

Technical White Paper

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SUSE® Linux Enterprise 10

Systems Management

Novell.

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Taking Full Advantage of Your Operating System

Novell designed SUSE Linux Enterprise to be the best engineered, lowest-cost and most interoperable platform for enterprise computing.

While business depends on reliable information systems, hardware and software platforms are the bedrock on which these systems are based. With an ideal combination of hardware and operating systems, IT managers can concentrate on providing applications and services that meet strategic business requirements.

Unfortunately, such platforms present businesses with numerous challenges. Some leading proprietary platforms include compromising reliability and security flaws that disrupt IT systems. These disruptions force administrators to spend too much effort and money on stabilizing this foundation. At the same time, continually increasing demand for current services coupled with the ongoing need to add new services further taxes the resources of even the largest organizations.

Organizations of all sizes require a cost-effective platform that scales to match workloads, maximizes available hardware resources, defends against both known and unknown security threats, and provides rock-solid reliability with minimum management intervention. They need an enterprise-quality platform backed by a reliable release cycle and top-notch support and services.

SUSE Linux Enterprise 10

SUSE® Linux Enterprise 10 from Novell® is the platform for the open enterprise. Novell designed SUSE Linux Enterprise to be the best engineered, lowest-cost and most inter-

operable platform for enterprise computing. From the desktop to the data center, only SUSE Linux Enterprise offers a complete open source solution for the mission-critical applications that drive your business.

Supported and certified by the world's leading hardware and software vendors, SUSE Linux Enterprise 10 is backed by award-winning Novell technical support and a global ecosystem of partners and services. Built using open standards, SUSE Linux Enterprise 10 enables your organization to easily share information with business partners both within and outside of the enterprise.

Unlike other Linux* offerings today, SUSE Linux Enterprise integrates with your existing IT infrastructure, including UNIX*, Microsoft Windows* and other Linux distributions, to lower the total cost of ownership. And powerful management tools and resources—including YaST, AutoYaST, Novell ZENworks®, Linux Management and Novell Customer Center—further reduce the cost of managing and integrating the network. The adoption of open industry standards such as Web-based Enterprise Management (WBEM) and Common Information Model (CIM) is an important step towards integrated systems management of distributed and heterogeneous computing environments. Furthermore, support for a broad range of hardware architectures, from x86 to IBM eServer zSeries*, allows your organization to leverage its IT management skills across multiple architectures.

The Challenges of Managing a Growing Network

Comprehensive and effective systems management has to cover installation, configuration, update management, monitoring and license management. Figure 1 shows the relevance of each of these tasks depending on the lifecycle phase of the system.

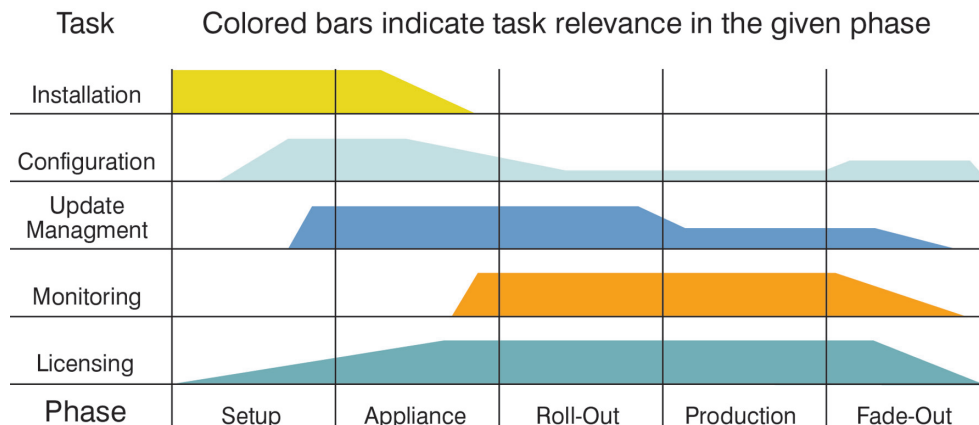


Figure 1. Comprehensive systems management covers many critical tasks.

Many systems administrators agree that installing and configuring a single server is a trivial task that becomes daunting, for a variety of reasons, when scaled across the enterprise. Different types of networks, such as those based on Windows, UNIX and Linux, need to interoperate. Security vulnerabilities need to be continually monitored and patches need to be applied as soon as they are available. Finally, as the business grows and more applications are deployed, the IT group must add, manage and maintain more machines. Unfortunately, the resources used to manage an expanding environment are often not increased proportionately. The result is an overtaxed IT department that struggles to support the organization's needs.

To date, it's widely agreed that Linux operating systems have been accompanied by weak centralized management. Attempts to remedy this weakness have resulted in a diverse range of tools to perform certain tasks. The problem is that too many tools are often required to perform any given task and there is often more than one way to perform any single task.

If you're preparing to implement a Linux network-management solution, you must consider a number of key issues and requirements:

Text-mode vs. high-resolution graphical user interfaces (GUIs). Most administrators do not load GUIs on UNIX or Linux systems because GUIs consume a significant amount of system resources and, in turn, negatively affect application services. Furthermore, while high-resolution GUIs are often preferred in desktop environments, text-mode is often a necessity in server environments.

Command-line vs. interactive GUIs. Experienced systems administrators recognize the efficiency made possible via command-line utilities and rely on these utilities to script interactive commands. Yet automation is critical in a managed environment, and those lacking the necessary experience benefit from an interactive GUI that guides them through complex administrative tasks.

