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5 Ethernet NIC Diagnostics Profile

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102

Foreword

103 The *Ethernet NIC Diagnostics Profile* (DSP1107) was prepared by the Diagnostics Working Group of the
104 DMTF.

105 DMTF is a not-for-profit association of industry members dedicated to promoting enterprise and systems
106 management and interoperability. For information about the DMTF, see <http://www.dmtf.org>.

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121

Introduction

122 A *profile* is a collection of Common Information Model (CIM) elements and behavior rules that represents
123 a specific area of management. The purpose of the profile is to ensure interoperability of web-based
124 enterprise management (WBEM) services for a specific subset of the CIM schema — in this case
125 Ethernet NIC diagnostics.

126 Diagnostics is a critical component of systems management. Diagnostic services are used in problem
127 containment to maintain availability, achieve fault isolation for system recovery, establish system integrity
128 during boot, increase system reliability, and perform routine proactive system verification. The goal of the
129 Common Diagnostic Model (CDM) is to define industry-standard building blocks, based on and consistent
130 with the DMTF CIM, which enables seamless integration of vendor-supplied diagnostic services into
131 system and SAN management frameworks.

132 The goal of the *Ethernet NIC Diagnostics Profile* is to define industry-standard building blocks that enable
133 seamless problem determination support for Ethernet NICs. The profile extends the standard diagnostic
134 profile by identifying a base set of Ethernet NIC functions that should be diagnosed by provider
135 implementations. Suppliers can differentiate their diagnostic offering by providing this base set of
136 diagnostics and developing diagnostics to analyze proprietary features of the Ethernet NIC.

137 Document conventions

138 Typographical conventions

139 The following typographical conventions are used in this document:

- 140 • Document titles are marked in *italics*.
- 141 • Important terms that are used for the first time are marked in *italics*.

142 ABNF usage conventions

143 Format definitions in this document are specified using ABNF (see [RFC5234](#)), with the following
144 deviations:

- 145 • Literal strings are to be interpreted as case-sensitive Unicode characters, as opposed to the
146 definition in [RFC5234](#) that interprets literal strings as case-insensitive US-ASCII characters.

147

Ethernet NIC Diagnostics Profile

148 1 Scope

149 The *Ethernet NIC Diagnostics Profile* specializes the *Diagnostics Profile* by defining the set of classes,
150 properties, methods and default values needed to perform effective problem determination for Ethernet
151 NICs within a management domain.

152 The target audience for this specification includes implementers who are writing CIM-based Ethernet NIC
153 diagnostics or consumers of CIM-based diagnostics for the Ethernet NIC.

154 2 Normative References

155 The following referenced documents are indispensable for the application of this document. For dated
156 references, only the edition cited applies. For undated references, the latest edition of the referenced
157 document (including any amendments) applies.

158 DMTF DSP0004, *CIM Infrastructure Specification 2.6*,
159 http://dmtf.org/sites/default/files/standards/documents/DSP0004_2.6.pdf

160 DMTF DSP0200, *CIM Operations over HTTP 1.3*,
161 http://dmtf.org/sites/default/files/standards/documents/DSP0200_1.3.pdf

162 DMTF DSP1001, *Management Profile Specification Usage Guide 1.0*,
163 http://dmtf.org/sites/default/files/standards/documents/DSP1001_1.0.pdf

164 DMTF DSP1002, *Diagnostics Profile 2.0*,
165 http://dmtf.org/sites/default/files/standards/documents/DSP1002_2.0.pdf

166 DMTF DSP1014, *Ethernet Port Profile 1.0*,
167 http://dmtf.org/sites/default/files/standards/documents/DSP1014_1.0.0.pdf

168 DMTF DSP1035, *Host LAN Network Port Profile 1.0*,
169 http://www.dmtf.org/sites/default/files/standards/documents/DSP1035_1.0.pdf

170 DMTF DSP1033, *Profile Registration Profile 1.0*,
171 http://dmtf.org/sites/default/files/standards/documents/DSP1033_1.0.pdf

172 IETF RFC5234, *ABNF: Augmented BNF for Syntax Specifications, January 2008*,
173 <http://tools.ietf.org/html/rfc5234>

174 ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*,
175 <http://isotc.iso.org/livelink/livelink.exe?func=ll&objId=4230456&objAction=browse&sort=subtype>

176 3 Terms and definitions

177 In this document, some terms have a specific meaning beyond the normal English meaning. Those terms
178 are defined in this clause.

179 The terms "shall" ("required"), "shall not," "should" ("recommended"), "should not" ("not recommended"),
180 "may," "need not" ("not required"), "can" and "cannot" in this document are to be interpreted as described
181 in [ISO/IEC Directives, Part 2](#), Annex H. The terms in parenthesis are alternatives for the preceding term,

182 for use in exceptional cases when the preceding term cannot be used for linguistic reasons. Note that
183 [ISO/IEC Directives, Part 2](#), Annex H specifies additional alternatives. Occurrences of such additional
184 alternatives shall be interpreted in their normal English meaning.

185 The terms "clause," "subclause," "paragraph," and "annex" in this document are to be interpreted as
186 described in [ISO/IEC Directives, Part 2](#), Clause 5.

187 The terms "normative" and "informative" in this document are to be interpreted as described in [ISO/IEC](#)
188 [Directives, Part 2](#), Clause 3. In this document, clauses, subclauses, or annexes labeled "(informative)" do
189 not contain normative content. Notes and examples are always informative elements.

