ISO/IEC 19099:2014-05 (E)

Information technology - Virtualization Management Specification

Contents

Page

Foreword ix
Introduction 1
1 Scope 3
1.1 Resource Allocation Profile 3
1.2 System Virtualization Profile 3
1.3 Allocation Capabilities Profile 3
1.4 Processor Resource Virtualization Profile 3
1.5 Memory Resource Virtualization Profile 3
1.6 Storage Resource Virtualization Profile 3
1.7 Ethernet Port Resource Virtualization Profile 3
1.8 Virtual System Profile 3
1.9 Generic Device Resource Virtualization Profile 3
1.10 Virtual Ethernet Switch Profile 4
2 Normative references 4
3 Terms and definitions 5
4 Symbols and abbreviated terms 12
5 Resource Allocation Profile 14
5.1 Description 14
5.2 Implementation 18
5.3 Methods 27
5.4 Use cases 35
5.5 CIM elements 40
6 System Virtualization Profile 52
6.1 Description 52
6.2 Implementation 59
6.3 Methods 67
6.4 Use cases 84
6.5 CIM elements 110
7 Allocation Capabilities Profile 126
7.1 Description 126
7.2 Implementation 129
7.3 Methods 130
7.4 Use cases 134
7.5 CIM elements 139
8 Processor Resource Virtualization Profile 144
8.1 Description 144
8.2 Implementation 149
8.3 Methods 157
8.4 Use cases 158
8.5 CIM elements 168
9 Memory Resource Virtualization Profile 178
9.1 Description (informative) 178
9.2 Implementation 186
9.3 Methods 198
9.4 Use cases (informative) 198
9.5 CIM elements 207
10 Storage Resource Virtualization Profile 221
10.1 Description 222
10.2 Implementation 234
10.3 Methods 251
10.4 Use cases 253
10.5 CIM Elements 270
11 Ethernet Port Resource Virtualization Profile 282
11.1 Description 282
11.2 Implementation 291
11.3 Methods 303

11.4 Use cases 304
11.5 CIM elements 318
12 Virtual System Profile 341
12.1 Description 341
12.2 Implementation 350
12.3 Methods 360
12.4 Use-cases 363
12.5 CIM elements 374
13 Generic Device Resource Virtualization Profile 381
13.1 Description 381
13.2 Implementation 383
13.3 Methods 383
13.4 Use cases 383
13.5 CIM elements 388
14 Virtual Ethernet Switch Profile 390
14.1 Description 390
14.2 Implementation 394
14.3 Methods 395
14.4 Use cases 397
14.5 CIM elements 400
Annex A (Informative) Virtual system modeling — background information 407
A.1 Concepts: Model, view, controller 407
A.2 Aspect-oriented modeling approach 407
A.3 Presence of model information 408
A.4 Model extension through settings 409
Annex B (Informative) Implementation details 410
B.1 Dual-configuration implementation approach 410
B.2 Single-configuration implementation approach 413

Figures

Figure 1 – Resource Allocation Profile: Class Diagram 15
Figure 2 – Abstract instance diagram: Concrete resource pool 35
Figure 3 – Abstract instance diagram: Primordial pool with backed resources 36
Figure 4 – Abstract instance diagram: Primordial pool without backed resources 36
Figure 5 – Resource pool hierarchy instance diagram 37
Figure 6 – Simple resource allocation 38
Figure 7 – Profiles related to system virtualization 54
Figure 8 – System Virtualization Profile: Class diagram 56
Figure 9 – System Virtualization Profile instance diagram: Discovery, localization, and inspection 86
Figure 10 – Virtual system configuration based on input virtual system configurations and implementation defaults 98
Figure 11 – Virtual system resource modification 102
Figure 12 – System Virtualization Profile: Snapshot example 105
Figure 13 – Allocation Capabilities Profile: Class diagram 127
Figure 14 – Allocation capabilities associated to CIM_ComputerSystem and CIM_ResourcePool 135
Figure 15 – Allocation capabilities associated to CIM_ResourceAllocationSettingData 136
Figure 16 – Multiple CIM_AllocationCapabilities instances 137
Figure 17 – Processor Resource Virtualization Profile: Class Diagram 145
Figure 18 – Processor Resource Virtualization Profile: Instance diagram 159
Figure 19 – Defined state 160
Figure 20 – Active state 161
Figure 21 – CIM_ModifyResourceSettings – Before 163
Figure 22 – RASD to Modify Resources 164

