
CWKS2CMDB Project Summary v1.4

Project Abstract

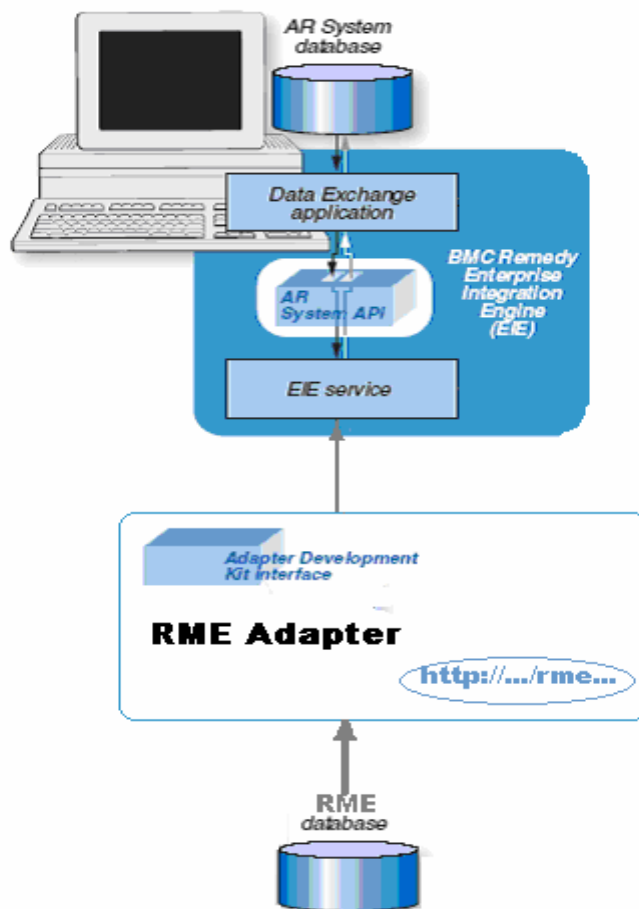
CWKS2CMDB is a project designed to provide integration between CiscoWorks® Resource Manager Essentials (RME), a network management solution for Cisco® switches, access servers, and routers, and BMC® Atrium® CMDB (Atrium CMDB) version 2.x. Atrium CMDB provides all the necessary features to implement the configuration management database in a user's environment. CWKS2CMDB can exchange data between RME and the BMC® Remedy® Action Request System® (AR System) forms or Atrium CMDB classes.

This functional specification will list all the components to be developed in the RME Adapter, their network locations, their features, their high-level implementation approaches, and their relationships with other components.

Integration Summary

Figure 1 shows how the Data Exchange application, the BMC® Remedy® Enterprise Integration Engine (EIE) service, and the RME CLI Framework interact with the RME Adapter.

Figure 1 Overview of the data exchange process



System Requirements

Supported Platforms

CWKS2CMDB will support the following BMC and third-party software products:

- BMC® Atrium® CMDB version 2.x on Microsoft® Windows using Oracle or MS-SQL database or SUN® Solaris using the Oracle® database
- BMC® Remedy® Action Request System® (ARS) version 7.0 on Microsoft Windows using Oracle or MS-SQL database or SUN Solaris using the Oracle database
- BMC® Remedy® Enterprise Integration Engine (EIE) 7.0 on Microsoft Windows using Oracle or MS-SQL database or SUN Solaris using the Oracle database
- CiscoWorks® RME 4.0 or greater

Installation Requirements

Before installing CWKS2CMDB, EIE has to be installed. EIE has the following components:

- Data Exchange application
- EIE Service

The other end of the RME adapter relies on RME CLI Framework (a Command-Line Interface). Given the fact that users may not install EIE and RME in the same system, the RME Adapter will remotely invoke RME CLI commands.

The RME Adapter installer will populate the EIE:VendorConfiguration and EIE:VendorFieldNames forms during installation. Even though you can enter the data manually, automating the process reduces the potential for errors and makes the task of installing the adapter easier.

The documentation of the RME Adapter will serve as an extension to the *BMC Remedy Enterprise Integration Engine 7.0 Administrator's Guide*.

