Cisco InfiniBand Switching for High Performance Applications

Defining a Unified Compute Fabric for The Enterprise

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InfiniBand Infrastructure

June 2006

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Agenda

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- **Unified Compute Fabric and Distributed Systems**
- **Cisco leadership: Open fabrics & Open MPI**
- **SFS-OS 2.7 update & CiscoWorks Integration**

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InfiniBand Adoption Across Customer Markets
Example 2005 Cisco SFS Deployments

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	Vertical	InfiniBand-attached servers	Top 500 Ranking
Sandia National Labs	Government/Research	4400	5
Bio-Infomatics Cluster*	Research	1066	
Tier 1 Systems Company*	Service Provider	1024	
University of Sherbrooke (Canada)	Education/Research	576	51
NCSA	Education/Commercial	512	59
University of Oklahoma	Education	512	67
University*	Education	386	
Wall Street Bank*	Financial/Grid	370	
Japanese Car Company*	Automotive/CAE	300	
MCNC	Government/Education	284	
SARA (Netherlands)	Government/Education	272	277
Tier 1 Systems Company*	Hosted Services	256	
Wall Street Bank*	Finance/Grid	256	
TACC	Education/Commercial	200	301
Arizona State	Education	200	328

*** Non-Referenceable Customer Name**

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Cisco Data Center Network Framework

Defining a Unified Compute Fabric

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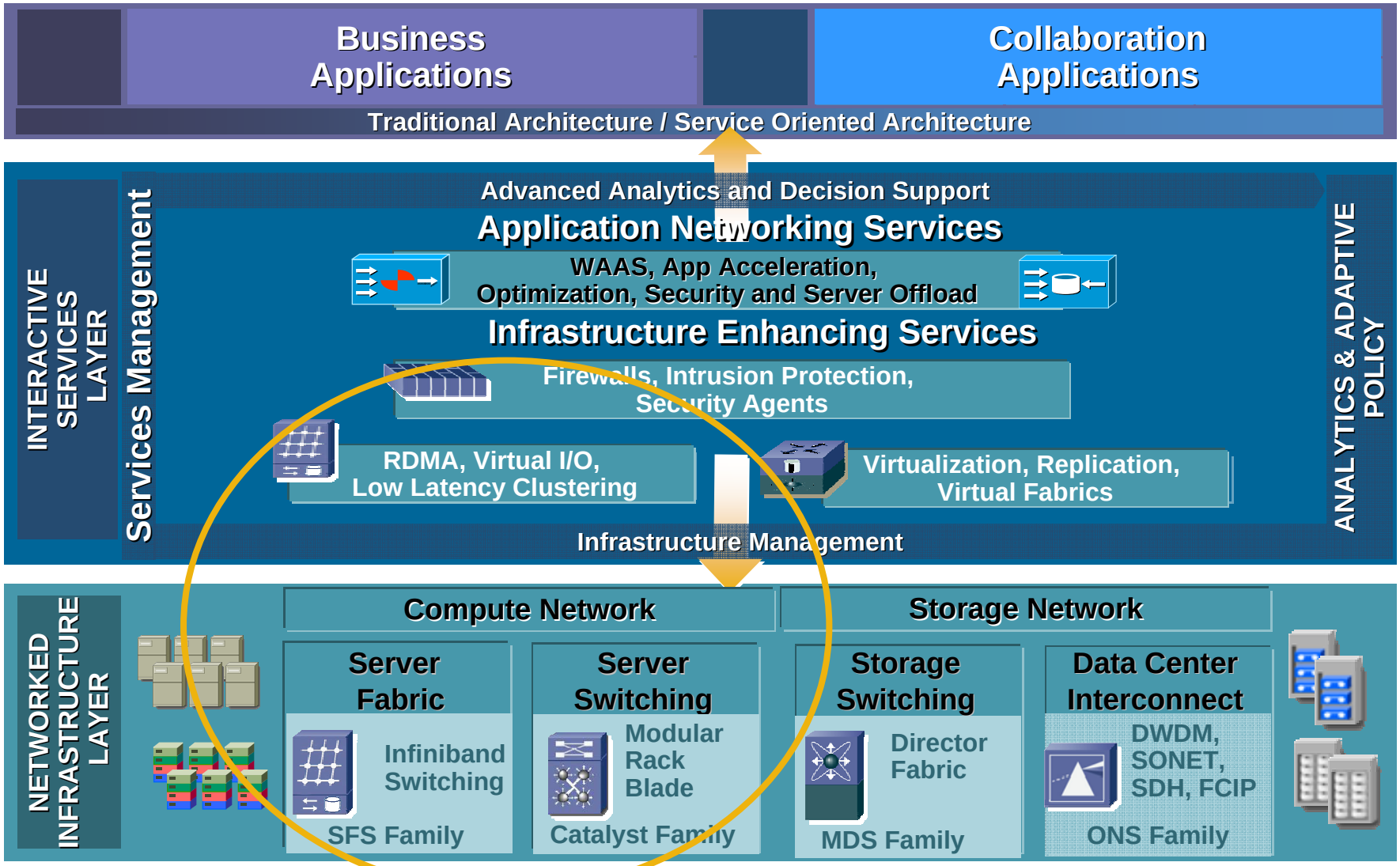

