Document Number: DSP1025

Date: 2009-06-16

Version: 1.0.0

Software Update Profile

Document Type: Specification

Document Status: DMTF Standard

Document Language: E

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Foreword

The *Software Update Profile* (DSP1025) was prepared by the Server Management Working Group and the Physical Platform Profiles Working Group of the DMTF.

DMTF is a not-for-profit association of industry members dedicated to promoting enterprise and systems management and interoperability.

Acknowledgments

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Introduction

The information in this specification should be sufficient for a provider or consumer of this data to identify unambiguously the classes, properties, methods, and values that must be instantiated and manipulated to support the installation and update of BIOS, Firmware, Drivers and related software on a managed element within a managed system, using the DMTF Common Information Model (CIM) core and extended model definitions.

The target audience for this specification is implementers who are writing CIM-based providers or consumers of management interfaces that represent the component described in this document.

153 # Software Update Profile

154 ## 1 Scope

155 The *Software Update Profile* describes the classes, associations, properties, and methods used to
156 support the installation and update of BIOS, firmware, drivers and related software on a managed
157 element within a managed system.

158 ## 2 Normative References

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

162 ### 2.1 Approved References

163 DMTF DSP0004, *CIM Infrastructure Specification 2.5*,
164 http://www.dmtf.org/standards/published_documents/DSP0004_2.5.pdf

165 DMTF DSP0200, *CIM Operations over HTTP 1.2*,
166 http://www.dmtf.org/standards/published_documents/DSP0200_1.2.pdf

167 DMTF DSP0215, *Server Management Managed Element Addressing Specification 1.0*,
168 http://www.dmtf.org/standards/published_documents/DSP0215_1.0.pdf

169 DMTF DSP1001, *Management Profile Specification Usage Guide 1.0*,
170 http://www.dmtf.org/standards/published_documents/DSP1001_1.0.pdf

171 DMTF DSP1023, *Software Inventory Profile 1.0*,
172 http://www.dmtf.org/standards/published_documents/DSP1023_1.0.pdf

173 DMTF DSP1033, *Profile Registration Profile 1.0*,
174 http://www.dmtf.org/standards/published_documents/DSP1033_1.0.pdf

175 ### 2.2 Other References

176 IETF RFC 2396, *Uniform Resource Identifiers (URI): Generic Syntax*, http://www.ietf.org/rfc/rfc2396.txt

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

179 ## 3 Terms and Definitions

180 For the purposes of this document, the following terms and definitions apply. For the purposes of this
181 document, the terms and definitions given in *Software Inventory Profile* also apply.

182 **3.1**
183 **can**
184 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

3.13
unspecified
indicates that this profile does not define any constraints for the referenced CIM element or operation

3.14
Software Installation Service
A component that can be used to perform an installation or update of software on a managed element

4 Symbols and Abbreviated Terms

None

5 Synopsis

Profile Name: Software Update

Version: 1.0.0

Organization: DMTF

CIM Schema Version: 2.22

Central Class: CIM_SoftwareInstallationService

Scoping Class: CIM_System

The *Software Update Profile* describes the classes and properties used to support the installation and update of BIOS, firmware, drivers and related software on a managed element within a managed system.

CIM_SoftwareInstallationService shall be the Central Class of this profile. An instance of CIM_SoftwareInstallationService shall be the Central Instance of this profile.

CIM_System shall be the Scoping Class of this profile. The instance of CIM_System shall be the Scoping Instance of this profile.

References to CIM_System may be interpreted as references to subclasses of CIM_System such as CIM_ComputerSystem.

Table 1 lists profiles upon which this profile has a dependency.

Table 1 – Referenced Profiles

Profile Name	Organization	Version	Description
Profile Registration	DMTF	1.0	Mandatory
Software Inventory	DMTF	1.0	Optional

6 Description

The *Software Update Profile* provides the ability to perform installation or update of software on Managed Elements in the scope of a managed system. The profile also defines relationship between a managed element and the installation service that represents the availability of software installation and update functionality for a managed element.

Figure 1 represents the class schema of the *Software Update Profile* and shows the elements of the profile along with the dependent relationships between the elements of the profile and the referencing profiles. For simplicity, the prefix CIM_ has been removed from the name of the classes.

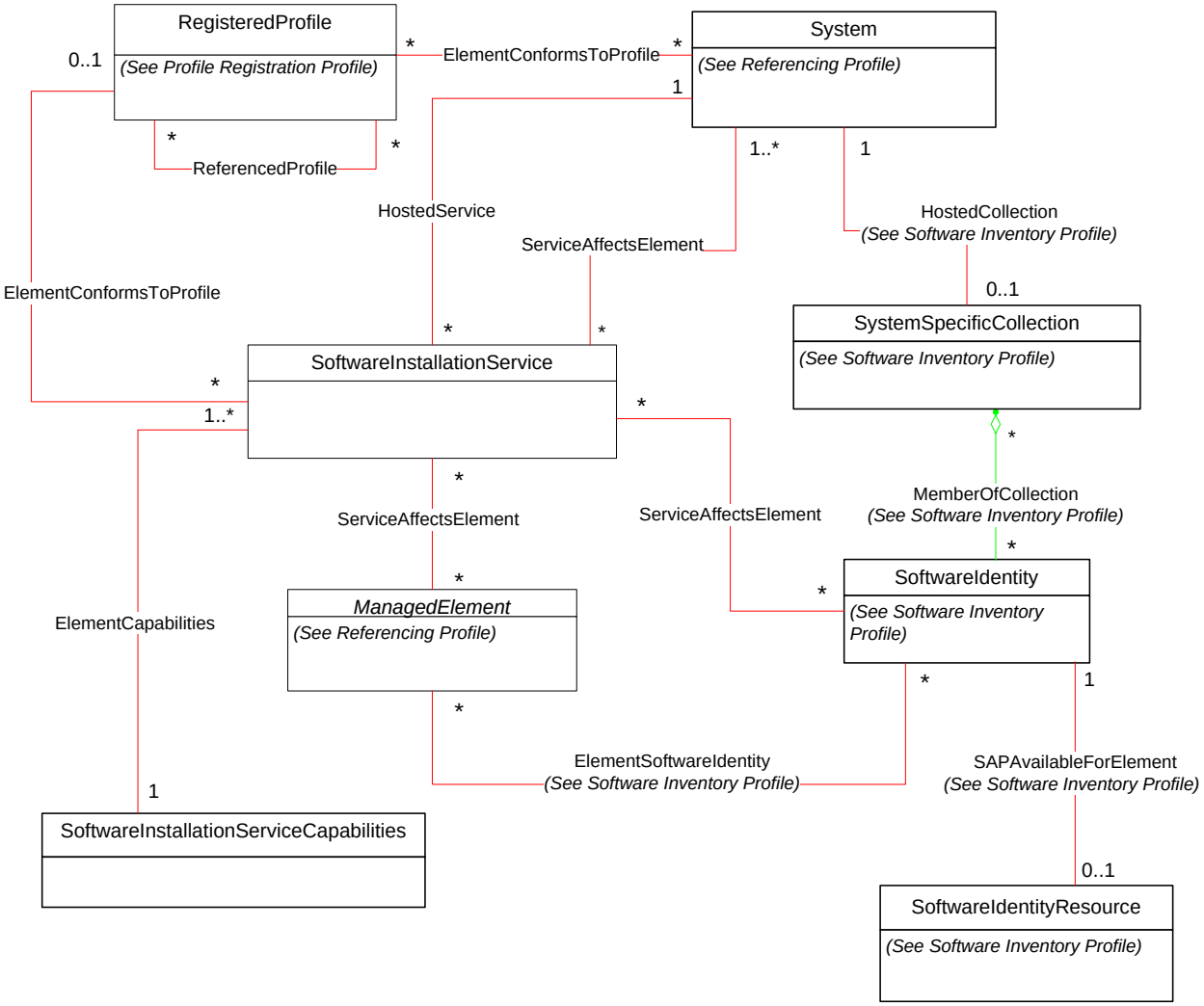


Figure 1 – Class Diagram: Software Update Profile

This profile supports installation and update of software on a managed element. Installation of software implies the first time installation of the software on the managed element and update of software implies that the managed element has a version of the software already installed on it.

The CIM_SoftwareInstallationService provides the ability to perform installation or update of software. The CIM_SoftwareInstallationServiceCapabilities define the capabilities of CIM_SoftwareInstallationService such as the list of the methods supported, the types of software that it is capable of installing and the supported installation options such as install, update, repair, forced installation and silent mode installation.

7 Implementation Requirements

This section describes the implementation requirements of the *Software Update Profile*. The list of all required methods can be found in Section 8 and properties in Section 9.2.

7.1 CIM_SoftwareInstallationService Instance

Each Software Installation Service shall be represented using exactly one instance of CIM_SoftwareInstallationService. An instance of CIM_SoftwareInstallationService shall support at least one of InstallFromSoftwareIdentity(), InstallFromByteStream() or InstallFromURI() methods.

7.2 CIM_SoftwareInstallationServiceCapabilities Instance

The capabilities of a Software Installation Service shall be represented by an instance of CIM_SoftwareInstallationServiceCapabilities. Each instance of CIM_SoftwareInstallationService shall be associated with exactly one instance of CIM_SoftwareInstallationServiceCapabilities through CIM_ElementCapabilities association. An instance of CIM_SoftwareInstallationServiceCapabilities may be associated with one or more instances of CIM_SoftwareInstallationService through CIM_ElementCapabilities association.

