SUSE® Linux Enterprise Server for System z Roadmap

Session 16418

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#SHAREorg

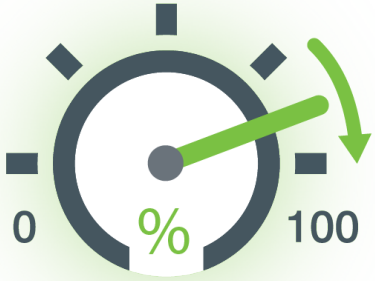
SHARE is an independent volunteer-run information technology association that provides **education**, professional **networking** and industry **influence**.

SUSE Linux Enterprise

A highly reliable, scalable and secure server operating system, built to power physical, virtual and cloud-based mission-critical workloads.

The advanced foundation for your success

Accelerate innovation

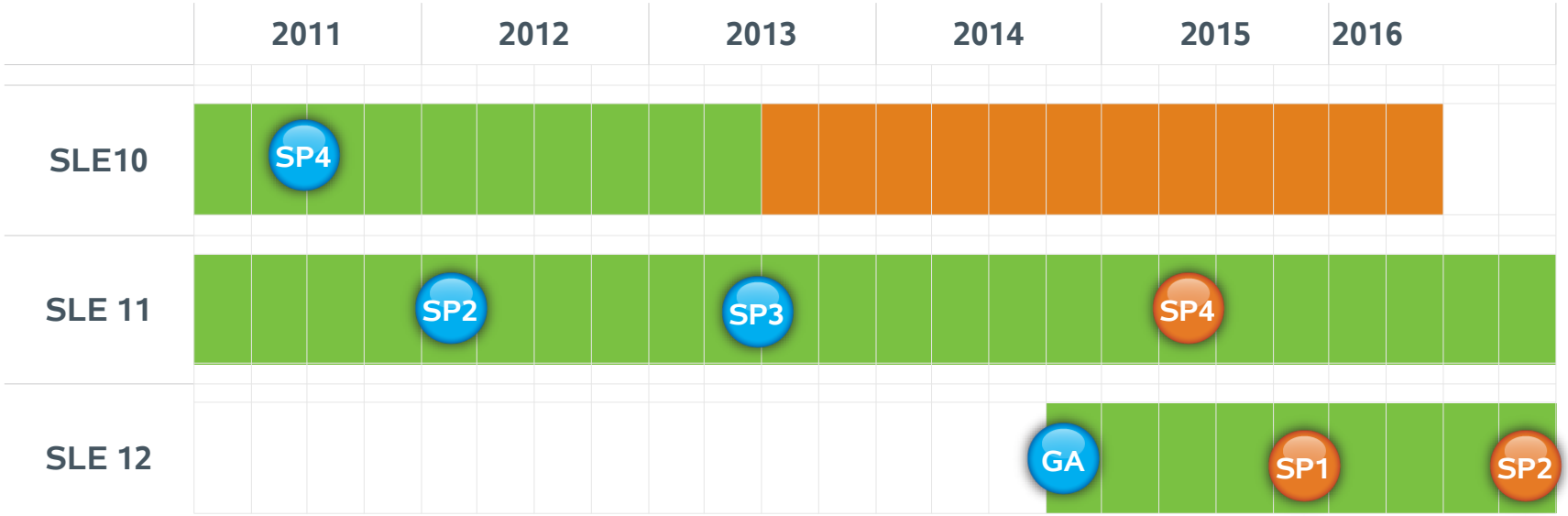


Increase uptime

Improve operational efficiency

SUSE Linux Enterprise

Lifecycle & Codestreams



13-year lifecycle

For SLES 11 and SLES 12,
10 years general support,
+3 years Long Term Support

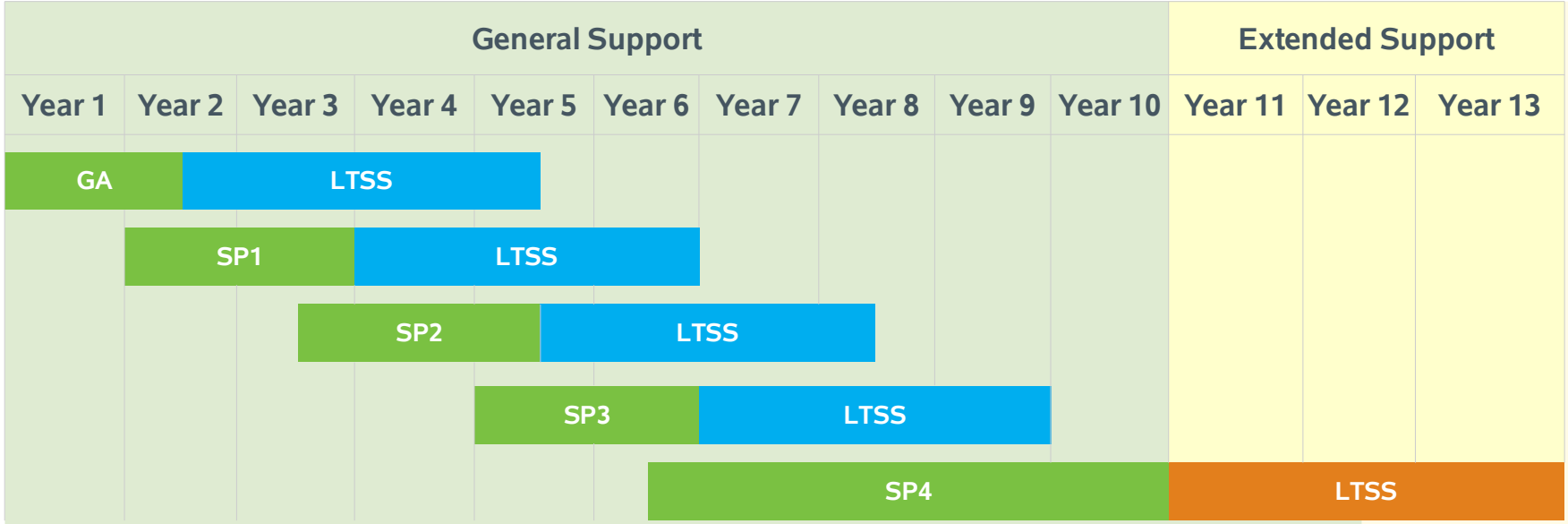
SUSE Linux Enterprise 12

Long Term Service Pack
Support for every Service Pack

SUSE® Linux Enterprise Server 12

Lifecycle Model

10 years lifecycle + 3 years Extended Support



- **13-year lifecycle** (10 years general support, 3 years extended support)
- **Long Term Service Pack Support** (LTSS) available for all versions, including GA

Unique Tools Included

with SUSE Linux Enterprise Server for System z

- High Availability Extension
  - Cluster Framework, Cluster FS, DRBD, GEO-cluster*
- AppArmor Security Framework
  - Application confinement
- YaST2 systems management
  - Install, deploy, and configure every aspect of the server
- Subscription Management Tool
  - Subscription and patch management, proxy/mirroring/staging
- Starter System for System z
  - A pre-built installation server, deployable with z/VM tools

** additional offering*

SUSE® Linux Enterprise Server for System z 11 SP3

- zEC12 + zBX = IBM zEnterprise exploitation continued
  - zBC12, z/VM 6.3, zBX HX5 support (blade center extension)
  - z9 EC, z10 EC, z196 EC, z9 BC, z10 BC, z114 BC support
  - Java 7 and supportive kernel enhancements
  - Flash Express SC Memory support (/dev/scm)
  - GCC 4.7 for applications targeting zEC12 processor

- Improved RAS tools and System z specific support
  - 2 stage dump & network storage sharing with compression
  - Robust disk mirroring for large pools of DASDs (MD RAID10)
  - Enhanced DASD statistics for PAV & HPF
  - IUCV terminal server client & server setup support
  - s390-tools update

SUSE® Linux Enterprise Server for System z 11 SP4

- z exploitation continued
  - **z13, zEC12, zBC12, z/VM 6.3,** zBX support
  - z9 EC, z10 EC, z196 EC, z9 BC, z10 BC, z114 BC support
  - http://www.ibm.com/systems/z/os/linux/resources/testedplatforms.html

- Improvements at a glance
  - s390-tools and performance monitoring updated
  - OFED introduction
  - Crypto support refresh
  - Networking enhancements
  - Update to IBM Java 7.1

SUSE® Linux Enterprise Server for System z 11 SP4

Generic Enhancements

- Package and repository management
  - Zypper can now display locked packages
  - Repository xml-based rpm metadata with sha256 checksums
- Miscellaneous
  - Kernel: MCS mutex support (scalabilty)
  - sshd X11 forwarding with IPv6
  - ltrace is now multi-thread capable
  - Updated btrfs tools (latest level)
  - sha256 in cryptsetup's luksFormat command (more secure)

z Exploitation

- OpenFabrics Enterprise Distribution (OFED™)
  - Open-source software for RDMA and kernel bypass applications
  - Support for RoCE Express Card (Infiniband)
- Crypto Express 4S
  - Device Driver Exploitation for EP11 and libica update
- Networking
  - QETH: Display Switch Port Mode
  - SRC_VIPA IPv6 enablement

z Exploitation

- Refresh IPL code
  - Improve maintainability
  - New keywords for cio_ignore for IPL and Console device
  - snIPL interface to control dynamic CPU capacity

- Performance monitoring
  - Sampling of CPU cycles
  - Basic sampling - snapshot of various PSW bits and instruction address at specific time interval
  - Support for raw sample data - sampling data made available to the perf program that be used/posted by external applications
  - Support for diagnostic sampling - provides a snapshot of hardware-model dependent information

Repository & Channels

Only a few are mandatory channels

```
# zypper lr
#  | // | Name                          | Enabled | Refresh |
---+----+-------------------------------+---------+---------+
 1 | // | SLES11-SP3-Pool               | No      | No      |
 2 | // | SLES11-SP3-Updates            | No      | Yes     |
 3 | // | SLES11-SP4-Pool               | Yes     | No      |
 4 | // | SLES11-SP4-Updates            | Yes     | Yes     |
```

Required SUSE Linux Enterprise Server 11 SP4 channels for installation and updates.

