Status of ASDC and CERES SCF

CERES-II  Science Team Meeting No. 7
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April 24, 2007
Overview

- SCF supplies analysis and development support
  - Development of Data Production & Analysis Codes
  - Cal/Val and analysis of data
  - General Support
- ASDC supplies production data support
  - Ingest, production, archive and delivery
  - User services
- Climate Data Records demand max system stability
  - Changes to computing environment effect data products
- ASDC and SCF supply a tightly coupled computing environment for CERES
  - Must evolve in a coordinated manner
Evolving CERES Compute Environment

• 40 years of computation to produce CDRs
  – Must accommodate evolving computing environment

• Four Factors Drive Evolution
  – Need to decrease Cost
  – Increase Capacity to handle re-processing
    • Complete re-processing within 2 years
      – Accommodate improvements/corrections to algorithms
      – Changes to input data (MODIS, GMAO, GEO satellites, etc.)
    • Increasing volume of instrument-months of data
  – Obsolescence of computing hardware and software
    • Recognize that hardware/OS/apps
  – Help from Management
    • IT Security
    • MS Active Directory User Authentication
    • Software Engineering
    • NASA Consolidation, Standardization and Interop
SCF/ASDC Initiatives

• Convert Codes to run on multiple platforms
  – SGI, Mac G5, IBM 970, Mac Intel, AMD/Intel LINUX
• Convert from multiprocessor to cluster computing
  – Big endian multiprocessor to big endian cluster
  – Big endian cluster to little endian cluster
  – Scientifically identical data products
• Increase capacity of shared storage (SAN)
  – Max data available for spontaneous computation
  – Increase reliability of data availability
• Improve SysAdmin Support to Science Team
  – Faq-o-matic
  – Replace help desk support software (e-mail & web)
• Increase capacity/reliability of Web and ftp servers
• Evolve ASDC Storage to ANGe
  – Modernize the ingest/archive/delivery tools
• ASDC implementing CERES Automation
  – Reduce production costs
Externally Required Change

- IT Security Certification and Authorization
  - 800 pages of plans
  - New Protective Measures for Systems
  - System Configuration Management processes
    - Increase data collection/retention
  - Contingency Planning and Disaster Recovery
    - Successful test by early summer

- Conversion of e-mail to NASA NOMAD
  - Many processes report results by e-mail
  - All users/correspondents impacted

- Guidance to Minimize GFE to offsite Contractors
  - Modernize SSAI off-site workstations & support

- All-ODIN (whatever that means)

- Standardization of all Windows configurations
  - Hold on WinVista until approved by OMB
CERES SCF Target Architecture
Backup Data
SGI 3800 and Attached Disk

- thunder, lightning (32 processors)
  - SCSI Disk Drives (10TB) experience INCREASING failure rates
    - Not configured as RAID
    - SCSI disks are harder to replenish (not on maintenance)
    - Not all directories are backed up
  - Aging components are more susceptible to power fluctuations
  - Current maintenance expires in early 2008
    - Continuation is estimated to be $10k per month
    - Will keep in service as long as possible without maintenance

- LaNina (40 processors)
  - FibreChannel disk drives covered by maintenance agreement
  - Generally has been reliable to date
  - Maintenance agreement expires in April, 2008
    - Continuation is estimated to be <$7k per month for next year
Open Directory

- **Purpose:** Ensure universal account authorization, file ownership, group access

- **Current Status**
  - Deployed on single Mac G5 (davaocity) with connectivity into each network in Room 124E
    - Backup system as a mirror
    - Attempting to integrate with NASA and Center Active Directory System
  - All computers mounting SAN via NFS will need to use OD to authenticate to ensure file ownership and group access is correct
    - AFP and Samba do this correctly already
SCF G5 Cluster

- **Purpose:** provide computational capacity for the CERES (and related) Science and Instrument staff
  - Code Development for data product generation
  - Analysis of data and data product validation studies

- **Current Status**
  - 47 Nodes (94 processors) managed by SunGridEngine
  - 2 user nodes (manila, corregidor) for compilation and testing
    - 2 More online by 01/01/07 (xxx, xxx) with 4 processors each
    - Nodes will be designated for specific groups (primary and backup)
  - Authenticates users via Open Directory (davaocity)
  - Users submit jobs from manila, corregidor
    - From 2 more on 01/01/07
  - Queues set up based on purchasing project, but can use idle nodes
    - CALIPSO - 2
    - AWIN - 4
    - CERES - 41
      - Designated for Instrument - 4
      - CERES General Purpose - 37

- **Near Term work**
  - Train users and support gaining experience
    - Assist in science/analysis code conversion
  - Add electrical capacity to computer room (~$4k)
Storage Area Network (SAN)

