Web Services and other IVOA GWS works, Workflow, …

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Web Services : a revolution ?

- Web Services are not a revolution but a simple way to distribute and consume software components
- IVOA : Web Services are a way to do … not a finality

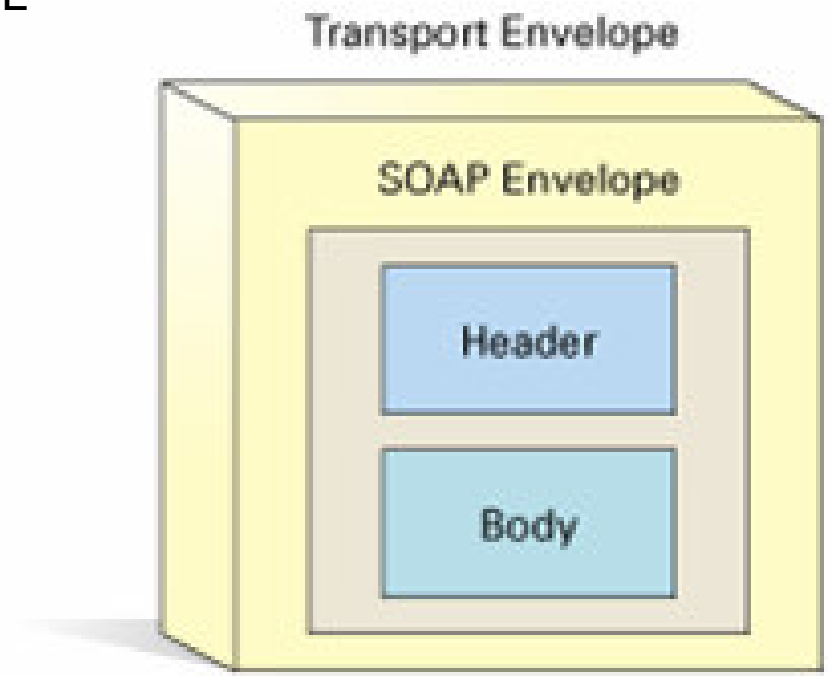
http://en.wikipedia.org/wiki/Web_services

Simple use case : Sesame

- Sesame is a name resolver available through cgi-bin
  - http://vizier.u-strasbg.fr/viz-bin/nph-sesame/-oX?m31
- How to use it in an application ?
  - Use the URL (hoping that it will not evolve) ?
  - It could be useful to use it like any other components of the application
  - A Web Service can respond to such needs, with an « overhead » of semantical information and it uses common technologies like HTTP et XML as support.
  - A Web Service is designed to transmit structured data to the client (example : an object with some properties rather than a flat file or an XML document)

