Power Utilization Management Profile

Document Number: DCIM1004
Document Type: Specification
Document Status: Published
Document Language: E
Date: 2008-11-10

Version: 1.0.0a

THIS PROFILE IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND. ABSENT A SEPERATE AGREEMENT BETWEEN YOU AND DELL™ WITH REGARD TO FEEDBACK TO DELL ON THIS PROFILE SPECIFICATION, YOU AGREE ANY FEEDBACK YOU PROVIDE TO DELL REGARDING THIS PROFILE SPECIFICATION WILL BE OWNED AND CAN BE FREELY USED BY DELL.

© 2008 Dell Inc. All rights reserved. Reproduction in any manner whatsoever without the express written permission of Dell, Inc. is strictly forbidden. For more information, contact Dell.

Dell and the *DELL* logo are trademarks of Dell Inc. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell disclaims proprietary interest in the marks and names of others.

CONTENTS

Foreword 7
Introduction 8
1 Scope 9
2 Normative References 9
2.1 Approved References 9
2.2 Other References 9
3 Terms and Definitions 9
4 Symbols and Abbreviated Terms 10
5 Synopsis 10
6 Description 11
6.1 Power Utilization Algorithms 12
6.2 Power Budgeting 13
7 Implementation Requirements 13
7.1 General Requirements 13
7.2 Power Utilization Modes 13
7.3 Power Aspect 14
7.4 Interesting Power Consumption Levels 14
8 Methods 15
8.1 Method: DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI() 15
8.2 Method: DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm ( ) 16
8.3 Method: DCIM_OEMPowerUtilizationManagementService. RequestPowerUtilizationLimit () 17
8.4 Profile Conventions for Operations 18
8.5 CIM_AllocationCapabilities 18
8.6 CIM_ElementCapabilities (CIM_AllocationCapabilities) 19
8.7 CIM_ElementCapabilities (DCIM_OEMPowerConfigurationCapabilties) 19
8.8 CIM_HostedService 19
8.9 CIM_ElementSettingData 20
8.10 CIM_RegisteredProfile 20
8.11 CIM_PowerAllocationSettingData (CIM_ComputerSystem) 20
8.12 CIM_PowerAllocationSettingData (CIM_AllocationCapabilities) 20
8.13 CIM_ServiceAffectsElement (CIM_ComputerSystem) 20
8.14 CIM_ServiceAffectsElement (CIM_PowerAllocationSettingData) 21
8.15 CIM_SettingsDefineState 21
8.16 CIM_SettingsDefineCapabilities 21
8.17 DCIM_OEMPowerUtilizationCustomSettingData 21
8.18 DCIM_OEMPowerUtilizationManagementCapabilities 22
8.19 DCIM_OEMPowerUtilizationManagementService 22
9 Use Cases 22
9.1 Profile Registration 22
9.2 Power Utilization Algorithms 22
9.3 Power Consumption Budget and Levels 25
9.4 Change the Managed System’s Power Consumption Budget 26
9.5 Remove Power Consumption Budget for the Managed System 27

10 CIM Elements 27
10.1 CIM_AllocationCapabilities 28
10.2 CIM_ElementCapabilities (CIM_AllocationCapabilities) 29
10.3 CIM_ElementCapabilities (CIM_PowerUtilizationManagementCapabilities) 29
10.4 CIM_HostedService 29
10.5 CIM_ElementSettingData Reference 30
10.6 CIM_RegisteredProfile 30
10.7 CIM_PowerAllocationSettingData (CIM_ComputerSystem) 30
10.8 CIM_PowerAllocationSettingData (CIM_AllocationCapabilities) 31
10.9 CIM_ServiceAffectsElement (CIM_ComputerSystem) 31
10.10 CIM_ServiceAffectsElement (CIM_PowerAllocationSettingData) 31
10.11 CIM_SettingsDefineCapabilities 32
10.12 CIM_SettingsDefineState 32
10.13 DCIM_OEMPowerUtilizationCustomSettingData 32
10.14 DCIM_OEMPowerUtilizationManagementCapabilities 33
10.15 DCIM_OEMPowerUtilizationManagementService 33
ANNEX A (informative) DCIM MOF 34
ANNEX B (informative) Change Log 48
ANNEX C (informative) Acknowledgments 49

Figures

Figure 1 – Power Utilization Management Profile: Class Diagram 12
Figure 2 – Power Utilization Management Profile: Profile Registration 22
Figure 3 – Power Utilization Management Profile: Before RequestPowerUtilizationAlgorithm() 23
Figure 4 – Power Utilization Management Profile: After RequestPowerUtilizationAlgorithm() 24
Figure 5 – Power Utilization Management Profile: After Reboot of the Managed System 25
Figure 6 – Power Utilization Management Profile: Power Consumption Budget and Levels 26

Tables

Table 1 – Related Profiles 11
Table 2 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI() Method: Return Code Values 15
Table 3 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI() Method: Parameters 16
Table 4 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Return Code Values 16
Table 5 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Parameters 17
Table 6 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Return Code Values 17
Table 7 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Parameters 18
Table 8 – CIM_ElementCapabilities Operations 19
Table 9 – CIM_ElementCapabilities Operations 19
Table 10 – CIM_HostedService Operations 19
Table 11 – CIM_ElementSettingData Operations 20
Table 12 – CIM_ServiceAffectsElement Operations 20
Table 13 – CIM_ServiceAffectsElement Operations 21
Table 14 – CIM_SettingsDefineState Operations 21
Table 15 – CIM_SettingsDefineCapabilities Operations 21
Table 16 – CIM Elements: Power Utilization Management Profile 28
Table 20 – Class: CIM_HostedService 29
Table 21 – Class: CIM_ElementSettingData 30
Table 22 – Class: CIM_RegisteredProfile 30
Table 25 – Class: CIM_ServiceAffectsElement 31
Table 26 – Class: CIM_ServiceAffectsElement 31
Table 27 – Class: CIM_SettingsDefineCapabilities 32
Table 29 – Class: DCIM_OEMPowerUtilizationCustomSettingData 32

Foreword

The Power Utilization Management Profile (DCIM1004) was prepared by the Dell CIM Review Board.

Introduction

This specification identifies the necessary classes, properties, methods, and values to be instantiated and manipulated to represent and manage power utilization modeled using the DMTF Common Information Model (CIM) core and extended model definitions.

This document is intended for implementers who write CIM-based providers or consumers of management interfaces representing the component described herein.

Power Utilization Management Profile

1 Scope

The Power Utilization Management Profile extends the management capabilities of referencing profiles by adding the capability to represent the different power utilization levels by the managed elements. The profile also provides information on the client configuration of the power utilization and profile versioning for the schema implementation.

2 Normative References

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

2.1 Approved References

DMTF DSP1033, *Profile Registration Profile 1.0.0*

DMTF DSP0200, *CIM Operations over HTTP 1.2.0*

DMTF DSP0004, *CIM Infrastructure Specification 2.3.0*

DMTF DSP1000, *Management Profile Specification Template*

DMTF DSP1001, *Management Profile Specification Usage Guide*

2.2 Other References

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

Unified Modeling Language (UML) from the Open Management Group (OMG), http://www.uml.org

SM Managed Element Addressing Specification (SM ME Addressing) DSP0215, http://www.dmtf.org/spec

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
can
used for statements of possibility and capability, whether material, physical, or causal

3.2
cannot
used for statements of possibility and capability, whether material, physical, or causal

3.3
conditional
indicates requirements to be followed strictly in order to conform to the document when the specified conditions are met

3.4
mandatory
indicates requirements to be followed strictly in order to conform to the document and from which no deviation is permitted

3.5
may
indicates a course of action permissible within the limits of the document

3.6
need not
indicates a course of action permissible within the limits of the document

3.7
optional
indicates a course of action permissible within the limits of the document

3.8
referencing profile
indicates a profile that owns the definition of this class and can include a reference to this profile in its "Related Profiles" table

3.9
shall
indicates requirements to be followed strictly in order to conform to the document and from which no deviation is permitted

3.10
shall not
indicates requirements to be followed strictly in order to conform to the document and from which no deviation is permitted

3.11
should
indicates that among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.12
should not
indicates that a certain possibility or course of action is deprecated but not prohibited

4 Symbols and Abbreviated Terms

4.1
CIM
Common Information Model

5 Synopsis

Profile Name: Power Utilization Management Profile

Version: 1.0.0

Organization: DCIM

CIM Schema Version: 2.18

Dell CIM Schema Version: 1.0.0

Central Class: DCIM_OEMPowerUtilizationManagementService

Scoping Class: CIM_ComputerSystem

The Power Utilization Management Profile extends the management capability of the referencing profiles by adding the capability to describe and manage power utilization of the managed system.

The Central Instance shall be associated with the Scoping Instance through CIM_HostedService association.

Table 1 identifies profiles that are related to this profile.

Table 1 – Related Profiles

Profile Name	Organization	Version	Relationship
Profile Registration	DMTF	1.0.0	Mandatory
Allocation Capabilities	DMTF	1.0.0	Specializes

6 Description

The Power Utilization Management Profile describes the different algorithms of power utilization for the managed system.

Figure 1 represents the class schema for the Power Utilization Management Profile. For simplicity, the prefix CIM_ has been removed from the names of the classes. DCIM_ prefixes has been preserved to denote DCIM extensions of CIM classes.

The profile information is represented with the instance of CIM_RegisteredProfile.

