What is SUSE® Linux Enterprise High Availability Extension?

SUSE Linux Enterprise High Availability Extension is an affordable, integrated suite of robust, open source clustering technologies that you can use to implement highly available physical and virtual Linux clusters, and eliminate single points of failure. Used with SUSE Linux Enterprise Server, it helps you maintain business continuity, protect data integrity, and reduce unplanned downtime for your mission-critical Linux workloads. SUSE Linux Enterprise High Availability Extension provides all of the essential monitoring, messaging and cluster resource management functionality of proprietary third-party solutions, but at a more affordable price. Based on an innovative, highly flexible policy engine, it supports a wide range of physical and virtual clustering scenarios, and its adherence to open standards ensures interoperability. For more details, visit [www.suse.com/products/highavailability/](http://www.suse.com/products/highavailability/)

When should I use SUSE Linux Enterprise High Availability Extension?

SUSE Linux Enterprise High Availability Extension is typically used for mission-critical Linux applications. Mission-critical workloads will vary depending on your individual business; however, mission-critical systems can generally be defined as systems that enable revenue generation or support core business processes. To ensure the continuous operation of your core business services when using industry standard components, you need a way to protect your mission-critical systems from failure and increase services availability, either through greater reliability and redundancy, or through faster failover to standby systems.

Clustering and replication are time-proven methods that increase services availability through hardware and software redundancy. Businesses are increasingly using Linux for mission-critical workloads, such as databases; line-of-business applications such as ERP and CRM; online transactions processing; and business intelligence applications. If your organization is using Linux and industry standard components to deliver mission-critical services, you should consider SUSE Linux Enterprise High Availability Extension. With our high availability extension, you can safely depend on commodity hardware for your mission-critical workloads, deliver the services required by your businesses and contain costs.

What are the components of SUSE Linux Enterprise High Availability Extension?

SUSE Linux Enterprise High Availability Extension integrates the following features:

- **Flexible, policy-driven cluster resource manager.**
  - *Pacemaker* is a highly scalable cluster resource manager with a flexible policy engine that supports n-node clusters. Using Pacemaker, you can continuously monitor the health of your resources, manage dependencies, and automatically stop and start services based on highly configurable rules and policies.
  - *OpenAIS* is the Open Source Initiative's certified implementation of the Service Availability Forum Application Interface Specification. It is used for the product's clustering messaging and membership layer. OpenAIS is the leading standards-based communication protocol for server and storage clustering, and is easily integrates with other infrastructure software.
  - *Corosync* is the Open Source Initiative's certified implementation of a complete cluster engine and is supported alongside OpenAIS. It provides membership, ordered messaging with virtual synchrony guarantees, closed process communication groups, and an
extendable framework. New with Service Pack 2, Corosync will support unicast and multicast communication. The addition of unicast communication will reduce the requirements for cluster installation by eliminating the need to implement specific configurations for multicast enabled network components.

• **Cluster aware file system and volume management.**
  o Oracle Cluster File System 2 (OCFS2) is a shared-disk, POSIX-compliant, generic cluster file system. Using OCFS2, you can cluster a much wider range of applications for higher availability using cluster-aware POSIX locking, as well as resize your clusters and add new nodes on the fly. Cluster-aware applications are also able to use parallel I/O for higher performance.
  o clustered Logical Volume Manager 2 (cLVM2) provides a more convenient, single, cluster-wide view of storage. Clustering extensions to the standard LVM2 toolset allow existing LVM2 commands to safely and simply manage shared storage, eliminating the need to learn a new set of tools.

• **Continuous data replication and node recovery.**
  o **DRBD** (Distributed Replicated Block Device) is a leading open source networked disk management tool. Using DRBD, you can build single partitions from multiple disks that mirror each other, and make data highly available.
  o Also included is Relax and Recover (ReaR), a popular open source node recovery framework, for quick bare metal restorations.

• **Resource agents for many open source and third-party applications.**
  o Included at no additional charge, these components are scripts for monitoring popular open source services, such as Apache, CTDB, MySQL, NFS, PostgreSQL, Tomcat and KVM, Xen. Also included are scripts for third-party applications, such as SAP Instance and Database, Oracle Database, IBM DB2, Informix Dynamic Server, WebSphere Application Server, and VMware. With these components, you can quickly and easily set up many highly available data center services, using physical and virtual systems.

