

Space Applications Services

RARE / Prod-Trees Projects

www.spaceapplications.com

- Company Presentation
- On-Going Activity: RARE
- On-Going Activity: Prod-Trees
- Potential use of TELEIOS

Space Applications Services NV



- An independent Belgian company founded in 1987, with a subsidiary in Houston, USA. Staff of 70+, and growing.
- Our aim is to research and develop innovative technology, solutions and/services for the aerospace and security markets and related industries:
 - Research and develop technologies for specific domains or subsystems which may be used stand alone or integrated within an overall system.
 - Services to design, develop and integrate scientific payloads, mission critical systems, facilities and command and control centres.
 - Services to operate facilities and command and control centres and to train persons to perform operations.
- The company capabilities cover system, software and operations engineering and our activities include manned and unmanned spacecraft, launch/re-entry vehicles, monitor and control, robotics and information systems.

Organisation

SPACE APPLICATIONS SERVICES NV

AEROSPACE APPLICATIONS NORTH AMERICA INC

SYSTEMS & GROUND SEGMENT

Avionics & Embedded Systems
 Robotic Systems
 Virtual Environments & HMI
 Future Projects & Ground Segments

SOFTWARE & DATA SYSTEMS

Control & Data Centres
 Earth Observation Systems
 SW Engineering Methods
 Knowledge Management Applications

OPERATIONS

Flight Operations
 Ground Operations
 Training & Evaluation

ENGINEERING SERVICES

European Programme for Life & Physical Sciences in Space, System Engineering Service
 Mission Science and Utilisation Planning Office Service
 Payload Operations and Engineering Support
 Crew Training & Simulation

PRODUCT ASSURANCE

Process & Product Quality Assurance
 Safety & Dependability
 Software Product Assurance

MARKETING & BUSINESS DEVELOPMENT

ADMINISTRATION FINANCE CONTRACTS & PERSONNEL

Locations



European Space Research and Technology Centre
Noordwijk, The Netherlands



European Astronaut Centre
Cologne, Germany



Aerospace Applications
North America Inc.,
Houston, USA



Belgian Institute for Space
Aeronomy
Brussels, Belgium

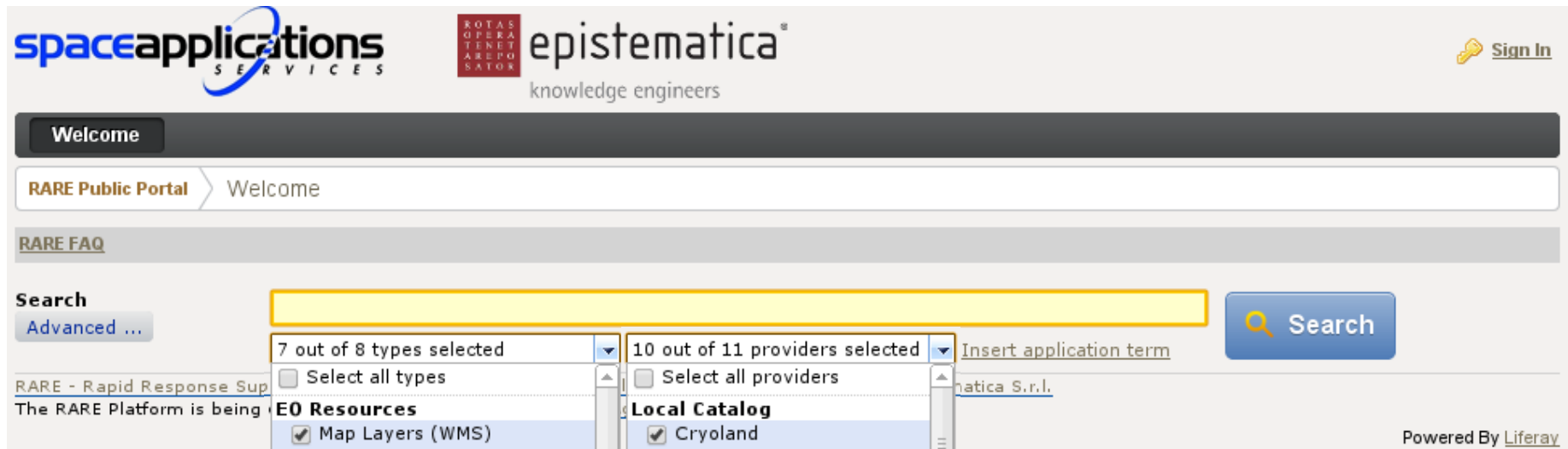


Space Applications Services NV
HQ, Zaventem, Belgium

EOS Team Activity: Rapid Response Support Server (RARE)