Integration Details

Code Requirements

The following code requirements apply to all development platforms:

- The Adapter is coded in C++
- The code must be multithreaded.
- The code must be thread-safe.

Compiler Requirements

The compiler requires the following:

- Windows—Must be compiled using Microsoft Visual C++ 6.0 or later, running on Windows 2003.
- UNIX—Must be compiled with:
 - Solaris C++ 5.0 or later, running on Solaris 2.7 or later.

XML Schema for RME inventory Data

The following is the schema used for exporting the inventory data in XML format. Each Device has Chassis and NetworkElement.

- Chassis:

Chassis contains a backplane and multiple Cards. Each Card contains CommunicationConnectors and multiple daughter cards. Flash Devices reside on the Cards.
- NetworkElement:

System Information, Interface Information and LogicalModules. LogicalModules contain OSElements and Logical Ports.
- The element AdditionalInformation is meant to capture device specific details that are not part of the common schema.

```
<xs:element name="SchemaInfo" xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="RMEServer" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element name="CreatedAt" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element name="SchemaVersion" type="xs:string" minOccurs="0" maxOccurs="1" />
    </xs:sequence>
  </xs:complexType>
</xs:element>

<xs:element name="RMEPlatform" xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Cisco_Chassis" minOccurs="0" maxOccurs="unbounded" />
      <xs:element ref="Cisco_NetworkElement" minOccurs="0" maxOccurs="unbounded" />
      <xs:element ref="Cisco_ComputerSystemPackage" minOccurs="0"
maxOccurs="unbounded" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

Remote Access RME CLI Framework

CLI framework (**cwcli**) offers remote access facilities to allow you to invoke **cwcli** commands from the client in the same way as they run on the RME server. The name of the servlet is `/rme/cwcli`.

The following is the servlet to be invoked to execute any command:

For post request,

http://rme-server:rme-port/rme/cwcli *payload XML file*

For get request,

http://rme-server:rme-port/rme/cwcli?command=cwcli config *commandname*
-u *user* **-p** *BAse64 encoded pwd* **-args1** *arg1value...*

The contents of the payload xml file is as follows.

<payload>

<command>

`cwcli config export -u admin -p <Base64Enocedpwd> -device 1.1.1.1 -xml`

</command>

<arg>

</arg>

<arg-val>

</arg-val>

</payload>

Methods Required By CWKS2CMDB

Methods are required to build an adapter in the Adapter Template development environment. An adapter is built in stages, each of which should be independently tested during development.

To build an adapter, you must complete the two major objects in the Adapter Template: the `dllmain.cpp` object and the `CBaseAdapter` object:

- `dllmain`

The `dllmain` object has entry points that are called by the EIE service to load and initialize an adapter object.

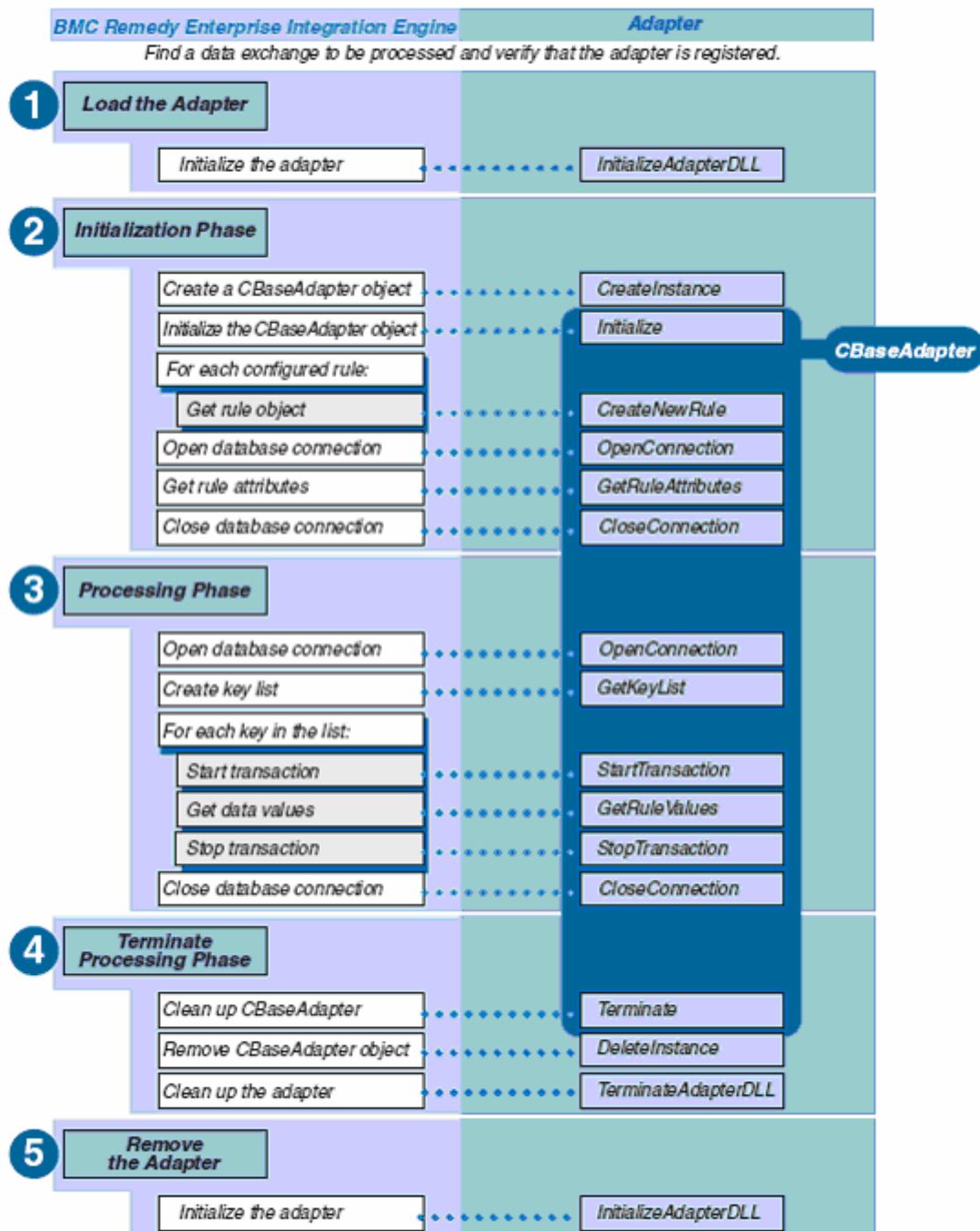
- `CBaseAdapter`

The `CBaseAdapter` object is the adapter object itself. This object provides the implementation of the methods needed for the EIE service to communicate with an adapter to complete a data exchange. BMC Remedy EIE calls these methods to complete a data exchange.