• **User-centric management tools.**
  o A powerful unified command-line interface is included for experienced IT managers to quickly and easily install, configure and manage their clustered Linux servers. Also provided is a graphical user interface to give operators a streamlined, user-friendly tool for monitoring and administering their clustered environment. YaST modules are also included for the configuration of DRBD, OpenAIS, and multipath. These modules help IT managers improve productivity and more easily configure distributed storage systems and high availability solutions.

**Can you explain DRDB in more detail?**

SUSE Linux Enterprise High Availability Extension includes support for distributed replicated block devices. Using DRBD, a leading open source networked disk management tool, you can build single partitions from multiple disks that mirror each other, and make data highly available. You can also quickly restore your clustered services by taking advantage of DRBD’s fast data resynchronization capabilities. DRBD mirrors the data of a high availability service from the active node of a cluster to its standby node. DRBD supports both synchronous and asynchronous mirroring. In the event of an outage, DRBD automatically resynchronizes the temporarily unavailable node to the latest version of data, without interfering with the service that is running. DRBD delivers the ability for active/active usage, providing replicated storage area network (SAN) semantics and allowing cluster-aware file systems to be used without additional SANs.
Is OCFS2 also shipped with SUSE Linux Enterprise Server 11?

No. Although OCFS2 remains part of SUSE Linux Enterprise Server 10, in the SUSE Linux Enterprise 11 platform generation, the cluster aware file system OCFS2 is exclusively shipped with SUSE Linux Enterprise High Availability Extension. SUSE Linux Enterprise Server 11 ships with other file systems that are suitable for many different kinds of workloads.

Can I use virtualization technologies within my clustered environment?

Yes, absolutely. The clustering technologies in SUSE Linux Enterprise High Availability Extension support physical and virtual environments equally well. Virtualization is increasingly being used by organizations seeking to improve resource utilization, responsiveness and services availability. Many IT managers are looking at clustering virtual servers together to improve services availability, since the low overhead associated with a virtual standby node makes it well suited for this purpose. As workloads become consolidated among fewer physical servers, it becomes increasingly important that those systems be highly available. SUSE Linux Enterprise Server includes KVM and Xen, the leading open source virtualization hypervisors. The cluster resource manager in SUSE Linux Enterprise High Availability Extension is able to recognize, monitor and manage services running within virtual servers created with KVM or Xen, as well as services running on physical servers. Virtual servers can be clustered together, and services can even be clustered within a virtual server. Moreover, virtual servers can be clustered with physical servers, and physical servers clustered with each other, extending high availability from virtual to physical workloads. And the ability to encapsulate entire workloads within virtual guests means that you can easily replicate and manage them using the tools and capabilities provided with SUSE Linux Enterprise High Availability Extension, such as DRBD, OCFS2 and cLVM2. The combination of SUSE Linux Enterprise Server, with integrated KVM and Xen, and SUSE Linux Enterprise High Availability Extension, with support for virtualized environments, gives you unprecedented flexibility to improve services availability as well as resource utilization.

What if I want to build clusters between multiple data centers?

SUSE offers support for Local, Metro Area, and Geographical Clustering (Geo Clustering). Local and Metro Area clusters are supported as part of the SUSE Linux Enterprise High Availability Extension. Metro Area clusters allow nodes to be connected at a distance up to 30 kilometers. Geo Clustering for SUSE Linux Enterprise High Availability Extension is an additional product that maximizes your tolerance to regional catastrophic events by deploying physical and virtual Linux clusters between data centers located anywhere in the world.

Can you explain Geo Clustering in more detail?

Geo clusters are built between groups of Local or Metro Area clusters. In the event of hardware failure or a flood in the data center, SUSE Linux Enterprise High Availability Extension will take a failing workload and first transfer it within the Local or Metro Area cluster to keep the service near its local user and infrastructure while minimizing latency. However, using Geo Clustering for SUSE Linux Enterprise High Availability Extension will ensure that a workload will be restarted on another cluster in a far removed location in the event of a disaster, such as an earthquake or blackout, that impacts the entire cluster.
Geo Clustering for SUSE Linux Enterprise High Availability Extension provides rules-based failover for automatic and manual transfer of the workload to another cluster outside of the affected area. Manual failover enables you to ensure alignment with your internal approval processes by providing maximum control over the movement of applications around the world and ensuring that other necessary resources are also assigned or moved. As a result, when disaster strikes data centers within a region, Geo Clustering for SUSE Linux Enterprise High Availability Extension ensures enterprises can meet their service level agreements, while maintaining compliance with corporate policies and external regulations.

