Public sector research laboratory providing facilities and support for the UK science research community

SSTD participation in over 40 space missions in recent years

SSTD involvement in ESA Solar System Research missions includes

- Giotto (DIDSY, JPA), SOHO (CDS, Archive), Cassini/Huygens (CAPS, CDA, SSP), Cluster (PEACE, RAPID, JSOC, UKCDC), SMART-1 (D-CIXS), Rosetta (Modulus), Mars Express (Aspera, Beagle, MEX-POS)

SSTD activities cover a broad range including

- Instrument design, development and testing
- Science operations facilities
- Data centres and archives
- Science research groups (incl. Solar, STP and Planetary)

E-science initiatives

- UK StarGRID demonstrator
- UK AstroGrid
Solar System Research

Why GRIDs?

- Solar System Research is a multi-disciplinary science
  - Solar Physics, Solar Terrestrial Physics, Planetary
- Complex 3-D environment
  - Phenomena occur over a range of temporal and spatial scales
- Complex set of instrumentation, data and formats
  - Particles, fields, waves and imagers
  - Scalars, vectors, tensors, images, multi-dimensional arrays
- Data processing is often responsibility of PI
  - Heterogeneous data handling systems
- Researchers need to combine and manipulate multiple data sets
  - This is where a Data Grid and collaborative working environment can help
Solar System Research
An example

- A scientist wishing to study the propagation and effect of a Coronal Mass Ejection might use:-
  - The coronagraph on SOHO
  - Upstream solar wind measurements from ACE
  - Cluster plasma and field measurements near the magnetopause
  - Plasma composition measurements in the mid altitude cusp
  - Ring current enhancements, in-situ, remote sampling and ground based geomagnetic indices
  - Position and timing information

- Data have different locations, query specifications and are returned in different formats
Solar System Research

An example

Current situation

SpaceGRID

26/09/2001

SpaceGRID KO
Solar System Research
Activities & Approach

SSR Baseline Requirements → Survey of SSR Facilities

Capture User Requirements → Evaluate Options

Evaluate Options → Plan Prototype Implementation

Plan Prototype Implementation → Prototyping (led by SSL)

Prototyping (led by SSL) → Dissemination Activities
Solar System Research
User Requirements Capture

- Local domain experts define framework
- Consultation with SSR community
  - WWW questionnaire (requirements and user scenarios)
  - Direct contacts with key players in the community
  - Community and facility e-mail lists
  - Mission Science Working Team meetings
  - Conferences
- Captured requirements reviewed by domain experts
  - Extract key requirements
  - Assess commonality and compatibility
  - Consider relative importance
  - Estimate ease of implementation
Evaluation of middleware

Implementation options assessed to evaluate
- Compliance with user requirements
- Ease and cost of implementation
- Robustness to changes in the infrastructure
- Isolation of SSR specific functionality
- Commonality and compatibility with other Grid initiatives

Evaluation of the use of COTS or proprietary systems
Define prototype implementation plan
- Select area (related to active ESA mission)
- Establish design features to be implemented

SSR prototyping work led by SSL
(see next presentation)
SSR portion of SpaceGRID is a Data Grid
- Data volumes small compared to some other domains
- Complexity comes from...
  - distributed data
  - heterogeneous formats and metadata specifications
  - need to combine products
- Network throughput and latency important
- Caching strategy for efficient data mining

Re-use of EO infrastructure for Planetary?

Collaborative workshop environment
- Could AccessGRID be an answer?