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Distributed Applications & Networking

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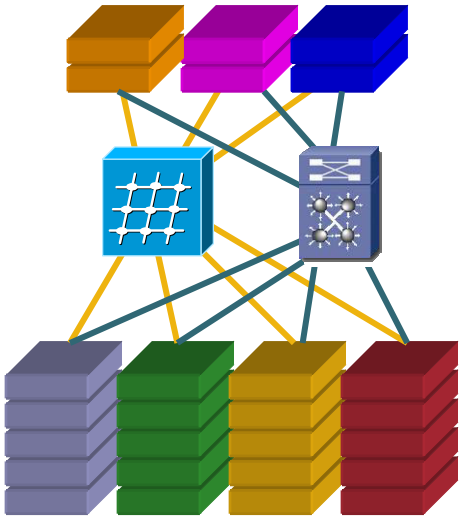
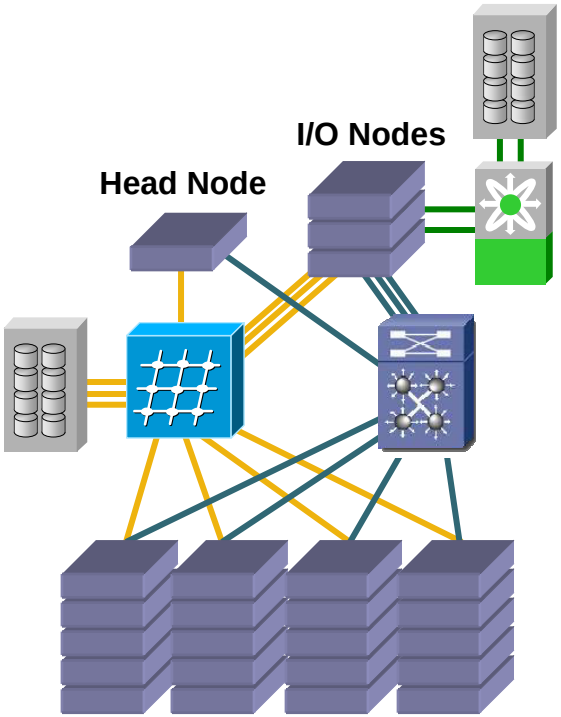
Distributed Systems



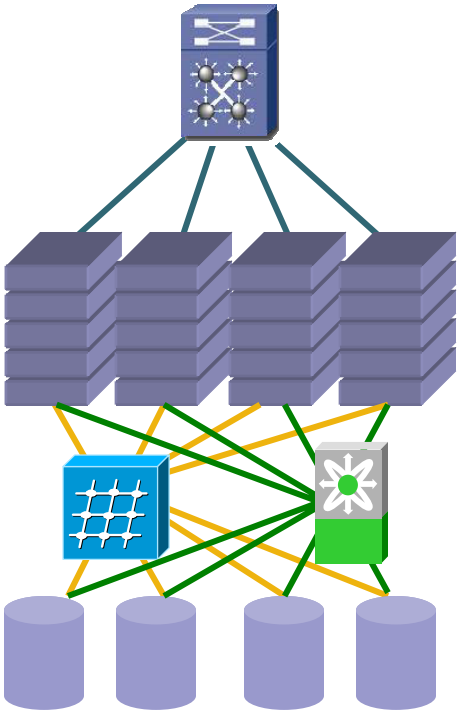
TIBco, Wombat, 29West, etc

High-Performance Computing



Fluent, Ansys, Charmm, Amber, LS-Dyna, etc

High-Performance Database and Storage



Oracle, IBM DB2
Luster, IBM GPFS, Panasas,

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Are feeds and Speeds enough?

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Fragmented Landscape Inhibits Distributed Systems Adoption

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- **Multiple MPI implementations – no standards to build off of, more options to certify**

• Extensive Configuration and management tools	• Limited Configuration and management tools
• Broad support for standard protocol stacks - Interoperable	• Loosely defined protocol stacks – limited interoperability
• Simple “Plug & Play” Operation • 10/100/1000 + 10GE	• Do-it-yourself testing, integration and certification • 4X 10Gbps Ports

Multiple Fabric Options – No uniform integration of Capabilities

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What is a Unified Compute Fabric?

