SUSE® Linux Enterprise

Today and Tomorrow

Dr. Gerald Pfeifer
Director Product Management
gp@suse.com

SUSE®

SUSE® at a Glance

SETTING THE BAR

LEADING PROVIDER
OF ENTERPRISE LINUX SOLUTIONS

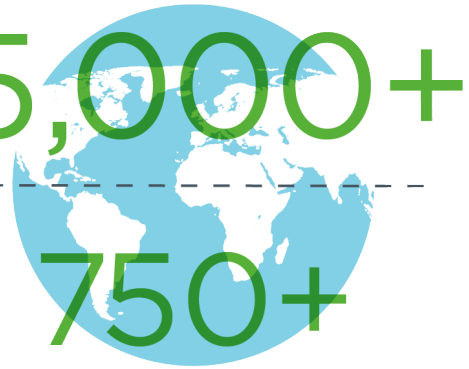
GLOBAL MARKET

CUSTOMERS WORLDWIDE

15,000+

GLOBAL ORGANIZATION

EMPLOYEES IN 43 COUNTRIES



KNOW HOW

20+
YEARS OF LINUX ENGINEERING EXPERIENCE

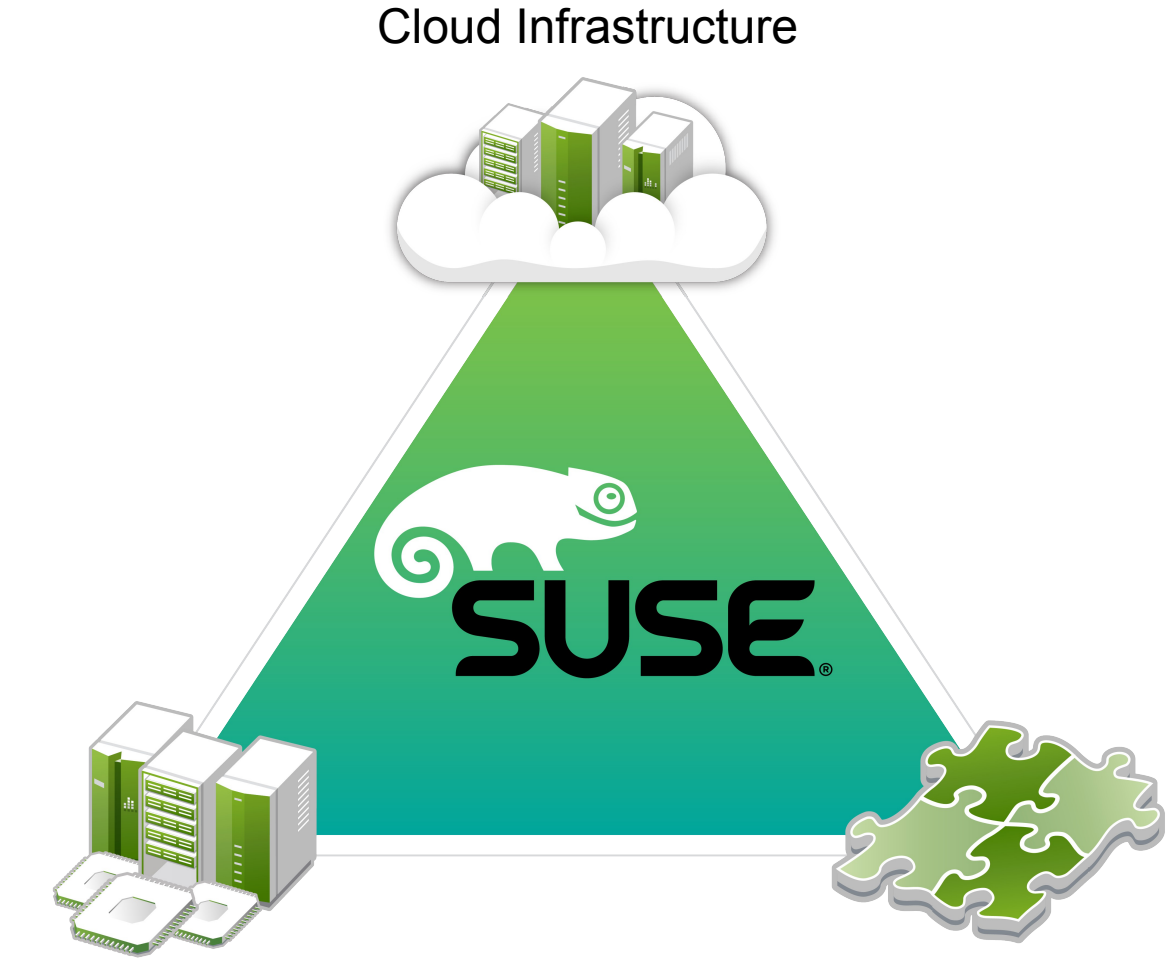
PARTNERS

5,000+ MEMBER PARTNER ECOSYSTEM

THE GOLD STANDARD

AWARD WINNING
