

Overview of CIM & WBEM including printing and job management

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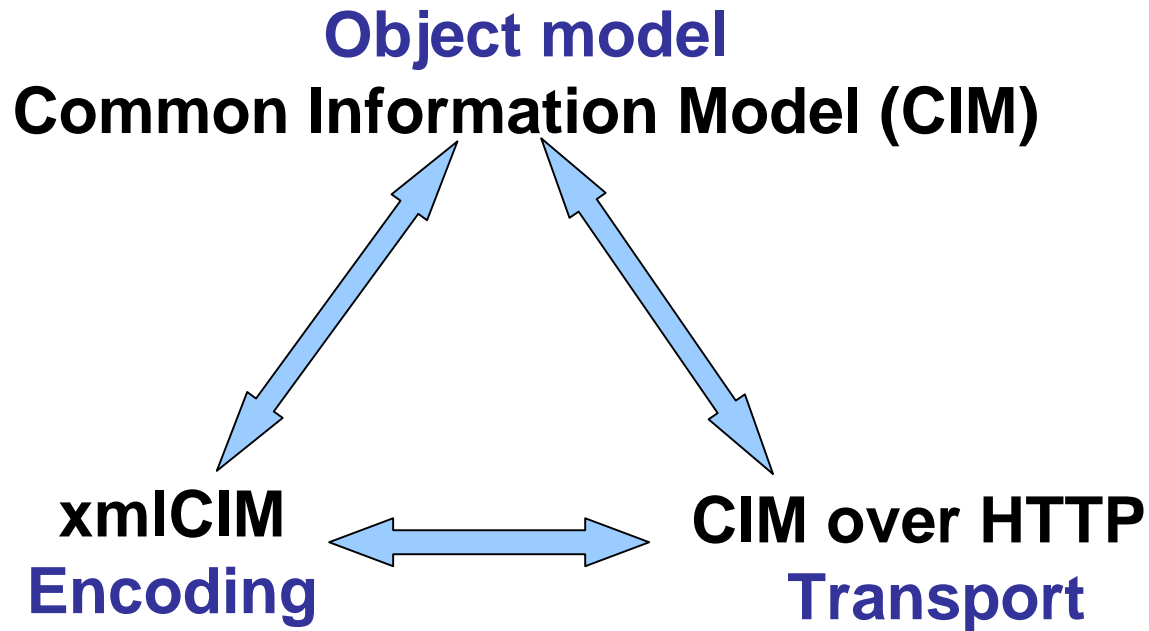
Disclaimers

- I am not a printer person!
 - I work in HP's networked storage division.
- CIM printer model developed several years ago for OS usage.
 - Little change recently apart from 'inherited' change.
- Not aware of any printing experts currently in the Systems and Devices workgroup.

Agenda

- Technical Overview
- Printer model discussion
- Job control discussion
- Futures

WBEM Technology



Extensible (OO), platform independent, interoperable, distributed management environment for enterprise class systems.

