assigned by the host) to search for.

Searches for a USB device with the given host address.

See also: `IUSBDevice::address`

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Given name does not correspond to any USB device.

9.4.8 findUSBDeviceById

```
IUSBDevice IConsole::findUSBDeviceById(  
    [in] uuid id)
```

id UUID of the USB device to search for.

Searches for a USB device with the given UUID.

See also: `IUSBDevice::id`

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Given id does not correspond to any USB device.

9.4.9 forgetSavedState

```
void IConsole::forgetSavedState(  
    [in] boolean remove)
```

remove If true remove the saved state file.

Forgets the saved state of the virtual machine previously created by `saveState()`. Next time the machine is powered up, a clean boot will occur. If `remove` is `true` the saved state file is deleted.

Note: This operation is equivalent to resetting or powering off the machine without doing a proper shutdown in the guest OS.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in state Saved.

9.4.10 `getDeviceActivity`

```
DeviceActivity IConsole::getDeviceActivity(  
    [in] DeviceType type)
```

type

Gets the current activity type of a given device or device group.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Invalid device type.

9.4.11 `getGuestEnteredACPIMode`

```
boolean IConsole::getGuestEnteredACPIMode()
```

Checks if the guest entered the ACPI mode G0 (working) or G1 (sleeping). If this method returns `false`, the guest will most likely not respond to external ACPI events.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Running state.

9.4.12 `getPowerButtonHandled`

```
boolean IConsole::getPowerButtonHandled()
```

Checks if the last power button event was handled by guest.

If this method fails, the following error codes may be reported:

- `VBOX_E_PDM_ERROR`: Checking if the event was handled by the guest OS failed.

9.4.13 `pause`

```
void IConsole::pause()
```

Pauses the virtual machine execution.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Running state.
- `VBOX_E_VM_ERROR`: Virtual machine error in suspend operation.

9.4.14 powerButton

`void IConsole::powerButton()`

Sends the ACPI power button event to the guest.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Running state.
- `VBOX_E_PDM_ERROR`: Controlled power off failed.

9.4.15 powerDown

`IProgress IConsole::powerDown()`

Initiates the power down procedure to stop the virtual machine execution.

The completion of the power down procedure is tracked using the returned `IProgress` object. After the operation is complete, the machine will go to the `PoweredOff` state.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine must be Running, Paused or Stuck to be powered down.

9.4.16 powerUp

`IProgress IConsole::powerUp()`

Starts the virtual machine execution using the current machine state (that is, its current execution state, current settings and current storage devices).

If the machine is powered off or aborted, the execution will start from the beginning (as if the real hardware were just powered on).

If the machine is in the `Saved` state, it will continue its execution the point where the state has been saved.

If the machine `IMachine::teleporterEnabled` property is enabled on the machine being powered up, the machine will wait for an incoming teleportation in the `TeleportingIn` state. The returned progress object will have at least three operations where the last three are defined as: (1) powering up and starting TCP server, (2) waiting for incoming teleportations, and (3) perform teleportation. These operations will be reflected as the last three operations of the progress object returned by `IVirtualBox::openRemoteSession()` as well.

Note: Unless you are trying to write a new VirtualBox front-end that performs direct machine execution (like the VirtualBox or VBoxSDL front-ends), don't call `powerUp()` in a direct session opened by `IVirtualBox::openSession()` and use this session only to change virtual machine settings. If you simply want to start virtual machine execution using one of the existing front-ends (for example the VirtualBox GUI or headless server), simply use `IVirtualBox::openRemoteSession()`; these front-ends will power up the machine automatically for you.

See also: `#saveState`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine already running.
- `VBOX_E_HOST_ERROR`: Host interface does not exist or name not set.
- `VBOX_E_FILE_ERROR`: Invalid saved state file.

9.4.17 powerUpPaused

[IProgress](#) `IConsole::powerUpPaused()`

Identical to `powerUp` except that the VM will enter the [Paused](#) state, instead of [Running](#).

See also: `#powerUp`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine already running.
- `VBOX_E_HOST_ERROR`: Host interface does not exist or name not set.
- `VBOX_E_FILE_ERROR`: Invalid saved state file.

9.4.18 registerCallback

Note: This method is not supported in the web service.

```
void IConsole::registerCallback(  
    [in] IConsoleCallback callback)
```

callback

Registers a new console callback on this instance. The methods of the callback interface will be called by this instance when the appropriate event occurs.

9.4.19 removeSharedFolder

```
void IConsole::removeSharedFolder(  
    [in] wstring name)
```

name Logical name of the shared folder to remove.

Removes a transient shared folder with the given name previously created by [createSharedFolder\(\)](#) from the collection of shared folders and stops sharing it.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine in Saved state or currently changing state.
- `VBOX_E_FILE_ERROR`: Shared folder does not exist.

9.4.20 reset

```
void IConsole::reset()
```

Resets the virtual machine.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Running state.
- `VBOX_E_VM_ERROR`: Virtual machine error in reset operation.

9.4.21 restoreSnapshot

IProgress `IConsole::restoreSnapshot([in] ISnapshot snapshot)`

snapshot The snapshot to restore the VM state from.

Starts resetting the machine's current state to the state contained in the given snapshot, asynchronously. All current settings of the machine will be reset and changes stored in differencing media will be lost. See [ISnapshot](#) for an introduction to snapshots.

After this operation is successfully completed, new empty differencing media are created for all normal media of the machine.

If the given snapshot is an online snapshot, the machine will go to the [Saved](#), so that the next time it is powered on, the execution state will be restored from the state of the snapshot.

Note: The machine must not be running, otherwise the operation will fail.

Note: If the machine state is [Saved](#) prior to this operation, the saved state file will be implicitly deleted (as if [forgetSavedState\(\)](#) were called).

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine is running.

9.4.22 resume

`void IConsole::resume()`

Resumes the virtual machine execution.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Paused state.
- `VBOX_E_VM_ERROR`: Virtual machine error in resume operation.

9.4.23 saveState

IProgress `IConsole::saveState()`

Saves the current execution state of a running virtual machine and stops its execution.

After this operation completes, the machine will go to the [Saved](#) state. Next time it is powered up, this state will be restored and the machine will continue its execution from the place where it was saved.

This operation differs from taking a snapshot to the effect that it doesn't create new differencing media. Also, once the machine is powered up from the state saved using this method, the saved state is deleted, so it will be impossible to return to this state later.

Note: On success, this method implicitly calls [IMachine::saveSettings\(\)](#) to save all current machine settings (including runtime changes to the DVD medium, etc.). Together with the impossibility to change any VM settings when it is in the [Saved](#) state, this guarantees adequate hardware configuration of the machine when it is restored from the saved state file.

Note: The machine must be in the Running or Paused state, otherwise the operation will fail.

See also: [takeSnapshot\(\)](#)

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine state neither Running nor Paused.
- `VBOX_E_FILE_ERROR`: Failed to create directory for saved state file.

9.4.24 sleepButton

```
void IConsole::sleepButton()
```

Sends the ACPI sleep button event to the guest.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine not in Running state.
- `VBOX_E_PDM_ERROR`: Sending sleep button event failed.

9.4.25 takeSnapshot

```
IProgress IConsole::takeSnapshot(
    [in] wstring name,
    [in] wstring description)
```

name Short name for the snapshot.

description Optional description of the snapshot.

Saves the current execution state and all settings of the machine and creates differencing images for all normal (non-independent) media. See [ISnapshot](#) for an introduction to snapshots.

This method can be called for a PoweredOff, Saved (see [saveState\(\)](#)), Running or Paused virtual machine. When the machine is PoweredOff, an offline snapshot is created. When the machine is Running a live snapshot is created, and an online snapshot is created when Paused.

The taken snapshot is always based on the [current snapshot](#) of the associated virtual machine and becomes a new current snapshot.

Note: This method implicitly calls [IMachine::saveSettings\(\)](#) to save all current machine settings before taking an offline snapshot.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine currently changing state.

9.4.26 teleport

```
IProgress IConsole::teleport(
    [in] wstring hostname,
    [in] unsigned long tcpport,
    [in] wstring password,
    [in] unsigned long maxDowntime)
```

hostname The name or IP of the host to teleport to.

tcpport The TCP port to connect to (1..65535).

password The password.

maxDowntime The maximum allowed downtime given as milliseconds. 0 is not a valid value.
Recommended value: 250 ms.

The higher the value is, the greater the chance for a successful teleportation. A small value may easily result in the teleportation process taking hours and eventually fail.

Note: The current implementation treats this a guideline, not as an absolute rule.

Teleport the VM to a different host machine or process.

TODO explain the details.

If this method fails, the following error codes may be reported:

- **VBOX_E_INVALID_VM_STATE:** Virtual machine not running or paused.

9.4.27 unregisterCallback

Note: This method is not supported in the web service.

```
void IConsole::unregisterCallback(  
    [in] IConsoleCallback callback)
```

callback

Unregisters the console callback previously registered using [registerCallback\(\)](#).

If this method fails, the following error codes may be reported:

- **E_INVALIDARG:** Given callback handler is not registered.

9.5 IConsoleCallback

Note: This interface is not supported in the web service.

This interface is used by a client of the Main API that need to be notified of events. For example, a graphical user interface can use this to learn about machine state changes so they can update the list of virtual machines without having to rely on polling.

Whenever relevant events occur in VirtualBox, the callbacks in objects of this interface are called. In order for this to be useful, a client needs to create its own subclass that implements this interface in which the methods for the relevant callbacks are overridden. An instance of this subclass interface can then be passed to [IConsole::registerCallback\(\)](#).

9.5.1 onAdditionsStateChange

```
void IConsoleCallback::onAdditionsStateChange()
```

Notification when a Guest Additions property changes. Interested callees should query IGuest attributes to find out what has changed.

9.5.2 onCPUChange

```
void IConsoleCallback::onCPUChange(
    [in] unsigned long cpu,
    [in] boolean add)
```

cpu The CPU which changed

add Flag whether the CPU was added or removed

Notification when a CPU changes.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.5.3 onCanShowWindow

```
boolean IConsoleCallback::onCanShowWindow()
```

Notification when a call to [IMachine::canShowConsoleWindow\(\)](#) is made by a front-end to check if a subsequent call to [IMachine::showConsoleWindow\(\)](#) can succeed.

The callee should give an answer appropriate to the current machine state in the `canShow` argument. This answer must remain valid at least until the next [machine state](#) change.

Note: This notification is not designed to be implemented by more than one callback at a time. If you have multiple `IConsoleCallback` instances registered on the given `IConsole` object, make sure you simply do nothing but return `true` and `S_OK` from all but one of them that actually manages console window activation.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.5.4 onKeyboardLedsChange

```
void IConsoleCallback::onKeyboardLedsChange(
    [in] boolean numLock,
    [in] boolean capsLock,
    [in] boolean scrollLock)
```

numLock

capsLock

scrollLock

Notification when the guest OS executes the `KBD_CMD_SET_LEDS` command to alter the state of the keyboard LEDs.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.5.5 onMediumChange

```
void IConsoleCallback::onMediumChange(
    [in] IMediumAttachment mediumAttachment)
```

mediumAttachment Medium attachment that is subject to change.

Notification when a [medium attachment](#) changes.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.5.6 onMouseCapabilityChange

```
void IConsoleCallback::onMouseCapabilityChange(
    [in] boolean supportsAbsolute,
    [in] boolean supportsRelative,
    [in] boolean needsHostCursor)
```

supportsAbsolute

supportsRelative

needsHostCursor

Notification when the mouse capabilities reported by the guest have changed. The new capabilities are passed.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.5.7 onMousePointerShapeChange

```
void IConsoleCallback::onMousePointerShapeChange(
    [in] boolean visible,
    [in] boolean alpha,
    [in] unsigned long xHot,
    [in] unsigned long yHot,
    [in] unsigned long width,
    [in] unsigned long height,
    [in] octet shape[])
```

visible Flag whether the pointer is visible.

alpha Flag whether the pointer has an alpha channel.

xHot The pointer hot spot x coordinate.

yHot The pointer hot spot y coordinate.

width Width of the pointer shape in pixels.

height Height of the pointer shape in pixels.

shape Shape buffer arrays.

The shape buffer contains a 1-bpp (bits per pixel) AND mask followed by a 32-bpp XOR (color) mask.

For pointers without alpha channel the XOR mask pixels are 32 bit values: (lsb)BGR0(msb).

For pointers with alpha channel the XOR mask consists of (lsb)BGRA(msb) 32 bit values.

An AND mask is used for pointers with alpha channel, so if the callback does not support alpha, the pointer could be displayed as a normal color pointer.

The AND mask is a 1-bpp bitmap with byte aligned scanlines. The size of the AND mask therefore is $cbAnd = (width + 7) / 8 * height$. The padding bits at the end of each scanline are undefined.

The XOR mask follows the AND mask on the next 4-byte aligned offset: $uint8_t *pXor = pAnd + (cbAnd + 3) \& \tilde{3}$. Bytes in the gap between the AND and the XOR mask are undefined. The XOR mask scanlines have no gap between them and the size of the XOR mask is: $cXor = width * 4 * height$.

Note: If shape is 0, only the pointer visibility is changed.

Notification when the guest mouse pointer shape has changed. The new shape data is given. If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.5.8 onNetworkAdapterChange

```
void IConsoleCallback::onNetworkAdapterChange(
    [in] INetworkAdapter networkAdapter)
```

networkAdapter Network adapter that is subject to change.

Notification when a property of one of the virtual [network adapters](#) changes. Interested callees should use [INetworkAdapter](#) methods and attributes to find out what has changed.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.5.9 onParallelPortChange

```
void IConsoleCallback::onParallelPortChange(
    [in] IParallelPort parallelPort)
```

parallelPort Parallel port that is subject to change.

Notification when a property of one of the virtual [parallel ports](#) changes. Interested callees should use [ISerialPort](#) methods and attributes to find out what has changed.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.5.10 onRemoteDisplayInfoChange

```
void IConsoleCallback::onRemoteDisplayInfoChange()
```

Notification when the status of the VRDP server changes. Interested callees should use [IRemoteDisplayInfo](#) attributes to find out what is the current status.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.5.11 onRuntimeError

```
void IConsoleCallback::onRuntimeError(
    [in] boolean fatal,
    [in] wstring id,
    [in] wstring message)
```

fatal Whether the error is fatal or not

id Error identifier

message Optional error message

Notification when an error happens during the virtual machine execution. There are three kinds of runtime errors:

- *fatal*
- *non-fatal with retry*
- *non-fatal warnings*

Fatal errors are indicated by the `fatal` parameter set to `true`. In case of fatal errors, the virtual machine execution is always paused before calling this notification, and the notification handler is supposed either to immediately save the virtual machine state using `IConsole::saveState()` or power it off using `IConsole::powerDown()`. Resuming the execution can lead to unpredictable results.

Non-fatal errors and warnings are indicated by the `fatal` parameter set to `false`. If the virtual machine is in the Paused state by the time the error notification is received, it means that the user can *try to resume* the machine execution after attempting to solve the problem that caused the error. In this case, the notification handler is supposed to show an appropriate message to the user (depending on the value of the `id` parameter) that offers several actions such as *Retry*, *Save* or *Power Off*. If the user wants to retry, the notification handler should continue the machine execution using the `IConsole::resume()` call. If the machine execution is not Paused during this notification, then it means this notification is a *warning* (for example, about a fatal condition that can happen very soon); no immediate action is required from the user, the machine continues its normal execution.

Note that in either case the notification handler **must not** perform any action directly on a thread where this notification is called. Everything it is allowed to do is to post a message to another thread that will then talk to the user and take the corresponding action.

Currently, the following error identifiers are known:

- "HostMemoryLow"
- "HostAudioNotResponding"
- "VDIStorageFull"
- "3DSupportIncompatibleAdditions"

Note: This notification is not designed to be implemented by more than one callback at a time. If you have multiple `IConsoleCallback` instances registered on the given `IConsole` object, make sure you simply do nothing but return `S_OK` from all but one of them that does actual user notification and performs necessary actions.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.12 onSerialPortChange

```
void IConsoleCallback::onSerialPortChange(
    [in] ISerialPort serialPort)
```

serialPort Serial port that is subject to change.

Notification when a property of one of the virtual [serial ports](#) changes. Interested callees should use [ISerialPort](#) methods and attributes to find out what has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.13 onSharedFolderChange

```
void IConsoleCallback::onSharedFolderChange(
    [in] Scope scope)
```

scope Scope of the notification.

Notification when a shared folder is added or removed. The scope argument defines one of three scopes: [global shared folders](#) ([Global](#)), [permanent shared folders](#) of the machine ([Machine](#)) or [transient shared folders](#) of the machine ([Session](#)). Interested callees should use query the corresponding collections to find out what has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.14 onShowWindow

```
unsigned long long IConsoleCallback::onShowWindow()
```

Notification when a call to [IMachine::showConsoleWindow\(\)](#) requests the console window to be activated and brought to foreground on the desktop of the host PC.

This notification should cause the VM console process to perform the requested action as described above. If it is impossible to do it at a time of this notification, this method should return a failure.

Note that many modern window managers on many platforms implement some sort of focus stealing prevention logic, so that it may be impossible to activate a window without the help of the currently active application (which is supposedly an initiator of this notification). In this case, this method must return a non-zero identifier that represents the top-level window of the VM console process. The caller, if it represents a currently active process, is responsible to use this identifier (in a platform-dependent manner) to perform actual window activation.

This method must set `winId` to zero if it has performed all actions necessary to complete the request and the console window is now active and in foreground, to indicate that no further action is required on the caller's side.

Note: This notification is not designed to be implemented by more than one callback at a time. If you have multiple `IConsoleCallback` instances registered on the given `IConsole` object, make sure you simply do nothing but return `S_OK` from all but one of them that actually manages console window activation.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.15 onStateChange

```
void IConsoleCallback::onStateChange(
    [in] MachineState state)
```

state

Notification when the execution state of the machine has changed. The new state will be given.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.16 onStorageControllerChange

```
void IConsoleCallback::onStorageControllerChange()
```

Notification when a property of one of the virtual [storage controllers](#) changes. Interested callees should query the corresponding collections to find out what has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.17 onUSBControllerChange

```
void IConsoleCallback::onUSBControllerChange()
```

Notification when a property of the virtual [USB controller](#) changes. Interested callees should use [IUSBController](#) methods and attributes to find out what has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.18 onUSBDeviceStateChange

```
void IConsoleCallback::onUSBDeviceStateChange(
    [in] IUSBDevice device,
    [in] boolean attached,
    [in] IVirtualBoxErrorInfo error)
```

device Device that is subject to state change.

attached `true` if the device was attached and `false` otherwise.

error `null` on success or an error message object on failure.

Notification when a USB device is attached to or detached from the virtual USB controller.

This notification is sent as a result of the indirect request to attach the device because it matches one of the machine USB filters, or as a result of the direct request issued by [IConsole::attachUSBDevice\(\)](#) or [IConsole::detachUSBDevice\(\)](#).

This notification is sent in case of both a succeeded and a failed request completion. When the request succeeds, the error parameter is `null`, and the given device has been already added to (when `attached` is `true`) or removed from (when `attached` is `false`) the collection represented by [IConsole::USBDevices\[\]](#). On failure, the collection doesn't change and the error parameter represents the error message describing the failure.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.5.19 onVRDPServerChange

```
void IConsoleCallback::onVRDPServerChange()
```

Notification when a property of the [VRDP server](#) changes. Interested callees should use [IVRDP](#)Server methods and attributes to find out what has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.6 IDHCPServer

The `IDHCPServer` interface represents the `vbox dhcp` server configuration.

To enumerate all the dhcp servers on the host, use the [IVirtualBox::DHCPServers\[\]](#) attribute.

9.6.1 Attributes

9.6.1.1 enabled (read/write)

```
boolean IDHCPServer::enabled
```

specifies if the dhcp server is enabled

9.6.1.2 IPAddress (read-only)

```
wstring IDHCPServer::IPAddress
```

specifies server IP

9.6.1.3 networkMask (read-only)

```
wstring IDHCPServer::networkMask
```

specifies server network mask

9.6.1.4 networkName (read-only)

```
wstring IDHCPServer::networkName
```

specifies internal network name the server is used for

9.6.1.5 lowerIP (read-only)

```
wstring IDHCPServer::lowerIP
```

specifies from IP address in server address range

9.6.1.6 upperIP (read-only)

```
wstring IDHCPServer::upperIP
```

specifies to IP address in server address range

9.6.2 setConfiguration

```
void IDHCPServer::setConfiguration(  
    [in] wstring IPAddress,  
    [in] wstring networkMask,  
    [in] wstring FromIPAddress,  
    [in] wstring ToIPAddress)
```

IPAddress server IP address

networkMask server network mask

FromIPAddress server From IP address for address range

ToIPAddress server To IP address for address range

configures the server

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: invalid configuration supplied

9.6.3 start

```
void IDHCPServer::start(  
    [in] wstring networkName,  
    [in] wstring trunkName,  
    [in] wstring trunkType)
```

networkName Name of internal network DHCP server should attach to.

trunkName Name of internal network trunk.

trunkType Type of internal network trunk.

Starts DHCP server process.

If this method fails, the following error codes may be reported:

- **E_FAIL**: Failed to start the process.

9.6.4 stop

```
void IDHCPServer::stop()
```

Stops DHCP server process.

If this method fails, the following error codes may be reported:

- **E_FAIL**: Failed to stop the process.

9.7 IDisplay

The IDisplay interface represents the virtual machine's display.

The object implementing this interface is contained in each [IConsole::display](#) attribute and represents the visual output of the virtual machine.

The virtual display supports pluggable output targets represented by the IFramebuffer interface. Examples of the output target are a window on the host computer or an RDP session's display on a remote computer.

9.7.1 completeVHWACommand

Note: This method is not supported in the web service.

```
void IDisplay::completeVHWACommand(  
    [in] [ptr] octet command)
```

command Pointer to VBOXVHWACMD containing the completed command.

Signals that the Video HW Acceleration command has completed.

9.7.2 drawToScreen

Note: This method is not supported in the web service.

```
void IDisplay::drawToScreen(  
    [in] unsigned long screenId,  
    [in] [ptr] octet address,  
    [in] unsigned long x,  
    [in] unsigned long y,  
    [in] unsigned long width,  
    [in] unsigned long height)
```

screenId

address Address to store the screenshot to.

x Relative to the screen top left corner.

y Relative to the screen top left corner.

width Desired image width.

height Desired image height.

Draws a 32-bpp image of the specified size from the given buffer to the given point on the VM display.

If this method fails, the following error codes may be reported:

- **E_NOTIMPL**: Feature not implemented.
- **VBOX_E_IPRT_ERROR**: Could not draw to screen.

9.7.3 getFramebuffer

Note: This method is not supported in the web service.

```
void IDisplay::getFramebuffer(  
    [in] unsigned long screenId,  
    [out] IFramebuffer framebuffer,  
    [out] long xOrigin,  
    [out] long yOrigin)
```

screenId

framebuffer

xOrigin

yOrigin

Queries the framebuffer for given screen.

9.7.4 getScreenResolution

```
void IDisplay::getScreenResolution(  
    [in] unsigned long screenId,  
    [out] unsigned long width,  
    [out] unsigned long height,  
    [out] unsigned long bitsPerPixel)
```

screenId

width

height

bitsPerPixel

Queries display width, height and color depth for given screen.

9.7.5 invalidateAndUpdate

```
void IDisplay::invalidateAndUpdate()
```

Does a full invalidation of the VM display and instructs the VM to update it.
If this method fails, the following error codes may be reported:

- **VBOX_E_IPRT_ERROR**: Could not invalidate and update screen.

9.7.6 resizeCompleted

```
void IDisplay::resizeCompleted(  
    [in] unsigned long screenId)
```

screenId

Signals that a framebuffer has completed the resize operation.

If this method fails, the following error codes may be reported:

- **VBOX_E_NOT_SUPPORTED**: Operation only valid for external frame buffers.

9.7.7 setFramebuffer

Note: This method is not supported in the web service.

```
void IDisplay::setFramebuffer(  
    [in] unsigned long screenId,  
    [in] IFramebuffer framebuffer)
```

screenId

framebuffer

Sets the framebuffer for given screen.

9.7.8 setSeamlessMode

```
void IDisplay::setSeamlessMode(
    [in] boolean enabled)
```

enabled

Enables or disables seamless guest display rendering (seamless desktop integration) mode.

Note: Calling this method has no effect if [IGuest::supportsSeamless](#) returns false.

9.7.9 setVideoModeHint

```
void IDisplay::setVideoModeHint(
    [in] unsigned long width,
    [in] unsigned long height,
    [in] unsigned long bitsPerPixel,
    [in] unsigned long display)
```

width**height****bitsPerPixel****display**

Asks VirtualBox to request the given video mode from the guest. This is just a hint and it cannot be guaranteed that the requested resolution will be used. Guest Additions are required for the request to be seen by guests. The caller should issue the request and wait for a resolution change and after a timeout retry.

Specifying 0 for either width, height or bitsPerPixel parameters means that the corresponding values should be taken from the current video mode (i.e. left unchanged).

If the guest OS supports multi-monitor configuration then the display parameter specifies the number of the guest display to send the hint to: 0 is the primary display, 1 is the first secondary and so on. If the multi-monitor configuration is not supported, display must be 0.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG:** The display is not associated with any monitor.

9.7.10 takeScreenShot

Note: This method is not supported in the web service.

```
void IDisplay::takeScreenShot(
    [in] unsigned long screenId,
    [in] [ptr] octet address,
    [in] unsigned long width,
    [in] unsigned long height)
```

screenId**address****width**

height

Takes a screen shot of the requested size and copies it to the 32-bpp buffer allocated by the caller and pointed to by *address*. A pixel consists of 4 bytes in order: B, G, R, 0.

Note: This API can be used only by the COM/XPCOM C++ API as it requires pointer support. Use [takeScreenShotToArray\(\)](#) with other language bindings.

If this method fails, the following error codes may be reported:

- `E_NOTIMPL`: Feature not implemented.
- `VBOX_E_IPRT_ERROR`: Could not take a screenshot.

9.7.11 takeScreenShotToArray

```
octet[] IDisplay::takeScreenShotToArray(
    [in] unsigned long screenId,
    [in] unsigned long width,
    [in] unsigned long height)
```

screenId Monitor to take screenshot from.

width Desired image width.

height Desired image height.

Takes a guest screen shot of the requested size and returns it as an array of bytes in uncompressed 32-bit RGBA format. A pixel consists of 4 bytes in order: R, G, B, 0xFF.

This API is slow, but could be the only option to get guest screenshot for scriptable languages not allowed to manipulate with addresses directly.

If this method fails, the following error codes may be reported:

- `E_NOTIMPL`: Feature not implemented.
- `VBOX_E_IPRT_ERROR`: Could not take a screenshot.

9.8 IFramebuffer

Note: This interface is not supported in the web service.

9.8.1 Attributes**9.8.1.1 address (read-only)**

```
octet IFramebuffer::address
```

Address of the start byte of the frame buffer.

9.8.1.2 width (read-only)

```
unsigned long IFramebuffer::width
```

Frame buffer width, in pixels.

9.8.1.3 height (read-only)

unsigned long IFramebuffer::height

Frame buffer height, in pixels.

9.8.1.4 bitsPerPixel (read-only)

unsigned long IFramebuffer::bitsPerPixel

Color depth, in bits per pixel. When [pixelFormat](#) is [FOURCC_RGB](#), valid values are: 8, 15, 16, 24 and 32.

9.8.1.5 bytesPerLine (read-only)

unsigned long IFramebuffer::bytesPerLine

Scan line size, in bytes. When [pixelFormat](#) is [FOURCC_RGB](#), the size of the scan line must be aligned to 32 bits.

9.8.1.6 pixelFormat (read-only)

unsigned long IFramebuffer::pixelFormat

Frame buffer pixel format. It's either one of the values defined by [FramebufferPixelFormat](#) or a raw FOURCC code.

Note: This attribute must never return [Opaque](#) – the format of the buffer [address](#) points to must be always known.

9.8.1.7 usesGuestVRAM (read-only)

boolean IFramebuffer::usesGuestVRAM

Defines whether this frame buffer uses the virtual video card's memory buffer (guest VRAM) directly or not. See [requestResize\(\)](#) for more information.

9.8.1.8 heightReduction (read-only)

unsigned long IFramebuffer::heightReduction

Hint from the frame buffer about how much of the standard screen height it wants to use for itself. This information is exposed to the guest through the VESA BIOS and VMMDev interface so that it can use it for determining its video mode table. It is not guaranteed that the guest respects the value.

9.8.1.9 overlay (read-only)

[IFramebufferOverlay](#) IFramebuffer::overlay

Note: This attribute is not supported in the web service.

An alpha-blended overlay which is superposed over the frame buffer. The initial purpose is to allow the display of icons providing information about the VM state, including disk activity, in front ends which do not have other means of doing that. The overlay is designed to be controlled exclusively by IDisplay. It has no locking of its own, and any changes made to it are not guaranteed to be visible until the affected portion of IFramebuffer is updated. The overlay can be created lazily the first time it is requested. This attribute can also return null to signal that the overlay is not implemented.

9.8.1.10 winId (read-only)

```
unsigned long long IFramebuffer::winId
```

Platform-dependent identifier of the window where context of this frame buffer is drawn, or zero if there's no such window.

9.8.2 getVisibleRegion

Note: This method is not supported in the web service.

```
unsigned long IFramebuffer::getVisibleRegion(  
    [in] [ptr] octet rectangles,  
    [in] unsigned long count)
```

rectangles Pointer to the RTRECT array to receive region data.

count Number of RTRECT elements in the rectangles array.

Returns the visible region of this frame buffer.

If the rectangles parameter is null then the value of the count parameter is ignored and the number of elements necessary to describe the current visible region is returned in countCopied.

If rectangles is not null but count is less than the required number of elements to store region data, the method will report a failure. If count is equal or greater than the required number of elements, then the actual number of elements copied to the provided array will be returned in countCopied.

Note: The address of the provided array must be in the process space of this IFramebuffer object.

Note: Method not yet implemented.

9.8.3 lock

```
void IFramebuffer::lock()
```

Locks the frame buffer. Gets called by the IDisplay object where this frame buffer is bound to.

9.8.4 notifyUpdate

```
void IFramebuffer::notifyUpdate(
    [in] unsigned long x,
    [in] unsigned long y,
    [in] unsigned long width,
    [in] unsigned long height)
```

x

y

width

height

Informs about an update. Gets called by the display object where this buffer is registered.

9.8.5 processVHWACommand

Note: This method is not supported in the web service.

```
void IFramebuffer::processVHWACommand(
    [in] [ptr] octet command)
```

command Pointer to VBOXVHWACMD containing the command to execute.

Posts a Video HW Acceleration Command to the frame buffer for processing. The commands used for 2D video acceleration (DDraw surface creation/destroying, blitting, scaling, color conversion, overlaying, etc.) are posted from quest to the host to be processed by the host hardware.

Note: The address of the provided command must be in the process space of this IFramebuffer object.

9.8.6 requestResize

Note: This method is not supported in the web service.

```
boolean IFramebuffer::requestResize(
    [in] unsigned long screenId,
    [in] unsigned long pixelFormat,
    [in] [ptr] octet VRAM,
    [in] unsigned long bitsPerPixel,
    [in] unsigned long bytesPerLine,
    [in] unsigned long width,
    [in] unsigned long height)
```

screenId Logical screen number. Must be used in the corresponding call to [IDisplay::resizeCompleted\(\)](#) if this call is made.

pixelFormat Pixel format of the memory buffer pointed to by VRAM. See also [FramebufferPixelFormat](#).

VRAM Pointer to the virtual video card's VRAM (may be null).

bitsPerPixel Color depth, bits per pixel.

bytesPerLine Size of one scan line, in bytes.

width Width of the guest display, in pixels.

height Height of the guest display, in pixels.

Requests a size and pixel format change.

There are two modes of working with the video buffer of the virtual machine. The *indirect* mode implies that the `IFramebuffer` implementation allocates a memory buffer for the requested display mode and provides it to the virtual machine. In *direct* mode, the `IFramebuffer` implementation uses the memory buffer allocated and owned by the virtual machine. This buffer represents the video memory of the emulated video adapter (so called *guest VRAM*). The direct mode is usually faster because the implementation gets a raw pointer to the guest VRAM buffer which it can directly use for visualizing the contents of the virtual display, as opposed to the indirect mode where the contents of guest VRAM are copied to the memory buffer provided by the implementation every time a display update occurs.

It is important to note that the direct mode is really fast only when the implementation uses the given guest VRAM buffer directly, for example, by blitting it to the window representing the virtual machine's display, which saves at least one copy operation comparing to the indirect mode. However, using the guest VRAM buffer directly is not always possible: the format and the color depth of this buffer may be not supported by the target window, or it may be unknown (opaque) as in case of text or non-linear multi-plane VGA video modes. In this case, the indirect mode (that is always available) should be used as a fallback: when the guest VRAM contents are copied to the implementation-provided memory buffer, color and format conversion is done automatically by the underlying code.

The `pixelFormat` parameter defines whether the direct mode is available or not. If `pixelFormat` is `Opaque` then direct access to the guest VRAM buffer is not available – the `VRAM`, `bitsPerPixel` and `bytesPerLine` parameters must be ignored and the implementation must use the indirect mode (where it provides its own buffer in one of the supported formats). In all other cases, `pixelFormat` together with `bitsPerPixel` and `bytesPerLine` define the format of the video memory buffer pointed to by the `VRAM` parameter and the implementation is free to choose which mode to use. To indicate that this frame buffer uses the direct mode, the implementation of the `usesGuestVRAM` attribute must return `true` and `address` must return exactly the same address that is passed in the `VRAM` parameter of this method; otherwise it is assumed that the indirect strategy is chosen.

The `width` and `height` parameters represent the size of the requested display mode in both modes. In case of indirect mode, the provided memory buffer should be big enough to store data of the given display mode. In case of direct mode, it is guaranteed that the given VRAM buffer contains enough space to represent the display mode of the given size. Note that this frame buffer's `width` and `height` attributes must return exactly the same values as passed to this method after the resize is completed (see below).

The `finished` output parameter determines if the implementation has finished resizing the frame buffer or not. If, for some reason, the resize cannot be finished immediately during this call, `finished` must be set to `false`, and the implementation must call `IDisplay::resizeCompleted()` after it has returned from this method as soon as possible. If `finished` is `false`, the machine will not call any frame buffer methods until `IDisplay::resizeCompleted()` is called.

Note that if the direct mode is chosen, the `bitsPerPixel`, `bytesPerLine` and `pixelFormat` attributes of this frame buffer must return exactly the same values as specified in the parameters of this method, after the resize is completed. If the indirect mode is chosen, these attributes must return values describing the format of the implementation's own memory buffer `address` points to. Note also that the `bitsPerPixel` value must always correlate with `pixelFormat`. Note that the `pixelFormat` attribute must never return `Opaque` regardless of the selected mode.

Note: This method is called by the IDisplay object under the `lock()` provided by this IFramebuffer implementation. If this method returns `false` in `finished`, then this lock is not released until `IDisplay::resizeCompleted()` is called.

9.8.7 setVisibleRegion

Note: This method is not supported in the web service.

```
void IFramebuffer::setVisibleRegion(
    [in] [ptr] octet rectangles,
    [in] unsigned long count)
```

rectangles Pointer to the RTRECT array.

count Number of RTRECT elements in the rectangles array.

Suggests a new visible region to this frame buffer. This region represents the area of the VM display which is a union of regions of all top-level windows of the guest operating system running inside the VM (if the Guest Additions for this system support this functionality). This information may be used by the frontends to implement the seamless desktop integration feature.

Note: The address of the provided array must be in the process space of this IFramebuffer object.

Note: The IFramebuffer implementation must make a copy of the provided array of rectangles.

Note: Method not yet implemented.

9.8.8 unlock

```
void IFramebuffer::unlock()
```

Unlocks the frame buffer. Gets called by the IDisplay object where this frame buffer is bound to.

9.8.9 videoModeSupported

```
boolean IFramebuffer::videoModeSupported(
    [in] unsigned long width,
    [in] unsigned long height,
    [in] unsigned long bpp)
```

width

height

bpp

Returns whether the frame buffer implementation is willing to support a given video mode. In case it is not able to render the video mode (or for some reason not willing), it should return `false`. Usually this method is called when the guest asks the VMM device whether a given video mode is supported so the information returned is directly exposed to the guest. It is important that this method returns very quickly.

9.9 IFramebufferOverlay

Note: This interface is not supported in the web service.

The `IFramebufferOverlay` interface represents an alpha blended overlay for displaying status icons above an `IFramebuffer`. It is always created not visible, so that it must be explicitly shown. It only covers a portion of the `IFramebuffer`, determined by its width, height and co-ordinates. It is always in packed pixel little-endian 32bit ARGB (in that order) format, and may be written to directly. Do re-read the width though, after setting it, as it may be adjusted (increased) to make it more suitable for the front end.

9.9.1 Attributes**9.9.1.1 x (read-only)**

```
unsigned long IFramebufferOverlay::x
```

X position of the overlay, relative to the frame buffer.

9.9.1.2 y (read-only)

```
unsigned long IFramebufferOverlay::y
```

Y position of the overlay, relative to the frame buffer.

9.9.1.3 visible (read/write)

```
boolean IFramebufferOverlay::visible
```

Whether the overlay is currently visible.

9.9.1.4 alpha (read/write)

```
unsigned long IFramebufferOverlay::alpha
```

The global alpha value for the overlay. This may or may not be supported by a given front end.

9.9.2 move

```
void IFramebufferOverlay::move(
    [in] unsigned long x,
    [in] unsigned long y)
```

x

y

Changes the overlay's position relative to the `IFramebuffer`.

9.10 IGuest

The IGuest interface represents information about the operating system running inside the virtual machine. Used in [IConsole::guest](#).

IGuest provides information about the guest operating system, whether Guest Additions are installed and other OS-specific virtual machine properties.

9.10.1 Attributes

9.10.1.1 OSTypeId (read-only)

wstring IGuest::OSTypeId

Identifier of the Guest OS type as reported by the Guest Additions. You may use [VirtualBox::getGuestOSType\(\)](#) to obtain an IGuestOSType object representing details about the given Guest OS type.

Note: If Guest Additions are not installed, this value will be the same as [IMachine::OSTypeId](#).

9.10.1.2 additionsActive (read-only)

boolean IGuest::additionsActive

Flag whether the Guest Additions are installed and active in which case their version will be returned by the [additionsVersion](#) property.

9.10.1.3 additionsVersion (read-only)

wstring IGuest::additionsVersion

Version of the Guest Additions (3 decimal numbers separated by dots) or empty when the Additions are not installed. The Additions may also report a version but yet not be active as the version might be refused by VirtualBox (incompatible) or other failures occurred.

9.10.1.4 supportsSeamless (read-only)

boolean IGuest::supportsSeamless

Flag whether seamless guest display rendering (seamless desktop integration) is supported.

9.10.1.5 supportsGraphics (read-only)

boolean IGuest::supportsGraphics

Flag whether the guest is in graphics mode. If it is not, then seamless rendering will not work, resize hints are not immediately acted on and guest display resizes are probably not initiated by the guest additions.

9.10.1.6 memoryBalloonSize (read/write)

unsigned long IGuest::memoryBalloonSize

Guest system memory balloon size in megabytes (transient property).

9.10.1.7 pageFusionEnabled (read/write)

```
boolean IGuest::pageFusionEnabled
```

Flag whether page fusion is enabled or not.

