IBM Netfinity ClusterProven Program

A foundation for complete solution performance

Executive Summary

IBM's Netfinity® ClusterProven™ Program is a major initiative in the computer industry to raise the bar of high availability by creating meaningful relationships with application providers. The program provides extensive support to multiple solution developers who want to achieve these new high standards. This program once again extends IBM's tradition of support and opportunity for its solution developers. The ClusterProven Program opens the door for hundreds of developers trying to respond to the demands of e-business by leveraging major gains in the high availability and scalability of IBM Clustered Servers.

The ClusterProven Program initiative is another example of IBM's commitment to extremely high availability and scalability provided by IBM Clustered Servers, and builds a foundation for complete solution performance. Whether customers choose IBM Netfinity midrange 5000 and 5500 family or the high-end 7000 M10 servers, they can leverage leading-edge clustering technologies and availability achievements. The new standards of high-availability application solutions can be applied to various combinations of operating system, middleware and end-user applications. A solution meeting the technical criteria will be validated with IBM and registered as ClusterProven.

According to Strategic Research Corp., the application market for clustered solutions on PC, UNIX® and mainstream platforms will reach $200 million in 2003, not counting operating systems. In addition to that, the services for cluster solutions produce 3.5 times cluster software revenue. (Source: Strategic Research Corp., *Clustering Market Analysis*, September 1998). IBM's ClusterProven Program is designed to help its solution developers enter this enormous market and capture a significant business opportunity.

This paper provides an overview of the Netfinity ClusterProven Program, its role in IBM's Cluster Services and the benefits it can help provide to solution developers. It explains the qualifications required to join the program and the criteria for the two levels of solution validation and registration offered. It also offers an overview of IBM's X-architecture blueprint that is bringing the technology of our large server systems to the Netfinity family of products, and a brief discussion of IBM's Netfinity servers. Given the rapidly changing nature of the industry, IBM reserves the right to change the implementation and terms of the program.

Introduction

IBM has introduced the ClusterProven Program as part of an ongoing, strategic effort to help solution development partners on their way to continuous system and application availability. This initiative demonstrates IBM's and its solutions developers' commitment to high availability and scalability in IBM Clustered Servers.

High availability is a critical factor for almost every industry in today's electronic world. The growing popularity of Enterprise Resource Planning (ERP) systems and core computing support enterprise development and growth, but at the same time they increase dependency on information technology. Because a company's operations might be based on the functionality of one computer system, its failure to perform even for a short time can result in significant losses. Productivity of an entire enterprise can be interrupted if one server goes down, especially if it runs supply chain applications or supports a highly integrated ERP application. According to an estimate made by Standish Group, the average cost per minute of downtime is $10,000 in revenue, productivity or profit.[1] Therefore there is a growing demand for application solutions with increased reliability and availability. These applications often require businesses to be operating 24 hours a day, 7 days a week and 365 days a year. Without this around-the-clock availability, businesses cannot work to their full potential.

In such environments, choosing the most available computer system becomes a vital business decision. And connecting systems together into clusters is rapidly becoming a preferred configuration in such demanding environments. Clustering can offer the reliability, availability, scalability and manageability you need for your Intel processor-based servers. Clustering offers the following potential benefits:

- High availability by proactive monitoring for failures and initiating automatic recovery mechanisms
- Access to data and shared devices in the cluster
- Improved performance and the ability to manage future growth
- Workload balancing among cluster nodes
- A single point of control and management
- Redundancy, even to the system level

The ClusterProven Program has been developed to help leverage customers' investments by encouraging the development of solutions that provide meaningful availability and scalability benefits, as well as meeting carefully defined technical and functional requirements.

IBM ClusterProven Program

The ClusterProven Program is focused on providing robust and effective support to qualified Netfinity solution developers to join the high-availability trend through delivery of proven, highly available solutions to their customers. To join the program and become eligible for using the name "ClusterProven" or "Advanced ClusterProven," it is necessary to ensure compliance with the program technical criteria. When an application meets the

[1] Standish Group *Research Note: Pound Foolishness*, 1998 High Availability Forecast.

criteria, the solution developer will complete a standard checklist and testing summary. When a checklist is filled out, an expert from IBM Netfinity servers will contact the solution developer and go through the list with the developer's representative to ensure the correct understanding of procedures and definitions.

