



Inside ESPAS - How ESPAS works to let you share and find data

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Outline

- ① Interoperability – Metadata is the key
- ② The ESPAS Data Model
- ③ Supported by agreed vocabulary
- ④ Realisation in XML
- ⑤ Metadata for Data Users



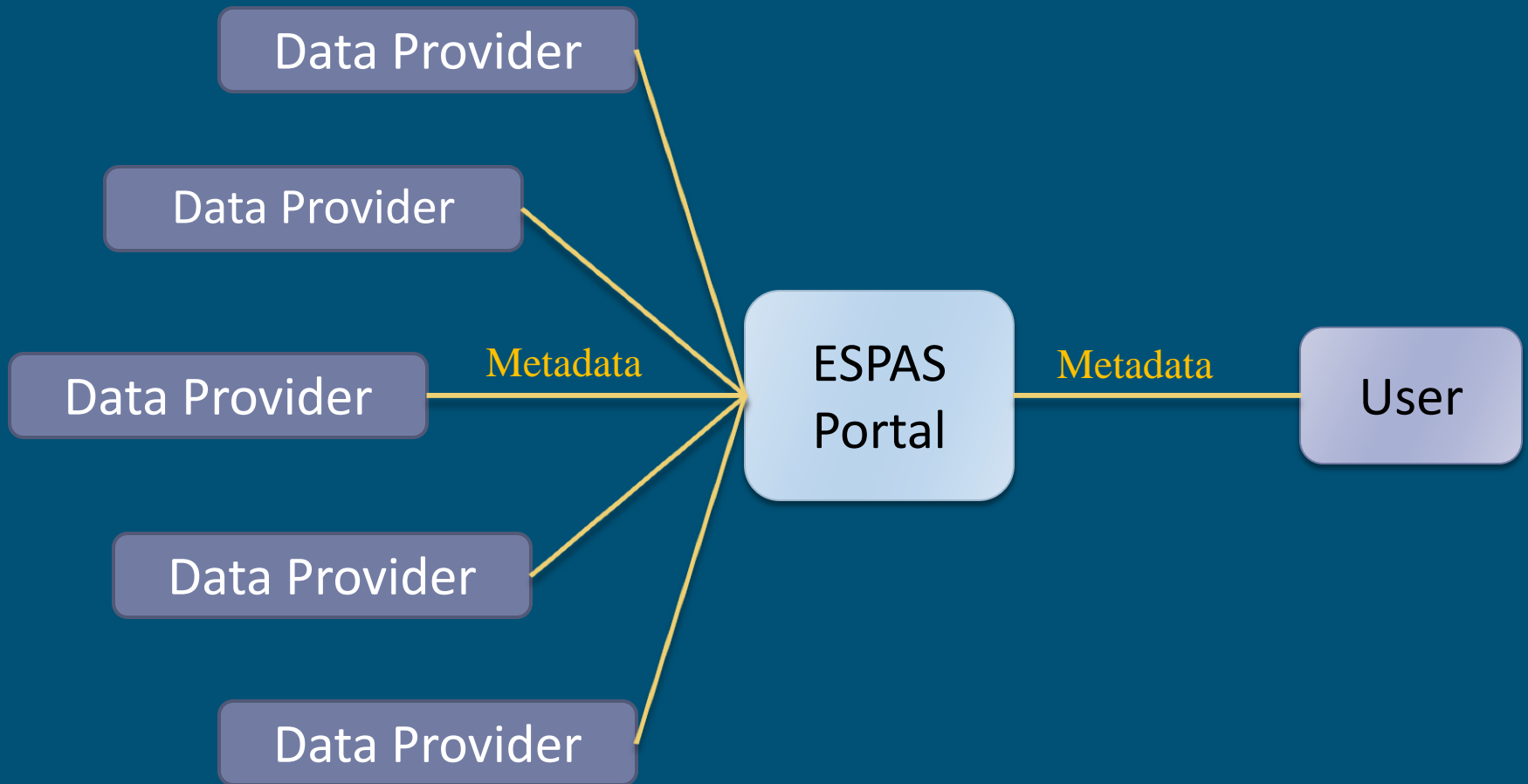
Metadata is the Key

Metadata is the key to interoperability in ESPAS

- ⦿ Data providers provide metadata to describe their data sets
- ⦿ Users use ESPAS to query metadata
- ⦿ Users use ESPAS to request data
- ⦿ ESPAS sends data request to data providers to fulfil
- ⦿ User receives a link to the data