• Purpose: to provide universal access to large capacity of data storage with confidence in its reliability

• Current Configuration: 2 SAN, RAID-5, 2 TapeLib (LTO2)
  – inSANity (84.17TB) currently 1 volume, 7 servers, 3 controllers
    • Cebu (FEN), ogygia (FEN), fs-g, fs2-g (BEN), olongopo (FEN, BU),
    • clu-fs(cluster)E+O
    • Insanity: 84.17 TB
  – quickSAN (25.04TB+11): currently 1 volume, 2 servers, 2 controllers,
  – You’ve got Backup (currently 100TB, soon 200TB)

• Allocations based on SS usage on SGI’s & LaCie Disks
  – Predictions by SS reps on DMT
  – Storage Tsar to monitor usage and re-allocate quotas (Scott Zentz)
CERES SCF Comm Architecture

• Purpose: Provide access to the data with low latency and capacity commensurate with computer system performance

• Current Status
  – 6 main ethernet switched networks
    • Front-end Net (larcnet) (connects users to systems) (100Mbps)
    • Back-end Net (connects compute servers for file transfer) (1Gbps)
    • Cluster Net (connects nodes, including file servers) (1Gbps)
    • SUDA metadata Net (connects SAN servers for user access) (100Mbps)
    • ARCH metadata Net (connects SAN servers for archive) (100Mbps)
    • Storage Component Monitoring Net (permits config of RAIDS) (100Mbps)
  – 2 Fiberchannel switched networks (move data among disks/servers)(4Gbps)
    • SUDA Network
    • ARCH Network

• Near Term Plans
  – Clean-up and documentation
  – Tune BEN to max effectiveness in NFS transfers
Code Conversion

• Purpose: Ensure codes run on all platforms available
  – NOW SGI, G5-OS X, IBM-Linux
  – Next Intel-Linux

• Scientifically equivalent data products
  – Needed to permit changing computer systems over long-duration missions without introducing bias or discontinuities into long time series data products
  – Would like to avoid re-processing just to introduce a new HW environment

• Limited Workforce, Not to Interfere with Science/Ed3 work
  – Instrument, SARB, MOA, Synoptic SARB, TISA Grid converted
  – Jim Donaldson currently working on ERBE-like
    • Needed for Instrument Validation
  – Victor Sothcott working on Inversion
  – Clouds and TISA proceeding very slowly due to conflicting science needs
    • Would need to redirect other resources to work Clouds and TISA conversion
  – Temporarily Diverted to test Upgrade IRIX & Toolkit on SGI’s for ASDC
System Admin Support

• Purpose: ensure system performance is maintained by detecting problems and correcting them
  – Monitoring systems
  – Preventive and corrective maintenance
  – Adjust system configuration as we gain experience with usage
  – Train & assist users in maximizing effective use of the SCF tools
  – Other user support functions

• Current State
  – Limited Mac experience
    • New Hire plus training for remainder of staff
  – Limited SGI experience
    • Supplemented by ASDC personnel when necessary
  – Not much automation
    • Ben Loyall, part time to help out with this
  – Short 4 personnel (1 trainee has been hired to start in Jan07)
System Logistics Support

• Purpose: Provide information on demand
• Planned Technologies
  – faq system
  – Property and system configuration management Support
  – Web and ftp support
Open SCF Issues

• Humans
  – Recruit 4 qualified SysAdmin personnel
  – Repair lack of documentation
  – Inexperience of user community in using a cluster environment requires more hand holding when the SA resources are short
  – Increase use of automation to improve service, reduce workload

• Facility
  – Power in computer room to be upgraded upon opening of P-card system
    • Currently available 200Amps at 208V, 3 Phase
  – Upgrade/tune comm to ASDC to 1Gbps with jumbo frames
  – Upgrade access to ASDC disk array via fiberchannel

• Cluster/SAN
  – Confirm Maintenance Procedures and Documentation
  – Work through conversion to use Intel based xServes
  – Tape Backup system online
  – Re-mix RAIDS to expand capacity of insanity volume on SUDA0
    • Increase allocations of space to users
  – Clean up and reconfigure ceresarchive

• Computer Security
  – Certification and Authorization (C&A) process imposed by OMB
## Status of Conversion by SubSystem