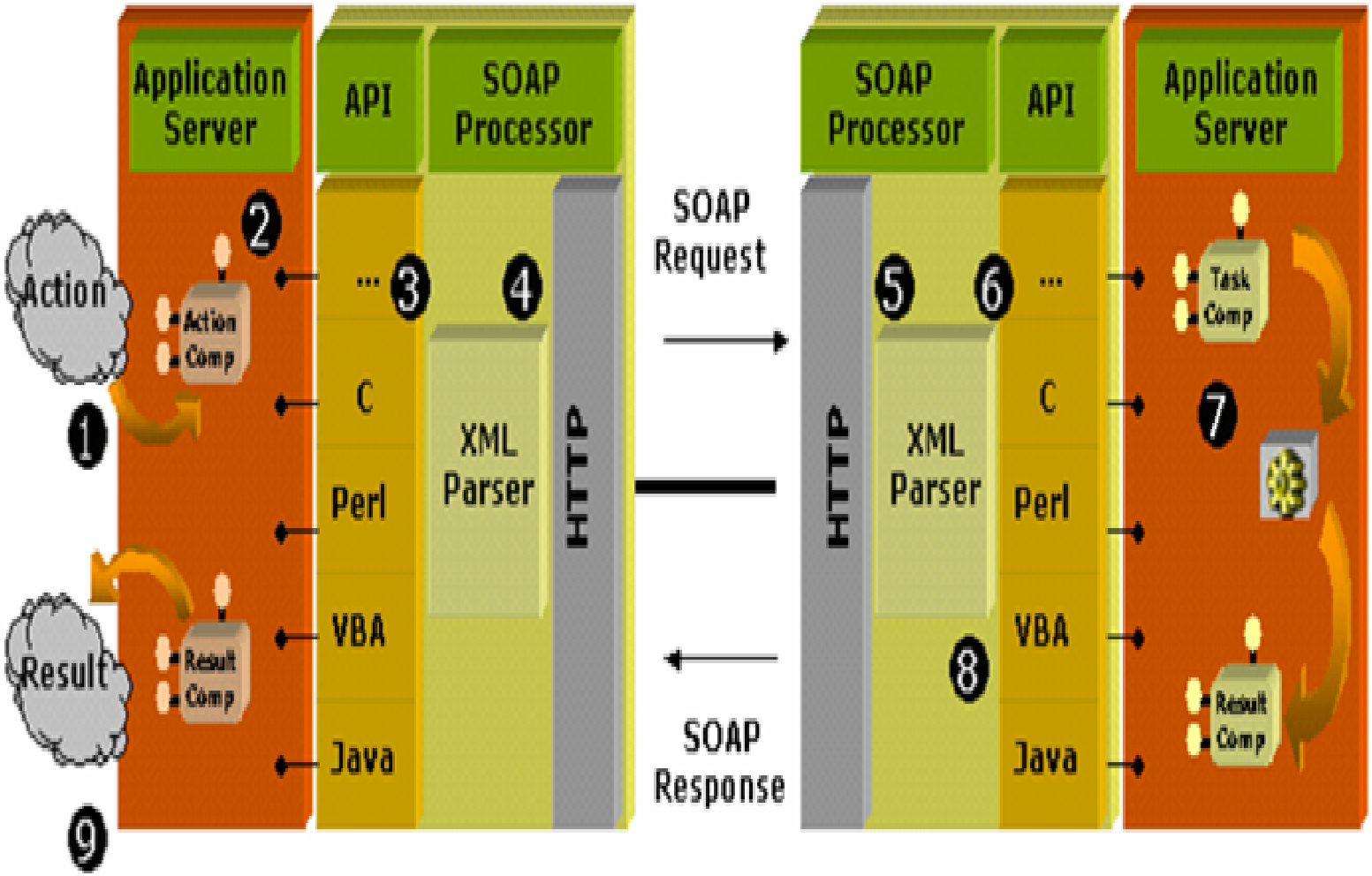
Web Services key : SOAP

- **Simple Object Access Protocol**
  - ***Aim*** **:** provide an exchange protocol between clients et servers
  - SOAP is based on HTTP and XML
  - SOAP is an XML « envelope » transported via HTTP



http://en.wikipedia.org/wiki/Simple_Object_Access_Protocol

From request to result…



SOAP message (1)

- Example of request to the Sesame Web Service
  - At the client level (for example in Java) :

```
mySesame.Sesame("M51");
…
```

The following message is sent from the client to the server :

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
 xmlns:apachesoap="http://xml.apache.org/xml-soap" xmlns:impl="http://cdsws.u-strasbg.fr/axis/services/Sesame"
 xmlns:intf="http://cdsws.u-strasbg.fr/axis/services/Sesame" xmlns:soapenc=http://schemas.xmlsoap.org/soap/encoding/
 xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" xmlns:wsdlsoap="http://schemas.xmlsoap.org/wsdl/soap/"
 xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <SOAP-ENV:Body>
     <mns:Sesame xmlns:mns="http://cdsws.u-strasbg.fr/axis/services/Sesame"
         SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
       <name xsi:type="xsd:string">M51</name>
     </mns:Sesame>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

SOAP message (2)

- Example of answer from Web Service Sesame

The server gets the message SOAP from the client, parses it, determines which service is concerned and sends him the parameters. The service sends back a result to the server, this result is put in an SOAP envelope and transmitted to the client who parses the message and transmits the data to the client.

```
<?xml version="1.0" encoding="UTF-8"?>
 <soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <soapenv:Body>
     <ns1:SesameResponse soapenv:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
        xmlns:ns1="http://cdsws.u-strasbg.fr/axis/services/Sesame">
      <SesameReturn xsi:type="xsd:string"># M51 #Q01227 #=Simbad: 1 %J 202.4682083 +47.1946667 (6) = 13 29
52.370 +47 11 40.80 %J.E [10800.00 10800.00 90] D 1999ApJS..125..409C %I.0 APG 85 %C IG %@ 8056,0 #---
ServerTime(ms): 1
      </SesameReturn>
   </ns1:SesameResponse>
 </soapenv:Body>
</soapenv:Envelope>
```

