GeoBrain BPELPower Wrokflow Engine

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Outline

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BPEL

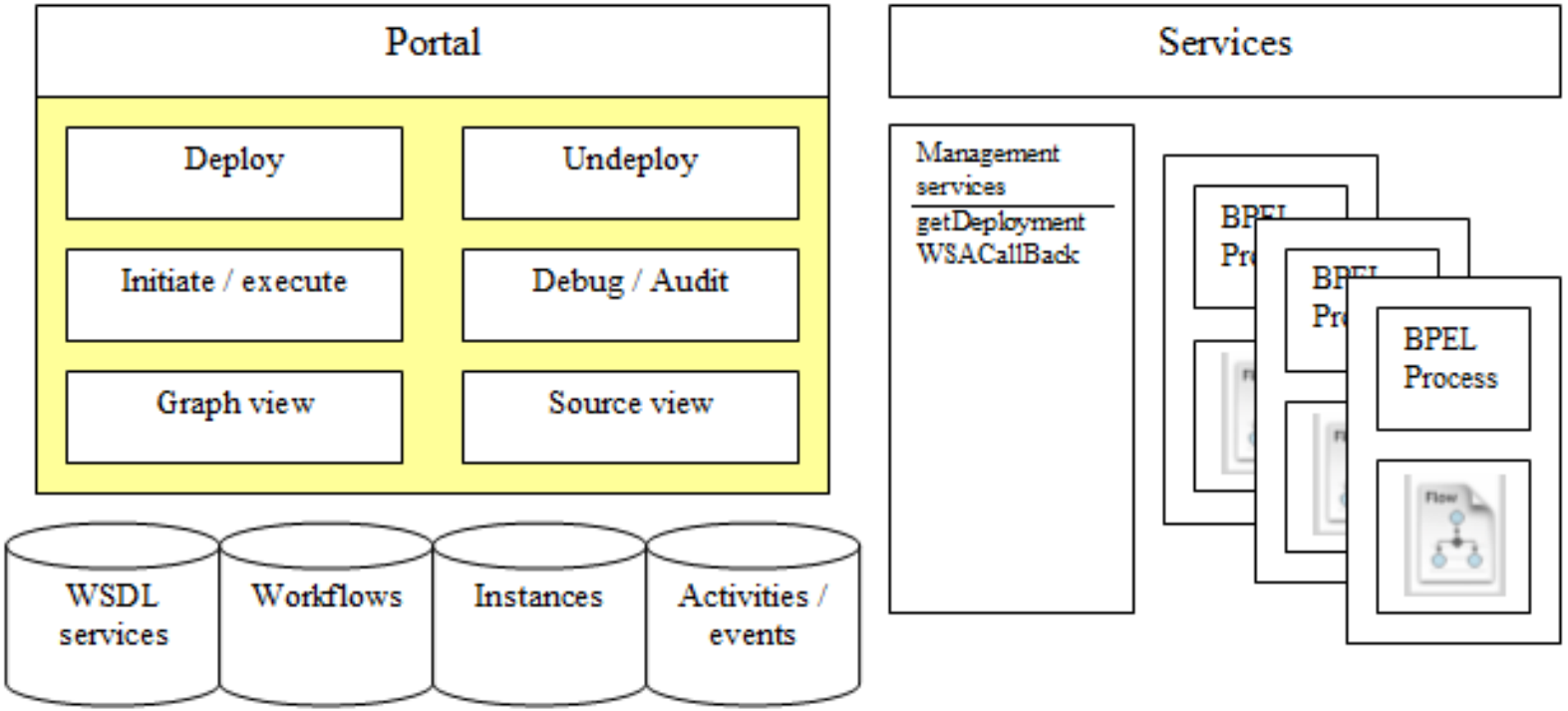
- Web Services Business Process Execution Language
  - An OASIS standard
  - A language for describing business processes
    - Executable business process: Executable workflows
    - Abstract business process: Non-executable abstract workflows
- Why we use BPEL?
  - Web Service effort: interoperability between geoprocessing applications through Web standards
  - Web Service workflows: Loosely coupled integration of heterogeneous systems in a variety of domains
    - Suitable for Sensor Web in the Earth and space science

