### LDAP Schema for the DMTF System CIM v2.2 Model
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Abstract

   This draft presents a LDAP schema for the DMTF CIM System model [5].

## 1. Introduction

   This draft presents a LDAPv3 [1,2] schema for the DMTF CIM System
   model.  It builds on the core model presented in [3].  Associations
   are mapped using a combination of auxiliary classes and DIT structure
   rules.  Where auxiliary classes are used, name form and DIT content
   rules are specified.

   This document is not a product of the DMTF, and represents the view
   of the authors.

**2**. **LDAP Mapping Considerations**

**2.1** **Differences Between this Mapping and the CIM System Model**

   Several classes have attributes removed because they do not make
   sense for the directory to store: LocalDateTime, NumberOfUsers,
   NumberOfProcesses, TotalSwapSpaceSize, TotalVirtualMemorySize,
   FreeVirtualMemory, FreePhysicalMemory, TotalVisibleMemorySize,
   SizeStoredInPagingFiles, and FreeSpaceInPagingFiles.  Further, a
   directory shouldn't store logicalfile information, including
   datafiles, directories, and devices shouldn't be stored Therefore the
   DeviceAccessedByFile, DirectoryContainsFile, Mount, Export, and
   FileStorage associations aren't included because referenced pieces
   are missing.

   A directory should not store either Process, Thread, Job, or
   JobDestination objects. Therefore the associations OSProcess,
   ProcessThread, ProcessExecutable, HostedJobDestination, and
   JobDestinationJobs aren't included either.

**2.2** **Changes to cimAssociationInstance**

   The core mapping [3] defined cimAssociationInstance as a helper
   class.  To support the auxiliary classes, the following classes
   should be added to cimAssociationInstance's content rule:

      cim22ComponentCSAuxClass
      cim22SystemPartitionAuxClass
      cim22HostingCSAuxClass
      cim22ParticipatingCSAuxClass
      cim22ClusterServiceAccessBySAPAuxClass
      cim22BootServiceAccessBySAPAuxClass
      cim22RunningOSAuxClass
      cim22OperatingSystemSoftwareFeatureAuxClass
      cim22BootOSFromFSAuxClass
      cim22BIOSFeatureBIOSElementsAuxClass
      cim22SystemBIOSAuxClass

   Also, the following structure rules defined here need to be added to
   the structure rule for cimAssociationInstance:  <sr29>, <sr30>,
   <sr31>.

**2.3** **cimCharacteristicsInstance**

   The class cimBIOSFeature defines two linked indexed arrays:
   Characteristics and CharacteristicDescriptions.  In the LDAP mapping,
   these are replaced with separate instances of
   cimCharacteristicsInstance, DIT contained by cimBIOSFeature.

```
      ( <oid-at284> NAME 'cimCharacteristics'
        DESC 'An integer that specifies the feature supported by the
              BIOS. For example, one can specify that PnP capabilities
              are provided (value=9) or that infrared devices are
              supported (21). Values specified in the enumeration are
              taken from both DMI and SMBIOS (the Type 0 structure, the
              BIOS Characteristics and BIOS Characteristics Extension
              Bytes attributes.'
        SYNTAX integer SINGLE-VALUE
      )

      ( <oid-at285> NAME 'cimCharacteristicDescriptions'
        DESC 'A free-form string providing more detailed explanations for
              any BIOS feature'
        SYNTAX string SINGLE-VALUE
      )

      ( <oid-oc157> NAME 'cimCharacteristicsInstance'
        DESC 'helper class to tie Characteristics and
              CharacteristicDescriptions in BIOSFeature together'
        SUP top
        MUST (arrayIndex)
        MAY (cimCharacteristic $ cimCharacteristicDescription)
      )

      ( <oid-nf32> NAME 'cimCharacteristicsInstanceNameForm'
        OC cimCharacteristicsInstance
        MUST (arrayIndex)
      )

      ( <sr32> NAME 'cimCharacteristicsInstanceStructureRule'
        FORM cimCharacteristicsInstanceNameForm
        SUP <sr31>
      )
```

## 3. Class Definitions

For efficiency in the LDAP representation, associations are specified
as a combination of auxiliary classes and DIT structure rules.
Attribute definitions for each class are presented with the object
class.  Other definitions are also provided when necessary.

This approach minimizes the number of DN pointers stored in the
schema, but some pointer dereferencing is necessary.  While not
explicitly stated in the definitions below, we assume that all
attributes with DN support the matching rule defined in [4].
Attribute names for DN pointers also follow the convention that a
single pointer's name ends in "Ref", while an array of pointers' name

ends in "Refs".

Note: all attribute, object class, and name form OIDs are place holders, and syntax OIDs in definitions have been replaced by names for clarity.

### [3.1](#) cim22ComponentCSAuxClass

A ComputerSystem can aggregate another ComputerSystem. This association can be used to model MPP Systems with workstation frontends, an I2O subsystem embedded in a UnitaryComputerSystem, or a System that splits functionality between two processors, potentially running different OperatingSystems. For example, if a CISC Processor and its associated OperatingSystem, are used for user interface and file support, and a RISC Processor and its OS are used for complex mathematical operations, this could be modeled as two ComputerSystems where one aggregates the other. Sometimes, this could be modeled as a Cluster. The difference is the focus of the relationship. ComponentCS represents that unique and distinct ComputerSystems are aggregated by a higher level CS object. However, each of the component CSs are still distinguishable entities and are only viewed as such. Alternately, with a Cluster, the ComputerSystems that participate in it are inconsequential, when viewed through the 'Cluster System'.