**Do I need an additional subscription for Geo Clustering?**

Yes. To receive technical support and maintenance for geographical clustered Linux servers, a separate Geo Clustering for SUSE Linux Enterprise High Availability Extension is required, in addition to active SUSE Linux Enterprise Server and SUSE Linux Enterprise High Availability Extension subscriptions. A Geo Clustering for SUSE Linux Enterprise High Availability Extension subscription provides maintenance and the same level of support for this product as the support level of the underlying SUSE Linux Enterprise Server subscription. For example, if you have a Priority subscription for SUSE Linux Enterprise Server for a given system, you will receive priority support for Geo Clustering for SUSE Linux Enterprise High Availability Extension for that system, too. GEO Clustering for SUSE Linux Enterprise High Availability Extension offers new functionality for a new use case and is not included as part of the previous SUSE Linux Enterprise High Availability Extension Grandfathering Program.

**What else is new in SUSE Linux Enterprise High Availability Extension 11 Service Pack 2?**

Service Pack 2 offers new functionality that makes it even easier to set up and use the suite of robust, open source clustering technologies integrated in SUSE Linux Enterprise High Availability Extension. These enhancements help reduce administrator effort and enable less experienced users to efficiently install and manage a variety of clustering scenarios. New features and functions include:

- Templates and wizards that enable the rapid completion of basic set up tasks. These tools can also be used to configure and add standard workloads. Using the product's flexible user interface, customers and third-parties can build their own wizards to speed the execution of routine tasks.
- The cluster bootstrap which offers a menu driven set up process for quickly deploying a base cluster.
- Cluster join that enables effortless cluster set up and expansion of existing clusters. Once a node or cluster is built, new nodes can be added without the need to manually replicate configurations.
- Access Control lists that ensure the proper authorization level of cluster administrators.
- An enhanced web console that offers full cluster administration and provides the management of groups of resources, which improves scalability on clusters with more than 100 resources. Additionally, you can access control lists, the cluster test drive, and a new graphical history explorer through the web console.
- Cluster Wide Shell that improves the effectiveness of managing cluster nodes by enabling the execution of commands across all nodes using the PSSH command.
- A new history explorer and log file query tools that work together to improve supportability by providing the necessary information to promptly diagnose and resolve cluster issues.
- Capabilities for automatically joining Clustered SAMBA with Active Directory, load balancer connection tracking, and reliable storage-based fencing with multiple SBD devices.
What are the benefits of using SUSE Linux Enterprise High Availability Extension?

Using SUSE Linux Enterprise High Availability Extension helps you meet your service level agreements, ensure continuous access to your business systems, and ensure data integrity—and do it all cost effectively.

• **Meet your SLAs cost effectively:** SUSE Linux Enterprise High Availability Extension delivers all of the components necessary to implement highly available Linux clusters, both physical and virtual—at a fraction of the cost of other clustering solutions. You can implement and configure a variety of clustered solutions to provide continuous access to your most mission critical applications. Virtual servers can even be clustered with physical servers to simultaneously improve services availability and resource utilization.

• **Ensure continuous access to mission-critical systems and data:** SUSE Linux Enterprise High Availability Extension allows you to ensure that your most mission-critical applications continue to deliver business value, 24 hours per day, every day. It does this by using high availability clustering to automate application and data recovery. You can use the integrated suite of innovative open source clustering technologies in SUSE Linux Enterprise High Availability Extension to implement highly available Linux clusters and eliminate single points of failure. You maintain business continuity and minimize unplanned downtime because your servers are continuously monitored. And when a fault or failure occurs, the workload is transferred from one server to another, or the application is automatically restarted on a known working system.

• **Maintain data integrity:** With SUSE Linux Enterprise High Availability Extension, you can protect your data assets using your existing IT infrastructure, and minimize data losses due to corruption or failure. It delivers continuous, real-time replication of data, ensuring that multiple copies of data are available at all times. The ability to incrementally synchronize large databases and data repositories reduces data recovery times. Built-in locking mechanisms ensure data integrity by only allowing one application to access shared storage at a time.

