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Article

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Authored by Mirko Dölle

Red Hat Enterprise Linux 5.1 and SUSE® Linux Enterprise Server 10 in Comparison

At the beginning of November, Red Hat* presented the new version of its Enterprise Linux*—5.1. We compared it with its direct competitor, SUSE® Linux Enterprise Server 10 with Service Pack 1 from Novell®, and took a particularly close look at the high-availability cluster and virtualization.

For the professional use of Linux on servers, many companies rely on certified server distributions such as Red Hat Enterprise Linux (RHEL) or SUSE Linux Enterprise Server in order to be able to receive support from third-party hardware and software vendors if there is a problem. Uncertified Linux distributions such as Debian* Linux or CentOS—the free RHEL clone—are technically just as well suited for database or application servers but are only rarely supported by the hardware and software manufacturers.

There is very little difference between the server distributions from Novell and Red Hat in this regard. All of the major manufacturers, such as HP*, IBM*, Oracle* and SAP*, have certified both Linux systems—not only for different software, such as databases or application servers, but also for complete server systems and individual components such as RAID* Controller, for example. As such, Red Hat lists a good 2000 supported x86 and x64 computers for its Enterprise Linux, including around 600 workstations and laptops. For SUSE Linux Enterprise Server, Novell has over 2500 certified systems incorporating almost 600 workstations and laptops; however, this figure also includes Power PC, Itanium and zSeries machines. Around 500 applications from software manufacturers are certified for RHEL 5, and a good 800 are certified for SUSE Linux Enterprise Server, although Novell numbers different versions a little more precisely. So, while IBM's software range for the DB2 database has some 75 entries for SUSE Linux Enterprise Server, it only appears four times in the RHEL list.

Hardware Support

Both distributions provide roughly the same software. While it is true that Novell uses the nominally older kernel 2.6.16 and Red Hat uses kernel 2.6.18, both distributions integrate patches from newer kernels in the Enterprise Distribution kernels, so the hardware support for RHEL 5.1 and SUSE Linux Enterprise Server is equally good. With its version number 3.0.4, the SUSE Linux Enterprise Server virtualization solution Xen* is somewhat newer than the Xen 3.0.3 of RHEL 5.1, but both distributors have already incorporated functions from the current Xen 3.1. Overall, the Xen implementations of the distributions are to be considered equal. The software status for the other important services, such as Bind*, Apache*, Procmail, Samba*, MySQL* and Tomcat*, also only varies slightly. With virus scanners Amavis and ClamAV*, Java* from Sun* and IBM as well as IBM's WebSphere* Application Server Community Edition, the SUSE Linux Enterprise Server software offering is nevertheless more comprehensive than that of RHEL, which only offers Eclipse.

When it comes to sealing the systems against compromised programs due to gaps in security, Novell and Red Hat have gone down different routes. SUSE Linux Enterprise Server uses AppArmor® to limit applications' access to the system resources they actually require, while RHEL uses the more comprehensive but also more complex SELinux. There are even differences between the standard file systems: RHEL 5.1 uses the tried-and-tested ext3 file system for all data partitions and no longer supports ReiserFS, while ReiserFS is still the standard file system

for SUSE Linux Enterprise Server. However, Novell will also upgrade to ext3 for SUSE Linux Enterprise Server 11.

When it comes to price, Novell has the edge. For example, the standard version of SUSE Linux Enterprise Server with one year's telephone support including a response time of four hours costs just under EUR 575 and permits up to 32 physical CPUs. Red Hat charges around EUR 760 for RHEL 5.1 with comparable support, but limits the number of physical CPUs to just two. Furthermore, the cluster functions are included in the standard version of SUSE Linux Enterprise Server. With RHEL 5.1, you must purchase the Advanced Platform at a cost of almost EUR 1500. However, this will then run on as many processors as you want.

The greatest differences between the distributions are in the tools provided for the administration of the different services and programs. Here Novell has the edge, with various YaST modules for setting up network services such as the Web server, Kerberos, NIS, NFS*, Samba, DNS server and NTP* server. Even iSCSI drives can be incorporated into the network with a few mouse clicks. Red Hat offers significantly fewer administrative front-ends; for example, there are no counterparts in comparison to Novell iSCSI and DNS administration tools.

In this test, we particularly looked at the areas of high availability and virtualization, which play a large role in the professional world today. One glance at the VMware* ESX Server should also show where the virtualization tools of the two Linux distributions stand in comparison to the virtualization leader. For this, we cooperated with Munich Airport, where the administrators and IT Quality Management provided their hardware and supported us for the test.