7.2.1 CIM_SoftwareInstallationServiceCapabilities.SupportedURISchemes[]

When the SupportedAsynchronousActions property or SupportedSynchronousActions property contains the value 5 (Install From URI), this property shall list the URI schemes that are supported by the associated instance of CIM_SoftwareInstallationService.

7.3 Advertising Compatibility with a Software Identity (Optional)

The following sections describe mechanisms to advertise compatibility between a Software Identity and an instance of CIM_SoftwareInstallationService that can install or update the Software Identity. The behavior described in each of the following sections is optional and should be implemented.

7.3.1 Using Target Types

The CIM_SoftwareIdentity.TargetTypes array property shall contain one or more strings that are used to advertise the compatibility with a Software Installation Service.

The CIM_SoftwareInstallationService.SupportedTargetTypes array property shall contain one or more strings that are used to advertise the compatibility with a Software Identity.

An instance of CIM_SoftwareInstallationService that is compatible to a Software Identity shall have at least one of the values in the SupportedTargetTypes property of the associated instance of CIM_SoftwareInstallationServiceCapabilities equal to at least one of the values in the TargetTypes array property of the Software Identity.

7.3.2 Using ExtendedResourceType

The CIM_SoftwareIdentity.ExtendedResourceType property shall represent a single format for an installer that is capable of installing or updating the Software Identity. The minimum version of the installer format required for compatibility shall be represented using the MinExtendedResourceTypeMajorVersion, MinExtendedResourceTypeMinorVersion, MinExtendedResourceTypeRevisionNumber, MinExtendedResourceTypeBuildNumber properties of the Software Identity.

The installer formats supported by the instance of CIM_SoftwareInstallationService shall be represented using the SupportedExtendedResourceTypes array property of the associated CIM_SoftwareInstallationServiceCapabilities instance. For each installer format, the supported versions shall be represented using the SupportedExtendedResourceTypesMajorVersions, SupportedExtendedResourceTypesMinorVersions, SupportedExtendedResourceTypesRevisionNumbers, SupportedExtendedResourceTypesBuildNumbers array properties of the associated CIM_SoftwareInstallationServiceCapabilities instance at the corresponding index.

An instance of CIM_SoftwareInstallationService that is compatible to a Software Identity shall have at least one of the values in the SupportedExtendedResourceTypes property of the associated instance of CIM_SoftwareInstallationServiceCapabilities equal to the ExtendedResourceType property of the Software Identity and the version of the installer format supported by the instance of CIM_SoftwareInstallationService shall be equal to or higher than the minimum version of the installer format required by the Software Identity. The version comparison algorithm is described in section 7.6.

7.3.3 CIM_ServiceAffectsElement

When an instance of CIM_SoftwareInstallationService is compatible with a Software Identity that is available for installation, there shall be an instance of CIM_SoftwareAffectsElement that associates the CIM_SoftwareInstallationService instance with the Software Identity.

7.4 Representing Relationship between Managed Element and Software Installation Service

When an instance of CIM_SoftwareInstallationService is capable of installing or updating software on a Managed Element, there may be an instance of CIM_ServiceAffectsElement that associates the CIM_SoftwareInstallationService with the CIM_ManagedElement instance. When an instance of CIM_SoftwareInstallationService is capable of installing or updating software on an instance of CIM_ComputerSystem or a ManagedElement scoped to the CIM_ComputerSystem instance, there shall be an instance of CIM_ServiceAffectsElement that associates the CIM_SoftwareInstallationService with the CIM_ComputerSystem instance.

7.5 Advertising the Location Information of a Software Identity (Optional)

The location of a Software Identity may be advertised. This is optional behavior. When this optional behavior is implemented, it shall be done according to the Implementation Requirements of the *Software Inventory Profile*.

7.6 Version Comparison Algorithm

The following algorithm shall be used to compare the minimum version of the installer format supported by a Software Identity with the installer format version supported by an instance of CIM_SoftwareInstallationService when the version information is represented as major version, minor version, revision number, and build number components using separate properties.

When comparing two properties in each step described below, if only one of the properties is null then the instance which has a non-null property shall be the instance with higher version. When both properties are null, the two instances shall be considered as having equal value.

1) If the properties representing the major version of the two instances are equal, go to step 2.

   Else the instance with the higher value of the property representing the major version shall be the instance with higher version.

2) If the properties representing the minor version of the two instances are equal, go to step 3.

   Else the instance with the higher value of the property representing the minor version shall be the instance with higher version.

3) If the properties representing the revision number of the two instances are equal, go to step 4.

   Else the instance with the higher value of the property representing the revision number shall be the instance with higher version.

4) If the properties representing the build number of the two instances are equal then the two instances shall have equal version.

   Else the instance with the higher value of the property representing the BuildNumber property shall be the instance with higher version.

8 Methods

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

8.1 CIM_SoftwareInstallationService.CheckSoftwareIdentity()

The CIM_SoftwareInstallationService.CheckSoftwareIdentity() method allows a client application to determine whether a Software Identity can be installed or updated on a Managed Element. It also allows the client to determine some other characteristics of the installation, such as whether install will require a reboot. When the Target parameter and the Collection parameter are both non-NULL, the method shall return 2 (Error Occurred). When the Target parameter and the Collection parameters are NULL, the method shall return 2 (Error Occurred).

No standard messages are defined.

Table 2 – CIM_SoftwareInstallationService.CheckSoftwareIdentity( ) Method: Return Code Values

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

Table 3 – CIM_SoftwareInstallationService.CheckSoftwareIdentity( ) Method: Parameters

Qualifiers	Name	Type	Description/Values
IN	Source	CIM_SoftwareIdentity REF	See 8.1.1.
IN	Target	CIM_ManagedElement REF	See 8.1.2.
IN	Collection	CIM_Collection REF	See 8.1.3.
OUT	InstallCharacteristics	uint16[]	An array describing the characteristics of installation/update of the Software Identity on the Managed Element

8.1.1 Source

The Source parameter is a reference to the Software Identity that represents the software to be checked for installation or update on a Managed Element. The method shall return 2 (Error Occurred) when this parameter is NULL.

8.1.2 Target

The Target parameter is a reference to the instance of CIM_ManagedElement that represents a managed element on which the Software Identity is intended to be installed or updated. When the Software Identity cannot be installed on the managed element represented by this parameter, the method shall return 2 (Error Occurred).

When this parameter is non-NULL and the method can determine that the Software Identity can be installed on the Managed Element represented by the Target parameter, the method shall return 0. When this parameter is non-NULL and the method can determine that the Software Identity cannot be installed on the Managed Element represented by the Target parameter, the method shall return 2 (Error Occurred).

8.1.3 Collection

The Collection parameter is a reference to the instance of CIM_SystemSpecificCollection that represents the collection to which the Software Identity will be added. When this parameter is not NULL and the CanAddToCollection property of the associated instance of CIM_SoftwareInstallationServiceCapabilities is FALSE, the method shall return 2 (Error Occurred).

When this parameter is non-NULL and the method can determine that the Software Identity can be added to the collection, the method shall return 0. When this parameter is non-NULL and the method can determine that the Software Identity cannot be added to the collection, the method shall return 2 (Error Occurred).

When this parameter is a reference to a collection whose Scoping Instance does not have a CIM_ServiceAffectsElement association to the CIM_SoftwareInstallationService upon which the method was invoked, the method shall return 2 (Error Occurred).

When this parameter is not a reference to an instance of CIM_SystemSpecificCollection implemented as defined in the *Software Inventory Profile*, the method shall return 2 (Error Occurred).

8.2 CIM_SoftwareInstallationService.InstallFromSoftwareIdentity()

The CIM_SoftwareInstallationService.InstallFromSoftwareIdentity( ) method allows a client application to install or update a Software Identity on a Managed Element and provides some installation options for the client to control the installation procedure. When this method is supported, at least one of SupportedAsynchronousActions property or SupportedSynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities shall contain the value 3 (Install From Software Identity).

When the method is used to install or update a software for which Installation Dependencies are advertised and the Dependencies are not satisfied, the method shall return 2 (Error Occurred).

When the Target and the Collection parameters are both non-NULL, the method shall return 2. When the Target and the Collection parameters are NULL, the method shall return 2 (Error Occurred).

When the Target parameter is non-NULL and the Collection parameter is NULL, the method will install or update the Software Identity on the Managed Element. When the Collection parameter is non-NULL and the Target parameter is NULL, the method will add the Software Identity to the collection.

No standard messages are defined.

Table 4 – CIM_SoftwareInstallationService.InstallFromSoftwareIdentity() Method: Return Code Values

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred.
4096	Job started: REF returned to started CIM_ConcreteJob.

414 **Table 5 – CIM_SoftwareInstallationService.InstallFromSoftwareIdentity() Method: Parameters**

Qualifiers	Name	Type	Description/Values
OUT	Job	CIM_ConcreteJob REF	See section 8.2.1.
IN	InstallOptions	uint16[]	See section 8.2.2.
IN	InstallOptionsValues	string[]	See section 8.2.3
IN	Source	CIM_SoftwareIdentity REF	See section 8.2.4.
IN	Target	CIM_ManagedElement REF	See section 8.2.5.
IN	Collection	CIM_Collection REF	See section 8.2.6.