TECHNICAL SUPPORT AND CUSTOMER SERVICE

SUSE® Strategy



SUSE® Linux Enterprise

Portfolio and Lifecycle

What we do and how we do it

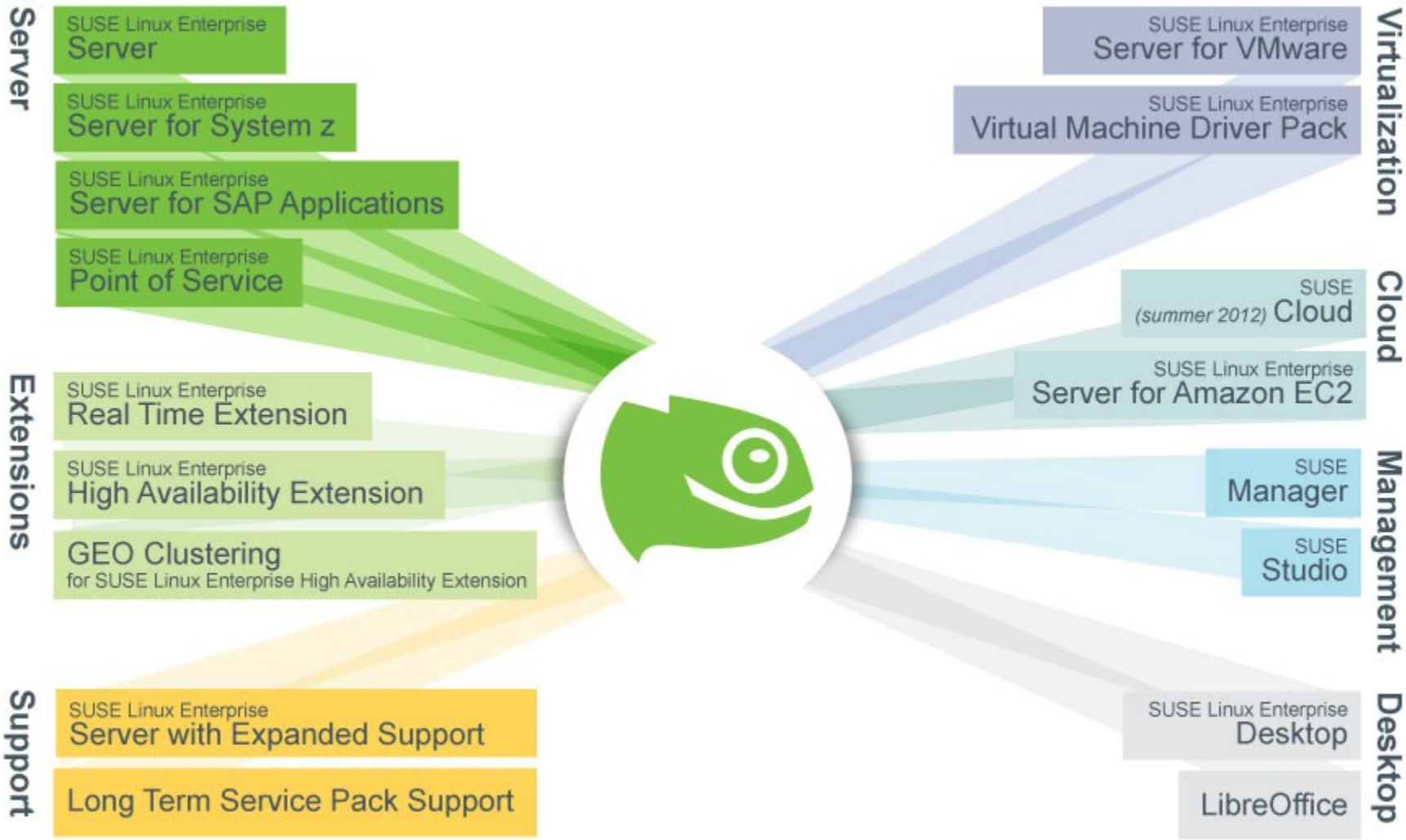
Current und Upcoming Releases

Server and Desktop Technology

Related Sessions at SUSECon

Portfolio and Lifecycle

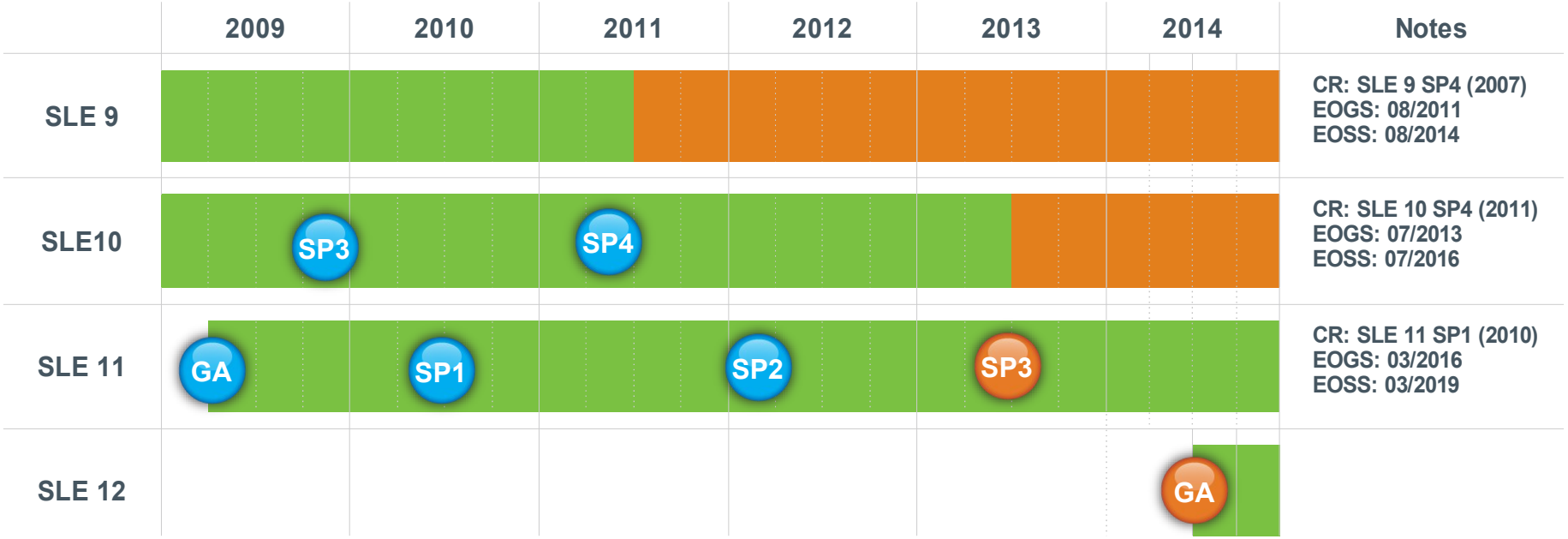
Comprehensive Portfolio



SUSE® Linux Enterprise
Standard Lifecycle

- 10-year lifecycle
- Service Packs every ~18 months
  - 5 years lifetime with