BPELPower

- BPELPower is a BPEL workflow engine developed by CSISS.
  - The initial version was developed in 2004
  - Multiple version has been released since then
- Supports
  - BPEL4WS 1.1
  - WS-BPEL 2.0 (partially supported now, in development)
- Released versions
  - Version 1.0: BPEL4WS 1.1
  - Version 2.0: abstract model and instantiation
  - Version 3.0: asynchronous support through WS-Addressing

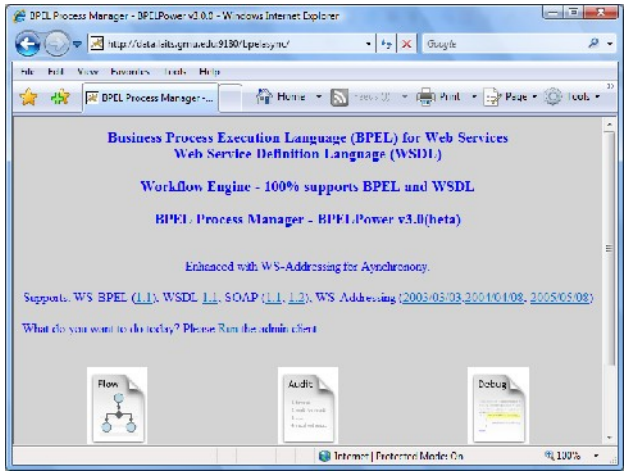
BPELPower workflow engine: architecture

- Major components of BPELPower workflow engine
  - Web Services
  - Human interfaces
  - Databases