415 ### 8.2.1 Job

416 The Job parameter is a reference to the instance of CIM_ConcreteJob that represents the job or task that
417 may be started by the invocation of the InstallFromSoftwareIdentity( ) method.

418 The method shall not return the Job output parameter when SupportedAsynchronousActions property of
419 the associated instance of CIM_SoftwareInstallationServiceCapabilities does not contain the value 3
420 (Install From Software Identity).

421 The method may return the Job output parameter and a return code value of 4096 when the parameters
422 for the method have been validated and a job has been spawned to complete the installation/update.

423 ### 8.2.2 InstallOptions

424 The InstallOptions array parameter is used to input the desired installation options to the
425 InstallFromSoftwareIdentity( ) method allowing the client to control the installation procedure. When this
426 parameter is NULL, the installation options used are implementation specific. The method shall return
427 2 (Error Occurred) when this parameter contains an installation option that is not listed in the
428 SupportedInstallOptions property of the associated instance of
429 CIM_SoftwareInstallationServiceCapabilities.

430 ### 8.2.3 InstallOptionsValues

431 The InstallOptionsValues array parameter is used when any installation option needs to be input as a
432 key-value pair with this parameter containing the value part.

433 If an install option in the InstallOptions array parameter requires a value, and there is a NULL value
434 specified in the InstallOptionsValues array parameter at the corresponding index, the method shall return
435 2 (Error Occurred).

436 If an install option in the InstallOptions array parameter is required not to have a value, and a non-NULL
437 value is specified in the InstallOptionsValues array parameter at the corresponding index, the method
438 shall return 2 (Error Occurred).

439 ### 8.2.4 Source

440 The Source parameter is a reference to the Software Identity that represents the software to be installed
441 or updated on a Managed Element. The method shall return 2 (Error Occurred) when this parameter is
442 NULL.

8.2.5 Target

The Target parameter is a reference to the instance of CIM_ManagedElement that represents a managed element on which the Software Identity is intended to be installed or updated. If the Target parameter is a reference to the Scoping Instance and

1) If the Software is applicable to a single managed element in its scope, including itself, the method shall install the software on the managed element.

2) If the Software is applicable to more than one managed element in its scope, the method may install the software on one, all or none of the managed elements. The behavior is implementation specific.

When this parameter references an Instance of CIM_SoftwareIdentity representing a Software Bundle, the method shall return 0 only if all the aggregated instances of Software Identity were successfully installed. If at least one SWID was not installed successfully, the method shall return 2 (Error Occurred).

When this parameter is non-NULL and the method can install or update the Software Identity on the Managed Element represented by the Target parameter, the method shall return 0. When this parameter is non-NULL and the method cannot install or update the Software Identity on the Managed Element represented by the Target parameter, the method shall return 2 (Error Occurred).

8.2.6 Collection

The Collection parameter is a reference to the instance of CIM_SystemSpecificCollection that represents the collection of Available Software to which the Software Identity referenced by the Source parameter will be added. When this parameter is not NULL and the CanAddToCollection property of the associated instance of CIM_SoftwareInstallationServiceCapabilities is FALSE, the method shall return 2 (Error Occurred).

When this parameter is non-NULL and the method can successfully add to the collection, the method shall return 0. When this parameter is non-NULL and the method cannot add the Software Identity to the collection, the method shall return 2 (Error Occurred).

When this parameter is a reference to a collection whose Scoping Instance does not have a CIM_ServiceAffectsElement association to the CIM_SoftwareInstallationService upon which the method was invoked, the method shall return 2 (Error Occurred).

When this parameter is not a reference to an instance of CIM_SystemSpecificCollection implemented as defined in the *Software Inventory Profile* (Version 1.0), the method shall return 2 (Error Occurred).

8.3 CIM_SoftwareInstallationService.InstallFromByteStream()

CIM_SoftwareInstallationService.InstallFromByteStream( ) method allows a client application to download or copy a series of bytes containing a software image to a Managed Element. When this method is supported, at least one of SupportedAsynchronousActions property or SupportedSynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities shall contain the value 4 (Install From ByteStream).

No standard messages are defined.

480 **Table 6 – CIM_SoftwareInstallationService.InstallFromByteStream( ) Method: Return Code Values**

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred.
4096	Job started: REF returned to started CIM_ConcreteJob.

481 **Table 7 – CIM_SoftwareInstallationService.InstallFromByteStream( ) Method: Parameters**

Qualifiers	Name	Type	Description/Values
OUT	Job	CIM_ConcreteJob REF	See 8.3.1.
IN	InstallOptions	uint16[]	See 8.3.2
IN	InstallOptionsValues	string[]	See 8.3.3
IN	Image	uint8	See 8.3.4.
IN	Target	CIM_ManagedElement REF	See 8.3.5.

482 ### 8.3.1 Job

483 The Job parameter is a reference to the instance of CIM_ConcreteJob that represents the job or task that
484 may be started by the invocation of the InstallFromByteStream( ) method.

485 The method shall not return the Job output parameter when SupportedAsynchronousActions property of
486 the associated instance of CIM_SoftwareInstallationServiceCapabilities does not contain the value
487 4 (Install From ByteStream).

488 The method may return the Job output parameter and a return code value of 4096 when the parameters
489 for the method have been validated and a job has been spawned to complete the installation/update.

490 ### 8.3.2 InstallOptions

491 The InstallOptions array parameter is used to input the desired installation options to the
492 InstallFromSoftwareIdentity( ) method allowing the client to control the installation procedure. When this
493 parameter is NULL, the installation options used are implementation specific and no error shall be
494 returned. The method shall return 2 (Error Occurred) when this parameter contains an installation option
495 that is not listed in the SupportedInstallOptions property of the associated instance of
496 CIM_SoftwareInstallationServiceCapabilities.

497 ### 8.3.3 InstallOptionsValues

498 The InstallOptionsValues array parameter is used when any installation option needs to be input as a
499 key-value pair with this parameter containing the value part.

500 If an install option in the InstallOptions array parameter requires a value, and there is a NULL value
501 specified in the InstallOptionsValues array parameter at the corresponding index, the method shall return
502 2 (Error Occurred).

503 If an install option in the InstallOptions array parameter is required not to have a value, and a non-NULL
504 value is specified in the InstallOptionsValues array parameter at the corresponding index, the method
505 shall return 2 (Error Occurred).

8.3.4 Image

The Image parameter is used to input the array of bytes that contain the installation image. When this parameter is NULL, the method shall return 2 (Error Occurred).

8.3.5 Target

The Target parameter is a reference to the instance of CIM_ManagedElement that represents a managed element on which the Software Identity is intended to be installed or updated. If the Target parameter is a reference to the Scoping Instance and

1) If the Software is applicable to a single managed element in its scope, including itself, the method shall install the software on the managed element.

2) If the Software is applicable to more than one managed element in its scope, the method may install the software on one, all or none of the managed elements. The behavior is implementation specific.

When this parameter is NULL, the method shall return 2 (Error Occurred).

8.4 CIM_SoftwareInstallationService.InstallFromURI( )

CIM_SoftwareInstallationService.InstallFromURI( ) method allows a client application to install or update software on a Managed Element from a URI. When this method is supported, at least one of SupportedAsynchronousActions property or SupportedSynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities shall contain the value 5 (Install From URI).

No standard messages are defined.

Table 8 – CIM_SoftwareInstallationService.InstallFromURI( ) Method: Return Code Values

Value	Description
0	Request was successfully executed.
1	Method is not supported in the implementation.
2	Error occurred.
4096	Job started: REF returned to started CIM_ConcreteJob.

Table 9 – CIM_SoftwareInstallationService.InstallFromURI( ) Method: Parameters

Qualifiers	Name	Type	Description/Values
OUT	Job	CIM_ConcreteJob REF	See 8.4.1.
IN	InstallOptions	uint16[]	See 8.4.2
IN	InstallOptionsValues	string[]	See 8.4.3
IN	URI	string	See 8.4.4.
IN	Target	CIM_ManagedElement REF	See 8.4.5.

8.4.1 Job

The Job parameter is a reference to the instance of CIM_ConcreteJob that represents the job or task that may be started by the invocation of the InstallFromURI( ) method.

The method shall not return the Job output parameter when SupportedAsynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities does not contain the value 5 (Install From URI).

533 The method may return the Job output parameter and a return code value of 4096 when the parameters
534 for the method have been validated and a job has been spawned to complete the installation/update.

535 8.4.2 InstallOptions

536 The InstallOptions array parameter is used to input the desired installation options to the
537 InstallFromSoftwareIdentity( ) method allowing the client to control the installation procedure. When this
538 parameter is NULL, the installation options used are implementation specific. The method shall return
539 2 (Error Occurred) when this parameter contains an installation option that is not listed in the
540 SupportedInstallOptions property of the associated instance of
541 CIM_SoftwareInstallationServiceCapabilities.

542 8.4.3 InstallOptionsValues

543 The InstallOptionsValues array parameter is used when any installation option needs to be input as a
544 key-value pair with this parameter containing the value part.

