SUSE® Linux Enterprise

CAVMEN January 2012

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4 COMPANIES THAT GET **IT**
1 **PURPOSE**

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Our Commitments

Quality Products

Exceptional Service

Easy to Do Business With

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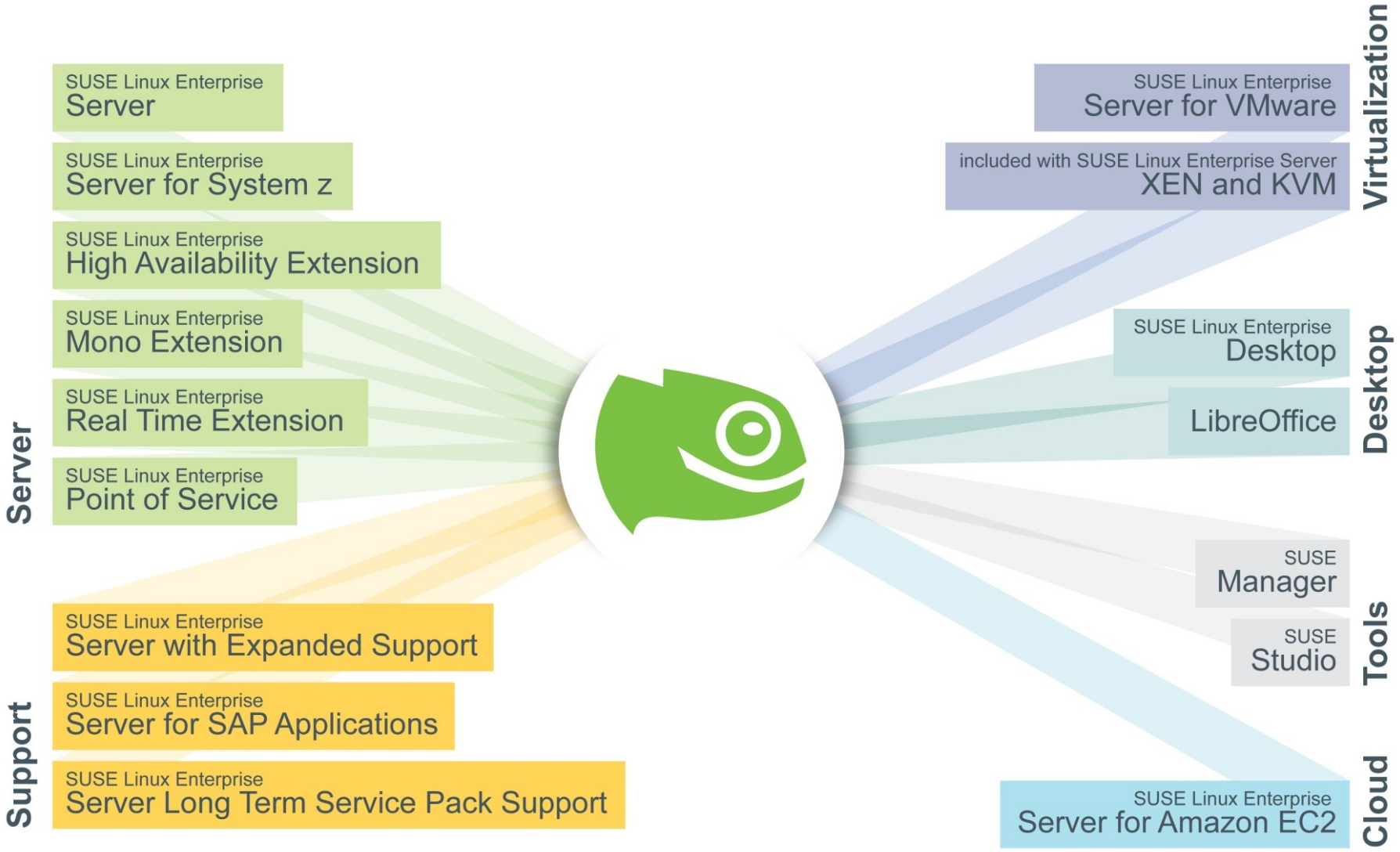
suse®

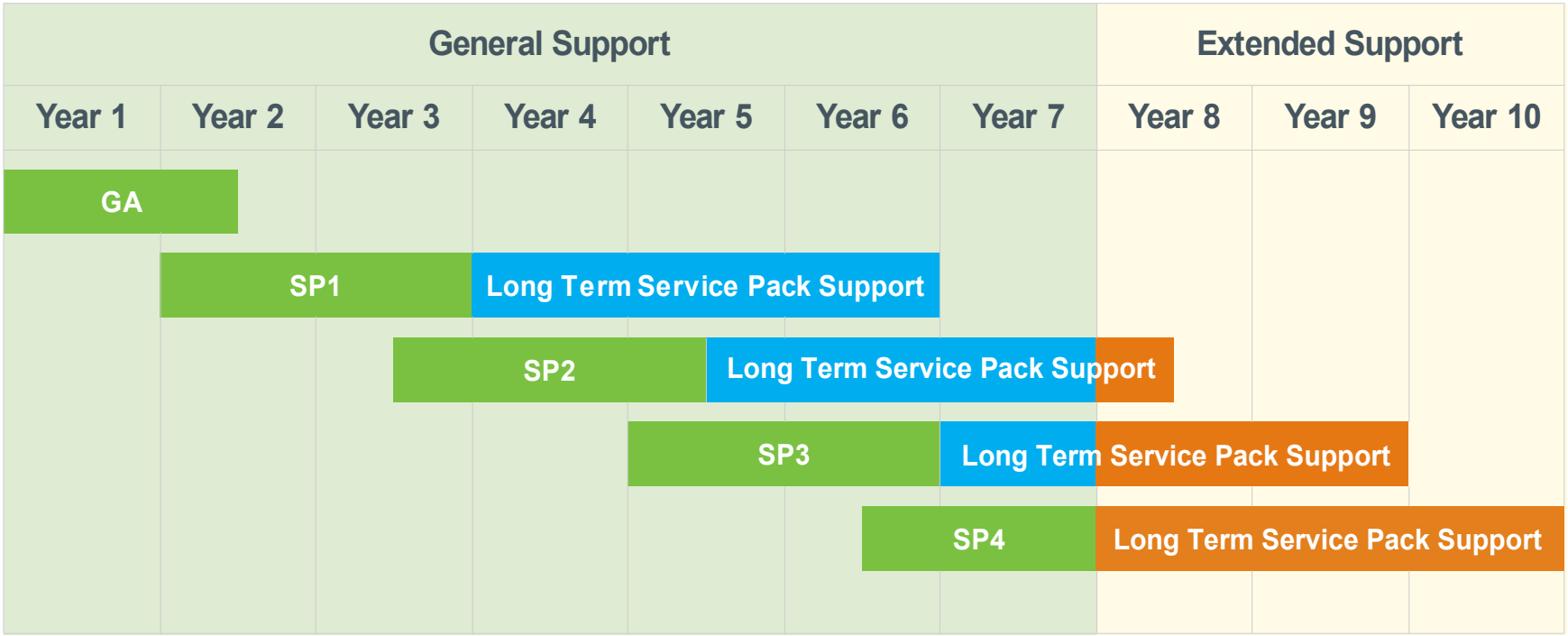
Comprehensive Portfolio



Roadmap

SUSE® Linux Enterprise

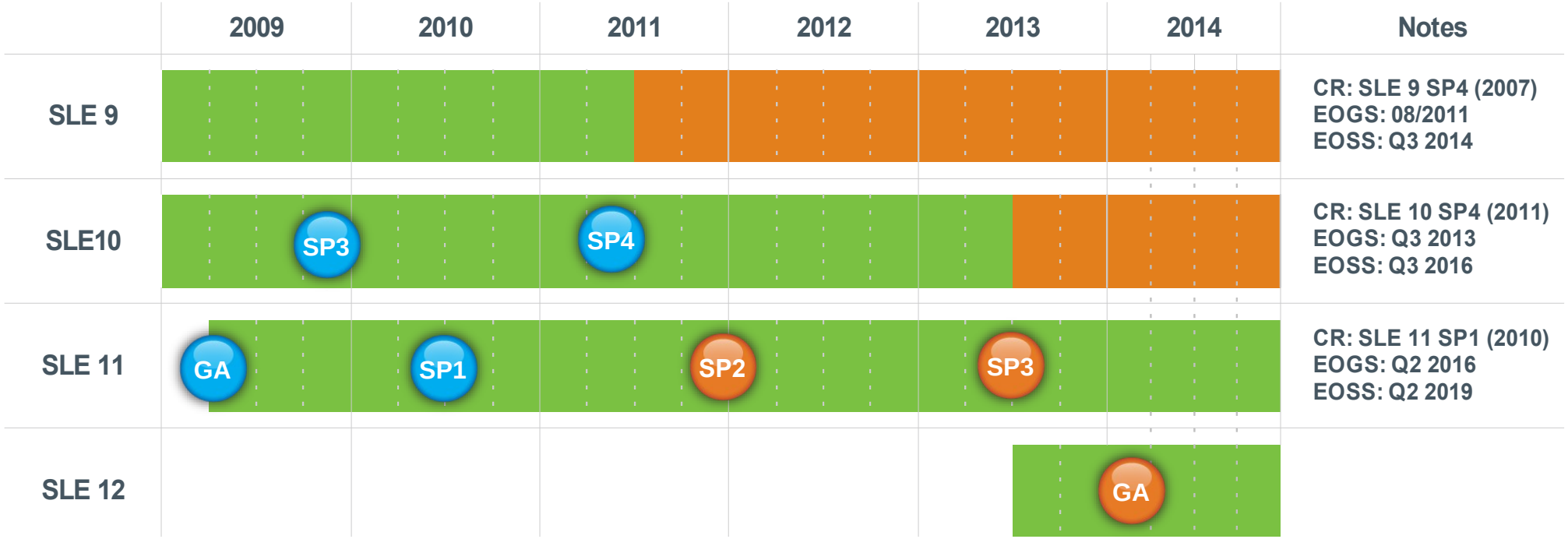
Standard Platform Lifecycle



- 10-year lifecycle (7 years general support, 3 years extended support)
- Major releases every ~4 years, service packs every ~18 months
- Six month upgrade window
- Long term service pack support – extend upgrade window or extend major release lifecycle

SUSE® Linux Enterprise

Current Platform Lifecycle



- SUSE announces service pack releases and development and product schedules to customers and partners
- Dependable release timing
- Predictability for planning rollouts and migrations

SUSE® Linux Enterprise 11 SP2

Key improvements

- New support model designed to ease updates
- Introduce full btrfs support, improving manageability
- Kernel moving to 3.X

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
- New maintenance model
  - Increased flexibility while retaining full control
- SUSE Linux Enterprise High Availability Extension: Geo-cluster, automated and pre-configuration

SUSE® Linux Enterprise 11 SP2

Reliability

- Improve support for hardware based RAS capabilities on all architectures, specifically
  - Intel Sandybridge
  - IBM System z
- Support for the btrfs filesystem
  - Reduce cost of storage management by providing an integration of logical volume management and filesystem
  - Checksums on data and metadata ensure data integrity
- LTTng (Linux Trace Toolkit Next Generation)
  - SUSE Labs contributing to LTTng technology
  - Availability of base functionality for SLE 11 SP2 (as part of an Extension)

Scalability

- Increasing number of cores per system → power management and scheduling key to control costs
- Local storage
  - Maintain existing capabilities (e.g. XFS)
  - Introduce full btrfs support, improving manageability
  - Maximum flexibility for customers
- Expand network filesystem capabilities (NFSv4.x/pNFS)
  - Improve performance, reliability and security
  - pNFS client support planned for 2012,
    server support for later version of SUSE Linux Enterprise High Availability Extension 11

SUSE® Linux Enterprise 11 SP2

Interoperability

- 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
- IPv6
  - Improve 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

Today

- Full Dynamic Resource Handling
  - Two level of virtualizations 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

Tomorrow

- z196 + zBX = zEnterprise exploitation
  - CPU topology and instruction set exploitation of z196
    - Improve single workload performance -> improve workload consolidation
  - New CHPID support connecting both environments
- Choose the right workload environment
  - SLES available for both hardware architectures
  - ISVs application support might mandate the platform
- Improved tools and infrastructure support
  - hypertop – check other LPAR or z/VM guests resource needs
  - Dynamic PAV toleration and improved FICON support

btrfs

Why another filesystem?

