Computational and Data Services at the APAC National Facility

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APAC National Facility

ANU Supercomputer Facility

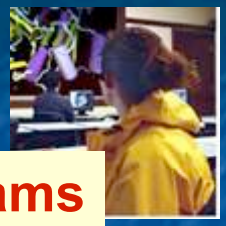
APAC

- Australian Partnership for Advanced Computing formed in 2000. Partnership formed from Federal funds and state based partnerships (AC3, iVEC, QPSF, SAPAC, TPAC, VPAC), the ANU and CSIRO.

- APAC has established:
  - National Peak computational system and data storage system at the ANU
  - Program for Computational Tools and techniques (CT&T),
  - APAC Grid Program development
  - Education Outreach and training program.

APAC National Grid Services

apac national facility

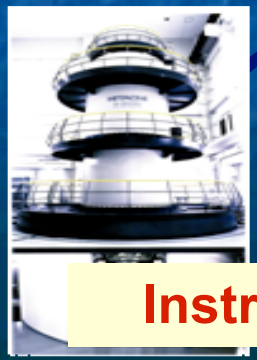


Research Teams

Sensor Networks

Peak Compute & Data Center and APAC Partner systems

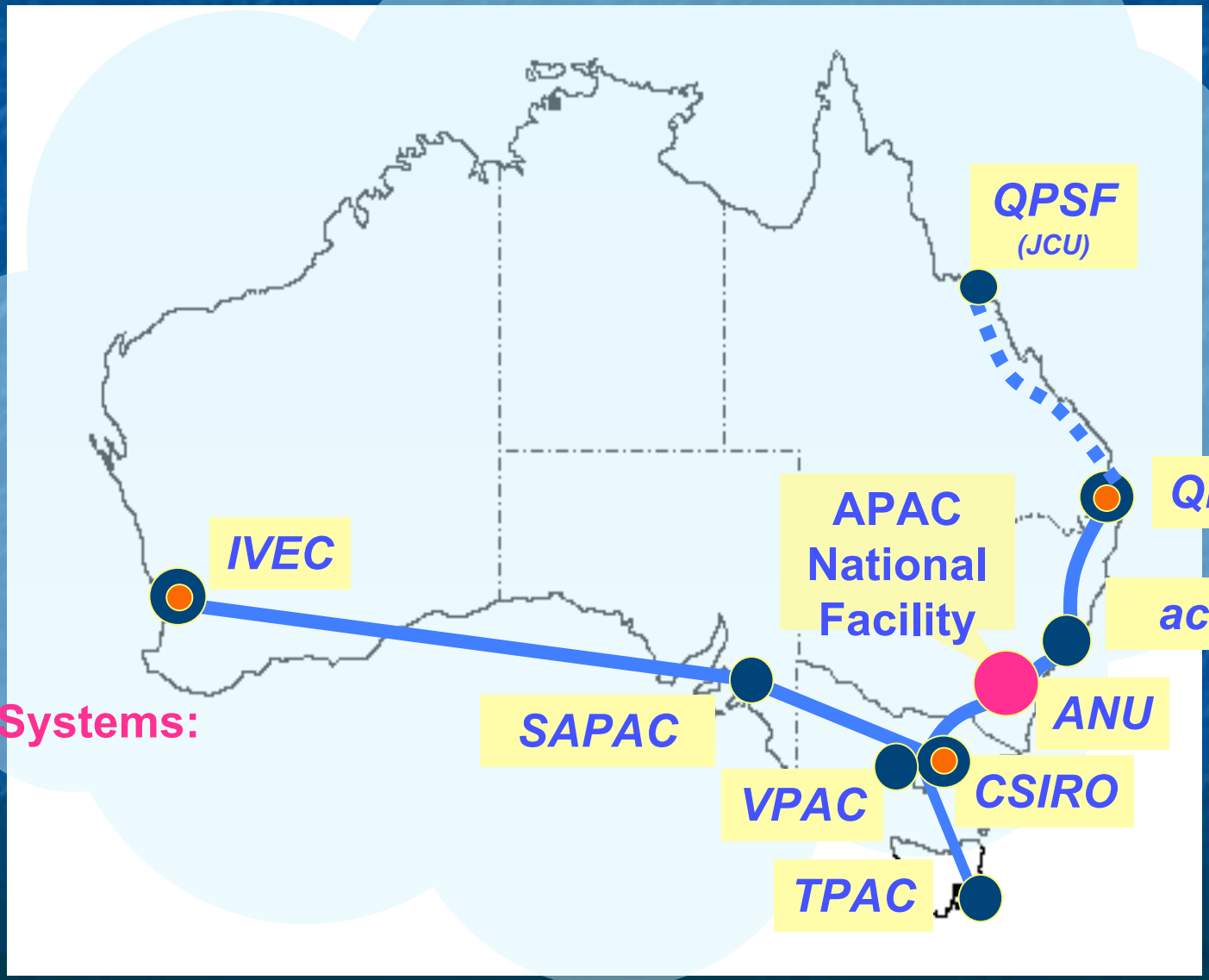
portals and workflow
distributed computation
federated data access
remote visualisation
collaboration services



