
# Ultimate Integrated Solution for Business Continuity & Disaster Recovery

April 2026

NEC
Technology Service and Software Department
(EXPRESSCLUSTER)

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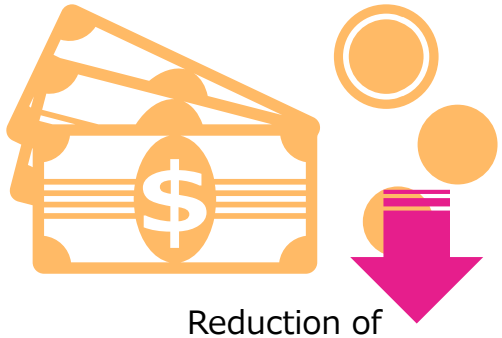
# Requirement for HA Cluster

## 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



Reduction of revenue

Credibility loss

Business opportunity loss

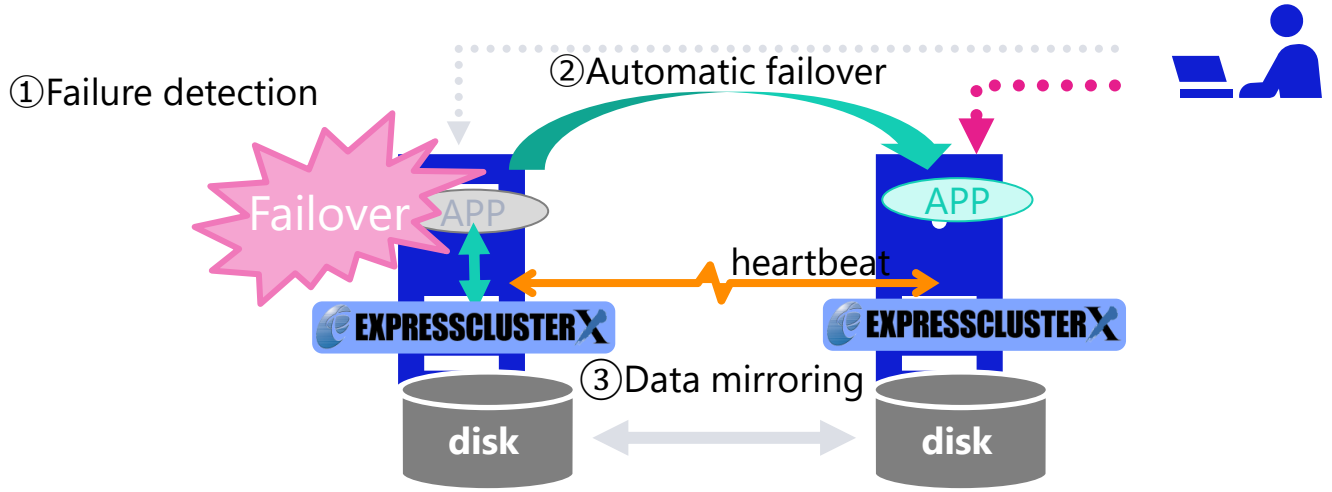
# What is EXPRESSCLUSTER X?

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

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

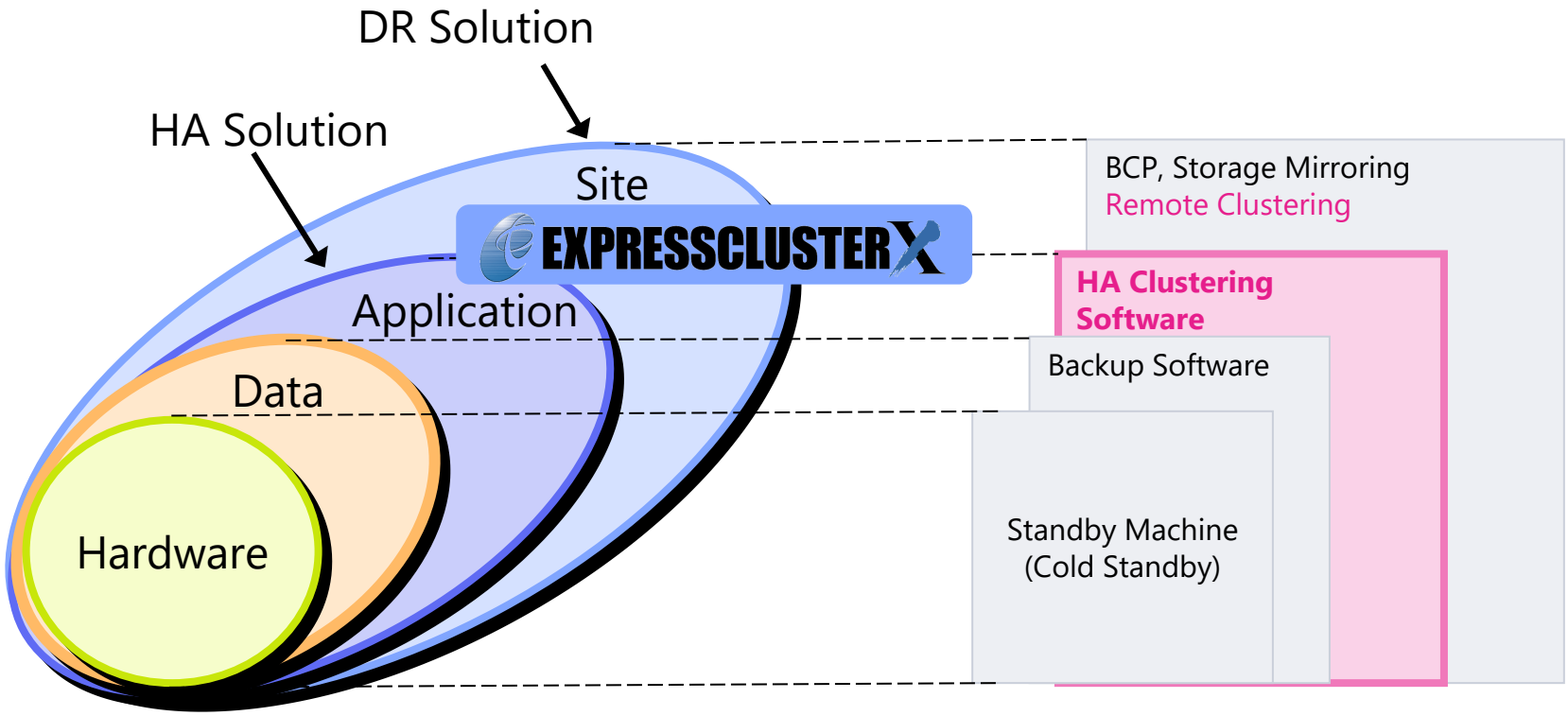
②Automatic / Quick application-level failover

③Data mirroring between clustered servers (also supports shared disk type clustering)



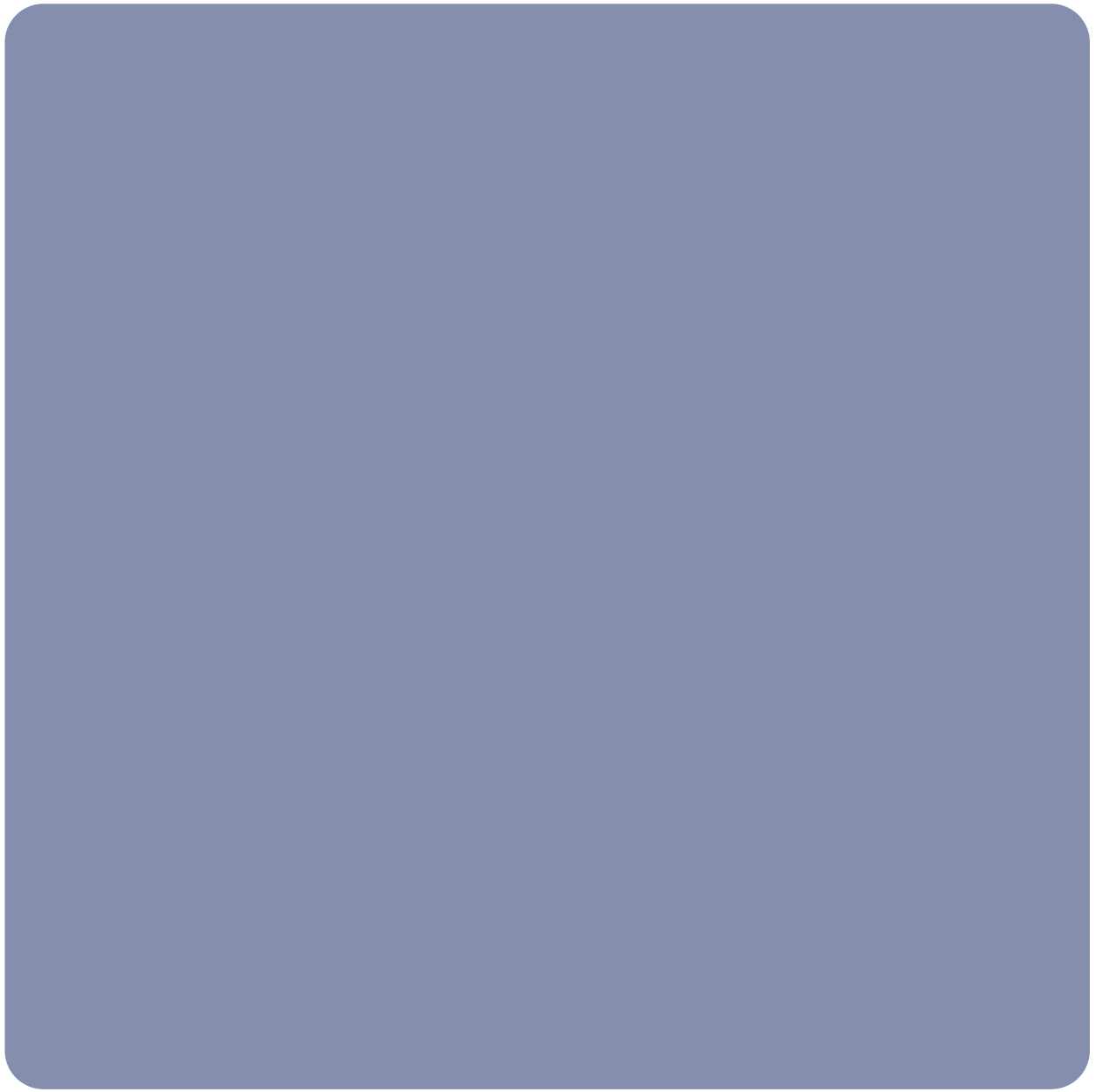
# Market Positioning of EXPRESSCLUSTER

## EXPRESSCLUSTER is Categorized as Clustering Software




**Covered fields by EXPRESSCLUSTER**

# 1. Customer Challenges



# Negative Impact of System Disruption

**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**

| Industry | Negative Impacts |
|---|---|
| Financial | • Social impact to nation's economy<br>• Damages to company's credibility |
| Manufacturing | • Economic loss due to stoppage of production activity<br>• Damage to credibility due to having negative impact to related companies<br>• Opportunity loss |
| Retail | • Economic loss due to stoppage of sales activities |

**by Type of System**

| System | Negative Impacts |
|---|---|
| Mail system | • Loss of productivity due to communication issue |
| Production system | • Opportunity loss due to disruption of manufacturing activities<br>• Damage to customer satisfaction |
| Ordering system | • Opportunity loss due to disruption of receiving orders from customers<br>• Damage to customer satisfaction |
| File Server | • Loss of productivity |

## Economic Loss Caused by System Disruption

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

| Domain | Amount of Loss/hour (US$) |
|---|---|
| Financial | 9,997,500 |
| Retail | 397,500 |
| Healthcare | 157,500 |
| Manufacturing | 59,930 |