Remote management. More and more organizations are realizing the value of and

Components of the SUSE Linux Enterprise 10 Platform:

- **SUSE Linux Enterprise Server 10**—The best operating system to host mission-critical workloads in your data center.
- **SUSE Linux Enterprise Desktop 10**—A general-purpose business desktop designed for use across your enterprise.
- **Novell Customer Center**—An online interface where you can get technical support, product updates and subscription renewals for all your SUSE Linux Enterprise products.

No other Linux platform is as easy to deploy, configure and maintain as SUSE Linux Enterprise.

AutoYaST is an extension to YaST that automates installation to a large number of machines. Because installations can be performed in parallel without user intervention, AutoYaST saves organizations tremendous amounts of time.

need for remote system management. Ensuring up-to-date and reliable systems across geographically dispersed locations is critical to smooth-running operations and unimpeded productivity. This is especially true as businesses expand to include remote home-based offices, satellite offices and warehouses, to name a few.

Target approach (systems management vs. network management). Systems management tasks for a whole network differ essentially from those required for single devices. This difference has to be addressed by choosing the right systems-management solution for each respective target situation.

Security: authentication, authorization and access control. Regulatory controls in various industries—such as separation of duties mandated by HIPAA—dictate the use of some security measures such as authentication, authorization and access control. Sometimes security policies even dictate direct physical access to the systems rather than access via the network.

Integration with management tools. Ideally, management tools are included with a Linux distribution. However, once your organization is running more than a handful of systems, you need a more powerful way to centrally manage your environment. A robust network is manageable by more than just the vendor's tools.

Comprehensive Systems Management from Novell

SUSE Linux Enterprise 10 ships with a comprehensive set of administration, configuration and deployment tools to ease the burden of systems and subscription

management. No other Linux platform is as easy to deploy, configure and maintain as SUSE Linux Enterprise. The market-leading set of integrated systems management capabilities included with SUSE Linux Enterprise features the following:

- **A unique set of installation, configuration, administration and deployment tools** (called YaST and AutoYaST) eases the burden of systems management. YaST is unique because it is used to configure every aspect of the server and the desktop, so regardless of whether you are adding users or configuring applications—such as DNS, Apache Web servers, Samba file-shares or Xen virtual machines—YaST is there to help. YaST has also been open sourced, so third-party companies can develop—and have already developed—YaST plug-ins that make it easier to administer their own applications. AutoYaST is an extension to YaST that automates installation to a large number of machines. Because installations can be performed in parallel without user intervention, AutoYaST saves organizations tremendous amounts of time.
- **Support for the WBEM/CIM industry standards** simplifies systems management across distributed environments. SUSE Linux Enterprise Server 10 ships with an open Web-based Enterprise Management (WBEM) Common Information Model Object Manager (CIMOM) as well as a variety of CIM providers.
- **Seamless integration with Novell Customer Center** enables customers and partners to easily manage their subscriptions and support entitlements and ensures uninterrupted access to software updates and security patches.
- **Novell ZENworks Linux Management**—which is supported by (but not included in) SUSE Linux Enterprise 10—can be used to augment the YaST tools and provide centralized control of any system in your enterprise as your network grows.

YaST: Installation, Configuration and Administration

The YaST administration tool, integrated in SUSE Linux Enterprise and released under the General Public License (GPL), is the most powerful and extensive Linux tool for installation, configuration and system administration. The term tool is a bit misleading because, in fact, YaST consists of many components and layers. Therefore, it may be more accurate to regard YaST as an installation and administering environment.

YaST covers a wide range of management tasks and features an *intuitive graphical interface*. Developed to provide an extensible and standardized means of systems administration, YaST serves three main purposes:

- **Installation of SUSE Linux Enterprise products on a system.** *YaST safely guides you through the installation procedure. In many cases, a few clicks are all that you need to install SUSE Linux Enterprise on your machine. YaST automatically detects available hardware and displays auto-generated system set-up proposals. These include hard disk, keyboard and network setup, to name a few.*
- **Configuration of the installed system.** *With YaST, you can quickly configure the Internet connection, the graphical interface and peripheral devices such as printers and scanners. For instance, using the respective YaST module and Samba, even inexperienced Linux users can easily network Linux and Windows hosts. Graphical dialogs facilitate the configuration of DNS, DHCP and Web servers in your network.*
- **Administration of the installed system.** *YaST is also a suitable tool for user administration, security settings and the installation of additional software.*

Rather than being a closed monolithic system, YaST offers a high degree of modularity. In fact, it consists largely of modules and, to ensure extensibility, allows you to add modules at any time.

YaST is completely extensible. In fact, YaST modules are what enable your users to interact with YaST. Nearly every on-screen installation dialog is a YaST module and additional modules act behind the scenes to address specific pieces of hardware, such as the keyboard.

The extensible design of YaST makes it very easy to add modules for new and emerging technologies. YaST provides an integrated GUI-based and guided workflow to help you set up individual virtual servers. For instance, SUSE Linux Enterprise 10 includes YaST modules that help you easily set up Xen virtual machine profiles. Furthermore, SUSE Linux Enterprise 10 includes modules for graphical iSCSI management to facilitate configuration of both iSCSI initiators and iSCSI targets.

All of these YaST modules are built into SUSE Linux Enterprise and provide the core functionality you need to install and administer a SUSE Linux Enterprise system. Third parties, such as hardware or software vendors or Linux developers, can also take advantage of the extensibility to contribute additional YaST functionality.

