Information Technology Infrastructure Committee (ITIC)

Report to the NAC

July 2012

Larry Smarr
Chair ITIC

ITIC Committee Members

Membership

- *Dr. Larry Smarr (Chair), Director- California Institute of Telecommunications and Information Technology, UC San Diego*
- *Dr. Charles Holmes (Vice-Chair), Retired- NASA HQ Heliophysics Program*
- *Mr. Alan Paller, Research Director- SANS Institute*
- *Dr. Robert Grossman, Professor- University of Chicago*
- *Dr. Alexander Szalay, Professor- Johns Hopkins University*
- *----------*

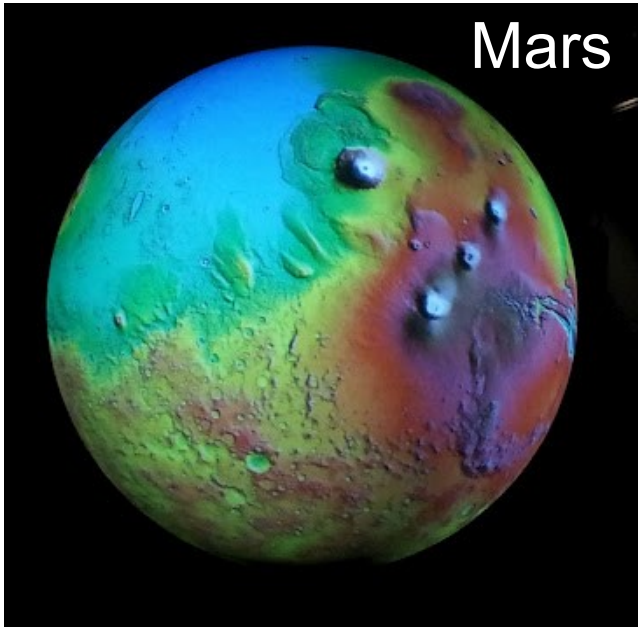
New Members

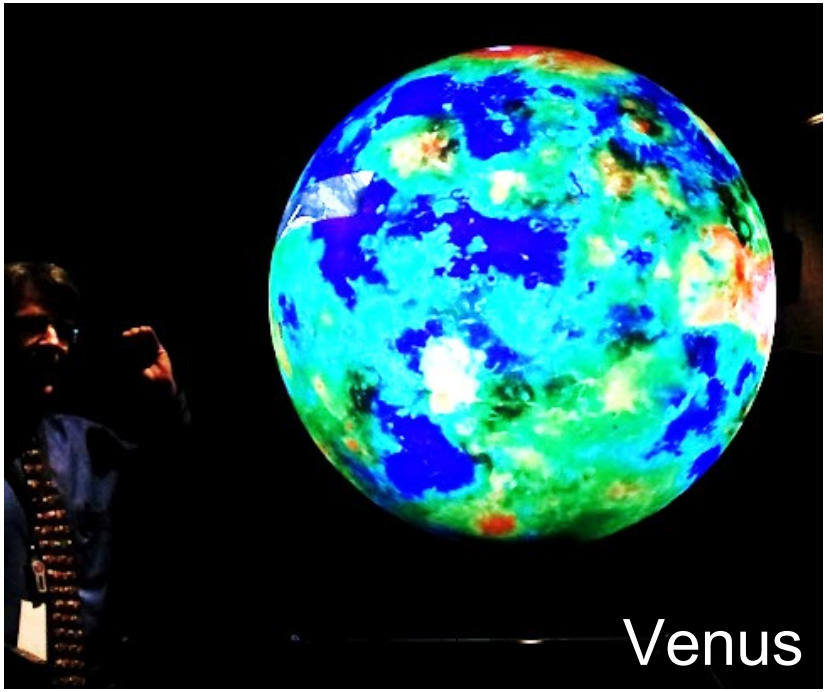
- *Dr. Mark Boster; President-ImpaQ Solutions, LLC*
- *Hon. Mark Forman, former associate director of IT and e-government, OMB*
- *Mr. Joel Mambretti, Director, Intl. Center for Advanced Internet Research, NW Univ.*
- *Dr. Ed Lazowska, Gates Professor & Chair , Dept of Computer Science, UWash*
- *Dr. Pete Beckman, Dir., Exascale Technology and Computing Institute, Argonne NL*
- *Mr. John Muratore, former NASA engineer & Program Manager, now with Space X*

