6. Side ESA actions related to GRID

1. Welcome and introduction (15m)
2. WP9 – Earth Observation Applications (50m)
3. ESA and WP9: infrastr, appl, TB 0/1 (50m)
4. Demonstration of EO applications (45m)
5. ESA and WP9: scale up, effort, recovery plan (50m)
6. Side ESA actions related to GRID (30m)
7. Reviewer separate meeting (60m)
8. Conclusions (30m)

ESA DataGrid Review
Frascati, 10 June 2002

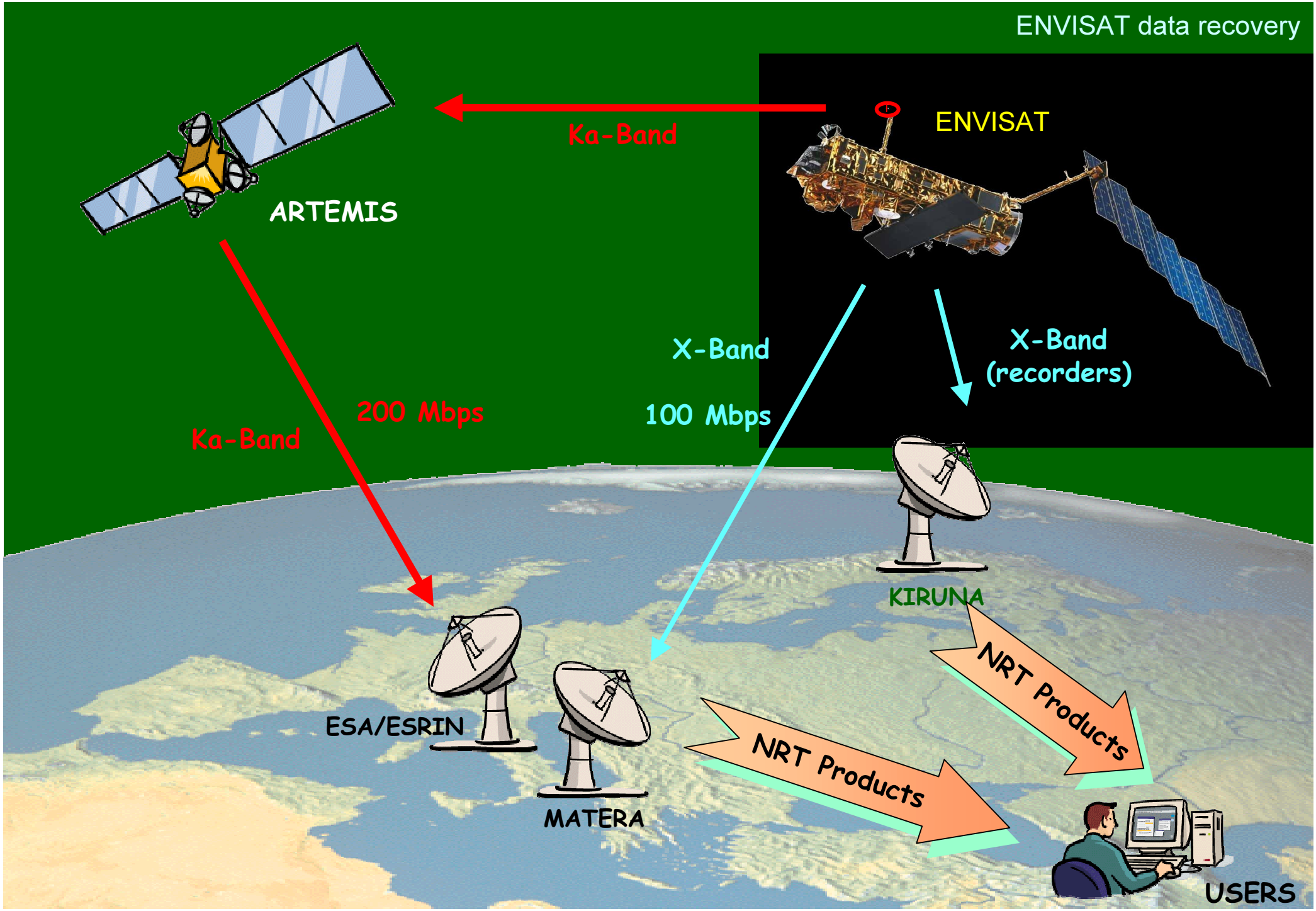
Summary

- GRID internal ESA promotion
- CEOS and GRID
- Compatible technologies to interface/integrate
  - MASS
  - Large EO database and Interoperability
  - OpenGIS and Web Services

ESA internal GRID promotion

http://esagrid.esa.int