These methods need to be implemented in CWKS2CMDB:

- Implementing initialization methods
- Implementing database connection methods
- Implementing rule validation methods
- Implementing key list creation methods
- Implementing data retrieval methods

Figure 2 Sample interaction between BMC Remedy EIE and an adapter



Register CWKS2CMDB

EIE works only with registered adapters. The EIE service verifies that the adapter is registered before it is used in a data exchange process.

An adapter is registered with a name that uniquely identifies the adapter to EIE. Adapter names can be any character string that is 64 characters or fewer in length and not already assigned to another adapter.

Registering an adapter on Windows

On Windows, adapters are registered in the Windows system registry. When the EIE service is installed, the following key is created, allowing adapters to create registry entries:

HKEY_LOCAL_MACHINE\SOFTWARE\Remedy\Enterprise Integration Engine Service

Under the Enterprise Integration Engine Service key, adapter registry keys are created. An adapter registry key is always given the same name as the name entered on the Vendor Application field of the EIE:DataExchange form. Within each adapter registry key are two string values that are used by the EIE service:

- **InstallDir**—Specifies the full path where your adapter .dll (and possibly other resources) are installed. This path is provided to your adapter.
- **Adapter**—Specifies the full path and name of the adapter .dll. This value is used by the EIE service to locate and load the .dll used to complete the data exchange process.

Adapters can add anything else to this registry entry, but it is up to the adapter to retrieve the values. The EIE service will ignore them.

Registering an adapter on UNIX

On UNIX, adapters are registered in your /etc/eie.reg file, which was created when the EIE service was installed. The file allows the adapter to create registry entries, which look like this:

[AdapterName]Adapter: /<eie_install_dir>/service/bin/fileadpr.so.1

[AdapterName]InstallDir: /<eie_install_dir>/service

Licensing the Adapter

You do not need a license to write and test adapters using the Adapter Development Kit. You must, however, license the adapter when you integrate the adapter with EIE by placing the adapter into use in a production environment. A license for each running instance of an adapter is required.

Each adapter license is pulled from a pool of floating licenses assigned to EIE. When you install EIE, make sure to create a large enough pool of floating licenses. See the *BMC Remedy Enterprise Integration 7.0 Administrator's Guide* for complete information on licensing EIE.

Class/Attributes Mapping

There are several special requirements in the mapping implementation:

- InstanceID and ParentInstanceID are the key attributes, and have the format of “Cisco.InstanceID” and “Cisco.ParentInstanceID”.
- The other attributes have the format of “[Class].[Attribute]”, i.e., “Cisco_Chassis.Model”.
- InstanceID and ParentInstanceID in CMDB are reserved for relationship mapping.
