SUSE® Linux Enterprise Kernel
Back to the Future

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Agenda

• SUSE Linux Enterprise Service Packs
  - What makes a SUSE Linux Enterprise kernel an enterprise kernel?
  - Bringing you enterprise stability and more innovation

• What this Means for You
SUSE Linux Enterprise Kernel
Development Model
Four Forces of a Service Pack Kernel

SUSE Linux Enterprise Kernel
Four Forces of a Service Pack Kernel

SUSE Linux Enterprise Kernel

Hardware Enablement
Four Forces of a Service Pack Kernel

SUSE Linux Enterprise Kernel

New Functionality

HW Enablement
Four Forces of a Service Pack Kernel

- New Functionality
- Interface Stability
- Hardware Enablement
- SLE Kernel

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Four Forces of a Service Pack Kernel

- New Functionality
- Interface Stability
- Robustness & Performance
- Hardware Enablement

SUSE Linux Enterprise Kernel
What Drives Kernel Changes in a Service Pack

• We make changes to the kernel based on
  - customer requests
  - requirements of upcoming hardware
    - new CPUs, chipsets, peripherals, and entire subsystems like USB 3.0
    - innovative changes in upstream kernel
      - btrfs, FCoE, ...
  - anticipated market needs

• These are plentiful and often massive and/or intrusive
Kernel Components Changed in a Service Pack

SUSE Linux Enterprise Kernel
Kernel Components Changed in a Service Pack

- NFS fixes
- e1000
- OFED
- 4K Sector Support
- Latest CPUs
Kernel Components Changed in a Service Pack

- Video Drivers
- NFS fixes
- OFED
- wireless stack update
- XEN
- KVM
- e1000
- OFED
- K Sector Support
- bnx2
- Latest CPUs
- Latest CPUs
Kernel Components Changed in a Service Pack

- multipath
- video drivers
- NFS fixes
- e1000
- OFED
- KVM
- XEN
- s390 enhancements
- bnx2
- qla2xxx
- wireless stack update
- VMware support
- MCE
- latest CPUs
- 4K sector support
- multipath
- video drivers
- NFS fixes
- e1000
- OFED
- KVM
- XEN
- s390 enhancements
- bnx2
- qla2xxx
- wireless stack update
- VMware support
- MCE
- latest CPUs
- 4K sector support
Kernel Components Changed in a Service Pack

- multipath
- Video Drivers
- RAID
- NFS fixes
- OCFS2
- OFED
- ACPI Enhancements
- qla2xxx
- KVM
- wireless stack update
- IPv6 Firewall
- VMware Support
- K Sector Support
- s390 Enhancements
- e1000
- bnx2
- Scheduler Improvements
- MCE
- 4K Sector Support
- multipath
- Video Drivers
- RAID
- NFS fixes
- OCFS2
- OFED
- ACPI Enhancements
- qla2xxx
- KVM
- wireless stack update
- IPv6 Firewall
- VMware Support
- K Sector Support
- s390 Enhancements
- e1000
- bnx2
- Scheduler Improvements
- MCE
- 4K Sector Support
Kernel Components Changed in a Service Pack

- multipath
- Video Drivers
- RAID
- XEN
- OCFSS
- e1000
- NFS server
- Scheduler Improvements
- qla2xxx
- IPv6 Firewall
- VMware Support
- wireless stack update
- Boise
- MCE
- RAID
- 4K Sector Support
- multipath
- Latest CPUs
- s390 Enhancements
- MCE
- IPv6 Firewall
- bnx2
- ACPI Enhancements
- KVM
- And it does not stop here
How Do We Make this all Work?

Previous SUSE Linux Enterprise 11 Kernel
How Do We Make this all Work?

Previous SUSE Linux Enterprise 11 Kernel

- Backports from Mainline
- Selected Enhancements
- Hardware Enablement
How Do We Make this all Work?

Previous SUSE Linux Enterprise 11 Kernel

- Backports from Mainline
  - Selected Enhancements
  - Hardware Enablement
- SUSE Quality Engineering
  - Stable Interface
  - Robustness
How Do We Make this all Work?