- ESA Internal Grid Initiative
  - few key departments are now participating (after first year)
  - Participation to EIROFORUM GRID GROUP
- Access to high speed research network
  - Complementarity with Corporate network (EQUANT),
  - GEANT access: ESTEC, KIRUNA, ESRIN …
  - space links for data dissemination …
- Distributed ESA internal GRID infrastructure
  - A second DataGrid ESA node planned to be installed at ESTEC

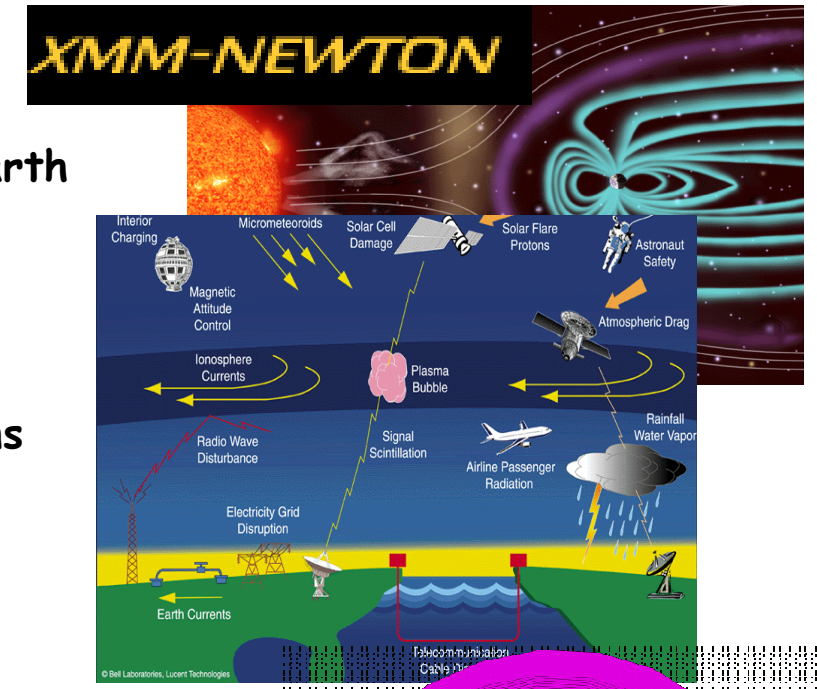

ENVISAT data recovery
ENVISAT
Ka-Band
ARTEMIS
X-Band
(recorders)
X-Band
100 Mbps
Ka-Band
200 Mbps
KIRUNA
ESA/ESRIN
MATERA
NRT Products
NRT Products
USERS

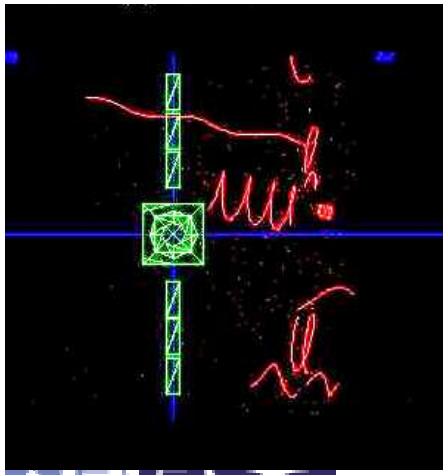
SpaceGRID: 1st ESA funded GRID study!

