Document Number: DSP1107

Date: 2011-12-15

Version: 1.0.0

Ethernet NIC Diagnostics Profile

Document Type: Specification

Document Status: DMTF Standard

Document Language: en-US

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Foreword

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

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

Acknowledgments

The DMTF acknowledges the following individuals for their contributions to this document:

- David Barrett – Emulex
- Rodney Brown – IBM Corporation
- Carl Chan – WBEM Solutions, Inc.
- Jerry Chin – Hewlett-Packard Company
- Jim Davis – WBEM Solutions, Inc.
- Hao-Yang Feng – Broadcom
- Ken Kotyak – Hewlett-Packard Company
- Kevin Kuelbs – Hewlett-Packard Company
- Peter Lamanna – EMC Corporation
- Eric Tend – Hewlett-Packard Company
- Mike Walker – Storage Networking Industry Association

Introduction

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

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

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

Document conventions

Typographical conventions

The following typographical conventions are used in this document:

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

ABNF usage conventions

Format definitions in this document are specified using ABNF (see RFC5234), with the following deviations:

- Literal strings are to be interpreted as case-sensitive Unicode characters, as opposed to the definition in RFC5234 that interprets literal strings as case-insensitive US-ASCII characters.

Ethernet NIC Diagnostics Profile

1 Scope

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

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

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated or versioned references, only the edition cited (including any corrigenda or DMTF update versions) applies. For references without a date or version, the latest published edition of the referenced document (including any corrigenda or DMTF update versions) applies.

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

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

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

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

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

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

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

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

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

3 Terms and definitions

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

The terms "shall" ("required"), "shall not," "should" ("recommended"), "should not" ("not recommended"), "may," "need not" ("not required"), "can" and "cannot" in this document are to be interpreted as described

in ISO/IEC Directives, Part 2, Annex H. The terms in parenthesis are alternatives for the preceding term, for use in exceptional cases when the preceding term cannot be used for linguistic reasons. Note that ISO/IEC Directives, Part 2, Annex H specifies additional alternatives. Occurrences of such additional alternatives shall be interpreted in their normal English meaning.

The terms "clause," "subclause," "paragraph," and "annex" in this document are to be interpreted as described in ISO/IEC Directives, Part 2, Clause 5.

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

The terms defined in DSP0004, DSP0200, and DSP1001 apply to this document.

3.1
Preboot
non-production OS/diagnostic environment running on system hardware

4 Symbols and abbreviated terms

The following symbols and abbreviations are used in this document.

