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Business Continuity and High Availability Options White Paper

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INTRODUCTION

Today, more than ever, security is a mission critical business component. This is not only true for our customers that are responsible for critical national infrastructure, but also for our corporate customers who have shareholder's interest to protect. They need a security management system that will meet their needs when they need it most.

There already exists a degree of redundancy in our system architecture due to the distributed intelligence model employed. If the server/communication client were to lose communications with the controllers (due to a network failure or a computer hardware or software failure), the system still behaves as usual from a user perspective. Of course, there are some limitations such as real-time alarms not getting routed and the limited amount of memory available for queuing transaction history. But when the communications are restored, the field panels automatically download their queued information to the server, and any changes made at the server are also synchronized with the controllers.

While such a distributed intelligence model will meet the need of the majority of customers, more sophisticated server-based solutions are required to meet mission critical availability goals. AMAG Technology provides a growing number of options to meet the business continuity (in the face of a disaster) and high availability concerns of our customers. The purpose of this document is to summarize these options and to compare and contrast the differences.

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A DEFINITION OF TERMS

As in any new topic, there are terms that may not be familiar to the reader. There are two categories that will be covered in this document. The first is "high availability" and the other is "business continuity" or "disaster recovery".

"High Availability" refers to the likelihood that a system will be available at any given time. The opposite of availability is "down time". A system that experiences unscheduled downtime an average of one hour per year (60 minutes) meets 99.99% availability. This is often referred to as "Four 9's". A system that only sees 5 minutes of unscheduled downtime meets 99.999% availability, or "Five 9's". These levels are often benchmarks for mission critical business systems.

"Redundancy" is a more common term and is used here just as it is used in the common vernacular. A redundant system is one that has two or more units running in tandem or one available as a backup to the other to provide system availability. As described below, redundant systems, depending on how they are configured can provide either high availability or disaster recovery.

"Fault Tolerance" is a version of redundancy. In the case of a redundant system, if the primary computer becomes unavailable to those resources requiring it then a backup computer will take over the task. There is a necessary transition period while the backup machine starts services or makes other required configuration changes. In a fault tolerant solution, two nodes (effectively separate computers) are running simultaneously. The FT control system virtualizes these nodes so that the outside world only sees a single unit (single MAC, single IP, single computer name, etc.), but internally both nodes process the same information at the same time. If one node goes bad (disk or other hardware failure) then the other is already doing the same operations and the task continues to perform without interruption.

"Business Continuity" is synonymous with "disaster recovery". This refers to a system's ability to continue operations in the face of a significant event. The most common example is the case in which the location of a computer system is left inoperable either due to damage or communications failures.

REDUNDANCY AND HIGH AVAILABILITY OPTIONS

Historically, high availability (HA) was limited to the realm of very high-end computing systems. One of the first affordable options for Windows-based HA computing systems was clustering software that monitors the operation of services on the primary server.

Microsoft Clustering

Microsoft Clustering (MSCS) is capable of starting services on the backup server if there is a problem. This software also controls the IP addresses of the overall system so that other network devices that rely on the primary server are not affected by the switchover.

Failover clustering in a Windows Server uses a group of independent computers that work together to increase the availability and scalability of clustered roles (formerly called clustered applications and services). The clustered servers (called nodes) are connected by physical cables and by software. If one or more of the cluster nodes fail, other nodes begin to provide service (a process known as failover). In addition, the clustered roles are proactively monitored to verify that they are working properly. If they are not working, they are restarted or moved to another node.[i] Failover clusters also provide Cluster Shared Volume (CSV) functionality that provides a consistent, distributed namespace that clustered roles can use to access shared storage from all nodes. With the Failover Clustering feature, users experience a minimum of disruptions in service.

