Introduction to

ExpressCluster X 2.0
An Integrated High Availability and Disaster Recovery Solution
(www.nec.com/expresscluster)
ExpressCluster **protects high value data, realizes quick time recovery, and keeps total ownership cost low**

- **Data protection + Application failover**
- **Remote disk copy and application failover**

**Functionality**
- **Data protection**
  - Disk-to-disk back-up
  - Electronic tape vaulting
  - Offsite tape back-up
- **Application failover**
  - Synchronous remote disk copy
  - Asynchronous remote disk copy

**Remote disc copy and application failover**
- **High cost**
  - Remote disk copy combined with clustering software
  - Data mirror clustering
- **Low cost**

**Position in Business Continuity**
- In one product

- Protect data by data mirroring capability
- Application takeover by failover capability
- Supports both LAN & WAN environments

**Fast Recovery**
What is ExpressCluster?

High Availability (HA) clustering software which protects data & applications on Windows & Linux

Monitor and detect

- Monitors SW, OS, HW and detects server failure widely and accurately

Server Failover

- Continue business by failing-over operation to healthy server (application failover)

Take over the data

- Takes over the data by shared disk or mirroring capability

![Diagram of ExpressCluster](image)
ExpressCluster can be effectively applied as a measure against system failure, disaster, and planned maintenance.

**Challenges**

1. Continue business even in case of system failure
2. Maximize business hour and improve service quality
3. Continue business even in case of disaster

**Key Features of ExpressCluster**

1. Reliably detect error and failover to standby server
2. Continue business even in case of planned maintenance
3. Support remote clustering as DR solution
Product Functions/Features
Supports small-scale cluster system to high-end cluster system which requires high availability with multi node

Support up to 32 nodes per cluster system *

* for shared disk type clustering

System scale

Supported # of nodes per clustering system: 2 to 32 nodes

Active Server: M nodes
Standby Server: N nodes

2 node clustering (Active - Standby or Active - Active)

# of servers

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Empowered by innovation
Supported operation type (failover type)

Supports various configuration flexibly

- **Active - Standby**
  - G1

- **Active - Active**
  - G1 → G2

- **M+1 Standby**
  - G1

- **M+n Standby**
  - M active
  - n standby
  - G1 → G2 → G3

- **G**: Failover group
- **: Failover**
ExpressCluster data takeover type

Shared disk type with high expandability, and data mirroring type with high cost performance

**Shared disk type**

- Shared Disk
- Interconnect LAN
- Public LAN

**Data mirroring type**

- Data mirroring
- Interconnect LAN
- Mirror connect LAN

**Hybrid clustering type**

- Shared Disk
- Interconnect LAN
- Public LAN

NEW

Also, shared disk type and data mirroring type can be configured in same clustering system.

ExpressCluster is the first clustering software which realized hybrid clustering capability.

- : Heartbeat path
- : Failover group
- : Failover
Target resources to be taken over to standby server are defined as “failover group”. 

- **Failover group**
  - Certain set of cluster resources which clustered server uses.
  - Failover group moves between servers in case failover occurs.
  - Resources which belongs to same failover group moves together.

- **Cluster resource**
  - Resources which can be a part of failover group are:
    - applications / services
    - shared disk, mirrored disk
    - virtual host name (Windows)
    - IP address (floating IP, virtual IP)
    - etc....
Failover Process

Takes only about 1 minute for switching server

1. Detect failure
2. Stop application
3. Deactivate virtual (floating) IP address
4. Release disk control
5. Get disk control
6. Activate virtual (floating) IP address
7. Start application

System recovery time (downtime) depends on application

about 1 minute

Active → Standby

shared disk

Failure

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Various Monitoring Targets (AP, OS, HW, NW)

