

# SUSE Linux Enterprise 10

## Roadmap

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**Novell**<sup>®</sup>

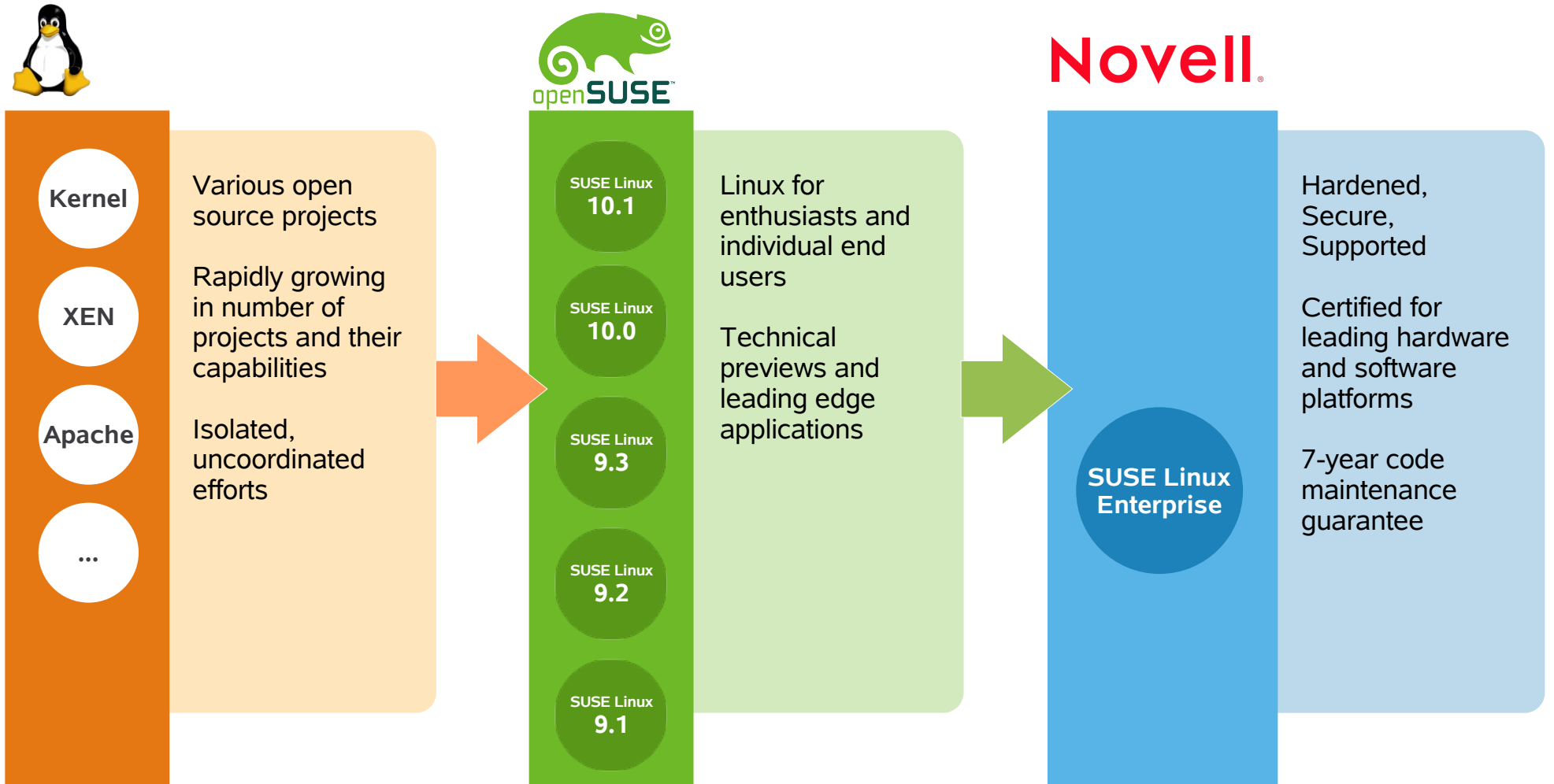
# Enterprises are Shifting to Open

•Today's Enterprise:  
**Multiple platforms, proprietary technologies, management and security challenges**

•Tomorrow's Open Enterprise:  
**Performance, reliability, and world-class support on standards-based, open platforms**



# Novell's Linux Development Process



# Leading Linux Innovation

First enterprise distribution to ship on 7 architectures:

x86, x86-64, ia64, ppc, ppc64, s390, s390x

First enterprise distribution to ship 2.6 Kernel

First journaling filesystem for Linux Kernel

First Linux distribution to receive Common Criteria

EAL2+, EAL3+ and EAL4+

First to ship with integrated IPsec support (1999)

First to rely on CIM standard for System Management

First enterprise distribution to ship Xen Virtualization

# Major Linux Kernel contributions

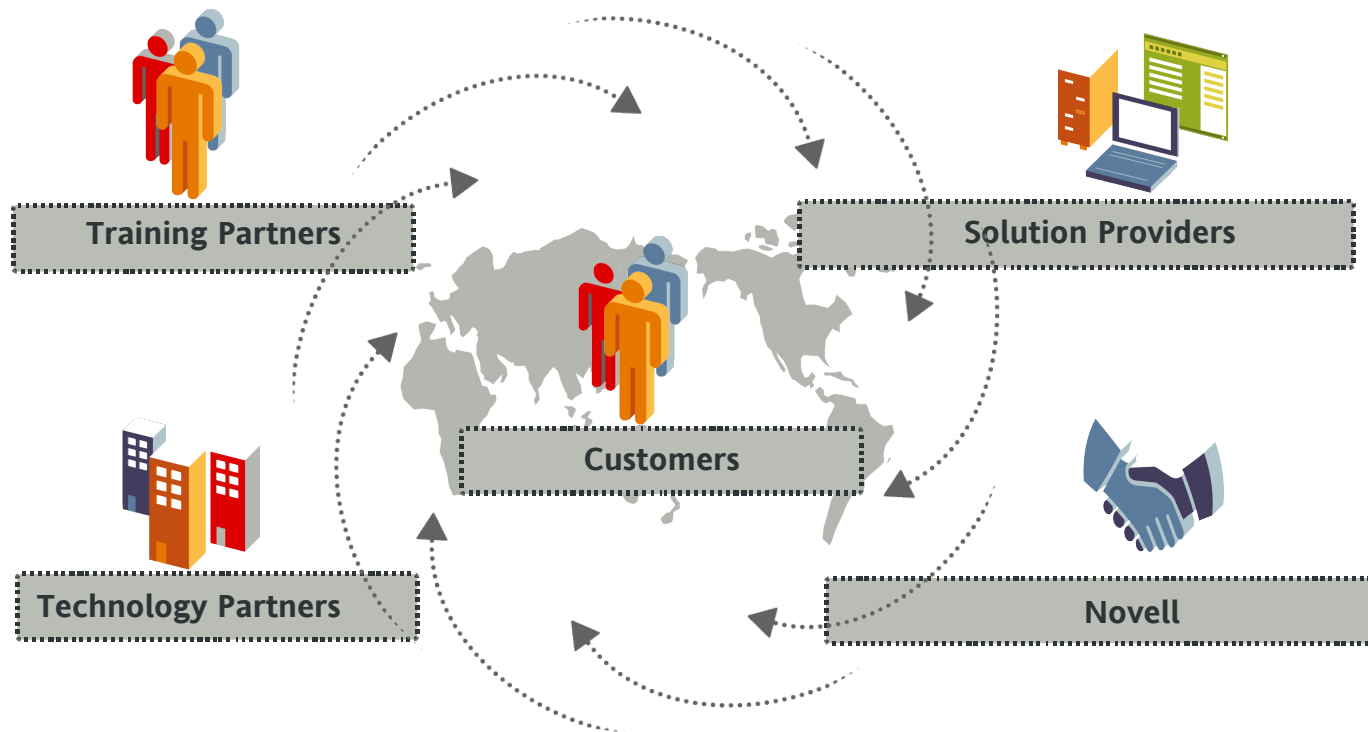
Linux Kernel areas with major involvement from SUSE/Novell:

- Memory management
- NUMA (Non-uniform Memory Architecture)
- Multi-core CPU support
- Block I/O subsystem
- I/O schedulers
- Reiser FS
- NFS
- IPv6
- Power management
- Virtualization (User Mode Linux and Xen)

# Novell Partner Ecosystem

## The power of working as one

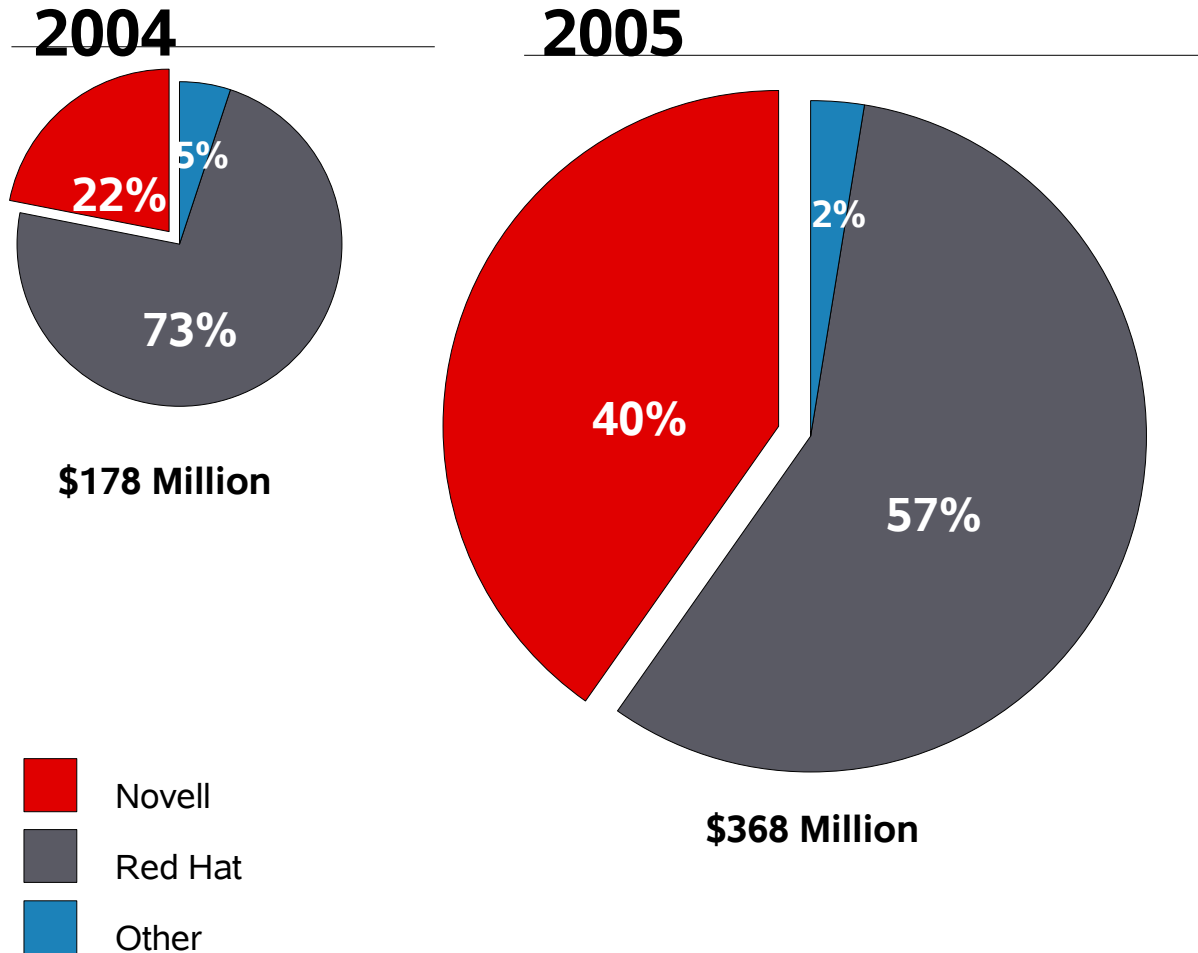
ec-o-sys-tem (äk'o-sīs'tam) *noun*. A community working together in a common environment considered as a single unit