When instantiating or subclassing the ComponentCS relationship, care should be taken that the component ComputerSystem meets the definitional requirements of a ComputerSystem - ie, a functional whole that provides compute capabilities and aggregates System Devices, an OperatingSystem, etc.

```
( <oid-oc131> NAME 'cim22ComponentCSAuxClass'
  DESC 'A ComputerSystem can aggregate another ComputerSystem. This
        association can be used to model MPP Systems with
        workstation frontends, an I2O subsystem embedded in a
        UnitaryComputerSystem, or a System that splits
        functionality between two processors, potentially running
        different OperatingSystems. For example, if a CISC
        Processor and its associated OperatingSystem, are used for
        user interface and file support, and a RISC Processor and
        its OS are used for complex mathematical operations, this
        could be modeled as two ComputerSystems where one
        aggregates the other. In some cases, this could be modeled
        as a Cluster. The difference is the focus of the
        relationship. ComponentCS represents that unique and
        distinct ComputerSystems are aggregated by a higher level
        CS object. However, each of the component CSs are still
        distinguishable entities and are only viewed as
        such. Alternately, with a Cluster, the ComputerSystems that
```

> > participate in it are inconsequential, when viewed through
> > the "Cluster System".  When instantiating or subclassing
> > the ComponentCS relationship, care should be taken that the
> > component ComputerSystem meets the definitional
> > requirements of a ComputerSystem - ie, a functional whole
> > that provides compute capabilities and aggregates System
> > Devices, an OperatingSystem, etc. Both attributes
> > point to cim22ComputerSystem objects.'
>
>   SUP cim22SystemComponentAuxClass AUXILIARY
>   MAY (cimGroupComponentRef $ cimPartComponentRef)
> )

## 3.2 cim22UnitaryComputerSystem

A class derived from ComputerSystem that represents a Desktop,
Mobile, NetPC, Server or other type of a single node Computer System.

>   ( <oid-at229> NAME 'cimInitialLoadInfo'
>     DESC 'This object contains the data needed to find either the
>           initial load device (its key) or the boot service to
>           request the operating system to start up. In addition, the
>           load parameters (ie, a pathname and parameters) may also be
>           specified.'
>     SYNTAX string
>   )

>   ( <oid-at230> NAME 'cimLastLoadInfo'
>     DESC 'This object contains the data identifying either the
>           initial load device (its key) or the boot service that
>           requested the last operating system load. In addition, the
>           load parameters (ie, a pathname and parameters) may also be
>           specified.'
>     SYNTAX string SINGLE-VALUE
>   )

>   ( <oid-at231> NAME 'cimResetCapability'
>     DESC 'If enabled (value = 4), the UnitaryComputerSystem can be
>           reset via hardware (e.g. the power and reset buttons). If
>           disabled (value = 3), hardware reset is not allowed. In
>           addition to Enabled and Disabled, other Values for the
>           property are also defined - "Not Implemented" (5), "Other"
>           (1) and "Unknown" (2).'
>     SYNTAX integer SINGLE-VALUE
>   )

>   ( <oid-at232> NAME 'cimPowerState'
>     DESC 'Indicates the current power state of the ComputerSystem and
>           its associated OperatingSystem. Regarding the Power Save

          states, these are defined as follows: Value 4 ("Power Save
          - Unknown") indicates that the System is known to be in a
          power save mode, but its exact status in this mode is
          unknown; 2 ("Power Save - Low Power Mode") indicates that
          the System is in a power save state but still functioning,
          and may exhibit degraded performance; 3 ("Power Save -
          Standby") describes that the System is not functioning but
          could be brought to full power "quickly"; value 7 ("Power
          Save - Warning") indicates that the ComputerSystem is in a
          warning state, though also in a power save mode; and,
          values 8 and 9 describe the ACPI "Hibernate" and "Soft Off"
          states.'
      SYNTAX integer SINGLE-VALUE
    )

    ( <oid-at233> NAME 'cimWakeUpType'
      DESC 'The event that caused the System to power up. This
          information is available in SMBIOS, in the Type 1
          structure, the Wake Up Type attribute.'
      SYNTAX integer SINGLE-VALUE
    )

    ( <oid-oc132> NAME 'cim22UnitaryComputerSystem'
      DESC 'A class derived from ComputerSystem that represents a
          Desktop, Mobile, NetPC, Server or other type of a single
          node Computer System.'
      SUP cim22ComputerSystem
      MAY (cimInitialLoadInfo $ cimLastLoadInfo $ cimResetCapability $
          cimPowerManagementSupported $ cimPowerState $ cimWakeUpType $
          cimPowerManagementCapabilities)
    )

  The following content rule specifies the auxiliary classes that may
  be attached to cim22UnitaryComputerSystem.

    ( <oid-oc132> NAME 'cim22UnitaryComputerSystemContentRule'
      DESC 'The auxiliary classes that may be attached to
          cim22UnitaryComputerSystem'
      AUX (cim22SystemPartitionAuxClass $ cim22SystemBIOSAuxClass)
    )

## [3.3](#) cim22SystemPartitionAuxClass

A Partition is an instance of a UnitaryComputerSystem (with its own
OperatingSystem and Devices dedicated to the Partition) that is
supported by underlying hardware and software. A Partition is not a
virtualization of a ComputerSystem, but the segmentation of the
System's compute capabilities. Partitions can run independent copies

of possibly different OperatingSystems and have dedicated Devices.
The 'real', underlying System (perhaps a Cluster or another
UnitaryComputerSystem) aggregates its Partitions. These semantics are
described by the SystemPartition association.'

```
( <oid-oc133> NAME 'cim22SystemPartitionAuxClass'
  DESC 'A Partition is an instance of a UnitaryComputerSystem (with
        its own OperatingSystem and Devices dedicated to the
        Partition) that is supported by underlying hardware and
        software. A Partition is not a virtualization of a
        ComputerSystem, but the segmentation of the System's
        compute capabilities. Partitions can run independent copies
        of possibly different OperatingSystems and have dedicated
        Devices. The "real", underlying System (perhaps a Cluster
        or another UnitaryComputerSystem) aggregates its
        Partitions. These semantics are described by the
        SystemPartition association. Attribute cimGroupComponentRef
        points to cim22ComputerSystem and attribute
        cimPartComponentRef points to cim22UnitaryComputerSystem.'
  SUP cim22ComponentCSAuxClass AUXILIARY
  MAY (cimGroupComponentRef $ cimPartComponentRef)
)
```

