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8 June 2006

What is e-Research ?

briefing to ITS All Staff Meeting 8 June 2006

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Motivation

- DVC-Research seeks to improve Monash's research performance. e-Research technologies are *one* way to contribute to this.
- DEST seeks to improve the *preservation* and *accessibility* of research data.
- It is an exciting time:
- Compute and storage costs are now so low that new classes of research problems become tractable across all disciplines. Still the exponential continues.

What is **Monash e-Research Centre** ?

- A joint activity between DVC Research and ITS Division
- Director: Prof. Ah Chung Tsoi
AhChung.Tsoi@adm.monash.edu.au
- Manager: Mr Neil Clarke
Neil.Clarke@its.monash.edu.au
- Established pursuant to a Strategic Plan developed in 2005 ...



e-Research@Monash Centre Strategic Plan

**Prepared by
The e-Research@Monash Working Group
May 2005**

Professor John Crossley (Chair)
Professor Bill Applebe (VPAC)
Mr Jack Chorowicz (ITS)
Dr Asad Khan (Faculty of IT)
Mr Alan McMeekin (Director – ITS)
Ms Heidi Winnen (Secretary)

What is **Monash e-Research Centre** ?

- “Virtual Team” = *ITS does most of the work*
 - Neil Clarke
 - Nathan Bailey
 - Richard Spindler
 - A.B.M. Russel
- Shared Systems
- IMS
- IT Security
- NIS
- EWS
- Directors
- Client Communications
- Corporate Services
- Project Office
- Production Facilities

What is **Monash e-Research Centre** ?

- Will rely on (not replicate) many aspects of ITS Division's established operations
- Will provide a new focussed face (conduit between researchers and ITS) and new specialized services

3 planks to the Monash e-Research strategy:

- (a) Enable our own research staff so that they can use ICT infrastructure more efficiently and effectively
- (b) Engage with industry & government
- (c) Engage with national & international collaborators
 - These three planks should go hand in hand together rather than sequentially

Current activities

- ARROW & DART
- Monash Campus Grid (ITS)
 - Compute: Monash Sun Grid 120 CPU →
 - Storage: Large Research Data Store → 1 PB
 - Tools: Monash e-Research Portal
- Outreach (MeRC & ITS)
 - Faculties
 - Government
 - Industry

What is “e-Research” ?

- The use (& development) of ICT technologies and in particular “GRID” technologies:
 - to *facilitate* research and
 - in particular to foster research *collaboration*
- Major components:
 - Compute
 - Storage
 - Collaboration
 - Visualization
 - Sensors & Instruments

What is “e-Research” ?

- The use (& development) of ICT technologies and in particular “GRID” technologies:
 - to *facilitate* research and
 - in particular to foster research *collaboration*
- Major components:
 - Compute & tools
 - Storage & curation
 - Collaboration
 - Visualization
 - Sensors & instruments

What is “GRID” ?

- = Analogy to electricity GRID
But not to be taken literally!
- More than just “distributed super-computing”
although it does include distributed super-computing
and cluster computing
- **Collaborative use of ICT**
across organizational boundaries
- Requires the development of “middleware” software

What is “GRID” ?

