Computing in CERES

Mike Little

CERES-II Science Team Meeting 8

November 15, 2007

What Does CERES Need from IT?

- Near Term
  - Increased Dependability of SCF
  - Increased Information about SCF Use and Status
  - Convert Production Codes for Little-Endian
  - Easier access to sophisticated processing tools
    - Compilers, MATLAB, IDL-related tools
- Long Term
  - Stability
  - Improved access to data
  - FM-5 Support
    - Code Modification for new inputs
    - Capacity to run jobs
    - Capacity to store new data products

SCF Support to Projects

CERES	FM-5	DMT	SCF	ASDC	NASA
		Improve Ticket responsiveness	Improve Ticket Management		
Metrics		Metrics	Metrics		
Edition 3					
			Convert PGE's to Big-E. Cluster	Convert PGE's to B.E. Cluster	
			Convert PGE's to Little-E. Cluster	Convert PGE's to L.E. Cluster	
				ANGe	
				CERES Automation	
	Mod Codes for NPP/NPOESS			Modify for NPP/NPOESS	
					All-ODIN
					ITS C&A
					NOMAD
		Instrument from Ada to C++			
		Redesign File Directory Architecture	Segregate files for backup/archive	Redesign File Directory Architecture	

Outside Influences Impact CERES SCF

- NASA/LaRC Guidance
  - All-ODIN for workstations improve Configuration Management and IT Security Compliance
  - Increased Consolidation of Data Centers by NASA CIO
    - Increased integration under IT Enterprise Architecture
  - Increased guidance in how-to and IT Security
- Relevant Technological Advances Push to x86
  - Advances are in little-endian commodity-oriented hardware
    - More processor/cores
    - Faster execution
  - Apple-based high performance work is increasingly isolated
    - Fewer 3rd Party vendors providing needed advances
  - File-sharing technologies are increasing file transfer rates
    - Improved bandwidth and latency
    - More efficient protocols

SCF Metrics: Initial Conclusions

- Retire thunder/lightning as soon as possible
  - Retire thunder/lightning disk drives
  - Users must migrate to Cluster
- Find a better way to balance load on G5 compile servers (manila, corregidor, nagacity)
- Stop doing unplanned maintenance
  - Help users leverage redundant capabilities
- Stop changing system configuration without approved ECP
  - Consider impact on other users, security, SysAdmins

Need: Increase Dependability of SCF

- Near Term (0-3months)
  - Regularly schedule maintenance outages
    - Eliminate short-notice shutdowns or bounces
    - Preventive Maintenance to avoid surprises
  - Increase redundancy of key components
  - Retirement of antique equipment
    - User workstations at SSAI
    - Last 6 months have seen major failures/outages
    - Thunder/lightning in April 08 (Leaving LaNina)
  - Meaningful metrics to identify problem areas
- Long Term
  - Improve professionalism of SysAdmin support
  - Configuration Management to avoid surprises
    - Avoid fixing one thing and breaking another

Need: Increase Information about SCF

- E-mails 1 week in advance of scheduled outage
  - Suggestions to use backup/alternative capabilities
- Update SCF Web Pages
  - Meaningful and current status information
  - faq (http://cavite.larc.nasa.gov/cgi-bin/fom)
  - Metrics to inform users about dependability
    - Meantime Between Mission Critical Failure (MTBMCF)
      - Failure rate for components
    - Meantime to Repair (MTTR)
      - By Component
    - Operational Availability (A_o)
      - Key Mission Scenarios

Need: Little-endian Code Conversion

- Hardware status
  - Test platform similar to manila
  - LINUX platform by December, 2007
- Compilers selection in conjunction with ASDC
  - GCC Suite for C
  - FORTRAN
    - gcc
    - Intel-based FORTRAN
  - IDL - Shared licenses within SD
    - Working with ITT-Vis (formerly RSI) to increase accessibility
    - Adding new tools
    - Seminar for users tailored to LaRC's work in next few months

Need:Modify CERES Production Codes

- Convert Instrument Subsystem to C++
  - Ada programming staff is scarce
- Production Scripts for CERES Automation
  - Excel Spreadsheet
- Modify Production Codes for FM5
  - Depends on schedule and platform

Need: Improve Access to Data

- Acquire More Disk Space
  - Add into existing architecture
- Use Disk Space More Effectively
  - Improve organization of data being stored
    - Reduce duplication of files
  - Users need to manage their own storage within available space
- Work with ASDC to eliminate need for daacget
  - Put more production data online

Need: Improve Access to Tools

- IDL-related tools
  - Licenses for cluster nodes
  - Licenses for ENVI
  - IDL Workshop on Applying IDL to SD Missions
- Matlab
  - Conversion/Acquisition of licenses to shared