Figure 23 – CIM_ModifyResourceSettings – After 165
Figure 24 – CIM_AddResourceSettings – Before 166
Figure 25 – RASD to add processor 167
Figure 26 – CIM_AddResourceSettings – After 168
Figure 27 – Memory Resource Virtualization Profile: Profile class diagram 179
Figure 28 – Instance Diagram: Concept of memory resource pool hierarchies 181
Figure 29 – Instance Diagram: Concept of memory resource allocation 183
Figure 30 – Instance Diagram: Memory composition 185
Figure 31 – Instance Diagram: Example CIM representation of memory resource virtualization 200
Figure 32 – Storage Resource Virtualization Profile: Profile class diagram 223
Figure 33 – Instance diagram: Concept of storage resource pool hierarchies 227
Figure 34 – Instance diagram: Concept of storage resource allocation 230
Figure 35 – Cooperation of DMTF SVPC and SNIA SMI-S profiles 233
Figure 36 – Instance diagram: Example CIM representation of storage resource virtualization 254
Figure 37 – Create virtual disk with implicit file creation 263
Figure 38 – Create virtual disk with pre-existing file 265
Figure 39 – Create dedicated virtual disk 267
Figure 40 – Create virtual delta disk and file 269
Figure 41 – Ethernet Port Resource Virtualization: Profile class diagram 283
Figure 42 – Virtual ethernet switch port allocation 287
Figure 43 – Instance Diagram: Ethernet adapter and Ethernet connection resource allocations 289
Figure 44 – Ethernet switch port and Ethernet connection resource pools 306
Figure 45 – Static Ethernet switch port allocation to a virtual Ethernet switch 308
Figure 46 – Ethernet adapter connection to static switch port 310
Figure 47 – Dynamic Ethernet switch port connection capabilities 313
Figure 48 – Dynamic Ethernet switch port allocation 314
Figure 49 – Allocation capabilities for simple Ethernet connection 315
Figure 50 – Simple connection of virtual machine to Ethernet switch 316
Figure 51 – Profiles related to system virtualization 343
Figure 52 – Virtual System Profile: Class diagram 344
Figure 53 – Virtual system states 349
Figure 54 – Virtual system representation and virtual system configuration 354
Figure 55 – Sample virtual system configuration 365
Figure 56 – Sample virtual system in "active" state 367
Figure 57 – Instance diagram: Profile conformance of scoped resources 368
Figure 58 – Generic Device Resource Virtualization: Class diagram 382
Figure 59 – Simple virtual device allocation 384
Figure 60 – Profile registration using central class 385
Figure 61 – Profile registration using scoping class 386
Figure 62 – Determining resource capabilities 387
Figure 63 – DMTF Management profiles related to the virtual Ethernet switch 392
Figure 64 – Virtual Ethernet Switch Profile: Class Diagram 393
Figure 65 – Basic example of virtual Ethernet switch 398
Figure A-1 – State-dependent presence of model elements 408
Figure B-2 – Sample virtual system in a state other than "defined" (Dual-configuration approach) 412
Figure B-3 – Sample virtual system in the "defined" state (Single-configuration approach) 414
Figure B-4 – Sample virtual system in a state other than "defined" (Single-configuration approach) 415

