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EXPRESSCLUSTER X

Disaster Recovery Solution Achieved by EXPRESSCLUSTER

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NEC Corporation,
Cloud Platform Division,
(EXPRESSCLUSTER)

Orchestrating a brighter world

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.

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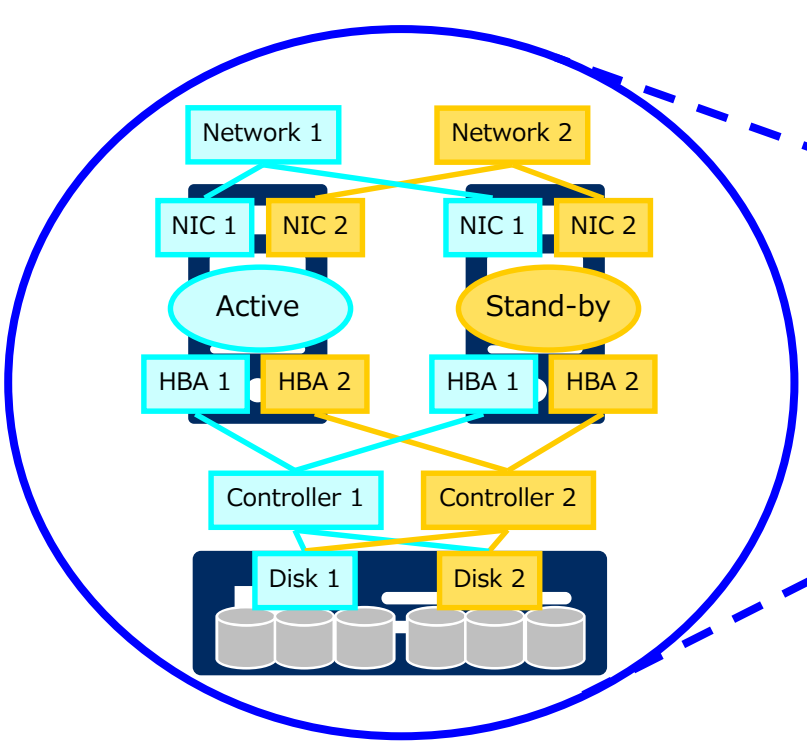
1. Clustering system and disaster recovery

1. Clustering system and disaster recovery

- Even highly available clustering system has risk of system disruption in case of widespread disaster
  - Clustering system ensures redundancy for wide system components such as hardware, software, and network.
  - There is still risk of system disruption in case of widespread disaster such as fire, power outage, earthquake, floods etc.



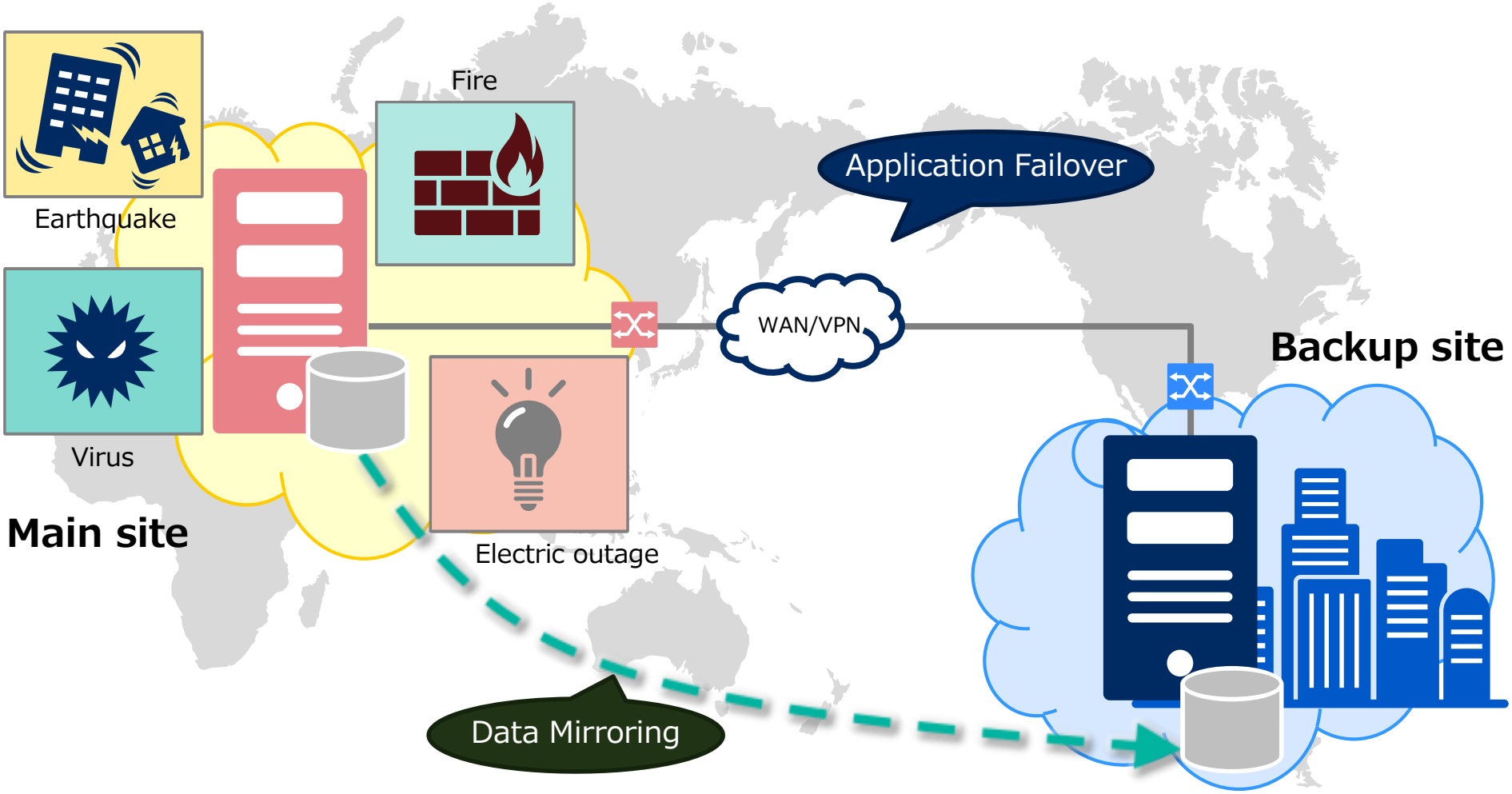
IT infrastructure disruption due to fire disaster, electric outage, earthquake, etc.

Geographical impact ranges from meters to kilometers!!

2. Disaster recovery with remote clustering

2. Disaster recovery with remote clustering

Earthquake, fire disaster, electric outage…
ensures business continuity from any disaster



3. Configuration of remote clustering

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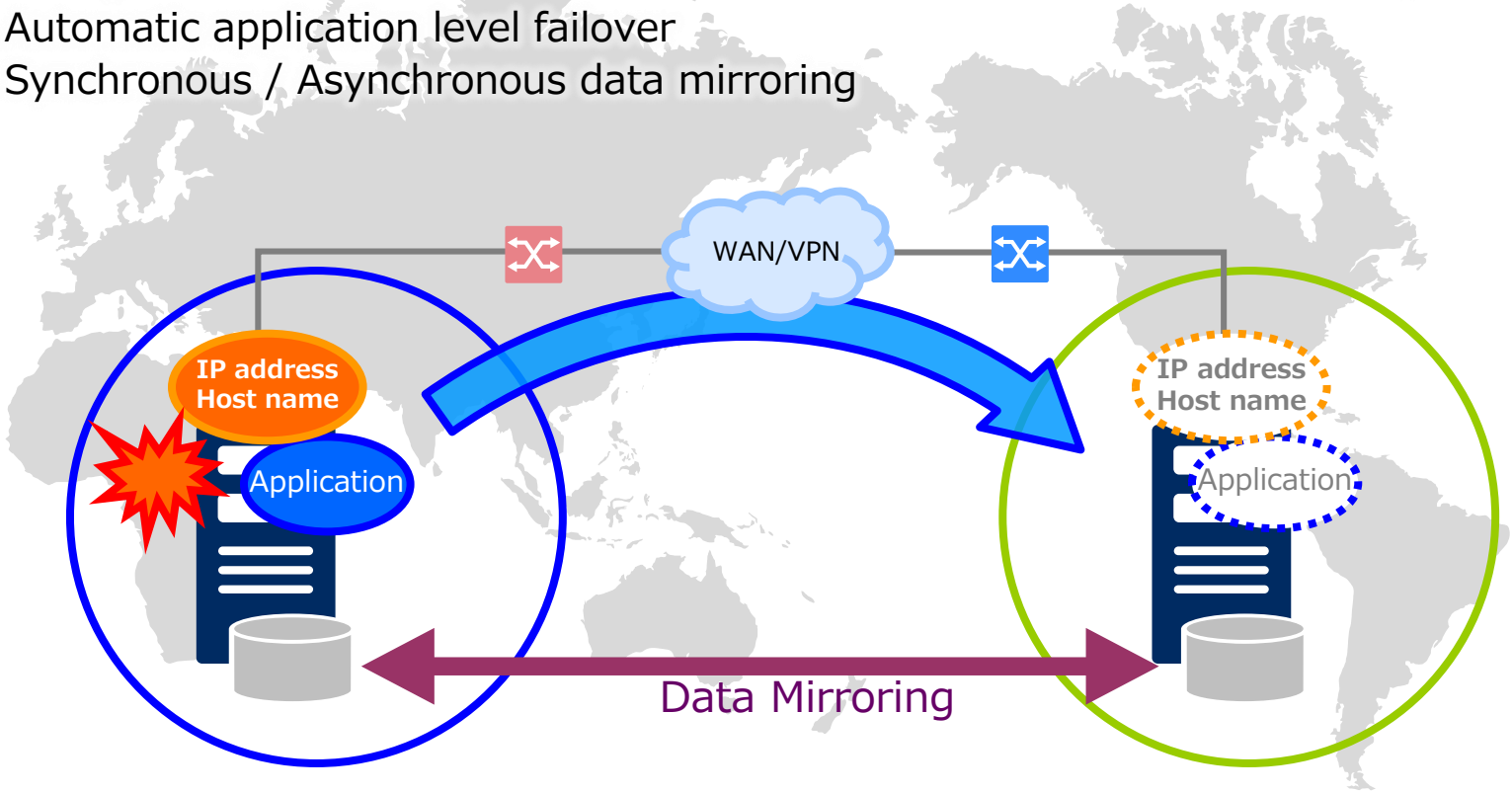
Clustering configured across remote sites