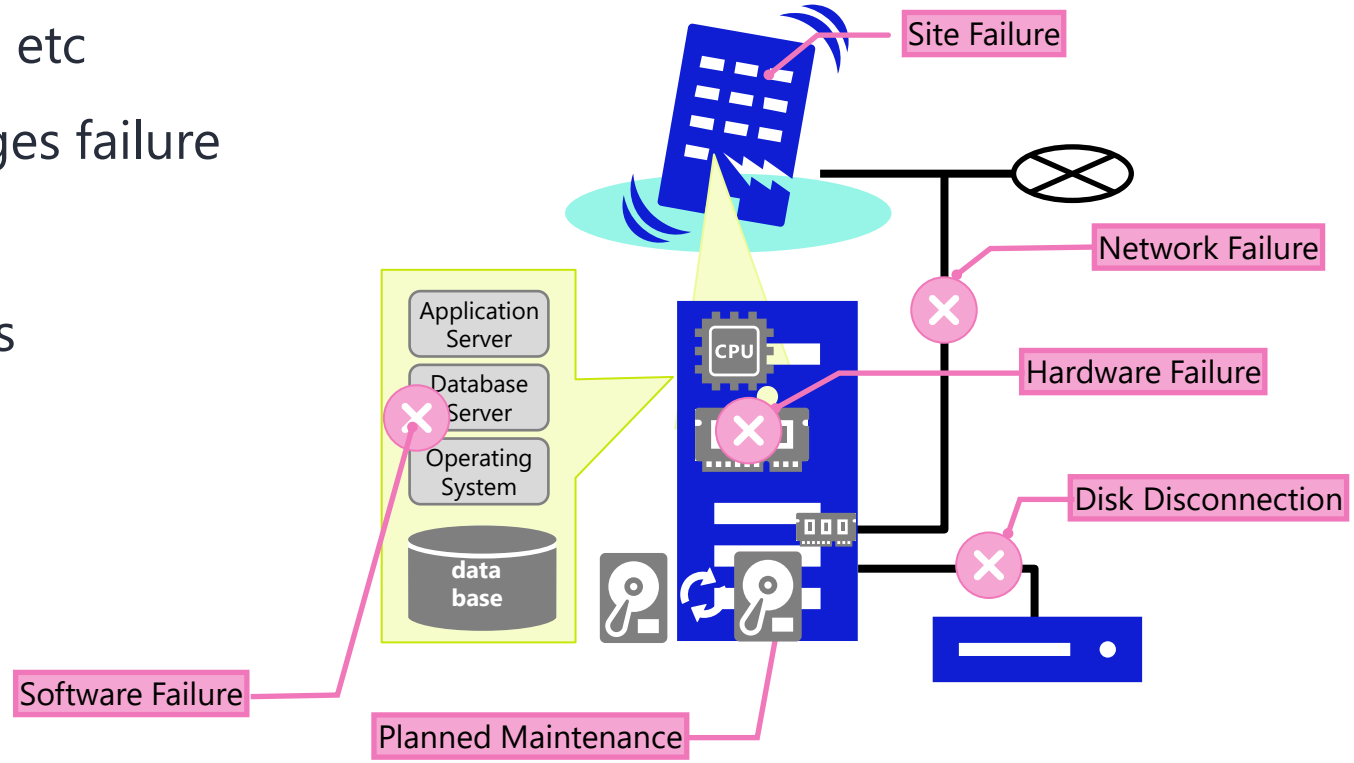
Source : IDC Research

## 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 ...

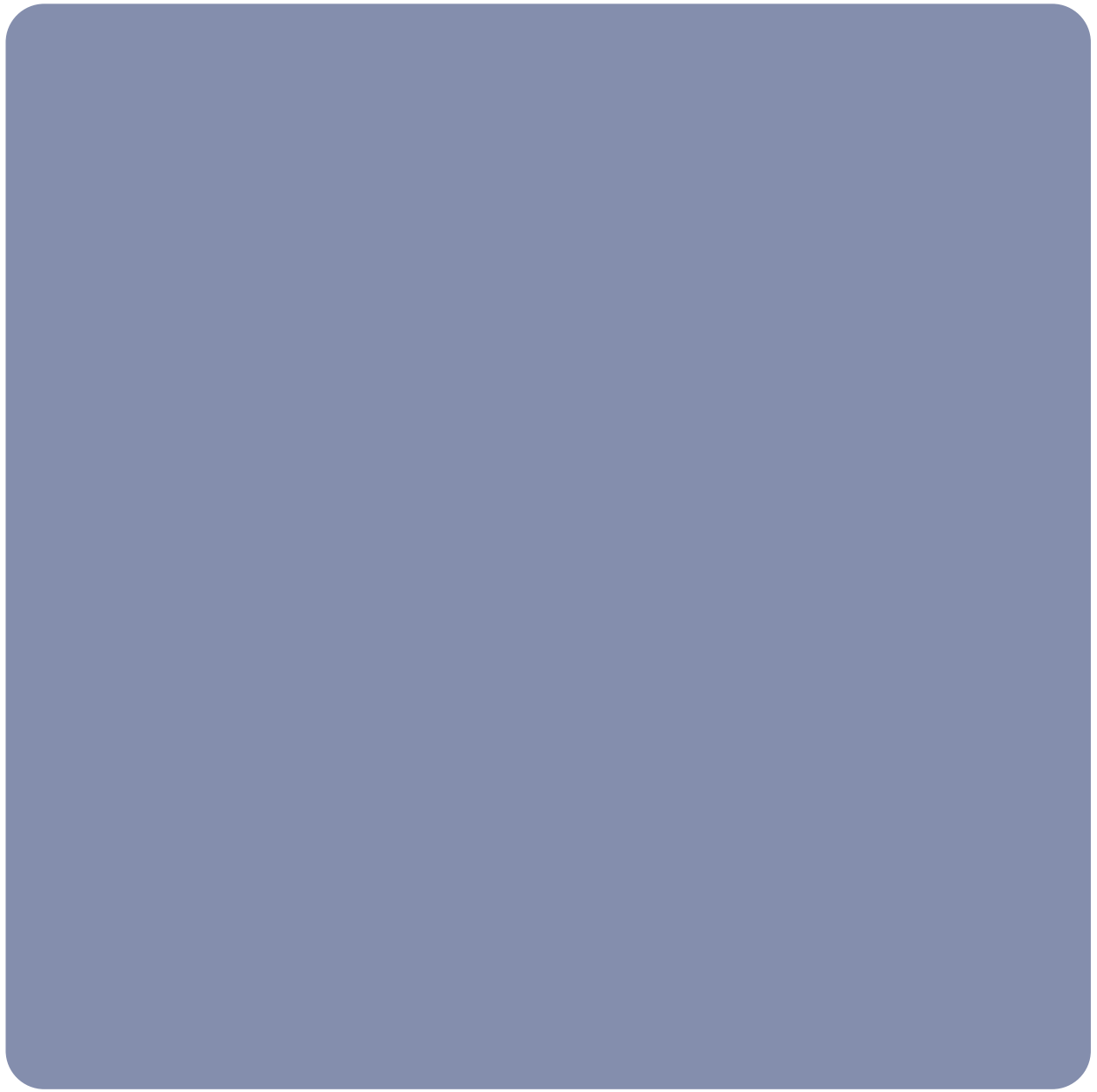
# Cause of System Disruption

- 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 29 years experience

**Flexible**

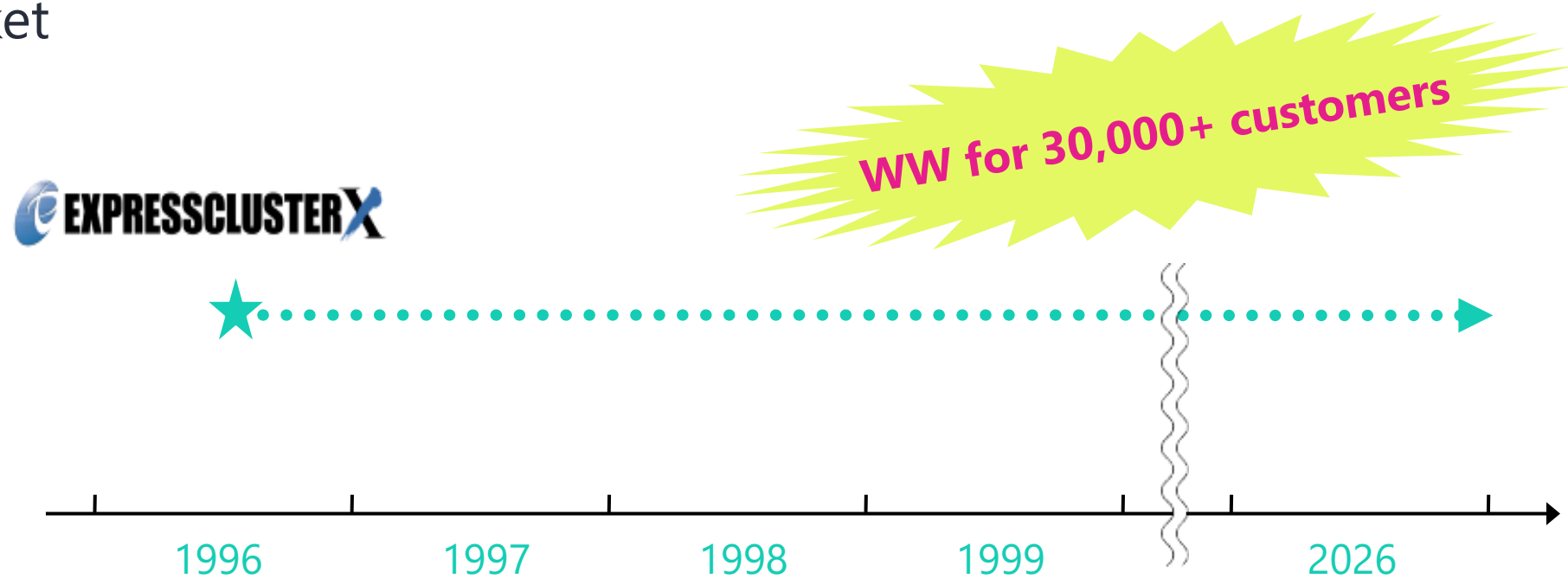
Supports various platforms / applications / configurations in order to fit within any kind of system environments

**Leading-Edge**

Immediate support of up-to-date technologies in order to meet new customer demands

# Reliable: Long History

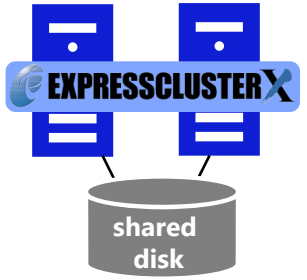
- EXPRESSCLUSTER X was released in Oct 1996 which was earlier than other major clustering solutions.
- The product has been improved continuously based on direct feedback from the market



# Flexible-1: Supported Cluster Configuration

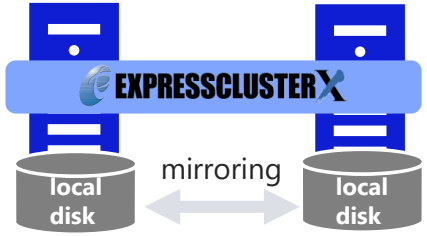
## Supporting three different data sharing mechanism

### 1) Shared disk type



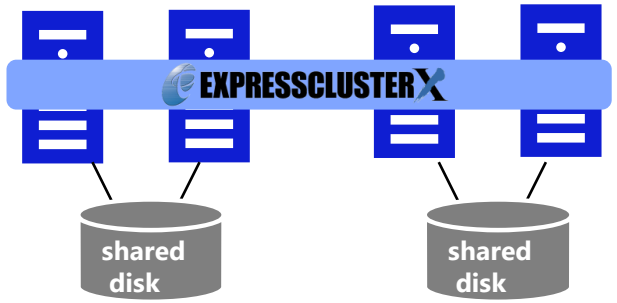

- For larger data volume
- High reliability provided by storage system
- Simple configuration

### 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)

# Flexible-2: No Hardware / Application Dependency

## EXPRESSCLUSTER X supports all types of IA servers and storages

| Server | Storage |
|---|---|
| • Express5800<br>• ProLiant<br>• PowerEdge<br>• PRIMERGY<br>... and more | • iStorage<br>• EqualLogic<br>• EVA<br>• FAStT<br>... and more |

