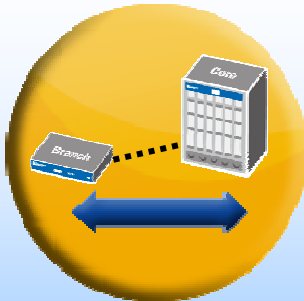


**Reduce Complexity, Achieve
Operational Excellence, and
Deliver Dynamic Services**

Rajat Upadhyay- SANOG 15 -28th January 2010

JUNOS Software: The Power of One

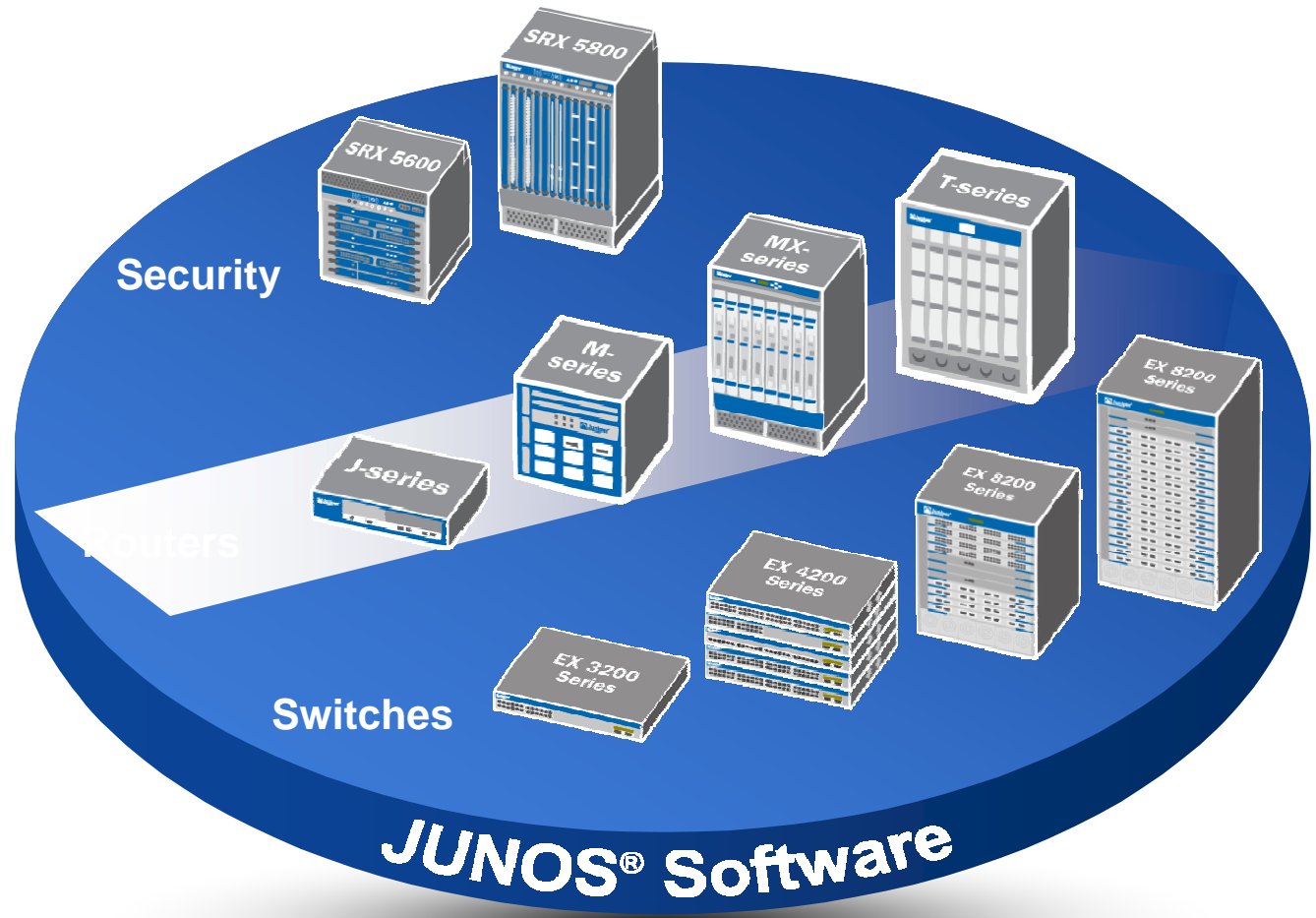
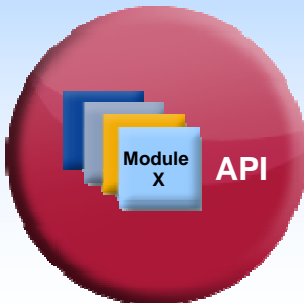
One OS