# Novell Partnering Facts (Nov 2005)

- 1) **42** ISV/IHVs in Q1 FY04 -to- **975** by Q1 FY06:
  - **90%** of these partners are new to Novell
  - Averaging **10 - 15** new or renewing companies per week
  
- 2) **203** Enterprise Linux Products in Q1 FY04 -to- **2157** at Q2 FY06:
  
- 3) **5,000** total Novell partners in Q2 FY06:
  - **3,200** Solution Providers (VADs/VARs) & System Integrators
  - **900** Training Partners
  - **975** Technology Partners (ISV/IHVs)

# Paid Linux Market Share



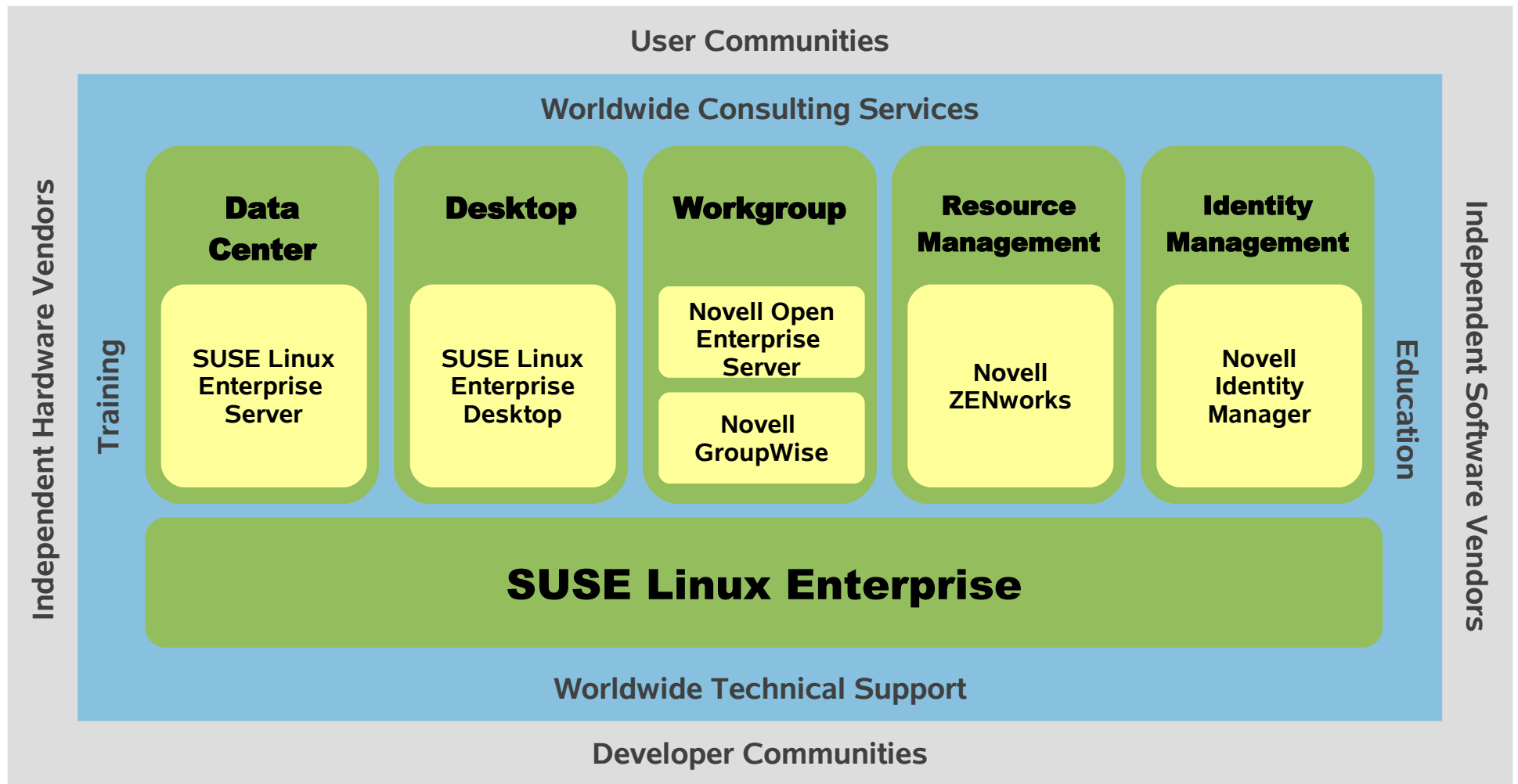
## Why Novell is Winning

- Acquired SUSE Linux in early 2004
- F1000 accounts standardizing on SUSE Linux Enterprise
- Enterprise-grade software solutions and technical support
- Successful migrations from NetWare to Linux

**Source:** Comparison of paid Linux revenue from NOVL and RHAT 10-Q Statements for 8 consecutive quarters

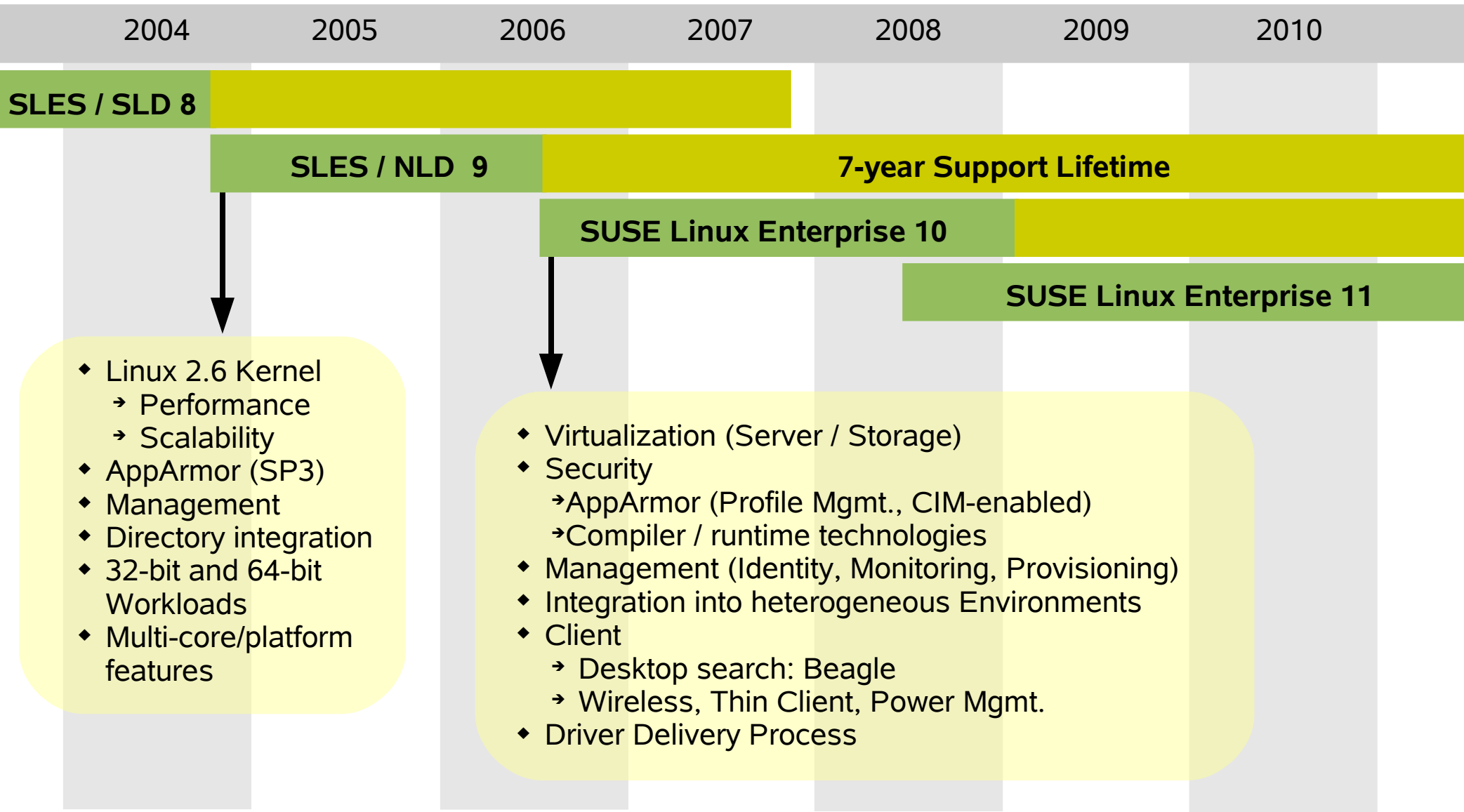
# Novell's Comprehensive Ecosystem

When performance, reliability, and world-class support really matter, organizations choose SUSE Linux Enterprise from Novell. From desktops to data centers, the best just got better.



# SUSE Linux Enterprise Roadmap

# SUSE Linux Enterprise Roadmap



# INTRODUCING: SUSE Linux Enterprise 10

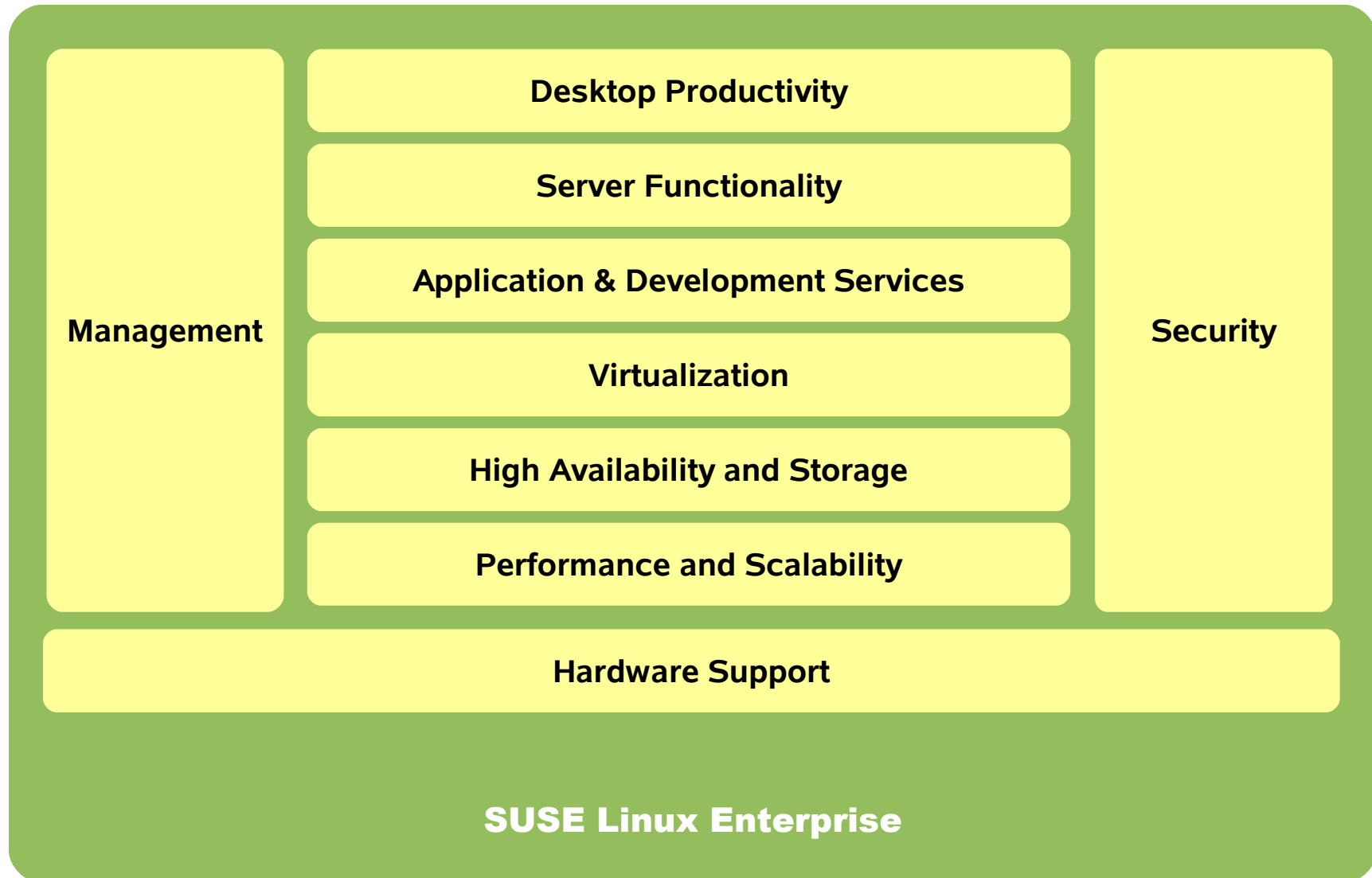
The platform for the open enterprise

- State of the Art Linux
- Virtualization Energized
- Application Security
- Systems Management
- System Integration
- Broad Hardware Support



# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Hardware Support

## CPU

- ◆ Available on x86, x86-64, ia64, ppc, ppc64 and s390x
- ◆ Support and optimizations for the latest CPU technology, including Virtualization (VT, Pacifica) and Multi-core.