- *Mr. Jason Gillis (Exec Sec), Special Assist. to CIO, NASA*

Using Scientific Data for Education and Outreach



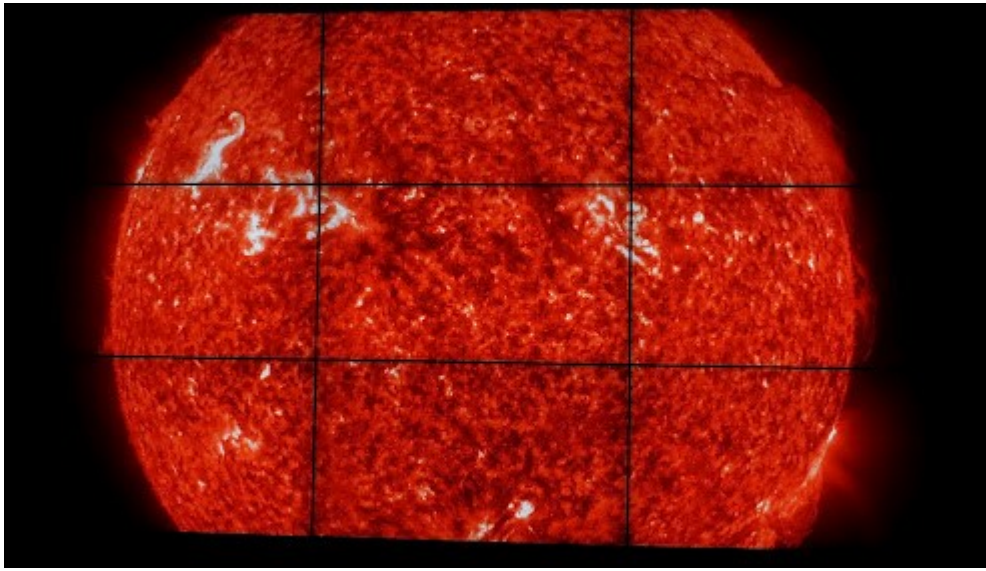




GFSC Chief Scientist
Dr. James Garvin Showing
"Science on a Sphere"
at GFSC Visitors Center



