NonStop Enterprise Storage: Agenda

- NonStop Product / Plans: Nomi Trapnell
- HP StorageWorks XP: James R. Wilson
- EAP Results: Pat Klatt
- Q&A
Customer Objectives

- Open SAN support without compromising the NonStop fundamentals:
  - No regression in data integrity
  - Continuous availability
  - Scalability

- Improved TCO

- No regression in performance
  - Possible increase in application performance

- Other desired features
  - Exploit Snapshots for improved Backup/Restore
## Enterprise Storage Releases

<table>
<thead>
<tr>
<th>4Q2003</th>
<th>1Q2004</th>
<th>2Q2004</th>
<th>3Q2004</th>
<th>4Q2004</th>
<th>2005</th>
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</table>

**Release 1**

- **EAP Ship:** July 2004
- **FCS:** September 2004

**R1 Features:**
- NonStop fundamentals preserved
- HP StorageWorks XP 128/1024
- S76000/S86000 and beyond
- Single point of server/storage support

**Release 2**

- **XP 12000 connectivity**

[General availability](#) [EAP](#)
Enterprise Storage: EAP Sites

- Royal Bank of Canada
- Chicago Mercantile Exchange
- Rabobank (Netherlands)
- Telecom Italia
- UK NHS (BT/Fujitsu/IDX)
NonStop Enterprise Storage: Summary

NonStop Enterprise Storage
- HP StorageWorks XP128/1024
- RAID
- Storage virtualization
- Storage Area Network (SAN) or Direct Connect

Standard, fast, flexible interconnect
- 2 Gb/s Fibre Channel
- Fibre Channel ServerNet Adapter (FCSA)
- Modular I/O

Stronger data integrity
- Standard 512-byte sectors
- Stronger checksum
- No application change required

NonStop fundamentals
- Redundant FC adapters
- Redundant fabric/paths
- Redundant XP for DR
- NonStop system-based backup/recovery; RDF

1/21/2005
HP NonStop Customer Conference
Modular I/O Packaging

- Allows flexible and extensible configurations
- Enables independent technology updates
- Provides granular part replacement
- Based on 19-inch industry standard rack with NonStop server enhancements
- Can be connected to current S-series processor enclosures
- Ready for Itanium®-based HP NonStop servers

IO-Switch
IO-Switch

I/O Adapter Module
Enclosure

ServerNet Adapters
- Fibre Channel
- G4SA Ethernet

Fibre Channel Disk Module
Mid-2005
NonStop to ESS connection

Switched Connection:
- NonStop and other servers may connect to SAN
- Dedicated NonStop ports (zoned SAN)

Point-to-Point Connection also supported
Checksum for Enterprise Storage

Enhanced Data Integrity

• All data check-summed:
  − Structured files
  − Unstructured files
  − Audit Trail and
  − other structures on the disk

• Disk checksum is calculated and checked in the processor

• Transparent to applications (requires no changes)

• On-line data migration:
  • From internal disk to Enterprise Storage (or FCDM)
Enterprise Storage Virtualization

- Logical Unit Number (LUNs): what the servers see
- LUNs can be enlarged or relocated within the storage array
- Logical Devices (LDEVs): created across the physical array groups
  - Each LUN maps to an LDEV.
  - The same LDEV may be mapped by different LUNs
- Enterprise Storage manages physical disks

Enterprise Storage

Logical Units (LUN)

Logical Device (LDEV)

servers

physical disks

raid

cache
Enterprise Storage Management

**Storage Management:**

- NonStop OSM manages ServerNet Adapters and displays Enterprise Storage logical disks
- The Enterprise Storage System manages the array logical and physical disks
- XP Command View provides user-friendly Web-based logical device management
  - manage storage anytime, from anywhere
NonStop Enterprise Storage Configuration Guidelines

- Switched SAN:
  - Redundant FCSAs (minimum) (each FCSA adapter has two FC ports)
  - Minimum one XP Subsystem
  - Minimum one IOAM
  - Dual redundant SAN fabrics (non-interconnected SANs)
  - Separate zones, each consisting of FCSAs and the XP array ports
- Data mirrored by host and RAID protected by the XP
- Site-wide UPS required
StorageWorks XP Disk Array family

- Mission Critical Reliability
  - No Single Point of Failure
  - Online Hardware Upgrade
  - Online Firmware Upgrade
- Industry Leading Security
  - User Authentication
  - Secure Socket Layer
  - Host IP Authentication
- Heterogeneous OS
  - **NonStop OS**
  - HP-UX — Solaris
  - Windows — Netware
  - Tru64 — AIX
  - LINUX — OVMS
  - Mainframe — SGI-IRIX
- Connectivity
  - Fibre Channel
  - ESCON (ExSA)
  - FICON