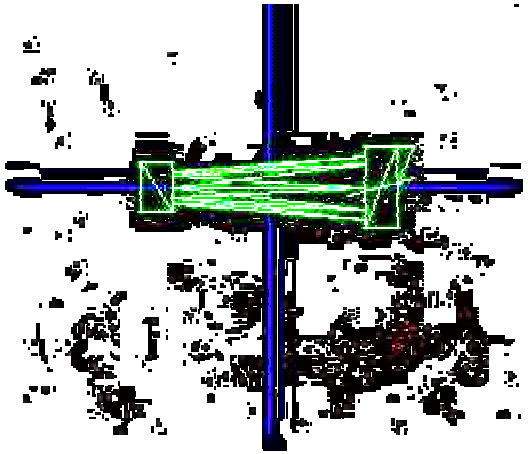
- Assess how GRID technology can serve requirements across a variety of space disciplines
- Foster collaboration and enable shared efforts across space applications
- Sketch the design of an ESA-wide (and common) GRID infrastructure
- Proof of concept through prototyping
- Involve both industry and research centres

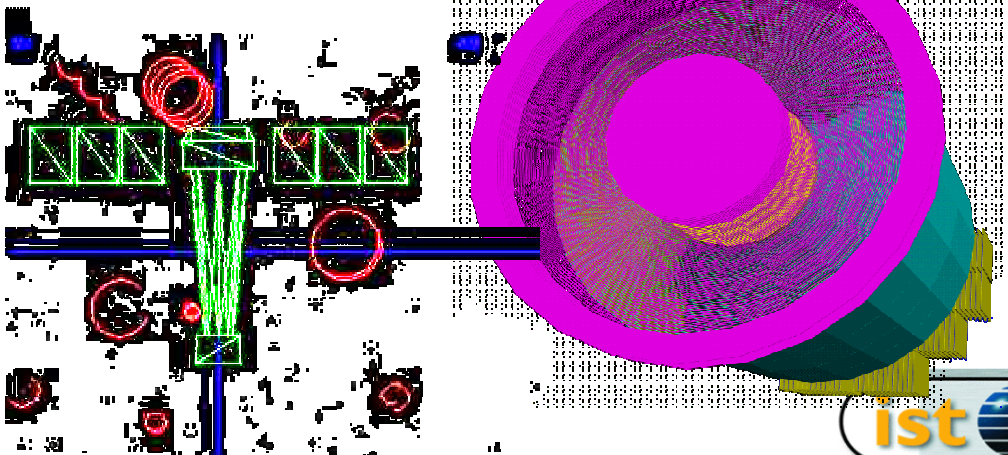
SpaceGRID: Space science applications

- **Space Weather Simulation:**
  - Simulation of a Coronal Mass Ejection and interplanetary shock from the Sun to the Earth and subsequent effects on the Earth's magnetosphere
- **Geant4 Application:**
  - simulation of high energy particle interactions inside a spacecraft system, components or detector
- **Spacecraft/Plasma Simulation**









SpaceGRID: Spacecraft Engineering Analysis

- Large scale parametric stochastic analyses and design optimisation
- Multi-discipline Phase B/C/D analyses
- Concurrent / collaborative / multi-site e-engineering"
- Fine mesh analysis / results post-processing
- NURBS faces/elements analyses

SpaceGRID: Earth Science Analysis

- Future EO G/S requirements
- Collaborative environments demo

Other ESA Initiatives related to GRID

- Virtual Institutes for International Space Station Utilisation
- PLANCK/IDIS: High-rate data transfer to Multiple sites of 1-GB Maps
  - includes: MPS, Garching, Paris, OAT/Trieste, Cantabria
- Helio-seismology data retrieval: Daily Solar Images
- Concurrent Design Facility
- ESA Virtual Archive

