



Rutherford Appleton Laboratory

Space Science and Technology Department

- 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
 - Scalers, 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 environment can help

working



Solar System Research

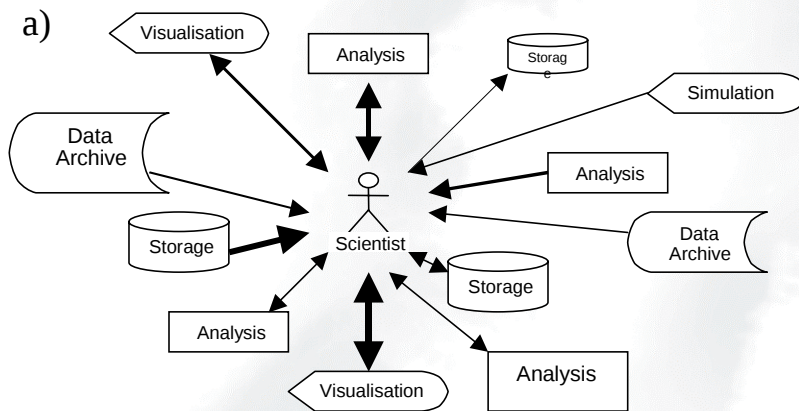
An example

- 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

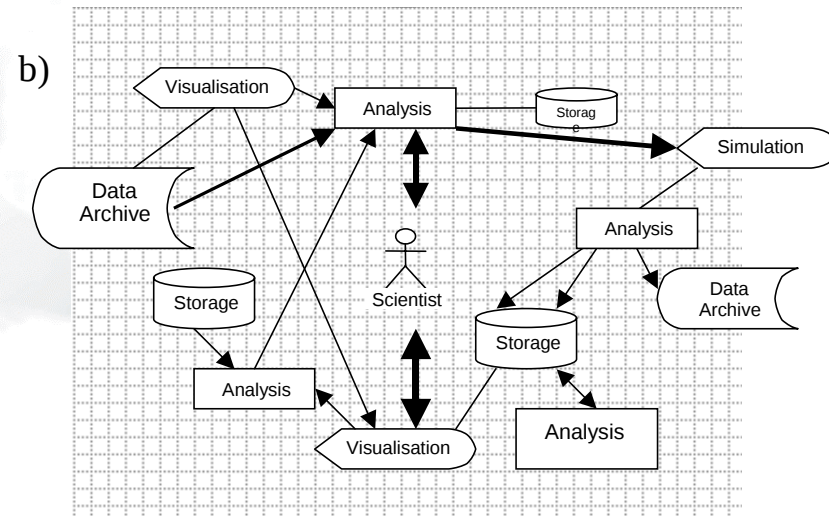


Solar System Research

An example



Current situation

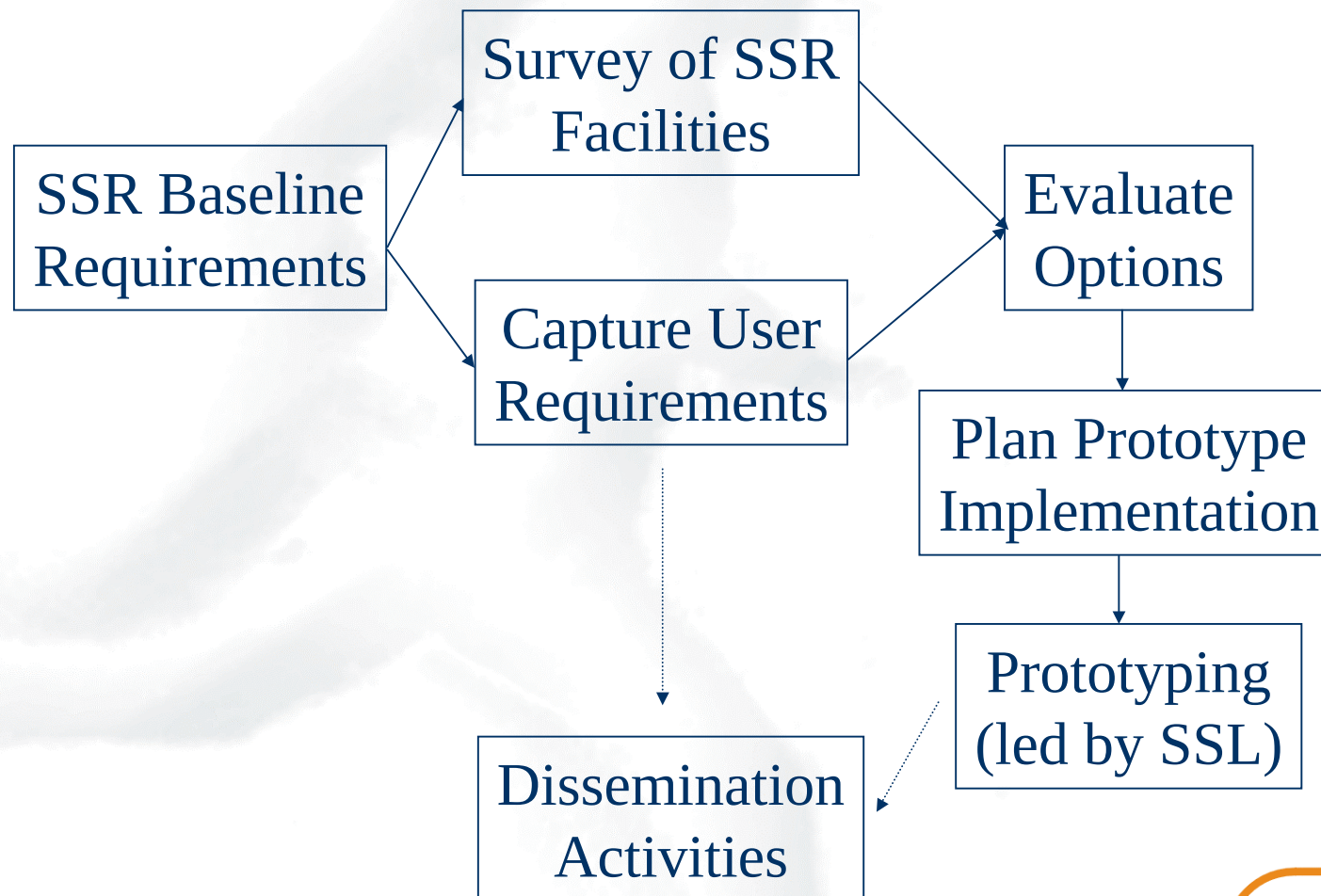