Description : WSDL

- **Web Service Description Language**
  - ***Aim*** : describe the services as a set of operations and abstract messages linked to protocols and network servers, self description
  - XML and XML schema
  - Same role as OMG-IDL for CORBA
  - A WSDL file contents all what a client need to use a service
    - Description of the interfaces, ports, …
  - Example : Sesame description Sesame (doc)
  - http://en.wikipedia.org/wiki/WSDL

IVOA Grid and Web Services WG

- Global Grid Forum, Astro-RG
- VO Support Interfaces
- VO Web Services Basic Profile
- Security
- VOSpace/VOStore
- Asynchronous tasks

GGF

- **Global Grid Forum**
  - 2 meetings per year (~600 participants)
  - Sessions for enterprises and research + WG and RG meetings
  - Astro-RG initiated at GGF 10
    - Chairs : Masatoshi Ohishi and Nic Walton
    - ***Aim*** : explore potentialities of Grid technologies in the Astronomical domain
  - GGF12 : some remarks…
  - GGF15 at Boston :
    - VOSpace, VOStore, UWS
  - **Last GGF (16), Athens, 13-16 February 2006**
    - http://www.ggf.org/gf/event_schedule/index.php?id=131

VO Support Interfaces

- ***Aim* :** define standard interfaces.
- The role of Web Services is increasing in the VO
- It is very important to describe interfaces that all Web Services have to provide
- Examples
  - getAvailability
    - Last shutdown, next maintenance, …
  - HarvestWebLog **(with** begin, end parameters)
    - IP of the users, request type, answer time, …

http://www.ivoa.net/internal/IVOA/IvoaGridAndWebServices/VOSupportInterfaces-0.24.pdf

VO Web Services Basic Profile

- ***Aim* :** define a set of rules to take into account when implementing Web Services.
- Considers WS-I Basic Profile (Microsoft, Sun, …) as a minimum and extends it by adding specific rules to the VO
  - The getAvailability interface MUST be implemented
  - ...
- A guide of « good implementation » for the service providers
- Conformity test automation

http://en.wikipedia.org/wiki/WS-I_Basic_Profile

Security

- ***Aim* :** define authentication mechanisms for the VO
- Example : Single Sign On
- Authentication with digital signature of the SOAP messages (involves certification authority)
- Work based on WS-Security (OASIS)

http://www.ivoa.net/internal/IVOA/IvoaGridAndWebServices/security-architecture-v0.1.html

VOSpace / VOStore

- ***Aim* :** integrate different technologies to access to « storage » spaces
  - Examples : MYDB (NVO), MYSpace (AstroGrid)

    cf. schema «VO Architecture » on the last slide

- Standard interfaces definition to permit the communication between the different workspaces**…**

http://www.ivoa.net/internal/IVOA/IvoaGridAndWebServices/vospace.pdf

Asynchronous tasks, …

- ***Aim*** : manage the execution of time greedy tasks
- Notion of context : associate a service operation to a task
- Information about a context state
- Manage context lifecycle
- Notification of context change, example : "job completed"
- …

http://www.ivoa.net/internal/IVOA/IvoaGridAndWebServices/VOSupportInterfaces-0.24.pdf