545 If an install option in the InstallOptions array parameter requires a value, and there is a NULL value
546 specified in the InstallOptionsValues array parameter at the corresponding index, the method shall return
547 2 (Error Occurred).

548 If an install option in the InstallOptions array parameter is required not to have a value, and a non-NULL
549 value is specified in the InstallOptionsValues array parameter at the corresponding index, the method
550 shall return 2 (Error Occurred).

551 8.4.4 URI

552 The URI parameter is used to specify the URI information of the software to be installed on the Managed
553 Element. When the URI is NULL or not well-formed according to RFC 2396, the InstallFromURI( ) method
554 shall return 2 (Error Occurred). When the URI scheme of this parameter is not present in the
555 SupportedURISchemes[] property of the associated instance of
556 CIM_SoftwareInstallationServiceCapabilities, the method shall return 2 (Error Occurred).

557 8.4.5 Target

558 The Target parameter is a reference to the instance of CIM_ManagedElement that represents a managed
559 element on which the Software Identity is intended to be installed or updated. If the Target parameter is a
560 reference to the Scoping Instance and

561 1) If the Software is applicable to a single managed element in its scope, including itself, the
562 method shall install the software on the managed element.

563 2) If the Software is applicable to more than one managed element in its scope, the method may
564 install the software on one, all or none of the managed elements. The behavior is
565 implementation specific.

566 When this parameter is NULL, the method shall return 2 (Error Occurred).

567 8.5 Profile Conventions for Operations

568 For each profile class (including associations), the implementation requirements for operations, including
569 those in the following default list, are specified in class-specific subclauses of this clause.

570 The default list of operations is as follows:

571 • GetInstance

572 • Associators

- AssociatorNames
- References
- ReferenceNames
- EnumerateInstances
- EnumerateInstanceNames

8.6 CIM_SoftwareInstallationService Operations

All operations in the default list in 8.5 shall be implemented as defined in DSP0200.

NOTE: Related profiles may define additional requirements on operations for the profile class.

8.7 CIM_HostedService Operations

Table 10 lists implementation requirements for operations. If implemented, these operations shall be implemented as defined in DSP0200. In addition, and unless otherwise stated in Table 10, all operations in the default list in 8.5 shall be implemented as defined in DSP0200.

NOTE: Related profiles may define additional requirements on operations for the profile class.

Table 10 – Operations: CIM_HostedService

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

8.8 CIM_SoftwareInstallationServiceCapabilities Operations

All operations in the default list in 8.5 shall be implemented as defined in DSP0200.

NOTE: Related profiles may define additional requirements on operations for the profile class.

8.9 CIM_ElementCapabilities Operations

Table 11 lists implementation requirements for operations. If implemented, these operations shall be implemented as defined in DSP0200. In addition, and unless otherwise stated in Table 11, all operations in the default list in 8.5 shall be implemented as defined in DSP0200.

NOTE: Related profiles may define additional requirements on operations for the profile class.

Table 11 – CIM_ElementCapabilities Operations

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

8.10 CIM_ServiceAffectsElement

Table 12 lists implementation requirements for operations. If implemented, these operations shall be implemented as defined in DSP0200. In addition, and unless otherwise stated in Table 12, all operations in the default list in 8.5 shall be implemented as defined in DSP0200.

NOTE: Related profiles may define additional requirements on operations for the profile class.

Table 12 – CIM_ServiceAffectsElement Operations

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

9 Use Cases

This section contains Object Diagrams and Use Cases for the *Software Update Profile*.

9.1 Object Diagrams

This section contains object diagrams for the *Software Update Profile.* For simplicity, the prefix CIM_ has been removed from the names of the classes in the diagrams.

9.1.1 Registered Profile

Figure 2 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the central instance, swinst1 has a CIM_HostedService association to the Scoping Instance, system1. Profile registration information is represented by profile1. Following the CIM_ElementConformsToProfile association from the central instance to profile1, the client can retrieve information such as the version of the current *Software Update Profile* implementation.

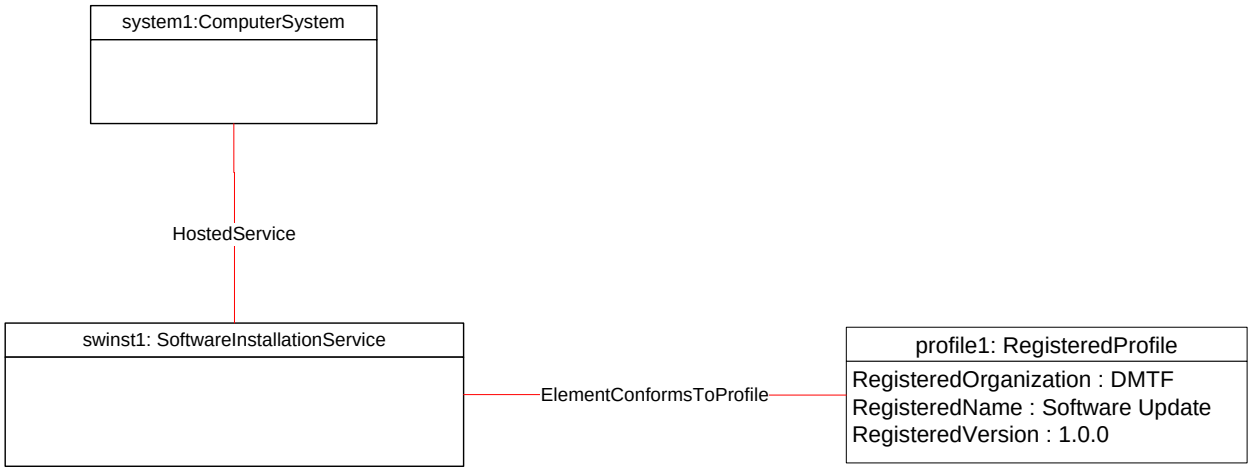


Figure 2 – Registered Profile

9.1.2 Representing Available Software, Managed Element, Software Installation Service and their Relationships

Figure 3 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the optional behavior of "Representing Available Software" from the *Software Inventory Profile* has been implemented. The managed system, system1 hosts a collection, "Available Software" and an installation service, swinst1. The firmware image applicable to the Network PCIController (pcictrl1) is represented by the Software Identity (swid2) which is a member of the "Available Software" collection. A CIM_ElementSoftwareIdentity association is shown between the pcictrl1 and swid2.

The capabilities of swinst1 are represented by the instance of CIM_SoftwareInstallationServiceCapabilities (swinstcap1). The TargetTypes[] property on swid2 has a value that matches one of the values in SupportedTargetTypes[] property of swinstcap1 and so swid2 is compatible with swinst1. Thus, swid2 can be installed or updated using swinst1.

The CIM_ServiceAffectsElement association between pcictrl1 and swinst1 indicates that the swinst1 can provide a software install or update service to pcictrl1. The CIM_ServiceAffectsElement association between system1 and swinst1 indicates that the swinst1 can provide a software install or update service to system1 and or components installed in system1.