One Release

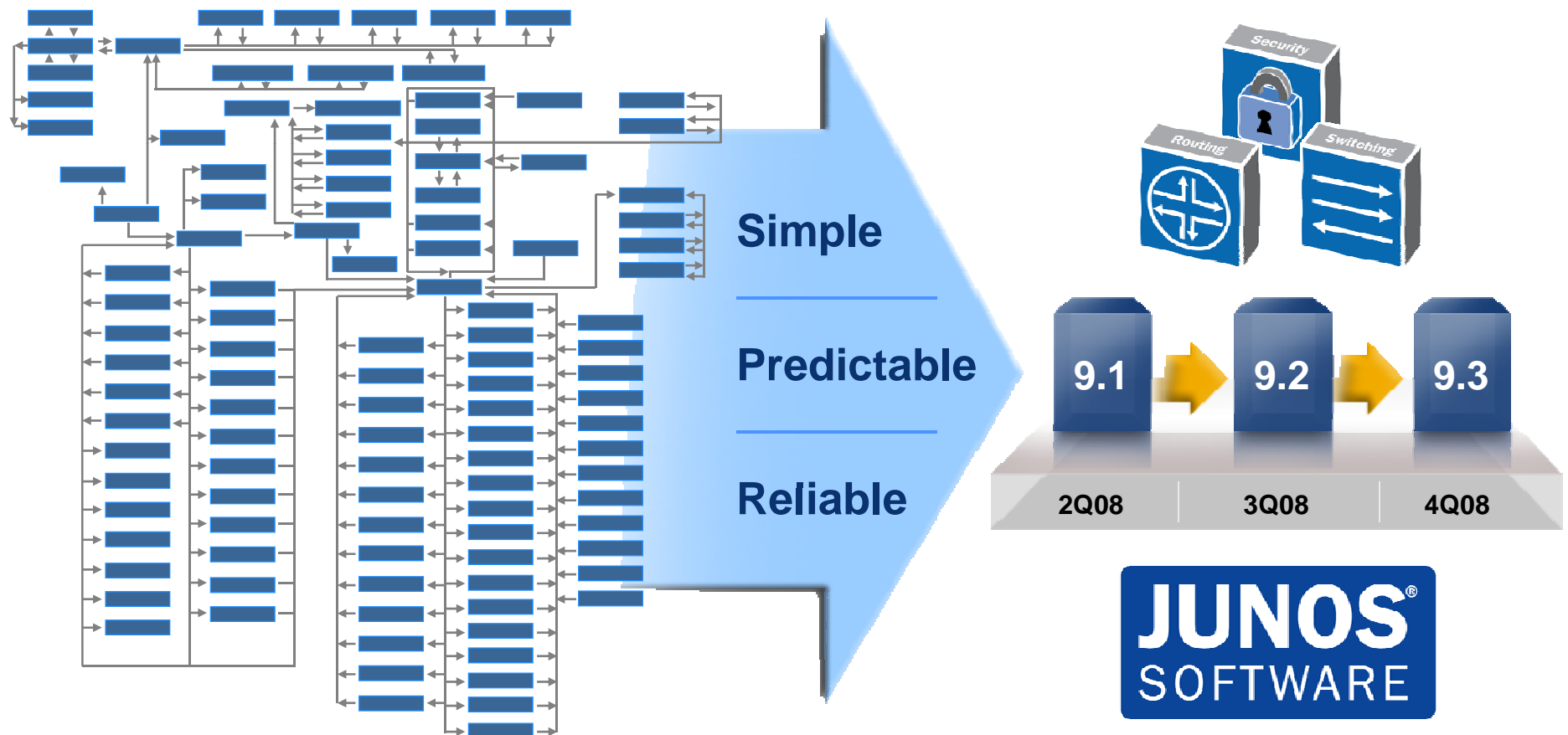


One Architecture



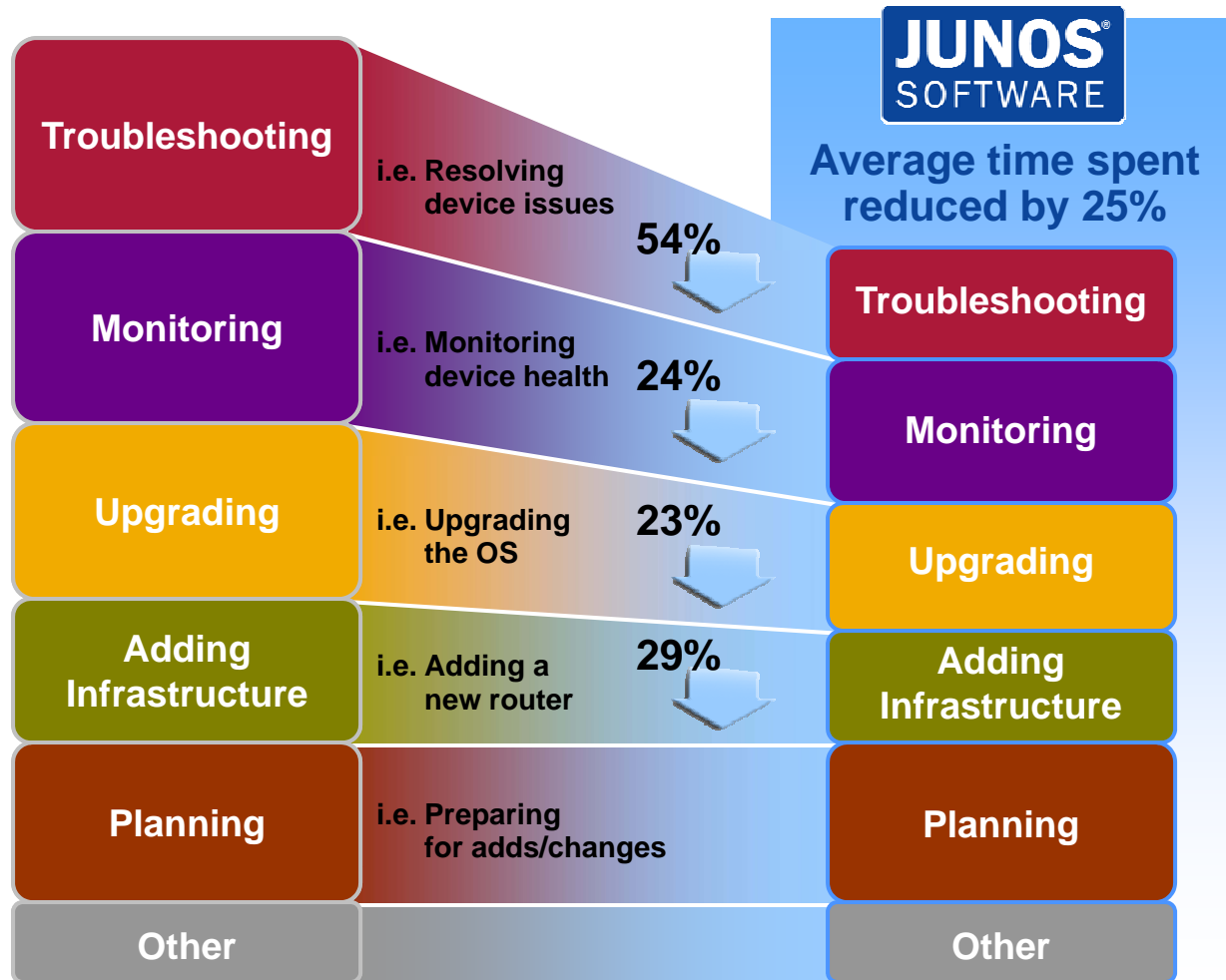
Reduce Complexity

Ten Years on Time, Stable Release Delivery



JUNOS Software Operational Savings

Reduce the Time and Cost of Operating the Network



How Operating Systems Create Network Efficiency
 Lake Partners 2007 survey report of 122 cross-industry ops leaders. See full report at: <http://www.juniper.net/lakepartners>

Achieve Operational Excellence

Improves the Availability, Performance, and Security of Business Applications



- Run wirespeed
- Activate features, keep performance
- Scale both integrated security and networking with performance



- Automatically prevent configuration errors
- Speed response and proactively avert issues
- Reduce time of maintenance and upgrades



- Architectural design and integrity
- System testing in breadth and depth
- Fix once, fix right
- Rapid response of Security Incident Response Team

Economic Case Study

Philadelphia Stock Exchange



■ Challenges

- Evolve to a completely electronic trading environment while ensuring optimal application performance, minimal latency and compliance with regulations
 - Significant organic growth in transactions resulting in latency slowdowns
 - SEC's overhaul of the national market systems (Reg. NMS)
 - Planned shift to "Penny" priced options that leads to significant growth in options messaging and trading traffic

■ Solution

- PHLX expanded its network by augmenting its single data center with the addition of virtual data centers near the metropolitan N.Y.C. financial district
- M320s provide private network infrastructure on fiber

■ Benefits

- Consolidation of services into a single, common environment
- Employ many fail-safe mechanisms for fast recovery
- Optimized reliability, performance, security and scalability
- Simplified management with JUNOS

Customer Case Study

Actual Customer Network Results

- **Network Operations**
 - 75% improvement in Network Management efficiency
 - 3 headcount can be re-tasked to planning and engineering from remote site monitoring/troubleshooting
- **Reliability: 99.9999887%**
 - Voice network reliability (35 seconds of downtime)
 - High customer satisfaction and retention
- **Latency**
 - Up to a 50% improvement with Juniper
 - More applications, more revenue potential
- **Self-Healing**
 - 5 to 10 Milliseconds
 - Higher customer satisfaction and retention
- **Easy to Grow**
 - 75% reduction in time to add capacity (from weeks to hours)
 - Improve revenue attainment and customer satisfaction
 - Lowers OPEX, improves operating margins



http://www.juniper.net/solutions/customer_profiles/phlx_case_study.pdf

Reduce Complexity, Achieve Excellence

Reduce Risks

- **Continuous Systems Availability**
 - Improve network availability and delivery of applications/services

