November, 2015

NEC Corporation,
Cloud Platform Division,
EXPRESSCLUSTER Group

SingleServerSafe Product Introduction
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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3. Features in Operation (Screen, Usability)
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1. Requirements for High Availability
Requirements for high availability

- Requirement for high availability expanded from traditional mission critical system to servers in departments/shops.
- Impact of server failure in complex and highly-developed IT society is getting bigger and bigger.
- Usage of Windows / Linux servers in low-end to middle-range became general in recent years, and higher availability / usability has been required more and more.

Technology of EXPRESSCLUSTER X * can be applied to single server.

Maximum usage of EXPRESSCLUSTER X technology for enabling to improve availability and to avoid failure on single server.

* ... No.1 Market Share in Asia Pacific region.

EXPRESSCLUSTER X SingleServerSafe
How you avoid the server disruption of mission critical systems?

Advantage of EXPRESSCLUSTER X SingleServerSafe:

- Duplication in required systems enables to improve availability in single server.
- Monitors abnormality of HW & SW, recovers them from failure, and improves availability!
- FT server (HW duplicated server) also acquires SW availability to become server with higher reliability!
- For further availability, upgrade to clustering system is enabled.

Easy implementation compared with cluster, achieving high robustness to the failure.
2. Product Overview
Detectable failure (monitoring target)

Accurate monitoring to check the actual status

- Application layer:
  - Presence monitoring of process
    - Restarts when process abnormality is detected
  - Monitoring agent
    - Restarts when abnormality in SQL, HTTP and so on is detected

- OS layer
  - User space monitoring
    - Restarts when abnormality in AP layer such as hang-up is detected.

- Hardware layer
  - Disk monitoring
    - Restarts when disk access abnormality is detected.
  - Ping monitoring
    - Restarts when ping abnormality is detected.
  - NIC Link UP/DOWN monitoring
    - Restarts when link-down is detected.
    - Availability can be improved by NIC duplication.
Improves high availability due to appropriate monitoring of application

- Same monitoring Agent as Agent of EXPRESSCLUSTER X can be used.

**Without Agent**

- Application Restart
- EXPRESSCLUSTER X SSS feature enables existence monitoring of process. When the process disappears, this is regarded as abnormal.
- □ Abnormal termination of application (Existence monitoring setting is required)
- × Hang-up detection of application
- × Response detection from application

**With Agent**

- Agent sends request to target application periodically. Simultaneously, Agent waits for response with clock timer, and checks the content of it.
- ○ Hang-up detection of application
- ○ Response detection from application
- ○ Abnormal termination of application

*Monitoring Agent is strongly recommended*
Frequently used key apps in five fields are supported. Two more monitoring Agent is added to line-up (from X 3.1)

<table>
<thead>
<tr>
<th><strong>System Resource</strong> (System Resource Agent)</th>
<th><strong>Java VM Resource</strong> (Java Resource Agent)</th>
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</thead>
<tbody>
<tr>
<td>(Windows, Linux) CPU, memory, file, and so on</td>
<td>(Windows) WebOTX, WebLogic</td>
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<tr>
<td></td>
<td>(Linux) WebOTX, WebLogic, JBoss, Tomcat</td>
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<tr>
<th><strong>Database</strong> (Database Agent)</th>
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<tr>
<td>(Windows) Oracle, SQL Server, DB2, ODBC, PowerGres, etc</td>
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<tr>
<td>(Linux) Oracle, DB2, PostgreSQL, PowerGresPlus, MySQL</td>
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<tr>
<th><strong>File Server</strong> (File Server Agent)</th>
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<tr>
<td>(Linux) Samba, NFS</td>
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<th><strong>Internet Server</strong> (Internet Server Agent)</th>
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<tr>
<td>(Windows) IIS, SMTP/POP/IMAP4, HTTP/HTTPS, etc</td>
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<tr>
<td>(Linux) apache, httpd, sendmail, postfix, popd, etc</td>
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<th><strong>Application Server</strong> (Application Server Agent)</th>
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<tr>
<td>(Windows, Linux) Oracle AS, Tuxedo, WebLogic, WebSphere, WebOTX</td>
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<th><strong>Anti-Virus Software</strong> (Anti-Virus Agent)</th>
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<tr>
<td>(Windows) Trend Micro Enterprise Security</td>
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Off-line creation of setting information can be applied to other servers.

- Setting file acquired from operating server.
- Setting reflect and upgrade are achieved without stopping application by suspend feature.
- Setting information can be used to other servers!
- Setting information can be exported to external media such as FD or USB memory.

Builder:
- New File
- Import
- Export
  - Get the Configuration File
  - Apply the Configuration File
  - Update Server Data
  - Online
  - Save Log Files
- Exit

App:
- X SingleServerSafe
  - Resume
  - Suspend

X SingleServerSafe

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Alert and support in case of failure

Status can be checked with view of management terminal.

