

Brocade Advanced Fabric Services and Management

Daniel Cohen

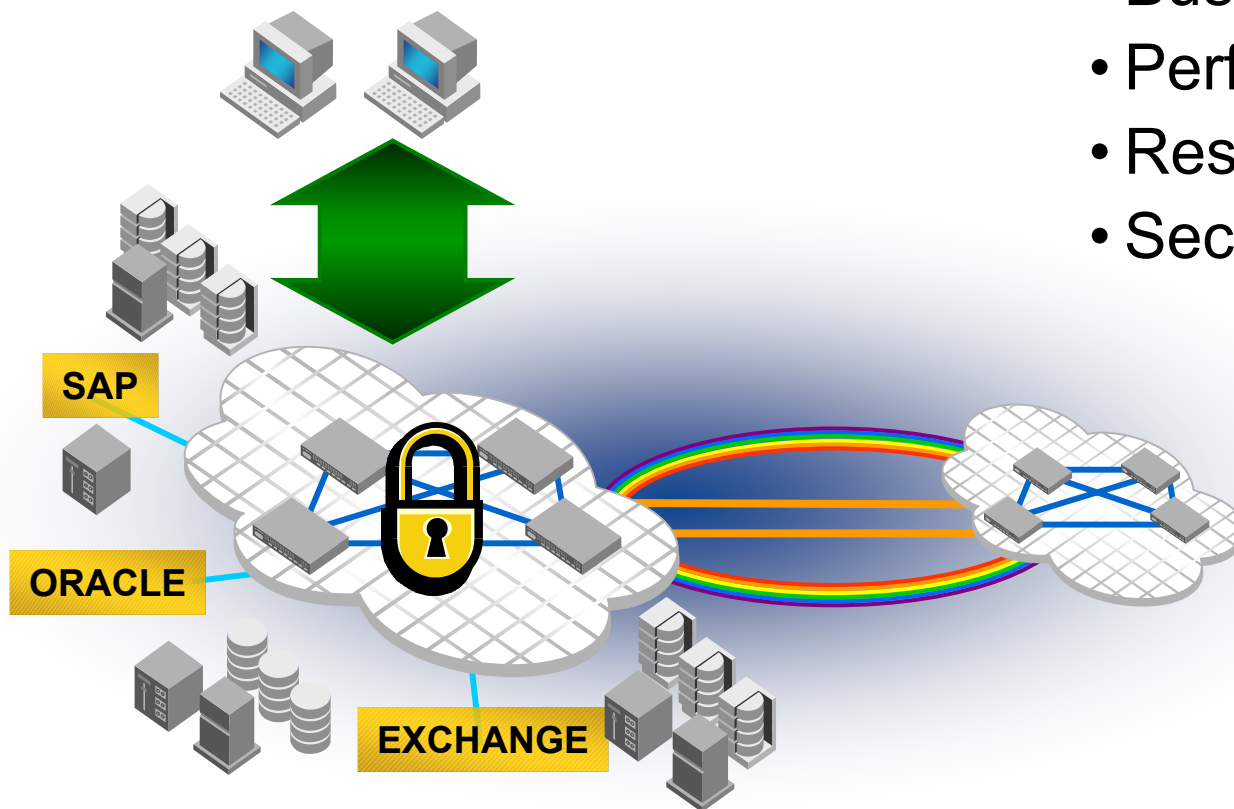
Solutioneer

Brocade Communication Systems, Inc.

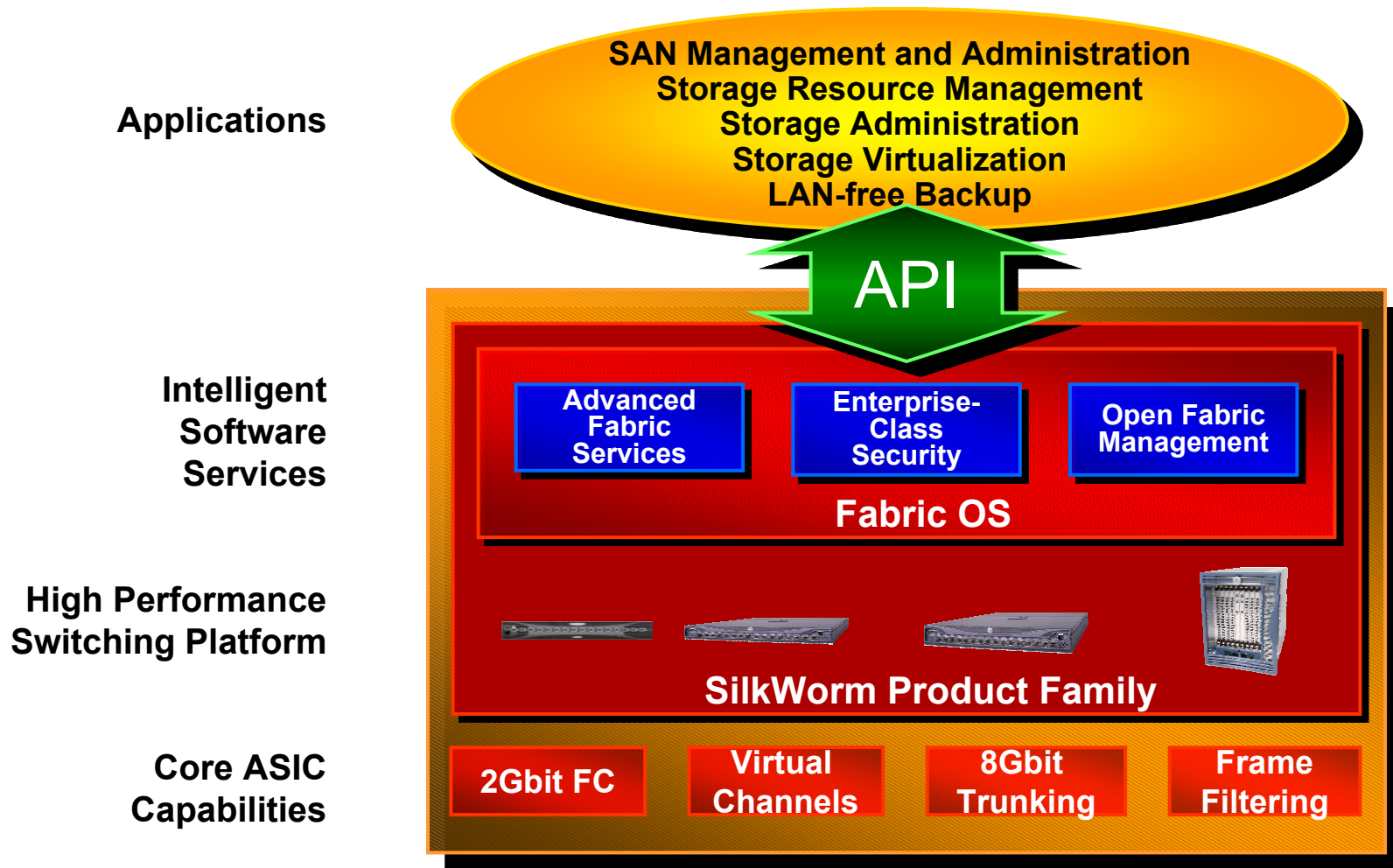
September 26, 2002

The New Storage Environment

- Manageability
- High availability
- Business continuance
- Performance
- Resource sharing
- Security



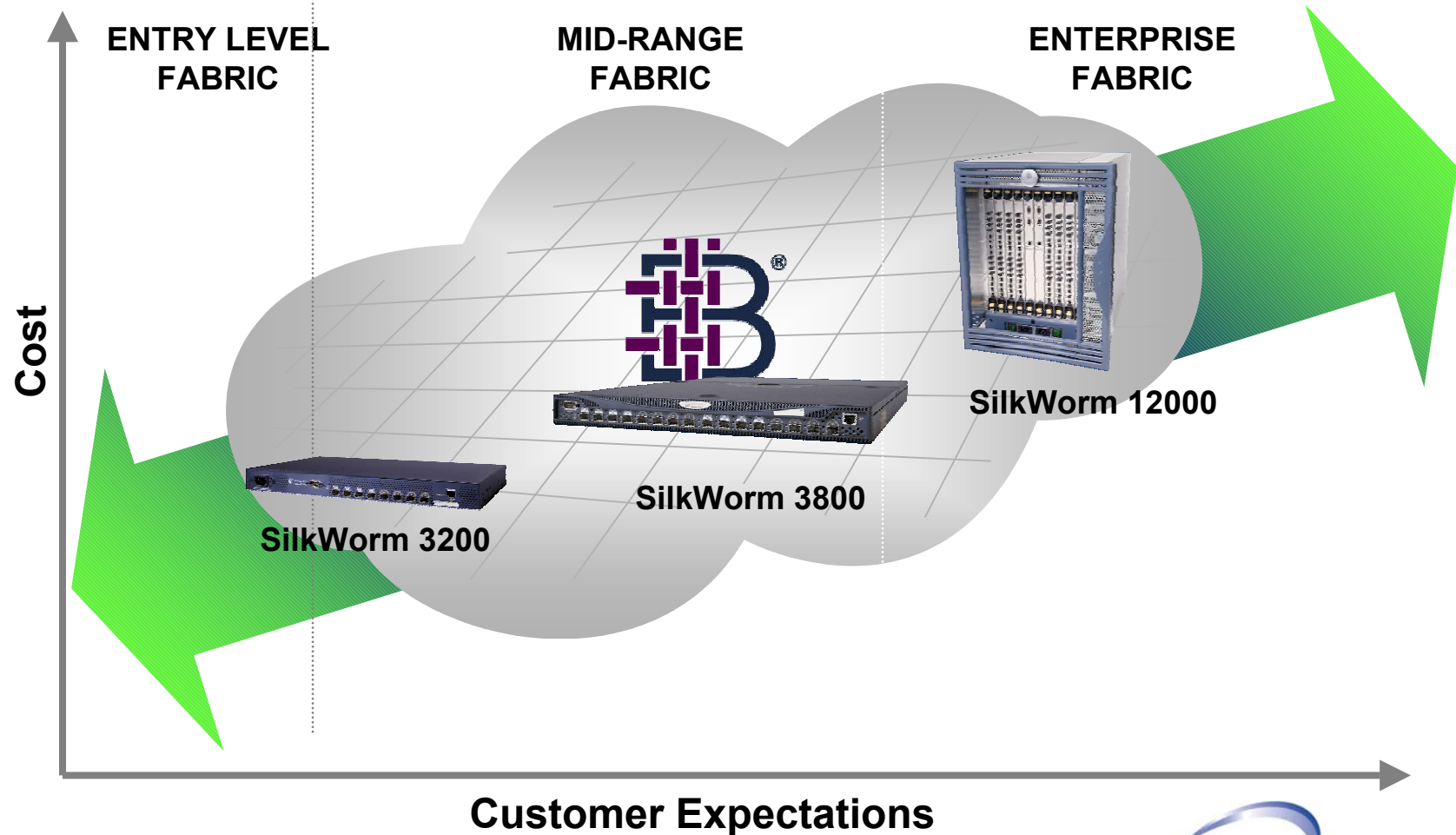
Intelligent Fabric Services Architecture