- Solve Storage Challenges
  - Scalability
  - Data Integrity
  - Dynamic Resources (expand and shrink)
  - Storage Management
  - Server, Cloud – Desktop, Mobile
- Compete and exceed other Operating Systems

btrfs (better fs) – Features

- Integrated Volume Management
- Support for Copy on Write
- Powerful Snapshot capabilities
- Scalability (16 EiB) including effective shrink
- Supports offline in-place migration from ext2+
- Other Capabilities:
  - Compression
  - Data integrity (checksums)
  - SSD optimization

Why btrfs?

btrfs (better fs) – Background

- Summarizes ideas from
  - ext2,3,4
  - reiserfs
  - xfs (SGI)
  - aufs (HP)
- Implements the same concepts as ZFS does
- Built for scalability and extensibility
- Integration with Volume Management
- Cloud readiness
  - builds the foundation for the Ceph distributed filesystem and its RADOS object store layer
- Active Community

Why btrfs?

btrfs (better fs) – Status

- SUSE® Linux Enterprise 11 SP1: Technology Preview
- SUSE® Linux Enterprise 11 SP2: Supported
- SUSE® Linux Enterprise 12 (plan): Default Filesystem

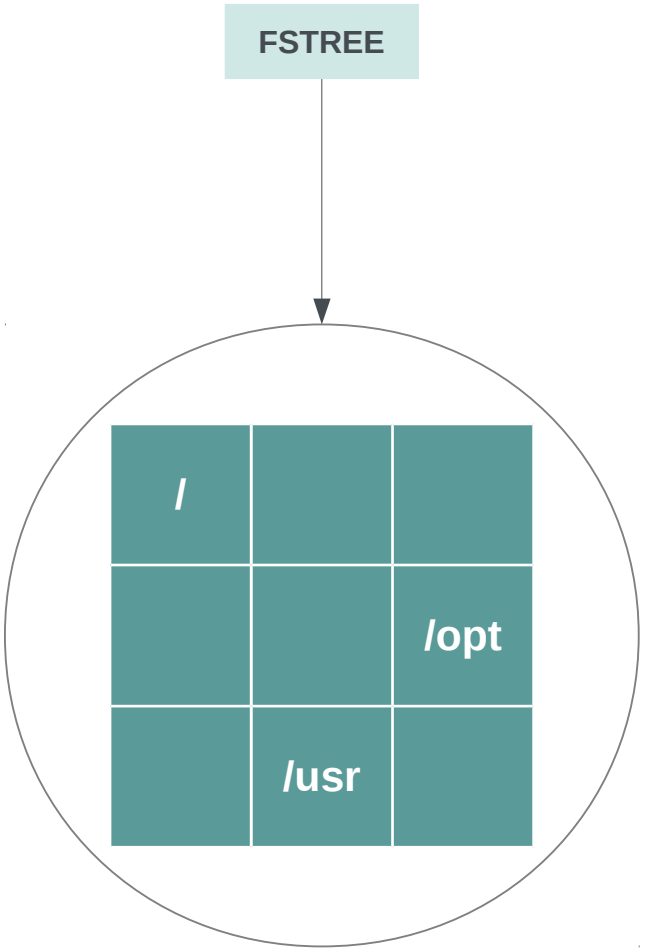
Subvolume (1)

- A complete filesystem tree
- Usually appears as a sub-directory in the “parent” fs
- Can be mounted separately
- not “just a subdirectory”
- Simliar to
  - two “foreign” filesystems, which are
  - using the same pool of data blocks (and other infrastructure)
- Benefits
  - different parts (subvolumes) of a filesystem can have different attributes, such as quotas or snapshotting rules
  - Copy on Write is possible across volumes
- Basic commandline management
  - “btrfs subvolume …”

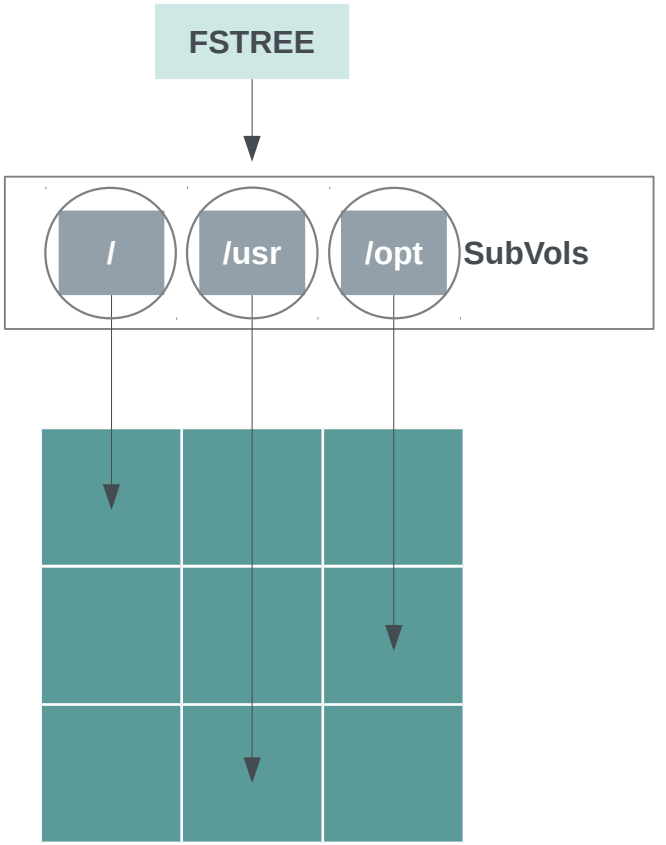
Technology Overview

Subvolume (2)

Normal Filesystem



With Subvolumes



Technology Overview

Snapshots

- Copy on Write on a
  - full subvolume tree
  - instead of a single file only
- Every snapshot is again a subvolume of its own
- Snapshots (as subvolumes) can be mounted and accessed as every other subvolume
- Snapshots can be created read-only
- Basic commandline management
  - “btrfs subvolume snapshot …”

Rollback – per Subvolume

How it works

- Instead of the original subvolume, the snapshot is mounted with the options “subvol=<name>”
  - Remember: snapshots are subvolumes
- Talking about the “/” filesystem, the “subvol” can also be hardcoded using “btrfs subvolume set-default ...”

Benefits

- “atomic” operation
- Very fast

Disadvantages

- Additional complexity
  - May require explicit mounting of subvolumes
- No “rollback” per single file

Rollback – File based → “undochange”

How it works

- The system uses the same instance of a subvolume: “working instance”
- single files are copied from the snapshot to the “working instance” – using CoW

Benefits

- Subvolumes are treated as read-only
- Subvolumes can be used for Backup
- Supports Pick and Choose

Disadvantages

- rollback not “atomic”
  - may need some more computing time

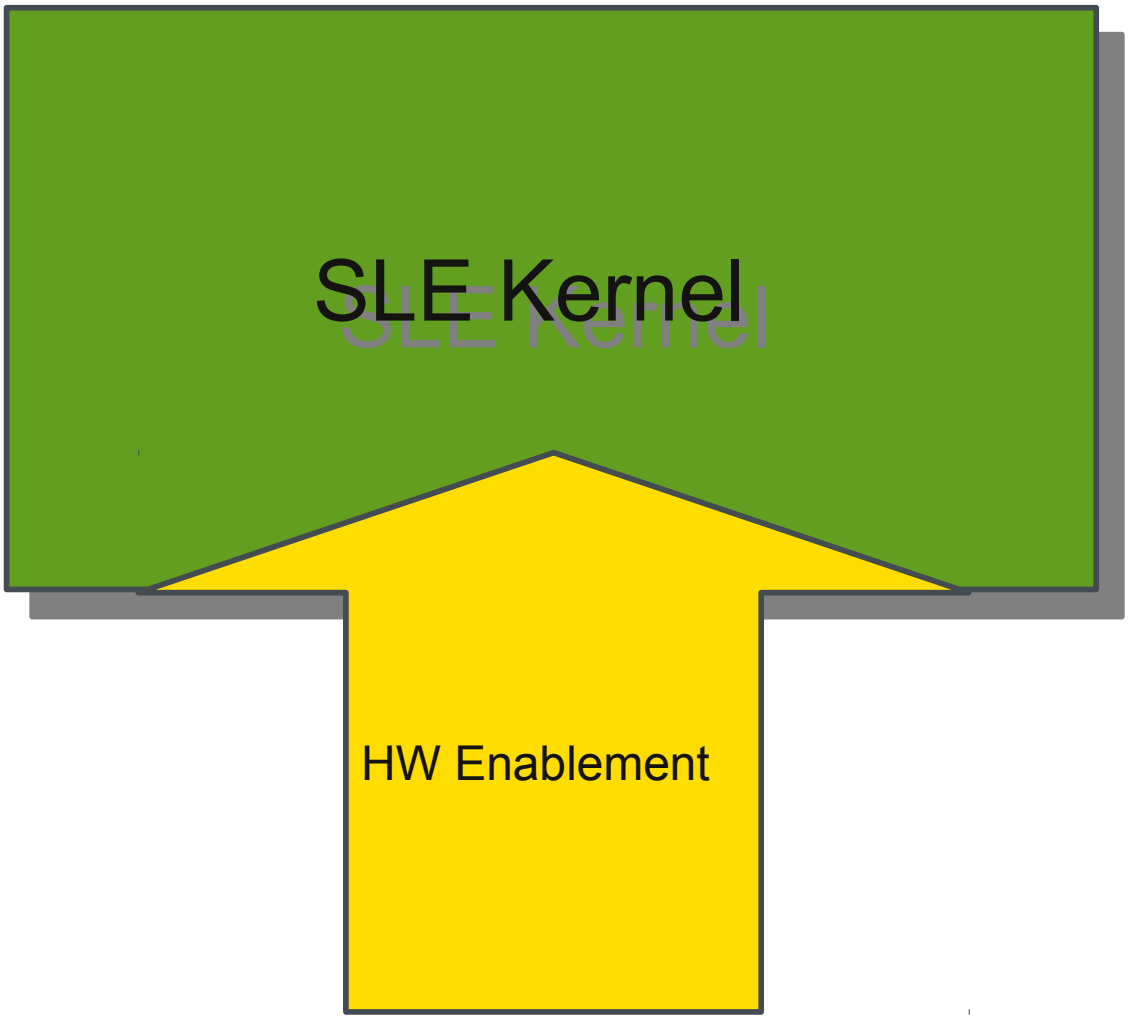
Requirements

- Single file rollback (“undochange”)
- Keep option to implement subvolume based rollback in the future
- User interface: cmdline and YaST2 integration
- Snapshots for YaST2 and zypper activities
- Automated snapshots (time based)
- Automated snapshot cleanup (time/number based)
- Allow to work with several kernels
  - implemented independently of btrfs (in ZYpp)

Kernel changes – the why and what

Four Forces of a Service Pack Kernel

Four Forces of a Service Pack Kernel



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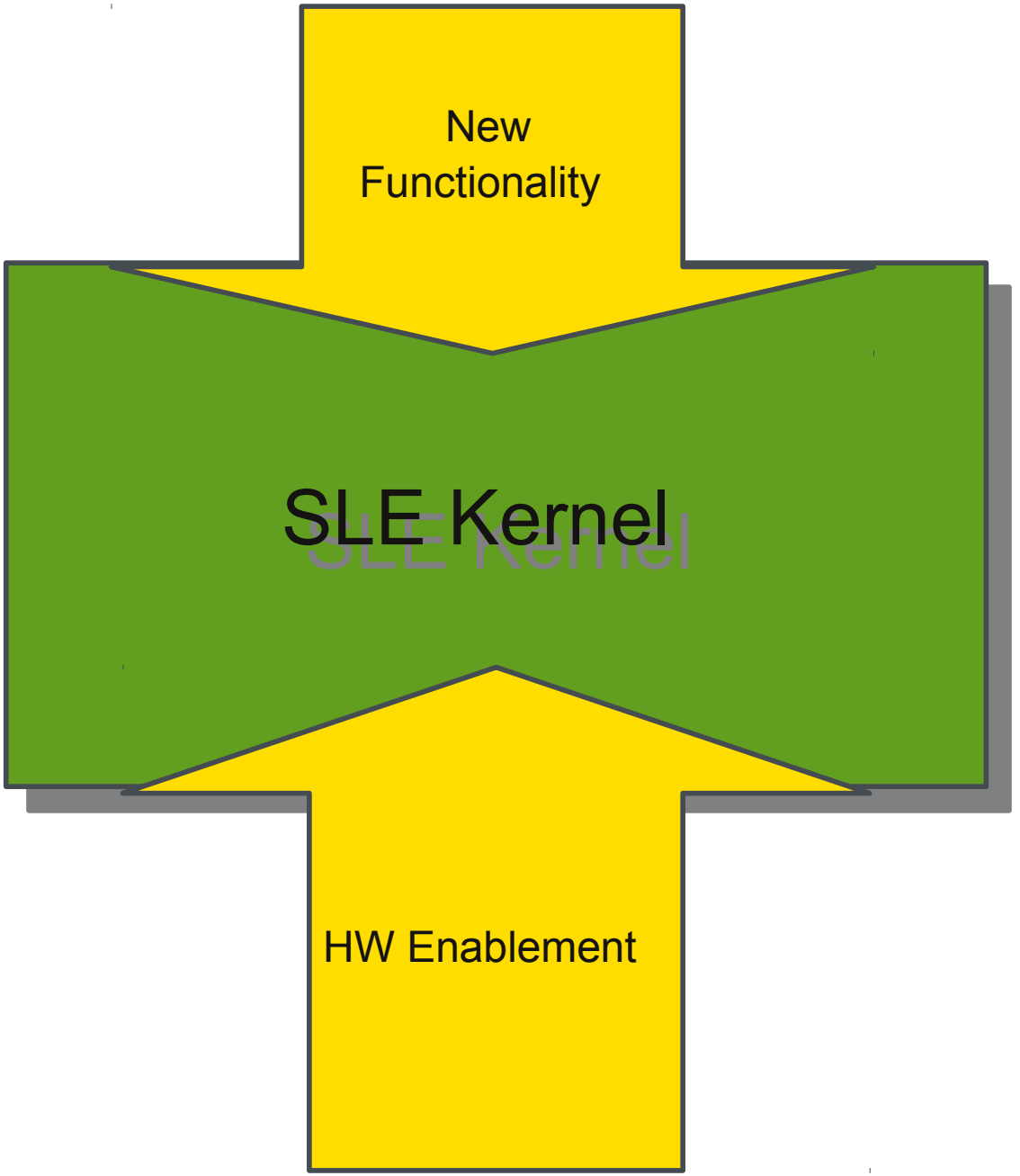

