Sun's OS Strategy: Solaris and Linux

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Sun Microsystems, Inc.
Agenda

• Sun's operating system strategy
• Solaris™ 9 Operating System (OS) features
• Solaris lifecycle/roadmap
• Summary
The IT Challenge

• Deliver increased value
• Reduce cost and risk

Accelerating the Business
...Do More with Less
Addressing IT Needs

• Providing the right choices
  – Solaris / Linux operating systems
  – Java™ platform / XML / web services

• Increasing value
  – Integrated, integratable platform

• Superior innovation
  – Sun's technology leadership
Providing the Right Choices
End-to-End Services Delivery

Java Platform / XML / Web Services

Data Center
Application
Edge
Client

Solaris
Linux

SPARC
x86

End-to-End Services Delivery
Increased Value
Sun Provides an Open, Integrated Platform

Development: Build the Service

Operations: Manage and Deploy the Service

Solaris
Server
Network Storage

iForce
Sun Microsystems
bea WebSphere
Apache Software Foundation
TomCat
Novell Directory
ORACLE
SYBASE
hp OpenView DB2
Unicenter
Tivoli
bmc software
MICROMUSE Network Solutions
VERITAS
EMC²
JNI
HITACHI
Sun Delivers the Infrastructure and the Foundation

Solaris™ on SPARC/x86
Sun Delivers the Foundation of Network Computing

- Solaris Operating System
  - For SPARC and x86 systems
- Trusted Solaris OS
  - For SPARC and x86 systems
- Linux
  - Red Hat Enterprise Linux
  - SuSE Linux Enterprise Server
- Software Express
  - Tomorrow's software, today
Increasing Value
The Integrated Platform

Open Source SW
Middleware
OS
Hardware
Increasing Value
The Integrated Platform

MySQL  Grid  MPEG-4  etc.

App  Direct.  Portal  Identity
Msging  Tools  ASP
HA  Security  Mgmt

Solaris  Linux

SPARC®  x86
Increasing Value
The Integrated Platform

MySQL, Grid, MPEG-4, etc.
App, Direct., Portal, Identity
Msging, Tools, ASP
HA, Security, Mgmt

Solaris, Linux
SPARC, x86

Project Orion
Increased Value
Java Enterprise Systems

- One distribution for all Sun™ Open Net Environment (Sun ONE) software, on Solaris (SPARC/x86) and Linux
- Three licensing models
  - Traditional
  - Predictable
  - Metered
- Solaris train model
- A radical reduction in complexity
Sun's Linux x86 Strategy

- Standard Linux + Java + Sun™ Open Net Environment (Sun ONE) + Sun℠ Services
  - Common integrated Sun ONE stack
  - Broad ISV application portfolio
  - Broad hardware support
  - Java performance optimization

- Delivering Superior Value
  - Java
  - Sun ONE portfolio
  - Development tools
  - Solaris / Linux compatibility

- Continue active engagement with open community and standards groups
  - Promote LSB (standards vs. brand)
Solaris x86 Strategy

- Solaris x86 = Solaris + Java + Sun ONE + Sun Services
- Complete Sun stack on Solaris x86
- Drive volume through all sales channels
- Aggressive ISV recruitment for target markets
- Linux apps run on Solaris x86 unmodified
- Support on Sun and 3rd party x86 systems
- Java performance optimization
Solaris & Linux: When & Where?

- Solaris expertise
- Commercial Solaris applications
- Scalability
- Predictability
- Security: C2/B1 (Trusted)
- Manageability
- Developer tools
- Many hardware platforms

- Standardized on Linux
- Commercial Linux applications
- Open OS source
- Community development
- Broad x86 platform support
Solaris/Linux Compatibility

- Java, Sun ONE compatibility
  - Equal availability on Solaris and Linux
- Open source and Linux applications
  - Integrated into Solaris: Apache, Samba, sendmail...
  - Additional apps via Solaris Companion CD
- Source and binary compatibility
  - Adhere to industry standards (e.g. POSIX)
  - Linux API compatibility
    - Libraries (glib, GTK+, Tcl/TK, XML2)
  - Linux Compatibility Assessment Toolkit (LinCAT)
    - Library call differences, check shell scripts, recreate config data
  - lxrun: run Linux binaries on Solaris x86
Sun Linux advantages