- Prime objective
 - develop an ontology-based resolving service for heterogeneous EO resources,
 - which integrates with existing EO facilities via standardized protocols and
 - provides users with a web interface for textual search and graphical navigation.
- Challenges
 - Must be usable by users with no specific EO knowledge
 - Search for different types of resources in a seamless manner
 - Automatic discovery of newly published resources (harvesting)

RARE User Interface

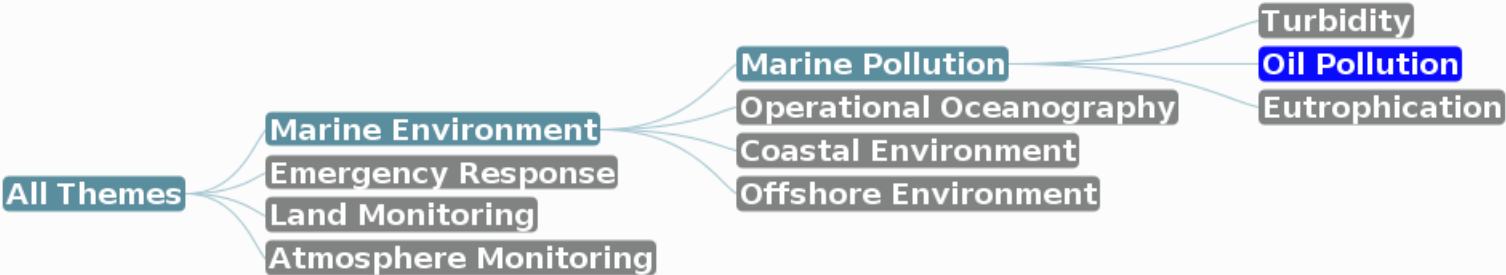


The screenshot displays the RARE User Interface. At the top, there are logos for "spaceapplications SERVICES" and "epistematica knowledge engineers". A "Sign In" button is visible in the top right. Below the logos is a "Welcome" banner. The main content area includes a "RARE Public Portal" breadcrumb, a "RARE FAQ" link, and a search section. The search section features a search bar with a "Search" button. Below the search bar, there are two filter panels: "EO Resources" and "Local Catalog". The "EO Resources" panel shows 7 out of 8 types selected, with a list of checked items: Map Layers (WMS), Feature Types (WFS), Coverage (WCS), Processors (WPS), EO Products (EOP), and Data Records (ISO/CIM). The "Local Catalog" panel shows 10 out of 11 providers selected, with a list of checked items: Cryoland, Disasters Charter, Enviro SDI, G-POD, MyOcean, and RDC-SNSF. A "Powered By Liferay" watermark is visible in the bottom right corner.

RARE Ontology Browser

View All Occurrences Cancel Use Selected Term

Oil Pollution (4 occurrences)



```
graph LR; AllThemes[All Themes] --- MarineEnvironment[Marine Environment]; AllThemes --- EmergencyResponse[Emergency Response]; AllThemes --- LandMonitoring[Land Monitoring]; AllThemes --- AtmosphereMonitoring[Atmosphere Monitoring]; MarineEnvironment --- MarinePollution[Marine Pollution]; MarineEnvironment --- OperationalOceanography[Operational Oceanography]; MarineEnvironment --- CoastalEnvironment[Coastal Environment]; MarineEnvironment --- OffshoreEnvironment[Offshore Environment]; MarinePollution --- Turbidity[Turbidity]; MarinePollution --- OilPollution[Oil Pollution]; MarinePollution --- Eutrophication[Eutrophication]; style OilPollution fill:#0070C0,color:#fff
```

Focus On

Oil Pollution
Contamination of any ecosystem, but usually of freshwater or marine ecosystems, by oil or other petroleum products.

RARE User Interface

EO Resources

Select ...

272 results
(13.39 seconds)

Footprints

Thumbnails

Details

Types

EO products (4)

Map layers (71)

Feature layers (57)

Coverage layers (140)

Providers

Not defined (227)

Disasters Charter (3)

Enviro SDI (34)

Disaster Charter (2)

MyOcean (6)

Sort

▲ Relevance

Resource Type

Area of Interest



Time of Interest

Harvesting Date

[EO Product] UK-DMC → OPTICAL - Sun Nov 18 2012 09:57:59 GMT+0100 (CET) XML


Acquisition information

- Product type: DMCII
- Platform: UK-DMC
- Instrument:
- Sensor type: OPTICAL
- Begin position: Sun Nov 18 2012 09:57:59 GMT+0100 (CET)
- End position: Sun Nov 18 2012 09:58:03 GMT+0100 (CET)
- Orbit type: LEO


[Coverage] Atmospheric Infrared Sounder (AIRS) data from NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) → TotCldLiqH2O_A XML

Mean total integrated column cloud liquid water in kg/m2, for ascending orbits.




