

SUSE[®] LINUX Enterprise Server 9

for Enterprises Considering Linux^{*} Systems

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TECHNICAL FEATURES LIST



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Enterprises Considering Linux Systems

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Secure, Reliable Platform



Backed by the extensive Novell® support infrastructure and partner network, SUSE LINUX Enterprise Server 9 is a secure, reliable platform for open source computing in the enterprise. SUSE LINUX Enterprise Server 9 offers unmatched performance and scalability, comprehensive open source functionality and support for a broad range of hardware platforms and software packages. SUSE LINUX Enterprise Server 9 also provides open application programming interfaces (APIs) and other development tools that simplify Linux* integration and customization.

INDUSTRY-LEADING PERFORMANCE AND SCALABILITY

SUSE LINUX Enterprise Server 9 is the first enterprise-class Linux server built on the new Linux 2.6 kernel, offering unmatched performance and scalability for large-scale Linux deployments. With advanced memory management and processor support, Native Posix Thread Library (NPTL), advanced I/O capabilities and the unique class-based kernel resource management (CKRM) feature, SUSE LINUX Enterprise Server 9 offers the industry's best performance and linear scalability.

HIGH AVAILABILITY AND RELIABILITY

SUSE LINUX Enterprise Server 9 is architected for mission-critical use and minimal downtime. With its high-availability features, IT administrators can rely on Hotplug services; change hard disks, processors and other periphery at runtime; cluster IP aliases for non-cluster-aware applications; and use the administration console to configure clustered-server deployments.

UNMATCHED SECURITY

SUSE LINUX Enterprise Server 9 (SP1) has been certified to be compliant with Common Criteria Evaluation Assurance Level (EAL) 4+. This is the highest security certification ever awarded to a Linux operating system. SUSE LINUX Enterprise Server 9 merits this strong rating for numerous reasons: it was developed in a secure environment and also provides essential security capabilities such as encryption, security certificate creation and management, user authentication and access control, and firewall and proxy management.

UNIQUE DEPLOYMENT AND SYSTEMS-MANAGEMENT CAPABILITIES

SUSE LINUX Enterprise Server 9 simplifies management with YaST, a comprehensive installation, configuration and administration suite unique to SUSE LINUX. YaST gives IT administrators a common foundation for managing not just operating system components but also accompanying services such

as a DNS server, an Apache* Web server or even third-party applications.

Novell ZENworks. Linux Management complements YaST by enabling IT administrators to centrally control how they deploy and update systems inside the firewall. By using YaST and integrating ZENworks for Linux Management, administrators can easily install, configure, update, secure and manage SUSE LINUX Enterprise Server 9.

COMPREHENSIVE OPEN SOURCE FUNCTIONALITY

SUSE LINUX Enterprise Server 9 offers a wealth of built-in functionality, including a relational database and numerous file, print, Web-application and networking services. YaST makes it easy to configure these services via its graphical interface or through scripted automation.

FLEXIBLE ENTERPRISE STORAGE AND VIRTUALIZATION CAPABILITIES

SUSE LINUX Enterprise Server 9 supports numerous file systems, network-based storage and a new Enterprise Volume Manager that enables administrators to deploy SUSE LINUX Enterprise Server 9 in any IT setting. SUSE LINUX Enterprise Server 9 also supports User-Mode Linux; now administrators can easily test disparate Linux configurations and use virtualization to distribute different deployments on the same hardware.

BROAD PLATFORM SUPPORT, BUILT FROM A COMMON CODE BASE

SUSE LINUX Enterprise Server 9 supports a broad range of hardware architectures, including x86,

AMD64* and Intel* EM64T, as well as the Intel Itanium* Processor Family, IBM POWER*, IBM zSeries* and IBM S/390. For IT managers, this provides flexibility and cost savings, delivering a common operating system, consistent management tools, uniform standards support and software updates across all Linux deployments.

DEVELOPER PRODUCTIVITY

SUSE LINUX Enterprise Server 9 supports a variety of open development tools and runtime environments. Developers, customers and independent software vendors (ISVs) can use these tools to quickly customize and develop Linux-compatible applications.

NOVELL BACKING

Novell brings a complete enterprise software ecosystem to Linux, providing technical support, training, consulting, indemnification and the extended partner network that IT buyers demand when deploying a strategic platform. SUSE LINUX products are built for performance and reliability and are backed by hundreds of software engineers, support staff and consultants who are dedicated to Linux, open source and customer success.

SERVICE PACK INFORMATION

The feature-rich SUSE LINUX Enterprise Server 9 ships with thousands of software packages. Novell keeps these packages up to date—and ensures their security and high quality—by releasing Service Packs. In addition to security and maintenance patches and bug fixes, these Service Packs often include enhancements requested by Novell customers. All fixes, patches and updates have been rigorously

tested for compatibility before they are integrated into the SUSE LINUX Enterprise Server environment.

For the most current Service Pack information—including detailed information on new features, updated version numbers, revised package specifications and the latest modifications—visit:

www.novell.com/products/linuxenterpriseserver/

Download the latest Service Packs by following the instructions below:

- Registered customers with Novell Upgrade Protection should use the SUSE LINUX maintenance portal to download the latest Service Packs.