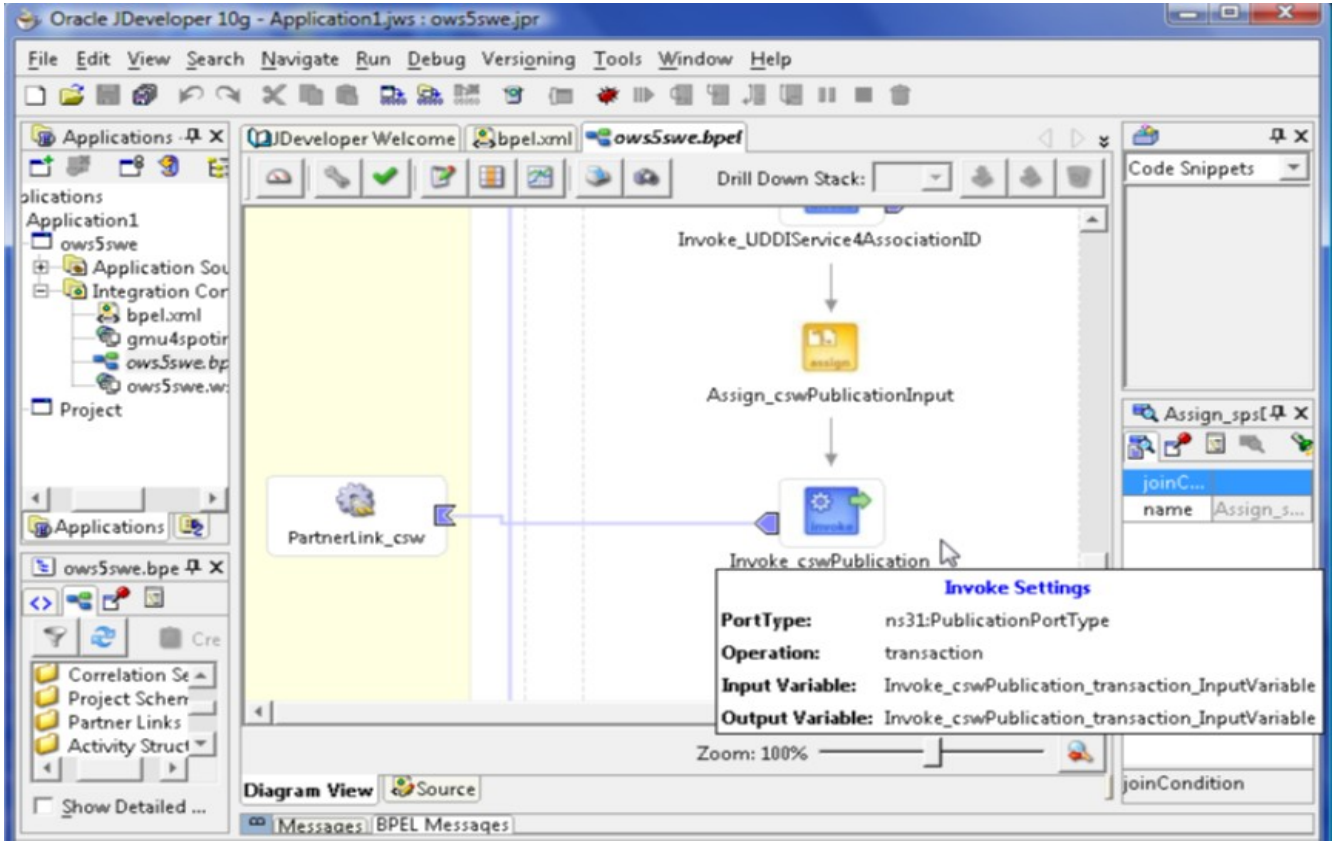
Functions of BPELPower

- Standard-compliant
  - BPEL4WS 1.1/WS-BPEL 2.0
  - XPath 1.0
  - SOAP 1.1, 1.2
  - OGC services
- Enhanced message encoding/decoding capabilities
  - XML schema
  - GML
- Extended asynchronous support
  - WS-Addressing
- RESTful Web Service support
- Security
  - WS-Security



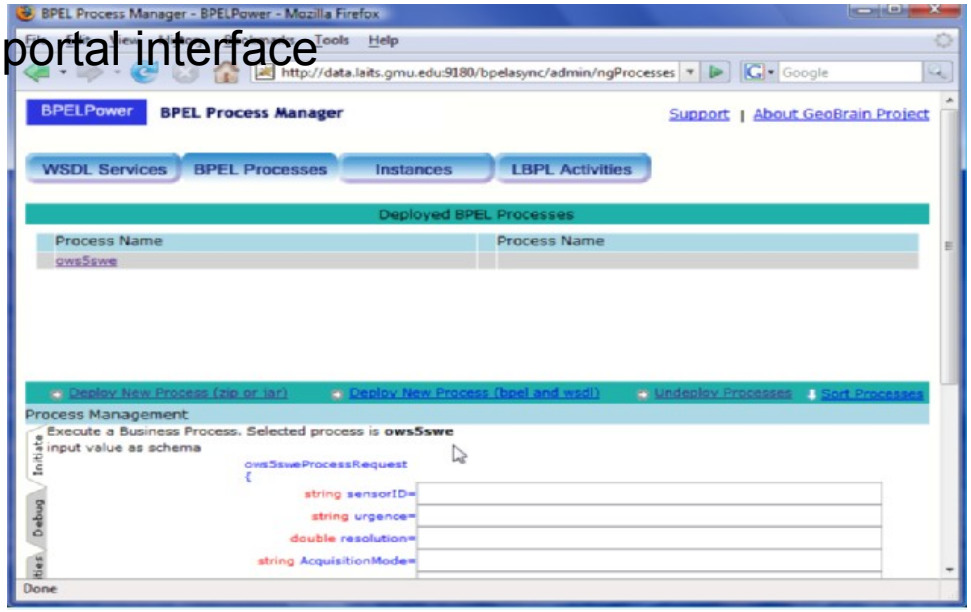
Design a workflow

- Support packaging of BPEL project using commercial BPEL designer
  - Oracle BPEL Designer