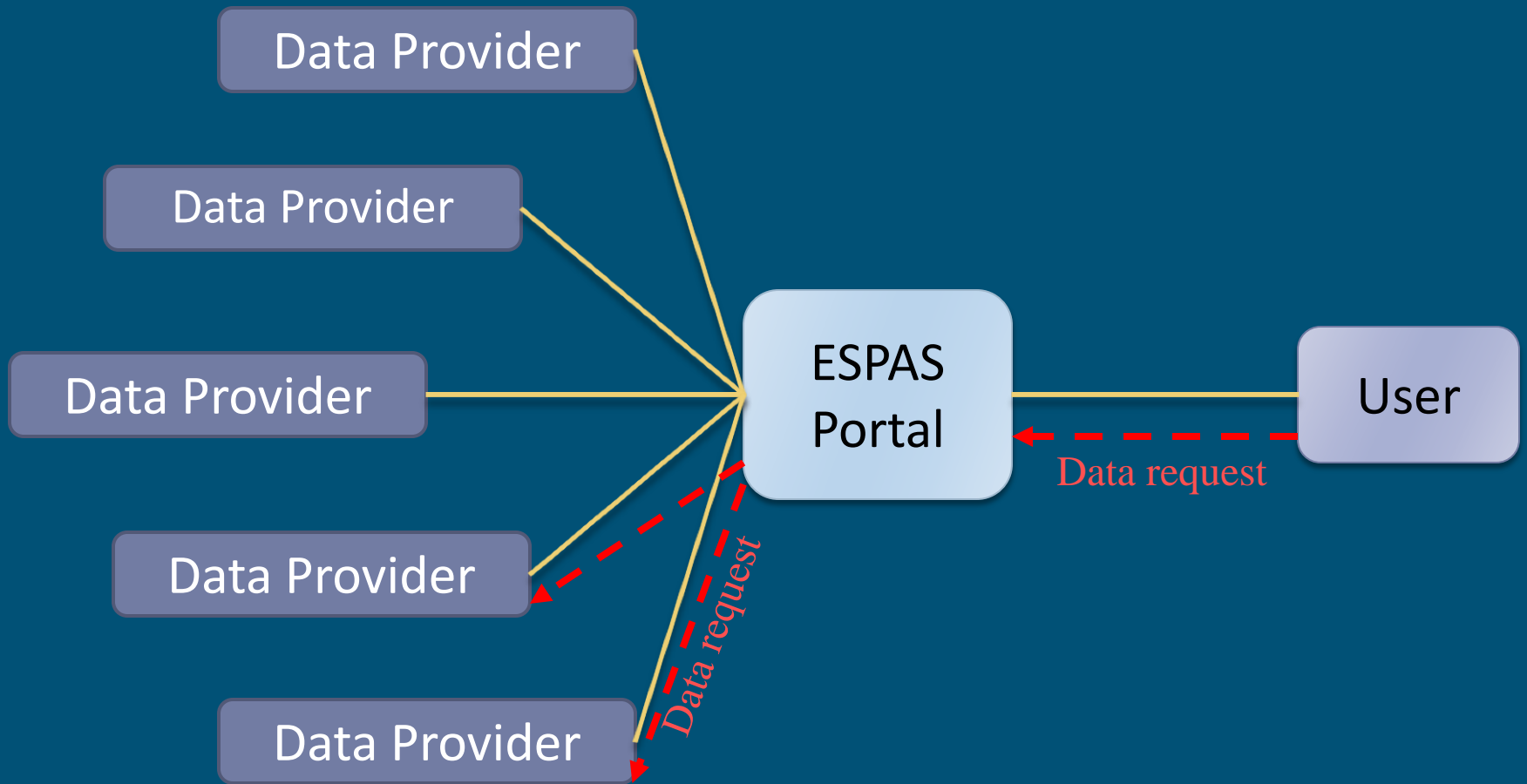


An ESPAS Data Search



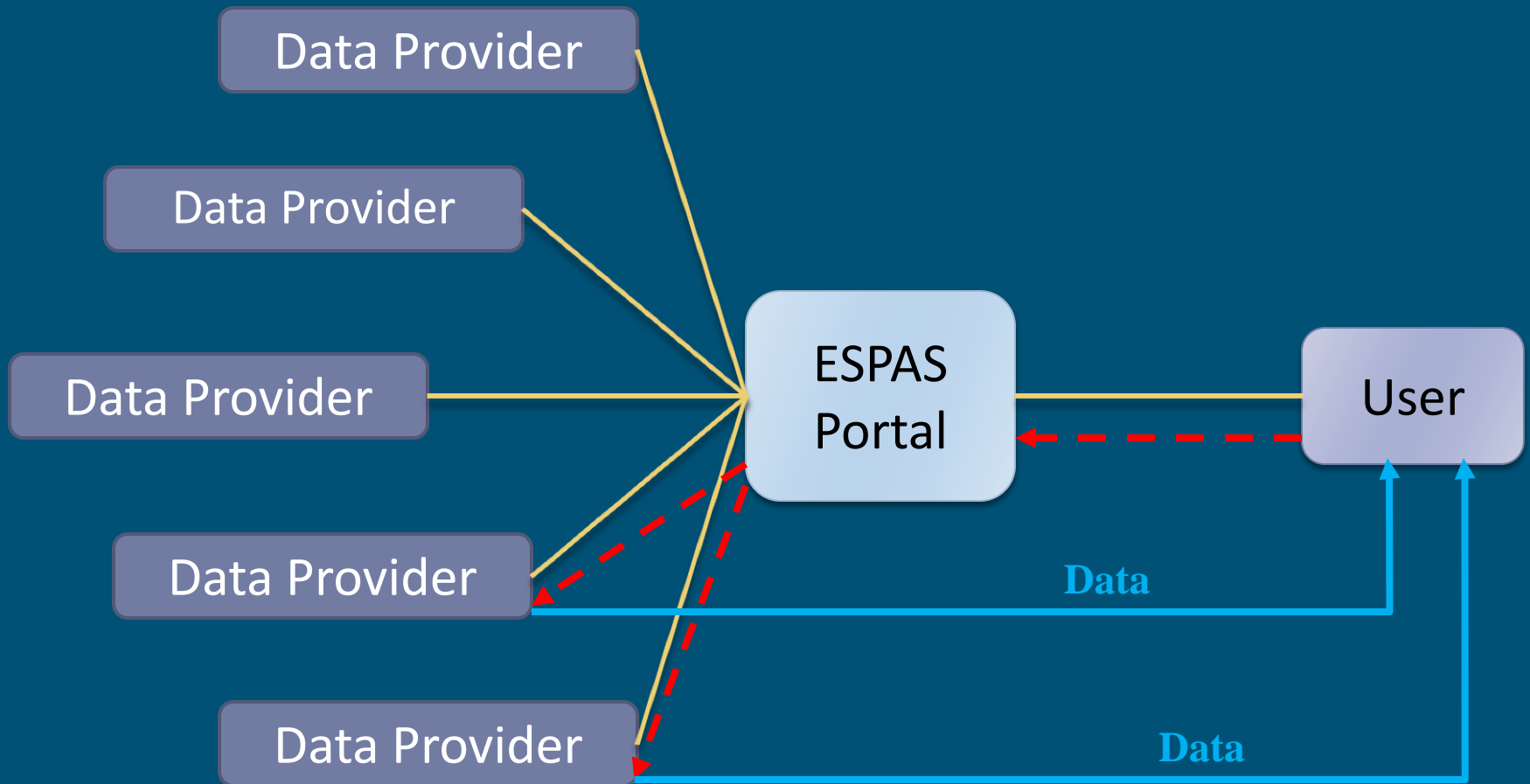


An ESPAS Data Search





An ESPAS Data Search





What do we need to answer?

- ⦿ To describe data, and to be able to find data we need to know:
 - ▶ What?
 - ▶ Where?
 - ▶ When?
 - ▶ How?
 - ▶ Who?
 - ▶ Related data?
 - ▶ Grouping?