● Sun expertise and support
  – One vendor to contact for service, support
  – Integration with 64bit environment for all your Datacenter needs
  – Data management and storage solutions

● Best of both worlds
  – Redhat compatible yet streamlined for service and support
Find the right platform

ISV Application Binary
Solaris/SPARC

Academic Application Developer
Perf Lib
HPC Cluster Tools

Open MP Code

I/O > Comp

> 192 GB
> 24 CPU
No

> 32 GB
> 8 CPU
Yes

Sun Fire 15k
Sun Fire 12K

> 2 GB
> 2 CPU
No

V880
V480
280R

I/O >

Fp > Int

> 2 GB
> 2 CPU
Yes

V100/Blade

MPI

Sun Fire 6800
Sun Fire 4800
Sun Fire 3800

LX 50

Blades

I/O > Comp

> 32 GB
> 8 CPU
Yes

> 2 GB
> 2 CPU
Yes

ISV Application Binary
Linux

> 8 CPU

Yes

Myrinet

No

(1) Time spent for I/O compared to compute
(2) Floating point stronger than integer
Solaris Development Model
Compatibility, Stability, Performance — by Design

- Product support lifecycle designed for customers' needs
  - Releases extend, rather than replace
  - Guaranteed compatibility

- Extensive testing
  - Continuous, measurable quality gains
  - Solaris 10 OS already deployed internally
Solaris 9 OS — Over 300 New Features

Manageability
- Solaris Containers
- Solaris™ 9 Resource Manager
- IPQoS
- Solaris™ Volume Manager (SVM)
- Soft Disk Partitions
- Filesystem for DBMS
- UFS Snapshots
- Solaris™ Flash
- Solaris™ Live Upgrade 2.0
- Patch Manager
- Product Registry
- Sun ONE DS integration
- Legacy directory proxy
- Secure LDAP client
- Solaris WBEM Services
- Solaris instrumentation
- FRU ID
- Sun™ Management Center

Availability
- Solaris Live Upgrade 2.0
- Dynamic Reconfiguration
- Sun StorEdge™ Traffic Manager Software
- IP Multipathing
- Reconfiguration Coordination Manager
- Driver Fault Injection Framework
- Mobile IP
- Reliable NFS
- TCP timers
- PCI and cPCI hot-swap

Security
- IPSec v4 and v6
- SunScreen Firewall
- Enhanced RBAC
- Kerberos V5
- IKE
- PAM enhancements
- Secure sockets layer (SSL)
- Solaris™ Secure Shell
- Extensible password encryption
- Solaris™ Security Toolkit
- TCP Wrappers
- Kernel and user-level encryption frameworks
- Random number generator
- SmartCard APIs

Scalability
- IPv6
- Thread enhancements
- Memory optimization
- Advanced page coloring
- Mem Placement Optimization
- Multi Page Size Support
- Hotspot JVM tuning
- NFS performance increase
- UFS Direct I/O
- Dynamic System Domains
- Enhanced DNLC
- RSM API
- J2SE™ 1.4 software with 64-bit and IPv6
- NCA enhancements

... and more:
- Compatibility Guarantee
- Java Support
- Linux Compatibility
- Network Services
- G11N and Accessibility
- GNOME Desktop
Addressing IT Needs

Do More with Less

- Applications
- Scalability
- Availability
- Manageability
- Security

Service

Cost
Solaris 9 OS: The Services Platform

**Manageability**
- Sun ONE integration
- Solaris Containers
- Data management
- Provisioning

**Availability**
- RAS profile
- Patch manager

**Security**
- Fine-grained access control
- Secure remote mgt
- Strong authentication

**Scalability**
- Threads
- Memory
- Data

**Applications**
- Cost savings
- Compatibility
Manageability
Deploy and Manage Application Services

- Sun ONE integration
  - Directory server
  - Application server
- Solaris Containers
- Data management
  - Logging, performance, volume management
- Provisioning services
  - Solaris Flash, Solaris Live Upgrade,
    Sun™ Management Center Change Manager
Manageability
Server Virtualization

- Dynamic Reconfiguration

Solaris

App Server

Web Server
Manageability
Server Virtualization

- Dynamic Reconfiguration
- Dynamic System Domains
Manageability
Server Virtualization