- New customers who purchased the electronic version of SUSE LINUX Enterprise Server 9 (including the downloadable e-Software Media Kit) received the ISO images of the latest Service Packs in their electronic download.
- New customers who purchased a physical copy of SUSE LINUX Enterprise Server 9 must first register the product online before downloading Service Packs from the SUSE LINUX maintenance portal at: <http://portal.suse.com>

Service Pack Download

<http://portal.suse.com>

TECHNICAL FEATURE LIST

Items marked "Exclusive" are features unique to SUSE LINUX as of June 2004.

1. Open Source Solutions

1.1 FILE AND PRINT SERVICES	
FEATURE	DESCRIPTION
Common UNIX Printing System (CUPS)	CUPS centralizes configuration and print-job interpretation and uses a standardized, open protocol for accessibility from a variety of software tools, including YaST and even Web browsers. Compared to other Linux distributions, SUSE LINUX Enterprise Server ships a more secure CUPS implementation, supports more printers, and offers more tests and configuration options.
Samba3 (SMB and NMB)	Samba implements the Server Message Block (SMB), or Common Internet File System (CIFS), and NetBIOS name-resolving protocols for compatibility with Windows* networking systems. It provides file, print, authentication and Windows Internet Name Service (WINS) services for Microsoft* Windows Client systems. In addition to functioning as a server for Windows clients, Samba allows a Linux client to integrate into an existing Microsoft domain.
Netatalk	SUSE LINUX Enterprise Server also supports file and print services via Appletalk* to Macintosh* OS X and OS 9 users.
Network File System (NFS)	NFS* is the standard network file-sharing protocol for UNIX* and Linux installations. SUSE LINUX Enterprise Server 9 supports NFS versions 2 and 3 over both UDP and TCP.
SMBFS and CIFS	These virtual file system (VFS) modules for Linux allow access to SMB and CIFS servers. The CIFS VFS is designed to take advantage of advanced network file-system features such as locking, Unicode character encoding, hard links, dfs name spaces, distributed caching and native TCP names (rather than NetBIOS names).

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1.1 FILE AND PRINT SERVICES CONTINUED

FEATURE	DESCRIPTION
File system support	<p>For maximum media compatibility, SUSE LINUX Enterprise Server supports the following file systems:</p> <ul style="list-style-type: none">• ext2 and ext3• JFS• Reiser• xfs• Lustre• ISO9660 (CD-ROM)• UDF (DVD/packet mode CDRW)• EFS (non-ISO9660 CD-ROM, IRIX < 5.3 XFS)• CRAMFS (compressed RAM file system)• ROMFS (small ROM file system)• TMPFS (RAM disk file system)• NTFS (Microsoft Windows NT)• BFS (UnixWare boot file system)• SYSV (SCO/Xenix/Coherent)• UFS (BSD and derivatives)• FAT/VFAT (Microsoft DOS and Windows 9x)• HFS (Macintosh)• HPFS (OS/2)• QNX4• Minix <p>For more information about file systems, see section 3.5.</p>

1.2 WEB SERVICES

FEATURE	DESCRIPTION
Web server: Apache and extension modules	<p>SUSE LINUX Enterprise Server 9 includes Apache 2.0, which supports IPv6, hybrid multi-process/multi-threaded implementation, filtering, multi-language error responses, simplified configuration and a new API. New modules include mod_ssl, mod_dav, mod_deflate, mod_auth_ldap and mod_charset_lite.</p> <p>For compatibility with earlier installations and modules, Apache 1.3 is also available.</p>
PHP and extensions	<p>SUSE LINUX Enterprise Server 9 contains version 4.3.4 of the popular PHP Web development framework. Each module ships as a separate package, providing administrators a greater degree of control over server functions.</p>
Tomcat	<p>Tomcat is a commercial-quality Java server solution that supports the Java[®] Servlet and Java Server Pages specifications of the Java 2 Enterprise Edition (J2EE[®]).</p>
JBoss	<p>JBoss[®] is an application server that implements the complete Java 2 Enterprise Edition (J2EE) stack, including Java Server Pages (JSP), servlets and Enterprise JavaBeans[®] (EJB). It provides enterprise-class security, transaction support, resource management, load balancing and clustering.</p>
Java, JVM	<p>The Java 2 Platform provides a complete environment for application development on desktops and servers. It also serves as the foundation for J2EE and Java Web Services.</p>

1.3 DATABASES	
FEATURE	DESCRIPTION
MySQL	MySQL* 4.0.18 is a very popular open source database and one of the fastest growing databases in the industry. This version includes rollback, crash recovery, low-level locking, database replication, clustering, and full-text indexing and searching.
PostgreSQL	PostgreSQL 7.4.2 is another flexible and extensible open source database with many features similar to MySQL.
ODBC support	ODBC is an open standard for portable database access, which allows the user, the system administrator or the database developer to easily configure an application to use any ODBC-compliant data source.