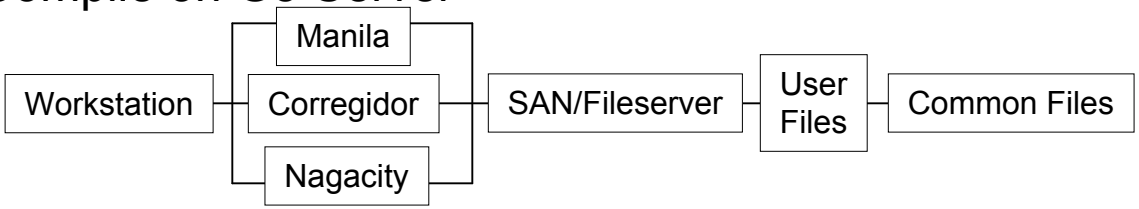
Backup Slides

SCF Metrics: Mission Scenario Definitions

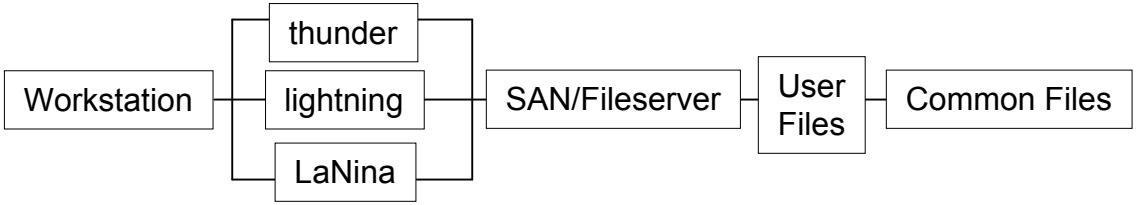
- Compile Code on Mac G5 environment
- Test Code on Mac G5 environment
- Compile Code on thunder/lightning/LaNina
- Test Code on thunder/lightning/LaNina
- Analyze data on thunder/lightning/LaNina
- Analyze data on Mac G5 environment

SCF Metrics: Reliability Block Diagrams

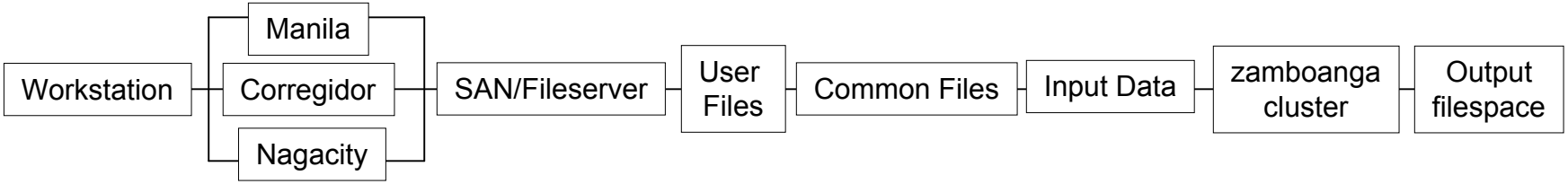
Compile on G5 Server



Compile on SGI3800



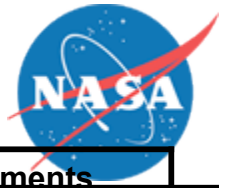
Test data products on zamboanga cluster



SCF Metrics: Component Failure Rates

Component	Mode	MC Failures (Jul-Oct)	Corrective Maint (hr)	Λ (hr^{-1})	MTBMCF (hr)	MTTR (hr)	A_o
SAN		30		0.010163	98	2	0.9801
CERES Data on SAN		0	0	-	-	0	1
zamboanga		5	12	0.001694	590.4	2.4	0.9959
thunder		6	48	0.002033	492	8	0.984
lightning		35	175	0.118564	84.3429	5	0.94404
LaNina		2	12	0.000678	1476	6	0.99595
User Home Dir on SAN		0	0	-	-	0	1
manila		24	14	0.008130	123	0.583	0.9952799
corregidor		2	.3	0.000677	1476	.15	0.99989838
nagacity		1	.3	0.000339	2952	.3	0.99989838
Open Directory		0	0	-	-	0	1
Front-end Network		0	0	-	-	0	1
Back-end Net-ASDC		0	0	-	-	0	1
License Server		4	12	0.001355	738	3	0.9959142
Common Data/Libs		6	8	0.002033	492	1.3333	0.9972973

SCF Metrics: Components Defined 1



Subsystem	Mission Mode	Components Included	Components Excluded	Comments
SAN	Read/Write Data	Disks, file servers, NIC, Fiber Channel Switches, MD Cntlr, MD Net	BEN, FEN CNet, Data	
CERES Data on SAN	Readable			
zamboanga	Run jobs via SGE	Head node, 1 node, Cluster Net		10-node minimum to be operational
thunder	Run jobs manually	HW, OS, SysDisk, user disk		User disk removed
lightning	Run jobs manually	HW, OS, SysDisk, user disk		User disk removed
LaNina	Run jobs manually	HW, OS, SysDisk, user disk		
User Home Dir on SAN	Read/Write	Files, capacity, account active	hardware	
manila	Compile, test	hardware, OS, NIC, compilers, libraries	ethernet	High usage
corregidor	Compile, test	hardware, OS, NIC, compilers, libraries	ethernet	
nagacity	Compile, test	hardware, OS, NIC, compilers, libraries	ethernet	
Open Directory	Authenticate Users	Davaocity, quiapo, OD server, data, NIC	ethernet	
Front-end Network	Internal to LaRC	Cables, routers, DNS		
Back-end Net-ASDC	Internal to SD	Cables, switches, FC to ASDC	File Servers NIC	
License Server	Deliver Licenses	asdsun, server SW, licenses	Ethernet, client, app	IDL, matlab
Common Data/Libs	Readable	Toolkit, cereslib, compilers	hardware	Vers control

SCF Metrics: Components Defined 2

Subsystem	Mission Mode	Components Included	Components Excluded	Comments