## Updated drivers for:

- ◆ Storage (RAID, SAS, SATA, Multipathing, Fibrechannel)
- ◆ Networking (including support for I/OAT and Wireless)
- ◆ Platform management (IPMI) and Power management
- ◆ Graphics, Audio, Bluetooth and USB devices

## Hotplug

- ◆ Hotplug improvements through Hardware Abstraction Layer
- ◆ Persistent device naming

## Scalability

- ◆ Support for 10+ TB Memory, 12000 SCSI LUNs and up to 1024 CPUs

# Novell Driver Delivery Process

**Challenge:** Kernel Modules including drivers need to be available at the time hardware ships or the driver is updated.

**Solution:** Kernel Module Packages make vendors independent from SUSE Linux Enterprise releases as the modules can be distributed, installed and updated via an automated process

## **For the customer:**

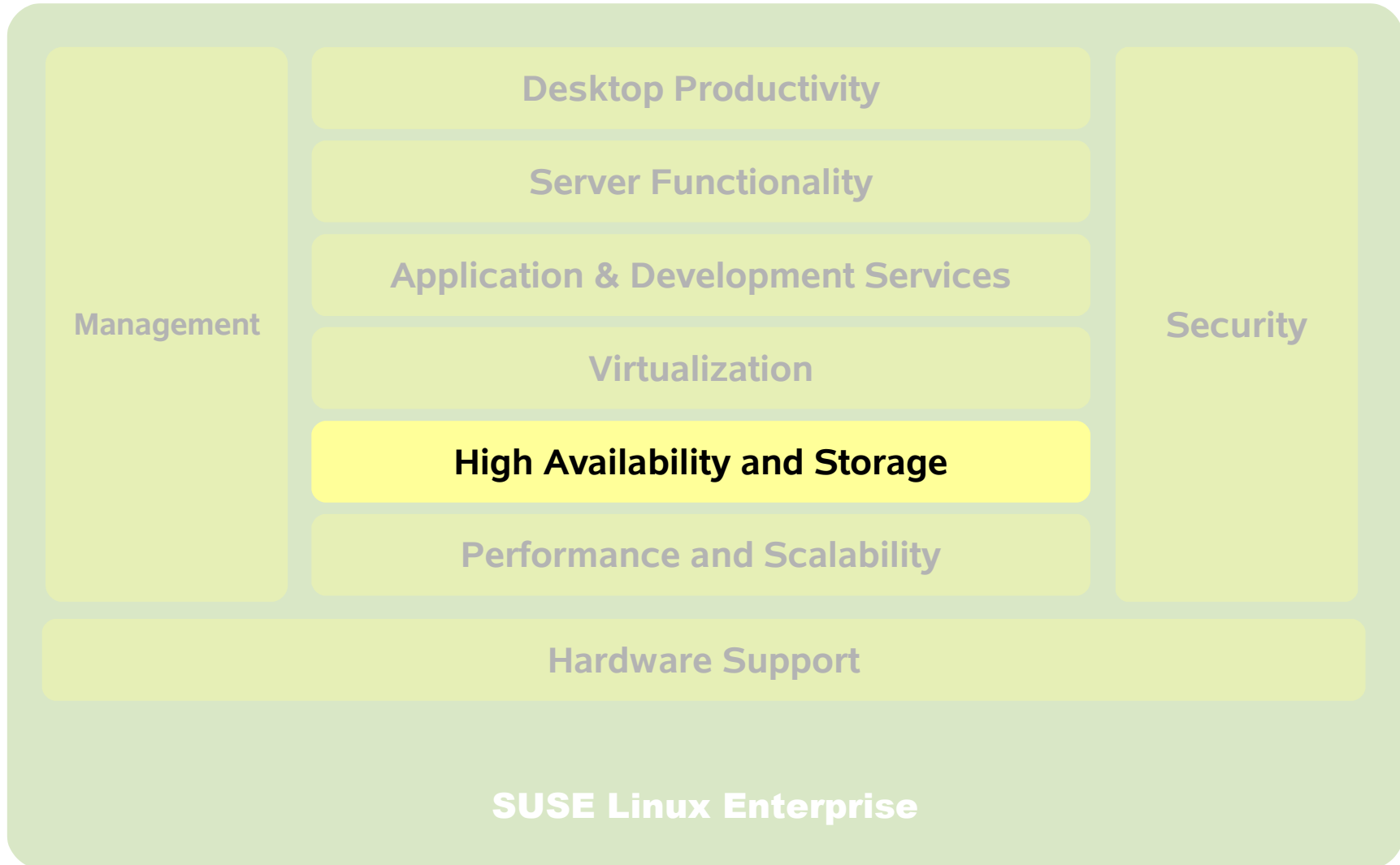
YaST driver installation and update  
Component certification gives confidence

## **For the vendor**

Well-defined infrastructure to build SUSE Linux Enterprise drives  
Kernel update notification and kABI notification  
Build service and validation to build and revalidate  
Novell can distribute through Novell Customer Center if GPL

# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Storage Foundation

## High Availability Storage Foundation

- ◆ Integrating OCFS2 cluster filesystem, cluster-aware volume management with EVMS and HA failover with Heartbeat2

## OCFS2

- ◆ Optimized for fast access to large files
- ◆ Joint development with Oracle

## Heartbeat 2

- ◆ Modular design with new cluster resource manager
- ◆ Large clusters: 16 nodes tested, no inherent limit
- ◆ Resources actively monitored for health
  - via Open Clustering Framework (OCF) Resource Agents (RA)
- ◆ Powerful resource dependency model based on XML
  - Cluster information base (XML) replicated across nodes

# Storage Features

## Multipathing

- ◆ Improve and harden multipathing support
  - ✓ I/O Load balancing
  - ✓ HA failover

## NFS

- ◆ NFS v4 Client and Server
  - ✓ Performance improvements
  - ✓ Improved security

## iSCSI

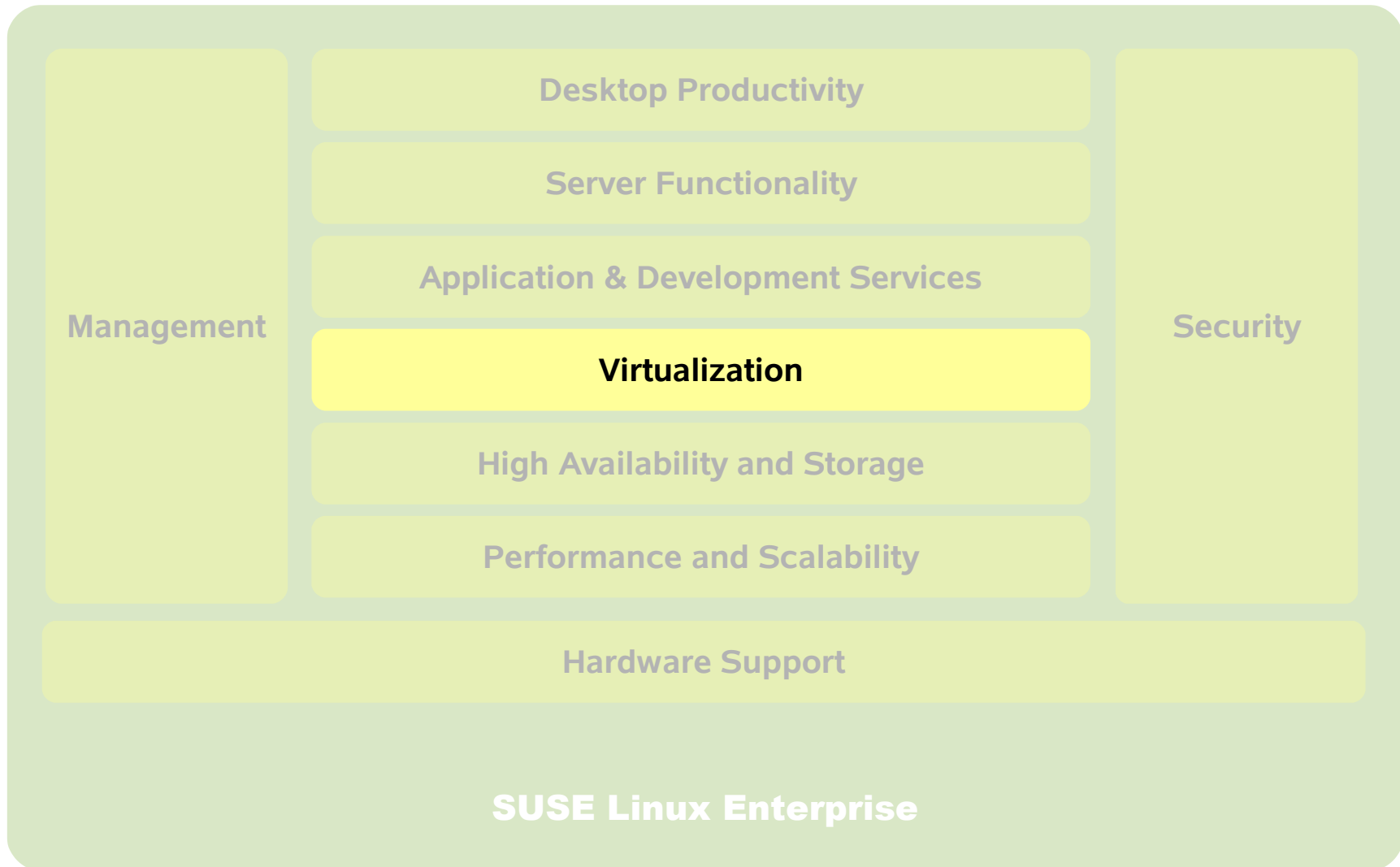
- ◆ iSCSI target and initiator
- ◆ “turn SLES into a SAN box”