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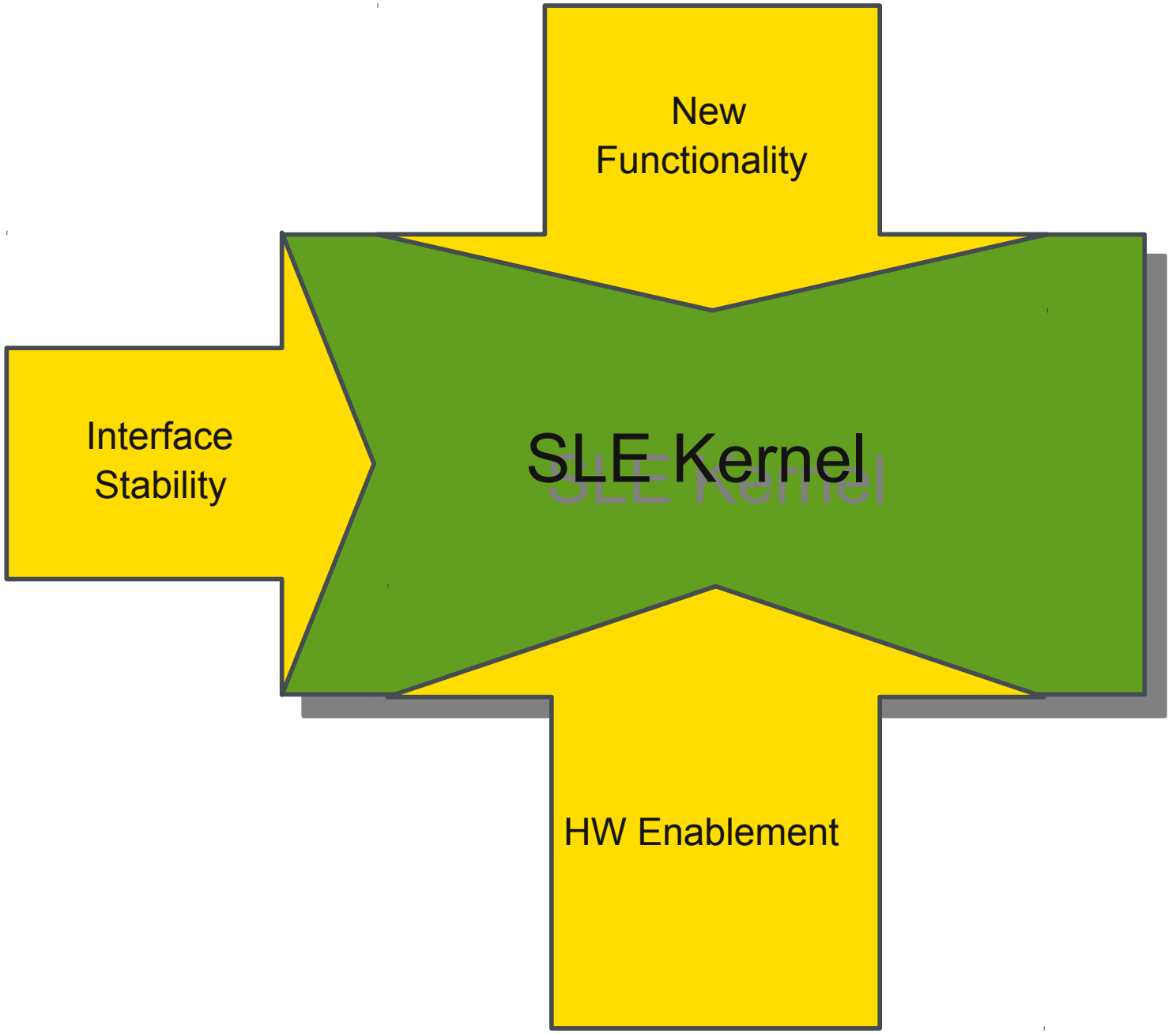

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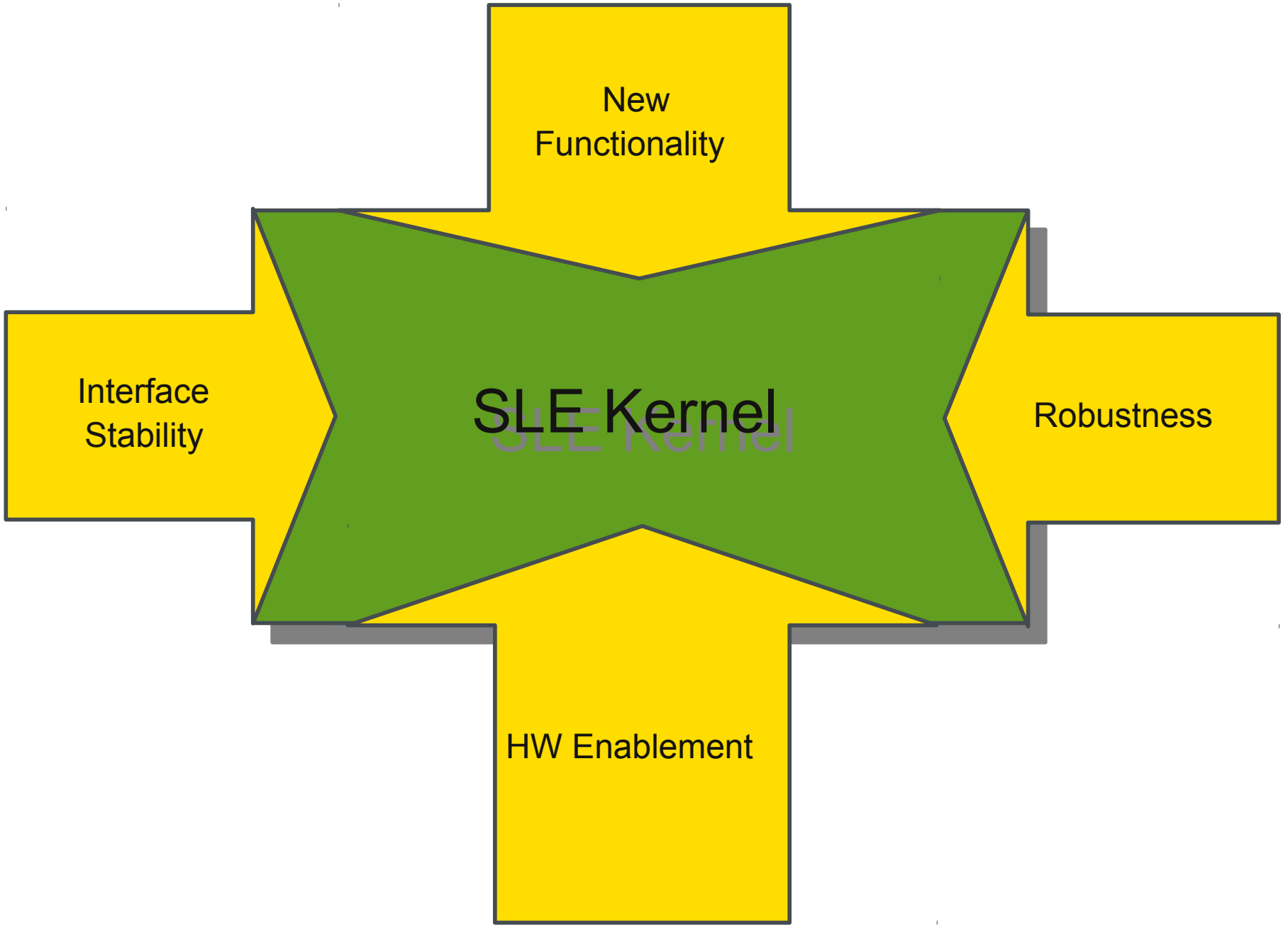
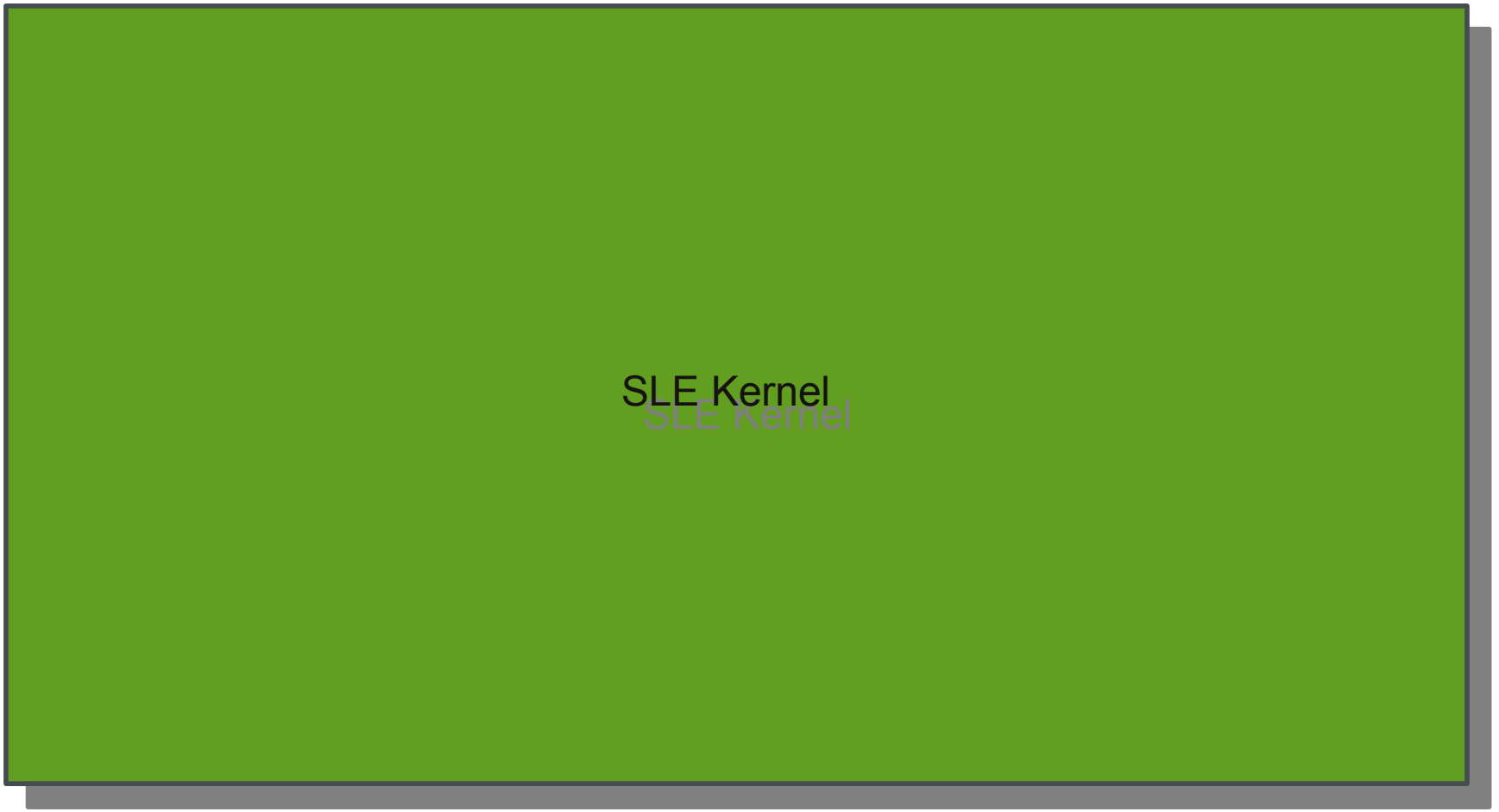


What Drives Kernel Changes in a Service Pack

- 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
- And the changes are both massive and often intrusive