Network Availability Metric	Average Decrease*
Frequency of Unplanned Events	↓ 24%
Duration of Unplanned Events	↓ 30%

Decrease Cost & Complexity

- **Automated Operations Efficiency**
 - Streamline operations, enhance efficiency, and lower TCO

Network Efficiency Metric	Average Time Saved*
Troubleshooting	↓ 54%
Monitoring	↓ 24%

Increase Speed of Change

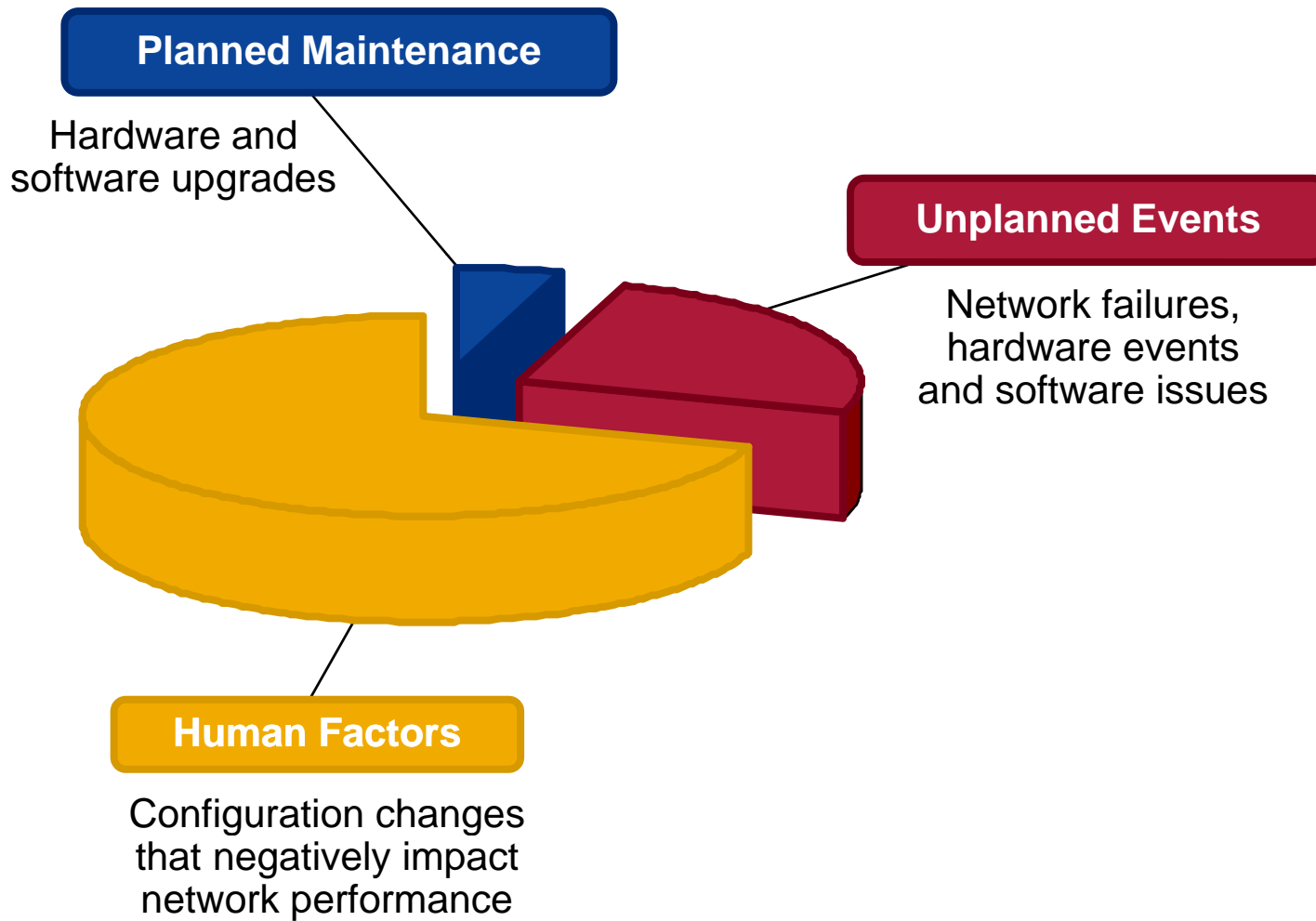
- **Open Innovation Flexibility**
 - Provide the flexibility to meet changing business requirements

Network Flexibility Metric	Average Time Saved*
Upgrading	↓ 23%
Adding Infrastructure	↓ 29%



Continuous Systems

Continuous Systems Availability



Planned Events

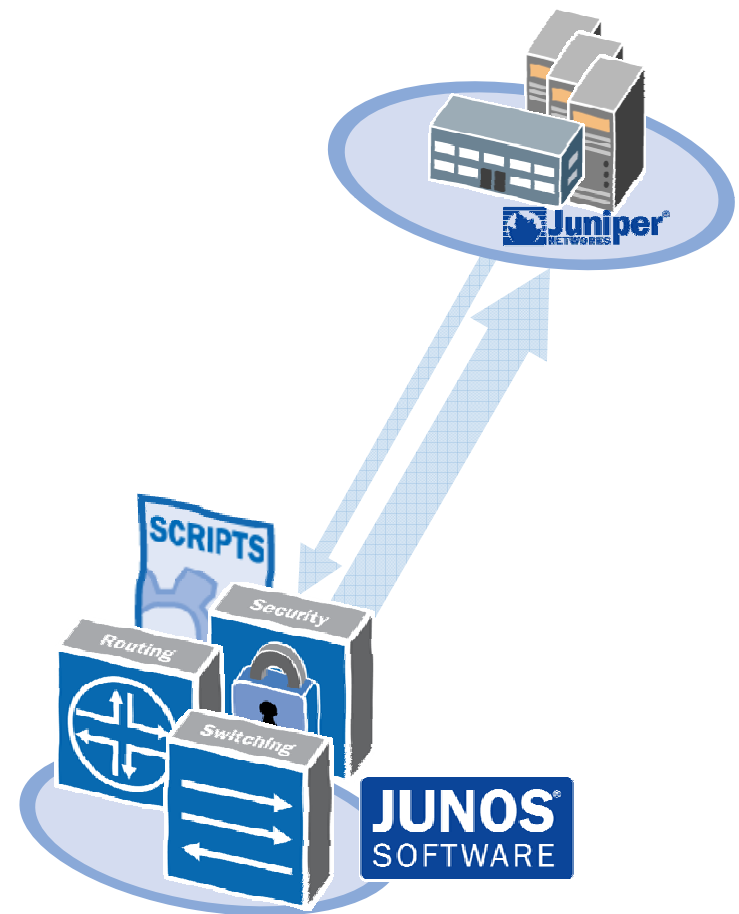
- **Stable releases reduce the number of fixes and the time required for upgrades**
 - Extensive system testing in depth and breadth
 - Fix once, fix right
 - Whole, tested system updates
 - Proactively manage change control
- **Unified in-service software upgrades (ISSU) available in high-end routing platforms**
 - In-service migration of one JUNOS release to another
 - Upgrade path available from one supported release to another
 - Upgrade of entire system preserves full integrity of quality and regression testing
 - Minimize upgrade time and risk



