EXPRESSCLUSTER D
Product Introduction

October, 2015

NEC Corporation,
Cloud Platform Division,
EXPRESSCLUSTER Group
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.
Agenda

**Product Introduction**
1. Market Trend
2. EXPRESSCLUSTER D Series
3. Feature
4. Cluster Configuration
5. Various Operation Models
6. Function
7. Option Product
8. Product Lineup
9. Licensing Scheme
10. Configuration Example
11. System Requirements
12. Precaution
1. Market Trend
No.1 Market Share for ACS* in Asia Pacific Region for 6 Straight Years

*ACS : Availability and Clustering Software

APAC (including Japan)

Breakdown of market share by OS

**Windows**
- A: 46.9%
- E: 11.7%
- C: 5.2%
- D: 3.9%
- H: 3.0%
- Others: 7.7%

**Linux**
- A: 33.8%
- B: 12.3%
- G: 11.7%
- D: 7.5%
- C: 6.2%
- F: 5.9%
- I: 4.2%
- E: 3.9%
- Others: 14.5%

IDC AP, August 2015 “Asia/Pacific (Excluding Japan) Availability and Clustering Software Market Update 2015” (AP251101)
2. EXPRESSCLUSTER D Series
Why “D”?

Diversity
- Dynamic data synchronization with intelligent mirroring
- Robust data protection with snapshot mirroring and multi-stage configuration
- Intuitive GUI. Easy HA cluster configuration with DevOps
- Various disaster recovery measure by additional stand-by node on remote site and cloud
- Rich experience and know-how over 20 years

Dynamic
- Dynamic data synchronization
- Snapshot mode
- Async mode
- Sync mode

Data Protection

Deployment

Disaster Recovery

Double Decade

Orchestrating a brighter world
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2. EXPRESSCLUSTER D Series

Cloud/remote HA cluster function
- Snapshot mirroring
- Network partition automatic recovery
- Object storage linkage

HA cluster function
- M+N Stand-by config
- NIC failure detection
- Process detection
- System log output
- Storage exclusive control
- Status monitoring
- Cluster disaster recovery
- Service and function for major application

Single server availability improvement function
- Disk failure detection
- OS hung up detection
- System log output

Brand

HA Clustering SW
- HA for cloud and remote
  - EXPRESSCLUSTER D
  - EXPRESSCLUSTER D Standard
  - EXPRESSCLUSTER D Standard for VM
  - EXPRESSCLUSTER D DR Option
  - EXPRESSCLUSTER D Media Kit

HA cluster
- EXPRESSCLUSTER X
- EXPRESSCLUSTER X for VM
- EXPRESSCLUSTER X CD
- EXPRESSCLUSTER X Replicator
- EXPRESSCLUSTER X Replicator DR
- EXPRESSCLUSTER X Database Agent
- EXPRESSCLUSTER X Internet Server Agent
- EXPRESSCLUSTER X File Server Agent
- EXPRESSCLUSTER X Application Server Agent
- EXPRESSCLUSTER X Anti Virus Agent
- EXPRESSCLUSTER X System Resource Agent
- EXPRESSCLUSTER X Java Resource Agent
- EXPRESSCLUSTER X for SAP NetWeaver
- EXPRESSCLUSTER X for FileMaker Server

Server Availability
- Single server availability
  - EXPRESSCLUSTER X SingleServerSafe
3. Feature
Detect system failure and execute failover for business continuity

Case: Single configuration
- Business stops until server will be restored
- Business stops until maintainer arrives
- System is not fully protected even operated in cloud or datacenter
- Lose business opportunity
- Lose “credibility” of a company

Case: Cluster system
- Server operation is ensured in both on-premise and cloud without anxiety
- Another server automatically takes over the business application and data
- Redundancy is crucial in case of cloud and datacenter as well
- Minimize the loss of business opportunity
- Company operates system without anxiety
Flexible configuration for each customer’s requirement

- **Windows**
  - Windows Server 2012 R2, 2012

- **Linux**
  - Asianux Server 4 == MIRACLE LINUX V6 SP4
  - CentOS 7.1, 6.6
  - Red Hat Enterprise Linux 7.1, 6.6