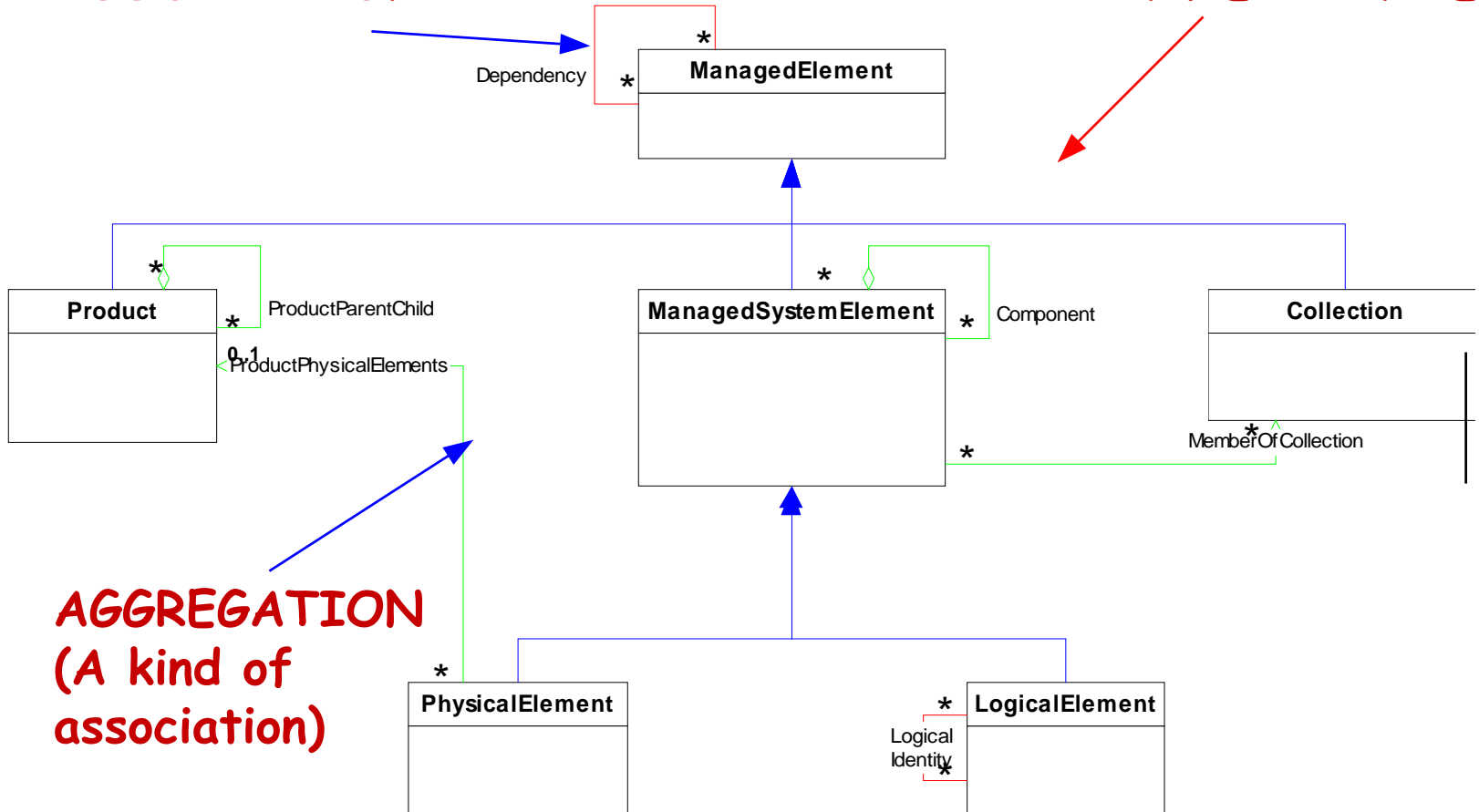
What Is CIM?

- Object-oriented data model not an implementation
- CIM facilitates the integration of management information from different sources (e.g. easy to map DMI, SNMP etc).
- Core Specification
 - “Meta”-model, high level concepts and language definitions
- “Core” and “Common” Models
 - Core Model contains info applicable to all management domains
 - Common Models address specific domains - Systems, Devices, Applications, Networks, Users, ...
 - Subclass from the Core Model
 - Models overlap and cross-reference
 - SNIA have been working to extend storage model.
- Expressed graphically (UML) or text (“Managed Object Format”)

UML/Visio Example

ASSOCIATION

INHERITANCE



AGGREGATION
(A kind of association)

MOF Example

```

[Abstract, Description (
  "An abstraction or emulation of a hardware entity, that may "
  "or may not be Realized in physical hardware. ... ") ]
class CIM_LogicalDevice : CIM_LogicalElement
{
  . . . .
  [Key, MaxLen (64), Description (
    "An address or other identifying information to uniquely "
    "name the LogicalDevice.") ]
  string DeviceID;
  [Description (
    "Boolean indicating that the Device can be power "
    "managed. ...") ]
  boolean PowerManagementSupported;
  [Description (
    "Requests that the LogicalDevice be enabled (\\"Enabled\\" "
    "input parameter = TRUE) or disabled (= FALSE). ...)" ]
  uint32 EnableDevice([IN] boolean Enabled);
  . . . .
};