9.x → 9.y

Unplanned Events

- **Resiliency and recovery**
 - Rapid detection of failure
 - Transparent hardware failover
 - Self-healing of networks
 - Link and network layer mechanisms
 - Host to network mechanisms
- **Proactive and early response**
 - Extensive on-box instrumentation
 - JUNOScript Automation
 - Event policies and scripts automate detection
 - Op scripts speed and automate response
 - Advanced Insight Solutions support services
 - Automated incident management and proactive analysis assistance



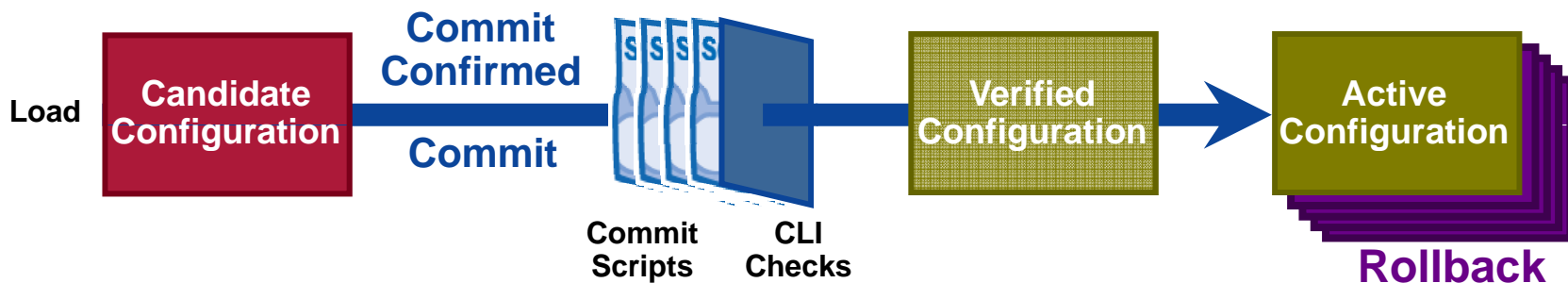
Human Factors

■ JUNOS Features

- Changes made to candidate
 - Commit verifications check file
 - No changes made until full configuration is ready
- Hierarchical command structure
 - User-defined variables, such as policies, for consistent re-use
 - Command completion + extensive set of help tools
- Commit scripts customize checks and verifications
 - Macros minimize line entries
- Commit confirmed automates rollback
- Rollback restores up to 50 configs

■ Benefits

- Avert downtime caused by configuration errors
- Reduce time for configuration and changes
- Enforce compliance to policies
- Avoid risks of transient configuration state



Automated Operations

Automated Operations Efficiency

JUNOS CLI

- Telnet, SSH
- Commit model
- JUNOScript: automated configuration, operations



J-Web

- Quick setup with templates
- Dashboard view
- Performance monitoring



Juniper NSM

- Discovery & configuration
- Policy management
- Inventory management
- Log management



Juniper AIS

- Integrate dynamic service intelligence
- Automate the delivery of tailored and proactive support services



■ Reduce configuration effort and issues

- Use consistent and user friendly command-line and management tools for error-resilient configuration with commit/confirm/rollback as well as automated configuration with commit scripts

■ Simplify day-to-day operations

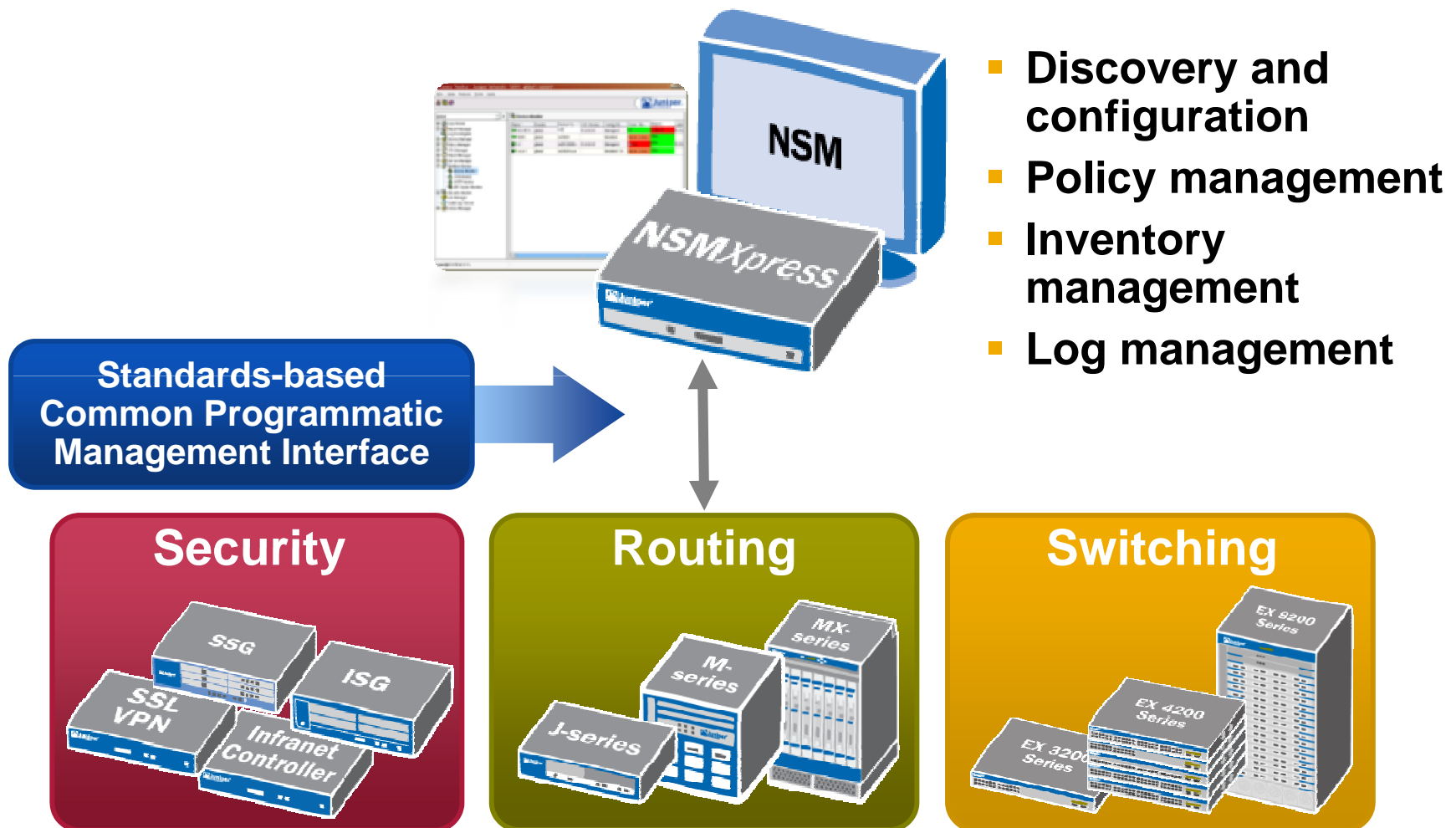
- Customize and automate monitoring and health checks with extensive instrumentation, automation scripts, open integration to existing tools, and more
- Use one management system – Juniper NSM – to manage security, switching and routing platforms