Upon validation (which can be done on the solution developer's premises) and approval of the submitted checklist, IBM will provide the solution developer with an opportunity to register the solution as ClusterProven or Advanced ClusterProven. To do so, it is necessary to sign the ClusterProven Trademark Use Agreement, which includes the rules for placing the trademark on products and promotional materials; it also states the limitations and responsibilities of both parties. IBM will maintain the register of ClusterProven and Advanced Cluster Proven solutions.

In 1999 the Netfinity ClusterProven Program will focus on solutions for Microsoft Windows NT and MSCS. In the second half of 1999 and beyond, IBM intends to expand the program to include additional clustering platforms and Advanced ClusterProven testing.

ClusterProven and Advanced ClusterProven solutions will be identified in the IBM Global Software Solutions Guide, accessible online by customers. Solution developers in the may benefit from cooperative marketing activities and customer awareness with education activities that exploit the ClusterProven trademark, can interlock with other advertising campaigns and deliverables, and may participate in IBM analyst and media events.

Netfinity High-Availability Clustering Subsegments

Solution developers who are eligible to join the program must meet certain qualifications from IBM.

They are identified in a key Netfinity subsegment:

- Infrastructure
- Transaction Processing
- Enterprise Resource Planning
- e-business
- Business Intelligence

Their applications align with selected industries:

- Distribution
- Cross Accounting
- e-business
- Manufacturing
- Telecom and Media
- Business Intelligence
- Banking, Finance and Savings
- Health

Their applications demonstrate Netfinity ClusterProven leadership attributes with:

- High availability

- Solution developer partnership
- Validated and registered applications

And they have a service and support infrastructure. Refer to “IBM Support and Service” later in this paper for details.

ClusterProven Program Categories

An application meeting the technical criteria will be validated with IBM and registered as ClusterProven. An application can also be validated and registered as Advanced ClusterProven. The criteria are as follows.

ClusterProven. A solution (an application that runs on a Netfinity certified platform) can be registered as ClusterProven if it:

- Has been tested in and integrates smoothly with a Netfinity clustering environment
- Switches to an alternate cluster node in the event of an unrecoverable failure of any system component
- Gracefully recovers after switching nodes. Graceful recovery implies the following characteristics:
    - The solution maintains application availability in the event of failure.
    - The solution provides failure recovery with minimal impact on application availability at the client level.
    - Data integrity is preserved during failover. (However, it does not imply guarding against in-flight data loss).

Advanced ClusterProven. In addition to the base ClusterProven registration, a solution developer could add at least two items from the Advanced ClusterProven solutions category. The Advanced ClusterProven category provides increased benefits above the ClusterProven status and moves customers even closer to continuous operation. This status implies a higher level of application integration and the delivery of superior high availability and scalability.

Examples of Advanced ClusterProven characteristics are:

- Proactive notification before failure
- Application monitoring
- Recovery of transactions upon failure (up to client applications)
- Start/Stop scripts running Vinca Co-Standby Server for Microsoft® Windows NT®
- Dynamic workload balancing
- Cluster serviceability and diagnosis
    - Isolation of failed node from a cluster
- Further reduction of costly downtime for planned upgrades
- Integration with Netfinity management capabilities.

To help solution developers as they develop clustering technology within their solutions, IBM Netfinity will provide new, worldwide partnership centers of competency where IBM will provide clustered server equipment and technical expertise, including workshops, to assist solution developers in their implementation of clustering.

ClusterProven Test Summary

The goal of the Netfinity ClusterProven checklist is to provide solution developers with guidelines for validating their applications for the ClusterProven Program. The validation objectives are intended to demonstrate that an application solution meets the prescribed ClusterProven criteria using the following testing methodology:

- Test the installation of the application
  - Product can be installed from a new installation package (or normal maintenance package), and the overall functional capabilities described are included in the installation package, along with any helpful installation and configuration tips
  - Solution developer documentation adequately describes the installation process in a high-availability environment
- Test the functionality of the application with the cluster platform (hardware, operating system plus MSCS or other cluster software)
  - Application launches correctly
  - Application is recognized as an appropriate resource in a high-availability environment
  - Automatic failover occurs in the event of a failure
  - Application failover keeps the system up and running
  - The application starts on the surviving node
  - Data integrity is preserved during failover (but this does not imply guarding against in-flight data loss)
  - Application is fully functional after hardware-induced failure
- Test the integration of the application with other applications in the cluster
  - The application can run concurrently with other applications in the cluster
- Measure application performance under different user loads
  - State what tuning, if any, was required to achieve maximum performance, and any effects on cluster operations
  - Measure CPU utilization under maximum user load

IBM Solution Partnership Centers

The ClusterProven Program is focused on providing robust and effective support to Netfinity Partners in Development to join the high-availability trend through delivery of proven, highly available solutions to their partners. To help solution developers with ClusterProven and testing, IBM offers Solution Partnership Centers (SPCs) in Waltham, Massachusetts and San Mateo, California. These centers support developers with state-of-the-art Netfinity Cluster Server equipment. Their expertise will help solution developers achieve ClusterProven validation for their applications.

IBM Netfinity Server Solutions: X-architecture Blueprint

PC servers are continuing to expand their role in the enterprise, growing from traditional, back-office applications to business-critical servers. In response, IBM has harnessed decades of expertise and experience that helped build our enterprise systems, and applied that knowledge toward building its new generation of IBM Netfinity servers.

Drawing on that experience and expertise, IBM has developed a blueprint to bring the reliability, availability and scalability of our mainframe servers to the Netfinity family of products. This blueprint is called *X-architecture*. IBM designed X-architecture to:

- Leverage IBM's vast technology portfolio and server expertise into industry-standard computing
- Help customers reduce their total cost of ownership
- Set the standard for enterprise quality through unmatched testing, systems integration and compatibility

IBM Netfinity systems extend today's industry-standard platform beyond the server to include advances in technologies needed to implement business-critical core business, e-business and deep computing applications. IBM is committed to delivering Netfinity server solutions with industry-leading high-availability solutions that address the dynamically changing needs of emerging IT strategies.

Key elements of the Netfinity X-architecture include powerful processors, reliable and available memory systems, scalable I/O, world-class silicon and module technology and advanced caching software. Also included are clustered systems featuring technology derived from IBM's industry-leading AS/400®, RS/6000® and S/390® products, as well as interoperability with existing large and midrange systems.

And in a recent survey of 753 PC server customers, Netfinity Manager™ 5.2, IBM's system-management middleware for Netfinity servers, was voted the top PC server management tool in all four categories of satisfaction assessed: functionality, ease of use, integration with respondent's enterprise systems management product, and integration with respondent's desktop management product. HP OpenView NNM was the only product to tie with Netfinity Manager in any category, in integration with desktop management product.[2]

According to data from Standish Group[3] in 1997, IBM had clear leadership in the hardware part of the high-availability solutions market, with a 37% market share. IDC has identified IBM as the world's largest server company, building and installing more servers—such as Microsoft Windows NT, UNIX, mainstream and enterprise servers—than any other company in the industry.[4] IBM has no agenda in advocating any particular server architecture: each one has strengths and weaknesses, depending on the user's industry, company and the kinds of transactions managed. There is no single solution that is best for every business, nor is there any single operating system. For example, almost every business has existing investments in servers and the applications that run on them—servers and software that are as disparate as the businesses that own them. Knowing how to preserve and extend these investments while adding new servers and new capabilities is critical. After all, the Web's real business value lies in increasing your efficiency and effectiveness by allowing fast deployment of new applications, while expanding the capabilities of applications and architectures you already have. This paper focuses on IBM's Netfinity server platform.

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[2] Datapro *1998 User Ratings Survey of PC Servers*, January 1999.

[3] Standish Group Research Note: Pound Foolishness, 1998 High Availability Forecast.

[4] IDC Server Market Review and Forecast, 1995–2002, December 1998.

Base System Hardware and System Availability

IBM is exploiting a variety of memory and reliability, availability and serviceability (RAS) techniques learned from decades of large-system leadership for Netfinity systems. They are designed for proactive and predictive systems management.