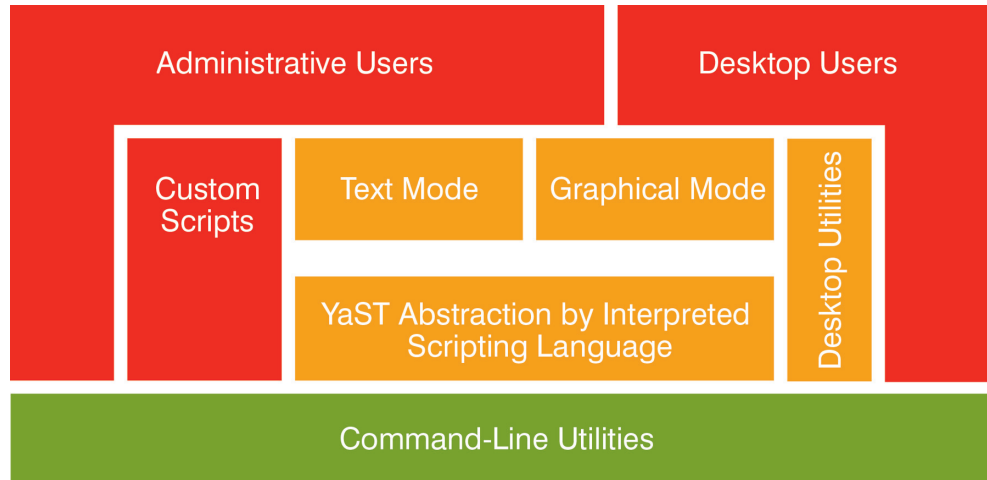
Centralized configuration and installation

YaST enables centralized configuration and installation. You can use it to centrally create, install, configure and administer all systems and user data. Furthermore, YaST enables a consistent management experience across all supported SUSE Linux Enterprise architectures. This means that the YaST experience is always the same, whether you have to administer a desktop machine, a commodity server or a mainframe. By offering both a text-mode and a graphical-mode view, YaST allows your desktop and administrative users to build scripts to complement the included management features—without requiring your administrators to learn how to manage tasks in different interfaces.

YaST Benefits for Third Parties

Thanks to its modular design, YaST is highly scalable, and hardware and software configurations—as well as plug-ins for system administration—can easily be added to the frame set. Released under the General Public License, YaST also includes convenient APIs that enable developers and third-party vendors to easily extend it.

SUSE Linux Enterprise 10 introduces pattern-based deployment in YaST. Because patterns assemble packages needed for a specific use case, it is possible to design custom functions that enhance custom SUSE Linux Enterprise Server 10 and SUSE Linux Enterprise Desktop 10 deployments inside corporations.



Expert knowledge of Linux is no longer necessary, and updates and new modules can be added automatically. Self-developed applications can also be easily integrated in the system due to the GUI and its ease of use.

Figure 2. The YaST model fosters consistency

Streamlined administration

YaST offers IT employees a common basis for the administration of operating system components, network services, open source components and applications from third-party vendors. It facilitates support of large IT environments and integration with systems-management tools from other vendors. You can administer YaST remotely, and it features an encrypted connection for security and efficiency.

SUSE Linux Enterprise 10 introduces pattern-based deployment in YaST. Patterns are server and desktop functions the administrator can use to accelerate and customize the installation and configuration process. Patterns can express dependencies to other patterns or packages. Because patterns assemble packages needed for a specific use case (e.g., for file server, print server, and Web and LAMP), it is possible to design custom functions that enhance custom SUSE Linux Enterprise Server 10 and SUSE Linux Enterprise Desktop 10 deployments inside corporations.

For example, your company may be deploying SUSE Linux Enterprise Desktop across

the organization, but with three different application profiles for engineering workstations, customer service desktops and general-purpose systems. You would like to facilitate self-service installation from a Pre-boot eXecution Environment (PXE) boot server to distribute the human workload, but you don't want to maintain multiple installation images. With installation patterns, you can define patterns that select the right packages and add-on applications for any of the defined user profiles. At installation time, users will select the use patterns that apply to them. In this way, you can create a single installation image to serve different types of users.

AutoYaST: Automated Installation

During a standard Linux installation, administrators or systems engineers must answer many questions. What should be installed? What hardware needs configuring? How is the network interface configured? Answering these questions once is informative and perhaps even interesting. But imagine having to set up a new Linux network with a large number of machines. Now, the same issues must be addressed and the same questions

answered repeatedly. This makes the task very inefficient, as well as a source of irritation and boredom. Clearly, this parameter- and option-selection process needs to be automated.

Regular installation of SUSE Linux Enterprise systems is semi-automated by default. The user selects the necessary information (often just the language) at the beginning of the installation. YaST then generates a proposed installation for the underlying system, depending on different factors and system parameters. In most cases, and especially for new systems, you can use such a proposal to install the system and leverage a usable installation. The steps following the proposal are fully automated, and at the end of the installation, they prompt the user to configure hardware and network services.

With AutoYaST, SUSE Linux Enterprise provides an integrated tool for an automatic enterprisewide Linux installation process. AutoYaST enables a fully customizable, automatic and remote Linux installation process for a large number of systems. These systems typically share similar environments and similar—but not necessarily identical—hardware, and they perform comparable tasks. Using AutoYaST, you can install these systems in parallel and in a very short time. This gives you centralized system control during individual or uniform installation, resulting in dramatically shortened installation times, reduced administration costs and a software rollout backed by global quality assurance.