190 The terms defined in [DSP0004](#), [DSP0200](#), and [DSP1001](#) apply to this document.

191 **4 Symbols and Abbreviated Terms**

192 The following symbols and abbreviations are used in this document.

193 **4.1**

194 **CDM**

195 Common Diagnostic Model

196 **4.2**

197 **CIM**

198 Common Information Model

199 **4.3**

200 **CIMOM**

201 CIM Object Manager

202 **4.4**

203 **CRU**

204 Customer Replaceable Unit

205 **4.5**

206 **FRU**

207 Field Replaceable Unit

208 **4.6**

209 **Inband**

210 Running on the customer hardware

211 **4.7**

212 **IRQ**

213 Interrupt Request

214 **4.8**

215 **LED**

216 Light Emitting Diode

217 **4.9**

218 **MAC**

219 Media Access Control which is the link layer of the OSI protocol model

220	4.10
221	ME
222	Managed Element
223	4.11
224	MOF
225	Managed Object Format
226	4.12
227	NIC
228	Network Interface Card
229	4.13
230	Online
231	Production/customer OS whether system is in production or not
232	4.14
233	Out of band (OOB)
234	Test performed by another system such as a service processor
235	4.15
236	Preboot
237	Non-production OS/diagnostic environment running on system hardware
238	4.16
239	PD
240	Problem Determination
241	4.17
242	PFA
243	Predictive Failure Analysis
244	4.18
245	PHY
246	The physical layer of OSI protocol model
247	4.19
248	PXE
249	Preboot Execution Environment
250	4.20
251	SAN
252	Storage Area Network
253	4.21
254	TOE
255	TCP/IP Offload Engine
256	4.22
257	WBEM
258	Web-Based Enterprise Management

259 5 Synopsis

260 **Profile Name:** Ethernet NIC Diagnostics

261 **Version:** 1.0.0a

262 **Organization:** DMTF

263 **CIM schema version:** 2.28

264 **Central Class:** CIM_EthernetNICDiagnosticTest

265 **Scoping Class:** CIM_ComputerSystem

266 **Specializes:** Diagnostics Profile 2.0.0

267 The *Ethernet NIC Diagnostics Profile* extends the management capability of referenced profiles by adding
268 common methods for determining that the state of managed processors in a system is optimal.

269
270 CIM_EthernetNICDiagnosticTest shall be the central class of this profile. The instance of
271 CIM_EthernetNICDiagnosticTest shall be the Central Instance of this profile. CIM_ComputerSystem shall
272 be the Scoping Class of this profile. The instance of CIM_ComputerSystem with which the Central
273 Instance is associated through an instance of CIM_HostedService shall be the Scoping Instance of this
274 profile.

275
276 The CIM_ManagedElement is CIM_EthernetPort or CIM_PortController or a subclass of them.

277 Table 1 identifies profiles on which this profile has a dependency.

278

Table 1 – Referenced Profiles

Profile Name	Organization	Version	Description
Diagnostics	DMTF	2.0	Specializes
Profile Registration	DMTF	1.0	Mandatory
Ethernet Port	DMTF	1.0	Optional

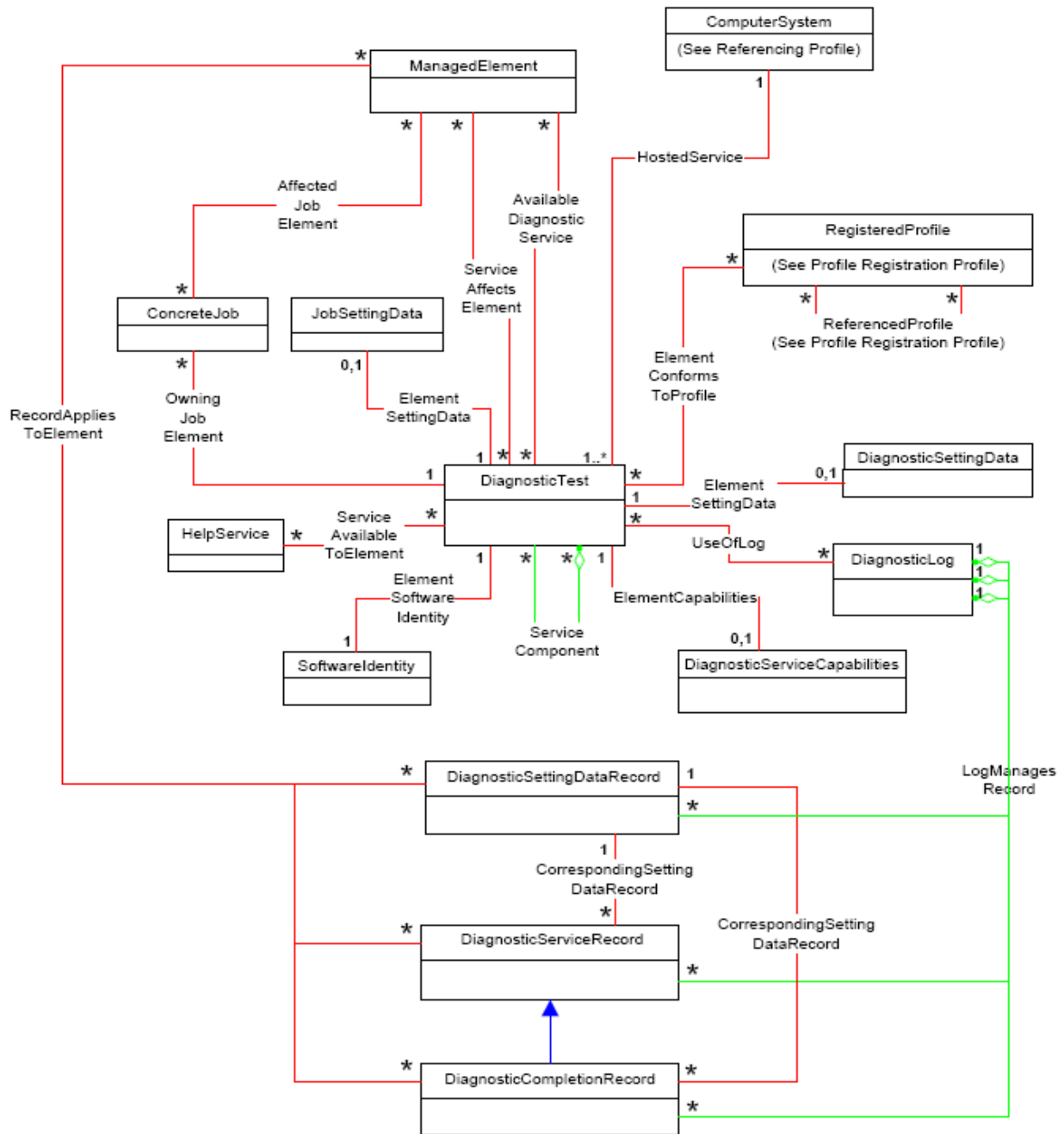
279 The [Ethernet Port Profile](#) specializes the [Host LAN Network Port Profile](#), which means that the former
280 inherits all of the classes from the latter. The *Ethernet NIC Diagnostics Profile* requires the use of a
281 subset of the [Ethernet Port Profile](#) and the [Host LAN Network Port Profile](#). Specifically, the
282 CIM_ManagedElement used by this profile may require support of one or more of the following classes:

283 CIM_EthernetPort, CIM_PortController and their PhysicalElement counterparts (for example, CIM_Card,
284 CIM_Chip, or CIM_PhysicalPackage, depending upon the vendor implementation).

285 6 Description

286 Diagnostic programs can be developed to verify that the Ethernet NIC device is behaving properly, to
287 identify its faulty components, or to diagnose the networking subsystem. Such tests are run in two distinct
288 environments: 1) at a vendor facility during development or manufacturing as part of the QA process, or
289 2) at an end-user location. In end-user environments, certain diagnostic tests are not practical to run
290 because they might modify or destroy data or they might take too long to run.

291 Figure 1 represents the class schema for the Ethernet NIC Diagnostics Profile. For simplicity, the prefix
292 CIM_ has been removed from the names of the classes.



293
294

Figure 1 – Ethernet NIC Diagnostics Profile: Profile Class Diagram

295 7 Implementation

296 This clause provides additional implementation details for the various diagnostic tests of this profile.

297 7.1 Ethernet NIC Tests

298 Table 2 provides general information for each test type.

Table 2 – Test Type Information

Test Name	Test Information	
MAC Register	Coverage Area	This test verifies access to MAC layer registers.
	Coverage Range	Test coverage is limited in an online environment. Full coverage is supported in preboot environments.
	User Control	None
	Execution Time	The test runs on the order of seconds per MAC.
	Built into Device	No
	Details	This test requires a pre-boot environment for full coverage.
Physical Register	Coverage Area	This test verifies the internal traffic path (Rx and Tx).
	Coverage Range	Full coverage can be supported in an online environment.
	User Control	The user may optionally specify the packet sizes to be used and whether the PHY and MAC layers are tested.
	Execution Time	The test runs on the order of seconds per port.
	Built into Device	No
	Details	Depending on the design of hardware and implementation, some options may not be available.
Internal Loopback	Coverage Area	This test verifies the internal traffic path for received (Rx) and transmitted (Tx) data.
	Coverage Range	Full coverage can be supported in an online environment.
	User Control	The user may optionally specify the packet sizes to be used and whether the PHY and/or MAC layer is tested.
	Execution Time	The test runs on the order of seconds per port.
	Built into Device	No
	Details	Depending on the design of hardware and implementation, some options may not be available.
External Loopback	Coverage Area	This test verifies external traffic path received (Rx) and transmitted (Tx) data.
	Coverage Range	Full coverage can be supported in an online environment.
	User Control	The user may optionally specify the packet sizes and link speeds to be used.
	Execution Time	The test runs on the order of seconds per port.
	Built into Device	No
	Details	Depending on the design of the hardware and the implementation, some options may not be available.
Beacon	Coverage Area	This test verifies the proper operation of the NIC LEDs.
	Coverage Range	Test coverage is limited in an online environment. Full coverage is supported in pre-boot environments.
	User Control	The user may optionally specify the number of times or duration that the LED blinks on and off.
	Execution Time	The test runs on the order of milliseconds per NIC.
	Built into Device	No
	Details	The LED flash pattern is determined by the vendor, but the pattern shall be distinct from that of normal activity. The LEDs to be flashed may be the normal activity/status LEDs or a separate LED provided solely for beaconing.

Self-Test	Coverage Area	This test verifies that that entire NIC is operating properly.
	Coverage Range	Virtual machine diagnostics shall be executed in a pre-boot environment only.
	User Control	None
	Execution Time	The test shall run on the order of seconds (quick tests) or minutes (full tests) per NIC.
	Built into Device	Vendor-specific
	Details	When invoked, the test determines which diagnostics it can run based on the managed element passed in.
Status	Coverage Area	This test verifies the overall status of the NIC.
	Coverage Range	
	User Control	None
	Execution Time	The test shall run on the order of milliseconds or seconds per NIC.
	Built into Device	Vendor-specific
	Details	Tests in a virtual machine environment shall be executed only in a pre-boot environment only.
Ping	Coverage Area	This test verifies the data path to the NIC
	Coverage Range	Full coverage can be supported in an online environment.
	User Control	The user may optionally specify the packet size to be used or the number of iterations to be run.
	Execution Time	The time to run the test depends on the user control parameters .
	Built into Device	No
	Details	
Embedded Processor	Coverage Area	This test verifies that NICs containing embedded processors is operating properly.
	Coverage Range	This test is limited to a NIC subsystem containing an embedded processor.
	User Control	None
	Execution Time	The test shall run on the order of seconds per NIC.
	Built into Device	No
	Details	High-end NICs can contain an embedded processor that can be used to provide additional capability. For example, some vendors use the processor to implement a TCP Offload Engine (TOE) that offloads processing of the entire TCP/IP stack to the network controller. Some vendors use the processor to implement the Preboot eXecution Environment (PXE) capability, which allows the host computer to be booted through the network. Here, an operating system is downloaded into host memory from a remote system through the NIC instead of using an operating system image stored locally on the system.
IRQ	Coverage Area	This test verifies that the NIC properly raises interrupt signals to the host.
	Coverage Range	This test is limited to the interrupt subsystem of the NIC.
	User Control	None
	Execution Time	The test shall run on the order of milliseconds per NIC.
	Built into Device	No
	Details	

301 **7.2 CIM_EthernetNICDiagnosticTest**

302 One or more instances of CIM_EthernetNICDiagnosticTest shall be implemented.

303 The CIM_EthernetNICDiagnosticTest class defines the tests that can be used to diagnose Ethernet NIC
 304 issues. Table 3 and Table 4 define the set of Ethernet NIC tests defined by this profile, the criteria, and
 305 the valid property values for this class. An implementation may extend this class and add vendor-defined
 306 tests using the vendor-defined range of the EthernetNICTestType valuemap.