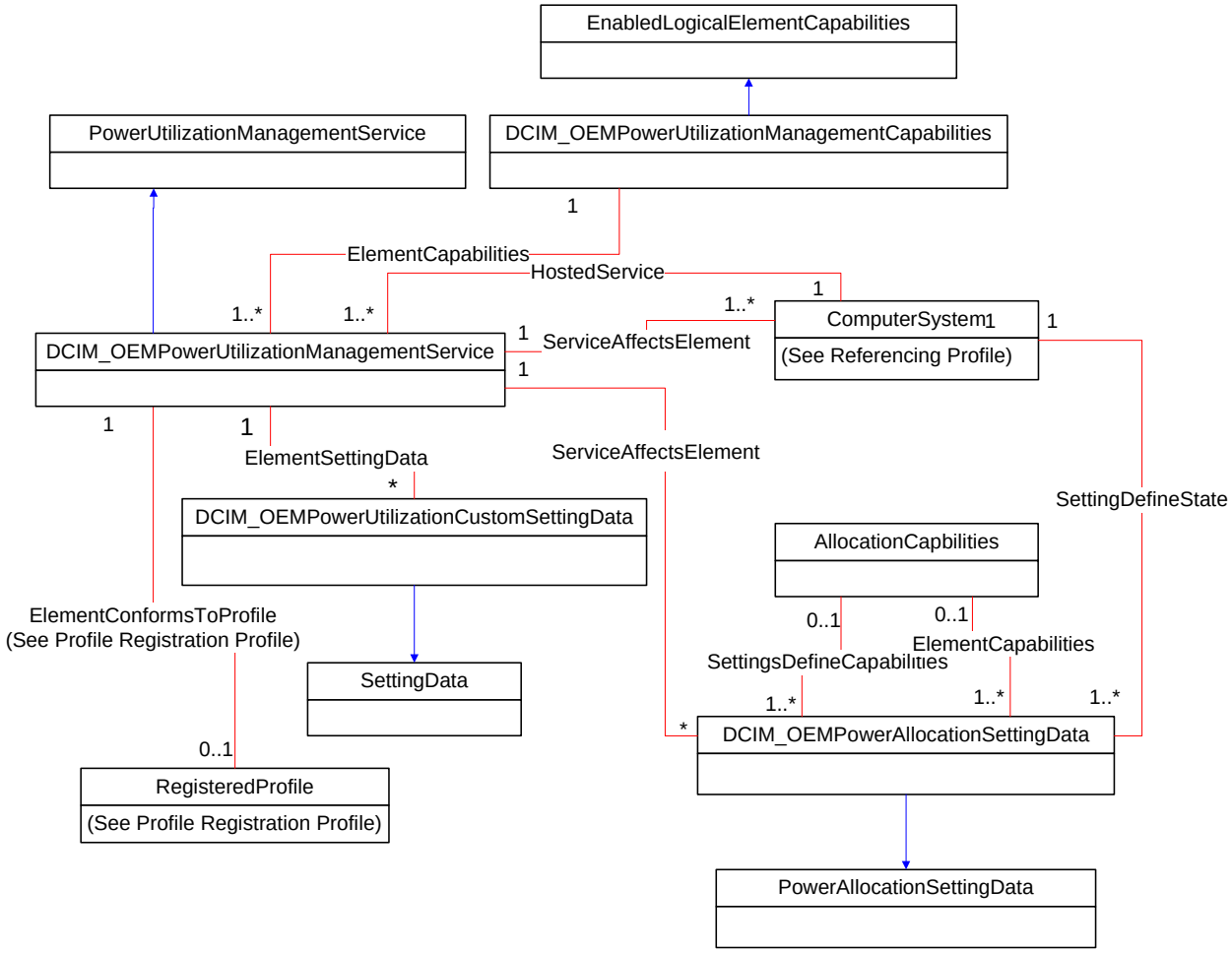

Figure 1 – Power Utilization Management Profile: Class Diagram

6.1 Power Utilization Algorithms

The managed system may employ a range of power utilization algorithms, in order to intelligently manipulate the consumption of its components based on workloads or on the client input. DCIM_OEMPOwerUtilizationManagementService represents a power utilization service that is associated to the managed system through CIM_ServiceAffectsElement. More granular and custom settings for power utilization can be represented and configured through the DCIM_OEMPowerUtilzationCustomSettingData class that is associated with the DCIM_OEMPowerUtilizationManagementService class through the CIM_ElementSettingData association.

There are two major modes of power utilization for the managed system: static and dynamic. The custom mode of operation can also be configured for more granular power utilization settings, and may contain mixed settings of static and dynamic power utilization.

6.1.1 Static Power Utilization

Static power utilization systems do not utilize any proactive algorithm to adjust the power consumption, but rather operate based on static settings. For example, the system may be set to utilize minimum power, where all the managed system components are set to run at their minimum power consumption mode. Other static power utilization modes include maximum performance, where all the system components are set to run at their maximum performance.

6.1.2 Dynamic Power Utilization

Dynamic power utilization mode enables a system to utilize proactive algorithms to adjust its power consumption. Such a mode is useful to balance power consumption with the system's performance. For example, a system may be set to let the operating system adjust the managed system components power consumptions based on the current load, or use active power management which is where the system utilizes an internal algorithm to adjust the power consumption of its components.

6.1.3 Custom Power Utilization

Custom power utilization mode lets the client application select granular settings for power utilization. The system's granular settings impact individual system components such as fan, processor, and memory.

6.2 Power Budgeting

Power budgeting is used to represent and manage the system's power consumption in absolute limits. The system may represent its current power consumption, as well as display the power consumption maximums that it can operate under. The system actively changes the power budgeting as it operates in dynamic power utilization mode except for the minimum and maximum points where system components are running at either their minimum power consumption setting or maximum performance setting.

6.2.1 System Power Aspect

The system power aspect defines the system's current power consumption, and the system's power consumption budget. The system's power aspect is represented by an instance of CIM_PowerAllocationSettingData associated to the instance of CIM_ComputerSystem by the CIM_SettingsDefineState association.

6.2.2 Interesting System Power Consumption Levels

Managed systems may have different power consumption levels. The system advertises these levels in order to give guidance on the possible power budget setting for the system. Power consumption levels can include the minimum and maximum power consumption level, and a set of power consumption levels that depend on the system configuration. These power consumption levels are represented by instances of CIM_PowerAllocationSettingData associated to CIM_AllocationCapabilities through SettingsDefineCapabilities association.

7 Implementation Requirements

Requirements and guidelines for propagating and formulating certain class properties are discussed in this section. Methods are listed in section 8 and properties are listed in section 10.

7.1 General Requirements

At least one instance of CIM_PowerUtilizationManagementService shall be implemented. The instance of CIM_ComputerSystem that represents the power managed system shall be represented with the instance of CIM_PowerUtilizationManagementService through the CIM_ServiceAffectsElement association.

An instance of DCIM_OEMPowerUtilizationManagementCapabilites shall be associated with CIM_PowerUtilizationManagementService through the CIM_ElementCapabilities association.

7.2 Power Utilization Modes

This clause details requirements on the representation of the power utilization mode of the managed system. If the DCIM_OEMPowerUtilizationmanagementCapabilities.SupportedMethods property array contains 32769 (RequestPowerUtilizationAlgorithm) or 32770 (RequestPowerUtilizationAlgorithmEI), then the requirements in this clause shall be followed.

The power utilization mode shall be represented by the PowerUtilizationMode, PowerUtilizationAlgorithm and PendingPowerUtilizationAlgorithm properties, and shall contain current and pending power algorithms of the impacted system respectively.

The power utilization mode may also be managed through granular custom settings. The instance of DCIM_OEMPowerUtilizationCustomSettingData shall represent the custom settings of the power utilization mode. If the PowerUtilizationAlgorithm property has value 3 (Custom Settings Based), then the instance of DCIM_OEMPowerUtilizationCustomSettingData shall be associated with the Central Instance through the CIM_ElementSettingData association that has the IsCurrent property set to 1 (IsCurrent). If the PendingPowerUtilizationAlgorithm property has value 3 (Custom Settings Based), then instance of DCIM_OEMPowerUtilizationCustomSettingData shall be associated with the Central Instance through the CIM_ElementSettingData association that has the IsPending property set to 2 (Is Pending).

7.3 Power Aspect

The power aspect of the managed system shall be implemented, and shall be represented by an instance of CIM_PowerAllocationSettingData associated to the instance of CIM_ComputerSystem through CIM_SettingsDefineState association. Power aspect instance of CIM_PowerAllocationSettingData shall be associated with the Central Instance through CIM_ServiceAffects association.

7.3.1 Current Power Consumption

Current power consumption of the managed system shall be represented through the power aspect instance of CIM_PowerAllocationSettingData. The Reservation property of the CIM_PowerAllocationSettingData instance shall represent the current power consumption of the managed system in the units defined in the AllocationUnits property.

7.3.2 Current Power Consumption Budget

This clause details the requirements for representing the managed system's power consumption. If the DCIM_OEMPowerUtilizationmanagementCapabilities.SupportedMethods property array contains 32768 (RequestPowerUtilizationLimit), then the requirements in this clause shall be followed.

The budget for the power consumption of the managed system shall be implemented, and shall be represented through the power aspect instance of CIM_PowerAllocationSettingData. The Limit property of the CIM_PowerAllocationSettingData instance shall represent the current power budget for the managed system in the units defined in the AllocationUnits property. The Reservation property of the CIM_PowerAllocationSettingData instance shall represent the current power consumption for the managed system in the units defined in the AllocationUnits property.

7.4 Interesting Power Consumption Levels

This clause details the requirements on the representation of the power aspect of the managed system. The requirements in this clause are optional. Only if the instrumentation supports advertising detailed power consumption levels, the constraints of this clause shall be followed.

CIM_PowerAllocationSettingData instances, associated to the CIM_AllocationCapabilities instances through CIM_SettingsDefineCapabilities association, shall represent detailed power consumption levels and shall be implemented. CIM_AllocationCapabilities instances shall be associated to the CIM_PowerAllocationSettingData instance representing the managed system's power aspect through CIM_ElementCapabilities.

The Limit property of the CIM_PowerAllocationSettingData instance shall represent the detailed power consumption level for the managed system in the units defined in the AllocationUnits property and shall be implemented.

7.4.1 Maximum Power Consumption Level

If the CIM_PowerAllocationSettingData instance represents the maximum power consumption level for the managed system, then the referenced CIM_SettingsDefineCapabilities association's ValueRange property shall have 2 (Maximums) value. The Limit property of the CIM_PowerAllocationSettingData instance shall represent the maximum power consumption level for the managed system in the units defined in the AllocationUnits property. The PowerAllocationSettingPurpose of the CIM_PowerAllocationSettingData shall have value 4 (MaxAsConfigured).

7.4.2 Minimum Power Consumption Level

If the CIM_PowerAllocationSettingData instance represents the maximum power consumption level for the managed system, then the referenced CIM_SettingsDefineCapabilities association's ValueRange property shall have 1 (Minimums) value. The Limit property of the CIM_PowerAllocationSettingData instance shall represent the minimum power consumption level for the managed system in the units defined in the AllocationUnits property. The PowerAllocationSettingPurpose of the CIM_PowerAllocationSettingData shall have value 3 (MinWhenOn).

