Interoperable Management over Web Services

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Abstract

The era of true in-field interoperability for monitoring, configuring, and controlling computing resources is at hand. It is now practical to management software to discover and manage computing resources as they as added to the network thereby making dynamic computer resource management possible. This session describes how DMTF and SNIA accomplish these ends over web services.

Agenda

- Answer: Why interoperable computer resource management is interesting?
- Building blocks of the standards
- Computer resource management through web services
- WS-Management protocol

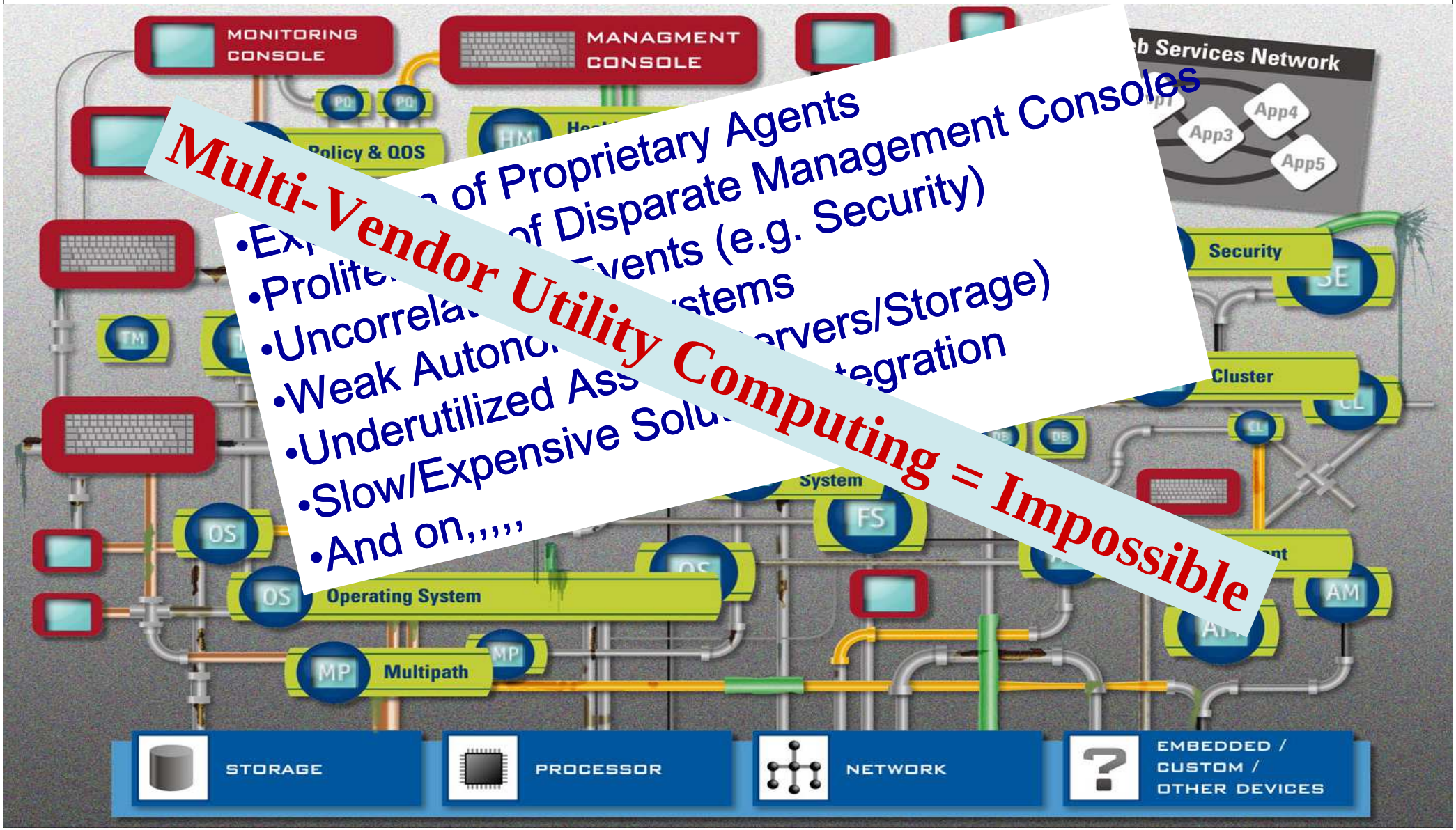
Interoperability as NATO defines it

interoperability through standardization: the development and implementation of concepts, doctrines, procedures and designs in order to achieve and maintain the compatibility, interchangeability or commonality which are necessary to attain the required level of interoperability or to optimize the use of resources, in the fields of operations, materiel and administration

Interoperability

- In a context of standards based interaction of computer resources, interoperability means that all that is required for interoperability is for the implementers to implement the standard correctly
- Interoperability is generally the quality a system where components of a system can be replaced with like components and the system continues to function
- Interoperability means for this presentation
  - Normalized Behavior and well understood functionality as defines by DMTF profiles
  - Shared Ontology as defined by CIM
  - Complex interactions built from simple components as defined by DMTF protocols

