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City Center Marriott
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Datacenter Abstraction Layer (DAL)

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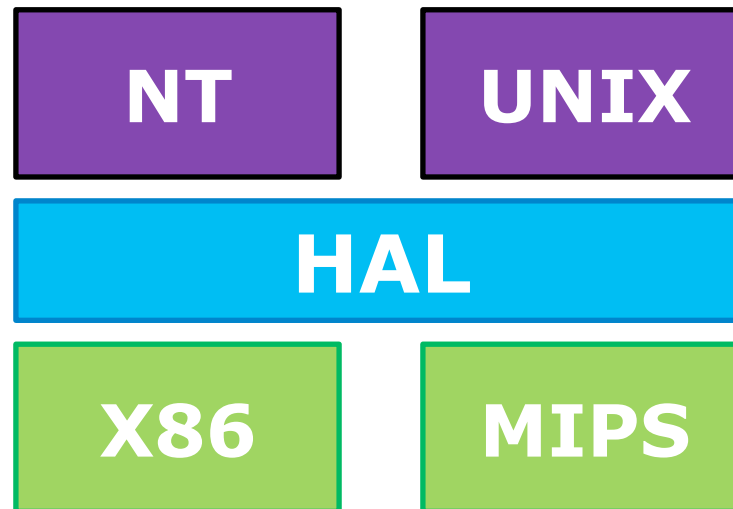
Agenda

- Introducing the Datacenter Abstraction Layer
- DAL in Windows Server 2012 & 2012 R2
- Enabling the ecosystem with OMI
- Q&A

What is a Cloud OS

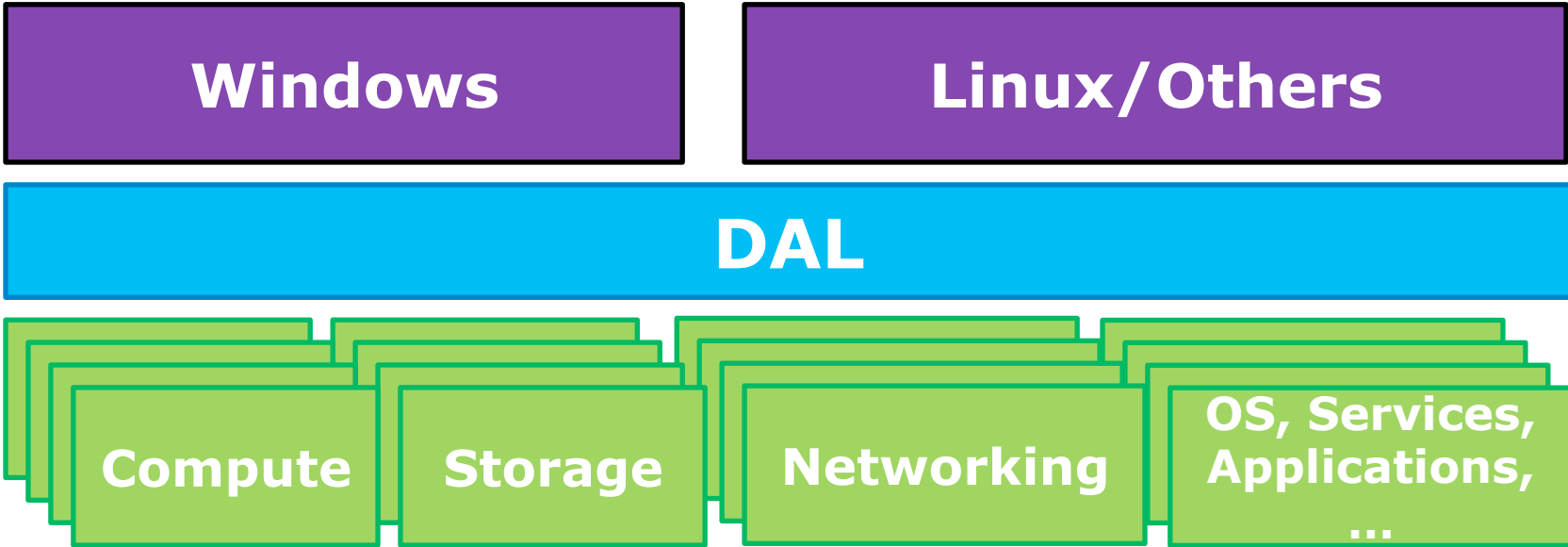
- OS mission
 - Abstract the underlying resources and make them available to others
 - Provide application services
- Cloud OS Mission
 - Abstract the entire datacenter as the “computer system”

Hardware Abstraction Layer (HAL)



HAL abstracts the H/W layer for the OS to provide application and services to the layers above

Datacenter Abstraction Layer (DAL)





DAL Motivations

- Datacenters today are expensive to manage
 - Complexity * Scale > Skills
 - Different (sometimes proprietary) models/protocols for management
 - Systems management at cloud scale
- Reduce OpEx (Operational Expenditure) through consistency by adopting CIM and WS-Man standards
 - Lower cost of adopting new technology
 - Enable reuse of existing skills



DAL Value Proposition

- Use industry proven standards-based management
 - Safe to adopt in the datacenter
 - DMTF Standards: CIM + WS-Management
- Result
 - Agentless management products improve and flourish
 - IT spend shifts from planning, evaluation, deployment, debugging and systems integration to adding new capacity and capabilities

