Ultimate Integrated Solution for Business Continuity & Disaster Recovery

July, 2019

NEC Corporation,
Cloud Platform Division,
(EXPRESSCLUSTER)
NEC brings together and integrates technology and expertise to create the ICT-enabled society of tomorrow.

We collaborate closely with partners and customers around the world, orchestrating each project to ensure all its parts are fine-tuned to local needs.

Every day, our innovative solutions for society contribute to greater safety, security, efficiency and equality, and enable people to live brighter lives.
Index

1. Customer Challenges
2. Key Advantages
3. Other Functions / Features
4. Successful Case Studies
Availability and reliability of ICT is one of the most important issue in IT related strategies

- Dependency/importance of ICT in business activity is increasing.
- Unexpected disruption of IT system directly affects business operation and service provision, leading to financial loss such as business opportunity and credibility loss.
What is EXPRESSCLUSTER X?

EXPRESSCLUSTER X is a “High Availability Clustering Software” which is designed to maximize uptime for any critical system.

1. Assured failure detection of wide range of system resources such as network, hardware, OS, and applications

2. Automatic / Quick application-level failover

3. Data mirroring between clustered servers (also supports shared disk type clustering)
EXPRESSCLUSTER is Categorized as Clustering Software

- Hardware
- Data
- Application
- Site

DR Solution

- BCP, Storage Mirroring
- Remote Clustering

HA Solution

- HA Clustering Software
- Backup Software
- Standby Machine (Cold Standby)
1. Customer Challenges
System disruption impacts not only your company, but also other companies or social infrastructure and causes serious damage to your company management.

### Negative Impacts

**by Enterprise Business**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Negative Impacts</th>
</tr>
</thead>
</table>
| Financial  | • Social impact to nation’s economy  
               • Damages to company’s credibility                                         |
| Manufacturing | • Economic loss due to stoppage of production activity  
               • Damage to credibility due to having negative impact to related companies  
               • Opportunity loss                                                   |
| Retail     | • Economic loss due to stoppage of sales activities                                |

**by Type of System**

<table>
<thead>
<tr>
<th>System</th>
<th>Negative Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail system</td>
<td>• Loss of productivity due to communication issue</td>
</tr>
</tbody>
</table>
| Production system | • Opportunity loss due to disruption of manufacturing activities  
               • Damage to customer satisfaction                                             |
| Ordering system | • Opportunity loss due to disruption of receiving orders from customers  
               • Damage to customer satisfaction                                             |
| File Server   | • Loss of productivity                                                             |

### Economic Loss Caused by System Disruption

**Average amount of economic loss per 1 hour downtime**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Amount of Loss/hour (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>9,997,500</td>
</tr>
<tr>
<td>Retail</td>
<td>397,500</td>
</tr>
<tr>
<td>Healthcare</td>
<td>157,500</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>59,930</td>
</tr>
</tbody>
</table>

Source: IDC Research

### Other Negative Impacts

- Resource / Cost issue for recovering
- Restitution to customer
- Loss of customer/partner goodwill
- Brand damage
- Driving business to competitors
- Bad publicity/press
- Administrative penalty
  etc …
Major causes of system disruption

- Site failure due to natural disaster or fire etc
- Hardware failure such as servers / storages failure
- Software failure such as OS, middleware, business application failures
- Access failure to disk
- Network failure
- Temporary system outage due to planned maintenance

Cause of system disruption ranges from software failure to natural disaster. Minimizing these risks will lead to maximizing the company revenue!
2. Key Advantages
Key Advantages Of EXPRESSCLUSTER X

- **Reliable**: Provides 99.99% availability to mission critical systems with its sophisticated features / quality accumulated in 23 years experience.

- **Flexible**: Supports various platforms / applications / configurations in order to fit within any kind of system environments.

- **Leading-Edge**: Immediate support of up-to-date technologies in order to meet new customer demands.
EXPRESSCLUSTER X was released in Oct, 1996 which was earlier than other major clustering solutions.

The product has been improved continuously based on direct feedback from the market.