## DRBD

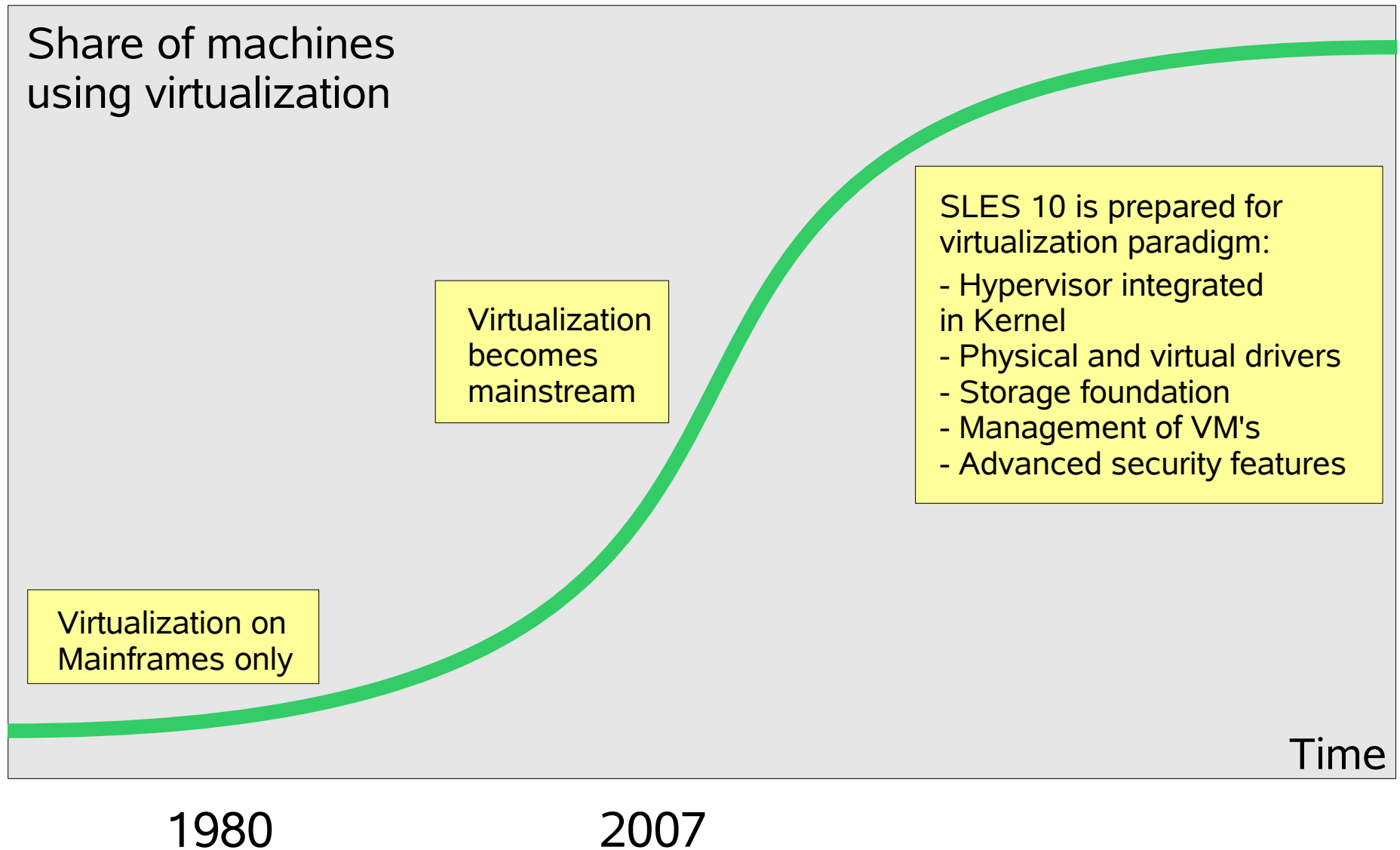
- ◆ Distributed Replicated Block Device
- ◆ Integrated with Heartbeat2

# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Technology trend: Virtualization



# Virtualization

## Use cases

- ◆ Server consolidation
- ◆ Workload isolation (e.g. dedicated VMs, QoS policies)
- ◆ Scheduled HW Maintenance w/o SW downtime
- ◆ Compatibility environments
- ◆ SLES9 solution stack in VM running on SLES10

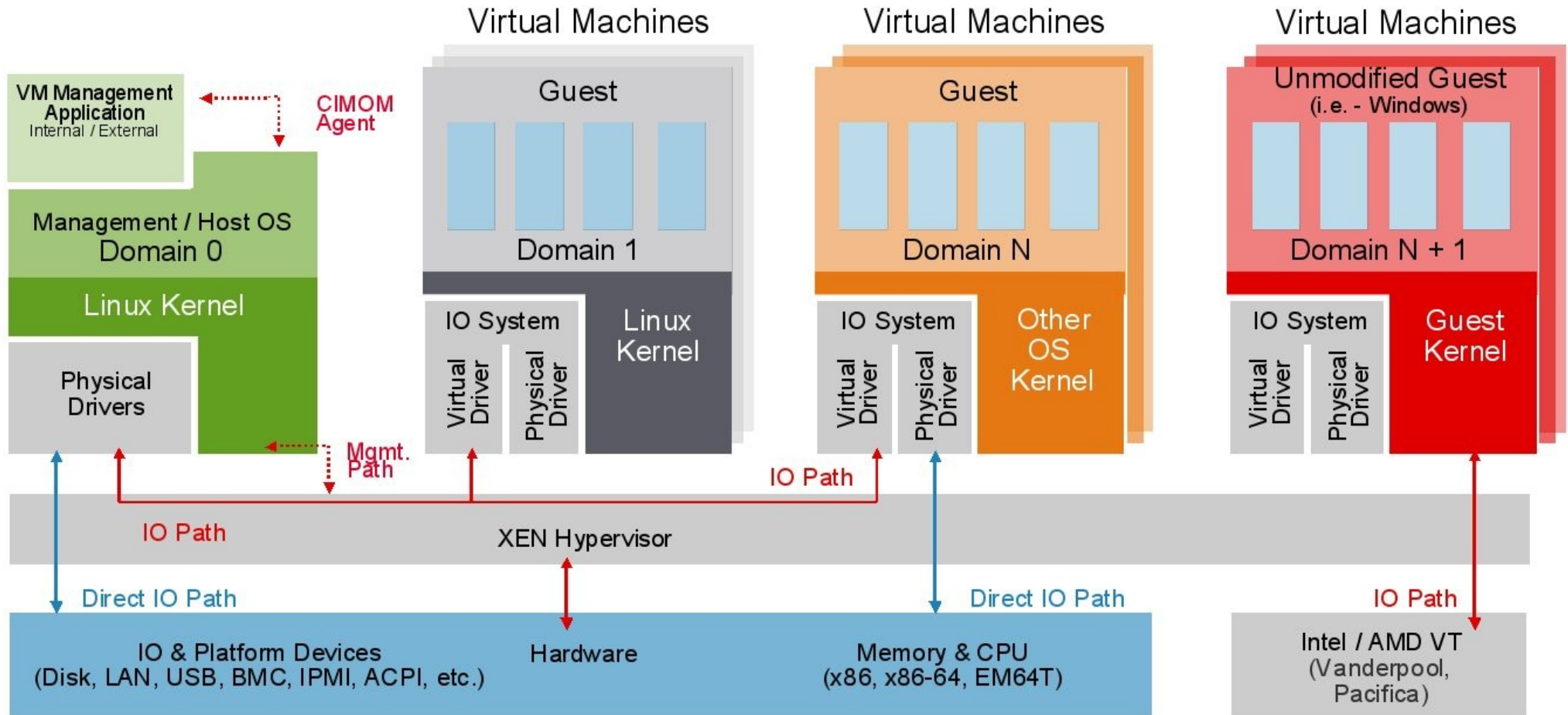
## Xen 3.0

- ◆ Hypervisor fully integrated and supported
- ◆ Support for SMP, PAE and 64-bit CPUs

## Management

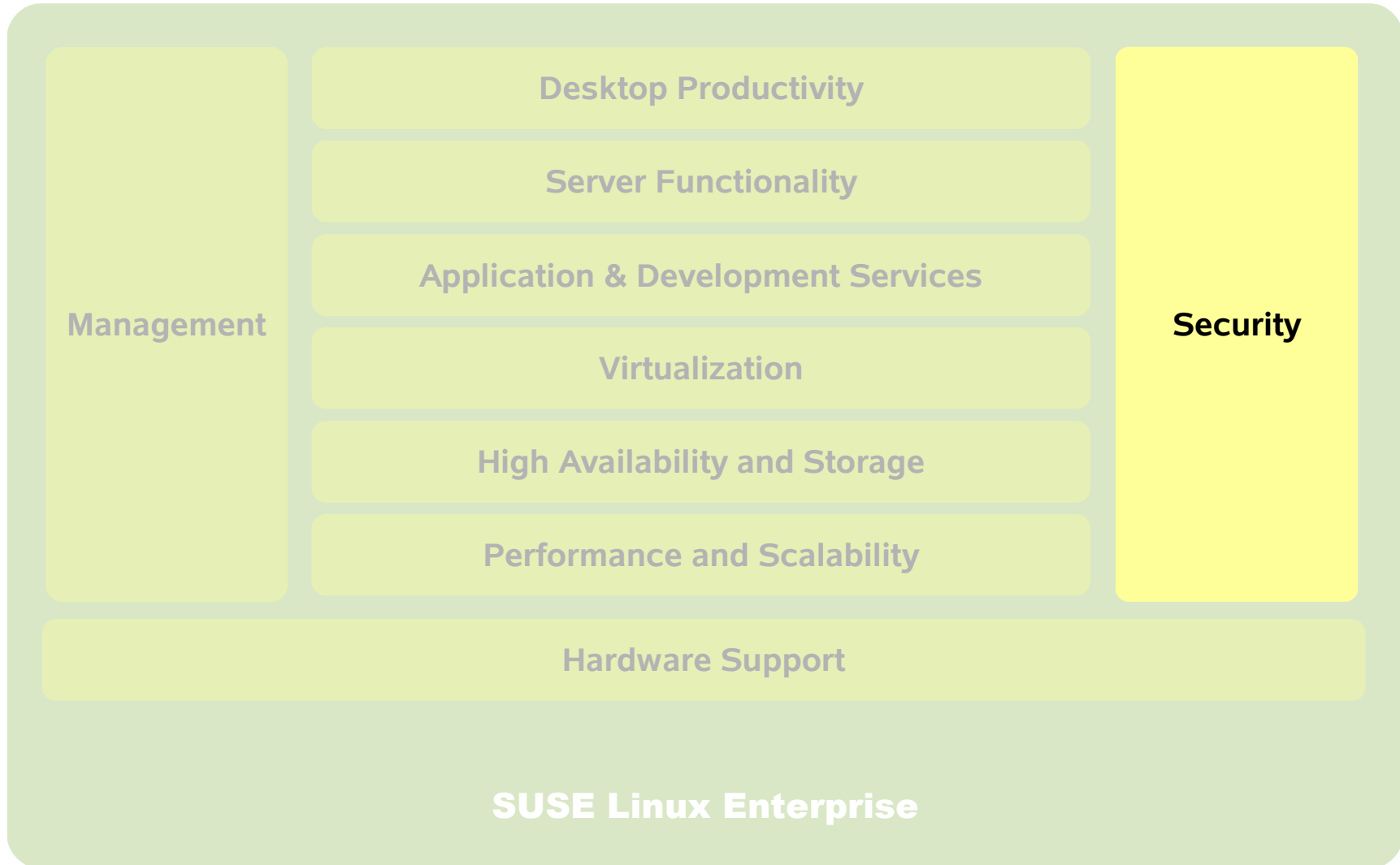
- ◆ Based on CIM standard, CIM providers for VM management
- ◆ YaST modules for easy management

# Novell Virtual Machine Architecture



# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Security

## Proactive

- ◆ Code audits of potentially dangerous programs
- ◆ Compiler improvements (buffer overflow checking with *fortify*)
- ◆ Stack less predictable through *randomize* (exploit prevention)

## Server Jail

- ◆ Secure encapsulation in VM via Xen virtualization

## AppArmor intrusion prevention

- Creates “firewall” around applications
- Protects even against **unknown** application vulnerabilities
- No security expertise required
  - Comprehensive wizard-based tool set, integrated in YaST
  - Default profiles for standard applications
- Low performance impact (typical: < 0.2 %, worst case: 2%)

# A closer look at AppArmor

## Security Model

- ◆ Proactive “whitelist” approach, **no** attack signature database
- ◆ Profiles grant access to the **minimal** list of files/directories and POSIX capabilities required by the application
- ◆ Complete kernel-level mediation through Linux Security Module

## Automated workflow for security profile generation

- ◆ Autoscans for open network ports
- ◆ Find applications listening to ports and check for existing profile
- ◆ Auto-generate profile template based on static analysis
- ◆ Auto learn mode: Automatically expands profile while running the application through normal operation
- ◆ Interactive optimizer assists in simplifying the profiles with regular expressions and foundation classes

# AppArmor Security Profile

Whenever a protected program runs regardless of UID, AppArmor controls:

- The POSIX capabilities it can have (even if it is running as root)
- The directories/files it can read/write/execute

Many default profiles

Apache2, postfix, etc.