Tables

Table 1 – Component documents 2
Table 2 – Related profiles for the Resource Allocation Profile 14
Table 3 – CIM_ResourcePoolConfigurationService.CreateChildResourcePool( ) method: Return code values 27
Table 4 – CIM_ResourcePoolConfigurationService.CreateChildResourcePool( ) method: Parameters 28
Table 5 – CIM_ResourcePoolConfigurationService.DeleteResourcePool( ) method: Return code values 28
Table 6 – CIM_ResourcePoolConfigurationService.DeleteResourcePool( ) method: Parameters 29
Table 7 – CIM_ResourcePoolConfigurationService.AddResourcesToResourcePool( ) method: Return code values 29
Table 8 – CIM_ResourcePoolConfigurationService.AddResourcesToResourcePool( ) method: Parameters 30
Table 9 – CIM_ResourcePoolConfigurationService.RemoveResourcesFromResourcePool( ) method: Return code values 31
Table 10 – CIM_ResourcePoolConfigurationService.RemoveResourcesFromResourcePool( ) method: Parameters 31
Table 11 – CIM_ResourcePoolConfigurationService.ChangeParentResourcePool( ) method: Return code values 32
Table 12 – CIM_ResourcePoolConfigurationService.ChangeParentResourcePool( ) method: Parameters 32
Table 13 – CIM elements: Resource Allocation Profile 40
Table 14 – Class: CIM_AffectedJobElement 41
Table 15 – Class: CIM_BaseMetricDefinition 41
Table 16 – Class: CIM_BaseMetricDefinition — Instantaneous consumption 42
Table 17 – Class: CIM_BaseMetricDefinition — Interval metrics 42
Table 18 – Class: CIM_BaseMetricDefinition — Aggregate consumption 42
Table 19 – Class: CIM_BaseMetricValue 43
Table 20 – Class: CIM_BaseMetricValue — Instantaneous consumption 43
Table 21 – Class: CIM_BaseMetricValue — Interval metrics 43
Table 22 – Class: CIM_BaseMetricValue — Aggregate consumption 44
Table 23 – Class: CIM_Component 44
Table 24 – Class: CIM_ConcreteJob 44
Table 25 – Class: CIM_ElementAllocatedFromPool 45
Table 26 – Class: CIM_ElementCapabilities 45
Table 27 – Class: CIM_ElementSettingData 45
Table 28 – Class: CIM_HostedDependency 46
Table 29 – Class: CIM_HostedResourcePool 46
Table 30 – Class: CIM_HostedService 46
Table 31 – Class: CIM_LogicalDevice 47
Table 32 – Class: CIM_MetricDefForME 47
Table 33 – Class: CIM_MetricForME 47
Table 34 – Class: CIM_ResourceAllocationFromPool 48
Table 35 – Class: CIM_ResourceAllocationSettingData (current settings) 48
Table 36 – Class: CIM_ResourceAllocationSettingData (defined settings) 49
Table 37 – Class: CIM_ResourcePool 49
Table 38 – Class: CIM_ResourcePoolConfigurationCapabilities 50
Table 39 – Class: CIM_ResourcePoolConfigurationService 50
Table 40 – Class: CIM_SettingsDefineState 51
Table 41 – Class: CIM_ServiceAffectsElement 51
Table 42 – Class: CIM_SystemDevice 51
Table 43 – Related profiles for the System Virtualization Profile 52
Table 44 – DefineSystem( ) method: Parameters 70
Table 45 – DefineSystem( ) method: Return code values 72
Table 46 – DestroySystem( ) method: Parameters 72
Table 47 – DestroySystem( ) method: Return code values 73