The Multi-vendor Enterprise – IT Consumer Dilemma



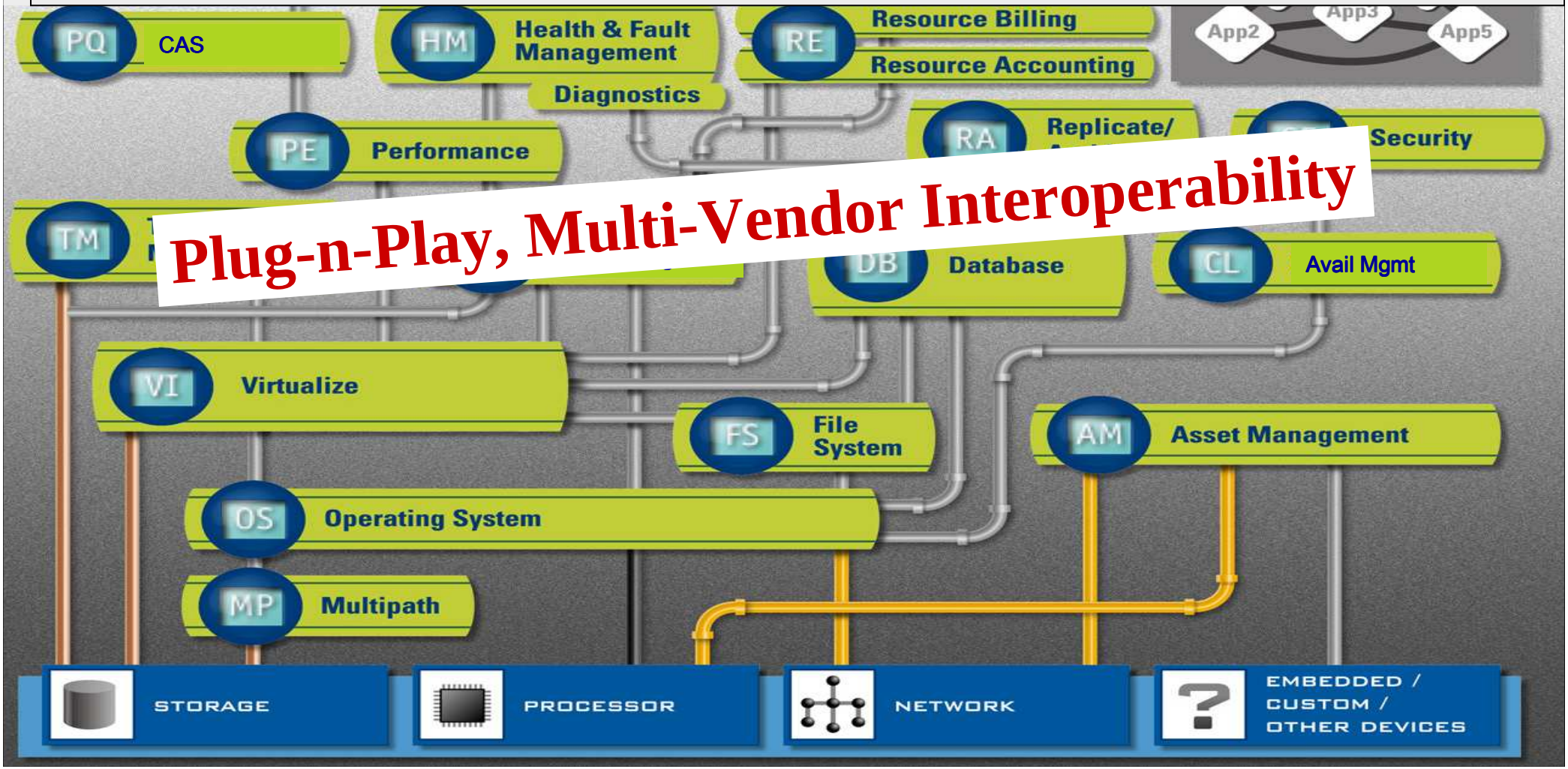
IT Consumer Solution

Regulatory Compliance Automation

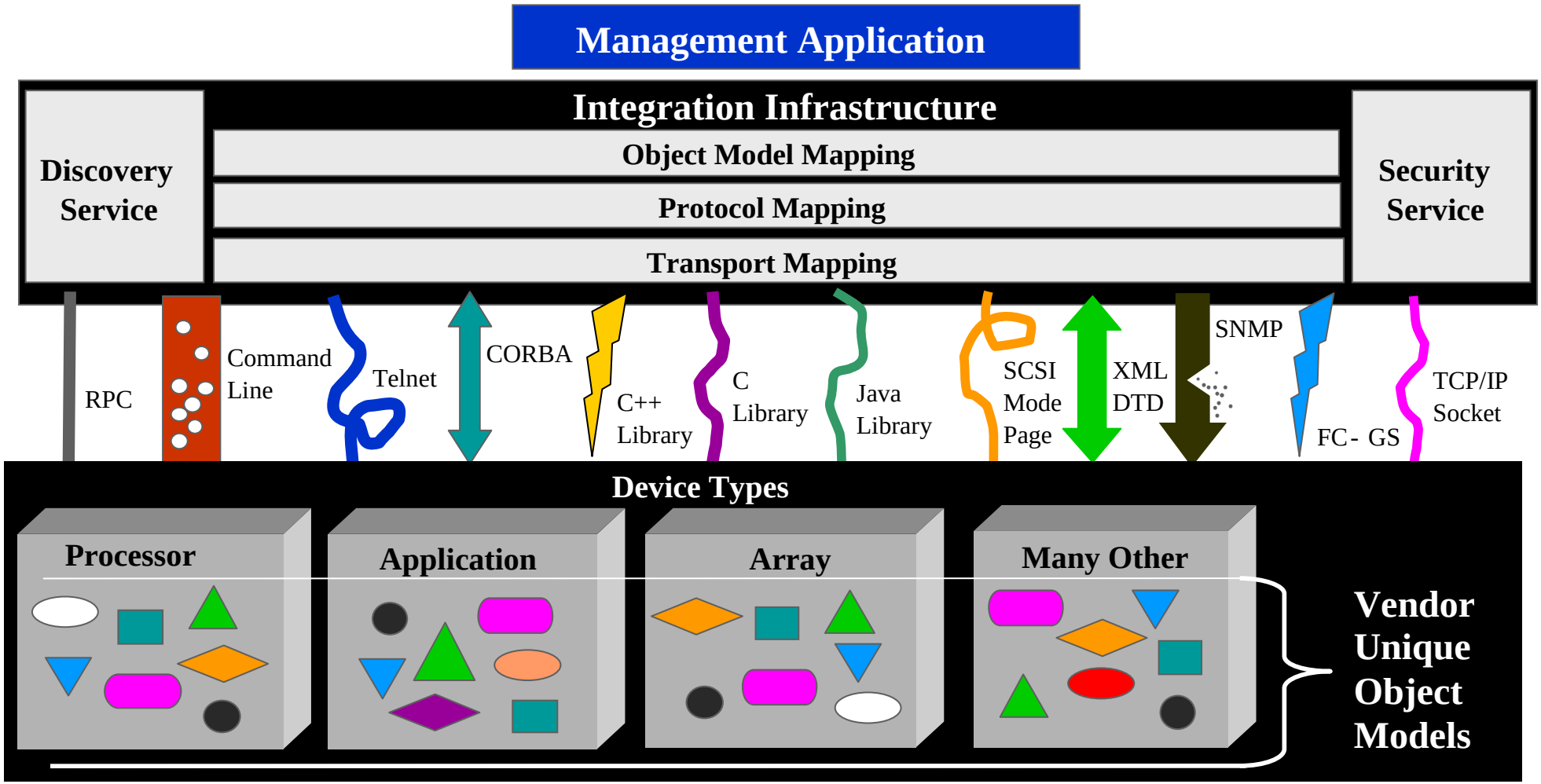
Security Administration Automation