Reliable: Long History

WW for 30,000+ customers
Flexible-1: Supported Cluster Configuration

Supporting three different data sharing mechanism

1) **Shared disk type**
   - For larger data volume
   - High reliability provided by storage system
   - Simple configuration

2) **Data mirroring type**
   - For less data volume
   - Lower cost
   - Avoiding HDD to be the Single Point Of Failure

3) **Hybrid clustering type**
   - Combination of shared disk & data mirroring type
   - Provides higher flexibility / operability for WAN clustering (disaster recovery)
**EXPRESSCLUSTER X supports all types of IA servers and storages**

<table>
<thead>
<tr>
<th><strong>Server</strong></th>
<th><strong>Storage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>NEC: Express5800</td>
<td>NEC: NEC Storage</td>
</tr>
<tr>
<td>HPE: ProLiant</td>
<td>HP: SmartArray</td>
</tr>
<tr>
<td>DELL: PowerEdge</td>
<td>NetApp: FAS2040</td>
</tr>
<tr>
<td>Fujitsu: PRIMERGY</td>
<td>EMC: Symmetrix</td>
</tr>
<tr>
<td>... and more</td>
<td>... and more</td>
</tr>
</tbody>
</table>

**EXPRESSCLUSTER X supports various applications**

<table>
<thead>
<tr>
<th><strong>Category</strong></th>
<th><strong>Applications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>Oracle, SQL Server, MySQL, DB2, Sybase, etc...</td>
</tr>
<tr>
<td>Backup</td>
<td>ARCserve, BackupExec, NetBackup, NetVault, NTBackup</td>
</tr>
<tr>
<td>Web Server</td>
<td>IIS, ExpressMail, apache, httpd, sendmail, Postfix</td>
</tr>
<tr>
<td>Groupware</td>
<td>Exchange, Star Office, Domino</td>
</tr>
<tr>
<td>Security</td>
<td>OfficeScan, ServerProtect, InfoCage</td>
</tr>
<tr>
<td>System Management</td>
<td>MasterScope, Tivoli, OpenView</td>
</tr>
<tr>
<td>Application Server</td>
<td>WebOTX, WebLogic, WebSphere, OracleAS, JBOSS</td>
</tr>
<tr>
<td>ERP</td>
<td>SAP, TASY</td>
</tr>
</tbody>
</table>

... and more!
In order to meet rapidly growing demand for virtualization, EXPRESSCLUSTER X already supports various virtualization technologies:

- VMware vSphere
- Microsoft Hyper-V
- Citrix XenServer
- Linux KVM

"2010 will be the first year in which the number of deployed virtual servers will outnumber the number of physical ones."

-- IDC Analyst : Cindy Borovick
EXPRESSCLUSTER X has been offering WAN clustering feature since 2004 which enables lower-cost disaster recovery solution.
Redundancy is becoming more important in terms of the challenges for cloud utilization such as:

- Applying cloud service SLA (Service Level Agreement)
- Measures against planned outage
- Disaster Recovery

EXPRESSCLUSTER supports many Cloud Services (IaaS):

- Amazon Web Services
- Enterprise Cloud
- IDC Frontier Cloud
- Microsoft Azure
- Techno CUVIC

※Cloud environment with the operation record by EXPRESSCLUSTER X.

3. Other Functions / Features
Supported Configuration / Failover Scenario

- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities
- Virtualization Supported
- Cloud Environment Supported
- Usability / Operability
- System Requirements
Shared Disk Clustering

Shared disk type clustering offers best reliable storage system and high performance with supporting larger data!

- Maximum 32 nodes in a single cluster is supported
- $M + n$ clustering ($M$ active servers and $n$ standby servers) is also supported!
Data Mirroring Clustering

Data mirroring type clustering does NOT require any external storage device and thus offers high cost performance!

- Data in local HDD of active server is real-time mirrored to local HDD of standby server.
- Lower cost, small-footprint HA solution.

Multi mirror set in a single cluster is supported (Windows 22 set, Linux 32 set)

Data will be written to both disks.
Hybrid Clustering

Combined configuration of shared disk clustering and data mirroring clustering for disaster recovery scenario

- 2 failover scenarios for higher operability:
  - In case of component failure such as HW, OS, application failure, application will fail over to standby server located in same site
  - In case of site down due to disaster, fire etc, application will fail over to standby server located in backup site

- Data stored in SAN will be mirrored to backup site in either synchronous / asynchronous mode

In case of failure:
- Failover within same site

In case of site down:
- Failover across WAN

Synchronous / Asynchronous Data mirroring
Supported Failover Scenario

1) Active - Standby

2) Active - Active

3) M+1 Standby

4) M+n Standby

... and more!

