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Multinode Clustering:

NetWare Cluster Services Expand On Reliability

Novell's clustering solution allows high-reliability failover service among much larger collections of servers than competing alternatives. Sharing a failed server's load over more nodes makes clustering even more affordable.

By [Logan Harbaugh](#)

As more companies rely on the Web for business transactions of all sorts, from E-mail to Web servers selling products, it becomes crucial to provide service 24 hours a day, seven days a week, with no interruptions or downtime. The old notion of being able to take systems down for maintenance at night fails completely in the Internet world--if you have a Web server, there will always be customers wanting to log on from somewhere where it's not the dead of night.

Clustering is one way to increase availability. It allows a set of servers to be connected, sharing the load among the clustered systems if one server goes down. In the mainframe world, clusters also allow load balancing, so an application can be automatically moved from a heavily loaded server to one that's not as heavily loaded. That feature hasn't been realized in the network operating-system market yet. Rather, most load-balancing needs must be addressed with other technologies: load-balancing routers or features such as the IP load-balancing support in Windows 2000. In some cases, such as relatively static Web sites, these load-balancing solutions provide many of the same benefits as a full-blown cluster solution. You'll have to manage mirroring updates to the Web site's content across all the load-balanced servers, but that's relatively trivial. For other applications, such as transactional databases or groupware, maintaining two or more copies of the data in perfect synchronization is a major obstacle--hence the need for a real clustering solution.

Until now, clustering in that marketplace really meant only two-node failover, where no more than two nodes could be clustered, with one taking over applications from the second in case of a failure. The problem with two-node clustering is that it severely limits the use of the servers. If the servers normally run near 50% capacity, diverting the combined load to a single server would overload the surviving platform.

Novell is the first major network operating-system player to market with a multinode clustering product. NetWare Cluster Services for NetWare 5 allows up to eight nodes in a cluster out of the box and will support up to 32 nodes with special support from Novell. This allows servers to be used more efficiently--individual servers can carry heavier loads, since each application can be distributed to a different server, rather than having only one other server to which to failover.

NetWare Cluster Services for NetWare 5 also supports failover clustering of both applications and network services, including file and print services as well as services such as Dynamic Host Configuration Protocol (DHCP) and domain name system. This lets administrators cluster critical

network services as well as applications such as Web servers or database servers.

NetWare is installed on two or more servers in what is to be the cluster. The servers share a storage device, either a Fibre Channel storage system shared through a daisy-chain or Fibre Channel hub or switch, or a shared SCSI device. The shared volume allows files from one server to be accessed by the server that's taking over its duties. The servers communicate synchronization information over a standard network interface--a separate network hooking the servers together isn't required, although it can be set up that way.

Shared storage isn't strictly required either--it's possible to replicate data between the servers using a product such as Novell Replication Services to replicate data to all servers and do without shared storage, although this would require that each server have more storage than a shared storage solution would use. Also, if applications were all using static data, such as Web servers, it would be possible to have all the data reside on all servers--meaning that replication would not be necessary.

NetWare Storage Services and TCP/IP are required. NetWare Storage Services ensures that volumes can be dismounted from the inactive server and remounted by the next server in a timely manner. NSS volumes mount much more quickly than standard NetWare volumes, regardless of the size of the volume or the amount of data it contains.

TCP/IP lets clients reconnect to the new server without having to reboot the client. IPX/SPX isn't supported in the cluster environment, since clients would generally have to reboot their workstations if a server in the cluster failed.

I installed NetWare5 and Novell Cluster Services for NetWare 5 on four Gateway 7300 servers, using a Winchester Systems FlashDisk Pedestal, a RAID 5 storage device that accommodates up to four hosts via SCSI. The most difficult part of the configuration was installing NetWare on all four servers--administrators contemplating a large cluster would be well-advised to look into a software distribution mechanism, such as Novell's ZENworks for Servers.

With NetWare 5 installed on all the servers, I set up the storage subsystem. NetWare Cluster Services requires a special cluster partition on the shared storage device, so I left free space for that and created two volumes for each server on the FlashDisk. I then installed NetWare Cluster Services. The installation is straightforward and relatively simple, considering the overall complexity of the system. The only other requirement is that the administrator's workstation be running Novell's Client 32 software and the ConsoleOne management interface.

It's a good idea to read through the documentation first, as I found a couple of requirements for application installations buried relatively deep in the instructions, such as whether volumes needed to be cluster-enabled for particular applications and the requirements for cluster-enabling volumes. Cluster-enabling volumes involves creating them as a special cluster resource with their own IP address, so the files on the volume can be made available from another server (rather than just to another server) if the first server fails. The difference here is that a cluster-enabled volume is available to users after failover, while a shared volume is available only to server applications.

In general, enabling applications is a simple process. The application is installed on the primary server that will run it and may need to be installed completely on the other nodes to which it will need to failover. An application object is then created for the cluster using ConsoleOne from the administrator's console.