Instruments

Other Grids:
Institutional
National
International

APAC National Grid Computing Infrastructure



Computing Systems:

- *Peak*
- *Mid-range*
- *Special*

APAC National Facility Computational Resources

SGI Altix 3700 BX2

- 1680 1.6 GHz Itanium2
- Approx 30 Tbytes of global storage, 70 Tbytes of scratch
- Ranked as 26th in June 2005 Top 500 list.

Small Dell linux cluster

- 152 Dell Precision 350
- 2.6GHz Pentium4

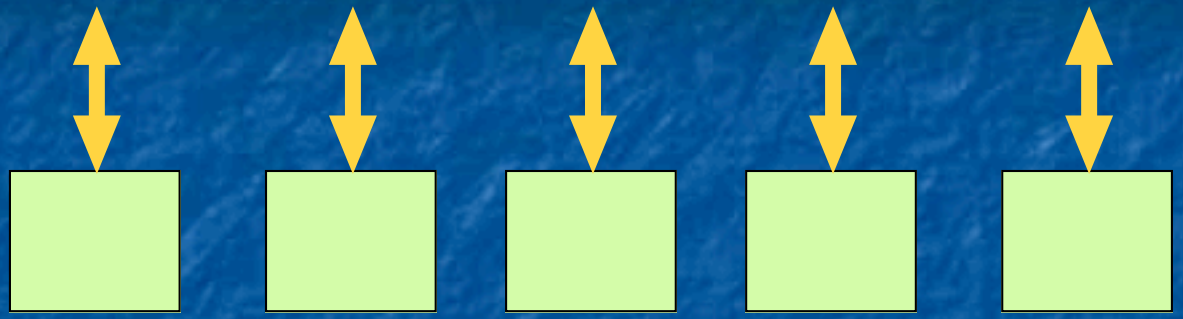
Upgrading by further 256 proc and 2 Tbytes in April/May

APAC-NF Data Center

Cluster of Components

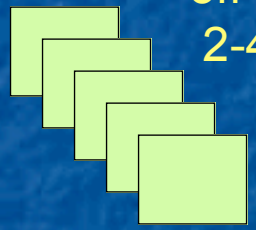
- Managed HSM disk cache, currently 7 Tbytes STK D280 (*upgrading*)
- STK 9310 robot and STK 9740 robot with
  - 4 x 9940B 200Gbyte drives @ 30MB/s
  - 8 x 9840 20Gbyte drives @ 10MB/s
- Cluster of managed relational database servers
- Cluster of Interface and transfer systems tightly coupled.