307 **Table 3 – CIM_EthernetNICDiagnosticTest Property Requirements**

Test Name	Criteria	ElementName*	EthernetNICTestType	TestType*
MAC Register	Mandatory	Ethernet NIC MAC Register Test	2	(2) Functional
Physical Register	Mandatory	Ethernet NIC Physical Register Test	3	(2) Functional
Internal Loopback	Optional	Ethernet NIC Internal Loopback Test	4	(2) Functional
External Loopback	Mandatory	Ethernet NIC External Loopback Test	5	(5) Access Test
Beacon	Optional	Ethernet NIC Beacon Test	6	(2) Functional
Self-Test	Optional	Ethernet NIC Self-Test	7	(2) Functional
Status	Optional	Ethernet NIC Status Test	8	(4) Health Check
Ping	Optional	Ethernet NIC Ping Test	9	(5) Access Test
Embedded Processor	Optional	Ethernet NIC Embedded Processor Test	10	(2) Functional
IRQ	Mandatory	Ethernet NIC IRQ Test	11	(2) Functional

308 An asterisk (*) indicates that the property is inherited from the parent class CIM_DiagnosticTest.

309 **Table 4 – CIM_EthernetNICDiagnosticTest Property Requirements**

Test Name	Characteristics*	OtherCharacteristicsDescriptions*	Comment
MAC Register			
Physical Register			
Internal Loopback			
External Loopback	10 (Additional Hardware Required)		An external device must be connected to the port that can receive and send back packets
Beacon			
Self-Test			
Status			

Ping			
Embedded Processor			
IRQ			

310 An asterisk (*) indicates that the property is inherited from the parent class CIM_DiagnosticTest.

311 **7.3 CIM_EthernetNICDiagnosticSettingData**

312 One or more instances of CIM_EthernetNICDiagnosticSettingData may be implemented. They are
 313 associated to CIM_EthernetNICDiagnosticTest using CIM_ElementSettingData. The vendor-defined
 314 default values may be specified and advertised using an instance of
 315 CIM_EthernetNICDiagnosticSettingData that is referenced by the instance of CIM_ElementSettingData
 316 whose property value for IsDefault is 1 (Is Default).

317 A diagnostic test may require parameters to run. Some parameters may affect how the test is run, while
 318 other parameters provide the values to be used by the test.

319 CIM_DiagnosticSettingData contains properties that affect how a diagnostic test is run (for example,
 320 LoopControl, QuickMode), how errors are handled (for example, HaltOnError), or how results are logged
 321 (for example, LogOptions). CIM_DiagnosticSettingData is an argument to the
 322 CIM_DiagnosticTest.RunDiagnosticService() extrinsic method. If additional properties are needed that
 323 control the behavior of the diagnostic test, then they should be defined in a subclass of
 324 CIM_DiagnosticSettingData.

325 The client may use the vendor-defined default CIM_EthernetNICDiagnosticSettingData instance as an
 326 argument to the CIM_EthernetNICDiagnosticTest.RunDiagnosticService() extrinsic method. Alternatively,
 327 the client may create their own instance of CIM_EthernetNICDiagnosticSettingData and use it instead.

328 The CIM_EthernetNICDiagnosticSettingData class defines the parameters that may be used by some of
 329 the Ethernet NIC tests. Table 5 lists these test parameters and shows which tests might use them. An
 330 implementation may extend this class and define additional parameters for any vendor-defined tests that
 331 were added.

332 **Table 5 – CIM_EthernetNICDiagnosticSettingData Property Requirements**

Test Name	ElementName*	PacketSizes	LinkSpeeds	LoopbackLayers*	OtherLoopbackLayers*
MAC Register	Ethernet NIC MAC Register Test				
Physical Register	Ethernet NIC Physical Register Test				
Internal Loopback	Ethernet NIC Internal Loopback Test	Used		Used	
External Loopback	Ethernet NIC External Loopback Test	Used	Used		
Beacon	Ethernet NIC Beacon Test				
Self-Test	Ethernet NIC Self-Test				
Status	Ethernet NIC Status Test				
Ping	Ethernet NIC Ping	Used			

	Test				
Embedded Processor	Ethernet NIC Embedded Processor Test				
IRQ	Ethernet NIC IRQ Test				

333 An asterisk (*) indicates that the property is inherited from the parent class CIM_DiagnosticServiceCapabilities.

334 If any CIM_EthernetNICDiagnosticSettingData property does not have a value when passed as an
 335 argument to the CIM_DiagnosticTest.RunDiagnosticService() extrinsic method, then the default values
 336 for the test arguments shall be used.

337 **7.3.1 CIM_EthernetNICDiagnosticSettingData.PacketSizes**

338 This array property is used by a client for the tests shown in Table 5 to specify the packet sizes to be
 339 used during the test.

340 The vendor-defined default value is advertised using the default instance of
 341 CIM_EthernetNICDiagnosticSettingData.

342 If no value is specified by the client, the vendor-defined default value will be used.

343 **7.3.2 CIM_EthernetNICDiagnosticSettingData.LinkSpeeds**

344 This array property is used by a client for the tests shown in Table 5 to specify the link speeds to be used
 345 during the test.

346 The vendor-defined default value is advertised using the default instance of
 347 CIM_EthernetNICDiagnosticSettingData.