Able to detect failure of application, OS, hardware, and network

ExpressCluster X

Monitoring Agent

Router or other network devices

Active server

Application

Self Monitoring

Life and death monitoring

Response monitoring

Hang-up monitoring

OS

Access Check

System Disk

Hardware

NIC

HBA

Stand-by server

Application

Self Monitoring

Link-down monitoring

Access Check

System Disk

Hardware

NIC

HBA

Cluster partition

User data

Other products

Don’t have support for as many monitoring targets as ExpressCluster supports hence they can not detect failure conditions accurately and quickly.
Monitors not only application down, but also application hang-up

Agent of ExpressCluster sends command to the application, and monitors the response. If no response or anomalous response comes back, ExpressCluster takes action. (Restart AP or failover)

Agent of ExpressCluster monitors registry I/O (Windows) or communication between user space and kernel space (Linux).

Monitors only existence of the process of an application, and can not detect application hang-up or OS hang-up conditions.
Realizes fast resynchronization by mirroring only updated blocks

ExpressCluster is the first product to implement data difference mirroring on Linux platform.

Failover

Shutdown of active server due to server failure

ExpressCluster X

Copies only updated blocks

Complete disk resynchronization quickly and able to minimize the time of server load
ExpressCluster responds to the growing demand for high availability on virtual environment

Strong growth seen in Server Virtualization, trend expected to continue.

ExpressCluster in virtual environment

More consolidation, higher risk of system down

Higher requirement for keeping availability

Vol. of virtual servers shipped ‘04–‘09

Source: IDC, 2006

Virtualized Platform market 150% growth

Physical Server

Virtual Server
ExpressCluster demonstrated clustering on Hyper-V as the first clustering software.

* Other than Hyper-V, ExpressCluster also supports VMware and Xen virtualization environments.
ExpressCluster is the only HA clustering software which can provide “Hybrid Clustering” function.

ExpressCluster’s “Hybrid Clustering” solution

In the case of disaster, Application will failover to the back-up site.

In case of server failure, Application will failover within the site.

Also, back-up site can be clustered by shared disk clustering.

ExpressCluster is the only HA clustering software which can mirror the data in shared disks.
ExpressCluster can save on power consumed by standby servers by around 20%, leading to lower cost of operations and greener IT.

“Power and cooling will be a top 3 issue with all CIO’s in the next 6-12 months” - Michael Bell – Gartner
Alert service of ExpressCluster

Alert the failure by Email or warning light automatically

For system administrators, knowing that some failure has occurred is also critical for fast recovery of clustering system.

Alert service allows administrators to ...

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

Helps to minimize the cluster system downtime and decrease the risk of system down due to the cluster system down.

System administrator need to check monitoring screen to recognize the failure. This means, it may take long time to recover clustering system.
Easy configuration by applying configuration file

Configuration file enables user to configure clustering system very simply

ExpressCluster X Builder
GUI tool for building cluster configuration

Configuration File
Cluster.conf

- Separated from installation and can be created off-site.
- In case of server replacement, new server can be configured only by applying the file.

In case of server replacement due to server failure ....

Other products

Need to configure for each clustering system, even they are same configuration
Enables to monitor Windows/Linux cluster system in integrated viewer

Need to monitor cluster systems by individual screen

Helps user to recognize alert immediately.
ExpressCluster is operational on any Intel Architecture (IA) servers and storage.

**Server:**
- Proliant DL380/360 (HP)
- PowerEdge (Dell)
- eServer xSeries (IBM)
- PRIMERGY (FUJITSU)
- HA8000 (HITACHI)
- Express5800 (NEC) etc...

**Storage:**
- FAS960/FAS250 (NetApp)
- SmartArray (HP)
- ETERNUS (FUJITSU)
- Symmetrix / CLarix (EMC)
- SANRISE (HITACHI)
- iStorage S Series/FC&SATA Disk Array Device (NEC)
- IBM storages
- Sun Microsystems storage
  etc...

**No hardware dependency**
Various configuration items enable applications to be configured and run with ExpressCluster. It provides users high flexibility.