HyperWall at GSFC
Scientific Visualization Studio



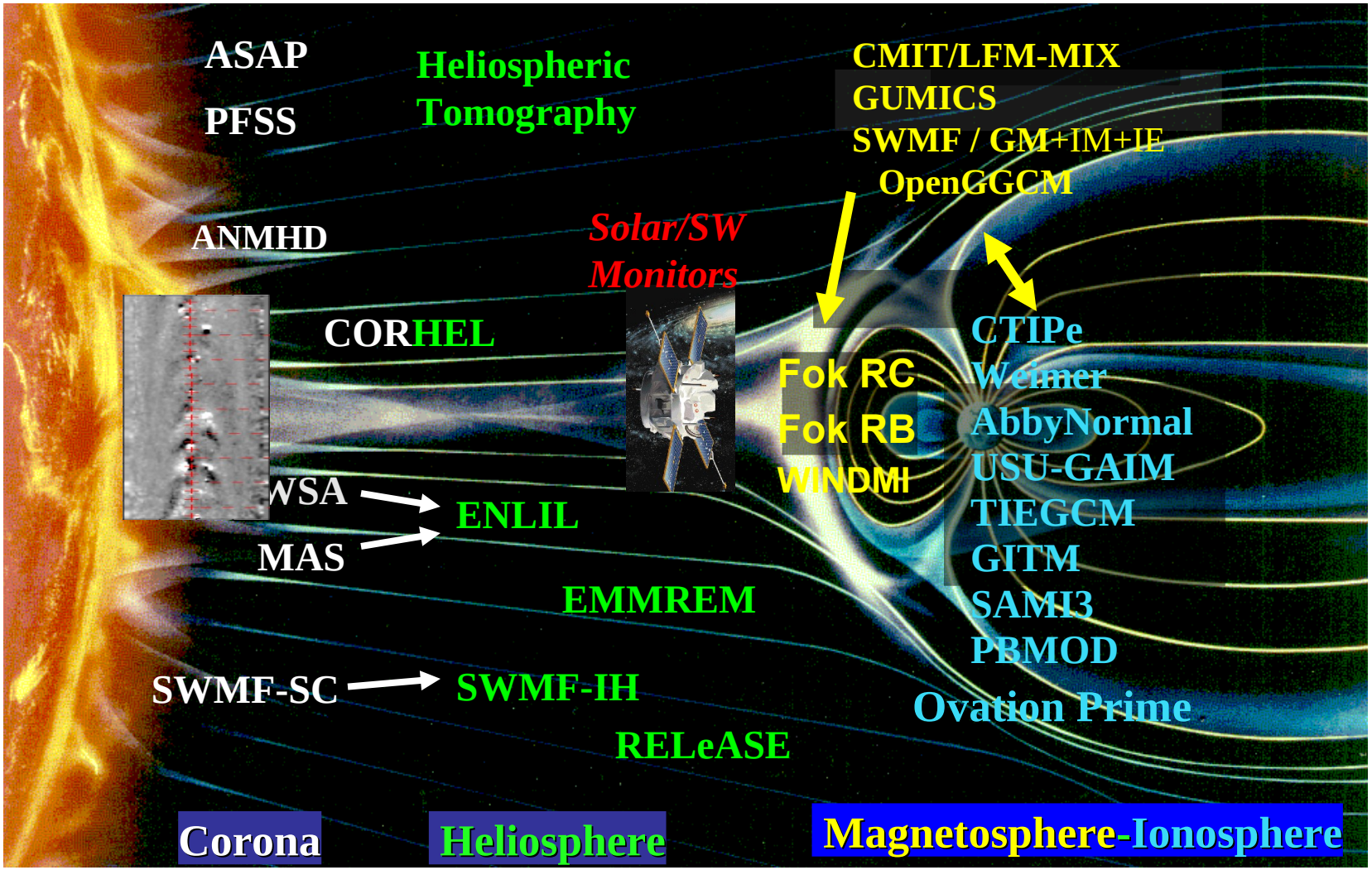
Finding #1 Presented at March, 2012 NAC

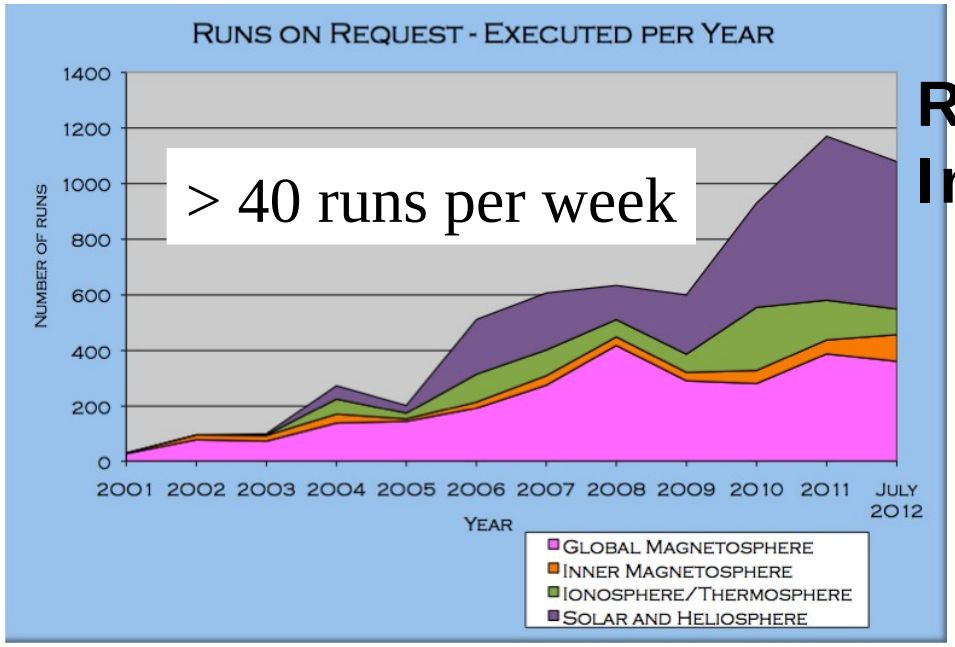
- **To enable new scientific discoveries, in a fiscally constrained environment, NASA must develop more productive IT infrastructure through "frugal innovation" and "agile development"**
  - Easy to use as "flickr"
  - Elastic to demand
  - Continuous improvement
  - More capacity for fixed investment
  - Adaptable to changing requirements of multiple missions
  - Built-in security that doesn't hinder deployment