348 If no value is specified by the client, the vendor-defined default value will be used.

349 **7.3.3 CIM_EthernetNICDiagnosticSettingData.LoopbackLayers**

350 This array property is used by a client for the Internal Loopback test to specify the layer to test. The
 351 allowed values are shown in Table 6.

352 The vendor-defined default value is advertised using the default instance of
 353 CIM_EthernetNICDiagnosticSettingData.

354 If no value is specified by the client, the vendor-defined default value will be used.

355 **Table 6 – CIM_EthernetNICDiagnosticSettingData.LoopbackLayers Property Requirements**

LoopbackLayers Value	Criteria	Notes
1 (Other)	Optional	
2 (PHY Layer)	Mandatory	
3 (MAC Layer)	Mandatory	

357 **7.3.4 CIM_EthernetNICDiagnosticSettingData.OtherLoopbackLayers**

358 This array property is used by a client for the Internal Loopback test to specify the layer to test when the
 359 corresponding element in the LoopbackLayers property is set to 1 (Other).

360 **7.4 CIM_EthernetNICDiagnosticServiceCapabilities**

361 The SupportedExecutionControls property lists the job controls that are supported by the Diagnostic
 362 Service. The values are: 0 (Unknown), 1 (Other), 2 (Job Creation), 3 (Kill Job), 4 (Suspend Job), 5
 363 (Terminate Job), 0x8000 (No Execution Controls).

364 The SupportedLoopControl property lists the loop controls that are supported by the Diagnostic Service.
 365 The values are: 0 (Unknown), 1 (Other), 2 (Continuous), 3 (Count), 4 (Timer), 5 (ErrorCount), 0x8000 (No
 366 Loop Control).
 367

368 Table 7 and Table 8 specify the possible values for each test for CIM_EthernetNICDiagnosticCapabilities.

369 **Table 7 – CIM_EthernetNICDiagnosticServiceCapabilities Property Requirements**

Test Name	ElementName*	SupportedExecutionControls*	OtherSupportedExecutionCo ntrols*
MAC Register	Ethernet NIC MAC Register Test	0x8000 (No Execution Control)	
Physical Register	Ethernet NIC Physical Register Test	0x8000 (No Execution Control)	
Internal Loopback	Ethernet NIC Internal Loopback Test	1 (Other)	PacketSize LoopbackLayer
External Loopback	Ethernet NIC External Loopback Test	1 (Other)	PacketSize LinkSpeed
Beacon	Ethernet NIC Beacon Test	0x8000 (No Execution Control)	
Self-Test	Ethernet NIC Self-Test	0x8000 (No Execution Control)	
Status	Ethernet NIC Status Test	0x8000 (No Execution Control)	
Ping	Ethernet NIC Ping Test	1 (Other)	PacketSize
Embedded Processor	Ethernet NIC Embedded Processor Test	0x8000 (No Execution Control)	
IRQ	Ethernet NIC IRQ Test	0x8000 (No Execution Control)	

370 An asterisk (*) indicates that the property is inherited from the parent class CIM_DiagnosticServiceCapabilities.

371 **Table 8 – CIM_EthernetNICDiagnosticServiceCapabilities Property Requirements**

Test Name	SupportedLoopControl	PacketSizes	LinkSpeeds	Loopback Layers*	OtherLoopback Layers*
MAC Register	0x8000 (No Loop Control)				
Physical Register	0x8000 (No Loop Control)				
Internal Loopback	2 (Continuous) 3 (Count)	Used		Used	Used
External	2 (Continuous)	Used	Used		

Loopback	3 (Count)				
Beacon	3 (Count) 4 (Timer)				
Self-Test	0x8000 (No Loop Control)				
Status	0x8000 (No Loop Control)				
Ping	2 (Continuous) 3 (Count)	Used			
Embedded Processor	0x8000 (No Loop Control)				
IRQ	0x8000 (No Loop Control)				

372 An asterisk (*) indicates that the property is inherited from the parent class CIM_DiagnosticServiceCapabilities.

373 **7.4.1 CIM_EthernetNICDiagnosticServiceCapabilities.SupportedExecutionControls**

374 This array property is used by a provider for the tests shown in Table 7 to specify whether or not the test
375 supports execution controls. If there are no execution controls, the value of this property is 0x8000 (No
376 Execution Control). Otherwise, the value is 1 (Other).

377 **7.4.2 CIM_EthernetNICDiagnosticServiceCapabilities.OtherSupportedExecutionControl** 378 **s**

379 This array property is used by a provider for the tests shown in Table 7 to specify the execution controls
380 supported by the test when the value of the SupportedExecutionControls property is 1 (Other).

381 **7.4.3 CIM_EthernetNICDiagnosticServiceCapabilities.SupportedLoopControl** 382

383 This array property is used by a provider for the tests shown in Table 8 to specify whether or not the test
384 supports loop control. If loop control is not supported, the value of this property is 0x8000 (No Loop
385 Control). If the test can be run a specified number of iterations, this array property shall contain the value
386 3 (Count). If the test can be run in a continuous manner, this array property shall contain the value 2
387 (Continuous).

388 **7.4.4 CIM_EthernetNICDiagnosticServiceCapabilities.PacketSizes**

389 This array property is used by a provider for the tests shown in Table 8 to specify the list of packet sizes
390 supported by the test.

391 **7.4.5 CIM_EthernetNICDiagnosticServiceCapabilities.LinkSpeeds**

392 This array property is used by a provider for the tests shown in Table 8 to specify the list of link speeds
393 supported by the test.

394 **7.4.6 CIM_EthernetNICDiagnosticServiceCapabilities.LoopbackLayers**

395 This array property is used by a provider for the tests shown in Table 8 to specify the list of layers (for
396 example, PHY, MAC, etc.) supported by the test.

397 **7.4.7 CIM_EthernetNICDiagnosticServiceCapabilities.OtherLoopbackLayers**

398 This array property is used by a provider for the tests shown in Table 8 to specify the list of layers
399 supported by the test when the value of the LoopbackLayers property is 1 (Other).