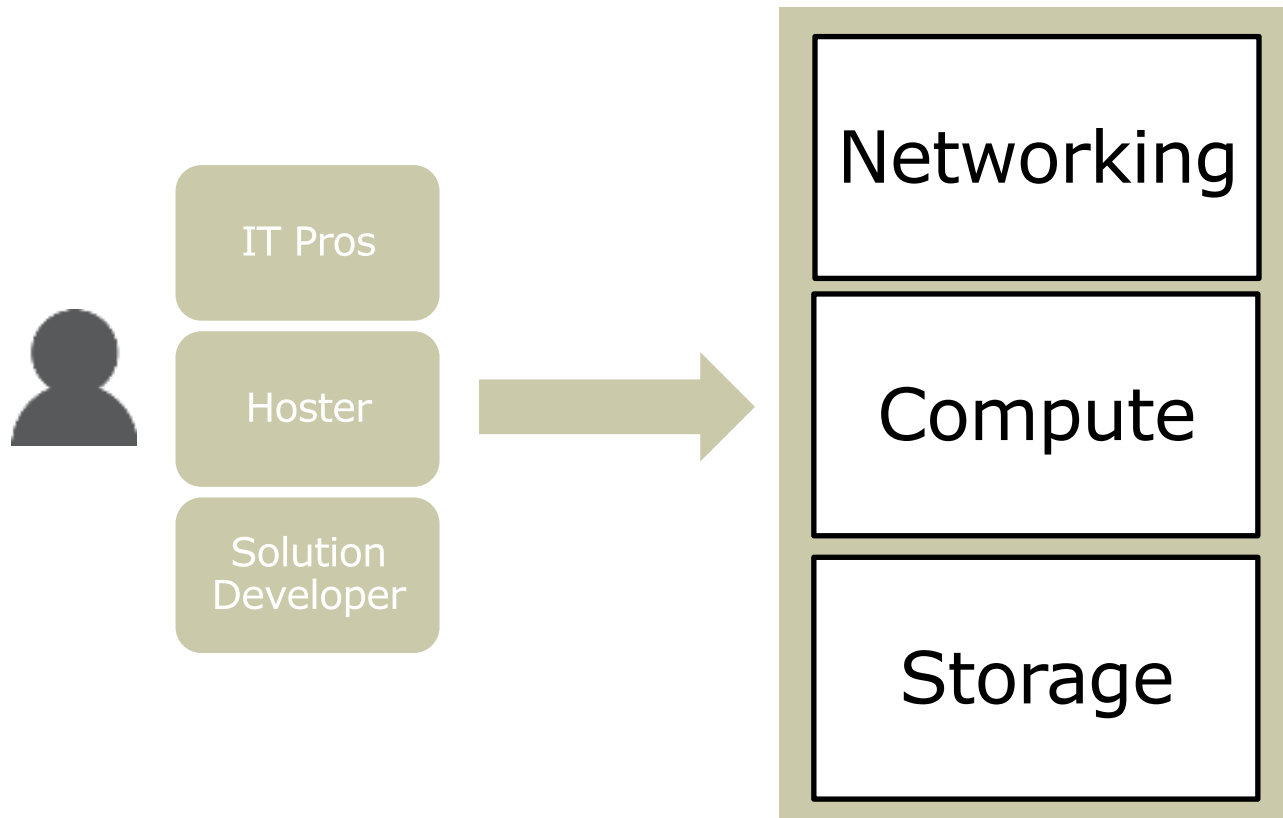
More time and resources on things that drive the business



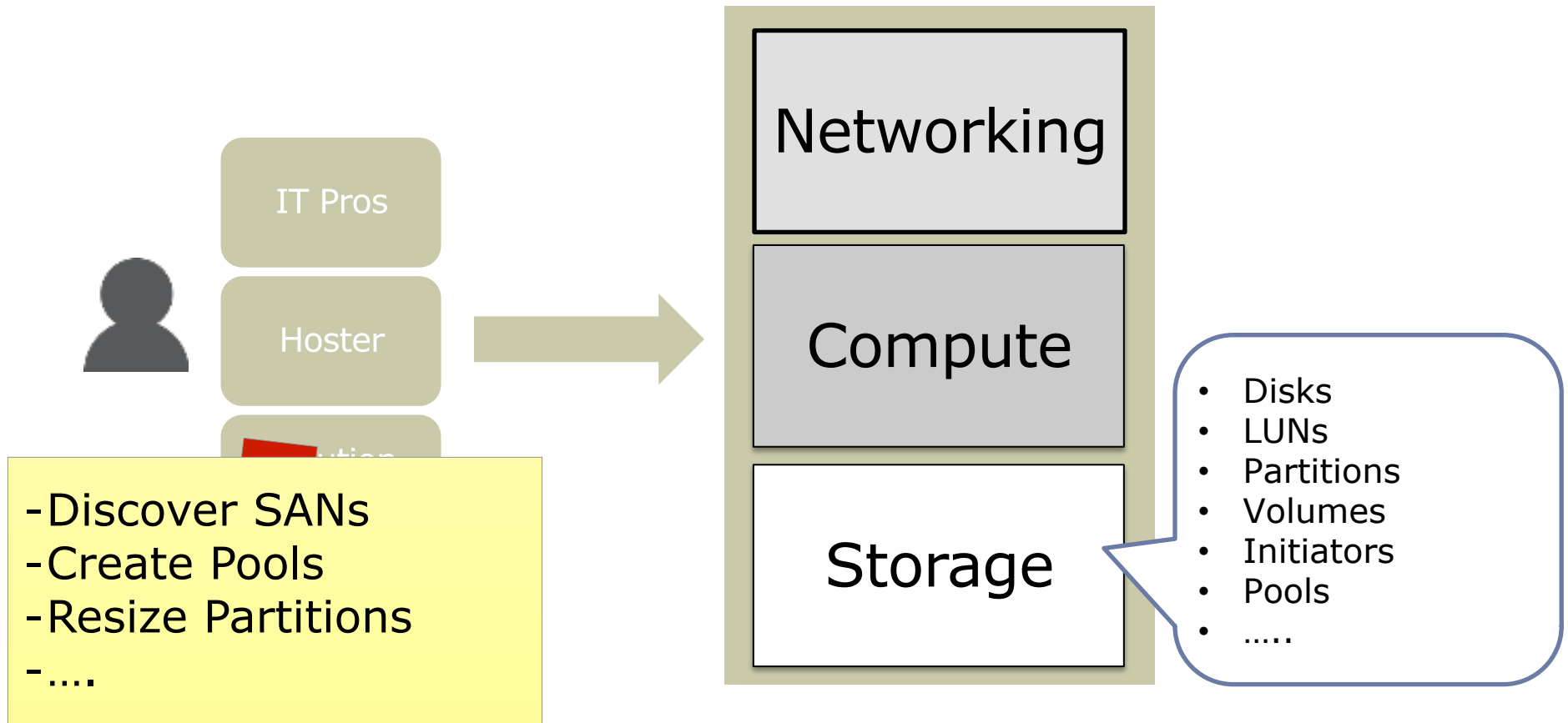
Microsoft's Role in the DAL

- Kick start the ecosystem by being a great managed element
 - Standards-based management was a core pillar of W8/WS2012
 - WS-Man is now the primary way to manage Windows
 - Simplified programming models and huge increase in coverage (CIM-Cmdlets)
 - Platform components available down-level to **maximize addressable market**
- Make it worthwhile to implement standards-based management
 - CIM APIs (devs) and PowerShell Cmdlets (IT) on all systems and down-level
 - Light it up in System Center products
 - Windows Logo to facilitate consistency in capability and quality
 - Include as a requirement in Microsoft Datacenter Request For Proposals (RFPs)
- Make it easy to implement and interoperate
 - Simplify development model
 - Open Source OMI
 - Participate in plug-fests (SNIA and SMF)
 - Define new schema/profiles where needed