Supports various configuration flexibly.
Failover Process

Takes only several ten seconds for switching server

1. Detect failure
2. Stop application
3. Release shared/mirror disk control, Deactivate virtual (floating) IP address
4. Activate virtual (floating) IP address, Get shared/mirror disk control
5. Start application

System recovery time

Failure

several ten seconds

depends on the application

Primary

Secondary

Disk
Minimizing Downtime During Planned Maintenance

Major Causes Of System Disruption

**Unexpected Failure**: 24%
- broken down as:
  - 9% : OS / Driver failure
  - 6% : Application error
  - 5% : Hardware failure
  - 4% : Other failures

**Planned Maintenance**: 76%
- broken down as:
  - 37% : OS Upgrade / Service Pack / Patch application or OS restart relating to these works
  - 13% : Application installation and maintenance
  - 12% : OS restart relating to configuration change of OS
  - 7% : OS restart relating to hardware configuration changes
  - 7% : Other OS restart

Source: Microsoft Research

System downtime caused by planned maintenance can be also minimized by switching active server with simple operation!

Manual failover can be done with simple operation!
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities
- Virtualization Supported
- Cloud Environment Supported
- Usability / Operability
- System Requirements
Various Monitoring Targets (AP, OS, HW, NW)

In order to minimize the risk of system disruption, application failover should be done in any kind of failures!

EXPRESSCLUSTER X’s Monitoring Capability

EXPRESSCLUSTER X monitors wide range of resources from NW to application and do not miss a failure which leads to system disruption!
Deeper Application Monitoring

Dedicated monitoring agent* for major applications detects not only application termination, but also abnormal status or hang-up status of the application through its proactive response monitoring.

* Offered as optional add-on

**without** Monitoring Agent

- Termination of the application process will be detected as an error.
- Application hang-up will not be detected.

- N/A Detection of application hang-up
- N/A Abnormal response from application
- ✓ Abnormal termination of application

**with** Monitoring Agent

- Detection of application hang-up
- ✓ Abnormal response from application
- ✓ Abnormal termination of application

Real time monitoring of application healthiness

Agent without Monitoring Agent

Agent with Monitoring Agent

App start

App failure

App hang-up
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- **Prevention of Split-Brain**
- Disaster Recovery Capabilities
- Virtualization Supported
- Cloud Environment Supported
- Usability / Operability
- System Requirements
What is Split-Brain?

Split-Brain is the condition where two or more nodes in the cluster becomes active due to disconnection of all the network between nodes.

How can you prevent split-brain?

- Data corruption due to simultaneous access to the same data from both nodes
- IP conflict due to allocation of same IP address to both nodes
Prevention of Split-Brain  - Redundancy of HB path -

Realize accurate alive monitoring against other servers by multiple use of heartbeat path

**LAN Heartbeat**
- Heartbeat connection through LAN

![LAN Heartbeat Diagram](image)

**COM Heartbeat**
- Heartbeat connection through COM connection

![COM Heartbeat Diagram](image)

**Disk Heartbeat**
- Alive monitoring by writing / reading the data on shared storage

![Disk Heartbeat Diagram](image)

**LAN Kernel Heartbeat**
- Send/receive heartbeats between each servers at kernel space.

![LAN Kernel Heartbeat Diagram](image)

* Less loads comparing to LAN HB
Prevention of Split-Brain - Resolution method -

Accurately detect the risk of split-brain and prevent beforehand

**Disk method**
- The lower priority server will be shut down to prevent split-brain

![Diagram of Disk method]

**COM method**
- The lower priority server will be shut down to prevent split-brain

![Diagram of COM method]

**Ping method**
- If no ping response comes back, lower priority server will be shut down

![Diagram of Ping method]

**Majority method**
- Shutting down a server that can no longer communicate with the majority of the servers in the entire cluster

![Diagram of Majority method]
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- **Disaster Recovery Capabilities**
- Virtualization Supported
- Cloud Environment Supported
- Usability / Operability
- System Requirements
Disaster Recovery Achieved by WAN Clustering

Disaster recovery can be also achieved by EXPRESSCLUSTER X with lower cost!

✓ Challenges

- Only data backup has been done.
- When servers and network has been damaged due to disaster, business will be disrupted.

✓ Measures

- Always mirror the data to backup site with EXPRESSCLUSTER X’s mirroring feature.
- In case of failure / disaster, automatically failover the application to backup site.

✓ Features

- Synchronous / Asynchronous mirroring
- Supporting single heartbeat connection
- Supporting failover across WAN
- Data in the shared storage can be also mirrored to backup site

Combination of “LAN Cluster” and “WAN Cluster”
Compression of Mirrored Data

Efficient data transfer by compressing the data to be mirrored

Compress before sending it to network (Buffering)

Extract before writing it to disk

Also acts as a anti-peeping measure since it is compressed

Average 50% reduction in data size as compared to the previous version (Results differ depending on file type)

* This feature is only valid in asynchronous mirroring mode.