Additional profiles available

```

/usr/sbin/ntpd {
    #include <abstractions/base>
    #include <abstractions/nameservice>

    capability ipc_lock,
    capability net_bind_service,
    capability sys_time,
    capability sys_chroot,
    capability setuid,

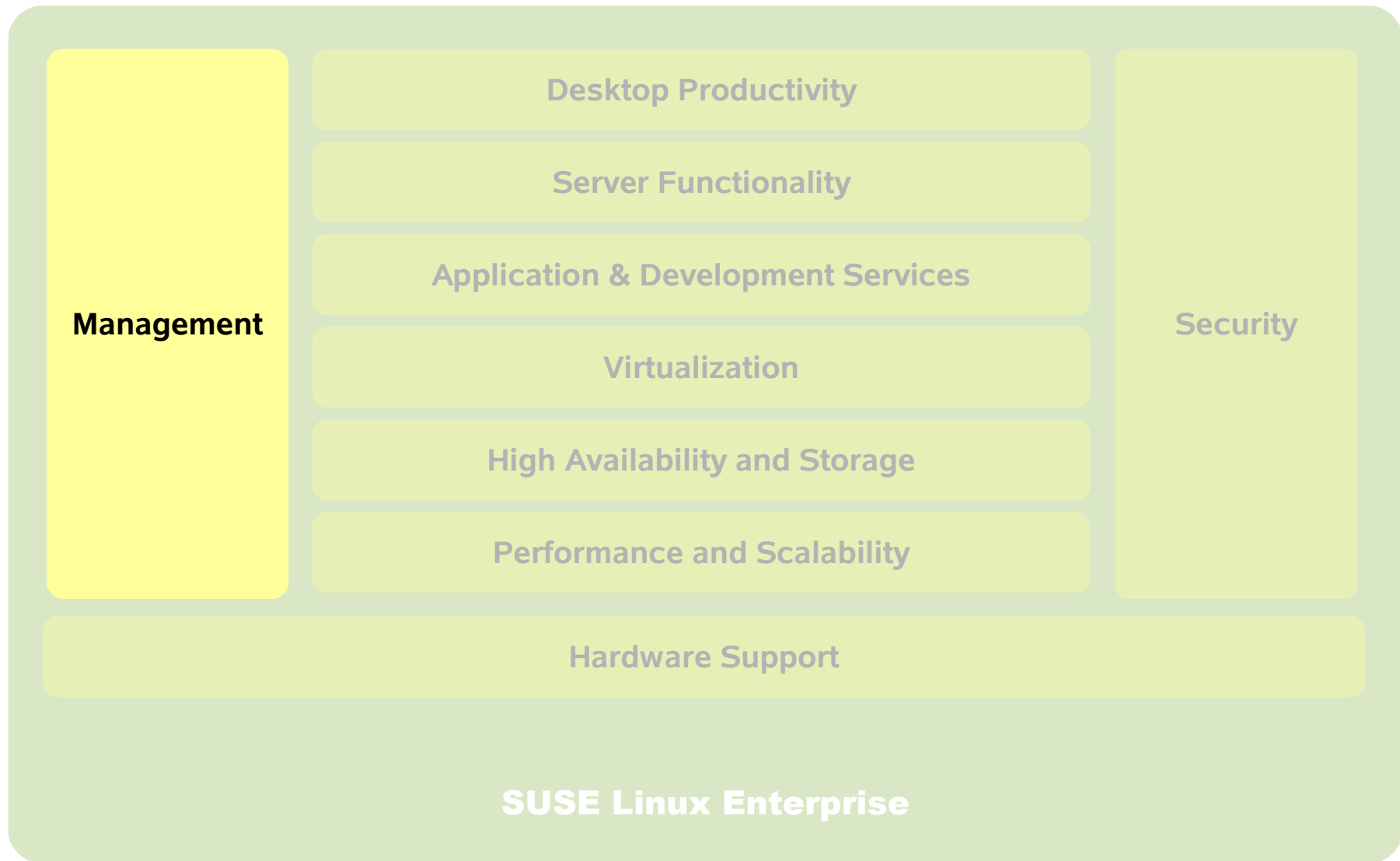
    /etc/ntp.conf                r,
    /etc/ntp/drift*              rwl,
    /etc/ntp/keys                r,
    /etc/ntp/step-tickers        r,
    /tmp/ntp*                    rwl,
    /usr/sbin/ntpd                rix,
    /var/log/ntp                 w,
    /var/log/ntp.log             w,
    /var/run/ntpd.pid            w,
    /var/lib/ntp/drift           rwl,
    /var/lib/ntp/drift.TEMP      rwl,
    /var/lib/ntp/var/run/ntp/ntpd.pid w,
    /var/lib/ntp/drift/ntp.drift  r,
    /drift/ntp.drift.TEMP        rwl,
    /drift/ntp.drift             rwl,
}

```

Example security profile for **ntpd**

# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise

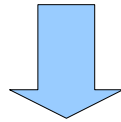


# Management Lifecycle

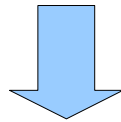
## Management Tasks



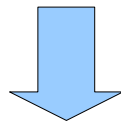
Installation



Configuration



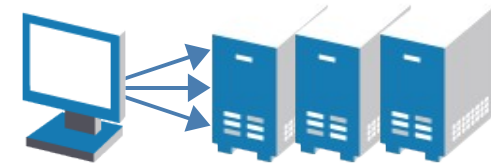
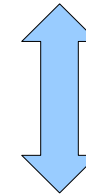
Update Management



Monitoring

## Management Impact

1 to 1



1 to many

# Management Lifecycle – Installation



1 to 1

- YaST Installation Workflow
- Pattern based software deployment



1 to many

- AutoYaST
- ZENworks Linux Management

**Preparation**

- ✓ Language
- ✓ License Agreement
- ✓ System Analysis
- ✓ Time Zone

**Installation**

- ➔ Installation Summary
- Perform Installation

**Configuration**

- Hostname
- Root Password
- Network
- Update Configuration
- Online Update
- Service
- Users
- Clean Up
- Release Notes
- Hardware Configuration

**Installation Settings**

Click any headline to make changes or use the "Change..." menu below.

Overview Expert

**Keyboard Layout**

- English (US)

**Partitioning**

- Format partition /dev/hda5 (10.7 GB) for / with reiserfs
- Use /dev/hda5

**Software**

Filter: Patterns

Package	Summary	Size
<input checked="" type="checkbox"/> bridge-utils	Utilities for Configuring the Linux Ethernet Bridge	67.9
<input type="checkbox"/> kernel-xen	The Xen Kernel	51.7
<input type="checkbox"/> xen	Xen Virtualization: Hypervisor (aka VMM aka Microkernel)	8.5
<input type="checkbox"/> xen-doc.html	Xen Virtualization: HTML documentation	460.6
<input type="checkbox"/> xen-doc.pdf	Xen Virtualization: PDF documentation	388.3
<input type="checkbox"/> xen-tools	Xen Virtualization: Control tools for domain 0	1.6
<input type="checkbox"/> xen-tools-ioctl	Xen Virtualization: BIOS and device emulation for unmodified guests	651.9
<input checked="" type="checkbox"/> xterm	The basic X Window System package	1.8

**Base Technologies**

- Default System
- Common Code Base
- Base System
- Novell AppArmor
- High Availability

**Graphical Environments**

- GNOME Desktop Environment
- KDE Desktop Environment
- X Window System

**Primary Functions**

- File Server
- Print Server
- Mail and News Server
- Web and LAMP Server
- Internet Gateway
- DHCP and DNS Server
- Directory Server (LDAP)
- SAP Application Server Base
- Oracle Server Base
- Xen Virtual Machine Host Server
- Web-Based Enterprise Management

**Development**

- C/C++ Compiler and Tools

**bridge-utils** - Utilities for Configuring the Linux Ethernet Bridge

Description: This package contains utilities for configuring the Linux ethernet bridge. The Linux ethernet bridge can be used for connecting multiple ethernet devices together. The connection is fully transparent: hosts connected to one ethernet device see hosts connected to the other ethernet devices directly.

Authors: Lennert Buytenhek

Check  Autocheck Cancel Accept

File View Classes Tools

**Available modules**

- [Keyboard Layout](#)
- Select the keyboard layout
- [Partitioning](#)
- Configure Partitioning and Storage Settings
- [Printer](#)
- Configure printers
- [Sound](#)
- Configure your sound card
- [Graphics Card and Monitor](#)
- Configure the graphics card and monitor

Software

- Hardware
- System
  - Boot Loader
  - General Options
  - Power Management
  - Reporting & Logging
  - System Restoration
  - System Services (Runlevel)
  - /etc/sysconfig Editor
  - Date and Time
  - Language
- Network Devices
- Network Services
  - Novell AppArmor
- Security and Users
- Miscellaneous

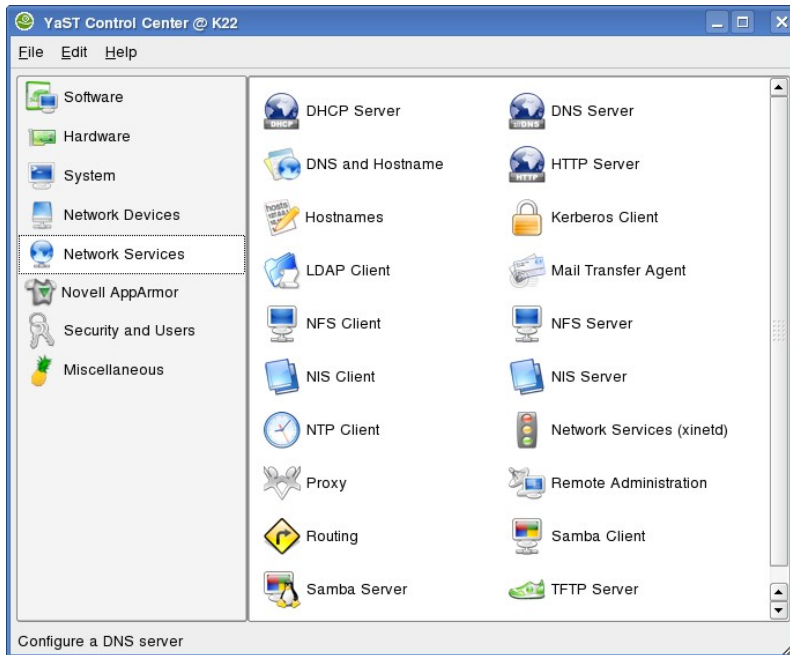
Help

# Management Lifecycle – Configuration



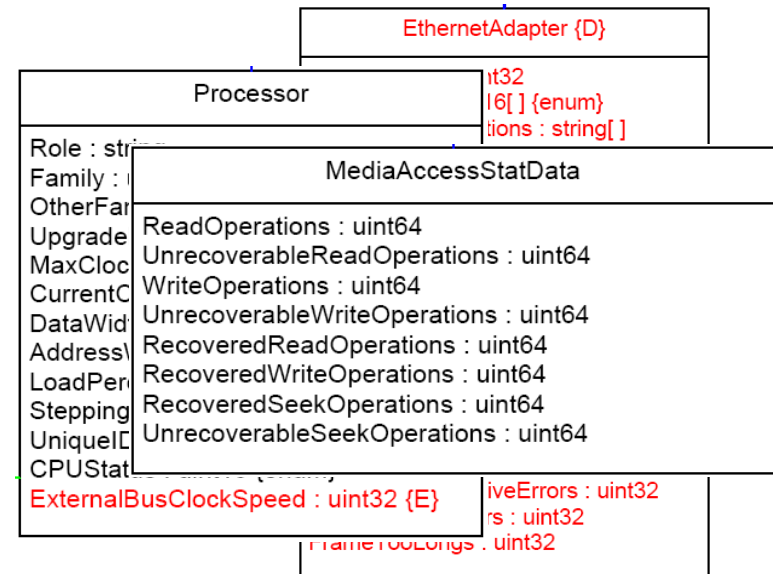
1 to 1

- YaST Control Center
  - Module based
  - Categorized



1 to many

- AutoYaST
- ZENworks Linux Management
  - Machine lock down
  - AppArmor profile deployment
- OpenWBEM / CIM support