The object contains information about the application, such as the IP address that will be used to access the application, the scripts that will run on the server that fails and on the new server the application moves to, as well as the designated cluster nodes for the application to move to, how it should be moved (automatically or manually), and when it should move back to the original server (failback). These objects are administered through the same ConsoleOne or NWAdmin interface as any other NetWare objects--a familiar task to any NetWare administrator.

To put the cluster services through their paces, we installed several enterprise platforms: GroupWise, Novell's Distributed Print Services, Oracle8i, and Netscape's Enterprise Server.

The GroupWise cluster installation instructions recommend that GroupWise volumes not be cluster-enabled. However, other services, including file and print, would require a cluster-enabled volume, so administrators may wish to create two or more shared volumes per server, one enabled and one not.

Installing GroupWise in a clustered environment is only a little more complex than a standard installation. When GroupWise is installed on one server, the agents must be installed on the other servers, which is a step in the standard installation process. It's also recommended that you use protected memory, which is simple to enable. Once GroupWise is installed, the next step is to create a GroupWise cluster resource, also a simple task. Once the resource is created, you edit the unload and load scripts, entering the proper IP addresses for the server that should be taking over for each post office, for instance.

Installing Novell Distributed Print Services in a clustered environment is also a little more difficult than a standard installation. Once NDPS is installed on a server, you create a cluster-enabled volume for print queue information, designate that volume for NDPS queues, enable the volume in the cluster, then create an NDPS print broker and print manager. The only step that's unique to clustering is creating the cluster-enabled volume. Finally, you create the NDPS volume load and unload scripts, which designates to which server the service fails over, which servers can mount the volume, and so forth. This is a simple process involving editing the template files provided.

Installing Oracle is only a little more difficult than the previous applications, primarily because the Oracle installation itself is more complex. It requires a dedicated volume, which shouldn't be cluster-enabled. The installation of Oracle is relatively straightforward for a large, capable database, and the installation must be done correctly to one server in the cluster as the next step. Once Oracle is correctly installed, you create an Oracle cluster resource, which, as with the previous two examples, includes templates for unload and load scripts. Once the resource is created, the scripts are edited to include the correct information on the other servers in the cluster and start, failover and failback modes are set.

Netscape Enterprise Server must be installed on all the servers in the cluster to which you might want it to failover. In addition, the administrator password and port number must be the same in every case, the default primary IP address must be used (secondary floating IP addresses can be added later), a shared volume is necessary, but cluster-enabled volumes for data aren't recommended. As with the other applications, once the basic installation is complete, a cluster object is created, thereby creating templates for unload and load scripts. The scripts are edited to designate which Web servers are failed over to which nodes in the cluster.

With Netscape, there's an additional step. The Hardware Virtual Server must be installed on each server in the cluster that will support Netscape, and each Web site on the server must be configured with an IP address that will move from node to node in the event of a failure. Also, there are some lines that must be added to the unload and load scripts for each Web site.

Once all the applications were installed, I tested failover in two ways; first by shutting off one of the servers in the cluster, simulating a hardware failure, then by using ConsoleOne to migrate applications manually from one node to another, as an administrator would do to upgrade a server. In both cases, failover of applications was seamless--even a large print job in the middle of spooling to the server continued on the new server. Once the server was brought back online, applications failed back to the original server.

By using ConsoleOne from the administrative workstation, it was easy to monitor cluster resources as they moved automatically or to move them manually from one node to another.

Even with several large, complex applications installed simultaneously on the same cluster, a configuration many users might not attempt, there were no bobbles as applications moved from one node to another.

NetWare Cluster Services for NetWare 5 supports only NetWare 5, not the newly released NetWare 5.1. NetWare Cluster Services for NetWare 5.1.1 will support NetWare 5.1 and the new Internet services included in NetWare 5.1, and should be available by the end of the first quarter. In addition to support for NetWare 5.1, it will offer a number of other enhancements, including greater DHCP support, which will allow DHCP services to move to any node in a cluster, out-of-box support for up to 32 nodes, and improved management of the cluster.

In all, configuring cluster services and applications on the cluster is relatively simple, especially compared with currently shipping two-node products. The product worked well and the installation was easy, partially because of the templates provided. Installing an application without a template would be a little more complex, since the unload and load scripts would need to be created from scratch. Still, the administrative tools are exemplary.

Since Novell doesn't require specific hardware certification (just that the servers be the minimum configuration for NetWare), and since nodes in the cluster don't even need to be identical and requirements for shared storage are also broad and easy to fulfill, NetWare Cluster Services is much easier to set up than competing products. This product is good enough to bring developers back into the Novell fold, especially once the version that supports NetWare 5.1 is released.

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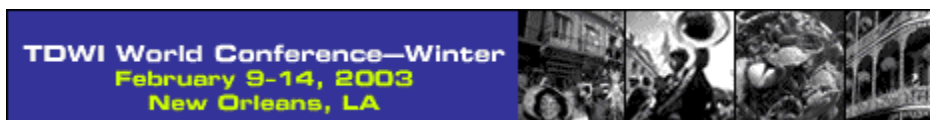
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