Provisioning and Capacity Planning Engine

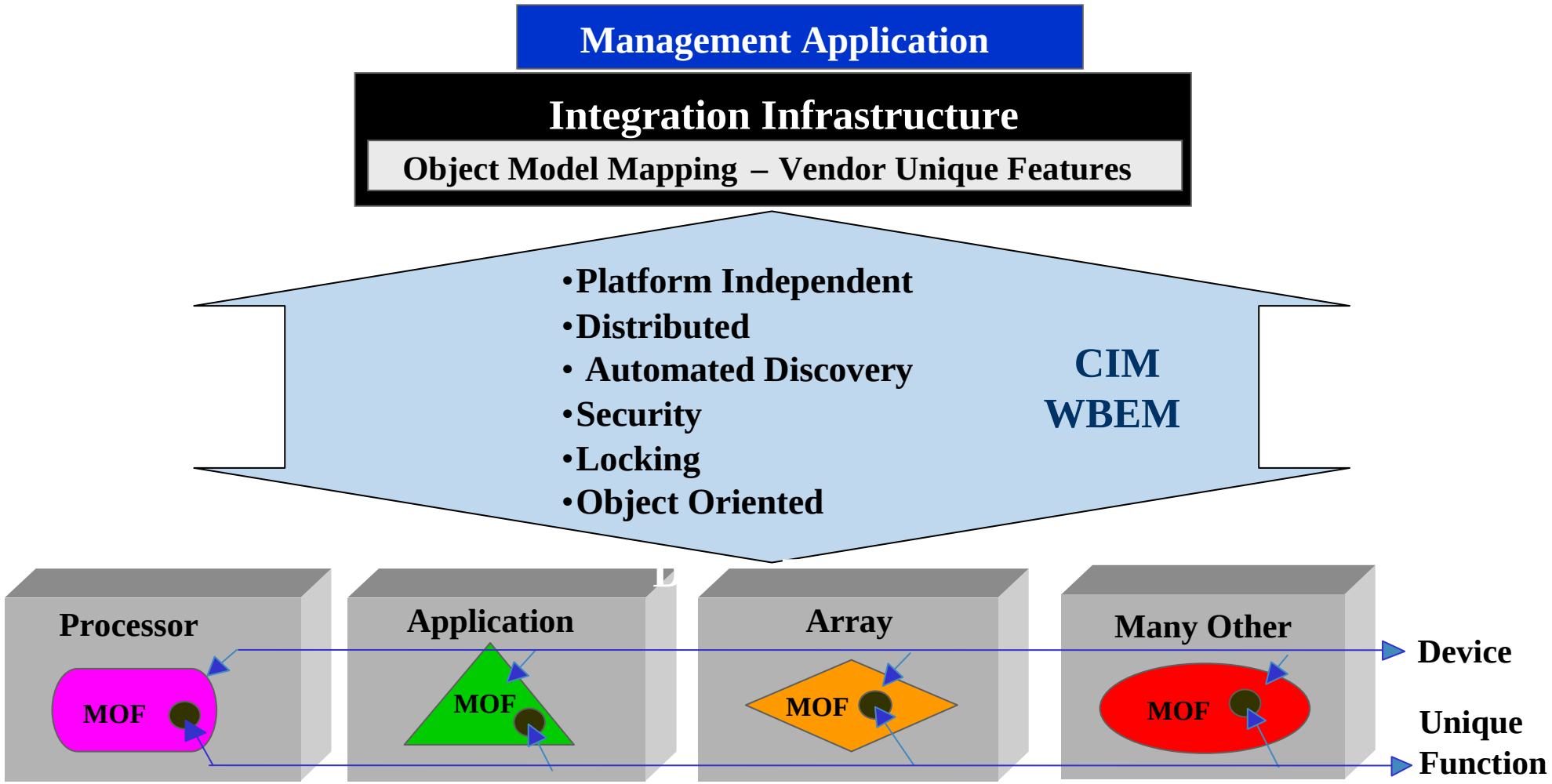
Application QOS Automation



Developer's Dilemma



Developer's Solution



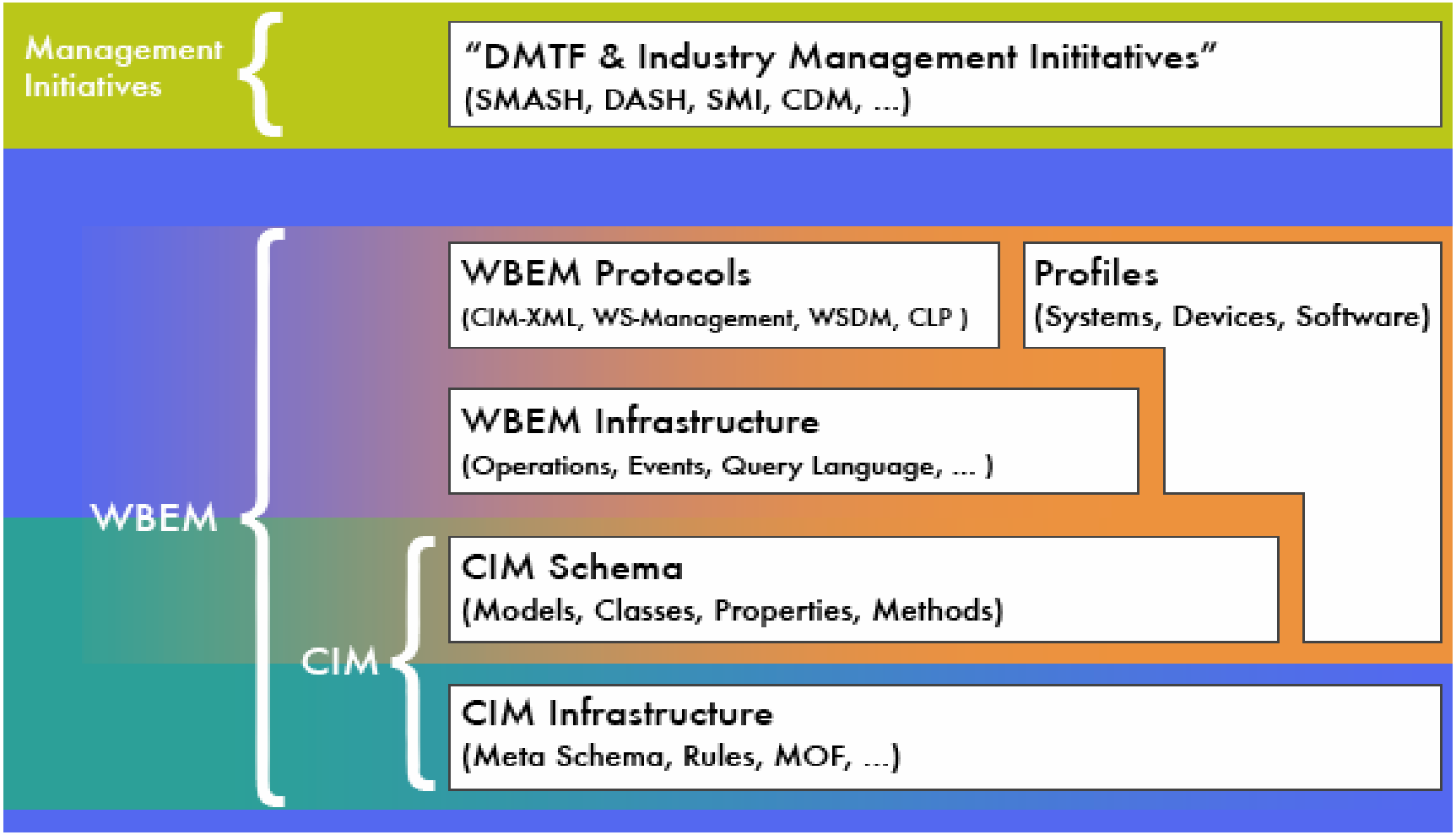
Business motivation for management standards