- Only one communication network is enough between servers
- Asynchronous mirroring eliminates performance degradation due to network delay
- Clustering can be configured among different network segments
- Compresses mirroring data, and saves bandwidth used by transferred data

Standby server takes over the workload in case of failure / disaster

- Automatic application level failover
- Synchronous / Asynchronous data mirroring



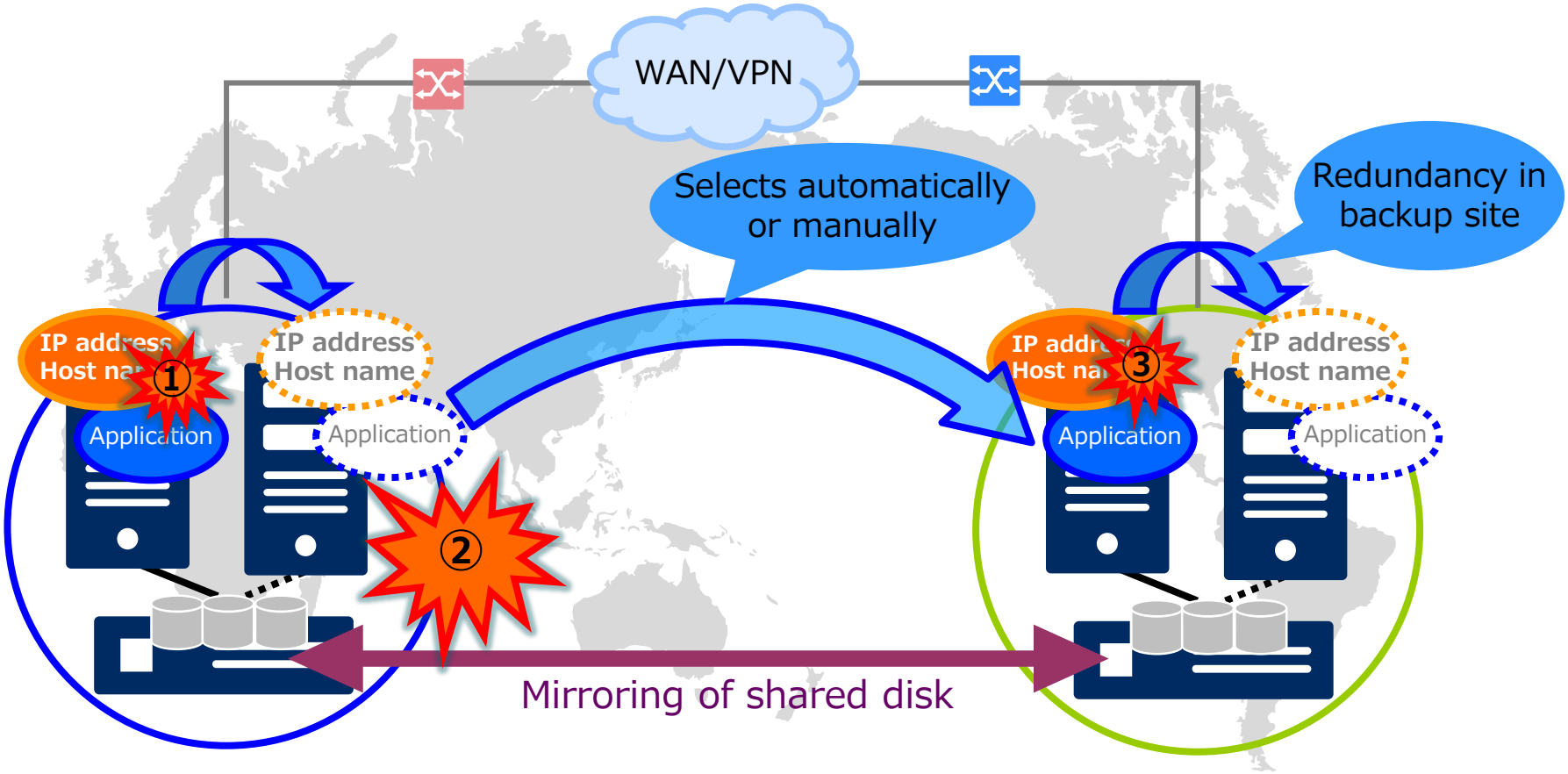
3. Configuration of remote clustering

Ensures redundancy even within backup site

① Local failover within primary site in case of system failure

② Failover to backup site in case of disaster

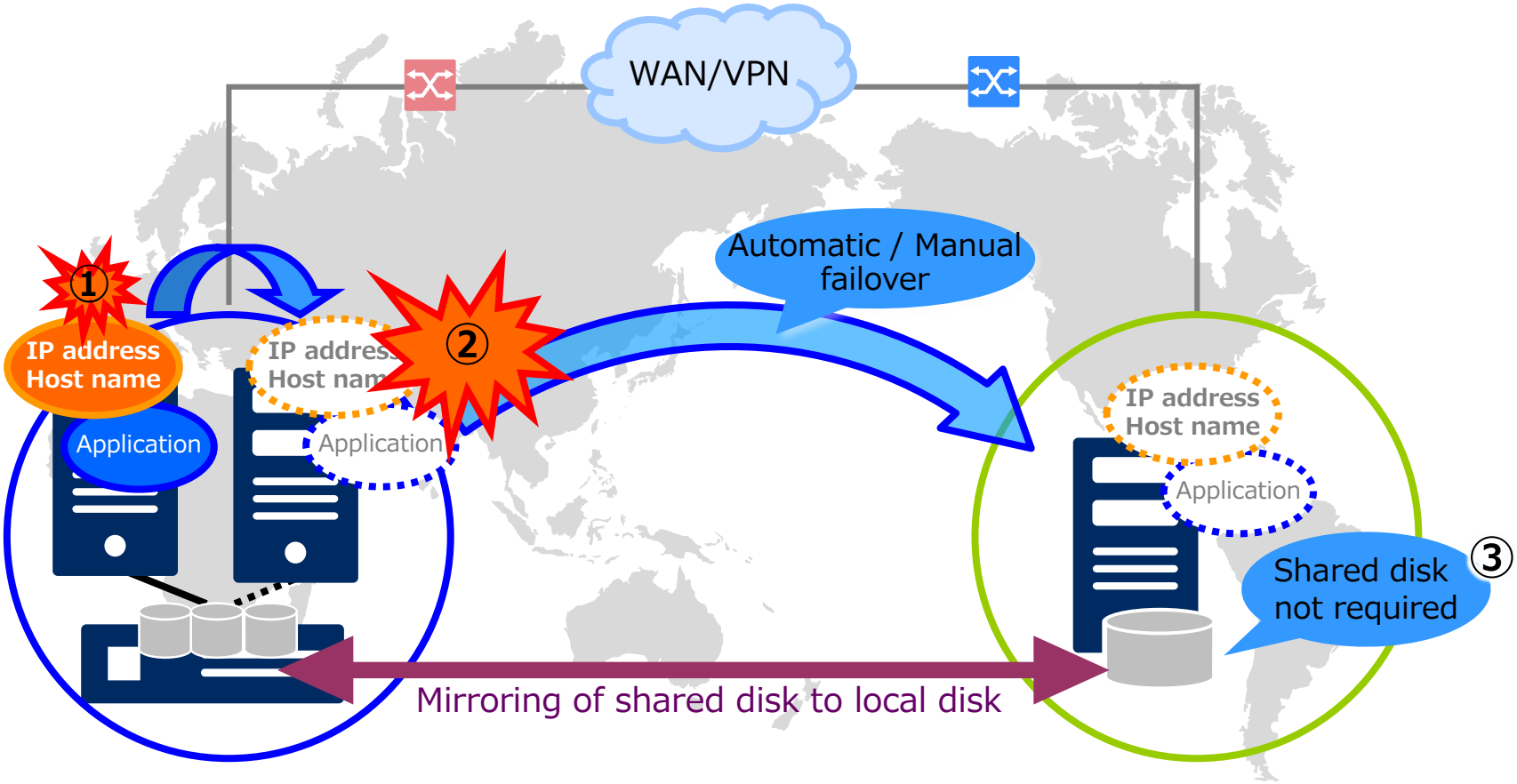
③ Ensures further availability by maintaining clustering configuration at backup site