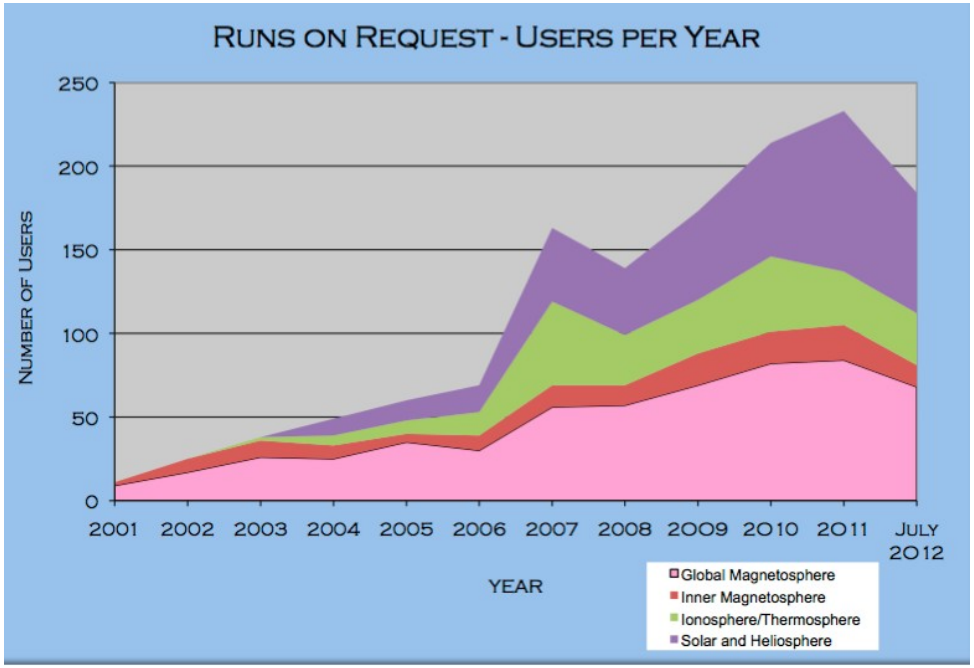
We Found A Two Examples at Goddard Moving in this Direction

Community Coordinated Modeling Center

Web Interface to Models hosted by CCMC: Coupling codes to Mission Data Streams







Runs-On-Request In Publications/Presentations

Community using CCMC runs:

publications: 85

presentations: 131

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total community: 216

CCMC publications: 34

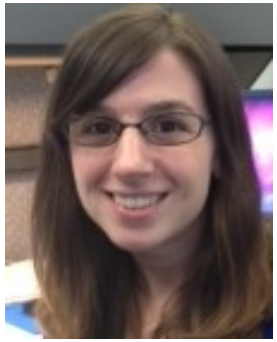
presentations:138

CCMC People Resources-All at NASA GSFC


S. Bakshi

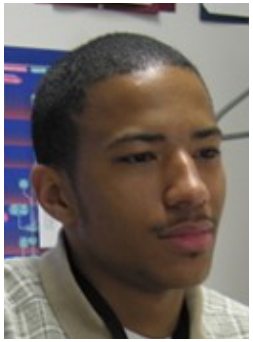

D. Berrios


A. Chulaki

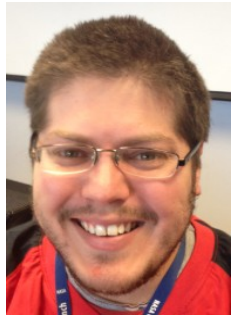

R. Frolov


M. Kuznetsova


P. MacNeice

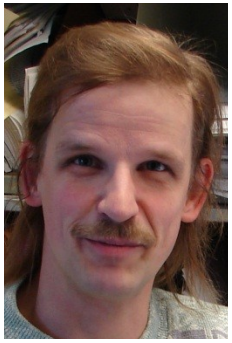

M. Maddox


M. Mendoza


R. Mullinix


K. Patel


A. Pulkkinen


L. Rastaetter


A. Taktakishvili


J-S. Shim


Y. Zheng

IPOST

NASA's New Cyber Continuous Diagnostics and Mitigation Program

- **High impact for low cost**
  - Large, immediate, and continued improvement in reducing cyber risk as measured by vulnerability elimination.
  - Total investment $1,500 and 400 hours.
- **Already covers 50% of NASA Centers**
- **Complements the pioneering work of the U.S. State Department, but proves that the work can be done at low cost.**
- **Delivers data directly to technician showing what they should do first to lower vulnerabilities most – like a video game.**
- **Provides relevant, timely and direct access to IT Security vulnerability information AND instructions on eliminating those vulnerabilities**
- **Uses continuous probing of NASA from an "attacker point of view"**
- **Data is shared among all technicians because "we share the risk"**
- **Leverages ego & peer pressure to encourage staff to remediate problem systems**

Presented by Matt Linton, ARC

Initial Impacts:



- **Illuminated very risky hosts that technical staff had thought were decommissioned (easy win!)**
- **Of top 10 "most vulnerable" hosts at ARC, 4 were completely remediated on day 1, and 7 by day 5.**
- **Highlighted areas where one sysadmin group had solved a security problem which was difficult for others – golden opportunity to information share**
- **Provided objective data for discussions of security fix prioritization among technical staff**
  - Motivation: "Wow, I clearly need to recompile my Apache build"

Presented by Matt Linton, ARC

NAC Committee on IT Infrastructure Recommendation #1



- **Recommendation:** To enable NASA to gain experience on emerging leading-edge IT technologies such as:
  - *Data-Intensive Cyberinfrastructure,*
  - *100 Gbps Networking,*
  - *GPU Clusters, and*
  - *Hybrid HPC Architectures,*

  we recommendation that NASA aggressively pursue partnerships with other Federal agencies, specifically NSF and DOE, as well as public/private opportunities.