An Intelligent Platform

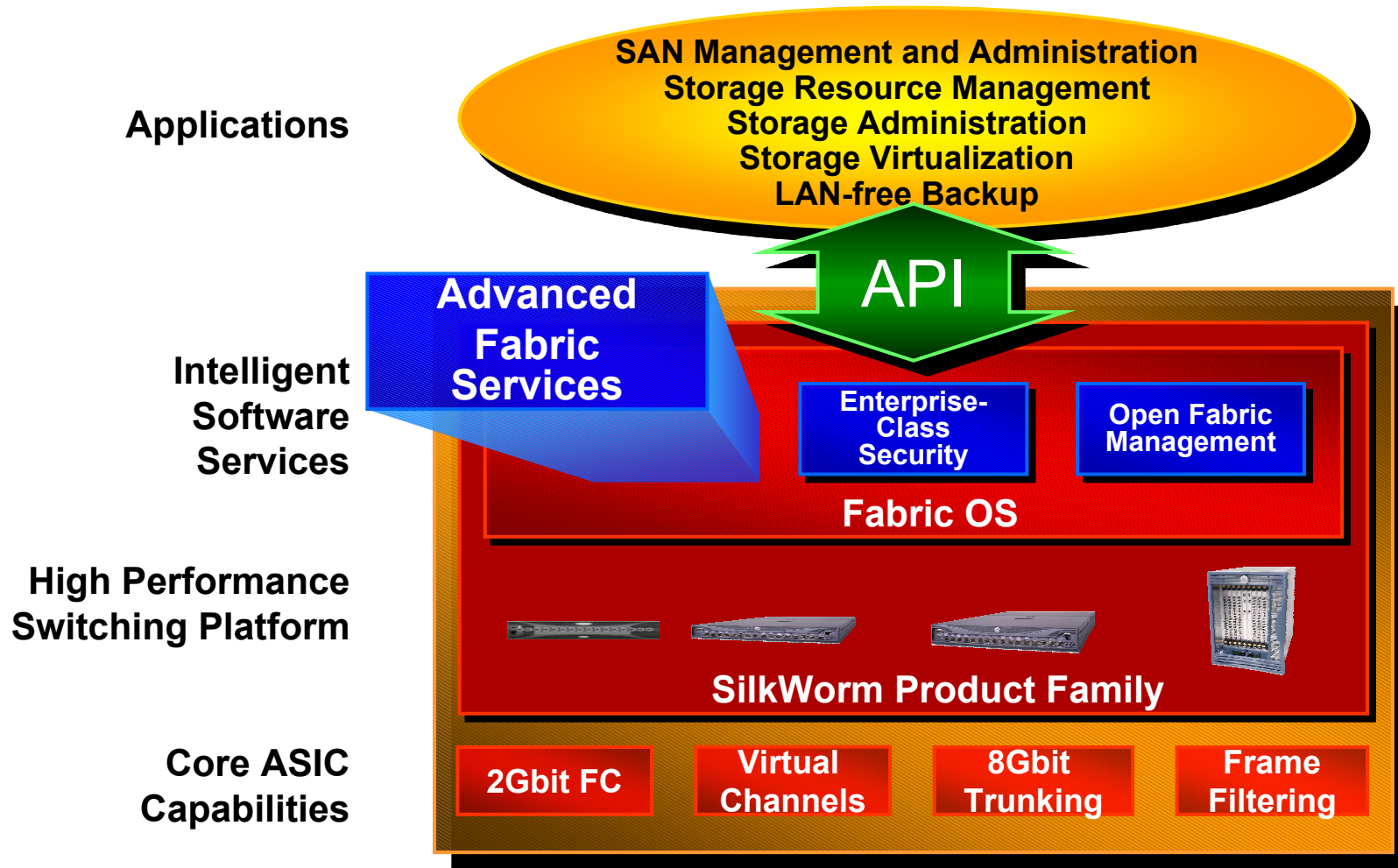
Entry Level to Enterprise

A Family of Solutions for all SAN Needs

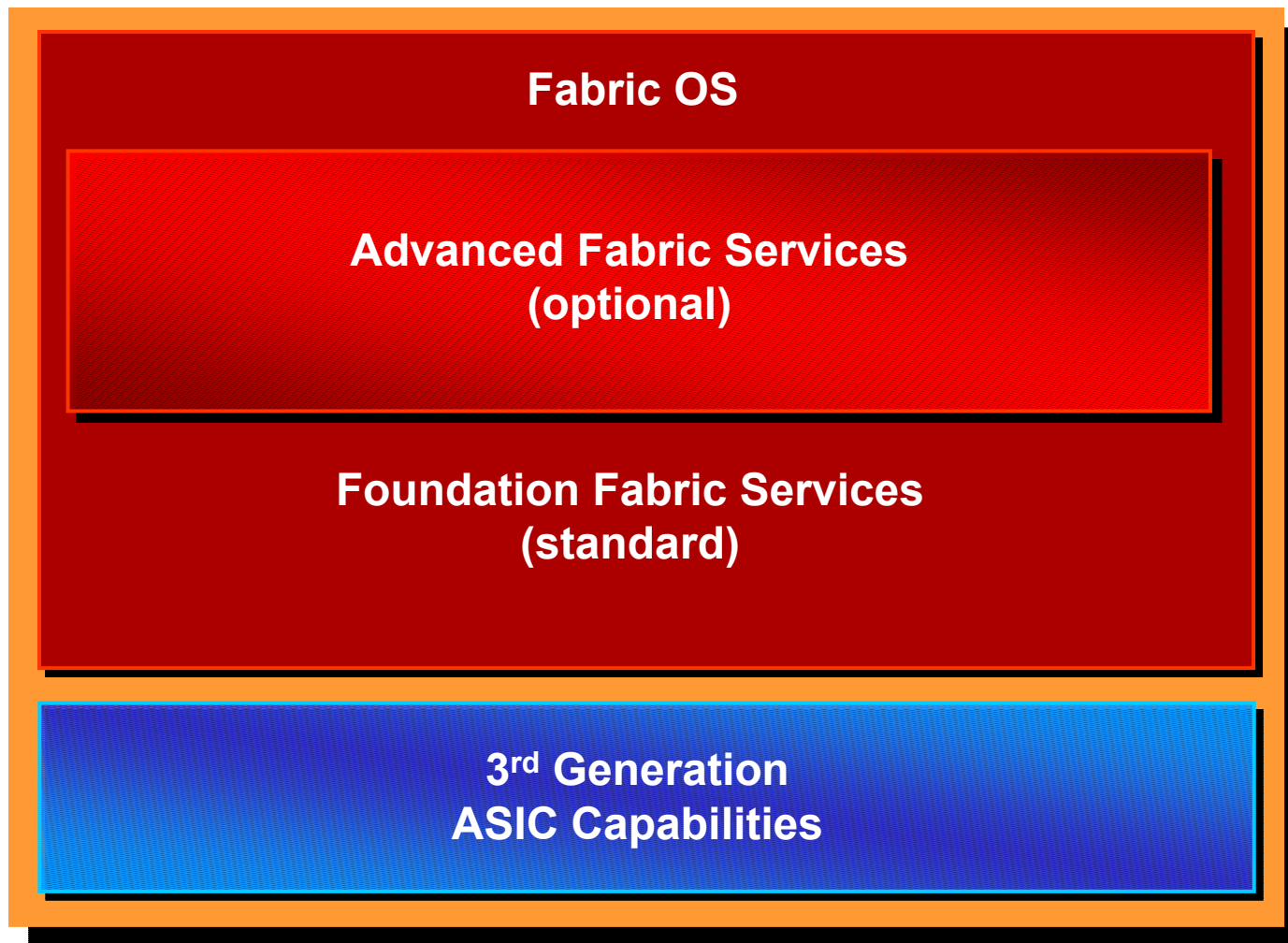


Brocade

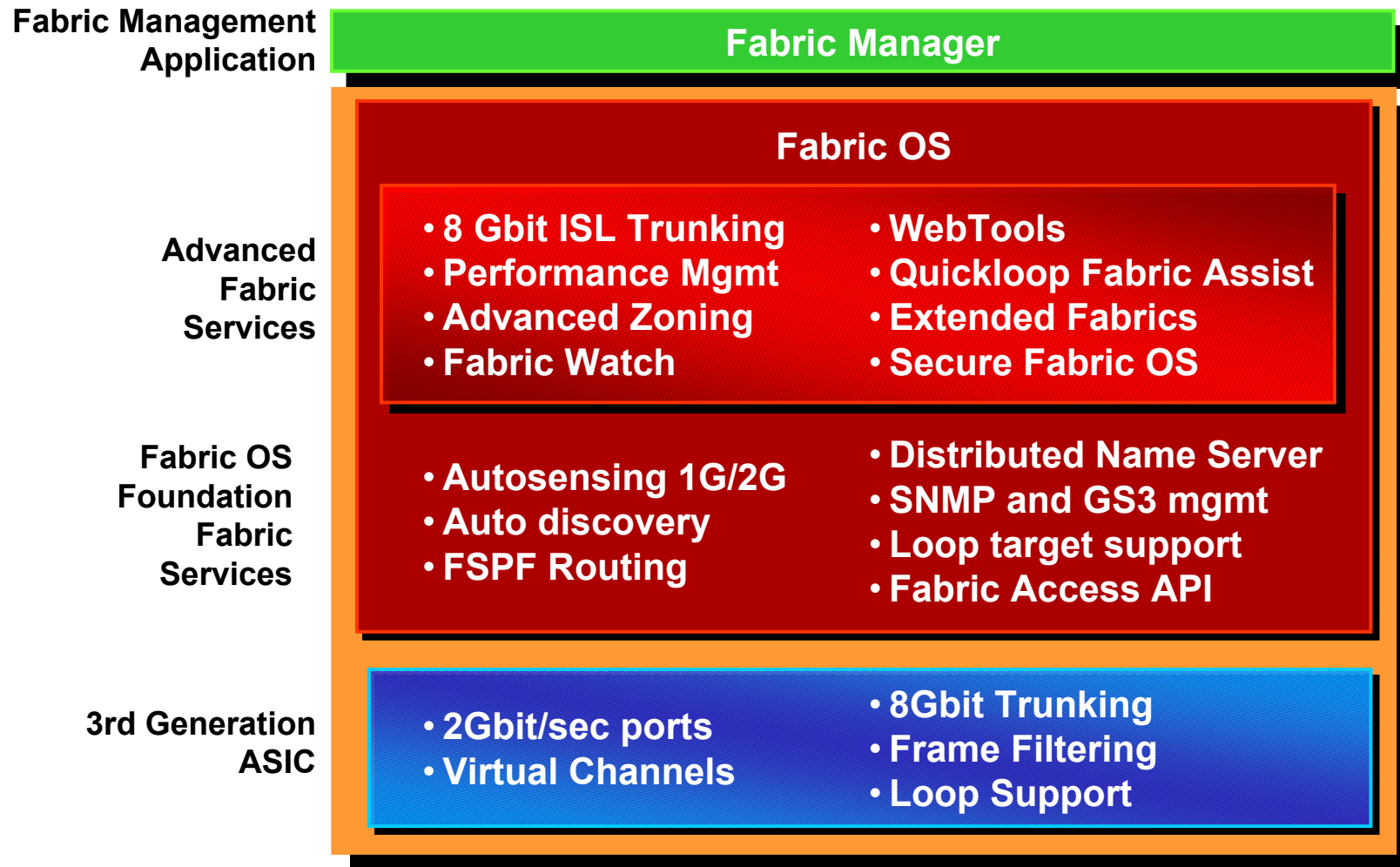
Intelligent Fabric Services Architecture



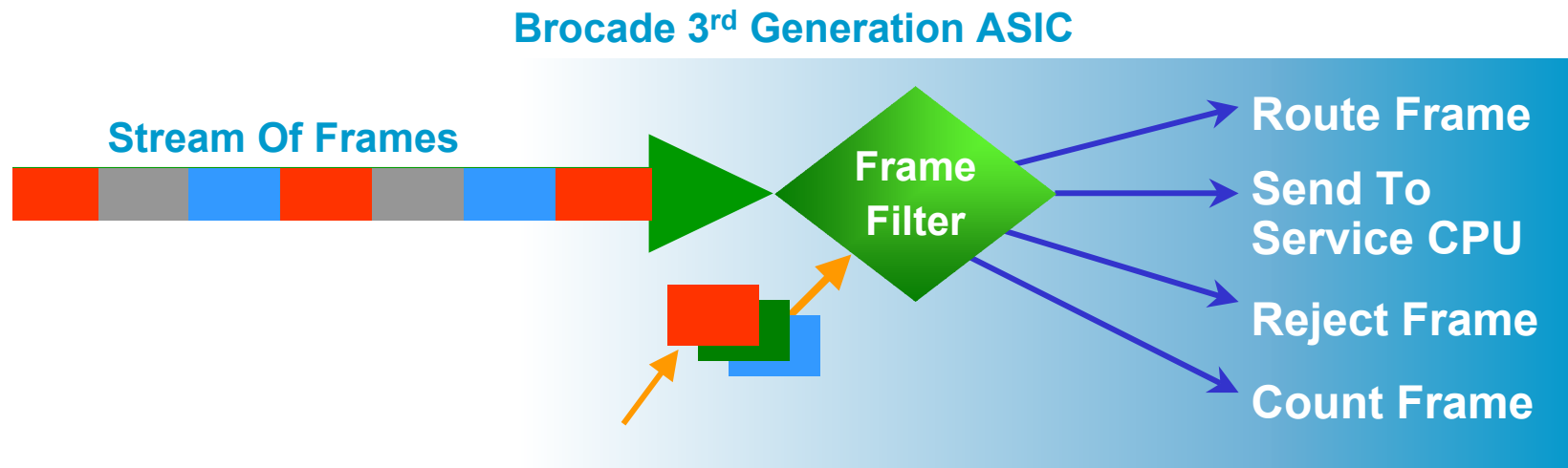
Foundations of Intelligence



Foundations of Intelligence

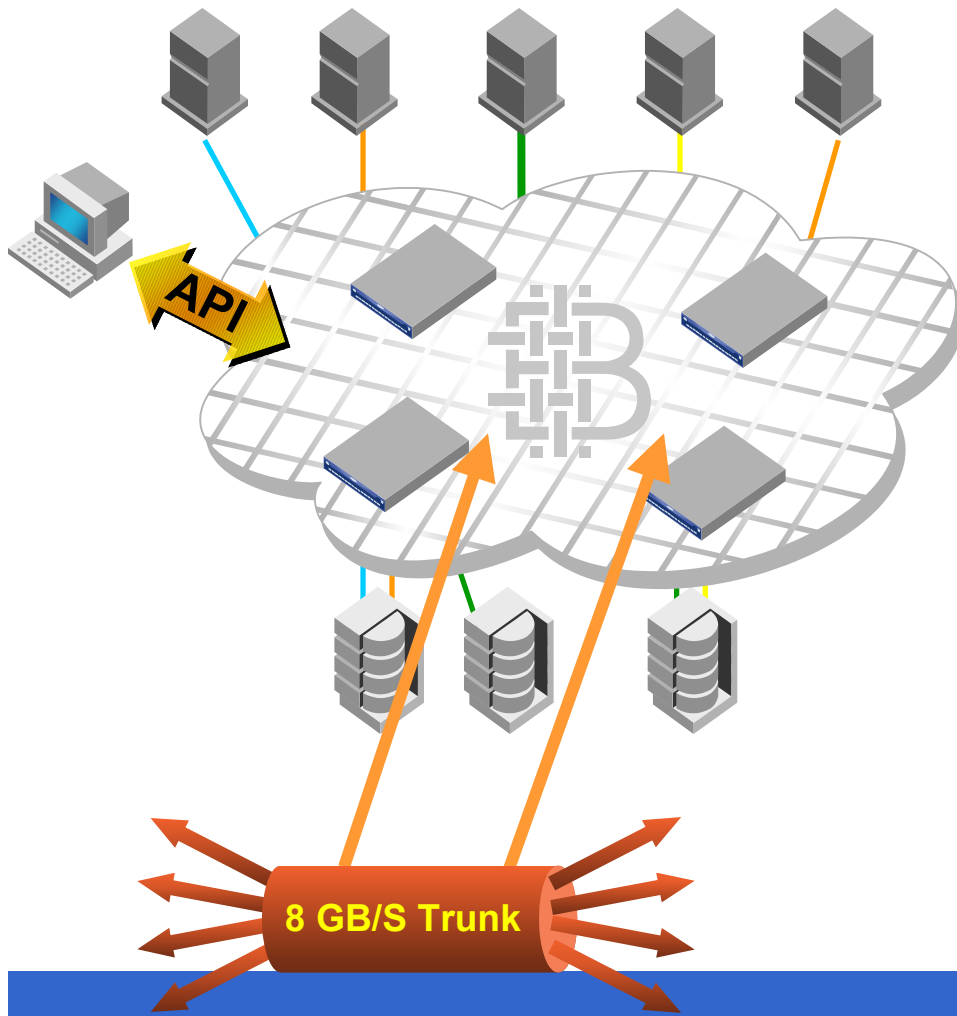


Frame Filtering



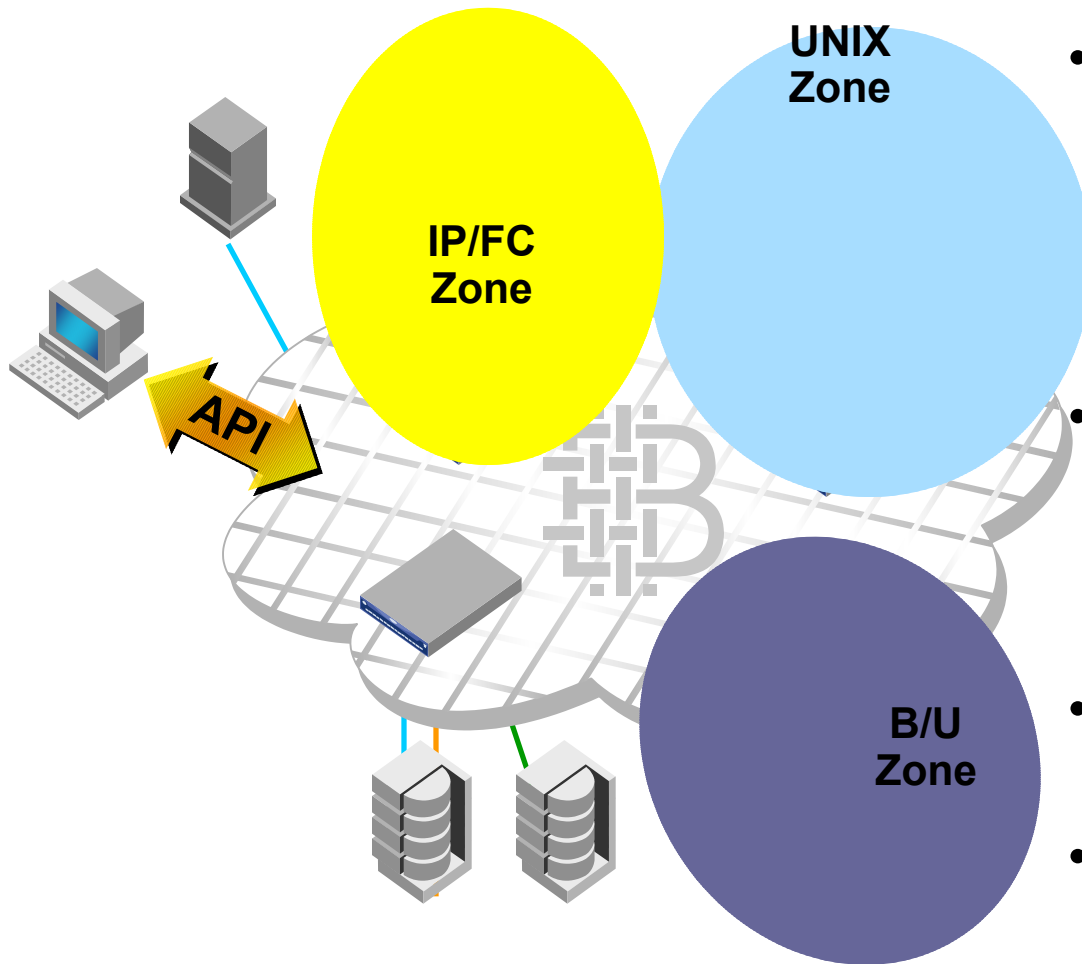
- Intelligent data routing through Frame Filtering

Inter-Switch Link Trunking



- ISL Trunking
 - 8 Gbit/sec logical links
 - Aggregate edge traffic
 - Zero management
- Simplify network design and management
- Simplifies administration (manage one link vs. four links)
- Maximizes fabric performance
- Enables increased Inter Switch Link availability

Advanced Zoning

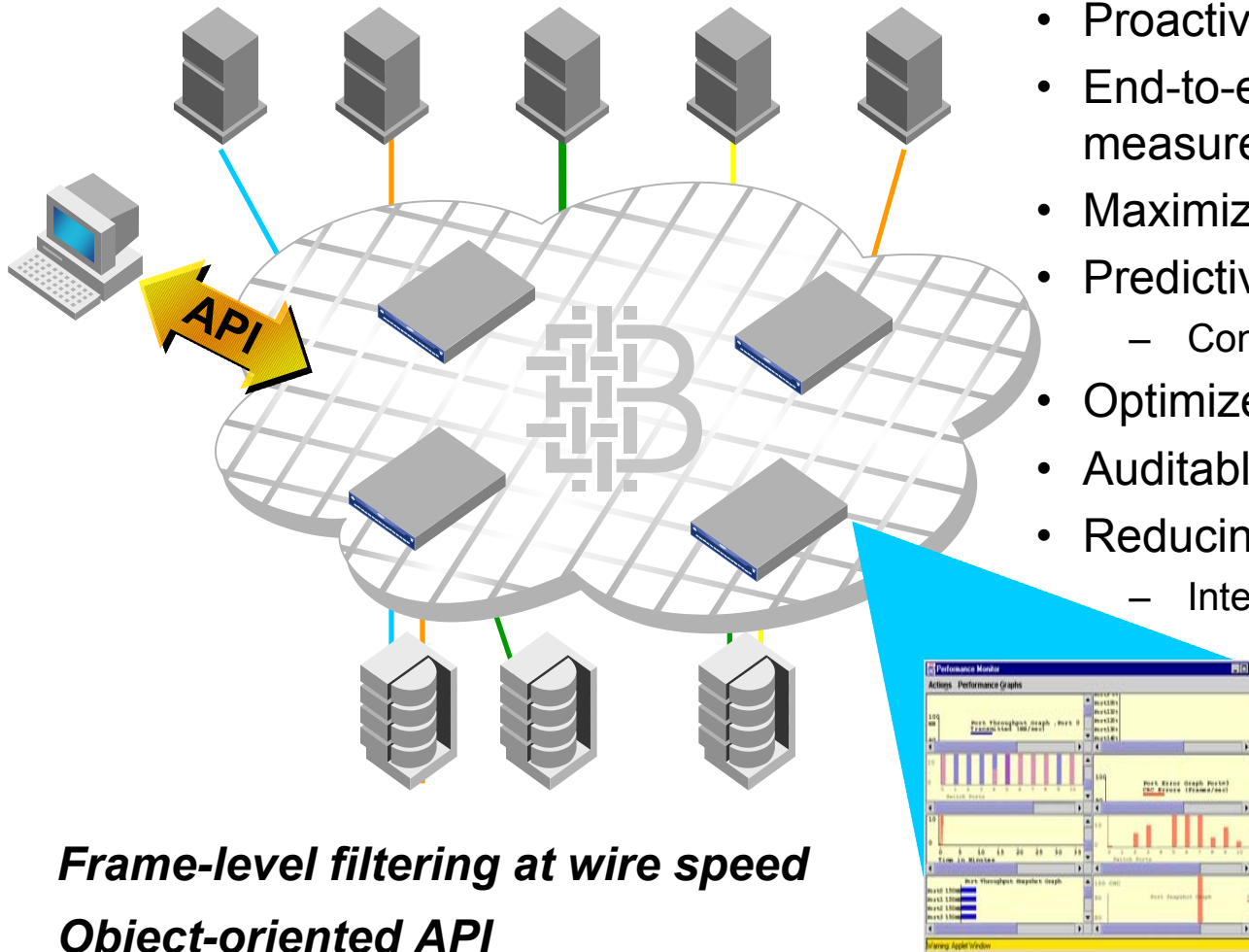


- Organize physical fabric into logical groups
- Prevent unauthorized access by devices outside of the zone
- WWN, Port Zoning
 - Hardware Enforced
 - Simple administration
 - Secure access control
- Hardware enforced access control
- Provides a safer, more secure SAN network