- **Hardware**
  - x86 server

- **Virtual Platform**
  - VMware vSphere 6.0, 5.5, 5.1
  - Windows Server 2012 R2 Hyper-V
  - Windows Server 2012 Hyper-V
  - Windows Server 2008 R2 Hyper-V

- **Cloud**
  - Amazon Web Services
  - NEC Cloud IaaS
  - Microsoft Azure*1

- **Multi-vendor support**
  - EXPRESSCLUSTER D can be used in any vendor’s hardware of latest model
  - It also can be applied to the virtual platform and cloud environment

- **Cross-platform support**
  - It will support for the latest version of Windows and Linux as they are released

*1 Soon be supported
3. Feature

Cost reduction without stable activation of standby server

- Snapshot is stored in inexpensive object storage*1
- Further cost cut is possible by launching standby server of on-demand standby status when any failure/disaster occurs

(*1) It is applied to Amazon Simple Storage Service (Amazon S3) as of Oct. 2015. It will also be applied to Microsoft Azure Cloud Storage.
3. Feature

Protect important business data from any failure or disaster

Easily restores data to any point of time by using the Snapshot function

Data can be mirrored to multiple standby servers. Standby server enables stable business operation in case of system failure

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Industry first!*1 Automatic & dynamic change among 3 modes according to network situation and data quantity.

Intelligent mirroring
Data transfer mode is automatically changed to network and data update quantity.

Multi-stage mirroring*2
In addition to 1:1 and 1:N, multi-stage mirroring such as 1:M:N is supported.

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*1: As of October 13th, 2015. Research from NEC.
*2: Please see Page36 for more configuration details.
- In single stage configuration of 1:N, simultaneous connection number is limited. If the connection becomes maximum, configuration will be changed to multi-stage mirroring (1:M:N). Maximum connection number is depending on setting value of mirror method.
- In case of 1:M:N, M must be more than 5.
- System image is pattern of 1 : 5 : 1 configuration.
4. Cluster Configuration
4. Cluster Configuration

Latest data is taken over by mirroring for resuming business

- Shared disk is not required for HA cluster configuration (*1)
- Clustering is enabled with remote server through the network

(*1) Shared Disk model will be supported in the fall 2016
Data Backup Solution using the Object Storage (*1)

- Preserve differential data to the Object Storage at regular intervals
- Reduce the running cost by keeping stop the standby node

- Regularly store the mirror data
- Obtain Data
- Start the standby node with a timer

(*1) Supported for Amazon Simple Storage Service (Amazon S3) in Oct. 2015
5. Various Operation Models
5. Various Operation Models

Active – Standby

- The most popular cluster model
- Most business system can be applied to this cluster model
- If any failure occurs in the active server, failover is done to the standby server
- Cluster scale can be expanded to more than 3 servers, such as “Active-Standby-Standby”

Active – Active (Dual-directional standby)

- By operating different system in each server, cluster operation of dual-directionally Active / Standby is enabled
- If any failure occurs in one server, failover is done to another server
- Load will be increased when failover happens as two business systems are managed in single server

Active – On demand standby

- Starting time of standby server is minimized by linkage with the cloud storage, which reduces the operation cost as well (more detail is on 3. Feature ③ Reduce managing cost with Cloud)
6. Function
6. Function

Switch to another server in around 1 minute

- **Detect failure**
  - ① Failure Detection
  - ② Application stop
  - ③ Mirror resource stop
  - ④ Virtual IP resource stop

- **Active**
  - Around 1 minute up to here
  - ⑤ Virtual IP resource start
  - ⑥ Mirror resource start
  - ⑦ Application start

- **Standby**

- **Resource group stop**
  - ② Application stop
  - ③ Mirror resource stop
  - ④ Virtual IP resource stop

- **Resource group launch**
  - ⑤ Virtual IP resource start
  - ⑥ Mirror resource start
  - ⑦ Application start

- **Resource group**
  - It is a container for unitarily managing multiple resources. Failover among each node is done based on resource group unit.

