Compaq NonStop™ Business Continuity Solutions

March 2002

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Director, Business Continuity Initiative
Agenda

- Business continuity vs. disaster recovery
- Compaq NonStop™ Transaction Management Facility (NonStop TMF) software
  - Data protection and improved performance
- Compaq NonStop AutoTMF software
  - Protection for non NonStop TMF applications
- Compaq Remote Database Facility (RDF) software
  - World-class database disaster recovery
- Compaq NonStop AutoSYNC software
  - Synchronization of nondatabase files  Now FCS
Something happens

Disaster event occurs

Productivity (Single department or multiple departments)

Business process loss

Source: DRII
Disaster recovery

Disaster event occurs

Business process loss

Productivity

Time

Source: DRII
Business continuity

Disaster event occurs

Business process loss

Productivity

Time

Source: DRIII
Is this YOUR COMPANY?

Our Disaster Recovery Plan Goes Something Like This...

Courtesy of DILBERT by Scott Adams
IT spending on business continuity

Source: Gartner 2001
Company Preparedness

- Business Continuity Plan: 52%
- Disaster Recovery Plan: 28%
- No DRP/BCP: 20%

Source: Meta Group 2001
Canadian Survey – December 2001

- 80 CEO/CIO of 1000 largest companies

- Results:
  - 26% have no business continuity plan
  - 25% have no computer disaster recovery plan
  - 41% have no overall crisis management plan

- 36% believe recovery time **EXCEEDS** business critical needs

Source: Ernst & Young LLP 2001
Why Companies do not have Plans

- Other business priorities: 62%
- No DRP or BCP champion: 48%
- Lack of top management support: 41%
- No money: 24%
- No LOB ownership: 21%
- Lack of LOB support: 7%
- Had a DRP or BCP in place, but it failed: 3%
- Other: 14%

Source: META Group 2001
Frequency of Plan Updates

- More than once a year: 43%
- Once a year: 40%
- Every two years: 3%
- Less often than every two years: 6%
- Never: 8%

Source: META Group 2001
Obstacles to Recovery

- Unavailable personnel: 31%
- Communication: 25%
- Backup Processing Facility: 13%
- Regional Infrastructure: 6%
- Inadequate DRP/BCP: 6%
- DR/BC Vendor: 6%
- Other: 13%

Source: META Group 2001
What is your cost of downtime?

**Productivity**
- Number of employees impacted x hours out x burdened hours

**Revenue**
- Direct loss
- Compensatory payments
- Lost future revenues
- Billing losses
- Investment losses

**Financial performance**
- Revenue recognition
- Cash flow
- Lost discounts (A/P)
- Payment guarantees
- Credit rating
- Stock price

**Damaged reputation**
- Customers
- Suppliers
- Financial markets
- Banks
- Business partners

**Know your downtime costs per hour, day, 2 days...**

**Other expenses**
Temporary employees, equipment rental, overtime costs, extra shipping costs, travel expenses, etc.
Hourly Cost of Downtime

Source: Eagle Rock Alliance 2001
Company Survival Risk

Source: Eagle Rock Alliance 2001
Why Companies have Business Continuity Plans

Source: META Group 2001
Company Survival Factors

Source: Eagle Rock Alliance 2001
It’s a process

1. Project initiation
2. Functional requirements
3. Design and development
4. Implementation
5. Testing and exercising
6. Maintenance and updating

Start

Business continuity process

Required availability times

Source: DRILL
Creating Business Continuity Plans

**PROCESS**

- Change Management
- Education
- Testing
- Review

- Testing
  - Group plans and procedures
  - Risk reduction
  - Implement standby facilities

- Create Planning Organization
- Recovery Strategy
- Risk Analysis
- Business Impact Analysis

**Ongoing process**

**Project**

**Policy**

**Organization**

**Resources**

**Scope**

**Business Continuity Planning Initiation**

*Source: Gartner 2001*
Business (dis) Continuity...
Integrated disaster tolerance and recovery products for the Compaq NonStop Himalaya™ server

- **NonStop™ TMF software**
  - The foundation for transaction integrity and data protection
- **NonStop AutoTMF software**
  - Enables TMF for non NonStop TMF applications
- **RDF software**
  - High-performance database replication
- **NonStop AutoSYNC software**—new (FCS March 2002)
  - Synchronizes nondatabase files
Compaq NonStop™ Transaction Management Facility
What is NonStop TMF software?