**Verified Applications (*)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>Oracle 10g/9i, SQLServer2005/2000, MySQL, DB2, Sybase, Yggdrasill, Interbase, Pervasive.SQL</td>
</tr>
<tr>
<td>Backup</td>
<td>ARCserve, BackupExec, NetBackup, NetVault, ntbackup</td>
</tr>
<tr>
<td>Internet</td>
<td>IIS, ExpressMail, apache, httpd, sendmail, Postfix, ipod (or other applications which use smtp and pop), ProFTPD</td>
</tr>
<tr>
<td>Groupware</td>
<td>Microsoft Exchange, Star Office, Domino</td>
</tr>
<tr>
<td>Security</td>
<td>AntiVirus, Virusbuster, ServerProtect, InfoCage</td>
</tr>
<tr>
<td>Operations Management</td>
<td>Tivoli, OpenView, WebSAM</td>
</tr>
<tr>
<td>Application Server</td>
<td>JRun4, WebLogic, WebSphere, OracleAS, Tuxedo, tomcat, JBOSS, WebOTX</td>
</tr>
<tr>
<td>ERP</td>
<td>IFS, SAP</td>
</tr>
</tbody>
</table>

(*) These are only few examples of various verified applications.
ExpressCluster – A Market Leader
Journey of ExpressCluster

ExpressCluster over last 12 years

- Achieved No.1 share in Windows and Linux
- Share No.1 continuously developing the business
- Windows, Linux Share No.1
- ExpressCluster is sold as CLUSTERPRO in Japan
- Above statistics are for Japan Market
Continuously achieving No.1 market share in Japan for Linux/Windows platform!

Market trends of high availability clustering software in Japan (2004 - 2006)

Growing demand for HA clustering solution

2006

HA Clustering Software Market in Japan

CAGR 2006-2011 15.5%

2005

HA Clustering Software Market in Japan

2004

HA Clustering Software Market in Japan

"ExpressCluster" is sold as "CLUSTERPRO" in Japan.

Source: IDC Japan, Dec. 2007 "Japan Virtualization and High Availability Clustering Software 2007-2011 Forecast and 2006 Vendor Shares" (J8370101)
ExpressCluster – A Global Product

Available globally
Local sales and support by NEC subsidiaries

DR solution by ExpressCluster won an award at Cebit of America 2004!

Partner program launched
(First partner event has held on Oct. 2007)

Expanding cases especially at JOC customers.

Support by NEC
Support by NEC subsidiaries
Local sales/support Office

North America/Canada
NECAM

Europe/EMEA
NECC

China
NEC-AS

Asia Pacific
NEC Asia
NEC Indonesia
NEC Thailand
NEC Vietnam
NEC Taiwan
NEC Hong Kong
NEC Australia
NEC India
etc...
Expand sales channel which do not depend on NEC platform

- ExpressCluster does not require HW/AP certification.
  - Can be embedded to various applications, collaborated with other server vendors
  - Partner development (ISV, Sler, Linux distributors and so on...)
  - Verification with partner’s products have been improving quality of ExpressCluster

Alliance Partners - Japan -

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Alliance Partners - Other Region -

➤ Distributors
- TEAM 1 SYSTEMS
- FORETECSON
- pds services
- ADISTEC
- SYNEX

➤ Platinum Partners
- Alliance Technology Group
- All Computer Solutions, Inc.
- genisys
- ZENTRA
- PARADIGM technology
- BeechTek
- VIRTUALIT
- HIT
- HyperTec

➤ ISV Partners
- AMAG Technology
- Continental Access
- LENEL
- HIRSCH ELECTRONICS
- GENETEC
- TOGGLE networks

➤ Technology Partners
- YES Certified SUSE, LINUX ENTERPRISE SERVER
- redhat.
- ORACLE
- Microsoft Gold Certified Partner
- Novell
- Novell
- Novell
- Novell
- Novell
- Novell
ExpressCluster – Case Studies
Company A
Application A
ExpressCluster
Server

Company B
Application B
ExpressCluster
Server

Company C
Application C
ExpressCluster
Server

Datacenter of Service Provider

Virtual Environment
Server

WAN
Application failover via WAN

For Customer;
• Low cost DR solution to protect critical business operation and data.
• Save investment of human resources to manage back-up site.