Next SUSE Linux Enterprise 11 Service Pack Kernel

- Selected Enhancements
- Hardware Enablement
- Stable Interface
- Robustness
SUSE Linux Enterprise 11 SP2
A Sneak Peek into the SUSE Labs
SUSE Linux Enterprise 11 SP2

• We received about 8,000 individual Feature Requests
  - The majority of which was in the kernel area
• The changes were almost all across the map
  - Scheduler
  - Block I/O layer (including FCoE and iSCSI)
  - Virtual memory management
  - USB stack
  - Introduce btrfs as supported file system
• Still, we decided to backport to 2.6.32
SUSE Linux Enterprise 11 SP2 Beta 4

• This was a tough challenge
  - We were almost done with incorporating all feature changes
  - We worked hard on stabilizing this kernel and bring its performance up to the expected level

• The result was up to par with our Enterprise quality standards
  - Again, we proved that the approach of backporting works
  - A kernel that we could have been proud of
SUSE Linux Enterprise 11 SP2

• The pace of innovation has picked up further
  - As of Beta 4, the SP2 kernel carried 12,500 patches. Details:
    1142872 insertions(+), 330837 deletions(-)
  - More than twice the number of code lines changed than usual. From 2.6.32 to SLE 11 SP1 we did:
    516135 insertions(+), 114429 deletions(-)
Statistics: Scope of Kernel Changes

Kernel Changes per Release

Files Changed

SLE Release

- 10 SP1
- 10 SP2
- 10 SP3
- 10 SP4
- 11 GA
- 11 SP1
- 11 SP2

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Is This the Best We Can Give You?

• Sadly, this Frankenkernel had no future
  - Future backports would have been anything but straightforward
  - Hardware enablement would have been almost impossible for some subsystems
  - Future service packs would have had to be be rather limited

• We did not incorporate some major features
  - pNFS would have meant another 700 patches
  - A number of virtualization improvements we missing
  - Forget about things like RADOS

• We certainly can do better!
Why Did We Stick to One Stable Kernel?

• When SUSE did the first Enterprise Linux distribution, the kernel development model was quite different
  - There was a “stable kernel” branch (2.2, 2.4) ...
  - ... and a development branch (2.3, 2.5)

• All the exciting stuff happened in the development branch
  - But it was broken more often than not
That Model has Changed!

- With the release of 2.6, the community moved to a different development model
  - No separate kernel series for development
  - Much more focus on stability of new features

- Turning an upstream kernel into a platform for an Enterprise product is still considerable work
  - But it's feasible, and actually not much different from the backporting patch-o-la we've been used to

- Linus decided that he wanted a birthday present for 20 years of Linux
For SUSE Linux Enterprise 11 SP2, we're proud to present

Linux 3.0
What Does this Change Mean?

Linux 2.6.32

- Stable Interfaces
- Robust
- Hardware Enablement
- Selected Enhancements
What Does this Change Mean?

Linux 2.6.32
- Stable Interfaces
- Robust
- Hardware Enablement
- Selected

Linux 3.0
- Hardware Enablement
- New Functionality
What Does this Change Mean?

Linux 2.6.32

- Stable Interfaces
- Robust
- Hardware Enablement
- Selected

Linux 3.0

- SUSE Quality Engineering
- Hardware Enablement
- New Functionality
What Does this Change Mean?

Linux 2.6.32
- Stable Interfaces
- Robust
- Hardware Enablement
- Selected

Linux 3.0
- Stable Interfaces
- Hardware Enablement
- New Functionality
What Does this Change Mean?

Linux 2.6.32
- Stable Interfaces
- Robust
- Hardware Enablement
- Selected

Linux 3.0
- Stable Interfaces
- Robust
- Tuning
- Hardware Enablement
- New Functionality
What Does this Change Mean?

Linux 2.6.32

- Stable Interfaces
- Robust
- Hardware Enablement
- Selected

Linux 3.0

- Stable Interfaces
- Robust
- Tuning
- Forward Ports
- Hardware Enablement
- New Functionality
SUSE Linux Enterprise 11 SP2

Linux 3.0

- Stable Interfaces
- Tuning
- Hardware Enablement

- Robust
- Forward Ports
- New Functionality
What this Means for You!
We deliver the **quality** you are used to

*and*

we give you more **innovation**
Yesterday, Today, Tomorrow

SUSE Quality Engineering

- Stable Interfaces
- Robust
- Support Latest Hardware
- Support your Enterprise Feature
- Tuned for Top Performance
Yesterday, Today, Tomorrow

SUSE Quality Engineering

- Stable Interfaces
- Robust
- Support Latest Hardware
- Support your Enterprise Feature
- Tuned for Top Performance

SLE 11 GA
SLE 11 SP1
SLE 11 SP2
...

No matter which kernel version
We are looking forward to your questions and feedback!

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