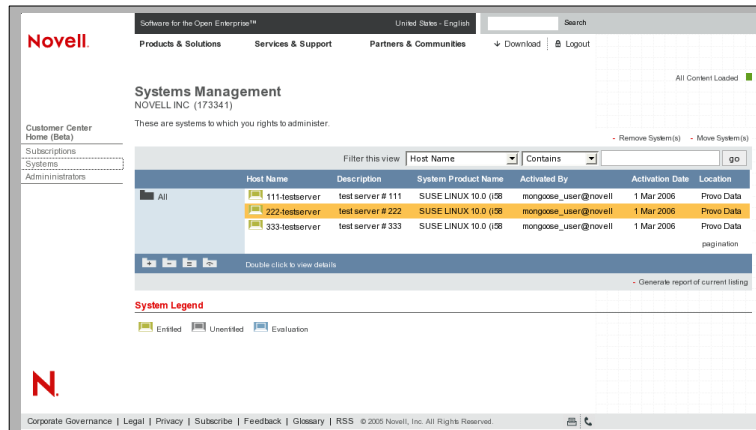


# Management Lifecycle – Updates



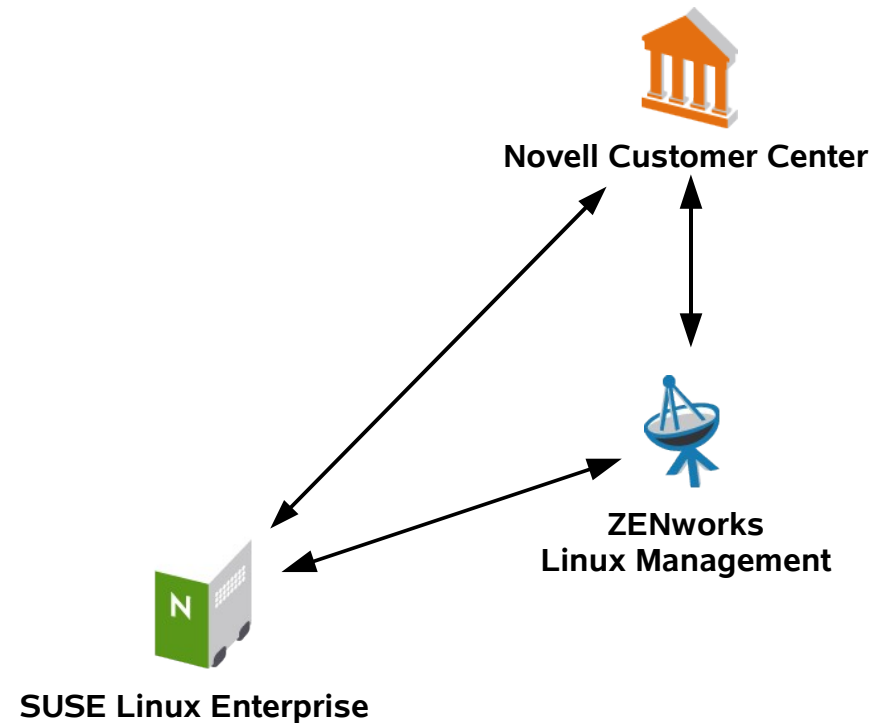
## 1 to 1

- YaST Package Manager
- ZENworks Tools
  - zmd
  - rug
  - zen-updater
- Novell Customer Center
  - Automatic Configuration
  - Registration and Entitlement Management



## 1 to many

- ZENworks Linux Management as Satellite Server

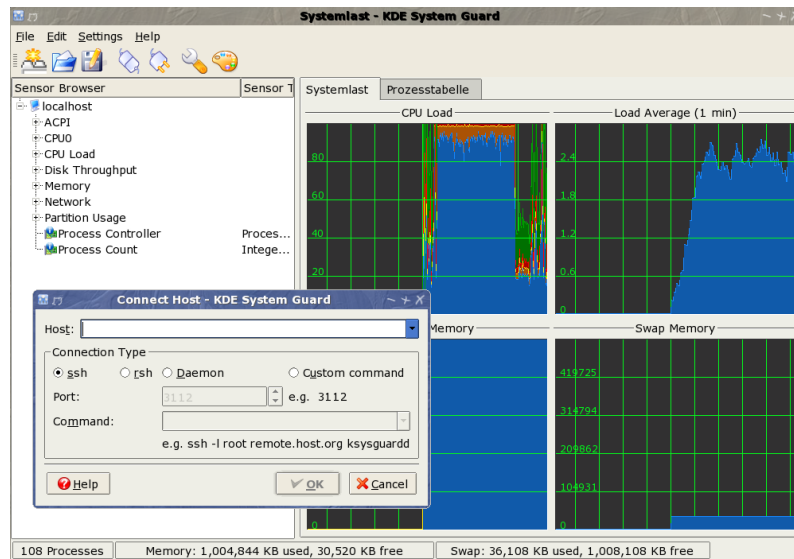


# Management Lifecycle – Monitoring



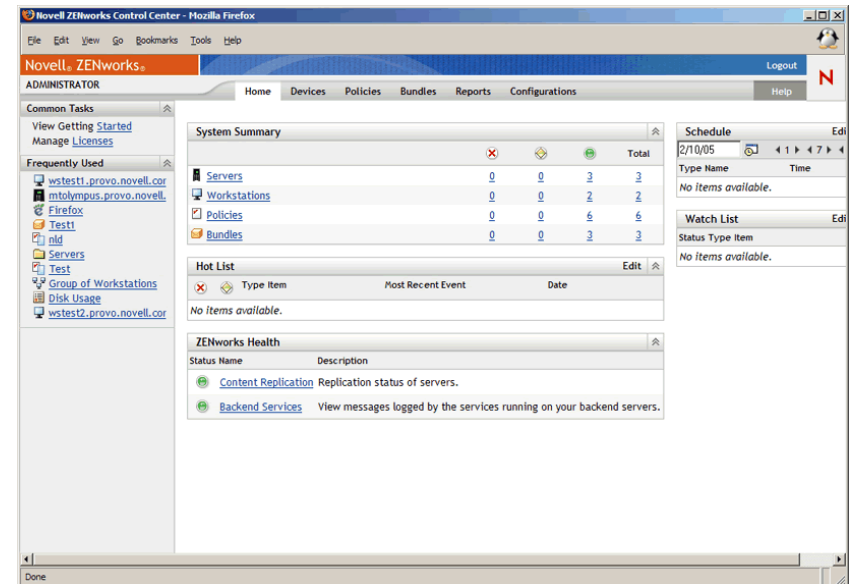
1 to 1

- sysstat-package for decent low level monitoring
- ksysguard using graphical frontend
  - local
  - remote