Failover Clustering has many practical applications, including:

- Highly available or continuously available file share storage for applications such as Microsoft SQL Server and Hyper-V virtual machines
- Highly available clustered roles that run on physical servers or on virtual machines that are installed on servers running Hyper-V

Traditionally, Microsoft Cluster Service (MSCS), available in the Windows Server 2016 and 2019 Enterprise Editions, has been an option, but MSCS based solutions are more costly and limited because it requires MS SQL Server Enterprise Edition.

Microsoft Clustering has been tested by AMAG, and will function as a redundant option, however, AMAG Technology does not support the use of Microsoft clustering, meaning, AMAG cannot provide instructions or guidance on Microsoft Clustering deployment, and, should the need arise, neither AMAG Technical Support nor AMAG Professional Services can assist in resolving any issues with Microsoft Clustering. Assistance can only be provided with Symmetry.

VM Failover: vCenter

A VM Failover cluster is used for high availability, while a replica failover is used for disaster recovery. A failover cluster protects VMs against hardware failure only, while a replica failover offers protection from both hardware and software failure.[ii]

VMware® High Availability provides high availability for virtual machines by pooling them and the hosts they reside on into a cluster. Hosts in the cluster are monitored and in the event of a failure, the virtual machines on a failed host are restarted on alternate hosts.

One of the big issues that many customers face when deploying vCenter is related to availability. vCenter itself can be a single point of failure in many environments. While technologies like HA are designed to function without vCenter being available, many deployments need very high uptime for vCenter just to carry out day-to-day activities. vCenter Heartbeat was the old way of doing this, but that product is no longer offered by VMware. With 6.5, VMware offers a new way of ensuring high uptime for vCenter itself.

VMware® High Availability has not been tested by AMAG, However, there are customers successfully using this option for redundancy on their Symmetry Systems. AMAG does not support the use of VMware High Availability, meaning, AMAG cannot provide instructions or guidance on VMware redundancy deployment, and, should the need arise, neither AMAG technical support nor AMAG Professional Services can assist in resolving any issues with VMware. Assistance can only be provided with Symmetry.

NEC EXPRESSCLUSTER™

NEC offers a software solution for high availability and remote disaster recovery preventing data loss and protecting IT systems which leads to saving time and money. NEC ExpressCluster™ provides for synchronous or asynchronous data replication over LAN, WAN, and SAN with granular application service and resource monitoring, system recovery, and virtual server identity support for simpler and faster migration of application and data workloads to and from the backup server.

- Recovery from all types of failures (hardware, network, application)
- Low-cost software solution without storage disk
- Verification experience with 200+ applications
- 1,000+ km disaster recovery experience
- Achieving zero data loss
- Assured failure detection of wide range of system resources such as network, hardware, OS, and applications
- Assured failure detection of wide range of system resources such as network, hardware, OS, and applications
- Automatic/quick application-level failover
- Data mirroring between servers

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LAN edition[iv]

ExpressCluster™ LAN delivers a simple, high availability software solution for departmental and branch office standalone systems that run critical applications and data by minimizing disruptions caused by hardware and software failures.