- SLES11-Pool static, copied media packages
- SLES11-Updates receives updates related to SLES12-Pool
- *All other channels are configured with the system for convenient activation*

- Note: removing the Pool and Updates channels disables receiving updates for SUSE Linux Enterprise Server 11

SUSE Linux Enterprise 12
The Platform

Accelerate Innovation

Hardware 64-bit

- 64-bit hardware is the future
  - 64-bit kernels only
  - Execution of 32-bit applications fully supported via 32-bit execution environment on top of 64-bit kernel
- Virtualization
  - KVM, Xen, z/VM, LPAR support (depends on architecture)
  - 64-bit host; 64-bit and 32-bit guests
- Hybrid Computing
  - Platform specific workloads, GPUs, special purpose PUs
- Device Driver Innovation
  - SUSE Solid Driver Program (SSDP)

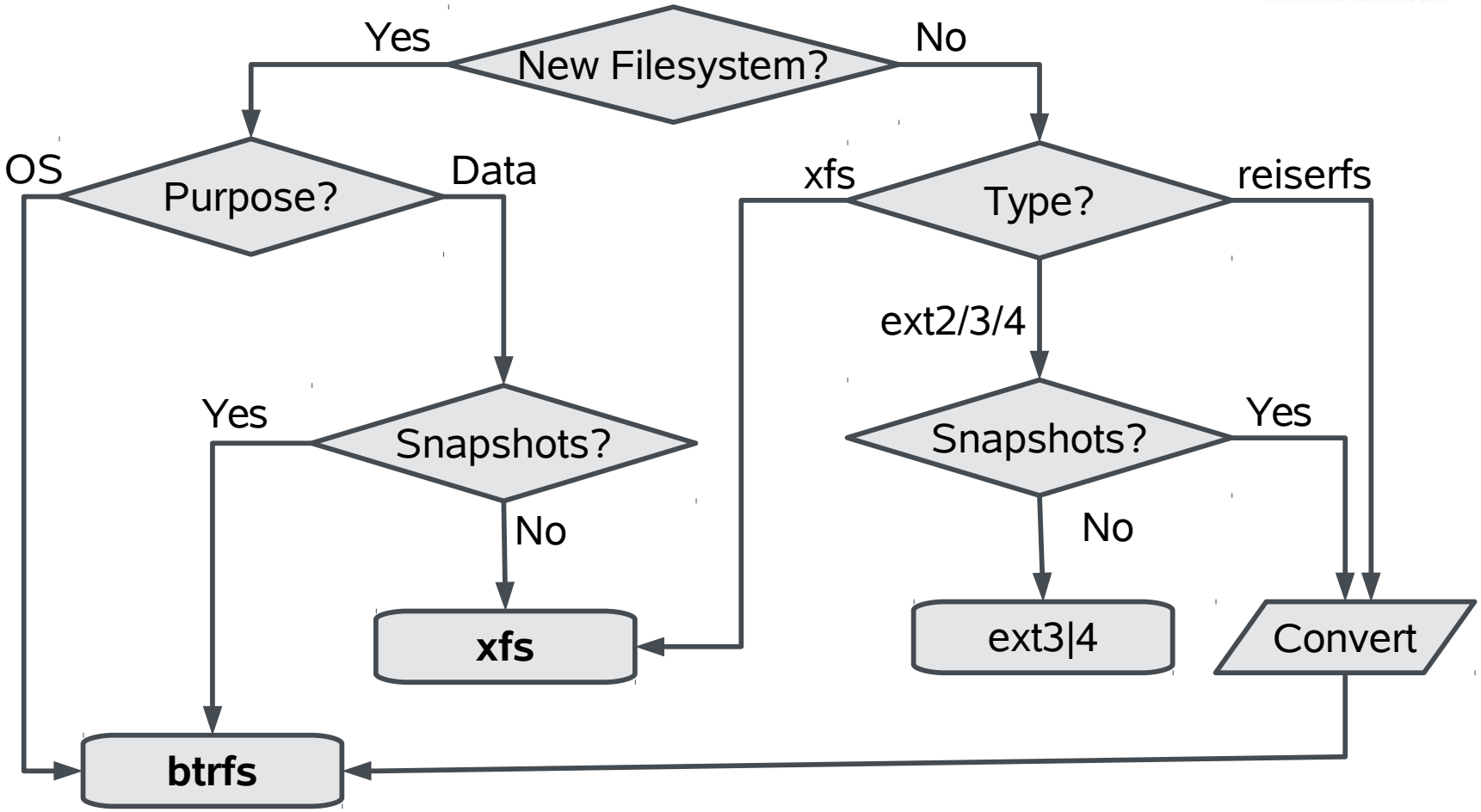
Accelerate Innovation

Innovations with Enterprise Quality

- Kernel 3.12
  - The third release based on Linux kernel 3.x, since SUSE Linux Enterprise 11 SP2 in 2012
- XFS and btrfs
  - Get the best from both worlds
  - Support for XFS for the last 10 years
  - Support and recommend XFS for data
  - btrfs as the default file system
- Linux Containers
  - Continued Linux Containers (LXC) support
  - Better manageability and integration with hypervisor

SUSE® Linux Enterprise 12

Filesystem Recommendations

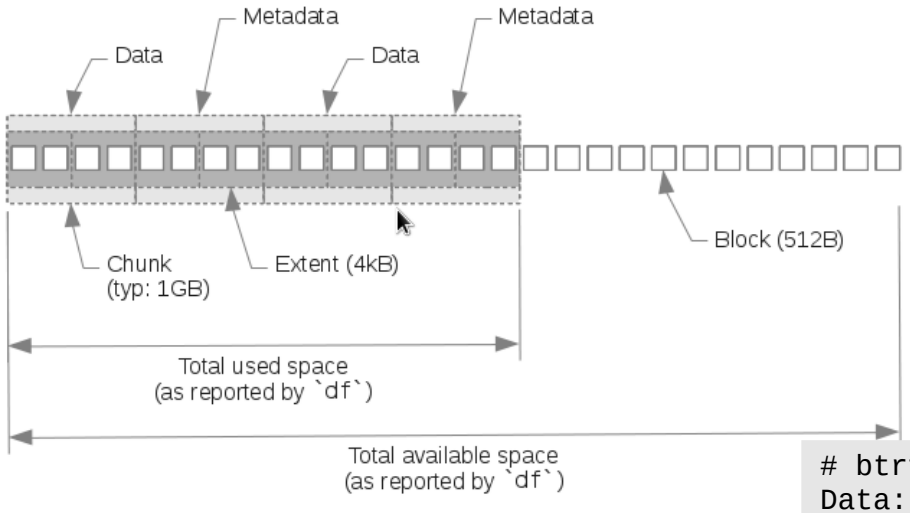


Note: the conversion to btrfs from ext2/3 leaves a copy of the old file system which should be deleted at some point

Btrfs – Functionality – Maturity

Today	Future
Copy on Write	Inode Cache
Snapshots	Auto Defrag
Subvolumes	RAID
Metadata Integrity	Compression
Data Integrity	Send / Receive
Online metadata scrubbing	Hot add / remove
Manual Defragmentation	Seeding devices
Manual Deduplication	Multiple Devices
Quota Groups	“Big” Metadata

Btrfs Disk Space And Extents



In case of a Btrfs filesystem on a single underlying block device

```
# btrfs filesystem df /
Data: total=14.50GB, used=12.20GB
System, DUP: total=8.00MB, used=12.00KB
System: total=4.00MB, used=0.00
Metadata, DUP: total=1.75GB, used=904.11MB

# df -h /
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda7        20G   14G  4.3G  77% /
#
```