Table 48 – AddResourceSettings( ) method: Parameters 73
Table 49 – AddResourceSettings( ) method: Return code values 74
Table 50 – ModifyResourceSettings( ) method: Parameters 75
Table 51 – ModifyResourceSettings( ) Method: Return code values 76
Table 52 – ModifySystemSettings( ) Method: Parameters 76
Table 53 – ModifySystemSettings( ) Method: Return code values 77
Table 54 – RemoveResourceSettings( ) Method: Parameters 78
Table 55 – RemoveResourceSettings( ) Method: Return code values 78
Table 56 – CreateSnapshot( ) method: Parameters 79
Table 57 – CreateSnapshot( ) method: Return code values 80
Table 58 – DestroySnapshot( ) method: Parameters 80
Table 59 – DestroySnapshot( ) method: Return code values 81
Table 60 – ApplySnapshot( ) method: Parameters 81
Table 61 – ApplySnapshot( ) method: Return code values 82
Table 62 – CIM Elements: System Virtualization Profile 110
Table 63 – Association: CIM_AffectedJobElement 111
Table 64 – Class: CIM_ConcreteJob 112
Table 65 – Class: CIM_Dependency Class 112
Table 66 – Association: CIM_ElementCapabilities (host system) 113
Table 67 – Association: CIM_ElementCapabilities (virtual system management) 113
Table 68 – Association: CIM_ElementCapabilities (snapshot service) 114
Table 69 – Association: CIM_ElementCapabilities (snapshots of virtual systems) 114
Table 70 – Association: CIM_ElementConformsToProfile 115
Table 71 – Association: CIM_HostedDependency 115
Table 72 – Association: CIM_HostedService (virtual system management service) 116
Table 73 – Association: CIM_HostedService (virtual system snapshot service) 116
Table 74 – Association: CIM_LastAppliedSnapshot 117
Table 75 – Association: CIM_MostCurrentSnapshotInBranch 117
Table 76 – Association: CIM_ReferencedProfile 118
Table 77 – Class: CIM_RegisteredProfile 118
Table 78 – Association: CIM_ServiceAffectsElement (virtual system management service) 119
Table 79 – Association: CIM_ServiceAffectsElement 120
Table 80 – Association: CIM_SnapshotOfVirtualSystem 120
Table 81 – Class: CIM_VirtualSystemManagementCapabilities 121
Table 82 – Class: CIM_VirtualSystemManagementCapabilities 121
Table 83 – Class: CIM_VirtualSystemManagementService 121
Table 84 – Class: CIM_VirtualSystemSettingData (input) 122
Table 85 – Class: CIM_VirtualSystemSettingData (Snapshot) 123
Table 86 – Class: CIM_VirtualSystemSnapshotCapabilities 124
Table 87 – Class: CIM_VirtualSystemSnapshotService 124
Table 88 – Class: CIM_VirtualSystemSnapshotServiceCapabilities 125
Table 89 – Related profiles for the Allocation Capabilities Profile 126
Table 90 – Operations: CIM_SettingsDefineCapabilities 131
Table 91 – Operations: CIM_ElementCapabilities 134
Table 92 – CIM elements: Allocation Capabilities Profile 139
Table 93 – Class: CIM_AllocationCapabilities 139
Table 94 – Class: CIM_ElementCapabilities 140
Table 95 – Class: CIM_ElementCapabilities (default) 140
Table 96 – Class: CIM_SettingsDefineCapabilities 141
Table 97 – Class: CIM_SettingsDefineCapabilities (Default) 141
Table 98 – Class: CIM_SettingsDefineCapabilities (minimums) 142
Table 99 – Class: CIM_SettingsDefineCapabilities (maximums) 142