- Dynamic Reconfiguration
- Dynamic System Domains
Manageability
Server Virtualization

- Dynamic Reconfiguration
- Dynamic System Domains
- Solaris Containers
Manageability
Integrated Data Management

• Investments in UFS
  – Journaling/logging (enhanced)
  – Direct I/O for DBMS
  – Snapshots, performance tuning

• Investments in Solaris Volume Manager
  – Transparent upgrades (including mirrored root)
  – Soft disk partitions, multi-terabyte disks
  – Improved management, device ID, RCM aware

• Freedom of choice
  – UFS and SVM – Ideal platform for DB filesystems
  – Sun StorEdge™ Utilization Suite (SAM-FS)
  – Sun StorEdge™ Performance Suite (QFS)
Manageability
Provisioning and Change Management

- Built into Solaris
  - Solaris Flash (enhanced)
  - Extension to JumpStart™
  - Solaris Live Upgrade
  - Secure WAN boot*

- Sun Management Center Change Manager
  - Aggregated, automated flash archive management
  - End-to-end secure

*Future

4/03
Availability

• Configuration Services
  – RAS Knowledge Database, RAS Profile
  – Sun BluePrints™, BigAdmin™ services
  – Sun ONE Reference Architectures
  – SunUP™ Availability Program

• Solaris 9 Registry

• Solaris Patch Manager
  – Notification, dependencies, secure delivery
  – Sequential, “semi-automatic” installation
  – Base version available for Solaris 8/7/2.6
Availability
New! Sun Fire 3800-15K RAS Enhancements

- Component Health Status
- Auto Diagnosis with Messaging
- Auto Restoration
- Automatic Recovery of Hung Domains
- Recovery of Repeated Domain Panics
- CPU Offlining
- Virtual Memory Pages Retirement
Availability
Clustering via SunPlex™

- Optimized Oracle9i Real Application Clusters
  - High-speed messaging via RSM™ technology
- Security hardening
- Agent builder
- Support for Dynamic Reconfiguration
Scalability
Performance

- Thread library enhancements
  - “CMT ready”
- Memory optimization
  - Advanced paging algorithms (page coloring)
  - Multiple Page Size Support
  - Memory Placement Optimization (enhanced)
  - *libumem* memory allocator
- Java™ 2 Platform, Standard Edition 1.4
  - Java HotSpot™ technology, 64-bit VM
- Datapath speedups
  - NFS, filesystem (enhanced)
Scalability
Solaris 9 vs. Solaris 8

- Threads: 400
- MPSS: 100
- UFS: 87
- NFS: 55
- LDAP Search: 400
- LDAP Overall: 40
- JVM: 200
Applications
Compatibility

• Application compatibility guaranteed
  – SolCAT: Solaris Compatibility Assurance Toolkit (GTS, CTS)
  – Applies to apps from Solaris 2.5 release forward

• ISV enthusiasm
  – Strongest enterprise ISV portfolio

• Linux compatibility
  – Common open source libraries and utilities
  – GNOME desktop environment
  – LinCAT: Linux Compatibility Assurance Toolkit
## Solaris Cost Benefit

<table>
<thead>
<tr>
<th>Acquisition</th>
<th>Tier 3 Data</th>
<th>Tier 2 Web</th>
<th>Tier 1 Web</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Server</td>
<td></td>
<td></td>
<td>0–6K</td>
<td></td>
</tr>
<tr>
<td>App Service</td>
<td></td>
<td>15K–60K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message Queue</td>
<td>3k–43K</td>
<td>0–100k</td>
<td>0–15K</td>
<td></td>
</tr>
<tr>
<td>File System</td>
<td>3k–43k</td>
<td></td>
<td>0–46K</td>
<td></td>
</tr>
<tr>
<td>Volume Manager</td>
<td>0–15K</td>
<td>0–15K</td>
<td>0–15K</td>
<td>0–15K</td>
</tr>
<tr>
<td>Host Based Firewall</td>
<td>0–15K</td>
<td>0–15K</td>
<td>0–15K</td>
<td>0–15K</td>
</tr>
<tr>
<td>Directory Server</td>
<td>0–23K</td>
<td>0–23K</td>
<td>0–3K</td>
<td>20K–400K</td>
</tr>
<tr>
<td>Resource Mgr/IPQoS</td>
<td>0–46K</td>
<td>15K–198K</td>
<td>0–24K</td>
<td>20K–415K</td>
</tr>
</tbody>
</table>

