NEC Corporation of America
Intro to High Availability / Fault Tolerant Solutions

ExpressCluster®
The Ultimate Application And Data Recovery Solution
NEC Corporation

Technology solutions leader for 100+ years
- Established 1899, headquartered in Tokyo
- First Japanese joint venture with U.S. capital
- 130,000+ employees
- 100+ manufacturing facilities in 22 countries

Total revenue: $40 billion
- 13th largest software & services supplier in the world
- Solutions revenue: $17 billion
- 84th in Fortune Global 100

Global solutions innovator
- World’s fastest supercomputer
- 10 R&D facilities in U.S., Japan and Germany
- 40,000 patents worldwide
- Top 4 for U.S. patents for the last 5 years

Focused on Internet solutions
- NEC provides 80% of the world’s wireless Internet connections
- NEC is the 2nd largest ISP (BIGLOBE) with 19 million users
Topics

Definition of Terms
Introduction to Fault Tolerance
NEC Fault Tolerant Servers F&B Review
Disaster Recovery/ExpressCluster
Roundtable
RA Events /NEC Resources
Conclusions – Q&A
Definition of Terms

**High Availability (HA)**
At least 99.99% Uptime in a PRODUCTION environment. Directly relates to the local (or hosted) application server.

**Fault Tolerant**
An electromechanical device that will continue normal operation despite the presence of hardware failures...no single point of failure exists in the system.

**Disaster Recovery (DR)**
REMOTE replication of a production environment designed to come online should the local production environment become unavailable due to natural or man-made disasters.
# What is Fault Tolerance?

<table>
<thead>
<tr>
<th>Source: IDC</th>
<th>Availability</th>
<th>Average Annual Downtime</th>
<th>User Tolerance to Downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fault Tolerant</strong>&lt;br&gt;Continuous Availability (CA)</td>
<td><strong>99.999%</strong></td>
<td><strong>5 Minutes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Cluster</strong>&lt;br&gt;High Availability (HA)</td>
<td><strong>99.9%</strong></td>
<td><strong>8 Hours 45 Minutes</strong></td>
<td>Business Interruption Lost Transaction</td>
</tr>
<tr>
<td><strong>Stand Alone</strong>&lt;br&gt;GP or Blade Server w/RAID</td>
<td><strong>99.5%</strong></td>
<td><strong>43 Hours 23 Minutes</strong></td>
<td>Tomorrow is O.K.</td>
</tr>
</tbody>
</table>

72% of mission critical applications experience nine hours of outage per year.
- Standish Group Research
It helps to think of a computer Solution as layers in a stack.

Each layer has its availability issues.

- Application
- Operating System
- Computer Hardware
- Device Interface
Intel Server Availability Feature Evolution

“Why choose a server designed to recover from failure rather than a server designed not to fail in the first place?”
- Vernon Turner, Vice President IDC

Fault Tolerance
“Total Lockstep Redundancy”

- Hot-Swap Processors
- Hot-Swap Memory
- Hot-Swap Chipset
- Hot-Swap I/O
- Hot-Swap Service Processors
- Hot-Swap BIOS

availability graph:
- 1995: Redundant Disk (RAID)
- 2000: ECC Memory
- 2005: Hot-Swap PCI

Empowered by Innovation
About Ft’s; In-the-Box Redundancy

Conventional Server System

- Disk
- CPU
- Memory
- Chipset

I/O-PCI

NEC High Availability (Fault Tolerant) Server System

- Disk
- CPU
- Memory
- Chipset

I/O-PCI

- Fault Detection
- Isolation

Processing Subsystem A

Processing Subsystem B

FT Cross Bar

CPU Lockstep

Dual Module Redundancy

- Mirror

No Single Point of Failure

No Switchover (removal based)

Single Logical Server

System A

System B

Empowered by Innovation
About Ft’s: - Ease of Maintenance

Designed for Simplified Service (Customer Replaceable Units (CRU))

Only 2 Replaceable Components – CRU and HDD
NEC FT can provide fault tolerant availability to any “straight out of the box” application!

FT uses standard operating systems:
- Windows Server 2003 Enterprise Edition
- Red Hat Enterprise Linux

Requires only one copy of any application
Applications need not be “cluster aware” or Enterprise version
Integrated Remote Management

Virtual Technician Module (VTM)

- Constant On – separate 5V DC
- Execute Rom PILOT BIOS extensions
- Accessible by LAN and Serial I/O
- Provides true remote management
- Redundant since integrated into CRU
**New For 2007 - ACTIVE UPGRADE**

An advanced method of performing software maintenance by using the system architecture of the FT Series Servers.