Features such as the following are designed into many Netfinity models:

- Mechanicals to allow easy access to components with a limited set of tools to maximize serviceability
- Extensive use of hot-plug and hot-add components to allow replacement without taking your server offline
- LEDs and panels to provide you with at-a-glance problem identification
- Components utilizing Predictive Failure Analysis® (PFA) to alert you before component failure
- Light-path diagnostics
- Redundant components on high-availability models for greater reliability, availability and serviceability
- Room for expansion on key components like disks, memory, power, processors and I/O
- ROM-based diagnostics available locally or through robust remote access
- Instrumented BIOS to allow for the maximum amount of system information to be provided for inventory and problem resolution

All of these technologies are the first line of defense in avoiding costly application outages and primarily address the unscheduled aspects of high availability.

Operating System and Network Operating System Software

The dominant system software base for Netfinity servers running business-critical applications is Microsoft Windows NT (and soon Microsoft Windows 2000). IBM is working closely with Microsoft in an initiative called OnForever™, which defines a series of joint projects to enhance the Microsoft Windows operating system to exploit high-availability technologies implemented in IBM Netfinity servers. One of the first developments in this initiative was IBM's introduction of hot-plug-and-play for Windows NT 4.0.

IBM Netfinity provides the ability to not only replace existing PCI adapters in the server but also dynamically add PCI to provide on-the-fly scalability of network bandwidth or disk storage. This capability starts to address reducing the requirements of scheduled downtime to attain higher availability levels. This capability is also supported with Novell NetWare and SCO UnixWare.

High Availability with System Clustering

The greatest level of system availability to date is attainable only through system clustering. For the Microsoft Windows NT platform IBM Netfinity has support, and significant enhancements to the high-availability clustering technology built into Windows NT Enterprise Edition 4.0, known as Microsoft Cluster Server (MSCS). Netfinity has certified a vast number of configuration options for MSCS for our mainstream and high-end servers with a variety of storage technologies (Ultra and Ultra2 SCSI, Fibre Channel and Serial Storage Architecture).

In addition to providing great system and storage flexibility, Netfinity servers provide additional management capability to the MSCS environment through IBM's Cluster Systems Management. This management extension for MSCS provides cluster status monitoring and alerting as well as the ability to schedule cluster activities such as resource group placement, starting and stopping. These functions can help in the automated maintenance of systems by ensuring that applications are moved to one server or another while the other server is serviced, backed up or has software maintenance performed (such as the application of service packs).

Other system clustering solutions for high availability are also supported for Netfinity, such as Vinca Standby and co-standby server for Windows NT, Novell NetWare and IBM OS/2®. Netfinity systems also support Novell's NetWare High-Availability Server.

In the table demonstrating this support, *OS* stands for *operating system*, *HW* stands for *hardware* and *MW* stands for *middleware*.

Current IBM Netfinity Clustering Solutions	**Cluster Technology Layer**	**High Availability**	**Scalability**
Microsoft Cluster Server—Microsoft has certified a full range of IBM Netfinity system clusters storage subsystems. IBM Cluster Systems Management (ICSM) provides monitoring, alerting and automated actions; improves control over MSCS environments; as well as a resource configuration wizard to enhance the manageability of Microsoft Cluster Server.	OS	X	
Netfinity Cluster Pack by Vinca—Microsoft Windows NT, Novell NetWare and IBM OS/2; 2-node "mirrored" cluster with primary and utility functionality; in event of node failure, surviving node automatically assumes the workload of the failed node; allows cluster nodes to be in different rooms or buildings.	HW	X	
IBM DB2® Universal Database™—Exploits parallel database technology; capable of supporting hundreds of gigabytes (GB) of data; extended to the Windows NT platform allows parallel query with minimal data transfer across nodes. Performance can scale in a near-linear fashion when you add Netfinity servers to a cluster running DB2 Universal Database Enhanced Enterprise Edition.	MW		X
Lotus® Domino™ Server—Allows higher availability and some load balancing by integrating up to 6 server nodes (mixture of Netfinity, AS/400, RS/6000, S/390 or other) for Domino-based applications by providing high-priority replication between server nodes.	MW	X	X
Oracle Parallel Server—High performance, high scalability, scalable technology to enable 6-node, shared-disk scalability. The no-charge Netfinity Cluster Enabler software enables this platform to scale from 1 to 6 server systems sharing hundreds of GB of disk storage.	MW	X	X
IBM WebSphere™—WebSphere Performance Pack provides availability and scalability to your Web site solutions by providing bandwidth management, caching, load balancing and high-performance data replication and file administration.	MW	X	X
Thin client/server clusters—Support WinFrame 1.7, WinCenter 3.1 and Citrix MetaFrame in a clustered configuration of Netfinity servers.	MW	X	X