Performance Monitoring

Performance Analysis

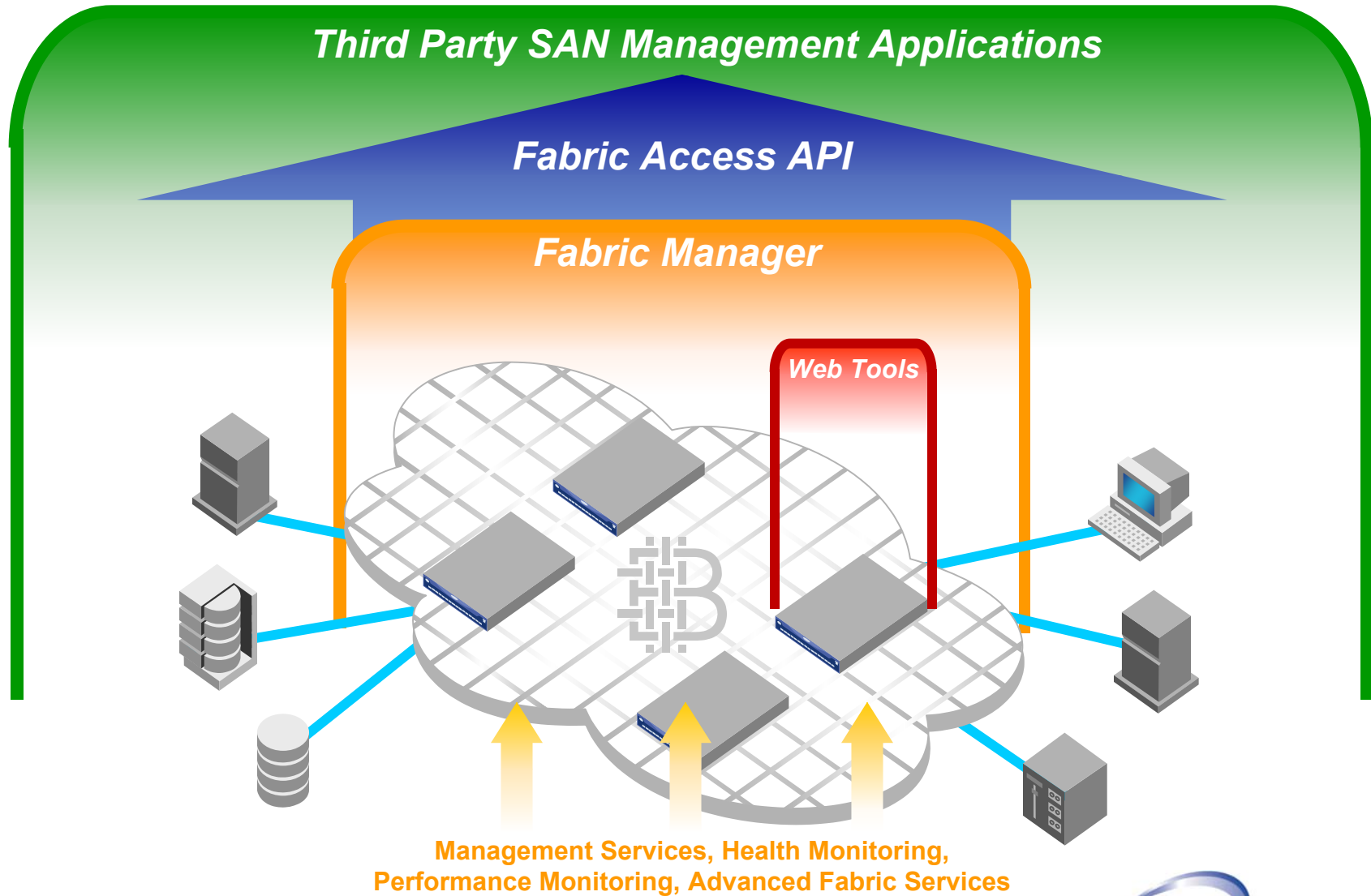
- Proactive SAN Management
- End-to-end performance measurement
- Maximizing performance tuning
- Predictive capacity planning
 - Congestion-free operation
- Optimizes Resource Utilization
- Auditable Service Level Agreements
- Reducing troubleshooting time
 - Integrated with Fabric Watch



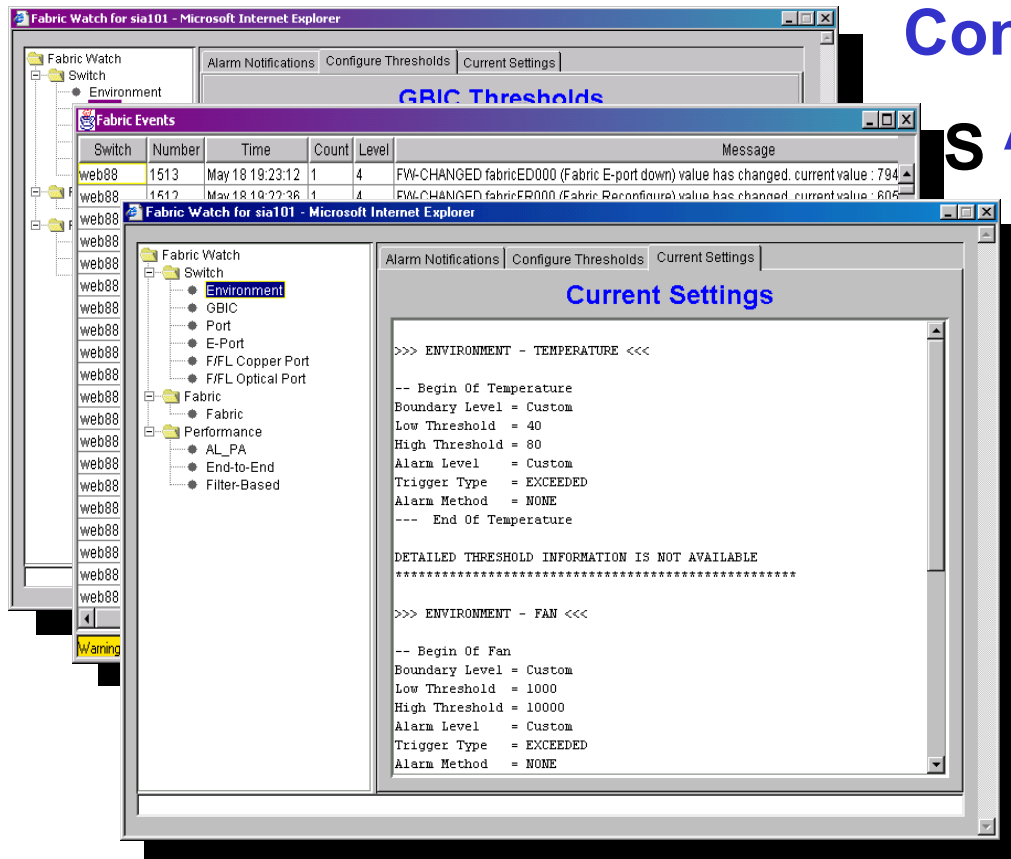
Frame-level filtering at wire speed

Object-oriented API

Brocade SAN Management



Brocade Fabric Watch



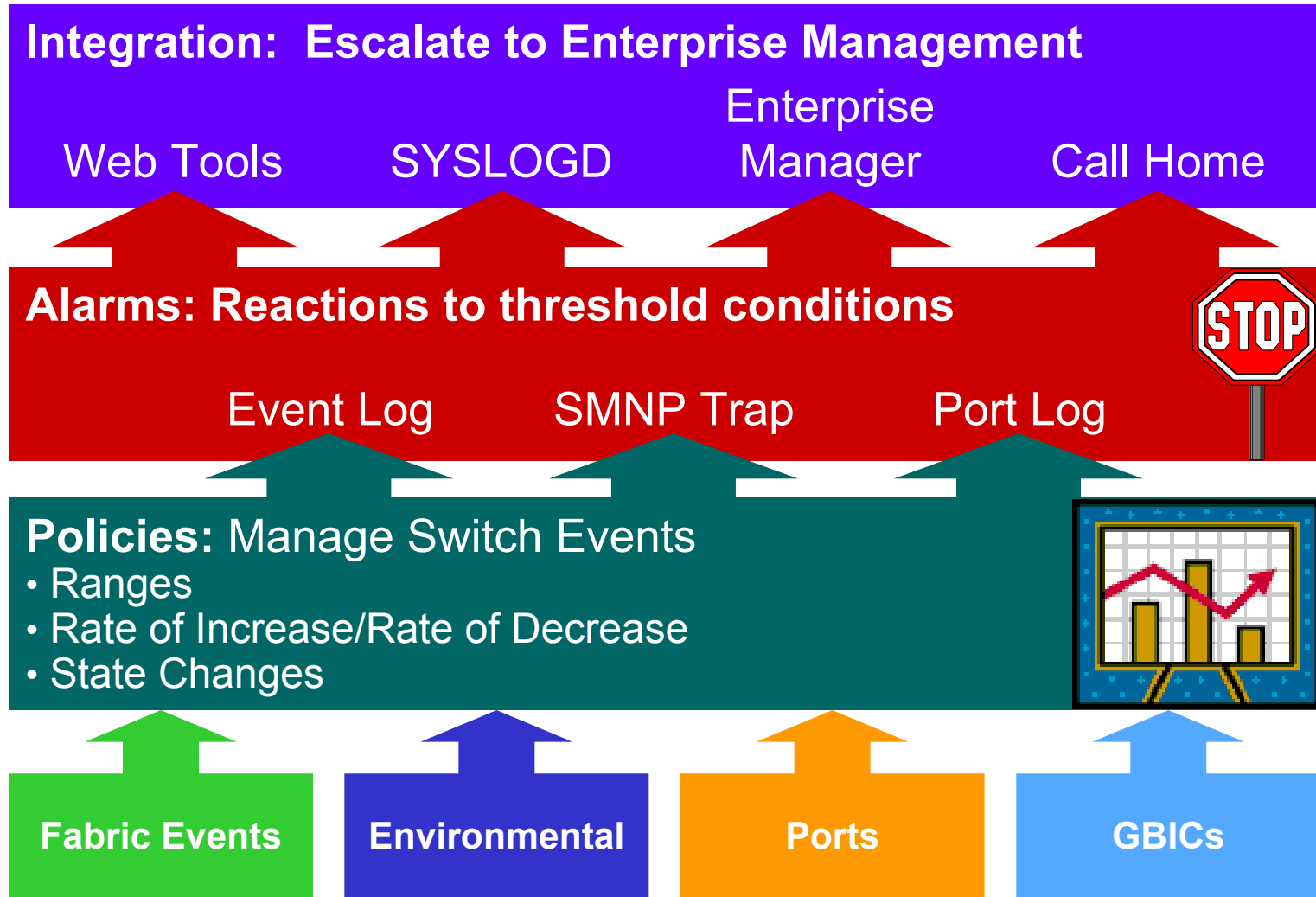
Configure Thresholds

Alarm Notifications

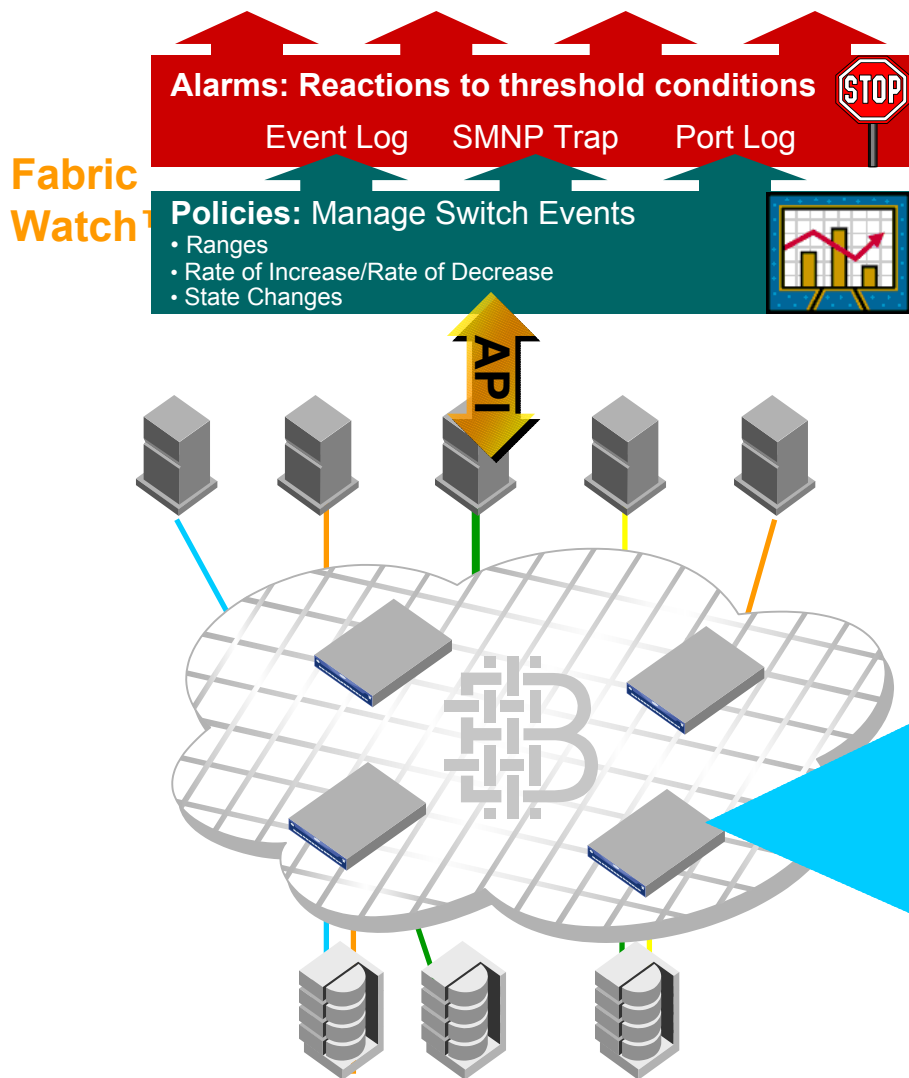
Current Settings

- Switch, Fabric, and Performance Reports
- Detailed descriptions of current settings in an easy to read format