- Attributes in bold blue font are extended from BMC generic class, i.e., **CISCO.RME.Cisco_Chassis extends BMC.CORE.BMC_Chassis**, defines “**NumberOfSlots**”.

An adapter registry key is always given the same name as the name typed on the Vendor Application field of the EIE:DataExchange form. Within each adapter registry key are two string values that are used by the EIE service:

- InstallDir—Specifies the full path where your adapter shared library (and possibly other resources) are installed. This path is provided to your adapter.
- Adapter—Specifies the full path and name of the adapter shared library. This value is used by the EIE service to locate and load the shared library used to complete the data exchange process.

Adapters can add anything else to this registry entry, but it is up to the adapter to retrieve the values. The EIE service will ignore them.

Cisco RME Class		BMC CMDB Class	
Note InstanceID and ParentInstanceID are the key attributes, and has the format of “Cisco.InstanceID”. The other attributes has the format of “[Class].[Attribute]”, i.e., “Cisco_Chassis.Model”.		Note InstanceID and ParentInstanceID is reserved for relationship mapping. Attributes in bold blue font are extended from BMC generic class, i.e., CISCO.RME.Cisco_Chassis extends BMC.CORE.BMC_Chassis , defines “ NumberOfSlots ”.	
Source Class	Attributes	Attributes	Target Class
Cisco_Chassis	InstanceID	InstanceID	CISCO.RME.Cisco_Chassis extends BMC.CORE.BMC_Chassis
	ParentInstanceID	ParentInstanceID	
	Model	Model	
	HardwareVersion	VersionNumber	
	SerialNumber	SerialNumber	
	ChassisSystemType	ChassisSystemType	
	NumberOfSlots	NumberOfSlots	
	NoOfCommunicationConnectors	NoOfCommunicationConnectors	
Cisco_Backplane	InstanceID	InstanceID	CISCO.RME.Cisco_Backplane extends BMC.CORE.BMC_BaseElement
	ParentInstanceID	ParentInstanceID	
	BackplaneType	Backplane Type	
	Model	Model	
	SerialNumber	SerialNumber	

Cisco_Card	InstanceID	InstanceID	CISCO.RME.Cisco_Card extends BMC.CORE.BMC_Card
	ParentInstanceID	ParentInstanceID	
	RequiresDaughterBoard	RequiresDaughterBoard	
	Model	Model	
	SerialNumber	SerialNumber	
	LocationWithinContainer	LocationWithinContainer	
	PartNumber	PartNumber	
	CardType	CardType	
	HardwareVersion	VersionNumber	
	Description	Description	
	OperationalStatus	OperationalStatus	
	FWManufacturer	FWManufacturer	
	Manufacturer	ManufacturerName	
	NumberOfSlots	NumberOfSlots	
	NoOfCommunicationConnectors	NoOfCommunicationConnectors	
Cisco_CommunicationConnector	InstanceID	InstanceID	CISCO.RME.Cisco_CommunicationConnector extends BMC_BaseElement
	ParentInstanceID	ParentInstanceID	
	ConnectorType	ConnectorType	
	Description	Description	
Cisco_FlashDevice	InstanceID	InstanceID	CISCO.RME.Cisco_FlashDevice extends BMC.CORE.BMC_HardwareSystemComponent
	ParentInstanceID	ParentInstanceID	
	InstanceName	Name	
	FlashDeviceType	FlashDeviceType	
	Size	Size	
	NumberOfPartitions	NumberOfPartitions	
	ChipCount	ChipCount	
	Description	Description	
	Removable	Removable	

Cisco_FlashPartition	InstanceID	InstanceID	CISCO.RME.Cisco_Flash Partition extends BMC.CORE.BMC_LogicalSystemComponent
	ParentInstanceID	ParentInstanceID	
	InstanceName	Name	
	Upgrade	Upgrade	
	NeedsErasure	NeedsErasure	
	PartitionStatus	PartitionStatus	
	FileSystemSize	FileSystemSize	