- Reduce complexity
  - Constraining the products used
  - Implementing best practices
  - Achieving common behavior through standards
- Increase responsiveness to changing business needs
  - Interoperability through common semantics
  - Leverage current processes in different operating environments using multiple products (of same type)
- Streamline development cycle
  - Improve time to market and quality
  - Focus on improved capabilities rather than “plumbing”

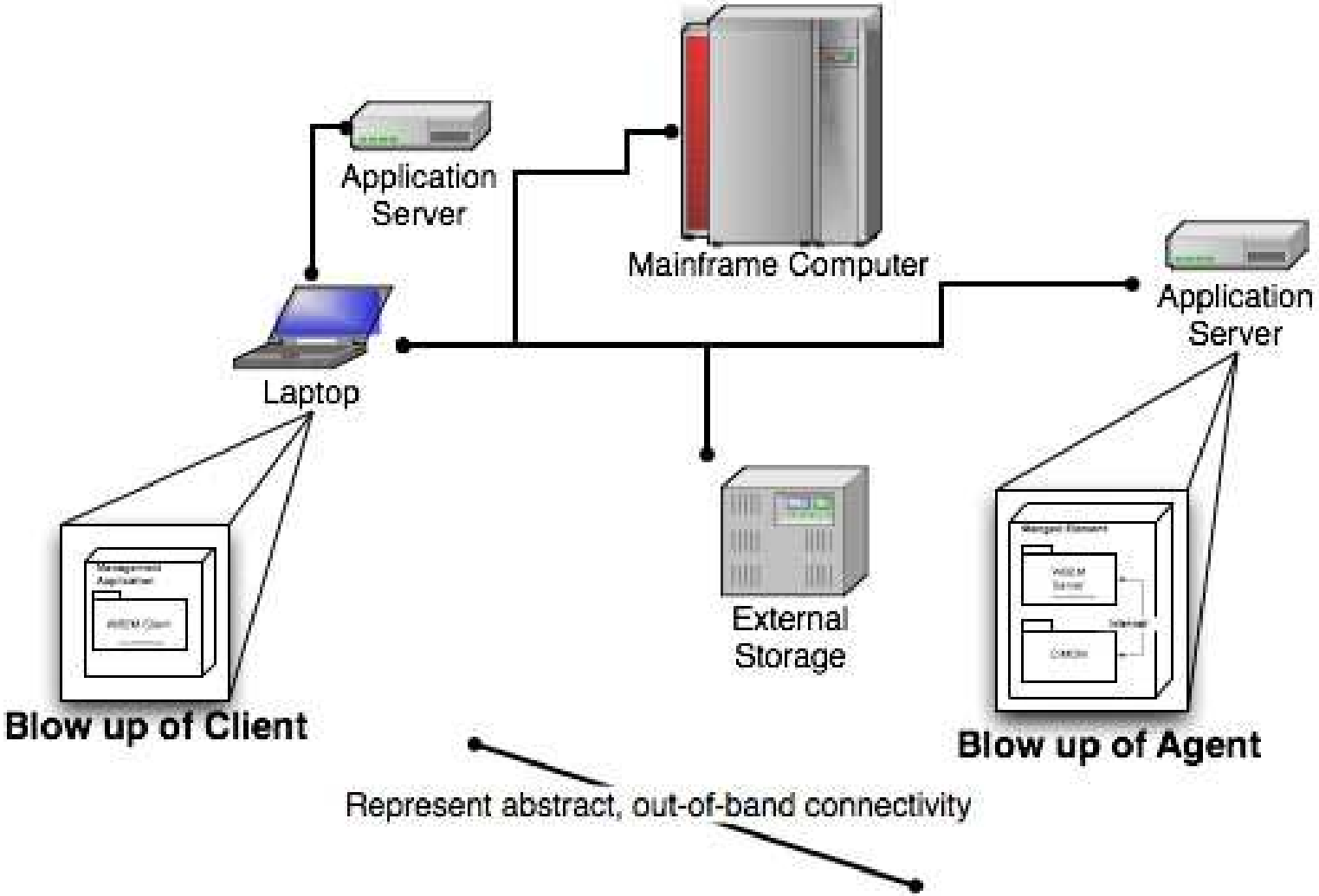
First, some concepts defined

- CIM
  - Object oriented information model (e.g. classes, instances, properties)
  - Is a ontology for management
  - Used to decompose the devices and applications
- WBEM
  - Web based protocols, currently using XML and HTTP
  - CIM elements (e.g. classes and instances) are marshaled into XML and conveyed over TCP/IP
- Profile
  - A profile defines the implementation requirements in terms of classes and behaviors
  - Imposes implementations requirements through normative language
  - Designed so that a conformance application and verify the requirements