■ Speed problem identification and resolution

- Automate finding and proactively resolving issues from the first, leading indicators with robust logging, op scripts, event policies, Advanced Insight Solutions technical support services, among others

NSM Management Platform

Network and Security Manager Spans Juniper Networks Portfolio



JUNOS System Health

■ Monitoring

- Real-time Performance Monitoring (RPM) probes
- Flow accounting
 - cflowd and rich filtering
 - Active monitoring, passive monitoring, port mirroring
- Health monitor and RMON
- Op scripts

■ Diagnostics

- System logging
- Traceoptions to flag events for all protocols
 - Safe to use; Forwarding performance uses different resources
- Packet capture with real-time tcpdump
- Event policy calls to op scripts



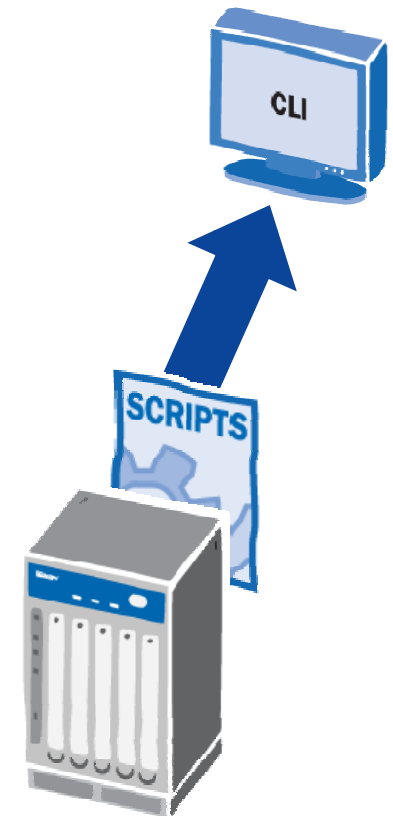
JUNOScript Automation

■ Commit Scripts

- Prevent human error in configuration
- Enforce compliance to your operations policies and procedures
 - Accept, reject, modify or generate message
- Macros minimize line entries

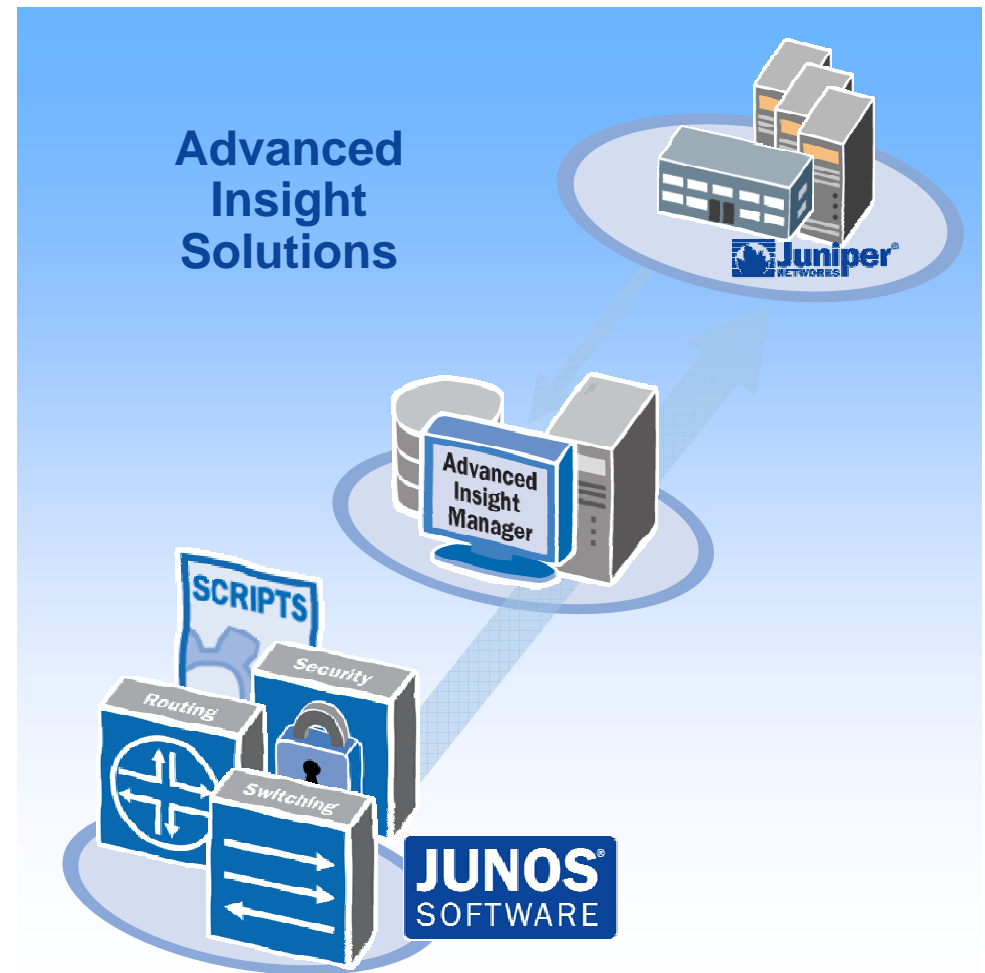
■ Op Scripts and Event Policies

- Build custom operational commands
- Automated remediation steps/guidance
 - Notifications, further diagnosis, or corrective actions
 - Correlate specific events and perform a set of actions
- Build custom network troubleshooting
 - Automated sequences for diagnosis



Automate Technical Support with AIS

- Deliver automated incident management and proactive analysis assistance for all devices run by JUNOS Software
- Increase availability, streamline operational efficiency and lower costs
- Begin troubleshooting an issue with a TAC case already opened





Open Innovation

Open Innovation Flexibility

 | 

- **Open to interoperate and integrate with existing devices and systems**
 - Time tested interoperability proven in thousands of diverse deployments
 - Integrate to policy, management, and support systems of dozens of partners via SNMP, NETCONF/XML, RADIUS, COPS, and more
- **Simplify new upgrades and redeploy systems**
 - Reduce planning, testing, and implementation time with one release train
- **Open to new development**
 - Graceful extensibility of the JUNOS Software architecture drives steady stream of new development by Juniper
 - Leverage new control and services applications that run on JUNOS Software developed with the Partner Solution Development Platform