Log information of all servers can be collected from management terminal in one click.

Email alert can be done in case of failure.
3. Features in Operation (Screen, Usability)
Features in operation

Start / stop order and recovery process from abnormal status can be set up.

Makes system groups in operation unit, and set up procedure of start /stop

Enables setting from operation point of view unlike start procedure of OS service manager (Windows) or init script (Linux).

Sets up restart in resource unit, group unit, or server unit, as a recovery procedure from abnormal situation.
Operating procedure

- Same Builder as one for EXPRESSCLUSTER X can be used for environment configuration.
- Server status monitoring, start / stop of operation group, and log collection can be done from WebManager, as well as CLI.

Stop/restart of server and group (operation service) can be unified by EXPRESSCLUSTER command!

With integrated management of all server, reduction of operator’s effort and human error, know-how and information sharing are enabled.
Managing cluster systems from Android devices.
Enables to refer to clustering configuration status of both EXPRESSCLUSTER X and SingleServerSafe in the same LAN.

Enables to run several WebManager separately.

Rapid search of node by search filter

Selected cluster display in business application unit by using group display filter.
Easy implementation for virtualization environment

- Easy setting of start / stop / monitoring of virtual machine
  - Only needs to input required items to GUI wizard format

Enables integration of virtual machine to one platform with HA feature
Easy setting of service resource

Automatically obtains the service name managed in service management console of Windows OS

Service name to be registered in service resource should be specified manually where human mistake is likely to occur.

1. Display service name from Connect button

2. Just select service name for registration from list box.
Child/Grandchild process can now be monitored

With process name monitoring resource, structure of app is understood while monitoring.

- E.g.1)
  - Process name “APPL"

- E.g.2)
  - Process name “APP*”

Wildcard “*” is supported
SNMP Manager enables cluster management

- Enables integrated management including network devices etc

Displays information/situation from SNMP communication of SingleServerSafe

Easy setting with GUI

Failover

SingleServerSafe

SNMP communication

SNMP Manager

* NEC MasterScope Network Manager case
Failure simulation from the management console

- “Verification Mode” is added to the management console
- Early discovery of mistakes in configuration, and confirms recovery of monitor resource.

1. Select verification mode
2. Select dummy failure from monitor resource
3. Select server to use for dummy failure
4. Easily simulate the failure
4. Usage Scene
Solution to improve reliability for Web 3 layer system

Enables integrated management of system under load balancer using SingleServerSafe

Improves availability of whole system by deploying EXPRESSCLUSTER X SSS in web server / app server under load balancer and deploying EXPRESSCLUSTER X to DB server.

With EXPRESSCLUSTER X integrated manager, enables to manage whole system configured for different purpose and on heterogeneous OS.

Achieves higher availability and usability of whole system
“System Resource Agent” usage situation

Realize stable operation by avoiding system resource failure

- Monitors whole system resource
- Prevents trouble in advance
- Monitors resource of each process
- Alerts abnormal resource usage
- Stores system resource information
- Can be used for sizing or reporting

System resource - CPU - Memory etc

- Predicts resource shortage near future
- Monitors resource of each process
- Alerts abnormal resource usage

Process

Resource usage

Now Future

System Resource Agent

SingleServerSafe

Big Alert

Resource usage

Process

Process

Resource usage

System Resource Agent

SingleServerSafe

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Linkage with EXPRESSCLUSTER X supporting virtual environment

**Guest cluster type**

Quicker failover than host cluster type

1. Physical failure on host OS occurs
2. Alerts failure detected on host OS to guest OS
3. Failover of application running on guest OS

**Host cluster type**

More economical than guest type cluster

1. Application failure on guest OS occurs
2. Alerts failure detected on guest OS to host OS
3. Failover of whole guest OS

**Supported hypervisor**

- VMware vSphere 5 / 4.x
- Windows 2008 R2 Hyper-V
- XenServer 5.6 / 5.5
- KVM
- IBM PowerVM
Anti-Virus Agent can protect system from virus!

Supported products: Trend Micro “OfficeScan Corporate Edition 10.5 & 8.0 SP1 Patch 1”

- Anti-Virus Agent monitors status of OfficeScan Client. Detects hang-up as well as service status, and restarts service.
- Monitors communication with OfficeScan Server, and ensures the pattern files to be delivered.
- For higher availability of the anti-virus system, OfficeScan Server is recommended to be clustered by EXPRESSCLUSTER X.

If failure occurs in Anti-Virus software, risk of virus infection becomes higher due to failure of pattern file import.

Operation with more robust Anti-Virus system can be achieved!
Thank You

An Integrated High Availability and Disaster Recovery Solution

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

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