	AvailableSpace	AvailableSpace	
	FileCount	FileCount	
Cisco_FlashFile	InstanceID	InstanceID	CISCO.RME.Cisco_Flash File extends BMC.CORE.BMC_FileSystem
	ParentInstanceID	ParentInstanceID	
	FileSize	FileSize	
	FileStatus	FileStatus	
	Checksum	Checksum	
	InstanceName	Name	
Cisco_PhysicalMemory	InstanceID	InstanceID	CISCO.RME.Cisco_PhysicalMemory extends BMC.CORE.BMC_Memory
	ParentInstanceID	ParentInstanceID	
	MemoryType	MemoryType	
	Capacity	Capacity	
Cisco_NetworkElement	InstanceID	InstanceID	CISCO.RME.Cisco_NetworkElement extends BMC.CORE.BMC_System
	ParentInstanceID	ParentInstanceID	
	Description	Description	
	PrimaryOwnerName	OwnerName	
	InstanceName	Name	
	PhysicalPosition	Site	
	SysObjectId	SysObjectId	
	SysUpTime	SysUpTime	
	OfficialHostName	OfficialHostName	
	NumberOfPorts	NumberOfPorts	
Cisco_LogicalModule	InstanceID	InstanceID	CISCO.RME.Cisco_LogicalModule extends BMC.CORE.BMC_LogicalSystemComponent
	ParentInstanceID	ParentInstanceID	
	ModuleNumber	ModuleNumber	
	ModuleType	ModuleType	
	InstanceName	Name	
	EnabledStatus	EnabledStatus	
	NumberOfPorts	NumberOfPorts	

Cisco_Port	InstanceID	InstanceID	CISCO.RME.Cisco_Port extends BMC.CORE.BMC_NetworkPort
	ParentInstanceID	ParentInstanceID	
	PortNumber	PortNumber	
	PortType	PortType	
	InstanceName	Name	
	IfInstanceID	IfInstanceID	
Cisco_MemoryPool	InstanceID	InstanceID	CISCO.RME.Cisco_MemoryPool extends BMC.CORE.BMC_LogicalSystemComponent
	ParentInstanceID	ParentInstanceID	
	InstanceName	Name	
	PoolType	PoolType	
	DynamicPoolType	DynamicPoolType	
	AlternatePoolType	AlternatePoolType	
	IsValid	IsValid	
	Allocated	Allocated	
	Free	Free	
	LargestFree	LargestFree	
Cisco_OSElement	InstanceID	InstanceID	CISCO.RME.Cisco_OSElement extends BMC.CORE.BMC_OperatingSystem
	ParentInstanceID	ParentInstanceID	
	InstanceName	Name	
	OSFamily	OSProductSuite	
	Version	VersionNumber	
	Description	Description	
Cisco_IfEntry	InstanceID	InstanceID	CISCO.RME.Cisco_IfEntry extends BMC.CORE.BMC_AccessPoint
	ParentInstanceID	ParentInstanceID	
	InstanceName	Name	
	ProtocolType	ProtocolType	
	Speed	Speed	
	RequestedStatus	RequestedStatus	
	OperationalStatus	OperationalStatus	
	Description	Description	
	PhysicalAddress	PhysicalAddress	
	NetworkAddress	NetworkAddress	
Cisco_IPProtocolEndpoint	InstanceID	InstanceID	CISCO.RME.Cisco_IPProtocolEndpoint extends BMC.CORE.BMC_IPEndpoint
	ParentInstanceID	ParentInstanceID	
	Address	Address	
	SubnetMask	SubnetMask	
	DefaultGateway	DefaultGateway	

Cisco_PEHasIfEntry	InstanceID	InstanceID	CISCO.RME.Cisco_PEHasIfEntry extends BMC.CORE.BMC_Collection
	ParentInstanceID	ParentInstanceID	
	Cisco_IPProtocolEndpoint	IPProtocolEndpoint	
	Cisco_IfEntry	IfEntry	
Cisco_ComputerSystemPackage	InstanceID	InstanceID	CISCO.RME.Cisco_ComputerSystemPackage extends BMC.CORE.BMC_Package
	ParentInstanceID	ParentInstanceID	
	Antecedent	Antecedent	
	Dependent	Dependent	
SoftwareIdentity	InstanceID	InstanceID	CISCO.RME.Cisco_SoftwareIdentity extends BMC_Collection
	ParentInstanceID	ParentInstanceID	
	Classification	Classification	
	VersionString	VersionString	
RMEPlatform	InstanceID	InstanceID	CISCO.RME.Cisco_RMEPlatform extends BMC.CORE.BMC_VirtualSystem
	ParentInstanceID	ParentInstanceID	
		Name	
		Description	

Appendix A: Cisco RME Inventory Schema