Time Tested Interoperability

■ Extensive field experience

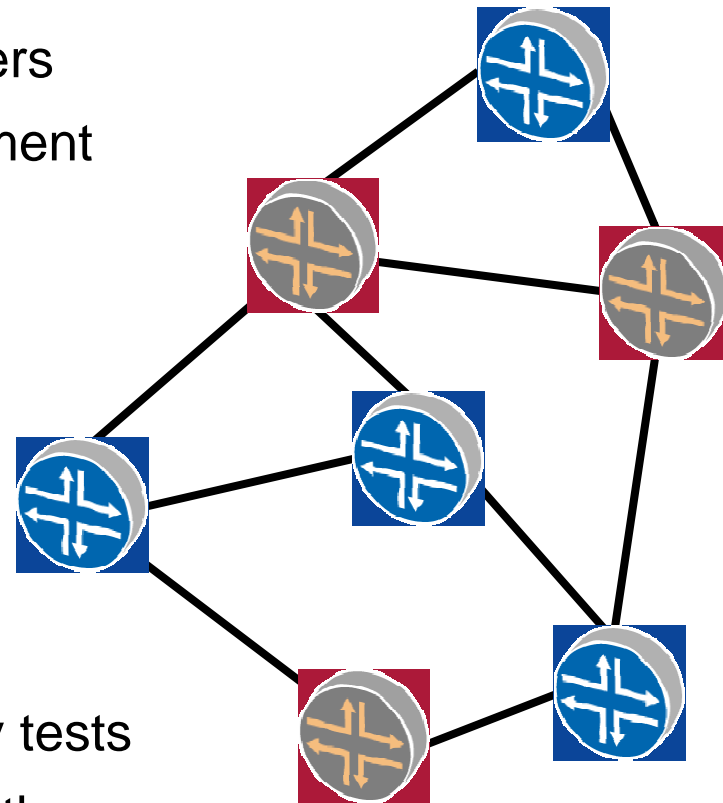
- 40 of the Top 40 Service Providers
- Thousands of business, government and education networks

■ Commitment to standards

- Policy and control
- Networking protocols
- Optics and transport

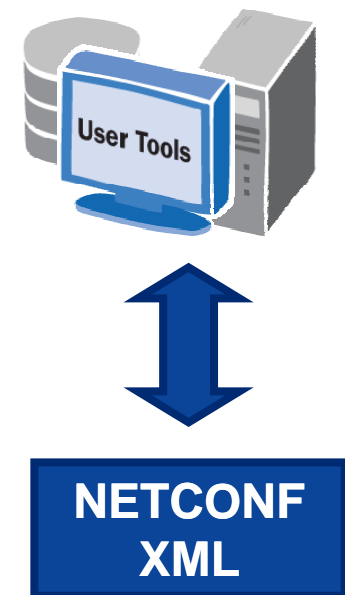
■ Pragmatic Approach

- Extensive vendor interoperability tests
- Focus on interoperability vs. “by the letter” implementation of standards



Standards-based Integration to Systems

- **Standards based integration to NMS and other operations tools**
 - Retrieve operational and configuration information
 - Efficiently search, modify and upload full or partial device configuration information
 - Standardized system logging messages and SNMP interfaces
- **NETCONF XML Interface**
 - Fully described in XML schemas
 - Defines an XML-based data encoding for configuration data as well as the protocol messages
 - Enables other systems to request and change configuration information in a standard way.



Partner Solution Development Platform

Opens JUNOS Software to New Development

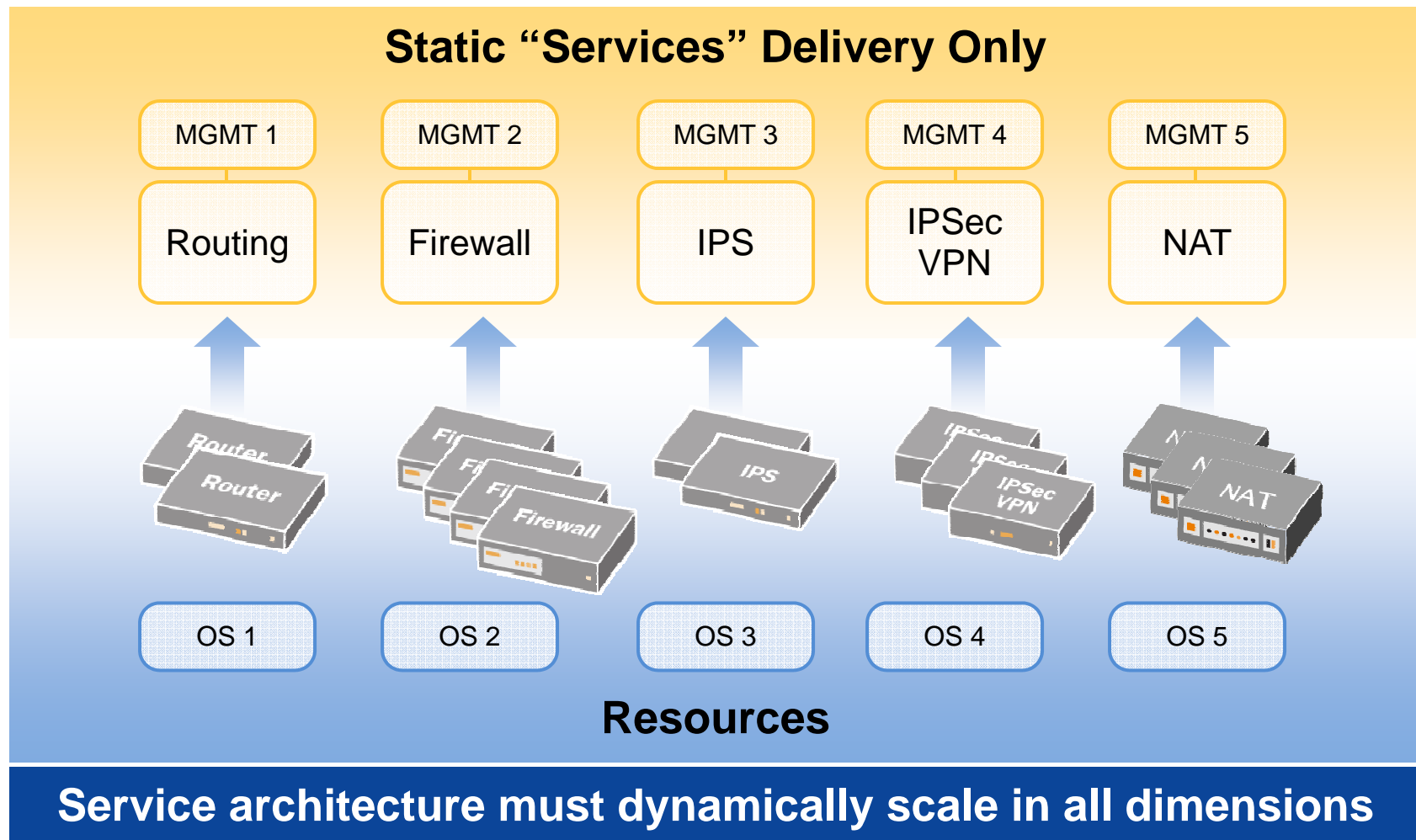
- **Enables customers and partners to build specialized applications on JUNOS Software**
 - Allows 3rd party apps to run on or integrate with JUNOS
 - Enables developers to integrate the unique expertise of others with JUNOS Software advantages
 - Accelerates innovation for the delivery of revenue-generating services and improved productivity
 - Delivers competitive advantage and greater choice and control