AutoYaST allows you to create a configuration for a single system or a set of systems. The configuration is stored in a *control file* that automates the installation process, ensuring consistency while tailoring each configuration to account for hardware differences, network settings and other variations. You start by configuring one server using YaST. When that configuration is exactly the way you want it, you use the AutoYaST module of YaST to write an XML configuration file. You can then specify this configuration file when running

With AutoYaST, SUSE Linux Enterprise provides an integrated tool for an automatic enterprisewide Linux installation process.

AutoYaST on other machines to reproduce the configuration.

AutoYaST automatically detects hardware differences, and you can easily tailor the control file to any environment. That means you can quickly install multiple systems that perform similar tasks in parallel—even if the machines are different. In addition, AutoYaST takes care of network settings and other individual configurations without manual intervention.

While AutoYaST is suitable when no user intervention is required or where customization *is* required, it is not an automated GUI system. This means that in most cases, you will skip many installation screens (e.g., you will never see the language selection interface).

With AutoYaST, you gain support for the following:

- *Unattended installation*
- *Unattended configuration*
- *Clone installed systems*
- *PXE boot support*
- *XML-based config file*
- *Kickstart migration*

Novell ZENworks Linux Management: Centralized, Policy-driven and Automated Management for Linux Resources

If you want additional Linux management functionality—beyond the YaST tools included in SUSE Linux Enterprise—Novell ZENworks 7 Linux Management can provide it. With ZENworks Linux Management, you have centralized control of Linux systems throughout your enterprise.

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Novell ZENworks Linux Management provides comprehensive management of Linux servers and workstations.

Automated software and patch management significantly reduces the time and risk of managing continuous software and security packages, and it resolves conflicts to keep your Linux resources stable and secure.

Novell ZENworks Linux Management offers all the tools and capabilities you need to extend enterprise-class resource management to distributed Linux systems—efficiently and cost effectively:

- **Web-based or command-line administration.** Choose from an intuitive Web-based console or a powerful command-line interface. Both of these options allow your organization to centrally configure and distribute software selections and organize groups of machines for installations and updates.
- **Policy-Driven Automation.** ZENworks Linux Management is the only solution that uses Policy-Driven Automation to deploy, manage and maintain Linux resources. These automated and intelligent policies allow ZENworks Linux Management to provide centralized control across the lifecycle of Linux systems with imaging, configuration, system lockdown, remote control, and inventory and software management.
- **Management for leading Linux software distributions.** ZENworks Linux Management supports SUSE Linux Enterprise Server, SUSE Linux Enterprise Desktop, Novell Open Enterprise Server and Red Hat* Enterprise Linux.
- **Custom catalogs.** With ZENworks Linux Management, your organization can organize available Linux software into logical catalogs that match the way it does business. This includes defining unique catalogs of applications, tools and designated platforms that include both internally developed and custom packages.

Novell ZENworks Linux Management provides comprehensive management of Linux servers and workstations. Using ZENworks Linux Management, you can:

- Manage software packages, including dependency resolution and previous version rollback.
- Manage configuration and application settings with policies.
- Automate the application of images and scripted installs using YaST autoinstall and Red Hat kickstart.
- Remotely control devices via a secure interface.
- Collect hardware and software inventory, as well as generate inventory reports.

Software Package Management

Using bundles, which are collections of one or more software (RPM) packages, Novell ZENworks Linux Management lets you install, remove and roll back software on your Linux devices. ZENworks automatically resolves dependencies for any software packages it is installing. It graphs all requirements for packages that need to be installed against currently installed packages and for packages that are available but not yet installed. Then, ZENworks can resolve missing or conflicting dependencies in the central package repository and update devices automatically if it locates a dependency. This eliminates the need to manually check each device and ensures regulatory compliance by logging the changes.

Automated software and patch management significantly reduces the time and risk of managing continuous software and security packages, and it resolves conflicts to keep your Linux resources stable and secure. ZENworks Linux Management also carefully tracks package deployment, so you always have the option of quickly reverting to a previous package version.

Policy-based Device Management

Novell ZENworks Linux Management provides a number of policies to help you manage SUSE Linux Enterprise Desktop, the Evolution™ e-mail client, the Firefox* Web browser and several other software

applications. ZENworks text-file policies give you full flexibility to configure and automate management of your Linux environment. With Policy-Driven Automation, you simply define business processes and policies once to ensure consistent operating system and application configuration settings. Then, you can automatically apply those processes and policies to Linux workstations and servers across your enterprise. You can even lock configuration settings so users cannot change them. This approach saves time, eliminates mistakes and allows you to focus your IT resources on more strategic tasks and initiatives.

Automated Install and Imaging

Novell ZENworks Linux Management includes integrated imaging, or Preboot Services, to automate management tasks on devices before their operating systems boot up. A powerful imaging framework supports the creation of base and add-on (layered) images to make the build process as modular as your organization requires. This modular approach allows your administrators to update individual components rather than continually rebuild the entire image, which in turn enables them to easily tailor and extend the build to meet your organization's exact configuration needs. In multisite environments, only the components that change need to be replicated between sites, minimizing work and simplifying the process.

With ZENworks Preboot Services, administrators can automatically—or manually, if needed—perform the following operations on a Linux device when it boots up:

- *Run scripted installations on the device, such as AutoYaST.*
- *Run ZENworks scripts on the device.*
- *Make an image of the device's hard drives and other storage devices.*
- *Restore an image to the device.*
- *Apply an existing image to multiple devices.*
- *Update the device's BIOS.*

Remote Management

Novell ZENworks Linux Management allows you to take centralized control of your Linux environment. You can use a graphical Web interface in the ZENworks Control Center to manage devices remotely. With ZENworks Linux Management, you can manage your environment from any location. And, it even makes it easy to securely connect to and remotely control both Linux servers and workstations.