  - ~2 years general support per Service Pack
  - 6 month upgrade window after release of the next Service Pack
- Long Term Service Pack Support (LTSS)
  - Extend upgrade window or major release lifecycle

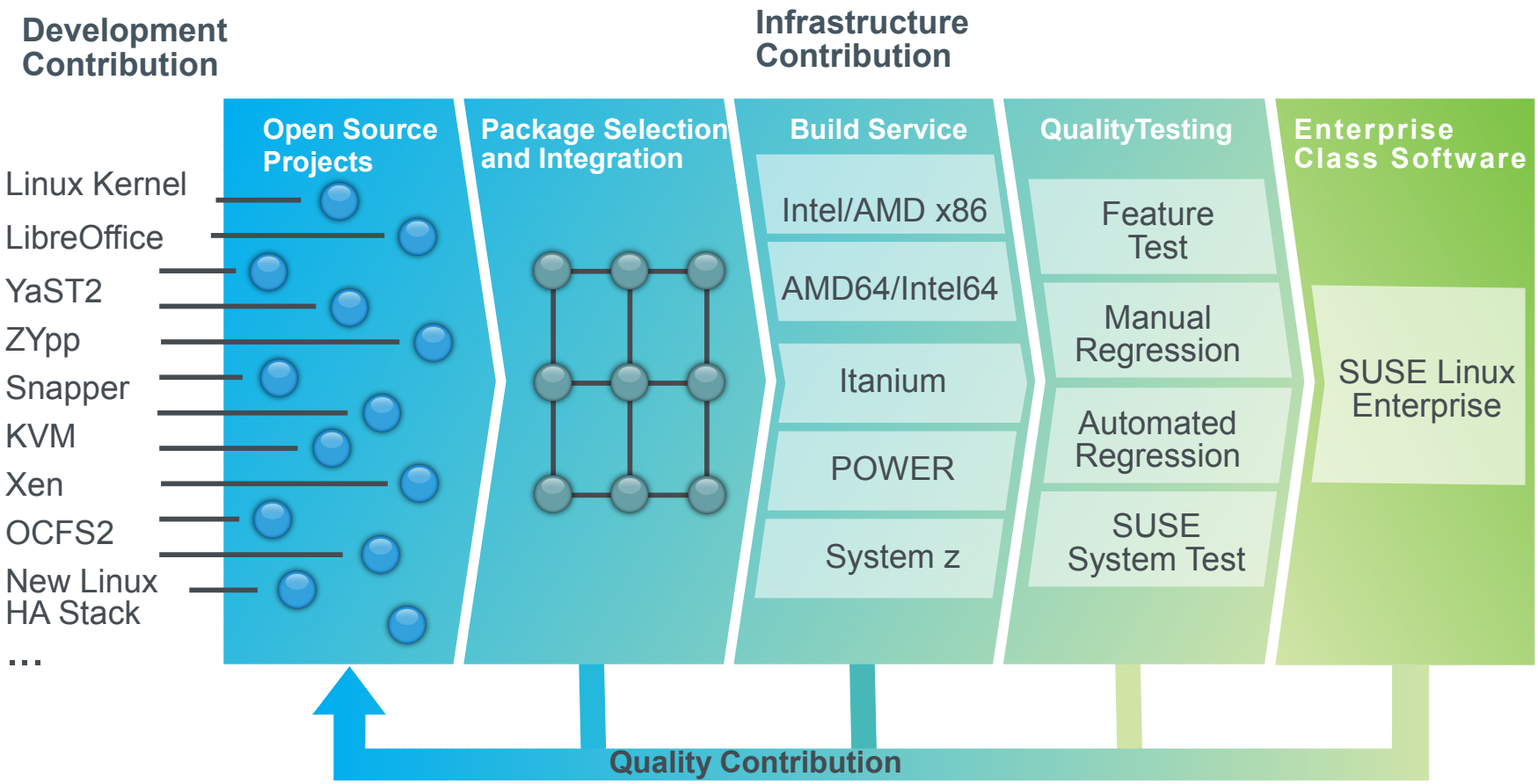
Current SUSE® Linux Enterprise Streams



- Dependable release timing
- Predictability for planning rollouts and migrations
  - Service Pack releases, development and product schedules announced to customers and partners
- Major releases every 4-5 years.