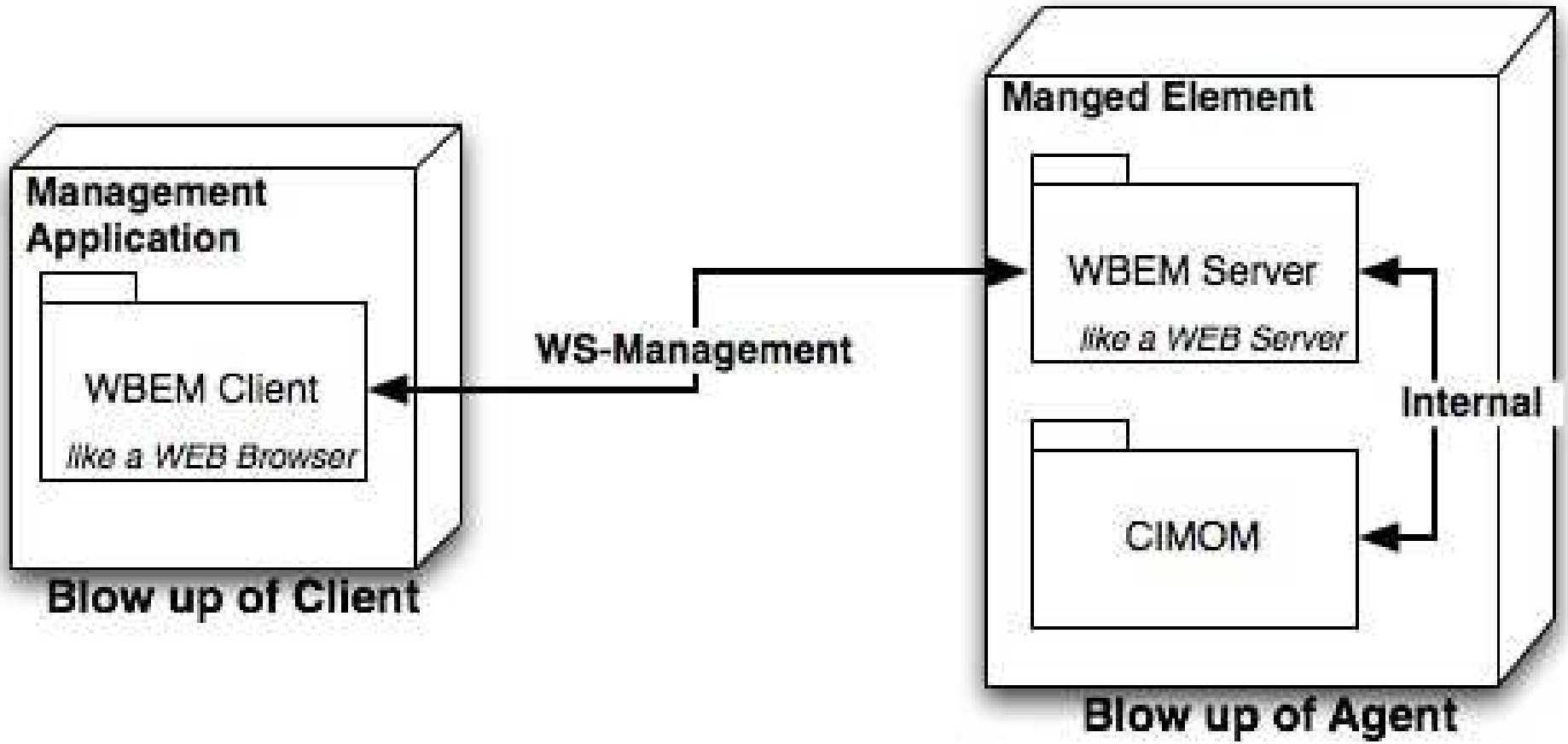
DMTF Technologies Diagram



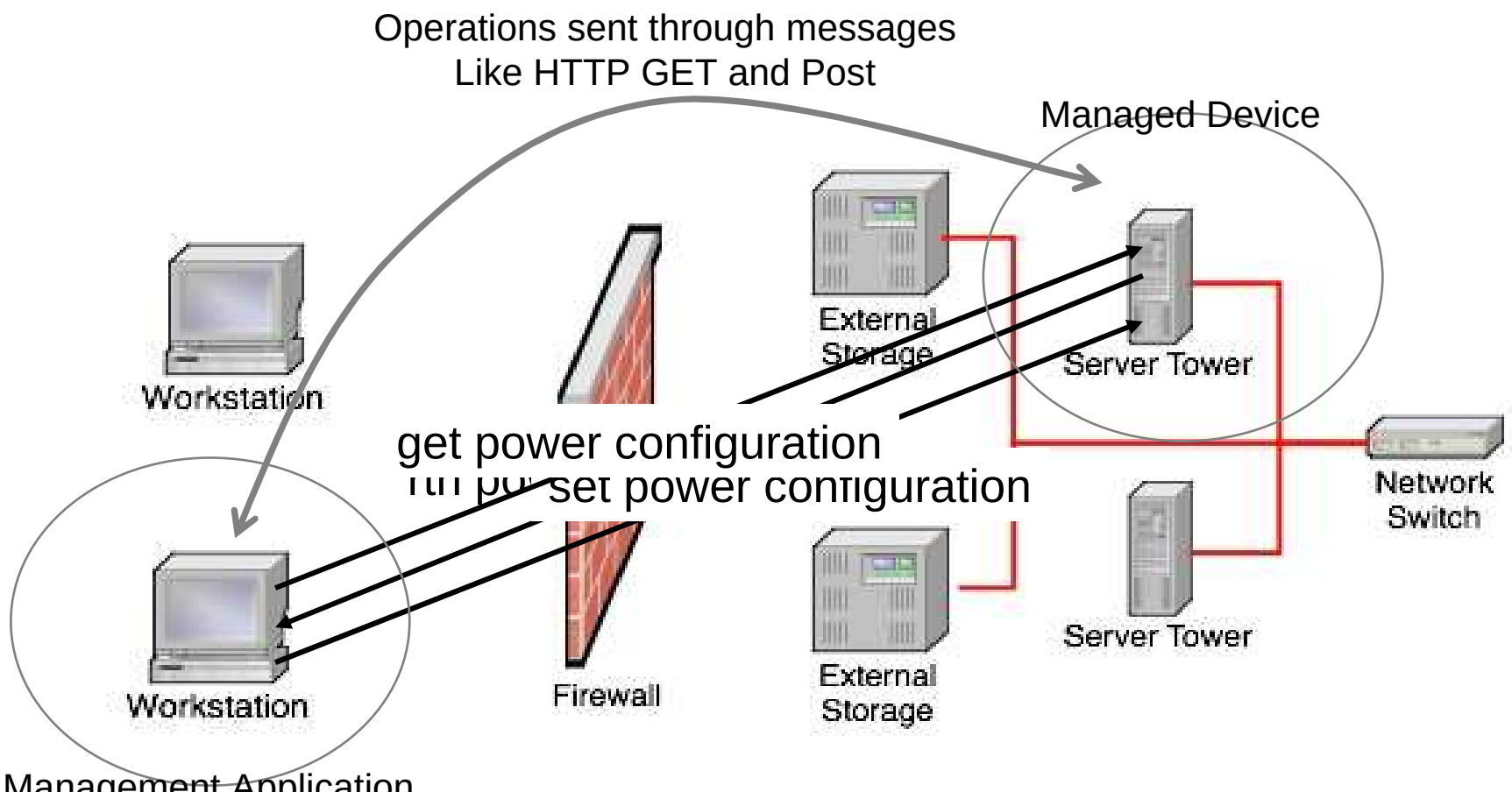
What does this configuration look like?