Kernel Components Changed in a Service Pack



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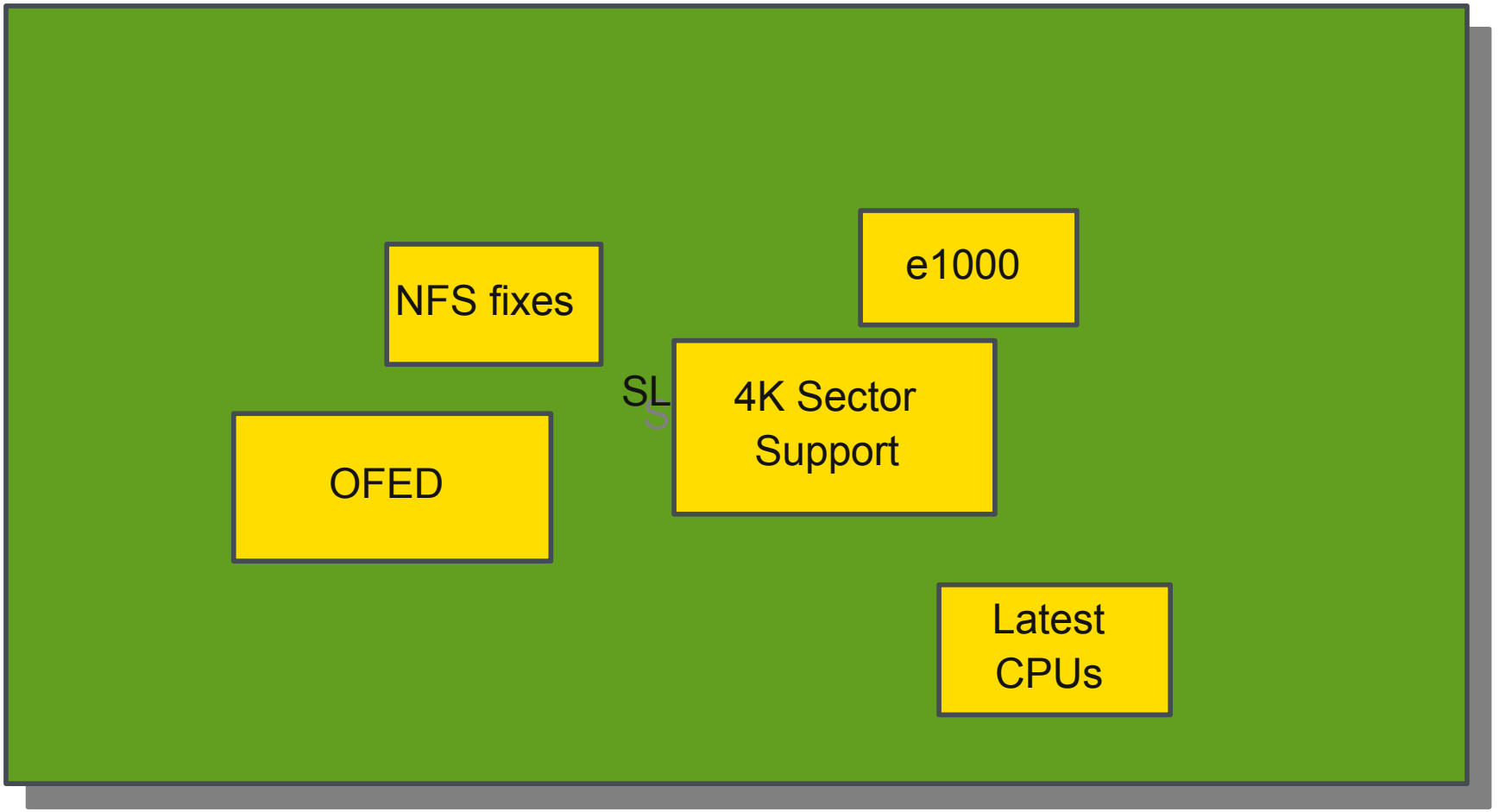

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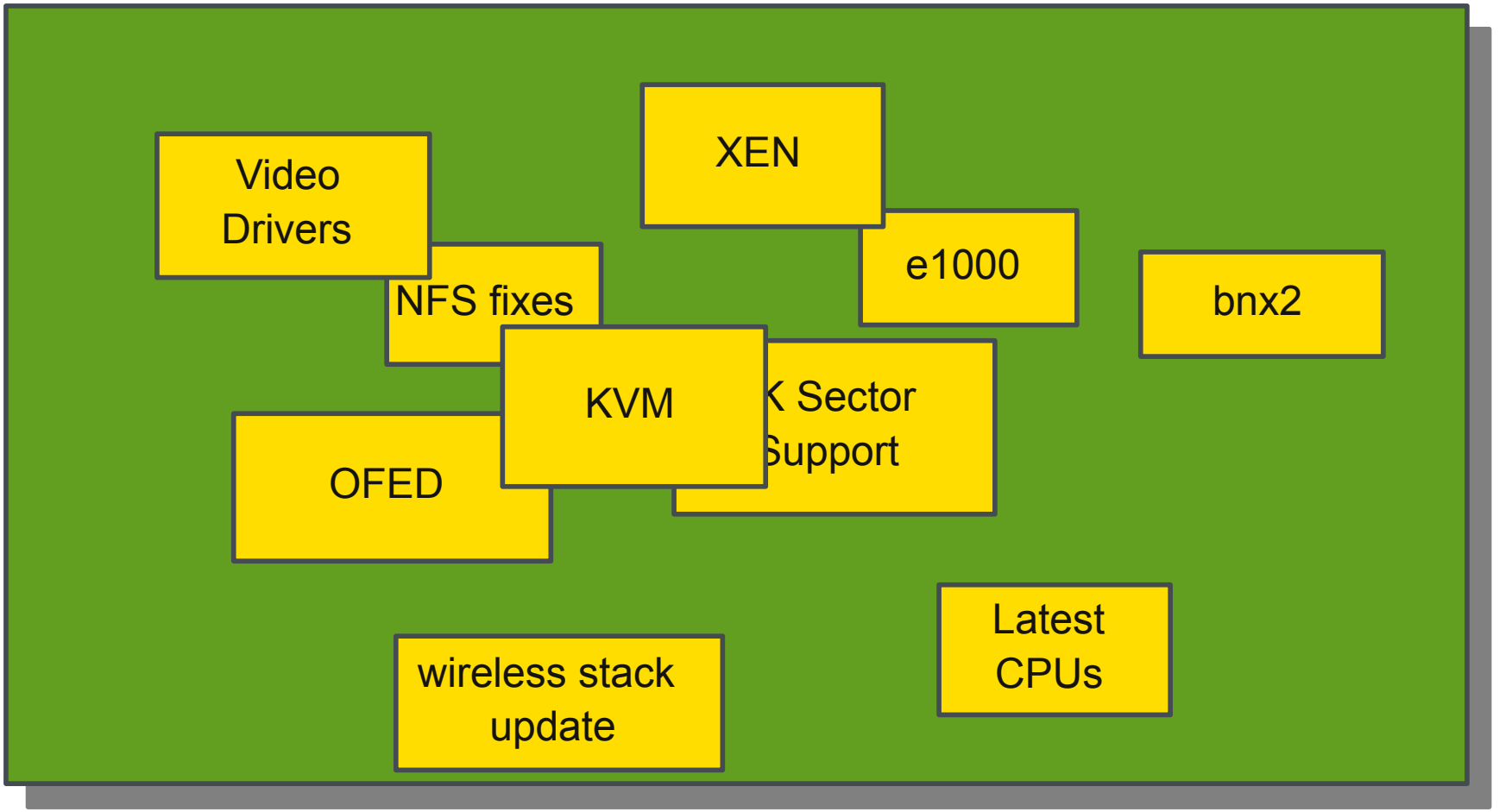

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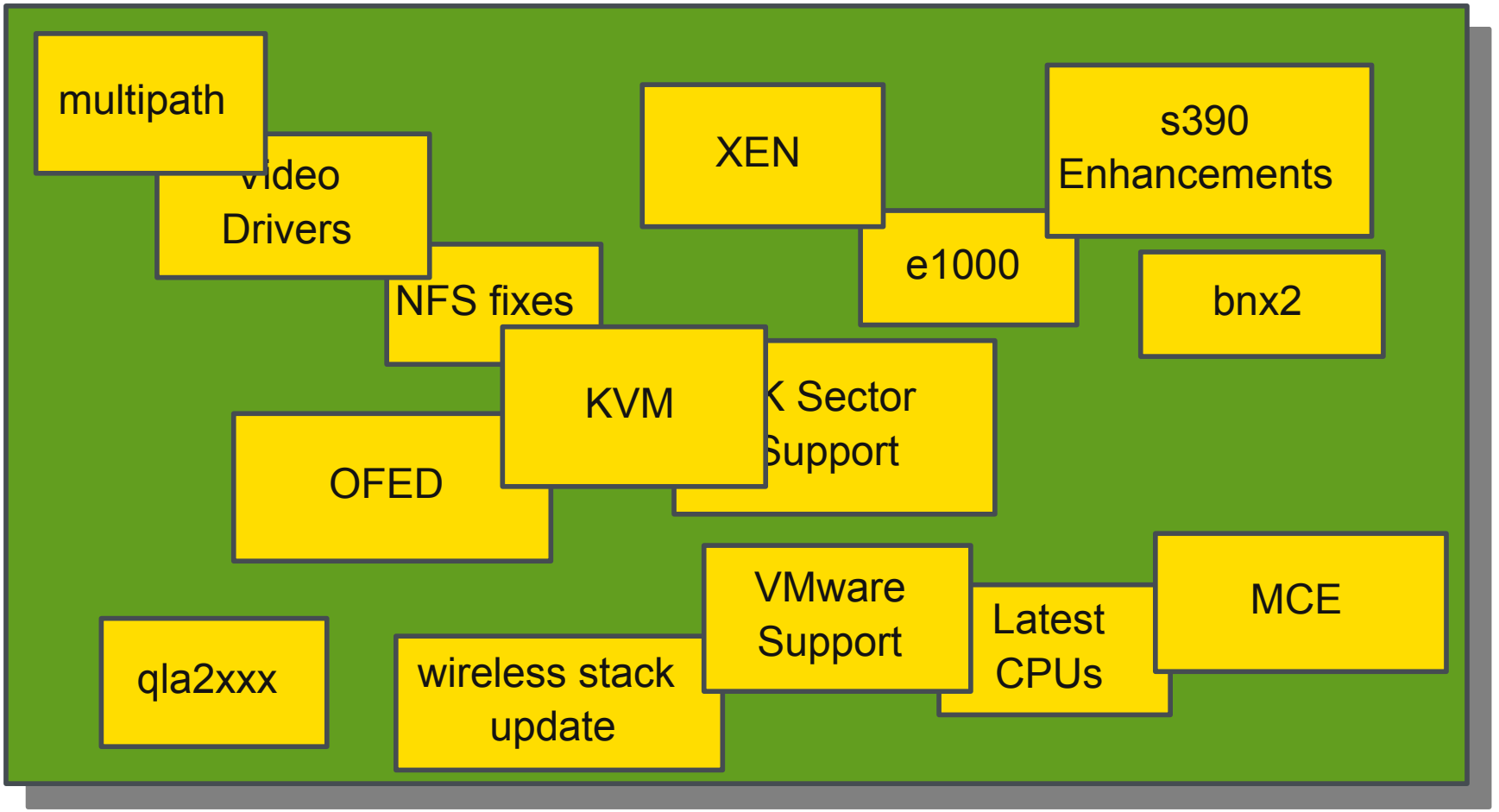

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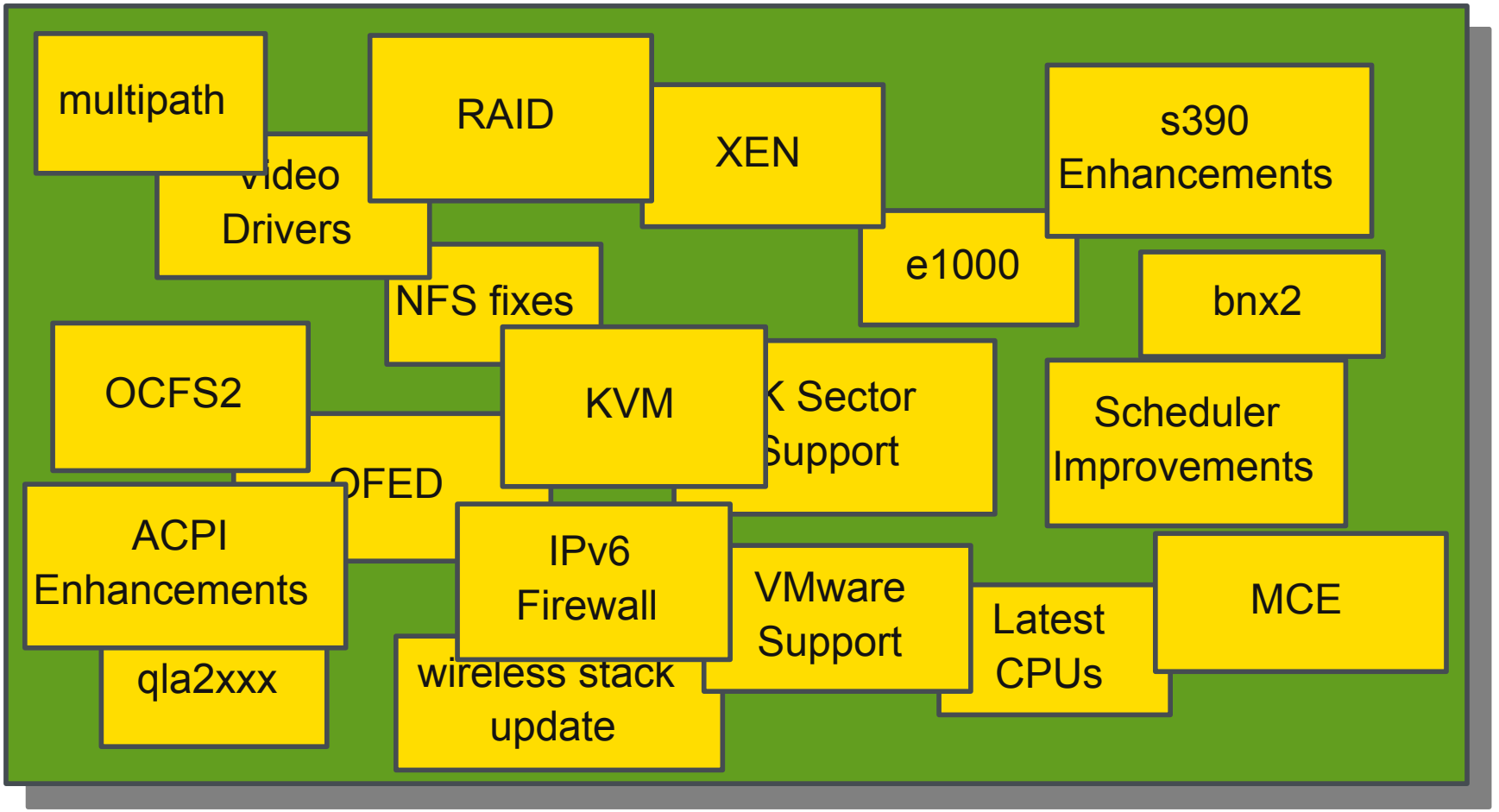