3. Configuration of remote clustering

Scale up existing cluster to remote cluster configuration with low cost

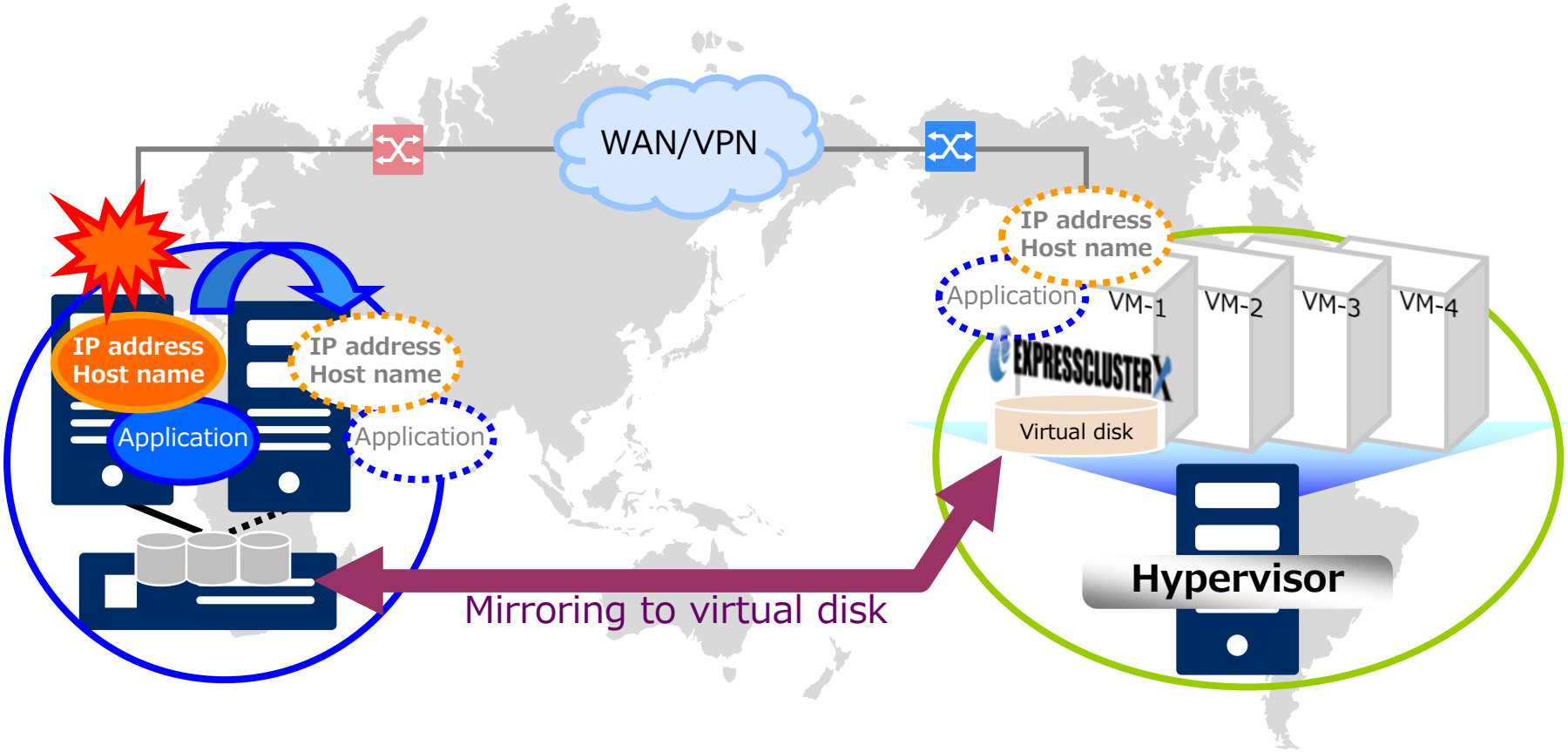
① Prepare for system failure with shared disk type of clustering at primary site
② Automatic application level failover in case of disaster
③ Leverage local disk at back up site and achieve low cost disaster recovery



3. Configuration of remote clustering

Cost reduction by virtualization of backup site

- Supporting leading hypervisors such as VMware, Hyper-V, KVM, XenServer, etc
- Enables flexible configuration such as physical/virtual mixed configuration, virtual machine only configuration, etc



4. Features of remote clustering

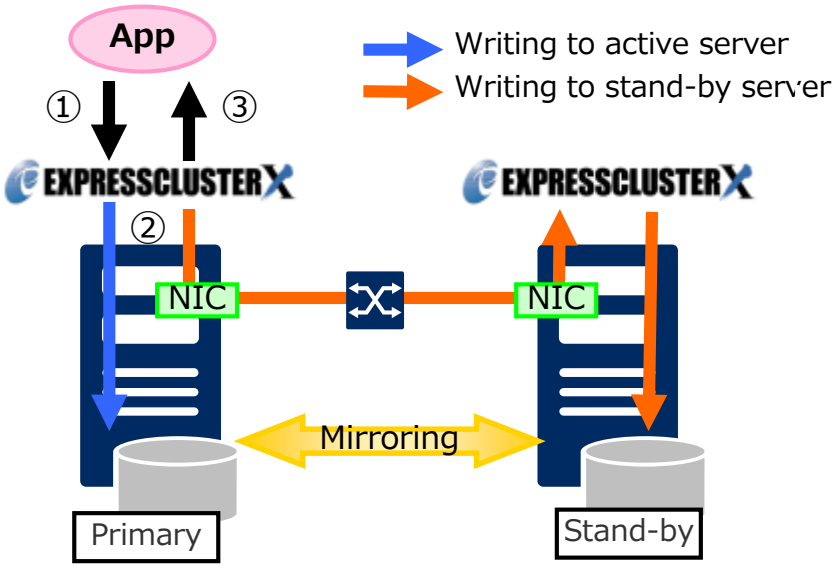
Always ensures to have the latest data on both servers

Write

①EXPRESSCLUSTER receives write data from the application.

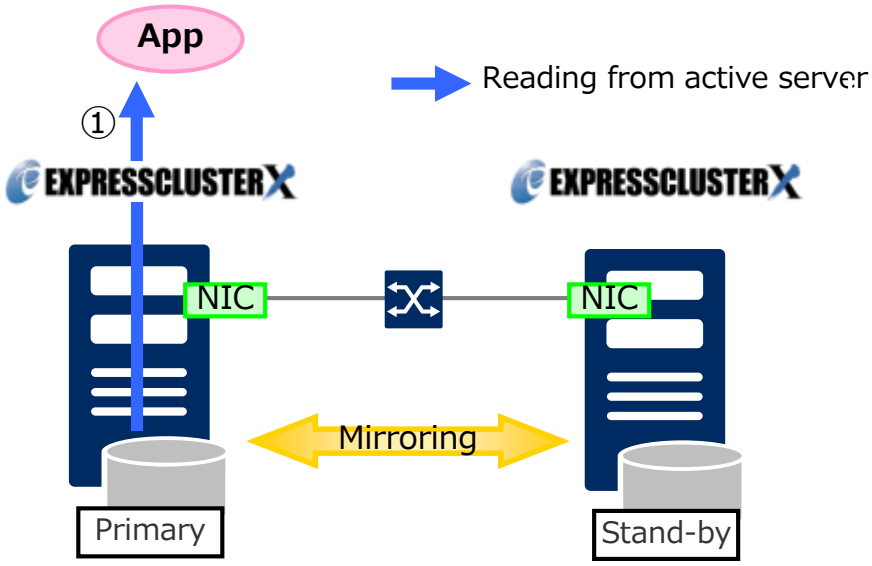
②Data is written to primary server, and transferred to standby server at the same time

③Writing is completed when data is written to the both servers



Read

①Read is done from active disk only thus will not be affected by network performance at all



Prevents application performance degradation due to narrow network

* In some products, function corresponding to this function is called semi-synchronous.