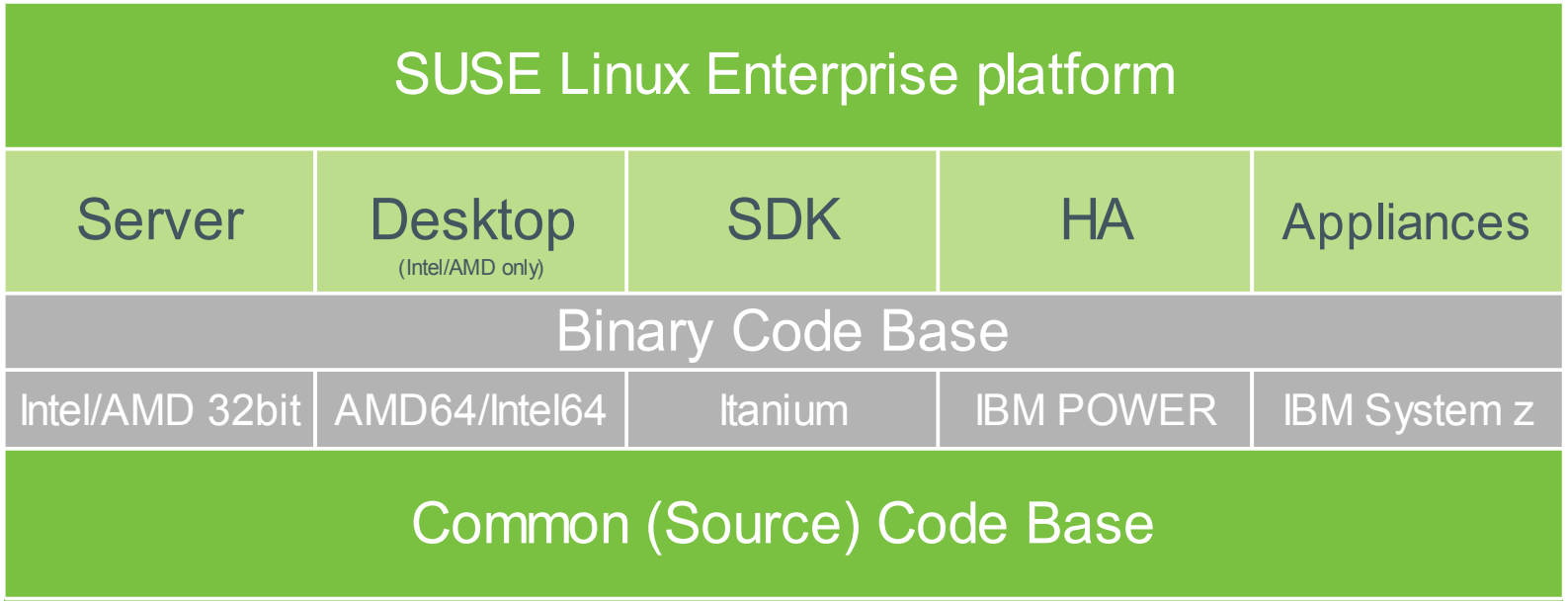
What We Do and How We Do It

How We Build It



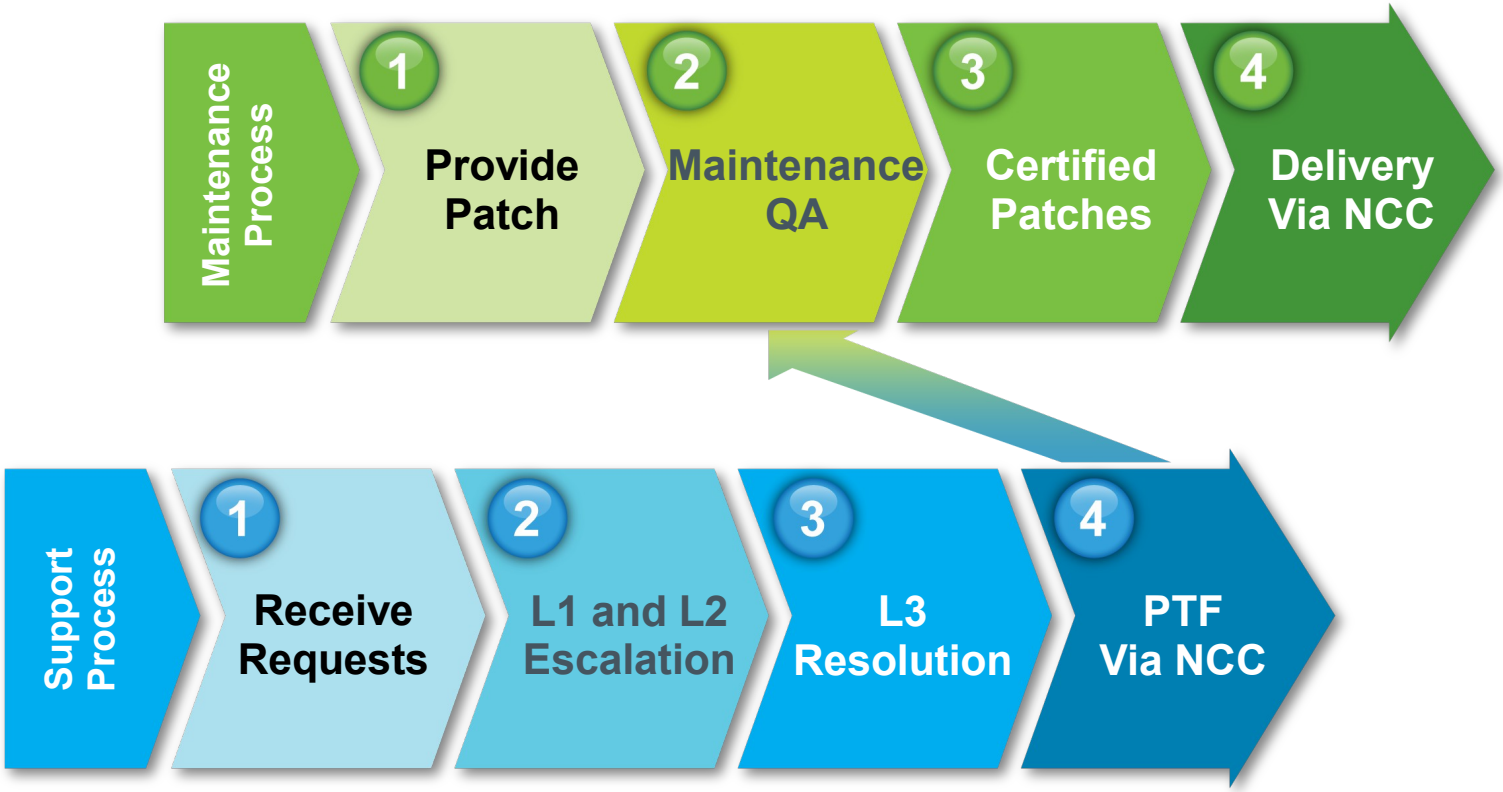
* SUSE Build Service is the internal entity of the Open Build Service