### Total acquisition savings

- Tier 3 Data: 6K–147K
- Tier 2 Web: 15K–198K
- Tier 1 Web: 0K–24K
- Directory: 20K–415K

### Ongoing cost savings

- **Reduced integration/test costs**
- **Reduced maintenance costs**
Solaris 9 OS Notes

• Simplified and enhanced distribution
  – All kits fully globalized
    • Increased language/locale support (enhanced)
    • Big5, HKSCS, GB18030
  – DVD media now available

• Open Windows phase-out
  – Applications still work
  – GNOME, CDE

• Runs on same Sun systems as the Solaris 8 OS
  – Exception: sun4d architecture (SPARCcenter 2000, SPARCserver 1000)
Solaris 9 on x86 Hardware

- Now shipping
- Supports Sun™ LX50, non-Sun hardware
- Linux applications run unmodified
- Building momentum
  - Increased support for Solaris community driver development
  - Aggressive ISV recruitment for target markets
  - Sun ONE stack will be available for x86
  - Endorsements from AMD, BEA, Computer Associates, Sybase, Symantec, Quantiva, Verizon, and others
Solaris Release Roadmap

- Named release planned every 2-3 years
  - Application compatibility guaranteed
- Approximately four updates per year
- Minimum shipping life: 4-1/2 years
- Minimum support life: 9-1/2 years
Resources

- sun.com/solaris
- sun.com/blueprints
- sun.com/bigadmin
- docs.sun.com
  - "What's New in the Solaris 9 Operating Environment" from latest update
- sdc.sun.com/solaris8
- sun.com/solaris/fcc/lifecycle.html
Summary

• Value
  – Delivering the integrated stack
  – End-to-end systems view

• Innovation
  – Integration of new technologies with investment protection

• Choice
  – Open software commitment
  – Coordinated Solaris / Linux strategy
  – Solaris OS on SPARC / x86
  – iForce partnerships
OS and Availability Products
Sun Microsystems, Inc.
Backup Slides
OS Strategy
A Sea of Change
Raised Floor to Client-Server to N-Tier to Web Services...

- Revolution at the edge of the network
  - Low-cost, horizontally scalable infrastructures
  - Content delivery networks
- Grid utility computing
- Integration/optimization of software stacks
Future of the Operating System
Evolving to Take on Two Critical Roles

OS Platform
- Allocate resources
- Provide services
- Provide APIs, commands, utilities

N1
The computer that is the network
Summary

• **Service deployment:**
  We make it easier, faster, safer to deploy the application service, while reducing deployment cost

• **Service management:**
  We enable delivery of higher service level while driving down cost of operations
Backup Slides
Manageability
Manageability

WHAT WE HEARD

• It should be easier, faster and cheaper to deploy application services

WHAT WE DID

• Made the Solaris OS a Services Platform
Manageability
Sun ONE Integration

• Sun ONE Application Server 7
  – Platform Edition now integrated into Solaris 9 OS
  – SPARC today, x86 coming soon

• Sun ONE Message Queue 3.0.1, Platform Edition

• Sun ONE Directory Server
  – Includes 200,000 user identities

• J2SE™ 1.4 (JVM™)
Manageability
Co-packaged Products

- Sun ONE Advantage Software*
  - Portal Server 9/02
  - Web Server 9/02
  - Integration Server
- Companion Software CD
- StarOffice 6.0 / StarSuite 6.0 Office Suites
- Sun StorEdge software†
- Sun™ ONE Studio development tools†
- BEA WebLogic Server*
Manageability
Solaris 9 Resource Manager

• Now a fundamental part of the Solaris OS
  – Fair share scheduler
  – CPU control
    • Persistent processor sets
  – Physical memory control*
  – Swap space control*
  – IPQoS 9/02
  – Container GUI*

*Future
Manageability

**WHAT WE HEARD**

- Filesystem and volume manager support costs are too high

**WHAT WE DID**

- Made new investments in file services
Manageability

WHAT WE HEARD

• Deploying and changing software across the network is hard to do

WHAT WE DID

• Enhanced Solaris Provisioning Services
• Announcing Sun Management Center Change Manager
Manageability