Disk utilization
12,2GB + 2x 0,9GB + = 14 GB

Increase Uptime

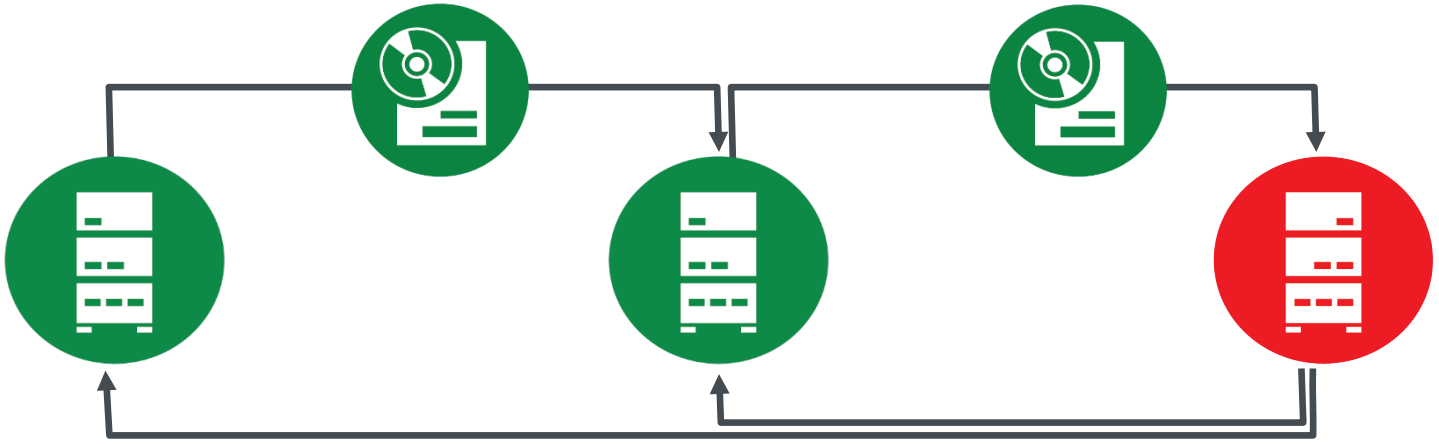
Full System Rollback

Rollback to a good state with one click for faster recovery from planned or unplanned downtime

Support for service pack rollback

Support for kernel upgrade

Based on btrfs and Snapper, bootloader integration



Increase Uptime

Outlook: Ready for Live Patching

- SUSE Linux Enterprise Live Patching
  - Kernel live patching designed and developed by SUSE Labs
  - Ease of use: Builds on well-known update processes
- Use Cases
  - Mission-critical systems: Improve general availability and run until the next “maintenance window”
  - Massive, time-critical deployment
- Competitive Advantage
  - Works with zero execution interruption
  - As opposed to competition who stop the whole system (milliseconds to seconds range) when patching

https://www.suse.com/communities/conversations/need-kgraft-2/

Increase Uptime

Service Availability with Clustering

SUSE Linux Enterprise High Availability Extension

- ***Quickly*** and ***easily*** install, configure and manage clustered Linux servers
- Increase ***service availability*** for mission-critical systems and data
- Transparent to ***Virtualization*** – nodes can be virtual, physical or mixed! ***Integrated*** with SUSE Linux Enterprise Server
- Meet ***Service Level Agreements***

Geo Clustering for SUSE Linux Enterprise High Availability Extension

- Business continuity, anywhere in the world

SUSE® Linux Enterprise High Availability 12

Features

- Service Availability 24/7
- Data Replication
- Cluster File System
- Unlimited Geo Clustering
- Virtualization Ready
- Network Load-Balancer
- Free Resource Agents
- Clustered Samba
- Broad Platform Support

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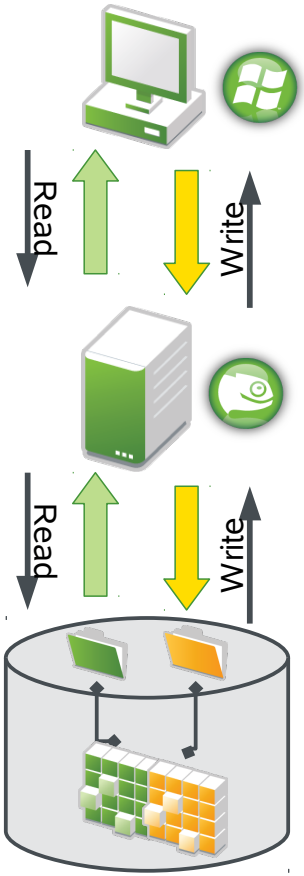
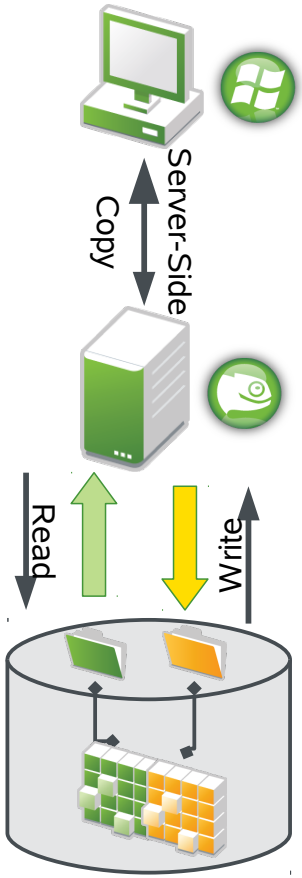
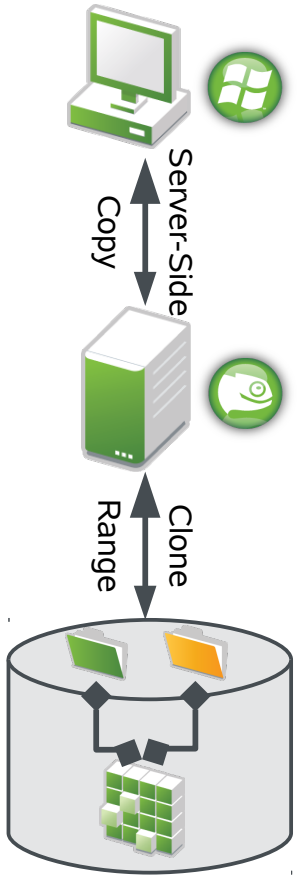
Interoperability – Samba 4