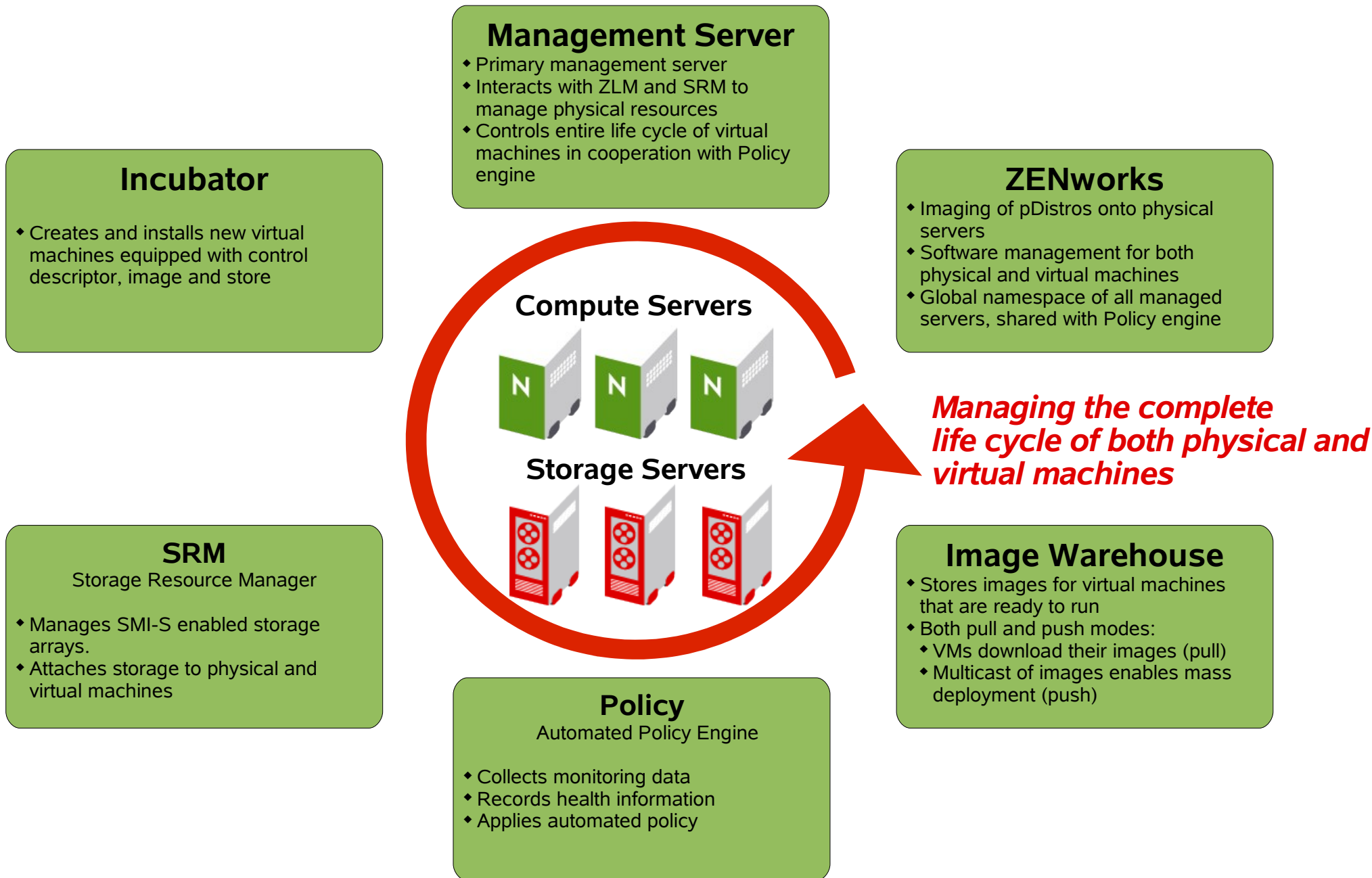


1 to many

- nagios
- OpenWBEM / CIM support
- ZENworks

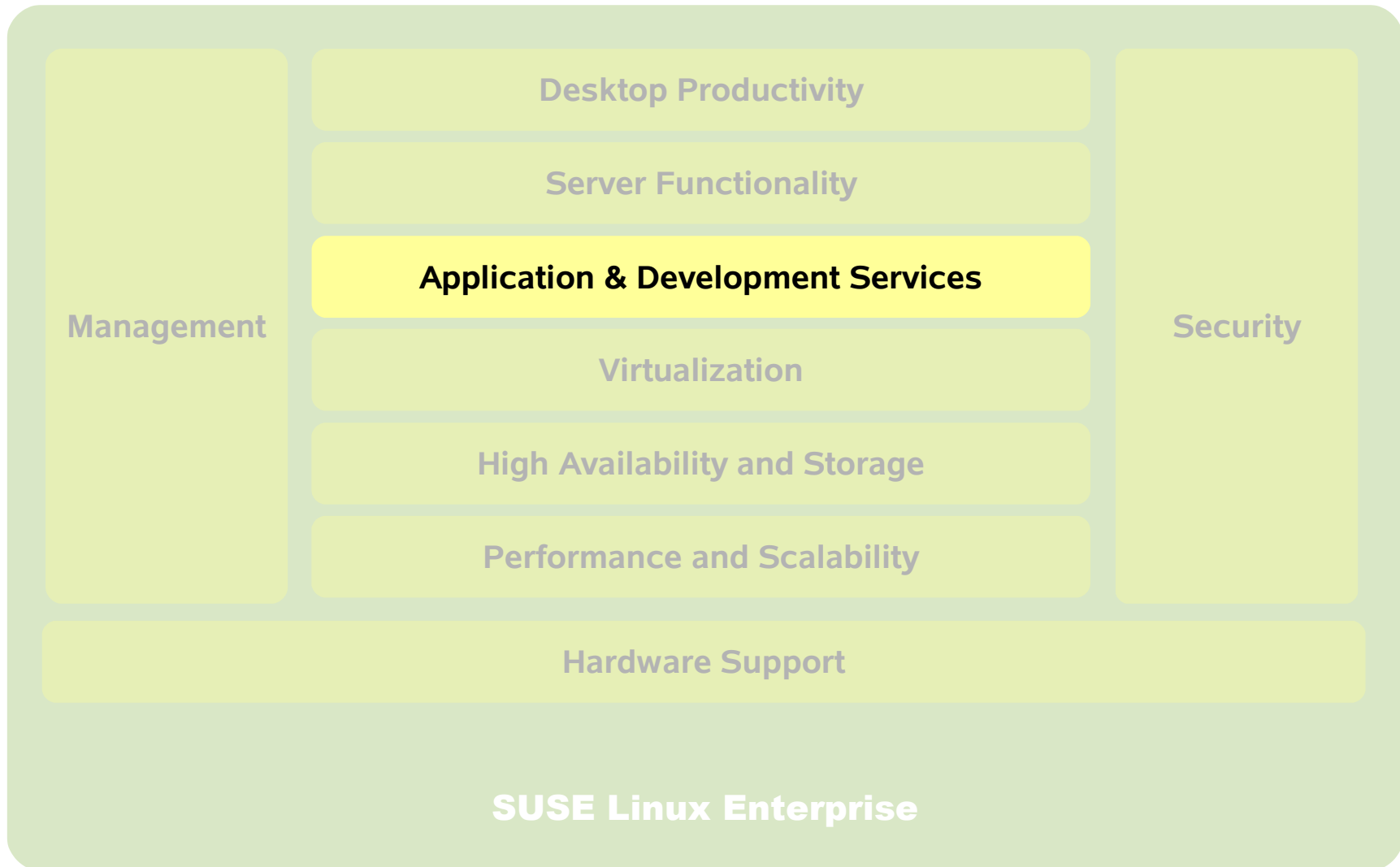


# Advanced Datacenter Vision



# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Software Development

## One Software Development Kit (SDK) for all products

- ◆ save developers the work of getting and configuring all the different tools by themselves
- ◆ provide a standardized, easy to set up development environment that can be rolled out & deployed via YaST

## Kernel Crash Dump Tools

- ◆ kexec / kdump

## Linux Profiling Tool OProfile

- ◆ Profiles kernel, kernel modules, interrupt handlers, shared libraries, and applications.

## Java Development

- ◆ Java 1.4 Runtime
- ◆ Eclipse 3.1 IDE

# .NET for Linux: Mono - Motivation

## Market Trends

- ◆ Heterogeneous environments foster large variety of programming languages being used
- ◆ Rising software complexity leads to high cost for porting

## Solution: .NET / Mono

- ◆ One platform for many (ideally all) object oriented programming languages
- ◆ Compile source code into Common Intermediate Language
- ◆ Just In Time compiler translates CIL code into machine code
- ◆ Easy integration of existing code into new projects through cross language calls and cross language inheritance

## Mono

- ◆ Most of the core components of .NET are available with Mono thus it considerably facilitates migration

# .NET for Linux: Mono

## Open Source implementation of the .NET Framework

- ◆ Based on ECMA standard for C# and CLI

## Binary Compatibility with .NET

- ◆ Estimated 80 % of all .NET 1.1 and many .NET 2.0 applications work out of the box with Mono

## Support for ADO.NET

- ◆ Provider for Oracle, OLE DB, ODBC, Microsoft SQL Server, MySQL, Postgres, DB2, Sybase and Sqlite

## Support for ASP.NET

- ◆ Test server XSP (xsp.exe), module for Apache (mod\_mono)

## Language Support

- ◆ C#, VB (experimental), Python, JavaScript
- ◆ Java interoperability at byte code level (IKVM.Net)

# File and Print Server - Scenarios

## Set up new File and Print Infrastructure

- ◆ Use SLES for authentication, directory, file and print server
- ◆ Authenticate Linux and Windows clients against SLES Server
- ◆ Both Linux and Windows clients access file data and printers via SLES server

## Integration in existing Microsoft Windows Infrastructure

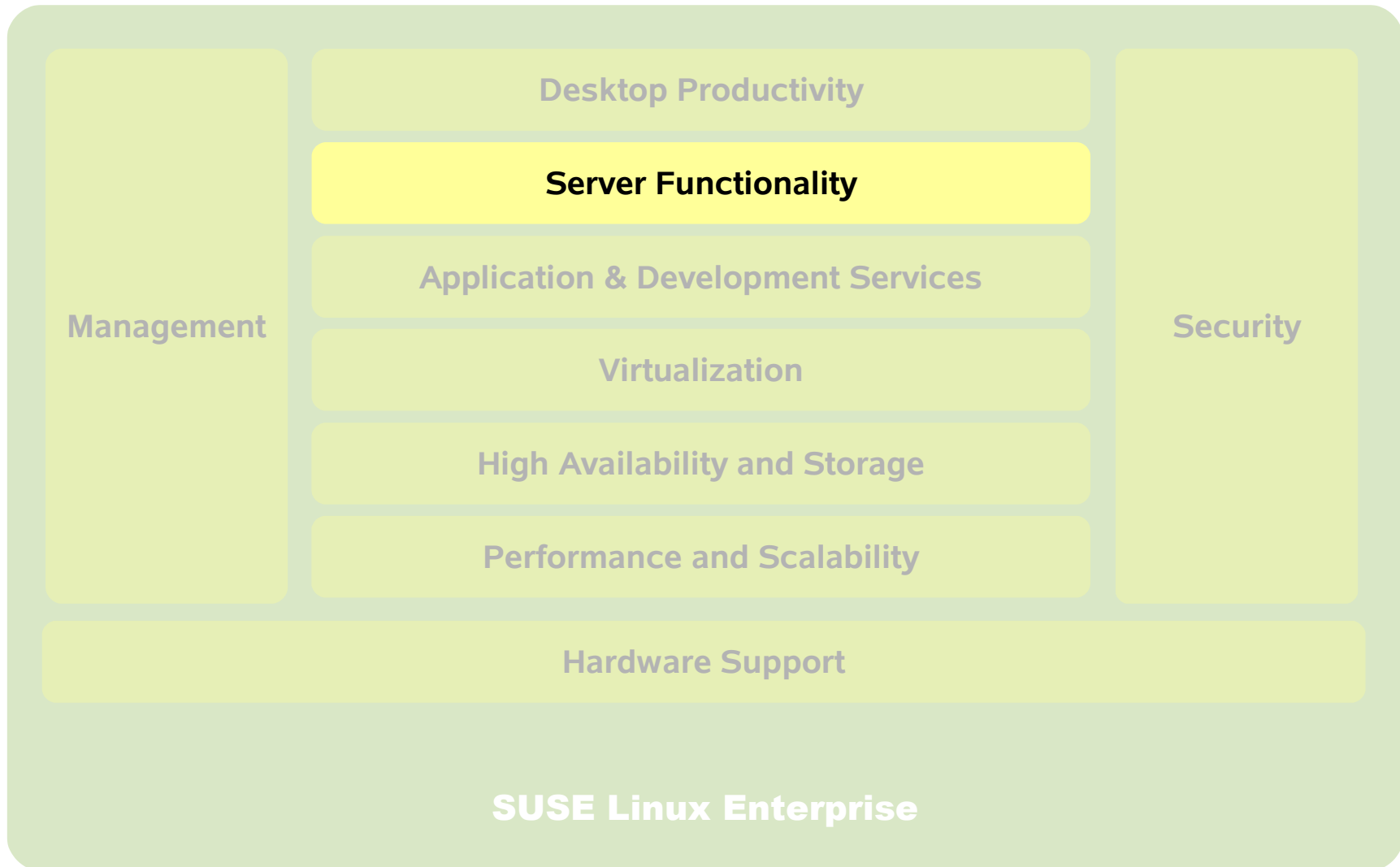
- ◆ Use SLES as file and print server
- ◆ Authenticate against Windows PDC or Active Directory

## Migrate Windows NT/2000 file and print server to SLES

- ◆ Replace Windows NT/2000 file and print server by SLES
- ◆ Migrate directory to SLES
- ◆ Note: Migration of an Active Directory Server (Windows 2003) to SLES can only be done partially and requires manual work

# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# Complete Server Functionality

## File and Print Services

- Samba 3 with improved integration into Windows environments (authentication against Active Directory)
- NFS v4
- CUPS
- Apple File Protocol (AFP) - NetATalk
- Support for Linux, UNIX, Windows and Macintosh clients

## Mail Services

- SMTP / Postfix
- IMAP / Cyrus
- SASL

## Security

- SUSEFirewall
- ClamAV Anti-Virus Protection
- Snort
- VPN with FreeS/WAN

## Middleware Services

- Apache Web Server 2.2.0 and scripting support (PHP5, PERL, Python, Ajax, Ruby on Rails, etc.)
- Java Runtime Environment 1.4
- Geronimo (Java Application Server)
- Tomcat
- Mono 1.1