Inventory Collection

Automated hardware and software inventory gathering and reporting make it easy to audit the software and configurations in your environment. ZENworks gathers extensive software and hardware inventory data from all managed devices and enables you to run reports and export data. This capability allows your administrators to discover the packages deployed on managed systems and easily identify any variation from your standard operating environment and approved configurations.

WBEM/CIM-based Management: Industry Standards to Manage Your Data Center

Managing a data center requires dealing with heterogeneous and distributed environments—a demanding challenge. Often each device defines its own representation of management information. You have to account for different semantics, terminology, data structures and protocols. You can spend a lot of time and effort trying to unite these silos of management data to achieve a single and consistent representation of all management data. With that said, collecting the information to manage an entire data center is just one part of the management challenge. Normalizing, organizing and analyzing that data is just as critical to ensuring successful data center management.

You can use a graphical Web interface in the ZENworks Control Center to manage devices remotely. With ZENworks Linux Management, you can manage your environment from any location.

SUSE Linux Enterprise 10 integrates and supports the open WBEM/CIM industry standard as a vendor-independent, robust and descriptive framework for systems management. With SUSE Linux Enterprise 10, Novell promotes this open standard and achieves enterprise readiness for the data center.

End-to-end management across the diverse components of a distributed environment is both a reality and a requirement. It is no longer sufficient to manage personal computers, servers, subnets, network core, storage and software in isolation. These components all interoperate to provide connectivity and services. Information regularly crosses these boundaries, and management must do the same.

To address these requirements, SUSE Linux Enterprise 10 integrates and supports the open WBEM/CIM industry standard as a vendor-independent, robust and descriptive framework for systems management. With SUSE Linux Enterprise 10, Novell promotes this open standard and achieves enterprise readiness for the data center.

Web-based Enterprise Management

WBEM is an industry-based systems management architecture initiative based on a set of management and Internet standard technologies developed to unify the management of enterprise computing environments across multiple vendor applications. It is an open standard managed and promoted by the Distributed Management Task Force, Inc. (DMTF, <http://www.dmtf.org/>).

WBEM simplifies systems management, enabling the industry to deliver a well-integrated set of standards-based management tools by leveraging emerging Web technologies. WBEM is compatible with all the major existing management protocols, including SNMP, DMI and CMIP.

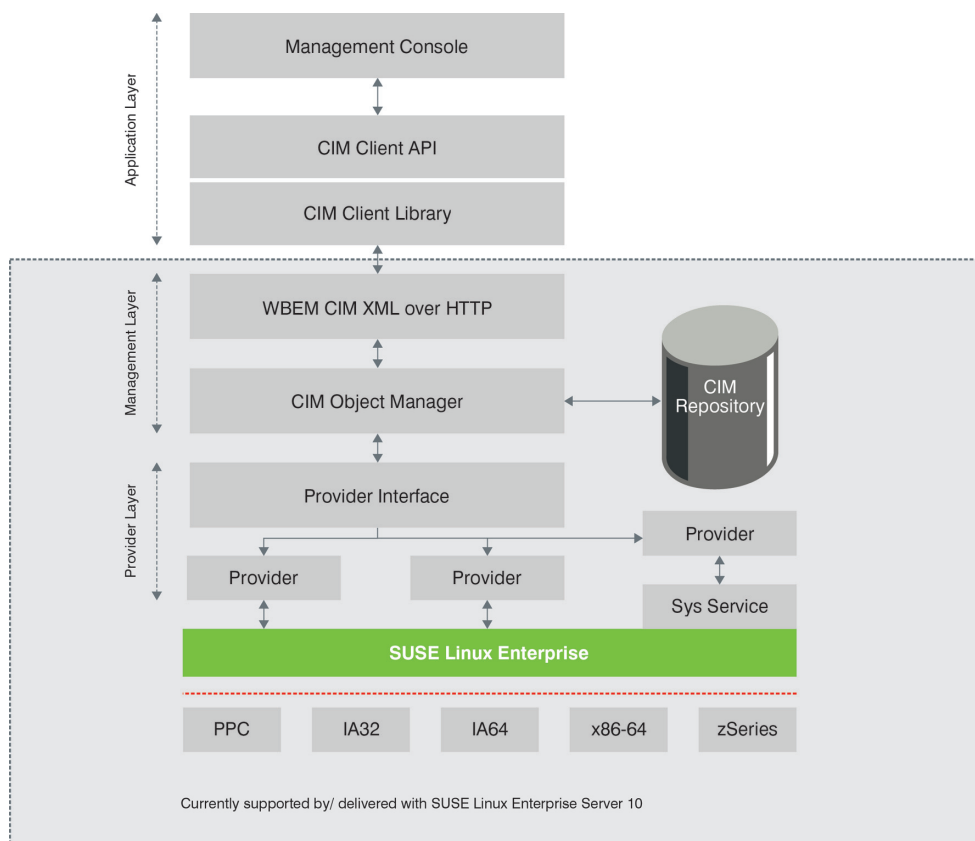
The DMTF has developed a core set of standards that make up WBEM, including the following:

- *A data model, the Common Information Model (CIM) standard*
- *An encoding specification, xmlCIM, which specifies how CIM information is represented in XML*
- *A transport mechanism, CIM Operations over HTTP, which describes how xmlCIM messages travel across a network using HTTP or HTTPS as the transport mechanism.*

Based on this information, WBEM also essentially defines a server that implements the standard. In other words, a WBEM server must understand, implement and honor CIM; it must interpret xmlCIM messages into CIM information; and it must implement an HTTP server in order to receive HTTP requests with xmlCIM information inside.