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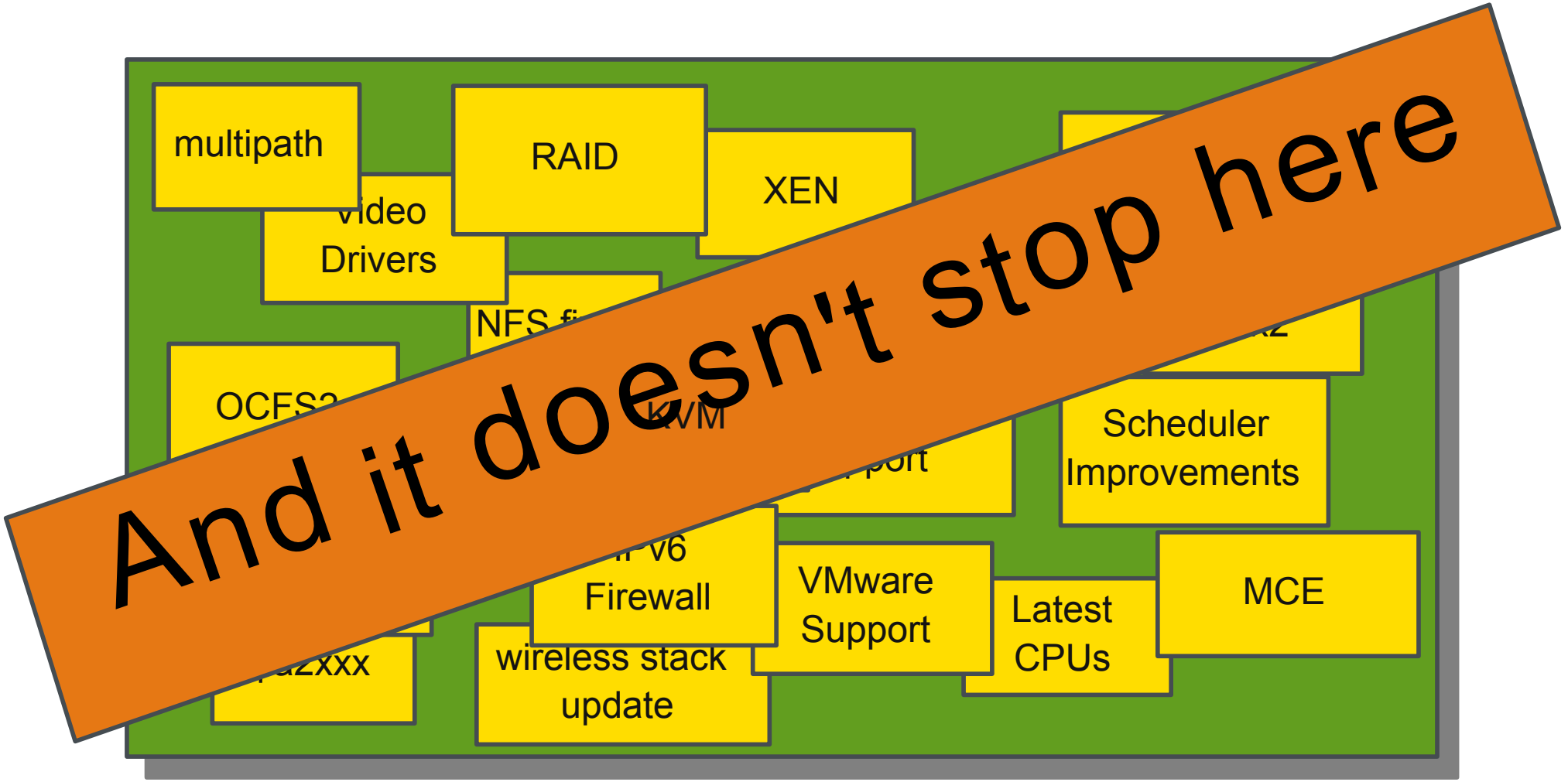
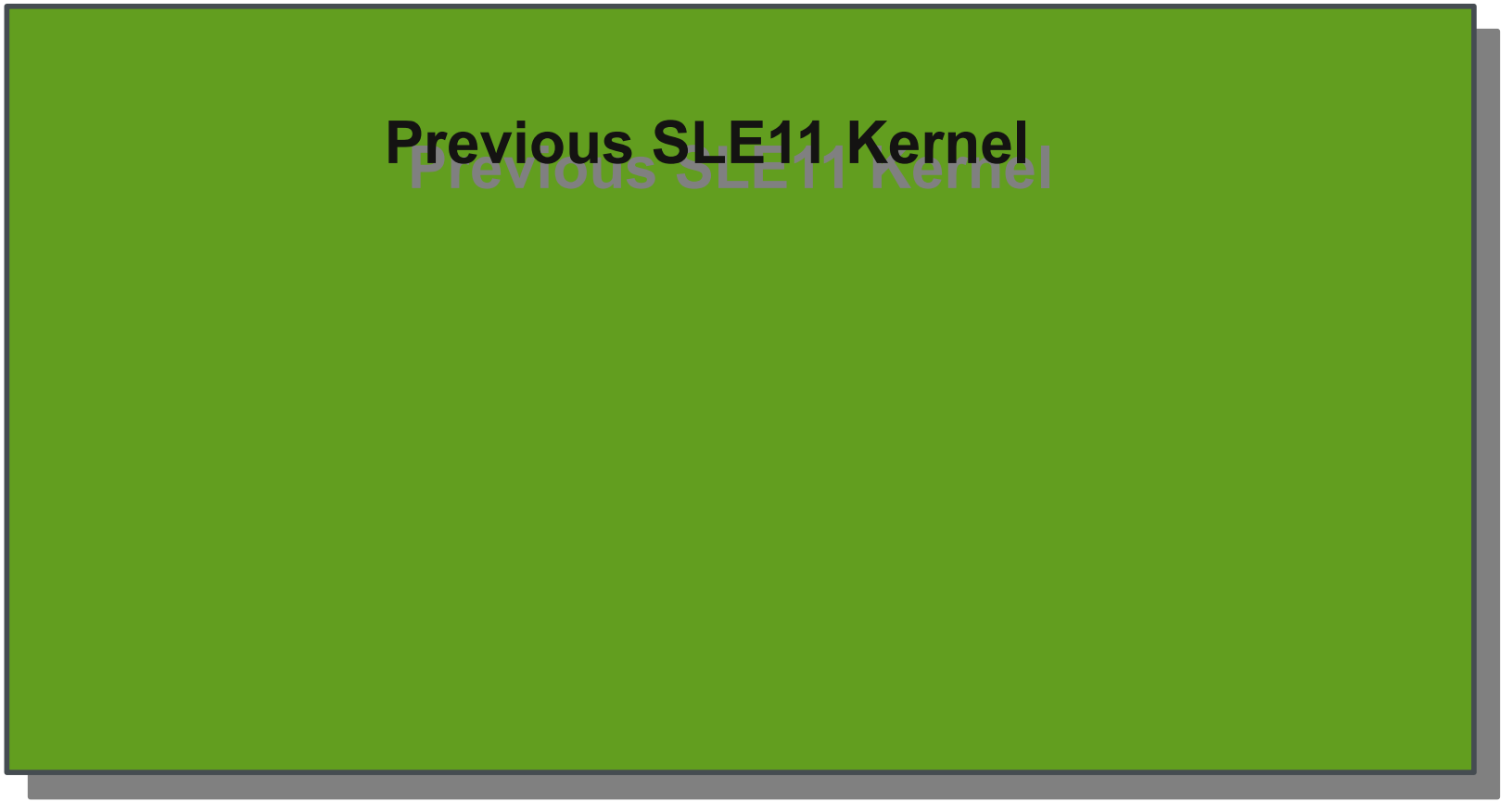


How do we make this all work?



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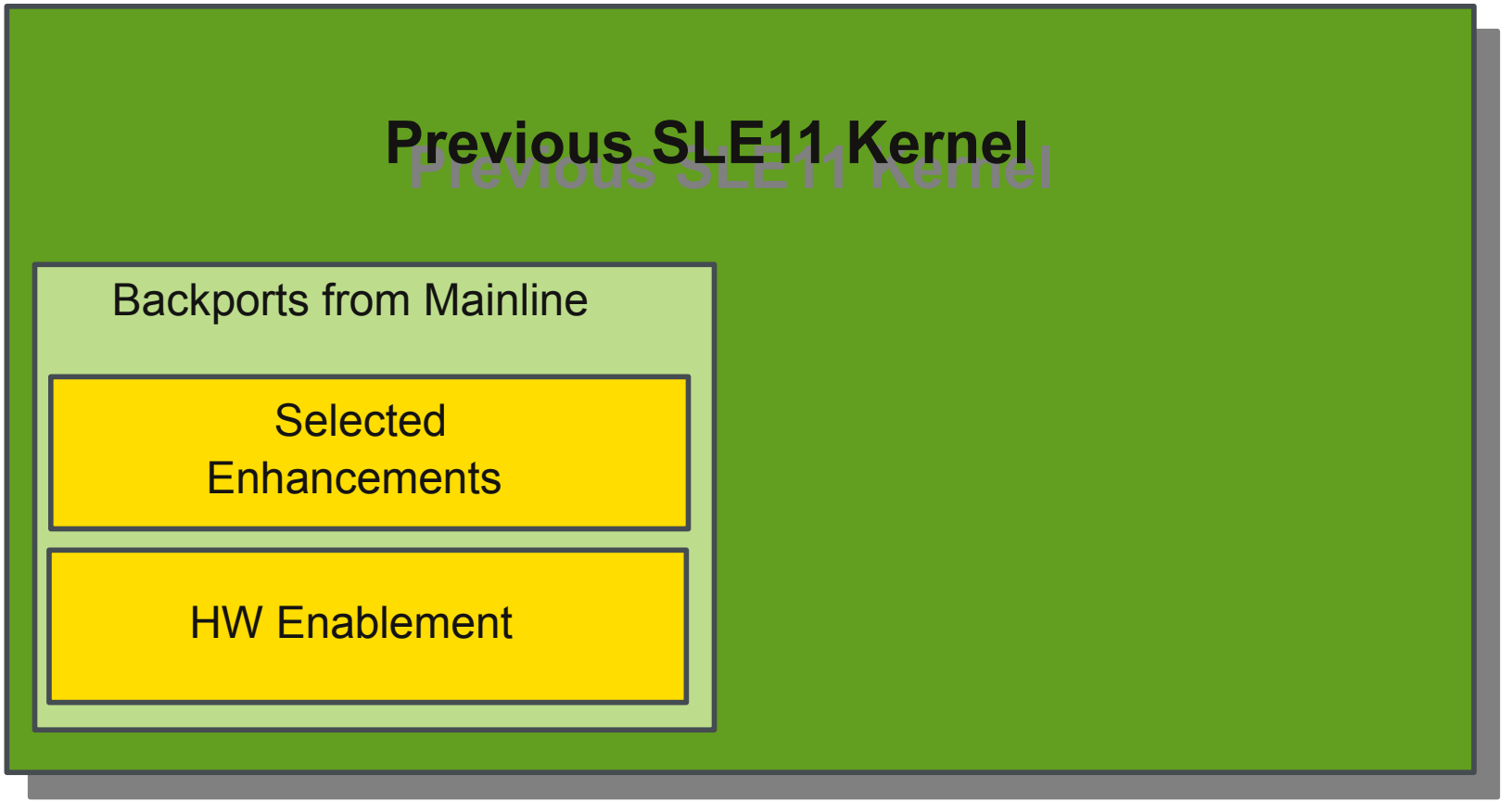