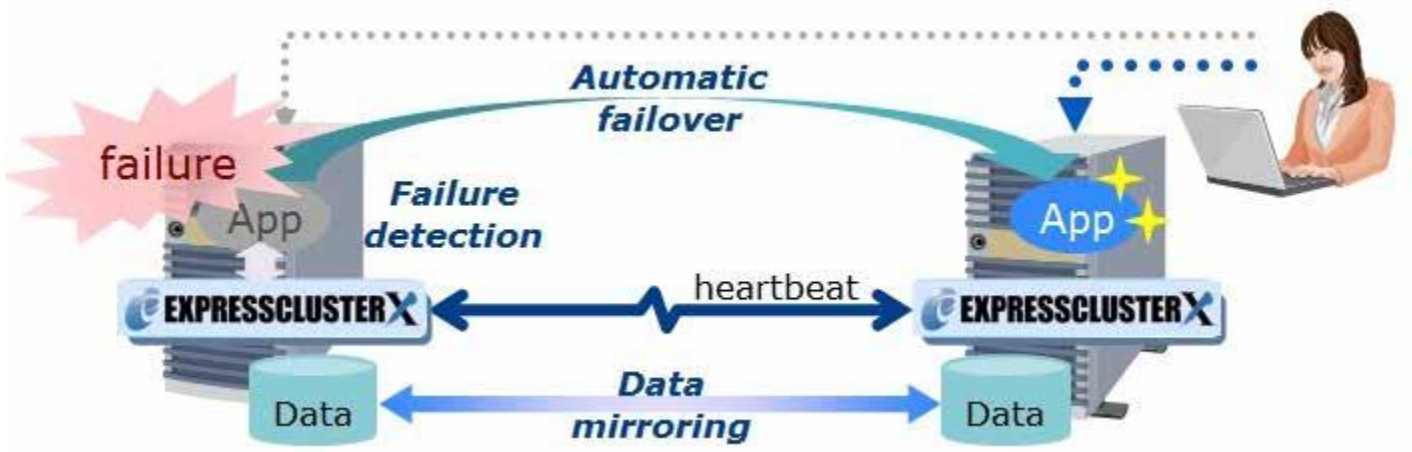
- Quick and automatic recovery and applications and data.
- Supports most standard applications and mirroring protection of internal disk storage devices.
- Integrated management of applications and data availability.
- The ability to detect application and component failures at a granular level.
- High performance, synchronous data mirroring over a LAN.
- Automated failover/failback of application and data workloads.
- Efficient FastSync resynchronization of changed data.
- Support for low-cost standard version of applications and operating systems.
- Data mirroring support for standard internal disks.

WAN edition[v]

ExpressCluster™ WAN delivers nearly instant automated application recovery from hardware, software and site failure using mirrored data even over a standard low bandwidth wide area network spanning hundreds of miles.[1]

- Recovery solution for physical and virtualized systems.
- Continuous application monitoring and fast recovery over WAN.
- Flexible synchronous and asynchronous data mirroring across WAN.
- Unified disaster recovery management for multiple application systems.
- Support for standard application, operating system, virtualization hypervisor and hardware for low total cost of ownership.
- Easy-to-use, Web-based management console accessible from standard browsers.
- Web-based management options streamline administration clusters and improve visibility.

In today's IT market, there are multiple redundancy options for mission critical hardware, data and software. The redundancy options described above are the most common in today's marketplace, when properly deployed by an IT professional, they can be utilized, or combined, to ensure ongoing server function when the unplanned occurs.



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AMAG REDUNDANCY SOLUTION

AMAG Technology recognizes that customers' needs vary and has teamed with NEC to offer NEC ExpressCluster™ high availability software solutions to meet those needs using cost effective solutions. NEC ExpressCluster supports standard and enterprise editions of Windows and MS SQL Server high-availability solutions, can be supported using virtual or physical servers and offers product editions that provide disk mirroring capability, eliminating the need for external shared storage systems required by other possible solutions. Each of these features can significantly lower deployment and usage costs.

NEC ExpressCluster™ redundancy options have been fully tested and are fully supported by AMAG Technology. The software can be custom configured to meet the requirements of the customer's network environment but is typically comprised of fully redundant nodes (a node can be thought of as a complete PC) running in "lock-step".

As described above, NEC is available in both a LAN and WAN configuration. When using NEC, there are several critical questions that need to be answered in order to detail the network path between the two servers. The answers to these questions are required so the proper NEC software option can be selected. Please reference Appendix A for a list of NEC network related questions. Utilizing the NEC option does have several preliminary requirements,. Please reference Appendix B for the list of NEC requirements.