```

Qualifiers




Class Name and Inheritance

Properties




Methods



WBEM - HTTP Operations

- Works with existing Web servers
- No new HTTP extensions
- Compatible with existing Web programming
- Simple Concept and Implementation
- Works through firewalls
- Can be secured
- SLP discovery

HTTP Operations

- Intrinsic Methods
 - Manipulate schema & instances
 - Retrieve classes, properties & instances
 - Navigate & query schema structure
- Extrinsic Methods
 - Execute method within classes
- Indication delivery
- Bulk & single operations

Intrinsic Methods

GetClass

DeleteClass

CreateClass

ModifyClass

EnumerateClasses

EnumerateClassNames

GetQualifier

SetQualifier

DeleteQualifier

EnumerateQualifiers

GetInstance

DeleteInstance

CreateInstance

ModifyInstance

EnumerateInstances

EnumerateInstanceNames

ExecQuery

Associators

AssociatorNames

References

ReferenceNames

GetProperty

SetProperty

Example MOF Fragment ..

```
[description ("Big hack .... but if it works"),
provider ("MethodHack")]
class SNIA_StorageService
{
    [description ("instance key ... well we might want more than "
                "one instance ..."), key]
    uint32 id;

    [description ("Scratch creation method"),provider ("MethodHack")]
    uint32 createLun (
        [IN, description ("Size")]
        uint32 Size,
        [IN, description ("LUN Number")]
        uint32 Lun,
        [OUT] uint32 test
    );
};
```

Java Client API Example

```
//set up method input parameters
    Vector ins = new Vector();
    CIMProperty Lsize = new CIMProperty("Size");
    Lsize.setValue(new CIMValue ( new Integer(40)));
    CIMProperty Lun = new CIMProperty("Lun");
    Lun.setValue(new CIMValue (new Integer(20)));
    ins.addElement (Lsize);
    ins.addElement (Lun);

//set up method output parameters
    Vector outs = new Vector();

//call method
    CIMValue ret = cimClient.invokeMethod(storageService,
        "createLun", ins, outs);

//and print results
    System.out.println("Return="+ret.toString());
    System.out.println("Outs="+outs);
```

XML 'Command' for Method Transaction

```

<?xml version="1.0" ?>
<CIM CIMVERSION="2.0" DTDVERSION="2.0">
  <MESSAGE ID="3" PROTOCOLVERSION="1.0">
    <SIMPLEREQ>
      <METHODCALL NAME="createLun">
        <LOCALINSTANCEPATH>
          <LOCALNAMESPACEPATH>
            <NAMESPACE NAME="root"> </NAMESPACE>
          </LOCALNAMESPACEPATH>
          <INSTANCENAME CLASSNAME="SNIA_StorageService">
            <KEYBINDING NAME="id">
              <KEYVALUE VALUETYPE="string"> 42 </KEYVALUE>
            </KEYBINDING>
          </INSTANCENAME>
        </LOCALINSTANCEPATH>
        <PARAMVALUE NAME="Size"><VALUE>40</VALUE></PARAMVALUE>
        <PARAMVALUE NAME="Lun"><VALUE>20</VALUE></PARAMVALUE>
        <PARAMVALUE NAME="test"><VALUE>1</VALUE></PARAMVALUE>
      </METHODCALL>
    </SIMPLEREQ>
  </MESSAGE>
</CIM>