## [3.4](#) cim22VirtualComputerSystem

A string describing the type of System or hardware platform that is
virtualized. OperatingSystem information is obtained via the
RunningOS inherited from ComputerSystem.

```
( <oid-at234> NAME 'cimVirtualSystem'
  DESC 'A string describing the type of System or hardware platform
        that is virtualized. OperatingSystem information is
        obtained via the RunningOS inherited from ComputerSystem.'
  SYNTAX string SINGLE-VALUE
)
```

```
( <oid-oc134> NAME 'cim22VirtualComputerSystem'
  DESC 'A class derived from ComputerSystem that represents the
        ability to virtualize or emulate another ComputerSystem.'
  SUP cim22ComputerSystem
  MAY (cimVirtualSystem)
)
```

The following content rule specifies the auxiliary classes that may
be attached to cim22VirtualComputerSystem.

```
( <oid-oc134> NAME 'cim22VirtualComputerSystemContentRule'
  DESC 'The auxiliary classes that may be attached to
```

```
            cim22VirtualComputerSystem'
        AUX (cim22HostingCSAuxClass)
      )
```

### 3.5 cim22HostingCSAuxClass

A VirtualComputerSystem is hosted on another ComputerSystem. This association makes that relationship explicit.

```
    ( <oid-oc135> NAME 'cim22HostingCSAuxClass'
      DESC 'A VirtualComputerSystem is hosted on another
            ComputerSystem. This association makes that relationship
            explicit. Attribute cimAntecedentRef points to
            cim22ComputerSystem and attribute cimDependentRef points to
            cim22VirtualComputerSystem.'
      SUP cim22DependencyAuxClass AUXILIARY
      MAY (cimAntecedentRef $ cimDependentRef)
    )
```

### 3.6 cim22Cluster

A class derived from ComputerSystem that is made up of two or more ComputerSystems that operate together as an atomic, functional whole to increase the performance, resources and/or RAS (Reliability, Availability and Serviceability) of the component ComputerSystems, related to some aspects of these ComputerSystems.

```
    ( <oid-at235> NAME 'cimInterconnect'
      DESC 'Interconnect is a free form string that describes the
            interconnection mechanism for the Cluster.'
      SYNTAX string SINGLE-VALUE
    )

    ( <oid-at236> NAME 'cimInterconnectAddress'
      DESC 'InterconnectAddress indicates the address of the Cluster
            System, which is dependent on the interconnection
            scheme. If no address is available or applicable, a null
            string should be used.'
      SYNTAX string SINGLE-VALUE
    )

    ( <oid-at237> NAME 'cimTypes'
      DESC 'The cluster types. This specifies whether the cluster is
            for failover (value=2), performance (3), etc. The values
            which can be specified are not mutually exclusive. Thus,
            Types is an array.'
      SYNTAX integer
    )
```

```
( <oid-at238> NAME 'cimMaxNumberOfNodes'
  DESC 'Indicates the maximum number of nodes that may participate
        in the Cluster. If unlimited, enter 0.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at239> NAME 'cimClusterState'
  DESC 'Indicates the state of the Cluster. The cluster can be
        defined to be on-line (value=2), off-line (3), in a
        degraded mode of operation (4) or unavailable (5).'
  SYNTAX integer SINGLE-VALUE
)

( <oid-oc136> NAME 'cim22Cluster'
  DESC 'A class derived from ComputerSystem that "is made up of"
        two or more ComputerSystems which operate together as an
        atomic, functional whole to increase the performance,
        resources and/or RAS (Reliability, Availability and
        Serviceability) of the component ComputerSystems, related
        to some aspects of these ComputerSystems.'
  SUP cim22ComputerSystem
  MAY (cimInterconnect $ cimInterconnectAddress $ cimTypes $
       cimMaxNumberOfNodes $ cimClusterState)
)
```

The following content rule specifies the auxiliary classes that may
be attached to cim22Cluster.

```
( <oid-oc136> NAME 'cim22ClusterContentRule'
  DESC 'The auxiliary classes that may be attached to cim22Cluster'
  AUX (cim22ParticipatingCSAuxClass)
)
```

### [3.7](#) cim22ParticipatingCSAuxClass

A Cluster is composed of two or more ComputerSystems, operating
together. A ComputerSystem may participate in multiple Clusters.

```
( <oid-at240> NAME 'cimStateOfNode'
  DESC 'StateOfNode indicates the condition of the participating
        ComputerSystem in the Cluster. For example, one value is
        "Joining" (2).'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at241> NAME 'cimRoleOfNode'
  DESC 'RoleOfNode indicates whether the Cluster nodes are peers
        (value = 2), connected in a master-slave/primary-secondary
```

```
              relationship (values = 3 for primary, 4 for secondary),
              available in a standby configuration (5) or of some other
              (1) or unknown (0) relationship. In a System/390
              environment, the nodes are identified as "Base Plex"
              (value=6) or "Enhanced Plex" (value=7).'
     SYNTAX integer SINGLE-VALUE
   )

   ( <oid-oc137> NAME 'cim22ParticipatingCSAuxClass'
     DESC 'A Cluster is composed of two or more ComputerSystems,
              operating together. A ComputerSystem may participate in
              multiple Clusters. When first establishing or bringing up a
              Cluster, only one ComputerSystem may be defined as
              participating in it. Attribute cimAntecedentRef points to
              cim22ComputerSystem and attribute cimDependentRef points to
              cim22Cluster.'
     SUP cim22DependencyAuxClass AUXILIARY
     MAY (cimAntecedentRef $ cimDependentRef $ cimStateOfNode $
cimRoleOfNode)
   )
```