Operational Availability through Superior Systems Management

Netfinity has always focused on providing industry-leading management capability—from virtually anywhere at any time—and that has helped enhance system reliability. IBM Cluster System Management is a single component of the Netfinity Manager software, which is shipped with all Netfinity servers at no additional charge. Netfinity Manager can, in addition to its cluster management capability, provide a greatly enhanced level of hardware management for Netfinity servers (as well as desktop, mobile or any IBM or non-IBM DCI-compliant systems).

Netfinity Manager provides system monitoring and alerting, remote control capability, event scheduling, capacity management, analysis and tuning assistance, to name a few of its functions. Netfinity Manager, along with the Netfinity Advanced System Management Processor technology, is a key component of the Netfinity Remote Connect (also known as "call home") service and our Mobile Support Terminal (MoST) capability.

MoST technology brings highly trained IBM support expertise to bear on complex server issues through electronic interaction from any of our support facilities.

The Netfinity Advanced System Management Processor allows administration and support personnel to maintain control over Netfinity servers and access to critical log information even if the server or operating systems are unavailable.

IBM Support and Service

A vital factor in considering what hardware systems and application solutions to purchase is often overlooked: What support and service will you receive from your vendors? If you don't know what help will be there as you make your purchasing decisions, you can find that you're left to plan, configure, install and set up your system on your own, and that can be very costly, especially for small and medium business owners. That is why IBM has, over the decades it has been in the computing business, developed one of the most outstanding support and service infrastructures in the industry.

IBM, with 40 years of service and support for enterprise-class customers, now provides the same type of unparalleled service and support for Netfinity. IBM's limited, three-year onsite warranty[5] provides hardware problem-determination onsite, as well as remotely, with IBM's latest technology and tools. Labor and IBM parts are covered for the full duration of the warranty period, including parts identified during Predictive Failure Analysis and the installation of required engineering changes. This warranty offers far more than the typical industry-standard warranty. For example, when you add Options by IBM to a Netfinity server, they assume the warranty term of the server on which they are installed. International warranty service is also available.

Service for Netfinity servers is available through this Web URL: **www.pc.ibm.com/us/solutions/netfinity/services.html**.

90-day IBM Start Up Support. In addition to our warranty coverage, and included with the purchase of any IBM Netfinity server, 90-day IBM Start Up Support is a

[5] For terms and conditions or copies of IBM's limited warranty, call 1 800 772-2227 in the U.S. Limited warranty includes International Warranty Service in those countries where this product is sold by IBM or IBM Business Partners (registration required). Telephone support may be subject to additional charges.

comprehensive program designed to speed installation of hardware and system software, as well as assist in resolving other technical challenges associated with the installation of new systems. To maximize the value of your investment and resolve issues during the first critical 90 days from installation, you'll receive installation, setup and configuration support for:

- IBM Netfinity servers.
- Supported network operating systems, including: Microsoft Windows NT, Novell NetWare, SCO OpenServer and UnixWare, NCD WinCenter and Citrix WinFrame, and IBM OS/2 Warp Server.
- Selected network interface cards (NICs), such as IBM, 3Com, Madge Networks and Standard Microsystems Corporation (SMC). For more information, visit the IBM ServerProven™ hardware Web site at **www.pc.ibm.com/compat**.

IBM HelpCenter®. Easy-to-use electronic access to IBM experts is available by phone, fax, bulletin board, commercial on-line services and the Internet. IBM is also introducing interactive Web-based forums, monitored around the clock by IBM specialists, complementing its support on all the major Internet service providers. And, customers can purchase extended services at any time during their IBM hardware warranty period.