9.10.1.8 statisticsUpdateInterval (read/write)

```
unsigned long IGuest::statisticsUpdateInterval
```

Interval to update guest statistics in seconds.

9.10.2 executeProcess

```
IProgress IGuest::executeProcess(
    [in] wstring execName,
    [in] unsigned long flags,
    [in] wstring arguments[],
    [in] wstring environment[],
    [in] wstring userName,
    [in] wstring password,
    [in] unsigned long timeoutMS,
    [out] unsigned long pid)
```

execName Full path name of the command to execute on the guest; the commands has to exists in the guest VM in order to be executed.

flags Execution flags - currently not supported and therefore has to be set to 0.

arguments Array of arguments passed to the execution command.

environment Environment variables that can be set while the command is being executed, in form of "NAME=VALUE"; one pair per entry. To unset a variable just set its name ("NAME") without a value.

userName User name under which the command will be executed; has to exist and have the appropriate rights to execute programs in the VM.

password Password of the user account specified.

timeoutMS The maximum timeout value (in msec) to wait for finished program execution. Pass 0 for an infinite timeout.

pid The PID (process ID) of the started command for later reference.

Executes an existing program inside the guest VM.

If this method fails, the following error codes may be reported:

- **VBOX_E_IPRT_ERROR:** Could not execute process.

9.10.3 getProcessOutput

```
octet[] IGuest::getProcessOutput(
    [in] unsigned long pid,
    [in] unsigned long flags,
    [in] unsigned long timeoutMS,
    [in] unsigned long long size)
```

pid Process id returned by earlier executeProcess() call.

flags Flags describing which output to retrieve.

timeoutMS The maximum timeout value (in msec) to wait for output data. Pass 0 for an infinite timeout.

size Size in bytes to read in the buffer.

Retrieves output of a formerly started process.

If this method fails, the following error codes may be reported:

- **VBOX_E_IPRT_ERROR**: Could not retrieve output.

9.10.4 getProcessStatus

```
unsigned long IGuest::getProcessStatus(
    [in] unsigned long pid,
    [out] unsigned long exitcode,
    [out] unsigned long flags)
```

pid Process id returned by earlier executeProcess() call.

exitcode The exit code (if available).

flags Additional flags of process status (not used at the moment).

Retrieves status, exit code and the exit reason of a formerly started process.

If this method fails, the following error codes may be reported:

- **VBOX_E_IPRT_ERROR**: Process with specified PID was not found.

9.10.5 internalGetStatistics

```
void IGuest::internalGetStatistics(
    [out] unsigned long cpuUser,
    [out] unsigned long cpuKernel,
    [out] unsigned long cpuIdle,
    [out] unsigned long memTotal,
    [out] unsigned long memFree,
    [out] unsigned long memBalloon,
    [out] unsigned long memShared,
    [out] unsigned long memCache,
    [out] unsigned long pagedTotal,
    [out] unsigned long memAllocTotal,
    [out] unsigned long memFreeTotal,
    [out] unsigned long memBalloonTotal,
    [out] unsigned long memSharedTotal)
```

cpuUser Percentage of processor time spent in user mode as seen by the guest

cpuKernel Percentage of processor time spent in kernel mode as seen by the guest

cpuIdle Percentage of processor time spent idling as seen by the guest

memTotal Total amount of physical guest RAM

memFree Free amount of physical guest RAM

memBalloon Amount of ballooned physical guest RAM

memShared Amount of shared physical guest RAM

memCache Total amount of guest (disk) cache memory

pagedTotal Total amount of space in the page file

memAllocTotal Total amount of memory allocated by the hypervisor

memFreeTotal Total amount of free memory available in the hypervisor

memBalloonTotal Total amount of memory ballooned by the hypervisor

memSharedTotal Total amount of shared memory in the hypervisor

Internal method; do not use as it might change at any time

9.10.6 setCredentials

```
void IGuest::setCredentials(
    [in] wstring userName,
    [in] wstring password,
    [in] wstring domain,
    [in] boolean allowInteractiveLogon)
```

userName User name string, can be empty

password Password string, can be empty

domain Domain name (guest logon scheme specific), can be empty

allowInteractiveLogon Flag whether the guest should alternatively allow the user to interactively specify different credentials. This flag might not be supported by all versions of the Additions.

Store login credentials that can be queried by guest operating systems with Additions installed. The credentials are transient to the session and the guest may also choose to erase them. Note that the caller cannot determine whether the guest operating system has queried or made use of the credentials.

If this method fails, the following error codes may be reported:

- VBOX_E_VM_ERROR: VMM device is not available.

9.11 IGuestOSType

Note: With the web service, this interface is mapped to a structure. Attributes that return this interface will not return an object, but a complete structure containing the attributes listed below as structure members.

9.11.1 Attributes

9.11.1.1 familyId (read-only)

wstring IGuestOSType::familyId

Guest OS family identifier string.

9.11.1.2 familyDescription (read-only)

wstring IGuestOSType::familyDescription

Human readable description of the guest OS family.

9.11.1.3 id (read-only)

wstring IGuestOSType::id

Guest OS identifier string.

9.11.1.4 description (read-only)

wstring IGuestOSType::description

Human readable description of the guest OS.

9.11.1.5 is64Bit (read-only)

boolean IGuestOSType::is64Bit

Returns true if the given OS is 64-bit

9.11.1.6 recommendedIOAPIC (read-only)

boolean IGuestOSType::recommendedIOAPIC

Returns true if IO APIC recommended for this OS type.

9.11.1.7 recommendedVirtEx (read-only)

boolean IGuestOSType::recommendedVirtEx

Returns true if VT-x or AMD-V recommended for this OS type.

9.11.1.8 recommendedRAM (read-only)

unsigned long IGuestOSType::recommendedRAM

Recommended RAM size in Megabytes.

9.11.1.9 recommendedVRAM (read-only)

unsigned long IGuestOSType::recommendedVRAM

Recommended video RAM size in Megabytes.

9.11.1.10 recommendedHDD (read-only)

unsigned long IGuestOSType::recommendedHDD

Recommended hard disk size in Megabytes.

9.11.1.11 adapterType (read-only)

[NetworkAdapterType](#) IGuestOSType::adapterType

Returns recommended network adapter for this OS type.

9.11.1.12 recommendedPae (read-only)

`boolean IGuestOSType::recommendedPae`

Returns `true` if using PAE is recommended for this OS type.

9.11.1.13 recommendedDvdStorageController (read-only)

`StorageControllerType IGuestOSType::recommendedDvdStorageController`

Recommended storage controller type for DVD/CD drives.

9.11.1.14 recommendedDvdStorageBus (read-only)

`StorageBus IGuestOSType::recommendedDvdStorageBus`

Recommended storage bus type for DVD/CD drives.

9.11.1.15 recommendedHdStorageController (read-only)

`StorageControllerType IGuestOSType::recommendedHdStorageController`

Recommended storage controller type for HD drives.

9.11.1.16 recommendedHdStorageBus (read-only)

`StorageBus IGuestOSType::recommendedHdStorageBus`

Recommended storage bus type for HD drives.

9.11.1.17 recommendedFirmware (read-only)

`FirmwareType IGuestOSType::recommendedFirmware`

Recommended firmware type.

9.11.1.18 recommendedUsbHid (read-only)

`boolean IGuestOSType::recommendedUsbHid`

Returns `true` if using USB Human Interface Devices, such as keyboard and mouse recommended.

9.11.1.19 recommendedHpet (read-only)

`boolean IGuestOSType::recommendedHpet`

Returns `true` if using HPET is recommended for this OS type.

9.11.1.20 recommendedUsbTablet (read-only)

`boolean IGuestOSType::recommendedUsbTablet`

Returns `true` if using a USB Tablet is recommended.

9.11.1.21 recommendedRtcUseUtc (read-only)

```
boolean IGuestOSType::recommendedRtcUseUtc
```

Returns true if the RTC of this VM should be set to UTC

9.12 IHost

The IHost interface represents the physical machine that this VirtualBox installation runs on.

An object implementing this interface is returned by the [IVirtualBox:host](#) attribute. This interface contains read-only information about the host's physical hardware (such as what processors and disks are available, what the host operating system is, and so on) and also allows for manipulating some of the host's hardware, such as global USB device filters and host interface networking.

9.12.1 Attributes**9.12.1.1 DVDDrives (read-only)**

```
IMedium IHost::DVDDrives[]
```

List of DVD drives available on the host.

9.12.1.2 floppyDrives (read-only)

```
IMedium IHost::floppyDrives[]
```

List of floppy drives available on the host.

9.12.1.3 USBDevices (read-only)

```
IHostUSBDevice IHost::USBDevices[]
```

List of USB devices currently attached to the host. Once a new device is physically attached to the host computer, it appears in this list and remains there until detached.

Note: If USB functionality is not available in the given edition of VirtualBox, this method will set the result code to E_NOTIMPL.

9.12.1.4 USBDeviceFilters (read-only)

```
IHostUSBDeviceFilter IHost::USBDeviceFilters[]
```

List of USB device filters in action. When a new device is physically attached to the host computer, filters from this list are applied to it (in order they are stored in the list). The first matched filter will determine the [action](#) performed on the device.

Unless the device is ignored by these filters, filters of all currently running virtual machines ([IUSBController::deviceFilters\[\]](#)) are applied to it.

Note: If USB functionality is not available in the given edition of VirtualBox, this method will set the result code to E_NOTIMPL.

See also: [IHostUSBDeviceFilter](#), [USBDeviceState](#)

9.12.1.5 networkInterfaces (read-only)

`IHostNetworkInterface IHost::networkInterfaces[]`

List of host network interfaces currently defined on the host.

9.12.1.6 processorCount (read-only)

`unsigned long IHost::processorCount`

Number of (logical) CPUs installed in the host system.

9.12.1.7 processorOnlineCount (read-only)

`unsigned long IHost::processorOnlineCount`

Number of (logical) CPUs online in the host system.

9.12.1.8 processorCoreCount (read-only)

`unsigned long IHost::processorCoreCount`

Number of physical processor cores installed in the host system.

9.12.1.9 memorySize (read-only)

`unsigned long IHost::memorySize`

Amount of system memory in megabytes installed in the host system.

9.12.1.10 memoryAvailable (read-only)

`unsigned long IHost::memoryAvailable`

Available system memory in the host system.

9.12.1.11 operatingSystem (read-only)

`wstring IHost::operatingSystem`

Name of the host system's operating system.

9.12.1.12 OSVersion (read-only)

`wstring IHost::OSVersion`

Host operating system's version string.

9.12.1.13 UTCTime (read-only)

`long long IHost::UTCTime`

Returns the current host time in milliseconds since 1970-01-01 UTC.

9.12.1.14 Acceleration3DAvailable (read-only)

`boolean IHost::Acceleration3DAvailable`

Returns true when the host supports 3D hardware acceleration.

9.12.2 createHostOnlyNetworkInterface

IProgress IHost::createHostOnlyNetworkInterface(
[out] **IHostNetworkInterface** **hostInterface**)

hostInterface Created host interface object.

Creates a new adapter for Host Only Networking.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: Host network interface name already exists.

9.12.3 createUSBDeviceFilter

IHostUSBDeviceFilter IHost::createUSBDeviceFilter(
[in] wstring **name**)

name Filter name. See **IUSBDeviceFilter::name** for more info.

Creates a new USB device filter. All attributes except the filter name are set to empty (any match), *active* is false (the filter is not active).

The created filter can be added to the list of filters using **insertUSBDeviceFilter()**.

See also: #USBDeviceFilters

9.12.4 findHostDVDDrive

IMedium IHost::findHostDVDDrive(
[in] wstring **name**)

name Name of the host drive to search for

Searches for a host DVD drive with the given name.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Given name does not correspond to any host drive.

9.12.5 findHostFloppyDrive

IMedium IHost::findHostFloppyDrive(
[in] wstring **name**)

name Name of the host floppy drive to search for

Searches for a host floppy drive with the given name.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Given name does not correspond to any host floppy drive.

9.12.6 findHostNetworkInterfaceById

IHostNetworkInterface IHost::findHostNetworkInterfaceById(
[in] uuid **id**)

id GUID of the host network interface to search for.

Searches through all host network interfaces for an interface with the given GUID.

Note: The method returns an error if the given GUID does not correspond to any host network interface.

9.12.7 findHostNetworkInterfaceByName

`IHostNetworkInterface` `IHost::findHostNetworkInterfaceByName(`
 [in] `wstring name`)

name Name of the host network interface to search for.

Searches through all host network interfaces for an interface with the given name.

Note: The method returns an error if the given name does not correspond to any host network interface.

9.12.8 findHostNetworkInterfacesOfType

`IHostNetworkInterface[]` `IHost::findHostNetworkInterfacesOfType(`
 [in] `HostNetworkInterfaceType type`)

type type of the host network interfaces to search for.

Searches through all host network interfaces and returns a list of interfaces of the specified type

9.12.9 findUSBDeviceByAddress

`IHostUSBDevice` `IHost::findUSBDeviceByAddress(`
 [in] `wstring name`)

name Address of the USB device (as assigned by the host) to search for.

Searches for a USB device with the given host address.

See also: `IHostUSBDevice::address`

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Given name does not correspond to any USB device.

9.12.10 findUSBDeviceById

`IHostUSBDevice` `IHost::findUSBDeviceById(`
 [in] `uuid id`)

id UUID of the USB device to search for.

Searches for a USB device with the given UUID.

See also: `IHostUSBDevice::id`

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Given id does not correspond to any USB device.

9.12.11 getProcessorCPUIDLeaf

```
void IHost::getProcessorCPUIDLeaf(  
    [in] unsigned long cpuId,  
    [in] unsigned long leaf,  
    [in] unsigned long subLeaf,  
    [out] unsigned long valEax,  
    [out] unsigned long valEbx,  
    [out] unsigned long valEcx,  
    [out] unsigned long valEdx)
```

cpuId Identifier of the CPU. The CPU must be online.

Note: The current implementation might not necessarily return the description for this exact CPU.

leaf CPUID leaf index (eax).

subLeaf CPUID leaf sub index (ecx). This currently only applies to cache information on Intel CPUs. Use 0 if retrieving values for [IMachine::setCPUIDLeaf\(\)](#).

valEax CPUID leaf value for register eax.

valEbx CPUID leaf value for register ebx.

valEcx CPUID leaf value for register ecx.

valEdx CPUID leaf value for register edx.

Returns the CPU cpuid information for the specified leaf.

9.12.12 getProcessorDescription

```
wstring IHost::getProcessorDescription(  
    [in] unsigned long cpuId)
```

cpuId Identifier of the CPU.

Note: The current implementation might not necessarily return the description for this exact CPU.

Query the model string of a specified host CPU.

9.12.13 getProcessorFeature

```
boolean IHost::getProcessorFeature(  
    [in] ProcessorFeature feature)
```

feature CPU Feature identifier.

Query whether a CPU feature is supported or not.

9.12.14 getProcessorSpeed

```
unsigned long IHost::getProcessorSpeed(  
    [in] unsigned long cpuId)
```

cpuId Identifier of the CPU.

Query the (approximate) maximum speed of a specified host CPU in Megahertz.

9.12.15 insertUSBDeviceFilter

```
void IHost::insertUSBDeviceFilter(  
    [in] unsigned long position,  
    [in] IHostUSBDeviceFilter filter)
```

position Position to insert the filter to.

filter USB device filter to insert.

Inserts the given USB device to the specified position in the list of filters.

Positions are numbered starting from 0. If the specified position is equal to or greater than the number of elements in the list, the filter is added at the end of the collection.

Note: Duplicates are not allowed, so an attempt to insert a filter already in the list is an error.

Note: If USB functionality is not available in the given edition of VirtualBox, this method will set the result code to E_NOTIMPL.

See also: #USBDeviceFilters

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_OBJECT_STATE: USB device filter is not created within this VirtualBox instance.
- E_INVALIDARG: USB device filter already in list.

9.12.16 removeHostOnlyNetworkInterface

```
IProgress IHost::removeHostOnlyNetworkInterface(  
    [in] uuid id)
```

id Adapter GUID.

Removes the given Host Only Networking interface.

If this method fails, the following error codes may be reported:

- VBOX_E_OBJECT_NOT_FOUND: No host network interface matching id found.

9.12.17 removeUSBDeviceFilter

```
void IHost::removeUSBDeviceFilter(  
    [in] unsigned long position)
```

position Position to remove the filter from.

Removes a USB device filter from the specified position in the list of filters.

Positions are numbered starting from 0. Specifying a position equal to or greater than the number of elements in the list will produce an error.

Note: If USB functionality is not available in the given edition of VirtualBox, this method will set the result code to E_NOTIMPL.

See also: #USBDeviceFilters

If this method fails, the following error codes may be reported:

- E_INVALIDARG: USB device filter list empty or invalid position.

9.13 IHostNetworkInterface

Represents one of host's network interfaces. IP V6 address and network mask are strings of 32 hexadecimal digits grouped by four. Groups are separated by colons. For example, fe80:0000:0000:0000:021e:c2ff:fed2:b030.

9.13.1 Attributes

9.13.1.1 name (read-only)

```
wstring IHostNetworkInterface::name
```

Returns the host network interface name.

9.13.1.2 id (read-only)

```
uuid IHostNetworkInterface::id
```

Returns the interface UUID.

9.13.1.3 networkName (read-only)

```
wstring IHostNetworkInterface::networkName
```

Returns the name of a virtual network the interface gets attached to.

9.13.1.4 dhcpEnabled (read-only)

```
boolean IHostNetworkInterface::dhcpEnabled
```

Specifies whether the DHCP is enabled for the interface.

9.13.1.5 IPAddress (read-only)

```
wstring IHostNetworkInterface::IPAddress
```

Returns the IP V4 address of the interface.

9.13.1.6 networkMask (read-only)

wstring IHostNetworkInterface::networkMask

Returns the network mask of the interface.

9.13.1.7 IPV6Supported (read-only)

boolean IHostNetworkInterface::IPV6Supported

Specifies whether the IP V6 is supported/enabled for the interface.

9.13.1.8 IPV6Address (read-only)

wstring IHostNetworkInterface::IPV6Address

Returns the IP V6 address of the interface.

9.13.1.9 IPV6NetworkMaskPrefixLength (read-only)

unsigned long IHostNetworkInterface::IPV6NetworkMaskPrefixLength

Returns the length IP V6 network mask prefix of the interface.

9.13.1.10 hardwareAddress (read-only)

wstring IHostNetworkInterface::hardwareAddress

Returns the hardware address. For Ethernet it is MAC address.

9.13.1.11 mediumType (read-only)

[HostNetworkInterfaceMediumType](#) IHostNetworkInterface::mediumType

Type of protocol encapsulation used.

9.13.1.12 status (read-only)

[HostNetworkInterfaceStatus](#) IHostNetworkInterface::status

Status of the interface.

9.13.1.13 interfaceType (read-only)

[HostNetworkInterfaceType](#) IHostNetworkInterface::interfaceType

specifies the host interface type.

9.13.2 dhcpRediscover

void IHostNetworkInterface::dhcpRediscover()

refreshes the IP configuration for dhcp-enabled interface.

9.13.3 enableDynamicIpConfig

void IHostNetworkInterface::enableDynamicIpConfig()

enables the dynamic IP configuration.

9.13.4 enableStaticIpConfig

```
void IHostNetworkInterface::enableStaticIpConfig(  
    [in] wstring IPAddress,  
    [in] wstring networkMask)
```

IPAddress IP address.

networkMask network mask.

sets and enables the static IP V4 configuration for the given interface.

9.13.5 enableStaticIpConfigV6

```
void IHostNetworkInterface::enableStaticIpConfigV6(  
    [in] wstring IPv6Address,  
    [in] unsigned long IPv6NetworkMaskPrefixLength)
```

IPv6Address IP address.

IPv6NetworkMaskPrefixLength network mask.

sets and enables the static IP V6 configuration for the given interface.

9.14 IHostUSBDevice

The IHostUSBDevice interface represents a physical USB device attached to the host computer.

Besides properties inherited from IUSBDevice, this interface adds the [state](#) property that holds the current state of the USB device.

See also: IHost::USBDevices, IHost::USBDeviceFilters

9.14.1 Attributes

9.14.1.1 state (read-only)

[USBDeviceState](#) IHostUSBDevice::state

Current state of the device.

9.15 IHostUSBDeviceFilter

The IHostUSBDeviceFilter interface represents a global filter for a physical USB device used by the host computer. Used indirectly in [IHost::USBDeviceFilters\[\]](#).

Using filters of this type, the host computer determines the initial state of the USB device after it is physically attached to the host's USB controller.

<p>Note: The IUSBDeviceFilter::remote attribute is ignored by this type of filters, because it makes sense only for machine USB filters.</p>

See also: IHost::USBDeviceFilters

9.15.1 Attributes

9.15.1.1 action (read/write)

[USBDeviceFilterAction](#) IHostUSBDeviceFilter::action

Action performed by the host when an attached USB device matches this filter.

9.16 IInternalMachineControl

Note: This interface is not supported in the web service.

9.16.1 adoptSavedState

```
void IInternalMachineControl::adoptSavedState(
    [in] wstring savedStateFile)
```

savedStateFile Path to the saved state file to adopt.

Gets called by IConsole::adoptSavedState.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Invalid saved state file path.

9.16.2 autoCaptureUSBDevices

```
void IInternalMachineControl::autoCaptureUSBDevices()
```

Requests a capture all matching USB devices attached to the host. When the request is completed, the VM process will get a [IInternalSessionControl::onUSBDeviceAttach\(\)](#) notification per every captured device.

9.16.3 beginPowerUp

```
void IInternalMachineControl::beginPowerUp(
    [in] IProgress progress)
```

progress

Tells VBoxSVC that [IConsole::powerUp\(\)](#) is under ways and gives it the progress object that should be part of any pending [IVirtualBox::openRemoteSession\(\)](#) operations. The progress object may be called back to reflect an early cancelation, so some care have to be taken with respect to any cancelation callbacks. The console object will call [endPowerUp\(\)](#) to signal the completion of the progress object.

9.16.4 beginSavingState

```
void IInternalMachineControl::beginSavingState(
    [in] IProgress progress,
    [out] wstring stateFilePath)
```

progress Progress object created by the VM process to wait until the state is saved.

stateFilePath File path the VM process must save the execution state to.

Called by the VM process to inform the server it wants to save the current state and stop the VM execution.

9.16.5 beginTakingSnapshot

```
void IInternalMachineControl::beginTakingSnapshot(
    [in] IConsole initiator,
    [in] wstring name,
    [in] wstring description,
    [in] IProgress consoleProgress,
    [in] boolean fTakingSnapshotOnline,
    [out] wstring stateFilePath)
```

initiator The console object that initiated this call.

name Snapshot name.

description Snapshot description.

consoleProgress Progress object created by the VM process tracking the snapshot's progress. This has the following sub-operations:

- setting up (weight 1);
- one for each medium attachment that needs a differencing image (weight 1 each);
- another one to copy the VM state (if offline with saved state, weight is VM memory size in MB);
- another one to save the VM state (if online, weight is VM memory size in MB);
- finishing up (weight 1)

fTakingSnapshotOnline Whether this is an online snapshot (i.e. the machine is running).

stateFilePath File path the VM process must save the execution state to.

Called from the VM process to request from the server to perform the server-side actions of creating a snapshot (creating differencing images and the snapshot object).

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.

9.16.6 captureUSBDevice

```
void IInternalMachineControl::captureUSBDevice(
    [in] uuid id)
```

id

Requests a capture of the given host USB device. When the request is completed, the VM process will get a `IInternalSessionControl::onUSBDeviceAttach()` notification.

9.16.7 deleteSnapshot

```
IProgress IInternalMachineControl::deleteSnapshot(
    [in] IConsole initiator,
    [in] uuid id,
    [out] MachineState machineState)
```

initiator The console object that initiated this call.

id UUID of the snapshot to delete.

machineState New machine state after this operation is started.

Gets called by `IConsole::deleteSnapshot`.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Snapshot has more than one child snapshot.

9.16.8 detachAllUSBDevices

```
void IInternalMachineControl::detachAllUSBDevices(
    [in] boolean done)
```

done

Notification that a VM that is being powered down. The `done` parameter indicates whether which stage of the power down we're at. When `done = false` the VM is announcing its intentions, while when `done = true` the VM is reporting what it has done.

Note: In the `done = true` case, the server must run its own filters and filters of all VMs but this one on all detach devices as if they were just attached to the host computer.

9.16.9 detachUSBDevice

```
void IInternalMachineControl::detachUSBDevice(
    [in] uuid id,
    [in] boolean done)
```

id

done

Notification that a VM is going to detach (`done = false`) or has already detached (`done = true`) the given USB device. When the `done = true` request is completed, the VM process will get a `IInternalSessionControl::onUSBDeviceDetach()` notification.

Note: In the `done = true` case, the server must run its own filters and filters of all VMs but this one on the detached device as if it were just attached to the host computer.

9.16.10 endPowerUp

```
void IInternalMachineControl::endPowerUp(
    [in] long result)
```

result

Tells `VBoxSVC` that `IConsole::powerUp()` has completed. This method may query status information from the progress object it received in `beginPowerUp()` and copy it over to any in progress `IVirtualBox::openRemoteSession()` call in order to complete that progress object.

9.16.11 endSavingState

```
void IInternalMachineControl::endSavingState(
    [in] boolean success)
```

success true to indicate success and false otherwise.

Called by the VM process to inform the server that saving the state previously requested by #beginSavingState is either successfully finished or there was a failure.

If this method fails, the following error codes may be reported:

- VBOX_E_FILE_ERROR: Settings file not accessible.
- VBOX_E_XML_ERROR: Could not parse the settings file.

9.16.12 endTakingSnapshot

```
void IInternalMachineControl::endTakingSnapshot(
    [in] boolean success)
```

success true to indicate success and false otherwise

Called by the VM process to inform the server that the snapshot previously requested by #beginTakingSnapshot is either successfully taken or there was a failure.

9.16.13 finishOnlineMergeMedium

```
void IInternalMachineControl::finishOnlineMergeMedium(
    [in] IMediumAttachment mediumAttachment,
    [in] IMedium source,
    [in] IMedium target,
    [in] boolean mergeForward,
    [in] IMedium parentForTarget,
    [in] IMedium childrenToReparent[])
```

mediumAttachment The medium attachment which needs to be cleaned up.

source Merge source medium.

target Merge target medium.

mergeForward Merge direction.

parentForTarget For forward merges: new parent for target medium.

childrenToReparent For backward merges: list of media which need their parent UUID updated.

Gets called by IConsole::onlineMergeMedium.

9.16.14 getIPCId

```
wstring IInternalMachineControl::getIPCId()
```

9.16.15 lockMedia

```
void IInternalMachineControl::lockMedia()
```

Locks all media attached to the machine for writing and parents of attached differencing media (if any) for reading. This operation is atomic so that if it fails no media is actually locked.

This method is intended to be called when the machine is in Starting or Restoring state. The locked media will be automatically unlocked when the machine is powered off or crashed.

9.16.16 onSessionEnd

```
IProgress IInternalMachineControl::onSessionEnd(
    [in] ISession session)
```

session Session that is being closed

Triggered by the given session object when the session is about to close normally.

9.16.17 pullGuestProperties

```
void IInternalMachineControl::pullGuestProperties(
    [out] wstring name[],
    [out] wstring value[],
    [out] unsigned long long timestamp[],
    [out] wstring flags[])
```

name The names of the properties returned.

value The values of the properties returned. The array entries match the corresponding entries in the name array.

timestamp The time stamps of the properties returned. The array entries match the corresponding entries in the name array.

flags The flags of the properties returned. The array entries match the corresponding entries in the name array.

Get the list of the guest properties matching a set of patterns along with their values, time stamps and flags and give responsibility for managing properties to the console.

9.16.18 pushGuestProperty

```
void IInternalMachineControl::pushGuestProperty(
    [in] wstring name,
    [in] wstring value,
    [in] unsigned long long timestamp,
    [in] wstring flags)
```

name The name of the property to be updated.

value The value of the property.

timestamp The timestamp of the property.

flags The flags of the property.

Update a single guest property in IMachine.

9.16.19 restoreSnapshot

```
IProgress IInternalMachineControl::restoreSnapshot(
    [in] IConsole initiator,
    [in] ISnapshot snapshot,
    [out] MachineState machineState)
```

initiator The console object that initiated this call.

snapshot The snapshot to restore the VM state from.

machineState New machine state after this operation is started.

Gets called by IConsole::RestoreSnapshot.

9.16.20 runUSBDeviceFilters

```
void IInternalMachineControl::runUSBDeviceFilters(  
    [in] IUSBDevice device,  
    [out] boolean matched,  
    [out] unsigned long maskedInterfaces)
```

device

matched

maskedInterfaces

Asks the server to run USB devices filters of the associated machine against the given USB device and tell if there is a match.

Note: Intended to be used only for remote USB devices. Local ones don't require to call this method (this is done implicitly by the Host and USBProxyService).

9.16.21 setRemoveSavedState

```
void IInternalMachineControl::setRemoveSavedState(  
    [in] boolean aRemove)
```

aRemove

Updates the flag whether saved state is removed on a machine state change from Saved to PoweredOff.

9.16.22 unlockMedia

```
void IInternalMachineControl::unlockMedia()
```

Unlocks all media previously locked using [lockMedia\(\)](#).

This method is intended to be used with teleportation so that it is possible to teleport between processes on the same machine.

9.16.23 updateState

```
void IInternalMachineControl::updateState(  
    [in] MachineState state)
```

state

Updates the VM state.

Note: This operation will also update the settings file with the correct information about the saved state file and delete this file from disk when appropriate.

9.17 IInternalSessionControl

Note: This interface is not supported in the web service.

9.17.1 accessGuestProperty

```
void IInternalSessionControl::accessGuestProperty(
    [in] wstring name,
    [in] wstring value,
    [in] wstring flags,
    [in] boolean isSetter,
    [out] wstring retValue,
    [out] unsigned long long retTimestamp,
    [out] wstring retFlags)
```

name

value

flags

isSetter

retValue

retTimestamp

retFlags

Called by [IMachine::getGuestProperty\(\)](#) and by [IMachine::setGuestProperty\(\)](#) in order to read and modify guest properties.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type is not direct.

9.17.2 assignMachine

```
void IInternalSessionControl::assignMachine(
    [in] IMachine machine)
```

machine

Assigns the machine object associated with this direct-type session or informs the session that it will be a remote one (if `machine == null`).

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.3 assignRemoteMachine

```
void IInternalSessionControl::assignRemoteMachine(
    [in] IMachine machine,
    [in] IConsole console)
```

machine

console

Assigns the machine and the (remote) console object associated with this remote-type session.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.

9.17.4 enumerateGuestProperties

```
void IInternalSessionControl::enumerateGuestProperties(
    [in] wstring patterns,
    [out] wstring key[],
    [out] wstring value[],
    [out] unsigned long long timestamp[],
    [out] wstring flags[])
```

patterns The patterns to match the properties against as a comma-separated string. If this is empty, all properties currently set will be returned.

key The key names of the properties returned.

value The values of the properties returned. The array entries match the corresponding entries in the key array.

timestamp The time stamps of the properties returned. The array entries match the corresponding entries in the key array.

flags The flags of the properties returned. The array entries match the corresponding entries in the key array.

Return a list of the guest properties matching a set of patterns along with their values, time stamps and flags.

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Machine session is not open.
- VBOX_E_INVALID_OBJECT_STATE: Session type is not direct.

9.17.5 getPID

```
unsigned long IInternalSessionControl::getPID()
```

PID of the process that has created this Session object.

9.17.6 getRemoteConsole

```
IConsole IInternalSessionControl::getRemoteConsole()
```

Returns the console object suitable for remote control.

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.17.7 onCPUChange

```
void IInternalSessionControl::onCPUChange(
    [in] unsigned long cpu,
    [in] boolean add)
```

cpu The CPU which changed

add Flag whether the CPU was added or removed

Notification when a CPU changes.

9.17.8 onMediumChange

```
void IInternalSessionControl::onMediumChange(
    [in] IMediumAttachment mediumAttachment,
    [in] boolean force)
```

mediumAttachment

force

Triggered when attached media of the associated virtual machine have changed.
If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.17.9 onNetworkAdapterChange

```
void IInternalSessionControl::onNetworkAdapterChange(
    [in] INetworkAdapter networkAdapter,
    [in] boolean changeAdapter)
```

networkAdapter

changeAdapter

Triggered when settings of a network adapter of the associated virtual machine have changed.
If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.17.10 onParallelPortChange

```
void IInternalSessionControl::onParallelPortChange(
    [in] IParallelPort parallelPort)
```

parallelPort

Triggered when settings of a parallel port of the associated virtual machine have changed.
If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.17.11 onSerialPortChange

```
void IInternalSessionControl::onSerialPortChange(
    [in] ISerialPort serialPort)
```

serialPort

Triggered when settings of a serial port of the associated virtual machine have changed.
If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.17.12 onSharedFolderChange

```
void IInternalSessionControl::onSharedFolderChange(
    [in] boolean global)
```

global

Triggered when a permanent (global or machine) shared folder has been created or removed.

Note: We don't pass shared folder parameters in this notification because the order in which parallel notifications are delivered is not defined, therefore it could happen that these parameters were outdated by the time of processing this notification.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.13 onShowWindow

```
void IInternalSessionControl::onShowWindow(
    [in] boolean check,
    [out] boolean canShow,
    [out] unsigned long long winId)
```

check

canShow

winId

Called by [IMachine::canShowConsoleWindow\(\)](#) and by [IMachine::showConsoleWindow\(\)](#) in order to notify console callbacks [IConsoleCallback::onCanShowWindow\(\)](#) and [IConsoleCallback::onShowWindow\(\)](#).

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.14 onStorageControllerChange

```
void IInternalSessionControl::onStorageControllerChange()
```

Triggered when settings of a storage controller of the associated virtual machine have changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.15 onUSBControllerChange

```
void IInternalSessionControl::onUSBControllerChange()
```

Triggered when settings of the USB controller object of the associated virtual machine have changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.16 onUSBDeviceAttach

```
void IInternalSessionControl::onUSBDeviceAttach(
    [in] IUSBDevice device,
    [in] IVirtualBoxErrorInfo error,
    [in] unsigned long maskedInterfaces)
```

device

error

maskedInterfaces

Triggered when a request to capture a USB device (as a result of matched USB filters or direct call to [IConsole::attachUSBDevice\(\)](#)) has completed. A null error object means success, otherwise it describes a failure.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.17 onUSBDeviceDetach

```
void IInternalSessionControl::onUSBDeviceDetach(
    [in] uuid id,
    [in] IVirtualBoxErrorInfo error)
```

id

error

Triggered when a request to release the USB device (as a result of machine termination or direct call to [IConsole::detachUSBDevice\(\)](#)) has completed. A null error object means success, otherwise it describes a failure.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.18 onVRDPServerChange

```
void IInternalSessionControl::onVRDPServerChange(
    [in] boolean restart)
```

restart Flag whether the server must be restarted

Triggered when settings of the VRDP server object of the associated virtual machine have changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Session state prevents operation.
- `VBOX_E_INVALID_OBJECT_STATE`: Session type prevents operation.

9.17.19 onlineMergeMedium

```
void IInternalSessionControl::onlineMergeMedium(
    [in] IMediumAttachment mediumAttachment,
    [in] unsigned long sourceIdx,
    [in] unsigned long targetIdx,
    [in] IMedium source,
    [in] IMedium target,
    [in] boolean mergeForward,
    [in] IMedium parentForTarget,
    [in] IMedium childrenToReparent[],
    [in] IProgress progress)
```

mediumAttachment The medium attachment to identify the medium chain.

sourceIdx The index of the source image in the chain. Redundant, but drastically reduces IPC.

targetIdx The index of the target image in the chain. Redundant, but drastically reduces IPC.

source Merge source medium.

target Merge target medium.

mergeForward Merge direction.

parentForTarget For forward merges: new parent for target medium.

childrenToReparent For backward merges: list of media which need their parent UUID updated.

progress Progress object for this operation.

Triggers online merging of a hard disk. Used internally when deleting a snapshot while a VM referring to the same hard disk chain is running.

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Machine session is not open.
- VBOX_E_INVALID_OBJECT_STATE: Session type is not direct.

9.17.20 uninitialized

```
void IInternalSessionControl::uninitialize()
```

Uninitializes (closes) this session. Used by VirtualBox to close the corresponding remote session when the direct session dies or gets closed.

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.

9.17.21 updateMachineState

```
void IInternalSessionControl::updateMachineState(
    [in] MachineState aMachineState)
```

aMachineState

Updates the machine state in the VM process. Must be called only in certain cases (see the method implementation).

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Session state prevents operation.
- VBOX_E_INVALID_OBJECT_STATE: Session type prevents operation.

9.18 IKeyboard

The IKeyboard interface represents the virtual machine's keyboard. Used in [IConsole::keyboard](#).

Use this interface to send keystrokes or the Ctrl-Alt-Del sequence to the virtual machine.

9.18.1 putCAD

```
void IKeyboard::putCAD()
```

Sends the Ctrl-Alt-Del sequence to the keyboard. This function is nothing special, it is just a convenience function calling [putScancodes\(\)](#) with the proper scancodes.

If this method fails, the following error codes may be reported:

- `VBOX_E_IPRT_ERROR`: Could not send all scan codes to virtual keyboard.

9.18.2 putScancode

```
void IKeyboard::putScancode(
    [in] long scancode)
```

scancode

Sends a scancode to the keyboard.

If this method fails, the following error codes may be reported:

- `VBOX_E_IPRT_ERROR`: Could not send scan code to virtual keyboard.

9.18.3 putScancodes

```
unsigned long IKeyboard::putScancodes(
    [in] long scancodes[])
```

scancodes

Sends an array of scancodes to the keyboard.

If this method fails, the following error codes may be reported:

- `VBOX_E_IPRT_ERROR`: Could not send all scan codes to virtual keyboard.

9.19 ILocalOwner

Note: This interface is not supported in the web service.

The ILocalOwner interface allows to register local objects (created without COM calls, but with `new()`). Once registered, calls to methods of such objects can be made from remote COM processes. The main usecase is the event callback implementation where API clients provide callback objects.

9.19.1 setLocalObject

```
void ILocalOwner::setLocalObject(
    [in] $unknown object)
```

object Local object to forward requests to. If null, clears currently set local object.

Set local object.

9.20 IMachine

The IMachine interface represents a virtual machine, or guest, created in VirtualBox.

This interface is used in two contexts. First of all, a collection of objects implementing this interface is stored in the `IVirtualBox::machines[]` attribute which lists all the virtual machines that are currently registered with this VirtualBox installation. Also, once a session has been opened for the given virtual machine (e.g. the virtual machine is running), the machine object associated with the open session can be queried from the session object; see [ISession](#) for details.

The main role of this interface is to expose the settings of the virtual machine and provide methods to change various aspects of the virtual machine's configuration. For machine objects stored in the `IVirtualBox::machines[]` collection, all attributes are read-only unless explicitly stated otherwise in individual attribute and method descriptions. In order to change a machine setting, a session for this machine must be opened using one of `IVirtualBox::openSession()`, `IVirtualBox::openRemoteSession()` or `IVirtualBox::openExistingSession()` methods. After the session has been successfully opened, a mutable machine object needs to be queried from the session object and then the desired settings changes can be applied to the returned object using IMachine attributes and methods. See the [ISession](#) interface description for more information about sessions.