DAL in WSSC 2012



WSSC 2012: Focus on storage

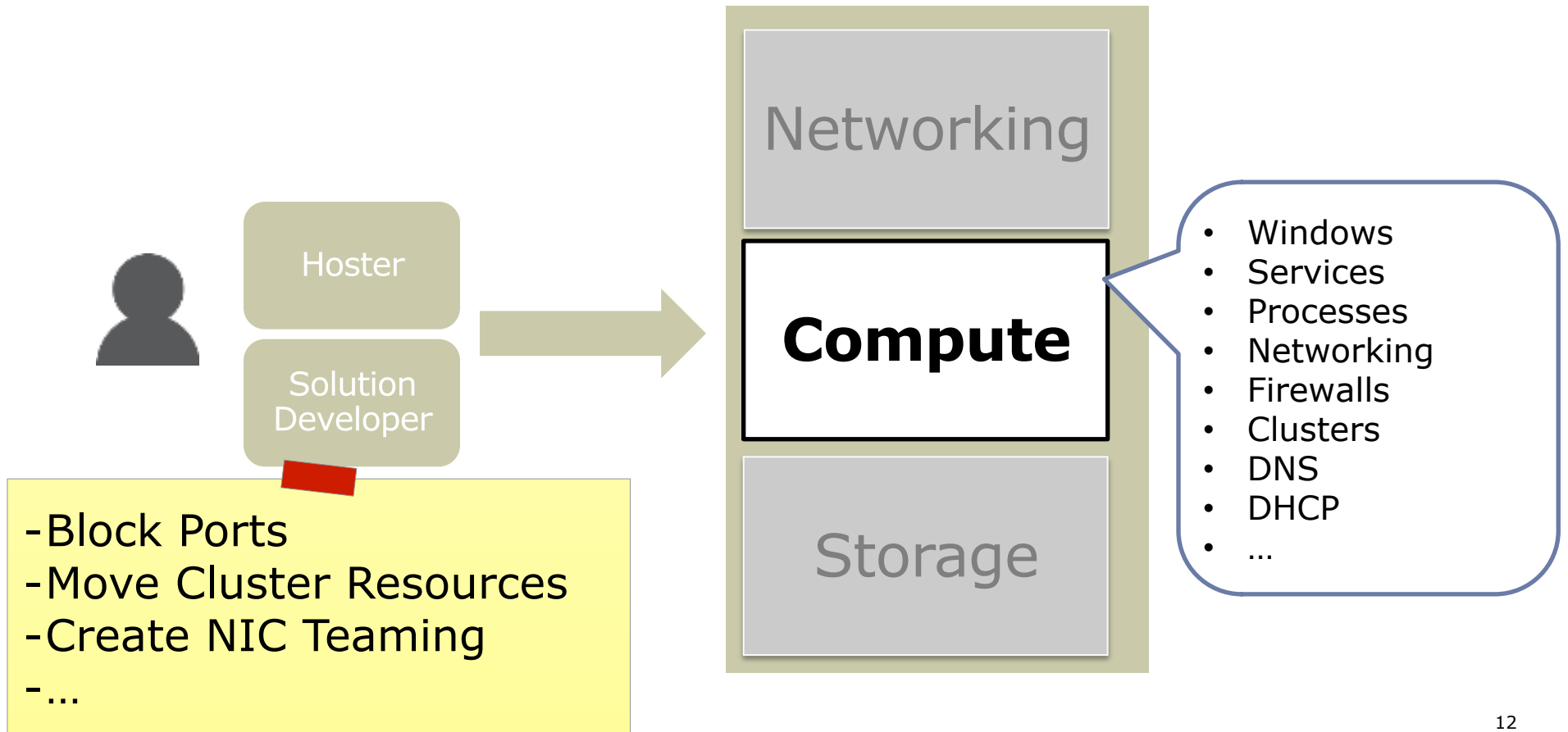




Storage Management in WSSC 2012

- Minimize the effort and risk for customers to deploy and operate SANs
 - Plug-n-Play of SANs using SMI-S
 - SMI-S service in Windows 2012 discovers and manages SANs using standards based management
 - SAN storage is managed just like local storage (Storage Spaces)
 - Exposed via WMI, PowerShell, Server Manager and SCVMM
- Enable customers to find/buy SANs that “Just work”
 - Logo Program: Server Certification for storage vendors implementing SMI-S
 - Regular plug-fest attendance with Windows
 - 2013: “SMI Outstanding Contributor Award”