It is important to note several items:

- While other solutions, such as Microsoft Clustering and VMware redundancy may function as desired, only the NEC ExpressCluster option is supported by AMAG, meaning, should any redundant option other than NEC ExpressCluster be utilized, AMAG technical support channels cannot assist with configuration or troubleshooting, should the need arise.
- When using virtual servers, AMAG Professional Services Engineer cannot make changes to a VM environment (VM server settings) but will work with the end user's IT department to ensure the virtual servers are configured correctly to support both Symmetry and NEC requirements.
- When using shared SQL resources, such as a SQL farm, AMAG Professional Services cannot make configuration changes to a shared SQL resource or SQL being supported via a SQL farm but will work with the end user's IT department to ensure the virtual servers are configured correctly to support both Symmetry and NEC requirements.

BUSINESS CONTINUITY SOLUTIONS

When used with Symmetry, NEC ExpressCluster provides synchronous data replication over LAN, WAN, and SAN with granular application service and resource monitoring, system recovery, and virtual server identity support for simpler and faster migration of application and data workloads to and from the backup server. Synchronous data replication ensures that the data in all the storage systems is identical at every point in time. NEC ExpressCluster™ supports synchronous with easy manageability and offers the superior recovery within minutes or seconds.

ExpressCluster continuously synchronizes the primary and backup data including databases and files and monitors application services, virtual server identity (host name and IP addresses) and other resources. When a problem is detected, the backup server takes over the virtual server identity and functionality of the primary so the overall system operations can resume instantaneously. When the cause of the failover is rectified, the system quickly re-synchronizes and fails back to normal operations. ExpressCluster requires the use of a Symmetry Enterprise-CA (Cluster Aware) software platform.

SERVER PLACEMENT

The single largest pitfall overlooked when considering redundancy options is the placement of the servers. Often, both the primary and secondary servers are placed within the same rack, or within the same LAN room. If the cause of the failure (computer system failure or communications failure) is due to physical damage or the loss of required services, such as AC power/network connectivity, etc. that can be brought on at the server facility by a natural disaster, then the same issue can bring down both servers simultaneously. One solution to this is remote redundancy where a backup server is located in a well-connected remote facility so that physical damage to one facility or interruption of local services will not necessarily affect the other.

COMBINATION SYSTEMS

A standard NEC deployment uses two identical servers with the synchronous data exchange managed by the NEC software. In essence, there are two computers running at the same time, doing the same thing. The hardware and software are constantly evaluating system operation and if something indicates an anomaly or has a failure in a module (hard drive, memory, CPU, motherboard, fan failure), the system is able to automatically recover in real-time with no user disruption.

For mission critical deployments, the use of Fault Tolerant servers, as an added layer of redundancy, is recommended. Fault Tolerant servers include internal redundancy for each critical server components (OS Drive, storage drive, RAM, NIC interface, power supply etc.). When using Fault Tolerant servers, if a component fails, the internal redundant unit is already running so there is no noticeable change in operation to the user. Systems using NEC High Availability (HA) and business continuity attributes can be combined using NEC Express5800 Fault Tolerant servers in two distinct locations to provide a 99.999% hardware high availability solution with remote disaster recovery function as well. If 99.999% hardware high availability is not required, then any PC-compatible servers could be used instead. A combined solution requires two fault tolerant servers with the addition of the ExpressCluster software from NEC that monitors the health of the servers as well as the software services and communications.

SUMMARY

The Symmetry SMS (Security Management System) from AMAG Technology offers companies one of the most flexible system architectures available. The software can be configured to run on a single platform, but also scales to run on clustered hardware, fault tolerant hardware, and can be implemented in a remote redundancy configuration to provide business continuity in the face of a catastrophic situation.

This document is only intended to be a guide. There are a variety of system configuration options that have been presented here. Your sales manager or applications engineer can further assist you in defining system configurations to meet your specific requirements.

NEC ExpressCluster™ features and benefits:

- Lower cost due to:
  - support for standard and enterprise editions of Windows and MS SQL Server
  - disk mirroring capability eliminates the need for external shared storage systems required by other possible solutions
- No requirement for duplicate licenses
- Supports the use of both physical and virtual servers
- Supports the use of Fault Tolerant servers to add an additional layer of protection/redundancy
- Can be configured to meet the requirements of the customer's network environment

SYSTEM COMPONENT DESCRIPTIONS

Each of the systems described has different requirements for hardware and software components. The following tables provide guidelines for assembling redundant and/or high availability systems.

