Strategy for Linux Systems Management

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Linux® in the IT Landscape
Linux in the IT Landscape
Most proprietary Operating Systems have invested heavily and focused on consistent systems management approaches/solutions, not necessarily perfect but quite useful and successful:

- ZAW, Active Directory, MMC, SMC, Solstice®, OpenView®, etc.
- This was in part possible because proprietary Operating Systems control their development and business environment.

In principle these solutions consist of:

- A generalized, extendable and open management infrastructure
  - Remoteable management APIs, extendable GUI environments, extendable instrumentation (models, providers)
- Out-of-the-box base management applications
- Invitations to third parties to add on top advanced management solutions and/or add specific manageability instrumentation.
Linux in the IT Landscape ...

- **Linux Systems Management does not compare favorably with its major competitors**
  - Ignoring desktop solutions provided by distributors, the Linux Systems Management profile does not reflect the IT industry state of the art for enterprise management

- **It does not have a consistent approach, it is a collection of incompatible, partially overlapping point and/or vertical solutions**
  - In contrast with the kernel community, the systems management community consists of competing companies, groups and individuals, none of them large enough to drive an accepted, consistent open source solution
  - In SourceForge, 128+ projects of System Management category

- **At most one sees**
  - Integration on the glass (KDE, Gnome, x11) of point solutions
  - Remote shell implementations
  - Browser driven management of individual systems
The Strategy
The Strategy

- Offering our own, IBM® centric/proprietary solution will only add to the confusion and will not help Linux to succeed

- We can only succeed in improving the Linux System Management profile by supporting and/or initiating open source projects that follow defacto industry infrastructure standards enabling base systems management

  → WBEM/CIM standards

- Apart from reference implementations, stay out of management application space and leave room for others to produce value added management solutions based on the standardized infrastructure
Industry Trends

- Growing perception that proprietary Manager/Agent models are too expensive
  - Everybody writing private Agents for all platforms

- Open management infrastructures and out-of-the-box base management applications becoming a commodity

- Realization that real value is in cross-vendor, Advanced Management Application domain - Fierce competition expected

- Platform owners increasingly willing to agree on common manageability infrastructure and extendable models

- Standard bodies rapidly understanding that just publishing standards is not enough (DMTF, The Open Group)
Industry Trends ...

- Something has changed in the standards arena: After years of CIM modeling without practical implementations WBEM technologies are getting center stage attention:
  
  - **WBEMServices** from Sun® (Java®)
  - **OpenCIMOM** from SNIA (Java) reimplementation of Sun's WBEM APIs
  - **OpenWBEM** from SCO (C++)
  - **Pegasus** from The Open Group (C++)

  - All are open source implementations dramatically lowering entry costs of CIM/WBEM based management solutions

- **WBEMsource** group being formed by major IT vendors and standard bodies to address inter-operability and make available open source, industrial strength implementations of relevant WBEM standards

- WBEM technology is seen and used by many in the IT industry as the basis for solving large parts of the manageability puzzle

- **Bluefin** accepted by NAS/SAN community as base architecture for managment
WBEM

Web Based Enterprise Management
WBEM Terminology

- **WBEM**
  - **Web Based Enterprise Management (WBEM)** is a set of management and Internet standard technologies developed to unify the management of enterprise computing environments.
  - **WBEM** provides the ability for the industry to deliver a well-integrated set of standard-based management tools leveraging the emerging Web technologies.
  - The **DMTF** has developed a core set of standards that make up **WBEM**:
    - the **Common Information Model (CIM)** standard
    - an encoding specification, **xmlCIM Encoding Specification**
    - a transport mechanism, **CIM Operations over HTTP**

- **CIMOM**
  - **CIM Object Manager (CIMOM)** is a name loosely used by the industry to describe server implementations providing access to instances of **CIM** models.
  - The name suggests faithful implementation of all or parts of the **WBEM** related standards.
  - It is not a standard - no compliance tests and no independent certification is currently available.
The WBEM standards describe a series of features that ultimately have to be supported by a CIMOM:

- Support the CIM meta model
  - Schema: MOF Language / xmlCIM encoding
  - Classes / Instances / Methods / Properties
  - Associations / References
  - Indications / Notification
  - Publish / Subscription
- The protocol and encoding
  - Requests are encoded as XML document over HTTP
  - 27 intrinsic operations
  - includes method invocation
- WBEM Query Language (WQL)
  - Very close to SQL/OQL
  - Used to query a namespace for particular objects
  - Used to define indication subscription filters

DMTF provides schemas that model most technical aspects of computer systems and its resources
- Are NOT part of the WBEM standard
- Can be added, modified, subclassed or ignored
Inherent CIMOM capabilities:

- When instrumented correctly, a CIMOM can discover all internal, technical relationships when started and expose this information as Associations.
- When told by an administrator, a CIMOM can expose higher level Association, i.e.: This set of technical entities shall be grouped and made known under the name "Purchase support".
- Individual CIMOMs can register using the Sever Location Protocol (SLP) enabling management apps to automatically discover management domain topologies.
- Individual CIMOMs could share objects using standard techniques like shared DBs or use techniques available via open source like Distributed Lock Manager (DLM) and Shared File Systems.
- Built-in subscription and Indication (Event) support to enable true management by exception and is the basis for self management.