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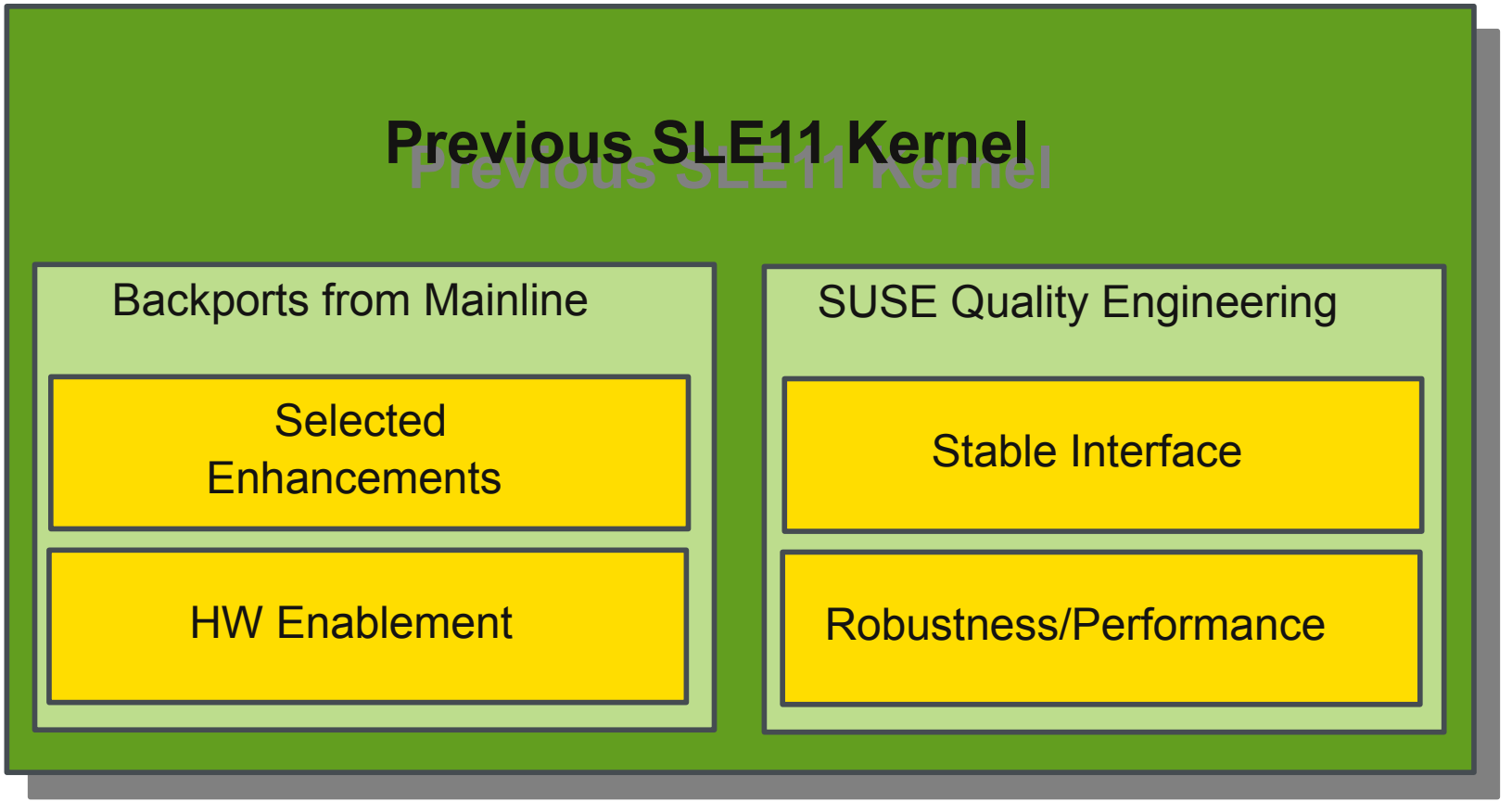

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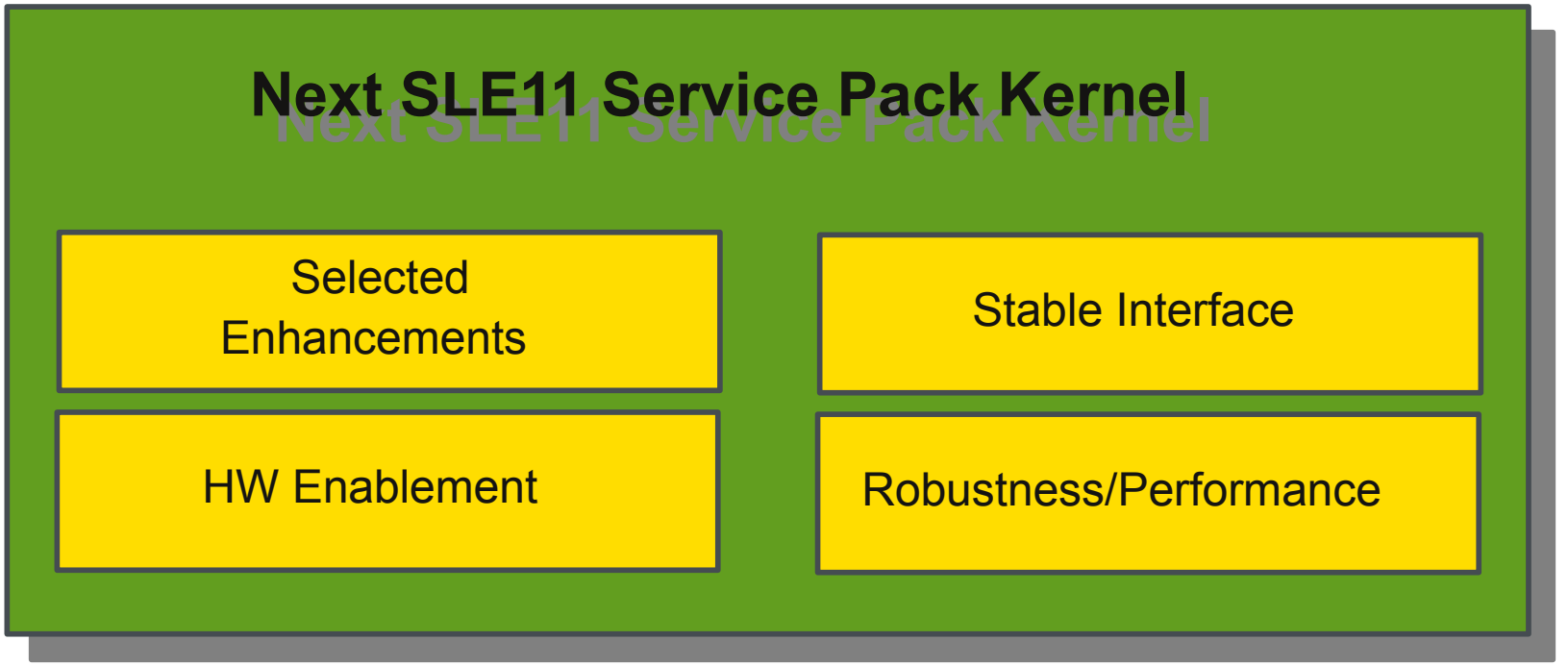


SUSE Linux Enterprise 11 SP2

- The pace of innovation has picked up further
  - Using 2.6.32, the SP2 kernel carried 12,500 patches, and >100,000 lines of code were changed
  - This is more than twice the number of code lines changed than usual
- The changes were almost all across the map
  - We replaced scheduler, block I/O layer, virtual memory management, the entire USB stack, plus a few more
  - We introduce btrfs as supported file system

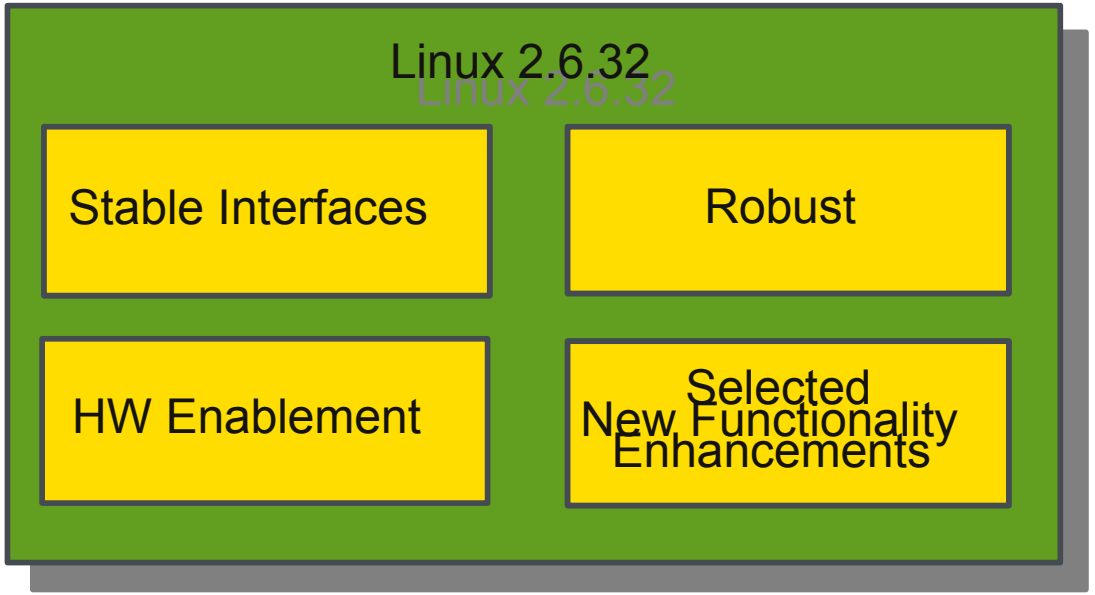
But is this the Best we can give you?

- We did not incorporate some major features
  - For instance pNFS would have meant another 700 patches
  - A number of virtualization improvements didn't make it
- We would have to be even more selective with future service packs
- We certainly can do better!

For SLE 11 SP2, we're proud to present to you

Linux 3.0

What does this change mean?



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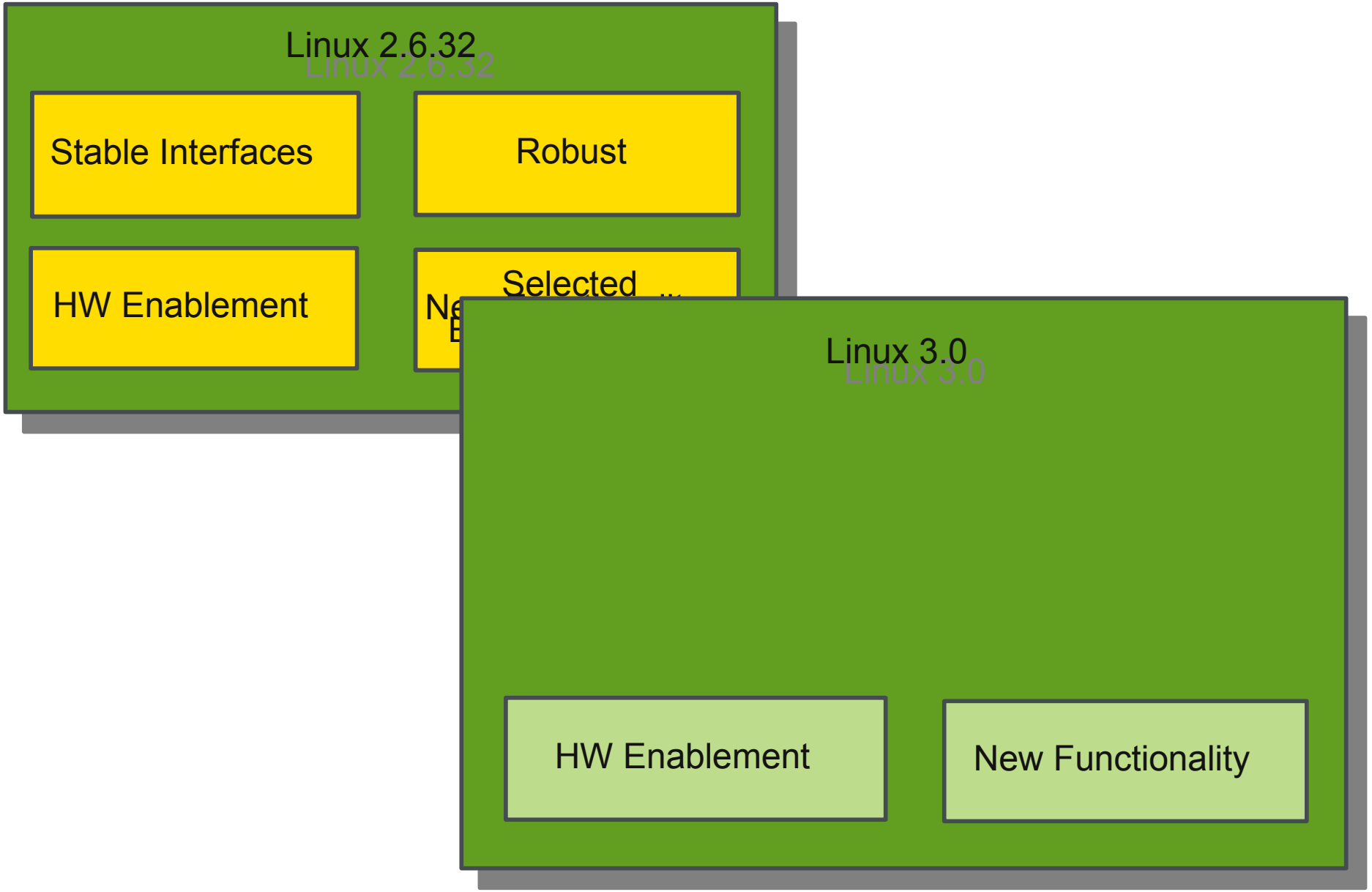