Note that IMachine does not provide methods to control virtual machine execution (such as start the machine, or power it down) – these methods are grouped in a separate interface called [IConsole](#).

See also: [ISession](#), [IConsole](#)

9.20.1 Attributes

9.20.1.1 parent (read-only)

`IVirtualBox IMachine::parent`

Associated parent object.

9.20.1.2 accessible (read-only)

`boolean IMachine::accessible`

Whether this virtual machine is currently accessible or not.

A machine is always deemed accessible unless it is registered *and* its settings file cannot be read or parsed (either because the file itself is unavailable or has invalid XML contents).

Every time this property is read, the accessibility state of this machine is re-evaluated. If the returned value is `false`, the [accessError](#) property may be used to get the detailed error information describing the reason of inaccessibility, including XML error messages.

When the machine is inaccessible, only the following properties can be used on it:

- [parent](#)
- [id](#)
- [settingsFilePath](#)
- [accessible](#)
- [accessError](#)

An attempt to access any other property or method will return an error.

The only possible action you can perform on an inaccessible machine is to unregister it using the `IVirtualBox::unregisterMachine()` call (or, to check for the accessibility state once more by querying this property).

Note: In the current implementation, once this property returns `true`, the machine will never become inaccessible later, even if its settings file cannot be successfully read/written any more (at least, until the VirtualBox server is restarted). This limitation may be removed in future releases.

9.20.1.3 `accessError` (read-only)

`IVirtualBoxErrorInfo IMachine::accessError`

Error information describing the reason of machine inaccessibility.

Reading this property is only valid after the last call to `accessible` returned `false` (i.e. the machine is currently inaccessible). Otherwise, a `null` `IVirtualBoxErrorInfo` object will be returned.

9.20.1.4 `name` (read/write)

`wstring IMachine::name`

Name of the virtual machine.

Besides being used for human-readable identification purposes everywhere in VirtualBox, the virtual machine name is also used as a name of the machine's settings file and as a name of the subdirectory this settings file resides in. Thus, every time you change the value of this property, the settings file will be renamed once you call `saveSettings()` to confirm the change. The containing subdirectory will be also renamed, but only if it has exactly the same name as the settings file itself prior to changing this property (for backward compatibility with previous API releases). The above implies the following limitations:

- The machine name cannot be empty.
- The machine name can contain only characters that are valid file name characters according to the rules of the file system used to store VirtualBox configuration.
- You cannot have two or more machines with the same name if they use the same subdirectory for storing the machine settings files.
- You cannot change the name of the machine if it is running, or if any file in the directory containing the settings file is being used by another running machine or by any other process in the host operating system at a time when `saveSettings()` is called.

If any of the above limitations are hit, `saveSettings()` will return an appropriate error message explaining the exact reason and the changes you made to this machine will not be saved.

Note: For “legacy” machines created using the `IVirtualBox::createLegacyMachine()` call, the above naming limitations do not apply because the machine name does not affect the settings file name. The settings file name remains the same as it was specified during machine creation and never changes.

9.20.1.5 `description` (read/write)

`wstring IMachine::description`

Description of the virtual machine.

The description attribute can contain any text and is typically used to describe the hardware and software configuration of the virtual machine in detail (i.e. network settings, versions of the installed software and so on).

9.20.1.6 id (read-only)

uuid IMachine::id

UUID of the virtual machine.

9.20.1.7 OSTypeId (read/write)

wstring IMachine::OSTypeId

User-defined identifier of the Guest OS type. You may use [IVirtualBox::getGuestOSType\(\)](#) to obtain an [IGuestOSType](#) object representing details about the given Guest OS type.

Note: This value may differ from the value returned by [IGuest::OSTypeId](#) if Guest Additions are installed to the guest OS.

9.20.1.8 HardwareVersion (read/write)

wstring IMachine::HardwareVersion

Hardware version identifier. Internal use only for now.

9.20.1.9 hardwareUUID (read/write)

uuid IMachine::hardwareUUID

The UUID presented to the guest via memory tables, hardware and guest properties. For most VMs this is the same as the id, but for VMs which have been cloned or teleported it may be the same as the source VM. This latter is because the guest shouldn't notice that it was cloned or teleported.

9.20.1.10 CPUCount (read/write)

unsigned long IMachine::CPUCount

Number of virtual CPUs in the VM.

9.20.1.11 CPUHotPlugEnabled (read/write)

boolean IMachine::CPUHotPlugEnabled

This setting determines whether VirtualBox allows CPU hotplugging for this machine.

9.20.1.12 memorySize (read/write)

unsigned long IMachine::memorySize

System memory size in megabytes.

9.20.1.13 memoryBalloonSize (read/write)

unsigned long IMachine::memoryBalloonSize

Memory balloon size in megabytes.

9.20.1.14 PageFusionEnabled (read/write)

boolean IMachine::PageFusionEnabled

This setting determines whether VirtualBox allows page fusion for this machine (64 bits host only).

9.20.1.15 VRAMSize (read/write)

unsigned long IMachine::VRAMSize

Video memory size in megabytes.

9.20.1.16 accelerate3DEnabled (read/write)

boolean IMachine::accelerate3DEnabled

This setting determines whether VirtualBox allows this machine to make use of the 3D graphics support available on the host.

9.20.1.17 accelerate2DVideoEnabled (read/write)

boolean IMachine::accelerate2DVideoEnabled

This setting determines whether VirtualBox allows this machine to make use of the 2D video acceleration support available on the host.

9.20.1.18 monitorCount (read/write)

unsigned long IMachine::monitorCount

Number of virtual monitors.

Note: Only effective on Windows XP and later guests with Guest Additions installed.
--

9.20.1.19 BIOSSettings (read-only)

[IBIOSSettings](#) IMachine::BIOSSettings

Object containing all BIOS settings.

9.20.1.20 firmwareType (read/write)

[FirmwareType](#) IMachine::firmwareType

Type of firmware (such as legacy BIOS or EFI), used for initial bootstrap in this VM.

9.20.1.21 pointingHidType (read/write)

[PointingHidType](#) IMachine::pointingHidType

Type of pointing HID (such as mouse or tablet) used in this VM. The default is typically “PS2Mouse” but can vary depending on the requirements of the guest operating system.

9.20.1.22 keyboardHidType (read/write)

[KeyboardHidType](#) IMachine::keyboardHidType

Type of keyboard HID used in this VM. The default is typically “PS2Keyboard” but can vary depending on the requirements of the guest operating system.

9.20.1.23 hpetEnabled (read/write)

boolean IMachine::hpetEnabled

This attribute controls if High Precision Event Timer (HPET) is enabled in this VM. Use this property if you want to provide guests with additional time source, or if guest requires HPET to function correctly. Default is false.

9.20.1.24 snapshotFolder (read/write)

wstring IMachine::snapshotFolder

Full path to the directory used to store snapshot data (differencing media and saved state files) of this machine.

The initial value of this property is `<path_to_settings_file>/<machine_uuid>`.

Currently, it is an error to try to change this property on a machine that has snapshots (because this would require to move possibly large files to a different location). A separate method will be available for this purpose later.

Note: Setting this property to null or to an empty string will restore the initial value.

Note: When setting this property, the specified path can be absolute (full path) or relative to the directory where the [machine settings file](#) is located. When reading this property, a full path is always returned.

Note: The specified path may not exist, it will be created when necessary.

9.20.1.25 VRDP Server (read-only)

[IVRDP Server](#) IMachine::VRDP Server

VRDP server object.

9.20.1.26 mediumAttachments (read-only)

[IMediumAttachment](#) IMachine::mediumAttachments[]

Array of media attached to this machine.

9.20.1.27 USBController (read-only)

[IUSBController](#) IMachine::USBController

Associated USB controller object.

Note: If USB functionality is not available in the given edition of VirtualBox, this method will set the result code to E_NOTIMPL.

9.20.1.28 audioAdapter (read-only)

[IAudioAdapter](#) IMachine::audioAdapter

Associated audio adapter, always present.

9.20.1.29 storageControllers (read-only)

[IStorageController](#) IMachine::storageControllers[]

Array of storage controllers attached to this machine.

9.20.1.30 settingsFilePath (read-only)

wstring IMachine::settingsFilePath

Full name of the file containing machine settings data.

9.20.1.31 settingsModified (read-only)

boolean IMachine::settingsModified

Whether the settings of this machine have been modified (but neither yet saved nor discarded).

Note: Reading this property is only valid on instances returned by [ISession::machine](#) and on new machines created by [IVirtualBox::createMachine\(\)](#) or opened by [IVirtualBox::openMachine\(\)](#) but not yet registered, or on unregistered machines after calling [IVirtualBox::unregisterMachine\(\)](#). For all other cases, the settings can never be modified.

Note: For newly created unregistered machines, the value of this property is always `true` until [saveSettings\(\)](#) is called (no matter if any machine settings have been changed after the creation or not). For opened machines the value is set to `false` (and then follows to normal rules).

9.20.1.32 sessionState (read-only)

[SessionState](#) IMachine::sessionState

Current session state for this machine.

9.20.1.33 sessionType (read-only)

wstring IMachine::sessionType

Type of the session. If [sessionState](#) is `SessionSpawning` or `SessionOpen`, this attribute contains the same value as passed to the [IVirtualBox::openRemoteSession\(\)](#) method in the type parameter. If the session was opened directly using [IVirtualBox::openSession\(\)](#), or if [sessionState](#) is `SessionClosed`, the value of this attribute is an empty string.

9.20.1.34 sessionPid (read-only)

unsigned long IMachine::sessionPid

Identifier of the session process. This attribute contains the platform-dependent identifier of the process that has opened a direct session for this machine using the [IVirtualBox::openSession\(\)](#) call. The returned value is only valid if [sessionState](#) is `SessionOpen` or `SessionClosing` (i.e. a session is currently open or being closed) by the time this property is read.

9.20.1.35 state (read-only)

[MachineState](#) IMachine::state

Current execution state of this machine.

9.20.1.36 lastStateChange (read-only)

long long IMachine::lastStateChange

Time stamp of the last execution state change, in milliseconds since 1970-01-01 UTC.

9.20.1.37 stateFilePath (read-only)

wstring IMachine::stateFilePath

Full path to the file that stores the execution state of the machine when it is in the [Saved](#) state.

Note: When the machine is not in the `Saved` state, this attribute is an empty string.

9.20.1.38 logFolder (read-only)

wstring IMachine::logFolder

Full path to the folder that stores a set of rotated log files recorded during machine execution. The most recent log file is named `VBox.log`, the previous log file is named `VBox.log.1` and so on (up to `VBox.log.3` in the current version).

9.20.1.39 currentSnapshot (read-only)

[ISnapshot](#) IMachine::currentSnapshot

Current snapshot of this machine. This is `null` if the machine currently has no snapshots. If it is not `null`, then it was set by one of [IConsole::takeSnapshot\(\)](#), [IConsole::deleteSnapshot\(\)](#) or [IConsole::restoreSnapshot\(\)](#), depending on which was called last. See [ISnapshot](#) for details.

9.20.1.40 snapshotCount (read-only)

unsigned long IMachine::snapshotCount

Number of snapshots taken on this machine. Zero means the machine doesn't have any snapshots.

9.20.1.41 currentStateModified (read-only)

boolean IMachine::currentStateModified

Returns true if the current state of the machine is not identical to the state stored in the current snapshot.

The current state is identical to the current snapshot only directly after one of the following calls are made:

- [IConsole::restoreSnapshot\(\)](#)
- [IConsole::takeSnapshot\(\)](#) (issued on a “powered off” or “saved” machine, for which [settingsModified](#) returns false)
- [setCurrentSnapshot\(\)](#)

The current state remains identical until one of the following happens:

- settings of the machine are changed
- the saved state is deleted
- the current snapshot is deleted
- an attempt to execute the machine is made

Note: For machines that don't have snapshots, this property is always false.

9.20.1.42 sharedFolders (read-only)

[ISharedFolder](#) IMachine::sharedFolders[]

Collection of shared folders for this machine (permanent shared folders). These folders are shared automatically at machine startup and available only to the guest OS installed within this machine.

New shared folders are added to the collection using [createSharedFolder\(\)](#). Existing shared folders can be removed using [removeSharedFolder\(\)](#).

9.20.1.43 clipboardMode (read/write)

[ClipboardMode](#) IMachine::clipboardMode

Synchronization mode between the host OS clipboard and the guest OS clipboard.

9.20.1.44 guestPropertyNotificationPatterns (read/write)

wstring IMachine::guestPropertyNotificationPatterns

A comma-separated list of simple glob patterns. Changes to guest properties whose name matches one of the patterns will generate an [IVirtualBoxCallback::onGuestPropertyChange\(\)](#) signal.

9.20.1.45 teleporterEnabled (read/write)

boolean IMachine::teleporterEnabled

When set to true, the virtual machine becomes a target teleporter the next time it is powered on. This can only set to true when the VM is in the PoweredOff or Aborted state.

9.20.1.46 teleporterPort (read/write)

unsigned long IMachine::teleporterPort

The TCP port the target teleporter will listen for incoming teleportations on.

0 means the port is automatically selected upon power on. The actual value can be read from this property while the machine is waiting for incoming teleportations.

9.20.1.47 teleporterAddress (read/write)

wstring IMachine::teleporterAddress

The address the target teleporter will listen on. If set to an empty string, it will listen on all addresses.

9.20.1.48 teleporterPassword (read/write)

wstring IMachine::teleporterPassword

The password the to check for on the target teleporter. This is just a very basic measure to prevent simple hacks and operators accidentally beaming a virtual machine to the wrong place.

9.20.1.49 RTCUseUTC (read/write)

boolean IMachine::RTCUseUTC

When set to true, the RTC device of the virtual machine will run in UTC time, otherwise in local time. Especially Unix guests prefer the time in UTC.

9.20.1.50 ioCacheEnabled (read/write)

boolean IMachine::ioCacheEnabled

When set to true, the builtin I/O cache of the virtual machine will be enabled.

9.20.1.51 ioCacheSize (read/write)

unsigned long IMachine::ioCacheSize

Maximum size of the I/O cache in MB.

9.20.1.52 ioBandwidthMax (read/write)

unsigned long IMachine::ioBandwidthMax

The maximum number of MB the VM is allowed to transfer per second. 0 means unlimited bandwidth.

9.20.2 addStorageController

```
IStorageController IMachine::addStorageController(
    [in] wstring name,
    [in] StorageBus connectionType)
```

name

connectionType

Adds a new storage controller (SCSI, SAS or SATA controller) to the machine and returns it as an instance of [IStorageController](#).

name identifies the controller for subsequent calls such as [getStorageControllerByName\(\)](#), [getStorageControllerByInstance\(\)](#), [removeStorageController\(\)](#), [attachDevice\(\)](#) or [mountMedium\(\)](#).

After the controller has been added, you can set its exact type by setting the [IStorageController::controllerType](#). If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_IN_USE`: A storage controller with given name exists already.
- `E_INVALIDARG`: Invalid controllerType.

9.20.3 attachDevice

```
void IMachine::attachDevice(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device,
    [in] DeviceType type,
    [in] uuid id)
```

name Name of the storage controller to attach the device to.

controllerPort Port to attach the device to. For an IDE controller, 0 specifies the primary controller and 1 specifies the secondary controller. For a SCSI controller, this must range from 0 to 15; for a SATA controller, from 0 to 29; for an SAS controller, from 0 to 7.

device Device slot in the given port to attach the device to. This is only relevant for IDE controllers, for which 0 specifies the master device and 1 specifies the slave device. For all other controller types, this must be 0.

type Device type of the attached device.

id UUID of the medium to mount. Zero UUID means do not mount any medium.

Attaches a device and optionally mounts a medium to the given storage controller ([IStorageController](#), identified by name), at the indicated port and device.

This method is intended for managing storage devices in general (it works for both fixed and removable media). For storage devices supporting removable media (such as DVDs and floppies), you can also use [mountMedium\(\)](#) for changing the media while the machine is running.

In a VM's default configuration of virtual machines, the secondary master of the IDE controller is used for a CD/DVD drive.

For fixed media such as hard disks, the given medium identifier cannot be a zero UUID. It may be a zero UUID for removable media such as DVDs and floppies.

After calling this returns successfully, a new instance of [IMediumAttachment](#) will appear in the machine's list of medium attachments ([mediumAttachments\[\]](#)).

The specified device slot must not have a device attached to it, or this method will fail.

See [IMedium](#) and [IMediumAttachment](#) for more information about attaching media.

Note: You cannot attach a device to a running machine. Also, you cannot attach a device to a newly created machine until this machine's settings are saved to disk using [saveSettings\(\)](#).

Note: If the medium is being attached indirectly, a new differencing medium will implicitly be created for it and attached instead. If the changes made to the machine settings (including this indirect attachment) are later cancelled using [discardSettings\(\)](#), this implicitly created differencing medium will implicitly be deleted.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: SATA device, SATA port, IDE port or IDE slot out of range.
- `VBOX_E_INVALID_OBJECT_STATE`: Attempt to attach medium to an unregistered virtual machine.
- `VBOX_E_INVALID_VM_STATE`: Invalid machine state.
- `VBOX_E_OBJECT_IN_USE`: Hard disk already attached to this or another virtual machine.

9.20.4 canShowConsoleWindow

```
boolean IMachine::canShowConsoleWindow()
```

Returns `true` if the VM console process can activate the console window and bring it to foreground on the desktop of the host PC.

Note: This method will fail if a session for this machine is not currently open.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.

9.20.5 createSharedFolder

```
void IMachine::createSharedFolder(
    [in] wstring name,
    [in] wstring hostPath,
    [in] boolean writable)
```

name Unique logical name of the shared folder.

hostPath Full path to the shared folder in the host file system.

writable Whether the share is writable or readonly

Creates a new permanent shared folder by associating the given logical name with the given host path, adds it to the collection of shared folders and starts sharing it. Refer to the description of [ISharedFolder](#) to read more about logical names.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_IN_USE`: Shared folder already exists.
- `VBOX_E_FILE_ERROR`: Shared folder hostPath not accessible.

9.20.6 deleteSettings

```
void IMachine::deleteSettings()
```

Deletes the settings file of this machine from disk. The machine must not be registered in order for this operation to succeed.

Note: [settingsModified](#) will return `true` after this method successfully returns.

Note: Calling this method is only valid on instances returned by [ISession::machine](#) and on new machines created by [IVirtualBox::createMachine\(\)](#) or opened by [IVirtualBox::openMachine\(\)](#) but not yet registered, or on unregistered machines after calling [IVirtualBox::unregisterMachine\(\)](#).

Note: The deleted machine settings file can be restored (saved again) by calling [saveSettings\(\)](#).

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Cannot delete settings of a registered machine or machine not mutable.
- `VBOX_E_IPRT_ERROR`: Could not delete the settings file.

9.20.7 detachDevice

```
void IMachine::detachDevice(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device)
```

name Name of the storage controller to detach the medium from.

controllerPort Port number to detach the medium from.

device Device slot number to detach the medium from.

Detaches the device attached to a device slot of the specified bus.

Detaching the device from the virtual machine is deferred. This means that the medium remains associated with the machine when this method returns and gets actually de-associated only after a successful [saveSettings\(\)](#) call. See [IMedium](#) for more detailed information about attaching media.

Note: You cannot detach a device from a running machine.

Note: Detaching differencing media implicitly created by [attachDevice\(\)](#) for the indirect attachment using this method will **not** implicitly delete them. The [IMedium::deleteStorage\(\)](#) operation should be explicitly performed by the caller after the medium is successfully detached and the settings are saved with [saveSettings\(\)](#), if it is the desired action.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Attempt to detach medium from a running virtual machine.
- `VBOX_E_OBJECT_NOT_FOUND`: No medium attached to given slot/bus.
- `VBOX_E_NOT_SUPPORTED`: Medium format does not support storage deletion.

9.20.8 discardSettings

```
void IMachine::discardSettings()
```

Discards any changes to the machine settings made since the session has been opened or since the last call to [saveSettings\(\)](#) or [discardSettings\(\)](#).

Note: Calling this method is only valid on instances returned by [ISession::machine](#) and on new machines created by [IVirtualBox::createMachine\(\)](#) or opened by [IVirtualBox::openMachine\(\)](#) but not yet registered, or on unregistered machines after calling [IVirtualBox::unregisterMachine\(\)](#).

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine is not mutable.

9.20.9 enumerateGuestProperties

```
void IMachine::enumerateGuestProperties(
    [in] wstring patterns,
    [out] wstring name[],
    [out] wstring value[],
    [out] unsigned long long timestamp[],
    [out] wstring flags[])
```

patterns The patterns to match the properties against, separated by '|' characters. If this is empty or null, all properties will match.

name The names of the properties returned.

value The values of the properties returned. The array entries match the corresponding entries in the name array.

timestamp The time stamps of the properties returned. The array entries match the corresponding entries in the name array.

flags The flags of the properties returned. The array entries match the corresponding entries in the name array.

Return a list of the guest properties matching a set of patterns along with their values, time stamps and flags.

9.20.10 export

```
IVirtualSystemDescription IMachine::export(
    [in] IAppliance aAppliance)
```

aAppliance Appliance to export this machine to.

Exports the machine to an OVF appliance. See [IAppliance](#) for the steps required to export VirtualBox machines to OVF.

9.20.11 findSnapshot

```
ISnapshot IMachine::findSnapshot(
    [in] wstring name)
```

name Name of the snapshot to find

Returns a snapshot of this machine with the given name.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Virtual machine has no snapshots or snapshot not found.

9.20.12 getBootOrder

```
DeviceType IMachine::getBootOrder(
    [in] unsigned long position)
```

position Position in the boot order (1 to the total number of devices the machine can boot from, as returned by `ISystemProperties::maxBootPosition`).

Returns the device type that occupies the specified position in the boot order.

@todo [remove?] If the machine can have more than one device of the returned type (such as hard disks), then a separate method should be used to retrieve the individual device that occupies the given position.

If there are no devices at the given position, then `Null` is returned.

@todo `getHardDiskBootOrder()`, `getNetworkBootOrder()`

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Boot position out of range.

9.20.13 getCPUIDLeaf

```
void IMachine::getCPUIDLeaf(
    [in] unsigned long id,
    [out] unsigned long valEax,
    [out] unsigned long valEbx,
    [out] unsigned long valEcx,
    [out] unsigned long valEdx)
```

id CPUID leaf index.

valEax CPUID leaf value for register eax.

valEbx CPUID leaf value for register ebx.

valEcx CPUID leaf value for register ecx.

valEdx CPUID leaf value for register edx.

Returns the virtual CPU cpuid information for the specified leaf.

Currently supported index values for cpuid: Standard CPUID leaves: 0 - 0xA Extended CPUID leaves: 0x80000000 - 0x8000000A

See the Intel and AMD programmer's manuals for detailed information about the cpuid instruction and its leaves.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Invalid id.

9.20.14 getCPUProperty

```
boolean IMachine::getCPUProperty(
    [in] CPUPropertyType property)
```

property Property type to query.

Returns the virtual CPU boolean value of the specified property.
If this method fails, the following error codes may be reported:

- E_INVALIDARG: Invalid property.

9.20.15 getCPUStatus

```
boolean IMachine::getCPUStatus(
    [in] unsigned long cpu)
```

cpu The CPU id to check for.

Returns the current status of the given CPU.

9.20.16 getExtraData

```
wstring IMachine::getExtraData(
    [in] wstring key)
```

key Name of the data key to get.

Returns associated machine-specific extra data.

If the requested data key does not exist, this function will succeed and return an empty string in the value argument.

If this method fails, the following error codes may be reported:

- VBOX_E_FILE_ERROR: Settings file not accessible.
- VBOX_E_XML_ERROR: Could not parse the settings file.

9.20.17 getExtraDataKeys

```
wstring[] IMachine::getExtraDataKeys()
```

Returns an array representing the machine-specific extra data keys which currently have values defined.

9.20.18 getGuestProperty

```
void IMachine::getGuestProperty(
    [in] wstring name,
    [out] wstring value,
    [out] unsigned long long timestamp,
    [out] wstring flags)
```

name The name of the property to read.

value The value of the property. If the property does not exist then this will be empty.

timestamp The time at which the property was last modified, as seen by the server process.

flags Additional property parameters, passed as a comma-separated list of “name=value” type entries.

Reads an entry from the machine’s guest property store.
If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.

9.20.19 `getGuestPropertyTimestamp`

```
unsigned long long IMachine::getGuestPropertyTimestamp(
    [in] wstring property)
```

property The name of the property to read.

Reads a property timestamp from the machine’s guest property store.
If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.

9.20.20 `getGuestPropertyValue`

```
wstring IMachine::getGuestPropertyValue(
    [in] wstring property)
```

property The name of the property to read.

Reads a value from the machine’s guest property store.
If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.

9.20.21 `getHWVirtExProperty`

```
boolean IMachine::getHWVirtExProperty(
    [in] HWVirtExPropertyType property)
```

property Property type to query.

Returns the value of the specified hardware virtualization boolean property.
If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Invalid property.

9.20.22 `getMedium`

```
IMedium IMachine::getMedium(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device)
```

name Name of the storage controller the medium is attached to.

controllerPort Port to query.

device Device slot in the given port to query.

Returns the virtual medium attached to a device slot of the specified bus.

Note that if the medium was indirectly attached by `mountMedium()` to the given device slot then this method will return not the same object as passed to the `mountMedium()` call. See [IMedium](#) for more detailed information about mounting a medium.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No medium attached to given slot/bus.

9.20.23 getMediumAttachment

```
IMediumAttachment IMachine::getMediumAttachment(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device)
```

name

controllerPort

device

Returns a medium attachment which corresponds to the controller with the given name, on the given port and device slot.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No attachment exists for the given controller/port/device combination.

9.20.24 getMediumAttachmentsOfController

```
IMediumAttachment[] IMachine::getMediumAttachmentsOfController(
    [in] wstring name)
```

name

Returns an array of medium attachments which are attached to the the controller with the given name.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: A storage controller with given name doesn't exist.

9.20.25 getNetworkAdapter

```
INetworkAdapter IMachine::getNetworkAdapter(
    [in] unsigned long slot)
```

slot

Returns the network adapter associated with the given slot. Slots are numbered sequentially, starting with zero. The total number of adapters per machine is defined by the [ISystemProperties::networkAdapterCount](#) property, so the maximum slot number is one less than that property's value.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Invalid slot number.

9.20.26 getParallelPort

```
IParallelPort IMachine::getParallelPort(
    [in] unsigned long slot)
```

slot

Returns the parallel port associated with the given slot. Slots are numbered sequentially, starting with zero. The total number of parallel ports per machine is defined by the [ISystemProperties::parallelPortCount](#) property, so the maximum slot number is one less than that property's value.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: Invalid slot number.

9.20.27 getSerialPort

```
ISerialPort IMachine::getSerialPort(
    [in] unsigned long slot)
```

slot

Returns the serial port associated with the given slot. Slots are numbered sequentially, starting with zero. The total number of serial ports per machine is defined by the [ISystemProperties::serialPortCount](#) property, so the maximum slot number is one less than that property's value.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: Invalid slot number.

9.20.28 getSnapshot

```
ISnapshot IMachine::getSnapshot(
    [in] uuid id)
```

id UUID of the snapshot to get

Returns a snapshot of this machine with the given UUID. A null UUID can be used to obtain the first snapshot taken on this machine. To traverse the whole tree of snapshots starting from the root, inspect the root snapshot's [ISnapshot::children\[\]](#) attribute and recurse over those children.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Virtual machine has no snapshots or snapshot not found.

9.20.29 getStorageControllerByInstance

```
IStorageController IMachine::getStorageControllerByInstance(
    [in] unsigned long instance)
```

instance

Returns a storage controller with the given instance number.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: A storage controller with given instance number doesn't exist.

9.20.30 `getStorageControllerByName`

```
IStorageController IMachine::getStorageControllerByName(
    [in] wstring name)
```

name

Returns a storage controller with the given name.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: A storage controller with given name doesn't exist.

9.20.31 `hotPlugCPU`

```
void IMachine::hotPlugCPU(
    [in] unsigned long cpu)
```

cpu The CPU id to insert.

Plugs a CPU into the machine.

9.20.32 `hotUnplugCPU`

```
void IMachine::hotUnplugCPU(
    [in] unsigned long cpu)
```

cpu The CPU id to remove.

Removes a CPU from the machine.

9.20.33 `mountMedium`

```
void IMachine::mountMedium(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device,
    [in] uuid medium,
    [in] boolean force)
```

name Name of the storage controller to attach the medium to.

controllerPort Port to attach the medium to.

device Device slot in the given port to attach the medium to.

medium UUID of the medium to attach. A zero UUID means unmount the currently mounted medium.

force Allows to force unmount/mount of a medium which is locked by theDevice slot in the given port to attach the medium to.

Mounts a medium ([IMedium](#), identified by the given UUID id) to the given storage controller ([IStorageController](#), identified by name), at the indicated port and device. The device must already exist; see [attachDevice\(\)](#) for how to attach a new device.

This method is intended only for managing removable media, where the device is fixed but media is changeable at runtime (such as DVDs and floppies). It cannot be used for fixed media such as hard disks.

The `controllerPort` and `device` parameters specify the device slot and have the same meaning as with `attachDevice()`.

The specified device slot can have a medium mounted, which will be unmounted first. Specifying a zero UUID (or an empty string) for `medium` does just an unmount.

See [IMedium](#) for more detailed information about attaching media.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: SATA device, SATA port, IDE port or IDE slot out of range.
- `VBOX_E_INVALID_OBJECT_STATE`: Attempt to attach medium to an unregistered virtual machine.
- `VBOX_E_INVALID_VM_STATE`: Invalid machine state.
- `VBOX_E_OBJECT_IN_USE`: Medium already attached to this or another virtual machine.

9.20.34 `passthroughDevice`

```
void IMachine::passthroughDevice(
    [in] wstring name,
    [in] long controllerPort,
    [in] long device,
    [in] boolean passthrough)
```

name Name of the storage controller.

controllerPort Storage controller port.

device Device slot in the given port.

passthrough New value for the passthrough setting.

Sets the passthrough mode of an existing DVD device. Changing the setting while the VM is running is forbidden. The setting is only used if at VM start the device is configured as a host DVD drive, in all other cases it is ignored. The device must already exist; see `attachDevice()` for how to attach a new device.

The `controllerPort` and `device` parameters specify the device slot and have the same meaning as with `attachDevice()`.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: SATA device, SATA port, IDE port or IDE slot out of range.
- `VBOX_E_INVALID_OBJECT_STATE`: Attempt to modify an unregistered virtual machine.
- `VBOX_E_INVALID_VM_STATE`: Invalid machine state.

9.20.35 `queryLogFilename`

```
wstring IMachine::queryLogFilename(
    [in] unsigned long idx)
```

idx Which log file name to query. 0=current log file.

Queries for the VM log file name of an given index. Returns an empty string if a log file with that index doesn't exist.

9.20.36 querySavedScreenshotPNGSize

```
void IMachine::querySavedScreenshotPNGSize(  
    [in] unsigned long screenId,  
    [out] unsigned long size,  
    [out] unsigned long width,  
    [out] unsigned long height)
```

screenId Saved guest screen to query info from.

size Size of buffer required to store the PNG binary data.

width Image width.

height Image height.

Returns size in bytes and dimensions of a saved PNG image of screenshot from saved state.

9.20.37 querySavedThumbnailSize

```
void IMachine::querySavedThumbnailSize(  
    [in] unsigned long screenId,  
    [out] unsigned long size,  
    [out] unsigned long width,  
    [out] unsigned long height)
```

screenId Saved guest screen to query info from.

size Size of buffer required to store the bitmap.

width Bitmap width.

height Bitmap height.

Returns size in bytes and dimensions in pixels of a saved thumbnail bitmap from saved state.

9.20.38 readLog

```
octet[] IMachine::readLog(  
    [in] unsigned long idx,  
    [in] unsigned long long offset,  
    [in] unsigned long long size)
```

idx Which log file to read. 0=current log file.

offset Offset in the log file.

size Chunk size to read in the log file.

Reads the VM log file. The chunk size is limited, so even if you ask for a big piece there might be less data returned.

9.20.39 readSavedScreenshotPNGToArray

```
octet[] IMachine::readSavedScreenshotPNGToArray(  
    [in] unsigned long screenId,  
    [out] unsigned long width,  
    [out] unsigned long height)
```

screenId Saved guest screen to read from.

width Image width.

height Image height.

Screenshot in PNG format is retrieved to an array of bytes.

9.20.40 readSavedThumbnailToArray

```
octet[] IMachine::readSavedThumbnailToArray(
    [in] unsigned long screenId,
    [in] boolean BGR,
    [out] unsigned long width,
    [out] unsigned long height)
```

screenId Saved guest screen to read from.

BGR How to order bytes in the pixel. A pixel consists of 4 bytes. If this parameter is true, then bytes order is: B, G, R, 0xFF. If this parameter is false, then bytes order is: R, G, B, 0xFF.

width Bitmap width.

height Bitmap height.

Thumbnail is retrieved to an array of bytes in uncompressed 32-bit BGRA or RGBA format.

9.20.41 removeAllCPUIDLeaves

```
void IMachine::removeAllCPUIDLeaves()
```

Removes all the virtual CPU cpuid leaves

9.20.42 removeCPUIDLeaf

```
void IMachine::removeCPUIDLeaf(
    [in] unsigned long id)
```

id CPUID leaf index.

Removes the virtual CPU cpuid leaf for the specified index
If this method fails, the following error codes may be reported:

- E_INVALIDARG: Invalid id.

9.20.43 removeSharedFolder

```
void IMachine::removeSharedFolder(
    [in] wstring name)
```

name Logical name of the shared folder to remove.

Removes the permanent shared folder with the given name previously created by [createSharedFolder\(\)](#) from the collection of shared folders and stops sharing it.

If this method fails, the following error codes may be reported:

- VBOX_E_INVALID_VM_STATE: Virtual machine is not mutable.
- VBOX_E_OBJECT_NOT_FOUND: Shared folder name does not exist.

9.20.44 removeStorageController

```
void IMachine::removeStorageController(
    [in] wstring name)
```

name

Removes a storage controller from the machine.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: A storage controller with given name doesn't exist.

9.20.45 saveSettings

```
void IMachine::saveSettings()
```

Saves any changes to machine settings made since the session has been opened or a new machine has been created, or since the last call to `saveSettings()` or `discardSettings()`. For registered machines, new settings become visible to all other VirtualBox clients after successful invocation of this method.

Note: The method sends `IVirtualBoxCallback::onMachineDataChange()` notification event after the configuration has been successfully saved (only for registered machines).

Note: Calling this method is only valid on instances returned by `ISession::machine` and on new machines created by `IVirtualBox::createMachine()` but not yet registered, or on unregistered machines after calling `IVirtualBox::unregisterMachine()`.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.
- `E_ACCESSDENIED`: Modification request refused.

9.20.46 setBootOrder

```
void IMachine::setBootOrder(
    [in] unsigned long position,
    [in] DeviceType device)
```

position Position in the boot order (1 to the total number of devices the machine can boot from, as returned by `ISystemProperties::maxBootPosition`).

device The type of the device used to boot at the given position.

Puts the given device to the specified position in the boot order.

To indicate that no device is associated with the given position, `Null` should be used.

@todo `setHardDiskBootOrder()`, `setNetworkBootOrder()`

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Boot position out of range.
- `E_NOTIMPL`: Booting from USB device currently not supported.

9.20.47 setCPUIDLeaf

```
void IMachine::setCPUIDLeaf(
    [in] unsigned long id,
    [in] unsigned long valEax,
    [in] unsigned long valEbx,
    [in] unsigned long valEcx,
    [in] unsigned long valEdx)
```

id CPUID leaf index.

valEax CPUID leaf value for register eax.

valEbx CPUID leaf value for register ebx.

valEcx CPUID leaf value for register ecx.

valEdx CPUID leaf value for register edx.

Sets the virtual CPU cpuid information for the specified leaf. Note that these values are not passed unmodified. VirtualBox clears features that it doesn't support.

Currently supported index values for cpuid: Standard CPUID leafs: 0 - 0xA Extended CPUID leafs: 0x80000000 - 0x8000000A

See the Intel and AMD programmer's manuals for detailed information about the cpuid instruction and its leafs.

Do not use this method unless you know exactly what you're doing. Misuse can lead to random crashes inside VMs.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: Invalid id.

9.20.48 setCPUProperty

```
void IMachine::setCPUProperty(
    [in] CPUPropertyType property,
    [in] boolean value)
```

property Property type to query.

value Property value.

Sets the virtual CPU boolean value of the specified property.

If this method fails, the following error codes may be reported:

- **E_INVALIDARG**: Invalid property.

9.20.49 setCurrentSnapshot

```
void IMachine::setCurrentSnapshot(
    [in] uuid id)
```

id UUID of the snapshot to set as the current snapshot.

Sets the current snapshot of this machine.

Note: In the current implementation, this operation is not implemented.
--

9.20.50 setExtraData

```
void IMachine::setExtraData(
    [in] wstring key,
    [in] wstring value)
```

key Name of the data key to set.

value Value to assign to the key.

Sets associated machine-specific extra data.

If you pass `null` or an empty string as a key value, the given key will be deleted.

Note: Before performing the actual data change, this method will ask all registered callbacks using the [IVirtualBoxCallback::onExtraDataCanChange\(\)](#) notification for a permission. If one of the callbacks refuses the new value, the change will not be performed.

Note: On success, the [IVirtualBoxCallback::onExtraDataChange\(\)](#) notification is called to inform all registered callbacks about a successful data change.

Note: This method can be called outside the machine session and therefore it's a caller's responsibility to handle possible race conditions when several clients change the same key at the same time.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.

9.20.51 setGuestProperty

```
void IMachine::setGuestProperty(
    [in] wstring property,
    [in] wstring value,
    [in] wstring flags)
```

property The name of the property to set, change or delete.

value The new value of the property to set, change or delete. If the property does not yet exist and value is non-empty, it will be created. If the value is `null` or empty, the property will be deleted if it exists.

flags Additional property parameters, passed as a comma-separated list of "name=value" type entries.

Sets, changes or deletes an entry in the machine's guest property store.

If this method fails, the following error codes may be reported:

- `E_ACCESSDENIED`: Property cannot be changed.
- `E_INVALIDARG`: Invalid flags.
- `VBOX_E_INVALID_VM_STATE`: Virtual machine is not mutable or session not open.
- `VBOX_E_INVALID_OBJECT_STATE`: Cannot set transient property when machine not running.

9.20.52 setGuestPropertyValue

```
void IMachine::setGuestPropertyValue(
    [in] wstring property,
    [in] wstring value)
```

property The name of the property to set, change or delete.

value The new value of the property to set, change or delete. If the property does not yet exist and value is non-empty, it will be created. If the value is null or empty, the property will be deleted if it exists.

Sets, changes or deletes a value in the machine's guest property store. The flags field will be left unchanged or created empty for a new property.

If this method fails, the following error codes may be reported:

- `E_ACCESSDENIED`: Property cannot be changed.
- `VBOX_E_INVALID_VM_STATE`: Virtual machine is not mutable or session not open.
- `VBOX_E_INVALID_OBJECT_STATE`: Cannot set transient property when machine not running.

9.20.53 setHWVirtExProperty

```
void IMachine::setHWVirtExProperty(
    [in] HWVirtExPropertyType property,
    [in] boolean value)
```

property Property type to set.

value New property value.

Sets a new value for the specified hardware virtualization boolean property.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Invalid property.