[Coverage] Atmospheric Infrared Sounder (AIRS) data from NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) → AIRX3STD:ascending:TotH2OVap_A XML

Total integrated column water vapor burden, in kg/m2, for ascending orbits.



[Coverage] Atmospheric Infrared Sounder (AIRS) data from NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) → Total Ozone for Ascending Orbit XML

The total integrated column ozone burden parameter (in Dobson Units), from the AIR IR and AMSU without HSB level 3 daily gridded product. The values cover a temporal period of



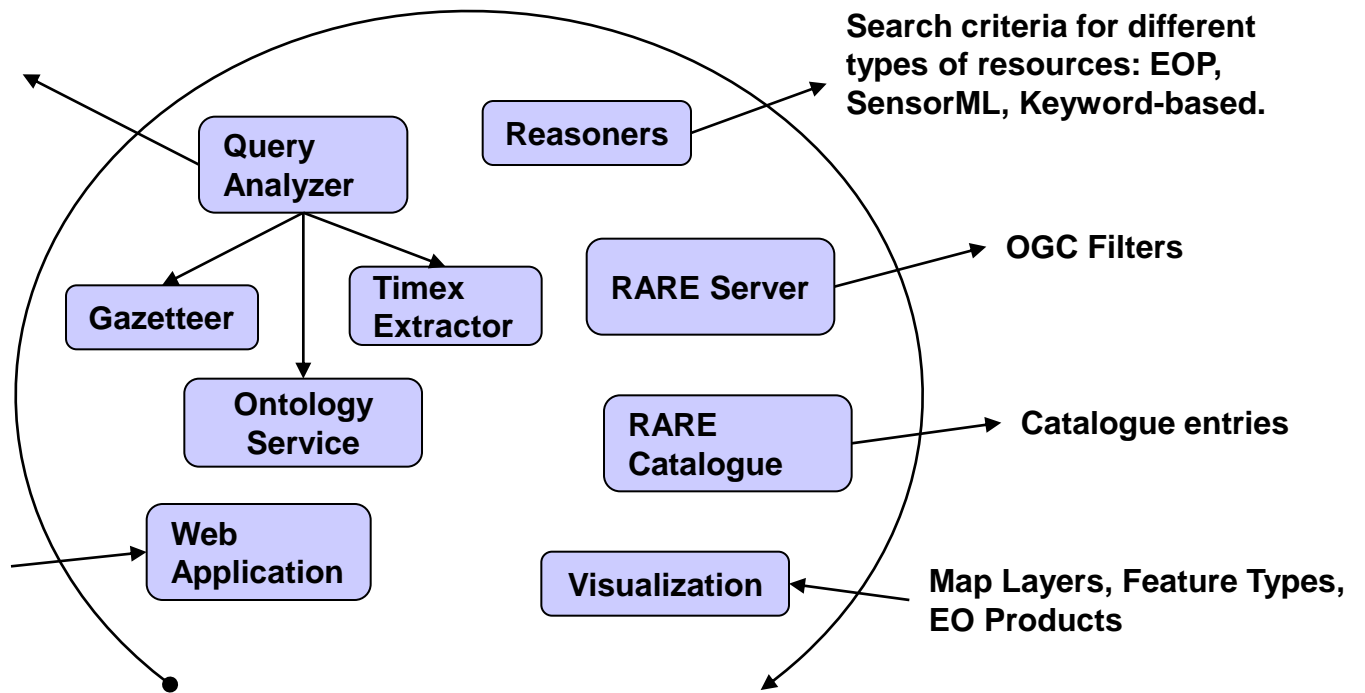
RARE Example Workflow: *Disaster London*

disaster »» Ontology Concept:
The result of a vast ecological
breakdown

london »» Toponym:
capital of UK (GeoNames)
»» bounding box

Search terms:

disaster **london**
AT GT



AT: Application Term
GT: Geographical Term / Toponym

RARE – Query Analyzer / Disambiguation Data

- Pseudo search query: "<token-1> <token-2>"
- SOAP-based interface
- Pseudo response:

```

{"DisambiguationData": {
  "Interpretation": [{"t0", "sid1"}, {"t2", "sid1"}],
  "t0": ["<token-1>", ["sid1", "sid2", "sid3"],
    {"sid1": {"<token-1-sense-1-data>}},
    {"sid2": {"<token-1-sense-2-data>}},
    {"sid3": {"<token-1-sense-3-data>}}
  ],
  "t2": ["<token-2>", ["sid1", "sid2"],
    {"sid1": {"<token-2-sense-1-data>}},
    {"sid2": {"<token-2-sense-2-data>}}
  ],
  "t0 t2": ["<token-1> <token-2>", ["sid1"],
    {"sid1": {"<token-1+2-sense-1-data>}}
  ],
  "NormalizedQuery": "<NormalizedQuery-XML>"
}}
```

RARE – Reasoners / Rule Interchange Format (W3C)

- Example query:

http://rare.spaceapplications.com/RARE-EORR/Eorr_EOGML?term=Volcanic_Eruption

```

<Formula>
  <Implies>
    <if> <Equal>
      <left><Var>term</Var></left> <right><Const type="xsd:string">Volcanic_Eruption</Const></right>
    </Equal> </if>
    <then> <And>
      <formula> <Equal> <left>Sensor Type</left> <right>OPTICAL</right> </Equal> </formula>
      <External>
        <content> <Atom>
          <op>
            <Const type="rif:iri">http://www.w3.org/2007/rif-builtin-predicate#numeric-less-than-or-equal</Const>
          </op>
          <args ordered="yes">
            <Var>Sensor Resolution</Var> <Const type="xsd:string">10</Const>
          </args>
        </Atom> </content>
      </External>
    </And> </then> </Implies>
</Formula>