Convenient at the time of using narrow network for remote clustering!
Other Features for WAN Clustering

More simple / convenient operations for WAN clustering!

- Dynamic DNS function
- Manual / Automatic select enabled in case of site failover in hybrid configuration

1. Change in IP address at the time of failover
2. EXPRESSCLUSTER X notifies change of IP address to the dynamic DNS server
3. Acquires current IP address from DNS by unique host name

Able to select manual or auto for switching the site
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities

**Virtualization Supported**

- Cloud Environment Supported
- Usability / Operability
- System Requirements
EXPRESSCLUSTER is also compatible with VMware HA solutions

**Scenario 1:** vMotion + EXPRESSCLUSTER X

- **vMotion**: VM migration at the time of planned maintenance
  
  >>> Minimize downtime caused by planned maintenance

- **EXPRESSCLUSTER**: Automatic failover in case of VM / application failure
  
  >>> Minimize downtime caused by unexpected failure

**Scenario 2:** VMware HA + EXPRESSCLUSTER X

- **VMware HA**: Automatic failover in case of EC standby server fails.
  
  >>> Ensure HA configuration of EXPRESSCLUSTER X is always available.

- **EXPRESSCLUSTER**: Automatic failover in case of VM / application failure
  
  >>> Ensure maximum uptime for business critical applications
Supported Configuration / Failover Scenario
Monitoring Capabilities
Prevention of Split-Brain
Disaster Recovery Capabilities
Virtualization Supported

Cloud Environment Supported

Usability / Operability
System Requirements
Cloud Resource (*)

Setup for public cloud is simplified!

- Setup is done by applying values in simple GUI. Operation which needs cloud service API knowledge such as virtual IP address is simplified.
- Amazon Web Services (AWS) and Microsoft Azure are supported.

Very simple GUI setting

(*): Cloud resource is generic name of group resource and monitor resource which is used for implementing EXPRESSCLUSTER on public cloud. In the product, following names are displayed.

Setup Guide: 
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities
- Virtualization Supported
- Cloud Environment Supported

**Usability / Operability**

- System Requirements
Easy configuration by applying configuration file

Configuration file enables to configure clustering system very simply

**Cluster WebUI**  
Config mode  
GUI tool for building cluster configuration

**Configuration File**

Cluster configuration can be extracted to configuration file which can be applied to another cluster

**Customer Benefit**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Replacement</td>
<td>In case of replacement of old server with new server, the same cluster configuration can be easily configured by simply applying the configuration file.</td>
</tr>
<tr>
<td>Deployment of same configuration to multiple sites</td>
<td>In case of deploying clusters with similar configuration to multiple site, only first cluster should be configured and other can be configured by just applying the configuration file. Time required for implementation will be significantly reduced.</td>
</tr>
<tr>
<td>Trouble Shooting</td>
<td>By using configuration file, support team can easily reproduce the cluster for investigation purpose.</td>
</tr>
</tbody>
</table>
Intuitive Cluster Generation GUI

User-friendly GUI for cluster configuration to prevent setting mistakes

**Point 1**
Steps of the current settings can be understood in a glance!

**Point 2**
IP address and device name are automatically acquired just by entering server name and it prevents committing mistakes!

Input Server name

Only have to select from pull down menu
User-friendly / Convenient management console “Cluster WebUI” offers higher operability for system administrators

Switch “Operation mode” and “Config mode” easily

Status of servers / group resource and monitor resource is shown in matrix display

Point 1

Point 2

Config mode Screen

Operation mode Screen
Features of Integrated WebManager
- Displays all cluster systems in a single console as well as its status
- Provides quick access to WebManager of each cluster

Customer Benefits
- No need to monitor clusters with multiple screens, and increases manageability
- Enables system administrator to realize status change of cluster immediately
EXPRESSCLUSTER X Alert Function

In order to notify any event occurred on cluster system, EXPRESSCLUSTER X sends alert by email or warning light (*).

(*) Offered as optional add-on

For system administrators, knowing that the failure has occurred is also important for maintaining the HA configuration.

Alert service allows administrators to:

- receive information about failures while not physically located in the same place as the management PC.
- receive e-mail messages on your mobile phone.
- visually be alerted of failures by warning light.