ESPAS Data Model

- ⦿ ***Data Model models the data description by defining a series of concepts:***
- ⦿ Observation (What, Where, When, Who)
- ⦿ Process (How, Who)
- ⦿ Related Observation (Related Data)
- ⦿ Project (Grouping)
- ⦿ Observation Collection (Grouping)
- ⦿ Related Party (Who) – Individual / Organisation



Observation

- Key Concept

- The **observation** is the act that results in the estimation of the values of a property (ie data)
- Uses a **process**: a sensor, instrument, algorithm or process chain



Process

- Process can be composite, with more than one component
 - ▶ **Acquisition** – process component that interacts with the subject of the observation. Instruments, sensors. Maybe involving platforms and platform operations
 - ▶ **Computation** – process component that involves only pure computation



Further Concepts

- ⦿ **Related Observation** - related data that is useful or essential to understanding the result

- ⦿ **Groupings:**
 - ▶ **Observation Collection**
 - ▶ **Project**

- ⦿ **Related Party:**
 - ▶ **Individual**
 - ▶ **Organisation**



Use of Standards

- ⦿ The Data Model is built strictly and entirely on ISO 19100 series geographic information standards, particularly the ISO 19156 Observations and Measurements (O&M) standard.
- ⦿ This standard introduces the concept of the ‘**observation**’
- ⦿ Following this approach the data which ESPAS model is aimed at describing is always considered as observation results and the observation together with its properties provide relevant metadata.



The ESPAS Ontology

Consistent metadata is supported by the development of an agreed vocabulary

- ▶ [Component](#)
- ▶ [Composite Observed Property](#)
- ▶ [Compressed Representation](#)
- ▶ [Computation Type](#)
- ▶ [Co-ordinate Reference System](#)
- ▶ [Dimensionality Instance](#)
- ▶ [Dimensionality Timeline](#)
- ▶ [Feature of Interest](#)
- ▶ [Instrument Type](#)
- ▶ [Interaction](#)
- ▶ [Licence](#)
- ▶ [Measurand](#)
- ▶ [Observed Property](#)
- ▶ [Phenomenon](#)
- ▶ [Platform Type](#)
- ▶ [Projection](#)
- ▶ [Propagation Mode](#)
- ▶ [Qualifier](#)
- ▶ [Related Observation Role](#)
- ▶ [Related Party Role](#)
- ▶ [Result Accumulation](#)
- ▶ [Result Data Format](#)
- ▶ [Service Function](#)
- ▶ [Status](#)
- ▶ [Unit](#)



ESPAS Ontology – SKOS Server

Simple Knowledge Organisation System

XML

```
▼<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:espas="http://ontology.espas-fp7.eu/espasdefinitions#" xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:owlxml="http://www.w3.org/2006/12/owl2-xml#">
  ▼<skos:Concept rdf:about="http://ontology.espas-fp7.eu/featureOfInterest/Sun">
    <skos:prefLabel xml:lang="en">Sun</skos:prefLabel>
    <skos:definition xml:lang="en"/>
    <skos:inScheme rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest"/>
    <owlxml:versionInfo>0.1</owlxml:versionInfo>
    <dc:date>2012-10-02 12:00:00.0</dc:date>
    <skos:narrower rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest/Sun_Chromosphere"/>
    <skos:narrower rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest/Sun_Corona"/>
    <skos:narrower rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest/Sun_Interior"/>
    <skos:narrower rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest/Sun_Photosphere"/>
    <skos:narrower rdf:resource="http://ontology.espas-fp7.eu/featureOfInterest/Sun_Transition_Region"/>
  </skos:Concept>
</rdf:RDF>
```

Definition of Sun, from the featureOfInterest vocabulary
Sun has narrower definitions, for example Sun_Photosphere



ESPAS Ontology - Viewer

observedProperty ▾ Show Vocabulary

ESPAS Observed Property

Observed Property describes the Phenomenon for which the Observation result provides an estimate of its value.