9.20.54 showConsoleWindow

```
unsigned long long IMachine::showConsoleWindow()
```

Activates the console window and brings it to foreground on the desktop of the host PC. Many modern window managers on many platforms implement some sort of focus stealing prevention logic, so that it may be impossible to activate a window without the help of the currently active application. In this case, this method will return a non-zero identifier that represents the top-level window of the VM console process. The caller, if it represents a currently active process, is responsible to use this identifier (in a platform-dependent manner) to perform actual window activation.

<p>Note: This method will fail if a session for this machine is not currently open.</p>
--

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Machine session is not open.

9.21 IMachineDebugger

Note: This interface is not supported in the web service.

9.21.1 Attributes

9.21.1.1 singlestep (read/write)

boolean IMachineDebugger::singlestep

Switch for enabling singlestepping.

9.21.1.2 recompileUser (read/write)

boolean IMachineDebugger::recompileUser

Switch for forcing code recompilation for user mode code.

9.21.1.3 recompileSupervisor (read/write)

boolean IMachineDebugger::recompileSupervisor

Switch for forcing code recompilation for supervisor mode code.

9.21.1.4 PATMEnabled (read/write)

boolean IMachineDebugger::PATMEnabled

Switch for enabling and disabling the PATM component.

9.21.1.5 CSAMEnabled (read/write)

boolean IMachineDebugger::CSAMEnabled

Switch for enabling and disabling the CSAM component.

9.21.1.6 logEnabled (read/write)

boolean IMachineDebugger::logEnabled

Switch for enabling and disabling logging.

9.21.1.7 HWVirtExEnabled (read-only)

boolean IMachineDebugger::HWVirtExEnabled

Flag indicating whether the VM is currently making use of CPU hardware virtualization extensions.

9.21.1.8 HWVirtExNestedPagingEnabled (read-only)

boolean IMachineDebugger::HWVirtExNestedPagingEnabled

Flag indicating whether the VM is currently making use of the nested paging CPU hardware virtualization extension.

9.21.1.9 HWVirtExVPIDEnabled (read-only)

boolean IMachineDebugger::HWVirtExVPIDEnabled

Flag indicating whether the VM is currently making use of the VPID VT-x extension.

9.21.1.10 PAEEnabled (read-only)

boolean IMachineDebugger::PAEEnabled

Flag indicating whether the VM is currently making use of the Physical Address Extension CPU feature.

9.21.1.11 virtualTimeRate (read/write)

unsigned long IMachineDebugger::virtualTimeRate

The rate at which the virtual time runs expressed as a percentage. The accepted range is 2% to 20000%.

9.21.1.12 VM (read-only)

unsigned long long IMachineDebugger::VM

Gets the VM handle. This is only for internal use while we carve the details of this interface.

9.21.2 dumpStats

```
void IMachineDebugger::dumpStats(  
    [in] wstring pattern)
```

pattern The selection pattern. A bit similar to filename globbing.

Dumps VM statistics.

9.21.3 getStats

```
void IMachineDebugger::getStats(  
    [in] wstring pattern,  
    [in] boolean withDescriptions,  
    [out] wstring stats)
```

pattern The selection pattern. A bit similar to filename globbing.

withDescriptions Whether to include the descriptions.

stats The XML document containing the statistics.

Get the VM statistics in a XMLish format.

9.21.4 injectNMI

```
void IMachineDebugger::injectNMI()
```

Inject an NMI into a running VT-x/AMD-V VM.

9.21.5 resetStats

```
void IMachineDebugger::resetStats(
    [in] wstring pattern)
```

pattern The selection pattern. A bit similar to filename globbing.

Reset VM statistics.

9.22 IManagedObjectRef

Note: This interface is supported in the web service only, not in COM/XPCOM.

Managed object reference.

Only within the webservice, a managed object reference (which is really an opaque number) allows a webservice client to address an object that lives in the address space of the webservice server.

Behind each managed object reference, there is a COM object that lives in the webservice server's address space. The COM object is not freed until the managed object reference is released, either by an explicit call to [release\(\)](#) or by logging off from the webservice ([IWebSessionManager::logoff\(\)](#)), which releases all objects created during the webservice session.

Whenever a method call of the VirtualBox API returns a COM object, the webservice representation of that method will instead return a managed object reference, which can then be used to invoke methods on that object.

9.22.1 getInterfaceName

```
wstring IManagedObjectRef::getInterfaceName()
```

Returns the name of the interface that this managed object represents, for example, "IMachine", as a string.

9.22.2 release

```
void IManagedObjectRef::release()
```

Releases this managed object reference and frees the resources that were allocated for it in the webservice server process. After calling this method, the identifier of the reference can no longer be used.

9.23 IMedium

The IMedium interface represents virtual storage for a machine's hard disks, CD/DVD or floppy drives. It will typically represent a disk image on the host, for example a VDI or VMDK file representing a virtual hard disk, or an ISO or RAW file representing virtual removable media, but can also point to a network location (e.g. for iSCSI targets).

Instances of IMedium are connected to virtual machines by way of medium attachments (see [IMediumAttachment](#)), which link the storage medium to a particular device slot of a storage controller of the virtual machine. In the VirtualBox API, virtual storage is therefore always represented by the following chain of object links:

- `IMachine::storageControllers[]` contains an array of storage controllers (IDE, SATA, SCSI, SAS or a floppy controller; these are instances of `IStorageController`).
- `IMachine::mediumAttachments[]` contains an array of medium attachments (instances of `IMediumAttachment`), each containing a storage controller from the above array, a port/device specification, and an instance of `IMedium` representing the medium storage (image file).

For removable media, the storage medium is optional; a medium attachment with no medium represents a CD/DVD or floppy drive with no medium inserted. By contrast, hard disk attachments will always have an `IMedium` object attached.

- Each `IMedium` in turn points to a storage unit (such as a file on the host computer or a network resource) that holds actual data. This location is represented by the `location` attribute.

Existing media are opened using the following methods, depending on the media type:

- `IVirtualBox::openHardDisk()`
- `IVirtualBox::openDVDImage()`
- `IVirtualBox::openFloppyImage()`

New hard disk media can be created with the VirtualBox API using the `IVirtualBox::createHardDisk()` method.

CD/DVD and floppy images (ISO and RAW files) are usually created outside VirtualBox, e.g. by storing a copy of the real medium of the corresponding type in a regular file.

Only for CD/DVDs and floppies, an `IMedium` instance can also represent a host drive; in that case the `id` attribute contains the UUID of one of the drives in `IHost::DVDDrives[]` or `IHost::floppyDrives[]`.

Known media

When an existing medium is opened for the first time, it is automatically remembered by the given VirtualBox installation or, in other words, becomes a *known medium*. Known media are stored in the media registry transparently maintained by VirtualBox and stored in settings files so that this registry is preserved when VirtualBox is not running.

Newly created virtual media are remembered only when the associated storage unit is actually created.

All known media can be enumerated using `IVirtualBox::hardDisks[]`, `IVirtualBox::DVDImages[]` and `IVirtualBox::floppyImages[]` attributes. Individual media can be quickly found by UUID using `IVirtualBox::getHardDisk()` and similar methods or by location using `IVirtualBox::findHardDisk()` and similar methods.

Only known media can be attached to virtual machines.

Removing known media from the media registry is performed when the given medium is closed using the `close()` method or when its associated storage unit is deleted.

Accessibility checks

VirtualBox defers media accessibility checks until the `refreshState()` method is called explicitly on a medium. This is done to make the VirtualBox object ready for serving requests as fast as possible and let the end-user application decide if it needs to check media accessibility right away or not.

As a result, when VirtualBox starts up (e.g. the VirtualBox object gets created for the first time), all known media are in the “Inaccessible” state, but the value of the `lastAccessError` attribute is an empty string because no actual accessibility check has been made yet.

After calling `refreshState()`, a medium is considered *accessible* if its storage unit can be read. In that case, the `state` attribute has a value of “Created”. If the storage unit cannot be read (for example, because it is located on a disconnected network resource, or was accidentally

deleted outside VirtualBox), the medium is considered *inaccessible*, which is indicated by the “Inaccessible” state. The exact reason why the medium is inaccessible can be obtained by reading the `lastAccessError` attribute.

Medium types

There are four types of medium behavior (see `MediumType`): “normal”, “immutable”, “writethrough” and “shareable”, represented by the `type` attribute. The type of the medium defines how the medium is attached to a virtual machine and what happens when a `ISnapshot` of the virtual machine with the attached medium is taken. At the moment DVD and floppy media are always of type “writethrough”.

All media can be also divided in two groups: *base* media and *differencing* media. A base medium contains all sectors of the medium data in its own storage and therefore can be used independently. In contrast, a differencing medium is a “delta” to some other medium and contains only those sectors which differ from that other medium, which is then called a *parent*. The differencing medium is said to be *linked to* that parent. The parent may be itself a differencing medium, thus forming a chain of linked media. The last element in that chain must always be a base medium. Note that several differencing media may be linked to the same parent medium.

Differencing media can be distinguished from base media by querying the `parent` attribute: base media do not have parents they would depend on, so the value of this attribute is always `null` for them. Using this attribute, it is possible to walk up the medium tree (from the child medium to its parent). It is also possible to walk down the tree using the `children[]` attribute.

Note that the type of all differencing media is “normal”; all other values are meaningless for them. Base media may be of any type.

Creating hard disks

New base hard disks are created using `IVirtualBox::createHardDisk()`. Existing hard disks are opened using `IVirtualBox::openHardDisk()`. Differencing hard disks are usually implicitly created by VirtualBox when needed but may also be created explicitly using `createDiffStorage()`.

After the hard disk is successfully created (including the storage unit) or opened, it becomes a known hard disk (remembered in the internal media registry). Known hard disks can be attached to a virtual machine, accessed through `IVirtualBox::getHardDisk()` and `IVirtualBox::findHardDisk()` methods or enumerated using the `IVirtualBox::hardDisks[]` array (only for base hard disks).

The following methods, besides `close()`, automatically remove the hard disk from the media registry:

- `deleteStorage()`
- `mergeTo()`

If the storage unit of the hard disk is a regular file in the host’s file system then the rules stated in the description of the `location` attribute apply when setting its value. In addition, a plain file name without any path may be given, in which case the `default hard disk folder` will be prepended to it.

Automatic composition of the file name part

Another extension to the `location` attribute is that there is a possibility to cause VirtualBox to compose a unique value for the file name part of the location using the UUID of the hard disk. This applies only to hard disks in `NotCreated` state, e.g. before the storage unit is created, and works as follows. You set the value of the `location` attribute to a location specification which only contains the path specification but not the file name part and ends with either a forward slash or a backslash character. In response, VirtualBox will generate a new UUID for the hard disk and compose the file name using the following pattern:

```
<path>/{<uuid>}.<ext>
```

where <path> is the supplied path specification, <uuid> is the newly generated UUID and <ext> is the default extension for the storage format of this hard disk. After that, you may call any of the methods that create a new hard disk storage unit and they will use the generated UUID and file name.

Attaching Hard Disks

Hard disks are attached to virtual machines using the `IMachine::attachDevice()` method and detached using the `IMachine::detachDevice()` method. Depending on their `type`, hard disks are attached either *directly* or *indirectly*.

When a hard disk is being attached directly, it is associated with the virtual machine and used for hard disk operations when the machine is running. When a hard disk is being attached indirectly, a new differencing hard disk linked to it is implicitly created and this differencing hard disk is associated with the machine and used for hard disk operations. This also means that if `IMachine::attachDevice()` performs a direct attachment then the same hard disk will be returned in response to the subsequent `IMachine::getMedium()` call; however if an indirect attachment is performed then `IMachine::getMedium()` will return the implicitly created differencing hard disk, not the original one passed to `IMachine::attachDevice()`. In detail:

- **Normal base** hard disks that do not have children (i.e. differencing hard disks linked to them) and that are not already attached to virtual machines in snapshots are attached **directly**. Otherwise, they are attached **indirectly** because having dependent children or being part of the snapshot makes it impossible to modify hard disk contents without breaking the integrity of the dependent party. The `readOnly` attribute allows to quickly determine the kind of the attachment for the given hard disk. Note that if a normal base hard disk is to be indirectly attached to a virtual machine with snapshots then a special procedure called *smart attachment* is performed (see below).
- **Normal differencing** hard disks are like normal base hard disks: they are attached **directly** if they do not have children and are not attached to virtual machines in snapshots, and **indirectly** otherwise. Note that the smart attachment procedure is never performed for differencing hard disks.
- **Immutable** hard disks are always attached **indirectly** because they are designed to be non-writable. If an immutable hard disk is attached to a virtual machine with snapshots then a special procedure called smart attachment is performed (see below).
- **Writethrough** hard disks are always attached **directly**, also as designed. This also means that writethrough hard disks cannot have other hard disks linked to them at all.
- **Shareable** hard disks are always attached **directly**, also as designed. This also means that shareable hard disks cannot have other hard disks linked to them at all. They behave almost like writethrough hard disks, except that shareable hard disks can be attached to several virtual machines which are running, allowing concurrent accesses. You need special cluster software running in the virtual machines to make use of such disks.

Note that the same hard disk, regardless of its type, may be attached to more than one virtual machine at a time. In this case, the machine that is started first gains exclusive access to the hard disk and attempts to start other machines having this hard disk attached will fail until the first machine is powered down.

Detaching hard disks is performed in a *deferred* fashion. This means that the given hard disk remains associated with the given machine after a successful `IMachine::detachDevice()` call until `IMachine::saveSettings()` is called to save all changes to machine settings to disk. This deferring is necessary to guarantee that the hard disk configuration may be restored at any time by a call to `IMachine::discardSettings()` before the settings are saved (committed).

Note that if `IMachine::discardSettings()` is called after indirectly attaching some hard disks to the machine but before a call to `IMachine::saveSettings()` is made, it will implicitly delete

all differencing hard disks implicitly created by `IMachine::attachDevice()` for these indirect attachments. Such implicitly created hard disks will also be immediately deleted when detached explicitly using the `IMachine::detachDevice()` call if it is made before `IMachine::saveSettings()`. This implicit deletion is safe because newly created differencing hard disks do not contain any user data.

However, keep in mind that detaching differencing hard disks that were implicitly created by `IMachine::attachDevice()` before the last `IMachine::saveSettings()` call will **not** implicitly delete them as they may already contain some data (for example, as a result of virtual machine execution). If these hard disks are no more necessary, the caller can always delete them explicitly using `deleteStorage()` after they are actually de-associated from this machine by the `IMachine::saveSettings()` call.

Smart Attachment

When normal base or immutable hard disks are indirectly attached to a virtual machine then some additional steps are performed to make sure the virtual machine will have the most recent “view” of the hard disk being attached. These steps include walking through the machine’s snapshots starting from the current one and going through ancestors up to the first snapshot. Hard disks attached to the virtual machine in all of the encountered snapshots are checked whether they are descendants of the given normal base or immutable hard disk. The first found child (which is the differencing hard disk) will be used instead of the normal base or immutable hard disk as a parent for creating a new differencing hard disk that will be actually attached to the machine. And only if no descendants are found or if the virtual machine does not have any snapshots then the normal base or immutable hard disk will be used itself as a parent for this differencing hard disk.

It is easier to explain what smart attachment does using the following example:

BEFORE attaching B.vdi:	AFTER attaching B.vdi:
Snapshot 1 (B.vdi)	Snapshot 1 (B.vdi)
Snapshot 2 (D1->B.vdi)	Snapshot 2 (D1->B.vdi)
Snapshot 3 (D2->D1.vdi)	Snapshot 3 (D2->D1.vdi)
Snapshot 4 (none)	Snapshot 4 (none)
CurState (none)	CurState (D3->D2.vdi)
	NOT
	...
	CurState (D3->B.vdi)

The first column is the virtual machine configuration before the base hard disk `B.vdi` is attached, the second column shows the machine after this hard disk is attached. Constructs like `D1->B.vdi` and similar mean that the hard disk that is actually attached to the machine is a differencing hard disk, `D1.vdi`, which is linked to (based on) another hard disk, `B.vdi`.

As we can see from the example, the hard disk `B.vdi` was detached from the machine before taking Snapshot 4. Later, after Snapshot 4 was taken, the user decides to attach `B.vdi` again. `B.vdi` has dependent child hard disks (`D1.vdi`, `D2.vdi`), therefore it cannot be attached directly and needs an indirect attachment (i.e. implicit creation of a new differencing hard disk). Due to the smart attachment procedure, the new differencing hard disk (`D3.vdi`) will be based on `D2.vdi`, not on `B.vdi` itself, since `D2.vdi` is the most recent view of `B.vdi` existing for this snapshot branch of the given virtual machine.

Note that if there is more than one descendant hard disk of the given base hard disk found in a snapshot, and there is an exact device, channel and bus match, then this exact match will be used. Otherwise, the youngest descendant will be picked up.

There is one more important aspect of the smart attachment procedure which is not related to snapshots at all. Before walking through the snapshots as described above, the backup copy of the current list of hard disk attachment is searched for descendants. This backup copy is created when the hard disk configuration is changed for the first time after the last

[IMachine::saveSettings\(\)](#) call and used by [IMachine::discardSettings\(\)](#) to undo the recent hard disk changes. When such a descendant is found in this backup copy, it will be simply re-attached back, without creating a new differencing hard disk for it. This optimization is necessary to make it possible to re-attach the base or immutable hard disk to a different bus, channel or device slot without losing the contents of the differencing hard disk actually attached to the machine in place of it.

9.23.1 Attributes

9.23.1.1 id (read-only)

`uuid IMedium::id`

UUID of the medium. For a newly created medium, this value is a randomly generated UUID.

Note: For media in one of `MediumState_NotCreated`, `MediumState_Creating` or `MediumState_Deleting` states, the value of this property is undefined and will most likely be an empty UUID.

9.23.1.2 description (read/write)

`wstring IMedium::description`

Optional description of the medium. For a newly created medium the value of this attribute is an empty string.

Medium types that don't support this attribute will return `E_NOTIMPL` in attempt to get or set this attribute's value.

Note: For some storage types, reading this attribute may return an outdated (last known) value when `state` is `Inaccessible` or `LockedWrite` because the value of this attribute is stored within the storage unit itself. Also note that changing the attribute value is not possible in such case, as well as when the medium is the `LockedRead` state.

9.23.1.3 state (read-only)

`MediumState IMedium::state`

Returns the current medium state, which is the last state set by the accessibility check performed by [refreshState\(\)](#). If that method has not yet been called on the medium, the state is "Inaccessible"; as opposed to truly inaccessible media, the value of [lastAccessError](#) will be an empty string in that case.

Note: As of version 3.1, this no longer performs an accessibility check automatically; call [refreshState\(\)](#) for that.

9.23.1.4 location (read/write)

```
wstring IMedium::location
```

Location of the storage unit holding medium data.

The format of the location string is medium type specific. For medium types using regular files in a host's file system, the location string is the full file name.

Some medium types may support changing the storage unit location by simply changing the value of this property. If this operation is not supported, the implementation will return `E_NOTIMPL` in attempt to set this attribute's value.

When setting a value of the location attribute which is a regular file in the host's file system, the given file name may be either relative to the [VirtualBox home folder](#) or absolute. Note that if the given location specification does not contain the file extension part then a proper default extension will be automatically appended by the implementation depending on the medium type.

9.23.1.5 name (read-only)

```
wstring IMedium::name
```

Name of the storage unit holding medium data.

The returned string is a short version of the [location](#) attribute that is suitable for representing the medium in situations where the full location specification is too long (such as lists and comboboxes in GUI frontends). This string is also used by frontends to sort the media list alphabetically when needed.

For example, for locations that are regular files in the host's file system, the value of this attribute is just the file name (+ extension), without the path specification.

Note that as opposed to the [location](#) attribute, the name attribute will not necessary be unique for a list of media of the given type and format.

9.23.1.6 deviceType (read-only)

```
DeviceType IMedium::deviceType
```

Kind of device (DVD/Floppy/HardDisk) which is applicable to this medium.

9.23.1.7 hostDrive (read-only)

```
boolean IMedium::hostDrive
```

True if this corresponds to a drive on the host.

9.23.1.8 size (read-only)

```
unsigned long long IMedium::size
```

Physical size of the storage unit used to hold medium data (in bytes).

Note: For media whose [state](#) is [Inaccessible](#), the value of this property is the last known size. For [NotCreated](#) media, the returned value is zero.

9.23.1.9 format (read-only)

wstring IMedium::format

Storage format of this medium.

The value of this attribute is a string that specifies a backend used to store medium data. The storage format is defined when you create a new medium or automatically detected when you open an existing medium, and cannot be changed later.

The list of all storage formats supported by this VirtualBox installation can be obtained using [ISystemProperties::mediumFormats\[\]](#).

9.23.1.10 mediumFormat (read-only)

IMediumFormat IMedium::mediumFormat

Storage medium format object corresponding to this medium.

The value of this attribute is a reference to the medium format object that specifies the backend properties used to store medium data. The storage format is defined when you create a new medium or automatically detected when you open an existing medium, and cannot be changed later.

<p>Note: null is returned if there is no associated medium format object. This can e.g. happen for medium objects representing host drives and other special medium objects.</p>

9.23.1.11 type (read/write)

MediumType IMedium::type

Type (role) of this medium.

The following constraints apply when changing the value of this attribute:

- If a medium is attached to a virtual machine (either in the current state or in one of the snapshots), its type cannot be changed.
- As long as the medium has children, its type cannot be set to [Writethrough](#).
- The type of all differencing media is [Normal](#) and cannot be changed.

The type of a newly created or opened medium is set to [Normal](#), except for DVD and floppy media, which have a type of [Writethrough](#).

9.23.1.12 parent (read-only)

IMedium IMedium::parent

Parent of this medium (the medium this medium is directly based on).

Only differencing media have parents. For base (non-differencing) media, null is returned.

9.23.1.13 children (read-only)

IMedium IMedium::children[]

Children of this medium (all differencing media directly based on this medium). A null array is returned if this medium does not have any children.

9.23.1.14 base (read-only)

`IMedium` `IMedium::base`

Base medium of this medium.

If this is a differencing medium, its base medium is the medium the given medium branch starts from. For all other types of media, this property returns the medium object itself (i.e. the same object this property is read on).

9.23.1.15 readOnly (read-only)

`boolean` `IMedium::readOnly`

Returns `true` if this medium is read-only and `false` otherwise.

A medium is considered to be read-only when its contents cannot be modified without breaking the integrity of other parties that depend on this medium such as its child media or snapshots of virtual machines where this medium is attached to these machines. If there are no children and no such snapshots then there is no dependency and the medium is not read-only.

The value of this attribute can be used to determine the kind of the attachment that will take place when attaching this medium to a virtual machine. If the value is `false` then the medium will be attached directly. If the value is `true` then the medium will be attached indirectly by creating a new differencing child medium for that. See the interface description for more information.

Note that all `Immutable` media are always read-only while all `Writethrough` media are always not.

Note: The read-only condition represented by this attribute is related to the medium type and usage, not to the current `medium state` and not to the read-only state of the storage unit.

9.23.1.16 logicalSize (read-only)

`unsigned long long` `IMedium::logicalSize`

Logical size of this medium (in megabytes), as reported to the guest OS running inside the virtual machine this medium is attached to. The logical size is defined when the medium is created and cannot be changed later.

Note: Reading this property on a differencing medium will return the size of its `base` medium.

Note: For media whose state is `state` is `Inaccessible`, the value of this property is the last known logical size. For `NotCreated` media, the returned value is zero.

9.23.1.17 autoReset (read/write)

```
boolean IMedium::autoReset
```

Whether this differencing medium will be automatically reset each time a virtual machine it is attached to is powered up. This attribute is automatically set to `true` for the last differencing image of an “immutable” medium (see [MediumType](#)).

See [reset\(\)](#) for more information about resetting differencing media.

Note: Reading this property on a base (non-differencing) medium will always `false`. Changing the value of this property in this case is not supported.

9.23.1.18 lastAccessError (read-only)

```
wstring IMedium::lastAccessError
```

Text message that represents the result of the last accessibility check performed by [refreshState\(\)](#).

An empty string is returned if the last accessibility check was successful or has not yet been called. As a result, if `state` is “Inaccessible” and this attribute is empty, then [refreshState\(\)](#) has yet to be called; this is the default value of media after VirtualBox initialization. A non-empty string indicates a failure and should normally describe a reason of the failure (for example, a file read error).

9.23.1.19 machineIds (read-only)

```
uuid IMedium::machineIds[]
```

Array of UUIDs of all machines this medium is attached to.

A `null` array is returned if this medium is not attached to any machine or to any machine’s snapshot.

Note: The returned array will include a machine even if this medium is not attached to that machine in the current state but attached to it in one of the machine’s snapshots. See [getSnapshotIds\(\)](#) for details.

9.23.2 cloneTo

```
IProgress IMedium::cloneTo(
    [in] IMedium target,
    [in] MediumVariant variant,
    [in] IMedium parent)
```

target Target medium.

variant Exact image variant which should be created.

parent Parent of the cloned medium.

Starts creating a clone of this medium in the format and at the location defined by the `target` argument.

The target medium must be either in `NotCreated` state (i.e. must not have an existing storage unit) or in `Created` state (i.e. created and not locked, and big enough to hold the data or else the

copy will be partial). Upon successful completion, the cloned medium will contain exactly the same sector data as the medium being cloned, except that in the first case a new UUID for the clone will be randomly generated, and in the second case the UUID will remain unchanged.

The parent argument defines which medium will be the parent of the clone. Passing a `null` reference indicates that the clone will be a base image, i.e. completely independent. It is possible to specify an arbitrary medium for this parameter, including the parent of the medium which is being cloned. Even cloning to a child of the source medium is possible. Note that when cloning to an existing image, the parent argument is ignored.

After the returned progress object reports that the operation is successfully complete, the target medium gets remembered by this VirtualBox installation and may be attached to virtual machines.

Note: This medium will be placed to [LockedRead](#) state for the duration of this operation.

If this method fails, the following error codes may be reported:

- `E_NOTIMPL`: The specified cloning variant is not supported at the moment.

9.23.3 close

```
void IMedium::close()
```

Closes this medium.

The medium must not be attached to any known virtual machine and must not have any known child media, otherwise the operation will fail.

When the medium is successfully closed, it gets removed from the list of remembered media, but its storage unit is not deleted. In particular, this means that this medium can be later opened again using the [IVirtualBox::openHardDisk\(\)](#) call.

Note that after this method successfully returns, the given medium object becomes uninitialized. This means that any attempt to call any of its methods or attributes will fail with the "Object not ready" (`E_ACCESSDENIED`) error.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Invalid medium state (other than not created, created or inaccessible).
- `VBOX_E_OBJECT_IN_USE`: Medium attached to virtual machine.
- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.

9.23.4 compact

```
IProgress IMedium::compact()
```

Starts compacting of this medium. This means that the medium is transformed into a possibly more compact storage representation. This potentially creates temporary images, which can require a substantial amount of additional disk space.

This medium will be placed to [LockedWrite](#) state and all its parent media (if any) will be placed to [LockedRead](#) state for the duration of this operation.

Please note that the results can be either returned straight away, or later as the result of the background operation via the object returned via the progress parameter.

If this method fails, the following error codes may be reported:

- `VBOX_E_NOT_SUPPORTED`: Medium format does not support compacting (but potentially needs it).

9.23.5 createBaseStorage

```
IProgress IMedium::createBaseStorage(
    [in] unsigned long long logicalSize,
    [in] MediumVariant variant)
```

logicalSize Maximum logical size of the medium in megabytes.

variant Exact image variant which should be created.

Starts creating a hard disk storage unit (fixed/dynamic, according to the variant flags) in the background. The previous storage unit created for this object, if any, must first be deleted using `deleteStorage()`, otherwise the operation will fail.

Before the operation starts, the medium is placed in `Creating` state. If the create operation fails, the medium will be placed back in `NotCreated` state.

After the returned progress object reports that the operation has successfully completed, the medium state will be set to `Created`, the medium will be remembered by this VirtualBox installation and may be attached to virtual machines.

If this method fails, the following error codes may be reported:

- `VBOX_E_NOT_SUPPORTED`: The variant of storage creation operation is not supported. See `IMediumFormat::capabilities`.

9.23.6 createDiffStorage

```
IProgress IMedium::createDiffStorage(
    [in] IMedium target,
    [in] MediumVariant variant)
```

target Target medium.

variant Exact image variant which should be created.

Starts creating an empty differencing storage unit based on this medium in the format and at the location defined by the target argument.

The target medium must be in `NotCreated` state (i.e. must not have an existing storage unit). Upon successful completion, this operation will set the type of the target medium to `Normal` and create a storage unit necessary to represent the differencing medium data in the given format (according to the storage format of the target object).

After the returned progress object reports that the operation is successfully complete, the target medium gets remembered by this VirtualBox installation and may be attached to virtual machines.

Note: The medium will be set to `LockedRead` state for the duration of this operation.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_IN_USE`: Medium not in `NotCreated` state.

9.23.7 deleteStorage

```
IProgress IMedium::deleteStorage()
```

Starts deleting the storage unit of this medium.

The medium must not be attached to any known virtual machine and must not have any known child media, otherwise the operation will fail. It will also fail if there is no storage unit to delete or if deletion is already in progress, or if the medium is being in use (locked for read or for write) or inaccessible. Therefore, the only valid state for this operation to succeed is [Created](#).

Before the operation starts, the medium is placed in [Deleting](#) state and gets removed from the list of remembered hard disks (media registry). If the delete operation fails, the medium will be remembered again and placed back to [Created](#) state.

After the returned progress object reports that the operation is complete, the medium state will be set to [NotCreated](#) and you will be able to use one of the storage creation methods to create it again.

See also: `#close()`

Note: If the deletion operation fails, it is not guaranteed that the storage unit still exists. You may check the [state](#) value to answer this question.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_IN_USE`: Medium is attached to a virtual machine.
- `VBOX_E_NOT_SUPPORTED`: Storage deletion is not allowed because neither of storage creation operations are supported. See [IMediumFormat::capabilities](#).

9.23.8 `getProperties`

```
wstring[] IMedium::getProperties(
    [in] wstring names,
    [out] wstring returnNames[])
```

names Names of properties to get.

returnNames Names of returned properties.

Returns values for a group of properties in one call.

The names of the properties to get are specified using the `names` argument which is a list of comma-separated property names or an empty string if all properties are to be returned. Note that currently the value of this argument is ignored and the method always returns all existing properties.

The list of all properties supported by the given medium format can be obtained with [IMediumFormat::describeProperties\(\)](#).

The method returns two arrays, the array of property names corresponding to the `names` argument and the current values of these properties. Both arrays have the same number of elements with each element at the given index in the first array corresponds to an element at the same index in the second array.

Note that for properties that do not have assigned values, an empty string is returned at the appropriate index in the `returnValues` array.

9.23.9 `getProperty`

```
wstring IMedium::getProperty(
    [in] wstring name)
```

name Name of the property to get.

Returns the value of the custom medium property with the given name.

The list of all properties supported by the given medium format can be obtained with [IMediumFormat::describeProperties\(\)](#).

Note that if this method returns an empty string in value, the requested property is supported but currently not assigned any value.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Requested property does not exist (not supported by the format).
- `E_INVALIDARG`: name is null or empty.

9.23.10 getSnapshotIds

```
uuid[] IMedium::getSnapshotIds(
    [in] uuid machineId)
```

machineId UUID of the machine to query.

Returns an array of UUIDs of all snapshots of the given machine where this medium is attached to.

If the medium is attached to the machine in the current state, then the first element in the array will always be the ID of the queried machine (i.e. the value equal to the `machineId` argument), followed by snapshot IDs (if any).

If the medium is not attached to the machine in the current state, then the array will contain only snapshot IDs.

The returned array may be null if this medium is not attached to the given machine at all, neither in the current state nor in one of the snapshots.

9.23.11 lockRead

```
MediumState IMedium::lockRead()
```

Locks this medium for reading.

A read lock is shared: many clients can simultaneously lock the same medium for reading unless it is already locked for writing (see [lockWrite\(\)](#)) in which case an error is returned.

When the medium is locked for reading, it cannot be modified from within VirtualBox. This means that any method that changes the properties of this medium or contents of the storage unit will return an error (unless explicitly stated otherwise). That includes an attempt to start a virtual machine that wants to write to the the medium.

When the virtual machine is started up, it locks for reading all media it uses in read-only mode. If some medium cannot be locked for reading, the startup procedure will fail. A medium is typically locked for reading while it is used by a running virtual machine but has a depending differencing image that receives the actual write operations. This way one base medium can have multiple child differencing images which can be written to simultaneously. Read-only media such as DVD and floppy images are also locked for reading only (so they can be in use by multiple machines simultaneously).

A medium is also locked for reading when it is the source of a write operation such as [cloneTo\(\)](#) or [mergeTo\(\)](#).

The medium locked for reading must be unlocked using the [unlockRead\(\)](#) method. Calls to [lockRead\(\)](#) can be nested and must be followed by the same number of paired [unlockRead\(\)](#) calls.

This method sets the medium state (see [state](#)) to “LockedRead” on success. The medium’s previous state must be one of “Created”, “Inaccessible” or “LockedRead”.

Locking an inaccessible medium is not an error; this method performs a logical lock that prevents modifications of this medium through the VirtualBox API, not a physical file-system lock of the underlying storage unit.

This method returns the current state of the medium *before* the operation.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Invalid medium state (e.g. not created, locked, inaccessible, creating, deleting).

9.23.12 lockWrite

```
MediumState IMedium::lockWrite()
```

Locks this medium for writing.

A write lock, as opposed to `lockRead()`, is exclusive: there may be only one client holding a write lock, and there may be no read locks while the write lock is held. As a result, read-locking fails if a write lock is held, and write-locking fails if either a read or another write lock is held.

When a medium is locked for writing, it cannot be modified from within VirtualBox, and it is not guaranteed that the values of its properties are up-to-date. Any method that changes the properties of this medium or contents of the storage unit will return an error (unless explicitly stated otherwise).

When a virtual machine is started up, it locks for writing all media it uses to write data to. If any medium could not be locked for writing, the startup procedure will fail. If a medium has differencing images, then while the machine is running, only the last (“leaf”) differencing image is locked for writing, whereas its parents are locked for reading only.

A medium is also locked for writing when it is the target of a write operation such as `cloneTo()` or `mergeTo()`.

The medium locked for writing must be unlocked using the `unlockWrite()` method. Write locks *cannot* be nested.

This method sets the medium state (see `state`) to “LockedWrite” on success. The medium’s previous state must be either “Created” or “Inaccessible”.

Locking an inaccessible medium is not an error; this method performs a logical lock that prevents modifications of this medium through the VirtualBox API, not a physical file-system lock of the underlying storage unit.

For both, success and failure, this method returns the current state of the medium *before* the operation.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Invalid medium state (e.g. not created, locked, inaccessible, creating, deleting).

9.23.13 mergeTo

```
IProgress IMedium::mergeTo(
    [in] IMedium target)
```

target Target medium.

Starts merging the contents of this medium and all intermediate differencing media in the chain to the given target medium.

The target medium must be either a descendant of this medium or its ancestor (otherwise this method will immediately return a failure). It follows that there are two logical directions of the merge operation: from ancestor to descendant (*forward merge*) and from descendant to ancestor (*backward merge*). Let us consider the following medium chain:

9 Classes (interfaces)

```
Base <- Diff_1 <- Diff_2
```

Here, calling this method on the `Base` medium object with `Diff_2` as an argument will be a forward merge; calling it on `Diff_2` with `Base` as an argument will be a backward merge. Note that in both cases the contents of the resulting medium will be the same, the only difference is the medium object that takes the result of the merge operation. In case of the forward merge in the above example, the result will be written to `Diff_2`; in case of the backward merge, the result will be written to `Base`. In other words, the result of the operation is always stored in the target medium.

Upon successful operation completion, the storage units of all media in the chain between this (source) medium and the target medium, including the source medium itself, will be automatically deleted and the relevant medium objects (including this medium) will become uninitialized. This means that any attempt to call any of their methods or attributes will fail with the "Object not ready" (`E_ACCESSDENIED`) error. Applied to the above example, the forward merge of `Base` to `Diff_2` will delete and uninitialized both `Base` and `Diff_1` media. Note that `Diff_2` in this case will become a base medium itself since it will no longer be based on any other medium.

Considering the above, all of the following conditions must be met in order for the merge operation to succeed:

- Neither this (source) medium nor any intermediate differencing medium in the chain between it and the target medium is attached to any virtual machine.
- Neither the source medium nor the target medium is an [Immutable](#) medium.
- The part of the medium tree from the source medium to the target medium is a linear chain, i.e. all medium in this chain have exactly one child which is the next medium in this chain. The only exception from this rule is the target medium in the forward merge operation; it is allowed to have any number of child media because the merge operation will not change its logical contents (as it is seen by the guest OS or by children).
- None of the involved media are in [LockedRead](#) or [LockedWrite](#) state.

Note: This (source) medium and all intermediates will be placed to [Deleting](#) state and the target medium will be placed to [LockedWrite](#) state and for the duration of this operation.

9.23.14 refreshState

```
MediumState IMedium::refreshState()
```

If the current medium state (see [MediumState](#)) is one of "Created", "Inaccessible" or "LockedRead", then this performs an accessibility check on the medium and sets the value of the `state` attribute accordingly; that value is also returned for convenience.

For all other state values, this does not perform a refresh but returns the state only.

The refresh, if performed, may take a long time (several seconds or even minutes, depending on the storage unit location and format) because it performs an accessibility check of the storage unit. This check may cause a significant delay if the storage unit of the given medium is, for example, a file located on a network share which is not currently accessible due to connectivity problems. In that case, the call will not return until a timeout interval defined by the host OS for this operation expires. For this reason, it is recommended to never read this attribute on the main UI thread to avoid making the UI unresponsive.

If the last known state of the medium is "Created" and the accessibility check fails, then the state would be set to "Inaccessible", and [lastAccessError](#) may be used to get more details about the failure. If the state of the medium is "LockedRead", then it remains the same, and a non-empty value of [lastAccessError](#) will indicate a failed accessibility check in this case.

Note that not all medium states are applicable to all medium types.

9.23.15 reset

IPProgress `IMedium::reset()`

Starts erasing the contents of this differencing medium.

This operation will reset the differencing medium to its initial state when it does not contain any sector data and any read operation is redirected to its parent medium. This automatically gets called during VM power-up for every medium whose `autoReset` attribute is true.

The medium will be write-locked for the duration of this operation (see `lockWrite()`).

If this method fails, the following error codes may be reported:

- `VBOX_E_NOT_SUPPORTED`: This is not a differencing medium.
- `VBOX_E_INVALID_OBJECT_STATE`: Medium is not in `Created` or `Inaccessible` state.

9.23.16 resize

IPProgress `IMedium::resize([in] unsigned long long logicalSize)`

logicalSize New nominal capacity of the medium in megabytes.

Starts resizing this medium. This means that the nominal size of the medium is set to the new value. Both increasing and decreasing the size is possible, and there are no safety checks, since VirtualBox does not make any assumptions about the medium contents.

Resizing usually needs additional disk space, and possibly also some temporary disk space. Note that `resize` does not create a full temporary copy of the medium, so the additional disk space requirement is usually much lower than using the clone operation.

This medium will be placed to `LockedWrite` state for the duration of this operation.

Please note that the results can be either returned straight away, or later as the result of the background operation via the object returned via the progress parameter.

If this method fails, the following error codes may be reported:

- `VBOX_E_NOT_SUPPORTED`: Medium format does not support resizing.