Remote Connect..."Call Home" Remote Support. Using the latest technology advances delivered by select models of the Netfinity product line, IBM offers a "Call Home" remote support feature. If your server experiences a problem, it will dial IBM and set in motion the right level of support to keep your system up and running. And, you can select options to have IBM contact you or your approved warranty service provider.[6] For more information visit **www.pc.ibm.com/techinfo/6342**.

MoST Connect...A Direct Communication Link to the Experts. Leveraging the latest technology advancements in Netfinity systems and Netfinity Manager, IBM increases its on-site support by enhancing the Mobile Solution Terminal (MoST), carried by our server field-service representatives. MoST Connect provides a direct communication link between the IBM field service specialist at your location and the experts at the IBM HelpCenter. Continuing to improve onsite support, IBM delivers remote-console capability with both voice and data communications through a Netfinity system's serial port.

MoST Connect allows the HelpCenter support specialist to perform remote problem determination and launch additional resources, including product engineering if required, to solve a server problem. MoST Connect enables the HelpCenter to assemble a pool of skills and be *virtually* on-site to address the most complex problems without delay.[7]

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[6] Remote Connect availability is limited to certain mainstream and high-end Netfinity servers (U.S. only) and supports selected network operating systems. Remote Connect is offered exclusively through IBM Global Services.

[7] MoST Connect is not yet available in all countries. MoST Connect is offered exclusively through IBM Global Services.

Conclusion

IBM's Netfinity ClusterProven Program—an important initiative in the computer industry—offers solution developers the opportunity to achieve new standards in clustering applications and thus participate in a rapidly growing and potentially enormous market opportunity. In this program, solution developers can have their application solutions thoroughly tested and, if the solutions exhibit the characteristics required by IBM Netfinity, they can be registered as either ClusterProven or Advanced ClusterProven.

This means that solution developers' highly available, reliable and scalable products will be included in the online IBM Software Solutions Guide and will be accessible to customers. These solutions will be able to bear the ClusterProven trademark.

In order to help solutions developers in these efforts, IBM has announced three new Solution Partnership Centers, where award-winning IBM Netfinity Clustered Server equipment and solutions expertise will be available. Training programs, workshops and expert analysis will be offered in the areas of architectural planning and design of highly available solutions. These benefits will help developers reach the markets they need to be successful.

Finally, with their application solutions certified on IBM Netfinity servers, solution developers can take advantage of IBM's worldwide support and service programs. These programs provide pre- and post-sales benefits offered by few of our competitors.

Additional Information

For more information on IBM Netfinity directions, products and services, refer to the following white papers, available from our Web site at **www.ibm.com/netfinity**.

Management

Implementing IBM Netfinity Server Management
Integrating IBM Netfinity Manager with Microsoft System Management Server
Integrating IBM Netfinity Manager with Intel LANDesk Server Manager
IBM Netfinity Manager 5.2
IBM Netfinity Advanced Systems Management
IBM Netfinity Advanced Systems Management for Servers
IBM ServerGuide for Netfinity and PC Server Systems

Other Topics

IBM Netfinity X-architecture
IBM Netfinity Predictive Failure Analysis
IBM Netfinity Cluster Directions
IBM Netfinity Web Server Accelerator
Lotus Domino Clusters Overview
Lotus Domino Clusters Installation Primer
IBM Netfinity ESCON Adapter
IBM Netfinity Hot-Plug Solutions
IBM Netfinity Storage Management Solutions Using Tape Subsystems
IBM Netfinity Technology Trends and Directions
IBM Netfinity Servers and Intel Architecture
IBM Netfinity 8-Way SMP Directions

IBM Netfinity Fibre Channel Directions
IBM Netfinity Server Ultra2 SCSI Directions
IBM Netfinity Server Quality
IBM Netfinity 5500 Server Family
IBM Netfinity 7000 M10 Server
Achieving Remote Access Using Microsoft Virtual Private Networking
At Your Service...Differentiation beyond technology

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IBM reserves the right to change specifications or other product information without notice.

IBM Netfinity servers and PC Servers are assembled in the U.S., Great Britain, Japan, Australia and Brazil and are comprised of U.S. and non-U.S. parts.

Are you Year 2000 ready? Visit **www.ibm.com/pc/year2000** or call 1 800 426-3395 (and request document number 10020 from our faxback database) for the latest information.