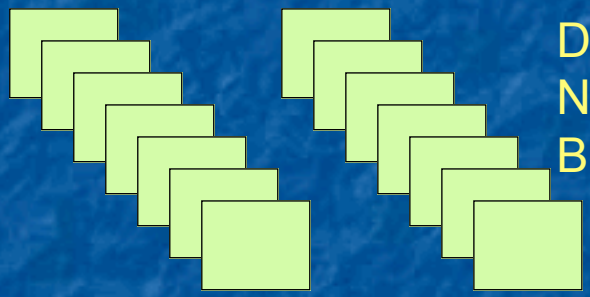
APAC-NF Data Center



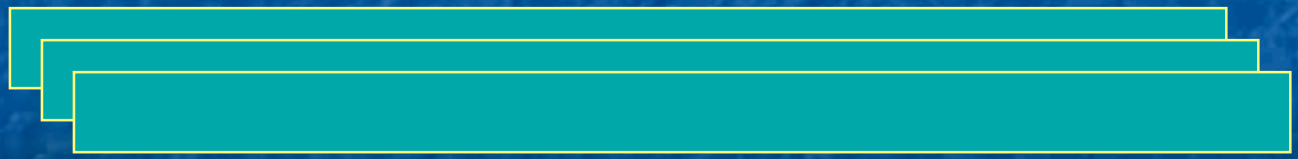
Data transfer, web access, video streaming, command line, API
Opteron 2-4p, 4Gb

Dedicated Database off-load engines
2-4p nodes, 4-8Gb





Future attachment:
Data Analysis Cluster
Nodes: 2p, 4Gbyte
Big and little endian



fast, on-line global filesystem

APAC-NF staff

16 Staff specialising in a range of areas

- High performance techniques and application porting and tuning
  - 8 Domain specific academic consultants
- Large data workflows and management
- specialised services in visualisation
- systems infrastructure and support programmers

Software available

- A large “toolbox” of application packages, compilers, libraries and other software is available on the APAC-NF
  http://nf.apac.edu.au/facilities/software/
  34 Chemistry, 8 Earth Systems, 6 Astronomy,
  3 Computational Fluid Dynamics, …

(Site also shows software available around the APAC Grid)

Requests for software to be installed on APAC-NF through help@nf.apac.edu.au

Specialised Earth Sciences programs being supported:

- Climate Codes (ANU,TPAC, ARCNESS)
- Finley/Escript (ACCESS MNRF)
- StGermain/Snark (VPAC)
- Portal to some earth sciences being established (CSIRO)