Table 100 – Class: CIM_SettingsDefineCapabilities (Increments) 143
Table 101 – Class: CIM_SettingsDefineCapabilities (Independent Supported Point) 143
Table 102 – Related profiles for the Processor Resource Virtualization Profile 144
Table 103 – Acronyms for RASD adapted for the representation of various flavors of allocation data 153
Table 104 – CIM Elements: Processor Resource Virtualization Profile 169
Table 105 – Association: CIM_Component for resource pool 170
Table 106 – Association: CIM_ElementAllocatedFromPool 171
Table 107 – Association: CIM_ElementSettingData 171
Table 108 – Association: CIM_ElementSettingData for processor resource allocation 172
Table 109 – Association: CIM_ElementSettingData (Processor Resource Pool) 172
Table 110 – Association: CIM_HostedDependency 173
Table 111 – Class: CIM_Processor (host processor) 173
Table 112 – Class: CIM_Processor (virtual system) 173
Table 113 – Class: CIM_RegisteredProfile 174
Table 114 – Association: CIM_ResourceAllocationFromPool 174
Table 115 – Class: CIM_ResourceAllocationSettingData 175
Table 116 – Class: CIM_ResourcePool 175
Table 117 – Association: CIM_SettingsDefineState 176
Table 118 – Association: CIM_SystemDevice (Host Processor) 176
Table 119 – Association: CIM_SystemDevice (Virtual Processor) 177
Table 120 – Related profiles for the Memory Resource Virtualization Profile 178
Table 121 – CIM Elements: Memory Resource Virtualization Profile 208
Table 122 – Association: CIM_AffectedJobElement 209
Table 123 – Class: CIM_AllocationCapabilities (memory allocation capabilities) 209
Table 124 – Class: CIM_AllocationCapabilities (memory allocation mutability) 210
Table 125 – Association: CIM_Component (memory resource) 211
Table 126 – Association: CIM_Component (resource pool) 211
Table 127 – Class: CIM_ConcreteJob 212
Table 128 – Association: CIM_ElementAllocatedFromPool 212
Table 129 – Association: CIM_ElementCapabilities (capabilities) 213
Table 130 – Association: CIM_ElementCapabilities (mutability) 213
Table 131 – Association: CIM_ElementSettingData (memory resource pool) 214
Table 132 – Association: CIM_ElementSettingData (memory resource) 214
Table 133 – Association: CIM_HostedDependency 215
Table 134 – Class: CIM_Memory (host system) 215
Table 135 – Class: CIM_Memory (virtual system) 216
Table 136 – Class: CIM_RegisteredProfile 216
Table 137 – Association: CIM_ResourceAllocationFromPool 216
Table 138 – Class: CIM_ResourceAllocationSettingData 217
Table 139 – Class: CIM_ResourcePool 218
Table 140 – Class: CIM_ResourcePoolConfigurationCapabilities 218
Table 141 – Association: CIM_SettingsDefineState 218
Table 142 – Association: CIM_ServiceAffectsElement 219
Table 143 – Association: CIM_SystemDevice (virtual memory) 219
Table 144 – Association: CIM_SystemDevice (host memory) 220
Table 145 – Related profiles for the Storage Resource Virtualization Profile 221
Table 146 – Optional Features 222
Table 147 – Predefined ResourceSubType values (EXPERIMENTAL) 237
Table 148 – Acronyms for RASD adapted for the representation of various flavors of allocation data 241
Table 149 – CIM Elements: Storage Resource Virtualization Profile 270
Table 150 – Association: CIM_Component for resource pool 272
Table 151 – Class: CIM_DiskDrive (Host) 272

Table 152 – Class: CIM_DiskDrive (Virtual System) 272
Table 153 – Association: CIM_ElementSettingData 273
Table 154 – Association: CIM_ElementSettingData 273
Table 155 – Association: CIM_ElementSettingData 274
Table 156 – Association: CIM_ElementSettingData 274
Table 157 – Association: CIM_HostedDependency 275
Table 158 – Class: CIM_LogicalDisk (Virtual System) 275
Table 159 – Association: CIM_ReferencedProfile 277
Table 160 – Class: CIM_RegisteredProfile 277
Table 161 – Class: CIM_ResourceAllocationSettingData 277
Table 162 – Class: CIM_ResourcePool 278
Table 163 – Association: CIM_SettingsDefineState 279
Table 164 – Class: CIM_StorageAllocationSettingData 279
Table 165 – Class: CIM_StorageVolume for host storage volume 280
Table 166 – Class: CIM_StorageExtent for virtual disks 281
Table 167 – Association: CIM_SystemDevice for host storage volumes 281
Table 168 – Association: CIM_SystemDevice for virtual resources 281
Table 169 – Related profiles for the Ethernet Port Resource Virtualization Profile 282
Table 170 – Acronyms for EASD adapted for the representation of various flavors of allocation data 295
Table 171 – CIM Elements: Ethernet Port Resource Virtualization Profile 318
Table 172 – Association: CIM_ActiveConnection 320
Table 173 – Association: CIM_Component for resource pool 321
Table 174 – Association: CIM_ElementAllocatedFromPool 321
Table 175 – Association: CIM_ElementSettingData for connection resources 322
Table 176 – Association: CIM_ElementSettingData for CIM_EthernetPort resource allocation 322
Table 177 – Association: CIM_ElementSettingData for CIM_EthernetPort resource allocation 323
Table 178 – Class: CIM_EthernetPort (host system) 323
Table 179 – Class: CIM_EthernetPort (virtual system) 323
Table 180 – Class: CIM_EthernetPortAllocationSettingData for Ethernet adapter (Q_EASD) 324
Table 181 – Class: CIM_EthernetPortAllocationSettingData for Ethernet adapter (R_EASD) 324
Table 182 – Class: CIM_EthernetPortAllocationSettingData for Ethernet adapter (C_EASD) 325
Table 183 – Class: CIM_EthernetPortAllocationSettingData for Ethernet adapter (D_EASD) 326
Table 184 – Class: CIM_EthernetPortAllocationSettingData for Ethernet adapter (M_EASD) 327
Table 185 – Class: CIM_EthernetPortAllocationSettingData for Ethernet connection (Q_EASD) 328
Table 186 – Class: CIM_EthernetPortAllocationSettingData for Ethernet connection (R_EASD) 329
Table 187 – Class: CIM_EthernetPortAllocationSettingData for Ethernet connection (C_EASD) 329
Table 188 – Class: CIM_EthernetPortAllocationSettingData for Ethernet connection (D_EASD) 330
Table 189 – Class: CIM_EthernetPortAllocationSettingData for Ethernet connection (M_EASD) 331
Table 190 – Class: CIM_EthernetPortAllocationSettingData for Ethernet switch port (Q_EASD) 332
Table 191 – Class: CIM_EthernetPortAllocationSettingData for Ethernet switch port (R_EASD) 332
Table 192 – Class: CIM_EthernetPortAllocationSettingData for Ethernet switch port (C_EASD) 333
Table 193 – Class: CIM_EthernetPortAllocationSettingData for Ethernet switch port (D_EASD) 334
Table 194 – Class: CIM_EthernetPortAllocationSettingData for Ethernet switch port (M_EASD) 335
Table 195 – Class: CIM_RegisteredProfile 335
Table 196 – Class: CIM_ResourcePool (Ethernet adapter) 336
Table 197 – Class: CIM_ResourcePool 336
Table 198 – Class: CIM_ResourcePool (Ethernet switch port) 337
Table 199 – Association: CIM_SettingsDefineState 339
Table 200 – Association: CIM_SystemDevice (Virtual EthernetPort) 339
Table 201 – Association: CIM_SystemDevice (host Ethernet adapter) 339
Table 202 – Related profiles for the Virtual System Profile 341
Table 203 – Observation of virtual system states 350