9.23.17 setProperties

```
void IMedium::setProperties(
    [in] wstring names[],
    [in] wstring values[])
```

names Names of properties to set.

values Values of properties to set.

Sets values for a group of properties in one call.

The names of the properties to set are passed in the `names` array along with the new values for them in the `values` array. Both arrays have the same number of elements with each element at the given index in the first array corresponding to an element at the same index in the second array.

If there is at least one property name in `names` that is not valid, the method will fail before changing the values of any other properties from the `names` array.

Using this method over `setProperty()` is preferred if you need to set several properties at once since it will result into less IPC calls.

The list of all properties supported by the given medium format can be obtained with `IMediumFormat::describeProperties()`.

Note that setting the property value to `null` or an empty string is equivalent to deleting the existing value. A default value (if it is defined for this property) will be used by the format backend in this case.

9.23.18 setProperty

```
void IMedium::setProperty(
    [in] wstring name,
    [in] wstring value)
```

name Name of the property to set.

value Property value to set.

Sets the value of the custom medium property with the given name.

The list of all properties supported by the given medium format can be obtained with [IMediumFormat::describeProperties\(\)](#).

Note that setting the property value to null or an empty string is equivalent to deleting the existing value. A default value (if it is defined for this property) will be used by the format backend in this case.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Requested property does not exist (not supported by the format).
- `E_INVALIDARG`: name is null or empty.

9.23.19 unlockRead

```
MediumState IMedium::unlockRead()
```

Cancels the read lock previously set by [lockRead\(\)](#).

For both success and failure, this method returns the current state of the medium *after* the operation.

See [lockRead\(\)](#) for more details.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Medium not locked for reading.

9.23.20 unlockWrite

```
MediumState IMedium::unlockWrite()
```

Cancels the write lock previously set by [lockWrite\(\)](#).

For both success and failure, this method returns the current state of the medium *after* the operation.

See [lockWrite\(\)](#) for more details.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Medium not locked for writing.

9.24 IMediumAttachment

Note: With the web service, this interface is mapped to a structure. Attributes that return this interface will not return an object, but a complete structure containing the attributes listed below as structure members.

The `IMediumAttachment` interface represents the attachment of a storage medium to a virtual machine. Each machine contains an array of its medium attachments in `IMachine::mediumAttachments[]`.

Each medium attachment specifies a storage controller as well as a port and device number. Fixed media (hard disks) will always also specify an instance of `IMedium` in `medium`, referring to the hard disk medium. For removable media, the `IMedia` instance is optional; it can be `null` if no media is mounted (see `IMachine::mountMedium()`).

9.24.1 Attributes

9.24.1.1 `medium` (read-only)

`IMedium` `IMediumAttachment::medium`

Medium object associated with this attachment; it can be `null` for removable devices.

9.24.1.2 `controller` (read-only)

`wstring` `IMediumAttachment::controller`

Name of the storage controller of this attachment; this refers to one of the controllers in `IMachine::storageControllers[]` by name.

9.24.1.3 `port` (read-only)

`long` `IMediumAttachment::port`

Port number of this attachment. See `IMachine::attachDevice()` for the meaning of this value for the different controller types.

9.24.1.4 `device` (read-only)

`long` `IMediumAttachment::device`

Device slot number of this attachment. See `IMachine::attachDevice()` for the meaning of this value for the different controller types.

9.24.1.5 `type` (read-only)

`DeviceType` `IMediumAttachment::type`

Device type of this attachment.

9.24.1.6 `passthrough` (read-only)

`boolean` `IMediumAttachment::passthrough`

Pass I/O requests through to a device on the host.

9.25 `IMediumFormat`

The `IMediumFormat` interface represents a medium format.

Each medium format has an associated backend which is used to handle media stored in this format. This interface provides information about the properties of the associated backend.

Each medium format is identified by a string represented by the `id` attribute. This string is used in calls like `IVirtualBox::createHardDisk()` to specify the desired format.

The list of all supported medium formats can be obtained using `ISystemProperties::mediumFormats[]`.

See also: `IMedium`

9.25.1 Attributes

9.25.1.1 id (read-only)

wstring IMediumFormat::id

Identifier of this format.

The format identifier is a non-null non-empty ASCII string. Note that this string is case-insensitive. This means that, for example, all of the following strings:

```
"VDI"
"vdi"
"VdI"
```

refer to the same medium format.

This string is used in methods of other interfaces where it is necessary to specify a medium format, such as [IVirtualBox::createHardDisk\(\)](#).

9.25.1.2 name (read-only)

wstring IMediumFormat::name

Human readable description of this format.

Mainly for use in file open dialogs.

9.25.1.3 fileExtensions (read-only)

wstring IMediumFormat::fileExtensions[]

Array of strings containing the supported file extensions.

The first extension in the array is the extension preferred by the backend. It is recommended to use this extension when specifying a location of the storage unit for a new medium.

Note that some backends do not work on files, so this array may be empty.

See also: [IMediumFormat::capabilities](#)

9.25.1.4 capabilities (read-only)

unsigned long IMediumFormat::capabilities

Capabilities of the format as a set of bit flags.

For the meaning of individual capability flags see [MediumFormatCapabilities](#).

9.25.2 describeProperties

```
void IMediumFormat::describeProperties(
    [out] wstring names[],
    [out] wstring description[],
    [out] DataType types[],
    [out] unsigned long flags[],
    [out] wstring defaults[])
```

names Array of property names.

description Array of property descriptions.

types Array of property types.

flags Array of property flags.

defaults Array of default property values.

Returns several arrays describing the properties supported by this format.

An element with the given index in each array describes one property. Thus, the number of elements in each returned array is the same and corresponds to the number of supported properties.

The returned arrays are filled in only if the [Properties](#) flag is set. All arguments must be non-null.

See also: [DataType](#) See also: [DataFlags](#)

9.26 IMouse

The IMouse interface represents the virtual machine's mouse. Used in [IConsole::mouse](#).

Through this interface, the virtual machine's virtual mouse can be controlled.

9.26.1 Attributes

9.26.1.1 absoluteSupported (read-only)

boolean IMouse::absoluteSupported

Whether the guest OS supports absolute mouse pointer positioning or not.

Note: You can use the [IConsoleCallback::onMouseCapabilityChange\(\)](#) callback to be instantly informed about changes of this attribute during virtual machine execution.

See also: [putMouseEventAbsolute\(\)](#)

9.26.1.2 relativeSupported (read-only)

boolean IMouse::relativeSupported

Whether the guest OS supports relative mouse pointer positioning or not.

Note: You can use the [IConsoleCallback::onMouseCapabilityChange\(\)](#) callback to be instantly informed about changes of this attribute during virtual machine execution.

See also: [putMouseEvent\(\)](#)

9.26.1.3 needsHostCursor (read-only)

boolean IMouse::needsHostCursor

Whether the guest OS can currently switch to drawing it's own mouse cursor on demand.

Note: You can use the [IConsoleCallback::onMouseCapabilityChange\(\)](#) callback to be instantly informed about changes of this attribute during virtual machine execution.

See also: [putMouseEvent\(\)](#)

9.26.2 putMouseEvent

```
void IMouse::putMouseEvent(
    [in] long dx,
    [in] long dy,
    [in] long dz,
    [in] long dw,
    [in] long buttonState)
```

dx Amount of pixels the mouse should move to the right. Negative values move the mouse to the left.

dy Amount of pixels the mouse should move downwards. Negative values move the mouse upwards.

dz Amount of mouse wheel moves. Positive values describe clockwise wheel rotations, negative values describe counterclockwise rotations.

dw Amount of horizontal mouse wheel moves. Positive values describe a movement to the left, negative values describe a movement to the right.

buttonState The current state of mouse buttons. Every bit represents a mouse button as follows:
 Bit 0 (0x01)left mouse buttonBit 1 (0x02)right mouse buttonBit 2 (0x04)middle mouse button
 A value of 1 means the corresponding button is pressed. otherwise it is released.

Initiates a mouse event using relative pointer movements along x and y axis.

If this method fails, the following error codes may be reported:

- E_ACCESSDENIED: Console not powered up.
- VBOX_E_IPRT_ERROR: Could not send mouse event to virtual mouse.

9.26.3 putMouseEventAbsolute

```
void IMouse::putMouseEventAbsolute(
    [in] long x,
    [in] long y,
    [in] long dz,
    [in] long dw,
    [in] long buttonState)
```

x X coordinate of the pointer in pixels, starting from 1.

y Y coordinate of the pointer in pixels, starting from 1.

dz Amount of mouse wheel moves. Positive values describe clockwise wheel rotations, negative values describe counterclockwise rotations.

dw Amount of horizontal mouse wheel moves. Positive values describe a movement to the left, negative values describe a movement to the right.

buttonState The current state of mouse buttons. Every bit represents a mouse button as follows:
 Bit 0 (0x01)left mouse buttonBit 1 (0x02)right mouse buttonBit 2 (0x04)middle mouse button
 A value of 1 means the corresponding button is pressed. otherwise it is released.

Positions the mouse pointer using absolute x and y coordinates. These coordinates are expressed in pixels and start from [1,1] which corresponds to the top left corner of the virtual display.

Note: This method will have effect only if absolute mouse positioning is supported by the guest OS.

See also: [absoluteSupported](#)

If this method fails, the following error codes may be reported:

- `E_ACCESSDENIED`: Console not powered up.
- `VBOX_E_IPRT_ERROR`: Could not send mouse event to virtual mouse.

9.27 INATEngine

Interface for managing a NAT engine which is used with a virtual machine. This allows for changing NAT behavior such as port-forwarding rules. This interface is used in the [INetworkAdapter::natDriver](#) attribute.

9.27.1 Attributes

9.27.1.1 network (read/write)

wstring INATEngine::network

The network attribute of the NAT engine (the same value is used with built-in DHCP server to fill corresponding fields of DHCP leases).

9.27.1.2 hostIP (read/write)

wstring INATEngine::hostIP

IP of host interface to bind all opened sockets to.

Note: Changing this does not change binding of port forwarding.

9.27.1.3 tftpPrefix (read/write)

wstring INATEngine::tftpPrefix

TFTP prefix attribute which is used with the built-in DHCP server to fill the corresponding fields of DHCP leases.

9.27.1.4 tftpBootFile (read/write)

wstring INATEngine::tftpBootFile

TFTP boot file attribute which is used with the built-in DHCP server to fill the corresponding fields of DHCP leases.

9.27.1.5 tftpNextServer (read/write)

wstring INATEngine::tftpNextServer

TFTP server attribute which is used with the built-in DHCP server to fill the corresponding fields of DHCP leases.

Note: The preferred form is IPv4 addresses.

9.27.1.6 aliasMode (read/write)

unsigned long INATEngine::aliasMode

9.27.1.7 dnsPassDomain (read/write)

boolean INATEngine::dnsPassDomain

Whether the DHCP server should pass the DNS domain used by the host.

9.27.1.8 dnsProxy (read/write)

boolean INATEngine::dnsProxy

Whether the DHCP server (and the DNS traffic by NAT) should pass the address of the DNS proxy and process traffic using DNS servers registered on the host.

9.27.1.9 dnsUseHostResolver (read/write)

boolean INATEngine::dnsUseHostResolver

Whether the DHCP server (and the DNS traffic by NAT) should pass the address of the DNS proxy and process traffic using the host resolver mechanism.

9.27.1.10 redirects (read-only)

wstring INATEngine::redirects[]

Array of NAT port-forwarding rules in string representation, in the following format: "name,protocol id,host ip,host port,guest ip,guest port".

9.27.2 addRedirect

```
void INATEngine::addRedirect(  
    [in] wstring name,  
    [in] NATProtocol proto,  
    [in] wstring hostIp,  
    [in] unsigned short hostPort,  
    [in] wstring guestIp,  
    [in] unsigned short guestPort)
```

name The name of the rule. An empty name is acceptable, in which case the NAT engine auto-generates one using the other parameters.

proto Protocol handled with the rule.

hostIp IP of the host interface to which the rule should apply. An empty ip address is acceptable, in which case the NAT engine binds the handling socket to any interface.

hostPort The port number to listen on.

guestIp The IP address of the guest which the NAT engine will forward matching packets to. An empty IP address is acceptable, in which case the NAT engine will forward packets to the first DHCP lease (x.x.x.15).

guestPort The port number to forward.

Adds a new NAT port-forwarding rule.

9.27.3 getNetworkSettings

```
void INATEngine::getNetworkSettings(
    [out] unsigned long mtu,
    [out] unsigned long sockSnd,
    [out] unsigned long sockRcv,
    [out] unsigned long TcpWndSnd,
    [out] unsigned long TcpWndRcv)
```

mtu

sockSnd

sockRcv

TcpWndSnd

TcpWndRcv

Returns network configuration of NAT engine. See [setNetworkSettings\(\)](#) for parameter descriptions.

9.27.4 removeRedirect

```
void INATEngine::removeRedirect(
    [in] wstring name)
```

name The name of the rule to delete.

Removes a port-forwarding rule that was previously registered.

9.27.5 setNetworkSettings

```
void INATEngine::setNetworkSettings(
    [in] unsigned long mtu,
    [in] unsigned long sockSnd,
    [in] unsigned long sockRcv,
    [in] unsigned long TcpWndSnd,
    [in] unsigned long TcpWndRcv)
```

mtu MTU (maximum transmission unit) of the NAT engine in bytes.

sockSnd Capacity of the socket send buffer in bytes when creating a new socket.

sockRcv Capacity of the socket receive buffer in bytes when creating a new socket.

TcpWndSnd Initial size of the NAT engine's sending TCP window in bytes when establishing a new TCP connection.

TcpWndRcv Initial size of the NAT engine's receiving TCP window in bytes when establishing a new TCP connection.

Sets network configuration of the NAT engine.

9.28 INetworkAdapter

Represents a virtual network adapter that is attached to a virtual machine. Each virtual machine has a fixed number of network adapter slots with one instance of this attached to each of them. Call [IMachine::getNetworkAdapter\(\)](#) to get the network adapter that is attached to a given slot in a given machine.

Each network adapter can be in one of five attachment modes, which are represented by the [NetworkAttachmentType](#) enumeration; see the [attachmentType](#) attribute.

9.28.1 Attributes

9.28.1.1 adapterType (read/write)

[NetworkAdapterType](#) `INetworkAdapter::adapterType`

Type of the virtual network adapter. Depending on this value, VirtualBox will provide a different virtual network hardware to the guest.

9.28.1.2 slot (read-only)

`unsigned long INetworkAdapter::slot`

Slot number this adapter is plugged into. Corresponds to the value you pass to [IMachine::getNetworkAdapter\(\)](#) to obtain this instance.

9.28.1.3 enabled (read/write)

`boolean INetworkAdapter::enabled`

Flag whether the network adapter is present in the guest system. If disabled, the virtual guest hardware will not contain this network adapter. Can only be changed when the VM is not running.

9.28.1.4 MACAddress (read/write)

`wstring INetworkAdapter::MACAddress`

Ethernet MAC address of the adapter, 12 hexadecimal characters. When setting it to `null` or an empty string, VirtualBox will generate a unique MAC address.

9.28.1.5 attachmentType (read-only)

[NetworkAttachmentType](#) `INetworkAdapter::attachmentType`

9.28.1.6 hostInterface (read/write)

`wstring INetworkAdapter::hostInterface`

Name of the host network interface the VM is attached to.

9.28.1.7 internalNetwork (read/write)

`wstring INetworkAdapter::internalNetwork`

Name of the internal network the VM is attached to.

9.28.1.8 NATNetwork (read/write)

`wstring INetworkAdapter::NATNetwork`

Name of the NAT network the VM is attached to.

9.28.1.9 VDENetwork (read/write)

`wstring INetworkAdapter::VDENetwork`

Name of the VDE switch the VM is attached to.

9.28.1.10 cableConnected (read/write)

boolean INetworkAdapter::cableConnected

Flag whether the adapter reports the cable as connected or not. It can be used to report offline situations to a VM.

9.28.1.11 lineSpeed (read/write)

unsigned long INetworkAdapter::lineSpeed

Line speed reported by custom drivers, in units of 1 kbps.

9.28.1.12 traceEnabled (read/write)

boolean INetworkAdapter::traceEnabled

Flag whether network traffic from/to the network card should be traced. Can only be toggled when the VM is turned off.

9.28.1.13 traceFile (read/write)

wstring INetworkAdapter::traceFile

Filename where a network trace will be stored. If not set, VBox-pid.pcap will be used.

9.28.1.14 natDriver (read-only)

[INATEngine](#) INetworkAdapter::natDriver

Points to the NAT engine which handles the network address translation for this interface. This is active only when the interface actually uses NAT (see [attachToNAT\(\)](#)).

9.28.1.15 bootPriority (read/write)

unsigned long INetworkAdapter::bootPriority

Network boot priority of the adapter. Priority 1 is highest. If not set, the priority is considered to be at the lowest possible setting.

9.28.2 attachToBridgedInterface

void INetworkAdapter::attachToBridgedInterface()

Attach the network adapter to a bridged host interface.

9.28.3 attachToHostOnlyInterface

void INetworkAdapter::attachToHostOnlyInterface()

Attach the network adapter to the host-only network.

9.28.4 attachToInternalNetwork

void INetworkAdapter::attachToInternalNetwork()

Attach the network adapter to an internal network.

9.28.5 attachToNAT

```
void INetworkAdapter::attachToNAT()
```

Attach the network adapter to the Network Address Translation (NAT) interface.

9.28.6 attachToVDE

```
void INetworkAdapter::attachToVDE()
```

Attach the network adapter to a VDE network.

9.28.7 detach

```
void INetworkAdapter::detach()
```

Detach the network adapter

9.29 IParallelPort

The IParallelPort interface represents the virtual parallel port device.

The virtual parallel port device acts like an ordinary parallel port inside the virtual machine. This device communicates to the real parallel port hardware using the name of the parallel device on the host computer specified in the `#path` attribute.

Each virtual parallel port device is assigned a base I/O address and an IRQ number that will be reported to the guest operating system and used to operate the given parallel port from within the virtual machine.

See also: `IMachine::getParallelPort`

9.29.1 Attributes

9.29.1.1 slot (read-only)

```
unsigned long IParallelPort::slot
```

Slot number this parallel port is plugged into. Corresponds to the value you pass to [IMachine::getParallelPort\(\)](#) to obtain this instance.

9.29.1.2 enabled (read/write)

```
boolean IParallelPort::enabled
```

Flag whether the parallel port is enabled. If disabled, the parallel port will not be reported to the guest OS.

9.29.1.3 IOBase (read/write)

```
unsigned long IParallelPort::IOBase
```

Base I/O address of the parallel port.

9.29.1.4 IRQ (read/write)

```
unsigned long IParallelPort::IRQ
```

IRQ number of the parallel port.

9.29.1.5 path (read/write)

wstring IParallelPort::path

Host parallel device name. If this parallel port is enabled, setting a null or an empty string as this attribute's value will result into an error.

9.30 IPerformanceCollector

The IPerformanceCollector interface represents a service that collects and stores performance metrics data.

Performance metrics are associated with objects of interfaces like IHost and IMachine. Each object has a distinct set of performance metrics. The set can be obtained with [getMetrics\(\)](#).

Metric data is collected at the specified intervals and is retained internally. The interval and the number of retained samples can be set with [setupMetrics\(\)](#). Both metric data and collection settings are not persistent, they are discarded as soon as VBoxSVC process terminates. Moreover, metric settings and data associated with a particular VM only exist while VM is running. They disappear as soon as VM shuts down. It is not possible to set up metrics for machines that are powered off. One needs to start VM first, then set up metric collection parameters.

Metrics are organized hierarchically, with each level separated by a slash (/) character. Generally, the scheme for metric names is like this:

Category/Metric[/SubMetric][:aggregation]

“Category/Metric” together form the base metric name. A base metric is the smallest unit for which a sampling interval and the number of retained samples can be set. Only base metrics can be enabled and disabled. All sub-metrics are collected when their base metric is collected. Collected values for any set of sub-metrics can be queried with [queryMetricsData\(\)](#).

For example “CPU/Load/User:avg” metric name stands for the “CPU” category, “Load” metric, “User” submetric, “average” aggregate. An aggregate function is computed over all retained data. Valid aggregate functions are:

- avg – average
- min – minimum
- max – maximum

When setting up metric parameters, querying metric data, enabling or disabling metrics wild-cards can be used in metric names to specify a subset of metrics. For example, to select all CPU-related metrics use CPU/*, all averages can be queried using *:avg and so on. To query metric values without aggregates *: can be used.

The valid names for base metrics are:

- CPU/Load
- CPU/MHz
- RAM/Usage

The general sequence for collecting and retrieving the metrics is:

- Obtain an instance of IPerformanceCollector with [IVirtualBox::performanceCollector](#)
- Allocate and populate an array with references to objects the metrics will be collected for. Use references to IHost and IMachine objects.
- Allocate and populate an array with base metric names the data will be collected for.

- Call `setupMetrics()`. From now on the metric data will be collected and stored.
- Wait for the data to get collected.
- Allocate and populate an array with references to objects the metric values will be queried for. You can re-use the object array used for setting base metrics.
- Allocate and populate an array with metric names the data will be collected for. Note that metric names differ from base metric names.
- Call `queryMetricsData()`. The data that have been collected so far are returned. Note that the values are still retained internally and data collection continues.

For an example of usage refer to the following files in VirtualBox SDK:

- Java: `bindings/webservice/java/jax-ws/samples/metrictest.java`
- Python: `bindings/xpcom/python/sample/shellcommon.py`

9.30.1 Attributes

9.30.1.1 `metricNames` (read-only)

`wstring IPerformanceCollector::metricNames[]`

Array of unique names of metrics.

This array represents all metrics supported by the performance collector. Individual objects do not necessarily support all of them. `getMetrics()` can be used to get the list of supported metrics for a particular object.

9.30.2 `disableMetrics`

```
IPerformanceMetric[] IPerformanceCollector::disableMetrics(
    [in] wstring metricNames[],
    [in] $unknown objects[])
```

metricNames Metric name filter. Comma-separated list of metrics with wildcard support.

objects Set of objects to disable metrics for.

Turns off collecting specified base metrics. Returns an array of `IPerformanceMetric` describing the metrics have been affected.

Note: Null or empty metric name array means all metrics. Null or empty object array means all existing objects. If metric name array contains a single element and object array contains many, the single metric name array element is applied to each object array element to form metric/object pairs.

9.30.3 `enableMetrics`

```
IPerformanceMetric[] IPerformanceCollector::enableMetrics(
    [in] wstring metricNames[],
    [in] $unknown objects[])
```

metricNames Metric name filter. Comma-separated list of metrics with wildcard support.

objects Set of objects to enable metrics for.

Turns on collecting specified base metrics. Returns an array of [IPerformanceMetric](#) describing the metrics have been affected.

Note: Null or empty metric name array means all metrics. Null or empty object array means all existing objects. If metric name array contains a single element and object array contains many, the single metric name array element is applied to each object array element to form metric/object pairs.

9.30.4 getMetrics

```
IPerformanceMetric[] IPerformanceCollector::getMetrics(
    [in] wstring metricNames[],
    [in] $unknown objects[])
```

metricNames Metric name filter. Currently, only a comma-separated list of metrics is supported.

objects Set of objects to return metric parameters for.

Returns parameters of specified metrics for a set of objects.

Note: Null metrics array means all metrics. Null object array means all existing objects.

9.30.5 queryMetricsData

```
Long[] IPerformanceCollector::queryMetricsData(
    [in] wstring metricNames[],
    [in] $unknown objects[],
    [out] wstring returnMetricNames[],
    [out] $unknown returnObjects[],
    [out] wstring returnUnits[],
    [out] unsigned long returnScales[],
    [out] unsigned long returnSequenceNumbers[],
    [out] unsigned long returnDataIndices[],
    [out] unsigned long returnDataLengths[])
```

metricNames Metric name filter. Comma-separated list of metrics with wildcard support.

objects Set of objects to query metrics for.

returnMetricNames Names of metrics returned in returnData.

returnObjects Objects associated with metrics returned in returnData.

returnUnits Units of measurement for each returned metric.

returnScales Divisor that should be applied to return values in order to get floating point values. For example: $(\text{double})\text{returnData}[\text{returnDataIndices}[0]+i] / \text{returnScales}[0]$ will retrieve the floating point value of i -th sample of the first metric.

returnSequenceNumbers Sequence numbers of the first elements of value sequences of particular metrics returned in returnData. For aggregate metrics it is the sequence number of the sample the aggregate started calculation from.

returnDataIndices Indices of the first elements of value sequences of particular metrics returned in `returnData`.

returnDataLengths Lengths of value sequences of particular metrics.

Queries collected metrics data for a set of objects.

The data itself and related metric information are returned in seven parallel and one flattened array of arrays. Elements of `returnMetricNames`, `returnObjects`, `returnUnits`, `returnScales`, `returnSequenceNumbers`, `returnDataIndices` and `returnDataLengths` with the same index describe one set of values corresponding to a single metric.

The `returnData` parameter is a flattened array of arrays. Each start and length of a sub-array is indicated by `returnDataIndices` and `returnDataLengths`. The first value for metric `metricNames[i]` is at `returnData[returnIndices[i]]`.

Note: Null or empty metric name array means all metrics. Null or empty object array means all existing objects. If metric name array contains a single element and object array contains many, the single metric name array element is applied to each object array element to form metric/object pairs.

Note: Data collection continues behind the scenes after call to `@c queryMetricsData`. The return data can be seen as the snapshot of the current state at the time of `queryMetricsData` call. The internally kept metric values are not cleared by the call. This makes possible querying different subsets of metrics or aggregates with subsequent calls. If periodic querying is needed it is highly suggested to query the values with `interval*count` period to avoid confusion. This way a completely new set of data values will be provided by each query.

9.30.6 setupMetrics

```
IPerformanceMetric[] IPerformanceCollector::setupMetrics(
    [in] wstring metricNames[],
    [in] $unknown objects[],
    [in] unsigned long period,
    [in] unsigned long count)
```

metricNames Metric name filter. Comma-separated list of metrics with wildcard support.

objects Set of objects to setup metric parameters for.

period Time interval in seconds between two consecutive samples of performance data.

count Number of samples to retain in performance data history. Older samples get discarded.

Sets parameters of specified base metrics for a set of objects. Returns an array of [IPerformanceMetric](#) describing the metrics have been affected.

Note: Null or empty metric name array means all metrics. Null or empty object array means all existing objects. If metric name array contains a single element and object array contains many, the single metric name array element is applied to each object array element to form metric/object pairs.

9.31 IPerformanceMetric

The IPerformanceMetric interface represents parameters of the given performance metric.

9.31.1 Attributes

9.31.1.1 metricName (read-only)

wstring IPerformanceMetric::metricName

Name of the metric.

9.31.1.2 object (read-only)

\$unknown IPerformanceMetric::object

Object this metric belongs to.

9.31.1.3 description (read-only)

wstring IPerformanceMetric::description

Textual description of the metric.

9.31.1.4 period (read-only)

unsigned long IPerformanceMetric::period

Time interval between samples, measured in seconds.

9.31.1.5 count (read-only)

unsigned long IPerformanceMetric::count

Number of recent samples retained by the performance collector for this metric.
When the collected sample count exceeds this number, older samples are discarded.

9.31.1.6 unit (read-only)

wstring IPerformanceMetric::unit

Unit of measurement.

9.31.1.7 minimumValue (read-only)

long IPerformanceMetric::minimumValue

Minimum possible value of this metric.

9.31.1.8 maximumValue (read-only)

long IPerformanceMetric::maximumValue

Maximum possible value of this metric.

9.32 IProgress

The IProgress interface is used to track and control asynchronous tasks within VirtualBox.

An instance of this is returned every time VirtualBox starts an asynchronous task (in other words, a separate thread) which continues to run after a method call returns. For example, `IConsole::saveState()`, which saves the state of a running virtual machine, can take a long time to complete. To be able to display a progress bar, a user interface such as the VirtualBox graphical user interface can use the IProgress object returned by that method.

Note that IProgress is a “read-only” interface in the sense that only the VirtualBox internals behind the Main API can create and manipulate progress objects, whereas client code can only use the IProgress object to monitor a task’s progress and, if `cancelable` is `true`, cancel the task by calling `cancel()`.

A task represented by IProgress consists of either one or several sub-operations that run sequentially, one by one (see `operation` and `operationCount`). Every operation is identified by a number (starting from 0) and has a separate description.

You can find the individual percentage of completion of the current operation in `operationPercent` and the percentage of completion of the task as a whole in `percent`.

Similarly, you can wait for the completion of a particular operation via `waitForOperationCompletion()` or for the completion of the whole task via `waitForCompletion()`.

9.32.1 Attributes

9.32.1.1 id (read-only)

```
uuid IProgress::id
```

ID of the task.

9.32.1.2 description (read-only)

```
wstring IProgress::description
```

Description of the task.

9.32.1.3 initiator (read-only)

```
$unknown IProgress::initiator
```

Initiator of the task.

9.32.1.4 cancelable (read-only)

```
boolean IProgress::cancelable
```

Whether the task can be interrupted.

9.32.1.5 percent (read-only)

```
unsigned long IProgress::percent
```

Current progress value of the task as a whole, in percent. This value depends on how many operations are already complete. Returns 100 if `completed` is `true`.

9.32.1.6 timeRemaining (read-only)

long IProgress::timeRemaining

Estimated remaining time until the task completes, in seconds. Returns 0 once the task has completed; returns -1 if the remaining time cannot be computed, in particular if the current progress is 0.

Even if a value is returned, the estimate will be unreliable for low progress values. It will become more reliable as the task progresses; it is not recommended to display an ETA before at least 20% of a task have completed.

9.32.1.7 completed (read-only)

boolean IProgress::completed

Whether the task has been completed.

9.32.1.8 canceled (read-only)

boolean IProgress::canceled

Whether the task has been canceled.

9.32.1.9 resultCode (read-only)

long IProgress::resultCode

Result code of the progress task. Valid only if `completed` is `true`.

9.32.1.10 errorInfo (read-only)

[IVirtualBoxErrorInfo](#) IProgress::errorInfo

Extended information about the unsuccessful result of the progress operation. May be `null` if no extended information is available. Valid only if `completed` is `true` and `resultCode` indicates a failure.

9.32.1.11 operationCount (read-only)

unsigned long IProgress::operationCount

Number of sub-operations this task is divided into. Every task consists of at least one suboperation.

9.32.1.12 operation (read-only)

unsigned long IProgress::operation

Number of the sub-operation being currently executed.

9.32.1.13 operationDescription (read-only)

wstring IProgress::operationDescription

Description of the sub-operation being currently executed.

9.32.1.14 operationPercent (read-only)

unsigned long IProgress::operationPercent

Progress value of the current sub-operation only, in percent.

9.32.1.15 timeout (read/write)

unsigned long IProgress::timeout

When non-zero, this specifies the number of milliseconds after which the operation will automatically be canceled. This can only be set on cancelable objects.

9.32.2 cancel

void IProgress::cancel()

Cancels the task.

Note: If `cancelable` is false, then this method will fail.

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_OBJECT_STATE`: Operation cannot be canceled.

9.32.3 setCurrentOperationProgress

void IProgress::setCurrentOperationProgress(
[in] unsigned long **percent**)

percent

Internal method, not to be called externally.

9.32.4 setNextOperation

void IProgress::setNextOperation(
[in] wstring **nextOperationDescription**,
[in] unsigned long **nextOperationsWeight**)

nextOperationDescription

nextOperationsWeight

Internal method, not to be called externally.

9.32.5 waitForCompletion

void IProgress::waitForCompletion(
[in] long **timeout**)

timeout Maximum time in milliseconds to wait or -1 to wait indefinitely.

Waits until the task is done (including all sub-operations) with a given timeout in milliseconds; specify -1 for an indefinite wait.

If this method fails, the following error codes may be reported:

- `VBOX_E_IPRT_ERROR`: Failed to wait for task completion.

9.32.6 waitForOperationCompletion

```
void IProgress::waitForOperationCompletion(  
    [in] unsigned long operation,  
    [in] long timeout)
```

operation Number of the operation to wait for. Must be less than [operationCount](#).

timeout Maximum time in milliseconds to wait or -1 to wait indefinitely.

Waits until the given operation is done with a given timeout in milliseconds; specify -1 for an indefinite wait.

If this method fails, the following error codes may be reported:

- `VBOX_E_IPRT_ERROR`: Failed to wait for operation completion.

9.33 IRemoteDisplayInfo

Note: With the web service, this interface is mapped to a structure. Attributes that return this interface will not return an object, but a complete structure containing the attributes listed below as structure members.

Contains information about the remote display (VRDP) capabilities and status. This is used in the [IConsole::remoteDisplayInfo](#) attribute.

9.33.1 Attributes

9.33.1.1 active (read-only)

```
boolean IRemoteDisplayInfo::active
```

Whether the remote display connection is active.

9.33.1.2 port (read-only)

```
long IRemoteDisplayInfo::port
```

VRDP server port number. If this property is equal to 0, then the VRDP server failed to start, usually because there are no free TCP ports to bind to. If this property is equal to -1, then the VRDP server has not yet been started.

9.33.1.3 numberOfClients (read-only)

```
unsigned long IRemoteDisplayInfo::numberOfClients
```

How many times a client connected.

9.33.1.4 beginTime (read-only)

```
long long IRemoteDisplayInfo::beginTime
```

When the last connection was established, in milliseconds since 1970-01-01 UTC.

9.33.1.5 endTime (read-only)

long long IRemoteDisplayInfo::endTime

When the last connection was terminated or the current time, if connection is still active, in milliseconds since 1970-01-01 UTC.

9.33.1.6 bytesSent (read-only)

unsigned long long IRemoteDisplayInfo::bytesSent

How many bytes were sent in last or current, if still active, connection.

9.33.1.7 bytesSentTotal (read-only)

unsigned long long IRemoteDisplayInfo::bytesSentTotal

How many bytes were sent in all connections.

9.33.1.8 bytesReceived (read-only)

unsigned long long IRemoteDisplayInfo::bytesReceived

How many bytes were received in last or current, if still active, connection.

9.33.1.9 bytesReceivedTotal (read-only)

unsigned long long IRemoteDisplayInfo::bytesReceivedTotal

How many bytes were received in all connections.

9.33.1.10 user (read-only)

wstring IRemoteDisplayInfo::user

Login user name supplied by the client.

9.33.1.11 domain (read-only)

wstring IRemoteDisplayInfo::domain

Login domain name supplied by the client.

9.33.1.12 clientName (read-only)

wstring IRemoteDisplayInfo::clientName

The client name supplied by the client.

9.33.1.13 clientIP (read-only)

wstring IRemoteDisplayInfo::clientIP

The IP address of the client.

9.33.1.14 clientVersion (read-only)

unsigned long IRemoteDisplayInfo::clientVersion

The client software version number.

9.33.1.15 encryptionStyle (read-only)

unsigned long IRemoteDisplayInfo::encryptionStyle

Public key exchange method used when connection was established. Values: 0 - RDP4 public key exchange scheme. 1 - X509 certificates were sent to client.

9.34 ISerialPort

The ISerialPort interface represents the virtual serial port device.

The virtual serial port device acts like an ordinary serial port inside the virtual machine. This device communicates to the real serial port hardware in one of two modes: host pipe or host device.

In host pipe mode, the #path attribute specifies the path to the pipe on the host computer that represents a serial port. The #server attribute determines if this pipe is created by the virtual machine process at machine startup or it must already exist before starting machine execution.

In host device mode, the #path attribute specifies the name of the serial port device on the host computer.

There is also a third communication mode: the disconnected mode. In this mode, the guest OS running inside the virtual machine will be able to detect the serial port, but all port write operations will be discarded and all port read operations will return no data.

See also: IMachine::getSerialPort

9.34.1 Attributes

9.34.1.1 slot (read-only)

unsigned long ISerialPort::slot

Slot number this serial port is plugged into. Corresponds to the value you pass to [IMachine::getSerialPort\(\)](#) to obtain this instance.

9.34.1.2 enabled (read/write)

boolean ISerialPort::enabled

Flag whether the serial port is enabled. If disabled, the serial port will not be reported to the guest OS.

9.34.1.3 IOBase (read/write)

unsigned long ISerialPort::IOBase

Base I/O address of the serial port.

9.34.1.4 IRQ (read/write)

unsigned long ISerialPort::IRQ

IRQ number of the serial port.

9.34.1.5 hostMode (read/write)

`PortMode` `ISerialPort::hostMode`

How is this port connected to the host.

Note: Changing this attribute may fail if the conditions for `path` are not met.

9.34.1.6 server (read/write)

`boolean` `ISerialPort::server`

Flag whether this serial port acts as a server (creates a new pipe on the host) or as a client (uses the existing pipe). This attribute is used only when `hostMode` is `PortMode_HostPipe`.

9.34.1.7 path (read/write)

`wstring` `ISerialPort::path`

Path to the serial port's pipe on the host when `hostMode` is `PortMode_HostPipe`, or the host serial device name when `hostMode` is `PortMode_HostDevice`. For both cases, setting a `null` or empty string as the attribute's value is an error. Otherwise, the value of this property is ignored.

9.35 ISession

The `ISession` interface represents a serialization primitive for virtual machines.

With `VirtualBox`, every time one wishes to manipulate a virtual machine (e.g. change its settings or start execution), a session object is required. Such an object must be passed to one of the session methods that open the given session, which then initiates the machine manipulation.

A session serves several purposes: it identifies to the inter-process `VirtualBox` code which process is currently working with the virtual machine, and it ensures that there are no incompatible requests from several processes for the same virtual machine. Session objects can therefore be thought of as mutex semaphores that lock virtual machines to prevent conflicting accesses from several processes.

How sessions objects are used depends on whether you use the Main API via COM or via the webservice:

- When using the COM API directly, an object of the `Session` class from the `VirtualBox` type library needs to be created. In regular COM C++ client code, this can be done by calling `createLocalObject()`, a standard COM API. This object will then act as a local session object in further calls to open a session.
- In the webservice, the session manager (`IWebSessionManager`) instead creates one session object automatically when `IWebSessionManager::logon()` is called. A managed object reference to that session object can be retrieved by calling `IWebSessionManager::getSessionObject()`. This session object reference can then be used to open sessions.

Sessions are mainly used in two variations:

- To start a virtual machine in a separate process, one would call `IVirtualBox::openRemoteSession()`, which requires a session object as its first parameter. This session then identifies the caller and lets him control the started machine (for example, pause machine execution or power it down) as well as be notified about machine execution state changes.

- To alter machine settings, or to start machine execution within the current process, one needs to open a direct session for the machine first by calling `IVirtualBox::openSession()`. While a direct session is open within one process, no any other process may open another direct session for the same machine. This prevents the machine from being changed by other processes while it is running or while the machine is being configured.

One also can attach to an existing direct session already opened by another process (for example, in order to send a control request to the virtual machine such as the pause or the reset request). This is done by calling `IVirtualBox::openExistingSession()`.

Note: Unless you are trying to write a new VirtualBox front-end that performs direct machine execution (like the VirtualBox or VBoxSDL front-ends), don't call `IConsole::powerUp()` in a direct session opened by `IVirtualBox::openSession()` and use this session only to change virtual machine settings. If you simply want to start virtual machine execution using one of the existing front-ends (for example the VirtualBox GUI or headless server), simply use `IVirtualBox::openRemoteSession()`; these front-ends will power up the machine automatically for you.