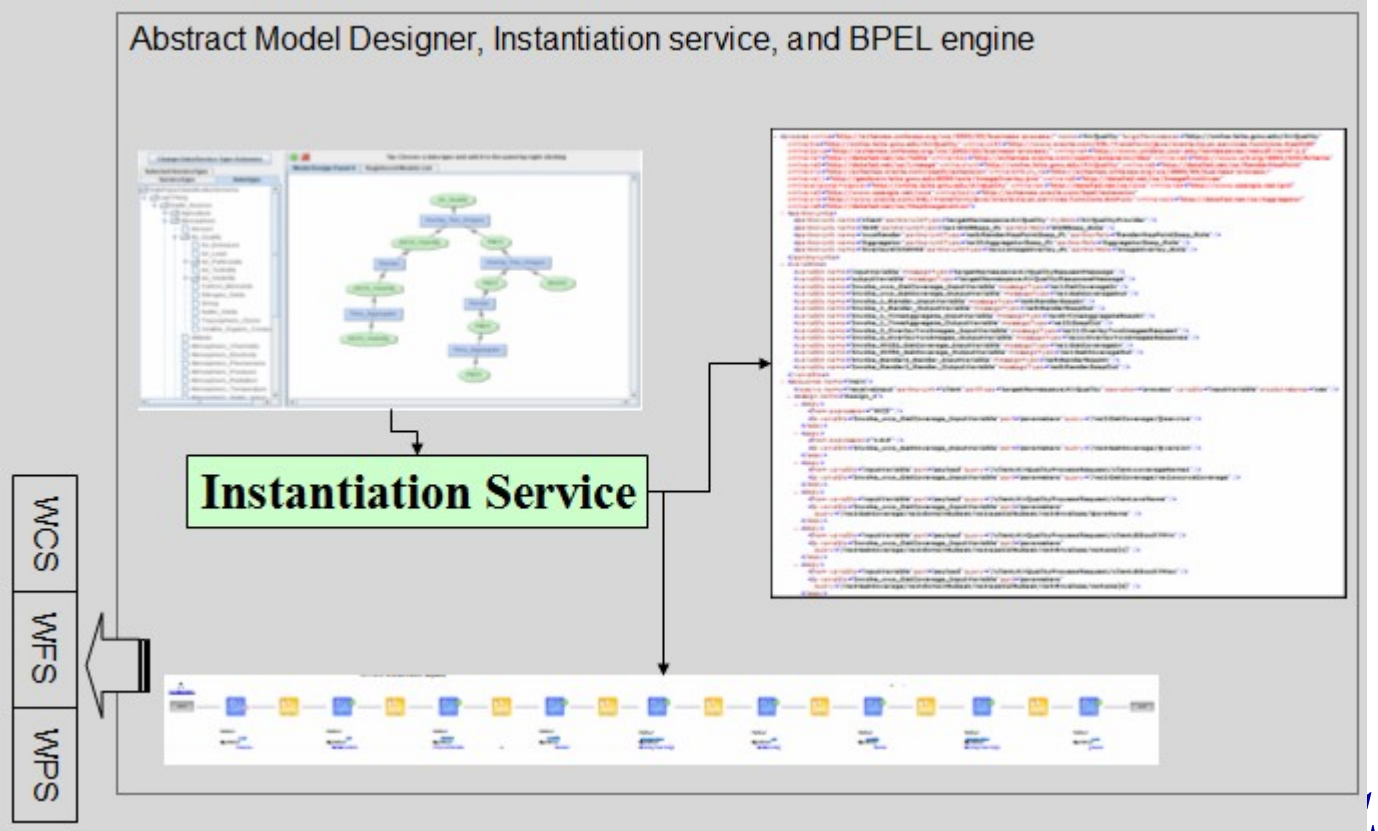
BPEL Process management

- BPELPower supports efficient management of BPEL processes
  - Deployment/undeployment
  - Deployed workflow
    - Standard Web service
      - SOAP service
      - RESTful service
    - Human portal interface



Instantiation service

- Web service for Abstract model instantiation
  - Manage abstract workflow
  - Instantiation of abstract model