Workflow

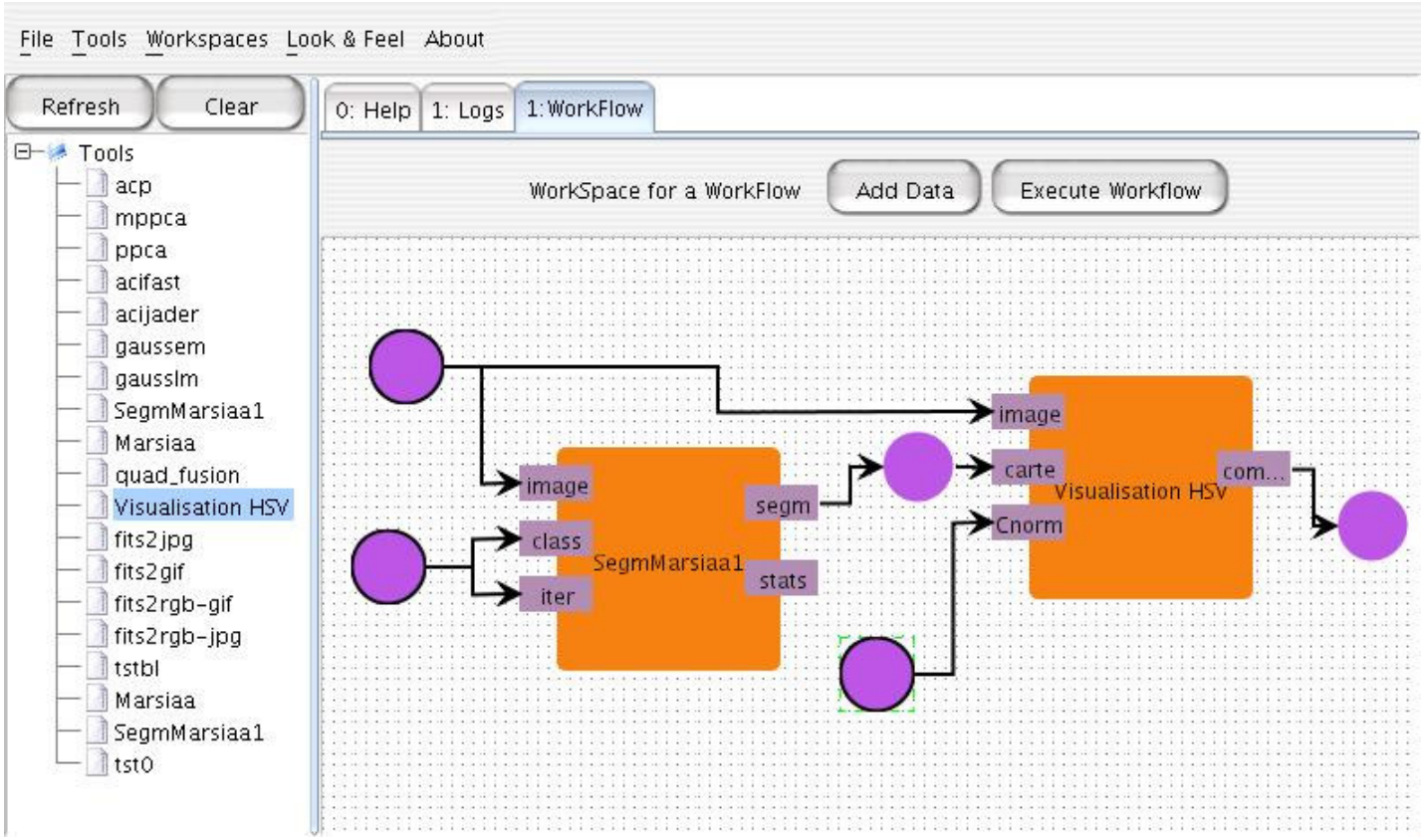
- **Workflow user friendly graphic representation tools**
  - JLOW – Java Libraries fOr Workflow
  - Sources and documentation available at :
    - http://cdsweb.u-strasbg.fr/devcorner.gml
  - Application in AÏDA (MDA project …)
- **Use cases**
  - Working group at CDS
  - Workflow working group of OV France :
    - http://www.france-ov.org/twiki/bin/view/GROUPEStravail/Workflow
    - First meeting 10 November 2005
    - 2006 plan : define scientific workflow use cases and use existing tools as demonstrators

Workflow (2) : design and engine side

- **JLOW has been developed during the Cycle 1**
  - Client side based on JGraph (http://www.jgraph.com/)
    - Workflow representation is stored in GXL (XML => can be mapped to other formats)
  - Server side
    - Very light Workflow engine but enough for applications like AÏDA (see further)
- **Collaboration with ESSI (Sophia Antipolis, IT laboratory) people started in December 2005**
  - ESSI is developing a middleware to access Grid5000 and EGEE
  - First use test in AÏDA architecture done beginning of February
  - ESSI is interested by light Workflow design tools like JLOW