- *NonStop™* TMF is a fault-tolerant disk and transaction manager that guarantees transaction atomicity and database integrity
  - All database modifications are captured in the *NonStop* TMF audit trail
    - Before and after images efficiently captured
    - Guaranteed log of database changes
    - Audit trail can be used to replicate and rebuild the database
  - If any part of the transaction fails, the entire transaction fails
NonStop TMF

Source node

- TMF-enabled application
- Disk process

Fault tolerance

Database

- Master audit trail
- Auxiliary trail

TMF

COMPAQ
Single, consolidated audit log

- Web browser
- IIS and Jolt
- Java, C++ (CORBA)
- Pathway

- iTP WebServer
- Tuxedo

- NonStop™ Server for Java
- NonStop Tuxedo

- NonStop JTS/OTS
- NonStop DOM/MP
- NonStop JORB/MP

- SQL or Enscribe

- NonStop TMF
Performance with NonStop TMF protection

Apparent paradox:
Why do you get better performance with NonStop™ TMF than without?

Answer:
More advanced buffering, fewer and more optimized DB disk writes, and serialized AT writes.
What can NonStop TMF do for an application?

- *NonStop™* TMF software is the foundation for any 24 x 7 IT operation
  - Database reorganization, partition split/merge/move, and backup to disk or tape with zero application downtime
  - Near real-time replication to a backup system
- Online database backup
  - One block split can ruin your whole day
  - Do you run tape retrieval and restore tests?
- Recovery from accidental or intentional database modification
  - Part or all of the database can be recovered to a point in time, including just before that “drop table” command
  - Using third-party tools, accidentally deleted records can be reinserted
Compaq NonStop™ AutoTMF
The problem: Protection for non NonStop TMF applications

- *NonStop™* TMF has great advantages
  - Online backups for 24 x 7 availability
  - Data recovery
  - Improved application performance

- Nearly half of the existing applications on *NonStop Himalaya™* systems are not coded to use *NonStop* TMF

- Even most *NonStop* TMF–enabled applications do not protect all files
  - Leaves a hole for replication and disaster protection

- Reprogramming an application is daunting and risky

- Development dollars better used for new features

- RDF requires *NonStop* TMF to provide guaranteed replication
The solution: NonStop AutoTMF

- Enables NonStop™ TMF and RDF protection for non NonStop TMF–enabled applications
- Quick, easy, low-risk implementation
  - Simple preparation of object files
  - Provides automatic NonStop TMF transactions for audited files
- No change to application, RDF, NonStop TMF, or DP2
- No privileged code, no SYSGEN required
- Data consistency same or better than pre-AutoTMF application
- Developed by Carr Scott Software
NonStop AutoTMF runtime

- Intercepts file system and NonStop™ TMF calls
  - Implemented as a user library
- Operations on nonaudited files are passed through
- Automatic transactions are triggered by operations that require a transaction
- Designed for performance
  - Files are buffered
  - Efficient block splits
  - Many updates per transaction
NonStop AutoTMF runtime

Source node
- TMF-enabled application
  - NonStop AutoTMF
  - Application

Fault tolerance
- Disk process
- Database
- Master audit trail
- Auxiliary trail
NonStop TMF and NonStop AutoTMF performance

- *NonStop™* AutoTMF is optimized
  - Low overhead and minimal operations requirements
  - Data consistency same or better than pre-AutoTMF application

- *NonStop* AutoTMF performance is TMF performance

- *NonStop* TMF activity is optimized
  - Minimizes number of transactions—several inserts/updates per transaction
  - Parallelism when multiple (separate) transactions are configured
  - No-wait transactions
  - User configurable
Compaq Remote Database Facility
What is RDF software?