WS 2012: Focus on Hosts

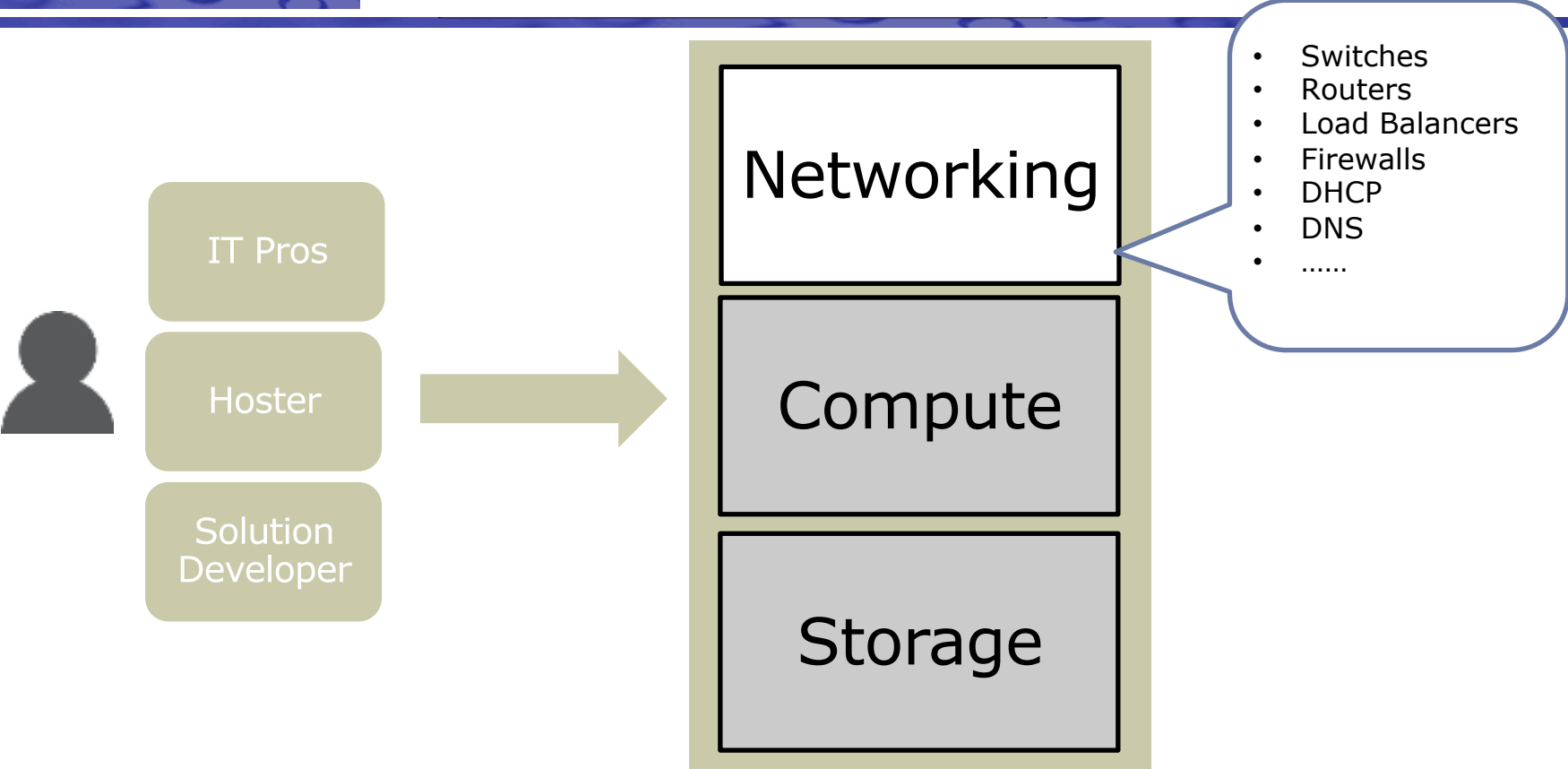




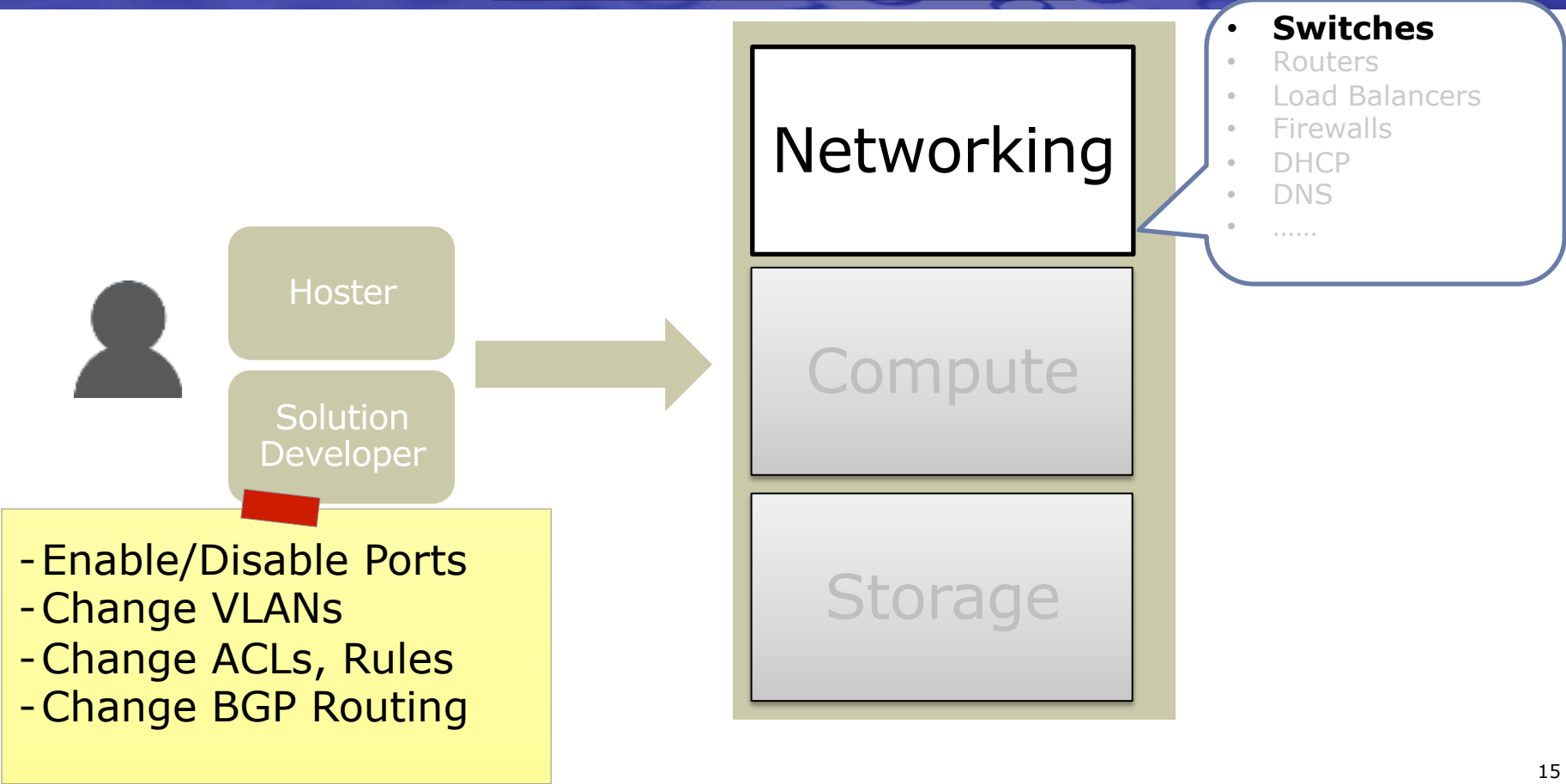
Windows Management in WS2012

- **Easy to create management providers**
 - New WMI/OMI programming model (“10x easier than V1”)
 - Largest increase in WMI providers ever
 - Simpler way to write PowerShell Cmdlets and WMI providers
- **Easy for IT Pros to manage Windows**
 - New multi-machine Server Manager layered on top of PowerShell and WMI
 - > 2400 PowerShell cmdlets – Many are CIM-Based Cmdlets
- **Easy for Developers to manage Windows**
 - WS-Man on by default for server and as the primary management protocol
 - New WMI programming APIs