Traditional Copy



Server-Side Copy

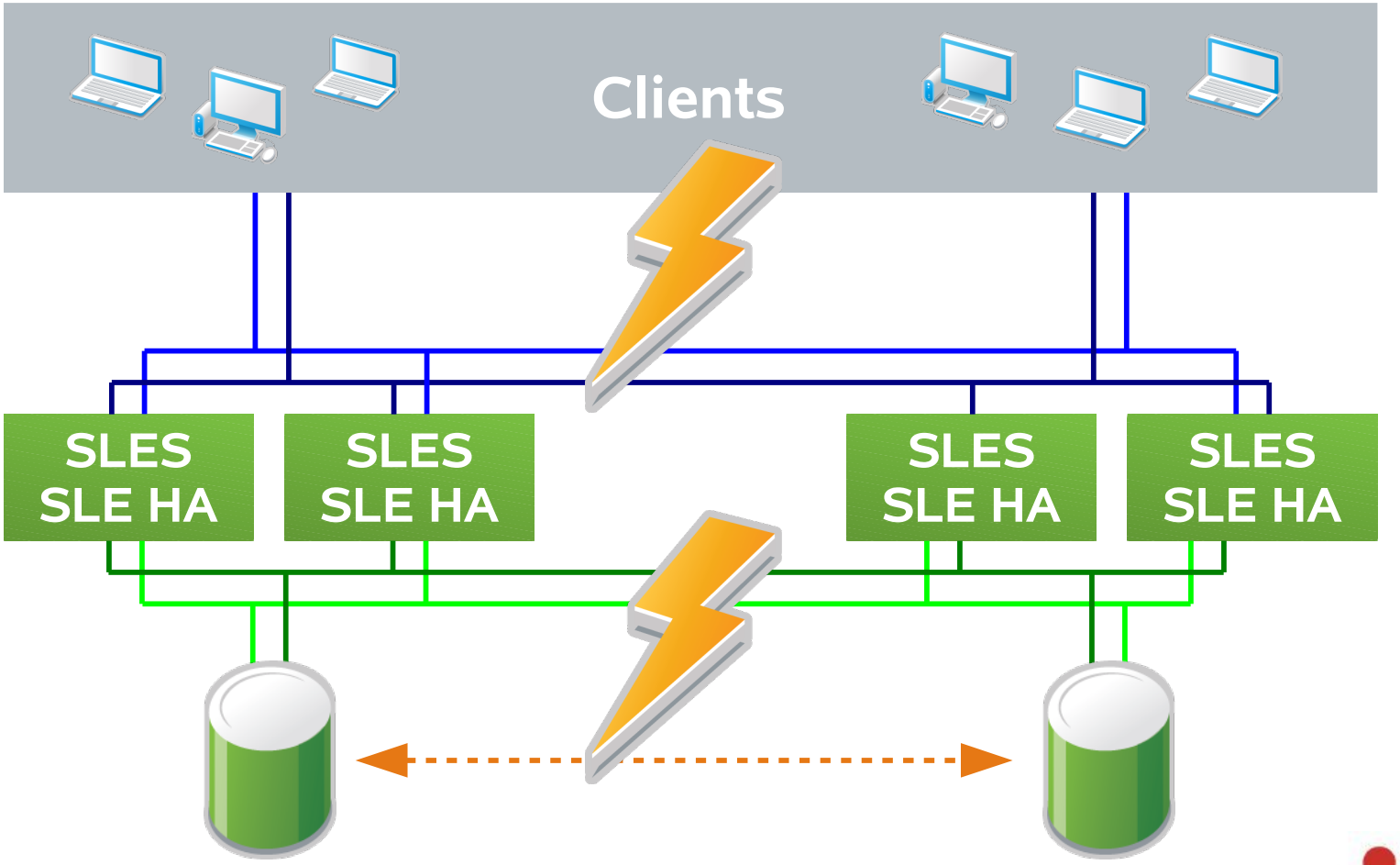


Btrfs Enhanced Server-Side Copy

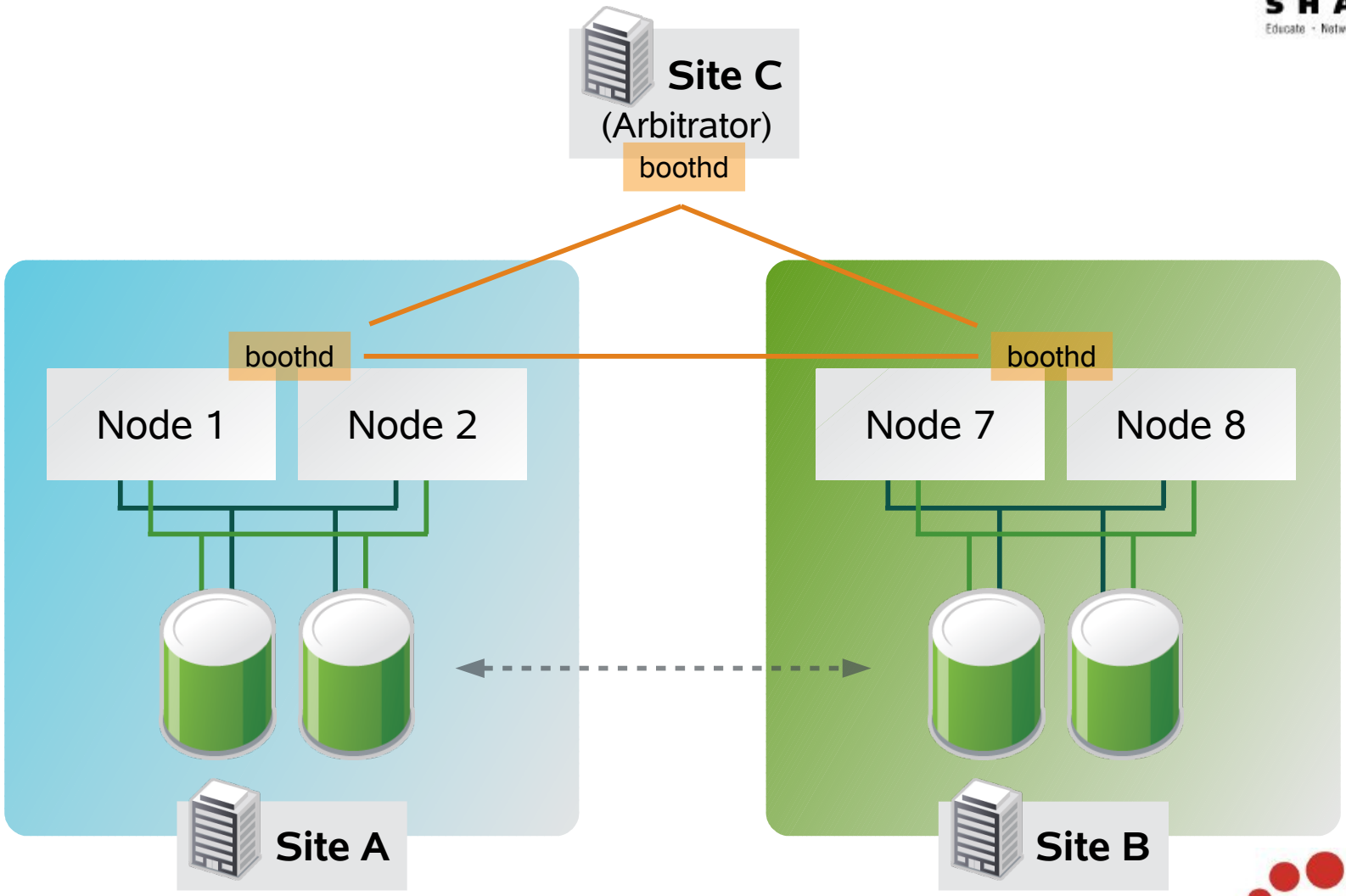
High Availability News

- History Explorer
  - Off-line support
- Fence Agents update
  - SCSI handling
- Administration
  - Cluster health evaluation
  - crmsh improvements
  - New config options
- Load Balancer
  - HAproxy
- Cluster File System
  - OCFS2 performance improvements
  - GFS2
- Geo Clustering
  - Multi tenancy arbitrator
  - IP relocation (DNS based)

Local & Stretched Cluster



Geo Cluster – Setup



Improve Operational Efficiency

Local System Management

Easy-to-use tools

- **YaST and AutoYaST:** now in Ruby, more open for customization
- **Wicked:** making it easy to manage ever-complicated network configuration such as vLan, virtualization, bridging, IPv6, etc.
- Improved installation workflow
- ***Interactive*** as well as ***Unattended upgrade*** (offline, in place) on all architectures

Improve Operational Efficiency

Systemd: System/Service Manager

- Init Replacement
  - Bring up system and start services
  - Integrate system wide ulimit settings and Cgroups
  - Activation via Socket and d-bus
- Command line “systemctl”
  - Compatibility with SystemV init scripts
  - Provide infrastructure for existing ISV applications
  - LSB compatibility
- SUSE specific usability enhancements
  - Keep insserv, chkconfig and /sbin/service
  - Old style (calling “rc...”) redirected to systemctl
  - LSB compatibility for targets like $network...

Improve Operational Efficiency

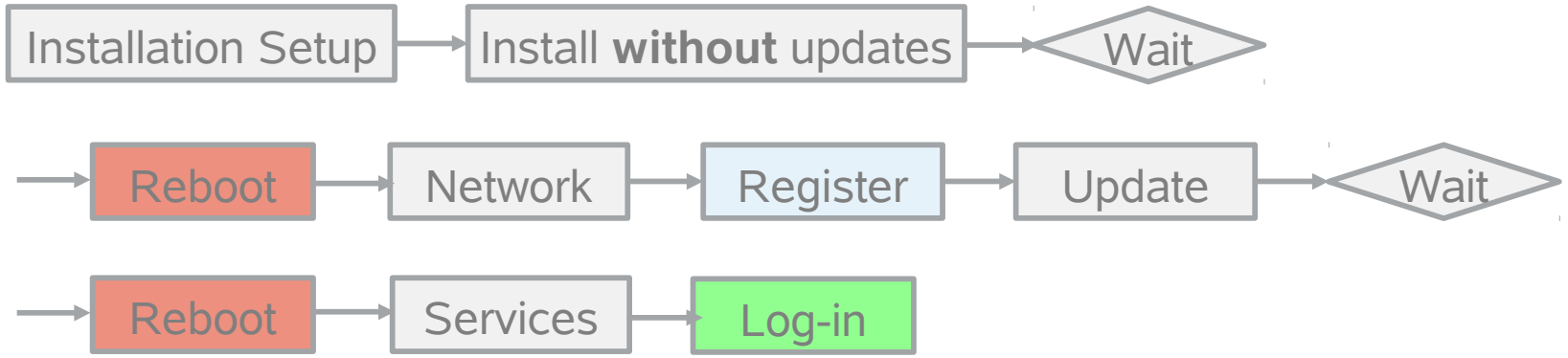
Network Management – Wicked

- Goal
  - Cope with increasingly complex configurations
  - Data Center and End Users
- Benefit
  - Network configuration as a service
  - Smooth adoption & migration
  - Technical Attributes
- Architecture-independent
  - Extensible
  - Small footprint
  - Event based