A server application that implements the WBEM specifications is called a Common Information Model Object Manager, or CIMOM. This core engine stores the CIM data either in its own repository or in a standard external database.

Stacked on top of the CIMOM, the WBEM interface uses the HTTP protocol. It communicates to the CIMOM and exposes its functionality over the Web. You can use a CIM WBEM client as a client for the WBEM interface. Generally, the CIM WBEM client is your system-management console. You can use one tool to configure your system and any other WBEM-enabled systems.



Through CIM, organizations can cooperatively develop more advanced customer solutions for inventory tracking, root cause analysis and cross-vendor administration.

Figure 3. Web-based Enterprise Management Architecture

Common Information Model

CIM—an object-oriented model that represents a wide variety of systems in a standard and neutral way—is commonly called the CIM schema. This schema ensures that a common component such as a server or a network router will be represented in a way that all management tools using CIM will understand. All the major systems-management tools available today rely on the CIM standard.

The CIM schema provides a common way to represent the computing and networking elements that make up a data center and the relationships among these elements. The management targets are fault, configuration, accounting, performance and security management, as well as the abstraction and decomposition of services and business

operations. The information model defines and organizes common and consistent semantics for equipment and services.

Through CIM, organizations can cooperatively develop more advanced customer solutions for inventory tracking, root cause analysis and cross-vendor administration.

CIM models support all the basic requirements for managing an enterprise, and there are several benefits from adopting CIM:

CIM is extensible: Model extensions automatically inherit higher-level schema content, providing consistency at the higher levels of the model without sacrificing any vendor-specific value-added content. This extensibility is also a huge timesaver and promotes cross-vendor interoperability.

SUSE Linux Enterprise 10 allows for interoperability with third-party CIM-enabled systems-management solutions.

CIM schemas can be partitioned: Integrators don't need to implement the complete CIM schema, just the portions that apply for their specific management requirements.

CIM is protocol agnostic: Operations defined for CIM are independent of the protocol used. Currently, CIM supports WBEM, an XML-based protocol, for encoding CIM operations. In the future, other protocols will be defined.

CIM helps integrators discuss the entities that are important for management and

how they relate to each other: CIM provides integrators with a common understanding of the overall management environment across the enterprise or Internet. This level of detail makes it easier to share information between integrators in a cohesive solution.

CIM maps to existing standards: The information defined in CIM maps to existing standards such as SNMP, DMI and ITU. Integrators who are familiar with the content as defined by these standards can more easily translate the management content to CIM.

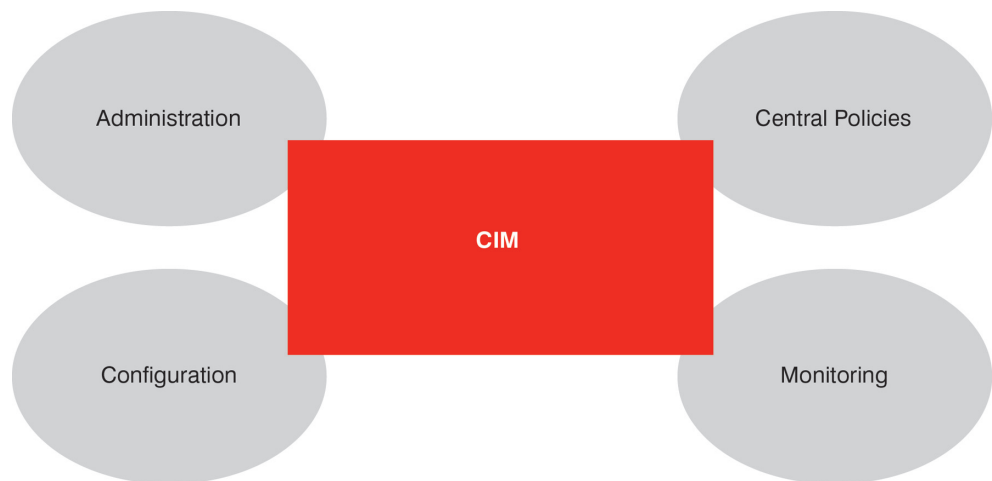


Figure 4. CIM supports all the basic requirements for managing an enterprise environment or data center.

Using CIM, systems-management tools can now focus on managing, versus uniting, silos of data. The CIM schema is about well-understood and abstracted information, and is technology-neutral with respect to its repository and access protocol. Enterprises that use CIM-based systems-management solutions for their data center/distributed computing environments can save significant money: they do not need to invest in and integrate different systems-management tools, but instead can rely on open standards and a common model. Moreover, they do not need to use different tools for each product and release since the tools are based on a single model and consistent abstractions.

Currently, SUSE Linux Enterprise Server 10 supports OpenWBEM, an enterprise-ready open-source implementation of WBEM, suitable for commercial and non-commercial applications; an OpenWBEM Common Information Model Object Manager (CIMOM); and a variety of CIM providers for consumption by management frameworks. By adopting the industry-standard CIM with OpenWBEM, SUSE Linux Enterprise 10 allows for interoperability with third-party CIM-enabled systems-management solutions. OpenWBEM provides a foundation for the development of management frameworks that overcome cross-platform barriers and empower true interoperability. Developers can use

OpenWBEM as a management agent and WBEM framework to provide applications for configuration and change management, system health monitoring and enterprisewide management functionality.