```

Instance path

Parameters

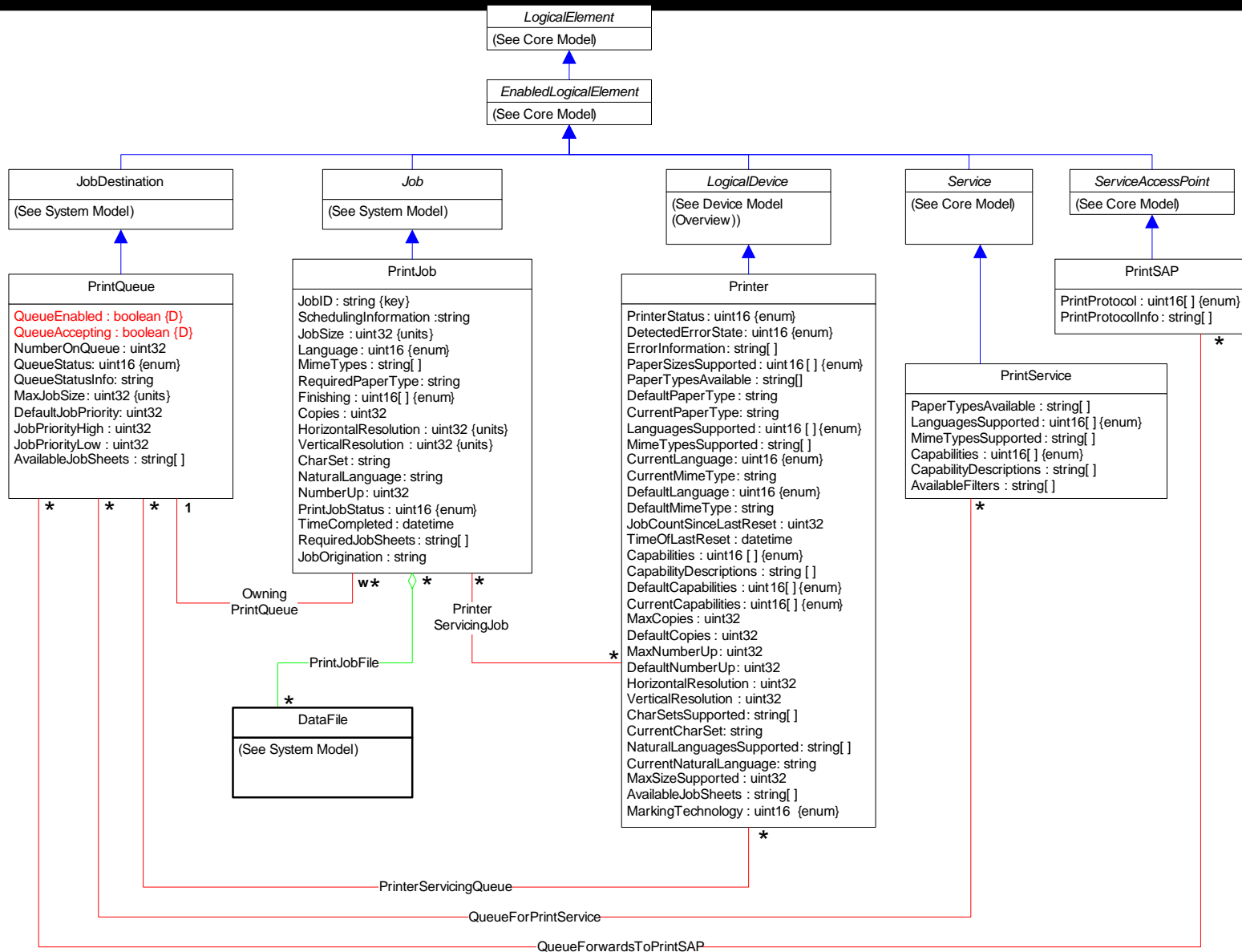
XML 'Response' for Method Transaction

```
<?xml version="1.0" ?>
<CIM CIMVERSION="2.0" DTDVERSION="2.0">
  <MESSAGE ID="3" PROTOCOLVERSION="1.0">
    <SIMPLERSP>
      <METHODRESPONSE NAME="createLun">
        <RETURNVALUE>
          <VALUE>24</VALUE>
          <PARAMVALUE NAME="test">
            <VALUE>21</VALUE>
          </PARAMVALUE>
        </RETURNVALUE>
      </METHODRESPONSE>
    </SIMPLERSP>
  </MESSAGE>
</CIM>
```