For Service Provider;
• Save investment by consolidating back-up servers on virtual environment.
• Value add solution for existing datacenter service business.

NEC ExpressCluster is the product which fits to DR service foundation by its high reliability and flexibility.

Case Study
ExpressCluster was selected as the foundation of business continuity service offered by Toggle Networks, from numbers of common products.

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

Press Release: April 24, 2008
(http://www.necam.com/press/read.cfm?Press_ID=2c1a9e79-8a59-409a-bb5c-462cc5ee4c49)
Objective of Introduction

To expand market share in auto-auction market, effective IT investment which improves customer’s trust was needed.

Merit/System Configuration

Ensuring business continuity was the first priority to prevent opportunity loss on auto-auction system which realizes real-time auction. ExpressCluster was selected to protect database server and realized it’s high reliability.

ExpressCluster offers service fail-over and synchronous data replication to the server which will be accessed from seven sites.
A large federal government procurement agency

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 backup site was required just in case main site goes down due to disaster.

Merit/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.
• Clustering of credit administration server which checks the credit of user at the time of online sign up.

Objective of Introduction

For internet service providers, system down of online services is unforgivable. ExpressCluster will minimizes down time in case of failure of HW, OS, and application.
Mail server for millions of members configured by Linux servers and EMC disk.

- ExpressCluster is running on more than 250 servers for the system.
- Planning to add new cluster servers to respond to the increase of members.
ExpressCluster has been applied to various systems since its first release in 1996.

- **Hospital** (200～1000 beds, Outpatient clinic 1,000 people scale, more than 50 cases)
- **Catalog Shopping “Sensyukai”** (Web payment of more than 12,000 registered customers)
- **Tamagawa Takashimaya Shopping Mall** (Card payment of 350 shops, Ticket issue management of parking for 2000 cars)
- **Major music download site** (More than 2 million members)
- **Biggest company of shop BGM** (Broadcasts latest songs in the charts to more than 1.6 million domestic shops)

**Diagram: ExpressCluster Select Success**

- **City Government**
  - Display "weather information" in terminals set at convenience store. 6,300 shops.
  - From disk sharing between 7 nodes down to mirroring of 2 nodes.

- **IT Company**
  - Operating mirroring type at more than 50 places.
  - Operating more than 300 servers for BIGLOBE mail box.

- **Weather Center**
  - Resident registry network

- **Taxi Card payment**
  - Credit payment for fare adjustment

- **ExpressCluster Select Success**
  - Since 1996

- **Baseball Broadcast - Race track seat Web reservation**
- **Music download - Mail order**
- **Broke the 2 millionth member mark**
- **Department store · Shopping mall payment server**
- **Tamagawa Takashimaya - First suburban shopping mall in Japan. Manages issue of parking tickets for 2000 cars for 350 shops.**

**ExpressCluster** has been used in various systems since its first release in 1996. It is a high-speed database server system that can be used in various fields such as hospitals, catalog shopping, major music download sites, and more.
We would be happy to provide you 60-day evaluation license for ExpressCluster with no limited function.

Please send email to info@expresscluster.jp.nec.com and request the license with following information.

- **Name**: Your name
- **Job Title**: Your job title
- **Company**: Company name
- **Address**: Address of your company
- **Telephone**: Your telephone number
- **Email**: Your email address
- **Country**: Your located country
- **Target application**: Any target application to be clustered with ExpressCluster at this evaluation. (If any)
- **Project schedule**: Schedule for any project to use clustering software. (If any)
  - “Immediate” or “Within 3 month” or “Within 6 month” or “No plan”
- **Cluster configuration to evaluate**: “Data mirroring type” or “Shared disk type” or “Hybrid clustering type” or “All”
Thank You

ExpressCluster X 2.0
An Integrated High Availability and Disaster Recovery Solution
(www.nec.com/expresscluster)

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