Table 204 – Observation of virtual system state transitions 352
Table 205 – CIM_ComputerSystem.RequestStateChange( ) method: Parameters 361
Table 206 – CIM_PowerManagementService.RequestPowerStateChange( ) method: Parameters 361
Table 207 – CIM elements: Virtual System Profile 374
Table 208 – Association: CIM_AffectedJobElement 375
Table 209 – Class: CIM_ComputerSystem 375
Table 210 – Class: CIM_ConcreteJob 375
Table 211 – Association: CIM_ElementConformsToProfile 376
Table 212 – Association: CIM_ElementSettingData 377
Table 213 – Class: CIM_EnabledLogicalElementCapabilities 377
Table 214 – Association: CIM_ReferencedProfile 378
Table 215 – Class: CIM_RegisteredProfile 378
Table 216 – Association: CIM_SettingsDefineState 379
Table 217 – Class: CIM_VirtualSystemSettingData 379
Table 218 – Association: CIM_VirtualSystemSettingDataComponent 380
Table 219 – Related profiles for the Generic Device Resource Virtualization Profile 381
Table 220 – CIM Elements: Generic Device Resource Virtualization Profile 388
Table 221 – Class: CIM_AllocationCapabilities 388
Table 222 – Class: CIM_ElementCapabilities 389
Table 223 – Class: CIM_RegisteredProfile 389
Table 224 – Related profiles for the Virtual Ethernet Switch Profile 390
Table 225 – CIM Elements: Virtual System Profile 400
Table 226 – Class: CIM_ComputerSystem 401
Table 227 – Association: CIM_ElementSettingData 401
Table 228 – Association: CIM_HostedCollection 402
Table 229 – Association: CIM_MemberOfCollection 402
Table 230 – Class: CIM_NetworkVLAN 403
Table 231 – Class: CIM_RegisteredProfile 403
Table 232 – Association: CIM_SettingsDefineState 405
Table 233 – Association: CIM_SystemComponent 405
Table 234 – Class: CIM_VirtualEthernetSwitchSettingData 406
Table 235 – Association: CIM_VirtualSystemSettingDataComponent 406