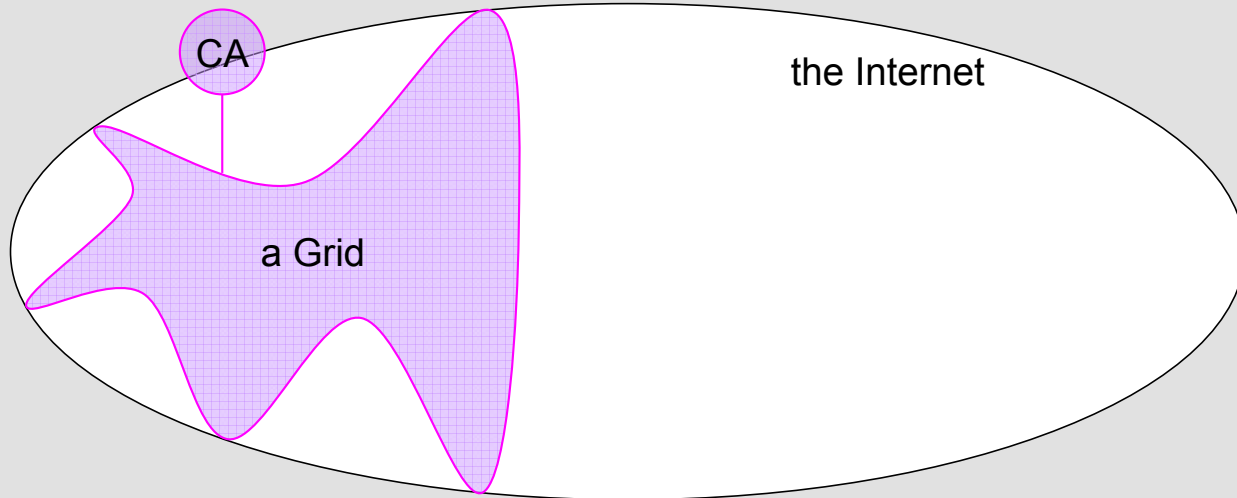
- GRID network (network capable of supporting GRID usage)
- storage GRID (distributed data-store/SAN)
- compute GRID (distributed compute power)
- data GRID (distributed database)
- distributed applications
- work-flow GRID
- data visualization tools
- researcher GRID (distributed collaborative workgroup)
- tele-presence: tele-working, remote monitoring and/or control, “access GRID” (a form of video conferencing)
- sensor GRID and remote instruments (telescope; synchrotron)

Summary: What is GRID / e-Research ?

- Yes, it's all these things
- But it's more:
 - > It's distributed research & distributed researchers
- It's a “paradigm shift”
 - > a new way of doing research
- Move data into the middle-ground
 - > real collaborative research
- Analogy: the research paper and the quill

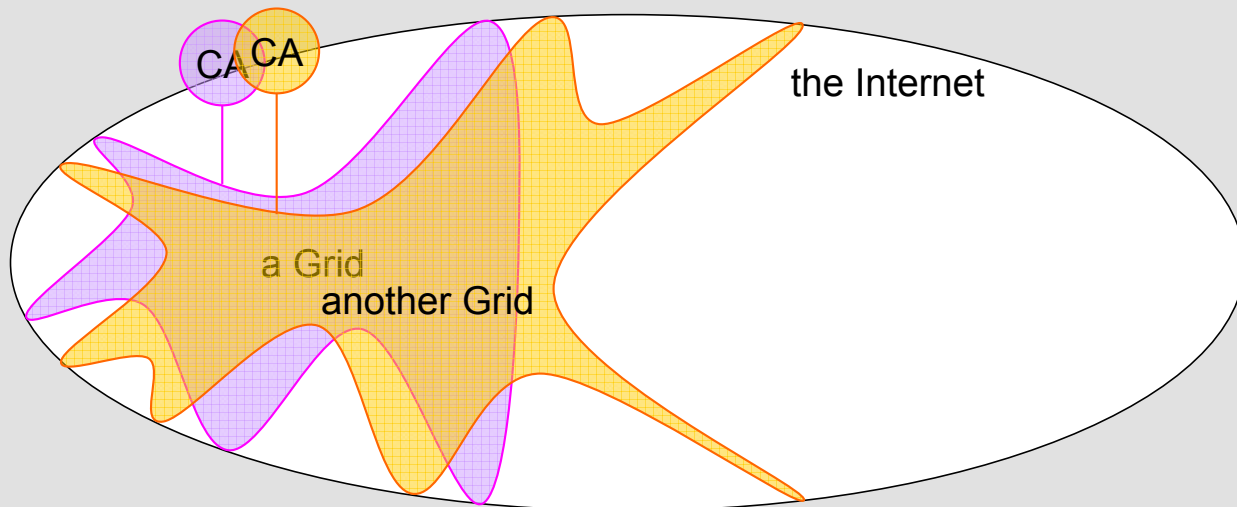
What is a GRID work-space ?