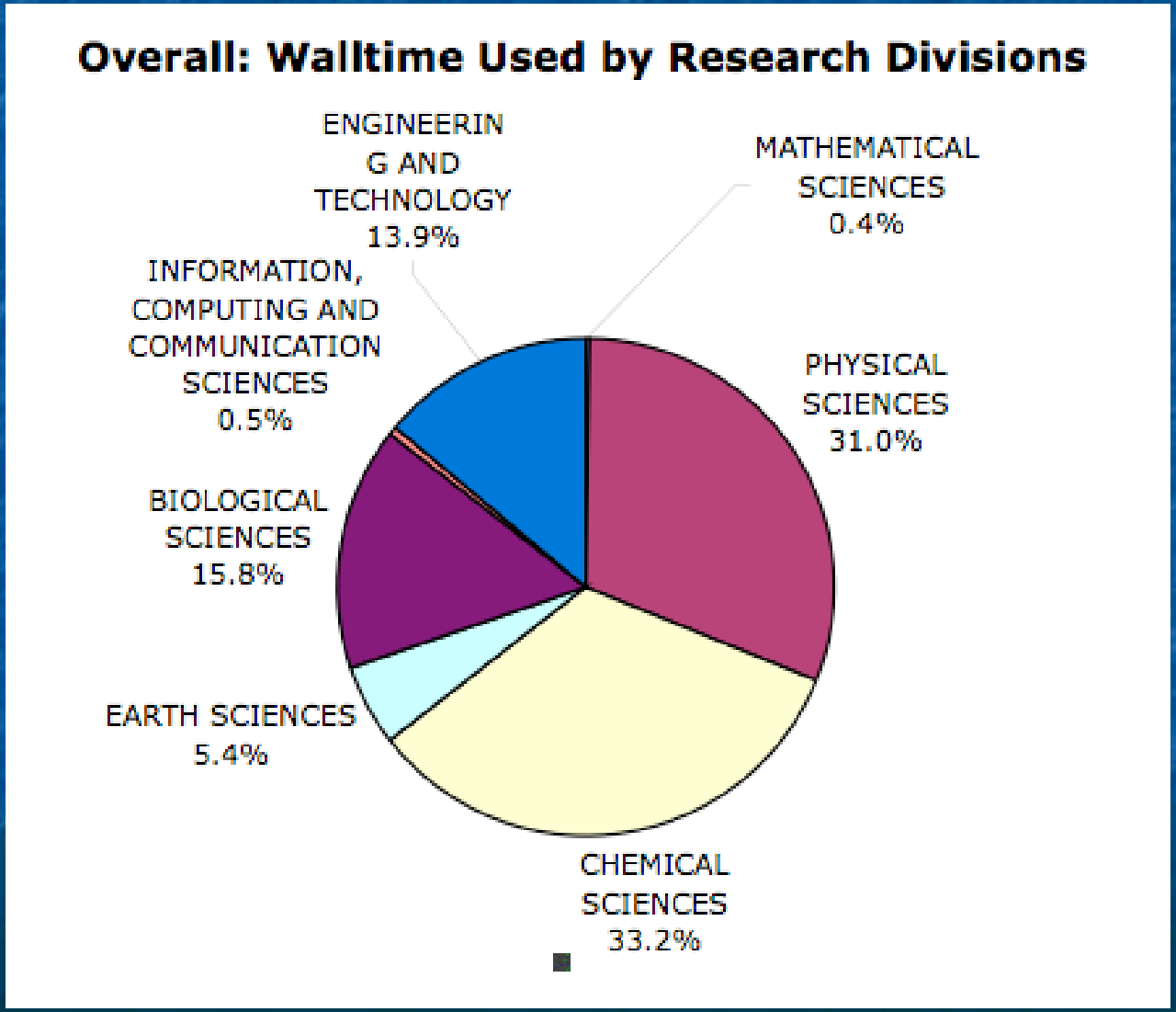
APAC activities in Data

- Supporting projects requiring
  - data intensive and interfaces
  - Data analysis and mining
  - data grid access and tools, or
  - high volume throughput connected to the APAC National Facility computational Models
- Provide common environment for National Collaboration to take place.
- Support for data formats,data tools, infrastructure to support complex data or national or international interest.
- Coordination of storage resources between APAC partner sites through data grid