1.4 NETWORK SERVICES	
FEATURE	DESCRIPTION
Domain Name System (DNS)	SUSE LINUX Enterprise Server ships version 9 of the BIND name server, which includes support for DNS security, IPv6, limited views, multi-processor support and several DNS protocol enhancements.
DHCP	Dynamic Host Configuration Protocol (DHCP) automatically assigns static or dynamic IP addresses to computers that use TCP/IP.
Samba3	Samba3 provides SMB and CIFS support. See section 1.1 for details.
OpenLDAP directory service	The OpenLDAP directory service allows administrators to manage large user bases and control access to networks and applications using the LDAP standard.
NTP	NTP helps synchronize the system time of networked computers and is required for many network file systems.
FTP	Allows users to upload and download files from a network.
TFTP	The Tiny FTP service, in addition to providing basic FTP functions, can be used as part of a network boot configuration. Due to its size, it works in many places a larger or more complex service would not.
SLP (Exclusive)	<p>Service Location Protocol (SLP) is used by servers to announce the services they offer. Implementing the ZeroConf SLP system means that clients can find services and servers automatically. SLP is compatible with the Macintosh OS X Rendezvous protocol. The following services are SLP enabled:</p> <ul style="list-style-type: none"> • rsync (remote file synchronization) • distcc (distributed compiler gcc) • ksysguard (load and resource monitoring) • NTP (time server) • ssh (secure shell login / secure file browsing) • VNC (KDE only, remote X desktop access) • samba (file & print server) • CUPS (print server) • SUSE LINUX install server • Software update (ZENworks Linux Management) • SMPPPD / kinternet (PPP Internet access) • LDAP (directory server) • rpasswd (change user password on remote server) • ypserv (NIS server) • postfix (mail server) • openwbem (CIM) • pwduils (remote password management) • cyrus-impad (mail server) • ypserv/ypbind (NIS) • YaST (per-module, e.g. AutoYaST.) • inn (news server) • saned (scanner daemon) <p>Additional services can easily be integrated into both server and client.</p>

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1.4 NETWORK SERVICES CONTINUED

FEATURE	DESCRIPTION
IP: versions 4, 6 and 6-mobile	IPv4 is the standard protocol used to connect any two computers over a network and is the basis for most other protocols and services. IPv6, the next generation of the protocol, offers many advantages, such as quality-of-service control and a much larger address space, while mobile IPv6 adds roaming capabilities. For information about the IPsec security extension and Virtual Private Networks (VPNs), see section 2.6.
Squid	The Squid proxy caches HTTP requests and answers; and can enhance performance and reduce network traffic, especially for static Web pages.
SNMP	The Simple Network Management Protocol (SNMP) is a network-management standard that provides a method of managing network hosts such as workstation or server computers, routers, bridges and hubs from a central location.

1.5 MAIL SERVICES

FEATURE	DESCRIPTION
SMTP (Postfix, Sendmail)	Postfix 2.1.1, the default mail server for SUSE LINUX products, is known for speed and security. Sendmail* 8.12.10 is available as an alternative and for backward compatibility.
IMAP	SUSE LINUX Enterprise Server 9 ships the Cyrus IMAP daemon.
SASL	The Simple Authentication and Security Layer (SASL) is used by many mail servers, particularly for relay authentication.

1.6 GRAPHICAL APPLICATIONS

FEATURE	DESCRIPTION
KDE 3.2	The K Desktop Environment version 3.2.1 includes a complete set of desktop tools and applications.
Gnome 2.4	The Gnome desktop environment version 2.4.2 includes a complete set of desktop tools and applications.
Acrobat Reader (x86 only)	The official Adobe Acrobat* Reader 5.08 displays and prints PDF files. An alternate PDF reader is available for non-x86 platforms.

2. Security**2.1 SECURITY CERTIFICATION**

FEATURE	DESCRIPTION
EAL 4+	SUSE LINUX Enterprise Server 9 has been certified to be compliant with the Common Criteria Controlled Access Protection Profile, Evaluation Assurance Level 4+ (CC-CAPP/EAL 4+).

2.2 SECURITY PROTOCOLS

FEATURE	DESCRIPTION
OpenSSL	OpenSSL is a commercial-grade, full-featured open source strong-cryptography toolkit and an implementation of the Secure Sockets Layer (SSLv2/v3) and Transport Layer Security (TLS) protocols. The OpenSSL libraries are integrated in numerous SUSE LINUX products and are among the core components of the operating system.
SASL	See section 1.5.
SSH	SUSE LINUX products make use of the openssh implementation of the secure shell protocol (ssh). With strong key-based encryption, several authentication mechanisms, and TCP forwarding and tunneling capabilities, SSH-based applications provide secure replacements for other networking commands like rsh, rlogin and rexec.

2.3 SECURITY AUTHORITY AND CERTIFICATE HANDLING

FEATURE	DESCRIPTION
YaST Certificate Authority	The YaST Certificate Authority module allows the creation and management of a public key infrastructure (PKI) using X.509 certificates and CRLs. Certificates may be stored on disk or in an LDAP server.
Server certificate import tool	The YaST certificate import tool allows administrators to import a PKCS12 format certificate.

2.4 AUTHENTICATION AND IDENTITY MANAGEMENT

FEATURE	DESCRIPTION
Kerberos	SUSE LINUX Enterprise Server ships with the Heimdal implementation of the Kerberos 5 authentication protocols.
LDAP	Lightweight Directory Access Protocol is a network directory service that is often used with SSL encryption for secure authentication. SUSE LINUX Enterprise Server ships with OpenLDAP.
PAM	Pluggable Authentication Modules (PAM) allow authentication for services that do not implement their own authentication mechanisms. Many authentication mechanisms are available through PAM, including password, Kerberos, LDAP and NIS.
NIS	Now deprecated in favor of the more secure LDAP protocol, the NIS directory service is provided for compatibility reasons.

