Why CIM? CIM in Grid Standards

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What’s the Problem with Management Data?

• Not all data is created equal
  
  Check boxes that indicate “management data provided” are NOT enough

• Each technology (and sometimes each product offering) represents its management data in a different way
  
  Creating its own semantics, terminology, data structures and protocols

• Management is NOT the area for differentiation but for conformance
  
  Uniqueness costs the customers in design time, normalization, …
What’s the Problem When Managing Resources?

- Not about:
  - Protocols
    - Although they are easier to define 😊
  - Or new technologies
    - XML, YML, ZML
  - Or interfaces/APIs
- All of these convey “how to communicate” but nothing about the data
  - “What is communicated?”
  - “How is the data analyzed/used?”
What Do End Users and Businesses Care About?
End to End Management

- Sharing information and access to data
- Data retention and availability
- Communication / transmittal of information
- Processing of necessary tasks
Differing Perspectives

• End User – Distributed processes, policies and data
  Security concerns
  Data to be retained and retrieved as quickly as possible

• Vendors – Lots of individual products
  Software – Application and services (for ex, database, storage, tape backup, security, …)
  Hardware – Computer, networking, …

• Each vendor knows their product, not their place in the bigger picture

• The end user needs to know each product, AND that product’s place in supporting the business
An Ideal World

- Complete description of the managed environment
  - Scalable from the “big picture”
  - Going to the component level only when necessary
  - Standardized semantics
- Emphasis on applying “interoperaible knowledge” to the managed environment
- Requires:
  - Common information model to describe and organize the managed environment
  - Policies to manage the system (May or may not be automated)
What’s a Solution?

- Work toward documented common concepts and common model (\(\rightarrow\) CIM)
  ComputerSystem, StorageVolume, ProtocolEndpoint, Collection, …
  This is possible - In most parts of the world, “Where is the bathroom?” is understood

- Goal to have “one size fits all” - a basic dictionary for management

- Define documented “translations” into other models and languages
  Support for different environments and languages, such as WSDL
But Is Information Modeling Possible?

- “Human language thrives when using the same term to mean somewhat different things, but automation does not.”
  Clowns, business addresses and PO Boxes
- “Human endeavor is caught in an eternal tension between the effectiveness of small groups acting independently and the need to mesh with the wider community. A small group ... produces a subculture whose concepts are not understood by others. Coordinating actions across a large group, however, is painfully slow and takes an enormous amount of communication.”
How Does CIM Complement GGF OGSA?

- Description of relationships (dependencies, component structures, etc.)
- Management and modeling of resources
- End to end context for management data
- Management of the OGSA architected services
  - Functional vs management interfaces
- Automated mapping from model definition to XML Schema/WSDL/WS-RF/…
Multi-Tiered, Iterative Modeling

Conceptual Model
From Domain Experts

Universal
Information Model

WS-RF
Rendering

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Rendering

UML
Model Unification

1. Model proposals from GGF, SNIA and other stds
2. Submission of Models
3. Model proposals unified in DMTF
4. Feedback
5. Proposal acceptable to all orgs
6. Building blocks
7. Model published by DMTF; Storage components incorporated in SNIA’s SMI-S; model used in GGF’s grid services architecture, ...
8. Industry feedback

Web services architecture (W3C), Mgmt Web services (OASIS), …
DMTF Alliance Partners Working on This Today

- BladeS – Blade server environment
- CompTIA – Diagnostics and help desk/support
- InTAP, Japan – Interoperability and protocols
- itSMF - ITIL
- NAC – IT-related issues, esp RBAC, identity, use of directories, …
- NIST – General modeling and policy
- Open Group – Open Source, applications, Unix modeling, …
- SNIA – Storage environment
- TMF – Telco environment
Open-Source Implementations

- SNIA’s SMI-S and SMI-Lab (formerly CIM-SAN)
- WBEMSSource/The Open Group
  Pegasus and Pegasus-J (aka SNIA Object Manager)
- Java WBEM Services
- OpenWBEM
- SBLIM (Standards Based Linux Instrumentation for Manageability) and CMPI (Common Manageability Programming Interface)
  - http://www.wbemsource.org/
Mappings from Other Standards

- SMBIOS (System Management BIOS)
- MIBs - IETF
- MIFs - DMI
- ITU concepts – X series
- TMF – eTOM, SID and other models
- ANSI T10 (Storage)
- JSR77 (AppServer)

Explicit in model via MappingStrings qualifier
CIM Coverage

- Applications and Services
- Application Server
- Database
- Operating System
- Systems, Devices/Storage, ...
- Network