Parabolic-approximation F2 layer semi-thickness (yF2)

Definition: The semi-thickness of the F2 layer in assumption of a parabolic layer
Ontology server link: http://ontology.espas-fp7.eu/observedProperty/SemiThickness_F2-Layer_Parabolic
Version: 0.1
Date: 2013-06-01 21:30:00.0
[Show ontology entry](#)
broader:

- <http://ontology.espas-fp7.eu/observedProperty/ParabolicLayerSemiThickness>

phenomenon:

- <http://ontology.espas-fp7.eu/phenomenon/Electron>

measurand:

- <http://ontology.espas-fp7.eu/measurand/SemiThickness>

qualifier:

- <http://ontology.espas-fp7.eu/qualifier/Shape>
- http://ontology.espas-fp7.eu/qualifier/Approximation_Parabolic

EM-wave Electric Field Vector Components in SC (Exyz)

Definition: Electric field vector components of electromagnetic wave in spacecraft coordinates
Ontology server link: http://ontology.espas-fp7.eu/observedProperty/EM-Wave_ElectricFieldComponentsSC
Version: 0.1
Date: 2013-06-01 21:30:00.0
[Show ontology entry](#)
broader:

- http://ontology.espas-fp7.eu/observedProperty/EM-Wave_ElectricField



ESPAS Ontology - Viewer

observedProperty ▼

Show Vocabulary

F2-layer Critical Frequency (foF2)

Definition: The ordinary wave critical frequency of the highest stratification in the F region of ionosphere

Ontology server link: http://ontology.espas-fp7.eu/observedProperty/CriticalFrequency_F2-Layer

Version: 0.1

Date: 2013-06-10 12:30:00.0

Parent scheme: [observedProperty](#)

broader:

- http://ontology.espas-fp7.eu/observedProperty/CriticalFrequency_O-Mode

phenomenon:

- <http://ontology.espas-fp7.eu/phenomenon/ElectromagneticWave>

measurand:

- <http://ontology.espas-fp7.eu/measurand/CriticalFrequency>

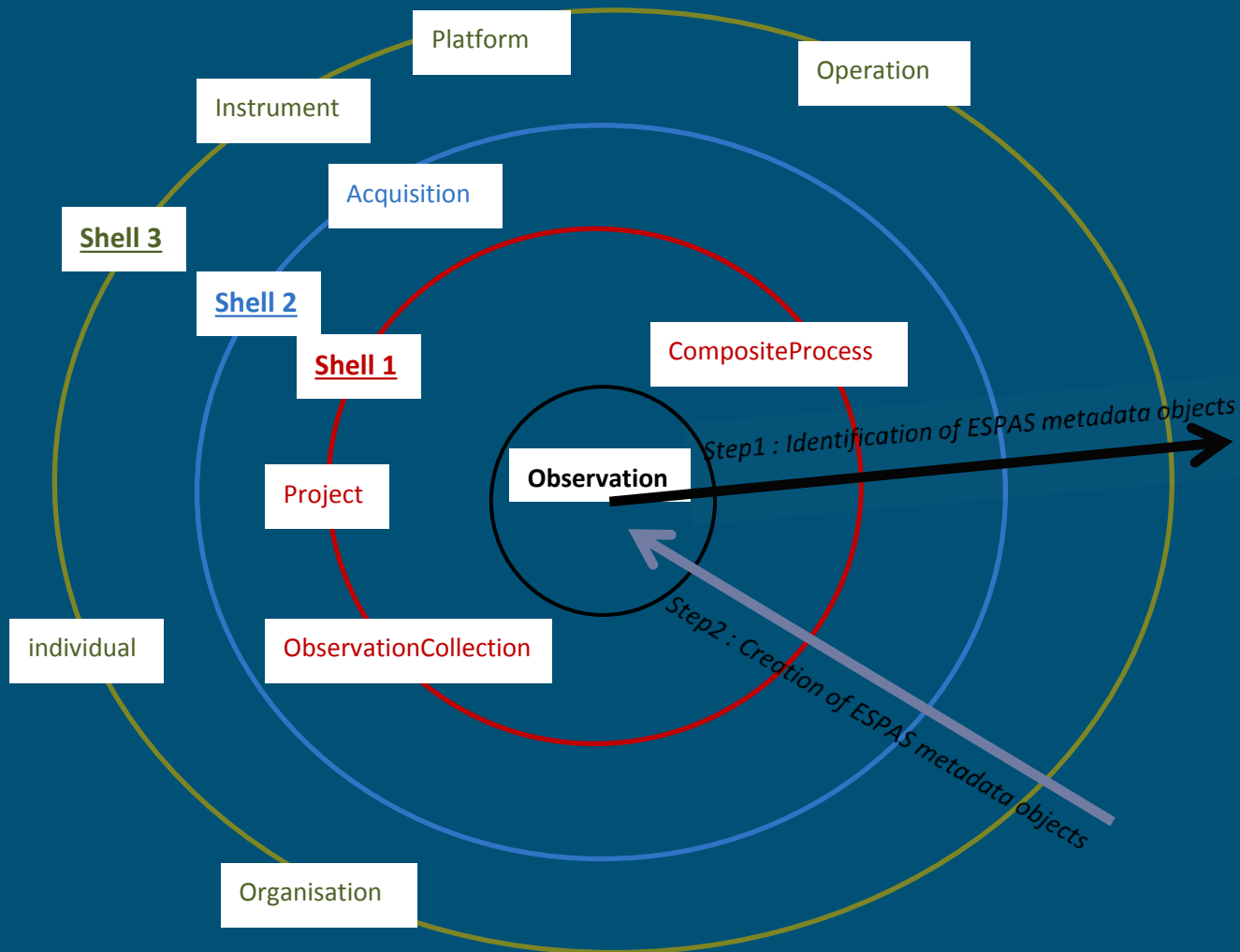


Realised in XML

- ⦿ The data model and the ESPAS metadata are realised in XML
- ⦿ Two steps to creating ESPAS metadata objects:
 - ▶ Modelling the data
 - ▶ Creating the XML
- ⦿ For data providers:
 - ▶ Registration GUI
 - ▶ XML templates
 - ▶ Guidelines



Creation of ESPAS Metadata objects





The Data Registration Tool

Hello, Sarah James | Sign Out

near earth space data infrastructure for e-science

HOME SEARCH BROWSE SUPPORT **MY ACCOUNT**

Manage Data Source

View and edit specific information related to your registered data providers

Add new entry

Individual

Edit/delete entry

Start typing to select options.

- Individuals
- Organisations
- Platforms
- Projects
- Instruments
- Operations
- Computations
- Acquisitions
- Composite Processes
- Observation Collections

Create a new Individual entry

Identifier (*)

LocalID:
SarahJames

Namespace:
ukssdc

Version:
1

Creation Date:
[Date Picker]

Last Modification Date:
[Date Picker]

Individual Info

Name (*):
Sarah James

Position Name:
ESPAS Project Manager

Organisation:
[Text Field]

IN THIS SECTION

- My Personal Info
- My Dataset File Downloads
- My Data Values Downloads
- Register Data Provider
- Manage Data Source**



The Data Registration Tool

The screenshot shows the Data Registration Tool interface. On the left, there is a form with the following sections:

- Individual Info**
 - Name (*): Sarah James
 - Position Name: ESPAS Project Manager
 - Organisation: Select organisation..
- Contact Info**
 - Contact: (dropdown menu)
 - Contact: (dropdown menu)
 - Buttons: Print XML, Save, Cancel
 - Buttons: Add new contact

At the bottom of the interface, there are two icons: "EVENTS" with a calendar icon and "PARTNER" with a group of people icon. The footer text reads: "The ESPAS Consortium - Copyright 2012" and "funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 283676."