In case disk mirroring is done through narrow band network with large communication delay such as remote clustering, asynchronous mode mirroring can prevent degradation of the write performance.

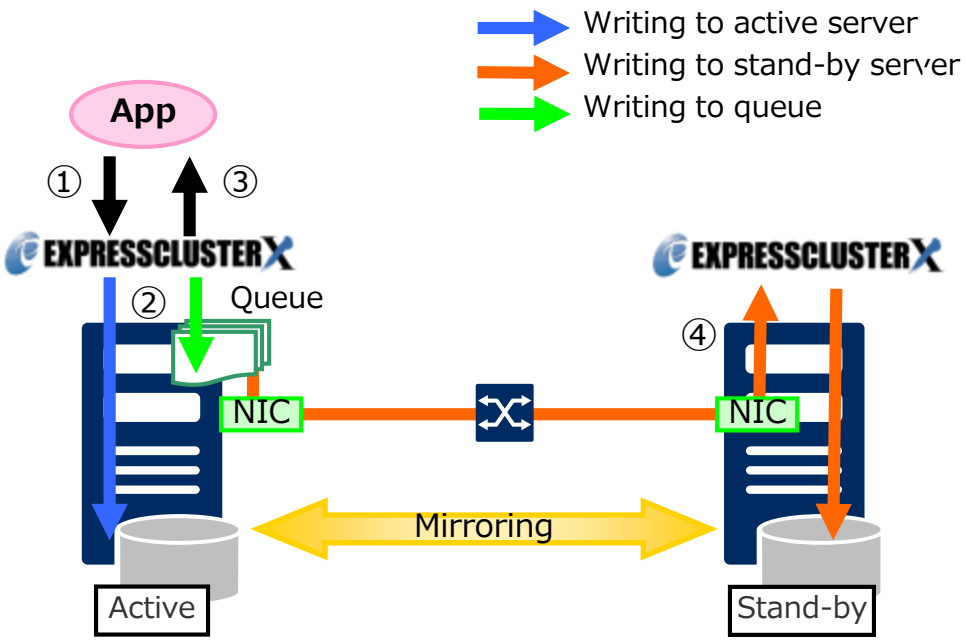
Write flow

① EXPRESSCLUSTER receives write transaction from application

② At the same time as writing to disk, the data will also be written to queue

③ Writing transaction completes when writing to the disk and queue is done

④ The queued data will be written to the disk of standby server in background



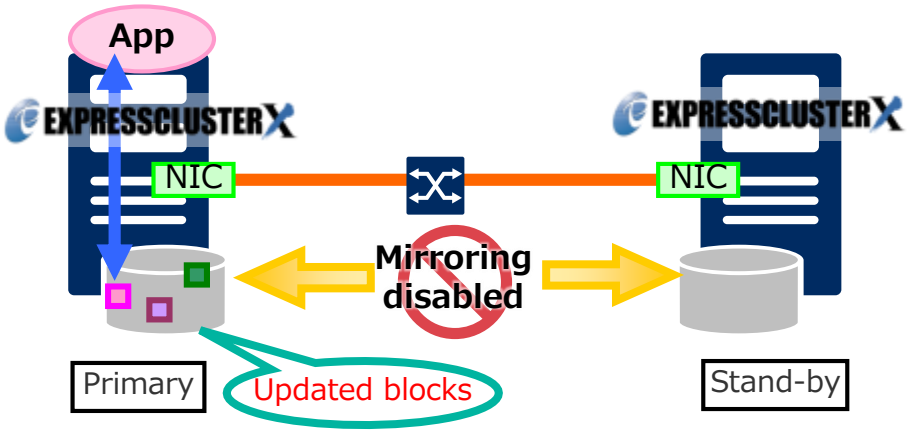
Schedule mirroring* enables data synchronization at quiescent point !

* Sometimes this function is called as “Asynchronous Mirroring”

In case synchronization must be done ensuring quiescent point in database etc, schedule mirroring is helps you to automate the synchronization process

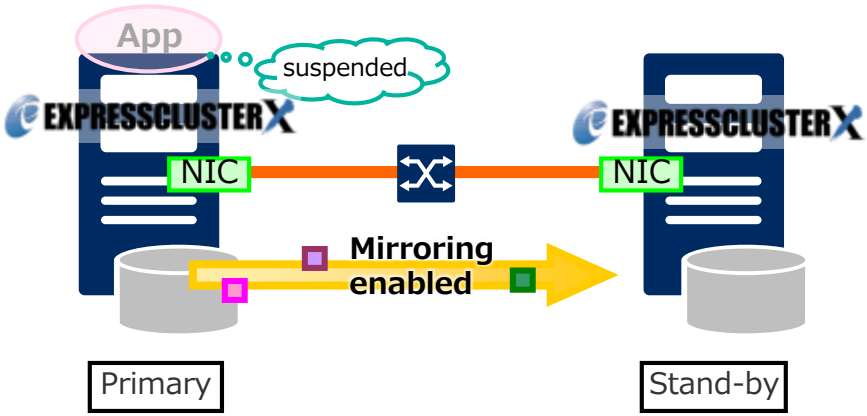
1. During normal operation

- Update of data on standby server can be prevented by disabling the data mirroring



2. During data synchronization

- Secure quiescent point, and mirror the updated data
  - Command to take quiescent point of Oracle, SQLServer, and MySQL is supported



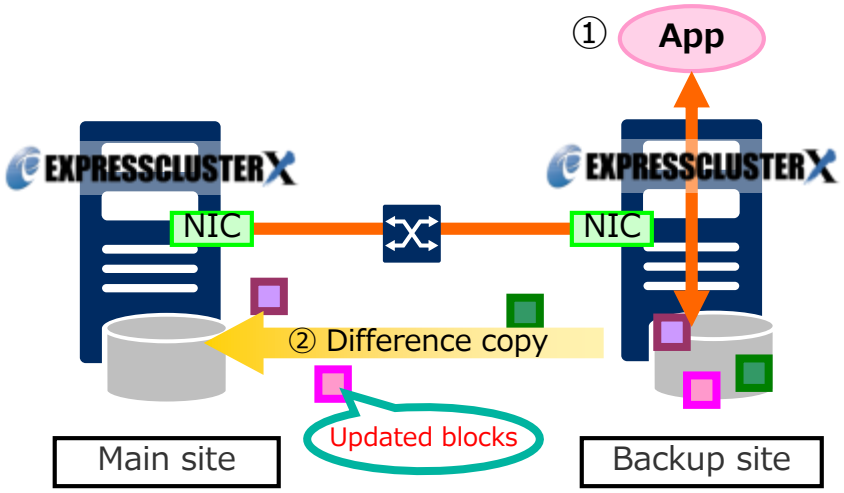
The process can be automated by scheduling as batch job !

Easy/rapid recovery by differential copy and used-area-only copy!

After restoration of server damaged in disaster/failure, disk can be resynchronized automatically and brings back to normal clustering condition

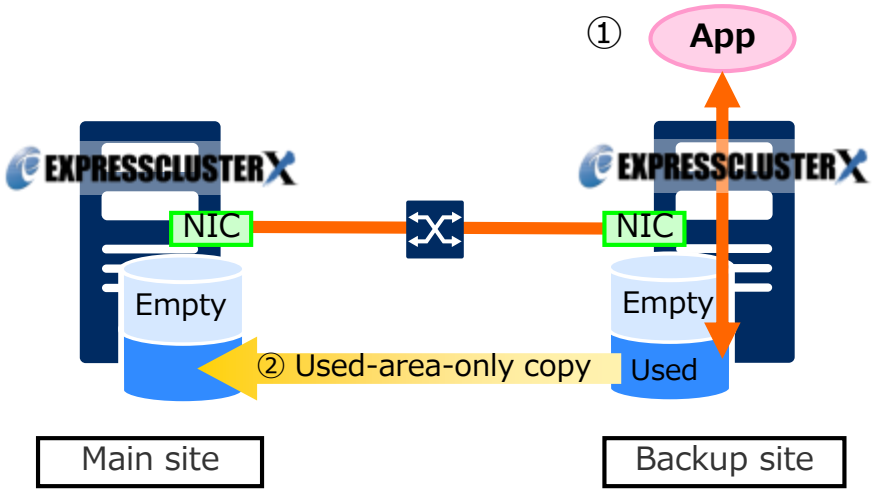
Differential Copy — **If disk is not damaged**

① Data can be mirrored in background while application is under operation at backup site.
② Only blocks which was updated after site failure will be mirrored