Why is the product called an “extension”?

The product is called an extension because it is an add-on product to SUSE Linux Enterprise Server 11, and it “extends” the capabilities of the server operating system. You need both SUSE Linux Enterprise Server and SUSE Linux Enterprise High Availability Extension to set up highly available Linux clusters. Paid subscriptions to both are also required to get technical support and maintenance for your clustered Linux servers.

Why should I choose SUSE Linux Enterprise High Availability Extension over other options?

When you choose SUSE Linux Enterprise High Availability Extension you get the most modern open source, high availability solution that supports clustering physical and virtual environments and that is:

• **More affordable and most complete solution** than other proprietary and open source clustering solutions. An annual support subscription for SUSE Linux Enterprise High Availability Extension offers the same functionality, but costs US$699\(^1\) per server node per year, well below the license, maintenance and support fees charged for Symantec's Veritas Cluster Server and SteelEye's LifeKeeper. Furthermore, included in our subscription price are resource agents—assets other vendors charge extra for. An annual subscription to SUSE Linux Enterprise High Availability Extension includes OCFS2, DRBD, ReaR, network load balancing, Metro Area Clustering, Clustered Samba (CTDB), and SAP resource agents, while Red Hat either has no functionality in these areas or charges separately for these components of a complete...

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\(^1\) All prices in U.S. dollars.
high availability solution. Additionally, Red Hat does not offer Geo Clustering and proprietary Geo Clustering solutions are far more expensive than SUSE's Geo Clustering for SUSE Linux Enterprise High Availability Extension annual subscription cost of $1,099 per server socket pair.

• **One of the most robust and secure high availability solutions** in the market today because of the tight integration of its clustering technologies with each other, and the integration of these technologies with SUSE Linux Enterprise Server. Modern high availability clustering solutions incorporate multiple components in order to continuously monitor the health of clustered resources, manage dependencies, and automatically stop and start services based on rules and policies. These components interact with each other and through the operating systems of the clustered servers to ultimately deliver highly available services. All of the essential technologies in SUSE Linux Enterprise High Availability Extension have been developed, qualified and tested with each other and with SUSE Linux Enterprise Server to ensure that they function as intended and work in concert to deliver the desired results. And because both operating system and clustering software are delivered by one vendor—SUSE—customers conveniently have just one place to call for any support issues.

• **Safer than proprietary solutions**, which expose you to unnecessary security risks. Some third-party providers of clustering and availability software, such as Veritas, require the use of proprietary kernel modules in order for their software to support Linux server clustering. Any kernel updates to the server operating system require that these proprietary modules also be recompiled and reinstalled, which is not a trivial task. And if these proprietary modules are not delivered in a timely fashion, you put your systems at risk, especially when security updates have since been issued to protect your critical systems and data. Because SUSE Linux Enterprise High Availability Extension does not rely on proprietary kernel modules, and because both it and SUSE Linux Enterprise Server are delivered by SUSE, you have the assurance of deploying a highly secure high availability solution.

**What happened to the High Availability Storage Infrastructure that was part of the SUSE Linux Enterprise 10 platform?**

It still exists. If you deploy SUSE Linux Enterprise Server 10, you can still use the High Availability Storage Infrastructure included to cluster Linux services. SUSE Linux Enterprise High Availability Extension is a new product built as an add-on for the SUSE Linux Enterprise 11 platform. Earlier versions of some of its packages, however, are included in previous versions of SUSE Linux Enterprise Server.

**What is the difference between the SUSE Linux Enterprise High Availability Extension and the High Availability Storage Infrastructure included in SUSE Linux Enterprise Server 10?**

The SUSE Linux Enterprise High Availability Extension features several completely new capabilities, as well as significant enhancements to existing technologies. New features include Pacemaker, a cluster resource management application that supports the Open Source Initiative's certified implementation of the Service Availability Forum Application Interface Specification; cLVM2, a cluster logical volume manager, a unified command line tool for easier configuration and administration, and an assortment of resource agents. Other features including OCFS2 (the Oracle cluster file system) and DRBD (for continuous data replication) have been significantly enhanced.
Do I need to purchase the SUSE Linux Enterprise High Availability Extension if I want to use the High Availability Storage Infrastructure integrated in SUSE Linux Enterprise Server 10?