ESA GRID future perspectives

- Provide a more responding GRID architecture model for Space Applications
- Invest in Building Blocks to Create a set of Attractive Tools (make Grid "touchable")
- Involve "educational" and General Public Institutions
- Contribution to EIROFORUM GRID Group:
  - Foster Relations in various domains to achieve a common European Grid Infrastructure
  - Promote e-collaboration across disciplines
  - Examine Industrial Readiness in Europe

Preparation of an ESA internal "GRID labeled" programme is an issue

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Committee on EO Satellites - CEOS

- CEOS is the International forum related to Earth Observation with the participation of:
  - Space Agencies, e.g. ESA, NASA, NASDA, NOAA … (data providers)
  - International "earth science" related institutions and research groups, e.g. UNEP, IGOS,WCRP, IGBP, … (data users)
- Includes technical working group for information systems and services
  - Propose standards, … co-operation projects, …
  - Specialised task teams on new earth science related technologies, e.g. interoperability

Considerations for CEOS "involvement" in GRID

- First dedicated meeting in Frascati 6-7 May, next meeting in Wash DC 25-27 June, …
  - Define 1-2 testbed cases (across Atlantic),
  - active role of NASA and ESA to build on DataGrid and DataTag
- "gridding" of EO emerging technologies and services
  - Catalogue Interoperability, EO data format handling, Archive management
  - Web-mapping
- Demonstrate GRID applications
  - To support key earth science International projects (e.g. GODAE, UN)
  - collaborative environment
- Support "CEOS standardisation" approach to metadata and data access