7.4.3 Other Power Consumption Level

If the CIM_PowerAllocationSettingData instance does not represent the maximum or minimum power consumption level for the managed system, then the referenced CIM_SettingsDefineCapabilities association's ValueRange property shall have 0 (Point) value. The Limit property of the CIM_PowerAllocationSettingData instance shall represent the detailed power consumption level for the managed system in the units defined in the AllocationUnits property.

8 Methods

This section details the requirements for supporting intrinsic operations, and extrinsic methods for the CIM elements defined by this profile.

8.1 Method: DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI()

The DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI () method requests a change in the power utilization algorithm for the managed system using an embedded instance for the CustomSettings parameter.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI () return values shall be as specified in Table 2.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI () parameters are specified in Table 3.

No standard messages are defined for this method.

Table 2 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI() Method: Return Code Values

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred

Table 3 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI() Method: Parameters

Qualifiers	Name	Type	Description/Values
IN, REQ	RequestedAlgorithm	uint16	Requested power utilization algorithm
IN	CustomSettings	String	An embedded instance of DCIM_OEMPowerUtilizationCustomSettingData that represents the requested custom settings
OUT	Job	CIM_ConcreteJob REF	Returned if job started

8.1.1 DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI ( ) Conditional Support

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities contains the value 32769 (RequestPowerUtilizationAlgorithmEI), the RequestPowerUtilizationAlgorithmEI( ) method shall be implemented and shall not return the value 1 (Not Supported).

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities does not contain the value 32769 (RequestPowerUtilizationAlgorithmEI), the RequestPowerUtilizationAlgorithmEI( ) method shall not be implemented or shall always return the value 1 (Not Supported).

8.2 Method: DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm ( )

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm( ) method requests a change in the power utilization algorithm for the managed system. The method does not have any parameters that utilize embedded instances.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm( ) return values shall be as specified in Table 2.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm( ) parameters are specified in Table 3.

No standard messages are defined for this method.

Table 4 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Return Code Values

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred

Table 5 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Parameters

Qualifiers	Name	Type	Description/Values
IN, REQ	RequestedAlgorithm	uint16	The scoping managed system for the power redundancy configuration.
IN	CustomSettingNames[]	string	Array of custom setting names having the same name as DCIM_OEMPowerUtilizationCustomSettingData properties.
IN	CustomSettingValues[]	string	The values for array of custom setting names. The values are equal to the DCIM_OEMPowerUtilizationCustomSettingData properties' values.
OUT	Job	CIM_ConcreteJob REF	Returned if job started

8.2.1 DCIM_OEMPowerUtilizationManagementService. RequestPowerUtilizationAlgorithm ( ) Conditional Support

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities contains the value 32770 (RequestPowerUtilizationAlgorithm), the RequestPowerUtilizationAlgorithm( ) method shall be implemented and shall not return the value 1 (Not Supported).

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities does not contain the value 32770 (RequestPowerUtilizationAlgorithm), the RequestPowerUtilizationAlgorithm( ) method shall not be implemented or shall always return the value 1 (Not Supported).

8.3 Method: DCIM_OEMPowerUtilizationManagementService. RequestPowerUtilizationLimit ()

DCIM_OEMPowerUtilizationManagementService.ConfigureExternalPowerDomains( ) method requests a change in the current power consumption budget of the managed system.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimit( ) return values shall be as specified in Table 2.

DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimit( ) parameters are specified in Table 3.

No standard messages are defined for this method.

Table 6 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Return Code Values

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred

Table 7 – DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Method: Parameters

Qualifiers	Name	Type	Description/Values
IN, REQ	EnforceUtilizationLimit	boolean	Enforces the budget limit for the managed system
IN	UtilizationLimit	uint16	The budget limit for the managed system
IN	UtilizationLimitUnit	string	The units of budget limit.
IN	UtilizingElement	CIM_PowerAllocationSettingData REF	The power aspect of the managed system.
OUT	Job	CIM_ConcreteJob REF	Returned if job started

8.3.1 DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimits( ) Conditional Support

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities contains the value 32768 (ConfigureExternalPowerDomains), the ConfigureExternalPowerDomains( ) method shall be implemented and shall not return the value 1 (Not Supported).

If the SupportedMethods property array of the associated instance of DCIM_OEMPowerUtilizationManagementCapabilities does not contain the value 32768 (ConfigureExternalPowerDomains), the ConfigureExternalPowerDomains( ) method shall not be implemented or shall always return the value 1 (Not Supported).

8.4 Profile Conventions for Operations

Support for operations for each profile class (including associations) is specified in the following subclauses. Each subclause includes either the statement “All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2” or a table listing all of the operations that are not supported by this profile or where the profile requires behavior other than that described by DSP0200.

The default list of operations is as follows:

- GetInstance
- EnumerateInstances
- EnumerateInstanceNames
- Associators
- AssociatorNames
- References
- ReferenceNames

A compliant implementation shall support all of the operations in the default list for each class, unless the “Requirement” column states something other than *Mandatory*.

8.5 CIM_AllocationCapabilities

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.6 CIM_ElementCapabilities (CIM_AllocationCapabilities)

Table 8 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 8 – CIM_ElementCapabilities Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.7 CIM_ElementCapabilities (DCIM_OEMPowerConfigurationCapabilties)

Table 9 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 9 – CIM_ElementCapabilities Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.8 CIM_HostedService

Table 10 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 10 – CIM_HostedService Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.9 CIM_ElementSettingData

Table 11 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 11 – CIM_ElementSettingData Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.10 CIM_RegisteredProfile

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.11 CIM_PowerAllocationSettingData (CIM_ComputerSystem)

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.12 CIM_PowerAllocationSettingData (CIM_AllocationCapabilities)

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.13 CIM_ServiceAffectsElement (CIM_ComputerSystem)

Table 12 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 12 – CIM_ServiceAffectsElement Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.14 CIM_ServiceAffectsElement (CIM_PowerAllocationSettingData)

Table 13 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 13 – CIM_ServiceAffectsElement Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.15 CIM_SettingsDefineState

Table 14 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 14 – CIM_SettingsDefineState Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.16 CIM_SettingsDefineCapabilities

Table 15 lists operations that either have special requirements beyond those from DSP0200, or shall not be supported.

Table 15 – CIM_SettingsDefineCapabilities Operations

Operation	Requirement	Messages
EnumerateInstances	Unspecified	None
EnumerateInstanceNames	Unspecified	None
Associators	Unspecified	None
AssociatorNames	Unspecified	None
References	Unspecified	None
ReferenceNames	Unspecified	None

8.17 DCIM_OEMPowerUtilizationCustomSettingData

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.18 DCIM_OEMPowerUtilizationManagementCapabilities

All operations in the default list in section 8.4 are supported as described by DSP0200 version 1.2.

8.19 DCIM_OEMPowerUtilizationManagementService

All operations in the default list in section 8.1.1 are supported as described by DSP0200 version 1.2.

9 Use Cases

This section contains object diagrams and use cases for the Power Supply Profile.

9.1 Profile Registration

Figure 2 represents a possible instantiation of the Power Utilization Management Profile. The registration of this profile is represented by profile2, using the scoping instance methodology. Service1 is the Central Instance of the profile.

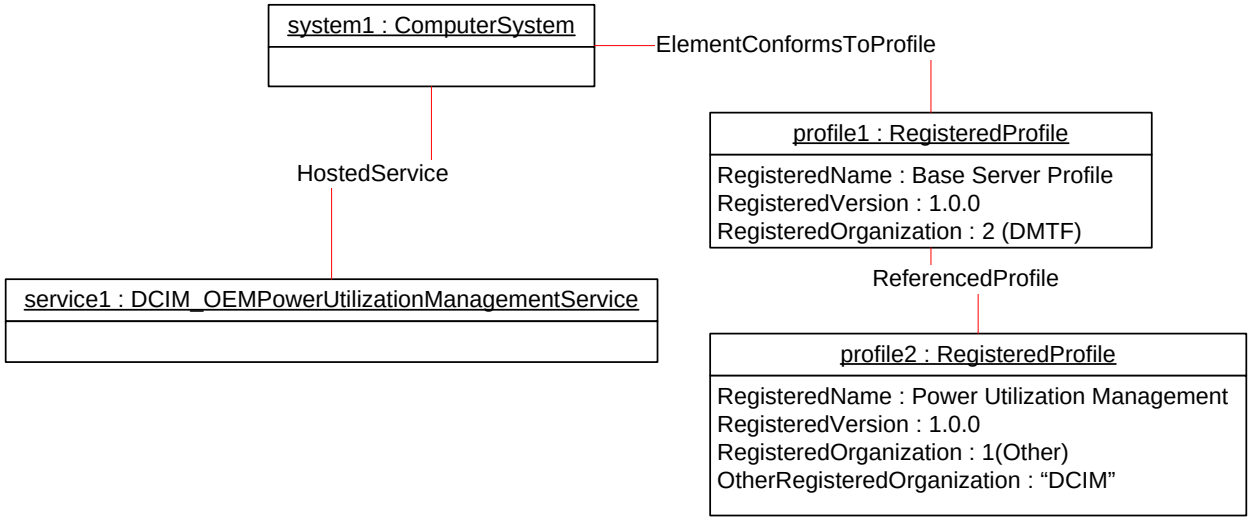

Figure 2 – Power Utilization Management Profile: Profile Registration

9.2 Power Utilization Algorithms

These use cases describe possible instantiation of the Power Utilization Management Profile for representing and managing power utilization algorithms.

9.2.1 Representing Power Utilization Algorithm

Figure 3 represents an instantiation of the Power Utilization Management Profile. Cap1 represents the capabilities of the power utilization service. The value of 32769 for the cap1.SupportedMethods property indicates that the RequestPowerUtilizationAlgorithm is supported by the associated service1. The Cap1.SupportedRequestAlgorithms and Cap1.RequiredCustomSettings properties represent the allowed values for the RequestedAlgorithm, CustomSettingNames and CustomSettingValues parameters of the service1.RequestPowerUtilizationAlgorithm() method.

The service1.PowerUtilizationMode represents the current power utilization mode of the associated ComputerSystem managed system. The service1.PowerUtilizationAlgorithm property’s value 7 (Active Power Utilization) represents that the power utilization service is employing a specific algorithm to yield the best power consumption and performance for the associated ComputerSystem managed system.