2.5 SUSE LINUX FIREWALL

FEATURE	DESCRIPTION
SUSE LINUX Firewall	The SUSE LINUX firewall tool is a simple configuration tool for the Linux kernel packet-filtering system provided by ipchains and iptables.

2.6 VIRTUAL PRIVATE NETWORKS (VPN) AND IPSEC

A virtual private network (VPN) is the extension of a private network that links across shared or public networks. Particularly useful for large corporations with remote offices, telecommuters or traveling employees, a VPN allows users at remote locations or on untrusted networks to connect to another network securely.

FEATURE	DESCRIPTION
IPsec: FreeS/WAN	FreeS/WAN is a robust implementation of IPsec ideally suited to VPN deployments. FreeS/WAN also supports mobile configurations for users who need to access their office systems and servers from remote locations in untrusted network environments.
Racoon	Racoon is an alternate implementation of IPsec key management. It also supports X.509 certificates.

3. Scalability, Performance and Availability

3.1 KERNEL 2.6 AND IMPROVED SCALABILITY PERFORMANCE

SUSE LINUX Enterprise Server 9 is the first commercially available server to ship with Linux kernel version 2.6. In large part because of the kernel upgrade, SUSE LINUX Enterprise Server 9 outperforms other enterprise Linux servers in scalability and processing speed.

FEATURE	DESCRIPTION
Kernel 2.6.x general enhancements (Exclusive)	<ul style="list-style-type: none"> • More processors: 512 CPUs have been tested on available hardware, but theoretically there is no limit to the number that will work. • More users: now supports over 4 billion unique users. • More processes: 65,535 user-level processes, plus additional kernel-level processes that represent threads. • More open files: SUSE LINUX Enterprise Server 9 automatically and dynamically tunes its resources usage to support the maximum number of simultaneous open files.

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3.1 KERNEL 2.6 AND IMPROVED SCALABILITY PERFORMANCE CONTINUED	
FEATURE	DESCRIPTION
Kernel 2.6 device enhancements (Exclusive)	<ul style="list-style-type: none"> • More device types: 4,095 major device types and more than a million subdevices per type make larger storage arrays, print farms and tape units more feasible. • More devices: The server can now manage more devices. For example, it can control up to 32,000 SCSI disks. • Faster devices: Support for high-speed USB 2.0 and Firewire (IEEE 1394 and 1394b). • Higher throughput: High-speed Serial ATA (S-ATA) device support enables transfer rates up to 50 MB/sec.
Non-Uniform Memory Access (NUMA)	NUMA allows SUSE LINUX Enterprise Server to scale more efficiently for systems with dozens or hundreds of CPUs because CPUs can access a dedicated memory bus for local memory. It also supports multiple interconnected memory nodes, each supporting a smaller number of CPUs. The result is greater scalability for applications that use local memory.
NUMA development tools	For x86-64 (Opteron) and IA-64 (Itanium), the NUMA tools allow developers to fine-tune applications for NUMA usage. Both Oracle and DB2 are developing NUMA API support, and Oracle already uses it in testing—one reason that SUSE LINUX Enterprise Server has surpassed other distributions in database benchmarks.
Hyperthreading	Hyperthreading enables multi-threaded server software applications to execute threads in parallel within each individual server processor, thereby dramatically improving transaction rates and response times.
Flexible I/O scheduler (Exclusive)	<p>The new I/O scheduler allows administrators to tune the server to match its usage with four I/O behavior policies:</p> <ol style="list-style-type: none"> 1. CFQ: Complete Fair Queuing, is suitable for a wide variety of applications, especially desktop and multimedia workloads. It is the default I/O scheduler. CFQ treats all competing processes equally by assigning each process a unique request queue and giving each queue equal bandwidth. 2. Deadline: The deadline I/O scheduler implements a per-request service deadline to ensure that no requests are neglected, thus providing excellent request latency while maintaining good disk throughput. Deadline policy is best for disk-intensive database applications. 3. Anticipatory: The anticipatory I/O scheduler uses the deadline mechanism plus an anticipation heuristic to predict the actions of applications. This provides greater disk throughput but slightly increases latency. The anticipation heuristic is suitable for file servers but does not work as well for database workloads. 4. No-Op: This no-operation mode does no sorting at all and is used only for disks that perform their own scheduling or that are randomly accessible. <p>The first three behaviors group and merge requests to maximize request sizes, cutting down on the number of searches performed.</p>
Class-based Kernel Resource Management (CKRM) (Exclusive)	With CKRM, system administrators can provide differentiated service at the user or job level, prevent denial-of-service attacks and increase the accuracy of resource consumption metering.
Asynchronous I/O	The kernel initiates data transfer before processing is complete and continues processing in parallel, which reduces overall read/write time in many cases.
Multipath I/O	The kernel can access a storage device through multiple channels at once. This allows greater load balancing and fault tolerance.
Raw I/O	Transferring data directly to a buffer in the application address space provides high-bandwidth, low-overhead SCSI disk I/O by skipping kernel buffers and I/O queuing for SCSI and fiber channel devices. Particularly in databases, this can improve read/write time.