How We Lego It



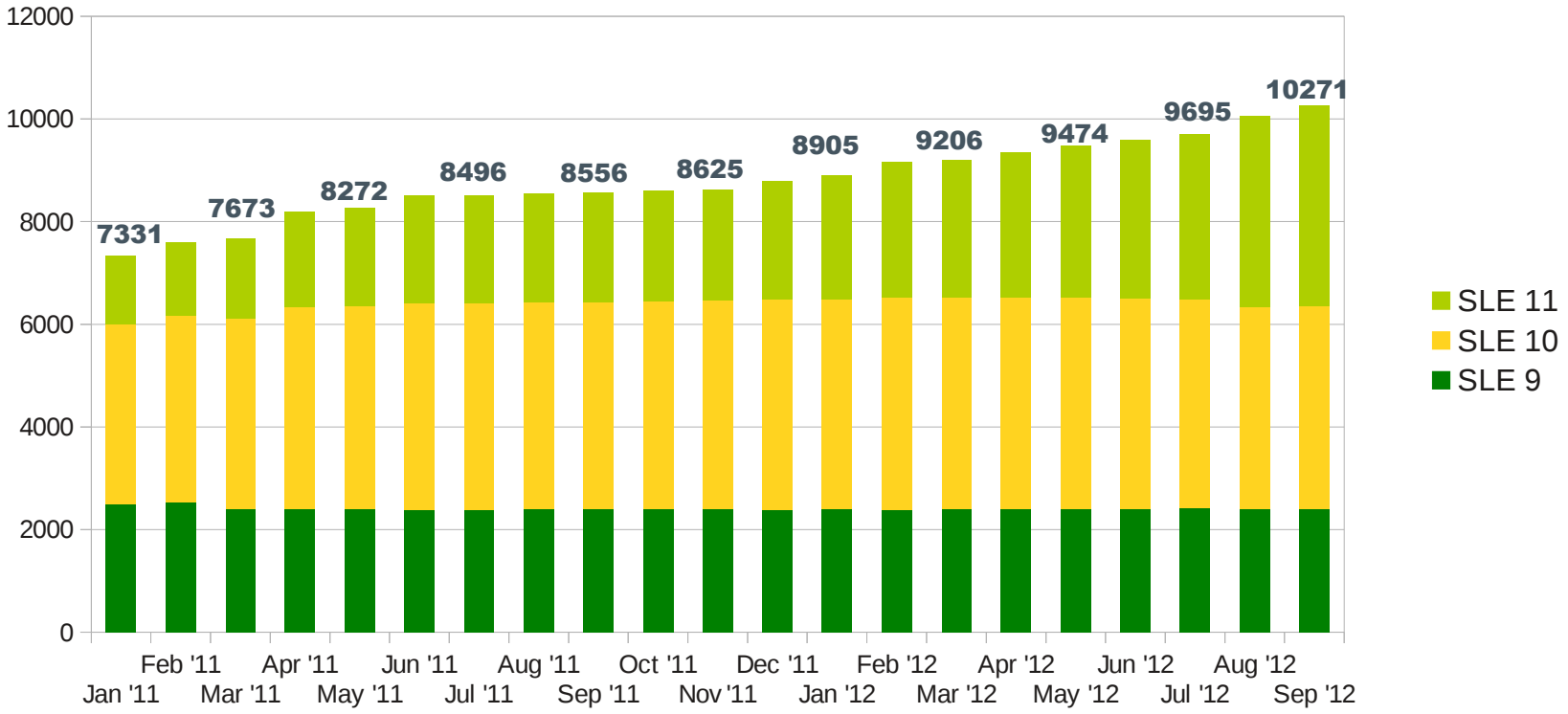
- Foundation for all SUSE® products
- Fully supported core system
- Choose the right architecture for your workload

SUSE® Maintenance and Support



SUSE® Linux Enterprise

ISV Certifications 2012



Current and Upcoming Releases

SUSE® Linux Enterprise 11 SP2

- Hardware enablement and RAS
- Solaris compete
  - btrfs: file system with Copy on Write", checksums, snapshotting
  - LXC: container support based on control groups
  - LTTng (Linux Trace Toolkit) capabilities
- Snapshot / rollback for package and configuration updates
  - YaST2 + ZYPP + btrfs
- SUSE Linux Enterprise High Availability Extension: Geo-cluster, automated and pre-configuration

First customer shipment: February 2012

SUSE® Linux Enterprise 11 SP3

- Consolidation release
- Hardware support
  - AMD64/Intel64
  - IBM System z
- UNIX to SUSE Linux Enterprise migration
  - Improve existing infrastructure and solutions, e.g. NFS
- Standards compliance
  - IPv6
- Solid base for SUSE Cloud and Integrated Systems
- Important customer requests with general business relevance