Used-area-only copy — **If disk is renewed**

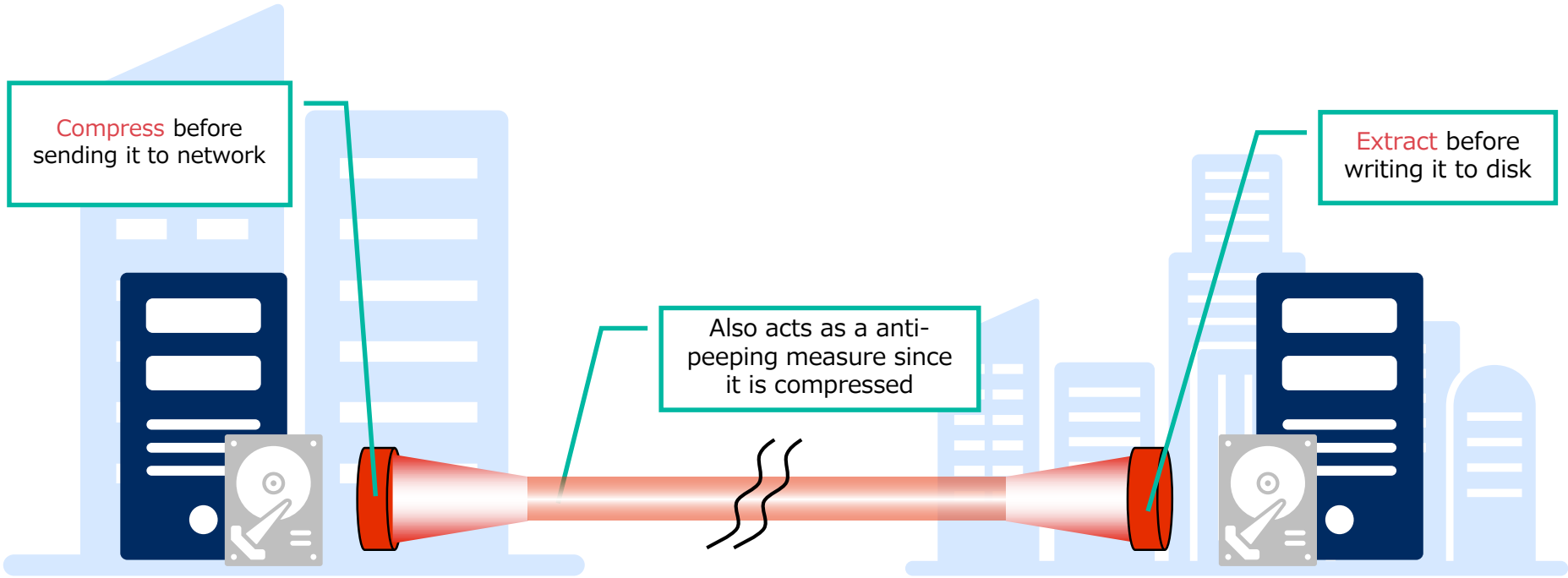
① Data can be mirrored in background while application is under operation at backup site.
② Only used area in the disk will be mirrored, but not the empty area



4. Features of remote clustering

⑤ Compression of mirroring data

Efficient data transfer by compressing the data to be mirrored!



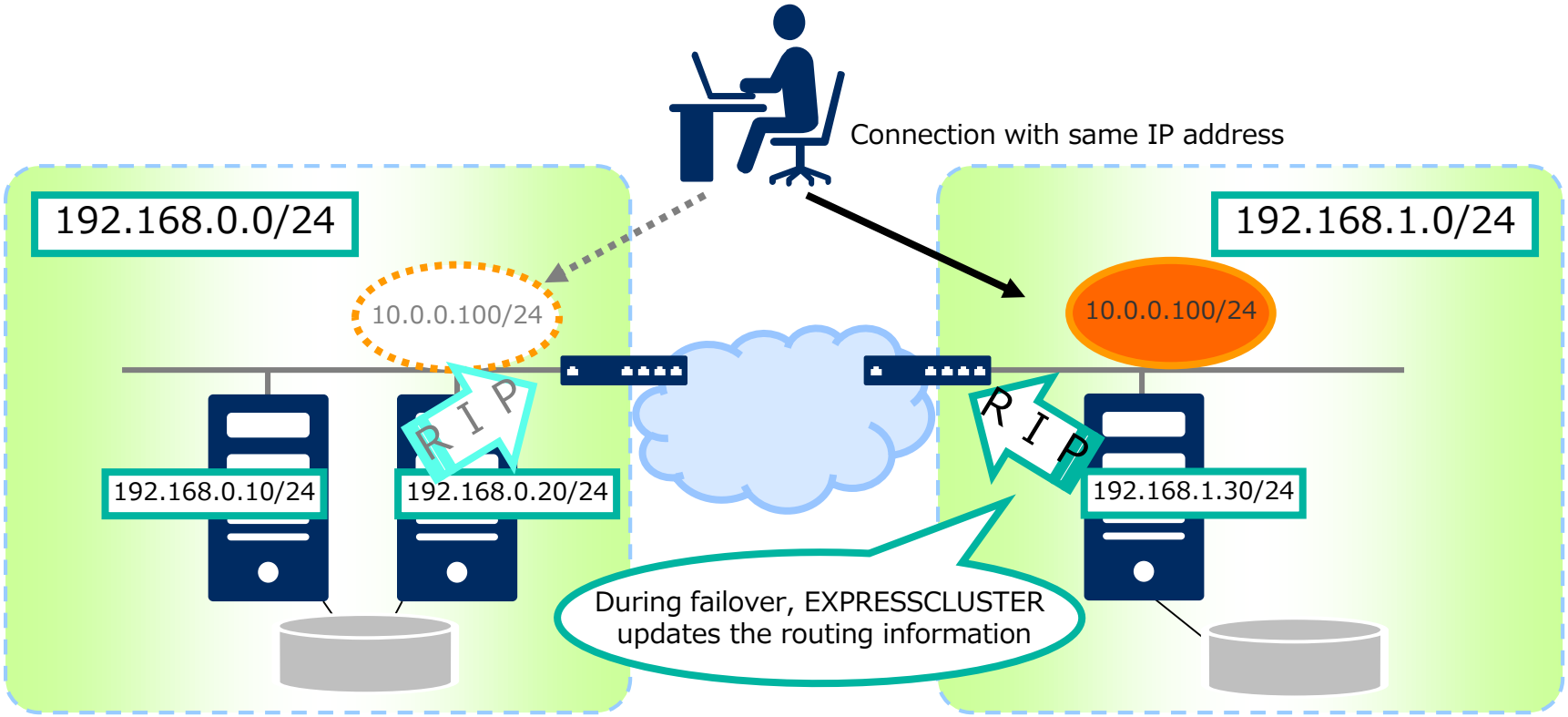
Average 50% reduction in data size as compared to the previous version
(Results differ depending on file type)

* This feature is only valid in asynchronous mirroring mode.

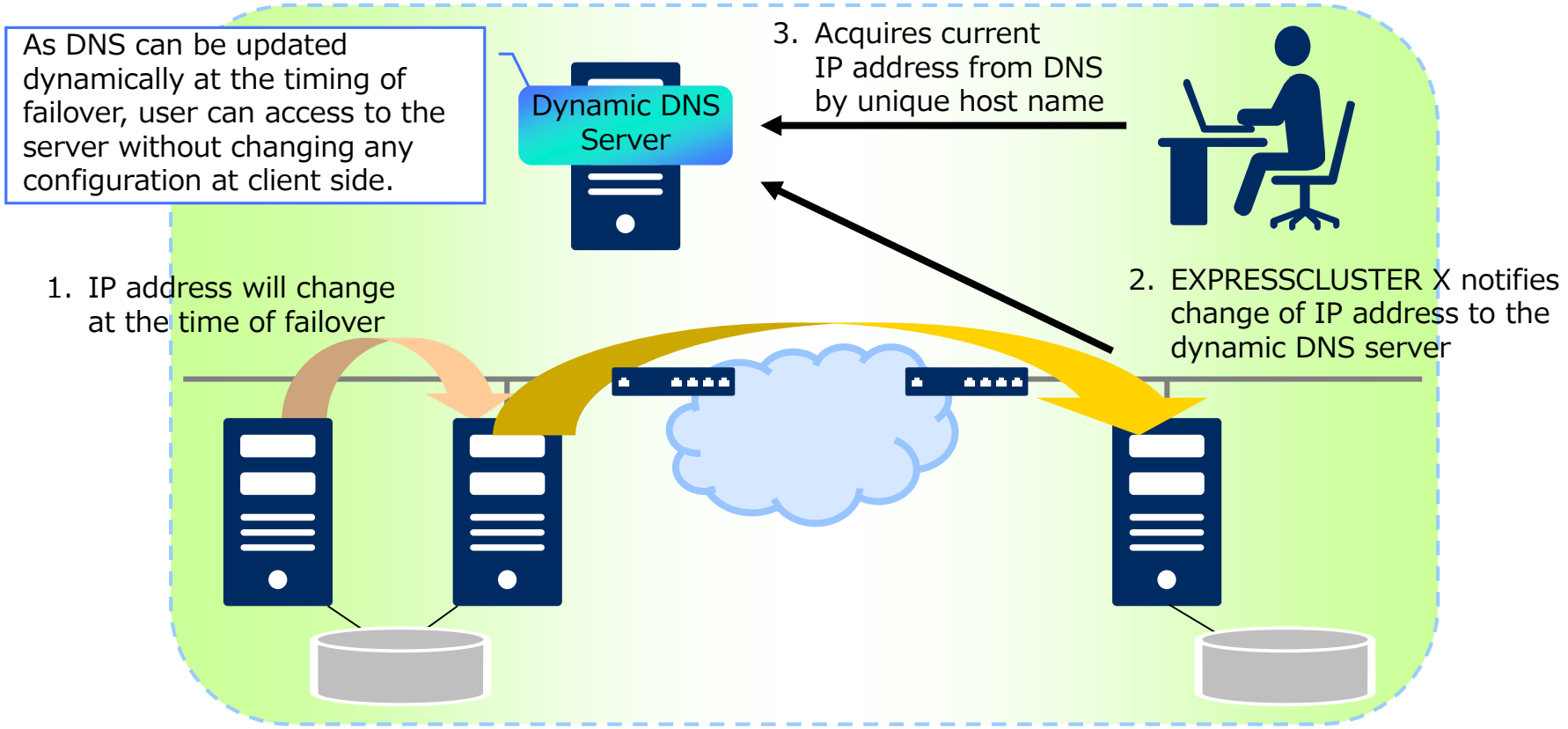
Helps configuring remote cluster even with narrow network!