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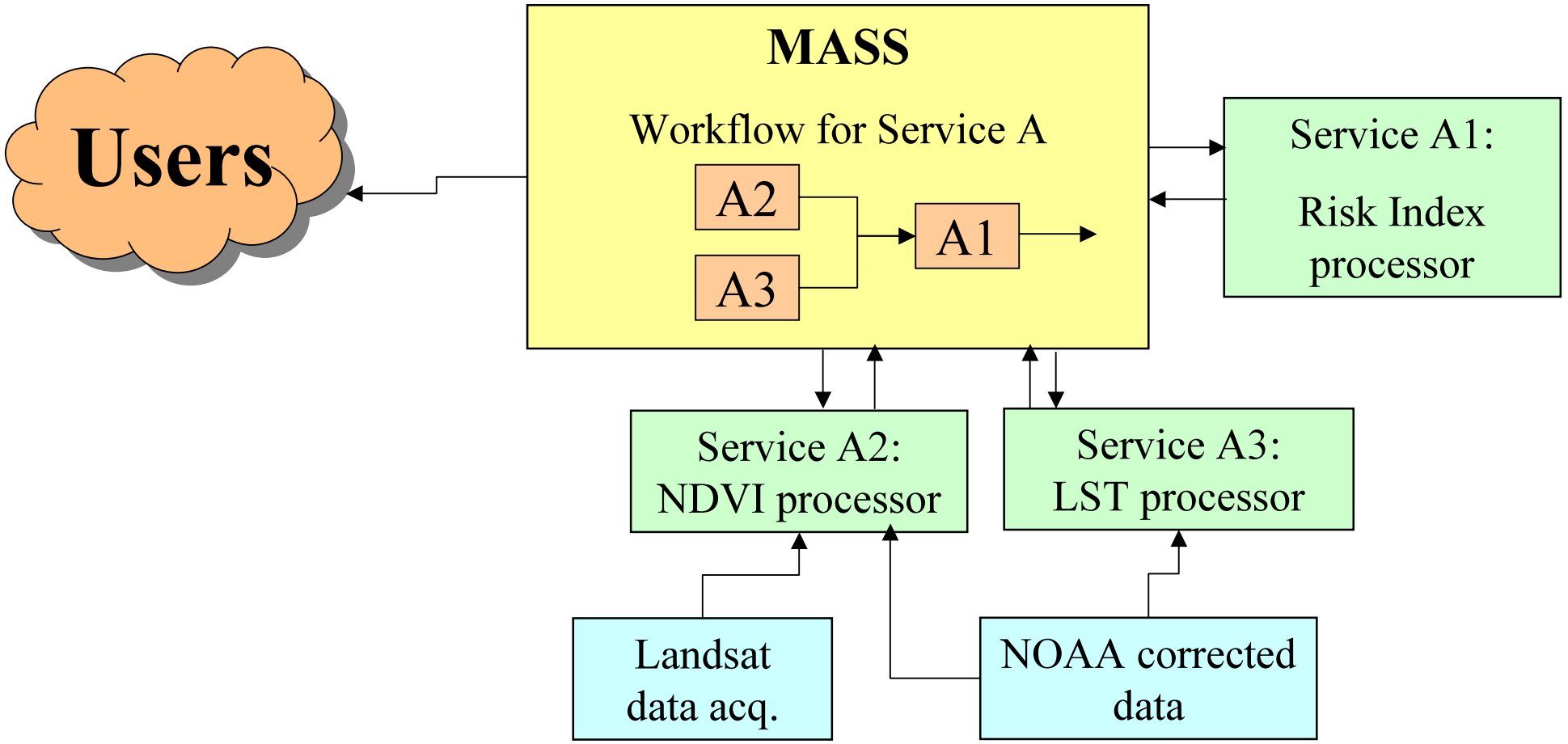