4.1
CDM
Common Diagnostic Model

4.2
CIM
Common Information Model

4.3
CIMOM
CIM Object Manager

4.4
CRU
Customer Replaceable Unit

4.5
FRU
Field Replaceable Unit

4.6
IRQ
Interrupt Request

4.7
LED
Light Emitting Diode

4.8
MAC
the link layer of the OSI protocol model

4.9
ME
Managed Element

4.10
MOF
Managed Object Format

4.11
NIC
Network Interface Card

4.12
OS
Operating System

4.13
PD
Problem Determination

4.14
PHY
the physical layer of the OSI protocol model

4.15
PXE
Preboot Execution Environment

4.16
Rx
received

4.17
SAN
Storage Area Network

4.18
TOE
TCP/IP Offload Engine

4.19
Tx
transmitted

4.20
WBEM
Web-Based Enterprise Management

5 Synopsis

Profile Name: Ethernet NIC Diagnostics

Version: 1.0.0

Organization: DMTF

CIM schema version: 2.31

Central Class: CIM_EthernetNICDiagnosticTest

Scoping Class: CIM_ComputerSystem

Specializes: Diagnostics Profile 2.0.0

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

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

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

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

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

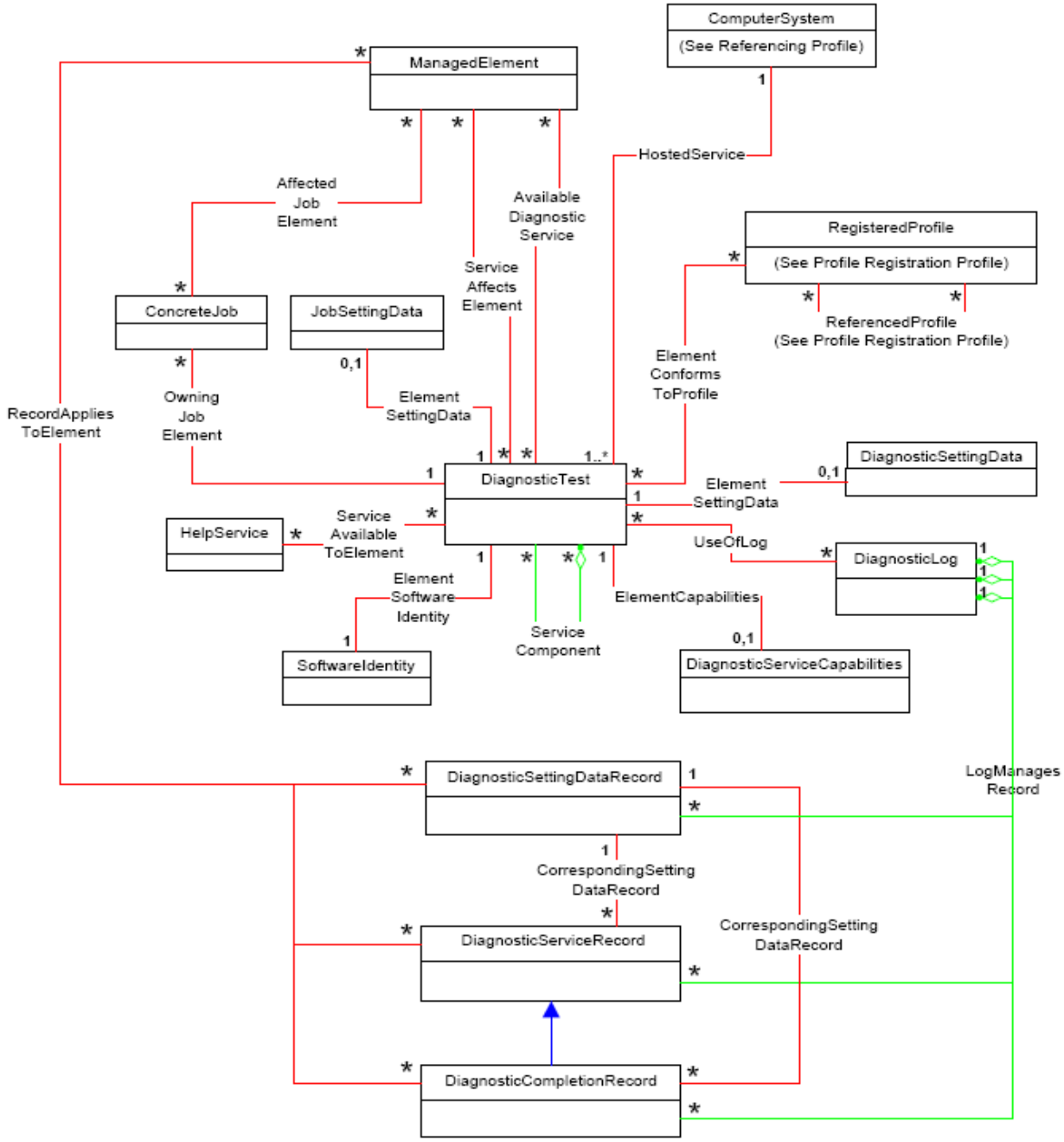
The *Ethernet Port Profile* specializes the *Host LAN Network Port Profile*, which means that the former inherits all of the classes from the latter. The Ethernet NIC Diagnostics Profile requires the use of a subset of the *Ethernet Port Profile* and the *Host LAN Network Port Profile*. Specifically, the CIM_ManagedElement used by this profile may require support of one or more of the following classes: CIM_EthernetPort, CIM_PortController, and their PhysicalElement counterparts (for example, CIM_Card, CIM_Chip, or CIM_PhysicalPackage, depending on the vendor implementation).