Improve Operational Efficiency

Installer – Workflow

SUSE Linux Enterprise 11



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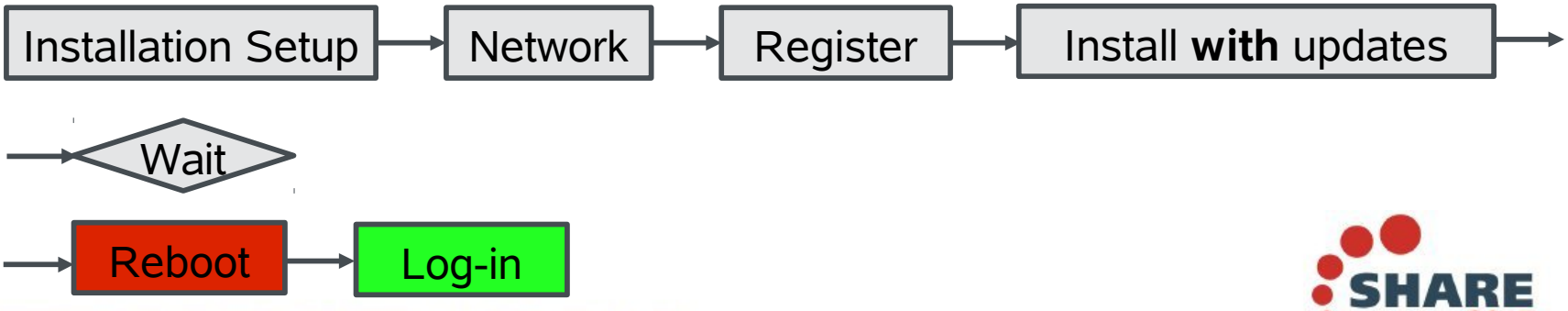
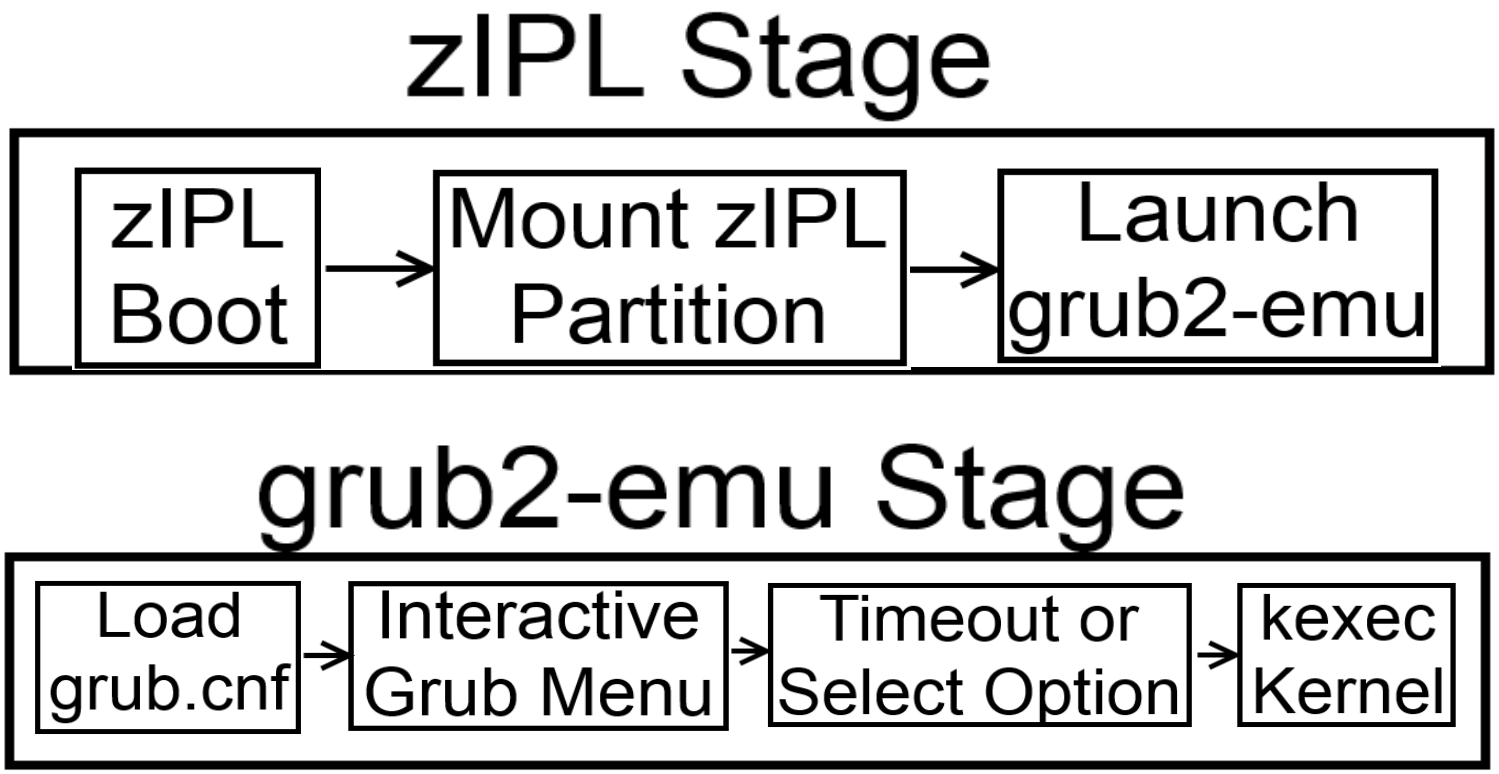


Grub 2 Boot Process



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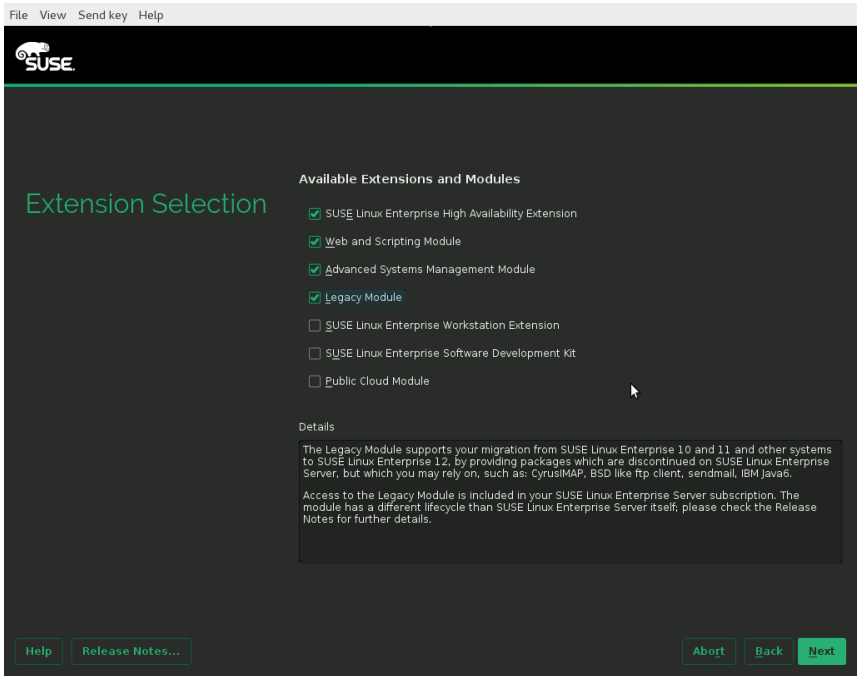
Modules

- Components of SUSE Linux Enterprise
  - Flexible lifecylce (different from the base product)
  - Delivered on-line
  - Fully supported
- List of modules
  - Web and Scripting
  - Legacy
  - Toolchain
  - Public Cloud
  - Advanced Systems Mgmt



Accelerate Innovation

Modules: A Closer Look

Module Name	Content	Lifecycle
Web and Scripting Module	“PHP”, “Python”, “Ruby on Rails”	3 years
Legacy Module	Sendmail, old IMAP stack, old Java etc.	3 years
Public Cloud Module	Public cloud initialization code and tools	Continuous Integration
Toolchain Module	GCC	Yearly delivery
Advanced Systems Management Module	the configuration management tools cfengine, puppet and the new "machinery" tool	Continuous Integration

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Systems Management Today

- Unattended migration reduces cost and downtime
  - SUSE Linux Enterprise 11 SP3 to SUSE Linux Enterprise 11 SP4
  - SUSE Linux Enterprise 11 SP3 to SUSE Linux Enterprise 12
  - SUSE Linux Enterprise 11 SP4 to SUSE Linux Enterprise 12
  - SUSE Linux Enterprise 11 SP4 to SUSE Linux Enterprise 12 SP1
- Example: *http://www.suse.com/documentation/sles11/book_sle_deployment/?page=/documentation/sles11/book_sle_deployment/data/cha_update_auto.html*

- Migration requires system restart with SLES 12
  - Shutdown SLES 11 based system
  - Boot / IPL with SLES 12 system
  - Update SLES 11 → 12 system on disk (pool + updates)
  - Reboot to SLES 12 system

Repository & Channels SLES® 12

Only a few are mandatory channels

```
# zypper lr
#  | // | Name                          | Enabled | Refresh |
---+----+-------------------------------+---------+---------+
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 2 | // | SLES11-SP3-Updates            | No      | Yes     |
 3 | // | SLES12-Pool                   | Yes     | No      |
 4 | // | SLES12-Updates                | Yes     | Yes     |
```

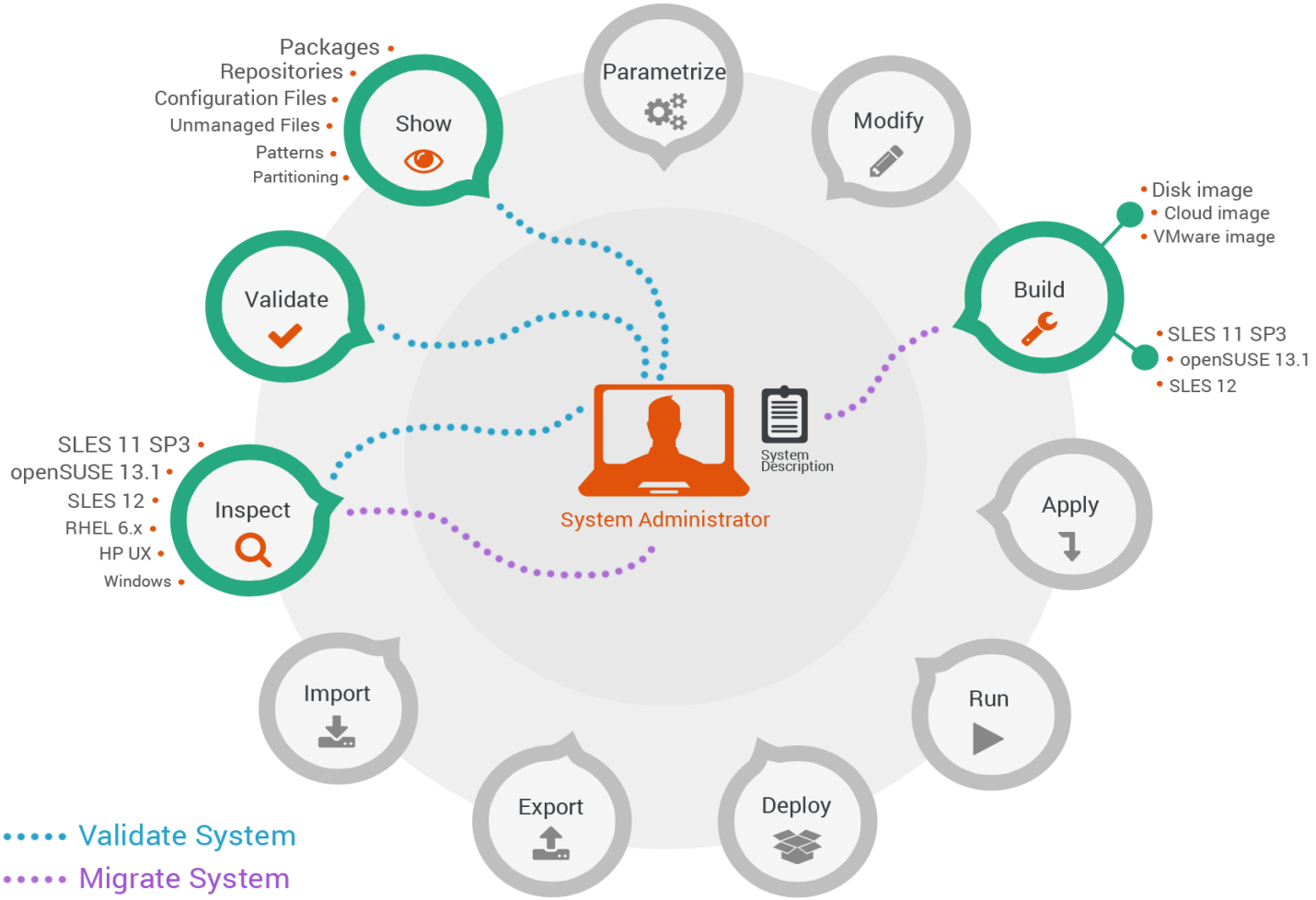
Required SUSE Linux Enterprise Server 12 channels for installation and updates.