## 3.8 cim22ClusteringService

This class represents the functionality provided by a Cluster. For
example, failover functionality may be modeled as a Service of a
failover Cluster.

```
   ( <oid-oc138> NAME 'cim22ClusteringService'
     DESC 'ClusteringService represents the functionality provided by
              a Cluster. For example, failover functionality may be
              modeled as a Service of a failover Cluster.'
     SUP cim22Service
   )
```

The following content rule specifies the auxiliary classes that may
be attached to cim22ClusteringService.

```
   ( <oid-oc138> NAME 'cim22ClusteringServiceContentRule'
     DESC 'The auxiliary classes that may be attached to
              cim22ClusteringService'
     AUX (cim22ClusterServiceAccessBySAPAuxClass)
   )
```

## 3.9 cim22ClusteringSAP

This class is a representation of the access points of a clustering
service.

```
   ( <oid-oc139> NAME 'cim22ClusteringSAP'
```

```
    DESC 'A representation of the access points of a
          ClusteringService.'
    SUP cim22ServiceAccessPoint
  )
```

The following content rule specifies the auxiliary classes that may be attached to cim22ClusteringSAP.

```
  ( <oid-oc139> NAME 'cim22ClusteringSAPContentRule'
    DESC 'The auxiliary classes that may be attached to
          cim22ClusteringSAP'
    AUX (cim22ClusterServiceAccessBySAPAuxClass)
  )
```

### 3.10 cim22ClusterServiceAccessBySAPAuxClass

This class handles the relationship between a ClusteringService and its access points.

```
  ( <oid-oc140> NAME 'cim22ClusterServiceAccessBySAPAuxClass'
    DESC 'ClusterServiceAccessBySAP is the relationship between a
          ClusteringService and its access points. Attribute
          cimAntecedentRef points to cim22ClusteringService and
          attribute cimDependentRef points to cim22ClusteringSAP.'
    SUP cim22ServiceAccessBySAPAuxClass AUXILIARY
    MAY (cimAntecedentRef $ cimDependentRef)
  )
```

### 3.11 cim22BootService

This class represents the functionality provided by a Device, software or via a Network to load an Operating System on a UnitaryComputerSystem.

```
  ( <oid-oc141> NAME 'cim22BootService'
    DESC 'BootService represents the functionality provided by a
          Device, software or via a Network to load an Operating
          System on a UnitaryComputerSystem.'
    SUP cim22Service
  )
```

The following content rule specifies the auxiliary classes that may be attached to cim22BootService.

```
  ( <oid-oc141> NAME 'cim22BootServiceContentRule'
    DESC 'The auxiliary classes that may be attached to
          cim22BootService'
    AUX (cim22BootServiceAccessBySAPAuxClass)
```

```
     )
```

## 3.12 cim22BootSAP

This class represents the access points of a boot service.

```
   ( <oid-oc142> NAME 'cim22BootSAP'
     DESC 'A representation of the access points of a BootService.'
     SUP cim22ServiceAccessPoint
   )
```

The following content rule specifies the auxiliary classes that may
be attached to cim22BootSAP.

```
   ( <oid-oc142> NAME 'cim22BootSAPContentRule'
     DESC 'The auxiliary classes that may be attached to cim22BootSAP'
     AUX (cim22BootServiceAccessBySAPAuxClass)
   )
```

## 3.13 cim22BootServiceAccessBySAPAuxClass

This class describes the relationship between a BootService and its
access points.

```
   ( <oid-oc143> NAME 'cim22BootServiceAccessBySAPAuxClass'
     DESC 'BootServiceAccessBySAP is the relationship between a
           BootService and its access points. Attribute
           cimAntecedentRef points to cim22BootService and attribute
           cimDependentRef points to cim22BootSAP.'
     SUP cim22ServiceAccessBySAPAuxClass AUXILIARY
     MAY (cimAntecedentRef $ cimDependentRef)
   )
```

## 3.14 cim22StorageLibrary

A StorageLibrary is a collection of ManagedSystemElements that
operate together to provide cartridge library capabilities. This
object serves as an aggregation point to group the following
elements:  MediaTransferDevices, a LabelReader, a library Door,
MediaAccessDevices, and other Library components.

```
   ( <oid-at242> NAME 'cimCapabilities'
     DESC 'Capabilities of the StorageLibrary. For example, it can be
           indicated that the Library can perform automatic cleaning
           of the MediaAccessDevices contained in it (value=1) or that
           the Library provides physical door access for an operator
           (value=2).'
     SYNTAX integer
```

```
        )

        ( <oid-at243> NAME 'cimOverfilled'
          DESC 'Boolean set to TRUE if there are more PhysicalMedia in a
                Library than there are StorageMediaLocations to contain
                them. For instance, if all MediaAccessDevices have a Media
                loaded in them, and all StorageMediaLocations are loaded by
                an operator, then an Overfilled condition exists.'
          SYNTAX boolean SINGLE-VALUE
        )

        ( <oid-at244> NAME 'cimAuditNeeded'
          DESC 'Boolean set to TRUE if the Library can not currently report
                the correct state of each PhysicalMedia within its proper
                StorageMediaLocation.'
          SYNTAX boolean SINGLE-VALUE
        )

        ( <oid-at245> NAME 'cimAuditInProgress'
          DESC 'Boolean set to TRUE if an audit of the location of some or
                all of the Library's PhysicalMedia is currently being
                performed. That an individual Changer is currently doing an
                audit is indicated by a similar AuditInProgress boolean
                property on the Changer object.'
          SYNTAX boolean SINGLE-VALUE
        )

        ( <oid-at246> NAME 'cimMaxAuditTime'
          DESC 'Maximum time in seconds that it takes for the
                StorageLibrary to perform a complete audit of each
                StorageMediaLocation, to determine the absence or presence
                of a PhysicalMedia. If automated support is not provided,
                then this property's value is undefined.'
          SYNTAX integer SINGLE-VALUE
        )

        ( <oid-at247> NAME 'cimAutomated'
          DESC 'Boolean set to TRUE if the Library includes a robotics
                mechanism that can be controlled by a ComputerSystem, to
                automatically load and unload PhysicalMedia to/from
                MediaAccessDevices and StorageMediaLocations. The property
                is set to FALSE if the Library represents a repository of
                Media that are inaccessible to a MediaAccessDevice without
                human intervention. An example of a non-automated Library
                is a "shelf" or "vault" where PhysicalMedia are kept for
                extended periods of time.'
          SYNTAX boolean SINGLE-VALUE
        )
```

```
    ( <oid-oc144> NAME 'cim22StorageLibrary'
      DESC 'A StorageLibrary is a collection of ManagedSystemElements
            that operate together to provide cartridge library
            capabilities. This object serves as an aggregation point to
            group the following elements: MediaTransferDevices, a
            LabelReader, a library Door, MediaAccessDevices, and other
            Library components.'
      SUP cim22System
      MAY (cimCapabilities $ cimOverfilled $ cimAuditNeeded $
           cimAuditInProgress $ cimMaxAuditTime $ cimAutomated)
    )
```

