Big + Fast + Safe + Simple = Lowest Technical Risk

The Synergy of Greenplum and Isilon Architecture in HP Environments

Steffen Thuemmel (Isilon)
Andreas Scherbaum (Greenplum)
Our problem …
What is Big Data?

- Big Data Storage
- Big Data Analytics
- Big Data Storage that supports Big Data Analytics


Big Data is always Big Data, no matter what the company size is.
The Digital Universe 2009-2020

2009: 0.8 Zb

Growing By A Factor Of 44

2020: 35.2 Zettabytes

Source: IDC Digital Universe Study, sponsored by EMC, May 2010
What’s a Zettabyte?

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
</table>
| Terabyte  | $2^{40} = 10^{12}$  
1,000,000,000,000 | 1 TB: Tape robot  
10 TB: U.S. Library of Congress |
| Petabyte  | $2^{50} = 10^{15}$  
1,000,000,000,000,000 | 1 PB: 3 years of EOS data (2001)  
20 PB: 1995 production of hard-disk drives |
| Exabyte   | $2^{60} = 10^{18}$  
1,000,000,000,000,000,000 | 5 EB: all words ever spoken by human beings |
| Zettabyte | $2^{70} = 10^{21}$  
1,000,000,000,000,000,000,000 | ? |

Can you help me?
# Data Formats in Big Data

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured</td>
<td>Relational database (i.e., full atomicity, consistency, isolation, and durability [ACID] support, referential integrity, strong type, and schema support).</td>
<td>Greenplum Database</td>
</tr>
<tr>
<td>Semistructured</td>
<td>Structured data files that include metadata and are self describing (e.g., netCDF and HDF5).</td>
<td>Greenplum Database, Greenplum Hadoop</td>
</tr>
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<td>Semistructured</td>
<td>XML data files that are self describing and defined by an XML schema.</td>
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</tr>
<tr>
<td>Quasistructured</td>
<td>Web clickstream data — contains some inconsistencies in data values and format.</td>
<td>Greenplum Hadoop, Greenplum Database</td>
</tr>
<tr>
<td>Unstructured</td>
<td>Text documents amenable to text analytics.</td>
<td>Greenplum Hadoop</td>
</tr>
<tr>
<td>Unstructured</td>
<td>Images and Video, Blobs.</td>
<td>Isilon</td>
</tr>
</tbody>
</table>
Big Data

Big Data Storage
• Founded 2000
• Rapidly growing
• Since 2010 a division of EMC
• Leader in Scale Out NAS
• 2000 customers ww

Big Data Analytics
• Founded 2003
• Rapidly growing
• Since 2010 a division of EMC
• (not yet)
• 300+ customers ww
Big Data Storage – Isilon
## Understand BIG DATA Workloads

<table>
<thead>
<tr>
<th>Shared Infrastructure</th>
<th>Virtual File Stores</th>
<th>Data Repositories</th>
</tr>
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<tbody>
<tr>
<td>Home Directories</td>
<td>VMDKs</td>
<td>Active Archives</td>
</tr>
<tr>
<td>Image Stores (Legal, Financial, Medical)</td>
<td>VHDs</td>
<td>Disk Based Backup</td>
</tr>
<tr>
<td>Business Specific Performance Applications (HPC, LS, CAD)</td>
<td>VMs</td>
<td>Rich Media Repository</td>
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<td>Rich Media Content Creation (Marketing)</td>
<td>VDI's</td>
<td>Business Archives</td>
</tr>
<tr>
<td>Surveillance and Audio (Security)</td>
<td></td>
<td></td>
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<td>Application Logging (Security)</td>
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<td>Business Specific Analytics Applications (Trading, Quants)</td>
<td></td>
<td></td>
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<tr>
<td>Web Properties / Web Logs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Development</td>
<td></td>
<td></td>
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Isilon Solution for BIG DATA Workloads