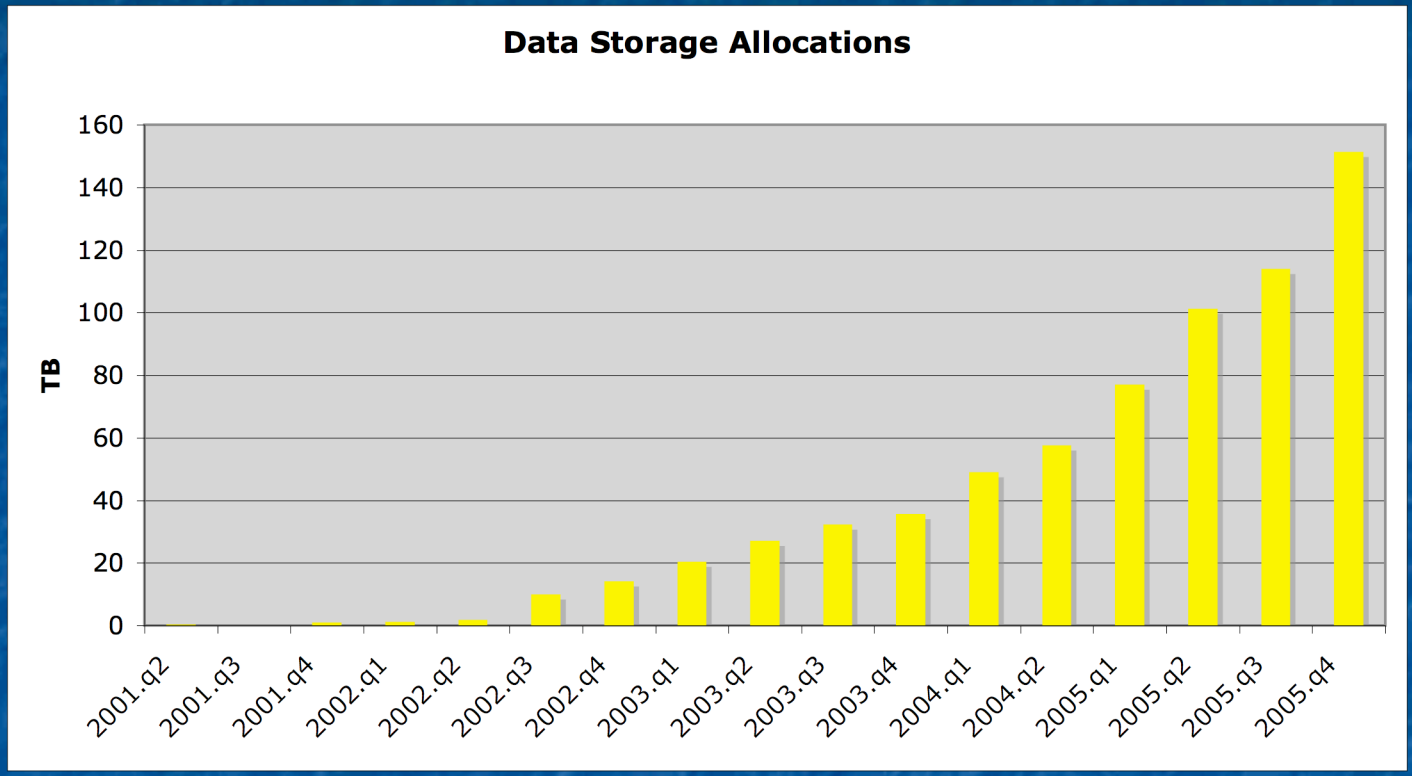
APAC-NF Allocations

- Merit Allocation on the systems governed by National Merit Allocation Scheme. Committee consists of Senior Australian Researchers nominated through APAC.
  - 117 of 249 projects have large ARC or Industry Grants
- APAC Partners also have a (small) formal share of the system for their own allocation.
- Industry collaborations are possible
  - $1/cpu walltime hour
- Data Intensive projects of National Significance granted up to 10 Tbytes each of large storage space and assistance with related specialised DB access.

APAC MAS & Partner Grants



APAC Data Scheme



- Managing ~150Tbytes of (project-based) datasets involving over 200 researchers.
- *Preparation for next generation tape drive => more capacity*
- *Requests through http://nf.apac.edu.au*

Data Ingest and Curation Practises

OASIS standard for the full complex scenario. But, basically

- Curating the data as ingested.
  - Involves metadata and data.
  - Standised formats
  - Nominated people to do this.
- Auditing and Reporting
- Access mechanisms and availability
- Long term and migration issues.

Funding issues over the longer term need to be considered.

Data Availability

- Challenge is to work through general access for public data
- Assist with managing and regularise this process in line with ARC and grants practises: Access, authentication, audit. Include some controls.
- Providing a repository of references to datasets:

http://nf.apac.edu.au/facilities/software/dataset.php

(link will move with enhancement of national facility web site)

- Some fields have VO registries and will be harvested and registered. (eg NVO in astronomy, Geographic, Humanities, Social Sciences)

