E-Gov Institute
Web-Enabled Government Conference
Storage for Government Enterprises Seminar
An Overview of Storage Technology: What Works, What's New, and How to Evaluate
June 2, 2005
Washington, D.C.

Douglas Hughes
Luke Dahl
NASA Jet Propulsion Laboratory
California Institute of Technology
Introduction

- Overview of storage technology at NASA JPL
  - Viewpoint of the JPL Information Services (JPL IS)
    - Under the JPL CIO
- What works for JPL IS and our customers
- What’s new for JPL IS and our customers
- How we evaluate storage technology
Overview

- JPL IS Storage System Components
  - Storage Service
  - Backup/Recovery Service
- Completely integrated services
- Simplified customer interface
- Simplified billing
Some of Our Customers

- **Storage**
  - Oracle databases
  - Oracle Application Servers
  - Web Sites
  - Remedy
  - DocuShare
  - Institutional e-mail
  - Institutional voice mail
  - AFS

- **Backup/Recovery**
  - 1,200 PCs and workstations
  - Institutional servers
  - Personal, Application and Project Data
Storage Architecture

- **R150 File** (ONTAP 6.5.3P9)
  - NFS
  - 24 TB*
  - Nearline Backup
  - icis-stor-002
  - Storage Network Area (SAN)

- **FAS 940 Clusters** (ONTAP 7.0.0.1)
  - NFS
  - 5 TB*
  - 4 TB*
  - icis-stor-002
  - Storage Network Area (SAN)
  - jplis-stor-003

- **NetCache** (OS 5.6)
  - Dailyplanet.jpl.nas.gov
  - Saturn.jpl.nasa.gov (OS 5.6.1D22)

- **F760 File** (ONTAP 9.3.1)
  - 2TB*
  - eis-dtanas-001
  - IT Lab Test
  - Bradley

- **R200 Filer** (ONTAP 7.0.0.1)
  - NFS
  - 2 x 3TB*
  - eis-dtanas-095
  - eis-dtanas-024
  - jplis-stor-004

- **Storage Network Area (SAN)**

- **Fiber Network**

- **GB Connection**
  - 100MB Connection
  - 1GB Connection

- **Two ATL M1500 2.5TB Capacity each**

- **CIFS NFS**

- **NDMP Backup**

- **Filer Admin Sun Ultra 420R**

- **eis-dta-023**

---

June 2, 2005

Storage for Government Enterprises
Key Features - Storage

- **Competitive Pricing**
  - Space is rented by the month in 1 TB RAW increments
  - Includes primary space, mirrors and snapshots
  - $1,200/month/TB for HA clustered storage (FC disk)
  - $600/month/TB for near-line (SATA disk)

- **Scalability**
  - Additional 15 TB RAW in clustered storage (open shelves)
    - ~3 years at current growth rate
  - Additional 88 TB RAW in near-line capacity (open shelves)
    - ~3 years at current growth rate

- **Availability**
  - 24x7 access to data (initial cluster has uptime of over 800 days)
  - NAS (Fast E or Gig E) and SAN
  - Fully automated backups
Backup/Recovery Architecture

171-399

Multi-Mode fiber

Rack mounted servers

Fiber to 230

McData 32 port switch

IBM 3584 Library

NetApp FAS940c/940
Backup/Recovery Architecture

230-B7A

McData 6064 Director

Multi-Mode Fibre to Switches

Single Mode Fibre to 171-399

230-B35

Dual IBM 2109 16 port switches

IBM 3494 Library containing eight 3590H1A Drives

Sun Servers and Storage

Dual IBM 2109 16 port switches

Sun Servers and Storage
Key Features - Backup/Recovery

- **Competitive Pricing**
  - Chargeback model includes all aspects of service
  - Cost reductions annually for the past three FY’s
  - Expected FY05 costs:
    - $2.35/GB per month for servers
    - $3.50/GB per month for workstations
    - $0.90/GB per month for 1TB+ servers

- **Scalability**
  - Hardware/Software
    - Addition of 80TB storage frames (up to four)
    - Addition of additional LTO2 tape drives
    - Additional servers may share the library
    - Ability to add servers quickly and with no impact to current service

- **Availability**
  - 24x7 access to data
  - Redundant hardware
  - Fully automated system; scheduling, tape management, notification, restores, etc.
What Works for Us at JPL

- Providing a service that’s more cost effective and robust than “rolling your own”
- Educating customers about data architecture and data lifecycle
- Supporting the customer’s full application lifecycle with appropriate storage and backup
- Intelligent, timely support
- Simplified billing
What’s New to Us

- iSCSI protocol support is new to us and our customers
  - Available for development and I&T on our system
  - Customers have not yet migrated to a iSCSI production environment
  - Waiting for first major off-site DR application
Evaluation Criteria

- Labor is the primary factor in evaluating new systems or upgrading current ones
  - Design labor
  - Integration labor
  - Operation labor
  - Maintenance labor
  Storage system has .5 FTE for storage engineer, .16 FTE for management and .33 FTE for 24x7x365 consolidated operations support tax.

- Customer demand
  - We do some capitalization on risk but customers pay for service through chargeback.

- Technology maturity and robustness
  - Forget the bleeding edge and think best of breed.

- Vendor support
  - Vendors are part of our Team and full partners in our success.

- Acquisition cost
  - It’s definitely a consideration but not the consideration.