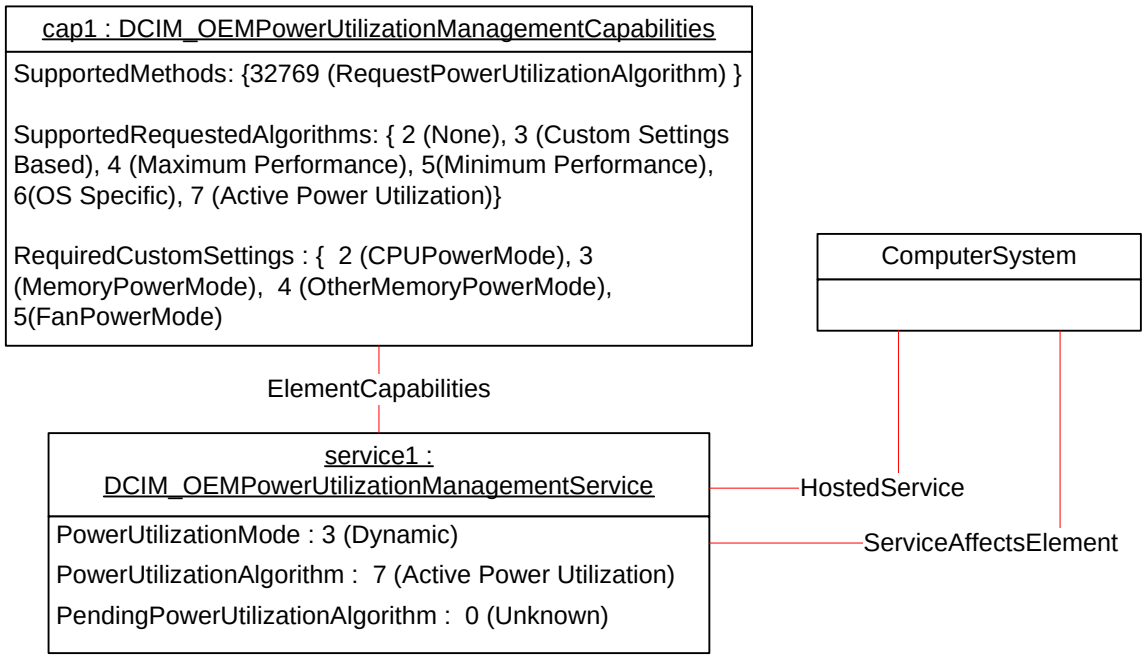

Figure 3 – Power Utilization Management Profile: Before RequestPowerUtilizationAlgorithm()

9.2.2 After the Successful RequestPowerUtilizationAlgorithm() Method Execution

Figure 4 represents an instantiation of the Power Utilization Management Profile after a successful RequestPowerUtilizationAlgorithm() method execution. The RequestPowerUtilizationAlgorithm() method was executed with the RequestedAlgorithm parameter set to 3 (Custom Settings Based), the CustomSettingNames parameter set to {“CPUPowerMode”, ”MemoryPowerMode”, ”OtherMemoryPowerMode”, ”FanPowerMode”} and CustomSettingValues parameters set to {4 (OS Demand Based), 1 (Other), 1067, 3 (Min Power).

After the successful execution, the service1.PendingPowerUtilizationAlgorithm changed from 0(Unknown) to 3(Custom Settings Based), as indicated in the RequestedAlgorithm parameter of the executed method. The granular pending settings are represented by the customsettingdata1 that is associated with service1 through the ElemenSettingData association. The ElementSettingData association’s IsPending property has 2 (IsPending) value, and the IsCurrent property has 2 (Is Not Current) value. The customsettingdata1 properties reflect the values of the executed method’s CustomSettingsValue parameter’s values. The service1.PowerUtilizationAlgorithm continues to have value 7(Active Power Utilization) because the change of the power service algorithm requires a reboot of the ComputerSystem managed system.

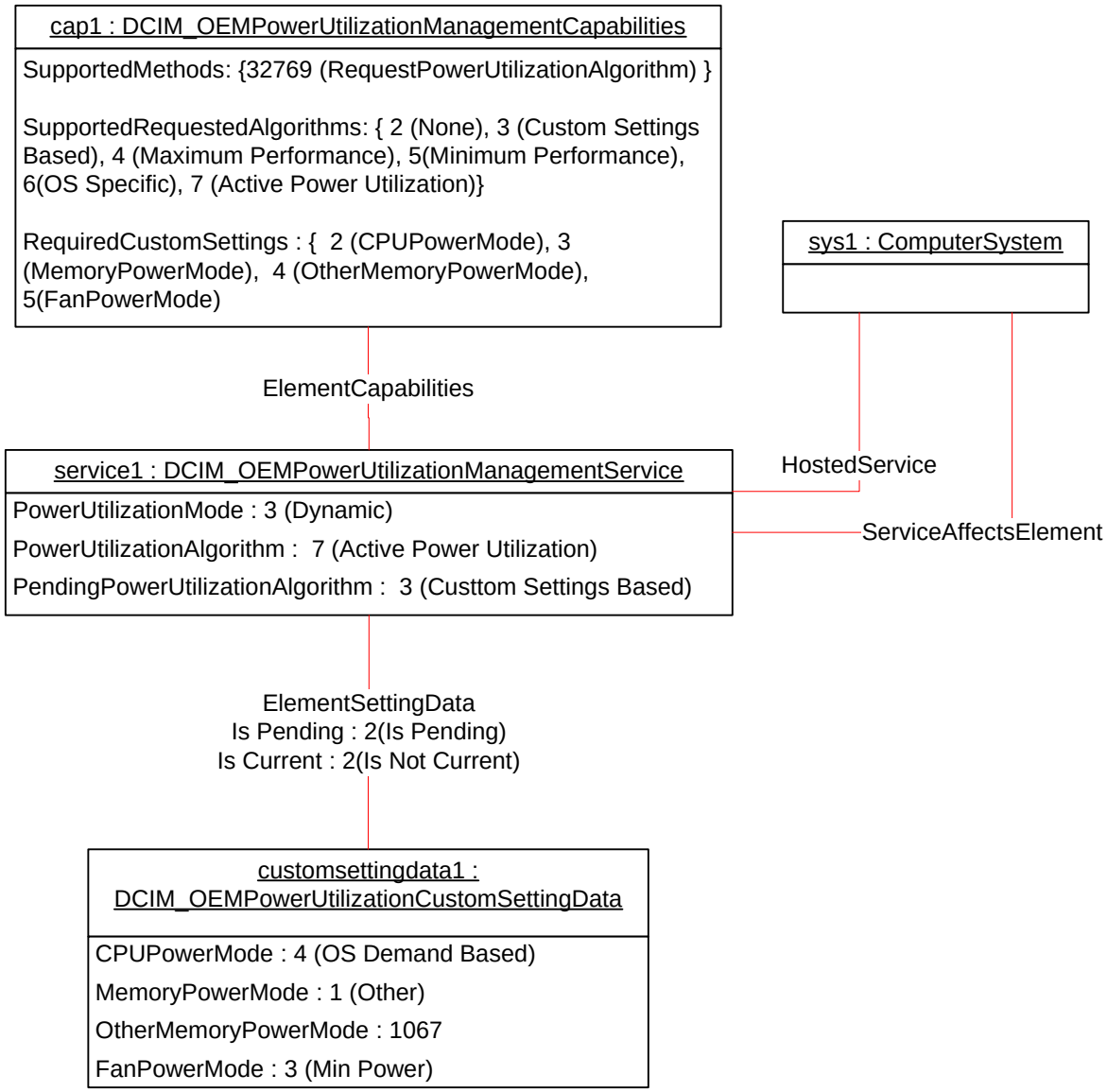

Figure 4 – Power Utilization Management Profile: After RequestPowerUtilizationAlgorithm()

9.2.3 After the Managed System Reboot

Figure 5 represents an instantiation of Power Utilization Management Profile after the reboot of the managed system. The pending settings have been applied, and the service1.PowerUtilizationAlgorithm property reflects the executed method's RequestedAlgorithms parameter value. Customsettingdata1 is not pending, but reflects the current custom settings as ElementSettingData association's properties indicate.