- A collaborative protected virtual working environment between consenting participants and consenting facilities



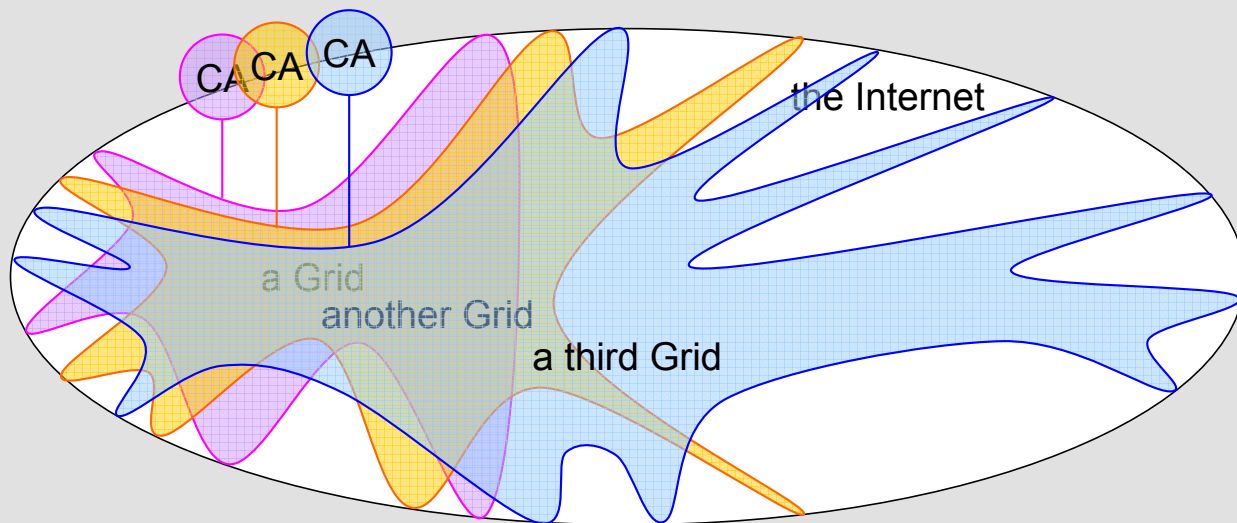
What is a GRID work-space ?

- There can be a multiplicity of GRIDs:



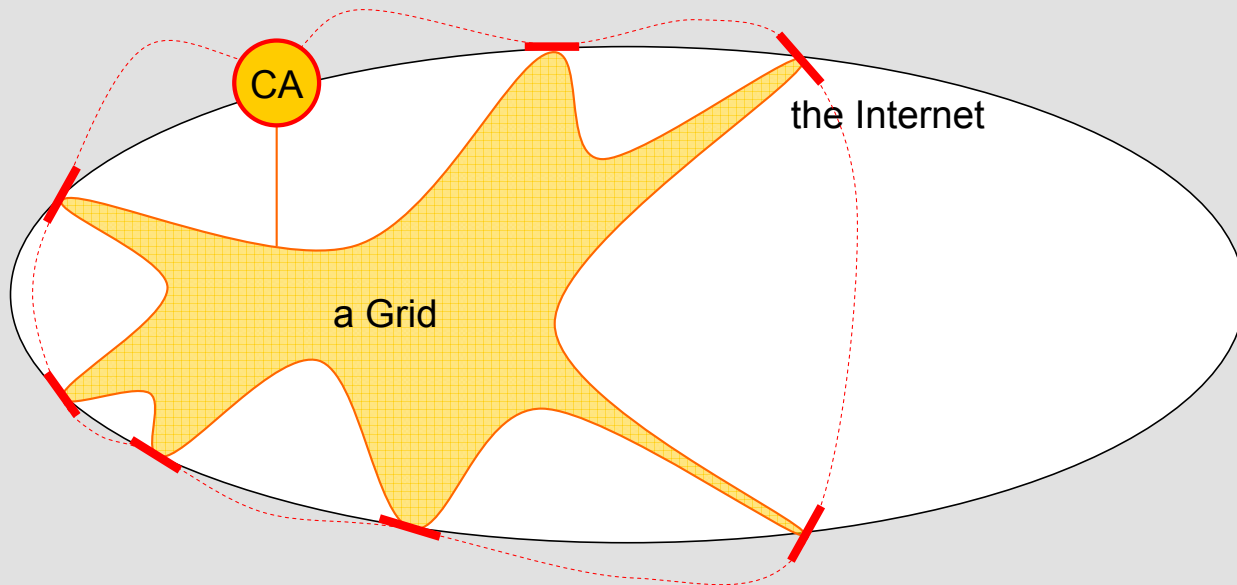
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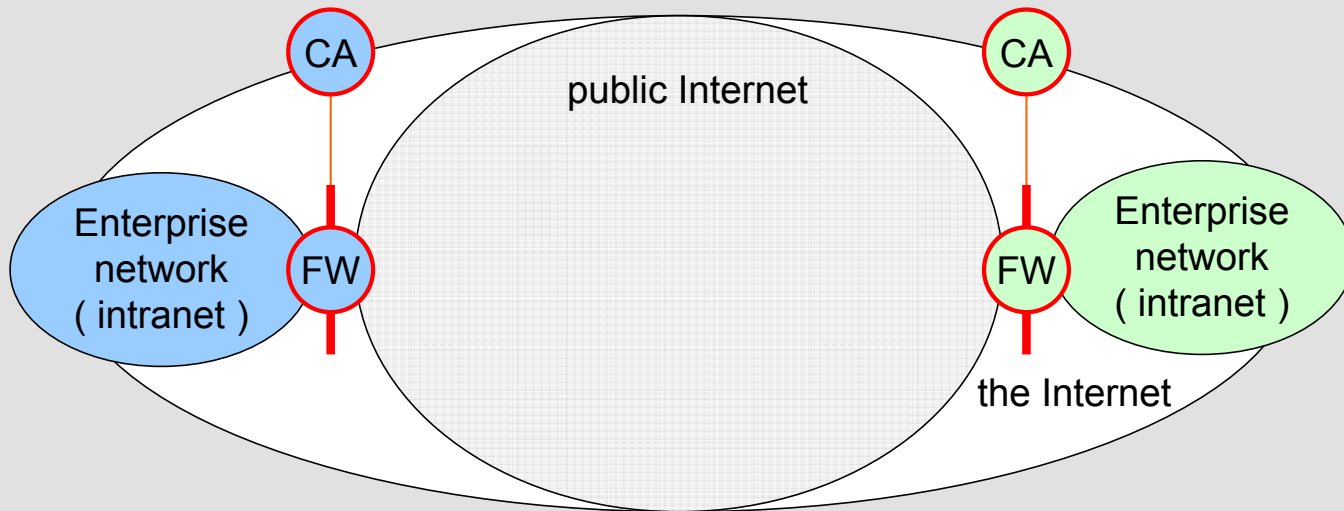
GRID security model

- The Grid security model is different:
Security at access point (within the end-system / host):