- **Quick failover for continuing business**
  - Record to OS system log
  - Notification by e-mail
Detect failure by various monitoring and do failover

① Disk monitoring
② Network monitoring
③ Process monitoring
④ Database monitoring
⑤ Monitoring by optional script
⑥ Dynamic DNS resource monitoring
⑦ Virtual IP resource monitoring
⑧ Mirror resource monitoring
⑨ File sharing resource monitoring

Monitoring on both on-premise and cloud.
Standby side is also monitored with following resource;
- IP monitoring resource
- Disk monitoring resource
- Process monitoring resource
- Generic resource
Resource integration by GUI for simple configuration/operation

Icon-based UI design
⇒ Intuitively understandable

Online help/ToolTips
⇒ Configuration / Operation without manual

Simplified setting by resource integration
⇒ Prevent setting mistake

Dojo Toolkit (JavaScript) is deployed
⇒ Smooth and high speed

Offer RESTful Web API
⇒ Easily linked with other tools
“Quickly”, “Simply” and “Automatically” configures large scale HA cluster linked with Chef

**Function**
- Manage HA cluster configuration as “recipe (code)”, not as “configuration procedure”
- “HA cluster configuration cookbook” is packaged in EXPRESSCLUSTER D Media Kit

**Advantage**
- Reduce configuration cost by shortening configuration time for large HA cluster system
- By following the “recipe”, anyone can configure the same environment anytime without mistake

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**Simplified cluster configuration/operation**

1. **Parameter Sheet**
   - Server name
   - IP address
   - Resource
   - Configuration file

2. **Recipe**
   - Installation
   - Firewall setting
   - Distribution of the configuration file
   - Server restart
   - Clustering start

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**Recipe Execution Process**

1. **Engineer**
   - Upload the configuration file

2. **Chef server**
   - Chef command execution

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**EXPRESSCLUSTER**

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7. Option Product
Provide necessary function for the remote clustering which is extended over the multiple network segments

- Dynamic DNS resource, which enables to dynamically register the DNS name to the DNS server is available. With the DNS name, access to the active server is enabled without caring server switch after failover and so on.

- Multiple data mirroring methods (synchronous, asynchronous, snapshot) are configurable when the number of node is more than 3.
  - Multiple mirroring modes are configurable according to where standby side is located.

**Without DR Option**
- Mirroring method: Synchronous (1 type)
  - Register the DNS name of active side

**With DR Option**
- Mirroring method: Synchronous/Asynchronous (2 types)
  - Register the DNS name of active side
1. Parameter sheet

Create setup file with one-click from parameter sheet. Drastically reduce man-hour for copying to setup file. Also, prevent any failure of copying. Shorten the time by diverting the contents of parameter sheet to the specification document.

2. EXPRESSCLUSTER D API reference and Sample code

Provide RESTful API. By executing API, it is possible to get information of cluster, and operate it. Attached sample code is compliant to the specification of API.

3. Chef user guide and Cookbook

Provide Cookbook that is necessary for automatic configuration of EXPRESSCLUSTER D environment by Chef. Reduce a load when the number of servers increases and human error. This can be used with the setup file created by Parameter sheet.