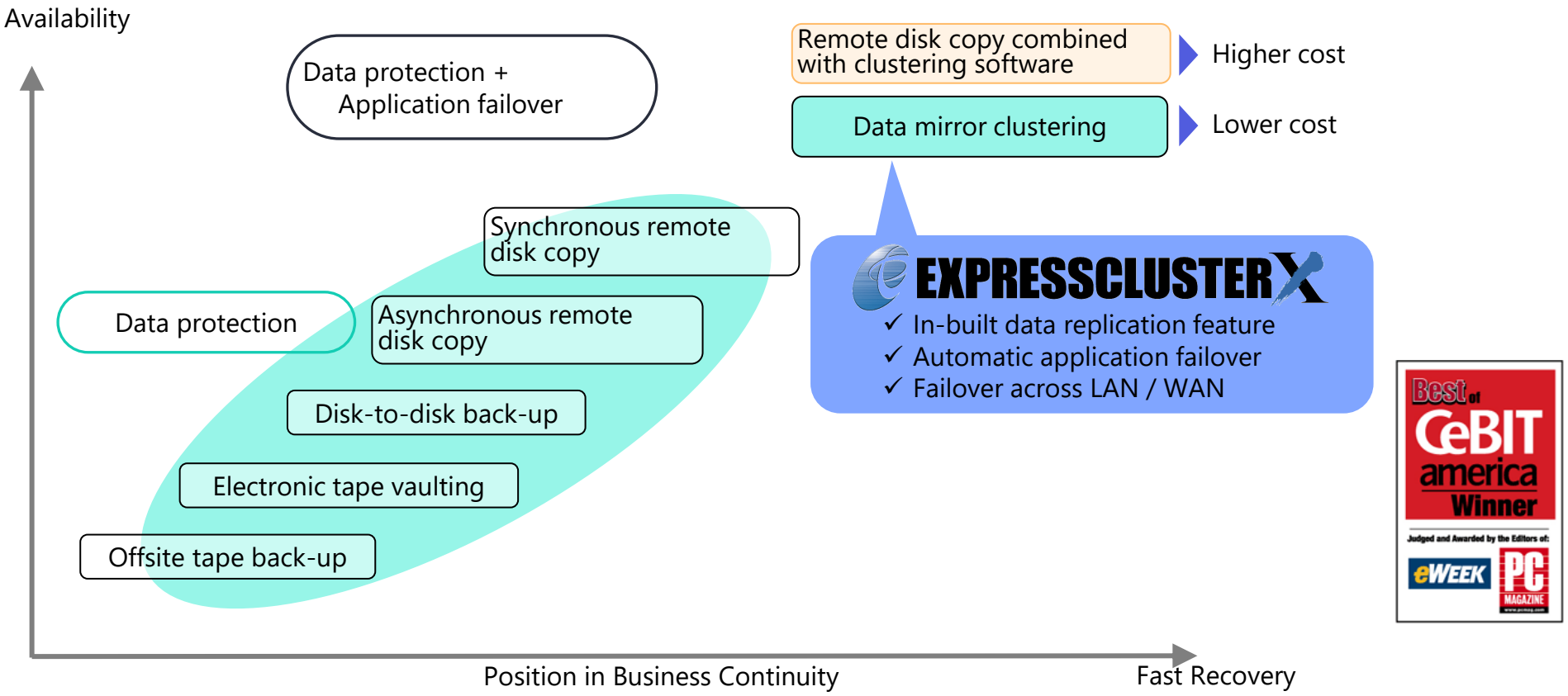
## EXPRESSCLUSTER X supports various applications

| | |
|---|---|
| Database | Oracle, SQL Server, MySQL, DB2, etc... |
| Backup | Arcserve, BackupExec, NetBackup, NetVault, NTBackup, Veeam Backup & Replication |
| Web Server | IIS, apache, httpd, sendmail, Postfix |
| Groupware | Exchange, Domino |
| Security | OfficeScan, ServerProtect, InfoCage |
| System Management | MasterScope, Tivoli, OpenView |
| Application Server | WebLogic, WebSphere, JBOSS |
| ERP | SAP, TASY |

... and more

# Leading-Edge-1: Disaster Recovery Supported

**EXPRESSCLUSTER X has been offering WAN clustering feature since 2004 which enables lower-cost disaster recovery solution**



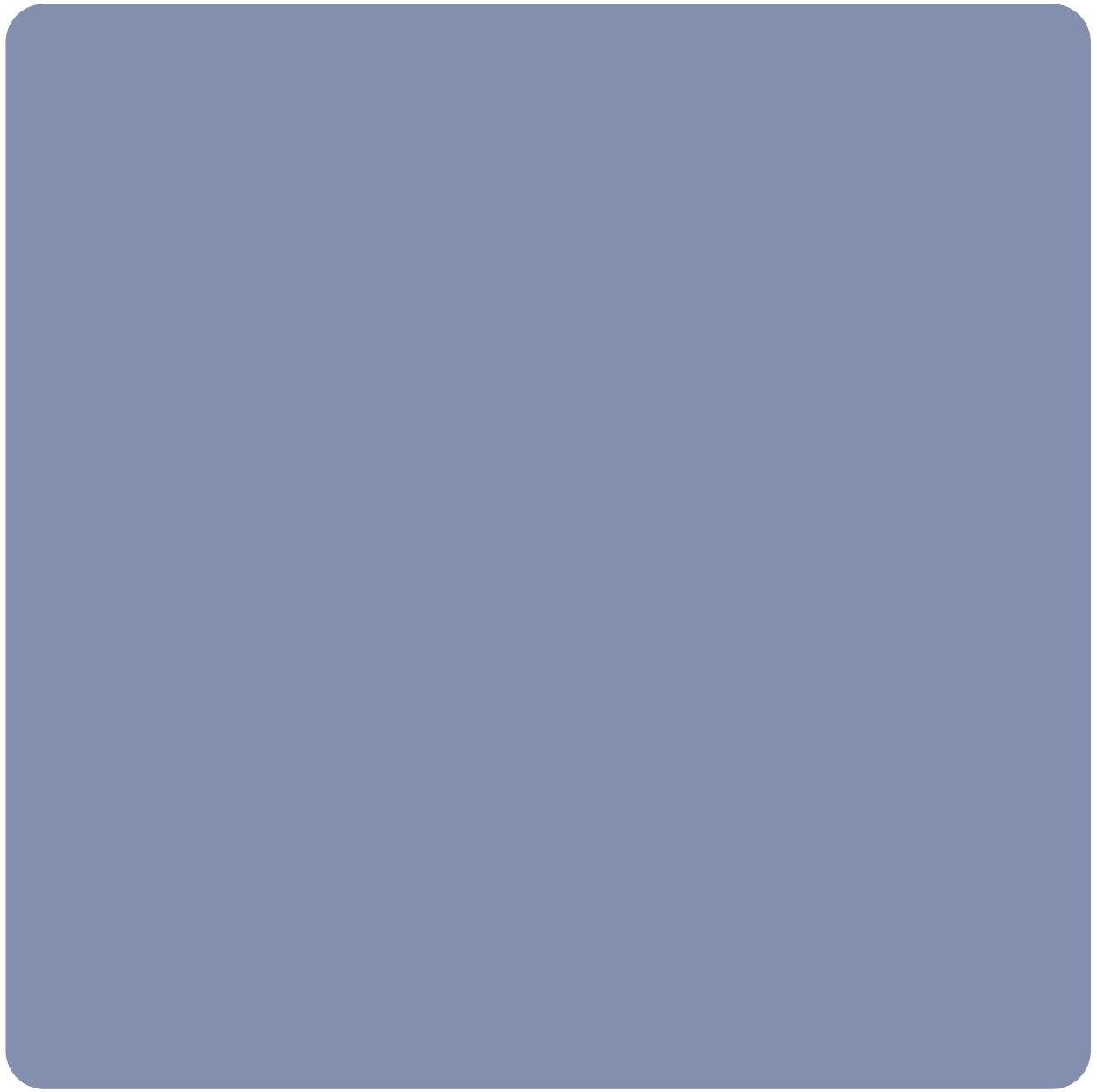
# Leading-Edge-2: Cloud Environment Supported

- 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):


**※Cloud environment with the operation record by EXPRESSCLUSTER X.**

Setup Guide: https://www.nec.com/en/global/prod/expresscluster/en/doc/guide.html
Official Blog: https://www.nec.com/en/global/prod/expresscluster/en/blog/index.html

# 3. Other Functions / Features

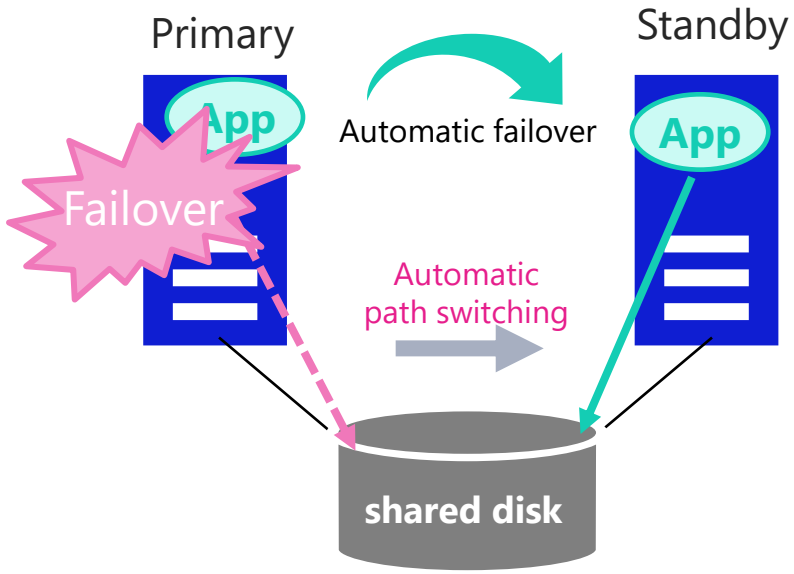


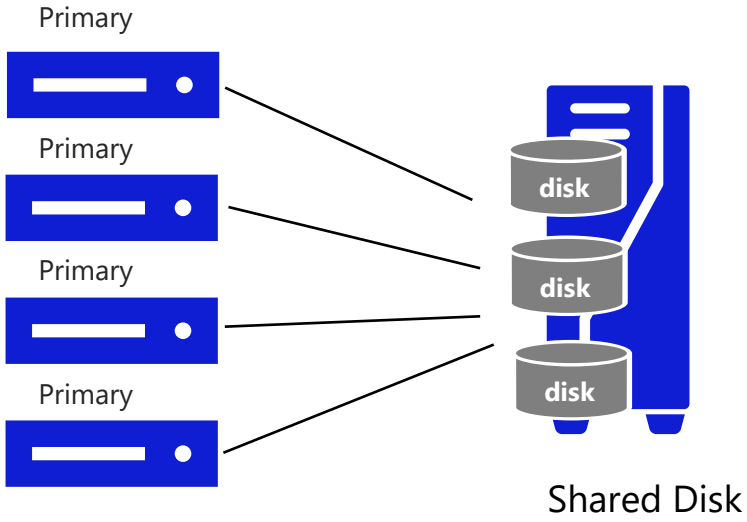
# Other Functions / Features

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

# Shared Disk Clustering

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



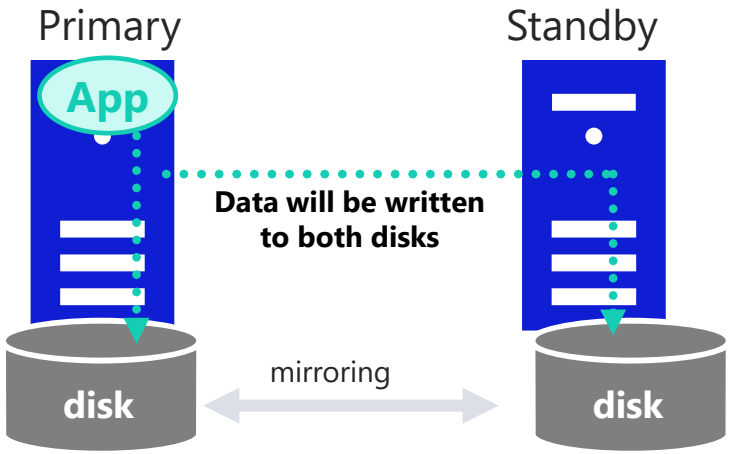




- Maximum 32 nodes in a single cluster is supported
- M + n clustering (M active servers and n standby servers) is also supported!