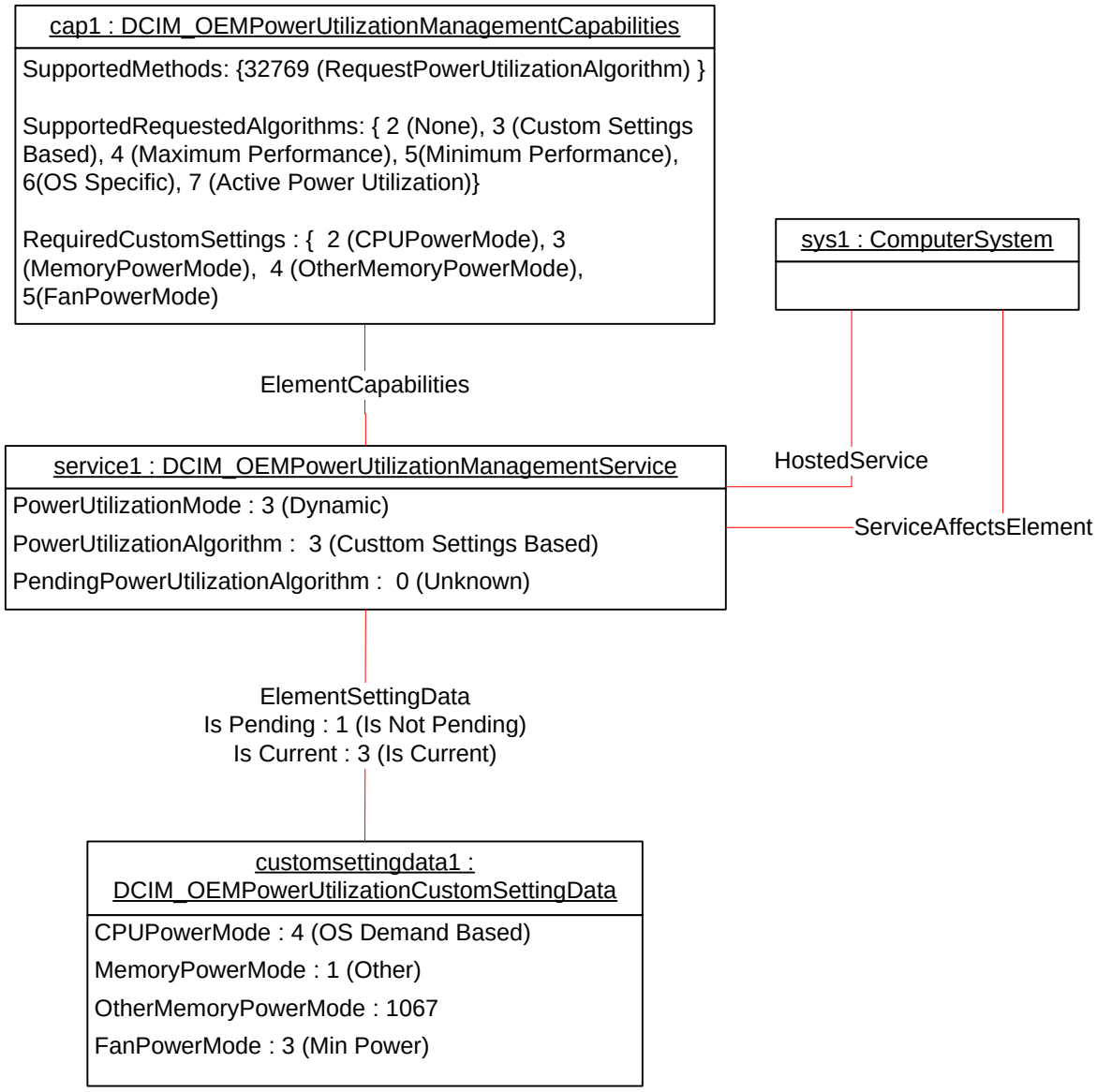

Figure 5 – Power Utilization Management Profile: After Reboot of the Managed System

9.3 Power Consumption Budget and Levels

Figure 6 represents an instantiation of the Power Utilization Management Profile. Syspwrcurr represents the system1's power aspect. The syspowercurr.Limit property represents the system1's current power consumption budget, while the syspowercurr.Reservation property represents the system1's power consumption. The SettingDefineCapabilities association references syspwrmax, and has the ValueRange property set to 3 (Maximus) denoting the syspwrmax as the maximum power consumption setting. The syspwrmax.Limit property represents the maximum power consumption budget for system1. Similarly, syspwrmin.Limit property represents the minimum power consumption budget for system1 because its association's ValueRange property has value 2 (Minimus).

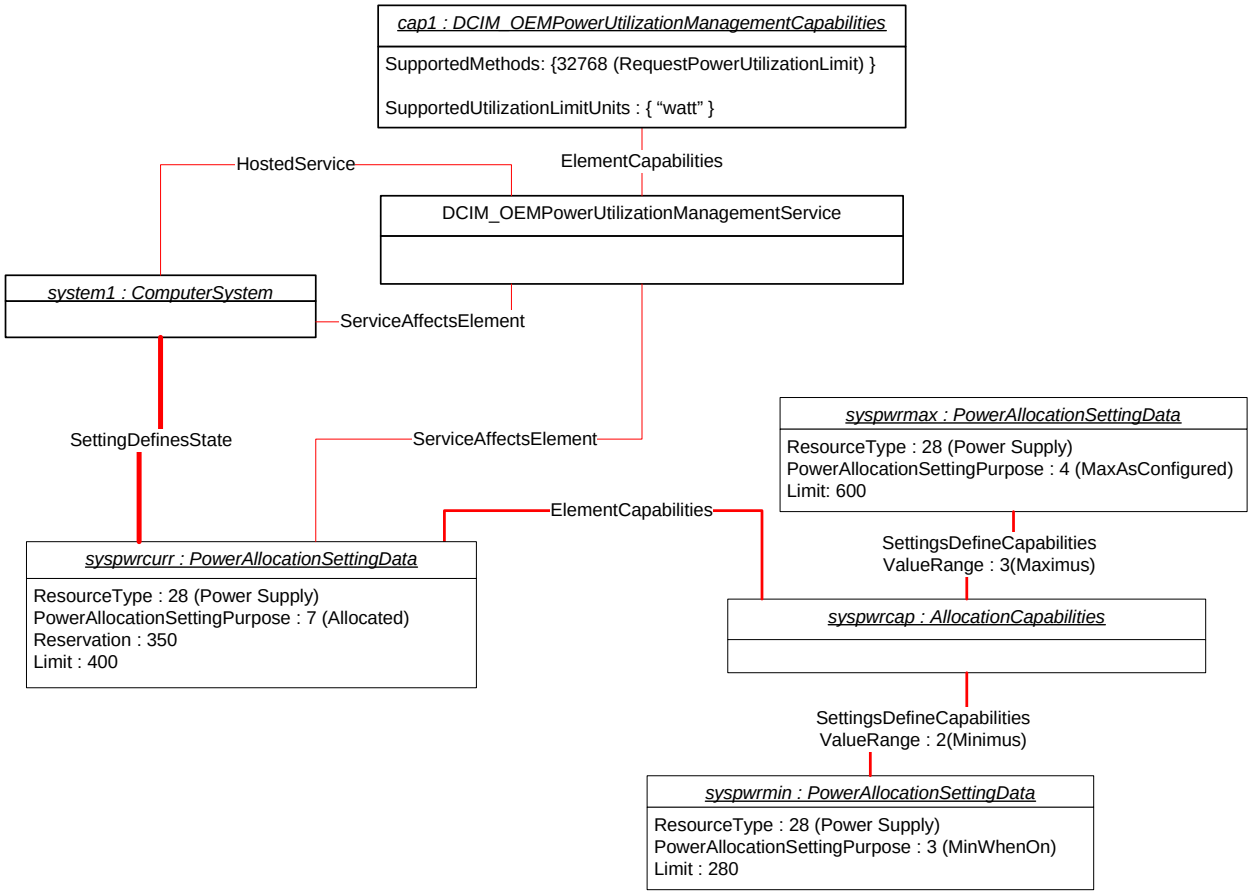

Figure 6 – Power Utilization Management Profile: Power Consumption Budget and Levels

9.4 Change the Managed System's Power Consumption Budget

1) From the given instance of CIM_ComputerSystem, select the DCIM_OEMPowerUtilizationManagementService (Service) instance associated to the given instance through the CIM_ServiceAffectsElement association.

2) Select the DCIM_OEMPowerUtilizationManagementCapabilities (Capabilities) instance associated to the Service instance through the ElementCapabilities association.

3) Verify that the Capabilities.SupportedMethods property contains 32768 (RequestPowerUtilizationLimit) value.

4) If there is no such value, then the Service does not support changing the power consumption budget of the managed system.

5) Otherwise, select the instance of CIM_PowerAllocationSettingData (PowerAspect) associated to the given managed system through CIM_SettingDefinesState association.

6) Select the instance of CIM_AllocationCapabilities associated to the PowerAspect instance through the CIM_ElementCapabilities.

7) Select the CIM_PowerAllocationSettingData instances associated to the selected CIM_AllocationCapabilities instance through the CIM_SettingsDefineCapabilities association.

   The CIM_PowerAllocationSettingData.Limit (Minimum Limit) property represents the minimum power budget setting for the managed system, if the CIM_SettingDefineCapabilities association referencing the instance has the ValueRange property set to 2 (Minimus).

The CIM_PowerAllocationSettingData.Limit (Maximum Limit) property represents the maximum power budget setting for the managed system, if the CIM_SettingDefineCapabilities association referencing the instance has the ValueRange property set to 3 (Maximus).

8) Invoke Service.RequestPowerUtilizationLimit() method using the following steps:
    1) Set the EnforceUtilizationLimit parameter to TRUE
    2) Set the UtilizationLimit parameter to a value less than or equal to the Maximum Limit, and greater than or equal to the Minimum Limit
    3) Set the UtilizationLimitUnit parameter to a value in the Capabilities.SupportedUtilizationLimitUnits[] property
    4) Set the UtilizationElement parameter to the Power Aspect instance reference.
9) After the successful execution of the method, the Power Aspect instance's Limit property will be set to the requested power consumption budget.

9.5 Remove Power Consumption Budget for the Managed System

1) From the given instance of CIM_ComputerSystem, select the DCIM_OEMPowerUtilizationManagementService (Service) instance associated to the given instance through the CIM_ServiceAffectsElement association.
2) Select the DCIM_OEMPowerUtilizationManagementCapabilities (Capabilities) instance associated to the Service instance through the ElementCapabilities association.
3) Verify that the Capabilities.SupportedMethods property contains 32768 (RequestPowerUtilizationLimit) value.
4) If there is no such value, then the Service does not support removing the power consumption budget of the managed system.
5) Otherwise, select the instance of CIM_PowerAllocationSettingData (PowerAspect) associated to the given managed system through the CIM_SettingDefinesState association.
6) Invoke Service.RequestPowerUtilizationLimit() method using the following steps:
    1) Set the EnforceUtilizationLimit parameter to FALSE
    2) Set the UtilizationLimit parameter to NULL
    3) Set the UtilizationLimitUnit parameter to NULL
    4) Set the UtilizationElement parameter to the Power Aspect instance reference.
7) After the successful execution of the method, the power consumption budget will not be enforced for the managed system and the Power Aspect instance's Limit property will be set to NULL.

10 CIM Elements

Table 16 lists the instances of CIM Elements for this profile. Instances of the CIM Elements shall be implemented as described in Table 16. Sections 7 ("Implementation Requirements") and 8 ("Methods") may impose additional requirements on these elements.