400 **8 Methods**

401 This clause details the requirements for supporting intrinsic operations and extrinsic methods for the CIM
 402 elements defined in this profile. Reference the [Diagnostics Profile](#) for more detail on these methods.

403 **8.1 CIM_EthernetNICDiagnosticTest.RunDiagnosticService()**

404 The RunDiagnosticService () method shall return one of the return code values defined in [DSP1002](#),
 405 Table 2 – RunDiagnosticService () Method: Return Code Values.

406 When failures occur during the execution of a diagnostic test, the failure shall be recorded in the instance
 407 of CIM_DiagnosticServiceRecord associated with the test. The reason for the failure shall be recorded in
 408 CIM_DiagnosticServiceRecord.ErrorCode[] and the corresponding
 409 CIM_DiagnosticServiceRecord.ErrorCount[] shall be incremented. Other occurrences of the same failure
 410 during the same test shall not create additional entries in CIM_DiagnosticServiceRecord.ErrorCode[], but
 411 shall cause the corresponding CIM_DiagnosticServiceRecord.ErrorCount[] to be incremented.

412 **8.2 Profile Conventions for Operations**

413 Support for operations for each profile class (including associations) shall be as mandated in [DSP1002](#)
 414 version 2.0.0 clauses 8.5 through 8.29.

415 **9 Use Cases**

416 **9.1 Overview**

417 This clause contains object diagrams and use cases for the Ethernet NIC Diagnostics Profile.

418 Table 9 summarizes the use cases that are described in this clause. The use cases are categorized and
 419 named, and references are provided to the body text that describes each use case.

420 The CIM_ prefix has been omitted from the class names in the use cases for readability.

421 **Table 9 – Ethernet NIC Diagnostics Profile Use Cases**

Category	Use Case Name	Description
Verify NIC Health	Verify Health	Verify the health of a NIC without impacting the host system's access to the network. See 9.2.1.
	Verify Hardware	Examine a NIC to discover any hardware issues. See 9.2.2.
	Identify NIC	Make a particular NIC easy to physically identify. See 9.2.3.
Troubleshoot Network Connectivity Issues	Verify Device Accessibility	Verify that a particular NIC is accessible. See 9.3.1.
	Stress Test	Create a high volume of traffic to a particular NIC to help uncover issues. See 9.3.2.

422

423 9.2 Verifying NIC Health

424 The use cases in this clause describe how the client can use the diagnostic tests to verify the health of
425 NICs and to locate them. The CIM_ prefix has been omitted from the class names in the use cases for
426 readability.

427 9.2.1 Verify Health

428 To substantiate that a NIC is healthy and not developing problems, without disrupting the functioning of
429 the host system, the client can use Status Test.

430 9.2.2 Verify Hardware

431 The client can confirm that the NIC hardware is functioning properly with the following procedure.

- 432 1) If available, use Internal Loopback Test to prove that the data path between the host system and
433 the NIC is functioning properly.
- 434 2) Use Self-Test to verify the functionality of the NIC hardware components.

435 9.2.3 Identify NIC

436 When it has been determined that a particular NIC has to be replaced, the client can use the Beacon Test
437 to cause the NIC LEDs to flash. This makes it easy to visually identify the defective NIC in a host system
438 with multiple NICs.

439 9.3 Troubleshooting Network Connectivity Issues

440 The use cases in this clause describe how the client can use the diagnostic tests to isolate problems
441 affecting network connectivity. The CIM_ prefix has been omitted from the class names in the use cases
442 for readability.

443 9.3.1 Verify Device Accessibility

444 The client can use External Loopback to verify that a particular NIC can be physically accessed.

445 9.3.2 Stress Test

446 Some problems only occur when there are high volumes of data passes through the NIC. To help
447 reproduce traffic problems, clients can use External Loopback or Ping. By configuring it with large packet
448 sizes, high link speeds and high loop counts, large amounts of traffic can be generated.

449 10 CIM Elements

450 Table 10 shows the instances of CIM Elements for this profile. Instances of the CIM Elements shall be
451 implemented as described in Table 10. Clause 7 (“Implementation”) and 8 (“Methods”) may impose
452 additional requirements on these elements.

453 **Table 10 – CIM Elements: Ethernet NIC Diagnostics Profile**

Element Name	Requirement	Description
Classes		
CIM_EthernetNICDiagnosticTest	Mandatory	See 10.1.
CIM_EthernetNICDiagnosticSettingData	Optional	See 10.2.

Element Name	Requirement	Description
CIM_EthernetNICDiagnosticServiceCapabilities	Optional	See 10.3.
CIM_RegisteredProfile	Mandatory	See 10.4.
CIM_AffectedJobElement	Optional	See 10.5.
CIM_AvailableDiagnosticService	Mandatory	See 10.6.
CIM_ElementCapabilities	Optional	See 10.7.
CIM_ElementSettingData (DiagnosticSettingData)	Optional	See 10.8.
CIM_ElementSettingData (JobSettingData)	Optional	See 10.9.
CIM_ElementSoftwareIdentity	Mandatory	See 10.10.
CIM_HostedService	Mandatory	See 10.11.
CIM_OwningJobElement	Mandatory	See 10.12.
CIM_RecordAppliesToElement	Optional	See 10.13.
CIM_ServiceAffectsElement	Mandatory	See 10.14.
CIM_ServiceAvailableToElement	Optional	See 10.15.
CIM_ServiceComponent	Optional	See 10.16.
CIM_UseOfLog	Mandatory	See 10.17.
Indications		
None defined in this profile		

454 **10.1 CIM_EthernetNICDiagnosticTest (Specializes CIM_DiagnosticTest)**

455 CIM_EthernetNICDiagnosticTest is used to represent the Diagnostic Testing for an Ethernet NIC. This
 456 class specializes CIM_DiagnosticTest as defined in the [Diagnostics Profile](#). The constraints listed in Table
 457 11 are in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other
 458 mandatory elements that must be implemented.