- SLES12-Pool static, copied media packages
- SLES12-Updates receives updates related to SLES12-Pool
- *All other channels are configured with the system for convenient activation*

- Note: removing the Pool and Updates channels disables receiving updates for SUSE Linux Enterprise Server 12

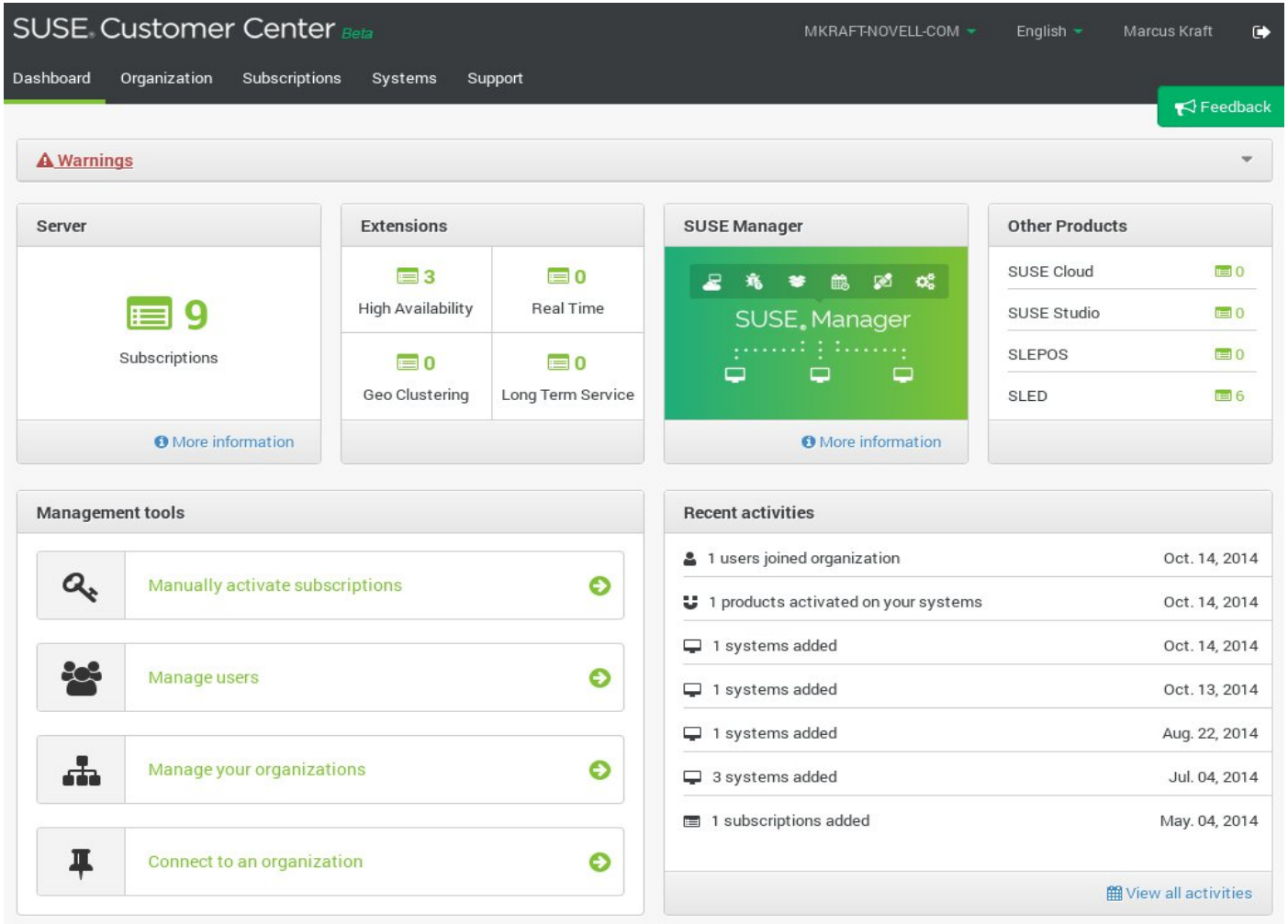
SUSE® Linux Enterprise 12

Advanced Systems Management



Improve Operational Efficiency

SUSE® Customer Center

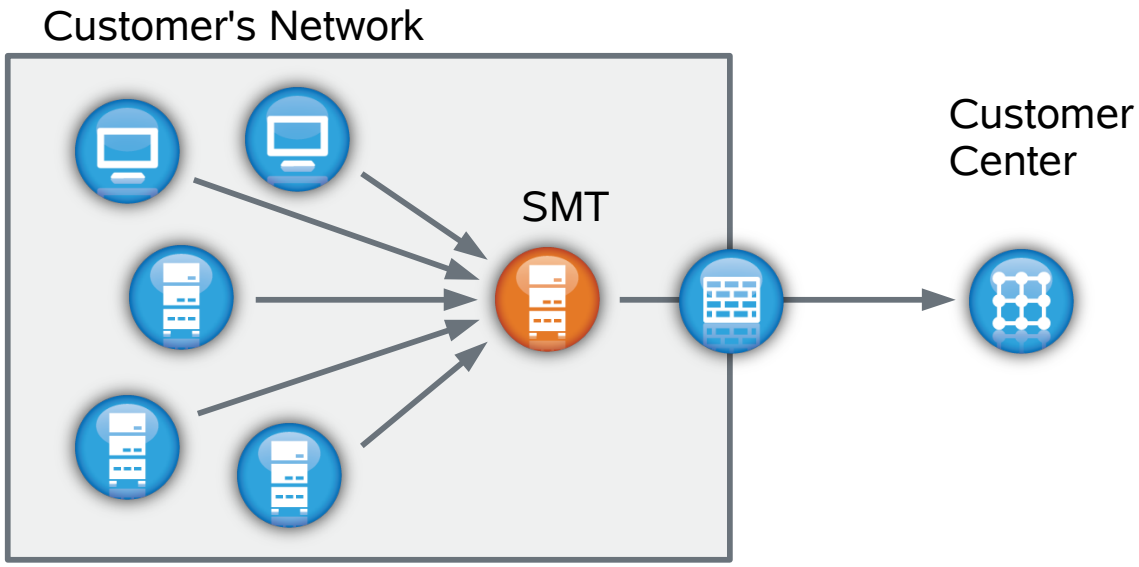


Subscription Management Tool

Overview

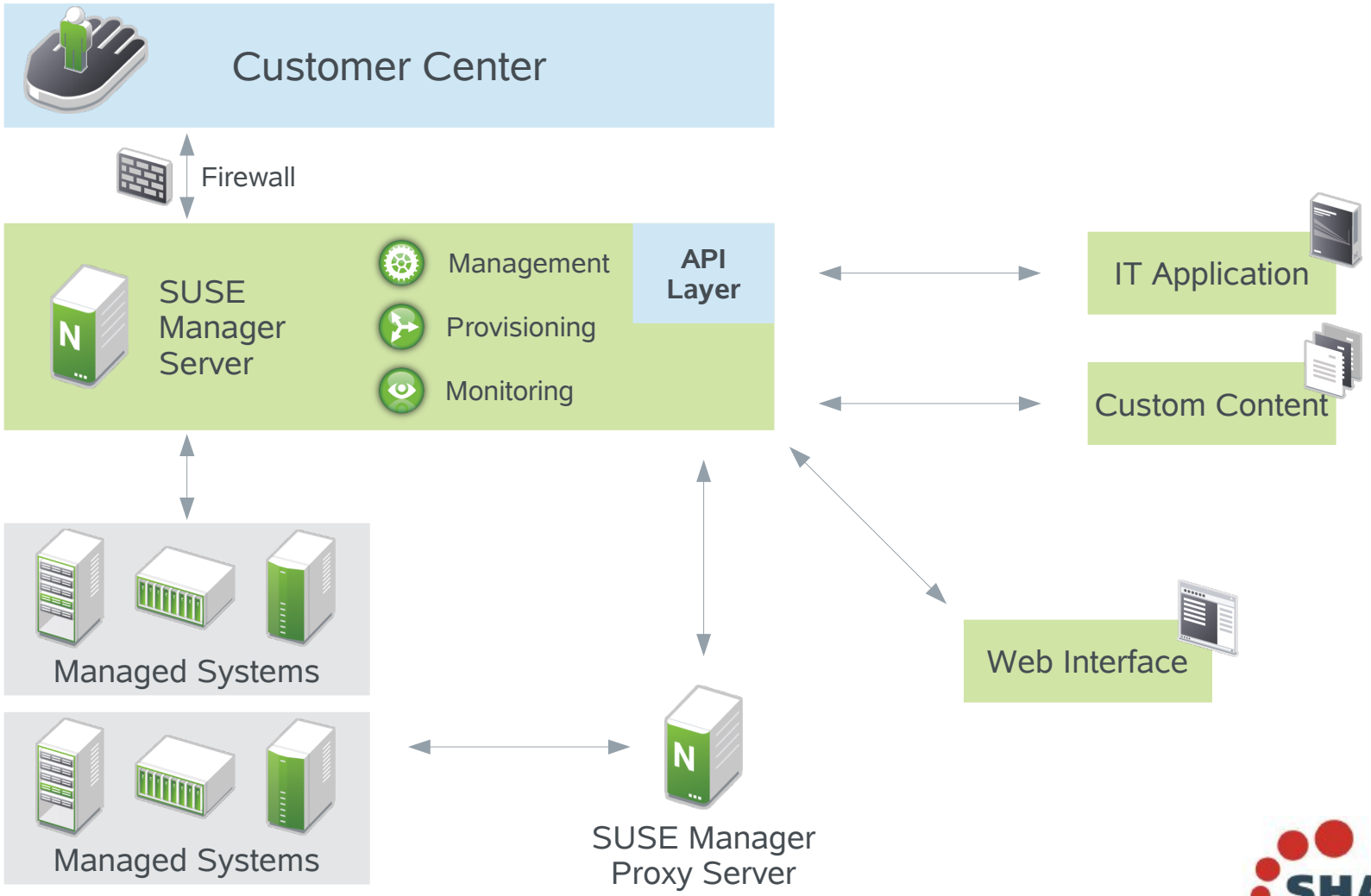
SMT is a proxy and auditing tool that mirrors the Customer Center and tightly integrates with it.

It allows you to accurately register and manage an entire SUSE® Linux Enterprise deployment, guaranteeing the subscription compliance and secure IT process flow organizations require.



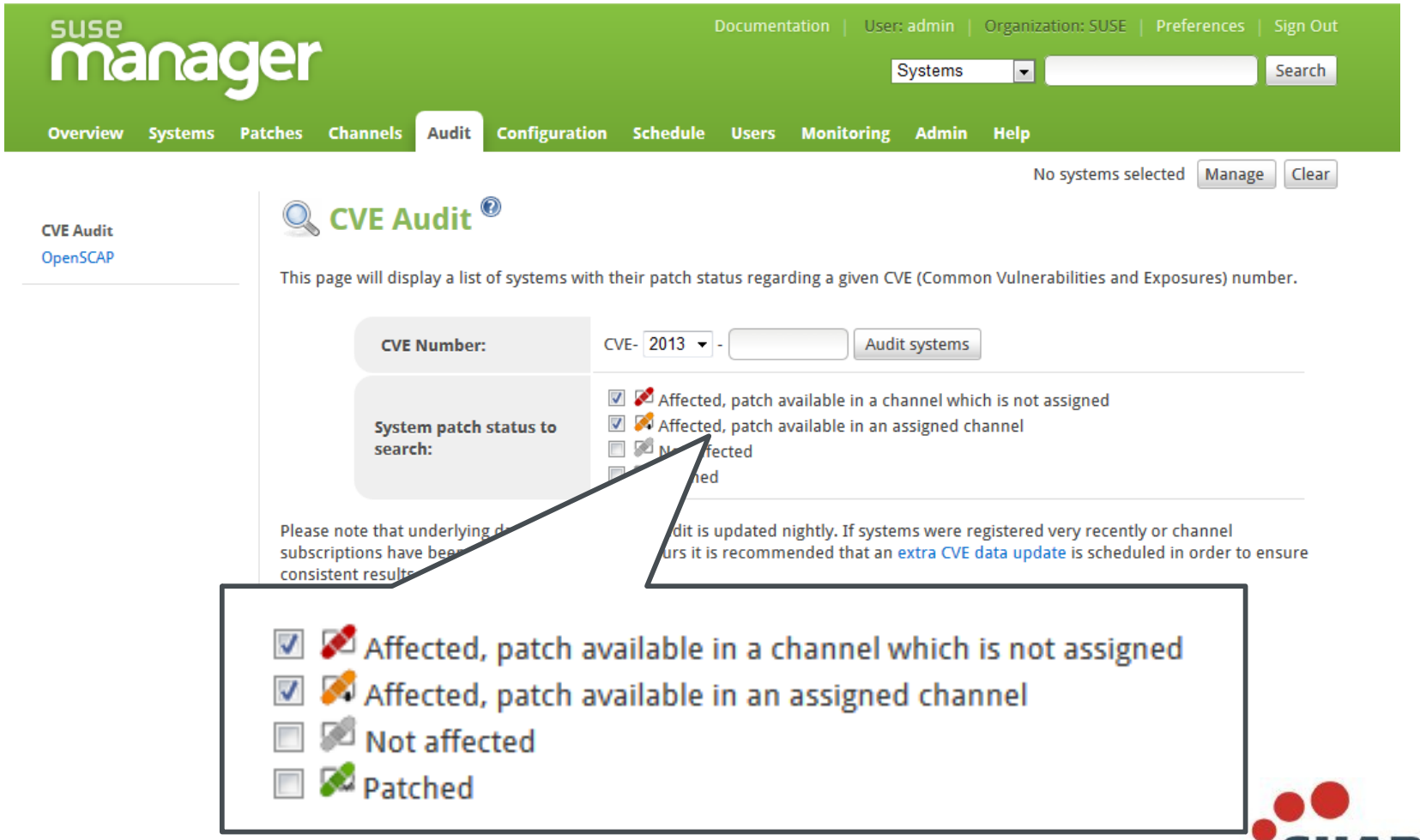
SUSE® Manager

How Does SUSE Manager Work?



SUSE® Manager

Security Patch Audit



What's New with SUSE® Linux Enterprise Server for System z 12

SUSE® Linux Enterprise Server for System z 12

What's New - Overview

Architecture Level Set for z/Architecture

- zarch=z196 - GCC to use instruction set of z196
- mtune=zEC12 - GCC to use instruction scheduling of zEC12
- Kernel, user land, applications

IBM zEnterprise exploitation continued

- z13, zEC12, zBC12, z/VM 6.3, z196 EC, z114 BC support
- zBX support (blade center extension)

Improved RAS tools and System z specific support

- Dump to zfcp/SCSI partition
- CryptoExpress4 support
- Disk mirroring with RT enhancement (DASD/mdadm)

SUSE® Linux Enterprise Server for System z 12

What's New - Overview

Transactional Memory support

- Kernel, GCC, binutils
- Allow kernel and applications to improve performance

STT_GNU_IFUNC support