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A *unified compute fabric* integrates network management and troubleshooting, application protocols and APIs for Ethernet and InfiniBand fabrics, offering IT cluster administrators a single operational model for greater ease-of-use, rapid deployment, higher reliability and integrated security

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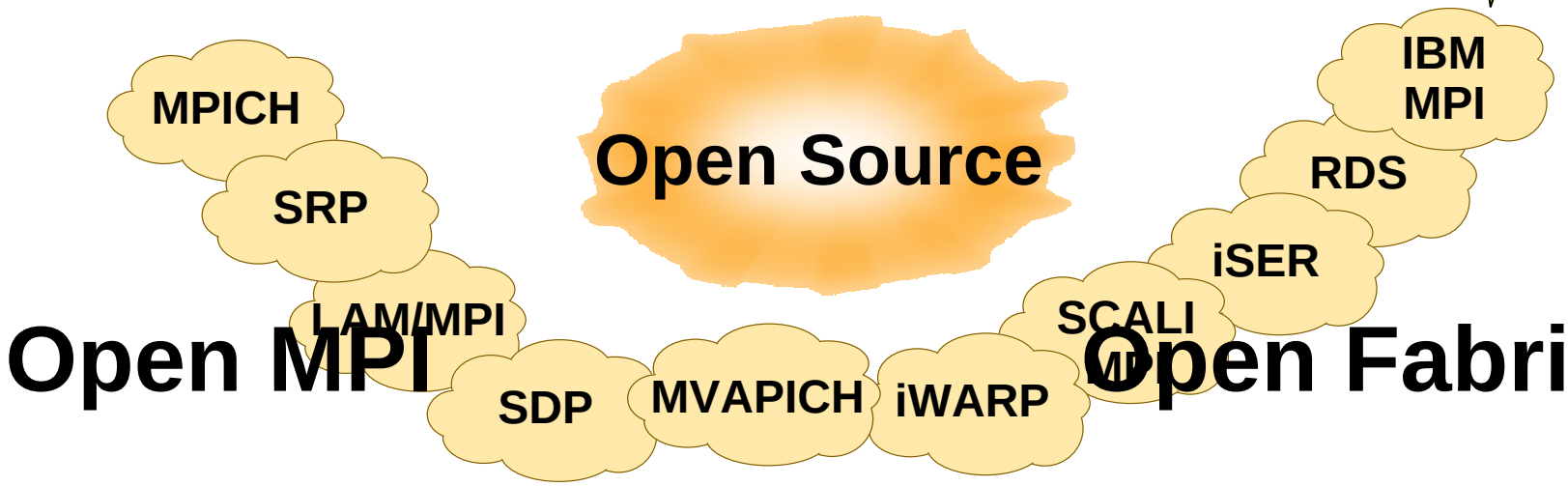
Driving Open Standards
Open Fabric and Open MPI

New



- **Problem: Proprietary protocol stacks multiply options for application development and complicate certifications**
- **Solution: Cisco will move strategic focus to Open Fabrics and Open MPI**
- **Benefits:**
  - **Single stack, fully interoperable between vendors**
  - **Eliminates fragmented infrastructure that reduce performance**
  - **Accelerates application development for the ISV and deployment and certification for the end-user**
  - **Consistent operation across Ethernet & InfiniBand**

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Bringing Ethernet-Like Maturity to Infiniband

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Ethernet

Standard Manageability

Standard MIBs and Manageability integrated into Ethernet

Standard Drivers and Application Interface

IEEE 802.3, 802.1, TCP/IP have unified the world around a common capability

Evolutionary Performance

Incremental performance capabilities provide right-sized price per port

Unifying Ethernet and Infiniband for High Performance Applications

Infiniband

CiscoWorks LMS Integration and TopSpin OS 2.7

Common platform for multi-fabric management and new management and security capability

Open Fabrics and Open MPI

Standard development platform for drivers and app integration

Double-Data Rate (DDR)

Higher bandwidth option for incremental bandwidth requirements

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Delivering the Unified Compute Fabric

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- Drive commercial Open MPI middleware to deliver standard features and perfoprmance, and reduce implementation and support overhead
- InfiniBand Integration into CiscoWorks Management tools
- Drive standardization of Protocols within Open Fabrics Consortium to deliver standard features and reduce time to deploy
- Extend Ethernet “Plug & Play” functionality to InfiniBand
- Deliver Next-generation technologies – InfiniBand dual speed DDR/SDR