## 3.15 cim22OperatingSystem

An OperatingSystem is software/firmware that makes a ComputerSystem's
hardware usable, and implements and/or manages the resources, file
systems, processes, user interfaces, and services available on the
ComputerSystem.

```
    ( <oid-at248> NAME 'cimCSCreationClassName'
      DESC 'The scoping ComputerSystem's CreationClassName.'
      SYNTAX string{256} SINGLE-VALUE
    )

    ( <oid-at249> NAME 'cimCSName'
      DESC 'The scoping ComputerSystem's Name.'
      SYNTAX string{256} SINGLE-VALUE
    )

    ( <oid-at250> NAME 'cimOSType'
      DESC 'A integer indicating the type of OperatingSystem.'
      SYNTAX integer SINGLE-VALUE
    )

    ( <oid-at251> NAME 'cimLastBootUpTime'
      DESC 'Time when the OperatingSystem was last booted.'
      SYNTAX generalizedTime SINGLE-VALUE
    )

    ( <oid-at252> NAME 'cimCurrentTimeZone'
      DESC 'CurrentTimeZone indicates the number of minutes the
            OperatingSystem is offset from Greenwich Mean Time. Either
            the number is positive, negative or zero.'
      SYNTAX integer SINGLE-VALUE
    )

    ( <oid-at253> NAME 'cimNumberOfLicensedUsers'
      DESC 'Number of user licenses for the OperatingSystem. If
```

```
            unlimited, enter 0.'
     SYNTAX integer SINGLE-VALUE
   )


   ( <oid-at254> NAME 'cimMaxNumberOfProcesses'
     DESC 'Maximum number of process contexts the OperatingSystem can
            support. If there is no fixed maximum, the value should be
            0.  On systems that have a fixed maximum, this object can
            help diagnose failures that occur when the maximum is
            reached.'
     SYNTAX integer SINGLE-VALUE
   )


   ( <oid-at255> NAME 'cimMaxProcessMemorySize'
     DESC 'Maximum number of Kbytes of memory that can be allocated to
            a Process. For Operating Systems with no virtual memory,
            this value is typically equal to the total amount of
            physical Memory minus memory used by the BIOS and OS. For
            some Operating Systems, this value may be infinity - in
            which case, 0 should be entered. In other cases, this value
            could be a constant - for example, 2G or 4G.'
     SYNTAX integer SINGLE-VALUE
   )


   ( <oid-at256> NAME 'cimDistributed'
     DESC 'Boolean indicating whether the OperatingSystem is
            distributed across several ComputerSystem nodes. If so,
            these nodes should be grouped as a Cluster.'
     SYNTAX boolean SINGLE-VALUE
   )


   ( <oid-at257> NAME 'cimPrimaryOS'
     DESC 'Boolean indicating that the OperatingSystem is the default
            OS for the ComputerSystem.'
     SYNTAX boolean SINGLE-VALUE
   )


   ( <oid-oc145> NAME 'cim22OperatingSystem'
     DESC 'An OperatingSystem is software/firmware that makes a
            ComputerSystem's hardware usable, and implements and/or
            manages the resources, file systems, processes, user
            interfaces, services, ... available on the ComputerSystem.'
     SUP cim22LogicalElement
     MUST (cimCSCreationClassName $ cimCSName $ cimCreationClassName $
cimName)
     MAY (cimOSType $ cimOtherTypeDescription $ cimVersion $
            cimLastBootUpTime $ cimCurrentTimeZone $
            cimNumberOfLicensedUsers $ cimMaxNumberOfProcesses $
```

cimMaxProcessMemorySize $ cimDistributed $ cimPrimaryOS)

```
    )

    ( <oid-nf29> NAME 'cim22OperatingSystemNameForm'
      OC cim22OperatingSystem
      MUST (orderedCimModelPath)
    )

    ( <sr29> NAME 'cim22OperatingSystemStructureRule'
      FORM cim22OperatingSystemNameForm
      SUP <sr11>
    )
```

The following content rule specifies the auxiliary classes that may
be attached to cim22OperatingSystem.

```
    ( <oid-oc145> NAME 'cim22OperatingSystemContentRule'
      DESC 'The auxiliary classes that may be attached to
            cim22OperatingSystem'
      AUX (cim22RunningOSAuxClass $
           cim22OperatingSystemSoftwareFeatureAuxClass $
           cim22BootOSFromFSAuxClass $ cim22LogicalIdentityAuxClass $
           cim22CollectedMSEsAuxClass $
           cim22ElementConfigurationAuxClass $
           cim22ElementSettingAuxClass $ cim22DependencyAuxClass $
           cim22ProvidesServiceToElementAuxClass $
           cim22ComponentAuxClass $ cim22SystemComponentAuxClass)
    )
```