Blow-up of end-points

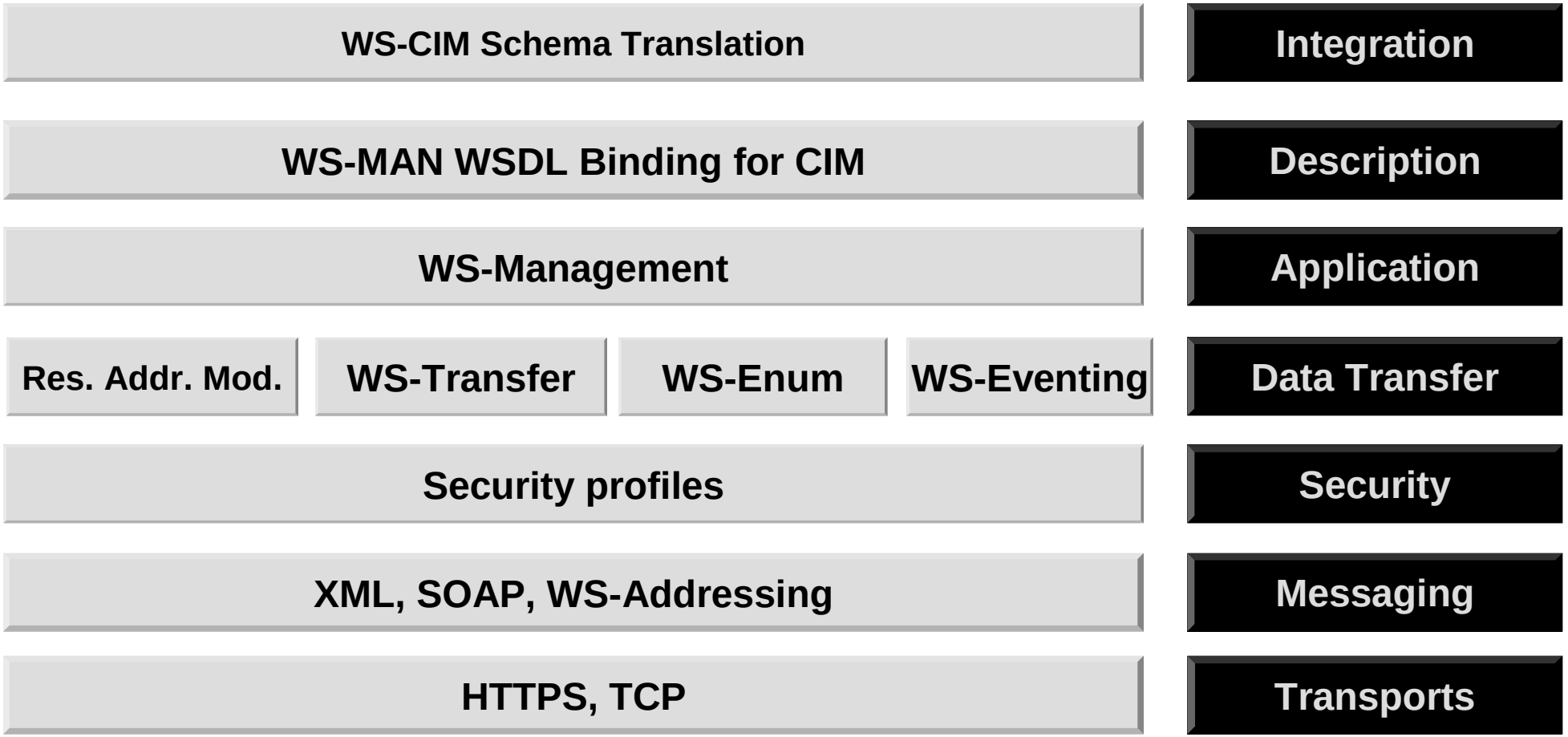


WBEM interaction

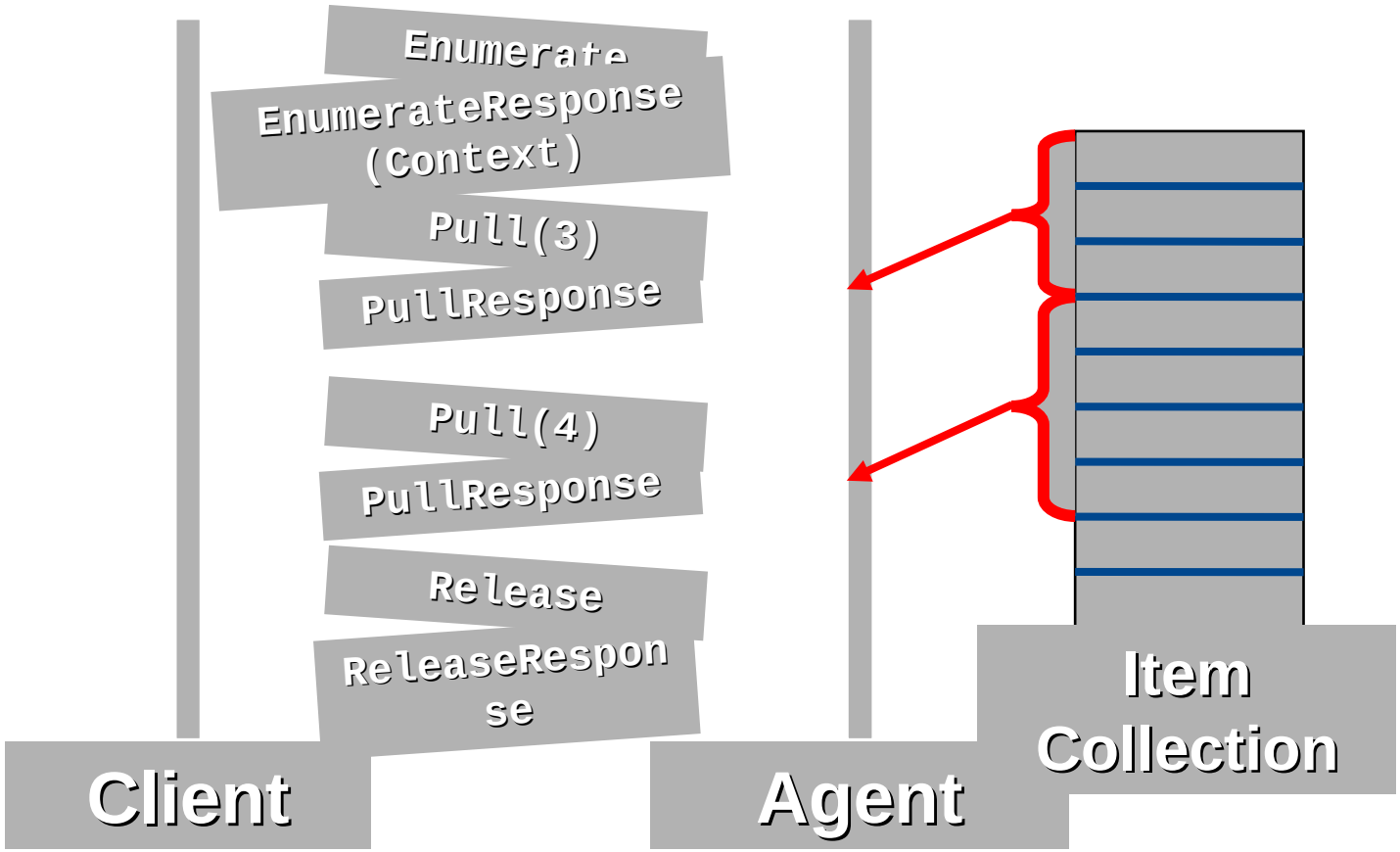


Applications are expected to use WBEM to manage systems

WS-MAN Protocol Composition



WS-Enumeration: Enumerating Data Sources



Request Message Contents

- HTTP header
- XML content
  - Soap envelope
    - URIs for standards supported (e.g. SOAP itself)
  - Soap header
    - Feature negotiation (e.g. must understand ResourceURI)
    - WS-MAN selector
  - Soap body
    - Enumeration modes