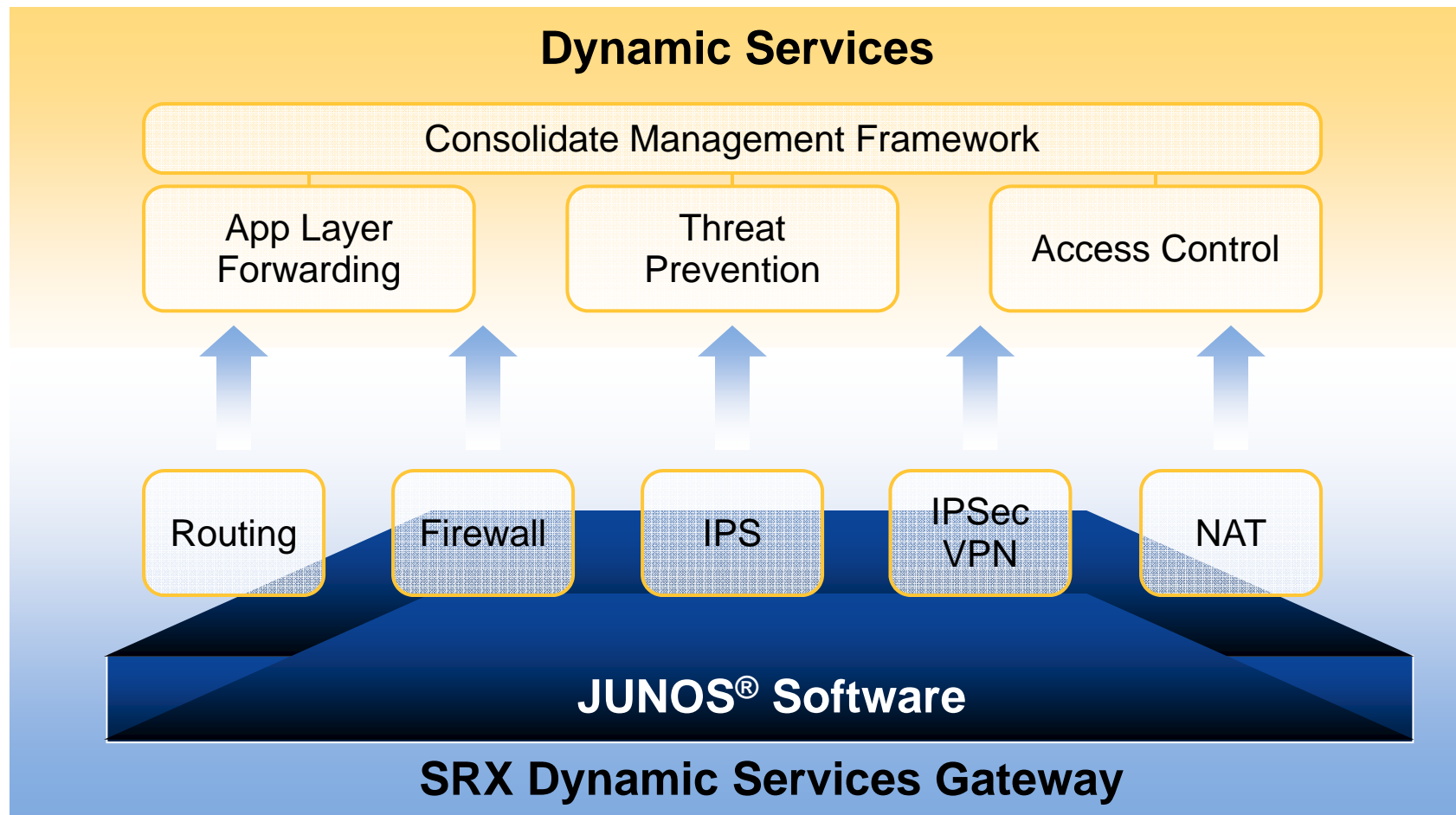
JUNOS as Secure Infrastructure Foundation

Architectural Complexity: Barrier to Accelerating Service Deployment



SRX Services Gateway

First in Family of JUNOS-based Dynamic Services Gateways

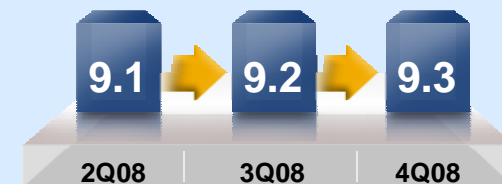
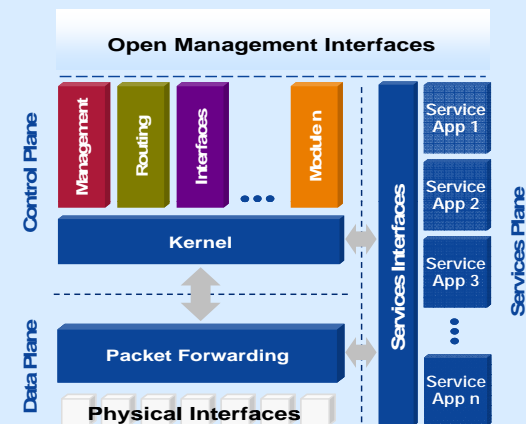


Security Infrastructure Foundation

Disciplined Software Engineering:

- **High-performance architecture**
 - Modular architecture protects processes, enables rich integration
 - Separation of the forwarding and control functions for stable operation
 - Dedicated services engine processing

- **Single software release train with rigorous development principles**
 - Strict software coding practices
 - System testing in both depth and breadth
 - Whole, tested system updates for maintenance and service releases



Security Infrastructure Foundation

Secure Deployment and Operation:

- **Powerful administration tools**
 - Granular user groups and controls
 - Error-resilient configuration
 - Forensic analysis tools
- **Juniper's Security Incidence Response Team (SIRT)**
 - Rapid reaction to zero day issues focused on one release train
 - Works in an inclusive model within the organization through targeted virtual teams