6 Description

Diagnostic programs can be developed to verify that the Ethernet NIC device is behaving properly, to identify its faulty components, or to diagnose the networking subsystem. Such tests are run in two distinct environments:

- at a vendor facility during development or manufacturing as part of the QA process
- at an end-user location (In end-user environments, certain diagnostic tests are not practical to run because they might modify or destroy data or they might take too long to run.)

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



291

292 **Figure 1 – Ethernet NIC Diagnostics Profile: Profile class diagram**

7 Implementation

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

7.1 Ethernet NIC tests

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 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 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.

Test name	Test information	
	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 the 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.
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 a NIC containing embedded processors is operating properly.
	Coverage Range	This test is limited to a NIC subsystem containing an embedded processor.
	User Control	None

Test name	Test information	
	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. In this case, 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	

299

300 7.2 CIM_EthernetNICDiagnosticTest

301 One or more instances of the CIM_EthernetNICDiagnosticTest class shall be implemented.

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

306 **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

Test name	Criteria	ElementName*	EthernetNICTestType	TestType*
IRQ	Mandatory	Ethernet NIC IRQ Test	11	(2) Functional

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

308 **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			

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

310 7.3 CIM_EthernetNICDiagnosticSettingData

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

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

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

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

327 The CIM_EthernetNICDiagnosticSettingData class defines the parameters that may be used by some of
328 the Ethernet NIC tests. Table 5 lists these test parameters and shows which tests might use them. An

329 implementation may extend this class and define additional parameters for any vendor-defined tests that
330 were added.

331 **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 Test	Used			
Embedded Processor	Ethernet NIC Embedded Processor Test				
IRQ	Ethernet NIC IRQ Test				

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

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

336 7.3.1 CIM_EthernetNICDiagnosticSettingData.PacketSizes

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

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

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

342 7.3.2 CIM_EthernetNICDiagnosticSettingData.LinkSpeeds

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

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

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

348 7.3.3 CIM_EthernetNICDiagnosticSettingData.LoopbackLayers

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

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

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

354 **Table 6 – CIM_EthernetNICDiagnosticSettingData.LoopbackLayers property requirements**

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

355 7.3.4 CIM_EthernetNICDiagnosticSettingData.OtherLoopbackLayers

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

358 7.4 CIM_EthernetNICDiagnosticServiceCapabilities

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

362 Table 7 specifies the possible values for each test for CIM_EthernetNICDiagnosticCapabilities.

363 **Table 7 – CIM_EthernetNICDiagnosticServiceCapabilities property requirements**

Test name	SupportedLoopControl*	PacketSizesSupported	LinkSpeedsSupported	LoopbackLayersSupported	OtherLoopbackLayersSupported
MAC Register	0x8000 (No Loop Control)				
Physical Register	0x8000 (No Loop Control)				
Internal Loopback	2 (Continuous) 3 (Count)	Used		Used	Used
External Loopback	2 (Continuous) 3 (Count)	Used	Used		
Beacon	3 (Count) 4 (Timer)				
Self-Test	0x8000 (No Loop				

Test name	SupportedLoopControl*	PacketSizesSupported	LinkSpeedsSupported	LoopbackLayersSupported	OtherLoopbackLayersSupported
	Control)				
Status	0x8000 (No Loop Control)				
Ping	2 (Continuous) 3 (Count)	Used			
Embedded Processor	0x8000 (No Loop Control)				
IRQ	0x8000 (No Loop Control)				

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

7.4.1 CIM_EthernetNICDiagnosticServiceCapabilities.SupportedLoopControl

This array property is used by a provider for the tests shown in Table 7 to specify whether the test supports loop control. If loop control is not supported, the value of this property is 0x8000 (No Loop Control). If the test can be run a specified number of iterations, this array property shall contain the value 3 (Count). If the test can be run in a continuous manner, this array property shall contain the value 2 (Continuous).