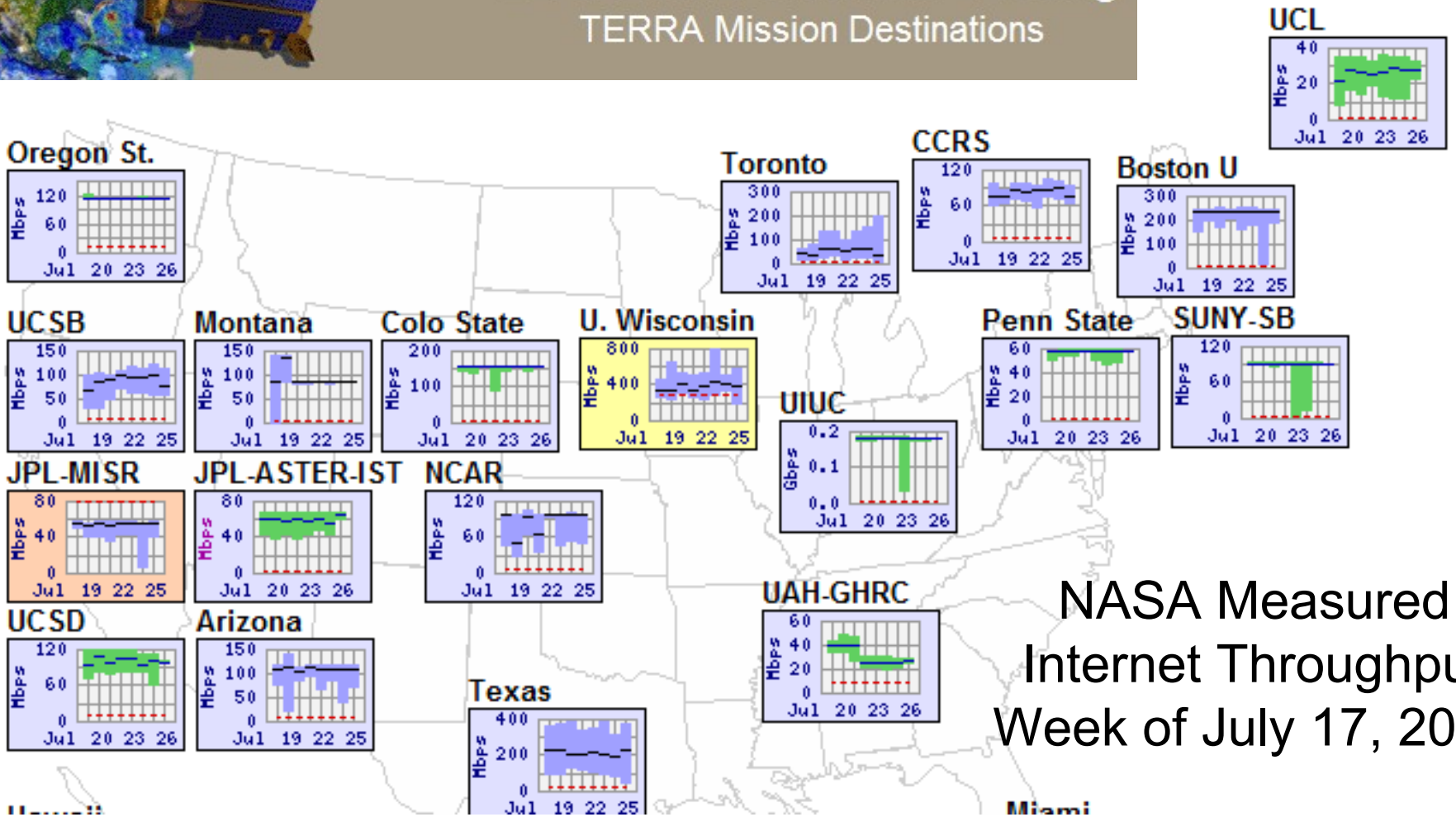
  We believe joint agency program calls for end users to develop innovative applications will help keep NASA at the leading edge of capabilities and enable training of NASA staff to support NASA researchers as these technologies become mainstream.

Toward 100,000 Mbps

Challenge: How to Create "Big Data Freeways"