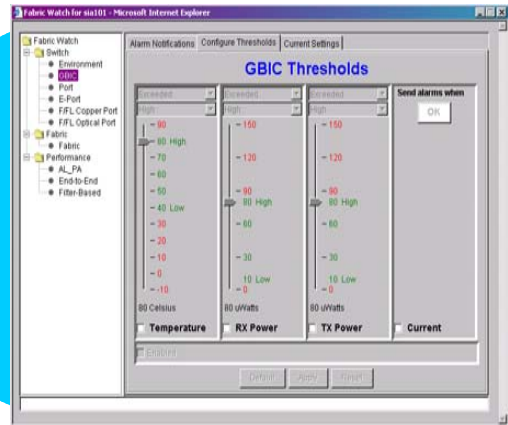
Fabric Watch overview



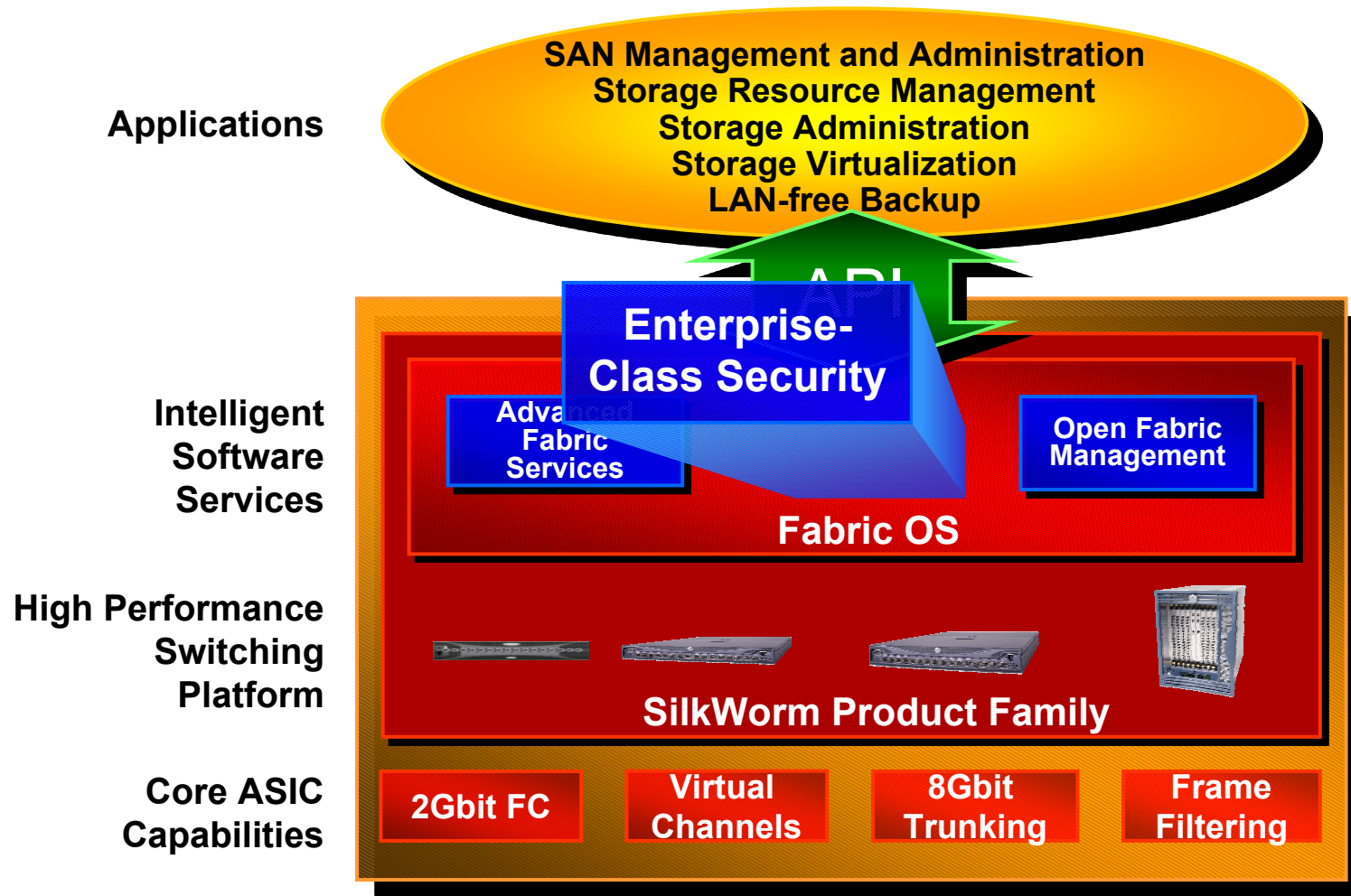
Fabric Watch™ Health Monitoring



- Intelligent, Proactive Monitoring
- Simple graphical threshold configuration
- Alarm Notifications
- Switch, Fabric, and Performance settings
- Default or user configurable settings
- Quickly diagnose problems
- Sends alerts to SNMP-based Applications
- Web Tools, FM and Fabric Access API

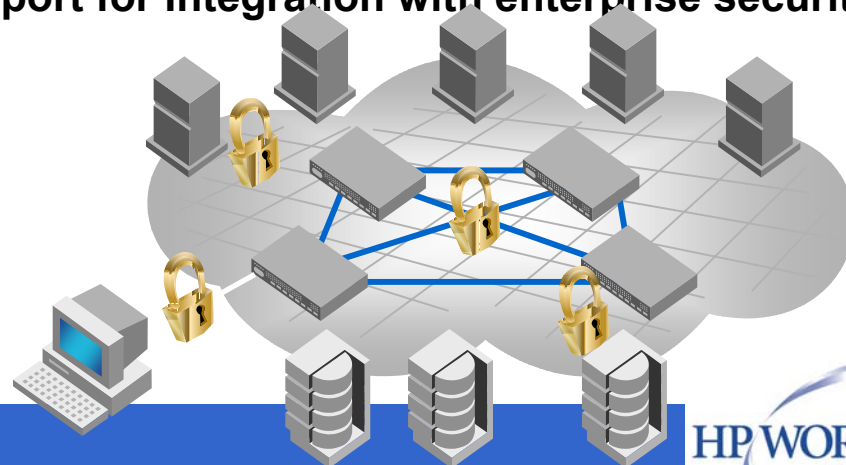


Brocade Intelligent Fabric Services Architecture



Brocade Secure Fabric OS™

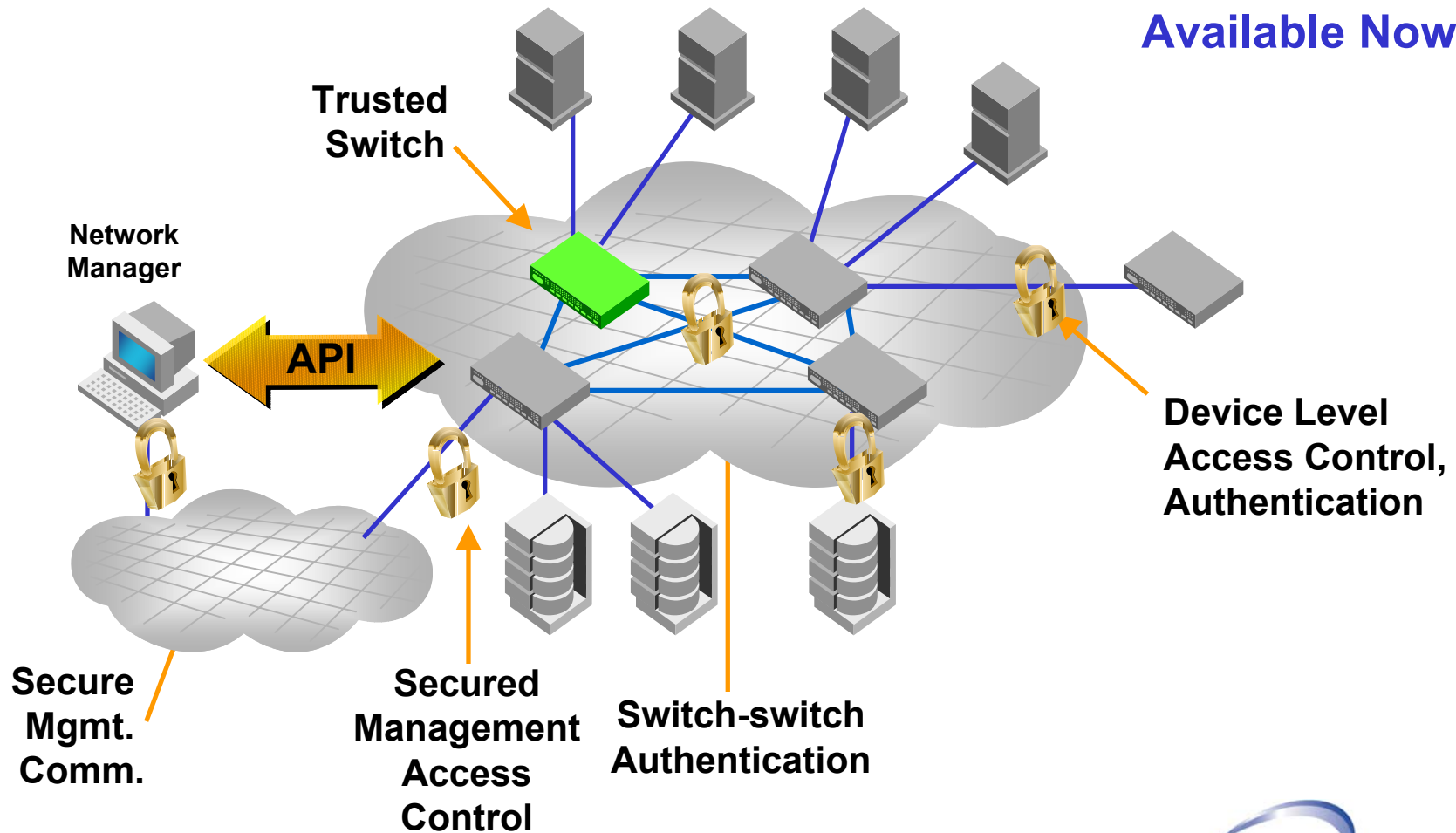
- *Fabric Based Security*
 - Next level above Advanced Zoning access control
 - Protection of Critical Corporate Data
- *Comprehensive policy-based security infrastructure*
 - Prevents unauthorized management access
 - Prevents unauthorized devices from joining the fabric
 - Eliminates the need for physical separation of fabrics
 - Simplifies administration of security
 - **Fabric Access API support for Integration with enterprise security infrastructure**
 - **Fabric Manager 3.0**
 - New standards proposal



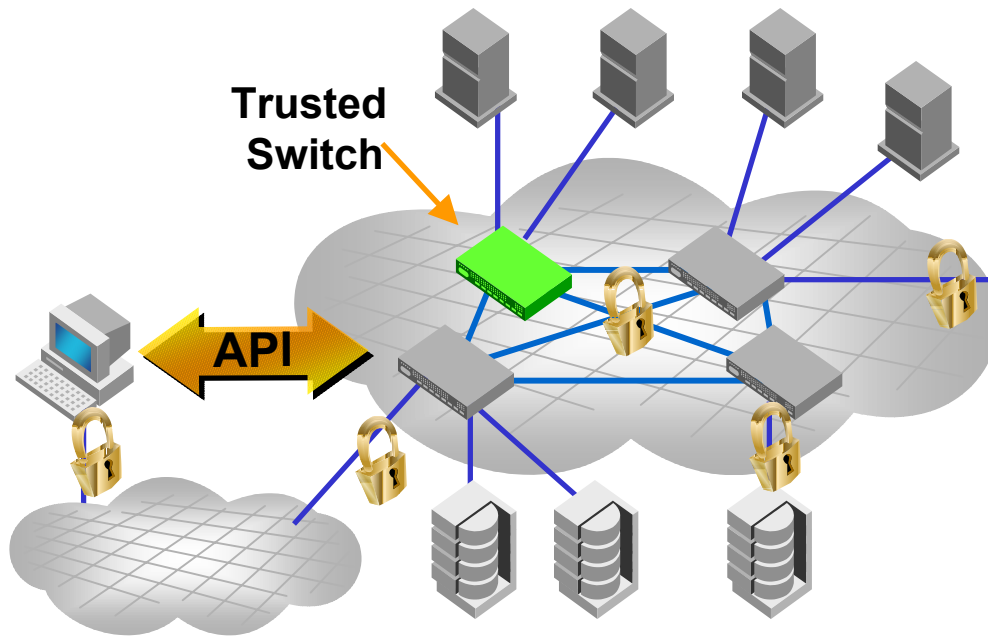
Secure Fabric OS

Ensures integrity of access to sensitive data

Available Now!



SAN Security: *Directions*



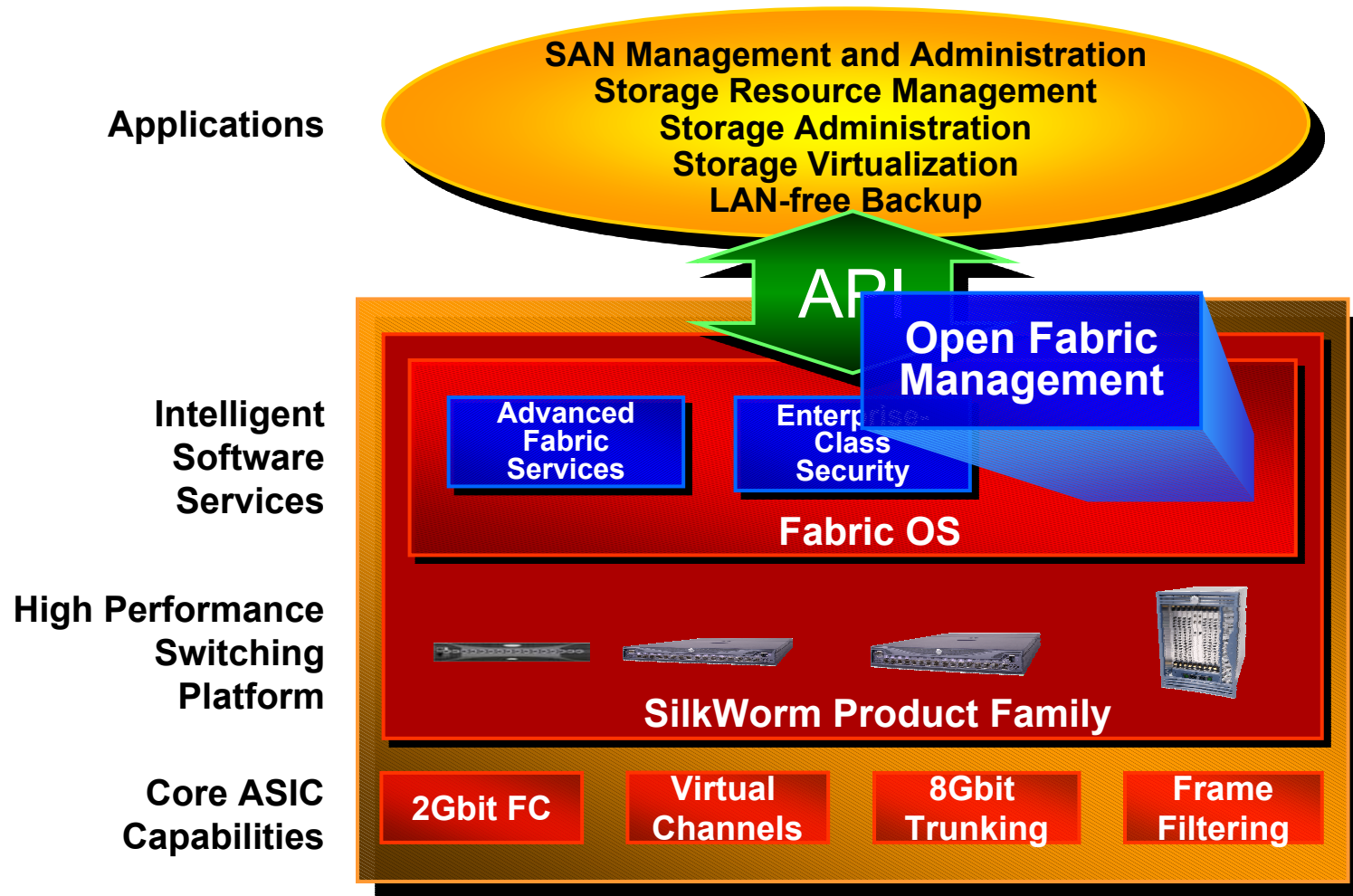
- Extend Secure Fabric OS
 - Policy-based response actions
 - Integration with existing authentication facilities
 - Expanded detection and reporting
- Strengthen security of the SAN
- Simplify administration