Relation to upcoming standards:

- The WBEM protocol and encoding (XML over HTTP) is very close to SOAP/WSDL.
- WBEM bindings for the Web Services Description Language (WSDL) can be designed.

Next generation CIMOM structures:

- The Pegasus project is currently discussing proposals to split up their CIMOM into selectable components that can be used to control Quality Of Service.
  - Use of standard DBs for persistent data.
  - Use of different transport protocols (RMI, Message Queuing, etc.)
  - Use of different protocols (SOAP/WSDL, SNMP, DCOM, Corba, etc.)
Usage Variations

1. Configuration Repository

2. Managed Configuration Repository

3. Hardware Configurator
Usage Variations ...

4. Manageability Layer

5. Extended Manageability Layer
Activities

- **Phase one: Concentrate on Infrastructure enablement - done**
  - Contributed crucial function to SNIA CIMOM (indications, query, security) and Pegasus (Linux syscall adaptation)
  - Started the Standards Based Linux Instrumentation for Manageability (SBLIM) Open source project
    - Produced base management instrumentation for Linux
    - Native Provider Interface (NPI) layer - enables management instrumentation to work with any of the four Opens Source CIMOMs
    - Produced a management reference application (SBLIM-SRI).
Activities ...

- Phase two: Concentrate on Linux instrumentation - since August 2002, through 2003
  - Extend the DMTF model with Linux specific extensions where needed
  - Extend base instrumentation, including monitoring, clustering and performance data gathering for Linux Grid management
  - Evolve NPI to industry standard for management instrumentation via The OpenGroup - Common Manageability Programming Interface (CMPI)
  - Work with other LTC functions for configuration instrumentation (Apache, Samba, NSF, Print, Services, etc.)
  - Work with University of Illinois (NCSA) on HPC cluster/grid monitoring.
  - Work with distributors on CIMOM integration and exploitation
SBLIM Project

- Open Source WBEM instrumentation project on developerworks
- Downloads: http://oss.software.ibm.com/pub/sblim
  - sblim-cim4linux Linux model description
  - sblim-npi Native Provider Interface
  - sblim-wbemcli Line command utility
  - sblim-psg Provider Skeleton Generator
  - sblim-base Linux Base providers
  - sblim-fsvol File System and LVM instrumentation
  - sblim-params Linux Kernel parameters
  - sblim-rpm RPM instrumentation
  - sblim-service Linux services instrumentation for RedHat
  - sblim-sri Reference Application
  - sblim-mail Mail Service Instrumentation (Cyrus IMAPd and Samsung Contact)
  - PerlProvider Support for writing providers in Perl
  - evsub Event subscription application package
SBLIM Reference Application
Reference Application ...
evsub - Event subscription support

- **evsub** is a small management application that can be used to monitor resources accessible via a CIMOM.
  - It exploits WBEM indication (event) concepts
    - remote monitoring without polling
- It is customized via a XML document.
- It can perform the following actions when triggered:
  - send e-mail, SMS messages, etc.
  - execute a WBEM method
  - generate a GUI popup
  - execute a shell script

```xml
<subscriptions>
  <namespace>root/cimv2</namespace>
  <subscription>
    <filter>select * from cim_instModification where sourceinstance isa linux_service and sourceinstance.name = "sendmail" and sourceinstance.status != "OK"
    <handler>
      <type>MethodAction</type>
      <arg>StartService</arg>
    </handler>
  </subscription>
  <subscription>
    <filter>select * from cim_instModification where sourceinstance isa linux_service and sourceinstance.name = "httpd" and sourceinstance.status != "OK"
    <handler>
      <type>MailAction</type>
      <arg>JimBean@yahoo.com</arg>
      <arg>root@acme.com</arg>
      <arg>smtp.acme.com</arg>
      <arg>mail-user</arg>
      <arg>mailpw</arg>
      <arg>%s.name status: %s.status</arg>
      <arg>The service %s.name has changed its status to %s.status. Sincerely</arg>
    </handler>
  </subscription>
</subscriptions>
```
"roll-your-own" support ...

- SBLIM will facilitate ad-hoc solutions for administrators in special situations. The following features will be extended over time to enable this:

  - **wbemcli** is a command line interface to a CIMOM
    - generates a client call to a CIMOM supporting most API client calls
    - similar in structure like LDAP line commands
    - supports enumeration, creation, deletion, etc.

  - **PerlProvider** supports writing CIMOM instrumentation using the Perl programming language
    - Enables administrators to write their own management instrumentation without diving into heavy programming

  - **SRI** can be used as a GUI shell to tie it all together ...
Last page ...
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