Scalable to 1152 disk drives

HP StorageWorks XP Disk Array family

Enhanced, tested, qualified, sold, supported by HP
Always on hardware

When downtime is not an option

- Designed for organizations that demand the most from their storage, the XP Disk Array family delivers uninterrupted availability for mission-critical IT environments.
- No Single Point of Failure
- Redundant cache
- Hot-swappable components
- Online Hardware Upgrade
- Online Firmware Upgrade
- End-to-end checksum
# Disk Array family scalability

<table>
<thead>
<tr>
<th></th>
<th>XP12000</th>
<th>XP1024</th>
<th>XP128</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max Disk Drives</strong></td>
<td>1152</td>
<td>1024</td>
<td>128</td>
</tr>
<tr>
<td>+ Ext Storage</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max Raw Capacity</strong></td>
<td>165 TB</td>
<td>149 TB</td>
<td>18 TB</td>
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<tr>
<td>+ Ext Storage</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Max Usable Capacity</strong></td>
<td>144 TB</td>
<td>129 TB</td>
<td>16 TB</td>
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<tr>
<td>+ Ext Storage</td>
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<td></td>
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<tr>
<td><strong>Max Cache</strong></td>
<td>128 GB</td>
<td>128 GB</td>
<td>64 GB</td>
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<tr>
<td><strong>Max Shared Memory</strong></td>
<td>6 GB</td>
<td>4 GB</td>
<td>4 GB</td>
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<tr>
<td><strong>Supported RAID levels</strong></td>
<td>RAID 1 (2D+2D)</td>
<td>RAID 1 (2D+2D)</td>
<td>RAID 1 (2D+2D)</td>
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<tr>
<td></td>
<td>RAID 1 (4D+4D)</td>
<td>RAID 1 (4D+4D)</td>
<td>RAID 1 (4D+4D)</td>
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<tr>
<td></td>
<td>RAID 5 (3D+1P)</td>
<td>RAID 5 (3D+1P)</td>
<td>RAID 5 (3D+1P)</td>
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<tr>
<td></td>
<td>RAID 5 (7D+1P)</td>
<td>RAID 5 (7D+1P)</td>
<td>RAID 5 (7D+1P)</td>
</tr>
<tr>
<td></td>
<td>RAID 5 (6D+2P)</td>
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<td></td>
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<tr>
<td><strong>Disk Drive Types</strong></td>
<td>73 GB 15K rpm</td>
<td>36 GB 15K rpm</td>
<td>36 GB 15K rpm</td>
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<tr>
<td></td>
<td>146 GB 10K rpm</td>
<td>73 GB 10K rpm</td>
<td>73 GB 10K rpm</td>
</tr>
<tr>
<td></td>
<td>(146 GB 15K rpm)</td>
<td>73 GB 15K rpm</td>
<td>73 GB 15K rpm</td>
</tr>
<tr>
<td></td>
<td>(300 GB 10K rpm)</td>
<td>146 GB 10K rpm</td>
<td>146 GB 10K rpm</td>
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</table>

*Future values marked with **Future**.*
## XP Competitive Comparisons

<table>
<thead>
<tr>
<th></th>
<th>HP XP12000</th>
<th>HP XP1024</th>
<th>EMC DMX 3000</th>
<th>IBM ESS 800 Turbo</th>
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</thead>
<tbody>
<tr>
<td><strong>Disk Drives</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Min / Max</td>
<td>8 / 1152</td>
<td>8 / 1024</td>
<td>289 / 576</td>
<td>16 / 384</td>
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<tr>
<td>+ Ext Storage</td>
<td>+ Ext Storage</td>
<td>+ Ext Storage</td>
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<tr>
<td><strong>Max Raw Capacity</strong></td>
<td>165 TB</td>
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<td>84 TB</td>
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<tr>
<td><strong>Max Usable Capacity (RAID 5 7D+1P)</strong></td>
<td>144 TB</td>
<td>129 TB</td>
<td>73 TB</td>
<td>45 TB</td>
</tr>
<tr>
<td>+ Ext Storage</td>
<td>+ Ext Storage</td>
<td>+ Ext Storage</td>
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</tr>
<tr>
<td><strong>Max Cache</strong></td>
<td>Global Mirrored 128 GB + 6 GB Control</td>
<td>Global Mirrored 128 GB + 4 GB Control</td>
<td>Partitioned 256 GB</td>
<td>Cluster 64 GB / cntlr pair + 2 GB Non-volatile</td>
</tr>
<tr>
<td><strong>Host System Interface</strong></td>
<td>2 Gb FC ESCON 2 Gb FICON</td>
<td>2 Gb FC iSCSI ESCON 2 Gb FICON</td>
<td>2 Gb FC iSCSI ESCON 2 Gb FICON</td>
<td>2 Gb FC ESCON 2 Gb FICON Ultra SCSI</td>
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</table>
Enterprise Storage EAP: At The Chicago Mercantile Exchange