WHAT WE HEARD

- We want higher utilization of our servers

WHAT WE DID

- Solaris Containers
- Solaris 9 Resource Manager
## Manageability
### Solaris Containers

<table>
<thead>
<tr>
<th>Feature</th>
<th>Container</th>
<th>Domain</th>
<th>VM</th>
<th>psLPAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Containment</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Security Containment</td>
<td>High*</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Fault Containment</td>
<td>Med*</td>
<td>High</td>
<td>Med</td>
<td>Med</td>
</tr>
<tr>
<td>OS Instances Supported</td>
<td>One</td>
<td>Many</td>
<td>Many</td>
<td>Many</td>
</tr>
<tr>
<td>Performance Overhead</td>
<td>None</td>
<td>None</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Granularity</td>
<td>Sub CPU</td>
<td>4/2 CPU</td>
<td>Sub CPU</td>
<td>1 CPU</td>
</tr>
<tr>
<td>Dynamic</td>
<td>Yes</td>
<td>Yes</td>
<td>Not Yet</td>
<td>Not Yet</td>
</tr>
</tbody>
</table>

*Future
Manageability
Networking

- Enhanced FTP server and client
- Enhanced PPP server and client
  - Includes PPPoE support
- Enhanced DHCP server
- VLAN for GB ethernet
- TFTP enhancements
- Solaris NCA enhancements
- Enhanced snoop packet capture
Manageability
Networking (cont'd)

• IPv6
  – X11 support
  – ATM support
  – Packet tunneling
  – 6to4 router
  – CDE enhancements

• Enhancements to Mobile IP
  – IPv6 with IPSec
  – Dynamic Interfaces
Manageability
Networking (cont'd)

- Native LDAP Phase 2
- NIS+ to LDAP migration
- BIND 8.2.4
- Sendmail 8.12
- TCP/IP fast detect
  - Rapid failover for clusters
- RIPv2
- Carrier-Grade Transport Protocol
- SNMP adaptor for WBEM
Backup Slides

Security
Security

WHAT WE HEARD

• Higher security out of the box
• End-to-end security

WHAT WE DID

• Enable secure configuration upon install
• Bring key Trusted Solaris features into standard Solaris
• Integrate and support the best of open, standard security features
Security
Secure Out of the Box

• Flexible OS network service packaging
  – Select/deselect services at or after install time
  – No "surprise reinstalls"

• Solaris Security Toolkit
  – Phase 1: post-install hardening
  – Phase 2: install-time hardening*

*Future
Security
Solaris Security Services

- Solaris Secure Shell (Open SSH)
- Integrated firewall: SunScreen 3.2
- Enhanced Role-Based Access Control
- TCP wrappers
- PAM enhancements
- Secure patching
Security
Solaris Security Services (cont'd)

- Kerberos v5
  - KDC and Incremental DB Propagation
  - MIT feature resync
  - "r*" (remote) commands*
  - DES performance, Delegation of Credentials

- 128 bit default encryption
- Buffer overflow exploit protection
- Random number generator
  - /dev/random, /dev/urandom

*Future
Security
Solaris Security Services (cont'd)

- IPSec v4 and v6
- Internet Key Exchange (IKE)
  - Hardware acceleration support
- Directory client security (libldap4)
  - SSL (SASL later)
- SmartCard SDK/PKI*
- Flexible `crypt()` for passwords
- Password aging, history support with LDAP

*Future
Backup Slides

Availability
Availability

**WHAT WE HEARD**

- We want higher service availability

**WHAT WE OBSERVED**

- Configuration errors are a leading contributor to reduced availability

**WHAT WE DID**

- Intelligent configuration management
- Patch management
Availability

WHAT WE HEARD

• We want easier management/reduced complexity of highly available clusters

WHAT WE DID

• Continued to enhance the SunPlex™ environment
Availability
Clustering via SunPlex™

- Failover and scalable services
- Enhanced manageability
- Disaster recovery
- Global network service with built-in load balancing
- Global devices and file services
Backup Slides
Scalability
Scalability

WHAT WE HEARD

• *It can never run too fast*

WHAT WE DID

• Made the Solaris OS faster
Threading Performance
Enhanced threads implementation speeds up Oracle OLAP application by up to 4X.
Web Server Performance