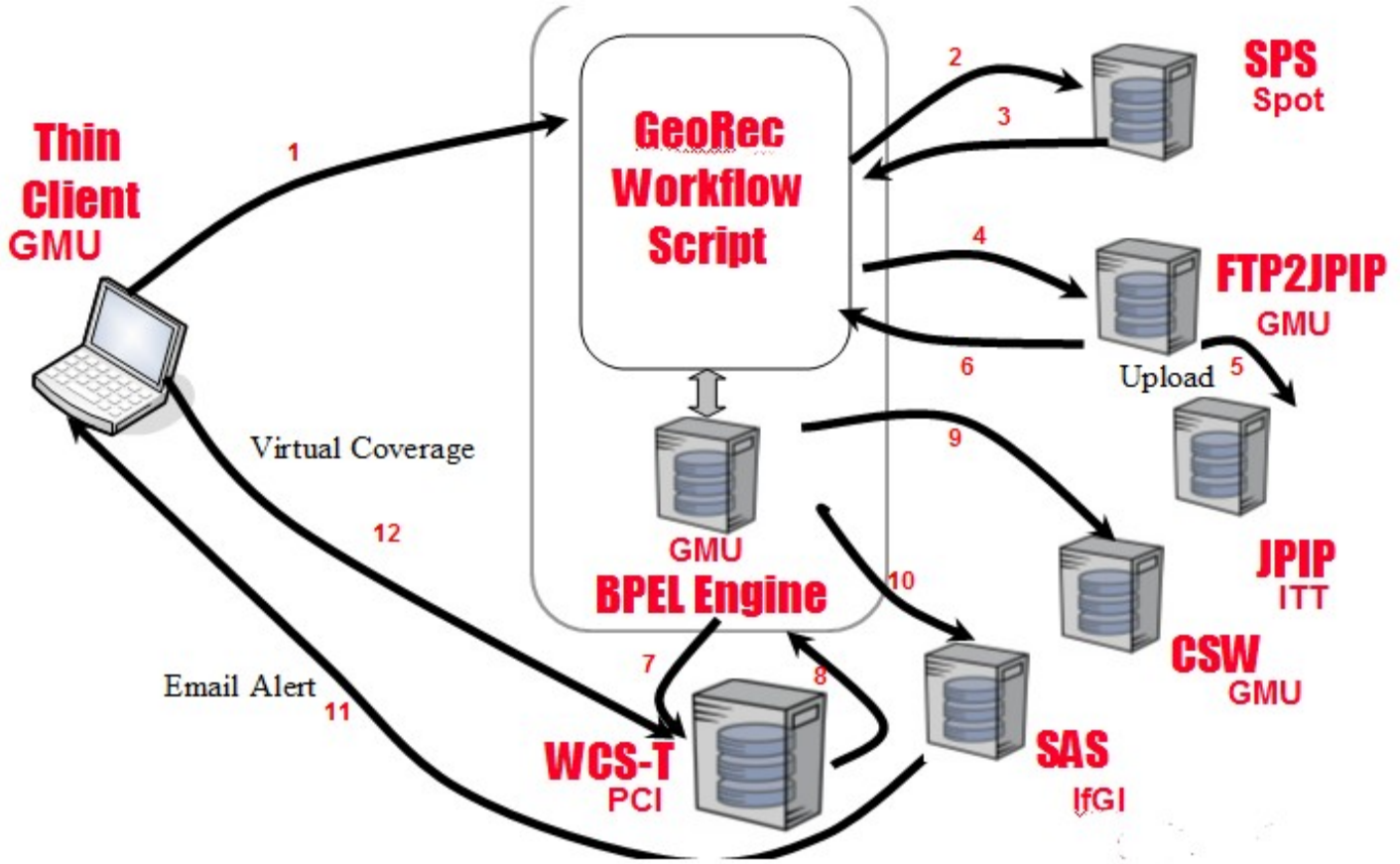
Use Case 1 – severe weather detection and tracking

- Workflow
  - Inputs of initial parameters
  - WCS data sources
  - Severe weather detection
  - Optional transactions to fed back results into WFS
  - Severe weather tracking
  - Optional transaction to fed back results into WFS
- The workflow supports transaction for WCS & WFS