Table 16 – CIM Elements: Power Utilization Management Profile

Element Name	Requirement	Description
Classes		
CIM_AllocationCapabilities	Conditional	See section 10.1 and 7.4.
CIM_ElementCapabilities (CIM_AllocationCapabilities)	Conditional	See section 10.2
CIM_ElementCapabilities (DCIM_OEMPowerConfigurationCapabilties)	Mandatory	See section 10.3
CIM_HostedService	Mandatory	See section 10.4
CIM_ElementSettingData	Conditional	See section 10.5 and 7.2
CIM_RegisteredProfile	Mandatory	See section 10.6
CIM_PowerAllocationSettingData (CIM_ComputerSystem)	Mandatory	See section 10.7 and 7.3
CIM_PowerAllocationSettingData (CIM_AllocationCapabilities)	Conditional	See section 10.8 and 7.4
CIM_ServiceAffectsElement (CIM_ComputerSystem)	Mandatory	See section 10.9
CIM_ServiceAffectsElement (CIM_PowerAllocationSettingData)	Mandatory	See section 10.10
CIM_SettingsDefineState	Mandatory	See section 10.11 and 7.3
CIM_SettingsDefineCapabilities	Conditional	See section 10.12 and 7.4
DCIM_OEMPowerUtilizationCustomSettingData	Conditional	See section 10.13 and 7.2
DCIM_OEMPowerUtilizationManagementCapabilities	Mandatory	See section 10.14 and 7.1
DCIM_OEMPowerUtilizationManagementService	Mandatory	See section 10.15 and 7.1
Indications		
None defined in this profile		

10.1 CIM_AllocationCapabilities

CIM_AllocationCapabilities instance represents managed systems' power budgeting capabilities. Table 17 contains the requirements for the elements of this class.

Table 17 – CIM_AllocationCapabilities

Properties	Requirement	Notes
InstanceID	Mandatory	Key
ElementName	Mandatory	
ResourceType	Mandatory	The property shall be set to 28 (Power).
RequestTypesSupported	Mandatory	The property shall be set to 2 (Specific).
SharingMode	Mandatory	The property shall be set to 2 (Dedicated).

10.2 CIM_ElementCapabilities (CIM_AllocationCapabilities)

CIM_ElementCapabilities associates the CIM_PowerAllocationSettingData instance that represents the power aspect of managed systems with CIM_AllocationCapabilities. Table 18 contains the requirements for elements of this class.

Table 18 – CIM_ElementCapabilities

Properties	Requirement	Notes
ManagedElement	Mandatory	Key: This property shall be a reference to the instance of CIM_PowerAllocationSettingData. Cardinality 1..* indicating at least one reference
Capabilities	Mandatory	Key: This property shall be a reference to the instance of CIM_AllocationCapabilities. Cardinality 0..1 indicating at most one reference

10.3 CIM_ElementCapabilities (CIM_PowerUtilizationManagementCapabilities)

CIM_ElementCapabilities associates the DCIM_OEMPowerUtilizationManagementService instance with DCIM_OEMPowerUtilizationManagementCapabilities. Table 19 contains the requirements for elements of this class.

Table 19 – CIM_ElementCapabilities

Properties	Requirement	Notes
ManagedElement	Mandatory	Key: This property shall be a reference to the instance of DCIM_OEMPowerUtilizationManagementService. Cardinality 1..* indicating at least one reference
Capabilities	Mandatory	Key: This property shall be a reference to the instance of DCIM_OEMPowerUtilizationManagementCapabilities. Cardinality 1 indicating one and only one reference

10.4 CIM_HostedService

CIM_HostedService is used to associate an instance of DCIM_OEMPowerUtilizationManagementService with an instance of CIM_ComputerSystem that is the computer system hosting the service. Table 20 contains the requirements for elements of this class.

Table 20 – Class: CIM_HostedService

Elements	Requirement	Notes
Antecedent	Mandatory	Key: This property shall reference the instance of CIM_ComputerSystem. Cardinality 1 indicating one and only one reference
Dependent	Mandatory	Key: This property shall reference the instance of CIM_RoleBasedAuthorizationService. Cardinality 1..* indicating one or more references

10.5 CIM_ElementSettingData Reference

CIM_ElementSettingData associates instances of DCIM_OEMPowerUtilizationCustomSettingData with the DCIM_OEMPowerUtilizationManagementService instance. Table 21 provides information about the properties of CIM_ElementSettingData.

Table 21 – Class: CIM_ElementSettingData

Elements	Requirement	Notes
ManagedElement	Mandatory	**Key** This shall be a reference to the Central Instance. Cardinality 1: indicating one and only one
SettingData	Mandatory	**Key** This shall be a reference to an instance of DCIM_OEMPowerUtilizationCustomSettingData. Cardinality *: indicating zero or many
IsCurrent	Mandatory	Matches 1 (Is Current) or 2 (Is Not Current)
IsPending	Mandatory	This property shall match 2 (Is Pending) or 3 (Is Not Pending)

10.6 CIM_RegisteredProfile

The CIM_RegisteredProfile class is defined by the Profile Registration Profile. The requirements listed in Table 22 are in addition to those mandated by the Profile Registration Profile.

Table 22 – Class: CIM_RegisteredProfile

Properties	Requirement	Description
RegisteredName	Mandatory	This property shall have a value of “Power Utilization Management”.
RegisteredVersion	Mandatory	This property shall have a value of “1.0.0”.
RegisteredOrganization	Mandatory	This property shall have a value of 1 (Other).
OtherRegisteredOrganization	Mandatory	This property shall match “DCIM”

10.7 CIM_PowerAllocationSettingData (CIM_ComputerSystem)

CIM_PowerAllocationSettingData instance represents the power aspect of a managed system. Table 23 contains the requirements for the elements of this class.

Table 23 – CIM_PowerAllocationSettingData

Properties	Requirement	Notes
InstanceID	Mandatory	Key
ElementName	Mandatory	
ResourceType	Mandatory	This property shall be set to a value of 28 (Power).
PowerAllocationSettingPurpose	Mandatory	This property shall match 7 (Allocated)
AllocationUnits	Mandatory	
Limit	Mandatory	
Reservation	Mandatory	

10.8 CIM_PowerAllocationSettingData (CIM_AllocationCapabilities)

CIM_PowerAllocationSettingData instance represents the detailed power consumption levels for managed systems. Table 24 contains the requirements for the elements of this class.

Table 24 – CIM_PowerAllocationSettingData

Properties	Requirement	Notes
InstanceID	Mandatory	Key
ElementName	Mandatory	
ResourceType	Mandatory	This property shall be set to a value of 28 (Power).
PowerAllocationSettingPurpose	Mandatory	
OtherSettingPurpose	Conditional	This property shall be implemented if the PowerAllocationSettingPurpose has value 1 (Other).
Limit	Mandatory	

10.9 CIM_ServiceAffectsElement (CIM_ComputerSystem)

CIM_ServiceAffectsElement is used to associate managed systems with the Central Instance. Table 25 details the requirements for instances of CIM_ServiceAffectsElement.

Table 25 – Class: CIM_ServiceAffectsElement

Elements	Requirement	Notes
AffectingElement	Mandatory	**Key** This property shall be a reference to the Central Instance of the profile. Cardinality 1 indicating one and only one
AffectedElement	Mandatory	**Key** This property shall be a reference to CIM_ComputerSystem. Cardinality 1..* indicating at least one
ElementEffects	Mandatory	Matches 5 (Manages)

10.10 CIM_ServiceAffectsElement (CIM_PowerAllocationSettingData)

CIM_ServiceAffectsElement is used to associate CIM_PowerAllocationSettingData representing the power aspect of a managed system with the Central Instance. Table 25 details the requirements for instances of CIM_ServiceAffectsElement.

Table 26 – Class: CIM_ServiceAffectsElement

Elements	Requirement	Notes
AffectingElement	Mandatory	**Key** This property shall be a reference to the Central Instance of the profile. Cardinality 1
AffectedElement	Mandatory	**Key** This property shall be a reference to CIM_PowerAllocationSettingData. Cardinality 1..*
ElementEffects	Mandatory	Matches 5 (Manages)

10.11 CIM_SettingsDefineCapabilities

Table 27 details the requirements for instances of CIM_SettingsDefineCapabilities when it is used to associate an instance of CIM_PowerAllocationSettingData representing the detailed power consumption level of managed systems with the instance of CIM_AllocationCapabilities.

Table 27 – Class: CIM_SettingsDefineCapabilities

Elements	Requirement	Notes
GroupComponent	Mandatory	**Key** This property shall be a reference to an instance of CIM_AllocationCapabilities. Cardinality 0..1 indicating at most one reference
PartComponent	Mandatory	**Key** This property shall be a reference to CIM_PowerAllocationSettingData. Cardinality 1..* indicating at least one reference
PropertyPolicy	Mandatory	This property shall match 0 (Independent)
ValueRole	Mandatory	This property shall match 3 (Supported)
ValueRange	Mandatory	This property shall match 0 | 1 | 2 (Point, Maximums, Minimums)

10.12 CIM_SettingsDefineState

CIM_SettingsDefineState instance associates the CIM_ComputerSystem instance that represents a managed system, with the CIM_PowerAllocationSettingData instance that represents the power capping aspect of the power aspect of the managed system. Table 28 contains the requirements for elements of this class.

Table 28 – CIM_SettingsDefinesState

Properties	Requirement	Notes
ManagedElement	Mandatory	This property shall be a reference to the instance of CIM_ComputerSystem. Cardinality 1 indicating one and only one
SettingData	Mandatory	This property shall be a reference to the instance of CIM_PowerAllocationSettingData. Cardinality 1 indicating one and only one

10.13 DCIM_OEMPowerUtilizationCustomSettingData

DCIM_OEMPowerUtilizationCustomSettingData represents the custom settings for power consumption algorithms. Table 29 provides information about the properties of DCIM_OEMPowerUtilizationCustomSettingData.

Table 29 – Class: DCIM_OEMPowerUtilizationCustomSettingData

Elements	Requirement	Notes
InstanceID	Mandatory	**Key**
ElementName	Mandatory	Pattern ".*"
CPUPowerMode	Mandatory	
MemoryPowerMode	Mandatory	
OtherMemoryPowerMode	Conditional	This property shall be implemented if the MemoryPowerMode has value 1 (Other).
FanPowerMode	Mandatory	

10.14 DCIM_OEMPowerUtilizationManagementCapabilities

DCIM_PowerUtilizationManagementCapabilities represents the power utilization capabilities of managed systems. Table 30 contains the requirements for elements of this class.

Table 30 – Class: DCIM_OEMPowerUtilizationManagementCapabilities

Properties	Requirement	Notes
InstanceID	Mandatory	**Key**
RequestedStatesSupported	Mandatory	This property shall match empty array.
PowerUtilizationModesSupported	Mandatory	
SupportedMethods	Mandatory	
SupportedUtilizationLimitUnits	Mandatory	
SupportedRequestedAlgorithms	Mandatory	
RequiredCustomSettings	Mandatory	

10.15 DCIM_OEMPowerUtilizationManagementService

DCIM_OEMPowerUtilizationManagementService represents the power utilization management service responsible for controlling the power utilization algorithms of managed systems. Table 31 contains the requirements for elements of this class.