### [3.16](#) cim22RunningOSAuxClass

This class shows the currently executing OperatingSystem. At most one
OperatingSystem can execute at any time on a ComputerSystem. 'At most
one' is specified, since the ComputerSystem may not be currently
booted, or its OperatingSystem may be unknown.

```
    ( <oid-oc146> NAME 'cim22RunningOSAuxClass'
      DESC 'RunningOS indicates the currently executing
            OperatingSystem. At most one OperatingSystem can execute at
            any time on a ComputerSystem. "At most one" is specified,
            since the ComputerSystem may not be currently booted, or
            its OperatingSystem may be unknown. Attribute
            cimAntecedentRef points to cim22OperatingSystem and attribute
            cimDependentRef points to cim22ComputerSystem.'
      SUP cim22DependencyAuxClass AUXILIARY
      MAY (cimAntecedentRef $ cimDependentRef)
    )
```

### [3.17](#) cim22OperatingSystemSoftwareFeatureAuxClass

Shows the SoftwareFeatures that make up the OperatingSystem. The SoftwareFeatures can be part of different Products.

```
( <oid-oc147> NAME 'cim22OperatingSystemSoftwareFeatureAuxClass'
  DESC 'Indicates the SoftwareFeatures that make up the
        OperatingSystem. The SoftwareFeatures can be part of
        different Products. Attribute cimGroupComponentRef points
        to cim22OperatingSystem and attribute cimPartComponentRef
        points to cim22SoftwareFeature.'
  SUP cim22ComponentAuxClass AUXILIARY
  MAY (cimGroupComponentRef $ cimPartComponentRef)
)
```

### [3.18](#) cim22FileSystem

A file or dataset store local to a ComputerSystem or remotely mounted from a file server.

```
( <oid-at258> NAME 'cimRoot'
  DESC 'Path name or other information defining the root of the
        FileSystem.'
  SYNTAX string SINGLE-VALUE
)

( <oid-at259> NAME 'cimBlockSize'
  DESC 'FileSystems can read/write data in blocks which are defined
        independently of the underlying StorageExtents. This
        property captures the FileSystem's block size for data
        storage and retrieval.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at260> NAME 'cimFileSystemSize'
  DESC 'The FileSystemSize property stores the total size of the
        FileSystem in bytes. If unknown, enter 0.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at261> NAME 'cimReadOnly'
  DESC 'Indicates that the FileSystem is designated as read only.'
  SYNTAX boolean SINGLE-VALUE
)

( <oid-at262> NAME 'cimEncryptionMethod'
  DESC 'A free form string indicating the algorithm or tool used to
        encrypt the FileSystem. If it is not possible or not
```

```
            desired to describe the encryption scheme (perhaps for
            security reasons), recommend using the following words:
            "Unknown" to represent that it is not known whether the
            FileSystem is encrypted or not, "Encrypted" to represent
            that the FileSystem is encrypted but either its encryption
            scheme is not known or not disclosed, and "Not Encrypted"
            to represent that the FileSystem is not encrypted.'
    SYNTAX string SINGLE-VALUE
  )

  ( <oid-at263> NAME 'cimCompressionMethod'
    DESC 'A free form string indicating the algorithm or tool used to
            compress the FileSystem. If it is not possible or not
            desired to describe the compression scheme (perhaps because
            it is not known), recommend using the following words:
            "Unknown" to represent that it is not known whether the
            FileSystem is compressed or not, "Compressed" to represent
            that the FileSystem is compressed but either its
            compression scheme is not known or not disclosed, and "Not
            Compressed" to represent that the FileSystem is not
            compressed.'
    SYNTAX string SINGLE-VALUE
  )

  ( <oid-at264> NAME 'cimCaseSensitive'
    DESC 'Indicates that case sensitive file names are supported.'
    SYNTAX boolean SINGLE-VALUE
  )

  ( <oid-at265> NAME 'cimCasePreserved'
    DESC 'Indicates that the case of file names are preserved.'
    SYNTAX boolean SINGLE-VALUE
  )

  ( <oid-at266> NAME 'cimCodeSetMV'
    DESC 'Array defining the character sets or encoding supported by
            the FileSystem. For example, the values, "ASCII" (2) or
            "ISO2022" (4), may be specified.'
    SYNTAX integer
  )

  ( <oid-at267> NAME 'cimMaxFileNameLength'
    DESC 'Integer indicating the maximum length of a file name within
            the FileSystem. 0 indicates that there is no limit on file
            name length.'
    SYNTAX integer SINGLE-VALUE
  )
```

```
      ( <oid-at268> NAME 'cimClusterSize'
        DESC 'The minimum file allocation size (an integral number of
              blocks), imposed by the FileSystem. (The size of a block is
              specified in the BlockSize property for the FileSystem.)
              Minimum allocation size is the smallest amount of storage
              allocated to a LogicalFile by the FileSystem. This is not a
              mandatory minimum allocation for all FileSystems. Under
              stress conditions, some FileSystems may allocate storage in
              amounts smaller than the ClusterSize.'
        SYNTAX integer SINGLE-VALUE
      )

      ( <oid-at269> NAME 'cimFileSystemType'
        DESC 'String describing the type of FileSystem and therefore, its
              conventions. For example, "NTFS" or "S5" may be listed as
              well as any additional information on the FileSystem's
              implementation. Since various flavors of FileSystems (like
              S5) exist, this property is defined as a string.'
        SYNTAX string SINGLE-VALUE
      )

      ( <oid-oc148> NAME 'cim22FileSystem'
        DESC 'A file or dataset store local to a ComputerSystem or
              remotely mounted from a file server.'
        SUP cim22LogicalElement
        MUST (cimCSCreationClassName $ cimCSName $ cimCreationClassName $
              cimName)
        MAY (cimRoot $ cimBlockSize $ cimFileSystemSize $ cimReadOnly $
              cimEncryptionMethod $ cimCompressionMethod $
              cimCaseSensitive $ cimCasePreserved $ cimCodeSetMV $
              cimMaxFileNameLength $ cimClusterSize $ cimFileSystemType)
      )

      ( <oid-nf30> NAME 'cim22FileSystemNameForm'
        OC cim22FileSystem
        MUST (orderedCimModelPath)
      )

      ( <sr30> NAME 'cim22FileSystemStructureRule'
        FORM cim22FileSystemNameForm
        SUP <sr11>
      )
```