459 **Table 11 – Class: CIM_EthernetNICDiagnosticTest**

Properties	Requirement	Notes
ElementName	Mandatory	See 7.2.
Characteristics	Mandatory	See 7.2.
OtherCharacteristicsDescriptions	Conditional	If Characteristics has the value of 1 (Other), this property is Mandatory.
EthernetNICTestType	Mandatory	See 7.2.
OtherEthernetNICTestTypeDescription	Conditional	If EthernetNICTestType has a value of 1 (Other), this property is Mandatory.

460 **10.2 CIM_EthernetNICDiagnosticSettingData (Specializes**
 461 **CIM_DiagnosticSettingData)**

462 CIM_EthernetNICDiagnosticSettingData is used to pass in test parameters and to specify other test
 463 control parameters. This class specializes CIM_DiagnosticSettingData as defined in the [Diagnostics](#)
 464 [Profile](#). The constraints listed in Table 12 are in addition to those specified in the [Diagnostics Profile](#). See
 465 the [Diagnostics Profile](#) for other mandatory elements that must be implemented.

466

Table 12 – Class: CIM_EthernetNICDiagnosticSettingData

Properties	Requirement	Notes
ElementName	Mandatory	See 7.3.
PacketSizes	Optional	See 7.3.1.
LinkSpeeds	Optional	See 7.3.2.
LoopbackLayers	Optional	See 7.3.3.
OtherLoopbackLayers	Conditional	If LoopbackLayers includes the value of 1 (Other), this property is Mandatory.

467

10.3 CIM_EthernetNICDiagnosticServiceCapabilities (Specializes CIM_DiagnosticServiceCapabilities)

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CIM_EthernetNICDiagnosticServiceCapabilities is used to provide information on the capabilities for the Ethernet NIC Diagnostic Service. This class specializes CIM_DiagnosticServiceCapabilities as defined in the [Diagnostics Profile](#). The constraints listed in Table 13 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory elements that must be implemented.

473

Table 13 – Class: CIM_EthernetNICDiagnosticServiceCapabilities

Properties	Requirement	Notes
ElementName	Mandatory	See 7.4.
PacketSizes	Optional	See 7.4.4.
LinkSpeeds	Optional	See 7.4.5.
LoopbackLayers	Optional	See 7.4.6.
OtherLoopbackLayers	Conditional	If LoopbackLayers includes the value of 1 (Other), this property is Mandatory.

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10.4 CIM_RegisteredProfile

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The CIM_RegisteredProfile class is defined by the [Profile Registration Profile](#). The requirements denoted in Table 14 are in addition to those mandated by the [Profile Registration Profile](#). See the [Profile Registration Profile](#) for the other mandatory elements that must be implemented. The constraints listed in Table 13 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory elements that must be implemented.

480

Table 14 – Class: CIM_RegisteredProfile

Properties	Requirement	Notes
RegisteredName	Mandatory	Shall be "EthernetNIC Diagnostics"
RegisteredVersion	Mandatory	Shall be "1.0.0"
RegisteredOrganization	Mandatory	Shall be 2 (DMTF)

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10.5 CIM_AffectedJobElement

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Although defined in the [Diagnostics Profile](#), the CIM_AffectedJobElement class is listed here because the AffectedElement reference is scoped down to CIM_EthernetPort or CIM_PortController, which is a subclass of CIM_ManagedElement. The constraints listed in Table 15 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of CIM_AffectedJobElement that must be implemented.

487

Table 15 – Class: CIM_AffectedJobElement

Properties	Requirement	Notes
AffectedElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetPort or CIM_PortController.
AffectingElement	Mandatory	Shall be a reference to an instance of CIM_ConcreteJob.

488 **10.6 CIM_AvailableDiagnosticService**

489 Although defined in the [Diagnostics Profile](#), the CIM_AvailableDiagnosticService class is listed here
 490 because the ServiceProvided reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a
 491 subclass of CIM_DiagnosticTest, and the UserOfService reference is scoped down to CIM_EthernetPort
 492 or CIM_PortController, which is a subclass of CIM_ManagedElement. The constraints listed in Table 16 in
 493 addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory
 494 properties of CIM_AvailableDiagnosticService that must be implemented.

495 **Table 16 – Class: CIM_AvailableDiagnosticService**

Properties	Requirement	Notes
ServiceProvided (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
UserOfService (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetPort or CIM_PortController.

496 **10.7 CIM_ElementCapabilities**

497 Although defined in the [Diagnostics Profile](#), the CIM_ElementCapabilities class is listed here because the
 498 ManagedElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
 499 CIM_DiagnosticTest, and the Capabilities reference is scoped down to
 500 CIM_EthernetNICDiagnosticServiceCapabilities, which is a subclass of
 501 CIM_DiagnosticServiceCapabilities. The constraints listed in Table 17 in addition to those specified in the
 502 [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of
 503 CIM_ElementCapabilities that must be implemented.

504 **Table 17 – Class: CIM_ElementCapabilities**

Properties	Requirement	Notes
ManagedElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
Capabilities (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticServiceCapabilities.

505 **10.8 CIM_ElementSettingData (DiagnosticSettingData)**

506 Although defined in the [Diagnostics Profile](#), the CIM_ElementSettingData class is listed here because the
 507 ManagedElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
 508 CIM_DiagnosticTest, and the SettingData reference is scoped down to
 509 CIM_EthernetNICDiagnosticSettingData, which is a subclass of CIM_DiagnosticSettingData. The
 510 constraints listed in Table 18 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics](#)
 511 [Profile](#) for other mandatory properties of CIM_ElementSettingData that must be implemented.

512 **Table 18 – Class: CIM_ElementSettingData**

Properties	Requirement	Notes
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Properties	Requirement	Notes
ManagedElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
SettingData (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticSettingData.
IsDefault	Mandatory	If the instance of CIM_EthernetNICDiagnosticSettingData is the default setting, this property shall have the value of TRUE.