Uniform Cross-Fabric Capabilities

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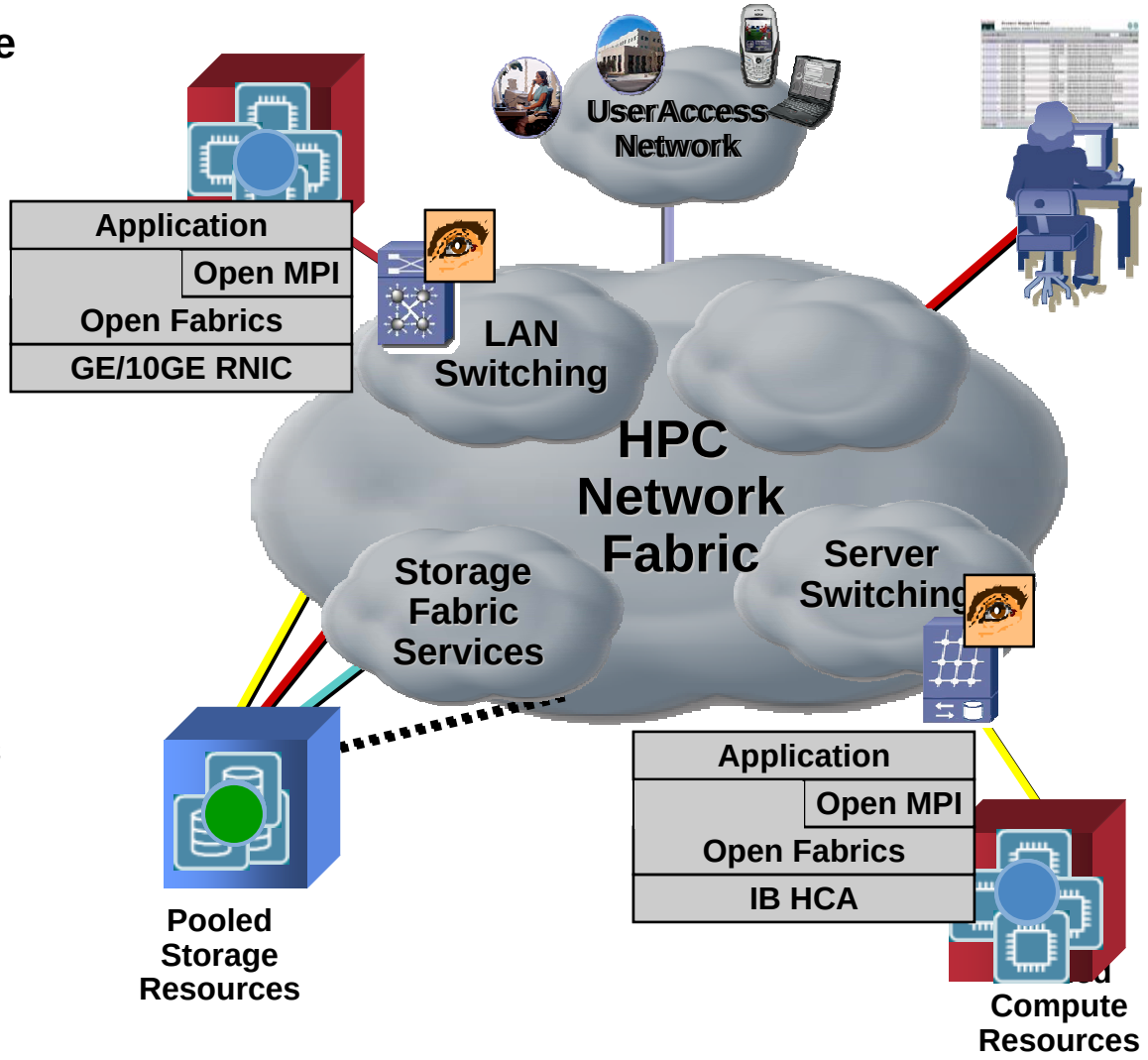
Cisco Open Fabric Strategy

- **The Enabler for true Enterprise High-performance Computing**
  - **HPC/GRID**
  - **Applications Systems**
- **Only vendor to offer <u>complete multifabric solution</u>**
- **Multi-fabric Management**
  - **Common tools for *Ethernet & InfiniBand***
  - **Comprehensive APIs for 3rd Party Integration**
- **Fabric Agnostic Protocols**
  - **Unify MPI across *Ethernet & InfiniBand* with Open MPI**
  - **Unify RDMA across *Ethernet & InfiniBand* with Open Fabrics.**
- **Cisco ISV Certification**
  - ***InfiniBand & Ethernet***
  - **Certification for *InfiniBand & Fiber Channel* Storage**



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Cisco Delivering Unification to Distributed Computing