DAL in WSSC 2012 R2



Modern Datacenter: Focus on switches

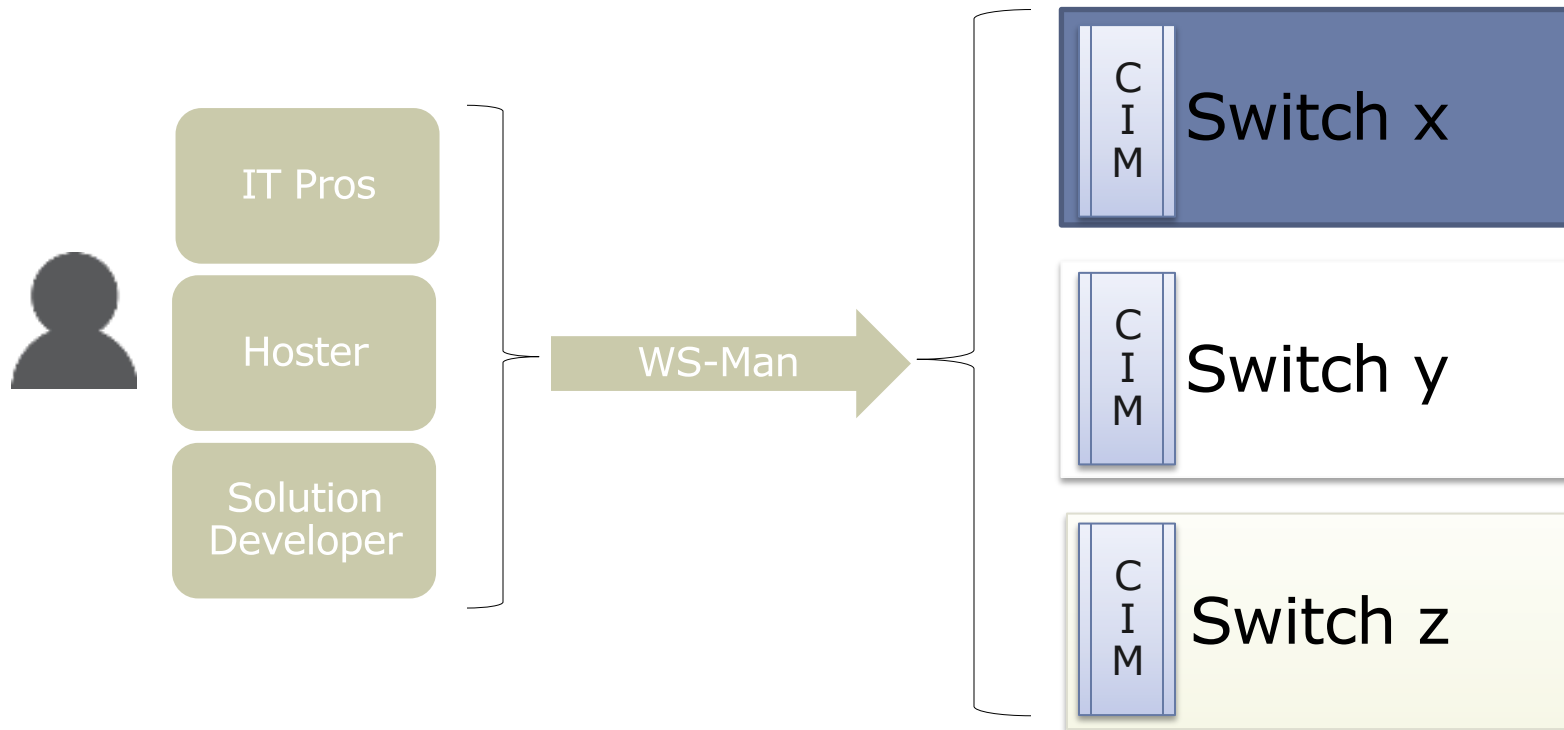




Switch Management: WSSC 2012 R2 Goals

- Minimize the effort and risk for customers to deploy and operate network switches
 - Enable customers to easily automate common tasks
 - PowerShell scripts for common switch management tasks
 - SCVMM in-box plugin imports and validates port configuration from switch
 - Enable customers to find/buy switches that “just work”
 - Logo Program : Server Certification for switch vendors implementing CIM Schema
- Make it easy for customers to take advantage of vendor value-add
 - Ability to subclass the CIM classes and to extend the schema
 - Define mechanisms to auto generate PowerShell cmdlets for vendor extensions

Switch Management



Switch Schema: High level overview

Global Settings

- Computer System
- Physical Computer System View
- Global Ethernet Switch Settings
- Features
- ...

Interfaces

- Switch Service
- Ethernet Port
- VLANs
- IP Protocol EndPoint
- Link Aggregation
- Switch Virtual Interface
-

User Management

- Role Based Authorization Service
- Account Management Service
- Accounts
- Roles
- Privileges
-

Network Policy

- ACL
- Conditions
- Actions
- Rules
-

BGP Routing

- BGP Service
- Configuration
- Peer Template
- Peer
- Address Family
-

Sample PowerShell script

```
$tors = "192.168.0.1", "192.168.0.2", "192.168.0.3"
$so = New-CimSessionOption -UseSsl
$s = New-CimSession -CN $tors -port 7779 -Auth Basic -Credential $cred -Sessionoption $so
#enable SSH Feature
$ssh = Get-CimInstance -CimSession $s MSFT_Feature | ? FeatureName -eq 2
Set-CimInstance -CimSession $s $ssh -Property @{ IsEnabled = $true }
#Enable all ports
$ports = Get-CimInstance -CimSession $s CIM_EthernetPort
$ports | Invoke-CimMethod -Method RequestStateChange -Parameter @{ RequestedState = 2}
#Set a Port to trunk mode and specify list of VLANs
$lanep = Get-CimAssociatedInstance $ports[5] -ResultClassName Cim_LanEndpoint
$vlanep = Get-CimAssociatedInstance $lanep -ResultClassName Cim_VLanEndpoint
$vlanepsd = Get-CimAssociatedInstance $vlanep -ResultClassName Cim_VLanEndpointSettingData
#Set Port Mode to Trunk
Set-CimInstance $vlanep -Property @{DesiredEndpointMode = 5}
#Set list of trunk VLANs
Set-CimInstance $vlanepsd -Property @{TrunkVlanList= "2,3,4"}
```