513 10.9 CIM_ElementSettingData (JobSettingData)

514 Although defined in the [Diagnostics Profile](#), the CIM_ElementSettingData class is listed here because the
515 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
516 CIM_DiagnosticTest, and the SettingData reference is scoped down to CIM_JobSettingData, which is a
517 subclass of CIM_SettingData. The constraints listed in Table 19 in addition to those specified in the
518 [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of
519 CIM_ElementSettingData that must be implemented.

520

Table 19 – Class: CIM_ElementSettingData

Properties	Requirement	Notes
ManagedElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
SettingData (overridden)	Mandatory	Shall be a reference to an instance of CIM_JobSettingData.
IsDefault	Mandatory	If the instance of CIM_JobSettingData is the default setting, this property shall have the value of TRUE.

521 10.10 CIM_ElementSoftwareIdentity

522 Although defined in the [Diagnostics Profile](#), the CIM_ElementSoftwareIdentity class is listed here because
523 the Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
524 CIM_DiagnosticTest. The constraints listed in Table 20 in addition to those specified in the [Diagnostics](#)
525 [Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of CIM_ElementSoftwareIdentity that
526 must be implemented.

527

Table 20 – Class: CIM_ElementSoftwareIdentity

Properties	Requirement	Notes
Antecedent	Mandatory	Shall be a reference to an instance of CIM_SoftwareIdentity.
Dependent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

528 10.11 CIM_HostedService

529 Although defined in the [Diagnostics Profile](#), the CIM_HostedService class is listed here because the
530 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
531 CIM_DiagnosticTest. The constraints listed in Table 21 in addition to those specified in the [Diagnostics](#)
532 [Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of CIM_HostedService that must be
533 implemented.

534

Table 21 – Class: CIM_HostedService

Properties	Requirement	Notes
Antecedent	Mandatory	Shall be a reference to an instance of CIM_ComputerSystem.
Dependent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

535 **10.12 CIM_OwningJobElement**

536 Although defined in the [Diagnostics Profile](#), the CIM_OwningJobElement class is listed here because the
 537 OwningElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
 538 CIM_DiagnosticTest. The constraints listed in Table 22 in addition to those specified in the [Diagnostics](#)
 539 [Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of CIM_OwningJobElement that must
 540 be implemented.

541

Table 22 – Class: CIM_OwningJobElement

Properties	Requirement	Notes
OwningElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
OwnedElement	Mandatory	Shall be a reference to an instance of CIM_ConcreteJob.

542 **10.13 CIM_RecordAppliesToElement**

543 Although defined in the [Diagnostics Profile](#), the CIM_RecordAppliesToElement class is listed here
 544 because the Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a
 545 subclass of CIM_DiagnosticTest. The constraints listed in Table 23 in addition to those specified in the
 546 [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of
 547 CIM_RecordAppliesToElement that must be implemented.

548

Table 23 – Class: CIM_RecordAppliesToElement

Properties	Requirement	Notes
Antecedent	Mandatory	Shall be a reference to an instance of CIM_RecordForLog.
Dependent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

549 **10.14 CIM_ServiceAffectsElement**

550 Although defined in the [Diagnostics Profile](#), the CIM_ServiceAffectsElement class is listed here because
 551 the AffectedElement reference is scoped down to CIM_EthernetPort or CIM_PortController, which is a
 552 subclass of CIM_ManagedElement, and the AffectingElement reference is scoped down to
 553 CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest. The constraints listed in
 554 Table 24 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other
 555 mandatory properties of CIM_ServiceAffectsElement that must be implemented.

556

Table 24 – Class: CIM_ServiceAffectsElement

Properties	Requirement	Notes
AffectedElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetPort or CIM_PortController.

Properties	Requirement	Notes
AffectingElement (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

557 10.15 CIM_ServiceAvailableElement

558 Although defined in the [Diagnostics Profile](#), the CIM_ServiceAvailableToElement class is listed here
 559 because the UsersOfService reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a
 560 subclass of CIM_DiagnosticTest. The constraints listed in Table 25 in addition to those specified in the
 561 [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of
 562 CIM_ServiceAvailableToElement that must be implemented.

563 **Table 25 – Class: CIM_ServiceAvailableToElement**

Properties	Requirement	Notes
ServiceProvided	Mandatory	Shall be a reference to an instance of CIM_HelpService.
UsersOfService (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

564 10.16 CIM_ServiceComponent

565 Although defined in the [Diagnostics Profile](#), the CIM_ServiceComponent class is listed here because the
 566 GroupComponent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
 567 CIM_DiagnosticTest, and the PartComponent reference is scoped down to
 568 CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest. The constraints listed in
 569 Table 26 in addition to those specified in the [Diagnostics Profile](#). See the [Diagnostics Profile](#) for other
 570 mandatory properties of CIM_ServiceComponent that must be implemented.

571 **Table 26 – Class: CIM_ServiceComponent**

Properties	Requirement	Notes
GroupComponent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
PartComponent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

572 10.17 CIM_UseOfLog

573 Although defined in the [Diagnostics Profile](#), the CIM_UseOfLog class is listed here because the
 574 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
 575 CIM_DiagnosticTest. The constraints listed in Table 27 in addition to those specified in the [Diagnostics](#)
 576 [Profile](#). See the [Diagnostics Profile](#) for other mandatory properties of CIM_UseOfLog that must be
 577 implemented.

578 **Table 27 – Class: CIM_UseOfLog**

Properties	Requirement	Notes
Antecedent	Mandatory	Shall be a reference to an instance of CIM_DiagnosticLog.
Dependent (overridden)	Mandatory	Shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

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ANNEX A (informative)

Change Log

Version	Date	Author	Description
0.1	2009-03-10	Carl Chan	Initial Draft
0.2	2009-08-05	Carl Chan	Revisions based on WG feedback
0.3	2011-03-23	Carl Chan	Revisions based on WG feedback
1.0.0a	2011-04-06	Carl Chan	DMTF Work in Progress

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