Helps system administrator to be always aware of the event occurred on the cluster system.
Other Functions / Features

- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities
- Virtualization Supported
- Cloud Environment Supported
- Usability / Operability

**System Requirements**
## EXPRESSCLUSTER X System Requirements

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Windows</th>
<th>Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x86_64 server</td>
<td>x86_64 server</td>
</tr>
<tr>
<td></td>
<td>IBM POWER server (Replicator, Replicator DR, Agents except Database Agent are not supported)</td>
<td>IBM POWER LE server (Replicator, Replicator DR and Agents are not supported)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Windows</th>
<th>Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>Windows Server 2019 Standard</td>
<td>Red Hat Enterprise Linux 7.6<del>7.3/6.10</del>6.8</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2019 Datacenter</td>
<td>Novell SUSE LINUX Enterprise Server 12 (SP1)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1809 Standard</td>
<td>Novell SUSE LINUX Enterprise Server 11 (SP4~SP3)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1809 Datacenter</td>
<td>Asianux Server 7 (SP3~SP1) (x86_64 only)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1803 Standard</td>
<td>Asianux Server 4 (SP7~SP6) (x86_64 only)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1803 Datacenter</td>
<td>CentOS 7.6<del>7.3/6.9</del>6.8</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1709 Standard</td>
<td>Oracle Linux 7.5/7.3/6.6 (x86_64 only)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server, version 1709 Datacenter</td>
<td>Ubuntu 16.04.3 LTS (x86_64 only)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2016 Standard</td>
<td>Ubuntu 14.04 LTS (x86_64 only)</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2016 Datacenter</td>
<td>Amazon Linux 2</td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2012 R2 Standard</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2012 R2 Datacenter</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2012 Standard</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td>Windows Server 2012 Datacenter</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Memory</th>
<th>x86_64</th>
<th>Memory</th>
<th>x86_64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>User Mode: 256MB +</td>
<td>User Mode: 200MB +</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>Kernel Mode: 32MB + 4MB(*) x (number of mirror disk resource + number of hybrid disk resource)</td>
<td>Kernel Mode:</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>(*) A single mirror/hybrid disk resource needs 4 MB RAM.</td>
<td>- When the synchronization mode is used:</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>When changing to asynchronous method, changing the queue size or changing the difference bitmap size, it is required to add more memory. Memory size increases as disk load increases because memory is used corresponding to mirror disk I/O.</td>
<td>1MB + (number of request queues x I/O size) + (2MB + Difference Bitmap Size x number of mirror disk resources and hybrid disk resources)</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>- When the asynchronous mode is used:</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>1MB + (number of request queues x I/O size) + (3MB + (number of asynchronous queues x I/O size) + (I/O size / 4KB x 8B + 0.5KB) x (max size of history file / I/O size + number of asynchronous queues) + (Difference Bitmap Size) ) x number of mirror disk resources and hybrid disk resources</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>- When the kernel mode LAN heartbeat driver is used:</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>8MB</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>- When the keepalive driver is used:</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>8MB</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>&lt;IBM POWER/IBM POWER LE&gt;</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>User Mode: 200MB +</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hard Disk</th>
<th>x86_64</th>
<th>Hard Disk</th>
<th>x86_64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Disk</td>
<td>Right after installation</td>
<td>Right after installation</td>
<td></td>
</tr>
<tr>
<td>Hard Disk</td>
<td>100MB</td>
<td>300MB</td>
<td></td>
</tr>
<tr>
<td>Hard Disk</td>
<td>During operation</td>
<td>During operation</td>
<td></td>
</tr>
<tr>
<td>Hard Disk</td>
<td>5.0GB</td>
<td>5.0GB</td>
<td></td>
</tr>
</tbody>
</table>
4. Successful Case Studies
UCA is a one of the leading insurance company in Saudi Arabia where EXPRESSCLUSTER greatly contributed to the business continuity with its sophisticated HA&DR features when the flood attacked in Jeddah. UCA was the only insurance company that achieved successful business continuity while other companies faced critical business disruption.

Jeddah Flood

“It was really wise decision we have taken to select NEC as technology partner. After what we have seen what happened to others during the flood, and the fast and simple procedures we follow to recover the operation, we believe that NEC and NajTech are the best technology partners.

Mr. Labib Assah,
UCA IT Director
Application: Logi-Sys by Softlink (Application Vendor Partner)

Benefits:
- High availability solution with capability of **scaling up to DR configuration**
- Automatic failover within 2 minutes
- Protection against planned & unplanned downtime

"We are very pleased with the partnership relationship with NEC which has exceeded our expectations and delivered innovative technology to enhance our IT infrastructure experience. NEC India has always been keen and eager to support our requirements."