Opportunity for Switch Vendors

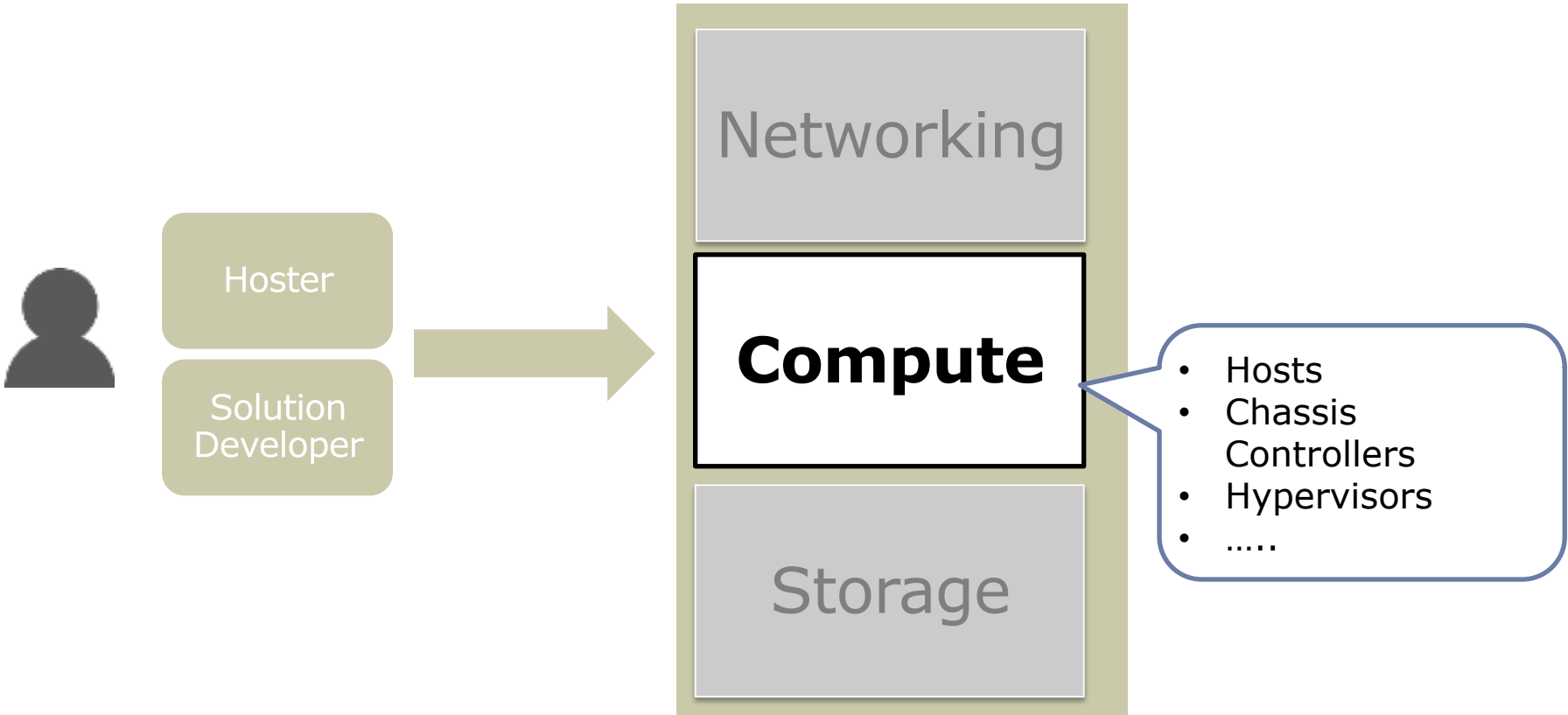
- Customers can manage your switches using standards-based tools
- Windows provides automation natively using PowerShell
- Windows auto-generates PowerShell cmdlets to highlight your value add extensions
- Seamless integration with SCVMM 2012 R2
- Logo certified devices listed on Windows Server Catalog