3.2 COMPILER: GCC

GCC is the GNU Compiler Collection (GCC), including tools for C, C++, Fortran77, Java, Ada, and Objective-C. GCC version 3.3.3, enhanced by the SUSE Labs team, is the system compiler for SUSE LINUX Enterprise Server 9.

FEATURE	DESCRIPTION
Support for AltiVEC (Exclusive)	Support for AltiVEC instruction set on IBM POWER architecture.
Optimized code scheduling for IBM POWER and AMD Opteron (Exclusive)	The compiler contains enhancements to generate better code on IBM POWER and AMD Opteron platforms.
Libstdc++ Performance Enhancements	Speed improvements for string and locale functions.
Better inlining algorithm (Exclusive)	The SUSE GCC contains a unit-at-a-time inlining algorithm that improves the performance of compiled applications, including SUSE LINUX Enterprise Server 9 itself.
Debugging improvements	Improvements in variable tracking make it easier to find bugs. Debugging information is now in a more compact format, which reduces memory and disk requirements.
Improved FDO	Feedback-directed optimizations (FDO), including value-based transformation, allow developers to optimize programs based on test-run executions.
Software trace cache	Basic blocks of code are arranged for better cache usage and enhanced performance.
Dual-architecture compilation	Compiler can produce both 32-bit and 64-bit code on AMD64, IBM POWER and IBM zSeries, without using both types of hardware.
New loop optimizer	Improved loop optimizer for both regular and irregular loops.
GNU Glibc Native POSIX Thread Library	The GNU C Library version 2.3.3 is the system C library used by all programs. It ensures conformance with the POSIX standard and significantly boosts performance in heavily threaded applications.

3.3 FAILOVER AND HIGH AVAILABILITY

SUSE LINUX Enterprise Server 9 includes features to increase the availability of IT services and provide resiliency against certain failures automatically. This reduces service downtime and operational cost.

FEATURE	DESCRIPTION
Heartbeat high-availability system	The Heartbeat system provides core cluster membership and messaging infrastructure. It implements the Open Clustering Framework APIs (a subset of the Service-Availability Forum APIs) to provide low-level services for node fencing, fault isolation and basic two-node failover. The node failure detection time can be tuned to below one second, allowing for sub-second failovers in some environments. In the case of a node failure, the Heartbeat system checks I/O to ensure data integrity and then moves resources to the alternate node. Return to action of failed nodes may be set to "automatic" or "manual," depending on administrator preference.
Cluster alias	A cluster alias IP provides IPv4 load balancing at layer 3 without the need for a dedicated load-balancer node. Scheduling decisions can be based on the IPv4 source port/address and destination port/address.
Linux Virtual Server (LVS)	The Linux Virtual Server (LVS) provides high-performance load balancing with a variety of scheduling algorithms. It integrates with the ldirectord resource agent via the Heartbeat failover system to provide load balancing and availability monitoring. For more information about virtualization, see User-Mode Linux in section 3.6.
Multipath I/O, Raw I/O	See section 3.1 for I/O information.

3.4 VOLUME MANAGEMENT AND STORAGE SYSTEMS

FEATURE	DESCRIPTION
Enterprise Volume Manager (EVMS) (Exclusive)	EVMS allows administrators to handle storage through a single mechanism. Specifically, administrators can use EVMS to manage RAID*, LVM, various file-system formats, disk checking and maintenance, bad block relocation and more.
Distributed Replicated Block Device (DRBD)	This networked disk-management tool builds single partitions from multiple disks that mirror each other. (Performance is similar to a RAID1 system, but it runs over a network). The partition size can be changed at runtime.

3.5 FILE SYSTEM FORMATS

FEATURE	DESCRIPTION
Reiser	<p>ReiserFS is a journaling file system with optimized disk-space utilization, fast disk access and quick crash recovery. It is the default file system for SUSE LINUX products.</p> <ul style="list-style-type: none">• Maximum file size: 16 TB• Maximum file limit: 32k directories, 4.2 billion files• Maximum partition/file system size: 1 EB• Maximum file name length: 255 characters
ext 2/3	<p>The ext3 file system is a journaling extension to the standard ext2 file system on Linux. Journaling dramatically reduces file-system crash-recover time and is widely used in HA sites with shared disks. It is the most common alternative to the Reiser file system.</p> <ul style="list-style-type: none">• Maximum file size: 2 TB• Maximum file limit: limited only by file-system size• Maximum partition/file system size: 16 TB• Maximum file name length: 255 characters• Default minimum/maximum block size: 1024/4096 bytes• Default inode allocation: 1 for every 4096 bytes• Maximum mounts before a forced FS check: 20 (configurable)
xfs	<p>XFS is a high-performance journaling file system originally developed by SGI for use in its IRIX systems.</p> <ul style="list-style-type: none">• Maximum file size: 8 EB• Maximum file system size: 8 EB
JFS	<p>JFS is a full 64-bit file system that can support very large files and partitions. JFS was developed by IBM under the GPL license and is ported from its AIX systems. JFS provides a log-based, byte-level file system that is ideal for high-performance systems but is applicable to many other systems as well.</p> <ul style="list-style-type: none">• Minimum file system size: 16 MB• Maximum file size: 8 EB• Maximum partition/file system size: 4 PB• Default minimum/maximum block size: 512/4096 bytes• Default inode allocation: Dynamic
Support for non-native file systems	See section 1.1 for a list of non-native file systems supported by SUSE LINUX Enterprise Server.
NFS	See section 1.1