First customer shipment: June 2013 (tentative)

Service & Support

Hardware

SUSE® Linux Enterprise 12

Virtualisation

Enterprise Community

Server and Desktop Technology

Today – Tomorrow

Server and Desktop Technology

- Scalability
- Virtualization & Cloud
- Reliability, Availability, Serviceability (RAS)
- Systems Management
- Interoperability
- Security and Certifications

SUSE® Linux Enterprise 11

Scalability Today

The only enterprise Linux OS that helps customers:

- Scale with their hardware
  - 4096 CPUs on Intel64 / Itanium, 1024 CPUs on POWER
- Compute huge amounts of data in memory
  - 16+TiB RAM on certified hardware (ERP, data-warehousing)
- Deploy huge amounts of data
  - By supporting SGI's XFS for filesystem and file sizes up to 8 EiB – in the 4th generation of the OS (8+ years)
  - By introducing support for btrfs
- Expand network filesystem capabilities: NFSv4.x, pNFS client support

SUSE® Linux Enterprise

Scalability Tomorrow and Future

- Network filesystem capabilities (NFS/pNFS)
  - Improve IPv6 support for NFSv3 and NFSv4
  - pNFS server support for a later version of SUSE Linux Enterprise High Availability Extension
- Support for new floating point and crypto hardware
- Scheduler optimizations improve performance
- Availability on systems with large numbers of lower power CPUs (ARM, etc.)
- Improve resource management and accounting functionality for containers
- Distributed storage option (CephFS)

SUSE® Linux Enterprise 11

Reliability Today (1)

- Strong cooperation with IBM
  - Optimization for mission-critical workloads on System z
- Hardware RAS features on Intel 64
  - Bring x86-64 systems on par with traditional RISC systems
- Support for the btrfs filesystem
  - Checksums on data and metadata ensure data integrity
- LTTng (Linux Trace Toolkit Next Generation)
  - Part of SUSE Linux Enterprise Real Time 11 SP2

SUSE® Linux Enterprise 11

Reliability Today (2)

- Large blade centers benefit from swap over NFS
  - Centralize swap space and improve availability
- Built-in open source MultiPath I/O (MPIO)
  - Replace expensive proprietary solutions.
- Software RAID (1/5/6/10)
  - Increase redundancy for storage

SUSE® Linux Enterprise

Reliability Tomorrow

Run SUSE Linux Enterprise systems uninterrupted

- Snapshot/rollback for full system
  - Based on btrfs
- Kernel patching without reboot
  - As part of an upstream effort (“ksplice”)
- Migrate tasks to more reliable Memory and CPUs
  - Requires hardware support

SUSE® Linux Enterprise 11

Virtualization Today (1)

- Built-in Virtualization Host
  - KVM 0.15+
    - I/O improvements, storage and network device hotplugging
    - Microsoft Windows support
  - Xen 4.1
    - Latency improvements, flexible partitioning
    - Better fault handling, improved scalability and performance
- Perfect guest
  - VMware ESX
  - Microsoft Hyper-V
  - Citrix XenServer
  - SUSE Linux Enterprise with Xen and KVM
  - LPAR and z/VM for IBM System z

SUSE® Linux Enterprise 11

Virtualization Today (2)

- Containers
  - Manage several workloads within one Linux instance
  - In a lightweight manner:
    control groups and Linux Containers (LXC)
- Virtual machine driver pack: paravirtualized drivers
  - Increase performance, improve reliability and stability
- SUSE Appliance Program and SUSE Studio™ for easy building, testing, distributing and managing of stack

SUSE® Linux Enterprise

Virtualization Tomorrow

- Built-in Virtualization host
  - Smooth migration between Xen and KVM
  - KVM inherits from the Linux kernel
    - Power-saving capabilities and
    - Scalability improvements
  - KVM on System z
- Perfect guest
  - Tuning according to hypervisor
- Containers
  - More detailed control and tuning for single processes and process groups
  - Improve container security

SUSE® Linux Enterprise

Ready for the Cloud Today

Amazon EC2

- Full support for SUSE Linux Enterprise Server 10 and 11
- Deploy from SUSE Studio™ to EC2
- Seamless integration with existing EC2 features
  - Elastic Block Storage (EBS)
  - CloudWatch
  - Load-balancing
  - Elastic IPs
- Available in all zones in all regions

SUSE® Cloud Computing Strategy

- **Public Cloud:** Broadly deploy SUSE Linux Enterprise Server through **SUSE Cloud Service Provider Program**

- **Private Cloud:** Deliver **SUSE Cloud** cloud infrastructure solution powered by OpenStack

- **Hybrid Cloud:** Tightly integrate **SUSE Studio** and SUSE Manager with **SUSE Cloud** to deliver a platform and tools that enable enterprise hybrid clouds

SUSE® Linux Enterprise 11

Systems Management Today

- YaST – unique, highly integrated local management tool
  - Ease of use, effective learning curve; reduces training efforts
  - Automation via AutoYaST data center mass deployments
- Fastest open source update stack (ZYpp)
  - Reduce management time, effort and cost
  - Improve reliability and availability by reducing downtimes
  - ZYpp handles multiple installed package versions (e.g. Kernel)
- Unattended migration from SUSE Linux Enterprise 10 to SUSE Linux Enterprise 11 SP1 reduces cost and downtime
- CIM instrumentation
  - Remote administration standard: data center integration