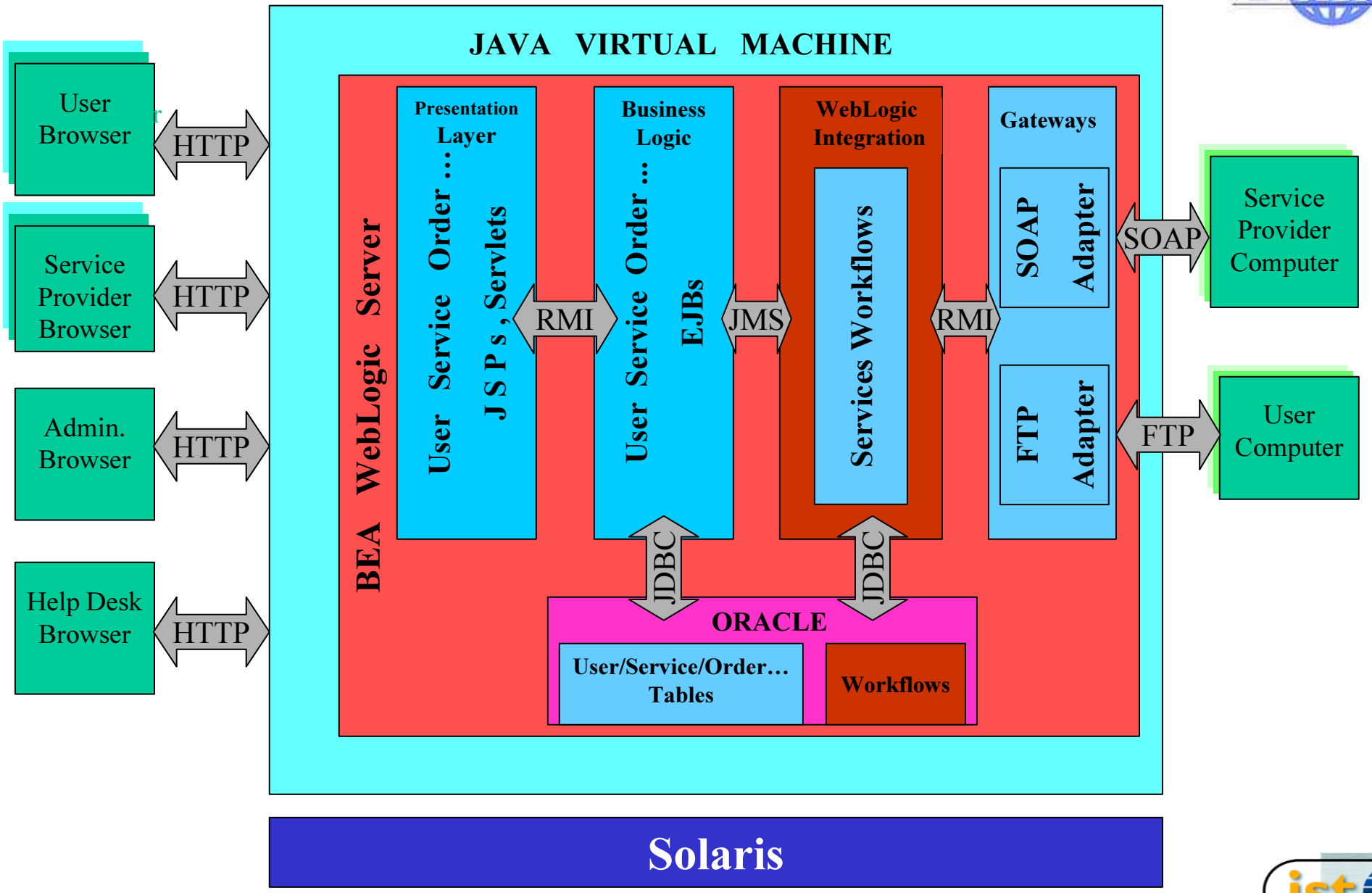
MASS (Multi Application Services System) Objectives