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Status</th>
<th>Planned Effort</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Instrument</td>
<td>Completed</td>
<td></td>
<td>Current Mac version lost in disk failure; Donaldson rebuilding</td>
</tr>
<tr>
<td>2,3 ERBE-like</td>
<td>Converted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Clouds</td>
<td>WIP (95%)</td>
<td></td>
<td>Main processor running.90/10</td>
</tr>
<tr>
<td>4 Convolution</td>
<td>Converted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Inversion</td>
<td>Converted</td>
<td></td>
<td>Beta Ed3 for both platforms. Scripts in csh, not perl, but work.</td>
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<tr>
<td>5 SARB</td>
<td>Completed</td>
<td></td>
<td>No IDL on cluster for 5.4P2</td>
</tr>
<tr>
<td>6 TISA Grid</td>
<td>Converted</td>
<td></td>
<td>Beta Ed3 for both platforms</td>
</tr>
<tr>
<td>7.2.1 Syn SARB</td>
<td>Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1 TISA Ave</td>
<td>Not Started</td>
<td>Feb/Mar-June</td>
<td>Depending on Doelling’s priorities</td>
</tr>
<tr>
<td>8 TISA Ave</td>
<td>Not Started</td>
<td>Feb/Mar-June</td>
<td>Depending on Doelling’s priorities</td>
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<tr>
<td>9 TISA Grid</td>
<td>Converted</td>
<td></td>
<td>Beta Ed3 for both platforms</td>
</tr>
<tr>
<td>10 TISA Ave</td>
<td>Completed with next delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 GGOE</td>
<td>WIP</td>
<td>Apr/May</td>
<td>Dependent upon clouds conversion</td>
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<tr>
<td>12 MOA</td>
<td>Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cerslib</td>
<td>Completed</td>
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## CERES SAN Status

<table>
<thead>
<tr>
<th>SubSystem or Project Quota</th>
<th>Pri Grp ID</th>
<th>POC</th>
<th>Actual Usage 3/19</th>
<th>Insanity Alloc 3/19</th>
<th>QSAN Alloc 3/30</th>
<th>Total Alloc 3/30</th>
<th>Need 3/30</th>
<th>Legacy Remain 3/19</th>
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<tbody>
<tr>
<td>CERES (Gen’l) incl archive</td>
<td>400</td>
<td>Scott</td>
<td>4.8GB</td>
<td>200GB</td>
<td>9.76TB</td>
<td>9.96TB</td>
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<tr>
<td>CERES CM</td>
<td>470</td>
<td>Tammy</td>
<td>77.83GB</td>
<td>150GB</td>
<td>0</td>
<td>150GB</td>
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<tr>
<td>Instrument</td>
<td>430</td>
<td>Denise</td>
<td>7.05TB</td>
<td>13TB</td>
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<td>13TB</td>
<td>15TB</td>
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<tr>
<td>ERBE-like</td>
<td>440</td>
<td>Dale</td>
<td>462GB</td>
<td>1TB</td>
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<td>1TB</td>
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<tr>
<td>Inversion</td>
<td>450</td>
<td>Victor</td>
<td>8.63TB</td>
<td>11TB</td>
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<td>11TB</td>
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<td>SOFA</td>
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<td>Kratz</td>
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<tr>
<td>SARB/MOA</td>
<td>460</td>
<td>Tom</td>
<td>475GB</td>
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<td>1TB</td>
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<tr>
<td>Clouds-DM</td>
<td>421</td>
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<td>3TB</td>
<td>7TB</td>
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<tr>
<td>Clouds-Convol</td>
<td>425</td>
<td>Walt</td>
<td>290GB</td>
<td>1TB</td>
<td>0</td>
<td>1TB</td>
<td></td>
<td></td>
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<tr>
<td>TISA-DMT</td>
<td>410</td>
<td>Cathy, Raja</td>
<td>1.7TB</td>
<td>5TB</td>
<td>0</td>
<td>5TB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TISA-Sci (Dave)</td>
<td>495</td>
<td>Dave</td>
<td>194GB</td>
<td>1TB</td>
<td>0</td>
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<tr>
<td>RadApp</td>
<td>710</td>
<td>Stackhouse</td>
<td>3.24TB</td>
<td>6.5TB</td>
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<td>6.5TB</td>
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<tr>
<td>RFA</td>
<td>730</td>
<td>Stackhouse</td>
<td>756MB</td>
<td>512GB</td>
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<tr>
<td>Bing</td>
<td>1026</td>
<td>Bing</td>
<td>3.96TB</td>
<td>9.76TB</td>
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<td>9.76TB</td>
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<tr>
<td>AWIN</td>
<td>1025</td>
<td>Louis Nguyen</td>
<td>0</td>
<td>0</td>
<td>19.52TB</td>
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<tr>
<td>NEWS</td>
<td>1027</td>
<td>Sunny</td>
<td>0</td>
<td>10TB</td>
<td>4.64TB</td>
<td>14.64TB</td>
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<tr>
<td>Laptop Security</td>
<td>1027</td>
<td>Little</td>
<td>0</td>
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<td>10TB</td>
<td>10TB</td>
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