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<th>Virtualization</th>
<th>Home Directories</th>
<th>Archive</th>
<th>New Applications</th>
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<td><strong>S200</strong></td>
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<td>• Blazing performance</td>
<td>• Balanced throughput and capacity</td>
<td>• Over 15 PB in a single cluster</td>
<td>• Parallel IO performance</td>
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- **Auto-Tiering of Files for Performance and Operational Efficiency**
- **Integrated and In Depth Analytics**
- **Simple and Efficient Provisioning**
Isilon Innovations
Meeting the Challenges of BIG DATA

- Operational Simplicity
- Scalable Reliability
- Application Accountability
Core Innovation…
Isilon’s OneFS Scale-Out Operating System

• Fully symmetric cluster
• Single file system, …15+ PBs, Multi-Tier
• Highest performance,
• Easy to manage and simple to scale
Isilon Storage Evolution Starts with Simplicity

• Enable rapid deployment of latest technology
  – Greener, faster every year
  – No server or client mount point or application changes

• Co-existence of generations of Isilon nodes, not migration
  – Heterogeneous nodes: mix and match

• Push-button retire
• No Manual Data Migration

Nodes are self contained:
- Storage
- Controller
- IP connectivity
- Connect via IB
Isilon - Linear Predictable Scalability

- Grow capacity and performance as needed
  - Don’t over-buy and over-provision
- No change in admins’ time or efforts as storage grows
  - Reduce management time and costs
  - Results in high business efficiency
- Improve productivity with new insights

NO DATA MIGRATION
Big Data Storage – Analytics
Big Data Analytics

Structured Data
• Greenplum Database

Unstructured Data
• Greenplum Hadoop
Greenplum Database

• Massive-parallel, shared-nothing database
• Based on PostgreSQL
• Scales linear, everywhere
• Runs on commodity hardware
• SQL + MapReduce
• Free Community Edition
Greenplum Database: Cluster Extensibility

If you need to add 2TB… add a node… no need to add a rack\(^1\)

\(^1\) Currently requires an RPQ
Fast Data Load

We can demonstrate 10TB/hour loading from 10 ETL servers to a single rack...

Plus the power of SQL as you load to perform parallel transformations in-flight... via external tables
Polymorphic Storage

The way you access the facts changes as the data ages… so we should change the way the data is stored…

<table>
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<tr>
<th>Compression strategy</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>No compression</td>
<td>• Possible update</td>
</tr>
<tr>
<td>Row compression</td>
<td>• Average Compression rate = 2.5</td>
</tr>
<tr>
<td></td>
<td>• Append only</td>
</tr>
<tr>
<td></td>
<td>• Better performance because reduce of IO</td>
</tr>
<tr>
<td>Column Compression (low level – Quicklz or Zlib-1)</td>
<td>• Average Compression rate = 10</td>
</tr>
<tr>
<td></td>
<td>• Append only</td>
</tr>
<tr>
<td></td>
<td>• Better performance if not all columns are selected</td>
</tr>
<tr>
<td>Column Compression (high level ( Zlib-9))</td>
<td>• Average Compression rate = 20</td>
</tr>
<tr>
<td></td>
<td>• Append only</td>
</tr>
<tr>
<td></td>
<td>• Less performance than low level compression because of uncompression task</td>
</tr>
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Greenplum Hadoop

• Implementation in C
• 100% compatible
• Includes HDFS (plus NFS)
• Includes MapReduce, Jive
• Fault tolerance Name Node and Job Tracker
• Free Community Edition
Hadoop Pain Points

Monitoring
- Poor Job and Application Monitoring Solution
- Non-existent Performance Monitoring

Operability and Manageability
- Complex System Configuration and Manageability
- No Data Format Interoperability & Storage Abstractions

Performance
- Poor Dimensional Lookup Performance
- Very poor Random Access and Serving Performance
Conclusion

• EMC provides tools for Big Data
• Continues supporting Communities
• Provides Support and Service
Q&A
THANK YOU