```

RARE – Reasoners / Translation Tables (Here: EOP/EO-GML)

```

<application_requirement xmlns:xsd="http://www.w3.org/2001/XMLSchema#" term="Sensor Type">
  <related_OGC_06-131_term>
    /eop:EarthObservation/gml:using/eop:EarthObservationEquipment/eop:sensor/eop:Sensor/eop:sensorType
  </related_OGC_06-131_term>
</application_requirement>

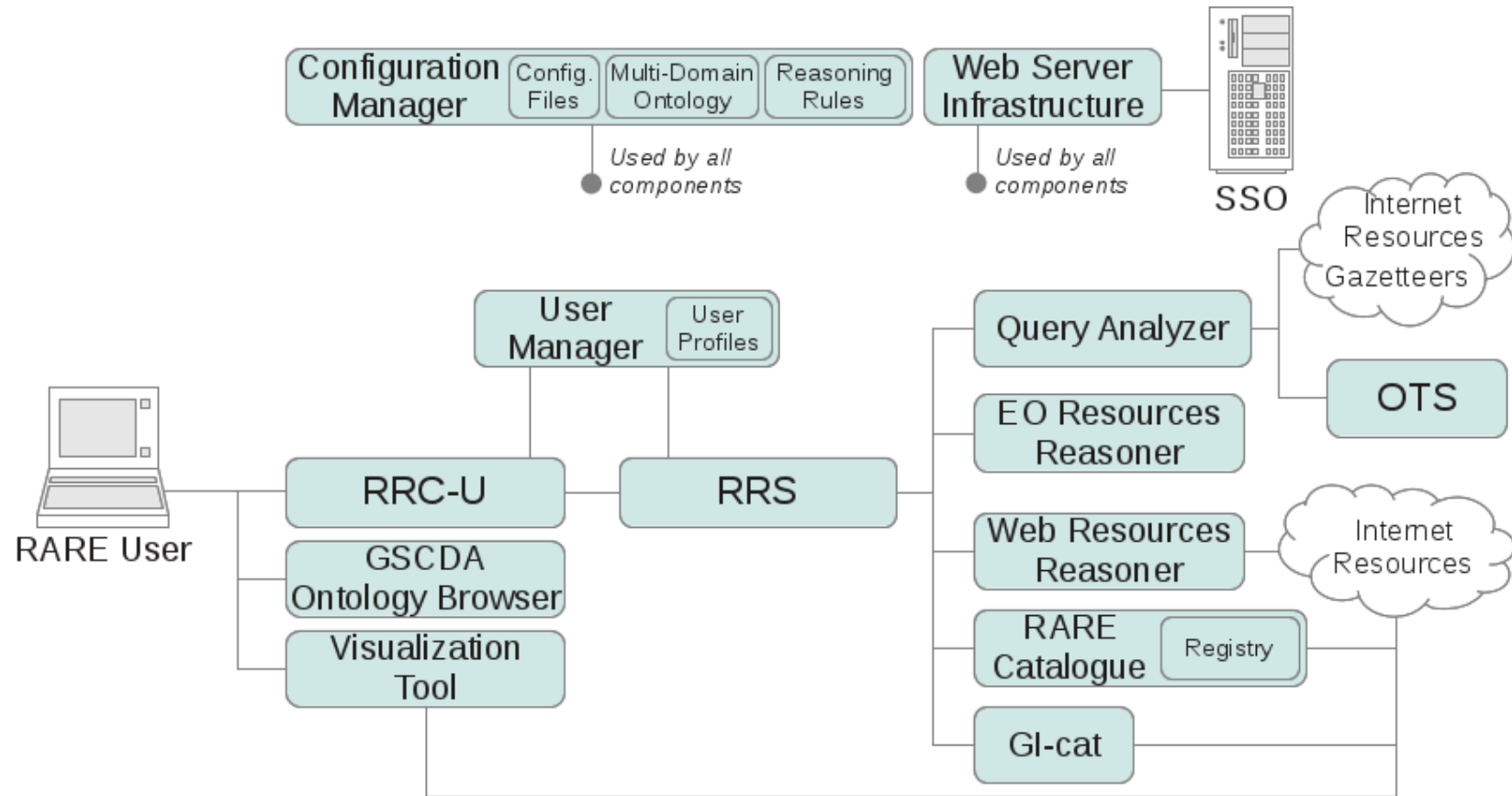
<application_requirement xmlns:xsd="http://www.w3.org/2001/XMLSchema#" term="Sensor Operational Mode">
  <related_OGC_06-131_term>
    /eop:EarthObservation/gml:using/eop:EarthObservationEquipment/eop:sensor/eop:Sensor/eop:operationalMode
  </related_OGC_06-131_term>
</application_requirement>

<application_requirement xmlns:xsd="http://www.w3.org/2001/XMLSchema#" term="Sensor Resolution">
  <related_OGC_06-131_term>
    /eop:EarthObservation/gml:using/eop:EarthObservationEquipment/eop:sensor/eop:Sensor/eop:resolution
  </related_OGC_06-131_term>
</application_requirement>

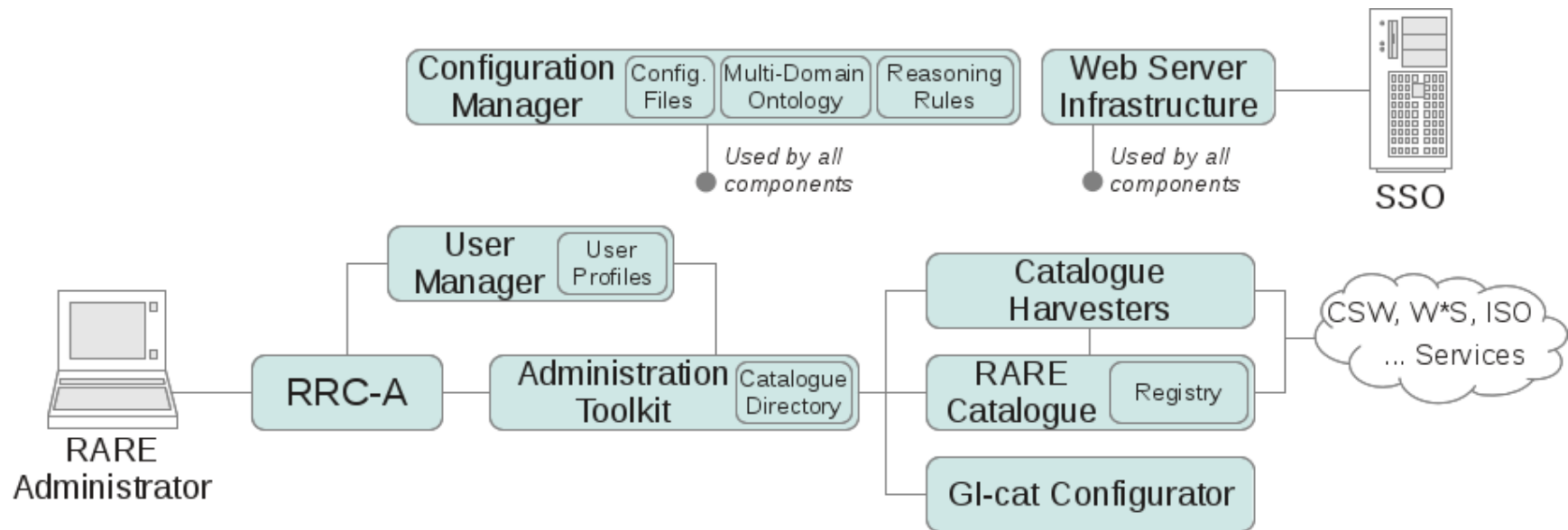
<application_requirement xmlns:xsd="http://www.w3.org/2001/XMLSchema#" term="Datalayer Species">
  <related_OGC_06-131_term>
    /atm:EarthObservation/gml:resultOf/atm:EarthObservationResult/atm:dataLayers/atm:DataLayer/atm:specy
  </related_OGC_06-131_term>
</application_requirement>