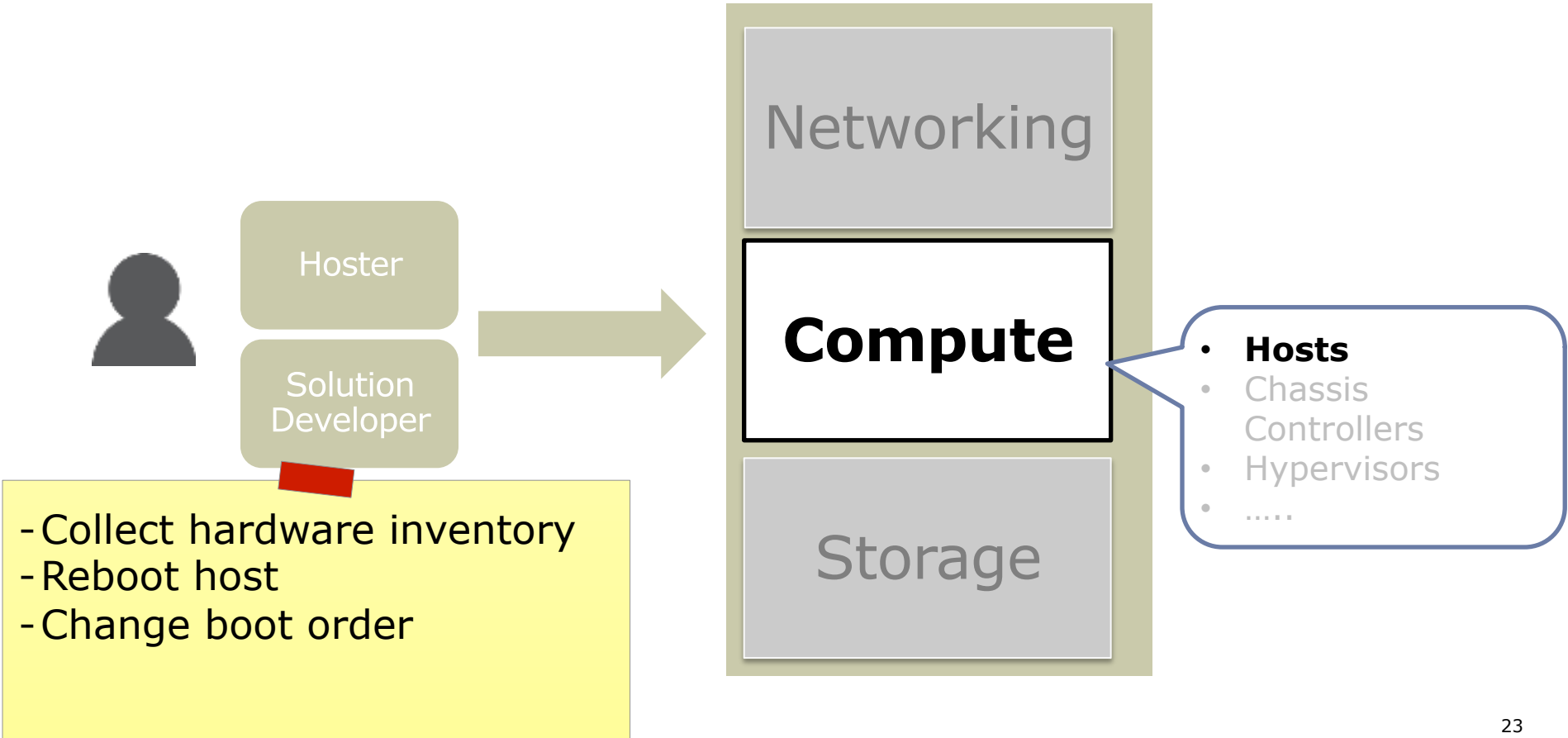
Switch Management: Call for Action

- Implement CIM + WS-Man interface and switch schema in your device
- Participate in plug fests to ensure interoperability
- Get Windows Logo certification for your switches
- Subclass schema with vendor value-add extensions
- Create a presence in the PowerShell community with scripts
- Participate in DMTF Network Services Management Working Group

WSSC 2012 R2: Focus on Hosts



WSSC 2012 R2: Focus on Hosts

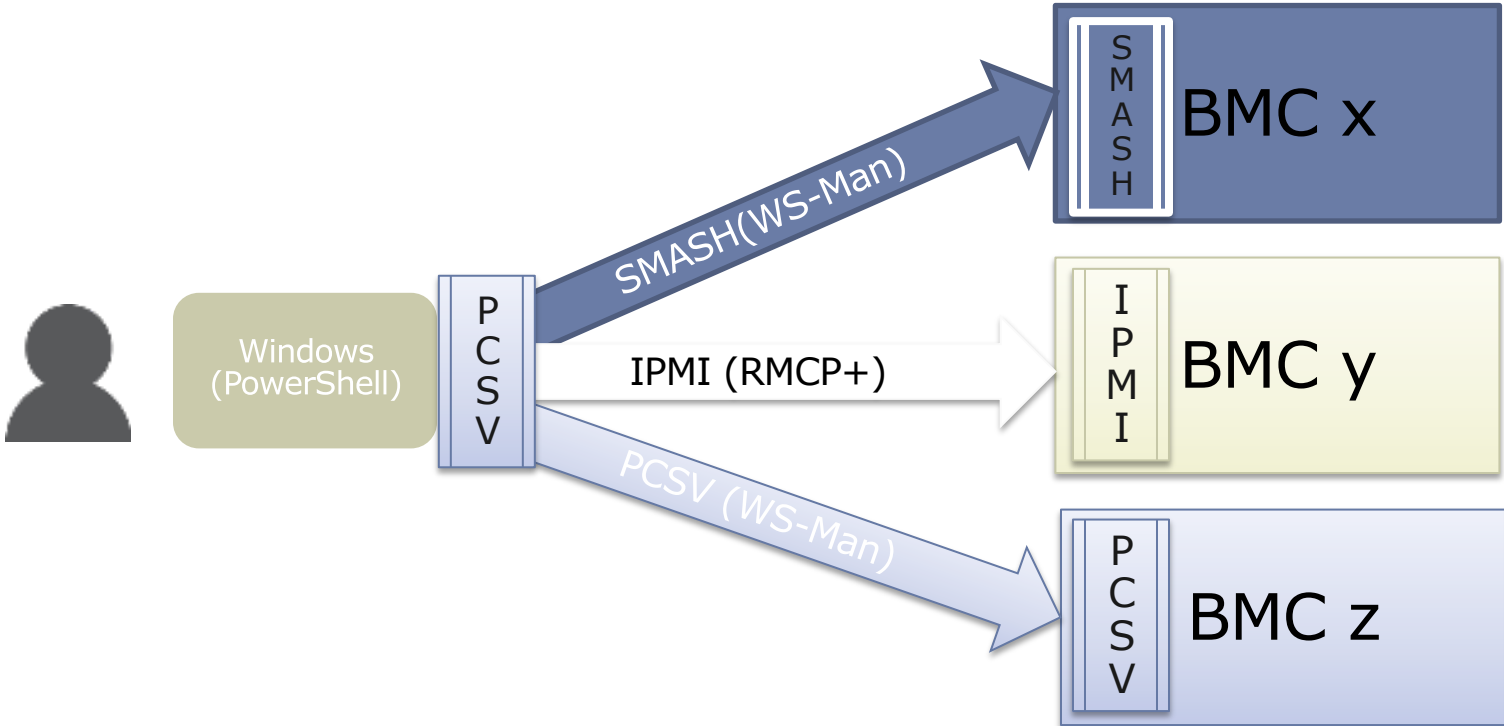




WSSC 2012 R2: Out-of-Band HW Management

- Enable customers to easily manage existing hardware
 - Support multiple industry standards, schemas and protocols
 - IPMI
 - SMASH/DASH (over WS-Man)
 - PCSV (Physical Computer System View)
 - PowerShell Module/WMI provider shipping in-box to provide a common abstraction layer
- Ensure interoperability between Windows and server hardware
 - Test scripts for validating hardware implementations

PCSV Device Management





Sample PowerShell script

```
# Get data from the devices - In this demo we are managing three different BMCs
$a = Get-PCSVDevice 10.20.30.111 -Credential admin -Auth Default -Protocol IPMI
$b = Get-PCSVDevice 10.20.30.112 -Credential admin -Auth Digest -Protocol SMASH
$c = Get-PCSVDevice 10.20.30.113 -Credential admin -Auth Digest -Protocol PCSV
$hosts = $a,$b,$c

$hosts | Select Manufacturer, Model, FirmwareVersion # Show Manufacturer, Model and Firmware
Version
$hosts | Select PowerState # Show Current Power State
$hosts | Set-PcsvDevice -NextBoot "Network" # Set to PXE Boot from network
$hosts | Restart-PcsvDevice # Restart the machines. This will prompt the user to
# confirm because this is a "high impact action"
$hosts | Restart-PcsvDevice -Force # Use force to suppress prompt and restart machine
```



Out-of-band Management: Call to Action

- Support standards in your hardware
 - Implement PCSV profile in new devices
 - Continue to support IPMI, SMASH or DASH
- Participate in interop testing

What Is OMI?