WS-MAN Example Sent Part 1

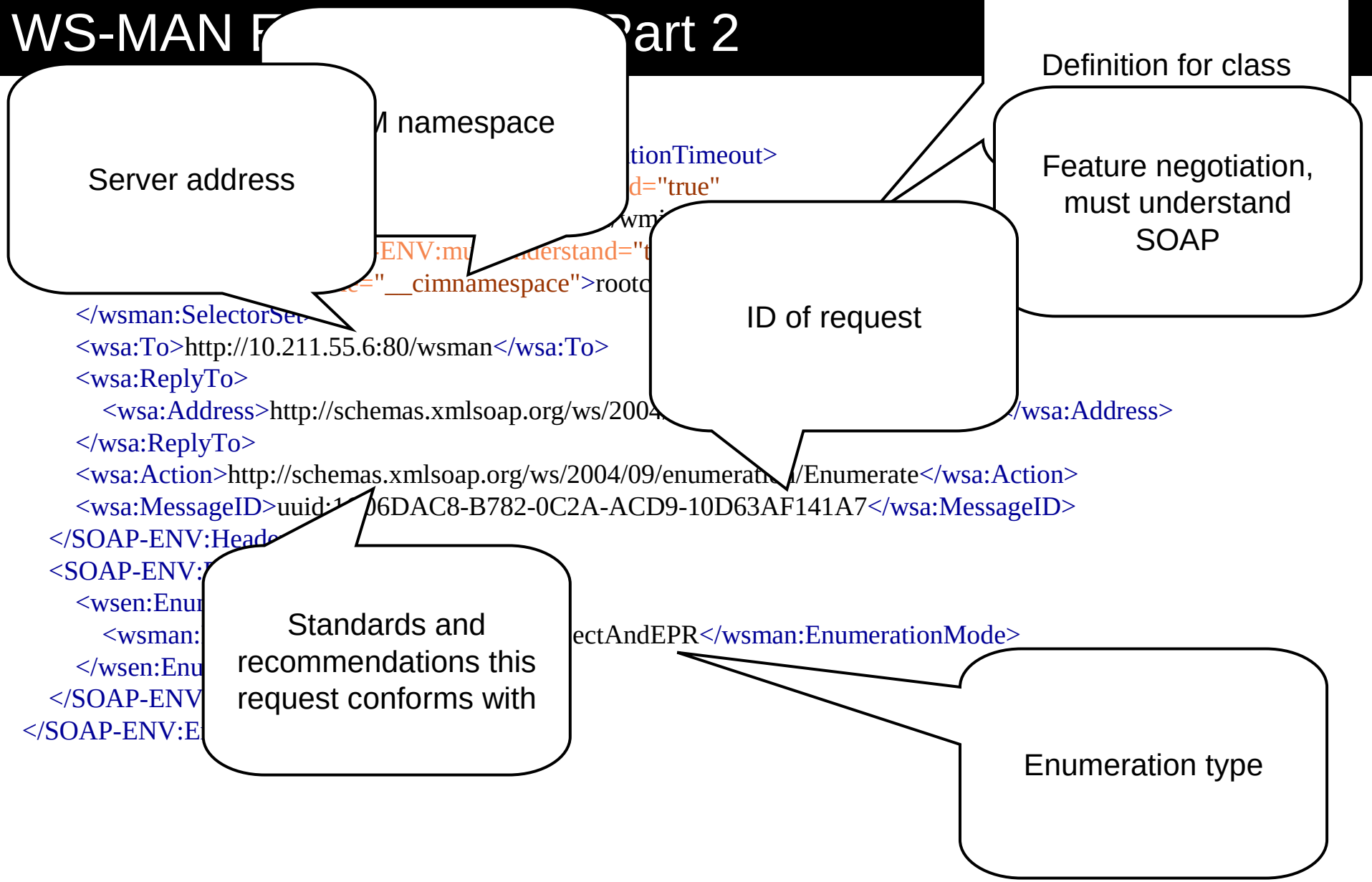
```
<HTTP header removed>

<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://www.w3.org/2003/05/soap-envelope"
   xmlns:SOAP-ENC="http://www.w3.org/2003/05/soap-encoding"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:wsmb="http://schemas.dmtf.org/wbem/wsman/1/cimbinding.xsd"
   xmlns:wsman="http://schemas.dmtf.org/wbem/wsman/1/wsman.xsd"
   xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
   xmlns:wxf="http://schemas.xmlsoap.org/ws/2004/09/transfer"
   xmlns:wsen="http://schemas.xmlsoap.org/ws/2004/09/enumeration"
   xmlns:tns="http://schemas.microsoft.com/wmx/2005/06"
   xmlns:wse="http://schemas.xmlsoap.org/ws/2004/08/eventing"
   xmlns:wsmid="http://schemas.dmtf.org/wbem/wsman/identity/1/wsmanidentity.xsd">

   …continued …
```

URIs for standards and recommendations supported

WS-MAN F Part 2



Response Message Contents

- Intermediate responses (pull - pull response)
- Pull response (envelope)
  - URI to standards (e.g. WS enumeration)
  - Header
    - Action (e.g. pull response)
    - RelatesToUID (original request ID)
  - Body
    - Enumeration context
    - Items
      - CIM instance
      - Endpoint reference
        - » If default address model, instance keys

WS-MAN Example Received Part 1

```
<HTTP header removed>

<s:Envelope xml:lang="en-US" xmlns:s="http://www.w3.org/2003/05/soap-envelope"
   xmlns:a="http://schemas.xmlsoap.org/ws/2004/08/addressing"
   xmlns:n="http://schemas.xmlsoap.org/ws/2004/09/enumeration"
   xmlns:w="http://schemas.dmtf.org/wbem/wsman/1/wsman.xsd">
   <s:Header>
      <a:Action>http://schemas.xmlsoap.org/ws/2004/09/enumeration/PullResponse</a:Action>
      <a:MessageID>uuid:4953B37A-B37B-4BD1-A359-A980E090E30F</a:MessageID>
      <a:To>http://schemas.xmlsoap.org/ws/2004/08/addressing/role/anonymous</a:To>
      <a:RelatesTo>uuid:427C3C55-9898-044D-2F43-56E509FE8ED8</a:RelatesTo>
   </s:Header>
   <s:Body>
      <n:PullResponse>
         <n:EnumerationContext>uuid:B6FACE6F-C24C-4D3D-8DE5-78AB5D9F4590</n:EnumerationContext>
         <n:Items>
            <w:Item xmlns:w="http://schemas.dmtf.org/wbem/wsman/1/wsman.xsd">
               <p:Win32_LogicalDisk xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                  xmlns:p="http://schemas.microsoft.com/wbem/wsman/1/wmi/root/cimv2/Win32_LogicalDisk"
                  xmlns:cim="http://schemas.dmtf.org/wbem/wscim/1/common"
                  xsi:type="p:Win32_LogicalDisk_Type">
                  <p:Access xsi:nil="true"/>
                  <p:Availability xsi:nil="true"/>
                  <p:Caption>A:</p:Caption>
                  <p:Compressed xsi:nil="true"/>
                  <p:CreationClassName>Win32_LogicalDisk</p:CreationClassName>
                  <p:Description>3 1/2 Inch Floppy Drive</p:Description>
                  <p:DeviceID>A:</p:DeviceID>
… continued …
```