3.6 VIRTUALIZATION

FEATURE	DESCRIPTION
User-Mode Linux (Exclusive)	<p>User-Mode Linux (UML), originally developed as a kernel-debugging tool, allows a Linux instance to run as a regular process under Linux. In other words, UML makes it possible to run several instances of Linux at once.</p> <p>UML is the virtualization tool of choice for Linux kernel and VPN development, and can be used to provide extra systems for labs, testing environments or hosting providers. It also makes an excellent secondary firewall.</p> <p>After installing the UML package like any other application binary, administrators can create additional Linux instances (installed into directories and managed using the same tools and applications as the non-virtual instance of Linux). Virtual performance is not quite as good as non-virtual, and UML systems require significant amounts of memory, but UML instances can generally be used for the same tasks as non-virtual Linux instances.</p>

4. Installation and Administration Process

4.1 YAST FAMILY OF MANAGEMENT TOOLS (EXCLUSIVE)

YaST gives administrators an integrated solution for installation, configuration and administration of SUSE LINUX systems. Now licensed under the GPL, YaST covers a wide range of management tasks and delivers a consistent management experience across all supported SUSE LINUX platforms. It also offers convenient APIs so that it can be extended by developers and third-party vendors. Because YaST is released under GPL, anyone in the industry can fully embrace it without any concerns about competing with Novell. The Novell decision to open source YaST delivers on our promise to provide vendors and customers with open standards—in this case for systems management—to make it far easier to manage systems and applications. Server administration with SUSE YaST has been enhanced to support a variety of modes. You can boot from CD-ROM, floppy, local hard disk or via PXE from the network.

FEATURE	DESCRIPTION
Multiple access methods	YaST provides a friendly GUI for everyday use, a text mode for changes at the console and well-documented APIs for scripting and extension.
GPL License	YaST is licensed under the GPL, so it can be extended without licensing fees.
New Modules	YaST has several new modules in SUSE LINUX Enterprise Server 9, including: <ul style="list-style-type: none"> The new YaST mail server configuration tool allows administrators to create secure servers with IMAP and POP service, quotas, access control lists, name spaces, routing, local mail delivery, server-side filtering of viruses and spam, and other enterprise-level mail system features. A VPN configuration assistant for both client and server configuration. The VPN is compatible with Linux and Windows clients and can be configured without additional software. The Samba 3 tool allows administrators to create PDC and BDC systems to share files over a Windows (CIFS or SMB) network. It supports LDAP or smbpasswd authentication, graphical share selection and management, access control lists and extended attribute support for non-native file systems.
Enhancements for SUSE LINUX Enterprise Server 9	The following YaST configuration tools have been enhanced and updated in this release. Changes range from user-interface improvements to new features and capabilities: <ul style="list-style-type: none"> Improved network configuration tools, including DNS, DHCP, LDAP, NIS, postfix and TFTP NFS and Samba network file-system settings Certification Authority now automatically generates default CA for servers including LDAP, Apache and postfix. Virtual Private Network (VPN) Installation server Boot server CD creation User-Mode Linux installation and virtualization setup Apache Wake-on LAN High-availability tools expanded to work with Heartbeat Update server User management tools now support plugins for external back-ends, including IMAP and Samba
AutoYaST (Exclusive)	AutoYaST allows unattended and automated installation. See section 4.4 for additional installation sources.
Software Update (Exclusive)	The online update system, based on YaST and Red Carpet™, allows administrators to install security updates and bug fixes automatically or on command.
Novell ZENworks Linux Management Server support	The ZENworks Linux Management server allows administrators to set up an in-house update server for installation of updates and new software from Novell, third parties or internal development teams. Administrators using ZENworks Linux Management have fine-grained policy control of software installation and update timing and can run the entire system from any location with both graphical and script-accessible interfaces.

4.2 CENTRALIZED MANAGEMENT SUPPORT

FEATURE	DESCRIPTION
Common Information Model support	The Common Information Model (CIM) standardizes the exchange of management information in a platform-independent and technology-neutral way. CIM-enabled software reduces the cost of management by providing a single API for heterogeneous technology environments. Where other CIM approaches require a new application module for each task, SUSE LINUX Enterprise Server 9 makes it possible to use a single CIM module to access YaST, which then provides a single interface to all configuration tasks in the operating system.
Novell ZENworks Linux Management integration (Exclusive)	Red Carpet Daemon (rcd) is included in SUSE LINUX Enterprise Server. This service, coupled with ZENworks Linux Management, allows administrators to control updates and system behavior from a centralized location. The daemon determines the configuration of a system and compares it to a list of upgrades and patches provided by the administrator. It can then download and install the new software, automatically taking dependencies and incompatibilities into account.
Basic update service support (Red Carpet, YOU)	The Red Carpet Daemon (rcd) and YaST Online Update (YOU) clients can also be used with free servers provided by Novell for simple updates.

4.3 DYNAMIC RESOURCE ALLOCATION

FEATURE	DESCRIPTION
CKRM (Exclusive)	Class-based Kernel Resource Management: see section 3.1.
Persistent device naming	Particularly useful in data centers, where administrators need to keep track of numerous devices, persistent device naming ensures that I/O and Hotplug devices are assigned unique IDs that do not change even when devices are moved. This way administrators can find specific hardware when necessary.