9.35.1 Attributes

9.35.1.1 state (read-only)

`SessionState` `ISession::state`

Current state of this session.

9.35.1.2 type (read-only)

`SessionType` `ISession::type`

Type of this session. The value of this attribute is valid only if the session is currently open (i.e. its `#state` is `SessionType_SessionOpen`), otherwise an error will be returned.

9.35.1.3 machine (read-only)

`IMachine` `ISession::machine`

Machine object associated with this session.

9.35.1.4 console (read-only)

`IConsole` `ISession::console`

Console object associated with this session.

9.35.2 close

`void ISession::close()`

Closes a session that was previously opened.

It is recommended that every time an “open session” method (such as `IVirtualBox::openRemoteSession()` or `IVirtualBox::openSession()`) has been called to manipulate a virtual machine, the caller invoke `ISession::close()` when it's done doing so. Since sessions are serialization primitives much like

ordinary mutexes, they are best used the same way: for each “open” call, there should be a matching “close” call, even when errors occur.

Otherwise, if a direct session for a machine opened with `IVirtualBox::openSession()` is not explicitly closed when the application terminates, the state of the machine will be set to `Aborted` on the server.

Generally, it is recommended to close all open sessions explicitly before terminating the application (regardless of the reason for the termination).

Note: Do not expect the session state (`state`) to return to “Closed” immediately after you invoke `ISession::close()`, particularly if you have started a remote session to execute the VM in a new process. The session state will automatically return to “Closed” once the VM is no longer executing, which can of course take a very long time.

If this method fails, the following error codes may be reported:

- `E_UNEXPECTED`: Session is not open.

9.36 ISharedFolder

Note: With the web service, this interface is mapped to a structure. Attributes that return this interface will not return an object, but a complete structure containing the attributes listed below as structure members.

The `ISharedFolder` interface represents a folder in the host computer’s file system accessible from the guest OS running inside a virtual machine using an associated logical name.

There are three types of shared folders:

- *Global* (`IVirtualBox::sharedFolders[]`), shared folders available to all virtual machines.
- *Permanent* (`IMachine::sharedFolders[]`), VM-specific shared folders available to the given virtual machine at startup.
- *Transient* (`IConsole::sharedFolders[]`), VM-specific shared folders created in the session context (for example, when the virtual machine is running) and automatically discarded when the session is closed (the VM is powered off).

Logical names of shared folders must be unique within the given scope (global, permanent or transient). However, they do not need to be unique across scopes. In this case, the definition of the shared folder in a more specific scope takes precedence over definitions in all other scopes. The order of precedence is (more specific to more general):

1. Transient definitions
2. Permanent definitions
3. Global definitions

For example, if `MyMachine` has a shared folder named `C_DRIVE` (that points to `C:\`), then creating a transient shared folder named `C_DRIVE` (that points to `C:\\\\WINDOWS`) will change the definition of `C_DRIVE` in the guest OS so that `\\\\VBOXSVR\C_DRIVE` will give access to `C:\\WINDOWS` instead of `C:\` on the host PC. Removing the transient shared folder `C_DRIVE` will restore the previous (permanent) definition of `C_DRIVE` that points to `C:\` if it still exists.

Note that permanent and transient shared folders of different machines are in different name spaces, so they don’t overlap and don’t need to have unique logical names.

Note: Global shared folders are not implemented in the current version of the product.

9.36.1 Attributes

9.36.1.1 name (read-only)

wstring ISharedFolder::name

Logical name of the shared folder.

9.36.1.2 hostPath (read-only)

wstring ISharedFolder::hostPath

Full path to the shared folder in the host file system.

9.36.1.3 accessible (read-only)

boolean ISharedFolder::accessible

Whether the folder defined by the host path is currently accessible or not. For example, the folder can be unaccessible if it is placed on the network share that is not available by the time this property is read.

9.36.1.4 writable (read-only)

boolean ISharedFolder::writable

Whether the folder defined by the host path is writable or not.

9.36.1.5 lastAccessError (read-only)

wstring ISharedFolder::lastAccessError

Text message that represents the result of the last accessibility check.

Accessibility checks are performed each time the [accessible](#) attribute is read. An empty string is returned if the last accessibility check was successful. A non-empty string indicates a failure and should normally describe a reason of the failure (for example, a file read error).

9.37 ISnapshot

The ISnapshot interface represents a snapshot of the virtual machine.

Together with the differencing media that are created when a snapshot is taken, a machine can be brought back to the exact state it was in when the snapshot was taken.

The ISnapshot interface has no methods, only attributes; snapshots are controlled through methods of the [IConsole](#) interface which also manage the media associated with the snapshot. The following operations exist:

- [IConsole::takeSnapshot\(\)](#): creates a new snapshot by creating new, empty differencing images for the machine's media and saving the VM settings and (if the VM is running) the current VM state in the snapshot.

The differencing images will then receive all data written to the machine's media, while their parent (base) images remain unmodified after the snapshot has been taken (see [IMedium](#) for details about differencing images). This simplifies restoring a machine to the state of a snapshot: only the differencing images need to be deleted.

The current machine state is not changed by taking a snapshot except that [IMachine::currentSnapshot](#) is set to the newly created snapshot, which is also added to the machine's snapshots tree.

- **IConsole::restoreSnapshot()**: this goes back to a previous snapshot. This resets the machine's state to that of the previous snapshot by deleting the differencing image of each of the machine's media and setting the machine's settings and state to the state that was saved in the snapshot (if any).

This destroys the machine's current state. After calling this, **IMachine::currentSnapshot** points to the snapshot that was restored.

- **IConsole::deleteSnapshot()**: deletes a snapshot without affecting the current machine state.

This does not change the machine, but instead frees the resources allocated when the snapshot was taken: the settings and machine state is deleted (if any), and the snapshot's differencing image for each of the machine's media gets merged with its parent image.

Neither the current machine state nor other snapshots are affected by this operation, except that parent media will be modified to contain the disk data associated with the snapshot being deleted.

Each snapshot contains a copy of virtual machine's settings (hardware configuration etc.). This copy is contained in an immutable (read-only) instance of **IMachine** which is available from the snapshot's **machine** attribute. When restoring the snapshot, these settings are copied back to the original machine.

In addition, if the machine was running when the snapshot was taken (**IMachine::state** is **Running**), the current VM state is saved in the snapshot (similarly to what happens when a VM's state is saved). The snapshot is then said to be *online* because when restoring it, the VM will be running.

If the machine was in **Saved** saved, the snapshot receives a copy of the execution state file (**IMachine::stateFilePath**).

Otherwise, if the machine was not running (**PoweredOff** or **Aborted**), the snapshot is *offline*; it then contains a so-called "zero execution state", representing a machine that is powered off.

Snapshot branches and the "current" snapshot

Snapshots can be chained, whereby every next snapshot is based on the previous one. This chaining is related to medium branching (see the **IMedium** description) in that every time a new snapshot is created, a new differencing medium is implicitly created for all normal media attached to the machine.

Each virtual machine has a "current snapshot", identified by **IMachine::currentSnapshot**. Presently, this is always set to the last snapshot in the chain. In a future version of VirtualBox, it will be possible to reset a machine's current state to that of an earlier snapshot without deleting the current state so that it will be possible to create alternative snapshot paths in a snapshot tree.

In the current implementation, multiple snapshot branches within one virtual machine are not allowed. Every machine has a single branch, and **IConsole::takeSnapshot()** operation adds a new snapshot to the top of that branch.

9.37.1 Attributes

9.37.1.1 id (read-only)

uuid ISnapshot::id

UUID of the snapshot.

9.37.1.2 name (read/write)

wstring ISnapshot::name

Short name of the snapshot.

Note: Setting this attribute causes `IMachine::saveSettings()` to be called implicitly.

9.37.1.3 description (read/write)

`wstring ISnapshot::description`

Optional description of the snapshot.

Note: Setting this attribute causes `IMachine::saveSettings()` to be called implicitly.

9.37.1.4 timeStamp (read-only)

`long long ISnapshot::timeStamp`

Time stamp of the snapshot, in milliseconds since 1970-01-01 UTC.

9.37.1.5 online (read-only)

`boolean ISnapshot::online`

true if this snapshot is an online snapshot and false otherwise.

When this attribute is true, the `IMachine::stateFilePath` attribute of the `machine` object associated with this snapshot will point to the saved state file. Otherwise, it will be an empty string.

9.37.1.6 machine (read-only)

`IMachine ISnapshot::machine`

Virtual machine this snapshot is taken on. This object stores all settings the machine had when taking this snapshot.

Note: The returned machine object is immutable, i.e. no any settings can be changed.

9.37.1.7 parent (read-only)

`ISnapshot ISnapshot::parent`

Parent snapshot (a snapshot this one is based on), or null if the snapshot has no parent (i.e. is the first snapshot).

9.37.1.8 children (read-only)

`ISnapshot ISnapshot::children[]`

Child snapshots (all snapshots having this one as a parent). By inspecting this attribute starting with a machine's root snapshot (which can be obtained by calling `IMachine::findSnapshot()` with a null UUID), a machine's snapshots tree can be iterated over.

9.38 IStorageController

Represents a storage controller that is attached to a virtual machine ([IMachine](#)). Just as drives (hard disks, DVDs, FDs) are attached to storage controllers in a real computer, virtual drives (represented by [IMediumAttachment](#)) are attached to virtual storage controllers, represented by this interface.

As opposed to physical hardware, VirtualBox has a very generic concept of a storage controller, and for purposes of the Main API, all virtual storage is attached to virtual machines via instances of this interface. There are five types of such virtual storage controllers: IDE, SCSI, SATA, SAS and Floppy (see [bus](#)). Depending on which of these four is used, certain sub-types may be available and can be selected in [controllerType](#).

Depending on these settings, the guest operating system might see significantly different virtual hardware.

9.38.1 Attributes

9.38.1.1 name (read-only)

wstring IStorageController::name

Name of the storage controller, as originally specified with [IMachine::addStorageController\(\)](#). This then uniquely identifies this controller with other method calls such as [IMachine::attachDevice\(\)](#) and [IMachine::mountMedium\(\)](#).

9.38.1.2 maxDevicesPerPortCount (read-only)

unsigned long IStorageController::maxDevicesPerPortCount

Maximum number of devices which can be attached to one port.

9.38.1.3 minPortCount (read-only)

unsigned long IStorageController::minPortCount

Minimum number of ports that [portCount](#) can be set to.

9.38.1.4 maxPortCount (read-only)

unsigned long IStorageController::maxPortCount

Maximum number of ports that [portCount](#) can be set to.

9.38.1.5 instance (read/write)

unsigned long IStorageController::instance

The instance number of the device in the running VM.

9.38.1.6 portCount (read/write)

unsigned long IStorageController::portCount

The number of currently usable ports on the controller. The minimum and maximum number of ports for one controller are stored in [minPortCount](#) and [maxPortCount](#).

9.38.1.7 bus (read-only)

`StorageBus` `IStorageController::bus`

The bus type of the storage controller (IDE, SATA, SCSI, SAS or Floppy).

9.38.1.8 controllerType (read/write)

`StorageControllerType` `IStorageController::controllerType`

The exact variant of storage controller hardware presented to the guest. Depending on this value, VirtualBox will provide a different virtual storage controller hardware to the guest. For SATA, SAS and floppy controllers, only one variant is available, but for IDE and SCSI, there are several.

For SCSI controllers, the default type is LsiLogic.

9.38.1.9 useHostIOCache (read/write)

`boolean` `IStorageController::useHostIOCache`

If true, the storage controller emulation will use a dedicated I/O thread, enable the host I/O caches and use synchronous file APIs on the host. This was the only option in the API before VirtualBox 3.2 and is still the default for IDE controllers.

If false, the host I/O cache will be disabled for image files attached to this storage controller. Instead, the storage controller emulation will use asynchronous I/O APIs on the host. This makes it possible to turn off the host I/O caches because the emulation can handle unaligned access to the file. This should be used on OS X and Linux hosts if a high I/O load is expected or many virtual machines are running at the same time to prevent I/O cache related hangs. This option new with the API of VirtualBox 3.2 and is now the default for non-IDE storage controllers.

9.38.2 getIDEEmulationPort

```
long IStorageController::getIDEEmulationPort(
    [in] long devicePosition)
```

devicePosition

Gets the corresponding port number which is emulated as an IDE device. Works only with SATA controllers.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: The `devicePosition` is not in the range 0 to 3.
- `E_NOTIMPL`: The storage controller type is not `SATAIntelAhci`.

9.38.3 setIDEEmulationPort

```
void IStorageController::setIDEEmulationPort(
    [in] long devicePosition,
    [in] long portNumber)
```

devicePosition**portNumber**

Sets the port number which is emulated as an IDE device. Works only with SATA controllers.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: The `devicePosition` is not in the range 0 to 3 or the `portNumber` is not in the range 0 to 29.
- `E_NOTIMPL`: The storage controller type is not `SATAIntelAhci`.

9.39 ISystemProperties

The `ISystemProperties` interface represents global properties of the given `VirtualBox` installation.

These properties define limits and default values for various attributes and parameters. Most of the properties are read-only, but some can be changed by a user.

9.39.1 Attributes

9.39.1.1 minGuestRAM (read-only)

`unsigned long ISystemProperties::minGuestRAM`

Minimum guest system memory in Megabytes.

9.39.1.2 maxGuestRAM (read-only)

`unsigned long ISystemProperties::maxGuestRAM`

Maximum guest system memory in Megabytes.

9.39.1.3 minGuestVRAM (read-only)

`unsigned long ISystemProperties::minGuestVRAM`

Minimum guest video memory in Megabytes.

9.39.1.4 maxGuestVRAM (read-only)

`unsigned long ISystemProperties::maxGuestVRAM`

Maximum guest video memory in Megabytes.

9.39.1.5 minGuestCPUCount (read-only)

`unsigned long ISystemProperties::minGuestCPUCount`

Minimum CPU count.

9.39.1.6 maxGuestCPUCount (read-only)

`unsigned long ISystemProperties::maxGuestCPUCount`

Maximum CPU count.

9.39.1.7 maxGuestMonitors (read-only)

`unsigned long ISystemProperties::maxGuestMonitors`

Maximum of monitors which could be connected.

9.39.1.8 maxVDISize (read-only)

unsigned long long ISystemProperties::maxVDISize

Maximum size of a virtual disk image in Megabytes.

9.39.1.9 networkAdapterCount (read-only)

unsigned long ISystemProperties::networkAdapterCount

Number of network adapters associated with every [IMachine](#) instance.

9.39.1.10 serialPortCount (read-only)

unsigned long ISystemProperties::serialPortCount

Number of serial ports associated with every [IMachine](#) instance.

9.39.1.11 parallelPortCount (read-only)

unsigned long ISystemProperties::parallelPortCount

Number of parallel ports associated with every [IMachine](#) instance.

9.39.1.12 maxBootPosition (read-only)

unsigned long ISystemProperties::maxBootPosition

Maximum device position in the boot order. This value corresponds to the total number of devices a machine can boot from, to make it possible to include all possible devices to the boot list. See also: [IMachine::setBootOrder\(\)](#)

9.39.1.13 defaultMachineFolder (read/write)

wstring ISystemProperties::defaultMachineFolder

Full path to the default directory used to create new or open existing machines when a settings file name contains no path.

The initial value of this property is < [VirtualBox_home](#) >/Machines.

Note: Setting this property to null or an empty string will restore the initial value.

Note: When setting this property, the specified path can be absolute (full path) or relative to the [VirtualBox home directory](#). When reading this property, a full path is always returned.

Note: The specified path may not exist, it will be created when necessary.

See also: [IVirtualBox::createMachine\(\)](#), [IVirtualBox::openMachine\(\)](#)

9.39.1.14 defaultHardDiskFolder (read/write)

wstring ISystemProperties::defaultHardDiskFolder

Full path to the default directory used to create new or open existing virtual disks.

This path is used when the storage unit of a hard disk is a regular file in the host's file system and only a file name that contains no path is given.

The initial value of this property is <VirtualBox_home>/HardDisks.

Note: Setting this property to null or empty string will restore the initial value.

Note: When settings this property, the specified path can be relative to the [VirtualBox home directory](#) or absolute. When reading this property, a full path is always returned.

Note: The specified path may not exist, it will be created when necessary.

See also: [IMedium](#), [IVirtualBox::createHardDisk\(\)](#), [IVirtualBox::openHardDisk\(\)](#), [IMedium::location](#)

9.39.1.15 mediumFormats (read-only)

IMediumFormat ISystemProperties::mediumFormats[]

List of all medium storage formats supported by this VirtualBox installation.

Keep in mind that the medium format identifier ([IMediumFormat::id](#)) used in other API calls like [IVirtualBox::createHardDisk\(\)](#) to refer to a particular medium format is a case-insensitive string. This means that, for example, all of the following strings:

```
"VDI"
"vdi"
"VdI"
```

refer to the same medium format.

Note that the virtual medium framework is backend-based, therefore the list of supported formats depends on what backends are currently installed.

See also: [IMediumFormat](#),

9.39.1.16 defaultHardDiskFormat (read/write)

wstring ISystemProperties::defaultHardDiskFormat

Identifier of the default medium format used by VirtualBox.

The medium format set by this attribute is used by VirtualBox when the medium format was not specified explicitly. One example is [IVirtualBox::createHardDisk\(\)](#) with the empty format argument. A more complex example is implicit creation of differencing media when taking a snapshot of a virtual machine: this operation will try to use a format of the parent medium first and if this format does not support differencing media the default format specified by this argument will be used.

The list of supported medium formats may be obtained by the [mediumFormats\[\]](#) call. Note that the default medium format must have a capability to create differencing media; otherwise operations that create media implicitly may fail unexpectedly.

The initial value of this property is "VDI" in the current version of the VirtualBox product, but may change in the future.

Note: Setting this property to null or empty string will restore the initial value.

See also: [mediumFormats\[\]](#), [IMediumFormat::id](#), [IVirtualBox::createHardDisk\(\)](#)

9.39.1.17 freeDiskSpaceWarning (read/write)

unsigned long long ISystemProperties::freeDiskSpaceWarning

Issue a warning if the free disk space is below (or in some disk intensive operation is expected to go below) the given size in Megabytes.

9.39.1.18 freeDiskSpacePercentWarning (read/write)

unsigned long ISystemProperties::freeDiskSpacePercentWarning

Issue a warning if the free disk space is below (or in some disk intensive operation is expected to go below) the given percentage.

9.39.1.19 freeDiskSpaceError (read/write)

unsigned long long ISystemProperties::freeDiskSpaceError

Issue an error if the free disk space is below (or in some disk intensive operation is expected to go below) the given size in Megabytes.

9.39.1.20 freeDiskSpacePercentError (read/write)

unsigned long ISystemProperties::freeDiskSpacePercentError

Issue an error if the free disk space is below (or in some disk intensive operation is expected to go below) the given percentage.

9.39.1.21 remoteDisplayAuthLibrary (read/write)

wstring ISystemProperties::remoteDisplayAuthLibrary

Library that provides authentication for VRDP clients. The library is used if a virtual machine's authentication type is set to "external" in the VM RemoteDisplay configuration.

The system library extension (".DLL" or ".so") must be omitted. A full path can be specified; if not, then the library must reside on the system's default library path.

The default value of this property is "VRDPAuth". There is a library of that name in one of the default VirtualBox library directories.

For details about VirtualBox authentication libraries and how to implement them, please refer to the VirtualBox manual.

Note: Setting this property to null or empty string will restore the initial value.

9.39.1.22 webServiceAuthLibrary (read/write)

wstring ISystemProperties::webServiceAuthLibrary

Library that provides authentication for webservice clients. The library is used if a virtual machine's authentication type is set to "external" in the VM RemoteDisplay configuration and will be called from within the [IWebSessionManager::logon\(\)](#) implementation.

As opposed to [remoteDisplayAuthLibrary](#), there is no per-VM setting for this, as the webservice is a global resource (if it is running). Only for this setting (for the webservice), setting this value to a literal "null" string disables authentication, meaning that [IWebSessionManager::logon\(\)](#) will always succeed, no matter what user name and password are supplied.

The initial value of this property is "VRDPAuth", meaning that the webservice will use the same authentication library that is used by default for VBoxVRDP (again, see [remoteDisplayAuthLibrary](#)). The format and calling convention of authentication libraries is the same for the webservice as it is for VBoxVRDP.

Note: Setting this property to null or empty string will restore the initial value.

9.39.1.23 LogHistoryCount (read/write)

unsigned long ISystemProperties::LogHistoryCount

This value specifies how many old release log files are kept.

9.39.1.24 defaultAudioDriver (read-only)

[AudioDriverType](#) ISystemProperties::defaultAudioDriver

This value hold the default audio driver for the current system.

9.39.2 getDeviceTypesForStorageBus

[DeviceType](#)[] ISystemProperties::getDeviceTypesForStorageBus(
[in] [StorageBus](#) bus)

bus The storage bus type to get the value for.

Returns list of all the supported device types ([DeviceType](#)) for the given type of storage bus.

9.39.3 getMaxDevicesPerPortForStorageBus

unsigned long ISystemProperties::getMaxDevicesPerPortForStorageBus(
[in] [StorageBus](#) bus)

bus The storage bus type to get the value for.

Returns the maximum number of devices which can be attached to a port for the given storage bus.

9.39.4 getMaxInstancesOfStorageBus

unsigned long ISystemProperties::getMaxInstancesOfStorageBus(
[in] [StorageBus](#) bus)

bus The storage bus type to get the value for.

Returns the maximum number of storage bus instances which can be configured for each VM. This corresponds to the number of storage controllers one can have.

9.39.5 getMaxPortCountForStorageBus

```
unsigned long ISystemProperties::getMaxPortCountForStorageBus(  
    [in] StorageBus bus)
```

bus The storage bus type to get the value for.

Returns the maximum number of ports the given storage bus supports.

9.39.6 getMinPortCountForStorageBus

```
unsigned long ISystemProperties::getMinPortCountForStorageBus(  
    [in] StorageBus bus)
```

bus The storage bus type to get the value for.

Returns the minimum number of ports the given storage bus supports.

9.40 IUSBController

9.40.1 Attributes

9.40.1.1 enabled (read/write)

```
boolean IUSBController::enabled
```

Flag whether the USB controller is present in the guest system. If disabled, the virtual guest hardware will not contain any USB controller. Can only be changed when the VM is powered off.

9.40.1.2 enabledEhci (read/write)

```
boolean IUSBController::enabledEhci
```

Flag whether the USB EHCI controller is present in the guest system. If disabled, the virtual guest hardware will not contain a USB EHCI controller. Can only be changed when the VM is powered off.

9.40.1.3 proxyAvailable (read-only)

```
boolean IUSBController::proxyAvailable
```

Flag whether there is an USB proxy available.

9.40.1.4 USBStandard (read-only)

```
unsigned short IUSBController::USBStandard
```

USB standard version which the controller implements. This is a BCD which means that the major version is in the high byte and minor version is in the low byte.

9.40.1.5 deviceFilters (read-only)

`IUSBDeviceFilter` `IUSBController::deviceFilters[]`

List of USB device filters associated with the machine.

If the machine is currently running, these filters are activated every time a new (supported) USB device is attached to the host computer that was not ignored by global filters (`IHost::USBDeviceFilters[]`).

These filters are also activated when the machine is powered up. They are run against a list of all currently available USB devices (in states [Available](#), [Busy](#), [Held](#)) that were not previously ignored by global filters.

If at least one filter matches the USB device in question, this device is automatically captured (attached to) the virtual USB controller of this machine.

See also: `IUSBDeviceFilter`, `::IUSBController`

9.40.2 createDeviceFilter

`IUSBDeviceFilter` `IUSBController::createDeviceFilter(
[in] wstring name)`

name Filter name. See `IUSBDeviceFilter::name` for more info.

Creates a new USB device filter. All attributes except the filter name are set to empty (any match), *active* is `false` (the filter is not active).

The created filter can then be added to the list of filters using `insertDeviceFilter()`.

See also: `#deviceFilters`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: The virtual machine is not mutable.

9.40.3 insertDeviceFilter

`void IUSBController::insertDeviceFilter(
[in] unsigned long position,
[in] IUSBDeviceFilter filter)`

position Position to insert the filter to.

filter USB device filter to insert.

Inserts the given USB device to the specified position in the list of filters.

Positions are numbered starting from 0. If the specified position is equal to or greater than the number of elements in the list, the filter is added to the end of the collection.

Note: Duplicates are not allowed, so an attempt to insert a filter that is already in the collection, will return an error.

See also: `#deviceFilters`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine is not mutable.
- `E_INVALIDARG`: USB device filter not created within this VirtualBox instance.
- `VBOX_E_INVALID_OBJECT_STATE`: USB device filter already in list.

9.40.4 removeDeviceFilter

`IUSBDeviceFilter` `IUSBController::removeDeviceFilter(
[in] unsigned long position)`

position Position to remove the filter from.

Removes a USB device filter from the specified position in the list of filters.

Positions are numbered starting from 0. Specifying a position equal to or greater than the number of elements in the list will produce an error.

See also: `#deviceFilters`

If this method fails, the following error codes may be reported:

- `VBOX_E_INVALID_VM_STATE`: Virtual machine is not mutable.
- `E_INVALIDARG`: USB device filter list empty or invalid position.

9.41 IUSBDevice

The `IUSBDevice` interface represents a virtual USB device attached to the virtual machine.

A collection of objects implementing this interface is stored in the `IConsole::USBDevices[]` attribute which lists all USB devices attached to a running virtual machine's USB controller.

9.41.1 Attributes

9.41.1.1 id (read-only)

`uuid` `IUSBDevice::id`

Unique USB device ID. This ID is built from `#vendorId`, `#productId`, `#revision` and `#serialNumber`.

9.41.1.2 vendorId (read-only)

`unsigned short` `IUSBDevice::vendorId`

Vendor ID.

9.41.1.3 productId (read-only)

`unsigned short` `IUSBDevice::productId`

Product ID.

9.41.1.4 revision (read-only)

`unsigned short` `IUSBDevice::revision`

Product revision number. This is a packed BCD represented as unsigned short. The high byte is the integer part and the low byte is the decimal.

9.41.1.5 manufacturer (read-only)

`wstring` `IUSBDevice::manufacturer`

Manufacturer string.

9.41.1.6 product (read-only)

wstring IUSBDevice::product

Product string.

9.41.1.7 serialNumber (read-only)

wstring IUSBDevice::serialNumber

Serial number string.

9.41.1.8 address (read-only)

wstring IUSBDevice::address

Host specific address of the device.

9.41.1.9 port (read-only)

unsigned short IUSBDevice::port

Host USB port number the device is physically connected to.

9.41.1.10 version (read-only)

unsigned short IUSBDevice::version

The major USB version of the device - 1 or 2.

9.41.1.11 portVersion (read-only)

unsigned short IUSBDevice::portVersion

The major USB version of the host USB port the device is physically connected to - 1 or 2. For devices not connected to anything this will have the same value as the version attribute.

9.41.1.12 remote (read-only)

boolean IUSBDevice::remote

Whether the device is physically connected to a remote VRDP client or to a local host machine.

9.42 IUSBDeviceFilter

The IUSBDeviceFilter interface represents an USB device filter used to perform actions on a group of USB devices.

This type of filters is used by running virtual machines to automatically capture selected USB devices once they are physically attached to the host computer.

A USB device is matched to the given device filter if and only if all attributes of the device match the corresponding attributes of the filter (that is, attributes are joined together using the logical AND operation). On the other hand, all together, filters in the list of filters carry the semantics of the logical OR operation. So if it is desirable to create a match like “this vendor id OR this product id”, one needs to create two filters and specify “any match” (see below) for unused attributes.

All filter attributes used for matching are strings. Each string is an expression representing a set of values of the corresponding device attribute, that will match the given filter. Currently, the following filtering expressions are supported:

- *Interval filters.* Used to specify valid intervals for integer device attributes (Vendor ID, Product ID and Revision). The format of the string is:

```
int: ((m) | ([m] - [n])) (, (m) | ([m] - [n]))*
```

where *m* and *n* are integer numbers, either in octal (starting from 0), hexadecimal (starting from 0x) or decimal (otherwise) form, so that $m < n$. If *m* is omitted before a dash (-), the minimum possible integer is assumed; if *n* is omitted after a dash, the maximum possible integer is assumed.

- *Boolean filters.* Used to specify acceptable values for boolean device attributes. The format of the string is:

```
true|false|yes|no|0|1
```

- *Exact match.* Used to specify a single value for the given device attribute. Any string that doesn't start with `int:` represents the exact match. String device attributes are compared to this string including case of symbols. Integer attributes are first converted to a string (see individual filter attributes) and then compared ignoring case.
- *Any match.* Any value of the corresponding device attribute will match the given filter. An empty or null string is used to construct this type of filtering expressions.

Note: On the Windows host platform, interval filters are not currently available. Also all string filter attributes ([manufacturer](#), [product](#), [serialNumber](#)) are ignored, so they behave as *any match* no matter what string expression is specified.

See also: `IUSBController::deviceFilters`, `IHostUSBDeviceFilter`

9.42.1 Attributes

9.42.1.1 name (read/write)

```
wstring IUSBDeviceFilter::name
```

Visible name for this filter. This name is used to visually distinguish one filter from another, so it can neither be null nor an empty string.

9.42.1.2 active (read/write)

```
boolean IUSBDeviceFilter::active
```

Whether this filter active or has been temporarily disabled.

9.42.1.3 vendorId (read/write)

```
wstring IUSBDeviceFilter::vendorId
```

Vendor ID filter. The string representation for the *exact matching* has the form XXXX, where X is the hex digit (including leading zeroes).

9.42.1.4 productId (read/write)

```
wstring IUSBDeviceFilter::productId
```

Product ID filter. The string representation for the *exact matching* has the form XXXX, where X is the hex digit (including leading zeroes).

9.42.1.5 revision (read/write)

wstring IUSBDeviceFilter::revision

[Product revision number](#) filter. The string representation for the *exact matching* has the form IFFF, where I is the decimal digit of the integer part of the revision, and F is the decimal digit of its fractional part (including leading and trailing zeros). Note that for interval filters, it's best to use the hexadecimal form, because the revision is stored as a 16 bit packed BCD value; so the expression `int:0x0100-0x0199` will match any revision from 1.0 to 1.99.

9.42.1.6 manufacturer (read/write)

wstring IUSBDeviceFilter::manufacturer

[Manufacturer](#) filter.

9.42.1.7 product (read/write)

wstring IUSBDeviceFilter::product

[Product](#) filter.

9.42.1.8 serialNumber (read/write)

wstring IUSBDeviceFilter::serialNumber

[Serial number](#) filter.

9.42.1.9 port (read/write)

wstring IUSBDeviceFilter::port

[Host USB port](#) filter.

9.42.1.10 remote (read/write)

wstring IUSBDeviceFilter::remote

[Remote state](#) filter.

Note: This filter makes sense only for machine USB filters, i.e. it is ignored by IHos-tUSBDeviceFilter objects.

9.42.1.11 maskedInterfaces (read/write)

unsigned long IUSBDeviceFilter::maskedInterfaces

This is an advanced option for hiding one or more USB interfaces from the guest. The value is a bit mask where the bits that are set means the corresponding USB interface should be hidden, masked off if you like. This feature only works on Linux hosts.

9.43 IVFSExplorer

The VFSExplorer interface unifies access to different file system types. This includes local file systems as well remote file systems like S3. For a list of supported types see [VFSType](#). An instance of this is returned by [IAppliance::createVFSExplorer\(\)](#).

9.43.1 Attributes

9.43.1.1 path (read-only)

wstring IVFSEplorer::path

Returns the current path in the virtual file system.

9.43.1.2 type (read-only)

VFSType IVFSEplorer::type

Returns the file system type which is currently in use.

9.43.2 cd

IProgress IVFSEplorer::cd(
[in] wstring aDir)

aDir The name of the directory to go in.

Change the current directory level.

9.43.3 cdUp

IProgress IVFSEplorer::cdUp()

Go one directory upwards from the current directory level.

9.43.4 entryList

void IVFSEplorer::entryList(
[out] wstring aNames[],
[out] unsigned long aTypes[])

aNames The list of names for the entries.

aTypes The list of types for the entries.

Returns a list of files/directories after a call to [update\(\)](#). The user is responsible for keeping this internal list up to date.

9.43.5 exists

wstring[] IVFSEplorer::exists(
[in] wstring aNames[])

aNames The names to check.

Checks if the given file list exists in the current directory level.

9.43.6 remove

IProgress IVFSEplorer::remove(
[in] wstring aNames[])

aNames The names to remove.

Deletes the given files in the current directory level.

9.43.7 update

`IProgress IVFSExplorer::update()`

Updates the internal list of files/directories from the current directory level. Use `entryList()` to get the full list after a call to this method.

9.44 IVRDP Server

9.44.1 Attributes

9.44.1.1 enabled (read/write)

`boolean IVRDP Server::enabled`

VRDP server status.

9.44.1.2 ports (read/write)

`wstring IVRDP Server::ports`

VRDP server port numbers. The server will try to bind to one of free ports from the list.

Note: This is a string of comma separated TCP port numbers or port number ranges. Example 5000,5010-5012,5015

9.44.1.3 netAddress (read/write)

`wstring IVRDP Server::netAddress`

VRDP server address.

9.44.1.4 authType (read/write)

`VRDPAuthType IVRDP Server::authType`

VRDP authentication method.

9.44.1.5 authTimeout (read/write)

`unsigned long IVRDP Server::authTimeout`

Timeout for guest authentication. Milliseconds.

9.44.1.6 allowMultiConnection (read/write)

`boolean IVRDP Server::allowMultiConnection`

Flag whether multiple simultaneous connections to the VM are permitted. Note that this will be replaced by a more powerful mechanism in the future.

9.44.1.7 reuseSingleConnection (read/write)

`boolean IVRDP Server::reuseSingleConnection`

Flag whether the existing connection must be dropped and a new connection must be established by the VRDP server, when a new client connects in single connection mode.

9.44.1.8 videoChannel (read/write)

boolean IVRDPSTechnology::videoChannel

Flag whether RDP video channel is supported.

9.44.1.9 videoChannelQuality (read/write)

unsigned long IVRDPSTechnology::videoChannelQuality

Image quality in percents.

9.45 IVirtualBox

The IVirtualBox interface represents the main interface exposed by the product that provides virtual machine management.

An instance of IVirtualBox is required for the product to do anything useful. Even though the interface does not expose this, internally, IVirtualBox is implemented as a singleton and actually lives in the process of the VirtualBox server (VBoxSVC.exe). This makes sure that IVirtualBox can track the state of all virtual machines on a particular host, regardless of which frontend started them.

To enumerate all the virtual machines on the host, use the [machines\[\]](#) attribute.

9.45.1 Attributes

9.45.1.1 version (read-only)

wstring IVirtualBox::version

A string representing the version number of the product. The format is 3 integer numbers divided by dots (e.g. 1.0.1). The last number represents the build number and will frequently change.

9.45.1.2 revision (read-only)

unsigned long IVirtualBox::revision

The internal build revision number of the product.

9.45.1.3 packageType (read-only)

wstring IVirtualBox::packageType

A string representing the package type of this product. The format is OS_ARCH_DIST where OS is either WINDOWS, LINUX, SOLARIS, DARWIN. ARCH is either 32BITS or 64BITS. DIST is either GENERIC, UBUNTU_606, UBUNTU_710, or something like this.

9.45.1.4 homeFolder (read-only)

wstring IVirtualBox::homeFolder

Full path to the directory where the global settings file, VirtualBox.xml, is stored.

In this version of VirtualBox, the value of this property is always <user_dir>/.VirtualBox (where <user_dir> is the path to the user directory, as determined by the host OS), and cannot be changed.

This path is also used as the base to resolve relative paths in places where relative paths are allowed (unless otherwise expressly indicated).

9.45.1.5 settingsFilePath (read-only)

wstring IVirtualBox::settingsFilePath

Full name of the global settings file. The value of this property corresponds to the value of [homeFolder](#) plus /VirtualBox.xml.

9.45.1.6 host (read-only)

IHost IVirtualBox::host

Associated host object.

9.45.1.7 systemProperties (read-only)

ISystemProperties IVirtualBox::systemProperties

Associated system information object.

9.45.1.8 machines (read-only)

IMachine IVirtualBox::machines[]

Array of machine objects registered within this VirtualBox instance.

9.45.1.9 hardDisks (read-only)

IMedium IVirtualBox::hardDisks[]

Array of medium objects known to this VirtualBox installation.

This array contains only base media. All differencing media of the given base medium can be enumerated using [IMedium::children\[\]](#).

9.45.1.10 DVDImages (read-only)

IMedium IVirtualBox::DVDImages[]

Array of CD/DVD image objects registered with this VirtualBox instance.

9.45.1.11 floppyImages (read-only)

IMedium IVirtualBox::floppyImages[]

Array of floppy image objects registered with this VirtualBox instance.

9.45.1.12 progressOperations (read-only)

IProgress IVirtualBox::progressOperations[]

9.45.1.13 guestOSTypes (read-only)

IGuestOSType IVirtualBox::guestOSTypes[]

9.45.1.14 sharedFolders (read-only)

[ISharedFolder](#) IVirtualBox::sharedFolders[]

Collection of global shared folders. Global shared folders are available to all virtual machines. New shared folders are added to the collection using [createSharedFolder\(\)](#). Existing shared folders can be removed using [removeSharedFolder\(\)](#).

Note: In the current version of the product, global shared folders are not implemented and therefore this collection is always empty.

9.45.1.15 performanceCollector (read-only)

[IPerformanceCollector](#) IVirtualBox::performanceCollector

Associated performance collector object.

9.45.1.16 DHCP Servers (read-only)

[IDHCP Server](#) IVirtualBox::DHCP Servers[]

dhcp server settings.

9.45.2 checkFirmwarePresent

```
boolean IVirtualBox::checkFirmwarePresent(
    [in] FirmwareType firmwareType,
    [in] wstring version,
    [out] wstring url,
    [out] wstring file)
```

firmwareType Type of firmware to check.

version Expected version number, usually empty string (presently ignored).

url Suggested URL to download this firmware from.

file Filename of firmware, only valid if result == TRUE.

Check if this VirtualBox installation has a firmware of the given type available, either system-wide or per-user. Optionally, this may return a hint where this firmware can be downloaded from.

9.45.3 createAppliance

[IAppliance](#) IVirtualBox::createAppliance()

Creates a new appliance object, which represents an appliance in the Open Virtual Machine Format (OVF). This can then be used to import an OVF appliance into VirtualBox or to export machines as an OVF appliance; see the documentation for [IAppliance](#) for details.

9.45.4 createDHCPsServer

```
IDHCPsServer IVirtualBox::createDHCPsServer(
    [in] wstring name)
```

name server name

Creates a dhcp server settings to be used for the given internal network name
If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Host network interface name already exists.

9.45.5 createHardDisk

```
IMedium IVirtualBox::createHardDisk(
    [in] wstring format,
    [in] wstring location)
```

format Identifier of the storage format to use for the new medium.

location Location of the storage unit for the new medium.

Creates a new base medium object that will use the given storage format and location for medium data.

Note that the actual storage unit is not created by this method. In order to do it, and before you are able to attach the created medium to virtual machines, you must call one of the following methods to allocate a format-specific storage unit at the specified location:

- [IMedium::createBaseStorage\(\)](#)
- [IMedium::createDiffStorage\(\)](#)

Some medium attributes, such as [IMedium::id](#), may remain uninitialized until the medium storage unit is successfully created by one of the above methods.