7.4.2 CIM_EthernetNICDiagnosticServiceCapabilities.PacketSizesSupported

This array property is used by a provider for the tests shown in Table 7 to specify the list of packet sizes supported by the test.

7.4.3 CIM_EthernetNICDiagnosticServiceCapabilities.LinkSpeedsSupported

This array property is used by a provider for the tests shown in Table 7 to specify the list of link speeds supported by the test.

7.4.4 CIM_EthernetNICDiagnosticServiceCapabilities.LoopbackLayersSupported

This array property is used by a provider for the tests shown in Table 6 to specify the list of layers (for example, PHY, MAC, etc.) supported by the test.

7.4.5 CIM_EthernetNICDiagnosticServiceCapabilities.OtherLoopbackLayersSupported

This array property is used by a provider for the tests shown in Table 6 to specify the list of layers supported by the test when the value of the LoopbackLayers property is 1 (Other).

8 Methods

This clause details the requirements for supporting intrinsic operations and extrinsic methods for the CIM elements defined in this profile. Reference the *Diagnostics Profile* for more detail on these methods.

8.1 CIM_EthernetNICDiagnosticTest.RunDiagnosticService( )

The RunDiagnosticService ( ) method shall return one of the return code values defined in *Diagnostics Profile*, Table 2 – RunDiagnosticService ( ) Method: Return Code Values.

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

8.2 Profile conventions for operations

Support for operations for each profile class (including associations) shall be as mandated in *Diagnostics Profile* version 2.0.0, clauses 8.5 through 8.29.

9 Use cases

9.1 Overview

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

Table 8 summarizes the use cases that are described in this clause. The use cases are categorized and named, and references are provided to the subclause that describes each use case.

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

Table 8 – 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.

9.2 Verifying NIC health

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

9.2.1 Verify health

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

9.2.2 Verify hardware

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

414 1) If available, use Internal Loopback Test to prove that the data path between the host system
415 and the NIC is functioning properly.

416 2) Use Self-Test to verify the functionality of the NIC hardware components.

417 9.2.3 Identify a defective NIC

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

421 9.3 Troubleshooting network connectivity issues

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

425 9.3.1 Verify device accessibility

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

427 9.3.2 Stress test

428 Some problems occur only when high volumes of data pass through the NIC. To help reproduce traffic
429 problems, clients can use External Loopback or Ping. By using large packet sizes, high link speeds, and
430 high loop counts, large amounts of traffic can be generated.

431 10 CIM elements

432 Table 9 shows the instances of CIM elements for this profile. Instances of the CIM elements shall be
433 implemented as described in Table 9. Clause 7 (“Implementation”) and 8 (“Methods”) may impose
434 additional requirements on these elements.

435 **Table 9 – CIM elements: Ethernet NIC Diagnostics Profile**

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

Element Name	Requirement	Description
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		

10.1 CIM_EthernetNICDiagnosticTest

The CIM_EthernetNICDiagnosticTest class is used to represent the Diagnostic Testing for an Ethernet NIC. This class specializes CIM_DiagnosticTest as defined in the *Diagnostics Profile*. The constraints listed in Table 10 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory elements that must be implemented.

Table 10 – 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.
TestType	Optional	See 7.2.

10.2 CIM_EthernetNICDiagnosticSettingData

The CIM_EthernetNICDiagnosticSettingData class is used to pass in test parameters and to specify other test control parameters. This class specializes CIM_DiagnosticSettingData as defined in the *Diagnostics Profile*. The constraints listed in Table 11 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory elements that must be implemented.

Table 11 – 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.