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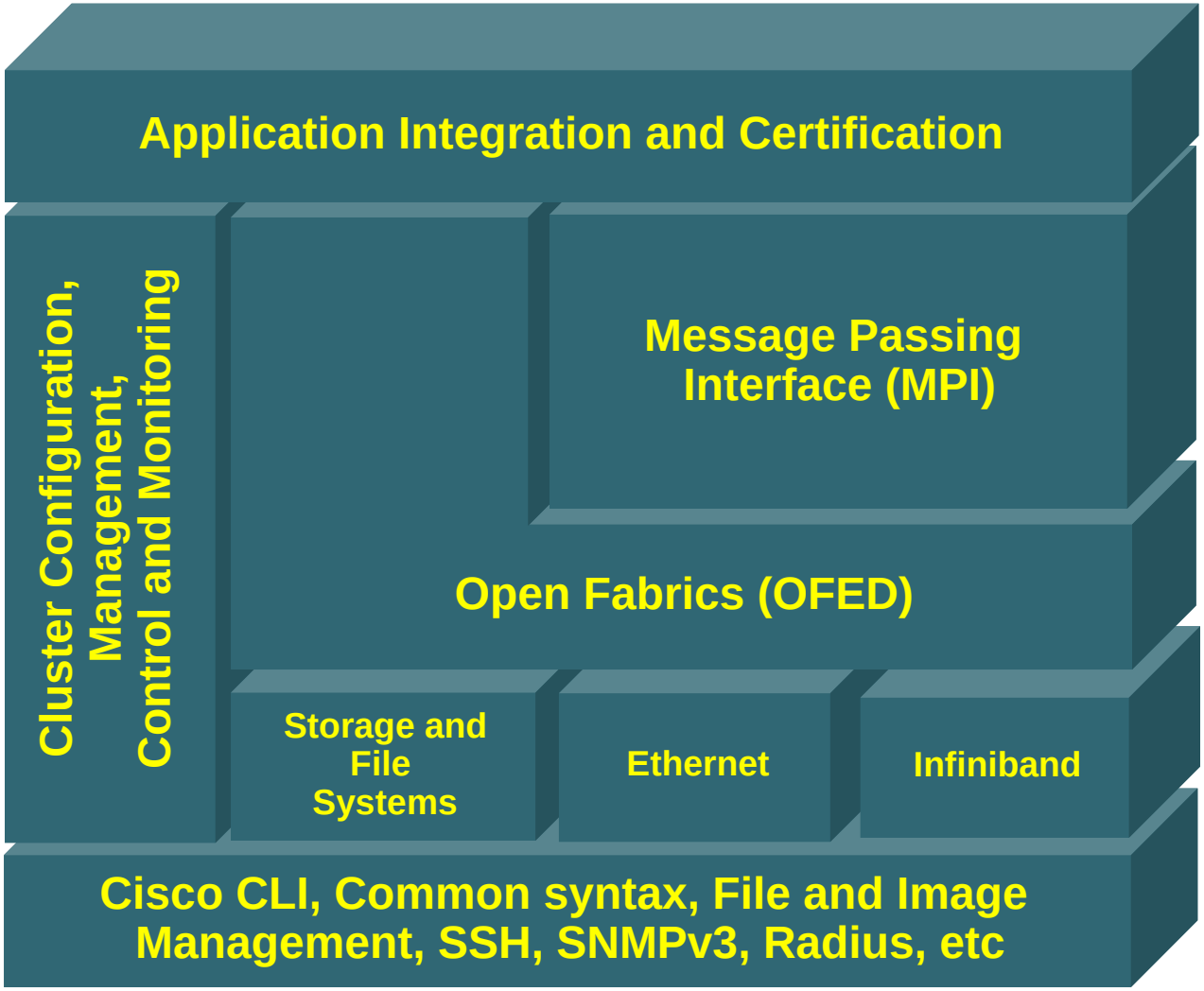

Cisco Technology Developer Program & Open source integration

Extended Network Awareness

Standards based functionality

Unify Ethernet & Infiniband Capabilities

Develop Next Generation InfiniBand & Ethernet

Unify Network management

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Cisco SFS-OS 2.7
Consistent Configuration & Management

New

- **Common CLI across all products**
  - **Command Syntax, scripting, etc.**
- **Consistent Security model**
  - **TACACS and RADIUS for Centralized Auth/ACS Integration**
  - **SSH/SSL/SNMPv3 for full management security**
  - **Multiple authorization levels**
- **File & Image Management**
  - **System image and configuration file libraries.**
- **Consistent Management Notification**
  - **Full SNMP v1/v2/v3 Support across all fabrics**
  - **Streaming Syslog: Integrates with Syslog Analyzer**