Users guide for EXPRESSCLUSTER D

5. Installation medium

Module of EXPRESSCLUSTER D
## 8. Product Lineup

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Product</td>
<td></td>
</tr>
<tr>
<td>EXPRESSCLUSTER D 1.0</td>
<td>EXPRESSCLUSTER D base product</td>
</tr>
<tr>
<td>CPU License</td>
<td></td>
</tr>
<tr>
<td>EXPRESSCLUSTER D Standard 1.0</td>
<td>EXPRESSCLUSTER D CPU license. Function overview;</td>
</tr>
<tr>
<td></td>
<td>- Mirror disk type cluster</td>
</tr>
<tr>
<td></td>
<td>- Deep monitoring for data base</td>
</tr>
<tr>
<td></td>
<td>- Email alert</td>
</tr>
<tr>
<td>VM License</td>
<td></td>
</tr>
<tr>
<td>EXPRESSCLUSTER D Standard 1.0</td>
<td>EXPRESSCLUSTER D VM license. Function overview;</td>
</tr>
<tr>
<td></td>
<td>- Mirror disk type cluster</td>
</tr>
<tr>
<td></td>
<td>- Deep monitoring for data base</td>
</tr>
<tr>
<td></td>
<td>- Email alert</td>
</tr>
<tr>
<td>Option Product</td>
<td></td>
</tr>
<tr>
<td>EXPRESSCLUSTER D DR Option 1.0</td>
<td>EXPRESSCLUSTER D option license to add following functions.</td>
</tr>
<tr>
<td></td>
<td>- Virtual host name (Takeover of DNS name)</td>
</tr>
<tr>
<td></td>
<td>- Data mirroring to multiple servers. (when the mode is mixed)</td>
</tr>
<tr>
<td>Media and Documents</td>
<td></td>
</tr>
<tr>
<td>EXPRESSCLUSTER D Media Kit 1.0</td>
<td>EXPRESSCLUSTER D setup media and documents for both Windows &amp;</td>
</tr>
<tr>
<td></td>
<td>Linux. Following contents are included.</td>
</tr>
<tr>
<td></td>
<td>- Installation Media</td>
</tr>
<tr>
<td></td>
<td>- User guide</td>
</tr>
<tr>
<td></td>
<td>- Parameter sheet</td>
</tr>
<tr>
<td></td>
<td>- EXPRESSCLUSTER D Chef usage guide and cookbook</td>
</tr>
<tr>
<td></td>
<td>- EXPRESSCLUSTER D API reference and sample code</td>
</tr>
</tbody>
</table>
9. Licensing Scheme
## 9. Licensing Scheme

<table>
<thead>
<tr>
<th>License Count</th>
<th>Target Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counted by cluster system</td>
<td>EXPRESSCLUSTER D 1.0</td>
<td>EXPRESSCLUSTER D base product. In addition, EXPRESSCLUSTER D CPU license or VM license is required.</td>
</tr>
</tbody>
</table>
| Counted by CPU number         | EXPRESSCLUSTER D Standard 1.0            | EXPRESSCLUSTER D CPU license. In addition, EXPRESSCLUSTER D base license is required. License number is equal to the total number of deployed CPU in each server.  
*Standby server is also counted.
*CPU’s empty slot is not counted.
*Core (dual core etc) & Hyper-Threading are not counted doubly.  
*In case of ft server, CPU number is counted as OS recognizes Function overview;  
- Mirror disk type cluster  
- Deep monitoring for data base  
- Email alert                                                            |
| Counted by server number      | EXPRESSCLUSTER D Standard 1.0 for VM     | EXPRESSCLUSTER D VM license for virtual machine. In addition, EXPRESSCLUSTER D base license is required. Function overview;  
- Mirror disk type cluster  
- Deep monitoring for data base  
- Email alert                                                            |
|                               | EXPRESSCLUSTER D DR Option 1.0           | EXPRESSCLUSTER D option license to add following functions.  
- Virtual host name (Takeover of DNS name)  
- Data mirroring to multiple servers. (when the mode is mixed)                                                            |
| (if required)                 | EXPRESSCLUSTER D Media Kit 1.0           | EXPRESSCLUSTER D setup media and documents for both Windows & Linux. Following contents are included.  
- Installation Media  
- User guide  
- Parameter sheet  
- EXPRESSCLUSTER D Chef usage guide and cookbook  
- EXPRESSCLUSTER D API reference and sample code                                                                    |
10. Configuration Example
10. Configuration Example

1. 2 node mirror type data base

**Mandatory**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPRESSCLUSTER D 1.0 (1 cluster license)</td>
<td>1</td>
</tr>
<tr>
<td>EXPRESSCLUSTER D Standard 1.0 (1 CPU license)</td>
<td>2</td>
</tr>
<tr>
<td>EXPRESSCLUSTER D Media Kit 1.0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Support fee is not included in the configuration above.*
10. Configuration Example