SUSE® Linux Enterprise 11

Systems Management Today

- Snapshot-Rollback for package updates with
  - btrfs
  - ZYpp/zypper
  - snapper
  - Rollback changes to the system, which have been unwanted (administrator error) or did show unwanted results or side effects

SUSE® Linux Enterprise

Systems Management Tomorrow

Best manageable Linux operating system

- Well defined API for standard tasks
- Open interfaces
- Strengthen YaST community
- Made for cloud

SUSE® Linux Enterprise 11

Interoperability Today

- Active Directory
  - Authentication to Windows domains at OS install time (YaST)
  - Integration with native SUSE Linux Enterprise systems management stack and security capabilities (e.g. PAM)
  - No need for additional software
  - Support for Windows 7 domain logon with Samba 3.6
- Remote Desktop Protocol (RDP, Windows environments)
  - Support xrdp server on AMD64/Intel64
  - Introduce FreeRDP client: better Performance and Interoperability
- Samba 3.6
  - SMB2 protocol support
- Improve CIFS kernel module

SUSE® Linux Enterprise 11

Interoperability Today

- Next-generation network infrastructure and filesystems (interoperability with UNIX systems): NFSv4.1
- Interoperability with other Linux distributions
  - Linux Standards Base 4.0 certification
- Lead in terms of IPv6 compatibility
  - USGv6 certification
  - DHCP server and client (ISC dhcp)
  - IPv6 support in NFS
  - IPv6 capable Squid proxy (most other network daemons are IPv6 ready since SLE 10 times)
  - Ensure IPv6 capabilities with UEFI network boot

SUSE® Linux Enterprise

Interoperability Tomorrow

- Samba 4
  - Active Directory controller
- Continue lead
  - Filesystem Hierarchy Standard (FHS)
  - Linux Standard Base (LSB)
  - IPv6
  - Virtualization
  - LibreOffice
  - ...

SUSE® Linux Enterprise 11

Security and Certifications Today

System Hardening	YaST2 Security Center
Application confinement	AppArmor
System Confinement	SE Linux (Stack Support)
Intrusion Detection (Filesystem)	AIDE
Fine-grained access rights	Filesystem POSIX capabilities
Encryption capabilities	Three ways: “Full Disk” – Volume – File System (eCryptFS)
Certifications	CGL 4.0 IPv6 (refresh)
Measure and monitor system integrity during (re)boot	Trusted Platform Modules (TPM) – Trusted Computing

SUSE® Linux Enterprise 11

Security and Certifications Today

- Common Criteria Certification
  in Evaluation Assurance Level 4 with augmentation according to the BSI OSPP (CC/OSPP EAL 4+)
- FIPS 140-2 Certification
  - "libopenssl" module
  - tentative/future modules based on customer demand
- Trusted Execution Technology (TXT)
  - Enhances Trusted Computing with processor-based separation functions on a page-level in memory
  - Keep systems in consistent and proven ("measured") state
  - in virtual environments and cloud

SUSE® Linux Enterprise Server 11 for System z

Today

- Full Dynamic Resource Handling
  - Two levels of virtualization to choose (LPAR and z/VM)
    - Choose the level of isolation mandated by compliance
    - Flexible resource allocation and reallocation
  - CPU, memory, I/O hotplug
    - Provide the resource where they are needed in LPAR and zVM guest
- Abundant memory and IO bandwidth and transaction capability
  - Hipersocket support connects Linux and z/OS applications and data
- RAS
  - SUSE Linux Enterprise High Availability Extension included
  - IO performance statistics
  - Dump generation and inspection facilities
  - System z specific kernel messages with documentation

SUSE® Linux Enterprise Server 11 SP2 for System z

Today

- z196 / z114 + zBX = IBM zEnterprise exploitation
  - CPU topology and instruction set exploitation of z196 (SDK)
  - New CHPID support connecting both environments
- Choose the right environment for the right workload
  - ISVs application support might mandate the platform
  - SUSE Linux Enterprise Server supported for both hardware architectures
- Improved tools and z specific support
  - Disk storage and crypto enhancements
  - Linux RAS support, s390-tools update

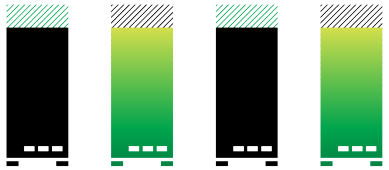
SUSE® – Technology Leadership

- Scalability
- Virtualization & Cloud
- Reliability, Availability, Serviceability (RAS)
- Systems Management
- Interoperability
- Security and Certifications

SUSE® Leadership

1

MAINFRAME LINUX



Over 80% of all Linux running on mainframe computers is SUSE Linux Enterprise Server

2

SAP ON LINUX

70% of all SAP applications running on Linux run on SUSE Linux Enterprise

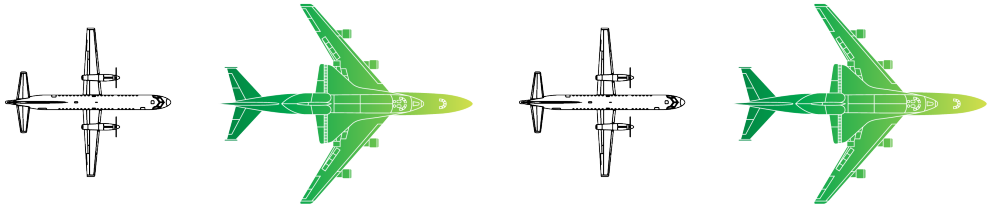
3

LINUX IN CHINA

SUSE Linux Enterprise Server is the most widely used commercial enterprise Linux distribution in China - more popular than Red Hat