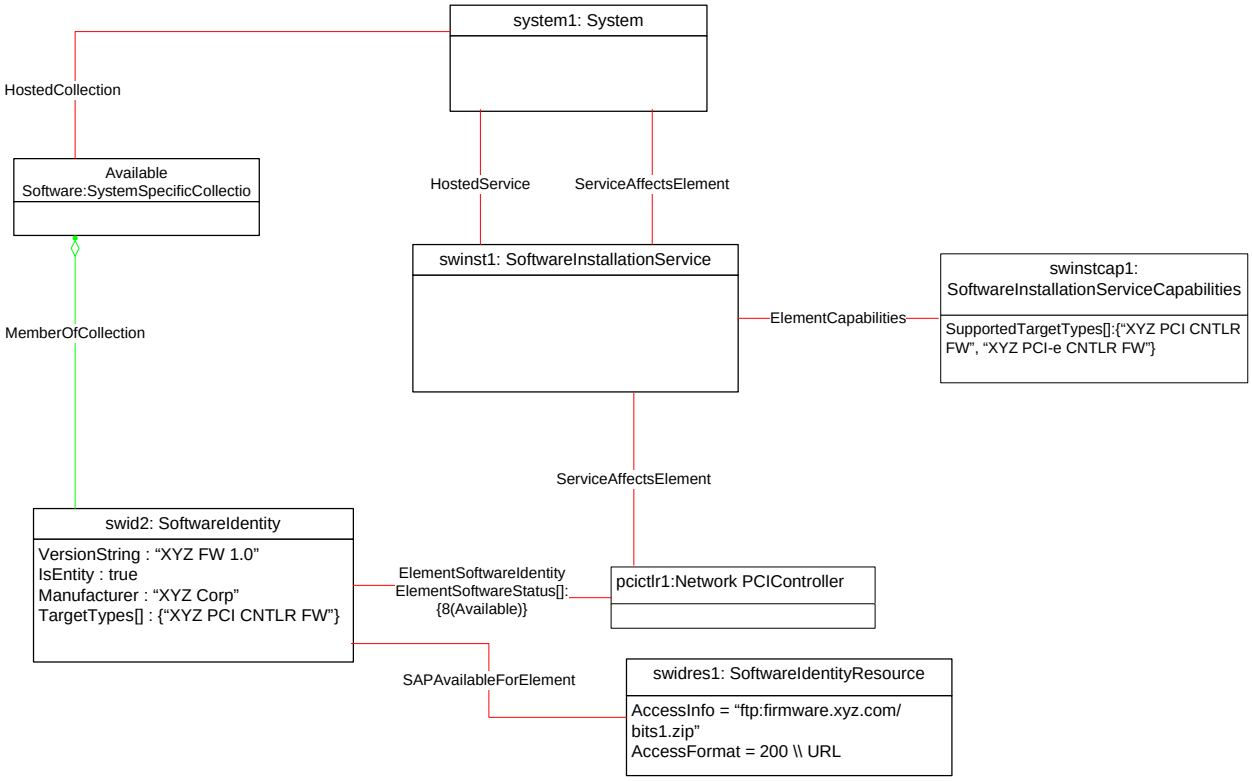


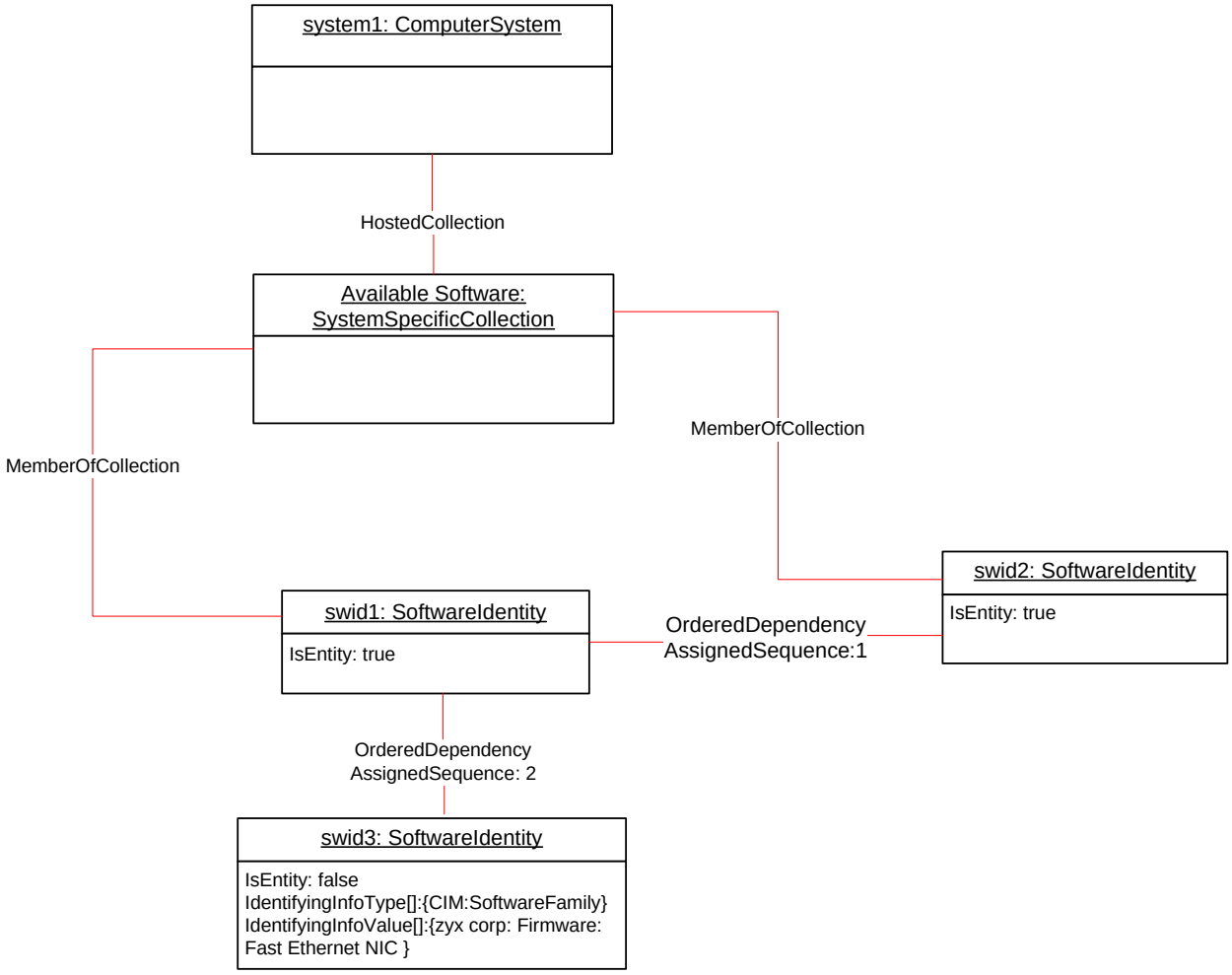
Figure 3 – Software Update Profile: Object Diagram

9.1.3 Representing a Software Identity with Installation Dependencies

Figure 4 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the optional behavior of "Representing Installation Dependencies" from the *Software Inventory Profile* has been implemented. The Software Identity, swid1, is a member of the "Available Software" collection and has Installation Dependencies on other Software Identities swid2 and swid3. A copy of swid2 is available

638 and so the IsEntity property of swid2 is true. A copy of the swid3 is not available or installed, and so the
639 IsEntity property of swid 3 is false.

640 swid2 followed by swid3 need to be installed before installing swid1. The object diagram does not show
641 the instances of CIM_SoftwareInstallationService that are compatible with swid1 and swid2.



642

643 **Figure 4 – Software Update Profile: Object Diagram**

644 ### 9.1.4 Representing a Software Identity with an Installation Dependency which Is
645 Installed

646 Figure 5 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the
647 optional behavior of “Representing Installation Dependencies” from the *Software Inventory Profile* has
648 been implemented. The Software Identity, swid1, is a member of the “Available Software” collection and
649 has Installation Dependencies on another Software Identity, swid3.

650 swid2, which is installed on the system, belongs to the same Software Family as swid3 and has a higher
651 version, and so the Installation Dependency of swid1 is satisfied.