Pat Klatt
Chicago Mercantile Exchange
Performance Systems Analyst

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The information contained herein is subject to change without notice
EAP Background Information

- CME is the Largest Futures Stock Exchange in the U.S. Second largest in the world

- We use NonStop systems for two applications:
  - PRS (Price Reporting System) – Disk Intense
  - GLOBEX (Electronic Trading Platform) – Message Switch

- Enterprise Storage EAP system configuration: NonStop system, Modular I/O, XP1024, Fibre Channel fabric direct connect.
EAP – Why we did it

- We are a Performance Centric Organization
- We participated in the EAP to introduce another level of caching between DP2 cache and the actual disk drives
- We have performed various functional tests. We have not stress tested as of yet.
- We found that the biggest performance gain for us was a 8 – 20 Msec decrease in Response Time for our GLOBEX application.
  - This is due to moving the Audit trails to the SAN because of the write through cache characteristics of TMF.
  - GLOBEX Physical I/Os minus TMF equate to only 1.25% of total I/Os. Thus our testing so far has not produced much of an advantage (from a performance aspect) of going to the SAN
EAP Experience/Results

- We have experienced an unintended benefit of using the SAN
  - Our Business profile is very spikey concerning our peaks.
  - We use approximately %15 - %20 of our disk space due to our need to bring many heads to the party.
  - By allocating our disk drives logically and taking advantage of large cache from both the DP2 and SAN perspective, we can fully allocate physical disk space on the SAN and thereby achieve a cost benefit when comparing pricing between internal drives and the SAN.
  - This allows us to gain a performance boost along with cost savings…WIN/WIN…
  - Caveat Emptor – The bet is that we get through our peak before filling cache. Thus allowing us to trickle feed the disk drives out the back end of the SAN to free up SAN cache before the next peak hits. Otherwise performance will actually suffer because we have collapsed the number of heads we can put on the data…
EAP – Helpful Hints

• Testing 1, 2, 3
  • Make sure to test the environment.
    • Even though the SAN is faster in most cases (because of the extra level of caching).
      • You must watch for extended peak periods within your application
        • If you fill SAN cache before you complete your peak, you will write through the SAN cache to the SAN disks.
        • This is a higher price to pay for your I/O and will result in longer response times.
For further HP Storage information
Visit . . . www.hp.com/go/storage

## Enterprise Storage w/XP

### Education & Training Options

<table>
<thead>
<tr>
<th>Title</th>
<th>Audience</th>
<th>Availability</th>
<th>Location/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modular IO for NonStop Servers U8586S</td>
<td>Nonstop Break/Fix hardware &amp; support engineers</td>
<td>February 2005</td>
<td>Cupertino Lecture/Lab</td>
</tr>
<tr>
<td>Overviews, Presentations, TOI, Technical Update Presentations</td>
<td>Nonstop Sales and Technical Specialists</td>
<td>Now</td>
<td>Nonstop U Keywords: - ESS - IOAME</td>
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</table>

### News from Nonstop Education & Training

- **Free Hp Digital Camera promotion**: Take any two NonStop classes and earn a Free Hp Digital camera.
- **Private training price reduction**: Up to 60% reduction on any 2 NonStop classes at your site.

### Your NonStop Education & Training Contacts

<table>
<thead>
<tr>
<th>Private Classes at your site:</th>
<th>Francine Barr</th>
<th><a href="mailto:francine.barr@hp.com">francine.barr@hp.com</a></th>
<th>(571) 212-8337</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor-Led Live classes over Internet</td>
<td>Ben Wood</td>
<td><a href="mailto:ben.wood@hp.com">ben.wood@hp.com</a></td>
<td>(408) 285-9662</td>
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<tr>
<td>Scheduled classes at Education Centers</td>
<td>Ben Wood</td>
<td><a href="mailto:ben.wood@hp.com">ben.wood@hp.com</a></td>
<td>(408) 285-9662</td>
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<td>Customer Conference Call enrollment</td>
<td>Dan Porter</td>
<td><a href="mailto:porter@hp.com">porter@hp.com</a></td>
<td>(412) 303-5213</td>
</tr>
<tr>
<td>Nonstop University Subscriptions</td>
<td>Tom Hill</td>
<td><a href="mailto:t.hill@hp.com">t.hill@hp.com</a></td>
<td>(408) 285-9874</td>
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Questions?