2. 3 node remote mirror type file server

Mandatory | Product Name                                                                 | Quantity
------------|--------------------------------------------------------------------------------|---------
✓            EXPRESSCLUSTER D 1.0 (1 cluster license)                                | 1       
✓            EXPRESSCLUSTER D Standard 1.0 for VM (1 node license)                | 3       
✓            EXPRESSCLUSTER D DR Option 1.0 (1 node license)                     | 3       
            EXPRESSCLUSTER D Media Kit 1.0                                        | 1       

*Support fee is not included in the configuration above.*
10. Configuration Example

3. 7 node multi-stage mirror type file server

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Product Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>EXPRESSCLUSTER D 1.0 (1 cluster license)</td>
<td>1</td>
</tr>
<tr>
<td>✓</td>
<td>EXPRESSCLUSTER D Standard 1.0 (1 CPU license)</td>
<td>5</td>
</tr>
<tr>
<td>✓</td>
<td>EXPRESSCLUSTER D Standard 1.0 for VM (1 node license)</td>
<td>3</td>
</tr>
<tr>
<td>✓</td>
<td>EXPRESSCLUSTER D DR Option 1.0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>EXPRESSCLUSTER D Media Kit 1.0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Support fee is not included in the configuration above.
10. Configuration Example

4. On-premise - cloud configuration file server

On-premise (company)    Amazon Web Services

- File Server
  - Active
  - DNS name
- 1CPU

VPN

- Stores snapshot in Amazon Simple Storage Service (Amazon S3)

Mandatory Product Name        Quantity
✓ EXPRESSCLUSTER D 1.0 (1 cluster license)    1
✓ EXPRESSCLUSTER D Standard 1.0 (1 CPU license)    1
✓ EXPRESSCLUSTER D Standard 1.0 for VM (1 node license)    1
✓ EXPRESSCLUSTER D DR Option 1.0    2
✓ EXPRESSCLUSTER D Media Kit 1.0    1

*Support fee is not included in the configuration above.
11. System Requirements
# 11. System Requirements

EXPRESSCLUSTER D support system and browser

<table>
<thead>
<tr>
<th>OS</th>
<th>Windows</th>
<th>Linux (*1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>x86_64</td>
<td>x86_64</td>
</tr>
<tr>
<td></td>
<td>Windows Server 2012 R2</td>
<td>Asianux Server 4 == MIRACLE LINUX V6 SP4</td>
</tr>
<tr>
<td></td>
<td>Windows Server 2012</td>
<td>CentOS 7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CentOS 6.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Hat Enterprise Linux 7.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red Hat Enterprise Linux 6.6</td>
</tr>
<tr>
<td>Required Memory</td>
<td>2GB+</td>
<td>2GB+</td>
</tr>
<tr>
<td>Required Disk Size</td>
<td>300MB+ (*2)</td>
<td>500MB (*2)</td>
</tr>
<tr>
<td>Advanced WebConsole support browser</td>
<td>Internet Explorer 11 (English / Japanese)</td>
<td>Mozila Firefox 31 or later (English / Japanese)</td>
</tr>
</tbody>
</table>

(*1) It depends on the kernel version because of specified driver module. Please refer to the user guide to know EXPRESSCLUSTER’s support kernel version.

(*2) In case of mirroring, it is recommended to ensure twice free space as much as value of directory size for saving mirror data.
12. Precaution
12. Precaution

Cluster configuration
- Shared disk cluster is not supported yet (will be supported in the fall 2016)

Mirroring
- Mirroring is operated by unit of virtual volume (Mirroring for physical partition is not supported yet)
- Virtual volumes are automatically created by EXPRESSCLUSTER function
- Maximum size of mirror volume is 2TB
- Data size of the mirror volume cannot be changed dynamically
- Supported file systems are only NTFS (Windows) and ext4 (Linux)
- Supported object storage is only Amazon S3

Others
- ODBC driver needs to be installed for database monitoring
- Virtual IP address (Floating IP address) can only be used within a same subnet
- DR Option (license) is necessary for using DDNS resource