Case 2 – geo-referencing

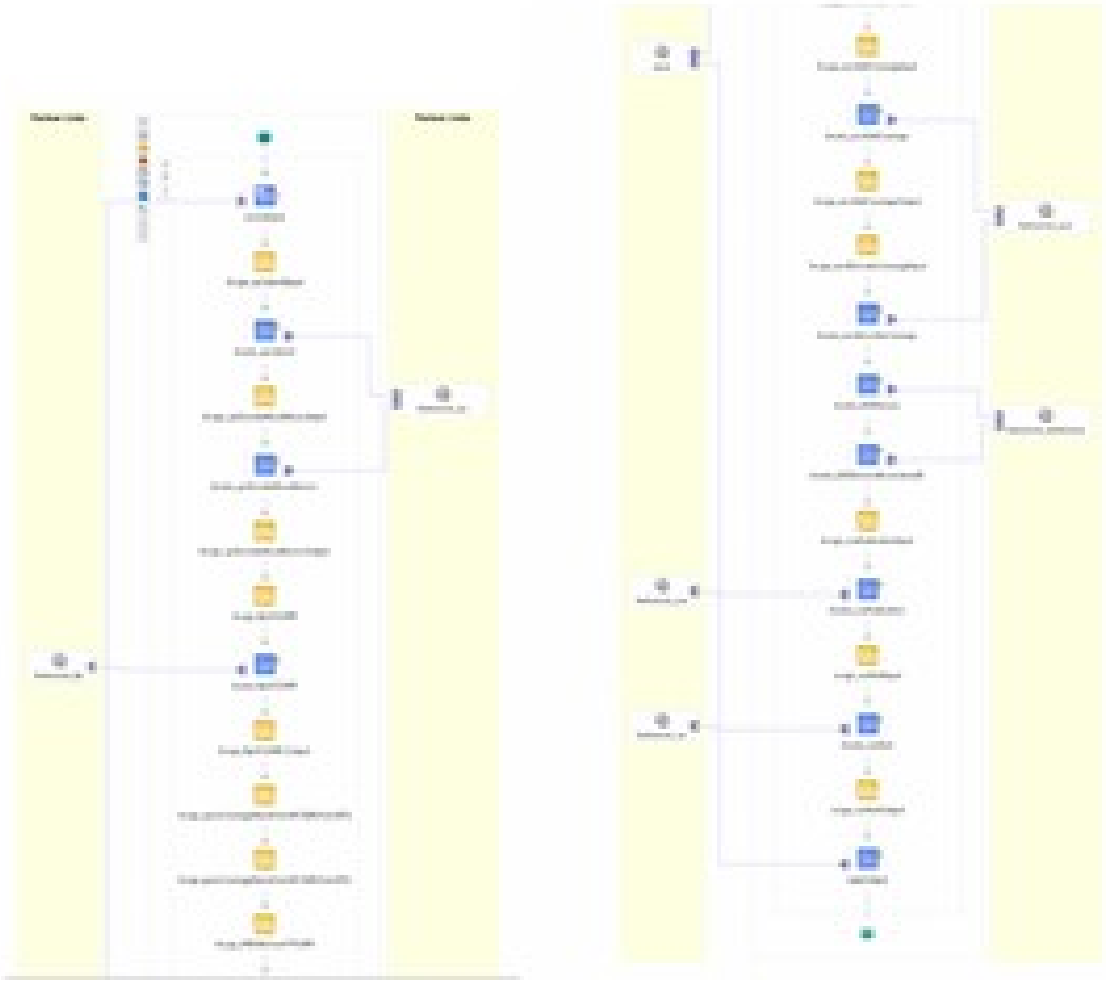
- Workflow steps
  - planning request to the SPS
    - User as actor
  - email notification
  - Retrieve observation from the SOS
  - Feed the observations into the JPIP server through secured transaction
  - Add the data along with description into WCS through transaction
  - Alert the data availability through SAS to all subscribed users