Cluster configuration even among different segment is possible by taking over IP address

Same IP address can be available after failover even between different network segment by leveraging RIP



Taking over the host name when RIP or VPN is not available



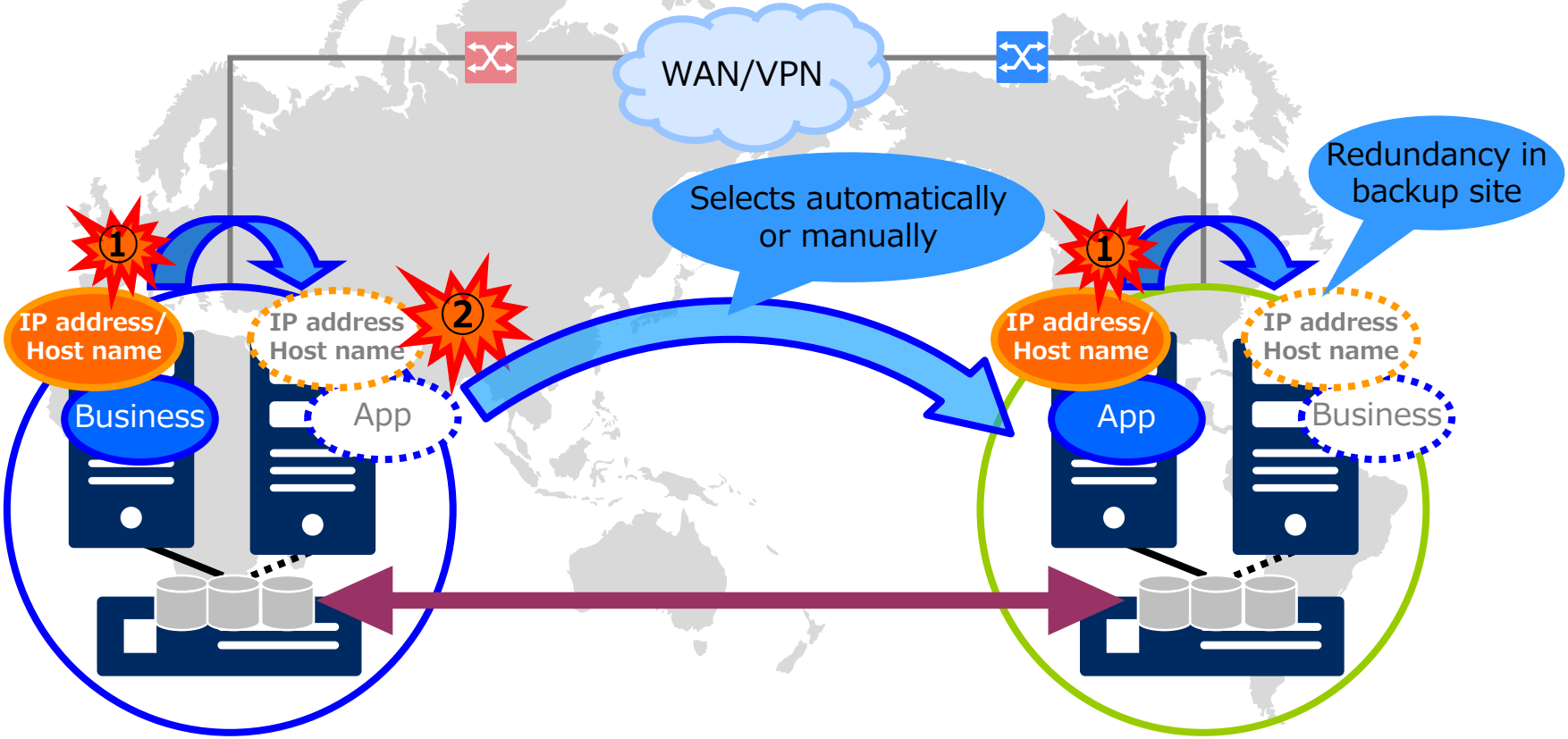
Makes remote clustering more easier, more convenient!

⑧ Automatic / manual failover option

Supports customers' demand to failover automatically in case of failure, and failover manually in case of disaster

① Automatically failover if failure can be recovered within site.
(Manual operation is also available by configuration)

② In case of switching to another site during disaster etc, manual failover can be performed. (Automatic operation is also available by configuration)



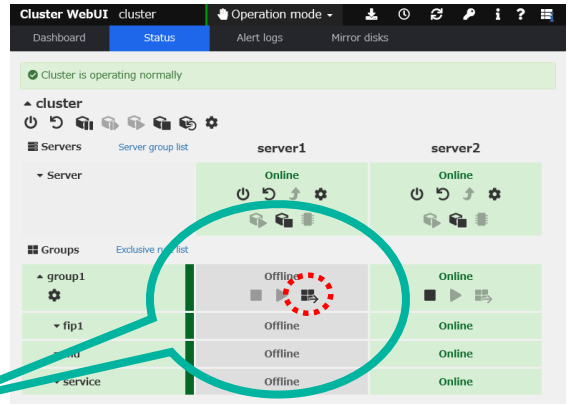
Easy operation to failback to main site

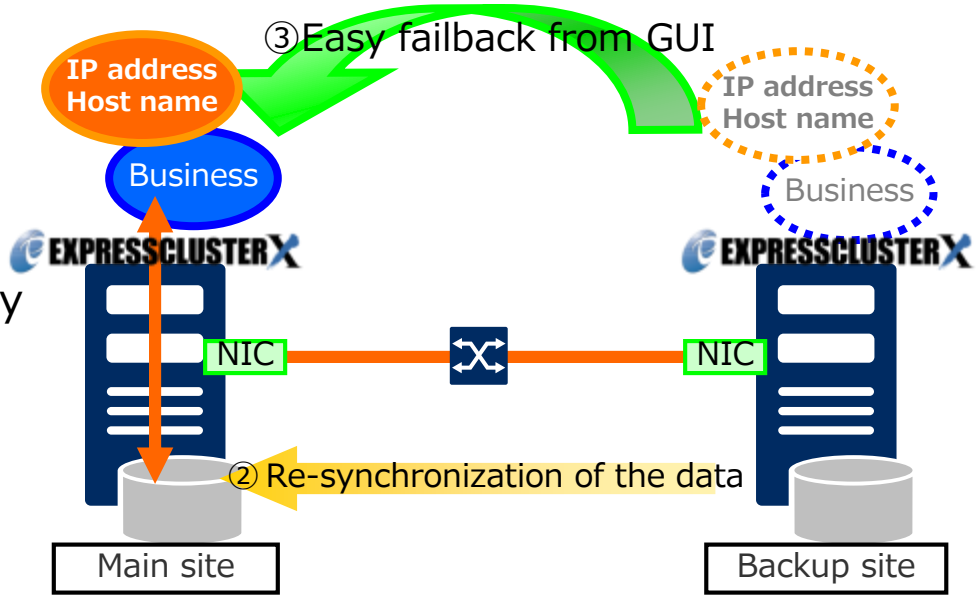
Step-1)
Recovers main site. Cluster settings can be easily recovered by push-button from GUI