4

LINUX IN AEROSPACE AND DEFENSE



Almost 80% of the US Fortune 500 aerospace and defense companies use SUSE Linux Enterprise Server

5

MOST CERTIFIED APPLICATIONS

Over 9,500 applications are certified and supported on SUSE Linux Enterprise Server, more than any other Linux distribution

SUSE® Leadership

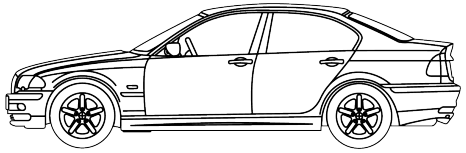
6

LINUX IN RETAIL

Nearly 70% of the US Fortune 100 general merchandisers, specialty retailers, and food and drug stores use SUSE Linux Enterprise Server

7

LINUX IN AUTOMOTIVE



Nearly all of the world's major automobile manufacturers use SUSE Linux Enterprise Server

8

MOST CERTIFIED HARDWARE DEVICES

SUSE is certified on over 13,500 hardware devices. More than any other Linux distribution.

9

LINUX IN HPC

Half of the world's largest supercomputer clusters use SUSE Linux Enterprise Server

10

BEST LINUX SUPPORT

SUSE offers better Linux support than Red Hat or Oracle

11

LINUX IN GLOBAL FORTUNE 100

2/3

Over two-thirds of the Fortune Global 100 use SUSE Linux Enterprise Server

Questions?

Thank you.

Appendix

SUSE® Linux Enterprise 11 SP2

Kernel Capabilities

SLE 11 SP 2	x86	ia64	x86_64	s390x	ppc64
CPU bits	32	64	64	64	64
max. # logical CPUs	32	up to 4096	up to 4096	64	up to 1024
max. RAM (theoretical/practical)	64/ 16 GiB	1 PiB/ 8+ TiB	64 TiB/ 16TiB	4 TiB/ 256 GiB	1 PiB/ 512 GiB
max. user-/ kernelspace	3/1 GiB	2 EiB/φ	128 TiB/ 128 TiB	φ/φ	2 TiB/ 2 EiB
max. swap space	up to 31 * 64 GB				
max. #processes	1048576				
max. #threads per process	tested with more than 120000; maximum limit depends on memory and other parameters				
max. size per block device	up to 16 TiB	and up to 8 EiB on all 64-bit architectures			

Supported on certified hardware only

SUSE® Linux Enterprise 11 SP2

Filesystems

Feature	Ext 3	reiserfs	XFS	OCFS 2	btrfs
Data/Metadata Journaling	•/•	○/•	○/•	○/•	N/A [3]
Journal internal/external	•/•	•/•	•/•	•/○	N/A
Offline extend/shrink	•/•	•/•	○/○	•/○	•/•
Online extend/shrink	•/○	•/○	•/○	•/○	•/•
Inode-Allocation-Map	table	u. B*-tree	B+-tree	table	B-tree
Sparse Files	•	•	•	•	•
Tail Packing	○	•	○	○	•
Defrag	○	○	•	○	•
ExtAttr / ACLs	•/•	•/•	•/•	•/•	•/•
Quotas	•	•	•	•	○
Dump/Restore	•	○	•	○	○
Blocksize default	4KiB				
max. Filesystemsize [1]	16 TiB	16 TiB	8 EiB	4 PiB	16 EiB
max. Filesize [1]	2 TiB	1 EiB	8 EiB	4 PiB	16 EiB
Support Status	SLES	SLES	SLES	SLE HA	SLES

SUSE® Linux Enterprise was the first enterprise Linux distribution to support journaling filesystems and logical volume managers back in 2000. Today, we have customers running XFS and ReiserFS with more than 8TiB in one filesystem, and the SUSE Linux Enterprise engineering team is using our 3 major Linux journaling filesystems for all their servers. We are excited to add the OCFS2 cluster filesystem to the range of supported filesystems in SUSE Linux Enterprise. For large-scale filesystems, for example for file serving (e.g., with with Samba, NFS, etc.), we recommend using XFS. (In this table "+" means "available/supported"; "-" is "unsupported")

[1] The maximum file size above can be larger than the filesystem's actual size due to usage of sparse blocks. It should also be noted that unless a filesystem comes with large file support (LFS), the maximum file size on a 32-bit system is 2 GB (2^{31} bytes). Currently all of our standard filesystems (including ext3 and ReiserFS) have LFS, which gives a maximum file size of 2^{63} bytes in theory. The numbers given in the above tables assume that the filesystems are using 4 KiB block size. When using different block sizes, the results are different, but 4 KiB reflects the most common standard.

[2] 1024 Bytes = 1 KiB; 1024 KiB = 1 MiB; 1024 MiB = 1 GiB; 1024 GiB = 1 TiB; 1024 TiB = 1 PiB; 1024 PiB = 1 EiB (see also http://physics.nist.gov/cuu/Units/binary.html)

[3] Btrfs is a copy-on-write logging-style file system, so rather than needing to journal changes before writing them in-place, it writes them in a new location, and then links it in. Until the last write, the new changes are not “committed.”

SUSE® Linux Enterprise

Documentation and Release Notes

- Product Pages
  - http://www.suse.com/products/server/
  - http://www.suse.com/products/sles-for-sap/
  - http://www.suse.com/products/highavailability/
  - http://www.suse.com/products/realtime/
- Unix to Linux Migration
  - http://www.suse.com/solutions/enterprise-linux-servers/unixtolinux.html
- Documentation
  - http://www.suse.com/documentation/
- Release Notes
  - http://www.suse.com/releasenotes/


SUSE®
We adapt. You succeed.