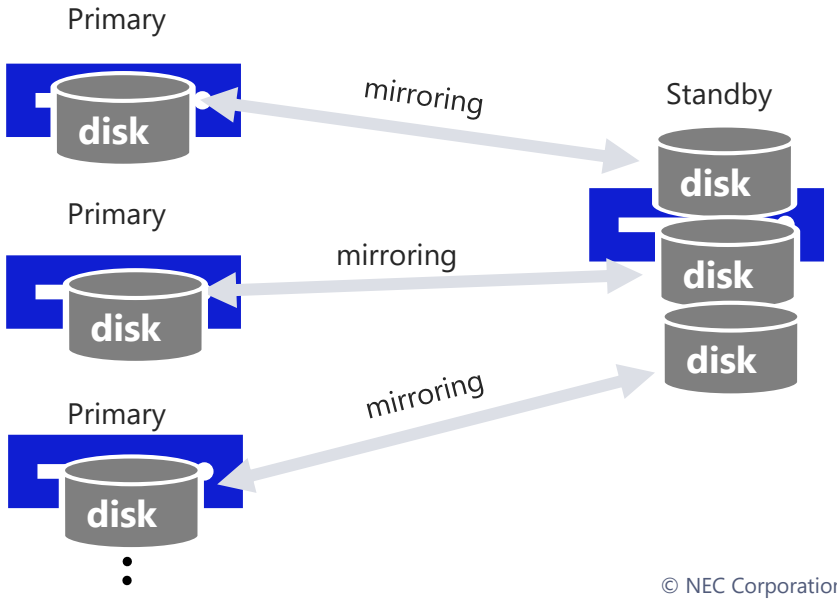
# Data Mirroring Clustering

**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.



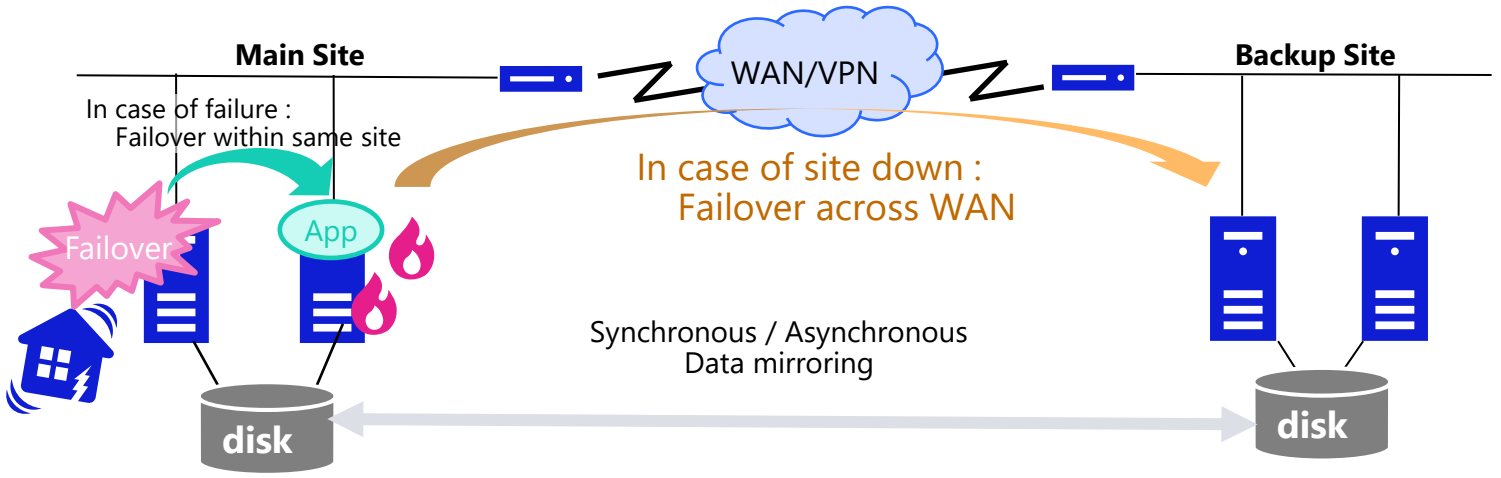

Multi mirror set in a single cluster is supported
(Windows 22 set, Linux 32 set)



# Hybrid Clustering

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

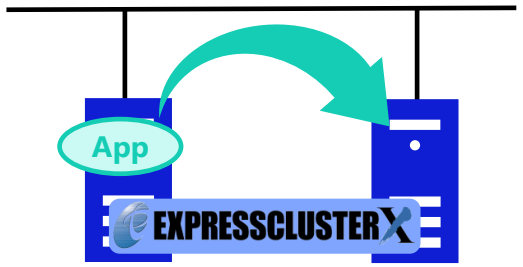
- 2 failover scenarios for higher operability:
  - In case of component failure such as HW, OS, application failure, application will failed over to standby server locating in same site
  - In case of site down due to disaster, fire etc, application will failed over to standby server located in backup site
- Data stored in SAN will be mirrored to backup site in either synchronous / asynchronous mode



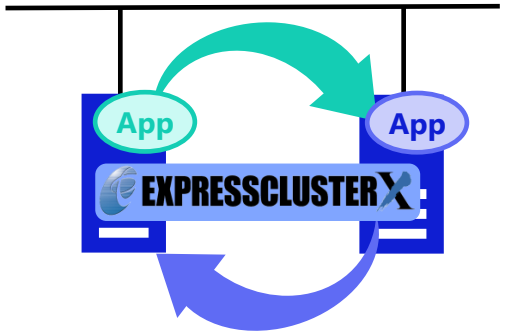
# Supported Failover Scenario

## Supports various configuration flexibly

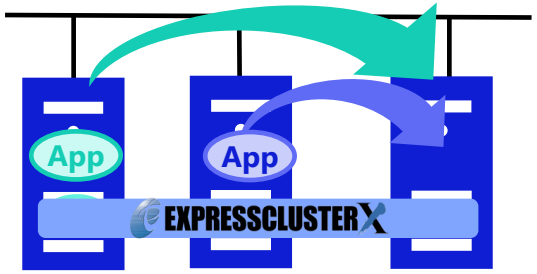
### 1) Active - Standby



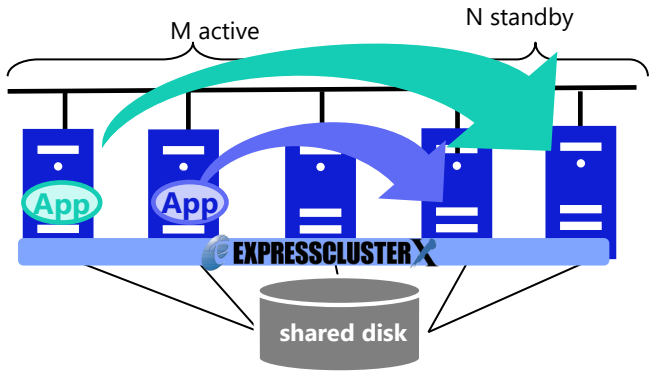

### 2) Active - Active




### 3) M+1 Standby



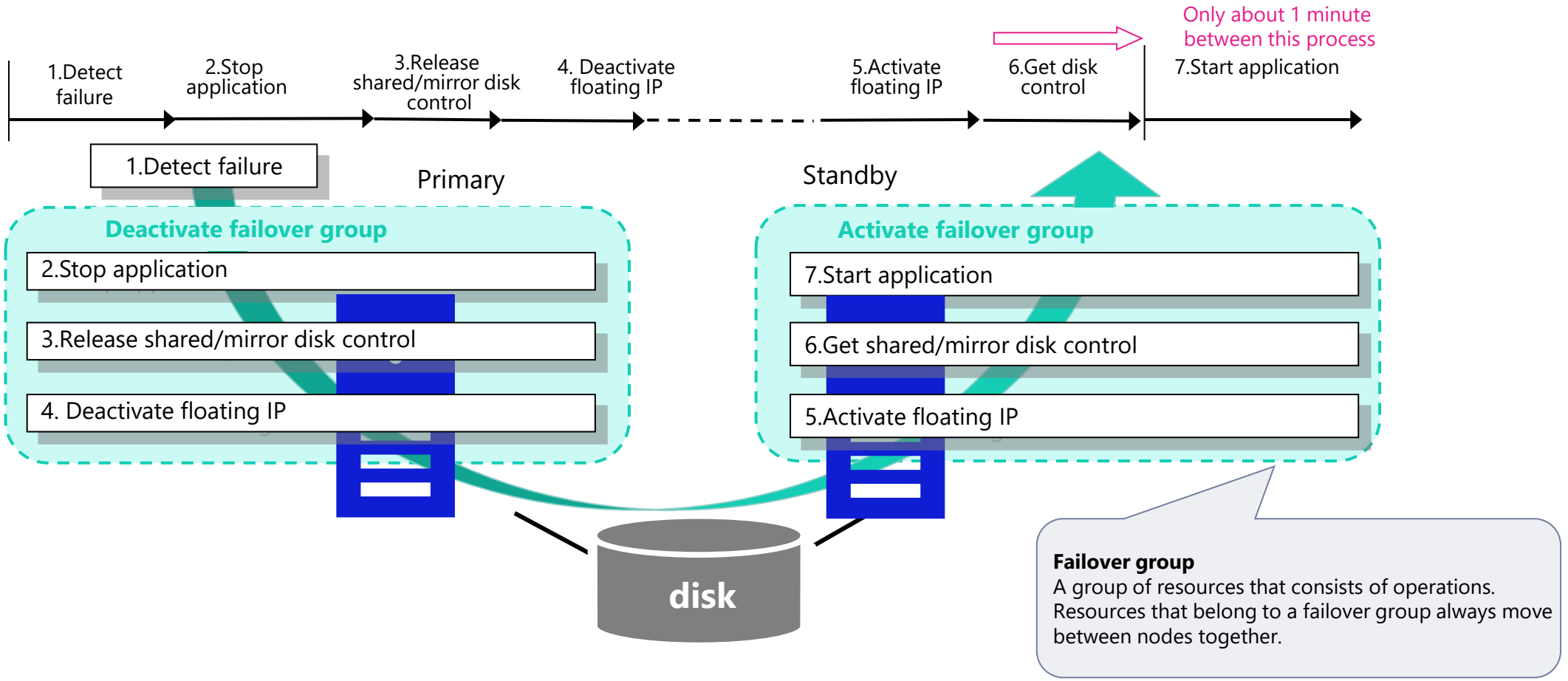

### 4) M+n Standby




***... and more !***

# Failover Process

## Takes only about 1 minute for switching server



# 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

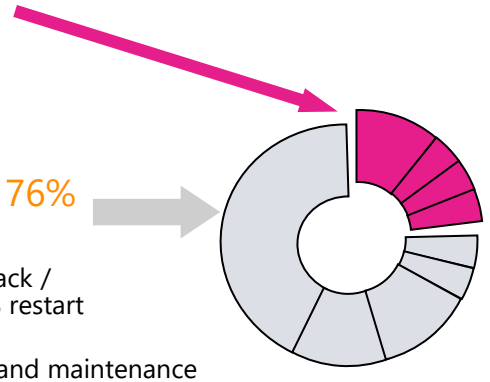
13% : Application installation and maintenance

12% : OS restart relating to configuration change of OS

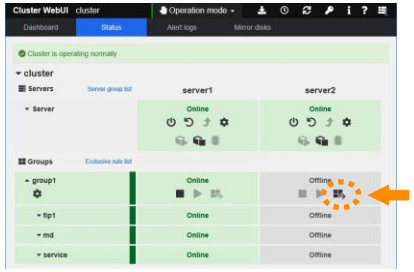
7% : OS restart relating to hardware configuration changes

7% : Other OS restart

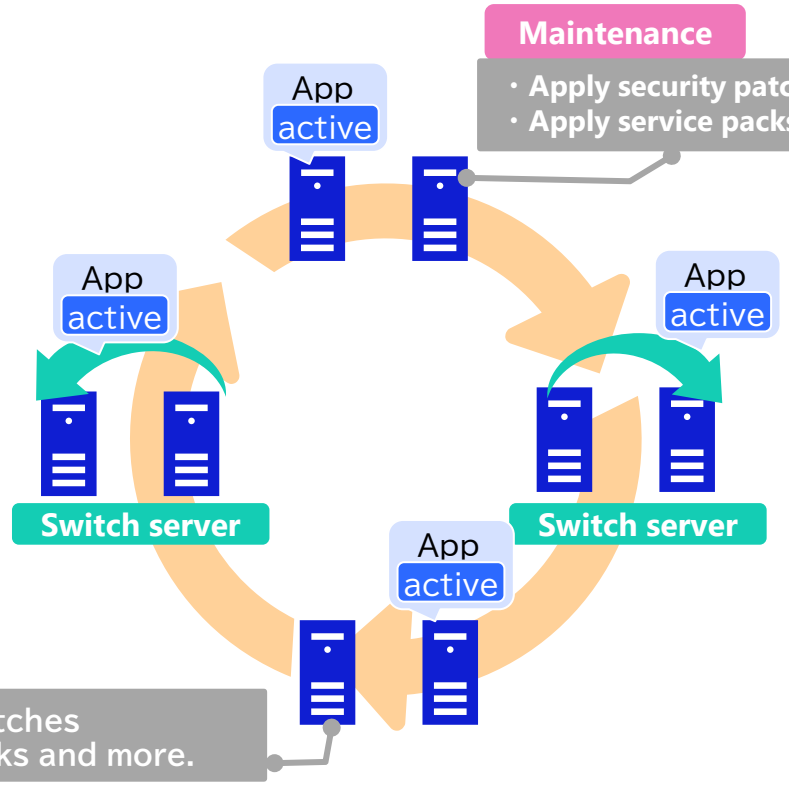
Source : Microsoft Research



(EXPRESSCLUSTER X Console)



Manual failover can be done with simple operation!