For the 32-bit version and cluster tests, we used two HP ProLiant* DL360s, which were equipped with two older Xeon* processors with 2.8 GHz and 2 GB RAM. Additional equipment included one "Emulex Thor-X LightPulse Fiber Channel Host Bus Adapter," via which an EMC Symmetrix was connected by SAN to a total of 21 drives as a cluster data storage unit, as well as two "Broadcom NetXtreme* BCM5703X Gigabit Ethernet" adapters. The HP server's CSB5 chip set also came from Broadcom. We installed the 64-bit versions of the two Enterprise Distributions on two Fujitsu Siemens RX300s with two Quad-Core Xeons with 2 GHz, Intel chip set and 2 GB RAM. Here the full virtualization was also tested, since the HP server did not have corresponding hardware virtualization functions. However, the Fujitsu Siemens machines only had two 146 GB SAS hard drives each (Seagate* ST3146855SS Cheetah*, 15,000 rpm). Two "Broadcom NetXtreme BCM5715 Gigabit Ethernet" adapters supplied the network connection.

During the installation and subsequent configuration of the distributions, there were few surprises. The HP server's "Compaq Smart Array 5i/532 SCSI RAID" controller, the RX300's LSI SAS1068 SAS controller and, the fiber channel controller built into the HP servers with all 21 drives were easily recognized by both distributions.

The iSCSI drives exported by SUSE Linux Enterprise Server can also mostly be incorporated without any problem, although it has resulted in crashes on the HP servers with SUSE Linux Enterprise Server due to a faulty and in the meantime updated Open-iSCSI package in the graphical iSCSI configuration. RHEL 5.1 had problems with the display of the Setup Wizard on the Fujitsu Siemens servers with an integrated Matrox* G200 graphics chip. The operation buttons along the bottom of the monitor disappeared in graphic failures so it was somewhat difficult to complete the installation. If you select text mode instead of the graphical installation, there are no problems on either of the two distributions.

Tools

With the tools for configuration and administration, Novell and Red Hat take very different approaches. While Novell combines the various configuration modules in YaST* with a very uniform user interface; RHEL 5.1 uses a variety of tools that are independent of one another and that in detail are very different to operate. However, there are also similarities, for example both distributions use the Virtual Machine Manager developed by Red Hat for the setup and administration of virtual machines.

The RHEL 5.1 and SUSE Linux Enterprise Server clustering tools differ significantly. While Red Hat uses Conga*—which is very easy to operate with the Web front-end Luci*—in the Advanced Platform, SUSE Linux Enterprise Server only uses a rudimentary YaST module to set up the heartbeat channels and start the cluster. All additional configuration work such as the setup of fencing, resources, services and dependencies is carried out either by importing XML files or via the front-end hb_gui, which is actually only an XML browser for the cluster configuration file.

The daily cluster monitoring and service administration provided by Conga from RHEL 5.1 is streets ahead of the Novell solution. In Conga, services can easily be repositioned for maintenance purposes onto other cluster nodes with a click of the mouse; while in SUSE Linux Enterprise Server, the parameters of the service dependencies must be manually changed in the hb_gui before you can stop the service and restart it on the desired node.

One disadvantage of the Red Hat tool is that the front-end Luci must be installed on a separate computer outside of the cluster. This can be a simple desktop computer with RHEL 5.1 and no redundancy. Should this computer ever fail, the cluster can still be managed with the program system-config-cluster; however this is just as difficult as with the hb_gui in SUSE Linux Enterprise Server.

Difficulty aside, neither of the two distributions has any weaknesses from an operational point of view. We tested both clusters with two nodes and equivalent processor platforms and with three nodes in a mixed 32- and 64-bit configuration. Both clusters were also able to manage virtual Xen guests and combine them into one virtual cluster. You can find details on this in the following article.

There are differences between the cluster file systems, which provide simultaneous access to data storage units like the SAN drives from Symmetrix*. Novell relies on the Oracle Cluster File System 2 (OCFS2) for this, which as standard provides no protection against simultaneous writing of the same file by different nodes; while Red Hat uses the Global File System 2 (GFS), which only allows competing write access after explicit configuration and no longer requires a dedicated locking server.

Both Enterprise distributions use Xen as a virtualization solution. Despite the similar version status, the Xen kernel and hypervisors are not compatible with one another. Therefore, RHEL 5.1 cannot be installed as a paravirtualized guest under SUSE Linux Enterprise Server, and a paravirtualized SUSE Linux Enterprise Server cannot be installed on an RHEL 5.1 host either. It is questionable whether the distributors also deliver Xen kernels that are adapted to the hypervisor of the respective competitor. Until that point, only full virtualization remains—which requires the corresponding functions of the processor.

Both distributions use the Virtual Machine Manager (virt-manager) for the management and setup of virtual machines but have different adaptations. The virt-manager of SUSE Linux Enterprise Server, for example, provides more comprehensive administration for the virtual drives than that of RHEL 5.1.

While a paravirtualized SUSE Linux Enterprise Server could be installed in an SUSE Linux Enterprise Server host system without any problems or peculiarities, the installation system in the paravirtualization under RHEL 5.1 did not find the installation DVD—which is why we used an NFS drive with the content of the DVD as the installation source.