```
<?xml version="1.0" encoding="UTF-8" ?>

<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
attributeFormDefault="unqualified">

  <!--This schema is based on the classes defined in Cisco Information Model V2.0
  (CIMCXV2.0)

  Each Device has Chassis and NetworkElement.

  Chassis:

  Chassis contains a blackplane and multiple Cards. Each Card contains
  CommunicationConnectors and multiple daughter cards. Flash Devices reside on the Cards.

  NetworkElement:

  System Information, Interface Information and LogicalModules. LogicalModules contain
  OSElements and Logical Ports.

  The element AdditionalInformation is meant to capture device specific details that are not
  part of the common schema.

  -->

  <xs:element name="InvDetails">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="SchemaInfo" minOccurs="0" maxOccurs="1" />
        <xs:element ref="RMEPlatform" minOccurs="0" maxOccurs="unbounded" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>

  <xs:element name="SchemaInfo">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="RMEServer" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="CreatedAt" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="SchemaVersion" type="xs:string" minOccurs="0" maxOccurs="1" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>

  <xs:element name="RMEPlatform">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Cisco_Chassis" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="Cisco_NetworkElement" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="Cisco_ComputerSystemPackage" minOccurs="0"
maxOccurs="unbounded" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

```

        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_Chassis">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:string" minOccurs="0" maxOccurs="1" />
<xs:element name="Model" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="HardwareVersion" type="xs:string" minOccurs="0" maxOccurs="1" />
        />
            <xs:element name="SerialNumber" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="ChassisSystemType" type="xs:string" minOccurs="0" maxOccurs="1" />
        />
            <xs:element name="NumberOfSlots" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="NoOfCommunicationConnectors" type="xs:integer" minOccurs="0"
maxOccurs="1" />
            <xs:element ref="Cisco_Backplane" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="Cisco_Card" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_Backplane">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="BackplaneType" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Model" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="SerialNumber" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_Card">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="RequiresDaughterBoard" type="xs:boolean" minOccurs="0"
maxOccurs="1" />
            <xs:element name="Model" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="SerialNumber" type="xs:string" minOccurs="0" maxOccurs="1" />