Industry Leadership in Securing Critical Enterprise Data

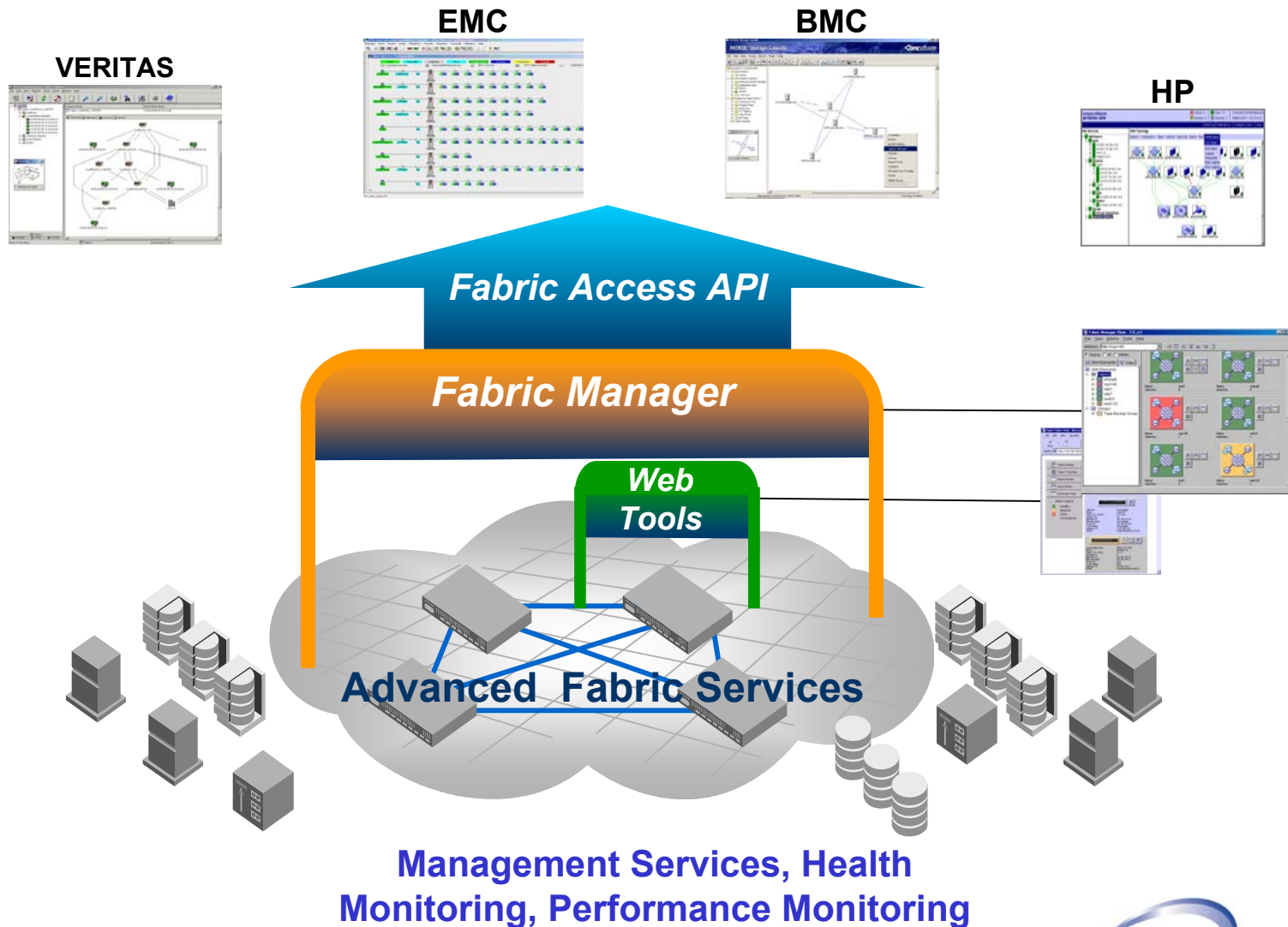
Brocade SAN Security Leadership

- Defined a comprehensive SAN security architecture based on proven LAN/WAN/Internet security technologies
- Set the agenda for strong policy-based SAN Security
- Delivered *first* Fabric based security offering to market
 - Only SAN infrastructure provider to offer a complete security product
 - A common services model across the entire Brocade SilkWorm product family
 - Integrated Management and Application

Intelligent Fabric Services Architecture

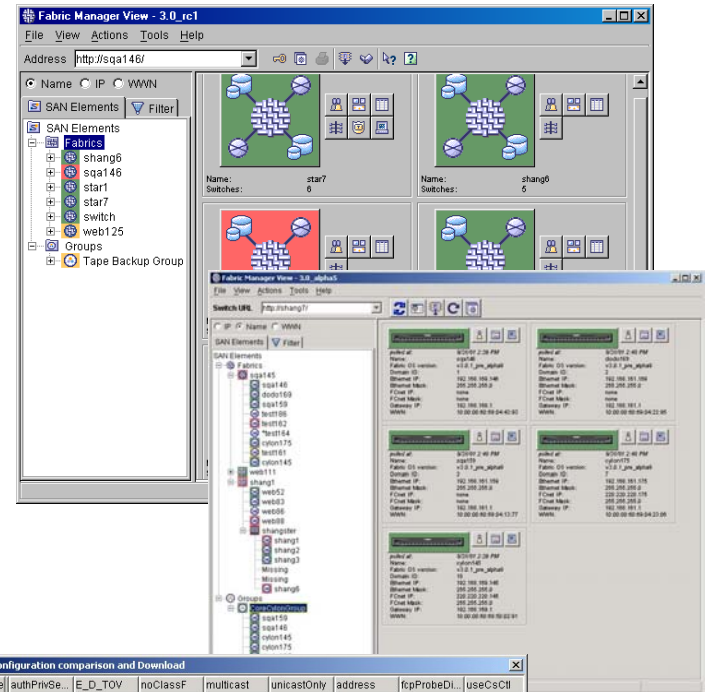


Open Fabric Management



Brocade Fabric Manager

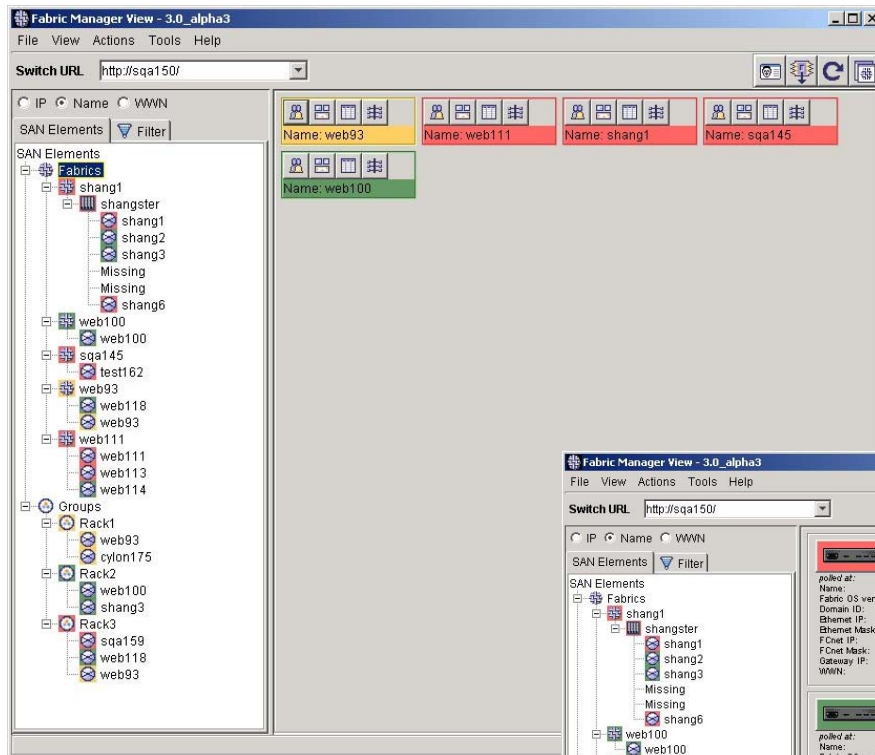
- Manage multiple Brocade switches, multiple fabrics and large fabrics
- Monitoring the SAN Through a Single Console
 - Collects fabric events from multiple fabrics
 - Rapid detailed drill down
- Rapid SAN provisioning
 - Clone and Deploy switch profiles
 - Intelligent group functions (devices and fabrics)
- Simplifies Core Management Tasks
 - FabricOS™ license management
 - Zone and Fabric merge
 - Flexible Control of firmware download
 - Backup and Restore fabric switch configs
- Uses Brocade Fabric Access API



SwitchName	authPrivSe	E_D_TOV	noClassF	multicast	unicastOnly	address	fcProbeDi	useCsCl
BaseLine	private	2000	0	7	0	0.0.0.0	0	0
web118	private	2000	0	7	0	0.0.0.0	0	0
shang3	private	2000	0	7	0	0.0.0.0	0	0
shang6	private	2000	0	7	0	0.0.0.0	0	0
web100	private	2000	0	7	0	0.0.0.0	0	0
web83	private	2000	0	7	0	0.0.0.0	0	0
shang1	private	2000	0	7	0	0.0.0.0	0	0
shang2	private	2000	0	7	0	0.0.0.0	0	0

Lower the Total Cost of Ownership

Fabric Manager – Status and Health Monitoring



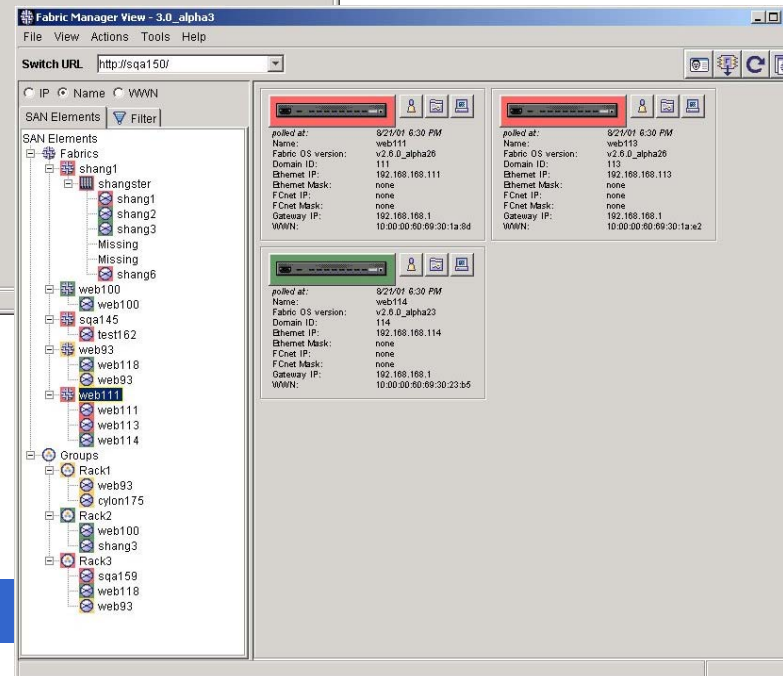
Fabric view focused

Multiple fabric intelligence

Multiple Icon view / Switch Status view

Real-time switch status indicators

Explorer tree & groups linked to statuses



Fabric Manager – License and Zone Merge Management

License Administration

License data obtained from switches

SwitchName	WWN	Feature	Key	Action	Location
test162	10:00:00:60:69:00:00:0e	Web; Zoning; SES; QuickLoop; Fabric;	zycbbeSSz0zdcc8	current	switch
test162	10:00:00:60:69:00:00:0e	Release v2.2;	bzSdQSSzR9c0TqSv	current	switch
test162	10:00:00:60:69:00:00:0e	Extended Fabric;	SdzzcQRyRTe00dd	current	switch
test162	10:00:00:60:69:00:00:0e	Fabric Watch; Release v2.3;	bzSdQSSzR9e0TsSz	current	switch
shang2	10:00:00:60:69:10:60:da	Release v2.2;	Rccd8ddeR9Sddqdy	current	switch
shang2	10:00:00:60:69:10:60:da	QuickLoop; Fabric;	RRSyZ9zycSSTz0z	current	switch
shang2	10:00:00:60:69:10:60:da	Web; Zoning; SES; Fabric Watch;	bRQ9RQy9R9eSR...	current	switch
shang6	10:00:00:60:69:10:63:4a	Release v2.2;	RSdyR9zcdySTeBTT	current	switch
shang6	10:00:00:60:69:10:63:4a	QuickLoop; Fabric;	9b9ycReQSAcAzdy	current	switch
shang6	10:00:00:60:69:10:63:4a	Web; Zoning; SES; Fabric Watch;	S9SQ9dQydyVATRAx	current	switch
shang3	10:00:00:60:69:10:63:4f	Release v2.2;	Rc9ceeRc9SSdAp...	current	switch
shang3	10:00:00:60:69:10:63:4f	QuickLoop; Fabric;	RRyYSQccebYSSTzTq	current	switch
shang3	10:00:00:60:69:10:63:4f	Web; Zoning; SES; Fabric Watch;	bRzdcRby9SeSe0dE	current	switch
web118	10:00:00:60:69:10:8f:01	Fabric;	Seeyz9R9QeTfz0G	current	switch
web118	10:00:00:60:69:10:8f:01	Release v2.2;	Rc9dRedRyR9SdAgTS	current	switch
web118	10:00:00:60:69:10:8f:01	Web; Zoning; SES; QuickLoop; Fabric; Remot...	RdSRbR99d9xeTS...	current	switch
web93	10:00:00:60:69:10:91:2e	Release v2.2;	RReSRRSdQeSSff...	current	switch
web93	10:00:00:60:69:10:91:2e	Web; Zoning; SES; QuickLoop; Fabric; Remot...	RRzzySeySzzS00TC	current	switch
web93	10:00:00:60:69:10:91:2e	Fabric;	Sbbcb9SbdTccd0z	current	switch
shang1	10:00:00:60:69:10:60:2a	Fabric;	SSScRdycezTtDsj	current	switch
shang1	10:00:00:60:69:10:60:2a	Release v2.2;	RQdRcbQyb9SRRee...	current	switch
shang1	10:00:00:60:69:10:60:2a	Web; Zoning; SES;	SyRdRzbQb9TzSeSf	current	switch
shang1	10:00:00:60:69:10:60:2a	QuickLoop; Fabric;	ybb9ybzczcAzo	current	switch
shang1	10:00:00:60:69:10:60:2a	Web; Zoning; SES; Fabric Watch;	SyRdRzbQb9VzSeSh	current	switch

Load from Switch Export to File Remove from Switch

Zone Merge

Zone info: Fabric1

- CFGs
 - EMCcfg (Enabled)
 - ECC_Manager
- Servers
 - Alpha
 - Beta
- c2
 - z2
 - z1
- c1
 - z1
- Zones
 - Alpha
 - SwitchPorts
 - WWNs
 - 10:00:00:e0:69:10:04:97
 - 20:00:00:20:37:00:a4:b0
 - 20:00:00:20:37:00:b5:a9
 - 20:00:00:20:37:0f:89:63
 - 20:00:00:20:37:00:a5:36
 - 10:00:00:e0:02:01:22:b0
 - Aliases
 - QuickLoops
 - Beta
 - SwitchPorts
 - WWNs

Zone info: Fabric9

- CFGs
 - test [Conflict: Type mismatch]
 - EMCcfg
 - ECC_Manager
- Servers
 - Alpha
 - Beta
- c2
 - z2
 - z1
- c1
 - z1
- Zones
 - Alpha
 - SwitchPorts
 - WWNs
 - 10:00:00:e0:69:10:04:97
 - 20:00:00:20:37:00:a4:b0
 - 20:00:00:20:37:00:b5:a9
 - 20:00:00:20:37:0f:89:63
 - 20:00:00:20:37:00:a5:36
 - 10:00:00:e0:02:01:22:b0
 - Aliases
 - QuickLoops
 - Beta
 - SwitchPorts

Disable CFG Remove conflict(s) Reset View Merged Results... Cancel

Audit and manage FabricOS™ licenses

Manage complex Merge operations

Zone and Fabric merge

Intelligent pre-merge checking

Fabric Manager – Firmware & Reboot Management

The screenshot displays three overlapping windows from the Fabric Manager software:

- Sequenced Reboot:** Shows a tree view of Reboot Groups (RBGroup1, RBGroup2) and a table of Rebooting switches. The table includes columns for IP Address, Switch Name, Firmware version, Reboot Group, and Status.
- Download Firmware:** Shows configuration for downloading firmware to Host Name B108932 using Remote User jjsosa via FTP. It includes a table of Selected Switches with columns for IP Address, Switch Name, Firmware version, and Status.
- Login Setup:** Shows configuration for User Id admin with Password *****. It includes a table of Selected Switches with columns for IP Address, Switch Name, Firmware version, Userid, and Status.

Buttons for 'Fastboot', 'Reboot', 'Create/Change Sequence...', 'Login Setup...', 'Abort', 'Close', and 'Download' are visible at the bottom of the windows.