Not (yet) based on GRID!

- a B2B technological demonstrator (ESA funded, SpaceBel (B), 2000 K€, following old idea … 2000)
- Provide an e-business architecture for the integration of Earth Observation services
- Create a real EO Portal
- Integrate services ranging from a simple function to end-to-end Services
- MASS Architecture based on protocols
  - extensible, customisable, scalable and maintainable
  - distributed and component-based.

MASS Concepts



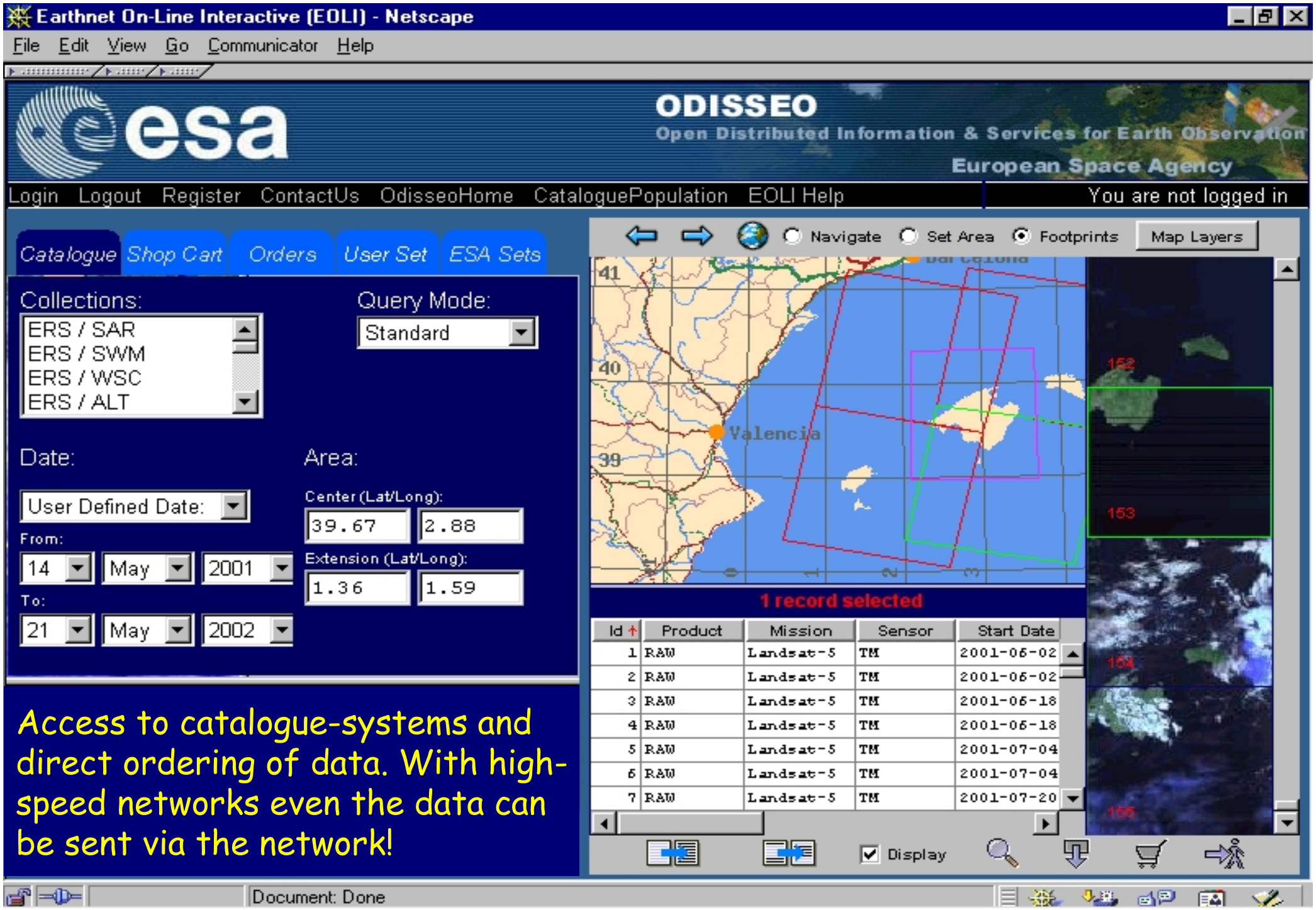

JAVA VIRTUAL MACHINE
BEA WebLogic Server
Presentation Layer
User Service Order …
JSPs, Servlets
Business Logic
User Service Order …
EJBs
WebLogic Integration
Services Workflows
Gateways
SOAP Adapter
FTP Adapter
RMI
JMS
RMI
JDBC
JDBC
ORACLE
User/Service/Order… Tables
Workflows
User Browser
Service Provider Browser
Admin. Browser
Help Desk Browser
HTTP
HTTP
HTTP
HTTP
SOAP
FTP
Service Provider Computer
User Computer
Solaris

MASS Protocols

- Protocols for service plug-in:
  - XML Schema for service
  - WSDL (not yet supported by workflow tool)
  - XSL stylesheet for input/output presentation
  - T3 (+HTTP tunneling) for workflow client tool
- Protocols communication MASS - Service
  - SendRfq, CheckRfq, GetRfq, SendOrder, CheckOrder, GetOrder
  - SOAP 1.1/HTTP
  - MASS XML Schema, includes ESRIN oi.xsd schema.

MASS Protocols (cont'd)

- **Protocols MASS - User**
  - HTTP: communication with MASS Internet Portal.
  - FTP: to provide input (image) files to MASS and to retrieve products from service provider server.
- **Service Results:**
  - Service/Function results are XML messages from MASS point of view
    - presented as HTML (via XSLT) to user.
    - or processed as XML by workflow engine.
  - May refer to products stored on FTP server



Access to catalogue-systems and direct ordering of data. With high-speed networks even the data can be sent via the network!