```

```

        <xs:element name="LocationWithinContainer" type="xs:string" minOccurs="0"
maxOccurs="1" />
        <xs:element name="PartNumber" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="CardType" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="HardwareVersion" type="xs:string" minOccurs="0" maxOccurs="1"
/>
        <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="OperationalStatus" type="xs:string" minOccurs="0" maxOccurs="1"
/>
        <xs:element name="FWManufacturer" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="Manufacturer" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="NumberOfSlots" type="xs:integer" minOccurs="0" maxOccurs="1" />
        <xs:element name="NoOfCommunicationConnectors" type="xs:integer" minOccurs="0"
maxOccurs="1" />
        <xs:element ref="SoftwareIdentity" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="Cisco_CommunicationConnector" minOccurs="0"
maxOccurs="unbounded" />
        <xs:element ref="Cisco_FlashDevice" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="Cisco_PhysicalMemory" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="Cisco_Card" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_CommunicationConnector">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="ConnectorType" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_FlashDevice">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="FlashDeviceType" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Size" type="xs:string" minOccurs="0" maxOccurs="1" />

```

```

        <xs:element name="NumberOfPartitions" type="xs:integer" minOccurs="0"
maxOccurs="1" />
        <xs:element name="ChipCount" type="xs:integer" minOccurs="0" maxOccurs="1" />
        <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="Removable" type="xs:boolean" minOccurs="0" maxOccurs="1" />
        <xs:element ref="Cisco_FlashPartition" minOccurs="0" maxOccurs="unbounded" />
        <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_FlashPartition">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Upgrade" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="NeedsErasure" type="xs:boolean" minOccurs="0" maxOccurs="1" />
            <xs:element name="PartitionStatus" minOccurs="0" maxOccurs="1">
                <xs:simpleType>
                    <xs:restriction base="xs:string">
                        <xs:enumeration value="unknown" />
                        <xs:enumeration value="readOnly" />
                        <xs:enumeration value="runFromFlash" />
                        <xs:enumeration value="readWrite" />
                    </xs:restriction>
                </xs:simpleType>
            </xs:element>
            <xs:element name="FileSystemSize" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="AvailableSpace" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="FileCount" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element ref="Cisco_FlashFile" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_FlashFile">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="FileSize" type="xs:string" minOccurs="0" maxOccurs="1" />

```

```

<xs:element name="FileStatus" minOccurs="0" maxOccurs="1">
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:enumeration value="unknown" />
      <xs:enumeration value="deleted" />
      <xs:enumeration value="invalidChecksum" />
      <xs:enumeration value="valid" />
    </xs:restriction>
  </xs:simpleType>
</xs:element>
<xs:element name="Checksum" type="xs:string" minOccurs="0" maxOccurs="1" />
<xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
<xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_PhysicalMemory">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="MemoryType" minOccurs="0" maxOccurs="1">
        <xs:simpleType>
          <xs:restriction base="xs:string">
            <xs:enumeration value="nvRam" />
            <xs:enumeration value="NVRAM" />
            <xs:enumeration value="processorRam" />
            <xs:enumeration value="ROM" />
            <xs:enumeration value="FEPRAM" />
            <xs:enumeration value="BRAM" />
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="Capacity" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Cisco_NetworkElement">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="InstanceID" type="xs:integer" maxOccurs="1" />

```

```

    <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
    <xs:element name="PrimaryOwnerName" type="xs:string" minOccurs="0" maxOccurs="1"
/>
<xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
    <xs:element name="PhysicalPosition" type="xs:string" minOccurs="0" maxOccurs="1" />
    <xs:element name="SysObjectId" type="xs:string" minOccurs="0" maxOccurs="1" />
    <xs:element name="SysUpTime" type="xs:string" minOccurs="0" maxOccurs="1" />
    <xs:element name="OfficialHostName" type="xs:string" minOccurs="0" maxOccurs="1"
/>

    <xs:element name="NumberOfPorts" type="xs:integer" minOccurs="0" maxOccurs="1" />
    <xs:element ref="Cisco_LogicalModule" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="Cisco_Port" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="Cisco_MemoryPool" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="Cisco_IfEntry" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="Cisco_IPProtocolEndpoint" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="Cisco_PEHASIfEntry" minOccurs="0" maxOccurs="unbounded" />
    <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_LogicalModule">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceID" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="ModuleNumber" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="ModuleType" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="EnabledStatus" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="NumberOfPorts" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element ref="Cisco_Port" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="Cisco_LogicalModule" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="Cisco_OSElement" minOccurs="0" maxOccurs="unbounded" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_Port">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="PortNumber" type="xs:integer" minOccurs="0" maxOccurs="1" />