All part numbers listed are current as of date of publication. Please contact your AMAG representative for current part numbers and pricing.

OPTION 1 (NEC ExpressCluster): for use with Symmetry 9.1, ENTERPRISE-CA

QTY	Description	Details/Notes	AMAG Part #
1	Symmetry Platform License	Supported in Enterprise-CA only	ENT-PLAT-CA-V9.1 *Must be purchased from AMAG*
	Reader and Additional Feature Set Licensing		Must be purchased from AMAG
2	Servers	Servers must be identical Server specifications listed below	Computer6[2]
2	Operating System	Microsoft Windows 2016/2017 Server Standard or Enterprise Edition	N/A
2	Full Version of Microsoft SQL	MSSQL Server 2014, 2016, 2017	SQL-2014 / SQL-2016 / SQL-2017
1	NEC ExpressCluster	LAN or WAN edition	NEC-EXP-CLST-LAN, NEC-EXP-CLST-WAN[3] *Must be purchased from AMAG*
1	AMAG Professional Services	Required on-site, to deploy NEC XxpressCluster services. A quote for NEC ExpressCluster with Professional Services deployment will be created by an AMAG Application Engineer, specific to the project.	PS-CLUSTER-DEPLOY *Must be purchased from AMAG*
1	AMAG Travel Expenses	Travel expenses (quoted as budgetary amount, billed at actual cost incurred)	PS-EXPENSES *Must be purchased from AMAG*
1	AMAG Software Support	AMAG recommends that customer maintains their AMAG SSA (Software Support Agreement). This is sold on a per year basis.	AMAG SSA *Must be purchased from AMAG (if desired)*
1	NEC Software Support (NEC-SUPPORT)	AMAG recommends that customer purchases and maintains their optional NEC Software support agreement. This is sold on a per year basis.	NEC-SUPPORT *Must be purchased from AMAG (if desired)*

OPTION 2 (NEC Fault Tolerant Server): for use with Symmetry 9.1
No secondary external server component

All part numbers listed are current as of date of publication.
Please contact your AMAG representative for current part numbers and pricing.

QTY	Description	Details/Notes	AMAG Part #
1	Symmetry Platform License	Business, Professional or Enterprise	BUSINESS-xx-V9.1 PRO-PLAT-V9.1 ENT-PLAT-CA-V9.1 *Must be purchased from AMAG*
1	Reader and additional feature set licensing		Must be purchased from AMAG
2	Server	Fault Tolerant Server Server specifications listed below	SERVER-NEC-1* SERVER-NEC-2* SERVER-NEC-3* *Must be purchased from AMAG*
1	Operating System	Microsoft Windows 2016 / 2017 Server Standard or Enterprise Edition	Included with the purchase of Fault Tolerant Server
1	Full version of Microsoft SQL	MSSQL Server 2014, 2016, 2017	SQL-2014/SQL-2016/SQL-2017
1	AMAG Professional Services	Required on-site, to deploy NEC expressCluster services. A quote for NEC expressCluster with Professional services deployment will be created by an AMAG Application Engineer, specific to the project.	
1	AMAG Travel expenses	Travel expenses (quoted as bud-getary amount, $3500, but billed at actual cost incurred	PS-EXPENSES*
1	AMAG Software Support	AMAG recommends that customer maintains their AMAG SSA (software support agreement). This is sold on a per year basis.	AMAG Software Support *Must be purchased from AMAG (if desired)*
1	NEC Software Support (NEC-SUPPORT)	AMAG recommends that cus-tomer purchases and maintains their optional NEC Software support agreement. This is sold on a per year basis.	NEC Software Support (NEC-SUP-PORT) *Must be purchased from AMAG (if desired)*

OPTION 3 (NEC Fault Tolerant Servers [two]): for use with Symmetry 9.1
No secondary external server component

All part numbers listed are current as of date of publication.
Please contact your AMAG representative for current part numbers and pricing.