SpaceGRID



Solar System Research

Activities & Approach





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



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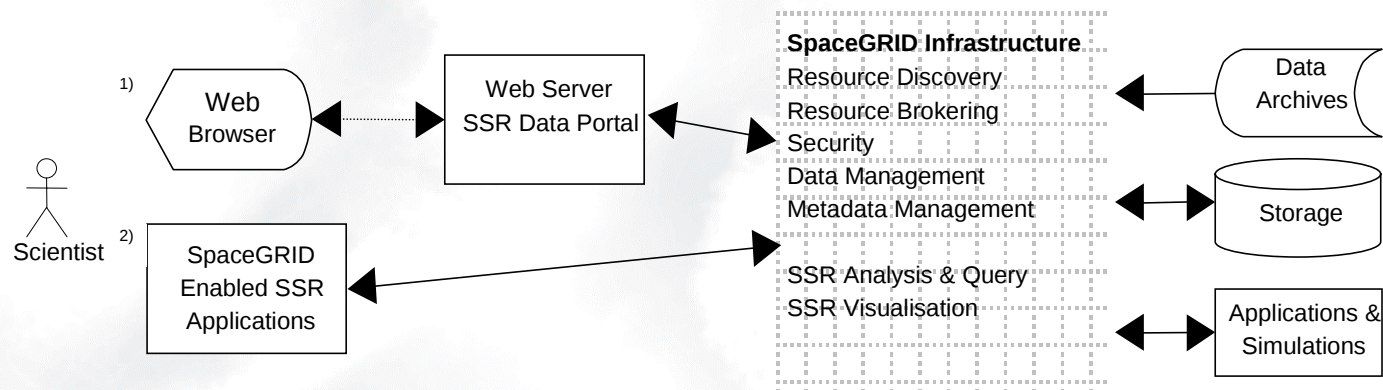
Implementation Options

- 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



Solar System Research Prototyping

- 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)



Solar System Research

Infrastructure Analysis

- 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?