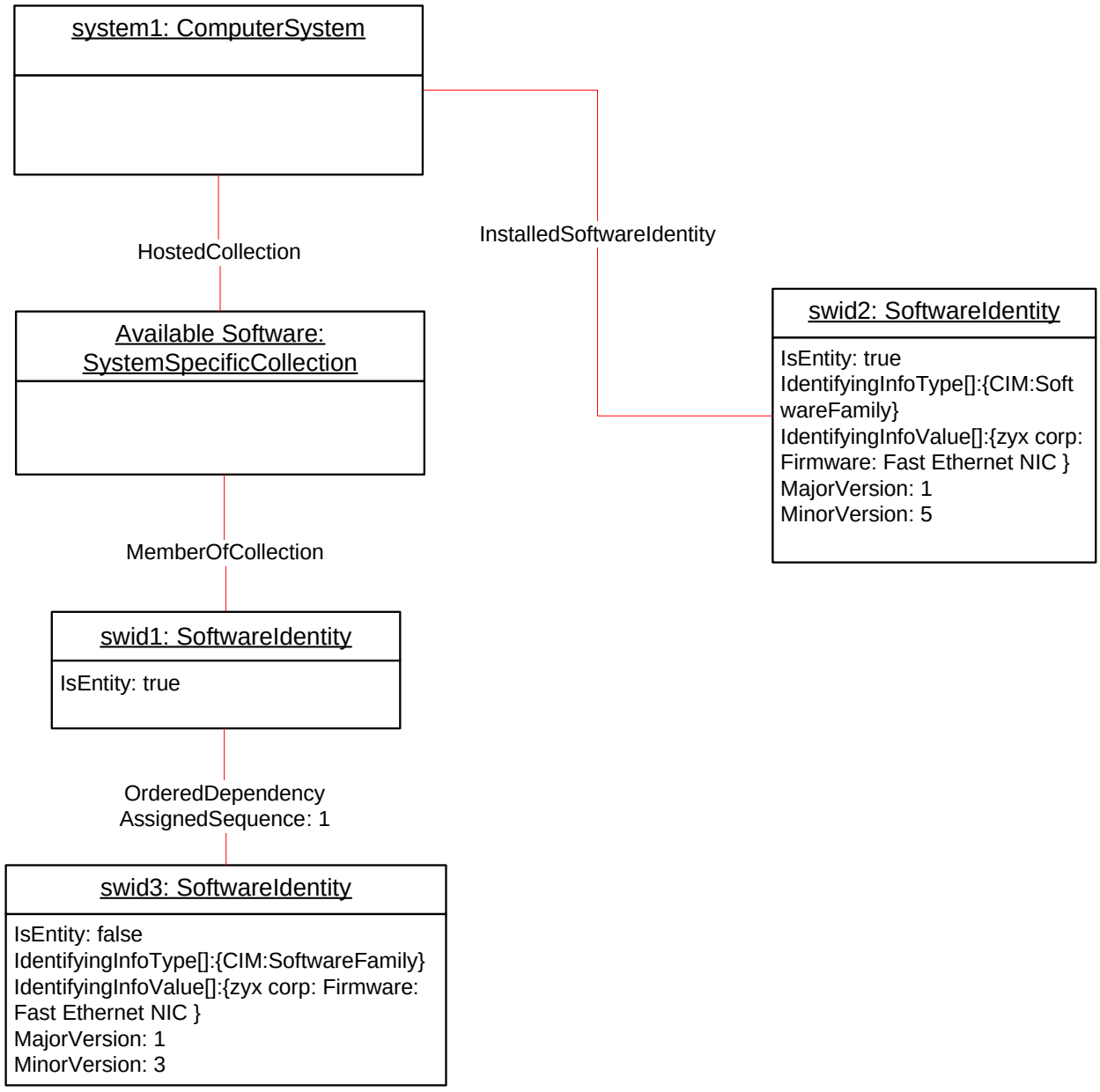
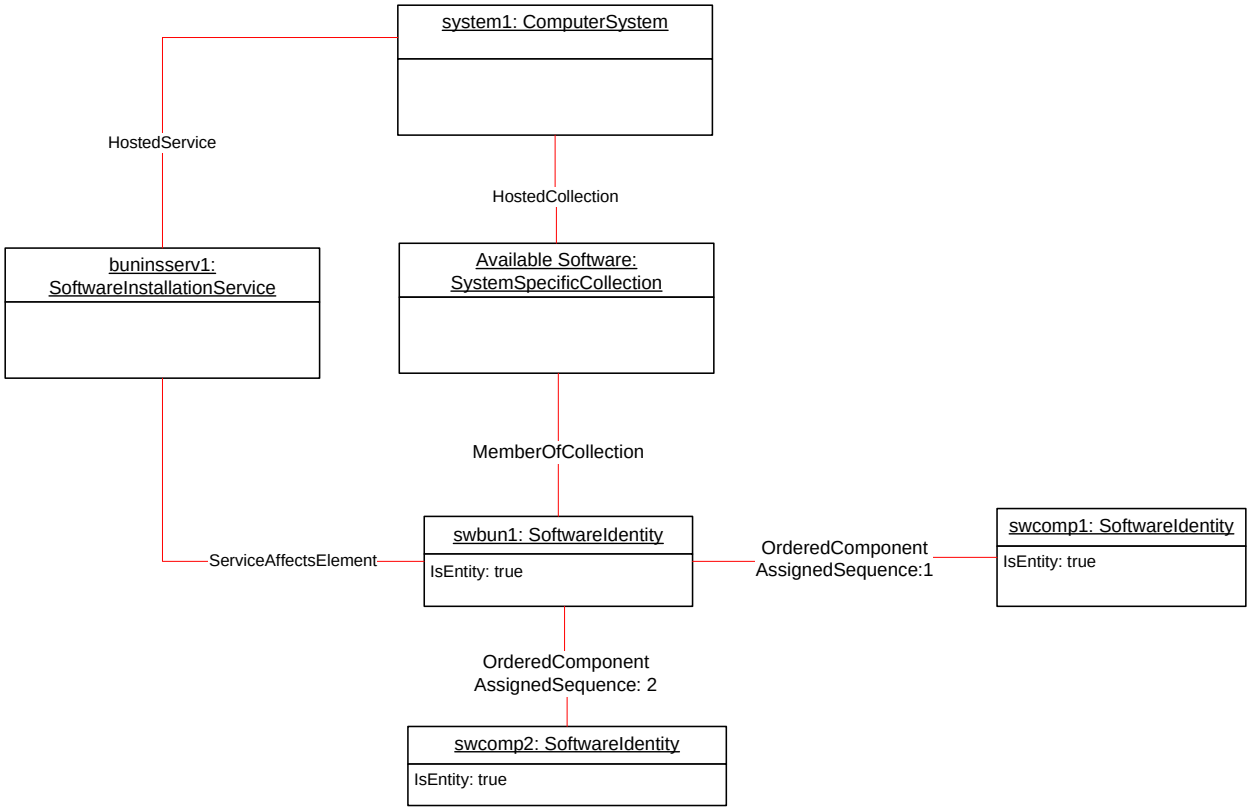


Figure 5 – Software Update Profile: Object Diagram

9.1.5 Representing Software Bundles

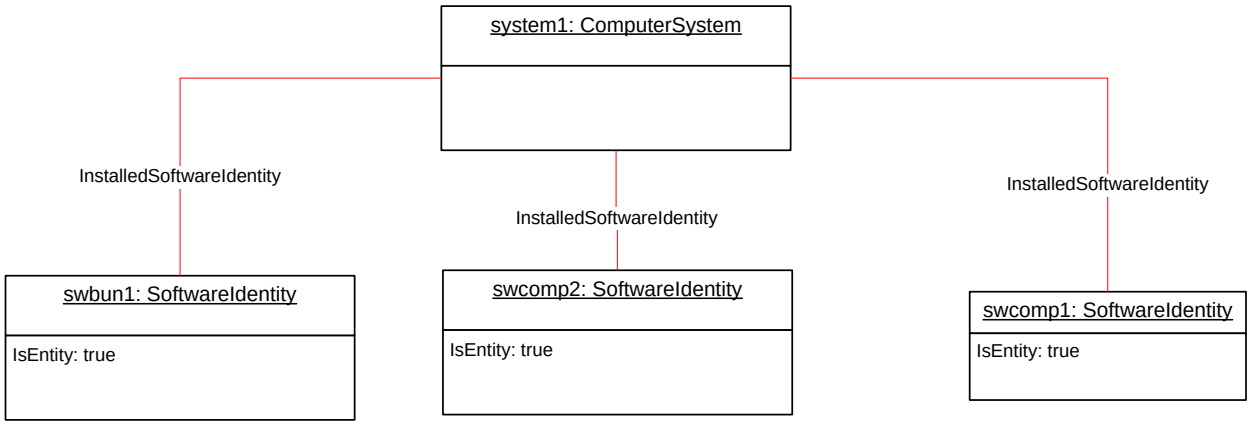
Figure 6 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the optional behavior of “Representing a Software Bundle” from the *Software Inventory Profile* has been implemented. The Software Bundle, swbun1, is a member of the “Available Software” collection and has the aggregated instances of swcomp1 and swcomp2. The Software Installation Service, buninsserv1, is compatible with swbun1 which is indicated by the CIM_ServiceAffectsElement association between the Software Bundle and the Software Installation Service. buninsserv1 can be used for installing swbun1.



662

663 **Figure 6 – Software Update Profile: Object Diagram**

664 Figure 7 represents the result of installing swbun1. In this instantiation, swbun1, swcomp1 and swcomp2
665 are shown as Installed Software for the system. In this example, the Software Bundle is a software
666 package which is tracked separately from the contained software components.



667

668 **Figure 7 – Software Update Profile: Object Diagram**

9.1.6 Representing Software Bundles

Figure 8 represents a possible instantiation of the *Software Update Profile*. In this instantiation, the optional behavior of “Representing a Software Bundle” from the *Software Inventory Profile* has been implemented. The Software Bundle, swbun2 has the aggregated instances of swcomp3 and swcomp4. The Software Installation Service, insserv3, is compatible with swcomp3 and can be used for installing it. The Software Installation Service, insserv4, is compatible with swcomp4 and can be used for installing it. swbun2 cannot be a direct target of installation as there is no compatible Software Installation Service.