900 Mhz Sun/Solaris systems are 55% and 50% faster than 1260 Mhz Compaq/Lintel and IBM/Lintel systems

Apache Web Server Performance on 2-way systems

Source: Sun PAE, SAE
Backup Slides
Compatibility,
Futures, etc.
Applications

WHAT WE HEARD

- Preserve my investment
- Let me choose best-of-breed solutions

WHAT WE DID

- Guaranteed application compatibility
- Linux compatibility
- Extensive ISV portfolio for the enterprise
Applications
Linux Compatibility

Anatomy of a Linux System diagram copyright 2001, O'Reilly & Associates. Used with permission
New Added Value Software

- Early Access directory (fully Sun-supported)
  - Software due to integrate into Solaris OS
- Bundled software directory (fully Sun-supported)
  - Software not intended to be fully integrated
  - May have limited licensing terms
    - (file product-name.license defines usage)
- Bonus Software with media kit—expanded
- Plans to expand ISV software included in media kit
Solaris Software Modularization

- Reduced package interdependencies
- Increased granularity of package selections
- Tool for minimizing OS footprint
  - Ideal for OEM and appliance makers
  - Ideal for creating OS installs for vertical stacks
What's Going Away/Gone Away?

- **Gone**
  - AnswerBook2™ Documentation Server

- **Going**
  - NIS+
  - J2SE™ platform
    - 1.1.x JRE remains, JDK gone
Internal Resources

- solaris.sfbay/
- onestop/
- srm.sfbay/solarispm/sadopt/
- suncluster.sfbay/
Solaris 8 OS Recap

**COMPLETE**
iPlanet™
Oracle
Perl
Other popular freeware

**SCALABLE**
64 X 64
More addresses
More processes & sockets
LDAP
Web cache accelerator
Filesystem performance

**MANAGEABLE**
Solaris Application Guarantee
Web Start Flash
Sun Management center
Solaris Resource Manager™ software
Solaris™ Bandwidth Manager software
Solaris™ WebStart

**SECURE**
Sunscreen Firewall
Kerberos
Role-based Access Control
System Hardening
IPsec

**AVAILABLE**
Automated DR
Clustering
Kernel Updates
Live Upgrade
IP Multipathing
UFS Snapshots
Release Comparison

**Solaris 2.6**
The Performance Release

- No longer shipping
- 3 months to decreased support
- 3-1/4 years to end of support

**Solaris 2.5.1 +**

**Solaris 2.6 +**

**Solaris 7**
The Scalability Release

- Consolidated locale sup’t
- Faster boot (I)
- traceroute
- UFS logging
- System crash dump utility
- Full 64-bit support

- Runs existing SW
- Runs on existing HW
- 4 months to end of ship
- 2-1/2 years to decreased support
- 5-1/2 years to end of support

**Solaris 2.6**

**Solaris 7**

**Solaris 8**
The .com OS

- UltraSPARC III
- LDAP client/server
- DHCP boot
- Faster boot (II)
- RBAC
- Tasks, Projects & Accounting
- IPSec for V4
- NFS server logging
- mdb
- IPMP
- IPv6
- DNLC lg dir caching
- core dump mgt
- NCA
- Apache, Perl, etc.
- DVD/UDF support

**Solaris 9**
The Services Platform

- Solaris Volume Mgr
- Solaris 9 Resource Mgr
- Sun ONE Application Server
- 7 Live Upgrade 2.0
- Solaris Flash
- NIS->LDAP tools
- Patch Manager
- Solaris Secure Shell
- Install flexibility
- Sunscreen FW 3.2
- TCP Wrappers
- IPSec for V6
- IKE
- Solaris Containers
- IPMP enhancements
- Threading enhancements
- Memory Placement
- Optimization
- Dir Svrs Enhancements
- NFS/NetFS Enhancements
- Multiple Page Size Support
- Enhanced DHCP

- Guaranteed SW compatibility
- Runs on existing HW
- Linux compatibility
- ~2 yrs to end of ship
- ~4 yrs to decreased support
- ~7 yrs to end of support

- Guaranteed SW compatibility
- Runs on existing HW
- ~2 yrs to end of ship
- ~4 yrs to decreased support
- ~9 yrs to end of support

**Fully Binary Compatible**