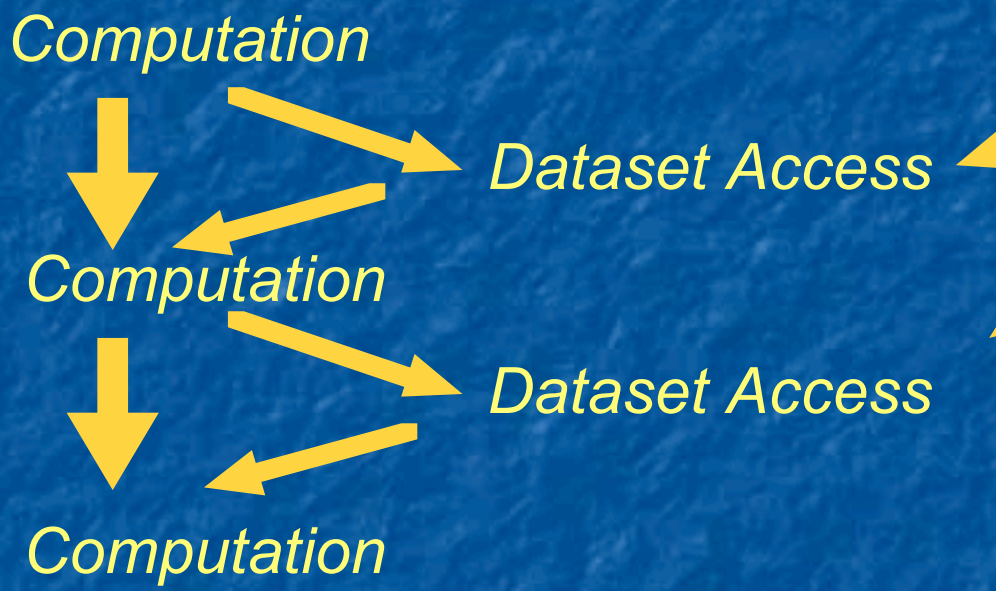
Data Protection

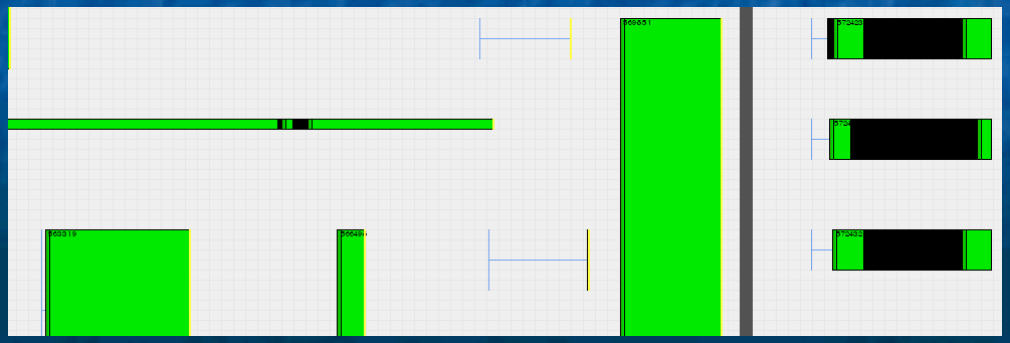
- Frequent scheduling of archival copies.
- Standard practice of 2 archival copies of all data. Some small datasets have 3 copies.
- Second off-site silo transparently managed for some approved projects.
- HA being established for some RDBMS and web services
- Audit logs and backups of NF data