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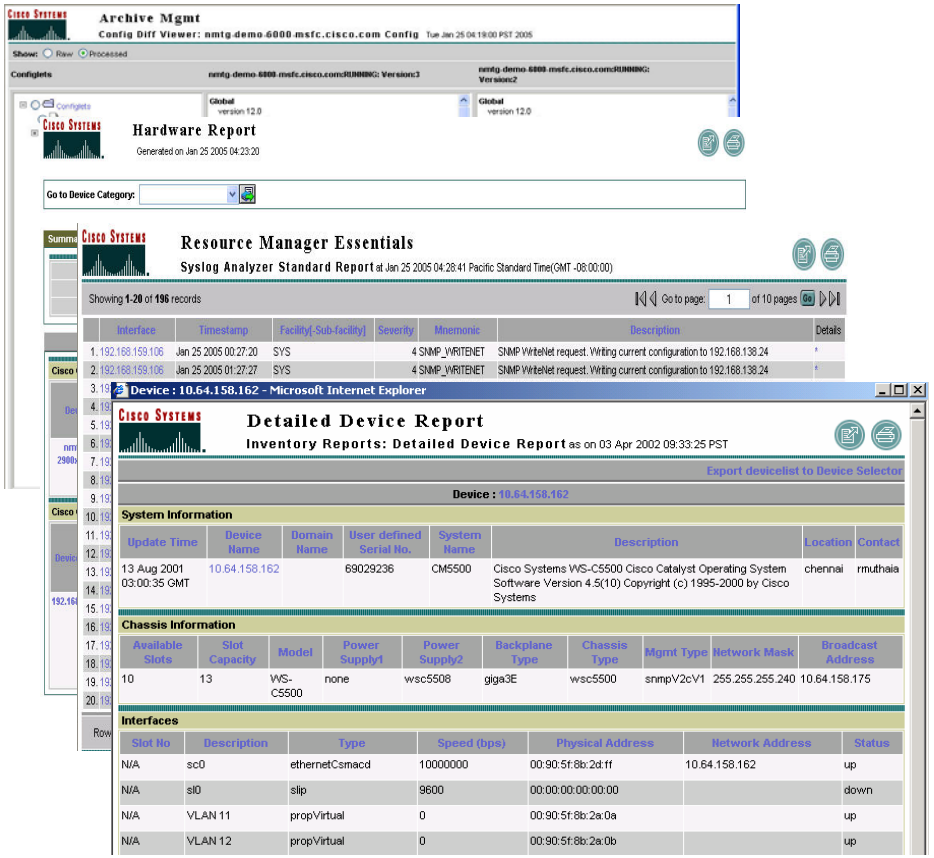
CiscoWorks LMS Support for Infiniban

New

- **Single network management application for Ethernet and InfiniBand networks**
- **Delivers Centralized Device, Software and Configuration Inventory Manager**
- **Diagnostic Tools and Syslog Analyzer**
- **Centralized Reporting**
- **Device level fault analysis for network fabric, including high availability monitoring, pager/email/trap notification**
- **Benefit: Eliminates administrative and usage barriers; identify and fix problems -> increased performance**



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High Performance Subnet Manager

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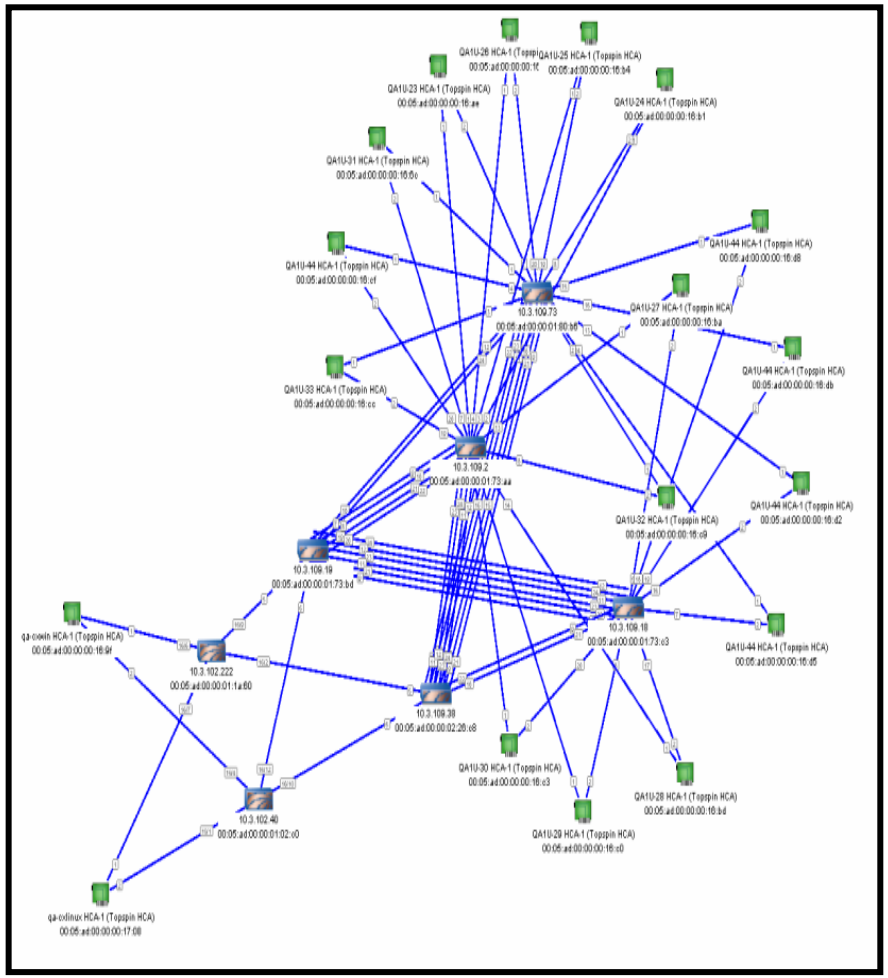
- **Overall Subnet Manager and framework tested on Sandia Thunderbird -- World's largest standard HPC server cluster (4500 IB-attached servers)**
- **SM brings multi-thousand server cluster up in less than one minute**
- **Includes database synchronization between redundant SM's for HA**
- **Includes performance and statistics tools capable of reporting on tens of thousands of network ports in half a minute**
- **Multi-Vendor support**