No. Customers that want to use the High Availability Storage Infrastructure in SUSE Linux Enterprise Server 10 can continue to do so and receive technical support for it if they have an active support subscription, for the life of the SUSE Linux Enterprise 10 platform. But those customers that want to leverage the new functionality and ongoing enhancements delivered with the SUSE Linux Enterprise High Availability Extension must purchase an additional subscription.

What subscription and support options does SUSE offer for SUSE Linux Enterprise High Availability Extension?

There is a single subscription price for SUSE Linux Enterprise High Availability Extension, per processor architecture. SUSE Linux Enterprise High Availability Extension is included as part of your SUSE Linux Enterprise Server for the Itanium, IBM POWER, and IBM System z hardware architectures. When you purchase a subscription for SUSE Linux Enterprise High Availability Extension, you receive the same level of support for this product as the support level of your underlying SUSE Linux Enterprise Server subscription. For example, if you have a Priority subscription for SUSE Linux Enterprise Server for a given system, you will receive priority support for SUSE Linux Enterprise High Availability Extension for that system as well. All subscriptions for SUSE Linux Enterprise products entitle you to upgrades, patches, security fixes, technical support, IP indemnification and much more. For more information about our subscription options, please visit www.suse.com/support

We'd like to deploy Linux clusters, and could use some assistance. How can SUSE help us?

You can deploy and manage SUSE Linux Enterprise Server clusters with complete confidence, knowing you're backed by the world-class services organization at SUSE. Whether you run a small business or a global enterprise, SUSE has the resources you need to build and manage your IT environment. Leverage our consulting experts, obtain industry-leading training, and access our award-winning support organization to ensure you get the most from your IT investment. You can count on SUSE to provide the services you need so you can focus on what matters most to you—your business.

However, the value that we deliver is not from our solutions alone. Interoperable solutions and mixed IT environments simply can’t work without strong, productive partnerships. We share our product expertise, best practices and delivery methodologies with our qualified service partners so they can provide best-of-breed services for our solutions. We have nearly 5,100 partners, including some of the most respected names in the industry. These partners include 3,200 solution providers, value-added resellers (VARs) and value-added distributors (VADs), more than 500 training partners, and more than 1,300 technology partners, both independent software and hardware vendors.

SUSE and its partner organizations back SUSE Linux Enterprise Server and SUSE Linux Enterprise High Availability Extension with a comprehensive set of offerings for implementation and training, with specialized practices in
enterprise platform services, data center technologies and open source development. We are ready to help you quickly deploy SUSE Linux Enterprise High Availability Extension inside your organization. For more information about the service options available, please visit http://www.suse.com/products/

**How much does the SUSE Linux Enterprise High Availability Extension and Geo Clustering for SUSE Linux Enterprise High Availability Extension cost?**

There is no license fee for using the SUSE Linux Enterprise High Availability Extension. In fact, you can download the clustering software for free from http://www.suse.com/products/highavailability/eval.html

SUSE charges a small fee, however, for support and maintenance. A paid subscription to SUSE Linux Enterprise High Availability Extension comes with major benefits—immediate delivery of upgrades, patches and security fixes; access to award-winning SUSE technical support; IP indemnification; and much more. For our most current pricing please visit www.suse.com/products/highavailability/how-to-buy/

**Where can I get SUSE Linux Enterprise High Availability Extension?**

You can purchase SUSE Linux Enterprise High Availability Extension directly from SUSE, or from one of our resellers and solution providers.

- To buy directly from SUSE, please visit www.suse.com/products/highavailability/how-to-buy/
- To buy via a reseller or solution provider, search www.novell.com/partnerlocator/locator.do?country=

**Where do I get more information about SUSE Linux Enterprise High Availability Extension, SUSE Linux Enterprise Server, and the SUSE Linux Enterprise platform?**

For more information about SUSE Linux Enterprise High Availability Extension and Geo Clustering for SUSE Linux Enterprise High Availability Extension, visit:

- www.suse.com/products/highavailability/

For more information about SUSE Linux Enterprise Server, visit:

- www.suse.com/products/server

For more information about SUSE Linux Enterprise, visit:

- www.suse.com

For more information about support and services for SUSE Linux Enterprise Server, visit:

- www.suse.com/products

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