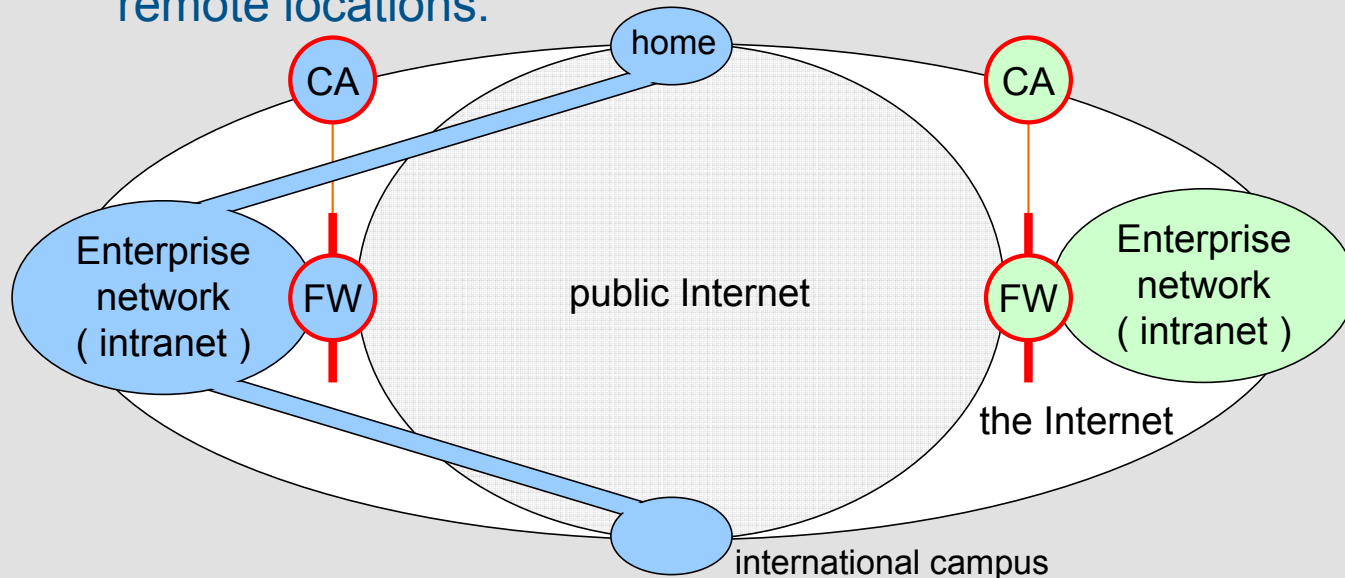
GRID security model is different

- Compared with the Enterprise network model:
Security at organizational border (firewall):



VPN security model

- The Enterprise VPN network model is different again: VPN extends 'islands' of the Enterprise network to remote locations:

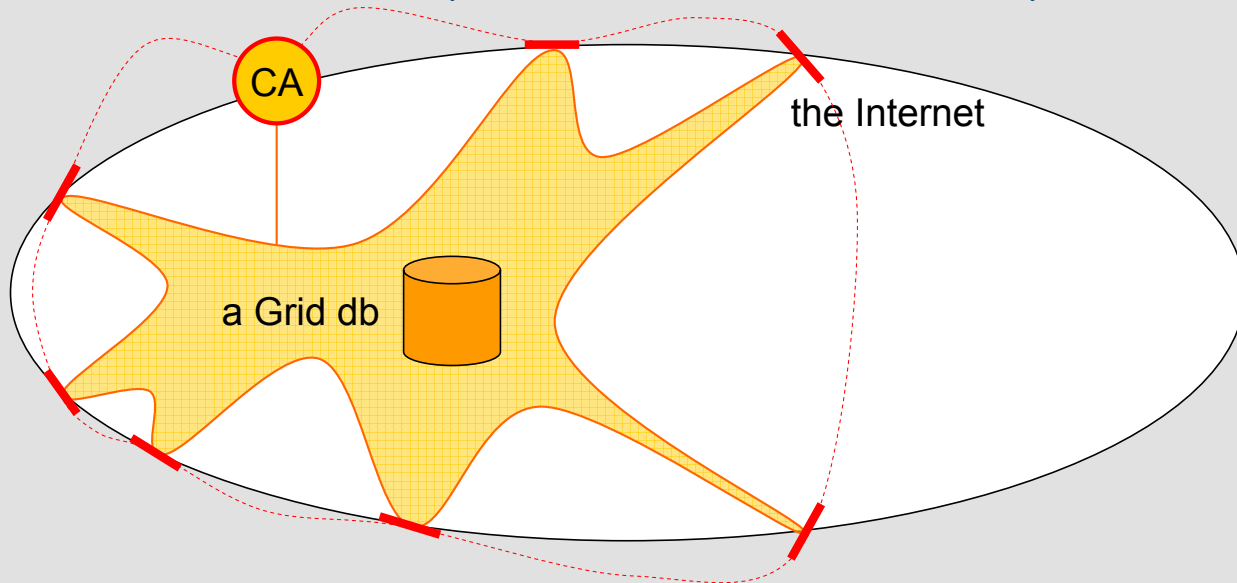


Information architecture

- The previous diagrams can also be used to illustrate the difference between the:
 - Enterprise information architectureand the:
 - Grid (collaborative) information architecture