Table 31 – Class: DCIM_OEMPowerUtilizationManagementService

Properties	Requirement	Notes
CreationClassName	Mandatory	**Key**
Name	Mandatory	**Key**
PowerUtilizationMode	Mandatory	
EnabledState	Mandatory	This property shall match 2 (Enabled)
RequestedState	Mandatory	This property shall match 0 (Unknown)
PowerUtilizationAlgorithm	Mandatory	
PendingPowerUtilizationAlgorithm	Mandatory	
RequestPowerUtilizationAlgorithmEI()	Conditional	
RequestPowerUtilizationAlgorithm()	Conditional	
RequestPowerUtilizationLimit()	Conditional	

ANNEX A
(informative)

DCIM MOF

NOTE: This may not be the most up-to-date MOF. Please, for implementation purposes refer to the MOF published separately from the profiles.

// Copyright (c) 2008 Dell Inc. All rights reserved.

```
// ===================================================================
// DCIM_OEMPowerUtilizationCustomSettingData
// ===================================================================



 [Experimental, Version ( "2.18.0" ),
     Description (
       "PowerUtilizationCustomSettingData class is used for custom "
       "configuration of power utilization for a "
       "CIM_ManagedSystemElement in addition to those provided in "
       "PowerAllocationSettingData class.")]
 class DCIM_OEMPowerUtilizationCustomSettingData : CIM_SettingData {


      [Description (
         "This property represents the setting to control processors' "
         "power consumption.\n "
         "2 (\"Max Performance\") - corresponds to the minimum PState of "
         "the processors. In this setting processors consume maximum "
         "power.\n "
         "3 (\"Min Power\") - corresponds to the maximum PState of the "
         "processors. In this setting processors consume minimum power.\n "
         "4 (\"OS Demand Based\") - corresponds to the OS controlled "
         "PState of the processors. In this setting processors power "
```

```
      "consumption is controlled by the OS.\n "
      "5 (\"System Demand Based\") - corresponds to the special "
      "algorithm used to control PState to maximize workload to power "
      "consumption ratio.\n In this setting system controls and "
      "adjusts power consumption of the processor based on the "
      "workload."),
  ValueMap { "0", "2", "3", "4", "5" },
  Values { "Unknown", "Max Performance", "Min Power",
    "OS Demand Based", "System Demand Based"}]
uint16 CPUPowerMode;

   [Description (
      "This property represents the setting for memory frequency.\n "
      "1 (\"Other\") - corresponds to a specific memory frequency "
      "setting. The specific frequency shall be represented in the "
      "OtherMemoryFrequency property.\n "
      "2 (\"Max Frequency\") - corresponds to the maximum frequency "
      "setting of memory.\n "
      "3 (\"Min Frequency\") - corresponds to the minimum frequency "
      "setting of memory.\n"),
  ValueMap { "0", "1", "2", "3" },
  Values { "Unknown", "Other", "Max Frequency", "Min Frequency" },
   ModelCorrespondence {
       "DCIM_OEMPowerUtilizationCustomSettingData.OtherMemoryFrequency" }]
uint16 MemoryPowerMode;

    [PUnit ("hertz * 10^6"), Description (
      "This property represents the setting for specific memory "
      "frequency. Supported frequencies include 800 MHz, 1067 MHz, "
      "1333 MHz")]
uint32 OtherMemoryPowerMode;
```