On the right, a window titled "Individual XML" displays the following XML code:

```
<?xml version="1.0" encoding="UTF-8"?>
<espas:ESPAS_Individual
  gml:id="idvalue0"
  xmlns:espas="http://schemas.espas-fp7.eu/2.1" xmlns:gco="http://www.isotc211.org/2005/gco"
  xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gmi="http://www.isotc211.org/2005/gmi"
  xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:gss="http://www.isotc211.org/2005/gss"
  xmlns:gss="http://www.isotc211.org/2005/gss" xmlns:gts="http://www.isotc211.org/2005/gts"
  xmlns:om="http://www.opengis.net/om/2.0" xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xml="http://www.w3.org/XML/1998/namespace" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://schemas.espas-fp7.eu/2.1 http://schemas.espas-fp7.eu/xsd/2.1/espas.xsd">
  <espas:identifier owns="false">
    <espas:ESPAS_Identifier>
      <espas:localID>SarahJames</espas:localID>
      <espas:namespace>ukssdc</espas:namespace>
      <espas:version>1</espas:version>
      <espas:creationDate>2014-11-11T20:37:57Z</espas:creationDate>
      <espas:lastModificationDate>2014-11-11T20:37:57Z</espas:lastModificationDate>
    </espas:ESPAS_Identifier>
  </espas:identifier>
  <espas:name>Sarah James</espas:name>
  <espas:contactInfo>
    <gmd:CI_Contact>
      <gmd:phone>
        <gmd:CI_Telephone>
          <gmd:voice>
            <gco:CharacterString>+44 1235 446579</gco:CharacterString>
          </gmd:voice>
        </gmd:CI_Telephone>
      </gmd:phone>
      <gmd:address>
        <gmd:CI_Address>
          <gmd:electronicMailAddress>
            <gco:CharacterString>sarah.james@stfc.ac.uk</gco:CharacterString>
          </gmd:electronicMailAddress>
        </gmd:CI_Address>
      </gmd:address>
    </gmd:CI_Contact>
  </espas:contactInfo>
  <espas:positionName>ESPAS Project Manager</espas:positionName>
</espas:ESPAS_Individual>
```



XML Templates



Wiki Tim

source: [espas](#) / [software](#) / [WP6_DataModel](#) / [trunk](#) / [examples](#) / [templates](#) / [Observation_template.xml](#) @ 831

Revision 756, 29.8 KB checked in by AnnaCharisi, 7 months ago (diff)

updated Observation_template

```
Line
1 <?xml version="1.0" encoding="UTF-8"?>
2 <ESPAS_Observation xmlns="http://schemas.espas-fp7.eu/2.1" xsi:schemaLocation="http://schemas.espas-fp7.eu/2.1 http://schemas.espas-fp7.eu/xsd/2.1/espas.xsd"
3   xmlns:espas="http://schemas.espas-fp7.eu/2.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml/3.2"
4   xmlns:om="http://www.opengis.net/om/2.0" gml:id="pr1">
5
6   <!-- The Observation XML file describes the action of the observation within the context of ESPAS. An Observation is the act that results in the estimation of
7     the value of an Observed Property (e.g. temperature, electron density) of a Feature of Interest (e.g. Ionosphere, Magnetosphere) using a designated process,
8     such as an instrument (Acquisition process), algorithm (Computation process) or process chain (Composite process). An observation is associated with a discrete
9     time instant or period (phenomenon time) and the result of the observation (i.e. data) is an estimate of the value of the observed property. -->
10
11   <!-- Define the related observation and its role. This will be used mainly for the satellite data, where the location observations will be related observations to the data observations -->
12   <om:relatedObservation>
13     <om:ObservationContext>
14       <om:role xlink:href="http://ontology.espas-fp7.eu/relatedObservationRole/satelliteLocation"/>
15       <om:relatedObservation xlink:href="http://resources.espas-fp7.eu/observation/now/observation1/1"/>
16     </om:ObservationContext>
17   </om:relatedObservation>
18
19   <!-- the "om:phenomenonTime" is the discrete time instant or the time period associated with the Observation (when the observation took place).
20     The date/time should be given in the format: "YYYY-MM-DDTHH:MM:SSZ" -->
21   <om:phenomenonTime><gml:TimeInstant gml:id="ph1">
22     <gml:timePosition>2013-04-25T14:00:00Z</gml:timePosition>
23   </gml:TimeInstant></om:phenomenonTime>
24   <!-- if the phenomenon time is time period use the following syntax:
25   <om:phenomenonTime>
26     <gml:TimePeriod gml:id="tp1">
27       <gml:begin><gml:TimeInstant gml:id="b1"><gml:timePosition>2013-04-25T14:00:00Z</gml:timePosition></gml:TimeInstant></gml:begin>
28       <gml:end><gml:TimeInstant gml:id="e1"><gml:timePosition>2013-04-30T14:00:00Z</gml:timePosition></gml:TimeInstant></gml:end></gml:TimePeriod>
29   </om:phenomenonTime>
30 -->
31   <!-- Element "resultTime" describes the time when the result became available, typically when the procedure associated with the observation was completed.
32     Typically is the same with the phenomenonTime. However, if you run models for forecast or for the past, the result time differs from the phenomenon time
33     -->
34   <om:resultTime><gml:TimeInstant gml:id="rt1"><gml:timePosition>2013-04-25T14:00:00Z</gml:timePosition></gml:TimeInstant></om:resultTime>
35   <!-- If present, the attribute validTime:TM_Period shall describe the time period during which the result is intended to be used. -->
36   <!-- element "om:validTime" is optional. If you don't want to provide any information (non applicable) for this element, please remove it completely -->
37   <om:validTime><gml:TimePeriod gml:id="tp1">
38     <gml:begin><gml:TimeInstant gml:id="b2"><gml:timePosition>2013-01-01T14:00:00Z</gml:timePosition></gml:TimeInstant></gml:begin>
39     <gml:end><gml:TimeInstant gml:id="e2"><gml:timePosition>2013-04-25T14:00:00Z</gml:timePosition></gml:TimeInstant></gml:end>
40   </gml:TimePeriod></om:validTime>
```