Move 1TB in ~1 day at 100 Mbps; in ~1.5 minutes at 100 Gbps

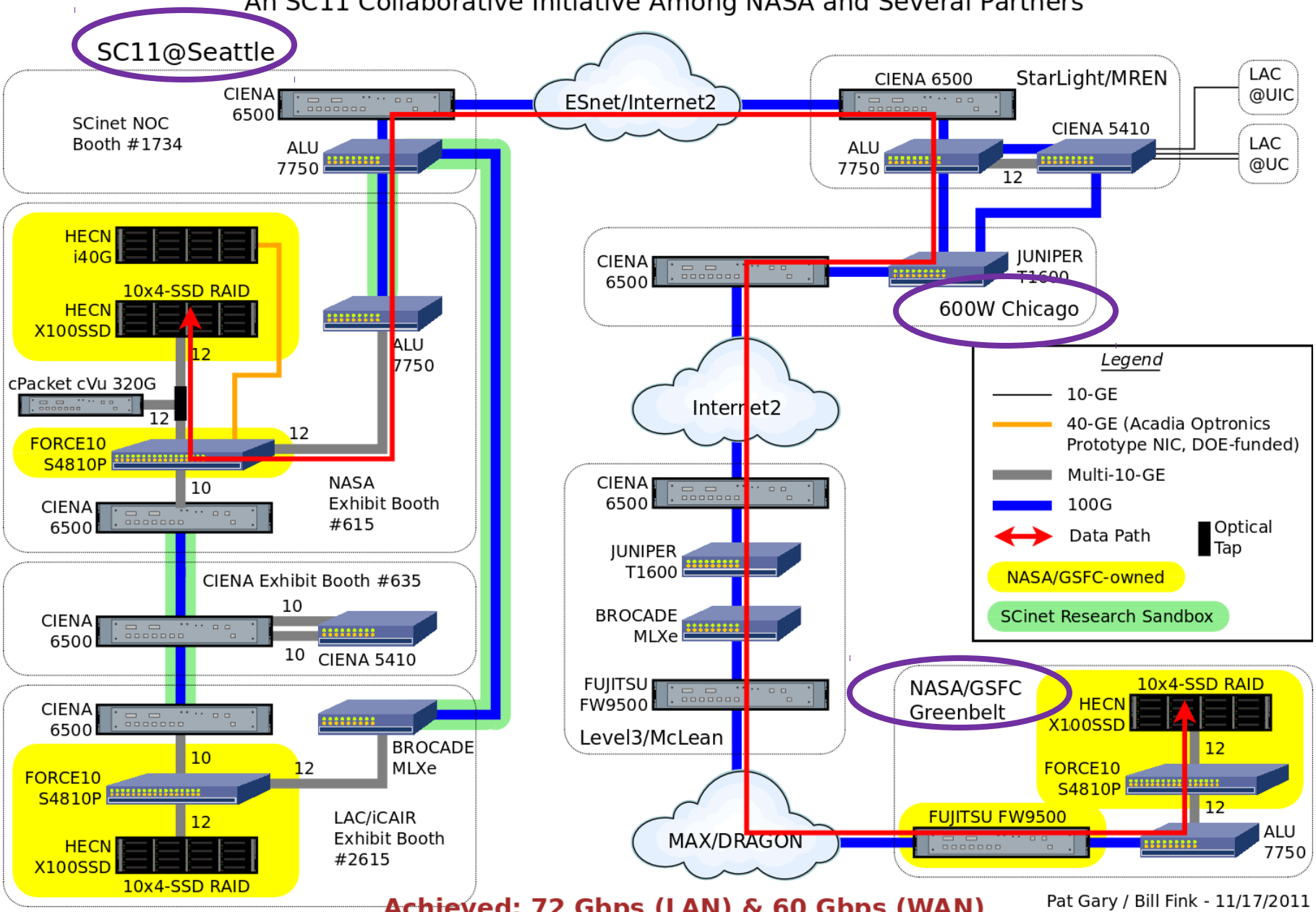




NASA Measured Internet Throughput Week of July 17, 2012

Evaluations/Demonstrations of 40-to-100 Gbps Disk-to-Disk File Transfer Performance Across LANs & WANs