```

RARE – Architecture (User View)



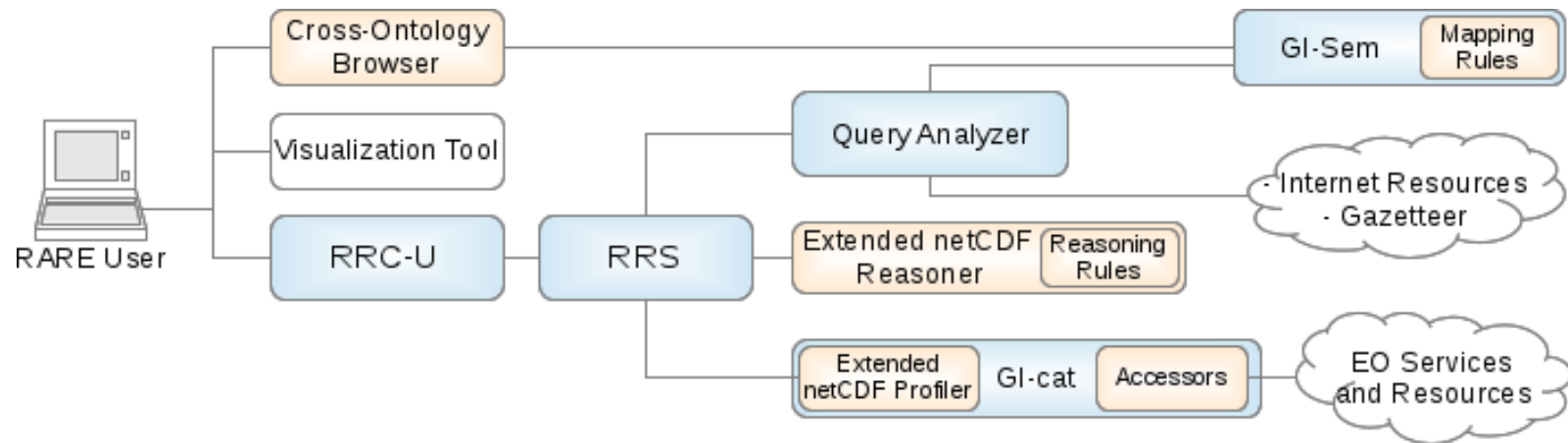
RARE – Architecture (Admin View)



EOS Team Activity: Prod-Trees

- Objective: specify an EO extension to the current netCDF standard with descriptive metadata compliant with state-of-the-art ontologies, develop and extend supporting libraries and tools, and demonstrate the outcome in a semantically-enabled EO products search platform.
- Implementation
 - Questionnaire, Validation Use Cases, Validation Group, Dissemination
 - Coordination with OGC CF-netCDF SWG, Earth System Science (ESS) DWG, ESA CCI
 - Envisaged ontologies: GSCDA, GEOSS, GEMET, GCMD
 - Demonstrator re-using RARE components
 - Extended software libraries and tools: Java API, GI-cat for supporting the EO convention
 - New or non-netCDF software components: cross-ontology browser, reasoner
 - netCDF software tools extended for supporting the work and facilitating the adoption (ncgen, ncview, ncBrowse, nccomp, etc.)

Prod-Trees – Proposed Architecture



Potential Use Of TELEIOS

- RARE may be extended to support new ontologies and new types of resources (netCDR products in Prod-Trees)
- Additional reasoner could support stSPARQL search criteria, allowing to query Strabon to access new types of resources

Thank you

Bernard Valentin

Bernard.Valentin@spaceapplications.com