4.4 INSTALLATION SOURCES

Single-system installations via CD-ROM are easy to perform and still allow users to customize their systems. For administrators, AutoYaST provides ample power to customize and automate network installs for clusters and other large deployments.

FEATURE	DESCRIPTION
Local CD-ROM	Installation data is read from a locally attached CD-ROM drive.
PXE Boot	Network installation is automated upon boot.
FTP	Installation occurs from an FTP server.
HTTP	Installation occurs from an HTTP server.
CIFS and SMB	Installation occurs from a file server sharing files via CIFS or SMB.
NFS	Installation occurs from a server over the network via NFS.
Local hard disk	Installation occurs from a local hard-disk directory or partition.
Install server	The installation server is an imaging solution for cluster installation.
Autodetection of install and update servers (Exclusive)	Systems can automatically detect installation or update servers using the Service Location Protocol (SLP).
AutoYaST	AutoYaST allows unattended and automated installation over a network. See section 4.1 for additional YaST information.

4.5 SERVICE PACK UPDATES

FEATURE	DESCRIPTION
Binary compatibility	Service pack updates will not break binary compatibility for glibc or other core libraries, although the X windowing system and direct low-level kernel interfaces are subject to change in some circumstances. Applications that conform to LSB 1.1 will work throughout the operating system lifespan.

5. Development Tools

5.1 SUPPORTED LANGUAGES AND RUNTIME ENVIRONMENTS

FEATURE	DESCRIPTION
Java	Most often used for cross-platform and application server development, Java is a strongly object-oriented development language. SUSE LINUX Enterprise Server 9 ships with the Java2 platform version 1.4.2. Depending on the hardware platform, IBM, Sun*, or BEA* versions are included.
C# (Exclusive)	The Mono™ project provides tools to build and run .NET applications on Linux and other operating systems. It provides support for numerous application frameworks, including ASP.NET, ADO.NET, and gtk#. Mono is shipped separately with the SUSE LINUX SDK, for x86 hardware only. Ports to 64-bit hardware are underway.
Python	Python is an object-oriented interpreted language that is often used for rapid development of cross-platform applications. SUSE LINUX Enterprise Server includes Python version 2.3.3 along with bindings for QT, Gtk, LDAP, XML, MySQL, Tk and curses.
Perl	Perl is often described as “the glue of the Internet.” A cross-platform scripting language used for almost any task, it is best suited to small applications, text processing, and Web forms. SUSE LINUX Enterprise Server 9 ships with version 5.8.3.
Shell scripting	SUSE LINUX Enterprise Server includes bash, ksh, tcsh, and zsh. The default is bash.
Tcl/Tk	Tcl/Tk 8.4.6 is the latest version of the popular Tcl/Tk scripting tools, which are often used for rapid development of cross-platform GUI applications.
Ruby	Ruby is an interpreted scripting language designed for quick and easy object-oriented programming. Version 1.8.1 is suitable for many of the same processing tasks performed by Python or Perl.

6. Hardware Support and System Requirements

6.1 SUPPORTED PROCESSOR PLATFORMS

FEATURE	DESCRIPTION
x86	The x86 platform, the most common personal computer hardware platform, is the basis for chips from Intel, AMD, VIA and Transmeta. Supported processors include Intel Pentium and Xeon processors, AMD Athlon and K7 series, and the AMD Opteron and Athlon64 chips in 32-bit mode.
AMD64 & Intel EM64T	The x86-64 architecture was created by AMD and is a 64-bit extension of the x86 platform that also runs 32-bit legacy code. Supported processors include the AMD Athlon64 and Opteron, and the Intel Xeon EM64T. Note that not all 32-bit applications are certified to run perfectly in this environment; check with your ISV or perform extensive testing before deployment.
Intel Itanium Processor Family	SUSE LINUX Enterprise Server supports the Itanium Processor Family, a 64-bit platform from Intel that includes an emulator for x86 32-bit hardware. Because 32-bit support relies on an emulator, 32-bit performance can suffer. However, 64-bit performance benefits from a clean break with the x86 platform.

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6.1 SUPPORTED PROCESSOR PLATFORMS CONTINUED

FEATURE	DESCRIPTION
IBM POWER (IBM iSeries and IBM pSeries systems)	SUSE LINUX Enterprise Server 9 is available for 64-bit IBM POWER series hardware. The IBM POWER 64-bit architecture is used in systems from Apple and IBM. It supports execution of code built for the 32-bit edition of the POWER platform. POWER systems include IBM iSeries and IBM pSeries servers.
IBM zSeries (S/390x)	The IBM zSeries is a 64-bit platform mostly used in the S/390x mainframe series. zSeries hardware can also run code built for the earlier 31-bit S/390 systems. SUSE LINUX Enterprise Server running on zSeries hardware can be used for zVM and LPAR virtualization of both 31-bit and 64-bit systems.
IBM S/390 (31-bit)	The IBM S/390 architecture is an anomaly in that it uses 31 bits, rather than the more common 32. In these systems, the 30-second processor bit is used by the chip itself instead of being made available to the software. SUSE LINUX Enterprise Server 9 is available in a 31-bit compile for S/390 mainframes. SUSE LINUX Enterprise Server 9 on S/390 hardware can be used for zVM and LPAR virtualization of 31-bit systems only.