QTY	Description	Details/Notes	AMAG Part #
1	Symmetry Platform License	Supported in Enterprise-CA only	ENT-PLAT-CA-V9.1 *Must be purchased from AMAG*
2	Reader and Additional Feature Set Licensing		*Must be purchased from AMAG*
2	Servers	Fault Tolerant Servers Server specifications listed below	SERVER-NEC-1* SERVER-NEC-2* SERVER-NEC-3* *Must be purchased from AMAG*
1	Operating System	Microsoft Windows 2016/2017 Server Standard or Enterprise Edition	Included with the purchase of Fault Tolerant Server
1	Full Version of Microsoft SQL	MSSQL Server 2014/2016/2017	SQL-2014/SQL-2016/SQL-2017
1	NEC ExpressCluster™	LAN or WAN edition	NEC-EXP-CLST-LAN NEC-EXP-CLST-WAN *Must be purchased from AMAG*
1	AMAG Travel Expenses	Travel expenses (quoted as budgetary amount, billed at actual cost incurred)	
1	AMAG Professional Services	PS-EXPENSES*	PS-EXPENSES*
1	AMAG Software Support	AMAG recommends that customer maintains their AMAG SSA (Software Support Agreement). This is sold on a per year basis.	AMAG Software Support *Must be purchased from AMAG (if desired)*
1	NEC Software Support (NEC-SUPPORT)	AMAG recommends that customer purchases and maintains their optional NEC Software support agreement. This is sold on a per year basis.	NEC Software Support (NEC-SUP-PORT) *Must be purchased from AMAG (if desired)*

CONFIGURATION ASSISTANCE

You must involve an AMAG Application Engineer for assistance in properly selecting servers, Fault Tolerant servers, NEC ExpressCluster software and creation of the AMAG Professional Services deployment Scope of Work.

Please contact your AMAG sales representative or send an email to the general Application Engineer mailbox, applicationengineer@amag.com.

APPENDIX A

Typical questions asked by AMAG Application Engineer when assisting with an NEC ExpressCluster™ deployment quote for AMAG Professional Services:

- Is the connection between the two servers supported via layer 2 or layer 3 switches/routers, or VLANs supported on Layer 3 routers?
- Will the two servers reside on the same subnet?
- Is the physical distance between the two servers greater than 8 miles?

Please note: A YES response to any of the above questions will indicate the use of NEC-EXP-CLST-WAN.

APPENDIX B

Requirements to support NEC redundancy:

- Symmetry Enterprise –CA licensing (v8.1 or v9.1)
- Two (2) full Microsoft MSSQL licenses, one for each server.
- Both servers must be identical.
- Both servers must be on the same domain.
- AMAG Professional Services, deployed to the site, to properly configure and deploy the NEC option.
  - NEC-CLUSTER-DEPLOY
  - PS-EXPENSES
- When utilizing NEC, the Symmetry Communication server cannot be located on either the Symmetry Application or Symmetry Database servers. Often, this requires the addition of a Symmetry Client (ENT-CLIENT-V9.1) to function as the communications server.
- Please note: Unless otherwise noted, servers are not required to be purchased from AMAG, however, if servers are procured through alternate channels, and are found not to meet the documented requirements, the AMAG Professional Services Engineer will immediately suspend the project.
- The on-site AMAG Professional Services Engineer must have full administrative rights to the Symmetry Application Server and the Symmetry MSSQL database/database server. This must be verified prior to deployment. Restricted computer or network rights will prevent the work from being performed and will cause the AMAG Professional Services On-Site engineer to immediately suspend the project.