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Cisco InfiniBand Hardware Roadmap

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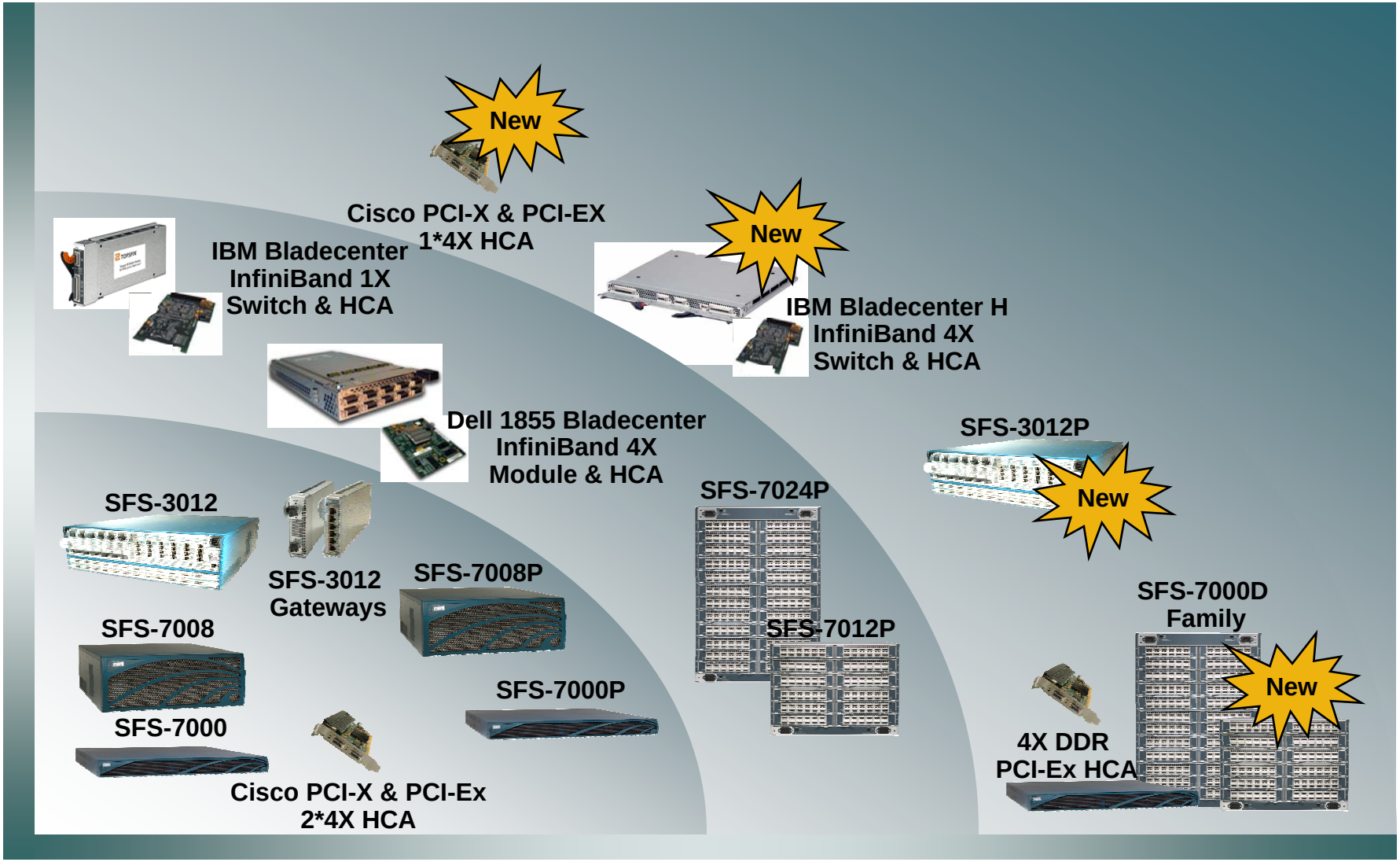