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

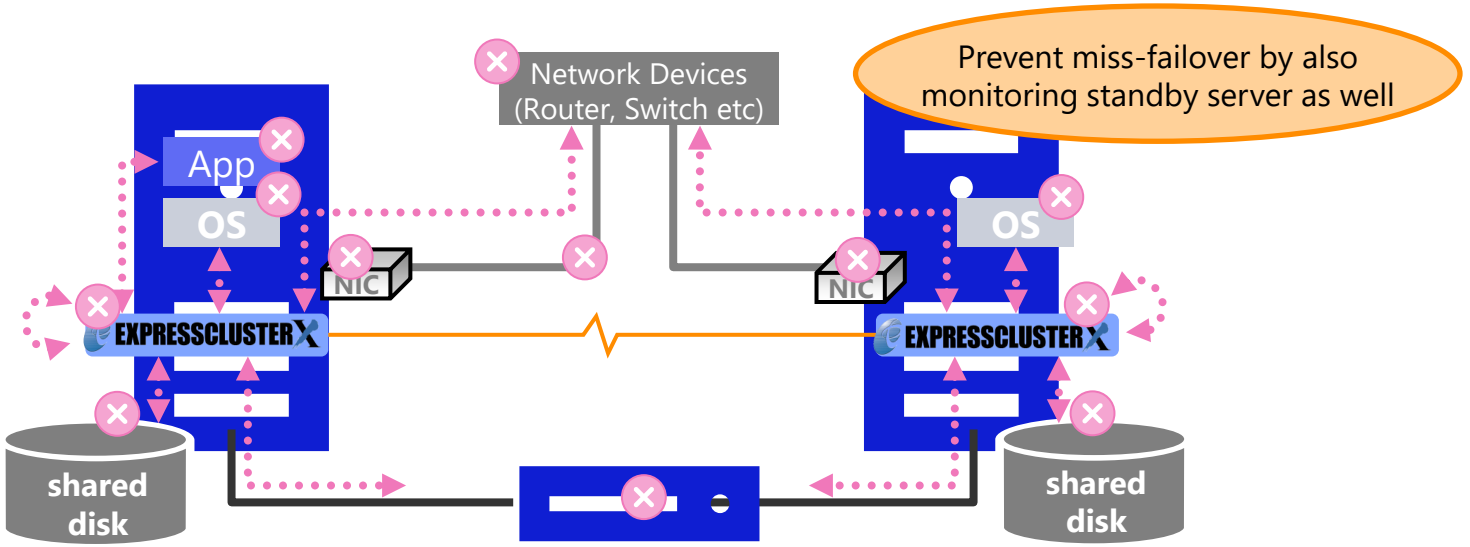
# Other Functions / Features

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



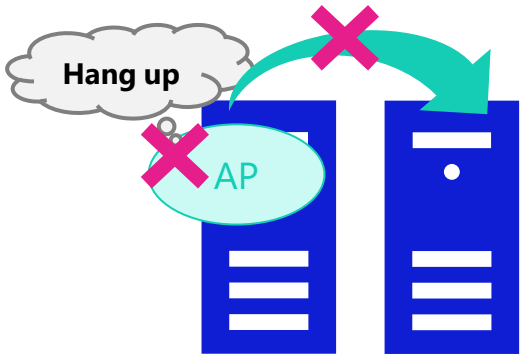

EXPRESSCLUSTER X monitors wide range of resources from NW to application and do not miss a failure which leads to system disruption!

# 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

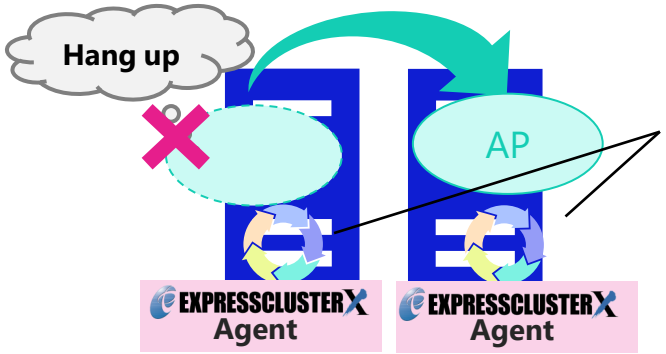



Termination of the application process will be detected as an error.

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




Real time monitoring of application healthiness

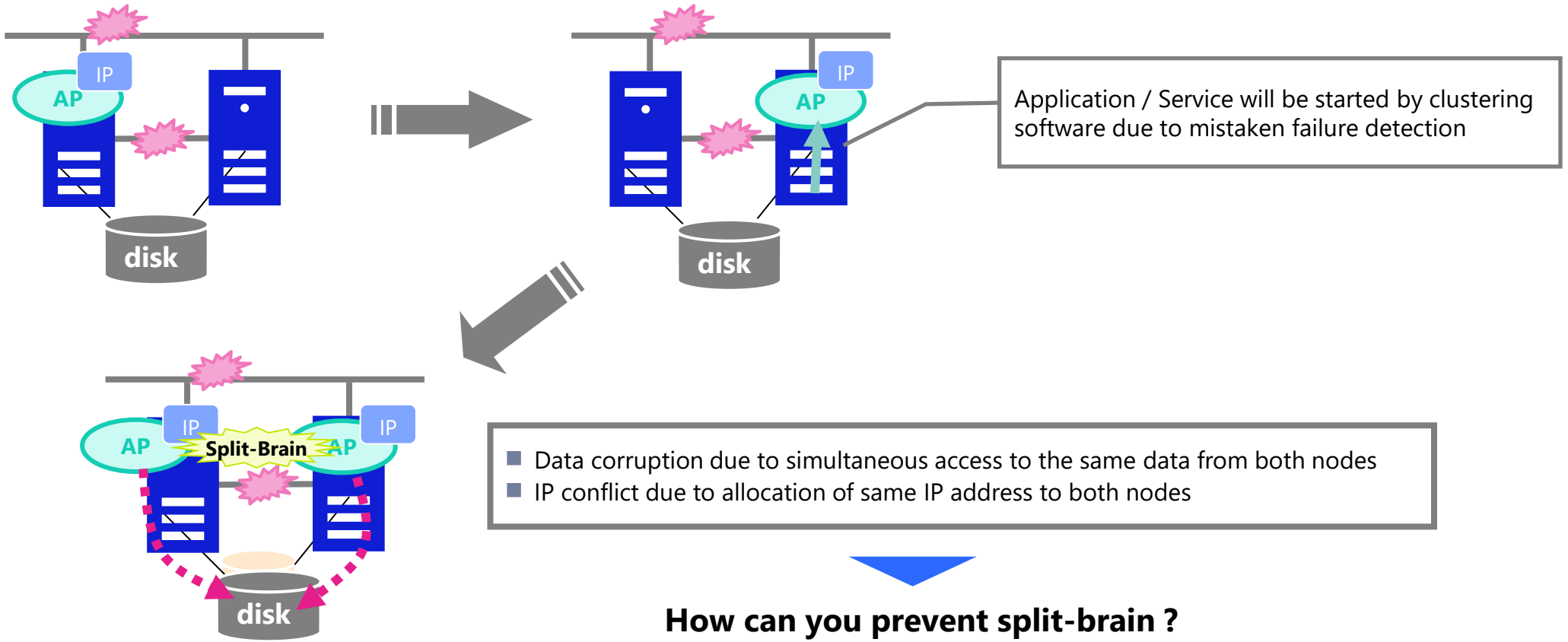
| | |
|---|---|
| ✓ | Detection of application hang-up |
| ✓ | Abnormal response from application |
| ✓ | Abnormal termination of application |

# Other Functions / Features

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

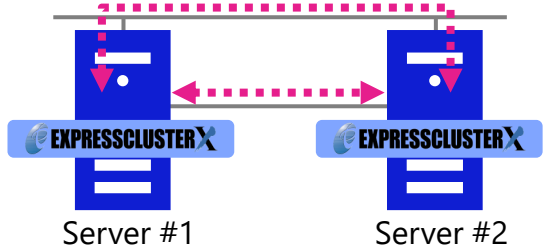


# Prevention of Split-Brain - Redundancy of HB path -

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

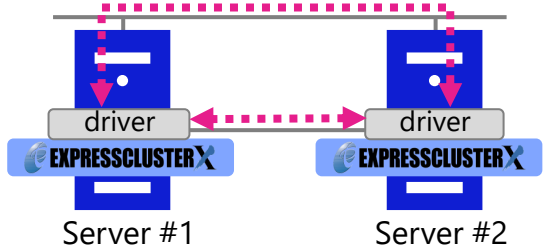
## LAN Heartbeat

- Heartbeat connection through LAN



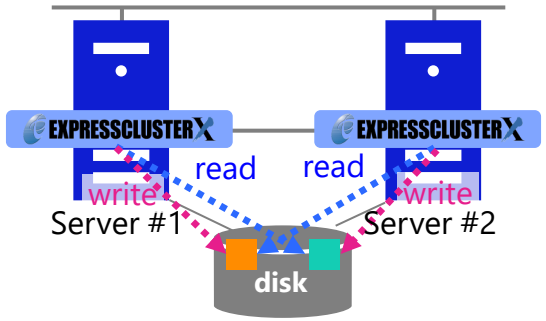

## LAN Kernel Heartbeat

- Send/receive heartbeats between each servers at kernel space.




## Disk Heartbeat

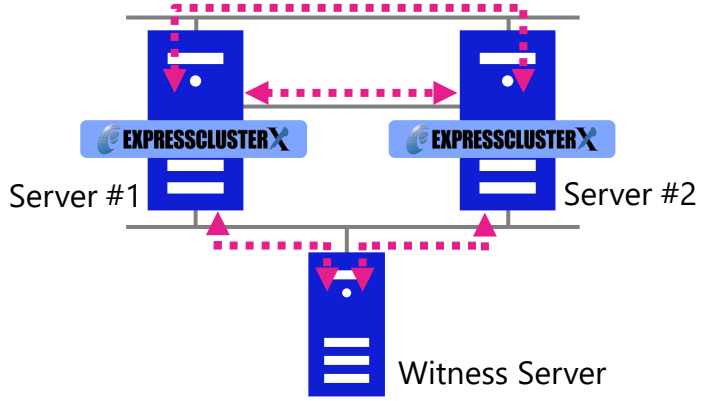
- Alive monitoring by writing / reading the data on shared storage




* Less loads comparing to LAN HB

## Witness Heartbeat

- Alive monitoring by sending /receiving heartbeats between each server and a Witness server.