10.3 CIM_EthernetNICDiagnosticServiceCapabilities

The CIM_EthernetNICDiagnosticServiceCapabilities class 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 12 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory elements that must be implemented.

Table 12 – Class: CIM_EthernetNICDiagnosticServiceCapabilities

Properties	Requirement	Notes
ElementName	Mandatory	See 7.4.
SupportedLoopControl	Optional	See 7.4.1.
PacketSizesSupported	Optional	See 7.4.2.
LinkSpeedsSupported	Optional	See 7.4.3.
LoopbackLayersSupported	Optional	See 7.4.4.
OtherLoopbackLayersSupported	Conditional	If LoopbackLayersSupported includes the value of 1 (Other), this property is Mandatory.

10.4 CIM_RegisteredProfile

The CIM_RegisteredProfile class is defined by the *Profile Registration Profile*. The requirements denoted in Table 13 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.

Table 13 – Class: CIM_RegisteredProfile

Properties	Requirement	Notes
RegisteredName	Mandatory	The value of this property shall be “Ethernet NIC Diagnostics”.
RegisteredVersion	Mandatory	The value of this property shall be “1.0.0”.
RegisteredOrganization	Mandatory	The value of this property shall be 2 (DMTF).

10.5 CIM_AffectedJobElement

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 14 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_AffectedJobElement that must be implemented.

Table 14 – Class: CIM_AffectedJobElement

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

10.6 CIM_AvailableDiagnosticService

Although defined in the *Diagnostics Profile*, the CIM_AvailableDiagnosticService class is listed here because the ServiceProvided reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest, and the UserOfService reference is scoped down to CIM_EthernetPort or CIM_PortController, which are subclasses of CIM_ManagedElement. The constraints listed in Table 15 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_AvailableDiagnosticService that must be implemented.

Table 15 – Class: CIM_AvailableDiagnosticService

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

10.7 CIM_ElementCapabilities

Although defined in the *Diagnostics Profile*, the CIM_ElementCapabilities class is listed here because the ManagedElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest, and the Capabilities reference is scoped down to CIM_EthernetNICDiagnosticServiceCapabilities, which is a subclass of CIM_DiagnosticServiceCapabilities. The constraints listed in Table 16 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_ElementCapabilities that must be implemented.

Table 16 – Class: CIM_ElementCapabilities

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

10.8 CIM_ElementSettingData (DiagnosticSettingData)

Although defined in the *Diagnostics Profile*, the CIM_ElementSettingData class is listed here because the ManagedElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest, and the SettingData reference is scoped down to CIM_EthernetNICDiagnosticSettingData, which is a subclass of CIM_DiagnosticSettingData. The constraints listed in Table 17 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_ElementSettingData that must be implemented.

491 **Table 17 – Class: CIM_ElementSettingData**

Properties	Requirement	Notes
ManagedElement (overridden)	Mandatory	The property shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
SettingData (overridden)	Mandatory	The property 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.

492 ## 10.9 CIM_ElementSettingData (JobSettingData)

493 Although defined in the *Diagnostics Profile*, the CIM_ElementSettingData class is listed here because the
494 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
495 CIM_DiagnosticTest, and the SettingData reference is scoped down to CIM_JobSettingData, which is a
496 subclass of CIM_SettingData. The constraints listed in Table 18 are in addition to those specified in the
497 *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of
498 CIM_ElementSettingData that must be implemented.

499 **Table 18 – Class: CIM_ElementSettingData**

Properties	Requirement	Notes
ManagedElement (overridden)	Mandatory	The property shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.
SettingData (overridden)	Mandatory	The property 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.

500 ## 10.10 CIM_ElementSoftwareIdentity

501 Although defined in the *Diagnostics Profile*, the CIM_ElementSoftwareIdentity class is listed here because
502 the Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
503 CIM_DiagnosticTest. The constraints listed in Table 19 are in addition to those specified in the
504 *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of
505 CIM_ElementSoftwareIdentity that must be implemented.