  Should the AMAG Professional Services Engineer be required to suspend the project, (not limited to the reasons described above), additional charges for a return trip will apply. Under these conditions, the return trip will not be scheduled until a new purchase order is issued. Be aware, the project will then be added to the Professional Services Queue, approximately 8-10 weeks out. No refunds will be issued if this occurs.

APPENDIX C

AMAG server part numbers with specifications.

All part numbers listed are current as of date of publication.
Please contact your AMAG representative for current part numbers and pricing.

COMPUTER6	Rack mount 2U - 2 TB RAID 5 Storage (usable) - Dell PowerEdge R540, Intel Xeon Silver 4110 @ 2.1GHz, 32GB RAM, PERC H730p Raid Controller, 2 x 1TB HDD (RAID 1), 3 x 1TB SATA HDD (RAID 5) raw storage, DVD+/-RW, Redundant Power, Quad Port NIC, rail kit, Windows Server 2016 Standard Embedded w/ 5cals, 3-year NBD (next business day) after diagnosis warranty + 3-year 24x7 Pro Support, (No keyboard/mouse/monitor). Recommended for NEC Cluster or Symmetry NVR.
SERVER-NEC-1	NEC Express/5800 R320f-E4 Fault Tolerant Server 4U Rackmount - Intel Xeon Processor E5-2630 v4, 2.20 GHz, 10 cores; 16GB Memory, (1) 300GB 15K HDD, and (1) 600GB 15K HDD per CRU; Windows Server 2016 Standard, Windows Server 2016 5-User Client Access License, Standard 3-year Warranty & Support with next business day parts.
SERVER-NEC-2	NEC Express/5800 R320f-M4 Fault Tolerant Server 4U Rackmount - Intel Xeon Processor E5-2671 v4, 2.30 GHz, 14 cores; 32GB Memory, (1) 300GB 15K HDD, and (1) 600GB 15K HDD per CRU; Windows Server 2016 Standard, Windows Server 2016 5-User Client Access License, Standard 3-year Warranty & Support with next business day parts.
SERVER-NEC-3	NEC Express/5800 R320f-M4 Fault Tolerant Server 4U Rackmount - Dual Intel Xeon Processor E5-2671 v4, 2.30 GHz, 14 cores; 32GB Memory, (1) 300GB 15K HDD, and (2) 600GB 15K HDD per CRU; Windows Server 2016 Standard, Windows Server 2016 5-User Client Access License, Standard 3-year Warranty & Support with next business day parts.

APPENDIX D

Network Port requirements for NEC redundancy.

Standard Ports for General Microsoft Software.

Purpose	Port	Type	Communication Direction
Microsoft file/printer sharing (if used)	139	TCP	IN and OUT
	445	TCP	IN and OUT
	137	UDP	IN and OUT
DNS, Domain Name System (required if a domain is used)	53	TCP & UDP	OUT
NETBIOS (Name Resolution) 137 UDP IN and OUT	137	UDP	IN and OUT
Windows Time Service (for time synchronization)	123	UDP	OUT
MSMQ (MS Messages Queue service). These ports are needed for Symmetry machines to host MSMQs.	1801	TCP & UDP	IN and OUT
MSMQ (MS Messages Queue service). This port is used for the internal "ping" mechanism for Message Queuing.	3527	UDP	IN and OUT
RPC (needed by DCOM, DTC, MSMQ, Cluster). Dynamic RPC port typically assigned by RPC for handshaking with an independent client or with an RPC server for the Message Queuing server to determine the fixed ports.	135	TCP	IN and OUT

Microsoft SQL Server

The following lists the default ports; SQL Server may be set up to use different ports than those specified below.