If you want to adapt the configuration of a virtual machine, you hit the limits of the virt-manager with both distributions. Although the SUSE Linux Enterprise Server virt-manager does display that it has accepted changes to drives or the number of CPUs, nothing is actually changed and the old settings are reinstated when virt-manager is restarted. Although the RHEL 5.1 Virt-Manager does allow you to add more drives, it falls down when creating a virtual CD-ROM. Ultimately, changes to the Xen configuration files must be inserted manually, or the virt-manager configuration has to be deleted and a new VM created with the amended settings.

The direct competitor in terms of virtualization is the VMware ESX Cluster, which is used for the administration of the Virtual Infrastructure Client (VI Client). However, Windows* Client is required for this, as there is no Linux version of the VI Client. During the test, the most difficult task was not setting up or adjusting the virtual machines using the VI Client, but managing the VMware licenses. On the whole, the VMware tool is very well thought-out and are beyond comparison with the RHEL 5.1 and SUSE Linux Enterprise Server virt-manager versions, which only meet the demands of an Enterprise Distribution management tool to a very limited degree.

Virtually Measured

If existing servers are replaced by virtual machines, the performance loss in virtualization compared to a natively running system is especially interesting. A large problem when measuring the performance of virtualized machines, however, is that the timers that use benchmark programs for the measurements are also stopped by the hypervisor. In principle therefore, transfer rates and access times turn out to be better than they actually are.

Nevertheless, in order to get a clue as to the performance of virtualized systems, we conducted measurements with the various virtualization solutions and distributions. The test scenario we selected was the virtualization of a Windows 2003 server. For this test, we installed Windows both natively on the Fujitsu Siemens servers and also fully virtualized under VMware ESX Server, SUSE Linux Enterprise Server and RHEL 5.1. We also tested the paravirtualized Windows drivers—which Novell offers for download for SUSE Linux Enterprise Server—under both Linux distributions.

We used Iometer version 2006.07.27 as a benchmark with the following settings: 100 percent sequential read, 64 KB blocks

Performance Measurement under Windows 2003 Server

System	I/O Performance [IO/s]	Data Throughput [Mbyte/s]
	better >	better >
Native Installation	1790	112
Virtualized under VMware ESX 3.2	1240	77
Virtualized under SUSE Linux Enterprise 10 with PV Drivers	1550	96
Virtualized under SUSE Linux Enterprise 10 without PV Drivers	1300	83
Virtualized under Red Hat Enterprise Linux 5.1	930	58

and 32 outstanding I/Os on one 10 GB LVM partition. Comparison measurements showed that the readings of a virtualized Iometer are around eight to ten percent too high compared to a paravirtualized system. Asked about the practicability of the Iometer measurements, VMware also explained that the time response of Iometer would not be exactly true to reality but would come close to it.

Because of the cache problem—Iometer normally has direct access to the hard drive, which does not work in virtualization—the measurement results of the virtual systems and those of the native Windows installation cannot be compared to one another. Up to now, there have been no benchmarks that are adapted to the difficulties of virtual machines and that allow a comparison with a natively installed system to be made.

The Iometer measurement results *(see table)* show that a fully virtualized Windows 2003 server under VMware and SUSE Linux Enterprise Server delivers around the same performance, while it is slower under RHEL 5.1. When the Windows driver package was installed from the Novell homepage, the hard disk driver, network driver and system-bus driver were replaced by the paravirtualized driver (PV driver). As a result of this change, the data throughput increased. A test of the paravirtualized Windows drivers was not possible on the RHEL 5.1 host because Windows did not boot with the new hard disk driver. RHEL users must therefore still forgo the speed advantages of a paravirtualized driver, although according to the readings, this is what RHEL particularly needed the most.

Conclusion

VWith regard to hardware support, software range and certifications, Red Hat Enterprise Linux 5.1 and SUSE Linux Enterprise Server 10 satisfy the usual corporate requirements. The essential differences lie in the tools offered. Here SUSE Linux Enterprise Server is on the whole better equipped than RHEL 5.1. With regard to virtualization, however, VMware with its successful administration front-end is still one step ahead of the two Enterprise Linuxes. When it comes to the capability of the virtualized systems, the Linux suppliers have already overtaken the virtualization specialists with Xen—at least with regard to the data transfer rate.

Anyone who operates a classic cluster is in good hands with Red Hat Linux 5.1—the SUSE Linux Enterprise Server configuration tools cannot hold a candle to Conga from RHEL 5.1. However, Novell gains points when it comes to virtualization, especially when the paravirtualized Windows drivers are used—performance is well above that of RHEL 5.1. Given the target group of the Enterprise distributions, Novell and Red Hat's virt-manager—the central configuration tool for virtualization—is merely covering up for the lack of a functioning program tailored to practical needs, such as the VMware VI Client.

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1 800 714 3400 U.S./Canada
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Novell, Inc.
404 Wyman Street
Waltham, MA 02451 USA

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