Novell Customer Center: Subscription Management

Some Linux vendors offer update tools that work well but benefit only a limited audience (i.e., system administrators). However, a number of constituents throughout an organization require insight into systems-management tools. For instance, IT system administrators want to know if their systems are up to date and have the latest security fixes. IT managers want to confirm that they are receiving the level of service they signed up for, need to be able to accurately track and plan contracts, and determine how effectively the tools are meeting the organization's needs. Purchasers, on the other hand, do not want to be bothered with technical information; they simply want to know that they're using what they paid for, and they want an easy way to renew contracts.

Novell Customer Center provides information, tools and resources for the many customer contacts that have business and technical relationships with Novell. An intuitive online interface, Novell Customer Center makes it easy to manage your business and technical interactions with Novell. From one location, you can review the status of all your Novell products, subscriptions and services—and obtain critical Linux updates and support. Novell Customer Center features automated registration, renewal notification and a complete order history. It allows you to reflect your own organizational structure by defining subsidiaries and assigning users, user groups, systems and subscriptions to them. Furthermore, Novell intends to provide tools you can use to enter and track support requests and to plan future purchases.

Novell Customer Center has all the resources you need—all in one place. It combines

innovative tools and automated services so you can ensure licensing compliance, increase productivity and reduce systems-management costs. With Novell Customer Center, you can:

- *Quickly access information based on your role*
- *Acquire patches, security updates and software enhancements*
- *Easily review entitlements and renew subscriptions*
- *Increase productivity*
- *Reduce systems-management costs*

Quickly Access Information Based on Your Role

Novell Customer Center makes it simple to manage all your business and technical interactions with Novell. You log in via the Web and get immediate access to a secure, easy-to-use interface. Designed with input from current customers, Novell Customer Center organizes your company's personalized information and resources effectively. You have complete control over which personnel are authorized to access, view and use tools and information. With Novell Customer Center, you can meet the needs of administrators, purchasers and IT managers in one location, giving each user access rights appropriate to their roles.

Acquire Patches, Security Updates and Software Enhancements

The value of a Linux subscription is in continual improvements to the code. These enhancements—including the latest hardware and software drivers, security updates and performance patches—are all available through Novell Customer Center. When you purchase any SUSE Linux Enterprise subscription from Novell, you receive automatic access to Novell Customer Center and these updates. Consolidated, easy-to-use tools make downloads quick and painless. And before it releases, all code must pass rigorous testing and quality-assurance processes.

Novell Customer Center makes it easy to manage your business and technical interactions with Novell. From one location, you can review the status of all your Novell products, subscriptions and services—and obtain critical Linux updates and support.

Your IT managers and buyers can rely on Novell Customer Center for accurate information on licensing and other business transactions.

You can be confident that updates obtained through Novell Customer Center will be compatible with your existing systems. If you configure your Novell Customer Center accordingly, you can receive notification on updates via e-mail automatically.

Easily Review Entitlements and Renew Subscriptions

When it comes to management, visibility is essential. You need to know what technologies you're using, what you're entitled to use and whether it's all up to date. Novell Customer Center gives you one tool to manage your Linux subscriptions—everything from purchases and renewals to entitlements and expirations. You can use Novell Customer Center to verify and display the number of registered and active Linux systems your company has in production and even forecast future subscription purchase needs. You can also use it to obtain real-time alerts about business events such as new servers coming online or new users requesting access to code.

Increase Productivity

It's a busy world, and you just don't have the time to manually track and update all your Linux software. Now, Novell Customer Center gets the job done automatically. It can identify the operating system version on your SUSE Linux Enterprise servers and desktops and spotlight machines that need the latest patches. Depending on your preferences, you can use Novell Customer Center to download the latest updates and patches. With the information in Novell Customer Center, you can easily measure and report on the patch levels of the Linux systems in your organization. All of these features will save you time, allowing you to be more productive and focus on projects that truly require hands-on management.

Reduce Systems-management Costs

Nearly everything you do with Novell Customer Center will help you cut management costs. From one screen, your system administrator can see how many servers are deployed, which operating systems run on those servers and any patches that have already been applied. The administrator can then use this data to establish consistency across your organization and thereby reduce the amount of time and money required to manage your servers.

Your IT managers and buyers can rely on Novell Customer Center for accurate information on licensing and other business transactions. (They won't have to rummage through a file cabinet and hope they've got the latest data.) The consolidated, easy-to-use information in Novell Customer Center will save them considerable time, stress and money.

A Tightly Integrated Set of Tools

With such a choice of tools, you may wonder which one to use for which task. While Novell offers you the choice to use the tool you are most familiar with, we recommend the following:

- *YaST for installation, configuration and re-configuration*
- *AutoYaST for automated mass deployment*
- *Novell ZENworks client tools (included in SUSE Linux Enterprise) for updates and patches to a small number of systems*
- *Novell ZENworks Linux Management (optional) for complete lifecycle management, software deployment and patch management for your business*
- *WBEM/CIM-based solutions for managing distributed computing environments—or your entire data center*

This integrated set of systems-management tools in SUSE Linux Enterprise 10 covers all the systems-management tasks depicted in Figure 1 on page 3.

The Vision: Solving the Systems-management Challenge

Until now, systems management in a heterogeneous environment has been complex—a variety of tools are required to present different user interfaces and all required information. Some organizations have attempted to link these systems using custom integration, but this approach places significant burdens on in-house developers who are constantly creating custom scripts to integrate the most recently introduced management tools and systems. On top of that, organizations must employ a method to enable management functionality of remote systems.