## Network Services

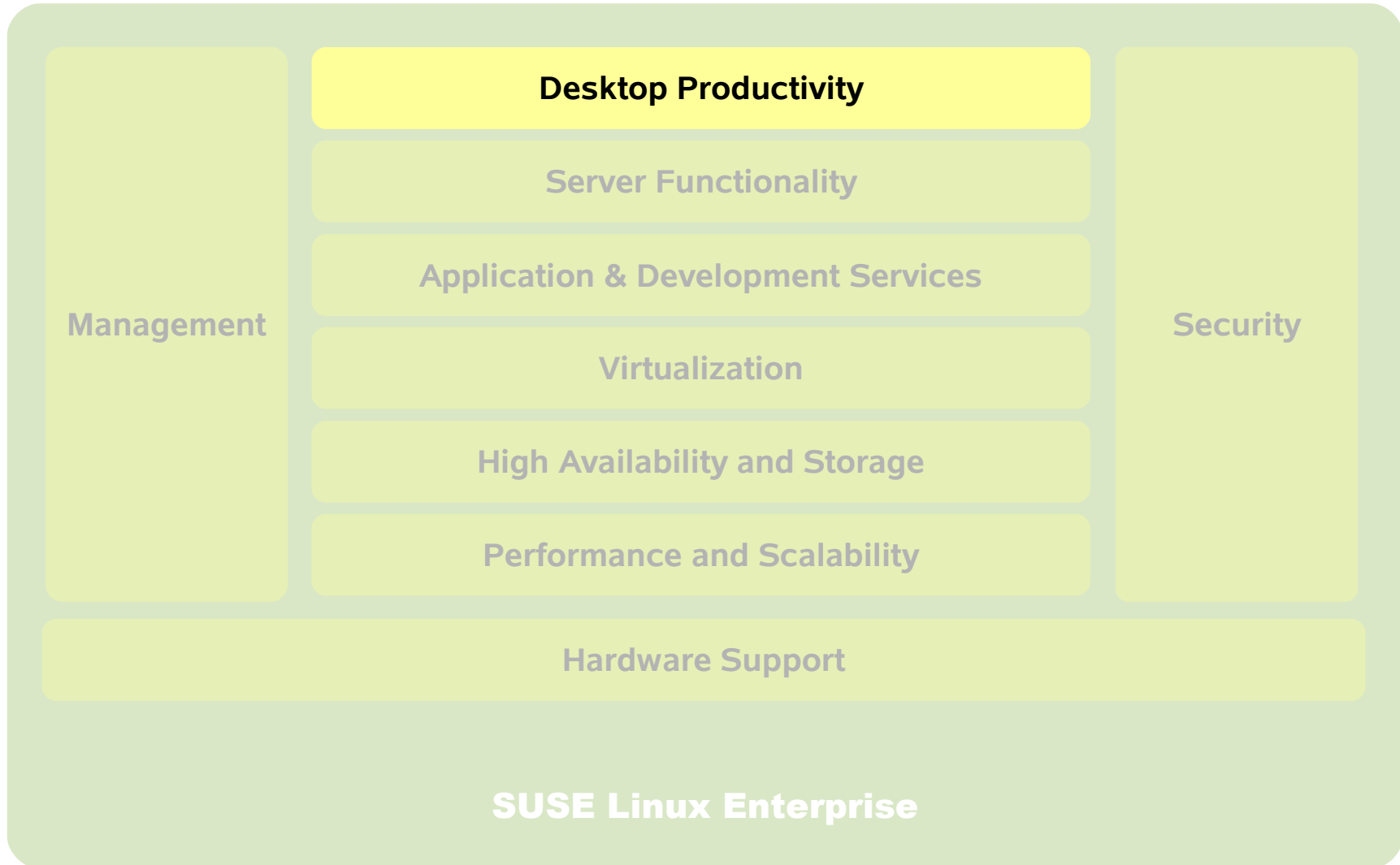
- DNS / DHCP
- NTP
- NIS
- OpenLDAP
- SLP
- TFTP

## Databases

- MySQL
- PostgreSQL
- ODBC connectivity

# SUSE Linux Enterprise 10

## The Platform for the Open Enterprise



# New in SUSE Linux Enterprise Desktop 10

## **New levels of end user productivity**

- Powerful desktop productivity tools: E-mail, desktop search, Firefox Web browser, Instant messaging, multi-media
- OpenOffice.org 2.0 office suite and Visual Basic macro conversion
- Easy-to-learn desktop environment with advanced animations and rendering

## **Seamless integration with enterprise systems**

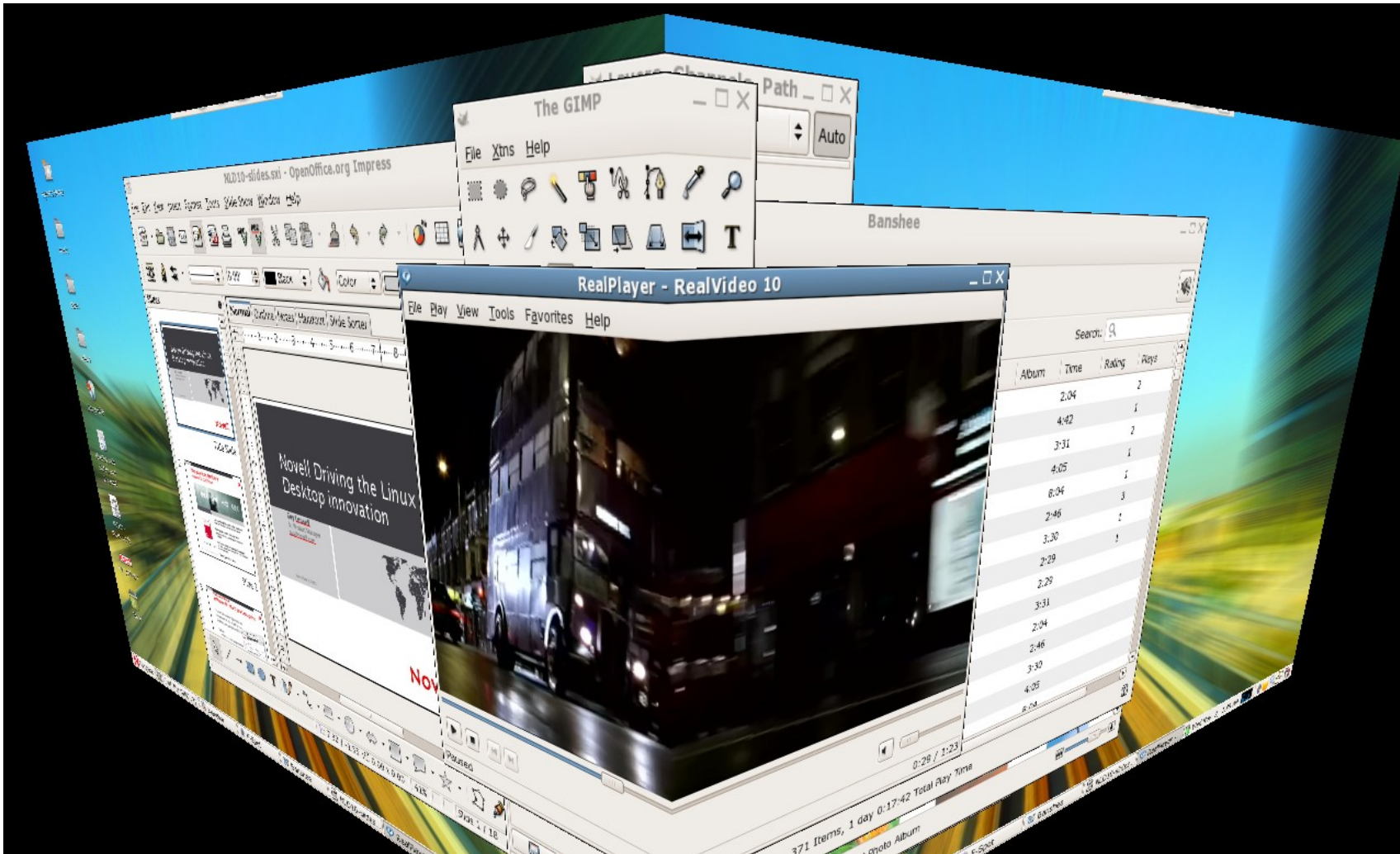
- Enhanced hardware support for USB and Bluetooth devices
- Seamless connectivity to mixed networks, including Novell eDirectory and Active Directory
- Printer support including auto driver download and installation, MS printer support

## **Flexible deployment options**

- Thin and thick-client deployment
- Easy deployment and desktop lock-down

Novell is #1 on the Linux desktop, providing vendor choice and dramatic costs savings for basic office workers

# Example: 3D Accelerated Graphics



# Novell Training Offerings on SUSE Linux Enterprise 10



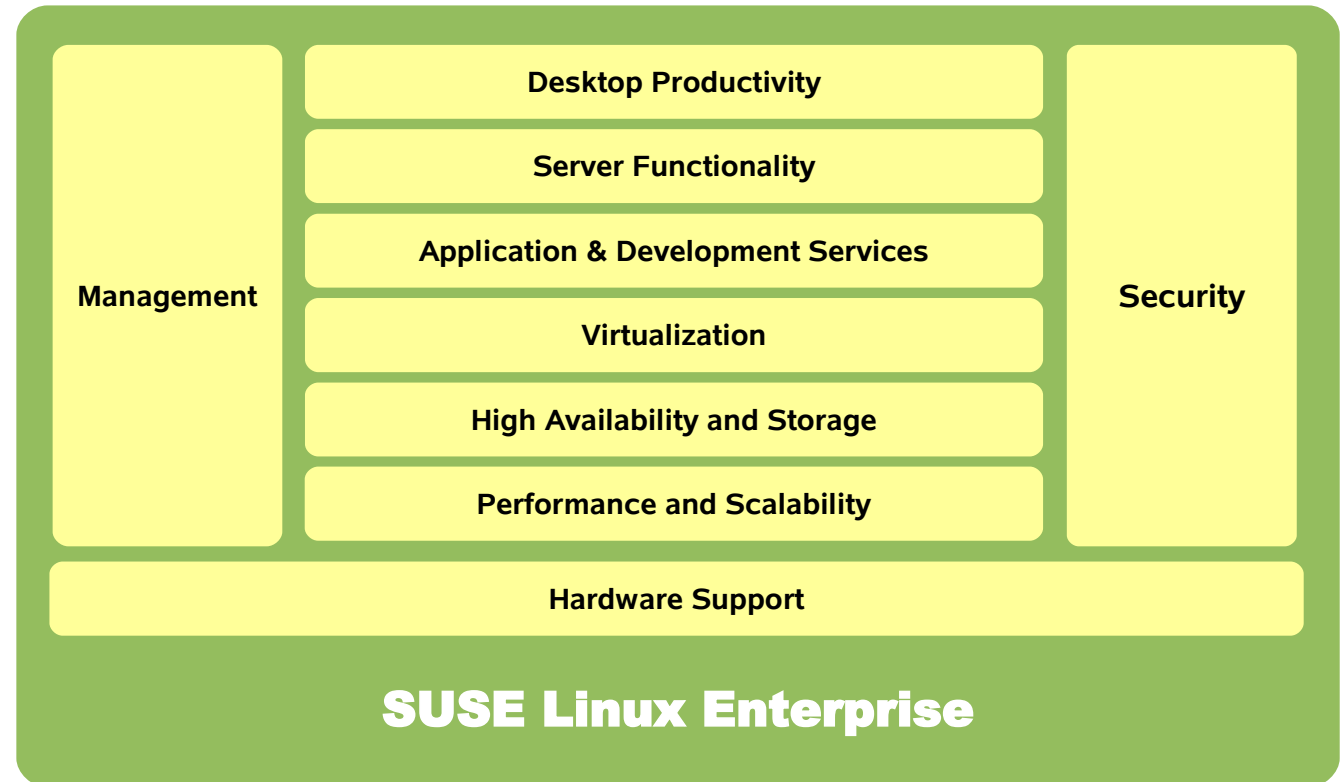
## SUSE Linux Enterprise 10 First Class

- provides an overview of both SUSE Linux Enterprise Server and SUSE Linux Enterprise Desktop.
- Available as Instructor-led , self study or on-line training.
- The training is developed on a privileged Beta version of the products and is available as of March 20<sup>th</sup> in the BrainShare bookstore (self-study)
- The training ships on a USB2 external hard drive and provides access to a live server and desktop in a virtual environment for hands-on labs as well as lecture materials, labs, and tests in a Learning Management System. It can be accessed from Microsoft Windows or Novell Linux PCs.

# Questions & Answers

The platform for the open enterprise

- State of the Art Linux
- Virtualization Energized
- Application Security
- Systems Management
- System Integration
- Broad Hardware Support



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