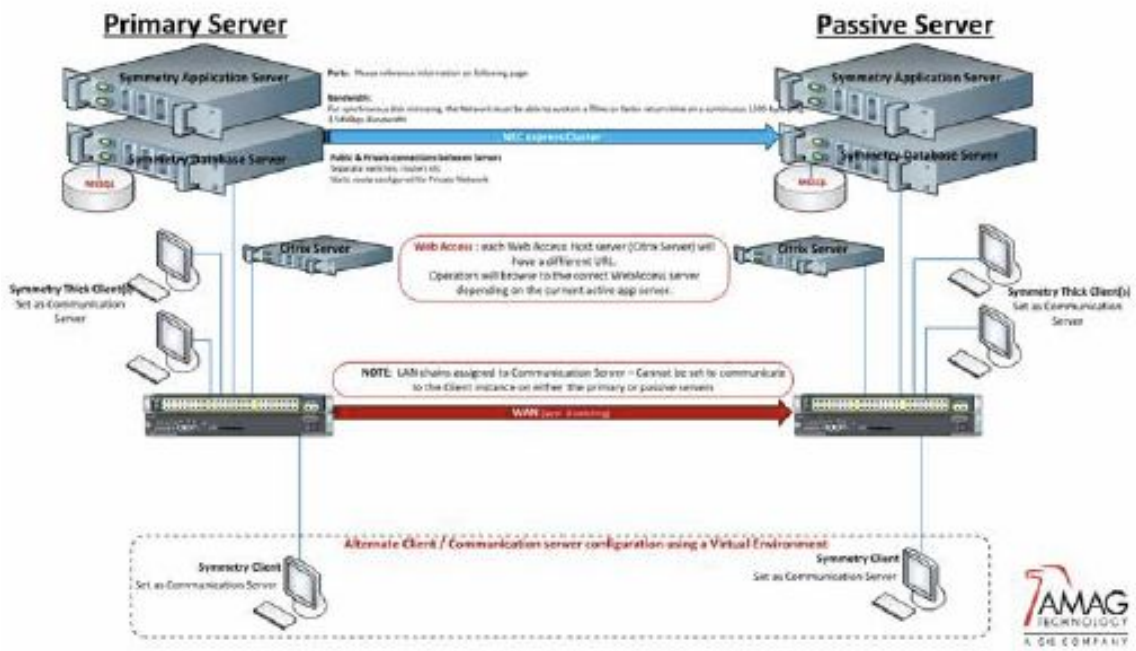
Purpose	Port	Type	Communication Direction
Port on Symmetry server for Symmetry client messaging	12090	TCP	IN and OUT
Port on any Symmetry computer that uses network communications to nodes	3001	TCP	OUT; also IN if node instigates communications
Port on any Symmetry computer that receives network communication initiated by a node (commonly referred to as "Node Punch-Out")	30002	TCP	IN (used only when nodes are configured to instigate communications)
Port on any Symmetry computer from which the G4S Flashnet utility or device discovery (Discover button) is used	49107	TCP & UDP	IN and OUT
Port on Symmetry server for Symmetry client messaging	12090	TCP	IN and OUT

NEC Clustering

The following lists the default ports; SQL Server may be set up to use different ports than those specified below.

Purpose	Port	Type	Communication Direction
For Symmetry remote registry access during install, and Symmetry registry key synchronization.	445	TCP	IN and OUT
	29001	TCP	IN and OUT
	29002	TCP	IN and OUT
	29003	TCP & UDP	IN and OUT
	29004	TCP	IN and OUT
	29005	TCP	IN and OUT
	29007	TCP & UDP	IN and OUT

NEC expressCluster Overview



Revision History

03/22/2005	Version 1.0	Initial release,
05/04/2005	Version 1.1	Added additional details in configuration tables.
08/22/2005	Version 1.2	Clarified DoubleTake configuration and use of DR option.
01/09/2006	Version 1.3	Clarified Symmetry software versions supported.
05/11/2007	Version 1.4	Updated descriptions.
07/17/2008	Version 1.5	Updated with NEC ExpressCluster™ product features.
06/08/2008	Version 1.6	Updated recommendation of Professional Services support to 5 days.
04/27/2010	Version 1.7	Reformatted.
10/13/2019	Version 2.0	Rewritten to current industry standards and available options.

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