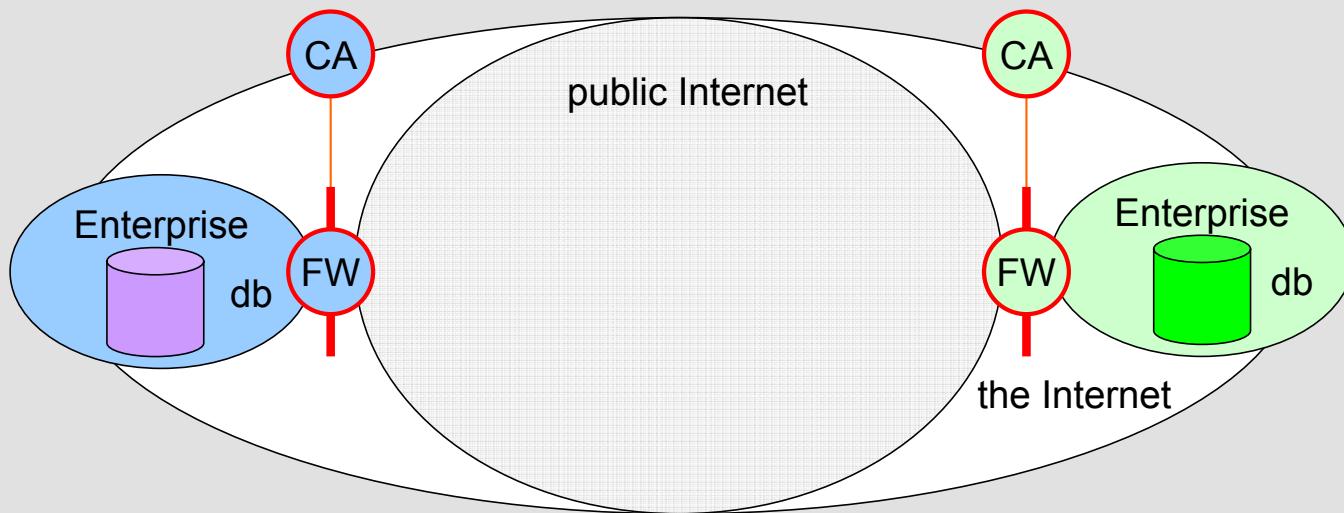
Grid (collaborative) information architecture

- The Grid information security model is different: Information is protected at the access point into the shared database (within the database server):



Enterprise information architecture

- Compared with the Enterprise information security model:
Information is protected within institutional databases:



What is Grid Middleware ? (the “A” words)

Machinery to create the collaborative environment:

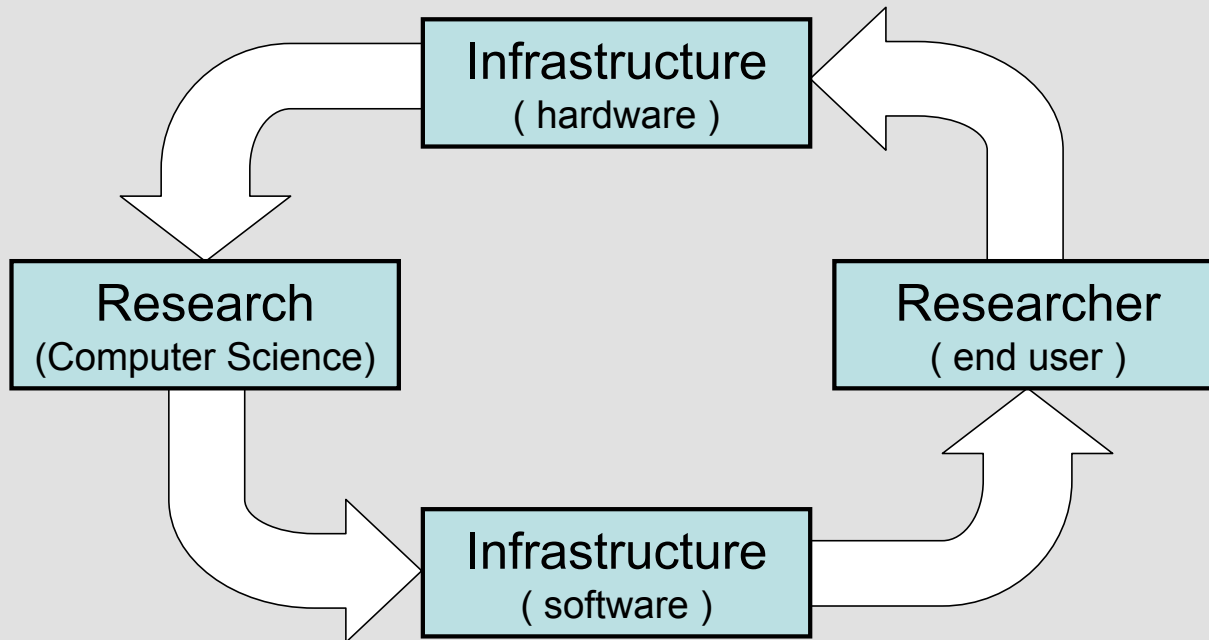
- Access (to data)
- Access rights & access controls
- Authorization
- Authentication (user identity)
- Authentication (data validity)
- Audit trail, provenance and time-stamping
- Archival
- Authoring, Annotation & Attribution
- Access grids (virtual reality)
- remote Access (remote control)