Mr. Vijay Mehta
Managing Director / AV Global India.

Complete Story: [http://www.nec.com/global/cases/avglobal/](http://www.nec.com/global/cases/avglobal/)
A large federal government procurement agency  
- High Availability Solution For Physical Security Application -

Realized high available disaster recovery solution by configuring remote clustering with EXPRESSCLUSTER and FT server for gate authorization system of federal agency.

**Objective of Introduction**

For gate authorization system, solution to improve business continuity on back-up site was required just in case main site goes down due to disaster.

**Benefit / System Configuration**

Configured disaster recovery solution by EXPRESSCLUSTER, which enables to continue business with minimum downtime and synchronous data protection, even in case disaster occurred and main site system goes down.

In addition, realized higher availability by using FT server for main site server.
EXPRESSCLUSTER X was selected as the foundation of business continuity service offered by Toggle Networks, from numbers of common products.

**Press Release:** (http://www.necam.com/press/read.cfm?Press_ID=2c1a9e79-8a59-409a-bb5c-462ccc5eac49)

Requirement was the product which;

- based on an open platform
- delivers synchronous, WAN-level protection
- offers geo-distributed hosting capability for site-level business continuity capabilities
- leverages industry-proven hosting infrastructures
- provides an affordable, cost-effective, and turnkey solution

**Benefit For Customer:**
- Low cost DR solution to protect critical application and data.
- Save investment of human resources to manage back-up site.

**Benefit For Service Provider:**
- Save investment by consolidating back-up servers on virtual environment.
- Value add solution for existing datacenter service business.
✓ Migration to virtual environment due to support expiration of servers
✓ Adopted EXPRESSCLUSTER as VMware HA cannot recover failures occurred inside the virtual machine
✓ Availability for 400 servers of Oracle and WebSphere used for the securities trading system has been ensured by EXPRESSCLUSTER.

Before system migration …

✓ Data mirroring cluster for each 2 servers.
  ➢ RHEL3, Oracle, WebSphere
  ➢ EXPRESSCLUSTER LE Ver3.x
✓ Total 200 sets of cluster (400 servers)

After migration …

✓ Shared disk clustering for 2 servers
  ➢ RHEL3, Oracle, WebSphere
  ➢ EXPRESSCLUSTER LE Ver3.x
✓ 8 virtual machines on 3 physical servers
  ➢ Merged standby VM to single physical server
Country : Nanning city, Guangxi province, China  
Industry : Large-scale retail store  
Product : EXPRESSCLUSTER X  
Challenges : To realize business continuity for cash register operations in each store. Each server failure took more than three hours to recover, resulting in huge losses to the tune of 1M RM loss per hour.  
Solutions : Improve availability and reliability of the POS systems with EC.  
- Data mirroring type cluster  
  Application servers in the headquarter office  
  POS system servers in the branch offices  
- Shared disk type cluster  
  POS system servers in the headquarter office  

Customer voice :  
“Our POS system has been stable since EXPRESSCLUSTER X installation. For example, a failure of database in the POS system occurred on the day of the 2nd anniversary of one of our stores. However, with EXPRESSCLUSTER X, we could failover the system to the standby server within 2 minutes, continue our operations and prevent huge business loss.”

**Customer issue:**

High availability in a heterogeneous environment to protect against service interruption in case of server failure or maintenance

**Customer and his needs:**

**CG36**: Conseil Général de l’Indre (Regional council)
- Very frequent database queries, constant use of print service
- Heterogeneous OS: Linux and Microsoft
- Just in time work process, rapid service delivery required by CG36’s partners

**Goal:**
- Ensure a quasi permanent availability of database and printing services

**EXPRESSIONCLUSTER X LE: Clustering + Mirroring**

**Clusters LINUX (Red Hat 2.1):**
- Clustering of Oracle database service. Automatic fail-over to a standby server in case of crash or maintenance of the active server
- Database mirroring

**Cluster WINDOWS:**
- Clustering of the print server. Automatic fail-over to a standby server in case of crash or maintenance of the active server
- Mirroring of spool queue

**Professional Services:**
- Delivery, installation, configuration, training performed on site
Other Case Studies

More successful case studies available at:

Thank You

An Integrated High Availability and Disaster Recovery Solution

For more product information & request for trial license, visit >> https://www.nec.com/en/global/prod/expresscluster/

For more information, feel free to contact us - info@expresscluster.jp.nec.com