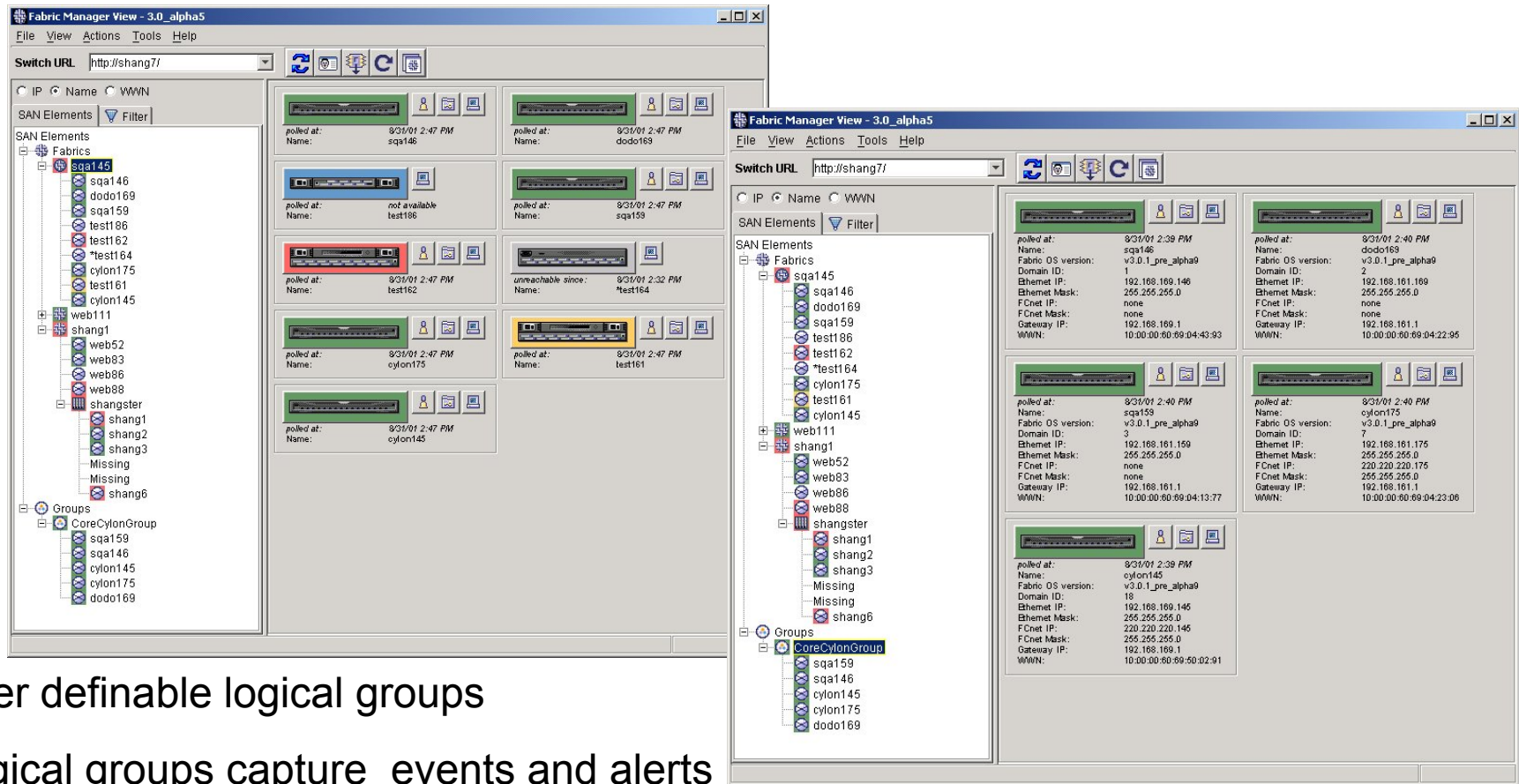
Flexible control of Firmware download

Reboot sequencing control

Full control of reboot after firmware download

Manage login passwords on all switches centrally

Fabric Manager – Powerful Grouping Control

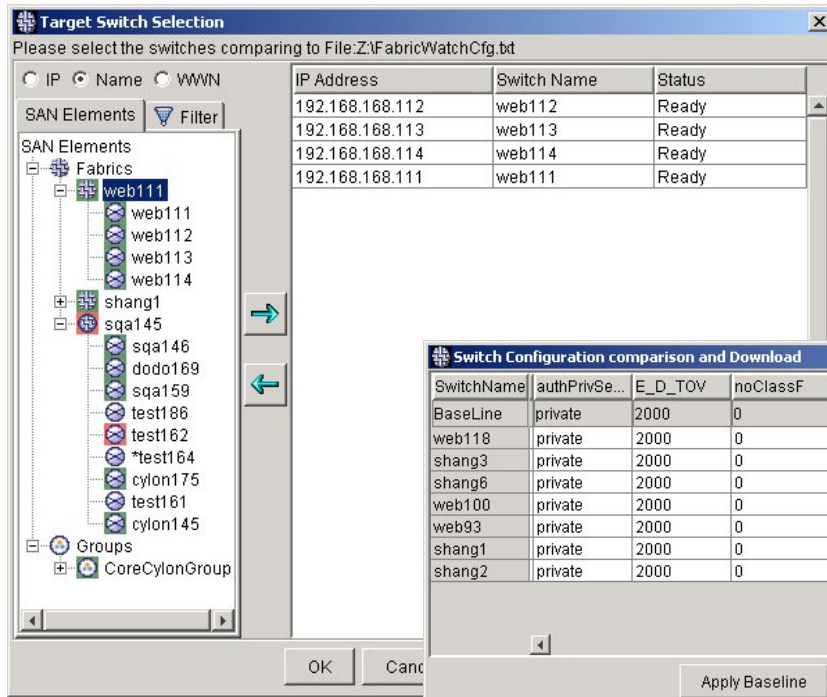


User definable logical groups

Logical groups capture events and alerts

Groups can be used for Active management control
(firmware, reboots, cloning etc)

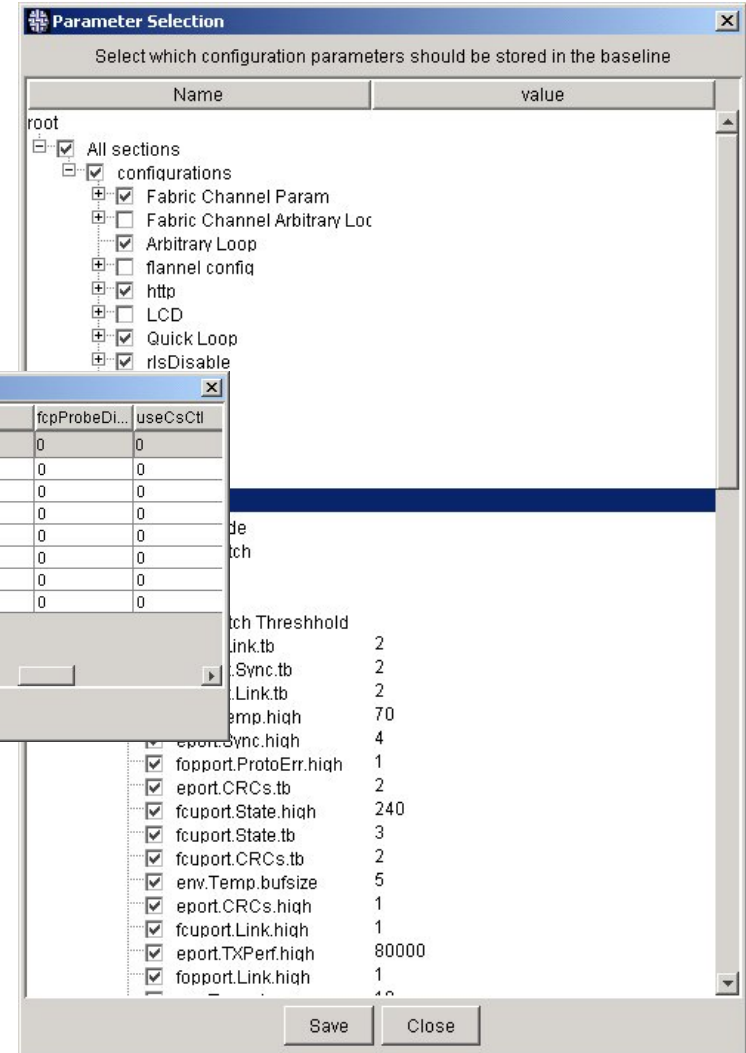
Fabric Manager – Cloning and Fabric Backup Control



Switch Configuration comparison and Download

SwitchName	authPrivSe...	E_D_TOV	noClassF	multicast	unicastOnly	address	fcpProbeDi...	useCsCtl
BaseLine	private	2000	0	7	0	0.0.0.0	0	0
web118	private	2000	0	7	0	0.0.0.0	0	0
shang3	private	2000	0	7	0	0.0.0.0	0	0
shang6	private	2000	0	7	0	0.0.0.0	0	0
web100	private	2000	0	7	0	0.0.0.0	0	0
web93	private	2000	0	7	0	0.0.0.0	0	0
shang1	private	2000	0	7	0	0.0.0.0	0	0
shang2	private	2000	0	7	0	0.0.0.0	0	0

Apply Baseline Print Report Cancel



User definable snapshot profiles

Backup and restore fabric switch configurations

Clone profiles and deploy to fabric switches

Compare and audit config profiles

Secure Fabric OS™ Management

The screenshot displays the Security Admin interface. The main window is titled "Security Admin" and contains several tabs: "Management Access Controls", "Device Connection Controls", "Options", "Switch Connection Controls", and "Fabric Configuration Servers". The "Fabric Configuration Servers" tab is active, showing an "Available Switch List" on the left and an "FCS Switch List" on the right. The "Available Switch List" shows a tree view of SAN Elements, including a "Fabric" named "web111" with sub-elements "web111", "web112", "web113", and "web114", and other elements like "shang1", "sqa145", and "web123". The "FCS Switch List" contains the MAC address "10:00:00:60:69:30:24:ab". Buttons for "Add FCS >", "Add Others >", and "< Remove FCS" are visible. At the bottom of the main window are "Activate", "Save", and "Cancel" buttons.

Overlaid on the main window is a "Security Policy Review. PLEASE READ CAREFULLY!" dialog box. It contains the following text:

Security Policy: FCS - switches trusted to originate fabric operations

You have elected the following switches as Fabric Configuration Servers(FCS) for this fabric. FCS switches are trusted to originate fabric wide operations such as those for Zoning, Security Policies and SES commands.

10:00:00:60:69:11:f8:b9 PRIMARY FCS Switch
10:00:00:60:69:11:fa:9b

Security Policy: RSNMP - clients permitted SNMP read-only access

You have granted RSNMP access exclusively to the following endpoints. Note: A zero ('0') in any IP address position is a wildcard for any legal value applicable to that position. For example 0.0.0.0 represents all IP

Buttons for "Continue", "Cancel", and "Copy to file" are at the bottom of the dialog box.

Secure FabricOS™ management

Security Policy control & deploy

Security audit & reporting

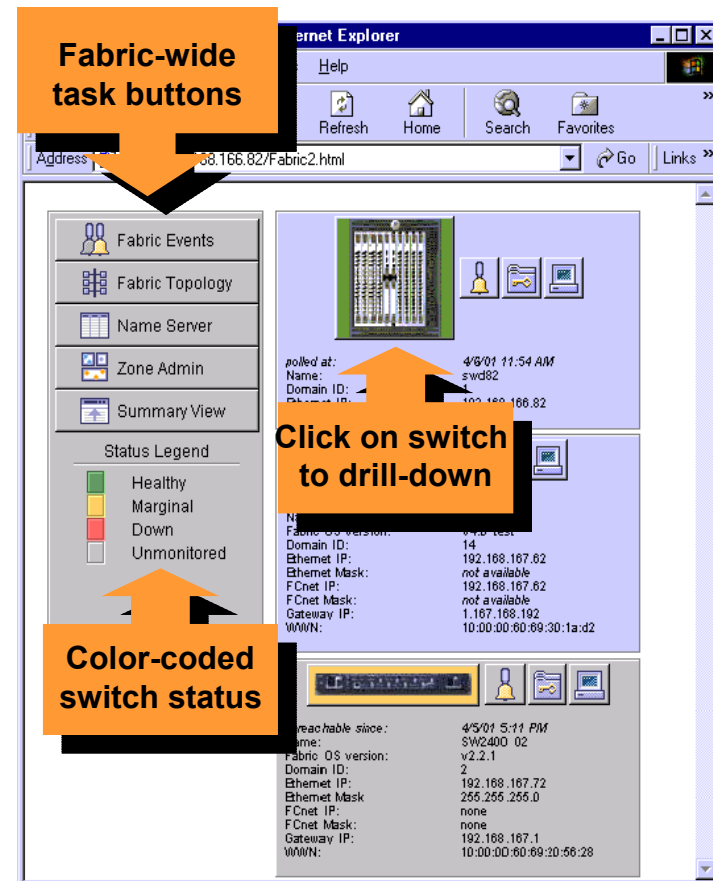
Multi personality (manage secure & non-secure

FabricOS SANs from a single console)

Brocade Web Tools TM

Simplified Fabric Administration

- Easy-to-use Web-based tool
- Lives in switch, self delivered
- Configuration and administration of single switch or small fabrics
- Enables management of any switch in the fabric from a single access point
 - Drill down to single switch and port-level details
- Fabric-wide tasks such as zoning, events and name services
- Telnet direct launch-point
- Fabric WatchTM launch-point
- Integrated with Fabric Manager



Brocade WebTools – Administration View

The image displays five overlapping screenshots of the Brocade WebTools administration interface, each with a blue arrow pointing to a specific function:

- Switch Administration:** Points to the top navigation menu and the 'Switch Name' field in the first screenshot.
- Configuration Up/Down load:** Points to the 'Configuration File Upload/Download for Switch SW2800_01' section in the second screenshot.
- License Administration:** Points to the 'License Key Administration on switch SW2800_01' section in the third screenshot.
- SNMP Administration:** Points to the 'SNMP System Configuration' section in the fourth screenshot.
- Firmware Upgrades:** Points to the 'Firmware Upgrade (Flash Download) on Switch SW2800_01' section in the fifth screenshot.

Brocade WebTools – Switch View



Real-time web browser display of switch status

Easy button access to most common tasks such as admin, Performance & events

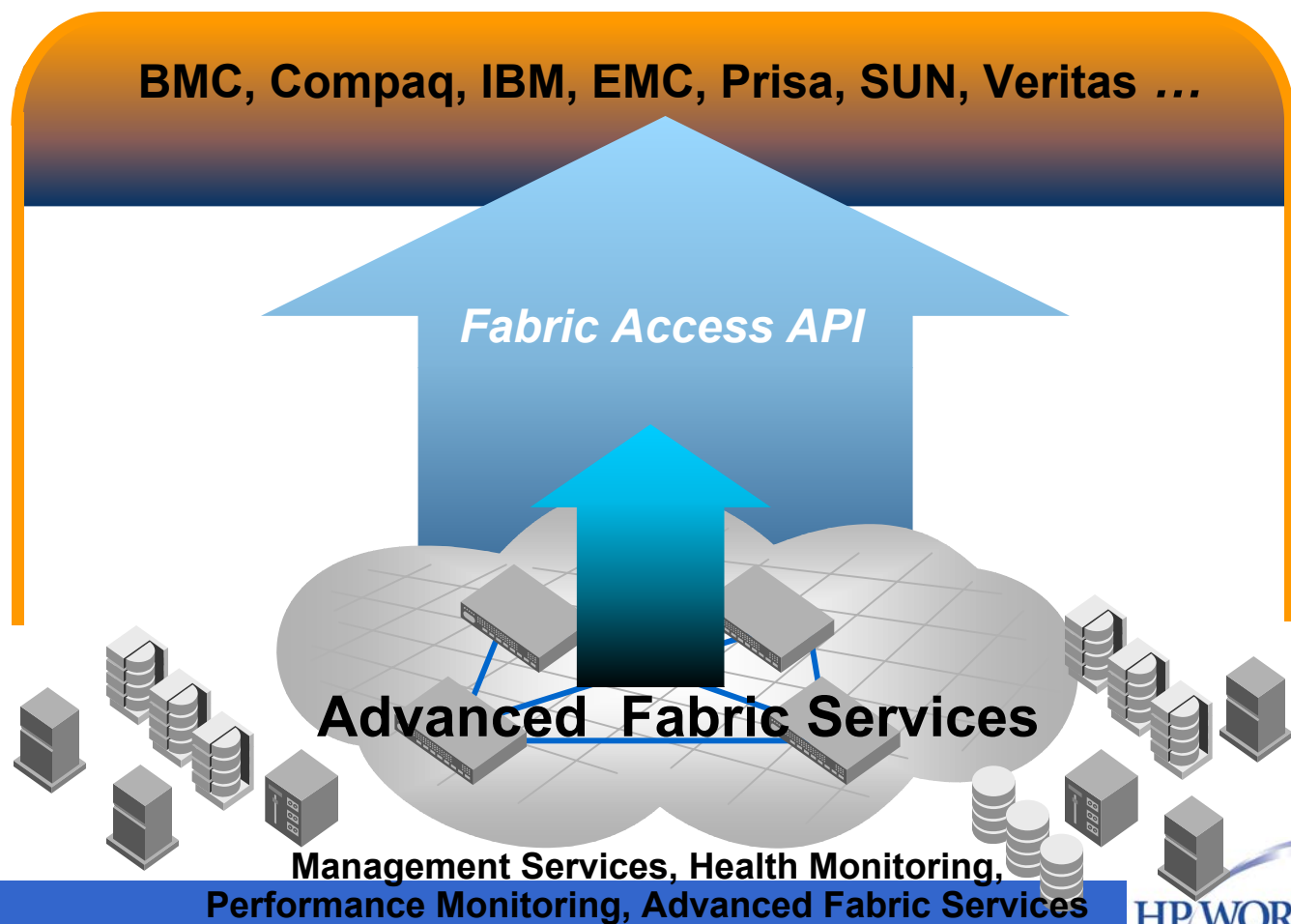


Environmental Status



Enabling SAN Management: Fabric Access API

End to End Storage/SAN Administration: Integrate Brocade SAN management with higher-level management applications



Fabric Access 2.0 *New*

Available Now

Physical Discovery - Provides information about Fabric components (Fabrics, switches, HBAs, storage).

Zoning Discovery and Control - Full interface to discover and control zone information.

Performance - Access to port performance and error statistics.

Logical Discovery - Allows applications to discovery path information. Can be easily combined with port information for route analysis.

Switch and Port Control - Control of ports and switch functions.