What is Grid Middleware ? (longer list of “A” words)

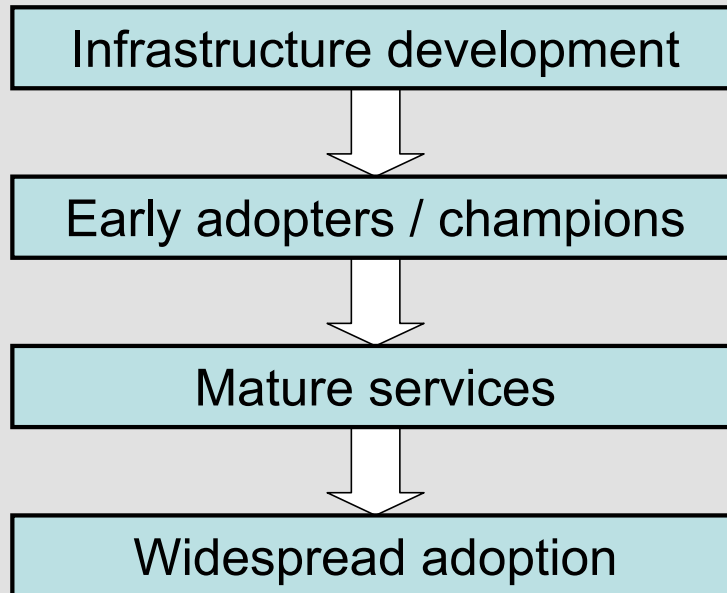
Machinery to create the collaborative environment:

- Abstraction layer (resource virtualization)
- Access controls
- Access rights
- Accessibility (to research data and resources)
- Accessibility (compatibility options)
- Acquisition (of data & information)
- Accounting and usage monitoring, quota Allocation and controls
- Adaptation layer (compatibility between disparate systems)
- Allocation and co-Allocation (of compute and other resources)
- Authorization
- Authentication – of user (user identity)
- Authentication – of device
- Authentication – of data (data validity, accuracy and integrity validation)
- Audit trail, provenance & time-stamping
- Archival, preservation & curation
- Authoring, Annotation & Attribution
- Access grids (virtual reality & tele-presence)
- remote Access (remote monitoring and/or control of devices/experiments)

The “spiral-up” model



Over several iterations ...



Summary: What is Grid Middleware ?

- In particular:
 - Identity management
 - Collaboration
 - Information management (curation)
 - ARROW & DART

What is ARROW and DART ?

- <http://arrow.edu.au/>
- <http://dart.edu.au/>

What is eRCC ?

= Federal (DEST) e-Research Coordinating Committee

- http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/e_research_consult/default.htm

What is VeRSI ?

= Victorian e-Research Strategic Initiative

- MMV initiative
- Phase 1: Parkville & Clayton
- Phase 2: Bundoora & Werribee
- part of the Victorian Government's Life Sciences Statement, "Healthy Futures":
http://www.business.vic.gov.au/BUSVIC.327908/STANDARD//PC_61353.html
- refer page 34 of:
http://www.business.vic.gov.au/busvicwr/_assets/main/lib60149/lifesci_web.pdf

What is an “e-Research Centre” / “Hub” ?

- At the national, state or institutional level:
- Infrastructure:
 - Compute
 - Storage
- Place researchers can go to:
 - For assistance
 - Promote e-Research

Need a national storage architecture

- Primary: Instrument facing
- Secondary: Long-term storage facility
- Tertiary: Researcher facing
- At national, state and institutional levels
- http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/e_research_consult/interim_report.htm

Questions & Answers ...