CIM

Policy
Management Infrastructure

Users and Security
Support
CIM Basics

- Object oriented paradigm
- Focus on well-defined concepts, but with a view to extensibility
- Technology neutral - Semantics only
DMTF Working Groups

- Applications/Metrics
- Architecture
- Behavior and State
- Database
- Networks
- Policy
- Security Protection and Management
- Server Management
- Support
- System and Devices
- User and Security
- Utility Computing
- WBEM Interoperability/Events
Example of CIM’s Use – CIM-SAN/SMI-Lab Demos

- October 2002, April 2003 and October 2003
- CIM-SAN1
  - 17 vendors integrated 32 products creating 97 points of interoperability
  - Physical inventory information (disk drives, cache, front and back end ports) for disk arrays
- CIM-SAN2
  - Added logical inventory (LUNs and other storage information) and extended the modeling to cover other device types such as tape libraries, NAS systems and FC switches
- SMI-Lab3
  - 22 participating companies integrating 40 products and creating more than 300 points of interoperability
  - Added key functionality like: Volume management and configuration reporting
SMI-Lab3 Participants

Vendors Shipping/Soon to Ship CIM Today

- Brocade – CIM Fabric management
- Cisco – CIM-based database design for inventory, Storage modeling, CiscoWorks interface
- Dell - CIM in OpenManage Server Administrator for Dell PowerEdge servers and Dell PowerVault NAS servers, and OpenManage Client Instrumentation for Dell Latitude, Dell OptiPlex and Dell Precision client systems
- EMC – Instrumentation/providers for Symmetrix storage arrays, CLARiiON storage arrays and Celerra NAS system (in development), and clients for EMC Control Center (enterprise-wide storage management) and EMC VisualSAN (mid-range storage management) in 2004
- HP - [www.hp.com/go/wbem](http://www.hp.com/go/wbem) highlights the HP (server side) CIM/WBEM solutions including HP WBEM Services for HP-UX and Linux, HP-UX 11iv2 for HP Integrity Servers (includes WBEM Providers), HP WBEM Providers for Linux on Integrity Servers, HP Servicecontrol Manager and HP System Insight Manager / Also, see [www.hp.com/go/devsmi-s](http://www.hp.com/go/devsmi-s) for details on CIM/SMI-S as the standard interface for HP’s storage products
Vendors Shipping/Soon to Ship CIM Today

- IBM - iSeries (OS/400) support for CIM in 2004, pSeries (AIX) Pegasus delivered as part of the Linux toolbox CD, CIM delivered with and used as foundation for IBM Director, CIM instrumentation/providers are available to all Windows management applications, IBM contributes to OpenPegasus project, and storage products support CIM (specifically, ESS (Shark), SAN Volume Controller, TotalStorage SAN File System, Tivoli Storage Resource Manager, and TotalStorage's new Multiple Device Manager products)

- Intel - [http://www.intel.com/design/servers/ISM/](http://www.intel.com/design/servers/ISM/) highlights Intel’s Server Management CIM/WBEM solutions (version 6.0 and greater), and CIM instrumentation shipped with Intel LAN adapters as part of “Intel PROSet for Wired Connections”

- Microsoft – Windows Management Instrumentation

- Oracle – Enterprise Manager 10g

- SMARTS – InCharge Suite for problem analysis (ICIM for IT and business modeling)
Vendors Shipping/Soon to Ship CIM Today

- Sun - Enterprise Storage Manager (SAN Manager), Solaris WBEM Services (full instrumentation of Solaris), SMC (a system management utility), and all disk arrays will include CIM/SMI-S management providers and clients (near future)
- VEIO – VEIO 1000, entire instrumented and managed application environment is CIM-based
- Veritas - CIM/SMI-S interface to its Command Central product stack in the first half of 2004, and CIM/SMI-S interface to Volume Manager in 2004
- WBEM Solutions - SDK Pro, J WBEM Server, and C WBEM Server (near future, for embedded environments)
Profiles

- Collection of CIM elements and behavior rules representing a specific area of management
  Detailed information/recipe for management
- Relevant to customers to tie instrumentation to clients
- Components:
  Description
  Required/supporting standards and other profiles
  Methods
  Discovery
  Instance Diagram
  Client Considerations
  Instrumentation Requirements
  Required CIM Elements
  Required and Recommended Properties for CIM Elements
CIM V3

- Maintain CIM v2.x semantics
- Additional data types (unions, structs, enum, embedded object)
- UML 1.3+ with canonical rendering in XMI
- Simplified model with Top, single consistent key structure, removal of deprecated classes