Events - Provides reliable information about any change in the SAN

Fabric Watch™ Thresholding Control - Allows the application to distribute tasks to the switch

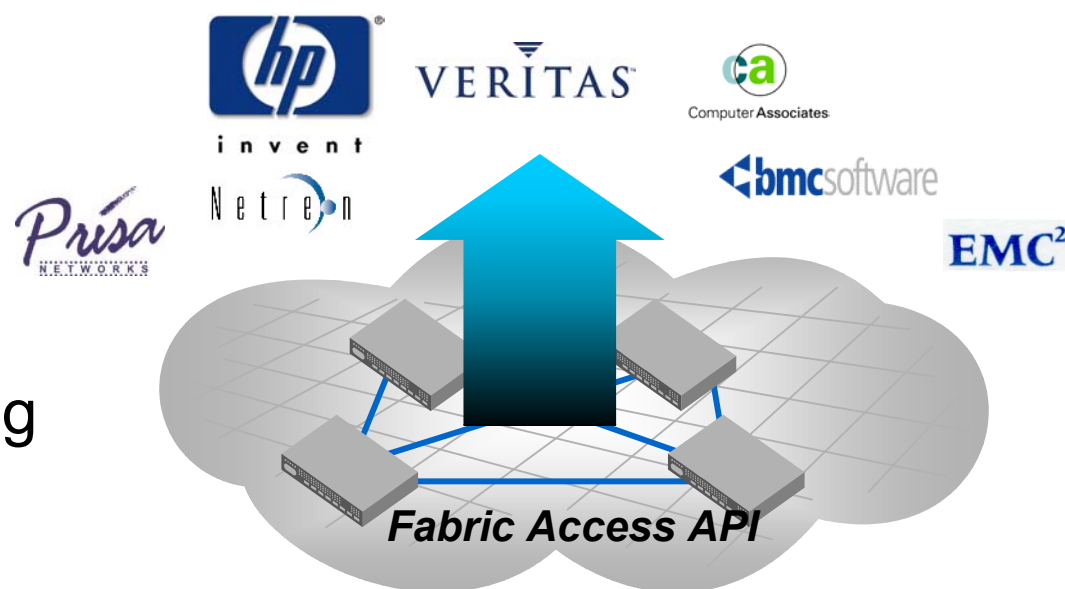
Security - Enables applications to manage Secure Fabric OS policies

Switch Configuration and Firmware Download - Full access to switch configuration facilities

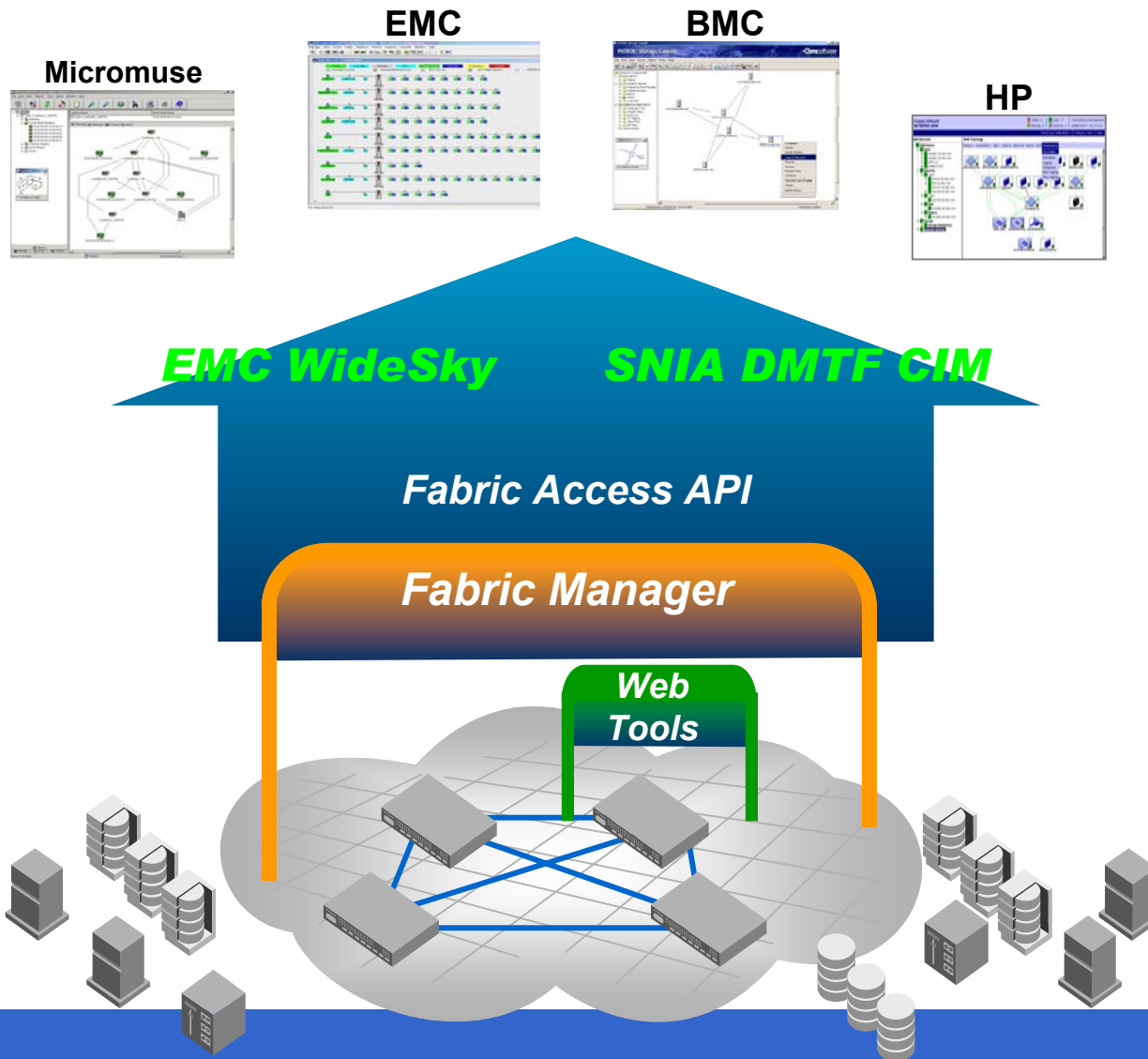
Fabric Access API Partners: Delivering Solutions

- Applications are being developed to the Fabric Access API that span the management needs of customers, including:

- Visualization
- SAN Design
- Event Management
- Automatic Provisioning
- SAN Configuration
- Security
- Performance Management
- Capacity Planning



Setting the Standard for Open APIs

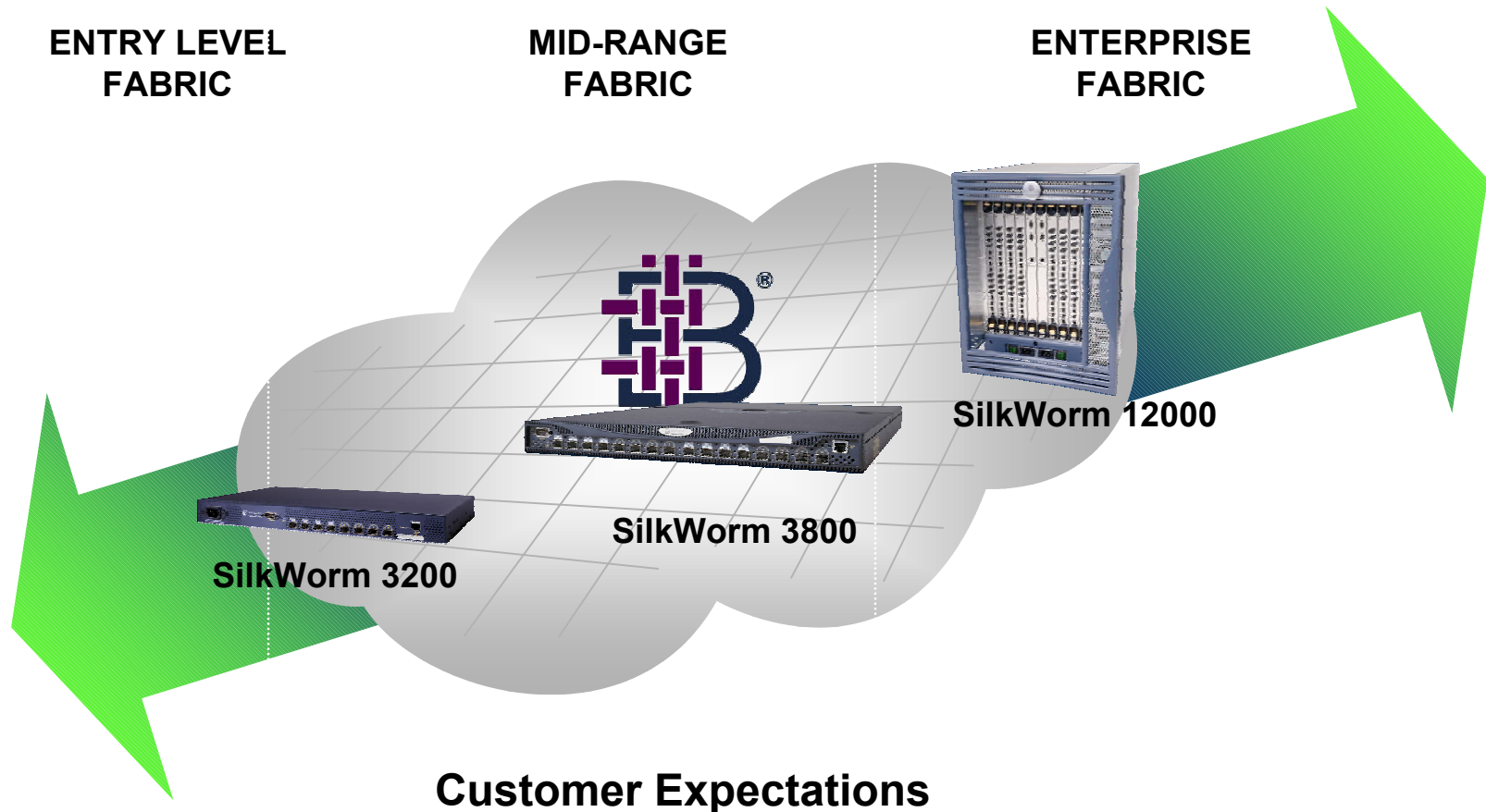


- **API Extension**
 - Persistent Objects
 - Event filtering
 - Object Query
 - Access HBA info
- Accelerate partner application design
- Enable policy-based management
- Compatible with emerging industry standards