506 **Table 19 – Class: CIM_ElementSoftwareIdentity**

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

507 ## 10.11 CIM_HostedService

508 Although defined in the *Diagnostics Profile*, the CIM_HostedService class is listed here because the
509 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
510 CIM_DiagnosticTest. The constraints listed in Table 20 are in addition to those specified in the

511 *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_HostedService that
512 must be implemented.

513 **Table 20 – Class: CIM_HostedService**

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

514 ## 10.12 CIM_OwningJobElement

515 Although defined in the *Diagnostics Profile*, the CIM_OwningJobElement class is listed here because the
516 OwningElement reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
517 CIM_DiagnosticTest. The constraints listed in Table 21 are in addition to those specified in the
518 *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of
519 CIM_OwningJobElement that must be implemented.

520 **Table 21 – Class: CIM_OwningJobElement**

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

521 ## 10.13 CIM_RecordAppliesToElement

522 Although defined in the *Diagnostics Profile*, the CIM_RecordAppliesToElement class is listed here
523 because the Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a
524 subclass of CIM_DiagnosticTest. The constraints listed in Table 22 are in addition to those specified in
525 the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of
526 CIM_RecordAppliesToElement that must be implemented.

527 **Table 22 – Class: CIM_RecordAppliesToElement**

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

528 ## 10.14 CIM_ServiceAffectsElement

529 Although defined in the *Diagnostics Profile*, the CIM_ServiceAffectsElement class is listed here because
530 the AffectedElement reference is scoped down to CIM_EthernetPort or CIM_PortController, which is a
531 subclass of CIM_ManagedElement, and the AffectingElement reference is scoped down to
532 CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest. The constraints listed in
533 Table 23 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other
534 mandatory properties of CIM_ServiceAffectsElement that must be implemented.

535 **Table 23 – Class: CIM_ServiceAffectsElement**

Properties	Requirement	Notes
AffectedElement (overridden)	Mandatory	The property shall be a reference to an instance of CIM_EthernetPort or CIM_PortController.
AffectingElement (overridden)	Mandatory	The property shall be a reference to an instance of CIM_EthernetNICDiagnosticTest.

536 ## 10.15 CIM_ServiceAvailableToElement

537 Although defined in the *Diagnostics Profile*, the CIM_ServiceAvailableToElement class is listed here
538 because the UsersOfService reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a
539 subclass of CIM_DiagnosticTest. The constraints listed in Table 24 are in addition to those specified in
540 the *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of
541 CIM_ServiceAvailableToElement that must be implemented.

542 **Table 24 – Class: CIM_ServiceAvailableToElement**

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

543 ## 10.16 CIM_ServiceComponent

544 Although defined in the *Diagnostics Profile*, the CIM_ServiceComponent class is listed here because the
545 GroupComponent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
546 CIM_DiagnosticTest, and the PartComponent reference is scoped down to
547 CIM_EthernetNICDiagnosticTest, which is a subclass of CIM_DiagnosticTest. The constraints listed in
548 Table 25 are in addition to those specified in the *Diagnostics Profile*. See the *Diagnostics Profile* for other
549 mandatory properties of CIM_ServiceComponent that must be implemented.

550 **Table 25 – Class: CIM_ServiceComponent**

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

551 ## 10.17 CIM_UseOfLog

552 Although defined in the *Diagnostics Profile*, the CIM_UseOfLog class is listed here because the
553 Dependent reference is scoped down to CIM_EthernetNICDiagnosticTest, which is a subclass of
554 CIM_DiagnosticTest. The constraints listed in Table 26 are in addition to those specified in the
555 *Diagnostics Profile*. See the *Diagnostics Profile* for other mandatory properties of CIM_UseOfLog that
556 must be implemented.

557 **Table 26 – Class: CIM_UseOfLog**

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

ANNEX A
(informative)

Change log

Version	Date	Description
1.0.0	2011-12-15	