Step-2)
Resynchronization of data to main site by differential copy

Step-3)
Failback can be done by a few clicks from GUI

▼ EXPRESSCLUSTER WebManager





①Example: Main site recovery

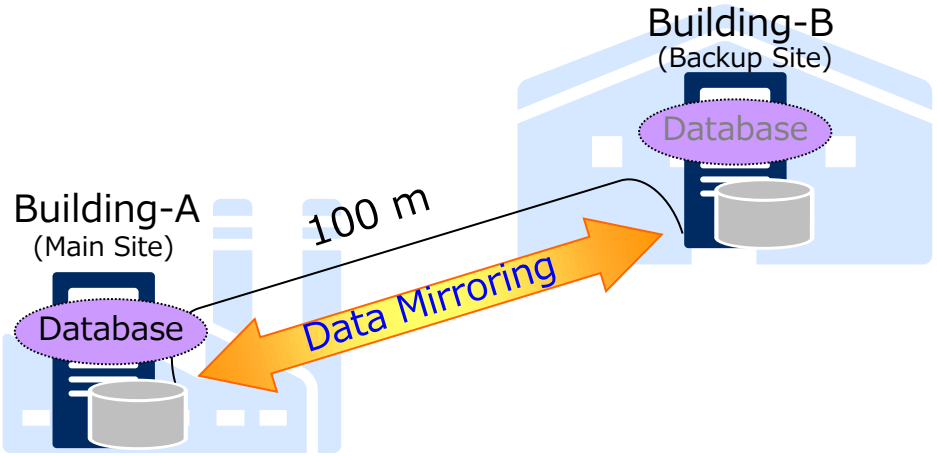
- Renewal of failed hardware
- Setup of OS / software
- Setup of EXPRESSCLUSTER

5. Case studies

EXPRESSCLUSTER has successfully deployed for various business continuity requirements

Major Deployments of EXPRESSCLUSTER DR Configuration

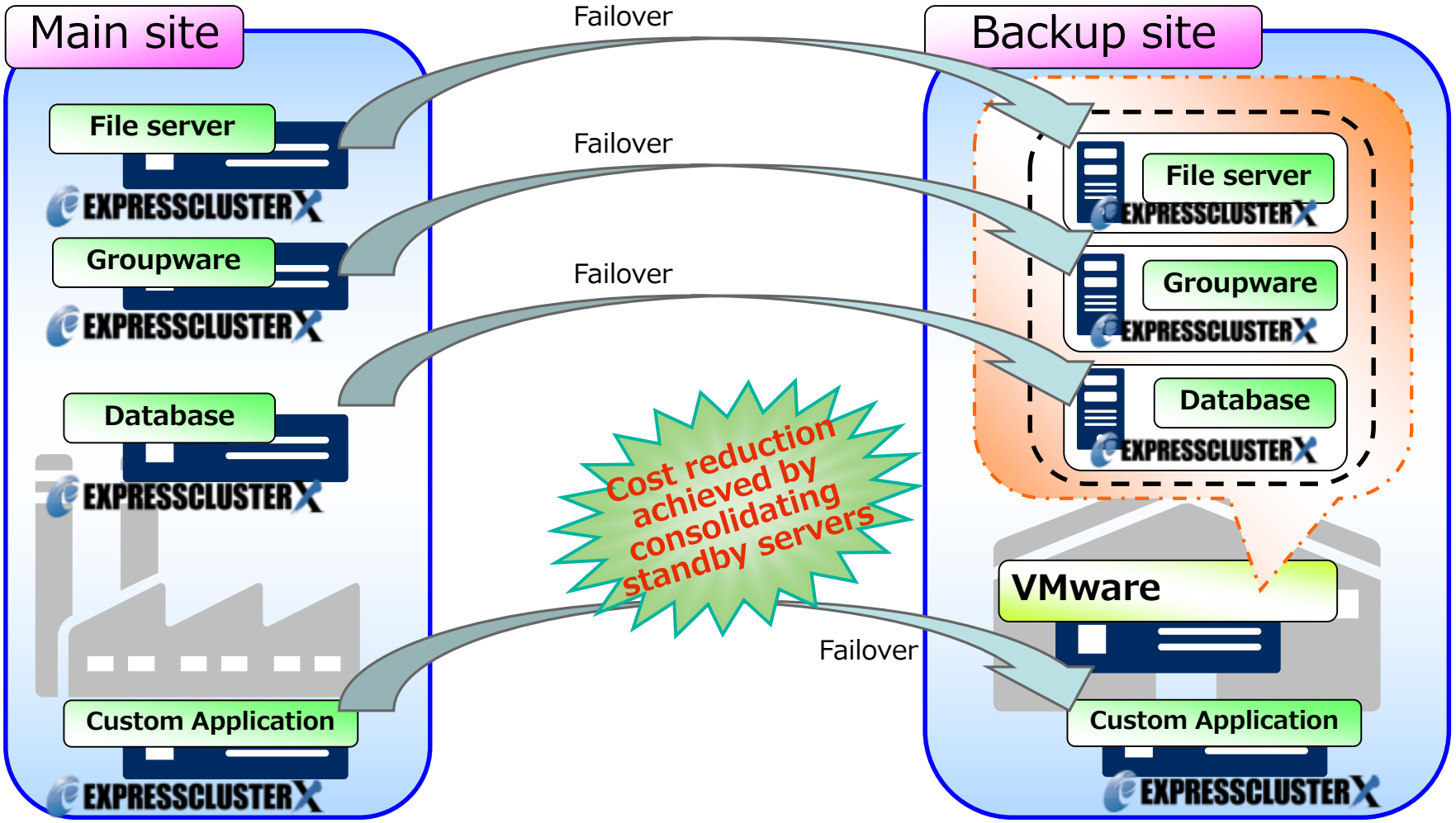
Domain	Distance	System	Configuration
Electricity	1,500km	Database	One-to-one data mirroring
Service	50km	Database	One-to-one data mirroring
Accounting	260km	Database	One-to-one data mirroring
Finance	50km	Database	Hybrid clustering
Finance	80km	Database	Hybrid clustering
Infrastructure	390km	Database	Hybrid clustering
Manufacturing	100m	Database	One-to-one data mirroring
Manufacturing	5km	Database	Three-to-one data mirroring
Public Sector	500m	Database	One-to-one data mirroring
Construction	390km	Database	Hybrid clustering
Finance	100km	Log Collection	1 to 1 mirroring
Public Sector	350km	Database	1 to 1 mirroring
Retail	50km	Database	Hybrid clustering
Retail	15km	Custom App	1 to 1 mirroring
Manufacturing	120km	Database	1 to 1 mirroring
Manufacturing	120km	Database	Hybrid clustering