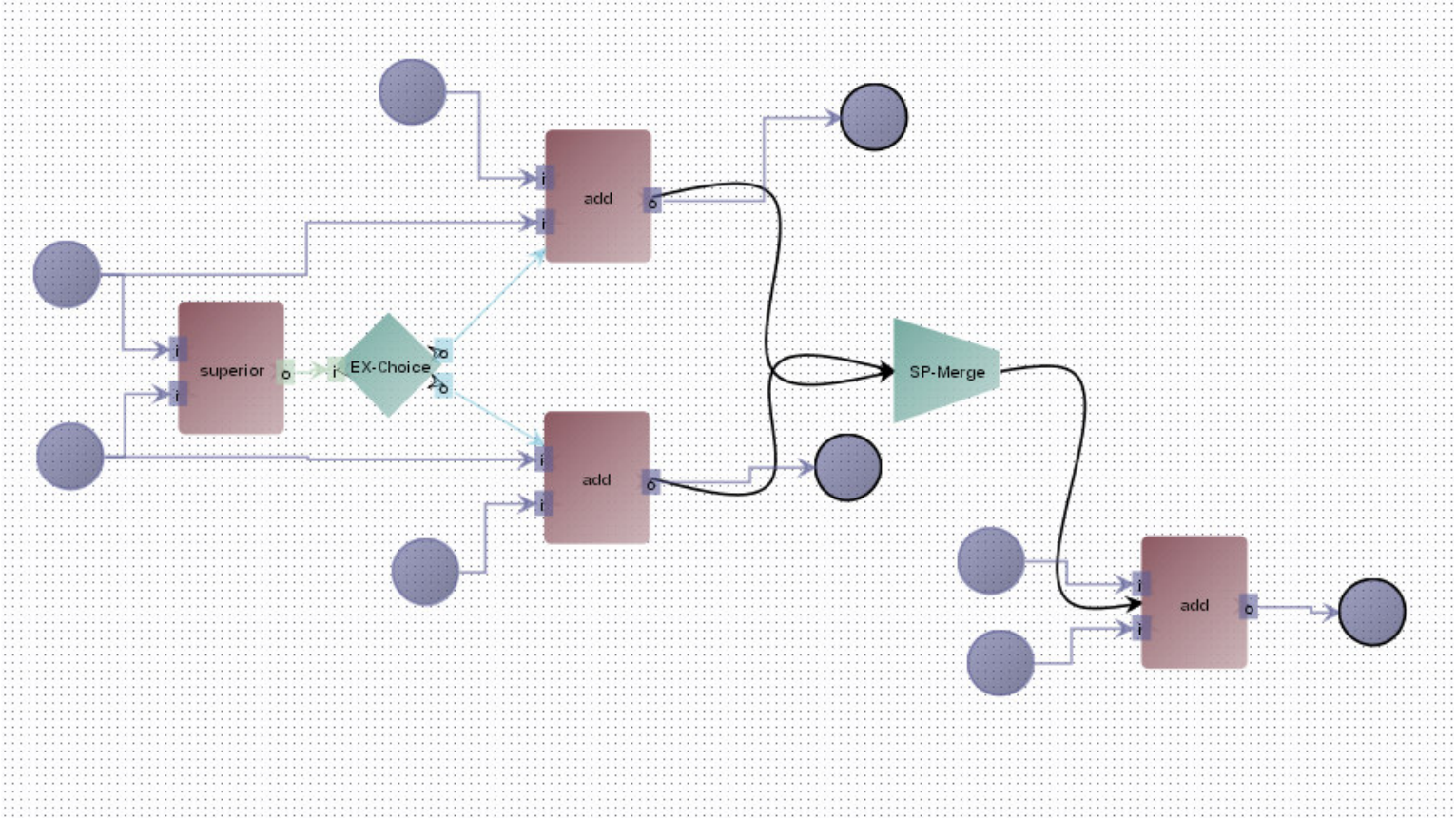
Workflow (3) : JLOW in AÏDA

Example of use in AÏDA (Astronomical Image processIng Architecture)



* AÏDA is developed in the frame of MDA (3 years) project (French ministry funds) ending mid 2006

Workflow (4) : other example



Workflow (5) : AÏDA aims

- Workflow Use cases in the image processing domain
- Used to preserve expertise from trainees, PhD students, … (software modules in an image processing workflow)

Conclusion

- Interesting and important work can be done in the frame of the IVOA Grid and Web Services WG (standardization, security, GGF (link between STIC and industry), etc…)
- Work about Workflow (use cases, tools) is ongoing in the frame of OV France (see OVF Workflow WG pages)

References

Links

- Astro-RG, http://www.ivoa.net/twiki/bin/view/IVOA/AstroRG
- GWS WG, http://www.ivoa.net/twiki/bin/view/IVOA/IvoaGridAndWebServices
- VOQL, http://www.ivoa.net/twiki/bin/view/IVOA/IvoaVOQL
- Tutorial ADASS 2003, http://www.adass.org:8080/meetings/adass2003/events/tutorial
- GGF, http://www.gridforum.org/
- SOAP, http://www.w3.org/TR/soap/
- WSDL, http://www.w3.org/2002/ws/desc/
- Sun Java WS, http://java.sun.com/webservices/index.jsp
- UDDI, http://www.uddi.org/
- WS-Security, http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wss
- OMG, http://www.omg.org
- …

VO Architecture