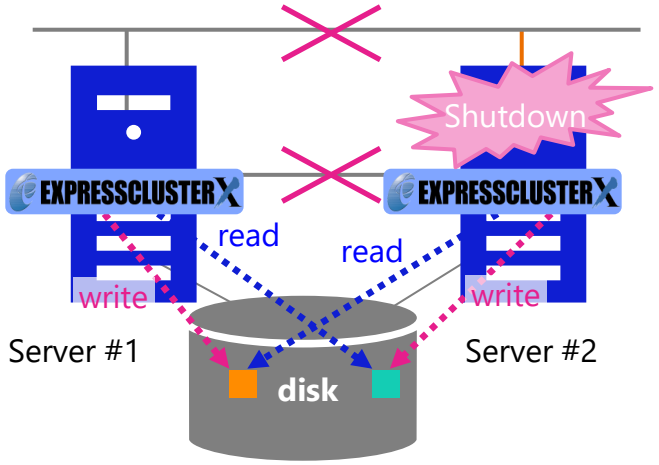


# Prevention of Split-Brain - Resolution method -

**Accurately detect the risk of split-brain and prevent beforehand**

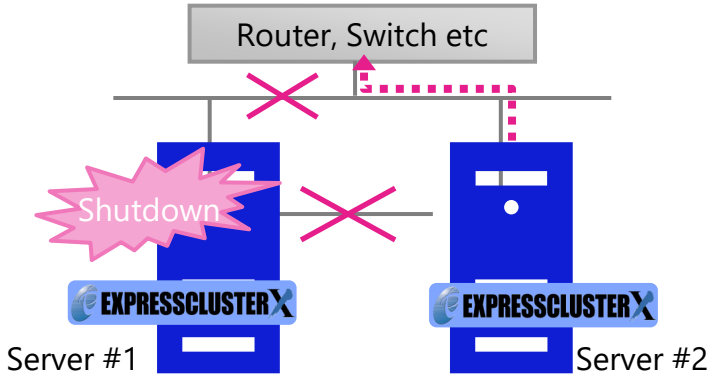
## Disk method

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



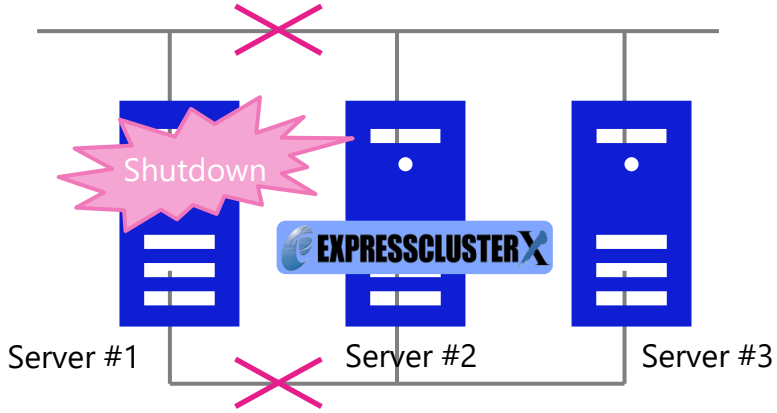

## Ping method

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




## Majority method

- shutting down a server that can no longer communicate with the majority of the servers in the entire cluster



# Other Functions / Features

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

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

### ✓ Challenges

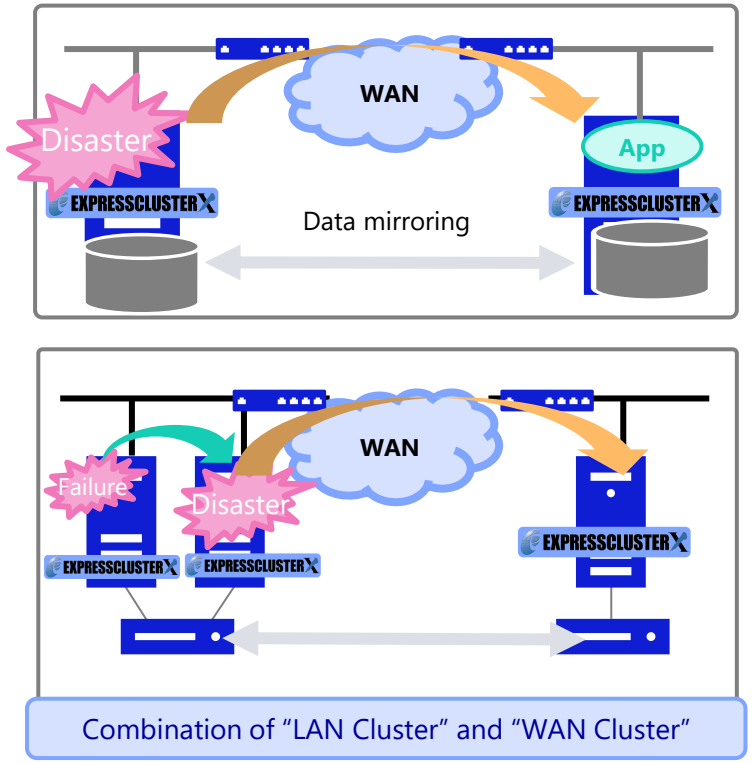
- Only data backup has been done.
- When servers and network has been damaged due to disaster, business will be disrupted.

### ✓ 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.

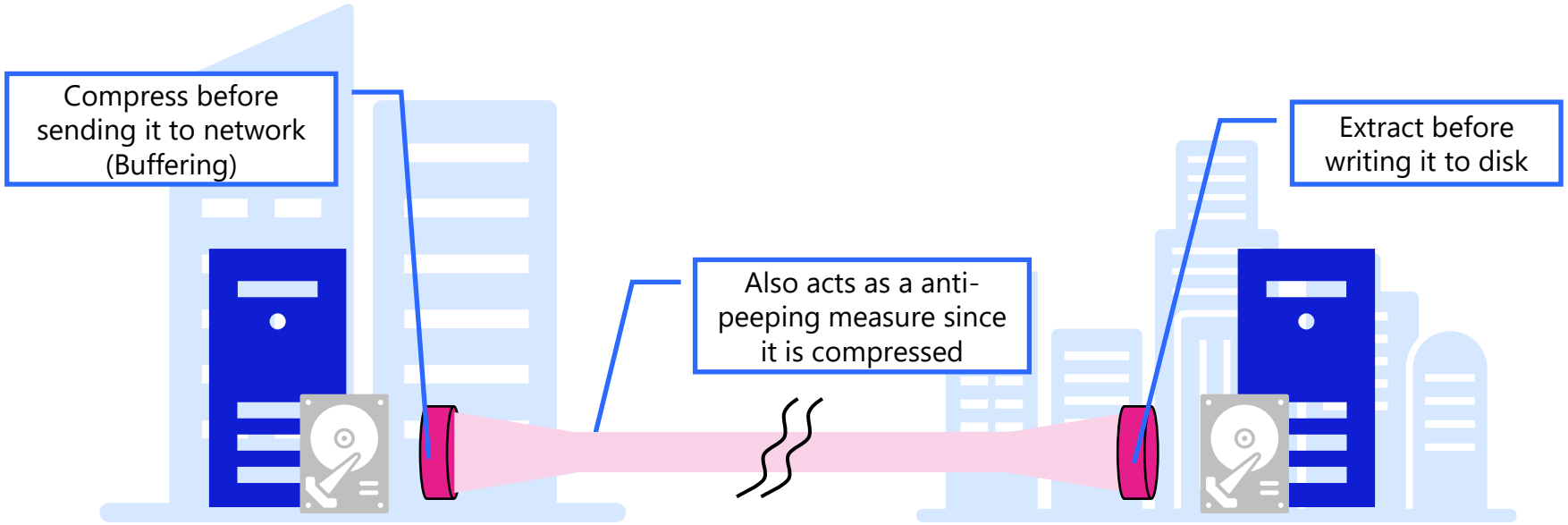
### ✓ Features

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



# Compression of Mirrored Data

## Efficient data transfer by compressing the data to be mirrored




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

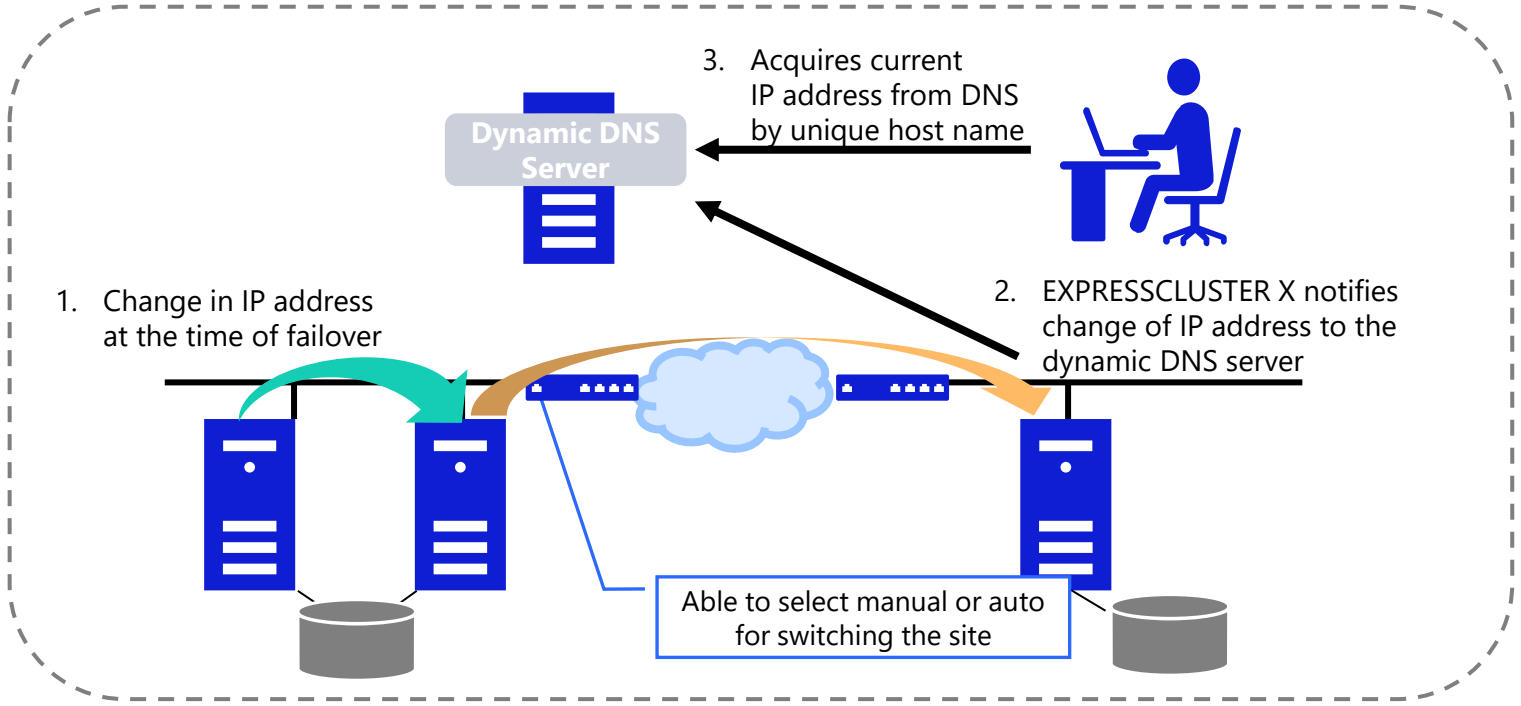
* This feature is only valid in asynchronous mirroring mode.

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



# Other Functions / Features

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# EXPRESSCLUSTER HA Solutions On VMware

## EXPRESSCLUSTER is also compatible with VMware HA solutions

### **Scenario1:** 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*

### **Scenario2:** 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*

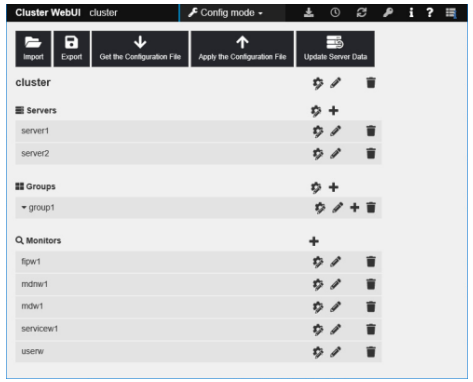
# Other Functions / Features

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

*clp.conf*

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

**Customer Benefit**

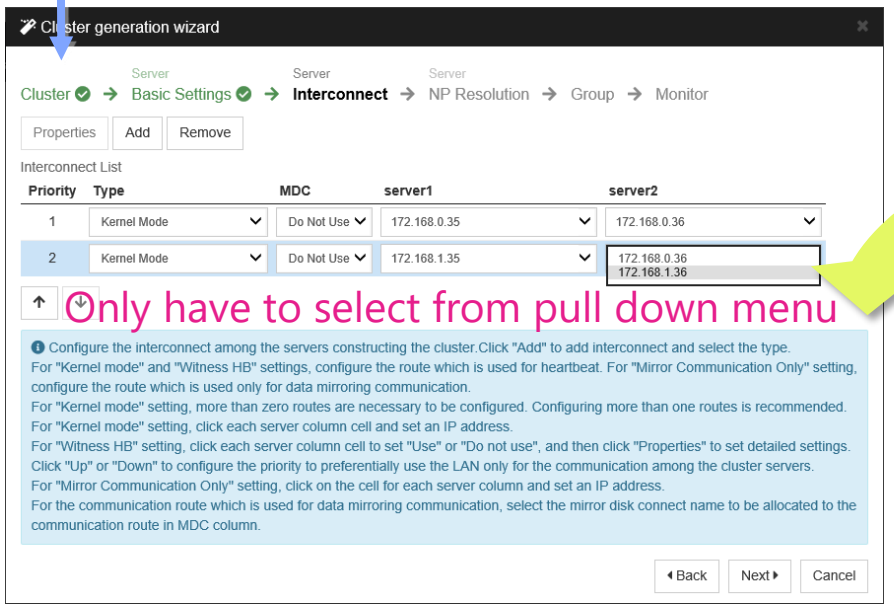
| Scenario | Benefit |
|---|---|
| Server Replacement | In case of replacement of old server with new server, the same cluster configuration can be easily configured by simply applying the configuration file. |
| Deployment of same configuration to multiple sites | In case of deploying clusters with 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. |
| Trouble Shooting | By using configuration file, support team can easily reproduce the cluster for investigation purpose. |

# Intuitive Cluster Generation GUI

## User-friendly GUI for cluster configuration to prevent setting mistakes

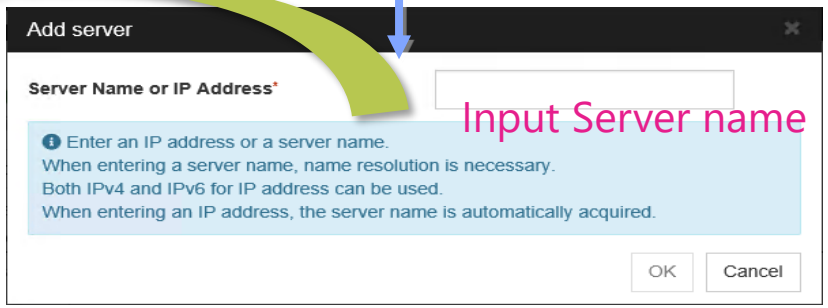
**Point 1**

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!