✓ Adopted as business continuity solution against fire disaster

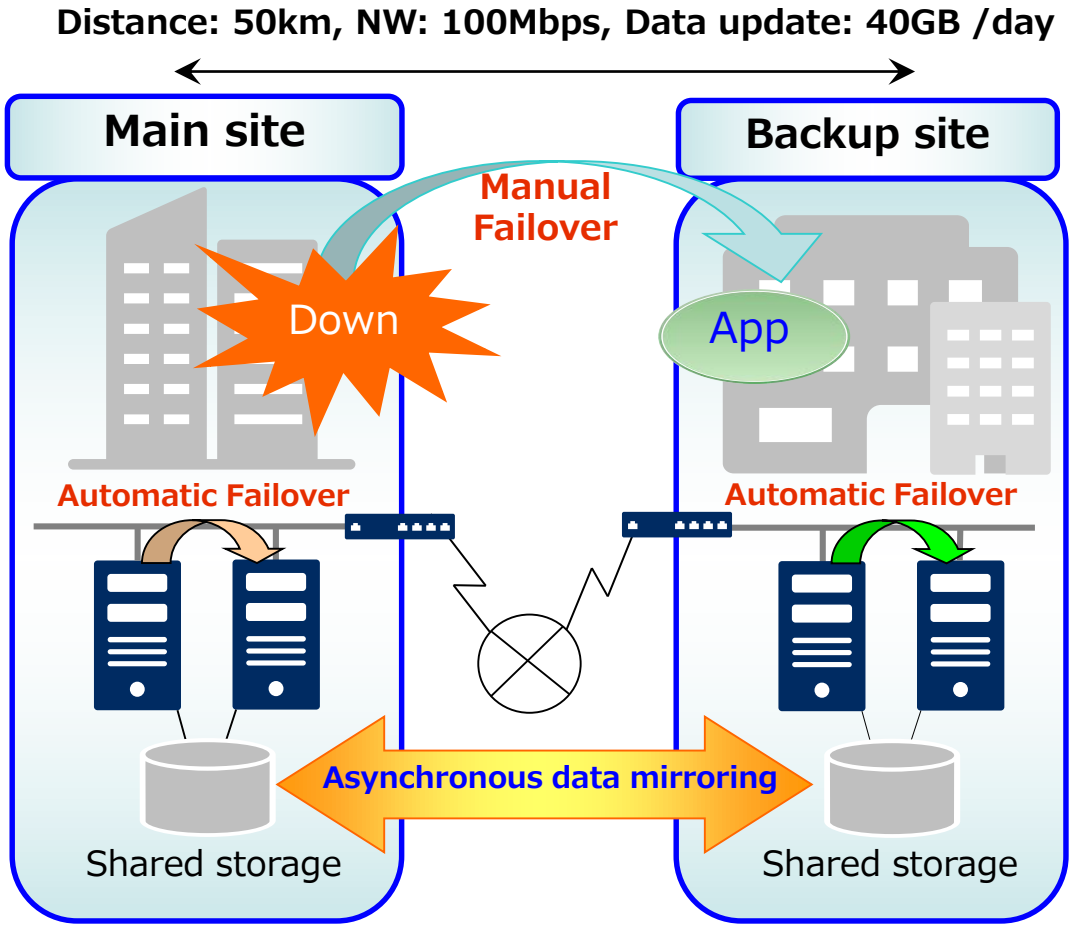
5. Case studies

- *Remote cluster of factory between 5km distance (Campus Cluster)*
- *Consolidated 3 standby servers to 1 physical server on VMware*



5. Case studies

- EXPRESSCLUSTER was adopted to take over both "data and business application"
- Dynamic cost reduction achieved compared to traditional storage-based replication



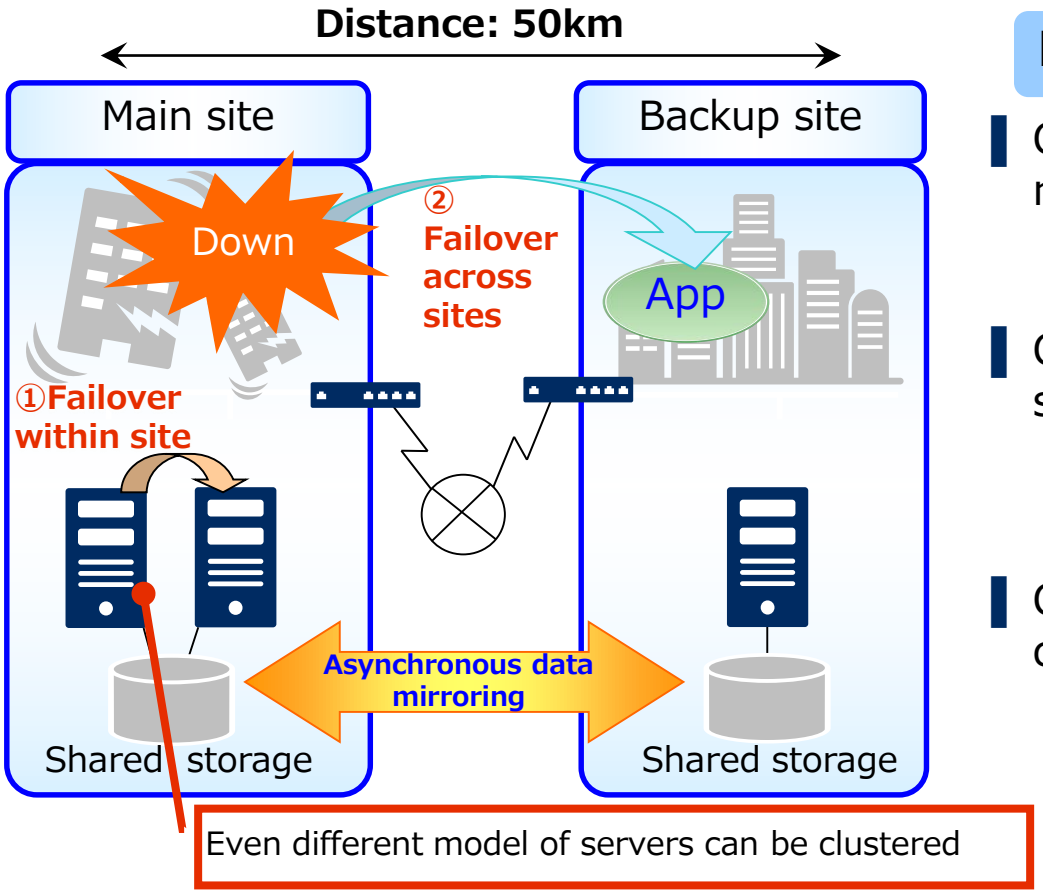
Key Decision Factor

- Failover can be performed automatically within same site in case of server failure
- In case of disaster, failover can be performed manually
  - User can judge whether to failover or not in case of disaster
  - Failover can be also automatic
- The process of switch over of the system can be pre-defined
  - Prevents manual operation error and realizes immediate recovery
  - Easy failback operation after failover testing

5. Case studies

Case -4 Distribution

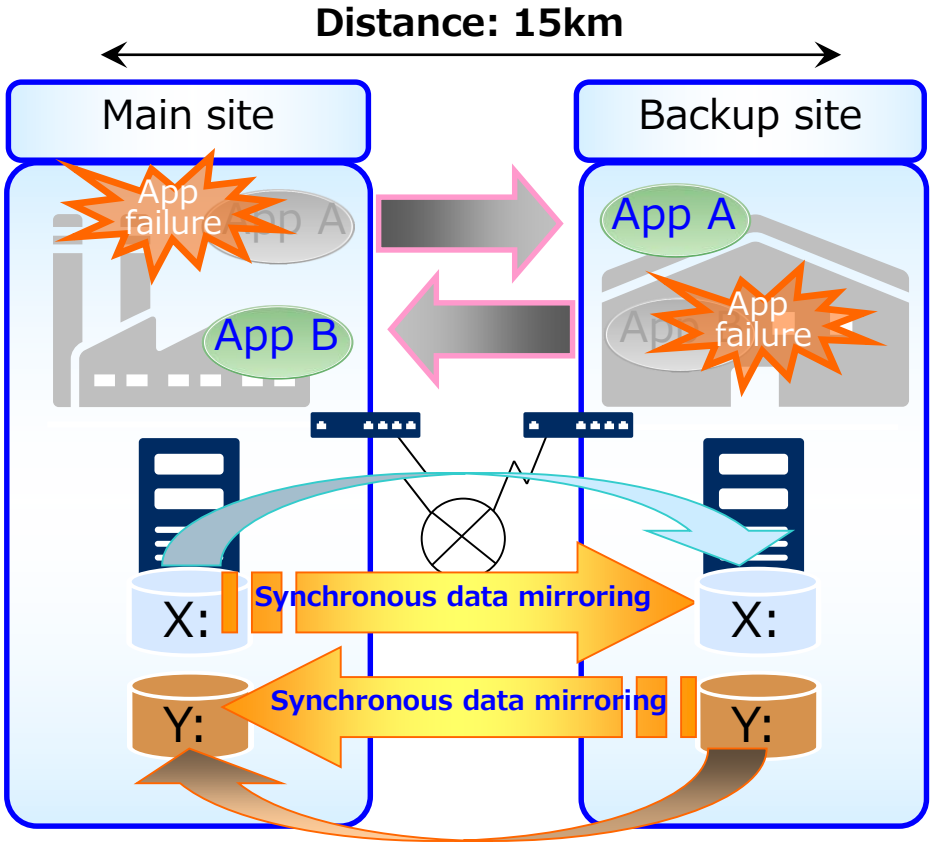
- *FT server + EXPRESSCLUSTER was operated before migrating to disaster recovery configuration*
- *At the timing of replacement of FT server, DR configuration was considered*
- *Adopted EXPRESSCLUSTER X which the operation know-how can be also leveraged even in DR configuration*



Key Decision Factor

- Cluster operation of main site remains same as previous
  - Can leverage operation know-how
- Clustering in combination of FT server and IA server.
  - Realizes disaster recovery in addition to robustness of both hardware and s/w.
- Can be implemented using existing corporate network
  - Dedicated line is not required

- *Disaster recovery (DR) was considered at the timing of BCP preparation*
- *Adopted data mirroring type cluster which enables minimum start with low cost*
- *Business operation with two clustered servers under "cross-standby" configuration*



Key Decision Factor

- Any kind of data can be mirrored between clustered servers
- Flexible failover (operation) scenario can be defined
  - In case of application failure, automatic failover will be performed
  - In case of site down, failover can be performed manually

Thank You

EXPRESSCLUSTER X

An Integrated High Availability and Disaster Recovery Solution

For more product information & request for trial license,
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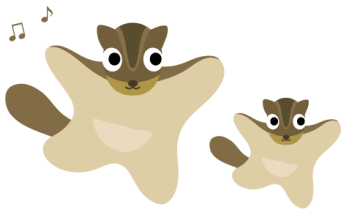


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