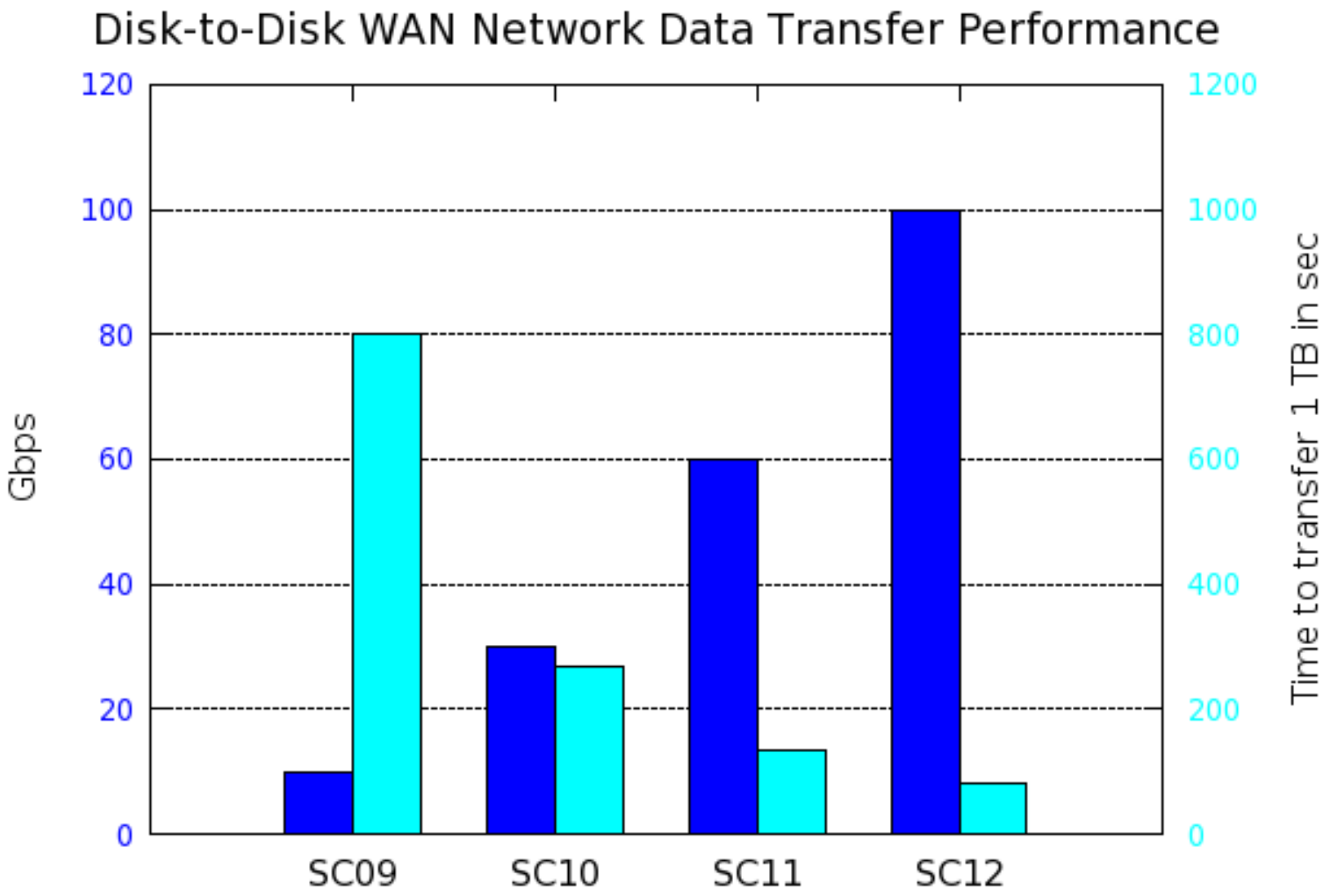
An SC11 Collaborative Initiative Among NASA and Several Partners



Achieved: 72 Gbps (LAN) & 60 Gbps (WAN)

Pat Gary / Bill Fink - 11/17/2011

NASA Rapid Progress Toward The Goal of National-Scale 100,000 Mbps Disk-to-Disk Transfer



Source: GSFC High End Computer Networking Team

NASA 100Gig Networking

Collaborating with the *GSFC High End Computer Networking Team*

10G/100G Optical Networking:
Mid-Atlantic Crossroads
DOE ESnet/ANI
StarLight/UIC/UC/LAC/NCDM
Internet2/National Lambda Rail

File Transfer testing:
Lab for Telecommunications Sciences
Johns Hopkins University
National Library of Medicine
Very Long Baseline Interferometry

Optical/Switch Vendors:
Alcatel, Arista, Brocade, Ciena, Cisco, Force10, Fujitsu, Juniper

NICs/Transceivers:
HotLava, Mellanox, Myricom, Finisar, ColorChip, Acadia Optronics

Raid Server Vendor Parts:
Intel, LSI, Supermicro, Asus, OCZ

Committee Concern: NASA and White House Big Data Initiative



- National Science Foundation
- National Institutes of Health
- Department of Defense
- Department of Energy
- U.S. Geological Survey

NAC Committee on IT Infrastructure
DRAFT* Recommendation #2 [March 2012]

- **Recommendation:** NASA should formally review the existing national data cyberinfrastructure supporting access to data repositories for NASA SMD missions. A comparison with best-of-breed practices within NASA and at other Federal agencies should be made.
- We request a briefing on this review to a joint meeting of the NAC IT Infrastructure, Science, and Education committees within one year of this recommendation. The briefing should contain recommendations for a NASA data-intensive cyberinfrastructure to support science discovery by both mission teams, remote researchers, and for education and public outreach appropriate to the growth driven by current and future SMD missions.

* To be completed after a joint meeting of ITIC, Science, and Education Committees in July 2012 and the final recommendation submitted to July 2012 NAC meeting

Good Progress, Stay Tuned for Next NAC Meeting

Questions?