Metadata for Data Users

The screenshot displays the ESPAS (European Space Agency Space Data Infrastructure) web application. The header includes the ESPAS logo, the text "near earth space data infrastructure for e-science", and a user greeting "Hello, Sarah James | Sign Out". The navigation menu contains "HOME", "SEARCH", "BROWSE", "SUPPORT", and "MY ACCOUNT".

The "SEARCH" menu is open, showing two main categories: "PROGRESSIVE SEARCH" and "SPATIAL/TEMPORAL SEARCH". Under "PROGRESSIVE SEARCH", there are options for "Time Period", "Assets", "Observed Properties", and "Observation Collections". Under "SPATIAL/TEMPORAL SEARCH", there is an option for "Time/Location".

The main content area is divided into several sections:

- Current Selections:** Currently shows "none".
- Search by assets:** Includes a search input field and a "Clear" button.
- Filter by:** A section for filtering results, currently showing "Asset Type".
- Assets:** A list of search results, currently showing a list of instruments.

The "Filter by" section shows a search input field and "Select All" / "Deselect All" buttons. The "Assets" section shows a search input field and "Select All" / "Deselect All" buttons. The list of instruments includes:

- Instruments
 - Andøya Magnetometer
 - Athens Digisonde
 - Bergen Magnetometer
 - Bjørnøya Geomagnetic Observatory Magnetometer
 - Dombås Geomagnetic Observatory Magnetometer
 - Dønna Magnetometer
 - DTU Space fluxgate magnetometer



Metadata for Data Users

The screenshot displays the ESPAS (European Space Agency Space Data Infrastructure) web interface. At the top left is the ESPAS logo, and at the top right, it shows the user's name "Hello, Sarah James" and a "Sign Out" link. Below the logo is the tagline "near earth space data infrastructure for e-science". A navigation bar contains links for "HOME", "SEARCH" (highlighted), "BROWSE", "SUPPORT", and "MY ACCOUNT".

The main content area is titled "Current Selections" and shows "none". To the right of this section are four icons representing different data types or tools, and buttons for "Back" and "Submit". Below these is a "Start New Search" link.

The "Search by assets" section includes the instruction "Select Assets on the right [Filter with available options on the left]" and a "Clear" button.

The "Filter by" section is expanded to show "Asset Type" filters. It includes a search input field and "Select All" and "Deselect All" buttons. The filter list is organized into "Instrument types" and "Model types". Under "Model types", several options are listed with checkboxes:

- Assimilative Model
- Autoscaled
- Empirical Model
- Manually Scaled
- Mathematic Model

The "Assets" section on the right also features a search input field and "Select All" and "Deselect All" buttons. It displays a tree view of asset categories:

- Instruments
- Models
 - ARTIST
 - CCIR F peak model
 - DIAS Ne3D
 - GUIDSAP
 - Interpre
 - ionobrowse
 - IRI (International Reference Ionosphere)



Summary

- ⦿ Metadata is the key
- ⦿ The data model to model the data description
- ⦿ The ontology to provide agreed terms
- ⦿ Tools and support to data providers to produce ESPAS metadata
- ⦿ Data users use ESPAS metadata to identify data of interest