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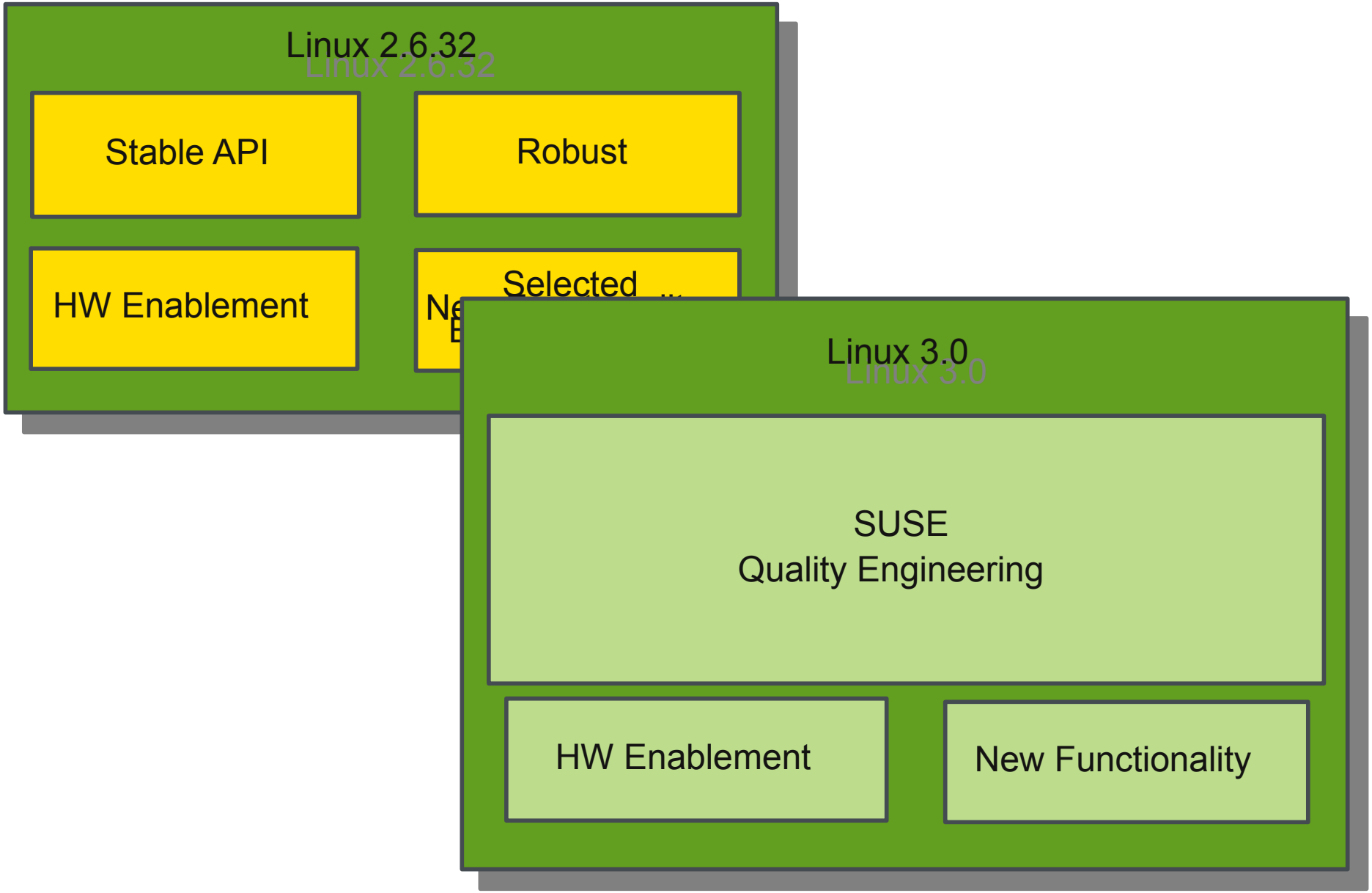

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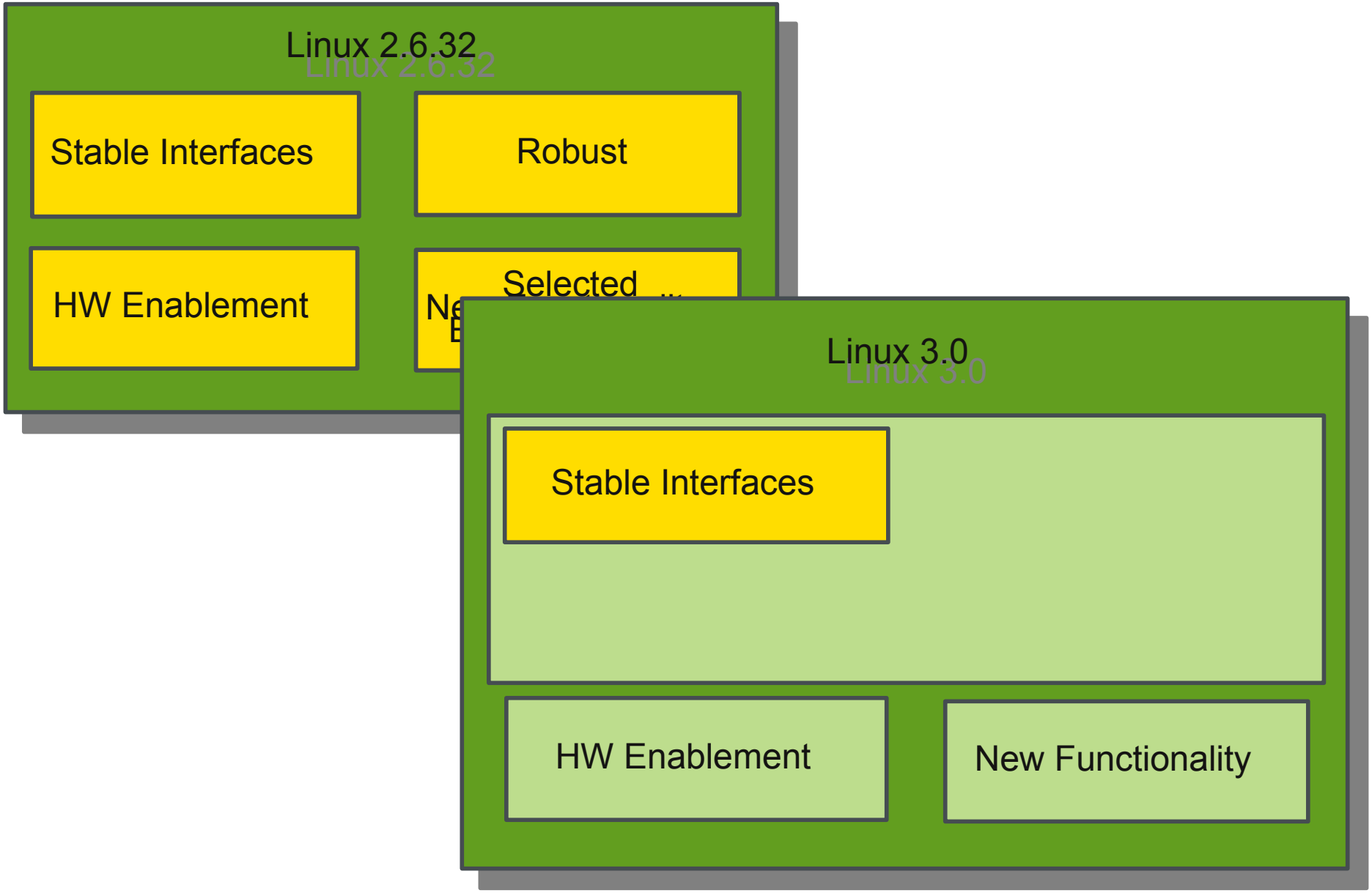

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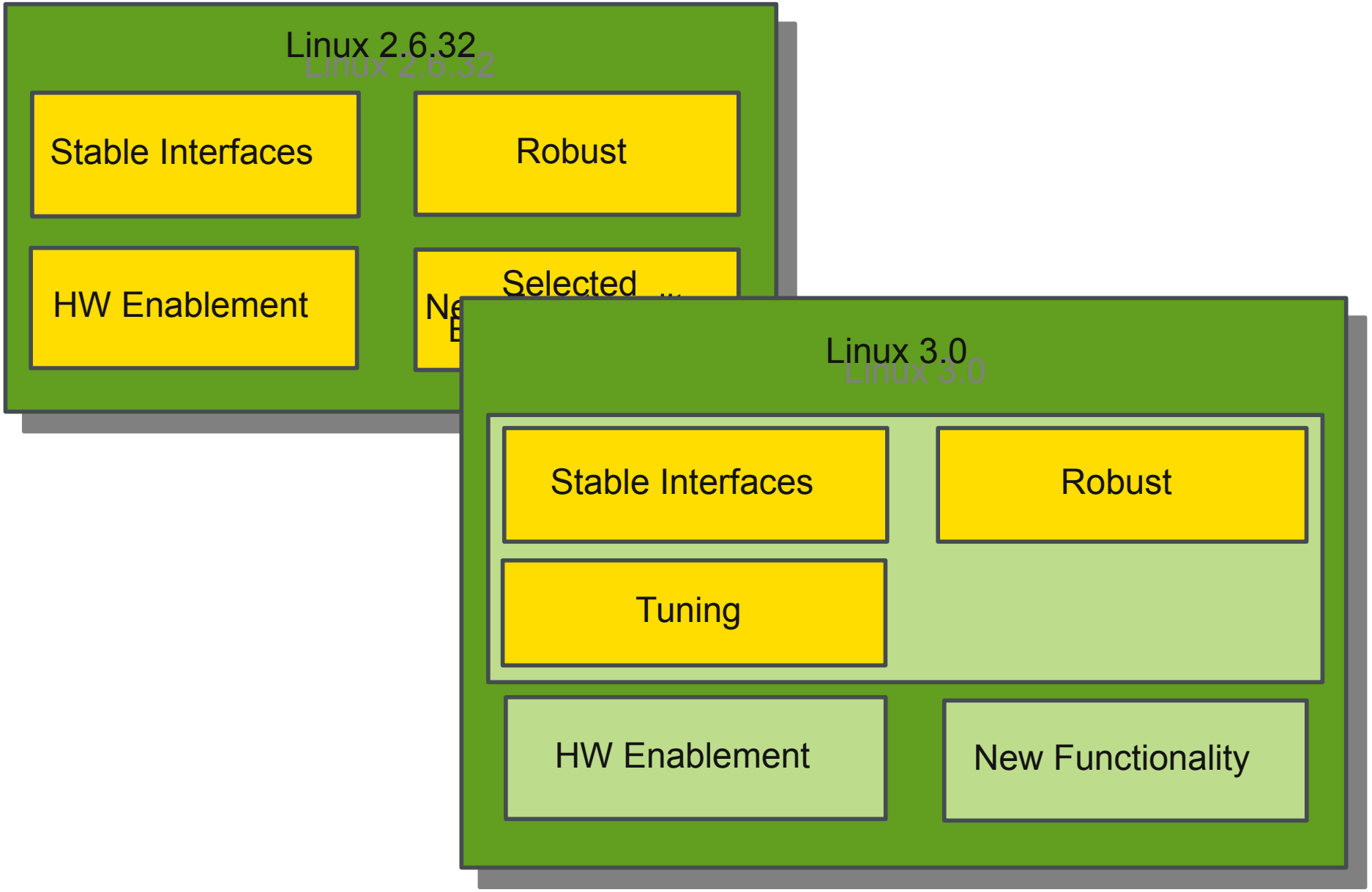