The following content rule specifies the auxiliary classes that may
be attached to cim22FileSystem.

```
      ( <oid-oc148> NAME 'cim22FileSystemContentRule'
        DESC 'The auxiliary classes that may be attached to
```

```
            cim22FileSystem'
    AUX (cim22BootOSFromFSAuxClass $ cim22LogicalIdentityAuxClass $
         cim22CollectedMSEsAuxClass $
         cim22ElementConfigurationAuxClass $
         cim22ElementSettingAuxClass $ cim22DependencyAuxClass $
         cim22ProvidesServiceToElementAuxClass $
         cim22ComponentAuxClass $ cim22SystemComponentAuxClass)
  )
```

### [3.19](#) cim22LocalFileSystem

A class derived from cim22FileSystem that represents the file store
on a ComputerSystem's locally controlled media.

```
( <oid-oc149> NAME 'cim22LocalFileSystem'
  DESC 'A class derived from FileSystem that represents the file
        store on a ComputerSystem's locally controlled media.'
  SUP cim22FileSystem
  )
```

### [3.20](#) cim22RemoteFileSystem

A class derived from FileSystem that represents access of the
FileSystem via a network-related service. For example, the file store
for a NFS FileSystem is NOT on a ComputerSystem's locally controlled
media.

```
( <oid-oc150> NAME 'cim22RemoteFileSystem'
  DESC 'A class derived from FileSystem that represents access of
        the FileSystem via a network-related service. For example,
        the file store for an NFS FileSystem is NOT on a
        ComputerSystem's locally controlled media.'
  SUP cim22FileSystem
  )
```

### [3.21](#) cim22NFS

A class derived from RemoteFileSystem representing that the
FileSystem is mounted from another ComputerSystem. The properties of
the NFS object deal with the operational aspects of the mount.'

```
( <oid-at270> NAME 'cimHardMount'
  DESC 'If set to true: Once the FileSystem is mounted, NFS
        requests are retried until the hosting System responds. If
        set to false: Once the FileSystem is mounted, an error is
        returned if the hosting System does not respond. '
  SYNTAX boolean SINGLE-VALUE
  )
```

```
( <oid-at271> NAME 'cimForegroundMount'
  DESC 'If set to true: Retries are performed in the
        foreground. If set to false: If the first mount attempt
        fails, retries are performed in the background.'
  SYNTAX boolean SINGLE-VALUE
)

( <oid-at272> NAME 'cimInterrupt'
  DESC 'If set to true: Interrupts are permitted for hard mounts.
        If set to false: Interrupts are ignored for hard mounts.'
  SYNTAX boolean SINGLE-VALUE
)

( <oid-at273> NAME 'cimMountFailureRetries'
  DESC 'Maximum number of mount failure retries allowed.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at274> NAME 'cimRetransmissionAttempts'
  DESC 'Maximum number of NFS retransmissions allowed.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at275> NAME 'cimRetransmissionTimeout'
  DESC 'NFS timeout in tenths of a second.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at276> NAME 'cimReadBufferSize'
  DESC 'Read buffer size in bytes.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at277> NAME 'cimWriteBufferSize'
  DESC 'Write buffer size in bytes.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at278> NAME 'cimServerCommunicationPort'
  DESC 'The remote ComputerSystem's (ie, the NFS File "Server"s)
        UDP port number.'
  SYNTAX integer SINGLE-VALUE
)

( <oid-at279> NAME 'cimAttributeCaching'
  DESC 'If set to true: Control attribute caching is enabled.  If
        set to false: Control attribute caching is disabled.'
  SYNTAX boolean SINGLE-VALUE
```

```
     )

     ( <oid-at280> NAME 'cimAttributeCachingForRegularFilesMin'
       DESC 'Minimum number of seconds that cached attributes are held
             after file modification.'
       SYNTAX integer SINGLE-VALUE
     )

     ( <oid-at281> NAME 'cimAttributeCachingForRegularFilesMax'
       DESC 'Maximum number of seconds that cached attributes are held
             after file modification.'
       SYNTAX integer SINGLE-VALUE
     )

     ( <oid-at282> NAME 'cimAttributeCachingForDirectoriesMin'
       DESC 'Minimum number of seconds that cached attributes are held
             after directory update.'
       SYNTAX integer SINGLE-VALUE
     )

     ( <oid-at283> NAME 'cimAttributeCachingForDirectoriesMax'
       DESC 'Maximum number of seconds that cached attributes are held
             after directory update.'
       SYNTAX integer SINGLE-VALUE
     )

     ( <oid-oc151> NAME 'cim22NFS'
       DESC 'A class derived from RemoteFileSystem representing that the
             FileSystem is mounted from another ComputerSystem. The
             properties of the NFS object deal with the operational
             aspects of the mount.'
       SUP cim22RemoteFileSystem
       MAY (cimHardMount $ cimForegroundMount $ cimInterrupt $
             cimMountFailureRetries $ cimRetransmissionAttempts $
             cimRetransmissionTimeout $ cimReadBufferSize $
             cimWriteBufferSize $ cimServerCommunicationPort $
             cimAttributeCaching $ cimAttributeCachingForRegularFilesMin $
             cimAttributeCachingForRegularFilesMax $
             cimAttributeCachingForDirectoriesMin $
             cimAttributeCachingForDirectoriesMax)
     )
```

## 3.22 cim22BootOSFromFSAuxClass

The relationship between the OperatingSystem and the FileSystem(s)
from which this OperatingSystem is loaded. The association is many-
to-many since a Distributed OS could depend on several FileSystems to
correctly and completely load.

```
( <oid-oc152> NAME 'cim22BootOSFromFSAuxClass'
  DESC 'A link between the OperatingSystem and the FileSystem(s)
        from which this OperatingSystem is loaded. The association
        is many-to-many since a Distributed OS could depend on
        several FileSystems in order to correctly and completely
        load. Attribute cimAntecedentRef points to cim22FileSystem
        and attribute cimDependentRef points to
        cim22OperatingSystem.'
  SUP cim22DependencyAuxClass AUXILIARY
  MAY (cimAntecedentRef $ cimDependentRef)
)
```