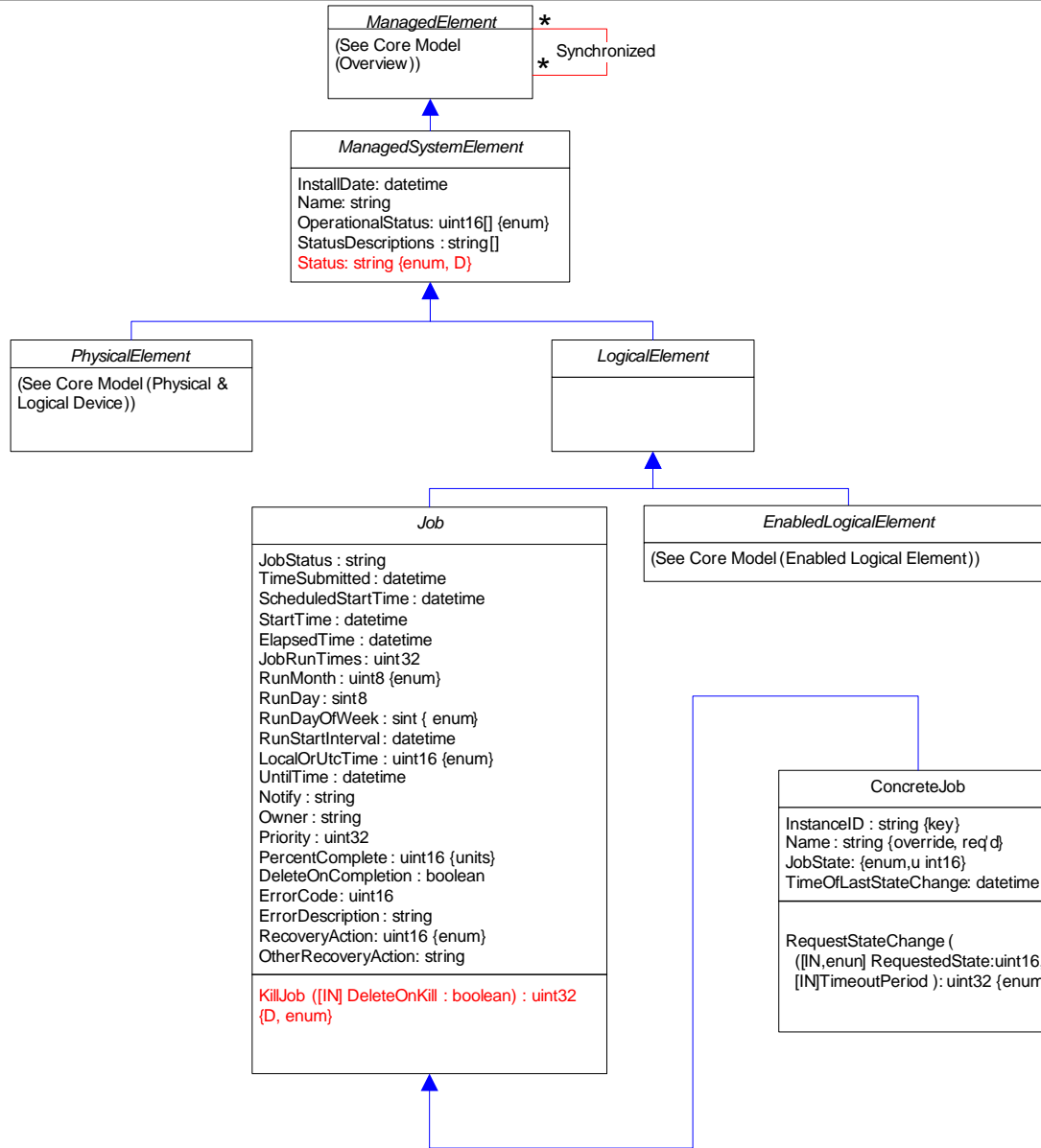
So who's using it?

- Lots of proprietary or semi interoperable implementations.
- Storage Networking Industry Association
 - SMI-S based on WBEM
- Server management workgroup
 - Defining CIM/WBEM based CLI and API for pre-OS server management
- Utility computing workgroup
 - Working with OASIS,GGF etc to extend model to cover utility 'services' space and be compatible with WSDM.

CIM printer specific modeling



Specifics of Job



Notable Activities for CIM 2.9

- Enhancing job control
 - Significant improvements to error and status handling
 - Driven from Common Diagnostics and SMI-S
- Batch jobs
 - From Global Grid Forum
- Other activities:
 - Developing formal UML representation of molel.
 - Developing SOAP based transport
 - New Utility Computing workgroup (stronger liaison with OASIS WSDM workgroup and GGF).