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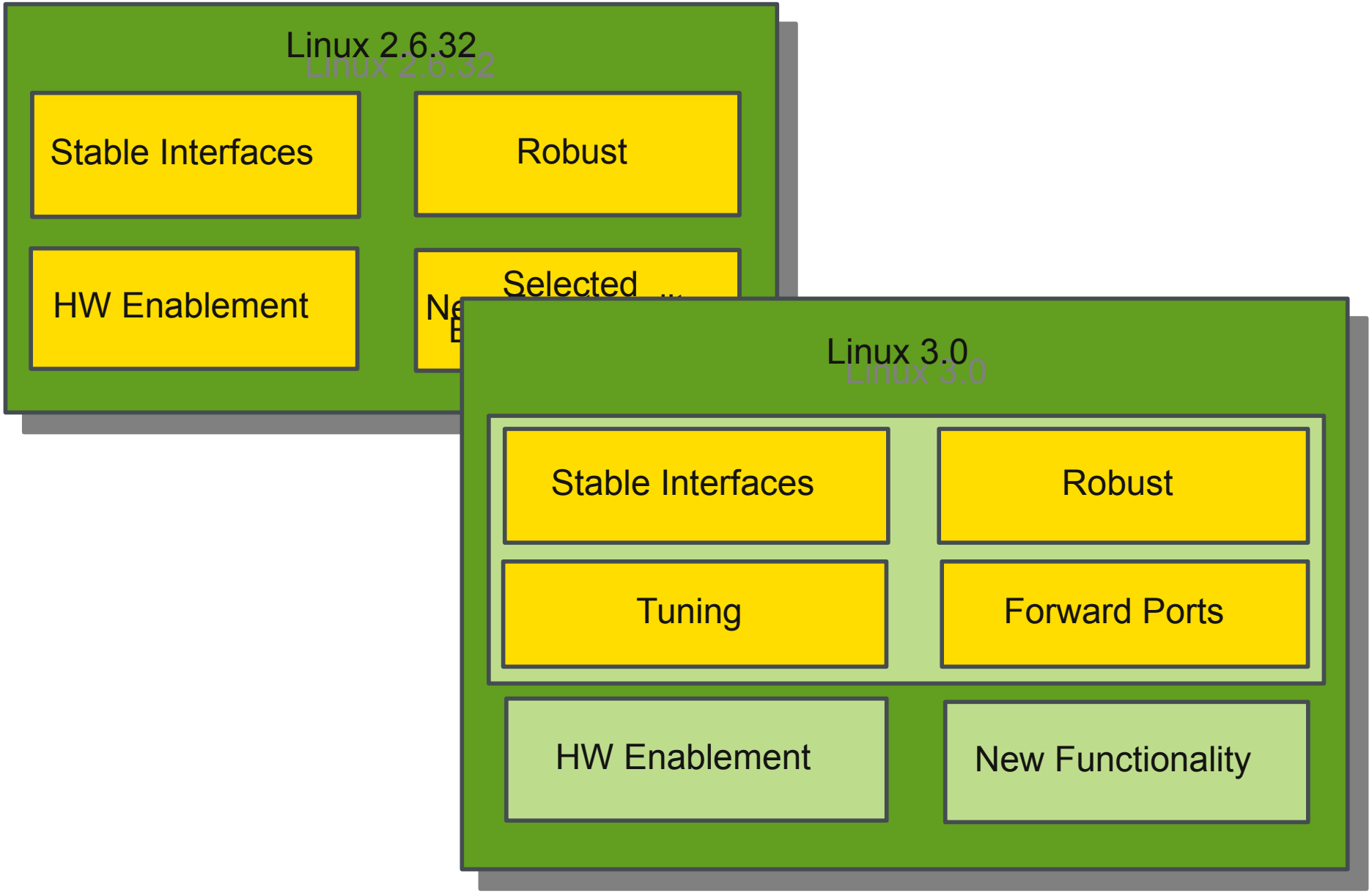
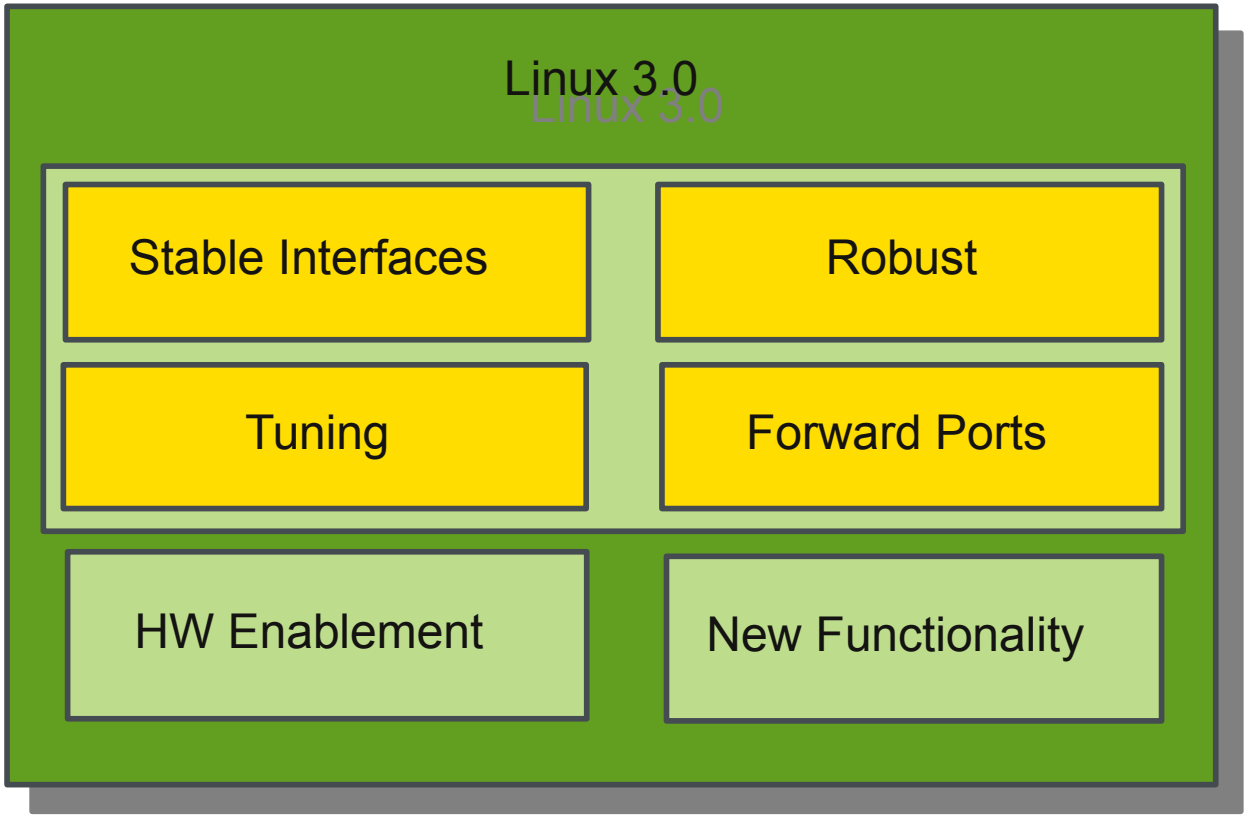


SUSE Linux Enterprise 11 SP2



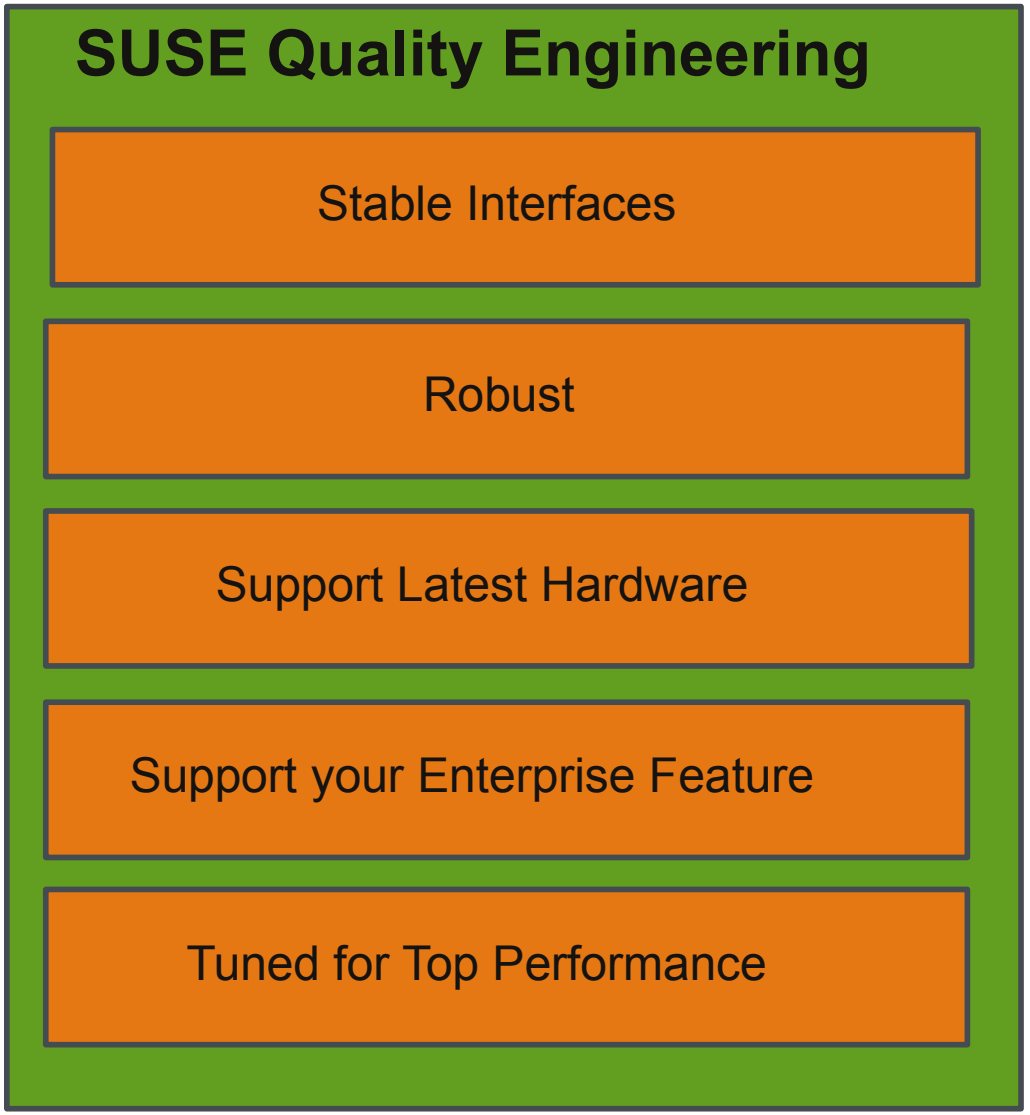
What this means for You!

We deliver the quality you are used to

and

we give you more innovation

Yesterday, Today, Tomorrow



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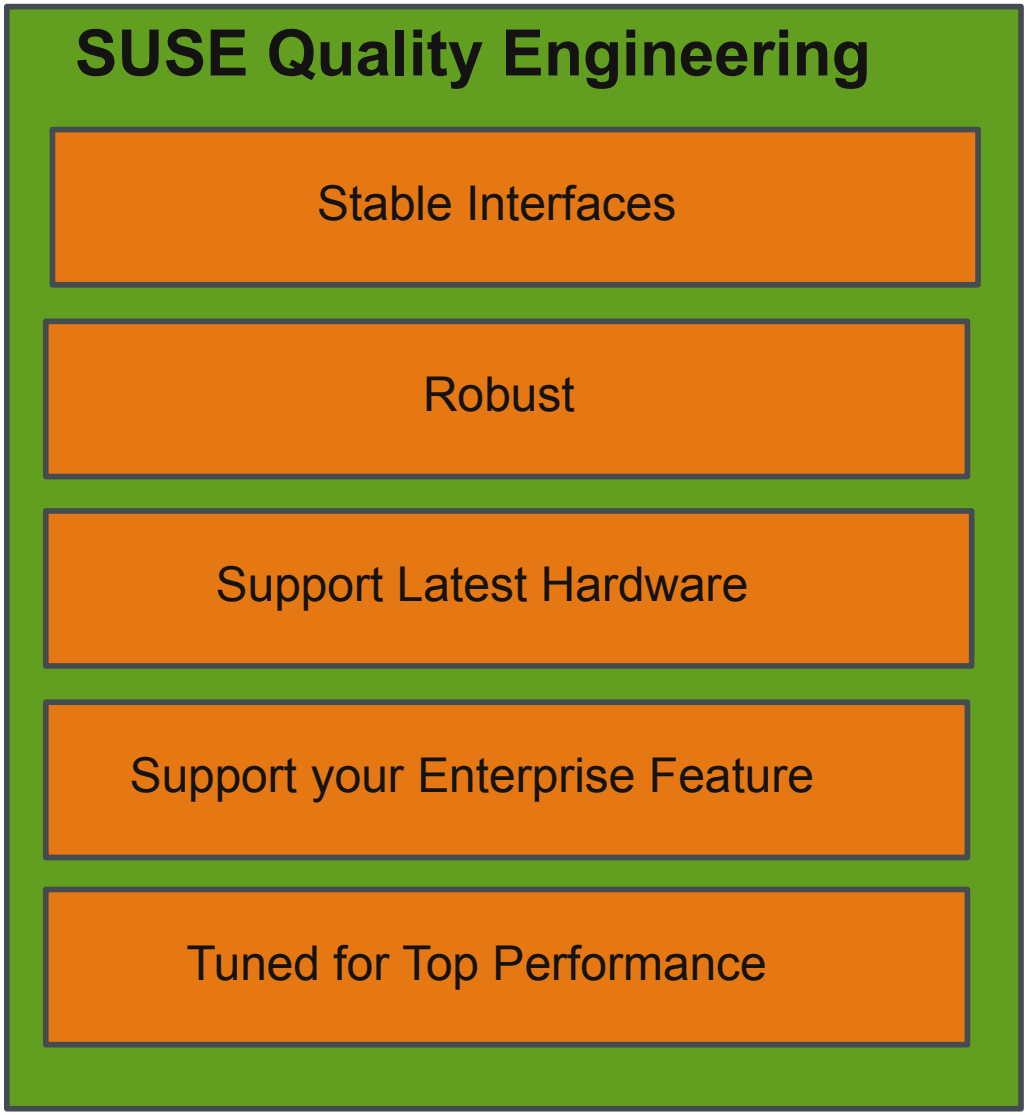

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