6.2 SUPPORTED HARDWARE EXTENSIONS

FEATURE	DESCRIPTION
InfiniBand (Exclusive)	InfiniBand technology is used for inter-system and inter-process communications within a single system. Inter-process communication (IPC) is used in parallel clustering systems, where it provides greater performance, lower latency, faster data sharing, improved usability and built-in security and reliability.
USB 2.0	USB 2.0 is a powered connection with bandwidth of up to 480 megabits per second.
Firewire (IEEE 1394)	Firewire IEEE 1394 powered connection with bandwidth of up to 400 megabits per second.
ACPI	The ACPI system handles low-level hardware control and configuration, including power management, processor speed and temperature management.

6.3 HARDWARE REQUIREMENTS

FEATURE	DESCRIPTION
For Installation	<ul style="list-style-type: none">Local Installation: 256 MB RAMSSH-based network install, graphical: 256 MB RAMVNC-based network install using FTP: 512 MB RAM
For Operation	<ul style="list-style-type: none">256 MB RAM500 MB hard-disk space for software500 MB hard-disk space for software
Recommended	<ul style="list-style-type: none">512 MB to 3 GB RAM, at least 256 MB per CPU4 GB hard-disk spaceNetwork interface (Ethernet, wireless or modem)
Suggestions for specific uses	<ul style="list-style-type: none">Print servers: A faster processor or additional processors will improve server-based printing.Web servers: Additional RAM can improve caching. Additional processors will improve Web application performance.Database server: Additional RAM can improve caching. Using multiple disks permits parallel I/O.File servers: Additional disks or a RAID system can improve I/O throughput.

7. Internationalization and Localization

7.1 TRANSLATION COMPLETED		
LANGUAGE	YAST SUPPORT	MANUALS [†]
English	full	Start-Up Guide, Preparation Guide, Architecture-specific Information, Installation and Administration Guide
German	full	Start-Up Guide, Preparation Guide, Architecture-specific Information, Installation and Administration Guide
Spanish	full	Start-Up Guide
French	full	Start-Up Guide
Italian	full	Start-Up Guide
Japanese	full	Start-Up Guide
Korean	full	Start-Up Guide
Portuguese (Brazil)	full	Start-Up Guide
Simplified Chinese	full	Start-Up Guide
Czech	full	
Hungarian	full	
Polish	full	
Dutch	80-90 percent	
Greek	80-90 percent	
Norwegian	80-90 percent	
Lithuanian	80-90 percent	
Russian	80-90 percent	
Slovak	80-90 percent	
Slovenian	80-90 percent	
Serbian	80-90 percent	
Swedish	80-90 percent	
Turkish	80-90 percent	
Bulgarian	50-60 percent	
Danish	50-60 percent	

[†]Documentation is provided in English unless noted here.

8. Standards Compliance

Novell is committed to compliance with a wide variety of standards, including those governing network protocols, operating system design and accessibility to individuals with visual or mobility impairments. Many Novell employees contribute to standards bodies directly. For example, see freestandards.org for a list of Novell employees who are on the Linux Standards Base board of directors.

8.1 SUPPORTED STANDARDS AND CERTIFICATIONS	
FEATURE	DESCRIPTION
Linux Standard Base (LSB) 1.3	SUSE LINUX Enterprise Server 9 (GA) will comply with the LSB 1.3 specifications. See www.linuxbase.org for details.
Linux Standard Base (LSB) 2.0	SUSE LINUX Enterprise Server 9 with Service Pack 1 has received the certificate for LSB 2.0. See www.linuxbase.org for details.
Filesystem Hierarchy Standard (FHS)	The Filesystem Hierarchy is now part of the LSB specifications.
Carrier Grade Linux (CGL) 2.0	The Carrier Grade Linux standards were developed by OSDL (www.osdl.net/) participants to meet the needs of the telecom industry and other high-demand enterprises. SUSE LINUX Enterprise Server offers all CGL Priority One features except Force Unmount (AVL4.0) and POSIX Message Queues (part of STD.2).
Data Center Linux (DCL)	The Data Center Linux standards are designed by OSDL participants to meet the needs of data center users. SUSE LINUX Enterprise Server contains many, but not all, of the DCL Priority One features.
GB18030	SUSE LINUX Enterprise Server complies with GB18030, a Chinese-language encoding standard required for sales within China.
U.S. Government Section 508	"Section 508" rules require that products sold to the U.S. government meet certain standards for accessibility to people with visual and mobility impairments. SUSE LINUX Enterprise Server 9 complies with these rules. For information about the rules, see www.section508.gov . For information about Novell accessibility efforts, see www.novell.com/accessibility .
EAL 4+	SUSE LINUX Enterprise Server 9 has been certified to be compliant with the Common Criteria Controlled Access Protection Profile, Evaluation Assurance Level 4+ (CC-CAPP/EAL 4+).
Export Classification	The U.S. Department of Commerce's Export Administration Regulations (EAR) control encryption software exports. SUSE LINUX Enterprise Server 9 ratings, and all other Novell product ratings, can be found at www.novell.com/info/exports/matrix.html .

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