- High-speed, low-latency database replication software
- Peer-to-peer for Compaq NonStop™ Himalaya™ servers only
- Focused on disaster protection capability
- An integral element of the Indestructible Scalable Computing initiative
NonStop TMF and RDF software: Unbeatable for NonStop Himalaya™ system-to-system replication

**Source node**
- TMF–enabled application
- NonStop AutoTMF Application
- Disk process
- RDF extractors

**Target node**
- Disk process
- RDF updaters
- RDF receivers
- RDF image trails

Fault tolerance

Disaster tolerance

Expand™ software
Some RDF topologies

- **Centralized**
- **Simplex**
- **Reciprocal**
- **Ring**
- **Multiple duplicate databases**
- **Triple contingency**
RDF Independent Product (IP)

- Third generation released on CD, not tied to operating system releases

- IP Version 1.2 released June 2001
  - Network transactions (RDF/IMPX only)
  - Accelerated objects

- IP Version 1.3 released September 2001
  - Process lockstep (RDF/IMPX only) – **Application change required**
  - Compaq ASAP Release 2 software
  - SQL Format 2 (big) files
  - Enscribe Queue files
RDF performance

- SUT product; MAT only
- IP 1.1 MAT only
- IP 1.1 MAT and 1 Aux
- IP 1.1 MAT and 2 Aux
- IP 1.1 MAT and 3 Aux

Transfer rate in megabytes per second
RDF Independent Product

- IP version 1.4 – Planned for FY’02
- **Projected** feature set – No promises!
  - > 255 volumes (SA44V1 only)
  - SMF support – Virtual volumes spanning multiple physical volumes
  - Superfast takeover documented – *Application change required*
  - SQL shared access support in Aux trails
    - Online partition split/merge/move
  - Fast file comparison
Backup system takeover timeline

Primary site fails

RDF-savvy applications
- RDF resolves outstanding transactions
- Application processing

Non-RDF-savvy applications
- RDF resolves outstanding transactions
- Application startup (user specific)

Other systems
- Expendable workload terminated
- TP monitors started, read logs, and resolve outstanding transactions
- Application startup (user specific)

10–120 seconds
9–10 minutes
50+ minutes
1+ hours
Compaq NonStop™ AutoSYNC
NonStop AutoSYNC software

- Nondatabase file replication
  - Auditing often impractical or impossible
- Synchronizes file sets between Compaq NonStop™ and Himalaya™ servers
- Replication of entire files, not record changes
- Complements RDF and other replication products
- Easy to install and manage
  - Completely automatic: “set it and forget it”
  - Fault tolerant and highly reliable
- Primary uses
  - Completes disaster protection environment
  - Automated operations support
- Developed by Carr Scott Software
NonStop AutoSYNC for nondatabase file replication

NonStop™ AutoSYNC for disaster recovery

Transaction replication for disaster recovery

File replication for disaster recovery
NonStop AutoSYNC for software distribution

New programs
Configuration files

Operators, developers, production control

Duplicate application environment

NonStop™ AutoSYNC

\HQ

Duplicate application environment

\PARIS

NonStop AutoSYNC

\ROME

Duplicate application environment

NonStop AutoSYNC

\TOKYO

Duplicate application environment

NonStop AutoSYNC
How it all fits together

Source node

- TMF-enabled application
- NonStop™ AutoTMF
- Application

- Disk process
- RDF extractors
- Expand™ software
- NonStop AutoSYNC
- Application files

Fault tolerance

Target node

- Database
- Disk process
- Master audit trail
- Auxiliary trail
- RDF updaters
- NonStop TMF audit trail
- RDF receivers
- NonStop AutoSYNC
- RDF image trails
- Application files

Disaster tolerance
Database Replication Partners

- **Golden Gate Software (Extractor/Replicator)**
  - Distributed by Insession Technologies
- **ITI (Shadowbase3)**
  - Direct in NA, multiple distributors WW
- **Network Technology (DRNet)**
  - Direct in NA, multiple distributors WW

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<thead>
<tr>
<th></th>
<th>RDF</th>
<th>E/R</th>
<th>S/B3</th>
<th>DRNet</th>
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<tbody>
<tr>
<td><strong>TMF Apps</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Non-TMF Apps</strong></td>
<td>W/Auto TMF</td>
<td>Yes</td>
<td>W/Auto TMF</td>
<td>Orig</td>
</tr>
<tr>
<td><strong>X- plat rep</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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Summary

- Continuity planning and disaster protection is increasingly important.
- It has become central to Compaq NonStop™ Himalaya™ server focus.
- Compaq products and services provide powerful business recovery tools.
- Continuing investment and enhancements.
- The best is yet to come!
For more information...