```

```

        <xs:element name="PortType" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="IfInstanceID" type="xs:integer" minOccurs="0"
maxOccurs="unbounded" />
        <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_MemoryPool">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="PoolType" type="xs:integer" minOccurs="0" maxOccurs="1" />
            <xs:element name="DynamicPoolType" type="xs:string" minOccurs="0" maxOccurs="1"
/>
            <xs:element name="AlternatePoolType" type="xs:string" minOccurs="0" maxOccurs="1"
/>
            <xs:element name="IsValid" type="xs:boolean" minOccurs="0" maxOccurs="1" />
            <xs:element name="Allocated" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Free" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="LargestFree" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
            <!--PoolType ValueMap {"0", "1", "2", "3", "4", "5", "65536"},
            Values {"Unknown", "Processor", "I/O", "PCI", "Fast", "Multibus", "Dynamic"},
            -->
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_OSElement">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="OSFamily" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Version" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
            <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Cisco_IfEntry">
    <xs:complexType>

```

```

<xs:sequence>
  <xs:element name="InstanceID" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element name="InstanceName" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element name="ProtocolType" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element name="Speed" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element name="RequestedStatus" minOccurs="0" maxOccurs="1">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:enumeration value="up" />
        <xs:enumeration value="down" />
        <xs:enumeration value="testing" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="OperationalStatus" minOccurs="0" maxOccurs="1">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:enumeration value="Up" />
        <xs:enumeration value="Down" />
        <xs:enumeration value="Testing" />
        <xs:enumeration value="Unknown" />
        <xs:enumeration value="Dormant" />
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="Description" type="xs:string" minOccurs="0" maxOccurs="1" />
<xs:element name="PhysicalAddress" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element name="NetworkAddress" type="xs:string" minOccurs="0" maxOccurs="1" />
  <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="Cisco_IPProtocolEndpoint">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Address" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element name="SubnetMask" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element name="DefaultGateway" type="xs:string" minOccurs="0" maxOccurs="1" />
      <xs:element ref="AdditionalInformation" minOccurs="0" maxOccurs="unbounded" />
    </xs:sequence>
  </xs:complexType>
</xs:element>

```

```

    </xs:complexType>
  </xs:element>
  <xs:element name="Cisco_PEHsIfEntry">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Cisco_IPProtocolEndpoint" type="xs:string" minOccurs="0"
maxOccurs="1" />
        <xs:element name="Cisco_IfEntry" type="xs:string" minOccurs="0" maxOccurs="1" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Cisco_ComputerSystemPackage">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Antecedent" type="xs:string" minOccurs="0" maxOccurs="1" />
        <xs:element name="Dependent" type="xs:string" minOccurs="0" maxOccurs="1" />
        <!--Antecedent is the InstanceID from Cisco_Chassis Element
        Dependent is the InstanceID from Cisco_NetworkElement -->
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="SoftwareIdentity">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Classification" minOccurs="0" maxOccurs="1">
          <xs:simpleType>
            <xs:restriction base="xs:string">
              <xs:enumeration value="Firmware" />
              <xs:enumeration value="Software" />
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
        <xs:element name="VersionString" type="xs:string" minOccurs="0" maxOccurs="1" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="AdditionalInformation">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="AD" minOccurs="0" maxOccurs="unbounded">

```

```
<xs:complexType>
  <xs:attribute name="name" type="xs:string" />
  <xs:attribute name="value" type="xs:string" />
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
```

Endnotes

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