- OMI (Open Management Infrastructure) is an open-source CIMOM that enables partners to easily adopt DMTF standards
 - OMI was built for embedded systems but capable of supporting large systems as well
 - Natively developed on Linux
 - Spring and Fall release cadence
- Available today from the Open Group
 - <https://collaboration.opengroup.org/omi/>
 - Available under the Apache 2.0 license

Why OMI?

- To enable heterogeneous cloud management through standards.
 - Key enabler of our **Datacenter Abstraction Layer (DAL)** strategy
 - Manage non-Windows based devices (network, storage, server hardware management, etc.)
 - Enable PowerShell richness for non-Windows devices
 - Kick start the ecosystem

OMI Goals

- Provide a high quality CIMOM allowing partners to focus investment on providers & schemas in their domain
 - Support wide range of devices
 - Native C code implementation
 - Small footprint, scalable, high performance
 - Validated & released initially for Linux
 - Simplify provider development
 - Includes MOF to C-code generation tool
 - API consistent with the latest WMI APIs in Win8/Server 2012
 - Also available in W7, WS2008, WS2008/R2

CIMOM Comparison

| CIM Server | WS-Man | Remote Binary Protocol | Windows and Non-Windows | Embedded Systems Support | Provider Tools | Open source | Power Shell Semantics |
|---------------|--------|------------------------|-------------------------|--------------------------|----------------|-------------|-----------------------|
| WMI | ✓ | ✓ | | | ✓ | | ✓ |
| WBEM Services | ✓ | | ✓ | | | ✓ | |
| OpenPegasus | (1) | | ✓ | (2) | | ✓ | |
| OpenWBEM | ✓ | | ✓ | | | ✓ | |
| SFCB | ✓ | | | (3) | | ✓ | |
| C-Server | ✓ | | | | | | |
| OMI | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

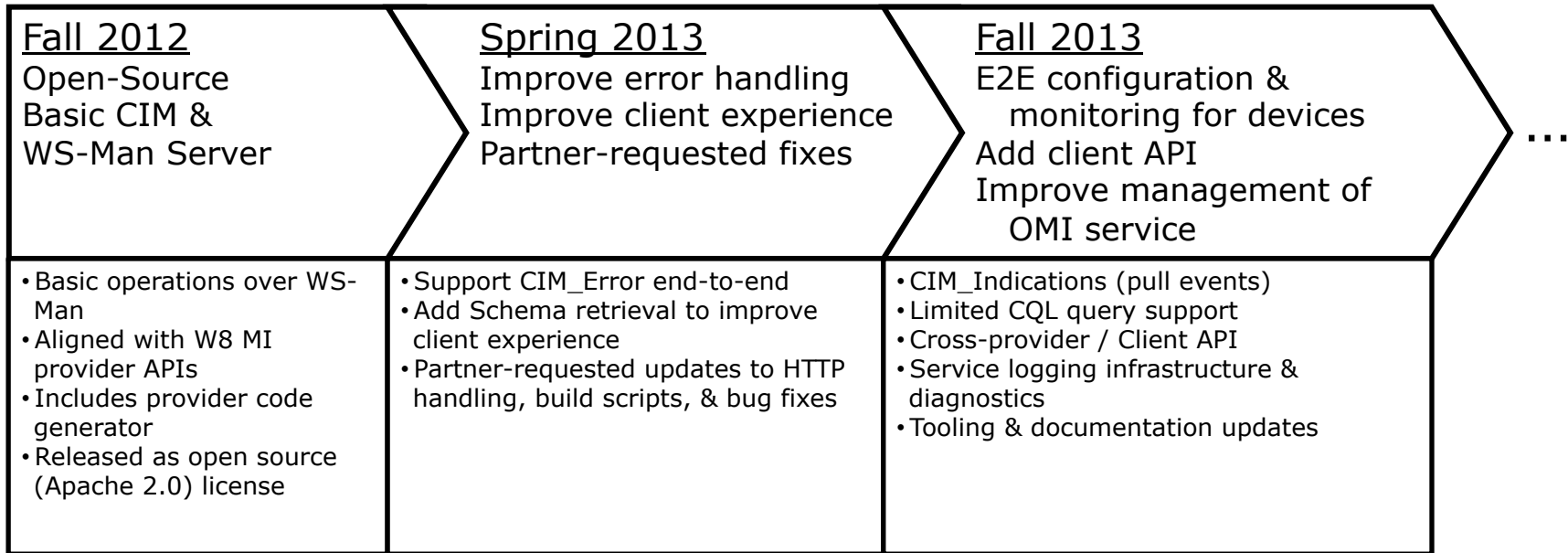
1. OpenPegasus does not support WS-Eventing
2. OpenPegasus object size can be squeezed down to 3 megabytes ("PegasusLite").
3. SFCB object size is over 3 megabytes after adding WS-Management

Competitive Analysis: OMI vs. OpenPegasus

| | OpenPegasus | OMI | Factor |
|-----------------------|-------------|--------|--------|
| Image object size | 8,000 KB | 150 KB | 53x |
| Trivial provider size | 30 KB | 3 KB | 10x |
| Virtual memory size | 54 MB | 1.5 MB | 36x |
| Resident set size | 8,500 KB | 500 KB | 17x |



OMI Roadmap for Open Source



Contributions after that point based on ecosystem feedback & needs



OMI: Call to Action

- Download and evaluate OMI

Key Takeaways



Datacenter abstraction layer helps solve complexities of modern data center

- DAL framework enables consistent management of datacenter elements
- DAL built on existing standards



Opportunity for Vendors

- Plug into the DAL by implementing and consuming standards based management (CIM/WSMAN)
- Participate in defining standard schemas



Investigate OMI



Contact and Resources

- Steve Lee: Steve.Lee@Microsoft.com
- OMI <https://collaboration.opengroup.org/omi/>
- DMTF
 - CIM <http://www.dmtf.org/standards/cim>
 - WS-Management: <http://www.dmtf.org/standards/wsman>
 - SMASH <http://dmtf.org/standards/smash>
 - PCSV Profile http://www.dmtf.org/sites/default/files/standards/documents/DSP1108_1.0.0a.pdf
- Introduction to OMI
 - <http://blogs.technet.com/b/windowsserver/archive/2012/06/28/open-management-infrastructure.aspx>
- DAL Center
 - <http://technet.com/cloud/DAL>