After the storage unit is successfully created, the medium gets remembered by this VirtualBox installation and will be accessible through [getHardDisk\(\)](#) and [findHardDisk\(\)](#) methods. Remembered base medium are also returned as part of the [hardDisks\[\]](#) array. See [IMedium](#) for more details.

The list of all storage formats supported by this VirtualBox installation can be obtained using [ISystemProperties::mediumFormats\[\]](#). If the format attribute is empty or null then the default storage format specified by [ISystemProperties::defaultHardDiskFormat](#) will be used for creating a storage unit of the medium.

Note that the format of the location string is storage format specific. See [IMedium::location](#), [IMedium](#) and [ISystemProperties::defaultHardDiskFolder](#) for more details.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: format identifier is invalid. See [ISystemProperties::mediumFormats\[\]](#).
- `VBOX_E_FILE_ERROR`: location is a not valid file name (for file-based formats only).

9.45.6 createLegacyMachine

```
IMachine IVirtualBox::createLegacyMachine(
    [in] wstring name,
    [in] wstring osTypeId,
    [in] wstring settingsFile,
    [in] uuid id)
```

name Machine name.

osTypeId Machine OS Type ID.

settingsFile Name of the machine settings file.

id Machine UUID (optional).

Creates a new virtual machine in “legacy” mode, using the specified settings file to store machine settings.

As opposed to machines created by [createMachine\(\)](#), the settings file of the machine created in “legacy” mode is not automatically renamed when the machine name is changed – it will always remain the same as specified in this method call.

The specified settings file name can be absolute (full path) or relative to the [VirtualBox home directory](#). If the file name doesn’t contain an extension, the default extension (.xml) will be appended.

Note that the configuration of the newly created machine is not saved to disk (and therefore no settings file is created) until [IMachine::saveSettings\(\)](#) is called. If the specified settings file already exists, this method will fail with `VBOX_E_FILE_ERROR`.

See [createMachine\(\)](#) for more information.

@deprecated This method may be removed later. Use [createMachine\(\)](#) instead.

Note: There is no way to change the name of the settings file of the machine created in “legacy” mode.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: `osTypeId` is invalid.
- `VBOX_E_FILE_ERROR`: `settingsFile` is invalid or the settings file already exists or could not be created due to an I/O error.
- `E_INVALIDARG`: `name` or `settingsFile` is empty or null.

9.45.7 createMachine

```
IMachine IVirtualBox::createMachine(
    [in] wstring name,
    [in] wstring osTypeId,
    [in] wstring baseFolder,
    [in] uuid id,
    [in] boolean override)
```

name Machine name.

osTypeId Guest OS Type ID.

baseFolder Base machine folder (optional).

id Machine UUID (optional).

override Create the VM even if there are conflicting files.

Creates a new virtual machine.

The new machine is created unregistered, with the initial configuration set according to the specified guest OS type. A typical sequence of actions to create a new virtual machine is as follows:

1. Call this method to have a new machine created. The returned machine object will be “mutable” allowing to change any machine property.
2. Configure the machine using the appropriate attributes and methods.
3. Call `IMachine::saveSettings()` to write the settings to the machine’s XML settings file. The configuration of the newly created machine will not be saved to disk until this method is called.
4. Call `registerMachine()` to add the machine to the list of machines known to VirtualBox.

You should specify valid name for the newly created machine when calling this method. See the `IMachine::name` attribute description for more details about the machine name.

The specified guest OS type identifier must match an ID of one of known guest OS types listed in the `guestOSTypes[]` array.

Every machine has a *settings file* that is used to store the machine configuration. This file is stored in a directory called the *machine settings subfolder*. Both the settings subfolder and file will have a name that corresponds to the name of the virtual machine. You can specify where to create the machine setting subfolder using the `baseFolder` argument. The base folder can be absolute (full path) or relative to the [VirtualBox home directory](#).

If `baseFolder` is a null or empty string (which is recommended), the [default machine settings folder](#) will be used as a base folder for the created machine. Otherwise the given base folder will be used. In either case, the full path to the resulting settings file has the following structure:

```
<base_folder>/<machine_name>/<machine_name>.xml
```

Note that if the resulting settings file already exists, this method will fail with `VBOX_E_FILE_ERROR`.

Optionally, you may specify an UUID of to assign to the created machine. However, this is not recommended and you should normally pass an empty (null) UUID to this method so that a new UUID will be automatically generated for every created machine. You can use UUID 00000000-0000-0000-0000-000000000000 as null value.

Note: There is no way to change the name of the settings file or subfolder of the created machine directly.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: `osTypeId` is invalid.
- `VBOX_E_FILE_ERROR`: Resulting settings file name is invalid or the settings file already exists or could not be created due to an I/O error.
- `E_INVALIDARG`: `name` is empty or null.

9.45.8 createSharedFolder

```
void IVirtualBox::createSharedFolder(
    [in] wstring name,
    [in] wstring hostPath,
    [in] boolean writable)
```

name Unique logical name of the shared folder.

hostPath Full path to the shared folder in the host file system.

writable Whether the share is writable or readonly

Creates a new global shared folder by associating the given logical name with the given host path, adds it to the collection of shared folders and starts sharing it. Refer to the description of [ISharedFolder](#) to read more about logical names.

Note: In the current implementation, this operation is not implemented.

9.45.9 findDHCPServerByNetworkName

[IDHCPServer](#) `IVirtualBox::findDHCPServerByNetworkName(
[in] wstring name)`

name server name

Searches a dhcp server settings to be used for the given internal network name
If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Host network interface name already exists.

9.45.10 findDVDImage

[IMedium](#) `IVirtualBox::findDVDImage(
[in] wstring location)`

location CD/DVD image file path to look for.

Returns a CD/DVD image with the given image location.

The image with the given UUID must be known to this VirtualBox installation, i.e. it must be previously opened by [openDVDImage\(\)](#), or mounted to some known virtual machine.

The search is done by comparing the value of the `location` argument to the [IMedium::location](#) attribute of each known CD/DVD image.

The requested location can be a path relative to the [VirtualBox home folder](#). If only a file name without any path is given, the [default hard disk folder](#) will be prepended to the file name before searching. Note that on case sensitive file systems, a case sensitive comparison is performed, otherwise the case in the file path is ignored.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Invalid image file location.
- `VBOX_E_OBJECT_NOT_FOUND`: No matching DVD image found in the media registry.

9.45.11 findFloppyImage

[IMedium](#) `IVirtualBox::findFloppyImage(
[in] wstring location)`

location Floppy image file path to look for.

Returns a floppy image with the given image location.

The image with the given UUID must be known to this VirtualBox installation, i.e. it must be previously opened by [openFloppyImage\(\)](#), or mounted to some known virtual machine.

The search is done by comparing the value of the `location` argument to the [IMedium::location](#) attribute of each known floppy image.

The requested location can be a path relative to the [VirtualBox home folder](#). If only a file name without any path is given, the [default hard disk folder](#) will be prepended to the file name before searching. Note that on case sensitive file systems, a case sensitive comparison is performed, otherwise the case of symbols in the file path is ignored.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Invalid image file location.
- `VBOX_E_OBJECT_NOT_FOUND`: No matching floppy image found in the media registry.

9.45.12 findHardDisk

```
IMedium IVirtualBox::findHardDisk(  
    [in] wstring location)
```

location Location string to search for.

Returns a medium that uses the given location to store medium data.

The given medium must be known to this VirtualBox installation, i.e. it must be previously created by `createHardDisk()` or opened by `openHardDisk()`, or attached to some known virtual machine.

The search is done by comparing the value of the `location` argument to the `IMedium::location` attribute of each known medium.

For locations represented by file names in the host's file system, the requested location can be a path relative to the `VirtualBox home folder`. If only a file name without any path is given, the `default medium folder` will be prepended to the file name before searching. Note that on case sensitive file systems, a case sensitive comparison is performed, otherwise the case of symbols in the file path is ignored.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No medium object matching location found.

9.45.13 findMachine

```
IMachine IVirtualBox::findMachine(  
    [in] wstring name)
```

name

Attempts to find a virtual machine given its name. To look up a machine by UUID, use `getMachine()` instead.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Could not find registered machine matching name.

9.45.14 getDVDImage

```
IMedium IVirtualBox::getDVDImage(  
    [in] uuid id)
```

id UUID of the image to look for.

Returns a CD/DVD image with the given UUID.

The image with the given UUID must be known to this VirtualBox installation, i.e. it must be previously opened by `openDVDImage()`, or mounted to some known virtual machine.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No matching DVD image found in the media registry.

9.45.15 `getExtraData`

```
wstring IVirtualBox::getExtraData(
    [in] wstring key)
```

key Name of the data key to get.

Returns associated global extra data.

If the requested data key does not exist, this function will succeed and return an empty string in the value argument.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.

9.45.16 `getExtraDataKeys`

```
wstring[] IVirtualBox::getExtraDataKeys()
```

Returns an array representing the global extra data keys which currently have values defined.

9.45.17 `getFloppyImage`

```
IMedium IVirtualBox::getFloppyImage(
    [in] uuid id)
```

id UUID of the image to look for.

Returns a floppy image with the given UUID.

The image with the given UUID must be known to this VirtualBox installation, i.e. it must be previously opened by `openFloppyImage()`, or mounted to some known virtual machine.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No matching floppy image found in the media registry.

9.45.18 `getGuestOSType`

```
IGuestOSType IVirtualBox::getGuestOSType(
    [in] uuid id)
```

id Guest OS type ID string.

Returns an object describing the specified guest OS type.

The requested guest OS type is specified using a string which is a mnemonic identifier of the guest operating system, such as "win31" or "ubuntu". The guest OS type ID of a particular virtual machine can be read or set using the `IMachine::OSTypeId` attribute.

The `guestOSTypes[]` collection contains all available guest OS type objects. Each object has an `IGuestOSType::id` attribute which contains an identifier of the guest OS this object describes.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: `id` is not a valid Guest OS type.

9.45.19 getHardDisk

```
IMedium IVirtualBox::getHardDisk(
    [in] uuid id)
```

id UUID of the medium to look for.

Returns a medium with the given UUID.

The medium with the given UUID must be known to this VirtualBox installation, i.e. it must be previously created by [createHardDisk\(\)](#) or opened by [openHardDisk\(\)](#), or attached to some known virtual machine.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: No medium object matching **id** found.

9.45.20 getMachine

```
IMachine IVirtualBox::getMachine(
    [in] uuid id)
```

id

Attempts to find a virtual machine given its UUID. To look up a machine by name, use [findMachine\(\)](#) instead.

If this method fails, the following error codes may be reported:

- **VBOX_E_OBJECT_NOT_FOUND**: Could not find registered machine matching **id**.

9.45.21 openDVDImage

```
IMedium IVirtualBox::openDVDImage(
    [in] wstring location,
    [in] uuid id)
```

location Full path to the file that contains a valid CD/DVD image.

id UUID to assign to the given image within this VirtualBox installation. If an empty (`null`) UUID is specified, the system will randomly generate a new UUID.

Opens a CD/DVD image contained in the specified file of the supported format and assigns it the given UUID.

After the image is successfully opened by this method, it gets remembered by (known to) this VirtualBox installation and will be accessible through [getDVDImage\(\)](#) and [findDVDImage\(\)](#) methods. Remembered images are also returned as part of the [DVDImages\[\]](#) array and can be mounted to virtual machines. See [IMedium](#) for more details.

See [IMedium::location](#) to get more details about the format of the location string.

Note: Currently only ISO 9960 CD/DVD images are supported by VirtualBox.

If this method fails, the following error codes may be reported:

- **VBOX_E_FILE_ERROR**: Invalid CD/DVD image file location or could not find the CD/DVD image at the specified location.
- **VBOX_E_INVALID_OBJECT_STATE**: CD/DVD image already exists in the media registry.

9.45.22 openExistingSession

```
void IVirtualBox::openExistingSession(
    [in] ISession session,
    [in] uuid machineId)
```

session Session object that will represent the open remote session after successful method invocation. This object must not represent an already open session.

Note: This session will be automatically closed when the peer (direct) session dies or gets closed.

machineId ID of the virtual machine to open a session with.

Opens a new remote session with the virtual machine for which a direct session is already open.

The remote session provides some level of control over the VM execution (using the IConsole interface) to the caller; however, within the remote session context, not all VM settings are available for modification.

As opposed to [openRemoteSession\(\)](#), the number of remote sessions opened this way is not limited by the API

Note: It is an error to open a remote session with the machine that doesn't have an open direct session.

See also: [openRemoteSession](#)

If this method fails, the following error codes may be reported:

- **E_UNEXPECTED:** Virtual machine not registered.
- **VBOX_E_OBJECT_NOT_FOUND:** No machine matching machineId found.
- **VBOX_E_INVALID_OBJECT_STATE:** Session already open or being opened.
- **VBOX_E_INVALID_SESSION_STATE:** Direct session state not Open.
- **VBOX_E_VM_ERROR:** Failed to get console object from direct session or assign machine to session.

9.45.23 openFloppyImage

```
IMedium IVirtualBox::openFloppyImage(
    [in] wstring location,
    [in] uuid id)
```

location Full path to the file that contains a valid floppy image.

id UUID to assign to the given image file within this VirtualBox installation. If an empty (null) UUID is specified, the system will randomly generate a new UUID.

Opens a floppy image contained in the specified file of the supported format and assigns it the given UUID.

After the image is successfully opened by this method, it gets remembered by (known to) this VirtualBox installation and will be accessible through [getFloppyImage\(\)](#) and [findFloppyImage\(\)](#) methods. Remembered images are also returned as part of the [floppyImages\[\]](#) array and can be mounted to virtual machines. See [IMedium](#) for more details.

See [IMedium:location](#) to get more details about the format of the location string.

Note: Currently, only raw floppy images are supported by VirtualBox.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Invalid floppy image file location or could not find the floppy image at the specified location.
- `VBOX_E_INVALID_OBJECT_STATE`: Floppy image already exists in the media registry.

9.45.24 openHardDisk

```
IMedium IVirtualBox::openHardDisk(
    [in] wstring location,
    [in] AccessMode accessMode,
    [in] boolean setImageId,
    [in] uuid imageId,
    [in] boolean setParentId,
    [in] uuid parentId)
```

location Location of the storage unit that contains medium data in one of the supported storage formats.

accessMode Determines whether to open the image in read/write or read-only mode.

setImageId Select whether a new image UUID is set or not.

imageId New UUID for the image. If an empty string is passed, then a new UUID is automatically created. Specifying a zero UUIDs is not valid.

setParentId Select whether a new parent UUID is set or not.

parentId New parent UUID for the image. If an empty string is passed, then a new UUID is automatically created, provided `setParentId` is `true`. A zero UUID is valid.

Opens a medium from an existing location, optionally replacing the image UUID and/or parent UUID.

After the medium is successfully opened by this method, it gets remembered by (known to) this VirtualBox installation and will be accessible through `getHardDisk()` and `findHardDisk()` methods. Remembered base media are also returned as part of the `hardDisks[]` array and can be attached to virtual machines. See `IMedium` for more details.

If a differencing medium is to be opened by this method, the operation will succeed only if its parent medium and all ancestors, if any, are already known to this VirtualBox installation (for example, were opened by this method before).

This method tries to guess the storage format of the specified medium by reading medium data at the specified location.

If `accessMode` is `ReadWrite` (which it should be), the image is opened for read/write access and must have according permissions, as VirtualBox may actually write status information into the disk's metadata sections.

Note that write access is required for all typical image usage in VirtualBox, since VirtualBox may need to write metadata such as a UUID into the image. The only exception is opening a source image temporarily for copying and cloning when the image will quickly be closed again.

Note that the format of the location string is storage format specific. See `IMedium::location`, `IMedium` and `ISystemProperties::defaultHardDiskFolder` for more details.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Invalid medium storage file location or could not find the medium at the specified location.

- `VBOX_E_IPRT_ERROR`: Could not get medium storage format.
- `E_INVALIDARG`: Invalid medium storage format.

9.45.25 openMachine

```
IMachine IVirtualBox::openMachine(
    [in] wstring settingsFile)
```

settingsFile Name of the machine settings file.

Opens a virtual machine from the existing settings file. The opened machine remains unregistered until you call [registerMachine\(\)](#).

The specified settings file name can be absolute (full path) or relative to the [VirtualBox home directory](#). This file must exist and must be a valid machine settings file whose contents will be used to construct the machine object.

@deprecated Will be removed soon.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file name invalid, not found or sharing violation.

9.45.26 openRemoteSession

```
IProgress IVirtualBox::openRemoteSession(
    [in] ISession session,
    [in] uuid machineId,
    [in] wstring type,
    [in] wstring environment)
```

session Session object that will represent the opened remote session after successful method invocation (this object must not represent an already open session).

machineId ID of the virtual machine to open a session with.

type Type of the remote session (case sensitive).

environment Environment to pass to the opened session.

Spawns a new process that executes a virtual machine (called a “remote session”).

Opening a remote session causes the VirtualBox server to start a new process that opens a direct session with the given VM. As a result, the VM is locked by that direct session in the new process, preventing conflicting changes from other processes. Since sessions act as locks that prevent conflicting changes, one cannot open a remote session for a VM that already has another open session (direct or remote), or is currently in the process of opening one (see [IMachine::sessionState](#)).

While the remote session still provides some level of control over the VM execution to the caller (using the [IConsole](#) interface), not all VM settings are available for modification within the remote session context.

This operation can take some time (a new VM is started in a new process, for which memory and other resources need to be set up). Because of this, an [IProgress](#) is returned to allow the caller to wait for this asynchronous operation to be completed. Until then, the remote session object remains in the closed state, and accessing the machine or its console through it is invalid. It is recommended to use [IProgress::waitForCompletion\(\)](#) or similar calls to wait for completion. Completion is signalled when the VM is powered on. Error messages etc. can be queried via the progress object, if available.

As with all [ISession](#) objects, it is recommended to call [ISession::close\(\)](#) on the local session object once [openRemoteSession\(\)](#) has been called. However, the session’s state (see [ISession::state](#))

will not return to “Closed” until the remote session has also closed (i.e. until the VM is no longer running). In that case, however, the state of the session will automatically change back to “Closed”.

Currently supported session types (values of the type argument) are:

- "gui": VirtualBox Qt GUI session
- "vrdp": VirtualBox VRDP Server session
- "sdl": VirtualBox SDL GUI session

The environment argument is a string containing definitions of environment variables in the following format: @code NAME[=VALUE]\n NAME[=VALUE]\n ... @endcode where \n is the new line character. These environment variables will be appended to the environment of the VirtualBox server process. If an environment variable exists both in the server process and in this list, the value from this list takes precedence over the server’s variable. If the value of the environment variable is omitted, this variable will be removed from the resulting environment. If the environment string is null or empty, the server environment is inherited by the started process as is.

The progress object will have at least 2 operation. The first operation covers the period up to the new VM process calls powerUp. The subsequent operations mirrors the [IConsole::powerUp\(\)](#) progress object. Because [IConsole::powerUp\(\)](#) may require some extra operation, the [IProgress::operationCount](#) may change at the completion of operation1.

For details on the teleportation progress operation, see [IConsole::powerUp\(\)](#).

See also: [openExistingSession](#)

If this method fails, the following error codes may be reported:

- E_UNEXPECTED: Virtual machine not registered.
- E_INVALIDARG: Invalid session type type.
- VBOX_E_OBJECT_NOT_FOUND: No machine matching machineId found.
- VBOX_E_INVALID_OBJECT_STATE: Session already open or being opened.
- VBOX_E_IPRT_ERROR: Launching process for machine failed.
- VBOX_E_VM_ERROR: Failed to assign machine to session.

9.45.27 openSession

```
void IVirtualBox::openSession(
    [in] ISession session,
    [in] uuid machineId)
```

session Session object that will represent the opened session after successful method invocation. This object must not represent the already open session.

Note: This session will be automatically closed if the VirtualBox server is terminated for some reason.

machineId ID of the virtual machine to open a session with.

Opens a new direct session with the given virtual machine.

A direct session acts as a local lock on the given VM. There can be only one direct session open at a time for every virtual machine, protecting the VM from being manipulated by conflicting actions from different processes. Only after a direct session has been opened, one can change all VM settings and execute the VM in the process space of the session object.

Sessions therefore can be compared to mutex semaphores that lock a given VM for modification and execution. See [ISession](#) for details.

Note: Unless you are writing a new VM frontend, you will not want to execute a VM in the current process. To spawn a new process that executes a VM, use [openRemoteSession\(\)](#) instead.

Upon successful return, the session object can be used to get access to the machine and to the VM console.

In VirtualBox terminology, the machine becomes “mutable” after a session has been opened. Note that the “mutable” machine object, on which you may invoke [IMachine](#) methods to change its settings, will be a different object from the immutable [IMachine](#) objects returned by various [IVirtualBox](#) methods. To obtain a mutable [IMachine](#) object (upon which you can invoke settings methods), use the [ISession::machine](#) attribute.

One must always call [ISession::close\(\)](#) to release the lock on the machine, or the machine’s state will eventually be set to “Aborted”.

In other words, to change settings on a machine, the following sequence is typically performed:

1. Call this method ([openSession](#)) to have a machine locked for the current session.
2. Obtain a mutable [IMachine](#) object from [ISession::machine](#).
3. Change the settings of the machine.
4. Call [IMachine::saveSettings\(\)](#).
5. Close the session by calling [ISession::close\(\)](#).

If this method fails, the following error codes may be reported:

- [E_UNEXPECTED](#): Virtual machine not registered.
- [E_ACCESSDENIED](#): Process not started by [OpenRemoteSession](#).
- [VBOX_E_OBJECT_NOT_FOUND](#): No matching virtual machine found.
- [VBOX_E_INVALID_OBJECT_STATE](#): Session already open or being opened.
- [VBOX_E_VM_ERROR](#): Failed to assign machine to session.

9.45.28 registerCallback

Note: This method is not supported in the web service.

```
void IVirtualBox::registerCallback(
    [in] IVirtualBoxCallback callback)
```

callback Callback object to register.

Registers a new global VirtualBox callback. The methods of the given callback object will be called by VirtualBox when an appropriate event occurs.

If this method fails, the following error codes may be reported:

- [E_INVALIDARG](#): A null callback cannot be registered.

9.45.29 registerMachine

```
void IVirtualBox::registerMachine(
    [in] IMachine machine)
```

machine

Registers the machine previously created using [createMachine\(\)](#) or opened using [openMachine\(\)](#) within this VirtualBox installation. After successful method invocation, the [IVirtualBoxCallback::onMachineRegistered](#) signal is sent to all registered callbacks.

Note: This method implicitly calls [IMachine::saveSettings\(\)](#) to save all current machine settings before registering it.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: No matching virtual machine found.
- `VBOX_E_INVALID_OBJECT_STATE`: Virtual machine was not created within this VirtualBox instance.

9.45.30 removeDHCPserver

```
void IVirtualBox::removeDHCPserver(
    [in] IDHCPserver server)
```

server Dhcp server settings to be removed

Removes the dhcp server settings

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Host network interface name already exists.

9.45.31 removeSharedFolder

```
void IVirtualBox::removeSharedFolder(
    [in] wstring name)
```

name Logical name of the shared folder to remove.

Removes the global shared folder with the given name previously created by [createSharedFolder\(\)](#) from the collection of shared folders and stops sharing it.

Note: In the current implementation, this operation is not implemented.

9.45.32 setExtraData

```
void IVirtualBox::setExtraData(
    [in] wstring key,
    [in] wstring value)
```

key Name of the data key to set.

value Value to assign to the key.

Sets associated global extra data.

If you pass `null` or empty string as a key value, the given key will be deleted.

Note: Before performing the actual data change, this method will ask all registered callbacks using the `IVirtualBoxCallback::onExtraDataCanChange()` notification for a permission. If one of the callbacks refuses the new value, the change will not be performed.

Note: On success, the `IVirtualBoxCallback::onExtraDataChange()` notification is called to inform all registered callbacks about a successful data change.

If this method fails, the following error codes may be reported:

- `VBOX_E_FILE_ERROR`: Settings file not accessible.
- `VBOX_E_XML_ERROR`: Could not parse the settings file.
- `E_ACCESSDENIED`: Modification request refused.

9.45.33 unregisterCallback

Note: This method is not supported in the web service.

```
void IVirtualBox::unregisterCallback(  
    [in] IVirtualBoxCallback callback)
```

callback Callback object to unregister.

Unregisters the previously registered global VirtualBox callback.

If this method fails, the following error codes may be reported:

- `E_INVALIDARG`: Specified callback not registered.

9.45.34 unregisterMachine

```
IMachine IVirtualBox::unregisterMachine(  
    [in] uuid id)
```

id UUID of the machine to unregister.

Unregisters the machine previously registered using `registerMachine()`. After successful method invocation, the `IVirtualBoxCallback::onMachineRegistered()` signal is sent to all registered callbacks.

Note: The specified machine must not be in the Saved state, have an open (or a spawning) direct session associated with it, have snapshots or have any medium attached.

Note: This method implicitly calls `IMachine::saveSettings()` to save all current machine settings before unregistering it.

Note: If the given machine is inaccessible (see [IMachine::accessible](#)), it will be unregistered and fully uninitialized right afterwards. As a result, the returned machine object will be unusable and an attempt to call **any** method will return the “Object not ready” error.

If this method fails, the following error codes may be reported:

- `VBOX_E_OBJECT_NOT_FOUND`: Could not find registered machine matching id.
- `VBOX_E_INVALID_VM_STATE`: Machine is in Saved state.
- `VBOX_E_INVALID_OBJECT_STATE`: Machine has snapshot or open session or medium attached.

9.45.35 `waitForPropertyChange`

```
void IVirtualBox::waitForPropertyChange(
    [in] wstring what,
    [in] unsigned long timeout,
    [out] wstring changed,
    [out] wstring values)
```

what Comma separated list of property masks.

timeout Wait timeout in milliseconds. Specify -1 for an indefinite wait.

changed Comma separated list of properties that have been changed and caused this method to return to the caller.

values Reserved, not currently used.

Blocks the caller until any of the properties represented by the `what` argument changes the value or until the given timeout interval expires.

The `what` argument is a comma separated list of property masks that describe properties the caller is interested in. The property mask is a string in the following format:

```
[[group.]subgroup.]name
```

where `name` is the property name and `group`, `subgroup` are zero or more property group specifiers. Each element (`group` or `name`) in the property mask may be either a Latin string or an asterisk symbol (`@c “*”`) which is used to match any string for the given element. A property mask that doesn’t contain asterisk symbols represents a single fully qualified property name.

Groups in the fully qualified property name go from more generic (the left-most part) to more specific (the right-most part). The first element is usually a name of the object the property belongs to. The second element may be either a property name, or a child object name, or an index if the preceding element names an object which is one of many objects of the same type. This way, property names form a hierarchy of properties. Here are some examples of property names:

`VirtualBox.version` [version](#) `propertyMachine.<UUID>.name` [IMachine::name](#) property of the machine with the given UUID

Most property names directly correspond to the properties of objects (components) provided by the `VirtualBox` library and may be used to track changes to these properties. However, there may be pseudo-property names that don’t correspond to any existing object’s property directly, as well as there may be object properties that don’t have a corresponding property name that is understood by this method, and therefore changes to such properties cannot be tracked. See

individual object's property descriptions to get a fully qualified property name that can be used with this method (if any).

There is a special property mask @c "*" (i.e. a string consisting of a single asterisk symbol) that can be used to match all properties. Below are more examples of property masks:

`VirtualBox.*Track` all properties of the `VirtualBox` object
`Machine.*.nameTrack` changes to the `IMachine::name` property of all registered virtual machines

Note: This function is not implemented in the current version of the product.

9.46 IVirtualBoxCallback

Note: This interface is not supported in the web service.

9.46.1 onExtraDataCanChange

```
boolean IVirtualBoxCallback::onExtraDataCanChange(
    [in] uuid machineId,
    [in] wstring key,
    [in] wstring value,
    [out] wstring error)
```

machineId ID of the machine this event relates to (null ID for global extra data change requests).

key Extra data key for the attempted write.

value Extra data value for the given key.

error Optional error message describing the reason of the veto (ignored if this notification returns true).

Notification when someone tries to change extra data for either the given machine or (if null) global extra data. This gives the chance to veto against changes.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP. Change is allowed.

9.46.2 onExtraDataChange

```
void IVirtualBoxCallback::onExtraDataChange(
    [in] uuid machineId,
    [in] wstring key,
    [in] wstring value)
```

machineId ID of the machine this event relates to. Null for global extra data changes.

key Extra data key that has changed.

value Extra data value for the given key.

Notification when machine specific or global extra data has changed.

If this method fails, the following error codes may be reported:

- `VBOX_E_DONT_CALL_AGAIN`: Do not call again, this method is a NOP.

9.46.3 onGuestPropertyChange

```
void IVirtualBoxCallback::onGuestPropertyChange(
    [in] uuid machineId,
    [in] wstring name,
    [in] wstring value,
    [in] wstring flags)
```

machineId ID of the machine this event relates to.

name The name of the property that has changed.

value The new property value.

flags The new property flags.

Notification when a guest property has changed.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.4 onMachineDataChange

```
void IVirtualBoxCallback::onMachineDataChange(
    [in] uuid machineId)
```

machineId ID of the machine this event relates to.

Any of the settings of the given machine has changed.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.5 onMachineRegistered

```
void IVirtualBoxCallback::onMachineRegistered(
    [in] uuid machineId,
    [in] boolean registered)
```

machineId ID of the machine this event relates to.

registered If true, the machine was registered, otherwise it was unregistered.

The given machine was registered or unregistered within this VirtualBox installation.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.6 onMachineStateChange

```
void IVirtualBoxCallback::onMachineStateChange(
    [in] uuid machineId,
    [in] MachineState state)
```

machineId ID of the machine this event relates to.

state New execution state.

The execution state of the given machine has changed. See also: `IMachine::state`

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.7 onMediumRegistered

```
void IVirtualBoxCallback::onMediumRegistered(
    [in] uuid mediumId,
    [in] DeviceType mediumType,
    [in] boolean registered)
```

mediumId ID of the medium this event relates to.

mediumType Type of the medium this event relates to.

registered If true, the medium was registered, otherwise it was unregistered.

The given medium was registered or unregistered within this VirtualBox installation.

The **mediumType** parameter describes what type of medium the specified **mediumId** refers to. Possible values are:

- **HardDisk**: the medium is a hard disk that, if registered, can be obtained using the `IVirtualBox::getHardDisk()` call.
- **DVD**: the medium is a CD/DVD image that, if registered, can be obtained using the `IVirtualBox::getDVDImage()` call.
- **Floppy**: the medium is a Floppy image that, if registered, can be obtained using the `IVirtualBox::getFloppyImage()` call.

Note that if this is a deregistration notification, there is no way to access the object representing the unregistered medium. It is supposed that the application will do required cleanup based on the **mediumId** value.

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.8 onSessionStateChange

```
void IVirtualBoxCallback::onSessionStateChange(
    [in] uuid machineId,
    [in] SessionState state)
```

machineId ID of the machine this event relates to.

state New session state.

The state of the session for the given machine was changed. See also: `IMachine::sessionState`

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.9 onSnapshotChange

```
void IVirtualBoxCallback::onSnapshotChange(
    [in] uuid machineId,
    [in] uuid snapshotId)
```

machineId ID of the machine this event relates to.

snapshotId ID of the changed snapshot.

Snapshot properties (name and/or description) have been changed. See also: `ISnapshot`

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN**: Do not call again, this method is a NOP.

9.46.10 onSnapshotDeleted

```
void IVirtualBoxCallback::onSnapshotDeleted(
    [in] uuid machineId,
    [in] uuid snapshotId)
```

machineId ID of the machine this event relates to.

snapshotId ID of the deleted snapshot. null means the current machine state has been deleted (restored from the current snapshot).

Snapshot of the given machine has been deleted.

Note: This notification is delivered **after** the snapshot object has been uninitialized on the server (so that any attempt to call its methods will return an error).

See also: ISnapshot

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.46.11 onSnapshotTaken

```
void IVirtualBoxCallback::onSnapshotTaken(
    [in] uuid machineId,
    [in] uuid snapshotId)
```

machineId ID of the machine this event relates to.

snapshotId ID of the new snapshot.

A new snapshot of the machine has been taken. See also: ISnapshot

If this method fails, the following error codes may be reported:

- **VBOX_E_DONT_CALL_AGAIN:** Do not call again, this method is a NOP.

9.47 IVirtualBoxErrorInfo

The IVirtualBoxErrorInfo interface represents extended error information.

Extended error information can be set by VirtualBox components after unsuccessful or partially successful method invocation. This information can be retrieved by the calling party as an IVirtualBoxErrorInfo object and then shown to the client in addition to the plain 32-bit result code.

In MS COM, this interface extends the IErrorInfo interface, in XPCOM, it extends the nsIException interface. In both cases, it provides a set of common attributes to retrieve error information.

Sometimes invocation of some component's method may involve methods of other components that may also fail (independently of this method's failure), or a series of non-fatal errors may precede a fatal error that causes method failure. In cases like that, it may be desirable to preserve information about all errors happened during method invocation and deliver it to the caller. The [next](#) attribute is intended specifically for this purpose and allows to represent a chain of errors through a single IVirtualBoxErrorInfo object set after method invocation.

Note that errors are stored to a chain in the reverse order, i.e. the initial error object you query right after method invocation is the last error set by the callee, the object it points to in the next attribute is the previous error and so on, up to the first error (which is the last in the chain).

9.47.1 Attributes

9.47.1.1 resultCode (read-only)

long IVirtualBoxErrorInfo::resultCode

Result code of the error. Usually, it will be the same as the result code returned by the method that provided this error information, but not always. For example, on Win32, CoCreateInstance() will most likely return E_NOINTERFACE upon unsuccessful component instantiation attempt, but not the value the component factory returned. Value is typed 'long', not 'result', to make interface usable from scripting languages.

Note: In MS COM, there is no equivalent. In XPCOM, it is the same as nsIException::result.

9.47.1.2 interfaceID (read-only)

uuid IVirtualBoxErrorInfo::interfaceID

UUID of the interface that defined the error.

Note: In MS COM, it is the same as IErrorInfo::GetGUID, except for the data type. In XPCOM, there is no equivalent.

9.47.1.3 component (read-only)

wstring IVirtualBoxErrorInfo::component

Name of the component that generated the error.

Note: In MS COM, it is the same as IErrorInfo::GetSource. In XPCOM, there is no equivalent.

9.47.1.4 text (read-only)

wstring IVirtualBoxErrorInfo::text

Text description of the error.

Note: In MS COM, it is the same as IErrorInfo::GetDescription. In XPCOM, it is the same as nsIException::message.

9.47.1.5 next (read-only)

[IVirtualBoxErrorInfo](#) IVirtualBoxErrorInfo::next

Next error object if there is any, or null otherwise.

Note: In MS COM, there is no equivalent. In XPCOM, it is the same as nsIException::inner.

9.48 IVirtualSystemDescription

Represents one virtual system (machine) in an appliance. This interface is used in the [IAppliance::virtualSystemDescriptions\[\]](#) array. After [IAppliance::interpret\(\)](#) has been called, that array contains information about how the virtual systems described in the OVF should best be imported into VirtualBox virtual machines. See [IAppliance](#) for the steps required to import an OVF into VirtualBox.

9.48.1 Attributes

9.48.1.1 count (read-only)

```
unsigned long IVirtualSystemDescription::count
```

Return the number of virtual system description entries.

9.48.2 addDescription

```
void IVirtualSystemDescription::addDescription(
    [in] VirtualSystemDescriptionType aType,
    [in] wstring aVBoxValue,
    [in] wstring aExtraConfigValue)
```

aType

aVBoxValue

aExtraConfigValue

This method adds an additional description entry to the stack of already available descriptions for this virtual system. This is handy for writing values which aren't directly supported by VirtualBox. One example would be the License type of [VirtualSystemDescriptionType](#).

9.48.3 getDescription

```
void IVirtualSystemDescription::getDescription(
    [out] VirtualSystemDescriptionType aTypes[],
    [out] wstring aRefs[],
    [out] wstring aOvfValues[],
    [out] wstring aVBoxValues[],
    [out] wstring aExtraConfigValues[])
```

aTypes

aRefs

aOvfValues

aVBoxValues

aExtraConfigValues

Returns information about the virtual system as arrays of instruction items. In each array, the items with the same indices correspond and jointly represent an import instruction for VirtualBox.

The list below identifies the value sets that are possible depending on the [VirtualSystemDescriptionType](#) enum value in the array item in `aTypes[]`. In each case, the array item with the same index in `aOvfValues[]` will contain the original value as contained in the OVF file (just for informational

purposes), and the corresponding item in `aVBoxValues[]` will contain a suggested value to be used for VirtualBox. Depending on the description type, the `aExtraConfigValues[]` array item may also be used.

- “OS”: the guest operating system type. There must be exactly one such array item on import. The corresponding item in `aVBoxValues[]` contains the suggested guest operating system for VirtualBox. This will be one of the values listed in [IVirtualBox::guestOSTypes\[\]](#). The corresponding item in `a0vfValues[]` will contain a numerical value that described the operating system in the OVF.
- “Name”: the name to give to the new virtual machine. There can be at most one such array item; if none is present on import, then an automatic name will be created from the operating system type. The corresponding item in `a0vfValues[]` will contain the suggested virtual machine name from the OVF file, and `aVBoxValues[]` will contain a suggestion for a unique VirtualBox [IMachine](#) name that does not exist yet.
- “Description”: an arbitrary description.
- “License”: the EULA section from the OVF, if present. It is the responsibility of the calling code to display such a license for agreement; the Main API does not enforce any such policy.
- Miscellaneous: reserved for future use.
- “CPU”: the number of CPUs. There can be at most one such item, which will presently be ignored.
- “Memory”: the amount of guest RAM, in bytes. There can be at most one such array item; if none is present on import, then VirtualBox will set a meaningful default based on the operating system type.
- “HardDiskControllerIDE”: an IDE hard disk controller. There can be at most two such items. An optional value in `a0vfValues[]` and `aVBoxValues[]` can be “PIIX3” or “PIIX4” to specify the type of IDE controller; this corresponds to the `ResourceSubType` element which VirtualBox writes into the OVF. The matching item in the `aRefs[]` array will contain an integer that items of the “Harddisk” type can use to specify which hard disk controller a virtual disk should be connected to. Note that in OVF, an IDE controller has two channels, corresponding to “master” and “slave” in traditional terminology, whereas the IDE storage controller that VirtualBox supports in its virtual machines supports four channels (primary master, primary slave, secondary master, secondary slave) and thus maps to two IDE controllers in the OVF sense.
- “HardDiskControllerSATA”: an SATA hard disk controller. There can be at most one such item. This has no value in `a0vfValues[]` or `aVBoxValues[]`. The matching item in the `aRefs[]` array will be used as with IDE controllers (see above).
- “HardDiskControllerSCSI”: a SCSI hard disk controller. There can be at most one such item. The items in `a0vfValues[]` and `aVBoxValues[]` will either be “LsiLogic”, “BusLogic” or “LsiLogicSas”. (Note that in OVF, the `LsiLogicSas` controller is treated as a SCSI controller whereas VirtualBox considers it a class of storage controllers of its own; see [StorageControllerType](#)). The matching item in the `aRefs[]` array will be used as with IDE controllers (see above).
- “HardDiskImage”: a virtual hard disk, most probably as a reference to an image file. There can be an arbitrary number of these items, one for each virtual disk image that accompanies the OVF.