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Cisco InfiniBand Software Roadmap

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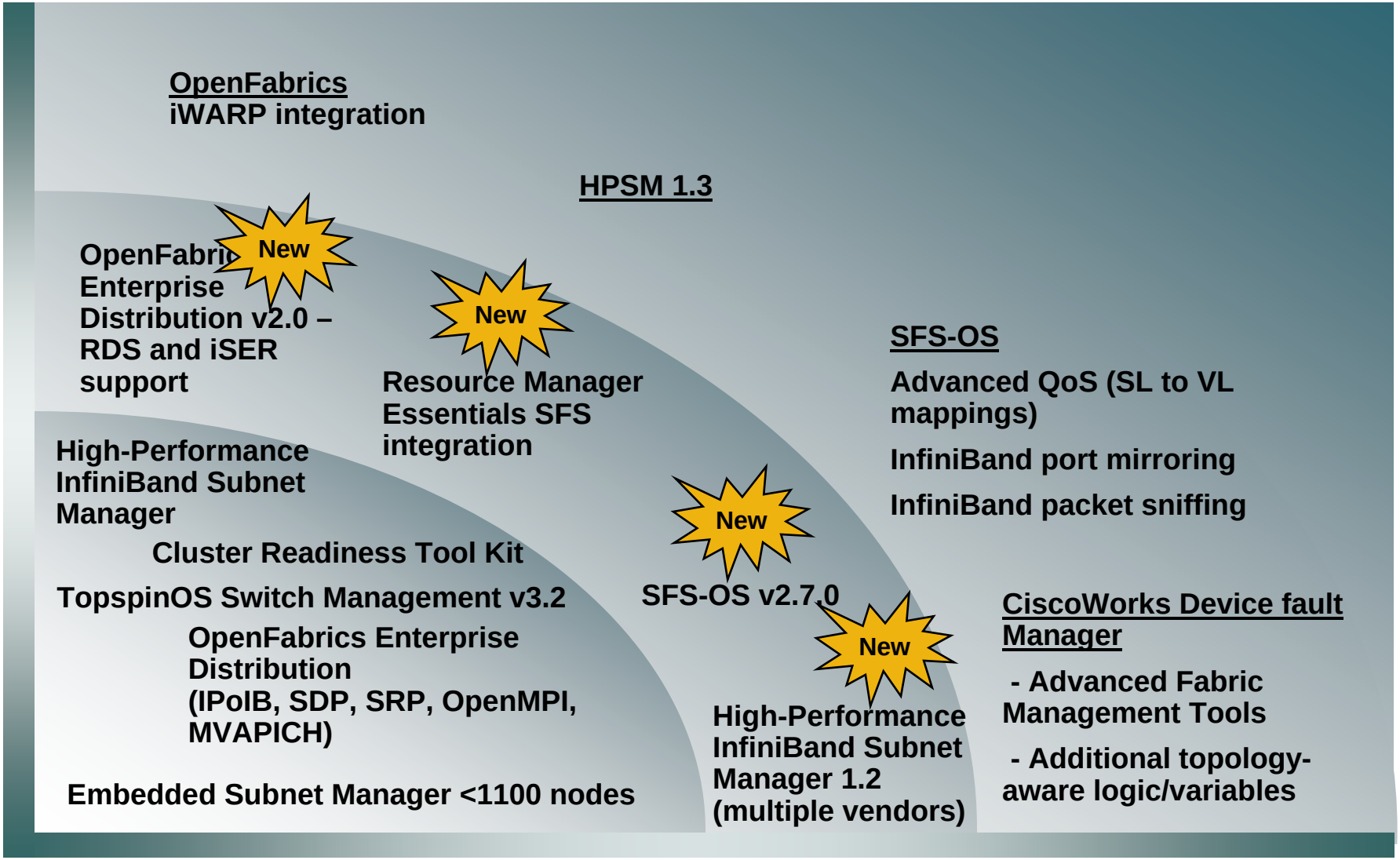

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Q and A

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