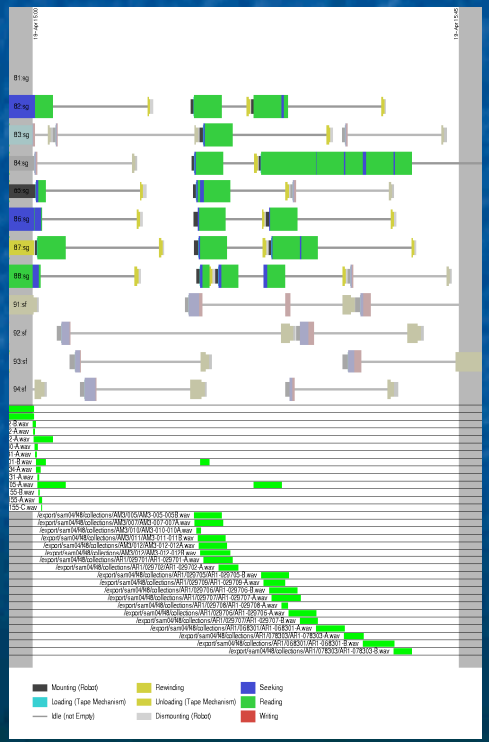
Data Lifecycle management

- Storage media has a useful lifetime, in capacity, speed and maintenance.
  - 6 generations of tape drives.
  - 3 generations of disks.
- HSM procedures for migration of large datasets to new storage media.
- Data formats change!
  - Projects with multiple generations of data standards, both in metadata and data (eg coordinate systems changes)
  - Presentation layer changes
  - Methods of querying data changes

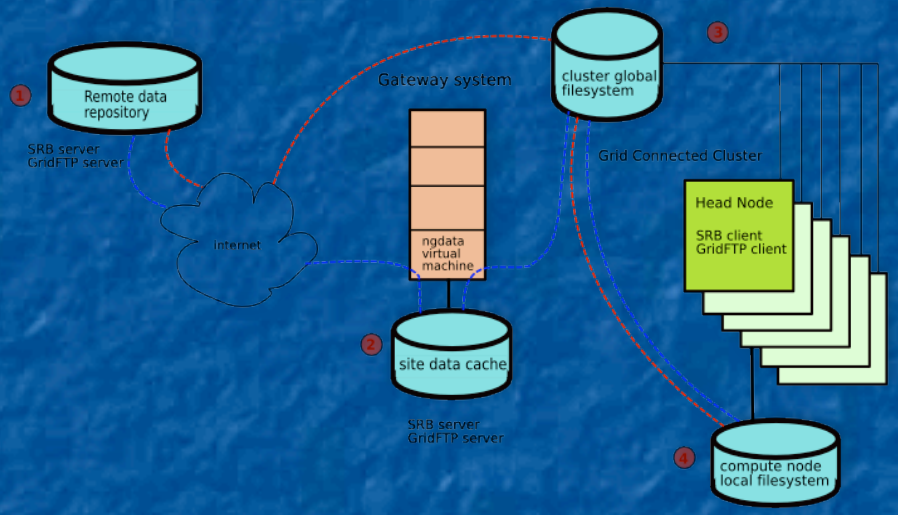
Assistance with Co-scheduled Computational and Data workflow







Grid Infrastructure for data/compute workflow



- Establish data workflow models supported by each site. Matrix of possibilities being generated
- Transfer of data to target cluster's global filesystem using GridFTP, SRB (and perhaps a Grid global filesystem …)
- Establish data cache (ngdata) on gateway system.

Grid Infrastructure for data/compute workflow

		ANU											
	send \ receive	ac.apac.edu.au			lc0.apac.edu.au			ngdata.apac.edu.au			store.apac.edu.au		
	Test	GridFTP	scp	rsync	GridFTP	scp	rsync	GridFTP	scp	rsync	GridFTP	scp	rsync
ANU	ac.apac.edu.au				30.3	18.8	17.1	err	8.7	err	10.1	6.1	14.8
	lc0.apac.edu.au	38.2	7.6	9.0				err	7.5	err	16.3	7.4	9.9
	ngdata.apac.edu.au	err	10.1	err	err	9.8	err				err	7.4	err
	store.apac.edu.au	27.8	8.8	6.9	26.7	6.4	6.0	err	5.4	err			

- Establish data transfer metrics for National Grid and International transfer performance across the interconnecting fabric.
- Lead to improvements in network in conjuction with network providers and local institutions.

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High Energy Physics - Belle

International SRB federation

- Japan -KEK
- Taiwan
- South Korea
- Australia
- Poland
- US

- A functioning, general purpose international Data Grid for high-energy physics

Slide from Reagan Moore, SDSC

Interested in current or Future Data projects?

- Online forms:

  http://nationalfacility.apac.edu.au
- For more detailed discussion contact:

  Ben.Evans@anusf.anu.edu.au

  Acting Head, APAC National Facility

Data Visualisation demos outside in APAC booth with Drew Whitehouse and Ajay Limaye.