Power Utilization Management Profile

```
      [Description (
         "This property represents the setting for cooling algorithm to "
         "maximimize power utilization. When the workload rises the "
         "cooling will need to be increased or the workload be executed "
         "slower.\n "
         "2 (\"Max Performance\") - corresponds to fan devices consuming "
         "more power because of speedups to handle heat generated from "
         "executing workloads faster.\n "
         "3 (\"Min Power\") - corresponds to slowing the workload through "
         "throttling so less heat is generated and fans can run slower."),
      ValueMap { "0", "2", "3"},
      Values { "Unknown", "Max Performance", "Min Power" }]
   uint16 FanPowerMode;
};



// Copyright (c) 2008 Dell Inc. All rights reserved.

// ==================================================================
// DCIM_OEMPowerUtilizationManagementCapabilities
// ==================================================================
// Preliminary Approved

[Experimental, Version ( "2.18.0" ),
   Description (
      "DCIM_OEMPowerUtilizationManagementCapabilities describes the capabilities "
      "of the associated Service.")]
class DCIM_OEMPowerUtilizationManagementCapabilities :
CIM_PowerUtilizationManagementCapabilities {


     [Description (
        "Each enumeration corresponds to support for the "
        "like-named method of the MetricService. "),
```

```
      ValueMap { "..", "32768", "32769", "32770", "32771..65535" },
      Values { "DMTF Reserved", "RequestPowerUtilizationLimit",
            "RequestPowerUtilizationAlgorithm",
            "RequestPowerUtilizationAlgorithmEI", "Vendor Specific" }]
  uint16 SupportedMethods[];

      [IsPUnit, Description (
        "Array of programmatic units for power utilization limit "
        "supported by the RequestPowerUtilizationLimit method's "
        "UtilizationLimit parameter."),
       ModelCorrespondence {
"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationLimit.UtilizationLimitUnit" }]
  string SupportedUtilizationLimitUnits[];

      [Description (
        "Array of power utilization algorithms supported by the "
        "RequestPowerUtilizationAlgorithm and "
        "RequestPowerUtilizationAlgorithmEI methods' RequestedAlgorithm "
        "parameter of the associated Service."),
       ModelCorrespondence {
"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm.RequestedAlgorithm",
"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI.RequestedAlgorithm" }]
  uint16 SupportedRequestedAlgorithms[];

      [Description (
        "Array of custom power utilization algorithm settings required  "
        "by the RequestPowerUtilizationAlgorithm and "
        "RequestPowerUtilizationAlgorithmEI methods' CustomSettingNames "
        "parameter, if the RequestedAlgorithm parameter has value of 2 "
```

```
        "(\"Custom Settings Based\").",
       ModelCorrespondence {

"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm.RequestedAlgorithm",

"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithmEI.RequestedAlgorithm" },
     ValueMap { "0", "2", "3", "4", "5"},
     Values { "Unknown", "CPUPowerMode", "MemoryPowerMode", "OtherMemoryPowerMode",
     "FanPowerMode"}]
  string RequiredCustomSettings[];
};



// Copyright (c) 2008 Dell Inc. All rights reserved.

// ==================================================================
// DCIM_OEMPowerUtilizationManagementService
// ==================================================================
     [Experimental, Version ( "2.18.0" ), Description (
      "PowerUtilizationManagementService represents the ability of a "
      "platform or component to perform autonomic management of "
      "its power utilization. ")]
class DCIM_OEMPowerUtilizationManagementService : CIM_PowerUtilizationManagementService {

     [Description (
        "This property describes the algorithm employed by the service "
        "for power utilization. Depending on the performance and power "
        "needs of the managed element, the selection could be made for "
        "the apropriate algorithm to be deployed for the power "
        "utilization.\n "
        "2  (\"None\") shall indicate that currently the service is not "
        "employing any power utilization algorithm. If the property "
```

```
    "value is 2 (\"None\"), then the PowerUtilizationMode shall be "
    "equal to 2 (\"None\").\n "
    "3 (\"Custom Settings Based\") shall indicate that the service "
    "is employing power utilzation algorithm based on a specific "
    "settings. This settings may be represented by the "
    "DCIM_OEMPowerUtilizationSettingData instance associated through "
    "ElementSettingData where the IsCurrent property has value 1 "
    "(\"Is Current\").\n  "
    "4 (\"Maximum Performance\") shall indicate that the service is "
    "employing a power utilization that yields the maximum "
    "performance for the affected managed elements. If the property "
    "value is 4 (\"Maximum Performance\"), then the "
    "PowerUtilizationMode shall be equal to 4 (\"Static\").\n "
    "5 (\"Minimum Performance\") shall indicate that the service is "
    "employing a power utilization that yields the minimum power "
    "consumption for the affected managed elements. If the property "
    "value is 5 (\"Minimum Performance\"), then the "
    "PowerUtilizationMode shall be equal to 4 (\"Static\").\n "
    "6 (\"OS Specific\") shall indicate that the service is "
    "employing a power utilization defined by the operating system.  "
    "If the property value is  6 (\"OS Specific\"), then the "
    "PowerUtilizationMode shall be equal to 3 (\"Dynamic\").\n "
    "7 (\"Active Power Utilization\") shall indicate that the "
    "service is employing a specific algorithm to yield the best "
    "power conumption and performance for the affected managed "
    "elements. If the property value is  7 (\"Active Power "
    "Utilization\"), then the PowerUtilizationMode shall be equal to "
    "3 (\"Dynamic\").\"),
  ValueMap { "0", "2", "3", "4", "5", "6", "7"},
  Values { "Unknown", "None", "Custom Settings Based",
           "Maximum Performance", "Minimum Performance", "OS Specific",
           "Active Power Utilization"},
```

```
    ModelCorrespondence {
        "DCIM_OEMPowerUtilizationManagementService.RequestedPowerUtilizationAlgorithm" }]
  uint16 PowerUtilizationAlgorithm;

    [Description (
        "This property describes the pending requested algorithm to be "
        "employed by the service for power utilization."),
    ValueMap { "0", "2", "3", "4", "5", "6", "7", "8"},
    Values { "Unknown", "None", "Custom Settings Based",
             "Maximum Performance", "Minimum Performance", "OS Specific",
             "Active Power Utilization", "Not Applicable"},
    ModelCorrespondence {
        "DCIM_OEMPowerUtilizationManagementService.PowerUtilizationAlgorithm" }]
  uint16 PendingPowerUtilizationAlgorithm;


    [Description (
        "This method is called to request a certain power utilization "
        "algorithm to be employed by the service for the system. The "
        "Service shall be associated with the System through "
        "CIM_ServiceAffectsElement.\n "
        "The return code of 0 shall indicate that the power utilization "
        "algorithm has been successfuly requested. The "
        "PendingPowerUtilizationAlgorithm shall be equal to the "
        "RequestedAlgorithm parameter or shall be equal to 0 (\"Unknown\").\n "
        "If the RequestedAlgorithm parameter has value 3 (\"Custom "
        "Settings Based \") then the return code of 0 shall indicate "
        "that  individual settings based power utilization algorithm has "
        "been requested. In this case the Service instance should be "
        "associated with an instance of "
        "DCIM_OEMPowerUtilizationCustomSettingData with ElementSettingData "
        "association that has IsPending property with value 2 (\"Is "
```

```
      "Pending\") or IsCurrent property with value 1(\"Is Current\"). "
      "The associated DCIM_OEMPowerUtilizationSettingData properties "
      "shall be set to the CustomSettings parameter embedded instance "
      "property values.\n "
      "Return code of 2 shall be returned if the RequestedAlgoritm "
      "parameter has a value that is not contained within the "
      "SupportedRequestedAlgorithms property array of the "
      "associated DEL_OEMPowerUtilizationManagementCapabilities "
      "instance.\n "
      "Return code of 2 shall be returned if the RequestedAlgorithm "
      "parameter has a value of 3 (\"Custom Settings Based\") and if "
      "the embedded instance of the CustomSettings paramater does not "
      "contain or has NULL values for the properties that named in the "
      "RequiredCustomSettings property array of the associated "
      "DEL_OEMPowerUtilizationManagementCapabilities."),
    ValueMap { "0", "1", "2", "3", "4", "5", "6", "7..32767",
      "32768..65535" },
    Values { "Completed with No Error", "Not Supported",
      "Error Occured", "Busy", "Invalid Reference",
      "Invalid Parameter", "Access Denied", "DMTF Reserved",
      "Vendor Specified" }]
  uint32 RequestPowerUtilizationAlgorithmEI (

    [Required, IN, Description (
       "Requested algorithm to be employed by the service for power utilization."),
   ValueMap { "2", "3", "4", "5", "6", "7", "8"},
   Values { "None", "Custom Settings Based", "Maximum Performance",
          "Minimum Performance", "OS Specific",
          "Active Power Utilization"},
   ModelCorrespondence {
     "DCIM_OEMPowerUtilizationManagementCapabilities.SupportedRequestedAlgorithms"}]
   uint16 RequestedAlgorithm,
```

```
    [IN, Description (
        "An instance of DCIM_OEMPowerUtilizationCustomSettingData "
        "that represents the requested custom settings and their "
        "values.\n "
        "This parameter shall not be NULL, if the RequestedAlgorithm "
        "parameter has value 3 (\"Custom Settings Based\").),
     EmbeddedInstance ( "DCIM_OEMPowerUtilizationCustomSettingData" )
        ]
  string CustomSettings,

    [IN ( false ), OUT, Description (
        "Reference to the job spawned if the operation continues "
        "after the method returns. (May be null if the task is "
        "completed).")]
  CIM_ConcreteJob REF Job);

    [Description (
     "This method is called to request a certain power utilization "
     "algorithm to be employed by the service for the system. The "
     "Service shall be associated with the System through "
     "CIM_ServiceAffectsElement.\n "
     "The return code of 0 shall indicate that the power utilization "
     "algorithm has been successfuly requested. The "
     "PendingPowerUtilizationAlgorithm shall be equal to the "
     "RequestedAlgorithm parameter or shall be equal to 0 (\"Unknown\").\n "
     "If the RequestedAlgorithm parameter has value 3 (\"Custom "
     "Settings Based \") then the return code of 0 shall indicate "
     "that  individual settings based power utilization algorithm has "
     "been requested. In this case the Service instance should be "
     "associated with an instance of "
     "DCIM_OEMPowerUtilizationCustomSettingData with ElementSettingData "
```

```
    "association that has IsPending property with value 2 (\"Is "
    "Pending\") or IsCurrent property with value 1(\"Is Current\"). "
    "The associated DCIM_OEMPowerUtilizationSettingData properties "
    "shall be set to the values of CustomSettingValues parameter "
    "array's elements of the index, where the "
    "DCIM_OEMPowerUtilizationCustomSettingData property name matches the "
    "CustomSettingNames array parameter's value.\n "
    "Return code of 2 shall be returned if the RequestedAlgoritm "
    "parameter has a value that is not contained within the "
    "SupportedRequestedAlgorithms property array of the "
    "associated DEL_OEMPowerUtilizationManagementCapabilities "
    "instance.\n "
    "Return code of 2 shall be returned if the RequestedAlgorithm "
    "parameter has a value of 3 (\"Custom Settings Based\") and if "
    "either the CustomSettingNames paramater or SettingValue "
    "parameter is NULL or contains no values.\n"
    "Return code of 2 shall be returned if the RequestedAlgorithm "
    "parameter has a value of 3 (\"Custom Settings Based\") and if  "
    "all the values of the RequiredCustomSettings property array of "
    "the associated DEL_OEMPowerUtilizationManagementCapabilities "
    "instance does not exist in CustomSettingNames paramater array.\n "
    "Return code of 2 shall be returned if the RequestedAlgorithm "
    "parameter has a value of 3 (\"Custom Settings Based\") and if  "
    "there exists NULL value for the CustomSettingValues parameter "
    "where the corresponding index in the CustomSettingNames "
    "parameter contains a non-NULL value."),
  ValueMap { "0", "1", "2", "3", "4", "5", "6", "7..32767",
    "32768..65535" },
  Values { "Completed with No Error", "Not Supported",
    "Error Occured", "Busy", "Invalid Reference",
    "Invalid Parameter", "Access Denied", "DMTF Reserved",
    "Vendor Specified" }]
```

```
  uint32 RequestPowerUtilizationAlgorithm (

      [Required, IN, Description (
          "Requested algorithm to be employed by the service for power utilization."),
    ValueMap { "2", "3", "4", "5", "6", "7", "8"},
    Values { "None", "Custom Settings Based", "Maximum Performance",
             "Minimum Performance", "OS Specific",
             "Active Power Utilization"},
    ModelCorrespondence {
     "DCIM_OEMPowerUtilizationManagementCapabilities.SupportedRequestedAlgorithms"}]
    uint16 RequestedAlgorithm,

      [IN, Description (
          "Requested custom setting name that shall correspond to the "
          "property name of DCIM_OEMPowerUtilizationCustomSettingData." "This parameter shall not be
NULL, if the RequestedAlgorithm "
          "parameter has value 3 (\"Custom Settings Based\")."),
        ArrayType ( "Indexed" ),
        ModelCorrespondence {

"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm.CustomSettingValu
es",
          "DCIM_OEMPowerUtilizationManagementCapabilities.SupportedCustomSettings" }
          ]
    string CustomSettingNames[],

      [IN, Description (
          "Requested custom setting values for the custom setting "
          "referenced in the corresponding index of the "
          "CustomSettingNames parameter. Each value shall match to the "
          "string value of the corresponding CustomSettingNames index "
          "same named property of the "
          "DCIM_OEMPowerUtilizationCustomSettingData class."
```

```
        "This parameter shall not be NULL, if the RequestedAlgorithm "
        "parameter has value 3 (\"Custom Settings Based\").."),
      ArrayType ( "Indexed" ),
      ModelCorrespondence {
"DCIM_OEMPowerUtilizationManagementService.RequestPowerUtilizationAlgorithm.CustomSettingNames" }
        ]
    string CustomSettingValues,
      [IN ( false ), OUT, Description (
        "Reference to the job spawned if the operation continues "
        "after the method returns. (May be null if the task is "
        "completed).")]
    CIM_ConcreteJob REF Job);

    [Description (
      "This method is called to request enabling and disabling "
      "enforcement of a specificed power utilization limit for a "
      "managed element.\n "
      "If the EnforceUtilizationLimit is FALSE then the successful "
      "return code of 0 shall indicate that the power utilization "
      "limit is not enforced and the Limit property of the "
      "CIM_PowerAllocationSettingData instance referenced by "
      "UtilizingElement shall be NULL.\n "
      "If the EnforceUtilizationLimit is TRUE then the successful "
      "return code of 0 shall indicate that the power utilization "
      "limit is enforced and the Limit property in the units of "
      "AllocationUnits property of the CIM_PowerAllocationSettingData "
      "instance referenced by UtilizingElement shall be equal to the "
      "value specified by the UtilizationLimit parameter in the units "
      "specified by the UtilizationLimitUnit parameter.\n "
      "Return code of 2 shall be returned if the UtilizingElement "
      "parameter references an instance of "
```

```
        "CIM_PowerAllocationSettingData which is not associated to the "
        "Service through the CIM_ServiceAffectsElement association."),
      ValueMap { "0", "1", "2", "3", "4", "5", "6", "7..32767",
        "32768..65535" },
      Values { "Completed with No Error", "Not Supported",
        "Error Occured", "Busy", "Invalid Reference",
        "Invalid Parameter", "Access Denied", "DMTF Reserved",
        "Vendor Specified" }]
  uint32 RequestPowerUtilizationLimit (
      [Required, IN, Description (
          "If TRUE, after the successful execution the Limit property "
          "of the associated CIM_PowerAllocationSettingData shall be "
          "set to the value of UtilizationLimit parameter in the units "
          "specified in the UtilizationLimitUnits parameter.\n "
          "If FALSE, after the successful exection the Limit property "
          "of the asscociated CIM_PowerAllocationSettingData shall be "
          "NULL.")]
    boolean EnforceUtilizationLimit,
      [IN, Description (
          "Amount of power utilization limit in the units specified by "
          "the UtilizationLimitUnit parameter. ")]
    uint16 UtilizationLimit,
      [IsPUnit, IN, Description (
          "Programmatic unit of power utilization.")]
    string UtilizationLimitUnit,
      [IN, Description (
          "References the instance of CIM_PowerAllocationSettingData "
          "that represents the current power aspects of the managed "
          "element.")]
    CIM_PowerAllocationSettingData REF UtilizingElement,
      [IN ( false ), OUT, Description (
          "Reference to the job spawned if the operation continues "
```

```
        "after the method returns. (May be null if the task is "
        "completed).")]
    CIM_ConcreteJob REF Job);
};
```

ANNEX B
(informative)

Change Log

Version	Date	Description
1.0.0	2/12/2009	Initial version.

ANNEX C
(informative)

Acknowledgments

The authors wish to acknowledge the following people.

Editor:

- Khachatur Papanyan – Dell

Contributors:

- Aaron Merkin – Dell
- Javier L. Jimenez – Dell
- Khachatur Papanyan – Dell
- Michael Brundridge – Dell
- Wayne Weilnau – Dell