Provides the ability to perform software maintenance without requiring a reboot of the operating system:

- Windows Hot-fixes & Security Patches
- Service Packs
- System Software upgrades from NEC
- Applications (dependant upon characteristics)
“The combination of Active Upgrade with NEC’s fault-tolerant servers pose an exciting technological advancement by enabling online software upgrades and patches without having to take the server or application offline. This blended offering further maximizes server reliability at the application layer, which is an essential requirement for maintaining and protecting the critical infrastructure of a manufacturing organization.”

- Don Richardson, Director, Manufacturing Solutions, Microsoft Corp.
Active Upgrade Process

Duplexed System

Split System (Simplex)

Merged System

Data

Network
LAN / SAN

Data

System

Mirror

Network
LAN / SAN

Data

System

Mirror

Network
LAN / SAN

Data

System

Software Update

Network
LAN / SAN

Data

System

Active Drive Pair

Network
LAN / SAN
NEC Express5800/ 320Ma Server Family

- **320Ma DC – Dual Core CPUs 2.8GHz – Data Center Platform**
  Supports up to 16GB memory

- **320Ma 3.2GHz – 2 x 3.2GHz CPUs – Application Platform**
  Supports up to 8GB memory

- **320Ma “Single Socket” 3.2GHz – Entry Level Platform**
  Supports up to 8GB memory
  Value Priced Entry Level Ma that still offers 99.999% Uptime
# FT vs. Cluster Comparison

<table>
<thead>
<tr>
<th></th>
<th>FT series</th>
<th>Cluster solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Availability</strong></td>
<td>99.999% 5 min. average/year</td>
<td>99.9% &gt;8 hrs. average/year</td>
</tr>
<tr>
<td><strong>Recovery time</strong></td>
<td>Zero switchover</td>
<td>Minutes of failover</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>No impact</td>
<td>Potentially serious impact</td>
</tr>
<tr>
<td><strong>Data loss</strong></td>
<td>None (memory &amp; disk)</td>
<td>Disk protection Only</td>
</tr>
<tr>
<td><strong>System integrity</strong></td>
<td>Complete</td>
<td>None</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>No work required</td>
<td>Script development &amp; testing</td>
</tr>
<tr>
<td><strong>Application modification</strong></td>
<td>None required</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>OS &amp; Application</strong></td>
<td>Single license</td>
<td>Multi-licenses Required</td>
</tr>
<tr>
<td><strong>IT support</strong></td>
<td>Lights out</td>
<td>Extensive</td>
</tr>
</tbody>
</table>

*FT series: 24/7 availability with minimal downtime.*

*Cluster solution: Lower availability with longer recovery time.*

*Performance: FT series has no impact, while Cluster solution has potentially serious impact.*

*Data loss: FT series has none, while Cluster solution requires disk protection only.*

*System integrity: FT series has complete integrity, while Cluster solution has none.*

*Implementation: FT series requires no work, while Cluster solution requires script development and testing.*

*Application modification: FT series requires none, while Cluster solution recommends.*

*OS & Application: FT series uses a single license, while Cluster solution requires multiple licenses.*

*IT support: FT series provides lights out service, while Cluster solution requires extensive support.*
The NEC Guarantee

FT Money-Back Guarantee Program

Program Summary

• 99.999% hardware availability guarantee for 12 months

• Refund up to $50,000* of the purchase price of the hardware

*Subject to terms and conditions, see your Team 1 representative
Disaster Tolerance

Since 9/11 disaster tolerance has become a critical requirement for IT Directors

The challenge:

- Protect mission critical data in the event of the destruction of local computing resources
- Allow surviving resources to continue working with access to the latest data
- Don’t break the IT budget to do it.
Integrated Application And Data Availability Solution

Near-Instant Recovery of Business Critical Applications and Data without Loss over LAN and WAN

Over 8,000 Licenses Worldwide

Volume Platform Support
- 32-bit (IA32)
- 64-bit (EM64T & Itanium)*

Windows, Linux, VMWare

Award Winning Technology
*Best of CeBIT America Award for Disaster Recovery Fault Tolerant Solution