When one considers the complexity of today's heterogeneous environments—and the number of multivendor components—it's easy to understand why there isn't a single integrated management application today.

And while—in an ideal world—a single management tool could be used across all platforms and applications for application, system and network management, a single tool may not be the right answer. Instead, the best solution may be to enable the various systems and tools to communicate. This not only solves the systems-management problem, but also does so without introducing the development complexities and dependencies that have prevented the interoperability of systems-management tools until now.

Unfortunately, efforts to solve this issue have been hampered by the choice of clients: while thick clients deliver rich content and are user-friendly, they are restricted to use on a single platform in a local environment. Many organizations now use lightweight, Web-based thin clients to enable the delivery of rich content, but they can be limited by Web browser functionality and access speeds. With the advent of Web 2.0, tools are now available to enable rich interactivity and functionality via the Web that was once only possible in a traditional graphical environment.

Simultaneously, while a number of emerging standards offer ways to link different management systems, the open CIM standard is quickly gaining ground. Combined with a Web console that provides a linkable interface, the CIM model seamlessly links applications from a variety of vendors, presenting administrators with all required views and information via a single application. A single CIMOM integration agent can aggregate data from multiple systems-management tools, regardless of vendor, and another CIMOM agent can then aggregate data from multiple CIMOMs deployed throughout the network. This high-level agent provides a logical view of the underlying systems providing services throughout the network. See the example architecture shown in Figure 5 on the following page.

When one considers the complexity of today's heterogeneous environments—and the number of multivendor components—it's easy to understand why there isn't a single integrated management application today.

Novell believes that systems management should address the entire solution stack and not just the operating system. Ultimately, Novell will make systems-management integration a smooth, hassle-free process for enterprises worldwide.

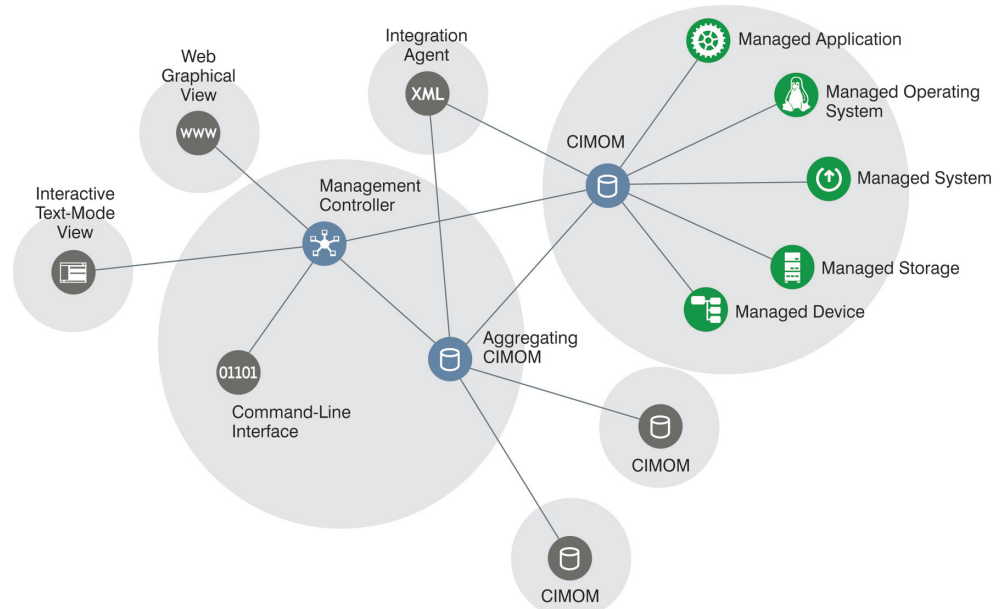


Figure 5. The ideal integrated network systems-management environment: an example architecture with CIM

By uniting various applications via a Web console, organizations have an environment more open to integration. This means that an organization could run an operating system such as SUSE Linux Enterprise but use a third-party management system: the CIMOM agent would pull data from the system running SUSE Linux Enterprise and submit it to the third-party management toolset. At the same time, a management controller would apply business logic to translate between the view and the stored data to present information in the appropriate interface, whether that is a command-line interface, a GUI or via text mode—and all of these functions could run on a single system. Furthermore, an organization could easily configure remote management for these functions. In other words, this idealized systems-management state would provide the management information to which an administrator was entitled, all outside of a secure system running in a data center.

Currently, SUSE Linux Enterprise Server 10 has already adopted the CIM standard as a vendor-independent framework for systems management. This allows other CIM-enabled systems-management solutions to easily run on SUSE Linux Enterprise Server systems. At the same time, YaST provides the necessary management functionality via both text and graphical views.

Novell believes that systems management should address the entire solution stack and not just the operating system. With that in mind, Novell will extend YaST functionality to the Web over time and create rich Web 2.0 applications—for all SUSE Linux Enterprise solutions—that can be linked to other management utilities via CIM. Ultimately, Novell will make systems-management integration a smooth, hassle-free process for enterprises worldwide.

Contact a sales representative for more information, or visit www.novell.com/datacenter to learn more about Novell Data Center solutions.

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Solutions Provider, or call
Novell at:

1 888 321 4272 U.S./Canada
1 801 861 4272 Worldwide
1 801 861 8473 Facsimile

Novell, Inc.
404 Wyman Street
Waltham, MA 02451 USA