**Common Criteria
Certification
of Platforms**



Juniper *your* Net™

Simplify Your Data Center Network with Juniper Networks

■ Simplified network design

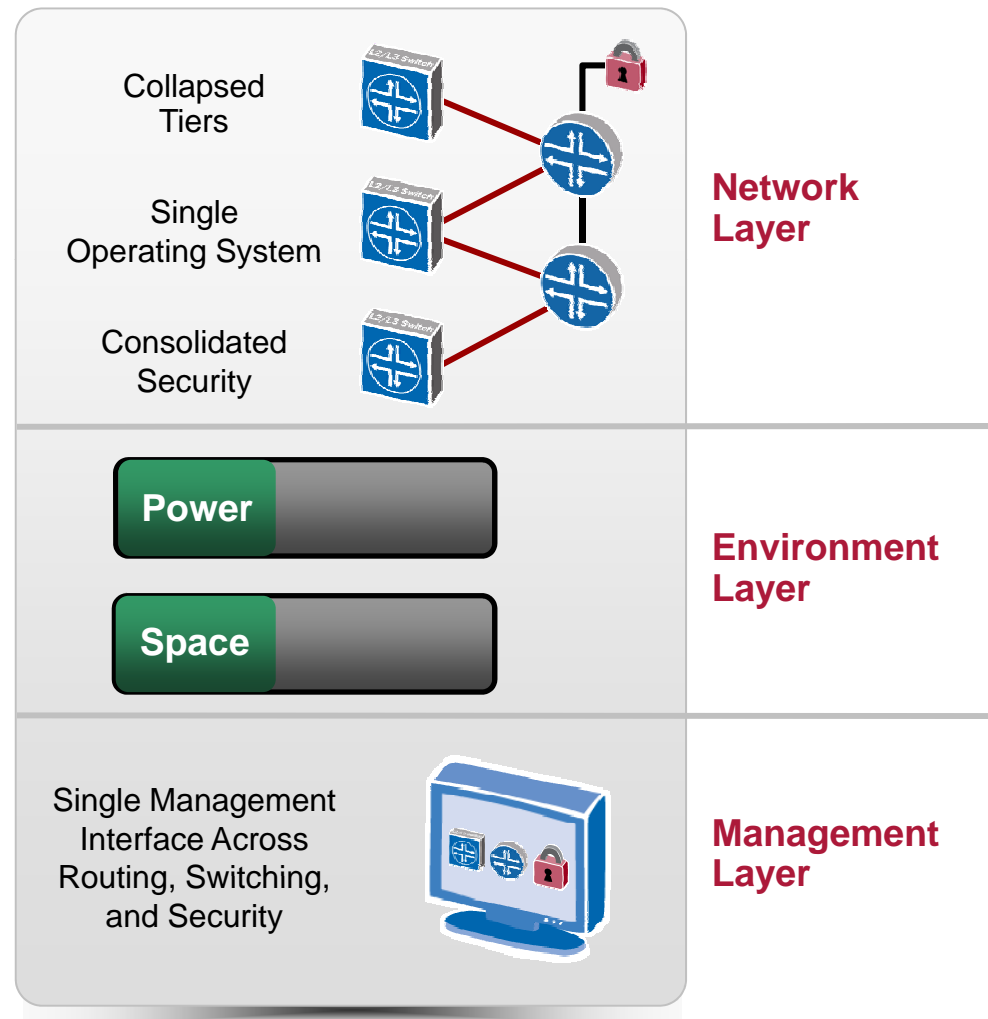
- Deploy Virtual Chassis™ and collapse switching tiers
- Single operating system
- Reduce interconnect links

■ Simplify network services

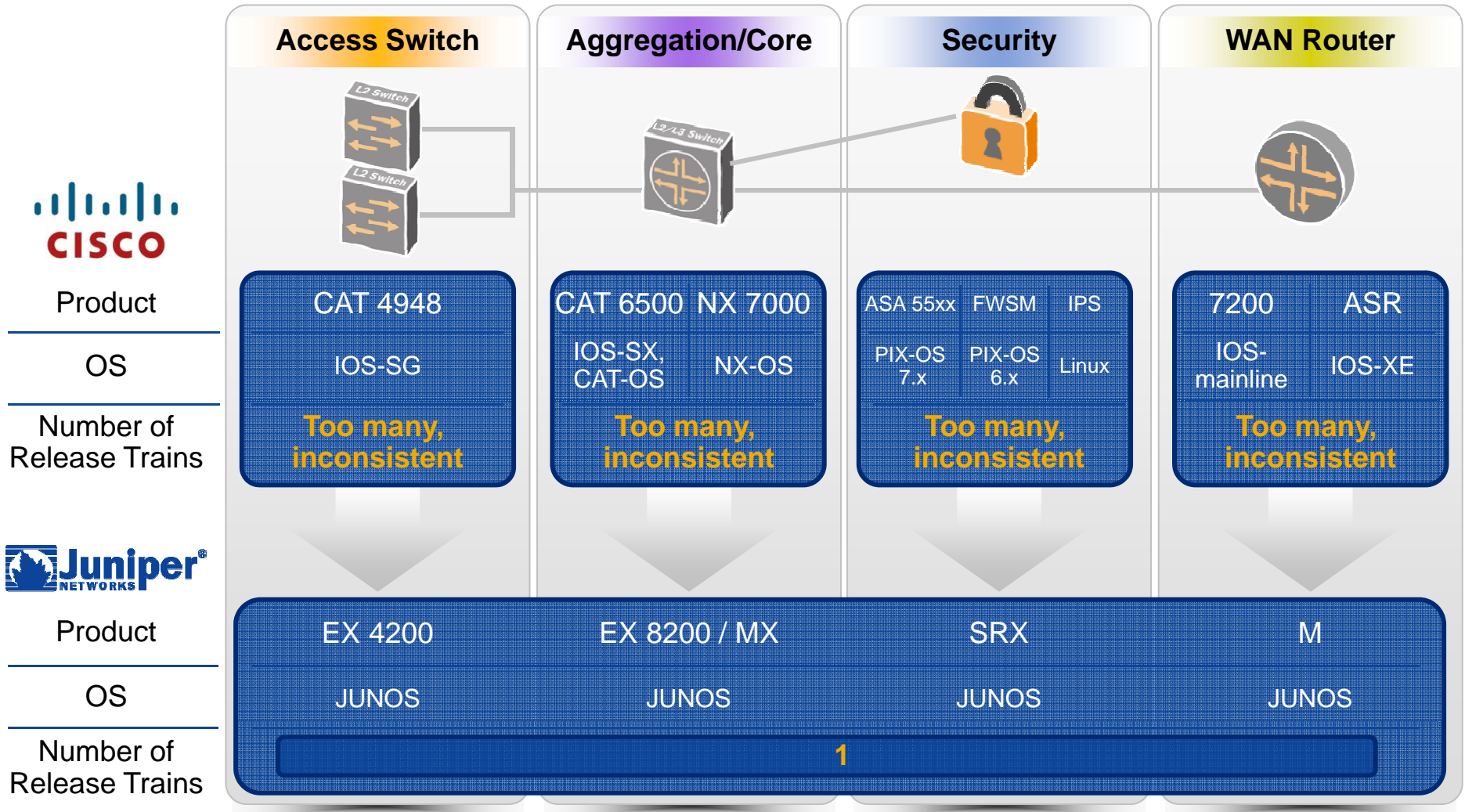
- Converge core network across data centers
- Consolidate security services
- Energy-efficient environment

■ Simplified management



- Standards-based interfaces
- Single management with NSM
- Automate technical support



JUNOS Simplifies Data Center Deployments



Reduce DC Network TCO with Juniper

Typical Configuration			
	<ul style="list-style-type: none"> 3000 servers, dual 1GbE attached Fully redundant design 	<ul style="list-style-type: none"> 125Gbps firewall 10GE uplink from access and in core 	
			Savings \$\$
Total List Price	\$4.6M	\$9.6M	Up to 52.1% CAPEX
Power	372,169 kW*hr/yr	666,758 kW*hr/yr	Up to 44.2% power
Rack Space	210 RU	450 RU	Up to 55.3% space
Operating Systems (time to manage)	JUNOS	IOS	Up to 25% OPEX
	Juniper Solution <ul style="list-style-type: none"> EX 4200 top-of-rack (2/rack) EX 8208 in core 2 SRX 5800 	Cisco Solution <ul style="list-style-type: none"> Cat 4948 top-of-rack (2/rack) Cat 6500 in aggregation and core 46 FWSM 	

Source: publicly available data sheets, price lists, Lake Partner study

Reduce Costs: Simplify Campus Switching

Virtual Chassis: Distribute a Switching Chassis Anywhere on Campus



- Typical corporate network
- 2,500 converged access ports
- 80 fiber GbE aggregation ports
- 20 10GbE backbone ports