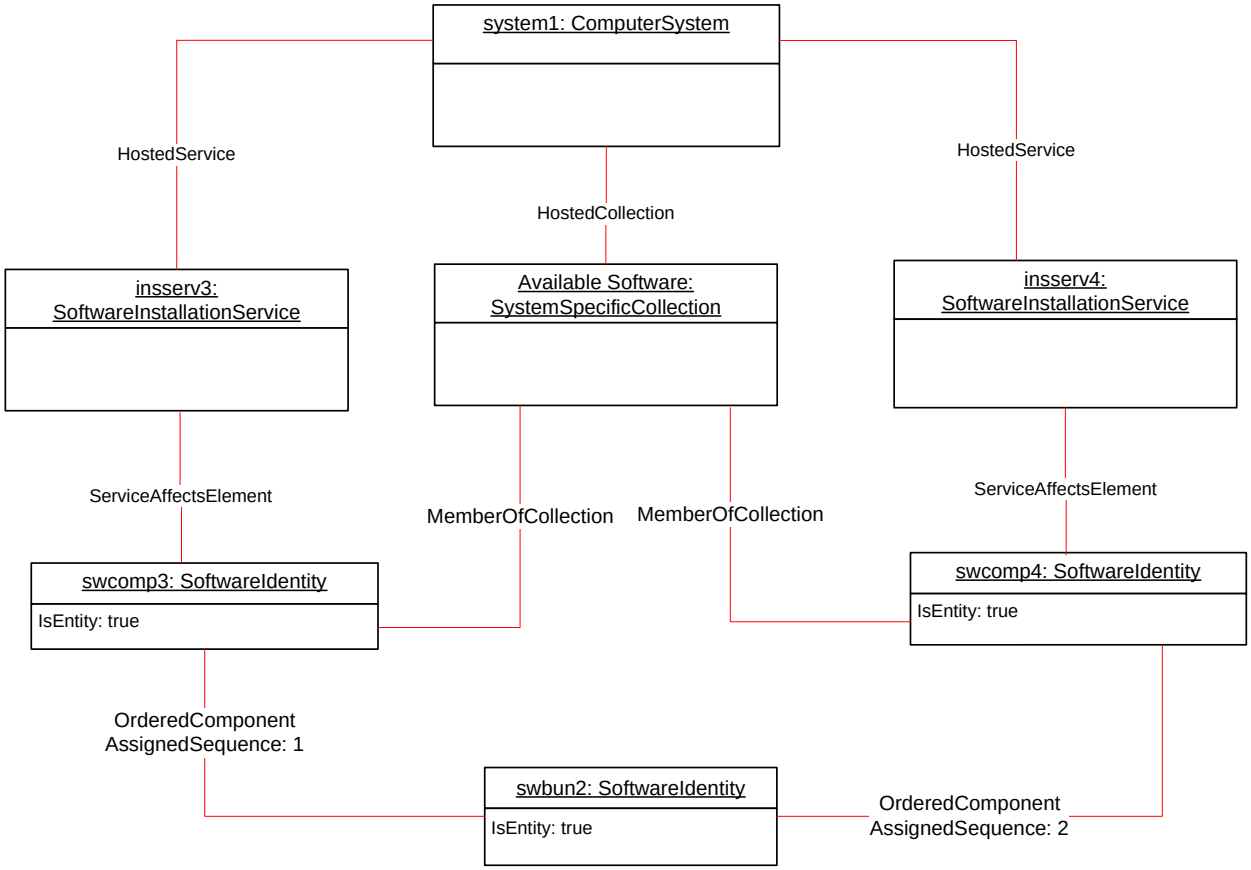
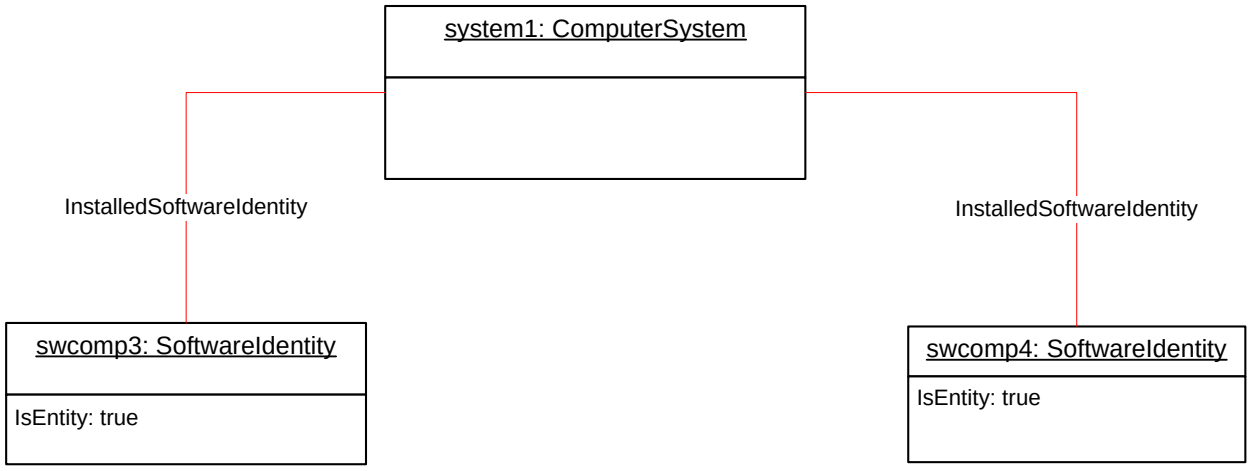


Figure 8 – Software Update Profile: Object Diagram

678 Figure 9 represents the result of installing swcomp3 and swcomp4. In this instantiation swcomp3 and
679 swcomp4 are shown as Installed Software for the system. swbun2 was not the target of installation and
680 therefore is not shown as Installed Software.



681

682 **Figure 9 – Software Update Profile: Object Diagram**

683 9.2 Find the Software Installation Services compatible with a Software Identity

684 A client can determine the Software Installation Services compatible with a Software Identity as follows:

685 1) For the given Software Identity, select the CIM_SoftwareInstallationService instances that are
686 associated to the Software Identity through the CIM_ServiceAffectsElement association.

687 2) Select the instances of CIM_SoftwareInstallationService with at least one value in the
688 SupportedTargetTypes property of the associated CIM_SoftwareInstallationServiceCapabilities
689 instance equal to at least one value in the TargetTypes property of the given Software Identity.

690 3) Select the instances of CIM_SoftwareInstallationService with at least one value in the
691 SupportedExtendedResourceTypes property equal to the ExtendedResourceType property of
692 the given Software Identity and the version of the installer format supported by
693 CIM_SoftwareInstallationService instance is equal to or higher than the version of the installer
694 format supported by the Software Identity (see 7.3.2).

695 4) The instances of CIM_SoftwareInstallationService from steps 1, 2 and 3 represent the Software
696 Installation Services that are compatible with the Software Identity.

697 9.3 Determine Whether Installing a Software Identity Requires a Reboot

698 A client can determine whether installing a Software Identity requires a reboot using the following steps:

699 1) Find the Software Installation Service compatible with the Software Identity by following the
700 steps in 9.2

701 2) Invoke the CheckSoftwareIdentity( ) method on the CIM_SoftwareInstallationService instance
702 with the given Software Identity as the Source parameter. After successful execution of the
703 method, if the InstallCharacteristics parameter contains the value 7 (No Reboot Required), then
704 no reboot is required after installing the Software identity. If it contains the value 6 (Manual
705 Reboot Required), then a reboot has to be performed to complete the installation. If it does not
706 contain 6 or 7 then no information about the requirements for the reboot can be determined.

9.4 Find Software Available for Installation on a Managed Element when CIM_ElementSoftwareIdentity Exists

Assuming that the Software Identities compatible to a Managed Element are associated to the Managed Element through CIM_ElementSoftwareIdentity, a client can find the Software Identities available for installation that are applicable to a Managed Element by using the following step:

1) Select the instances of Software Identity that are associated to the instance of CIM_ManagedElement through an instance of CIM_ElementSoftwareIdentity with the ElementSoftwareStatus property containing the value 8 (Available).

9.5 Find Software Available for Installation on a Managed Element when CIM_ElementSoftwareIdentity Does Not Exist

When the Software Identities compatible to a Managed Element are not associated to the Managed Element through CIM_ElementSoftwareIdentity, a client can find the Software Identities available for installation that are applicable to a Managed Element by using the following steps:

1) Starting at the Scoping Instance, find all the Available Software following steps described in section 9.5 of the *Software Inventory Profile*.

2) Find the instances of CIM_SoftwareInstallationService that can provide installation or update service to the Managed Element following the steps described in section 9.7.

3) For each Software Identity from step 1, find the compatible Software Installation Services following the steps described in section 9.2.

4) For each Software Installation Service which is also in the set of Software Installation Services found in step 2, invoke the CheckSoftwareIdentity() method using the appropriate parameters.

5) If the method returns 0, the Software Identity can be installed on the Managed Element.

9.6 Find Software Available for Installation on a Component

Given a priori knowledge of the values of the properties of an instance of Software Identity when the instance of Software Identity is applicable to the component of interest, a client can find the Software Identities available for installation that are applicable to the component using the following steps:

1) Starting at the instance of CIM_ComputerSystem representing the system to which the component belongs, find all the Available Software following the steps described in section 9.5 of the *Software Inventory Profile*.

2) Select the Software Identities from step 1where the property values match the required values for the component.

9.7 Find Software Installation Services that Can Install or Update Software on a Managed Element

A client can find the Software Installation Services that can install or update software on a Managed Element by using the following steps:

1) Starting from the Managed Element, select the instances of CIM_SoftwareInstallationService that are associated through CIM_ServiceAffectsElement association.

2) Select the instances of CIM_SoftwareInstallationService that are associated to the Scoping Instance through CIM_ServiceAffectsElement association.

3) The instances of CIM_SoftwareInstallationService from steps 1 and 2 represent the Software Installation Services that could provide installation or update service to the Managed Element.

9.8 Install or Update Software on a Managed Element Using Software Identity

A client can install or update software on a Managed Element with a Software Identity by using the following steps:

1) Find all the Software Identities that are applicable to the Managed Element following the steps described in section 9.4 and section 9.5. Select the Software Identity of interest.
2) Find the instances of CIM_SoftwareInstallationService that can provide installation or update service to the Managed Element following the steps described in section 9.7.
3) For the Software Identity from step 1, find the compatible Software Installation Services following the steps described in section 9.2.
4) For each Software Installation Service which is also in the set of Software Installation Services found in step 2, invoke the CheckSoftwareIdentity() method using the appropriate parameters.
5) If the method returns 0, invoke the InstallFromSoftwareIdentity() method on the instance of CIM_SoftwareInstallationService with the appropriate parameters.
6) Else if the Software Identity from step 1 is referenced by an instance of CIM_SAPAvailableForElement.
    a) Check if at least one of SupportedAsynchronousActions property or SupportedSynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities contains the value 5(Install From URI).
        - Starting from the Software Identity, select the instance of CIM_SoftwareIdentityResource through the CIM_SAPAvailableForElement association.
        - Extract the URI information using the instance of CIM_SoftwareIdentityResource and invoke the InstallFromURI() method with the appropriate parameters.