Standards and recommendations this request conforms with

Original message and enumeration response that this response is related to

The context all these operations are related to

CIM instance data

WS-MAN Example Received Part 2

```
            <p:DriveType>2</p:DriveType>
            <p:Size xsi:nil="true"/>
            <p:Status xsi:nil="true"/>
            <p:StatusInfo xsi:nil="true"/>
            <p:SupportsDiskQuotas xsi:nil="true"/>
            <p:SupportsFileBasedCompression xsi:nil="true"/>
            <p:SystemCreationClassName>Win32_ComputerSystem</p:SystemCreationClassName>
            <p:SystemName>STEVEHANDC989</p:SystemName>
            <p:VolumeDirty xsi:nil="true"/>
            <p:VolumeName xsi:nil="true"/>
            <p:VolumeSerialNumber xsi:nil="true"/>
          </p:Win32_LogicalDisk>
          <a:EndpointReference xmlns:a="http://schemas.xmlsoap.org/ws/2004/08/addressing"
            xmlns:w="http://schemas.dmtf.org/wbem/wsman/1/wsman.xsd">
            <a:Address>http://schemas.xmlsoap.org/ws/2004/08/addressing/role/anonymous</a:Address>
            <a:ReferenceParameters>
              <w:ResourceURI>http://schemas.microsoft.com/wbem/wsman/1/wmi/root/cimv2/Win32_LogicalDisk</w:ResourceURI>
              <w:SelectorSet>
                <w:Selector Name="DeviceID">A:</w:Selector>
              </w:SelectorSet>
            </a:ReferenceParameters>
          </a:EndpointReference>
        </w:Item>
      </n:Items>
    </n:PullResponse>
  </s:Body>
</s:Envelope>
```

more CIM instance data

End Point Reference

Class name and keys

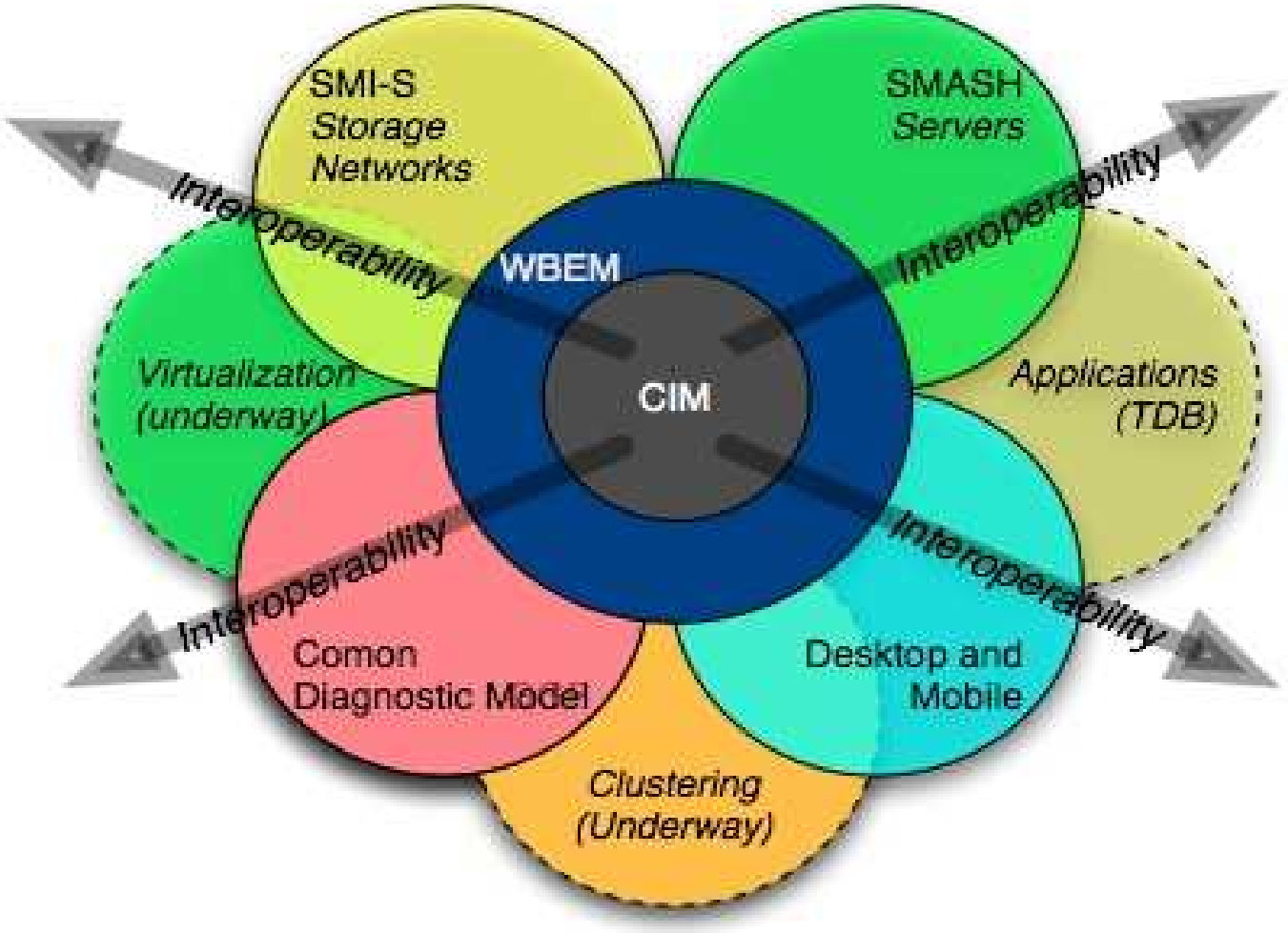
Standard technologies being deployed

- Distributed Management Task Force (DMTF)
  - Common Information Model (CIM)
  - Web Based Enterprise Management (WBEM)
    - WS-Management
  - Systems Management Architecture for Server Hardware (SMASH)
  - Desktop and Mobile Architecture for System Hardware (DASH)
  - Host Virtualization (yet to be named)
  - Clustering (HPC and HA)
- Storage Networking Industry Association (SNIA)
  - Storage Management Initiative Specification (SMI-S)
  - Other: Multipath API, iSCSI Management API
- All provide for monitoring, configuration, and control

Desktop management standard

- Based heavily on the SMASH work
- Components Instrumented
  - Boot control, fans, sensors, firmware, power, physical asset
- Deployment model
  - Onboard the computer themselves
- Schedule
  - Version 1.1. Specification release in late 2007
  - Expect implementations within twelve months
- Example use cases to be supported
  - IT configures TPM and provides disk image for system remotely and through automation

Management Standard Overlap



WS-MAN Efforts

- OpenWSMAN - Open Source Tool
  - Funded by Intel
- "Wiseman" - Open Source Tool
  - Started by Sun
- OpenPegasus - Open Source WBEM Infrastructure
  - WS-MAN supported
  - Contributed to by HP, IBM, EMC and Symantec
- Microsoft Embedded WS-Management Connector - Vendor Tool

Questions?

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