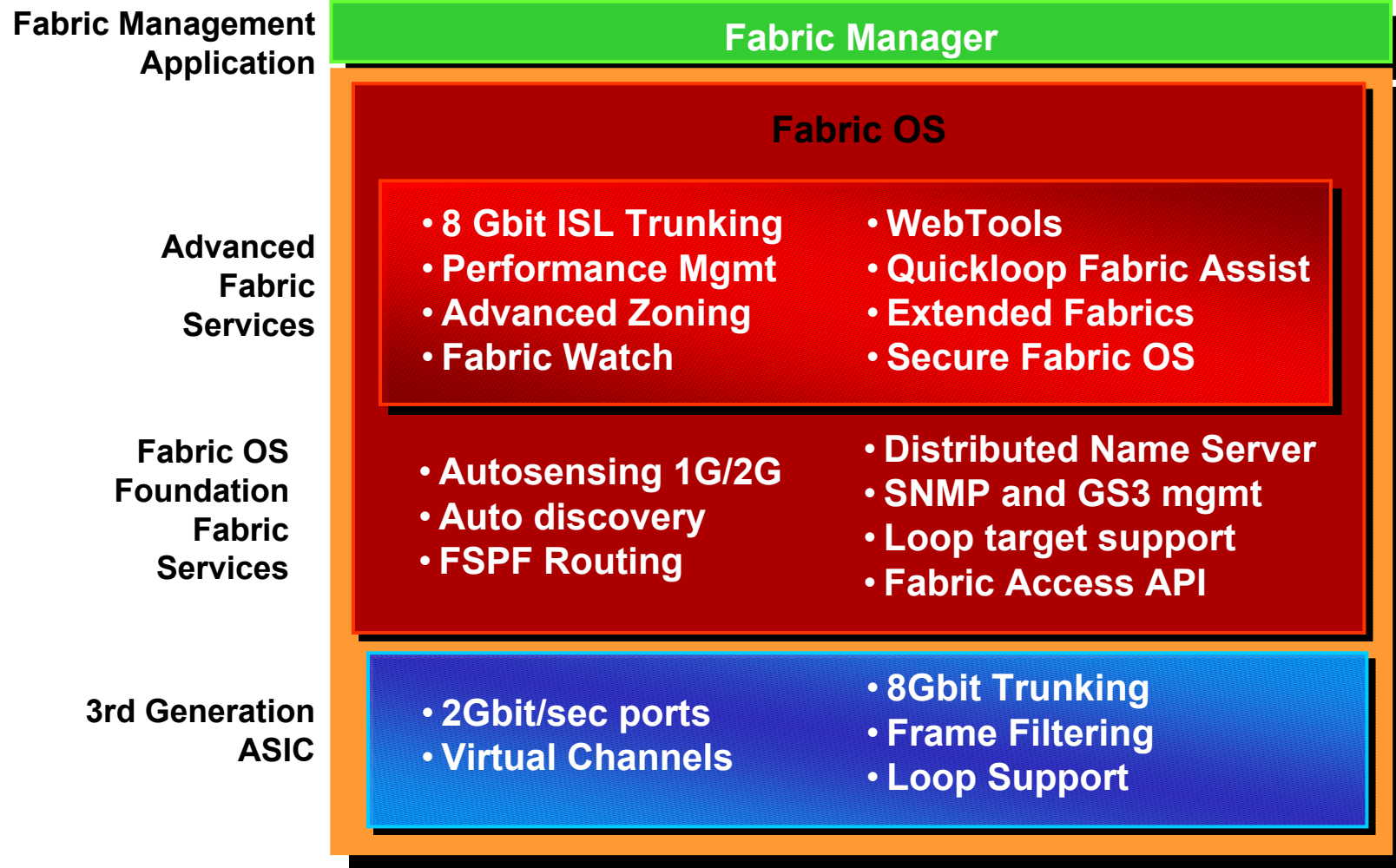
Summary

An Intelligent Platform for the Entry Level to Enterprise

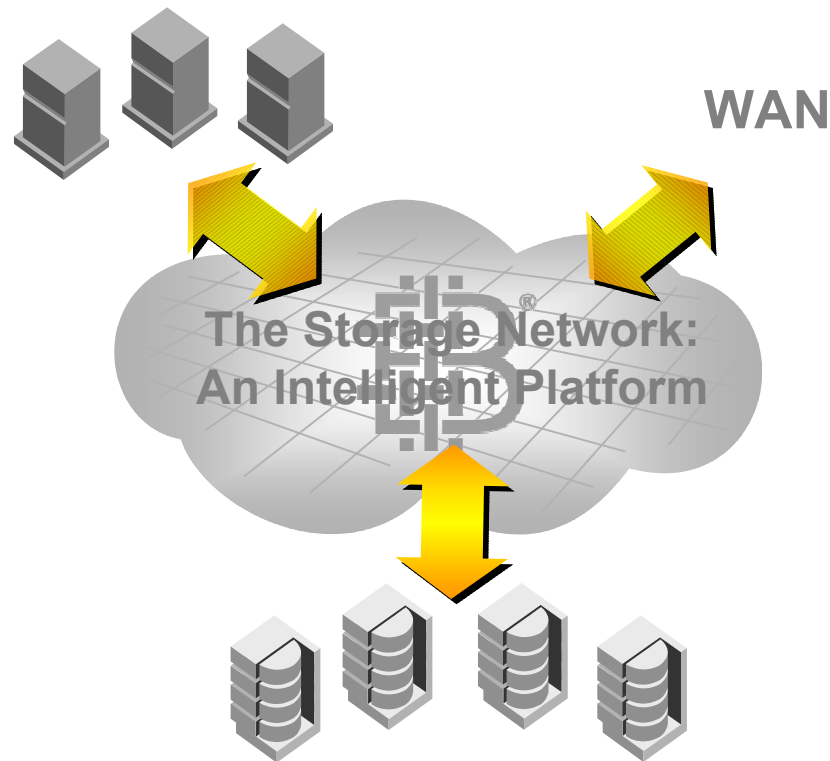
A Family of Solutions for all SAN Needs



Foundations of Intelligence



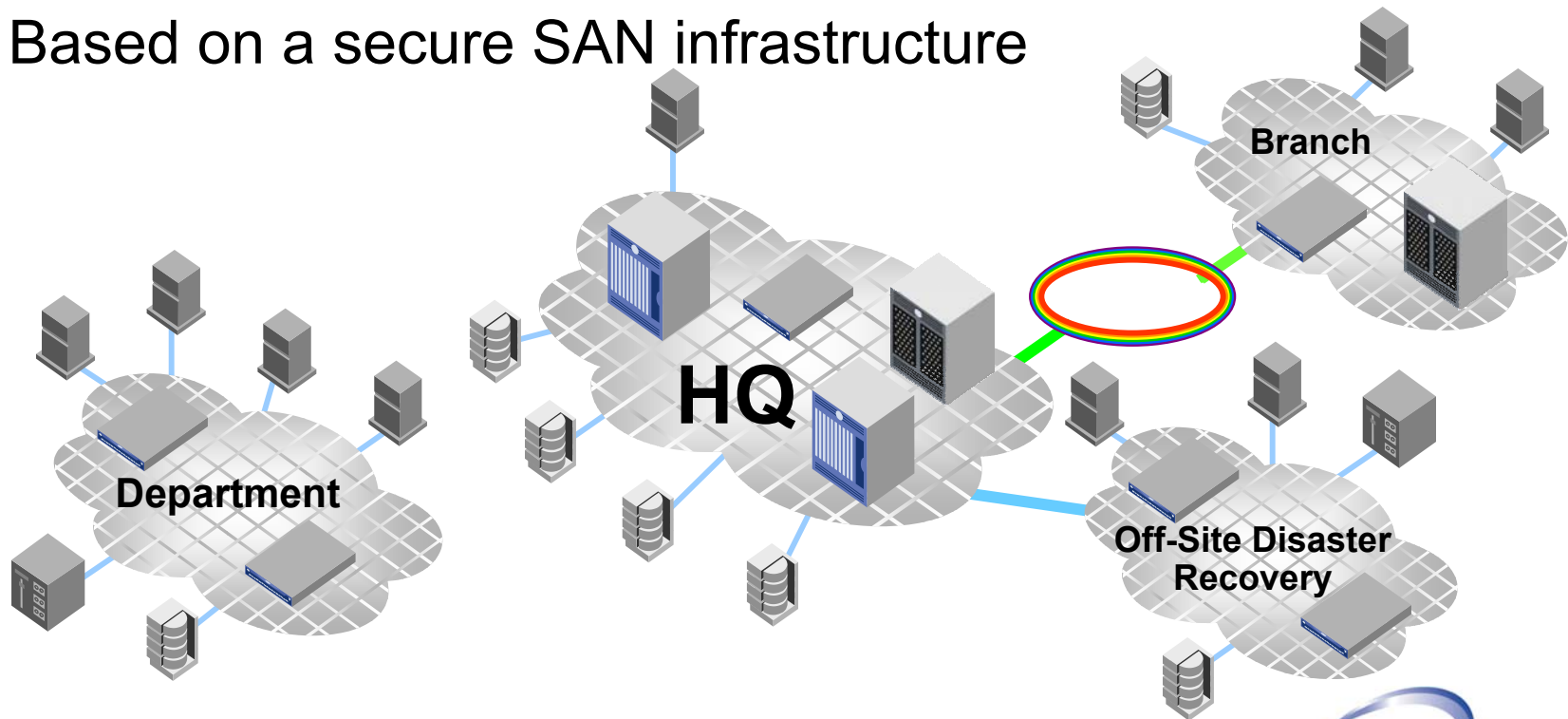
Extending the Intelligent Platform for Networking Storage



- **Storage Virtualization**
- **SAN Subnets**
- **Intelligent QoS**
- **Next-generation SAN security**
- **Expanded Open API**
- **Extensible Switching Platforms**

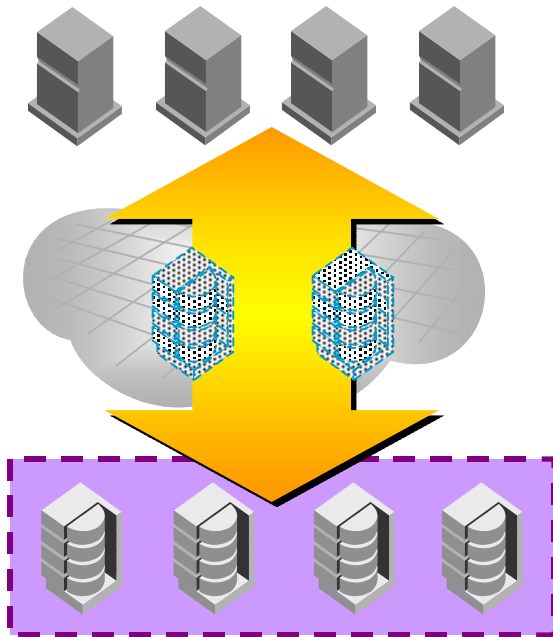
Brocade: The Intelligent Platform for Networking Storage

- Highest availability through a networking model
- A platform for business continuance and storage applications
- Simplifies administration and management
- Based on a secure SAN infrastructure



Future Direction

Advanced Fabric Services *Directions*: Switch Based Storage Virtualization



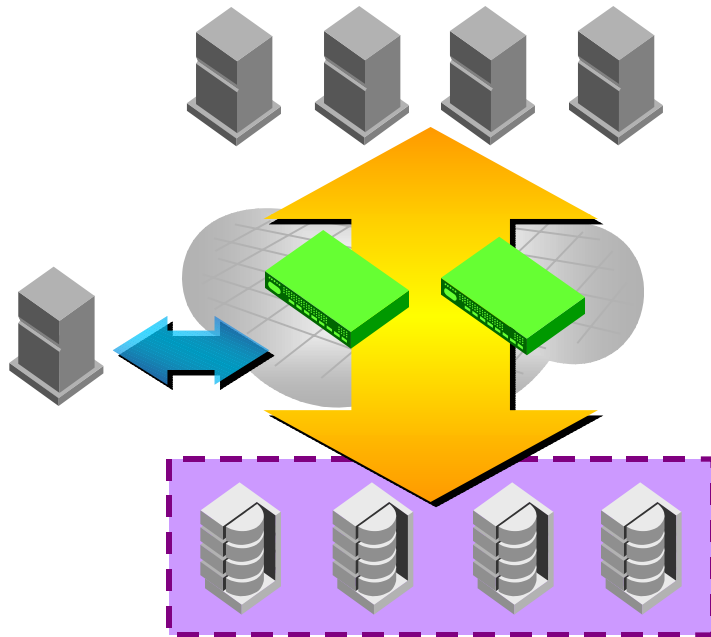
Storage Virtualization creates logical pools from physical storage

- Allows applications to see “virtual” disk volumes
- Translates “virtual” volume access to physical volume access
- Liberates applications from physical storage configuration limits

Benefits:

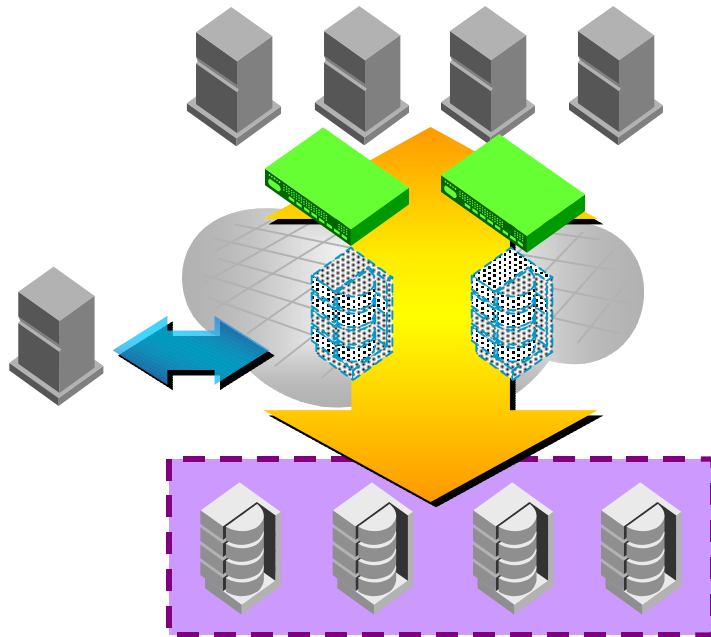
- Seamless expansion of application data across storage arrays
- Optimal use of storage resources
- Instant allocation of new storage
- Online migration of data

Switch-based Virtualization Platform



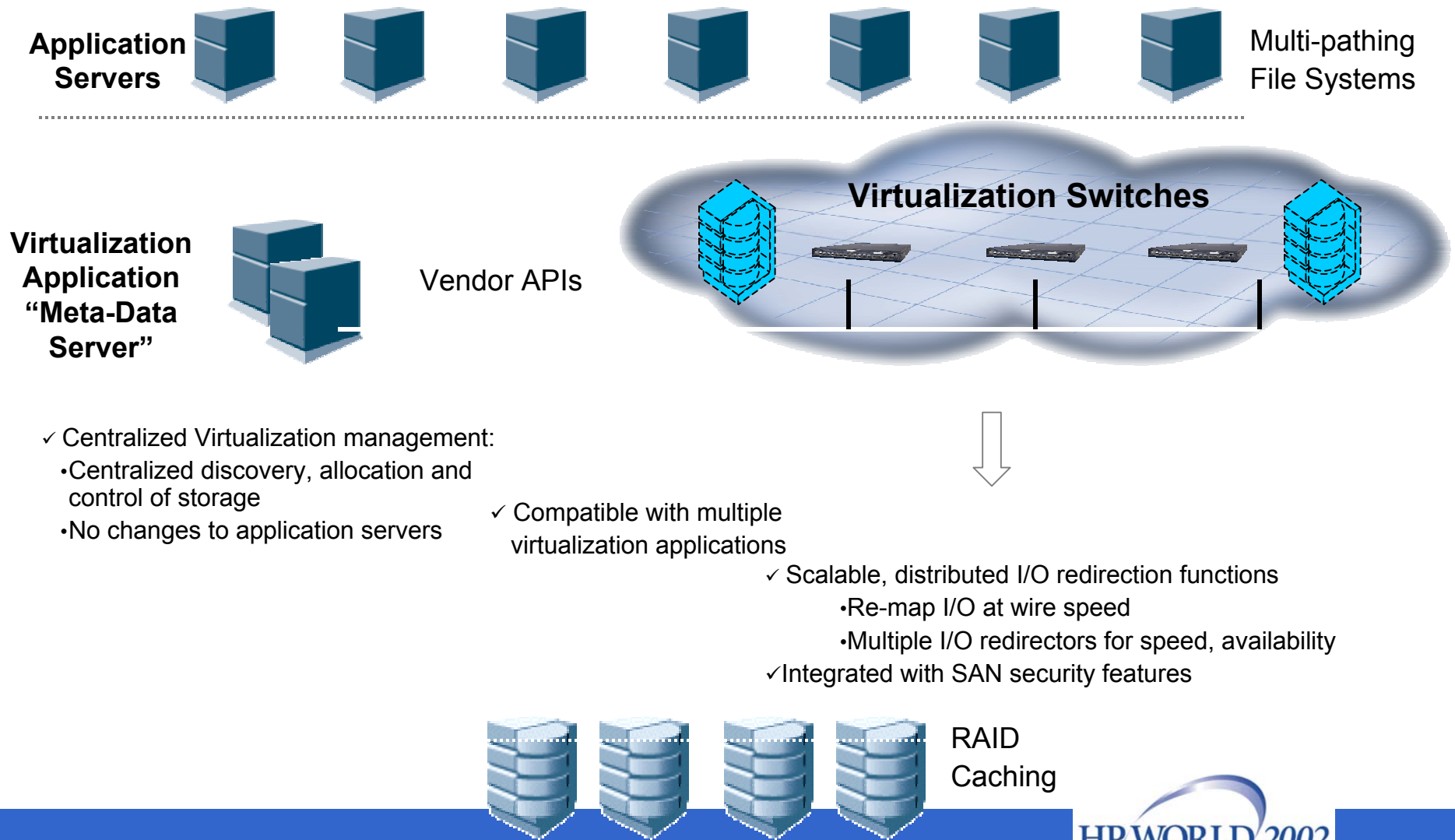
- **Switch-based virtualization provides distributed, high-performance virtual-physical translation**
- **Centralized management and security reduces effort and complexity**
- **Complements host or array-based virtualization**
- **Enables reduced server and O/S administrative complexity**
- **Scalable foundation not limited by host or storage device, but rather the networkability of the switch fabric**

Brocade Switches Optimized for Distributed Storage Virtualization



- Brocade switches will enable high-performance, highly scalable fabric-based virtualization
- Integrated, wire-speed virtualization in a fabric switch
- Enabler for OEM and third-party virtualization applications
 - Centralized management, security
 - Distributed data path
- Compatible with multiple virtualization applications
- Highly scalable
- Integrated with Brocade Advanced Fabric Services
- Compatible with installed base of 1.5 million SAN ports

Fabric-based Virtualization Functions



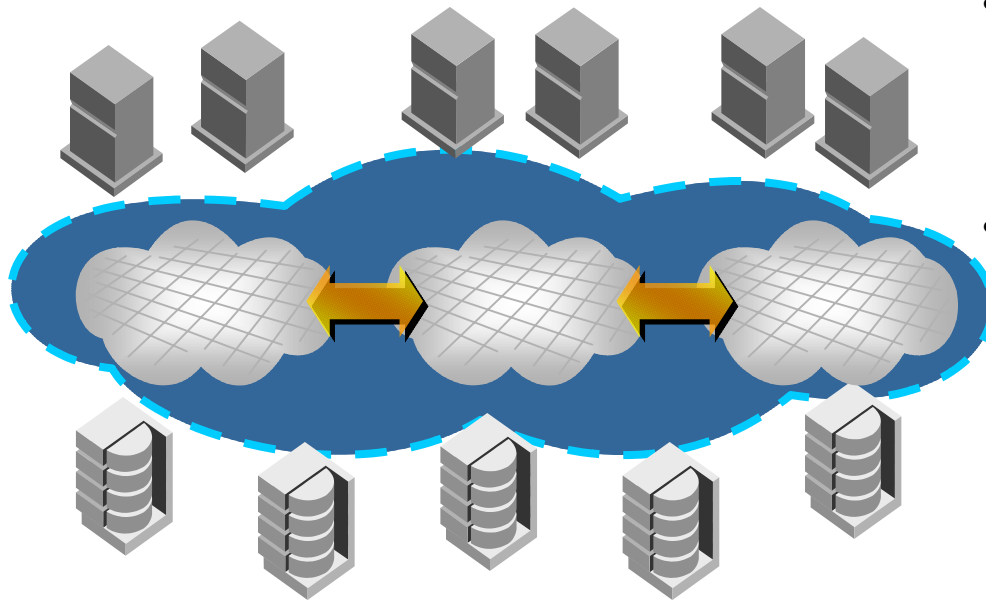
- ✓ Centralized Virtualization management:
 - Centralized discovery, allocation and control of storage
 - No changes to application servers

- ✓ Compatible with multiple virtualization applications

- ✓ Scalable, distributed I/O redirection functions
 - Re-map I/O at wire speed
 - Multiple I/O redirectors for speed, availability
- ✓ Integrated with SAN security features

Advanced Fabric Services *Directions:* Inter-Fabric Switching

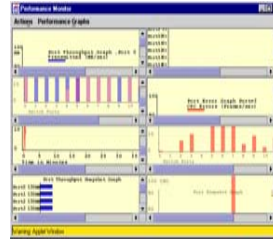
SAN Subnetting



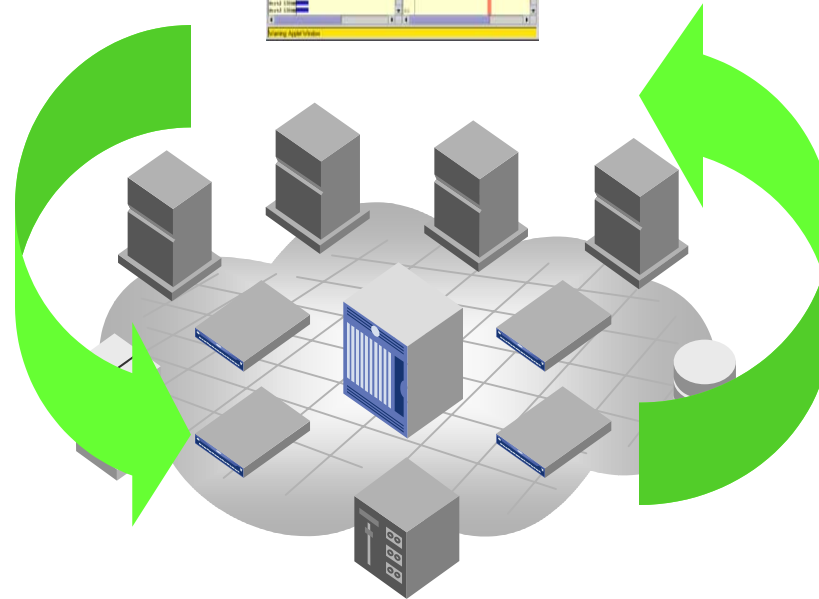
Accelerating Corporate SAN Growth

- SANs start as small networks
 - Project specific
 - Different storage vendors
- Barriers to merging project SANS
 - Organizational
 - Vendor support
- Inter-Fabric Switching
 - Allows selective connectivity between separate SAN islands
 - Shares resources at wire speed
 - Maintains separate management and support domains
- Servers see single “Virtual” Fabric
- Ensure seamless growth while protecting existing investments

Advanced Fabric Services *Directions*: Intelligent Network Quality of Service (QoS)



Partner application controls
network usage based on policy



Performance
monitoring provides
real-time and
historical usage
trends

- *Optimize application performance*
- *Optimize network asset utilization*
- *Meet service level agreements*

Thank You

Brocade Communications Systems,
Inc.