*Limited Release
No need for custom integration of separate products to enable coordinated application and data recovery means lower TCO
ExpressCluster Product Line

**ExpressCluster SAN**
- Data
- SAN
- Data on shared storage
- JBOD/SAN/NAS
- Large cluster support

**ExpressCluster LAN**
- LAN
- No shared disk data
- RAID1 via LAN
- Low cost

**ExpressCluster WAN**
- WAN
- Disaster Recovery
- Supports Synchronous and Asynchronous Mirroring
- Low bandwidth and long distance WAN support

**ExpressCluster WAN Version X **NEW****
ExpressCluster X WAN Edition

Next Generation ExpressCluster Technology

*ExpressCluster X WAN Edition for Windows is the first new product based on the new ExpressCluster X product platform*

ExpressCluster X WAN Edition for Windows Features/ Benefits

- **Synchronous/asynchronous data** mirroring support allows ease choose between full data protection and minimum network complexity
- **Pure web based** management console further simplifies management
- Fine grained disk mirroring configuration support further reduces disk requirements
- **IP based mirroring protocol** adds more flexible network infrastructure support (e.g. Internet)
- New resource level controls further reduces potential downtime for maintenance and configuration
- Various performance and scalability enhancements
Synchronous Mirroring for Guaranteed Data Replication

Data mirroring over LAN or WAN spanning hundreds of miles* with transactional integrity to ensure data can be recovered with no loss

1. **Primary** receives “write” request from **App**
2. **Primary** writes data to disk and forward it to **Standby**.
3. **Backup** writes data to its own disk.
4. **Backup** sends the result to **Primary**.
5. **Primary** receives the result from **Backup** and return the result of the “write” back **App**.

*Synchronous “write” transaction

* Depends on WAN link. Up to 200 miles over typical T1 link
Asynchronous Data Mirroring for Minimizing Network Requirements and Maximum Application Performance

1. **Primary** receives “write” request from **App**

2. **Primary** writes data to its disk and forward it to **Standby**.

3. **Primary** receives the result from its disk and returns result and control back **App** while **Standby** continues to write data to its disk.

4. **Standby** sends the result to **Primary**.
Ft + ExpressCluster = Flexible Deployment Options

Only DR solution compatible with NEC FT servers to provide up to 99.999% availability for most critical applications and data.
FT Disaster Tolerant Solution

FT Server

WAN (T1-1.5Mbps, 60ms RT latency)

Protection against unexpected SW failures

Protection against major Disasters

External Storage (S1500)

Corporate Network

Protection against unexpected HW failures

Site A

Site B
Roundtable

IS It Right for You?

Questions to ask:

Do you have 24x7 requirements?
What would be the impact if these applications were unavailable?
Have you had unexpected downtime recently?
Would you be interested in a solution that can give you less than 5 minutes of downtime a year?

If you discuss...

“Application X is very important to us”
“Our admins are on call 24 x 7 to support …”
“Application clustering is so expensive”
“Our company runs on SQL Server”
“I was here all weekend installing updates…”
“Outages are very expensive.”
**Q&A**

<table>
<thead>
<tr>
<th>NEC’s FT looks expensive</th>
<th>What is your downtime worth? What would the impact to your business be if this mission-critical application wasn’t available?</th>
</tr>
</thead>
<tbody>
<tr>
<td>My IT staff doesn’t have the specialized skills for this or seems complicated</td>
<td>No special skills are needed. An entire FT unit can be swapped-out by a non-technical person and runs like a GP server.</td>
</tr>
<tr>
<td>I don’t want to buy specialized software</td>
<td>The FT runs completely standard off-the-shelf operating systems and software and only needs 1 license (non-cluster aware versions)</td>
</tr>
<tr>
<td>What is the switch over time if a part fails? Will I lose data?</td>
<td>The FT server is a continuously running server. No switch over time is necessary, and no data is lost. All parts are redundant, and back each other up in the event of a part failure</td>
</tr>
</tbody>
</table>
NEC Resources

www.necam.com/channel

Log In: ept@necam.com

Password: ept
5 Customer Benefits of the FT Server:
- 99.999% Uptime
- Easy Maintenance
- Single copy of Standard Software
- Great Remote Management Tools
- FT TCO Beats Software Clusters

Disaster Recovery Solution:
- No Data Loss
- Less than 4 minutes from Disaster to Recovery
- No reprogramming of users or devices
- Affordable to Small/Medium Businesses
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NEC