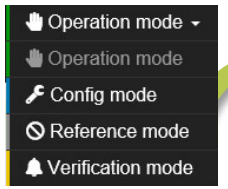


# User Friendly GUI

## User-friendly / Convenient management console “Cluster WebUI” offers higher operability for system administrators

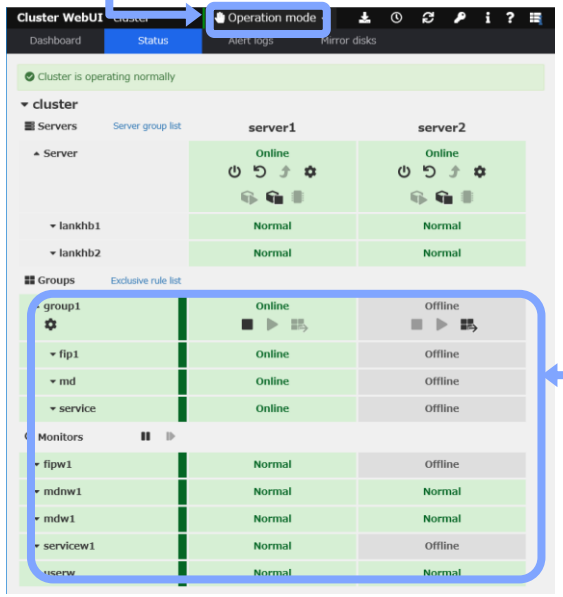
Point 1

Switch “Operation mode” and “Config mode” easily



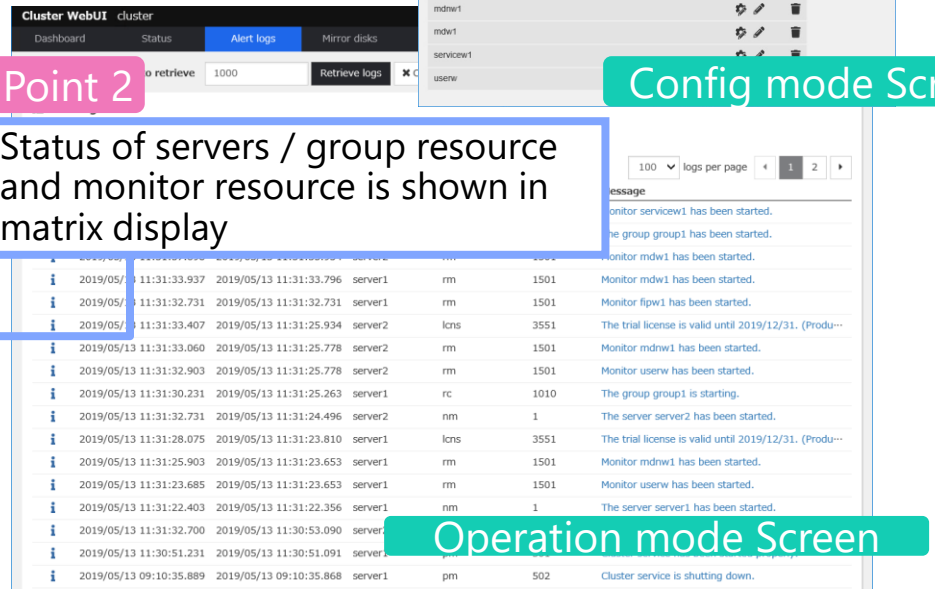


Config mode Screen




Point 2

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



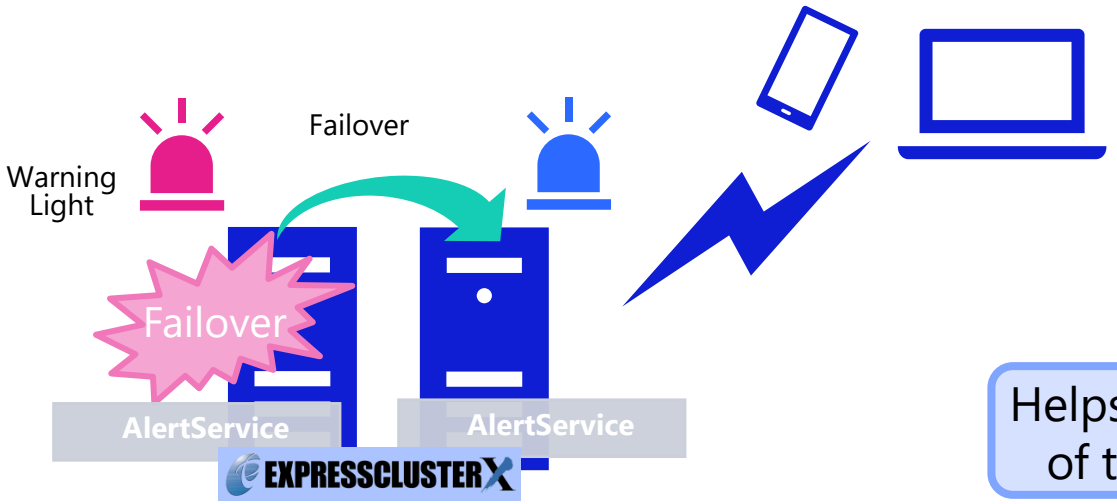

Operation mode Screen

# 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

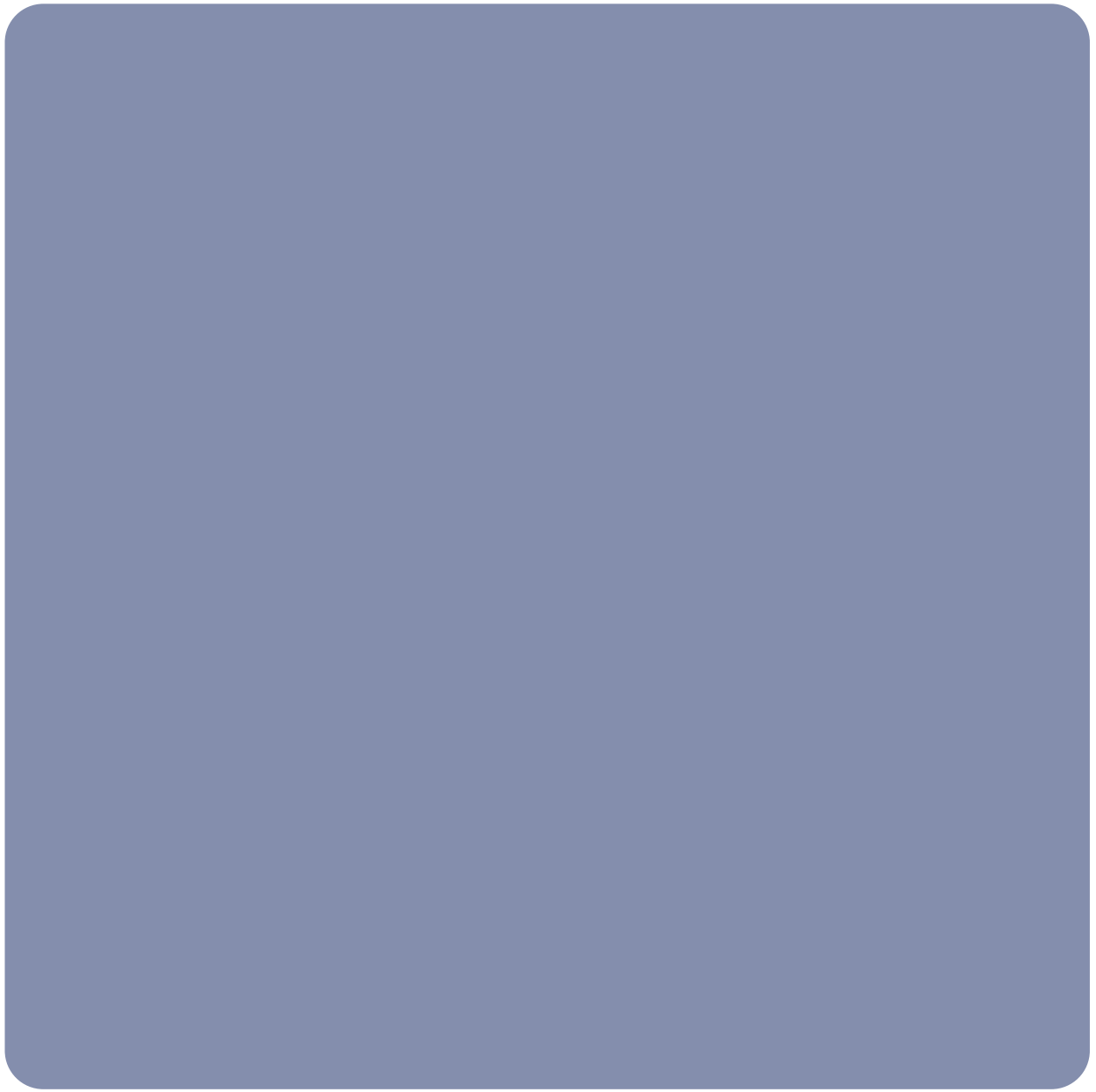
- Supported Configuration / Failover Scenario
- Monitoring Capabilities
- Prevention of Split-Brain
- Disaster Recovery Capabilities
- Virtualization Supported
- Usability / Operability
- **System Requirements**

# EXPRESSCLUSTER X System Requirements

| | Windows | Linux*1 |
|---|---|---|
| **Hardware** | x86_64 | x86_64 server<br>aarch64 |
| **Operating System** | Windows Server, version 2025<br>Windows Server, version 2022<br>Windows Server, version 2019 | Red Hat Enterprise Linux 10.0、9.6、9.4、8.10<br>MIRACLE LINUX 9.6、9.4、8.10<br>SUSE Linux Enterprise Server 16<br>SUSE Linux Enterprise Server 15(SP7/SP6/SP5/SP4)<br>Oracle Linux 10.0、9.6、9.4、8.10<br>Oracle Linux*2<br>Ubuntu Server 24.04.3 LTS、24.04.1 LTS<br>Ubuntu Server 22.04.3 LTS、22.04.1 LTS<br>AlmaLinux OS 10.0、9.6、9.4, 8.10<br>Amazon Linux 2023 |
| **Memory** | User Mode: 384MB +<br>Kernel Mode: 32MB + 4MB(*) x (number of mirror disk resource + number of hybrid disk resource) | User Mode: 300MB +<br>Kernel Mode:<br>- When the synchronization mode is used:<br>1024KB + (number of request queues x I/O size) + 2448KB x number of mirror disk resources and hybrid disk resources)<br>- When the asynchronous mode is used:<br>1024KB + (number of request queues x I/O size) + (3072KB + (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) + 400KB) x number of mirror disk resources and hybrid disk resources<br>- When the kernel mode LAN heartbeat driver is used: 8MB<br>- When the keepalive driver is used: 8MB |
| **Hard Disk** | Right after installation: 100MB<br>During operation: 5.0GB+9.0GB*2 | Right after installation: 300MB<br>During operation: 5.0GB+1.0GB*3 |

*1: The supported OS for Linux may be available by applying the update of EXPRESSCLUSTER. Please check our website for the latest information.
*2: When using Red Hat Compatible Kernel(RHCK), the supported kernel versions of Red Hat Enterprise Linux are supported.
However, Oracle Linux 9 is not supported.
*3: A disk capacity required to use mirror disk resources and hybrid disk resources.