The array item in `a0vfValues[]` will contain the file specification from the OVF file (without a path since the image file should be in the same location as the OVF file itself), whereas

the item in `aVBoxValues[]` will contain a qualified path specification to where VirtualBox uses the hard disk image. This means that on import the image will be copied and converted from the “ovf” location to the “vbox” location; on export, this will be handled the other way round. On import, the target image will also be registered with VirtualBox.

The matching item in the `aExtraConfigValues[]` array must contain a string of the following format: “controller=<index>;channel=<c>“ In this string, <index> must be an integer specifying the hard disk controller to connect the image to. That number must be the index of an array item with one of the hard disk controller types (`HardDiskControllerSCSI`, `HardDiskControllerSATA`, `HardDiskControllerIDE`). In addition, <c> must specify the channel to use on that controller. For IDE controllers, this can be 0 or 1 for master or slave, respectively. For compatibility with VirtualBox versions before 3.2, the values 2 and 3 (for secondary master and secondary slave) are also supported, but no longer exported. For SATA and SCSI controllers, the channel can range from 0-29.

- “CDROM”: a virtual CD-ROM drive. The matching item in `aExtraConfigValue[]` contains the same attachment information as with “HardDiskImage” items.
- “CDROM”: a virtual floppy drive. The matching item in `aExtraConfigValue[]` contains the same attachment information as with “HardDiskImage” items.
- “NetworkAdapter”: a network adapter. The array item in `aVBoxValues[]` will specify the hardware for the network adapter, whereas the array item in `aExtraConfigValues[]` will have a string of the “type=<X>“ format, where <X> must be either “NAT” or “Bridged”.
- “USBController”: a USB controller. There can be at most one such item. If and only if such an item is present, USB support will be enabled for the new virtual machine.
- “SoundCard”: a sound card. There can be at most one such item. If and only if such an item is present, sound support will be enabled for the new virtual machine. Note that the virtual machine in VirtualBox will always be presented with the standard VirtualBox soundcard, which may be different from the virtual soundcard expected by the appliance.

9.48.4 getDescriptionByType

```
void IVirtualSystemDescription::getDescriptionByType(
    [in] VirtualSystemDescriptionType aType,
    [out] VirtualSystemDescriptionType aTypes[],
    [out] wstring aRefs[],
    [out] wstring aOvfValues[],
    [out] wstring aVBoxValues[],
    [out] wstring aExtraConfigValues[])
```

aType

aTypes

aRefs

aOvfValues

aVBoxValues

aExtraConfigValues

This is the same as `getDescription()` except that you can specify which types should be returned.

9.48.5 `getValuesByType`

```
wstring[] IVirtualSystemDescription::getValuesByType(
    [in] VirtualSystemDescriptionType aType,
    [in] VirtualSystemDescriptionValueType aWhich)
```

aType

aWhich

This is the same as `getDescriptionByType()` except that you can specify which value types should be returned. See `VirtualSystemDescriptionValueType` for possible values.

9.48.6 `setFinalValues`

```
void IVirtualSystemDescription::setFinalValues(
    [in] boolean aEnabled[],
    [in] wstring aVBoxValues[],
    [in] wstring aExtraConfigValues[])
```

aEnabled

aVBoxValues

aExtraConfigValues

This method allows the appliance's user to change the configuration for the virtual system descriptions. For each array item returned from `getDescription()`, you must pass in one boolean value and one configuration value.

Each item in the boolean array determines whether the particular configuration item should be enabled. You can only disable items of the types `HardDiskControllerIDE`, `HardDiskControllerSATA`, `HardDiskControllerSCSI`, `HardDiskImage`, `CDROM`, `Floppy`, `NetworkAdapter`, `USBController` and `SoundCard`.

For the "vbox" and "extra configuration" values, if you pass in the same arrays as returned in the `aVBoxValues` and `aExtraConfigValues` arrays from `getDescription()`, the configuration remains unchanged. Please see the documentation for `getDescription()` for valid configuration values for the individual array item types. If the corresponding item in the `aEnabled` array is `false`, the configuration value is ignored.

9.49 `IWebSessionManager`

Note: This interface is supported in the web service only, not in COM/XPCOM.

Web session manager. This provides essential services to webservice clients.

9.49.1 `getSessionObject`

```
ISession IWebSessionManager::getSessionObject(
    [in] IVirtualBox refIVirtualBox)
```

refIVirtualBox

Returns a managed object reference to the internal `ISession` object that was created for this web service session when the client logged on.

See also: `ISession`

9.49.2 logoff

```
void IWebSessionManager::logoff(  
    [in] IVirtualBox refIVirtualBox)
```

refIVirtualBox

Logs off the client who has previously logged on with `logoff()` and destroys all resources associated with the session (most importantly, all managed objects created in the server while the session was active).

9.49.3 logon

```
IVirtualBox IWebSessionManager::logon(  
    [in] wstring username,  
    [in] wstring password)
```

username

password

Logs a new client onto the webservice and returns a managed object reference to the `IVirtualBox` instance, which the client can then use as a basis to further queries, since all calls to the `VirtualBox` API are based on the `IVirtualBox` interface, in one way or the other.

10 Enumerations (enums)

10.1 AccessMode

Access mode for opening files.

ReadOnly

ReadWrite

10.2 AudioControllerType

Virtual audio controller type.

AC97

SB16

10.3 AudioDriverType

Host audio driver type.

Null Null value, also means “dummy audio driver”.

WinMM Windows multimedia (Windows hosts only).

OSS Open Sound System (Linux hosts only).

ALSA Advanced Linux Sound Architecture (Linux hosts only).

DirectSound DirectSound (Windows hosts only).

CoreAudio CoreAudio (Mac hosts only).

MMPM Reserved for historical reasons.

Pulse PulseAudio (Linux hosts only).

SolAudio Solaris audio (Solaris hosts only).

10.4 BIOSBootMenuMode

BIOS boot menu mode.

Disabled

MenuOnly

MessageAndMenu

10.5 CPUPropertyType

Virtual CPU property type. This enumeration represents possible values of the IMachine get- and setCPUProperty methods.

Null Null value (never used by the API).

PAE This setting determines whether VirtualBox will expose the Physical Address Extension (PAE) feature of the host CPU to the guest. Note that in case PAE is not available, it will not be reported.

Synthetic This setting determines whether VirtualBox will expose a synthetic CPU to the guest to allow teleporting between host systems that differ significantly.

10.6 ClipboardMode

Host-Guest clipboard interchange mode.

Disabled

HostToGuest

GuestToHost

Bidirectional

10.7 DataFlags

None

Mandatory

Expert

Array

FlagMask

10.8 DataType

Int32

Int8

String

10.9 DeviceActivity

Device activity for [IConsole::getDeviceActivity\(\)](#).

Null

Idle

Reading

Writing

10.10 DeviceType

Device type.

Null Null value, may also mean “no device” (not allowed for [IConsole::getDeviceActivity\(\)](#)).

Floppy Floppy device.

DVD CD/DVD-ROM device.

HardDisk Hard disk device.

Network Network device.

USB USB device.

SharedFolder Shared folder device.

10.11 FirmwareType

Firmware type.

BIOS BIOS Firmware.

EFI EFI Firmware, bitness detected basing on OS type.

EFI32 Efi firmware, 32-bit.

EFI64 Efi firmware, 64-bit.

EFIDUAL Efi firmware, combined 32 and 64-bit.

10.12 FramebufferPixelFormat

Format of the video memory buffer. Constants represented by this enum can be used to test for particular values of [IFramebuffer::pixelFormat](#). See also [IFramebuffer::requestResize\(\)](#).

See also www.fourcc.org for more information about FOURCC pixel formats.

Opaque Unknown buffer format (the user may not assume any particular format of the buffer).

FOURCC_RGB Basic RGB format ([IFramebuffer::bitsPerPixel](#) determines the bit layout).

10.13 HWVirtExPropertyType

Hardware virtualization property type. This enumeration represents possible values for the [IMachine::getHWVirtExProperty\(\)](#) and [IMachine::setHWVirtExProperty\(\)](#) methods.

Null Null value (never used by the API).

Enabled Whether hardware virtualization (VT-x/AMD-V) is enabled at all. If such extensions are not available, they will not be used.

Exclusive Whether hardware virtualization is used exclusively by VirtualBox. When enabled, VirtualBox assumes it can acquire full and exclusive access to the VT-x or AMD-V feature of the host. To share these with other hypervisors, you must disable this property.

VPID Whether VT-x VPID is enabled. If this extension is not available, it will not be used.

NestedPaging Whether Nested Paging is enabled. If this extension is not available, it will not be used.

LargePages Whether large page allocation is enabled; requires nested paging and a 64 bits host.

Force Whether the VM should fail to start if hardware virtualization (VT-x/AMD-V) cannot be used. If not set, there will be an automatic fallback to software virtualization.

10.14 HostNetworkInterfaceMediumType

Type of encapsulation. Ethernet encapsulation includes both wired and wireless Ethernet connections. See also: IHostNetworkInterface

Unknown The type of interface cannot be determined.

Ethernet Ethernet frame encapsulation.

PPP Point-to-point protocol encapsulation.

SLIP Serial line IP encapsulation.

10.15 HostNetworkInterfaceStatus

Current status of the interface. See also: IHostNetworkInterface

Unknown The state of interface cannot be determined.

Up The interface is fully operational.

Down The interface is not functioning.

10.16 HostNetworkInterfaceType

Network interface type.

Bridged

HostOnly

10.17 KeyboardHidType

Type of keyboard device used in a virtual machine.

None No keyboard.

PS2Keyboard PS/2 keyboard.

USBKeyboard USB keyboard.

ComboKeyboard Combined device, working as PS/2 or USB keyboard, depending on guest behavior. Using of such device can have negative performance implications.

10 Enumerations (enums)

```

+------(same state as before the call)-----+
|
+--> PoweredOff --+
|
|-> Aborted -----+-->[lengthy VM configuration call] --> SettingUp -----+
|
+--> Saved -----+

```

The next two diagrams demonstrate the process of taking a snapshot of a powered off virtual machine, restoring the state to that as of a snapshot or deleting a snapshot, respectively.

```

+------(same state as before the call)-----+
|
+--> PoweredOff --+
|
|      +-->[takeSnapshot()] -----> Saving -----+
+--> Aborted -----+

+--> PoweredOff --+
|
|      Aborted -----+-->[restoreSnapshot() ]-----> RestoringSnapshot --+
|
|      [deleteSnapshot() ]-----> DeletingSnapshot --+
+--> Saved -----+
|
+---(Saved if restored from an online snapshot, PoweredOff otherwise)---+

```

Note that the Saving state is present in both the offline state group and online state group. Currently, the only way to determine what group is assumed in a particular case is to remember the previous machine state: if it was Running or Paused, then Saving is an online state, otherwise it is an offline state. This inconsistency may be removed in one of the future versions of VirtualBox by adding a new state.

Null Null value (never used by the API).

PoweredOff The machine is not running and has no saved execution state; it has either never been started or been shut down successfully.

Saved The machine is not currently running, but the execution state of the machine has been saved to an external file when it was running, from where it can be resumed.

Teleported The machine was teleported to a different host (or process) and then powered off. Take care when powering it on again may corrupt resources it shares with the teleportation target (e.g. disk and network).

Aborted The process running the machine has terminated abnormally. This may indicate a crash of the VM process in host execution context, or the VM process has been terminated externally.

Running The machine is currently being executed.

Paused Execution of the machine has been paused.

Stuck Execution of the machine has reached the “Guru Meditation” condition. This indicates a severe error in the hypervisor itself.

Teleporting The machine is about to be teleported to a different host or process. It is possible to pause a machine in this state, but it will go to the [TeleportingPausedVM](#) state and it will not be possible to resume it again unless the teleportation fails.

LiveSnapshotting A live snapshot is being taken. The machine is running normally, but some of the runtime configuration options are inaccessible. Also, if paused while in this state it will transition to [Saving](#) and it will not be resume the execution until the snapshot operation has completed.

Starting Machine is being started after powering it on from a zero execution state.

Stopping Machine is being normally stopped powering it off, or after the guest OS has initiated a shutdown sequence.

Saving Machine is saving its execution state to a file, or an online snapshot of the machine is being taken.

Restoring Execution state of the machine is being restored from a file after powering it on from the saved execution state.

TeleportingPausedVM The machine is being teleported to another host or process, but it is not running. This is the paused variant of the [Teleporting](#) state.

TeleportingIn Teleporting the machine state in from another host or process.

DeletingSnapshotOnline Like [DeletingSnapshot](#), but the merging of media is ongoing in the background while the machine is running.

DeletingSnapshotPaused Like [DeletingSnapshotOnline](#), but the machine was paused when the merging of differencing media was started.

RestoringSnapshot A machine snapshot is being restored; this typically does not take long.

DeletingSnapshot A machine snapshot is being deleted; this can take a long time since this may require merging differencing media. This value indicates that the machine is not running while the snapshot is being deleted.

SettingUp Lengthy setup operation is in progress.

FirstOnline Pseudo-state: first online state (for use in relational expressions).

LastOnline Pseudo-state: last online state (for use in relational expressions).

FirstTransient Pseudo-state: first transient state (for use in relational expressions).

LastTransient Pseudo-state: last transient state (for use in relational expressions).

10.19 MediumFormatCapabilities

Medium format capability flags.

Uuid Supports UUIDs as expected by VirtualBox code.

CreateFixed Supports creating fixed size images, allocating all space instantly.

CreateDynamic Supports creating dynamically growing images, allocating space on demand.

CreateSplit2G Supports creating images split in chunks of a bit less than 2 GBytes.

Differencing Supports being used as a format for differencing media (see [IMedium::createDiffStorage\(\)](#)).

Asynchronous Supports asynchronous I/O operations for at least some configurations.

File The format backend operates on files (the [IMedium::location](#) attribute of the medium specifies a file used to store medium data; for a list of supported file extensions see [IMediumFormat::fileExtensions\[\]](#)).

Properties The format backend uses the property interface to configure the storage location and properties (the [IMediumFormat::describeProperties\(\)](#) method is used to get access to properties supported by the given medium format).

CapabilityMask

10.20 MediumState

Virtual medium state. See also: [IMedium](#)

NotCreated Associated medium storage does not exist (either was not created yet or was deleted).

Created Associated storage exists and accessible; this gets set if the accessibility check performed by [IMedium::refreshState\(\)](#) was successful.

LockedRead Medium is locked for reading (see [IMedium::lockRead\(\)](#)), no data modification is possible.

LockedWrite Medium is locked for writing (see [IMedium::lockWrite\(\)](#)), no concurrent data reading or modification is possible.

Inaccessible Medium accessibility check (see [IMedium::refreshState\(\)](#)) has not yet been performed, or else, associated medium storage is not accessible. In the first case, [IMedium::lastAccessError](#) is empty, in the second case, it describes the error that occurred.

Creating Associated medium storage is being created.

Deleting Associated medium storage is being deleted.

10.21 MediumType

Virtual medium type. See also: [IMedium](#)

Normal Normal medium (attached directly or indirectly, preserved when taking snapshots).

Immutable Immutable medium (attached indirectly, changes are wiped out the next time the virtual machine is started).

Writethrough Write through medium (attached directly, ignored when taking snapshots).

Shareable Allow using this medium concurrently by several machines.

Note: Present since VirtualBox 3.2.0 , and accepted since 3.2.8 .
--

10.22 MediumVariant

Virtual medium image variant. More than one flag may be set. See also: IMedium

Standard No particular variant requested, results in using the backend default.

VmdkSplit2G VMDK image split in chunks of less than 2GByte.

VmdkStreamOptimized VMDK streamOptimized image. Special import/export format which is read-only/append-only.

VmdkESX VMDK format variant used on ESX products.

Fixed Fixed image. Only allowed for base images.

Diff Differencing image. Only allowed for child images.

10.23 MouseButtonState

Mouse button state.

LeftButton

RightButton

MiddleButton

WheelUp

WheelDown

XButton1

XButton2

MouseButtonMask

10.24 NATAliasMode

AliasLog

AliasProxyOnly

AliasUseSamePorts

10.25 NATProtocol

Protocol definitions used with NAT port-forwarding rules.

UDP Port-forwarding uses UDP protocol.

TCP Port-forwarding uses TCP protocol.

10.26 NetworkAdapterType

Network adapter type.

Null Null value (never used by the API).

Am79C970A AMD PCNet-PCI II network card (Am79C970A).

Am79C973 AMD PCNet-FAST III network card (Am79C973).

I82540EM Intel PRO/1000 MT Desktop network card (82540EM).

I82543GC Intel PRO/1000 T Server network card (82543GC).

I82545EM Intel PRO/1000 MT Server network card (82545EM).

Virtio Virtio network device.

10.27 NetworkAttachmentType

Network attachment type.

Null Null value, also means “not attached”.

NAT

Bridged

Internal

HostOnly

VDE

10.28 PointingHidType

Type of pointing device used in a virtual machine.

None No mouse.

PS2Mouse PS/2 auxillary device, a.k.a. mouse.

USBMouse USB mouse (relative pointer).

USBTablet USB tablet (absolute pointer).

ComboMouse Combined device, working as PS/2 or USB mouse, depending on guest behavior.
Using of such device can have negative performance implications.

10.29 PortMode

The PortMode enumeration represents possible communication modes for the virtual serial port device.

Disconnected Virtual device is not attached to any real host device.

HostPipe Virtual device is attached to a host pipe.

HostDevice Virtual device is attached to a host device.

RawFile Virtual device is attached to a raw file.

10.30 ProcessorFeature

CPU features.

HWVirtEx

PAE

LongMode

NestedPaging

10.31 Scope

Scope of the operation.

A generic enumeration used in various methods to define the action or argument scope.

Global

Machine

Session

10.32 SessionState

Session state. This enumeration represents possible values of [IMachine::sessionState](#) and [ISession::state](#) attributes. See individual enumerator descriptions for the meaning for every value.

Null Null value (never used by the API).

Closed The machine has no open sessions ([IMachine::sessionState](#)); the session is closed ([ISession::state](#))

Open The machine has an open direct session ([IMachine::sessionState](#)); the session is open ([ISession::state](#))

Spawning A new (direct) session is being opened for the machine as a result of [IVirtualBox::openRemoteSession\(\)](#) call ([IMachine::sessionState](#) or [ISession::state](#)). This state also occurs as a short transient state when a new direct session is opened by calling [IVirtualBox::openSession\(\)](#).

Closing The direct session is being closed ([IMachine::sessionState](#)); the session is being closed ([ISession::state](#))

10.33 SessionType

Session type. This enumeration represents possible values of the [ISession::type](#) attribute.

Null Null value (never used by the API).

Direct Direct session (opened by [IVirtualBox::openSession\(\)](#))

Remote Remote session (opened by [IVirtualBox::openRemoteSession\(\)](#))

Existing Existing session (opened by [IVirtualBox::openExistingSession\(\)](#))

10.34 SettingsVersion

Settings version of VirtualBox settings files. This is written to the “version” attribute of the root “VirtualBox” element in the settings file XML and indicates which VirtualBox version wrote the file.

Null Null value, indicates invalid version.

v1_0 Legacy settings version, not currently supported.

v1_1 Legacy settings version, not currently supported.

v1_2 Legacy settings version, not currently supported.

v1_3pre Legacy settings version, not currently supported.

v1_3 Settings version “1.3”, written by VirtualBox 2.0.12.

v1_4 Intermediate settings version, understood by VirtualBox 2.1.x.

v1_5 Intermediate settings version, understood by VirtualBox 2.1.x.

v1_6 Settings version “1.6”, written by VirtualBox 2.1.4 (at least).

v1_7 Settings version “1.7”, written by VirtualBox 2.2.x and 3.0.x.

v1_8 Intermediate settings version “1.8”, understood by VirtualBox 3.1.x.

v1_9 Settings version “1.9”, written by VirtualBox 3.1.x.

v1_10 Settings version “1.10”, written by VirtualBox 3.2.x.

Future Settings version greater than “1.10”, written by a future VirtualBox version.

10.35 StorageBus

The bus type of the storage controller (IDE, SATA, SCSI, SAS or Floppy); see [IStorageController::bus](#).

Null null value. Never used by the API.

IDE

SATA

SCSI

Floppy

SAS

10.36 StorageControllerType

The exact variant of storage controller hardware presented to the guest; see [IStorageController::controllerType](#).

Null null value. Never used by the API.

LsiLogic A SCSI controller of the LsiLogic variant.

BusLogic A SCSI controller of the BusLogic variant.

IntelAhci An Intel AHCI SATA controller; this is the only variant for SATA.

PIIX3 An IDE controller of the PIIX3 variant.

PIIX4 An IDE controller of the PIIX4 variant.

ICH6 An IDE controller of the ICH6 variant.

I82078 A floppy disk controller; this is the only variant for floppy drives.

LsiLogicSas A variant of the LsiLogic controller using SAS.

10.37 USBDeviceFilterAction

Actions for host USB device filters. See also: [IHostUSBDeviceFilter](#), [USBDeviceState](#)

Null Null value (never used by the API).

Ignore Ignore the matched USB device.

Hold Hold the matched USB device.

10.38 USBDeviceState

USB device state. This enumeration represents all possible states of the USB device physically attached to the host computer regarding its state on the host computer and availability to guest computers (all currently running virtual machines).

Once a supported USB device is attached to the host, global USB filters ([IHost::USBDeviceFilters\[\]](#)) are activated. They can either ignore the device, or put it to `USBDeviceState_Held` state, or do nothing. Unless the device is ignored by global filters, filters of all currently running guests ([IUSBController::deviceFilters\[\]](#)) are activated that can put it to `USBDeviceState_Captured` state.

If the device was ignored by global filters, or didn't match any filters at all (including guest ones), it is handled by the host in a normal way. In this case, the device state is determined by the host and can be one of `USBDeviceState_Unavailable`, `USBDeviceState_Busy` or `USBDeviceState_Available`, depending on the current device usage.

Besides auto-capturing based on filters, the device can be manually captured by guests ([IConsole::attachUSBDevice\(\)](#)) if its state is `USBDeviceState_Busy`, `USBDeviceState_Available` or `USBDeviceState_Held`.

Note: Due to differences in USB stack implementations in Linux and Win32, states `USBDeviceState_Busy` and `USBDeviceState_Available` are applicable only to the Linux version of the product. This also means that ([IConsole::attachUSBDevice\(\)](#)) can only succeed on Win32 if the device state is `USBDeviceState_Held`.

See also: [IHostUSBDevice](#), [IHostUSBDeviceFilter](#)

NotSupported Not supported by the VirtualBox server, not available to guests.

Unavailable Being used by the host computer exclusively, not available to guests.

Busy Being used by the host computer, potentially available to guests.

Available Not used by the host computer, available to guests (the host computer can also start using the device at any time).

Held Held by the VirtualBox server (ignored by the host computer), available to guests.

Captured Captured by one of the guest computers, not available to anybody else.

10.39 VFSFileType

File types known by VFSExplorer.

Unknown

Fifo

DevChar

Directory

DevBlock

File

SymLink

Socket

WhiteOut

10.40 VFSType

Virtual file systems supported by VFSExplorer.

File

Cloud

S3

WebDav

10.41 VRDPAuthType

VRDP authentication type.

Null Null value, also means “no authentication”.

External

Guest

10.42 VirtualSystemDescriptionType

Used with [IVirtualSystemDescription](#) to describe the type of a configuration value.

Ignore

OS

Name

Product

Vendor

Version

ProductUrl

VendorUrl

Description

License

Miscellaneous

CPU

Memory

HardDiskControllerIDE

HardDiskControllerSATA

HardDiskControllerSCSI

HardDiskControllerSAS

HardDiskImage

Floppy

CDROM

NetworkAdapter

USBController

SoundCard

10.43 VirtualSystemDescriptionValueType

Used with [IVirtualSystemDescription::getValuesByType\(\)](#) to describe the value type to fetch.

Reference

Original

Auto

ExtraConfig

11 Host-Guest Communication Manager

The VirtualBox Host-Guest Communication Manager (HGCM) allows a guest application or a guest driver to call a host shared library. The following features of VirtualBox are implemented using HGCM:

- Shared Folders
- Shared Clipboard
- Guest configuration interface

The shared library contains a so called HGCM service. The guest HGCM clients establish connections to the service to call it. When calling a HGCM service the client supplies a function code and a number of parameters for the function.

11.1 Virtual Hardware Implementation

HGCM uses the VMM virtual PCI device to exchange data between the guest and the host. The guest always acts as an initiator of requests. A request is constructed in the guest physical memory, which must be locked by the guest. The physical address is passed to the VMM device using a 32 bit out `edx, eax` instruction. The physical memory must be allocated below 4GB by 64 bit guests.

The host parses the request header and data and queues the request for a host HGCM service. The guest continues execution and usually waits on a HGCM event semaphore.

When the request has been processed by the HGCM service, the VMM device sets the completion flag in the request header, sets the HGCM event and raises an IRQ for the guest. The IRQ handler signals the HGCM event semaphore and all HGCM callers check the completion flag in the corresponding request header. If the flag is set, the request is considered completed.

11.2 Protocol Specification

The HGCM protocol definitions are contained in the `VBox/VBoxGuest.h`

11.2.1 Request Header

HGCM request structures contains a generic header (`VMMDevHGCMRequestHeader`):

Name	Description
size	Size of the entire request.
version	Version of the header, must be set to <code>0x10001</code> .
type	Type of the request.
rc	HGCM return code, which will be set by the VMM device.
reserved1	A reserved field 1.
reserved2	A reserved field 2.
flags	HGCM flags, set by the VMM device.
result	The HGCM result code, set by the VMM device.

<p>Note:</p> <ul style="list-style-type: none"> • All fields are 32 bit. • Fields from size to reserved2 are a standard VMM device request header, which is used for other interfaces as well.

The **type** field indicates the type of the HGCM request:

Name (decimal value)	Description
VMMDe-vReq_HGCMConnect (60)	Connect to a HGCM service.
VMMDe-vReq_HGCMDisconnect (61)	Disconnect from the service.
VMMDe-vReq_HGCMCall32 (62)	Call a HGCM function using the 32 bit interface.
VMMDe-vReq_HGCMCall64 (63)	Call a HGCM function using the 64 bit interface.
VMMDe-vReq_HGCMCancel (64)	Cancel a HGCM request currently being processed by a host HGCM service.

The **flags** field may contain:

Name (hexadecimal value)	Description
VBOX_HGCM_REQ_DONE (0x00000001)	The request has been processed by the host service.
VBOX_HGCM_REQ_CANCELLED (0x00000002)	This request was cancelled.

11.2.2 Connect

The connection request must be issued by the guest HGCM client before it can call the HGCM service (VMMDevHGCMConnect):

Name	Description
header	The generic HGCM request header with type equal to VMMDevReq_HGCMConnect (60).
type	The type of the service location information (32 bit).
location	The service location information (128 bytes).
clientId	The client identifier assigned to the connecting client by the HGCM subsystem (32 bit).

The **type** field tells the HGCM how to look for the requested service:

Name (hexadecimal value)	Description
VMMDevHGCM-Loc_LocalHost (0x1)	The requested service is a shared library located on the host and the location information contains the library name.
VMMDevHGCM-Loc_LocalHost_Existing (0x2)	The requested service is a preloaded one and the location information contains the service name.

Note: Currently preloaded HGCM services are hard-coded in VirtualBox:

- VBoxSharedFolders
- VBoxSharedClipboard
- VBoxGuestPropSvc
- VBoxSharedOpenGL

There is no difference between both types of HGCM services, only the location mechanism is different.

The client identifier is returned by the host and must be used in all subsequent requests by the client.

11.2.3 Disconnect

This request disconnects the client and makes the client identifier invalid (VMMDevHGCMDisconnect):

Name	Description
header	The generic HGCM request header with type equal to VMMDevReq_HGCMDisconnect (61).
clientId	The client identifier previously returned by the connect request (32 bit).

11.2.4 Call32 and Call64

Calls the HGCM service entry point (VMMDevHGCMCall) using 32 bit or 64 bit addresses:

Name	Description
header	The generic HGCM request header with type equal to either VMMDevReq_HGCMCall32 (62) or VMMDevReq_HGCMCall64 (63).
clientId	The client identifier previously returned by the connect request (32 bit).
function	The function code to be processed by the service (32 bit).
cParms	The number of following parameters (32 bit). This value is 0 if the function requires no parameters.
parms	An array of parameter description structures (HGCMFunctionParameter32 or HGCMFunctionParameter64).

The 32 bit parameter description (HGCMFunctionParameter32) consists of 32 bit type field and 8 bytes of an opaque value, so 12 bytes in total. The 64 bit variant (HGCMFunctionParameter64) consists of the type and 12 bytes of a value, so 16 bytes in total.

Type	Format of the value
VMMDevHGCMParamType_32bit (1)	A 32 bit value.
VMMDevHGCMParamType_64bit (2)	A 64 bit value.
VMMDevHGCMParamType_PhysAddr (3)	A 32 bit size followed by a 32 bit or 64 bit guest physical address.
VMMDevHGCMParamType_LinAddr (4)	A 32 bit size followed by a 32 bit or 64 bit guest linear address. The buffer is used both for guest to host and for host to guest data.
VMMDevHGCMParamType_LinAddr_In (5)	Same as VMMDevHGCMParamType_LinAddr but the buffer is used only for host to guest data.
VMMDevHGCMParamType_LinAddr_Out (6)	Same as VMMDevHGCMParamType_LinAddr but the buffer is used only for guest to host data.
VMMDevHGCMParamType_LinAddr_Locked (7)	Same as VMMDevHGCMParamType_LinAddr but the buffer is already locked by the guest.
VMMDevHGCMParamType_LinAddr_Locked_In (1)	Same as VMMDevHGCMParamType_LinAddr_In but the buffer is already locked by the guest.
VMMDevHGCMParamType_LinAddr_Locked_Out (1)	Same as VMMDevHGCMParamType_LinAddr_Out but the buffer is already locked by the guest.

The

11.2.5 Cancel

This request cancels a call request (VMMDevHGCMCancel):

Name	Description
header	The generic HGCM request header with type equal to VMMDevReq_HGCMCancel (64).

11.3 Guest Software Interface

The guest HGCM clients can call HGCM services from both drivers and applications.

11.3.1 The Guest Driver Interface

The driver interface is implemented in the VirtualBox guest additions driver (VBoxGuest), which works with the VMM virtual device. Drivers must use the VBox Guest Library (VBGL), which provides an API for HGCM clients (VBox/VBoxGuestLib.h and VBox/VBoxGuest.h).

```
DECLVBGL(int) VbglHGCMConnect (VBGLHGCMHANDLE *pHandle, VBoxGuestHGCMConnectInfo *pData);
```

Connects to the service:

11 Host-Guest Communication Manager

```
VBoxGuestHGCMConnectInfo data;

memset (&data, sizeof (VBoxGuestHGCMConnectInfo));

data.result = VINF_SUCCESS;
data.Loc.type = VMMDevHGCMLoc_LocalHost_Existing;
strcpy (data.Loc.u.host.achName, "VBoxSharedFolders");

rc = VbglHGCMConnect (&handle, &data);

if (RT_SUCCESS (rc))
{
    rc = data.result;
}

if (RT_SUCCESS (rc))
{
    /* Get the assigned client identifier. */
    ulClientID = data.u32ClientID;
}
```

```
DECLVBGL(int) VbglHGCMDisconnect (VBGLHGCMHANDLE handle, VBoxGuestHGCMDisconnectInfo *pData);
```

Disconnects from the service.

```
VBoxGuestHGCMDisconnectInfo data;

RtlZeroMemory (&data, sizeof (VBoxGuestHGCMDisconnectInfo));

data.result = VINF_SUCCESS;
data.u32ClientID = ulClientID;

rc = VbglHGCMDisconnect (handle, &data);
```

```
DECLVBGL(int) VbglHGCMCall (VBGLHGCMHANDLE handle, VBoxGuestHGCMCallInfo *pData, uint32_t cbData);
```

Calls a function in the service.

```
typedef struct _VBoxSFRead
{
    VBoxGuestHGCMCallInfo callInfo;

    /** pointer, in: SHFLROOT
     * Root handle of the mapping which name is queried.
     */
    HGCMFunctionParameter root;

    /** value64, in:
     * SHFLHANDLE of object to read from.
     */
    HGCMFunctionParameter handle;

    /** value64, in:
     * Offset to read from.
     */
    HGCMFunctionParameter offset;

    /** value64, in/out:
```

11 Host-Guest Communication Manager

```
    * Bytes to read/How many were read.
    */
    HGCMFunctionParameter cb;

    /** pointer, out:
    * Buffer to place data to.
    */
    HGCMFunctionParameter buffer;
} VBoxSFRead;

/** Number of parameters */
#define SHFL_CPARGS_READ (5)

...

VBoxSFRead data;

/* The call information. */
data.callInfo.result      = VINF_SUCCESS;      /* Will be returned by HGCM. */
data.callInfo.u32ClientID = ulClientID;      /* Client identifier. */
data.callInfo.u32Function = SHFL_FN_READ;     /* The function code. */
data.callInfo.cParms      = SHFL_CPARGS_READ; /* Number of parameters. */

/* Initialize parameters. */
data.root.type            = VMMDevHGCMParamType_32bit;
data.root.u.value32      = pMap->root;

data.handle.type          = VMMDevHGCMParamType_64bit;
data.handle.u.value64     = hFile;

data.offset.type          = VMMDevHGCMParamType_64bit;
data.offset.u.value64    = offset;

data.cb.type              = VMMDevHGCMParamType_32bit;
data.cb.u.value32        = *pcbBuffer;

data.buffer.type          = VMMDevHGCMParamType_LinAddr_Out;
data.buffer.u.Pointer.size = *pcbBuffer;
data.buffer.u.Pointer.u.linearAddr = (uintptr_t)pBuffer;

rc = VbglHGCMCall (handle, &data.callInfo, sizeof (data));

if (RT_SUCCESS (rc))
{
    rc = data.callInfo.result;
    *pcbBuffer = data.cb.u.value32; /* This is returned by the HGCM service. */
}
}
```

11.3.2 Guest Application Interface

Applications call the VirtualBox Guest Additions driver to utilize the HGCM interface. There are IOCTL's which correspond to the Vbgl* functions:

- VBOXGUEST_IOCTL_HGCM_CONNECT
- VBOXGUEST_IOCTL_HGCM_DISCONNECT
- VBOXGUEST_IOCTL_HGCM_CALL

These IOCTL's get the same input buffer as VbglHGCM* functions and the output buffer has the same format as the input buffer. The same address can be used as the input and output buffers.

For example see the guest part of shared clipboard, which runs as an application and uses the HGCM interface.

11.4 HGCM Service Implementation

The HGCM service is a shared library with a specific set of entry points. The library must export the `VBoxHGCMSvcLoad` entry point:

```
extern "C" DECLCALLBACK(DECLXPORT(int)) VBoxHGCMSvcLoad (VBOXHGCMSCVFNTABLE *ptable)
```

The service must check the `ptable->cbSize` and `ptable->u32Version` fields of the input structure and fill the remaining fields with function pointers of entry points and the size of the required client buffer size.

The HGCM service gets a dedicated thread, which calls service entry points synchronously, that is the service will be called again only when a previous call has returned. However, the guest calls can be processed asynchronously. The service must call a completion callback when the operation is actually completed. The callback can be issued from another thread as well.

Service entry points are listed in the `VBox/hgcmvc.h` in the `VBOXHGCMSCVFNTABLE` structure.

Entry	Description
<code>pf-nUn-load</code>	The service is being unloaded.
<code>pfn-Con-nect</code>	A client <code>u32ClientID</code> is connected to the service. The <code>pvClient</code> parameter points to an allocated memory buffer which can be used by the service to store the client information.
<code>pfnDis-con-nect</code>	A client is being disconnected.
<code>pfn-Call</code>	A guest client calls a service function. The <code>callHandle</code> must be used in the <code>VBOXHGCMSCVHELPER::pfnCallComplete</code> callback when the call has been processed.
<code>pfn-Host-Call</code>	Called by the VirtualBox host components to perform functions which should be not accessible by the guest. Usually this entry point is used by VirtualBox to configure the service.
<code>pfn-SaveS-tate</code>	The VM state is being saved and the service must save relevant information using the SSM API (<code>VBox/ssm.h</code>).
<code>pfn-Load-State</code>	The VM is being restored from the saved state and the service must load the saved information and be able to continue operations from the saved state.

12 RDP Web Control

The VirtualBox *RDP Web Control* (RDPWeb) provides remote access to a running VM. RDPWeb is a RDP (Remote Desktop Protocol) client based on Flash technology and can be used from a Web browser with a Flash plugin.

12.1 RDPWeb features

RDPWeb is embedded into a Web page and can connect to VRDP server in order to displays the VM screen and pass keyboard and mouse events to the VM.

12.2 RDPWeb reference

RDPWeb consists of two required components:

- Flash movie `RDPClientUI.swf`
- JavaScript helpers `webclient.js`

The VirtualBox SDK contains sample HTML code including:

- JavaScript library for embedding Flash content `SWFObject.js`
- Sample HTML page `webclient3.html`

12.2.1 RDPWeb functions

`RDPClientUI.swf` and `webclient.js` work with each other. JavaScript code is responsible for a proper SWF initialization, delivering mouse events to the SWF and processing resize requests from the SWF. On the other hand, the SWF contains a few JavaScript callable methods, which are used both from `webclient.js` and the user HTML page.

12.2.1.1 JavaScript functions

`webclient.js` contains helper functions. In the following table `ElementId` refers to an HTML element name or attribute, and `Element` to the HTML element itself. HTML code

```
<div id="FlashRDP">
</div>
```

would have `ElementId` equal to `FlashRDP` and `Element` equal to the `div` element.

- `RDPWebClient.embedSWF(SWFFileName, ElementId)`
Uses `SWFObject` library to replace the HTML element with the Flash movie.
- `RDPWebClient.isRDPWebControlById(ElementId)`
Returns true if the given id refers to a RDPWeb Flash element.

- `RDPWebClient.isRDPWebControlByElement(Element)`
Returns true if the given element is a RDPWeb Flash element.
- `RDPWebClient.getFlashById(ElementId)`
Returns an element, which is referenced by the given id. This function will try to resolve any element, even if it is not a Flash movie.

12.2.1.2 Flash methods callable from JavaScript

`RDPWebClientUI.swf` methods can be called directly from JavaScript code on a HTML page.

- `getProperty(Name)`
.
- `setProperty(Name)`
.
- `connect()`
.
- `disconnect()`
.
- `keyboardSendCAD()`
.
- `keyboardSendScancodes(Scancodes)`
.

12.2.1.3 Flash JavaScript callbacks

`RDPWebClientUI.swf` calls JavaScript functions provided by the HTML page.

12.2.2 Embedding RDPWeb in a HTML page

It is necessary to include `webclient.js` helper script. If `SWFObject` library is used, the `swfobject.js` must be also included and RDPWeb flash content can be embedded to a Web page using dynamic HTML. The HTML must include a “placeholder”, which consists of 2 div elements.

12.3 RDPWeb change log

12.3.1 Version 1.2.28

- `keyboardLayout`, `keyboardLayouts`, `UUID` properties.
- Support for German keyboard layout on the client.
- Rebranding to Oracle.

12.3.2 Version 1.1.26

- `webclient.js` is a part of the distribution package.
- `lastError` property.
- `keyboardSendScancodes` and `keyboardSendCAD` methods.

12.3.3 Version 1.0.24

- Initial release.