- Glibc, binutils, GCC
- Provide multiple versions of the same function in a library
- Performance improvements for selected library functions on newer hardware
- Transparent for ISV applications

SUSE® Linux Enterprise Server for System z 12

Accelerate Innovation

Cryptographic acceleration support

- Latest hardware and crypto stack (incl. PKCS#11 (EP11)
- New dedicated installation pattern
- Support of SHA-256 algorithm and CPACF MSA4 extensions

Support transparent large pages

- Potential speedup for applications that access large amounts of memory

src_vipa: IPV6 enablement

- Virtual IP address migration now available for IPv6 networks

SUSE® Linux Enterprise Server for System z 12

Increase Uptime

Disk mirroring with real-time enhancements

- Continuous operation in case of temporary disk storage unit timeout

PCHID mapping

- PCHID to CHPID mapping speeds up problem determination

Concurrent FLASH MCL updates

- Perform concurrent mircocode update during operation

SUSE® Linux Enterprise Server for System z 12

Improve Operational Efficiency

Simple configuration of large amounts of disks

- Restructured UI and workflow

Improve performance of dasdfmt

- Format in parallel and speed up single volume format

Multiple netiucv paths between z/VM guests

- More throughput and redundancy

Query OSA Address Table

- Gather and display OSA and TCP/IP configuration

Optimized compression library zlib

- Faster: installation of system and packages, java class decompression, compressed backups, pdf generation, etc

cgroups - Resource Control

Consider a large university server with various users - students, professors, system tasks etc. The resource planning for this server could be along the following lines:

CPUs

Top cpuset (20%)

/ \

CPUSet1 CPUSet2

| |

(Profs) (Students)