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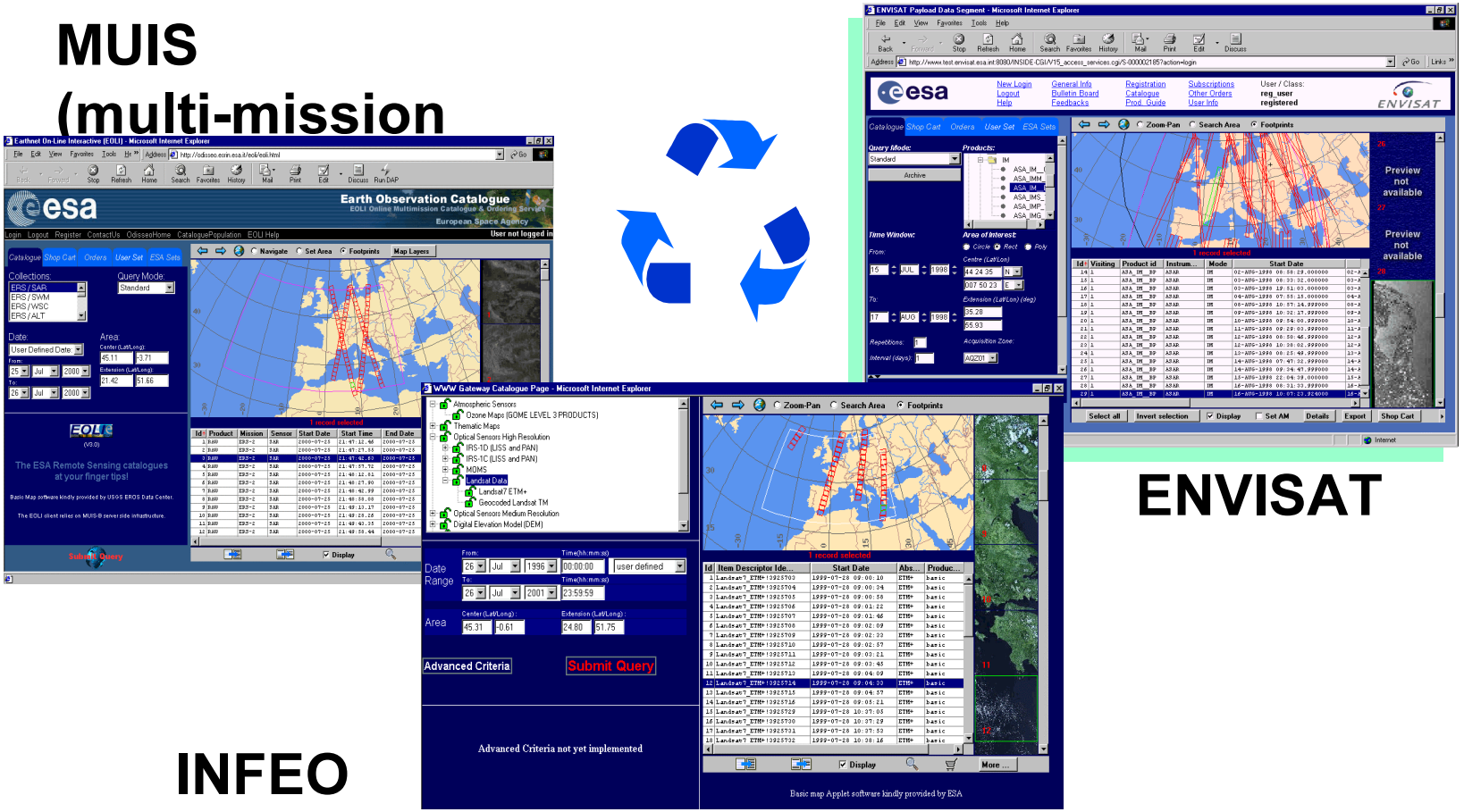
EO large databases and Interoperability across data servers – coherent user i/f



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Oil spill monitoring near the Suez canal (ESA).
On the background 1x1 km^2 MODIS (NASA).

The ESA Web map server offers access to multiple globally distributed databases (e.g., NASA and ESA). The need for fast access to large volumes of data requires usage of high-speed networks..