9.9 Install from Software Identity when the Managed Element is not modeled

A client can install or update software represented as a Software Identity on a component which is not modeled as a Managed Element by using the following steps:

1) Find all the Software Identities that are applicable to the component following the steps described in section 9.6. Select the Software Identity of interest.
2) Find the instances of CIM_SoftwareInstallationService that can provide installation or update service to the instance of CIM_ComputerSystem representing the system to which the component belongs, following the steps described in section 9.7.
3) For the Software Identity from step 1, find the compatible Software Installation Services following the steps described in section 9.1.6.
4) For each Software Installation Service from step 3, which is also in the set of Software Installation Services found in step 2:
    a) Invoke the InstallFromSoftwareIdentity() method on the instance of CIM_SoftwareInstallationService with the Target parameter as the Scoping Instance.
    b) If the method returns 0, then the Software Identity was successfully installed.

5) If the Software Identity was not installed, check if the Software Identity from step 1 is referenced by an instance of CIM_SAPAvailableForElement

   a) Check if at least one of SupportedAsynchronousActions property or SupportedSynchronousActions property of the associated instance of CIM_SoftwareInstallationServiceCapabilities contains the value 5 (Install From URI).

      - Starting from the Software Identity, select the instance of CIM_SoftwareIdentityResource through the CIM_SAPAvailableForElement association.
      - Extract the URI information using the instance of CIM_SoftwareIdentityResource and invoke the InstallFromURI() method with the appropriate parameters.
      - If the method returns 0, then the Software Identity was successfully installed.

9.10 Install or Update a Software on a Managed Element Using a URI

A client can install or update software on a Managed Element using a URI that identifies the software by using the following steps:

1) Find the instances of CIM_SoftwareInstallationService that can install or update software on the Managed Element using the steps described in section 9.7.
2) Select an instance of CIM_SoftwareInstallationService with the associated instance of CIM_SoftwareInstallationServiceCapabilities having at least one of the values in the SupportedAsynchronousActions property or SupportedSynchronousActions property equal to 5 (Install From URI) and the SupportedURISchemes property containing the URI scheme of the URI.
3) Invoke the InstallFromURI() method on the instance of CIM_SoftwareInstallationService from step 2 using the appropriate parameters.

9.11 Install from URI When the Managed Element Is Not Modeled

A client can install or update software on a component which is not modeled as a Managed Element using a URI that identifies the software by using the following steps:

1) Find the instances of CIM_SoftwareInstallationService that can provide installation or update service to the instance of CIM_ComputerSystem representing the system to which the component belongs, following the steps described in section 9.7.
2) Select an instance of CIM_SoftwareInstallationService with the associated instance of CIM_SoftwareInstallationServiceCapabilities having at least one of the values in the SupportedAsynchronousActions property or SupportedSynchronousActions property equal to 5(Install From URI) and the SupportedURISchemes property containing the URI scheme of the URI.
3) Invoke the InstallFromURI() method on the instance of CIM_SoftwareInstallationService from step 2 using the appropriate parameters.

9.12 Update Software on a Managed Element Using a Byte Stream

A client can install or update software on a Managed Element by transferring the image as a byte array by using the following steps:

1) Find the instances of CIM_SoftwareInstallationService that can install or update software on the Managed Element using the steps described in section 9.7.

827 2) Select an instance of CIM_SoftwareInstallationService with the associated instance of
828 CIM_SoftwareInstallationServiceCapabilities having at least one of the values in the
829 SupportedAsynchronousActions property or SupportedSynchronousActions property equal to
830 4(Install From ByteStream).

831 3) Invoke the InstallFromByteStream() method on the instance of CIM_SoftwareInstallationService
832 from step 2 using the appropriate parameters.

833 10 CIM Elements

834 **Table 13 – CIM Elements: Software Update Profile**

Element Name	Requirement	Description
Classes		
CIM_HostedService	Mandatory	See 10.1.
CIM_SoftwareInstallationService	Mandatory	See 7.1 and 10.2.
CIM_ElementCapabilities	Mandatory	See 10.3.
CIM_SoftwareInstallationCapabilities	Mandatory	See 7.2 and 10.4.
CIM_ServiceAffectsElement	Optional	See 7.3.3, 10.5 and 10.6.
CIM_SoftwareIdentity	Optional	See 7.5 and 10.7.
CIM_RegisteredProfile	Mandatory	See 10.8.
Indications		
None defined in this profile		

835 10.1 CIM_HostedService

836 CIM_HostedService associates the CIM_ComputerSystem instance with the
837 CIM_SoftwareInstallationService instance that it hosts. Table 14 contains the requirements for elements
838 of this class.

839 **Table 14 – Class: CIM_HostedService**

Elements	Requirement	Notes
Antecedent	Mandatory	Key: This property shall be a reference to the instance of CIM_ComputerSystem. Cardinality 1
Dependent	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareInstallationService. Cardinality *

840 10.2 CIM_SoftwareInstallationService

841 CIM_SoftwareInstallationService is used to represent a Software Installation Service. Table 15 contains
842 the requirements for elements of this class.

843 **Table 15 – Class: CIM_SoftwareInstallationService**

Elements	Requirement	Notes
SystemCreationClassName	Mandatory	Key
SystemName	Mandatory	Key
CreationClassName	Mandatory	Key
Name	Mandatory	Key
CheckSoftwareIdentity()	Optional	See 8.1.
InstallFromSoftwareIdentity()	Optional	See 8.2.
InstallFromByteStream()	Optional	See 8.3.
InstallFromURI()	Optional	See 8.4.

844 ## 10.3 CIM_ElementCapabilities

845 CIM_ElementCapabilities associates the CIM_SoftwareInstallationService instance that represents the
846 service responsible for performing software installations/updates with the
847 CIM_SoftwareInstallationServiceCapabilities instance that represents the capabilities of the Software
848 Installation Service. Table 16 contains the requirements for elements of this class.

849 **Table 16 – Class: CIM_ElementCapabilities**

Elements	Requirement	Notes
ManagedElement	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareInstallationService. Cardinality 1..*
Capabilities	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareInstallationServiceCapabilities. Cardinality 1

850 ## 10.4 CIM_SoftwareInstallationCapabilities

851 CIM_SoftwareInstallationServiceCapabilities represents the capabilities of a Software Installation Service.
852 Table 17 contains the requirements for elements of this class.

853 **Table 17 – Class: CIM_SoftwareInstallationCapabilities**

Elements	Requirement	Notes
InstanceID	Mandatory	Key
SupportedTargetTypes[]	Optional	See 7.3.1.
SupportedExtendedResourceTypes[]	Optional	See 7.3.2.
SupportedExtendedResourceTypesMajorVersions[]	Optional	See 7.3.2.
SupportedExtendedResourceTypesMinorVersions[]	Optional	See 7.3.2.
SupportedExtendedResourceTypesRevsionNumbers[]	Optional	See 7.3.2.
SupportedExtendedResourceTypesBuildNumbers[]	Optional	See 7.3.2.
SupportedInstallOptions[]	Mandatory	
SupportedURISchemes[]	Conditional	See 7.2.1

10.5 CIM_ServiceAffectsElement – CIM_SoftwareIdentity Reference

CIM_ServiceAffectsElement associates the instance of CIM_SoftwareInstallationService to the instance of CIM_SoftwareIdentity. Table 18 contains the requirements for elements of this class.

Table 18 – Class: CIM_ServiceAffectsElement

Elements	Requirement	Notes
AffectedElement	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareIdentity. Cardinality *
AffectingElement	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareInstallationService. Cardinality *

10.6 CIM_ServiceAffectsElement – CIM_ManagedElement Reference

CIM_ServiceAffectsElement associates the instance of CIM_SoftwareInstallationService to the instance of CIM_ManagedElement. Table 19 contains the requirements for elements of this class.

Table 19 – Class: CIM_ServiceAffectsElement

Elements	Requirement	Notes
AffectedElement	Mandatory	Key: This property shall be a reference to the instance of CIM_ManagedElement. Cardinality *
AffectingElement	Mandatory	Key: This property shall be a reference to the instance of CIM_SoftwareInstallationService. Cardinality *

10.7 CIM_SoftwareIdentity

CIM_SoftwareIdentity is defined by the *DSP1023*. The requirements denoted in Table 20 are in addition to those mandated by the *DSP1023*.

Table 20 – Class: CIM_SoftwareIdentity

Elements	Requirement	Notes
TargetTypes[]	Optional	See 7.3.1.
ExtendedResourceType	Optional	See 7.3.2.
MinExtendedResourceTypeMajorVersion	Optional	See 7.3.2.
MinExtendedResourceTypeMinorVersion	Optional	See 7.3.2.
MinExtendedResourceTypeRevisionNumber	Optional	See 7.3.2.
MinExtendedResourceTypeBuildNumber	Optional	See 7.3.2.

10.8 CIM_RegisteredProfile

CIM_RegisteredProfile is defined by the *DSP1033*. The requirements denoted in Table 21 are in addition to those mandated by the *DSP1033*.

Table 21 – Class: CIM_RegisteredProfile

Elements	Requirement	Notes
RegisteredName	Mandatory	This property shall have a value of “Software Update”.
RegisteredVersion	Mandatory	This property shall have a value of “1.0.0”.
RegisteredOrganization	Mandatory	This property shall have a value of 2 (DMTF).

ANNEX A
(Informative)

Change Log

Version	Date	Author	Description
1.0.0	2009-06-16		DMTF Standard Release