### 3.23 cim22BIOSFeature

This class represents the capabilities of the low-level software that
is used to bring up and configure a ComputerSystem.

```
( <oid-oc153> NAME 'cim22BIOSFeature'
  DESC 'BIOSFeature represents the capabilities of the low-level
        software that is used to bring up and configure a
        ComputerSystem.'
  SUP cim22SoftwareFeature
)

( <oid-nf31> NAME 'cim22BIOSFeatureNameForm'
  OC cim22BIOSFeature
  MUST (orderedCimModelPath)
)

( <sr31> NAME 'cim22BIOSFeatureStructureRule'
  FORM cim22BIOSFeatureNameForm
)
```

The following content rule specifies the auxiliary classes that may
be attached to cim22BIOSFeature.

```
( <oid-oc153>> NAME 'cim22BIOSFeatureContentRule'
  DESC 'The auxiliary classes that may be attached to
        cim22BIOSFeature'
  AUX (cim22BIOSFeatureBIOSElementsAuxClass)
)
```

### 3.24 cim22BIOSElement

This class represents the low-level software that is loaded into
non-volatile storage and used to bring up and configure a
ComputerSystem.

```
( <oid-at286> NAME 'cimPrimaryBIOS'
  DESC 'If true, this is the primary BIOS of the ComputerSystem.'
  SYNTAX boolean SINGLE-VALUE
)

( <oid-at287> NAME 'cimListOfLanguages'
  DESC 'A list of installable languages for the BIOS. This
        information can be obtained from SMBIOS, from the string
        list that follows the Type 13 structure. An ISO 639
        Language Name should be used to specify the BIOS'
        installable languages. The ISO 3166 Territory Name and the
        encoding method may also be specified, following the
        Language Name.'
  SYNTAX string
)

( <oid-at288> NAME 'cimCurrentLanguage'
  DESC 'The currently selected language for the BIOS. This
        information can be obtained from SMBIOS, using the Current
        Language attribute of the Type 13 structure, to index into
        the string list following the structure. The property is
        formatted using the ISO 639 Language Name, and may be
        followed by the ISO 3166 Territory Name and the encoding
        method.'
  SYNTAX string SINGLE-VALUE
)

( <oid-oc154> NAME 'cim22BIOSElement'
  DESC 'BIOSElement represents the low-level software that is
        loaded into non-volatile storage and used to bring up and
        configure a ComputerSystem.'
  SUP cim22SoftwareElement
  MAY (cimPrimaryBIOS $ cimListOfLanguages $ cimCurrentLanguage)
)
```

The following content rule specifies the auxiliary classes that may
be attached to cim22BIOSFeature.

```
( <oid-oc154> NAME 'cim22BIOSElementContentRule'
  DESC 'The auxiliary classes that may be attached to
        cim22BIOSElement'
  AUX (cim22BIOSFeatureBIOSElementsAuxClass $ cim22SystemBIOSAuxClass)
)
```

### 3.25 cim22BIOSFeatureBIOSElementsAuxClass

This auxiliary class provides a link between BIOSFeature and its
aggregated BIOSElements.

```
( <oid-oc155> NAME 'cim22BIOSFeatureBIOSElementsAuxClass'
  DESC 'A link between BIOSFeature and its aggregated
        BIOSElements. Attribute cimGroupComponentRef points to
        cim22BIOSFeature and attribute cimPartComponentRef points to
        cim22BIOSElement.'
  SUP cim22SoftwareFeatureSoftwareElementsAuxClass AUXILIARY
  MAY (cimGroupComponentRef $ cimPartComponentRef)
)
```

### 3.26 cim22SystemBIOSAuxClass

This auxiliary class associates a UnitaryComputerSystem's BIOS with
the System itself.

```
( <oid-oc156> NAME 'cim22SystemBIOSAuxClass'
  DESC 'SystemBIOS associates a UnitaryComputerSystem's BIOS with
        the System itself. Attribute cimGroupComponentRef points to
        cim22UnitaryComputerSystem and attribute cimPartComponentRef
        points to cim22BIOSElement.'
  SUP cim22SystemComponentAuxClass AUXILIARY
  MAY (cimGroupComponentRef $ cimPartComponentRef)
)
```

### 4. References

Request For Comments (RFC) and Internet Draft documents are available
from numerous mirror sites.

[1]        M. Wahl, T. Howes, S. Kille, "Lightweight Directory
           Access Protocol (v3)," RFC 2251, Decemeber 1997.

[2]        M. Wahl, A. Coulbeck, T. Howes, S. Kille, "Light-
           weight Directory Access Protocol (v3): Attribute
           Synatx Definitions," RFC 2252, December 1997.

[3]        Ryan Moats, Gerald Maziarski, John Strassner, "LDAP
           Schema for the DMTF Core CIM v2.2 Model," Internet
           Draft (work in progress), December 1999.

[4]        Ryan Moats, Gerald Maziarski, John Strassner,
           "Extensible Match Rule to Dereference Pointers",
           Internet Draft (work in progress), June 1999.

[5]        DMTF, "CIM System Model, v2.2".

**5**. **Author's Addresses**

Ryan Moats                  Jerry Maziarski          John Strassner
15621 Drexel Circle         Room C3-3Z01             Cisco Systems, Bldg 1
Omaha, NE 68135             200 S. Laurel Ave.       170 West Tasman Drive
USA                         Middletown, NJ 07748     San Jose, CA 95134
E-mail: jayhawk@att.com     USA                      E-mail:
johns@cisco.com

                            E-mail: gfm@qsun.att.com