# 4. Successful Case Studies



# United Cooperative Assurance - Disaster Recovery -

Saudi Arabia

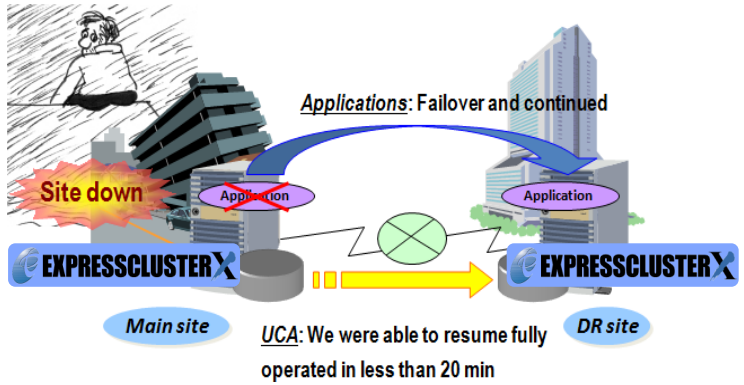
UCA is a one of the leading insurance company in Saudi Arabia where EXPRESSCLUSTER greatly contributed to the business continuity with its sophisticated HA&DR features when the flood attacked in Jeddah. UCA was the only insurance company that achieved successful business continuity while other companies faced critical business disruption.

* NEC technology partner

## 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 duding 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.*

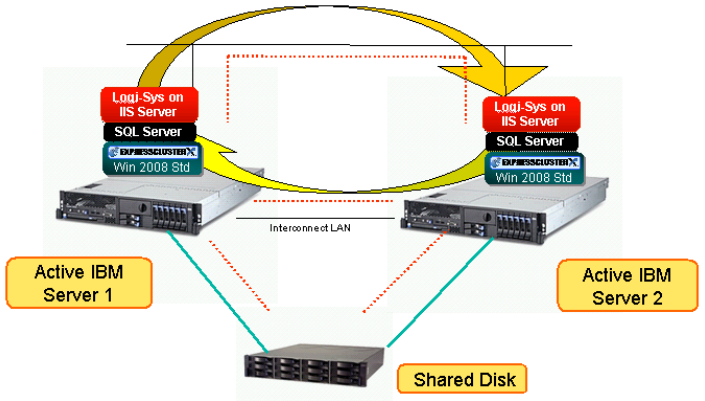
Mr. Labib Assah,
**UCA IT Director**



# AV Global Corporation Pvt. Ltd
## - High Availability for Logistics Service Provider -

India

- 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 :
https://www.nec.com/expresscluster/en/case_study/pdf/clusterpro_case_AVGlobalCorporationPvt.pdf

# A large federal government procurement agency
## - High Availability Solution For Physical Security Application -

USA

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

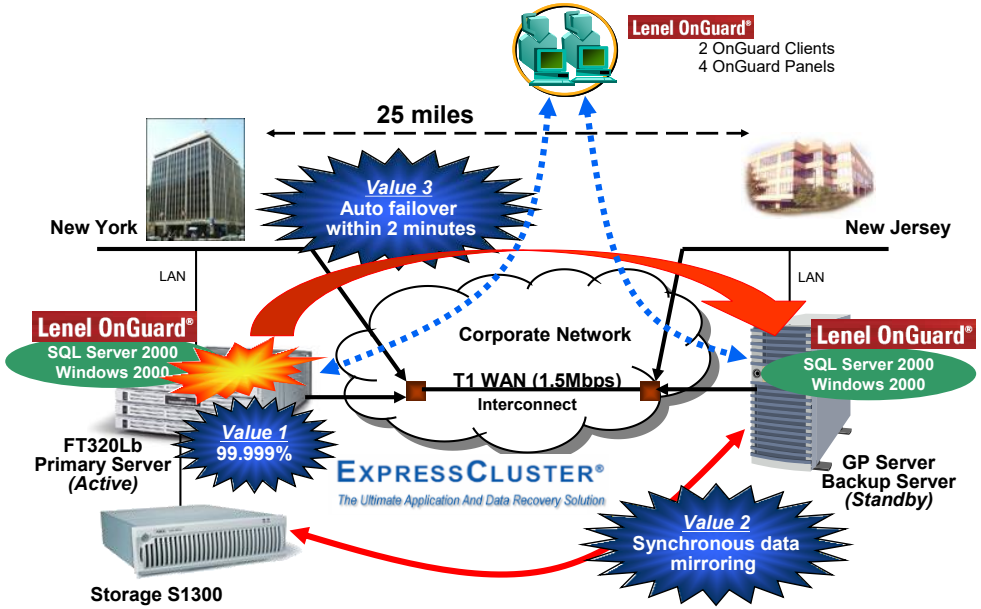
**Objective of Introduction**

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 **EXPRESCLUSTER**, 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.




<Overview of System Configuration>

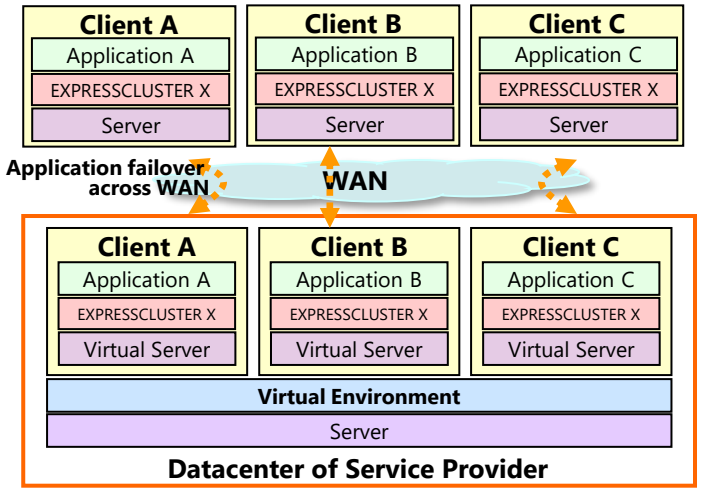
# Toggle Networks
# - High Availability Platform For Disaster Recovery Service -

Canada

TOGGLE networks

## Business Model

**Service Provider can provide DR site and lines for the customer**




**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.

## Case Study

**EXPRESSCLUSTER X was selected as the foundation of business continuity service offered by Toggle Networks, from numbers of common products.**

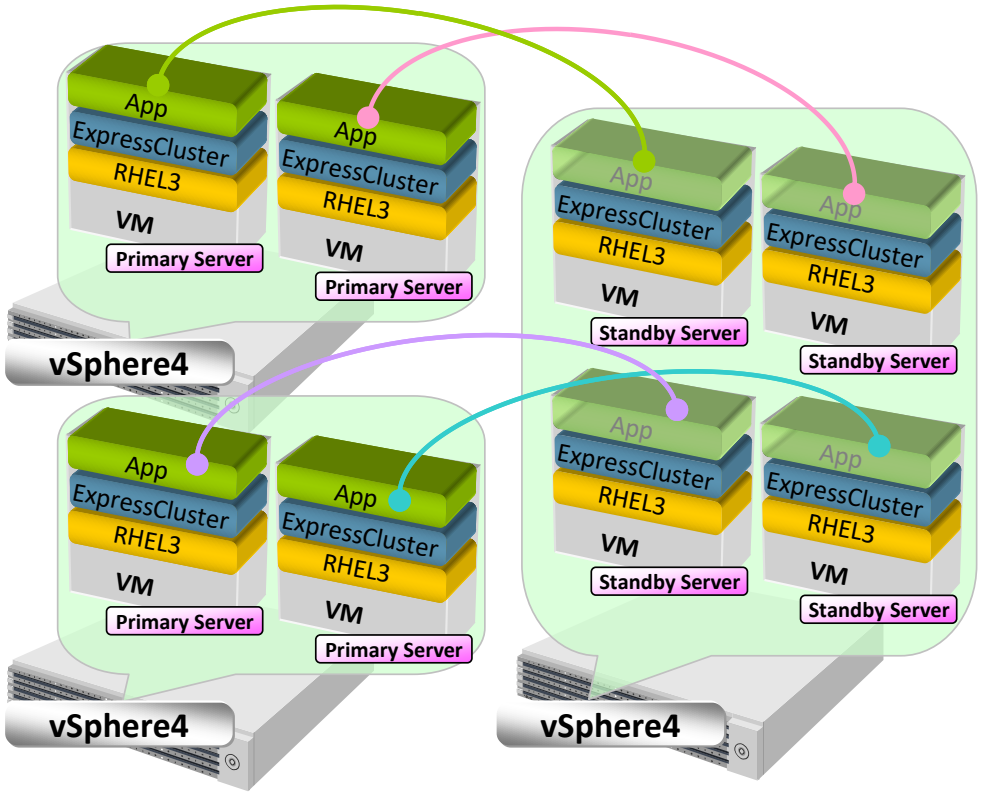
**Requirement was the product which;**

- 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

# Major Securities Firm
## - High Availability For Applications On Virtual Machines -

Japan

- ✓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)**

Migration to virtual environment

**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**

# Dream Island Department Store Ltd.
## - High Availability For Store POS System -

China

**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."

**Fan Jingzhao**
IT Division Manager,
Dream Island Department Store

*Complete story >>* https://www.nec.com/expresscluster/en/case_study/index.html

# CG36
## - High Availability For Database & Print Server -

France

### 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

### EXPRESSCLUSTER X LE : Clustering + Mirroring

**Clusters LINUX (Red Hat 2.1) :**

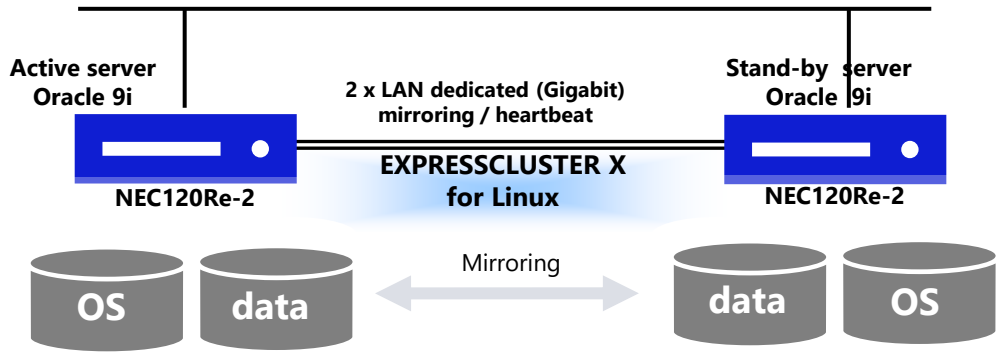
- Clustering of Oracle database service. Automatic fail-over to a standby server in case of crash or maintenance of the active server
- Database mirroring

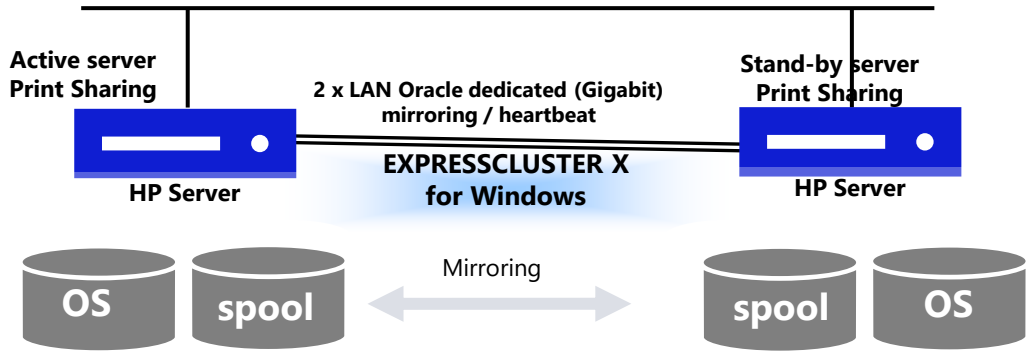
**Cluster WINDOWS :**

- 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 https://www.nec.com/expresscluster/en/case_study/index.html

# Thank You


An Integrated High Availability and Disaster Recovery Solution

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

For more information, feel free to contact us -
https://www.nec.com/expresscluster/en/contact.html

\Orchestrating a brighter world