60% 20%

Memory

Professors = 50%

Students = 30%

System = 20%

Disk I/O

Professors = 50%

Students = 30%

System = 20%

Network I/O

WWW browsing = 20%

/ \

Prof (15%) Students (5%)

Network File System (60%)

Others (20%)

Source: /usr/src/linux/Documentation/cgroups/cgroups.txt

Tools Onboard

cgroups – Resource Control

A system administrator can provide a list of devices that can be accessed by processes under cgroup

- Allow/Deny Rule
- Allow/Deny : READ/WRITE/MKNOD

Limits access to device or file system on a device to only tasks in specified cgroup

Source: http://jp.linuxfoundation.org/jp_uploads/seminar20081119/CgroupMemcgMaster.pdf

Technical Preview: KVM for s390x

- Kernel Based Virtual Machine
  - KVM (for Kernel-based Virtual Machine) is a virtualization solution for Linux on x86, POWER and z/Architecture hardware containing virtualization extensions.
  - It consists of a loadable kernel module, kvm.ko, that provides the core virtualization infrastructure and a processor specific module (eg. kvm-intel.ko or kvm-amd.ko)
  - KVM also requires a modified QEMU to connect to the I/O world of the hosting system.
  - Lowers the entry barrier for non-mainframe, but Linux skilled users to explore hardware and virtualization options of the mainframe

Outlook: What is kGraft

- A live patching technology
- Developed by SUSE
- Specifically for the Linux kernel
- Based on modern Linux technologies
  - Lazy update mechanism
  - fentry-based NOP space allocation
  - standard kernel module loading/linking mechanisms

Outlook

https://www.suse.com/promo/kgraft.html

Live Kernel Patching with kGraft

Try it today

Downtime is expensive

Planned or unplanned—downtime is still expensive. What if you could:

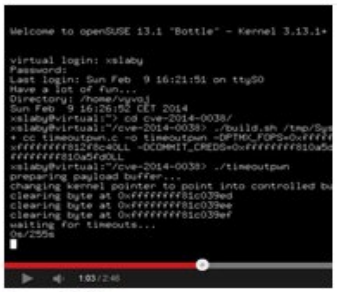
- apply critical updates to a running system, without having to reboot the server?
- eliminate costly planned downtime?

Now you can.

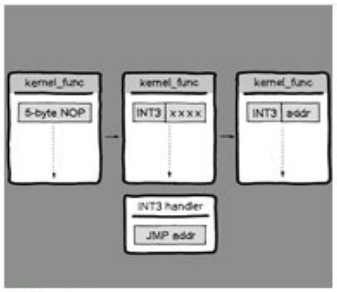
Introducing live kernel patching with kGraft. Technology from SUSE Labs that makes live kernel patching possible.

Download and try it

More information



Demo Video



Slideshow

Blog

SUSE Linux Enterprise 12

The advanced foundation for your success

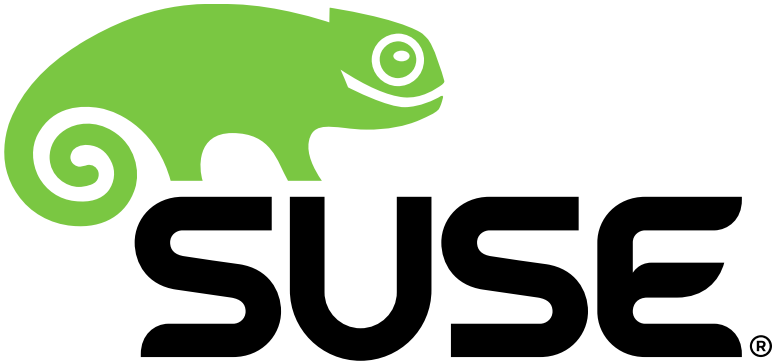
Accelerate innovation

Increase uptime

Improve operational efficiency

Learn more:

Session 16432	Linux Bootloaders on System z
Session 16431	KVM for System z
Session 16451	systemd, the Wave of the Future



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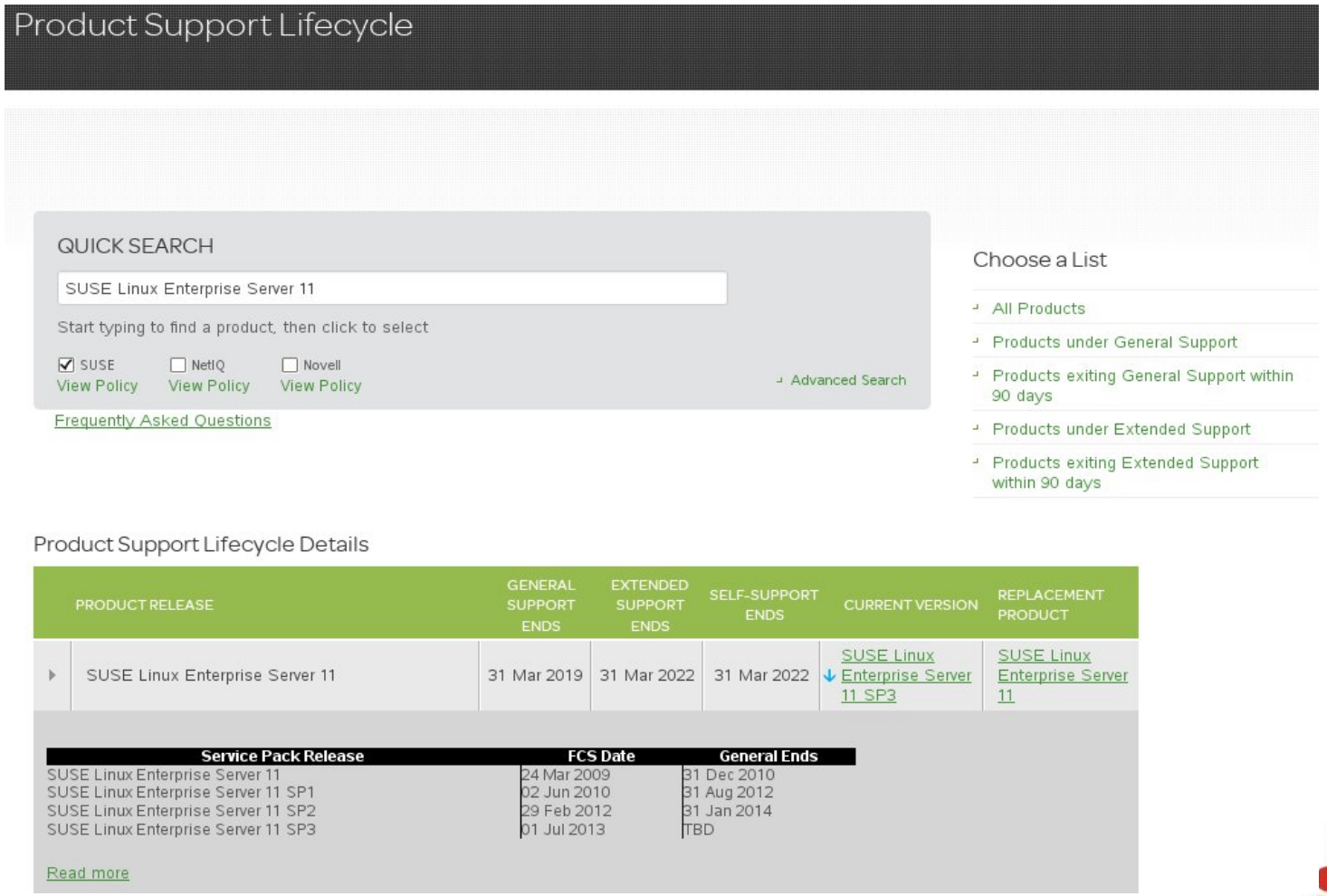

Product Support Lifecycle

QUICK SEARCH

SUSE Linux Enterprise Server 11

Start typing to find a product, then click to select

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Frequently Asked Questions

Choose a List

- All Products
- Products under General Support
- Products exiting General Support within 90 days
- Products under Extended Support
- Products exiting Extended Support within 90 days

Product Support Lifecycle Details

PRODUCT RELEASE	GENERAL SUPPORT ENDS	EXTENDED SUPPORT ENDS	SELF-SUPPORT ENDS	CURRENT VERSION	REPLACEMENT PRODUCT
SUSE Linux Enterprise Server 11	31 Mar 2019	31 Mar 2022	31 Mar 2022	SUSE Linux Enterprise Server 11 SP3	SUSE Linux Enterprise Server 11

Service Pack Release	FCS Date	General Ends
SUSE Linux Enterprise Server 11	24 Mar 2009	31 Dec 2010
SUSE Linux Enterprise Server 11 SP1	02 Jun 2010	31 Aug 2012
SUSE Linux Enterprise Server 11 SP2	29 Feb 2012	31 Jan 2014
SUSE Linux Enterprise Server 11 SP3	01 Jul 2013	TBD

Read more

Why live patching ?

- Common tiers of change management:
  1) Incident response – (we're down, actively exploited …)
  2) Emergency change – (we could go down, are vulnerable …)
  3) Scheduled change – (time is not critical, we keep safe)
- Live patching fits in with 1 and 2
- Rebooting a 1000 servers is not a quick way to fix a pressing issue and also carries the risk of them not coming up for other reasons
- Live patching allows quick response and leaving an actual update to a scheduled downtime window

kGraft function in detail: new function