- Useful URLs
  - External: http://nonstop.compaq.com/continuity
  - Internal:
    http://himalaya.inet.cpqcorp.net/view.asp?PAGE=RDF_SW

- Contacts
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    harry.scott@carrscott.com
Backup slides
Continuous availability: The bottom line

- It’s the user’s point of view that counts
  - Is the application available to me?
  - Is its response time acceptable?
  - Is my data correct and consistent?
- Customer responsibilities
  - Implement operational best practices
  - Develop business continuity plans
- How Compaq can help
  - Compaq NonStop™ Himalaya™ systems and software
  - Global Services (Compaq and partners)
## High availability continuum

<table>
<thead>
<tr>
<th>% availability</th>
<th>System Configuration</th>
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<tbody>
<tr>
<td>99.99%</td>
<td>IBM Parallel Sysplex, Compaq NonStop™ Himalaya™ 2.2</td>
</tr>
<tr>
<td>99.9%</td>
<td>Single mainframe     8.7</td>
</tr>
<tr>
<td>99.8%</td>
<td>AS/400, Compaq OpenVMS™, HP3000 17.5</td>
</tr>
<tr>
<td>99.6%</td>
<td>Solaris, HP-UX, Compaq Tru64™ UNIX, AIX 35.0</td>
</tr>
<tr>
<td>99.2%</td>
<td>Windows NT and Microsoft Cluster Server 69.9</td>
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</table>

**Recommended SLA commitment**

100% availability objective (application level)

Windows 2000 will improve this rapidly in 2001, 99.5% for AS, even better for DCS

**Source:** Gartner 2001
Where do failures happen?

- **20%** environmental factors, hardware, operating system, power, disasters
- **40%** application failure
- **40%** operator errors
NonStop AutoTMF

- NonStop™ AutoTMF quickly enables applications for NonStop TMF
  - A few minutes to install
  - A few minutes to prepare object files
    - Requires no programming, recompiling, or binding
  - A few minutes to audit desired files
- Low overhead and minimal operations requirements
- Data consistency same or better than before using NonStop AutoTMF
  - Automatic transaction boundaries are not “business transactions”
  - Incremental business transaction consistency is possible
  - Recovery is always better than pre NonStop TMF environment
  - In NonStop TMF enabled applications, ability to configure separate “parallel” transactions that will never abort or back out
Migration process

- Programs
  - Simple process—one command
  - Operates on object file
  - No changes to source or logic
  - No need to recompile, SQL compile, bind or accelerate

- Database
  - Turn on audit
  - Incrementally migrate files
RDF performance history

Aggregate updater throughput (kilobytes/sec)
Extractor-receiver catchup: Idle transaction activity

Transfer rate in megabytes per second

SUT product; MAT only
IP 1.0 MAT only
IP 1.1 MAT only
IP 1.1 MAT and 1 Aux
IP 1.1 MAT and 2 Aux
IP 1.1 MAT and 3 Aux
Auxiliary audit: Single path

- Master extractor
- MAT
- Auxiliary extractor
- Auxiliary trail
- Expand™
- Master receiver
- Image trail
- Image trail
- Auxiliary receiver
- Image trail
- Image trail
- Image trail
Auxiliary audit: Super paths

Master extractor → **Expand™** → Master receiver

MAT

Auxiliary extractor → **Expand** → Auxiliary receiver

Auxiliary trail

Image trail → Image trail → Image trail

Image trail → Image trail → Image trail
Network transactions

Appl. \(\backslash A\) RDF #1 \(\backslash A'\)

DB \(\backslash B\) RDF #2 \(\backslash B'\)

DB DB DB DB
NonStop™ AutoSYNC

- Nondatabase file replication
  - TACL macros and edit files
  - Configuration files (Pathway, batch, spooler, and so on)
  - Object/source files
  - Report flies, BLOBs, and so on

- Auditing of such files is impractical or impossible
NonStop™ AutoSYNC rollout plan

- Developed by Carr Scott Software
- Already in production at Carr Scott customers
- Worldwide sales and support from Compaq
  - Target FCS 1Q 2002