Georeferencing logical workflow



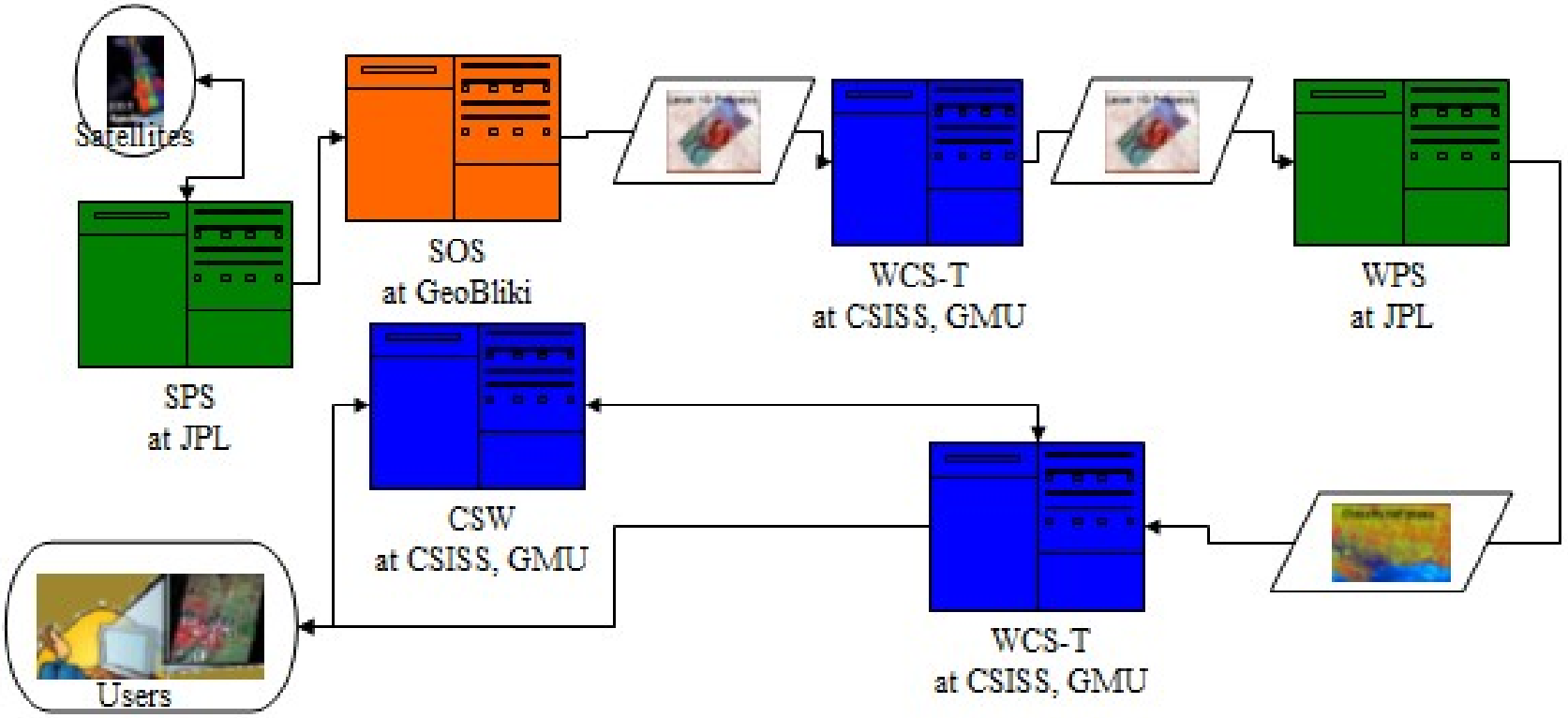
Geo-referencing workflow

- Workflow
  - Demonstrated at OWS 5
  - SPOT Image
- Asynchronous
  - SPS based on WNS
    - WS-Addressing
    - Callback pattern
  - Notification of data availability through SAS
    - XMPP
    - Publish/subscribe pattern



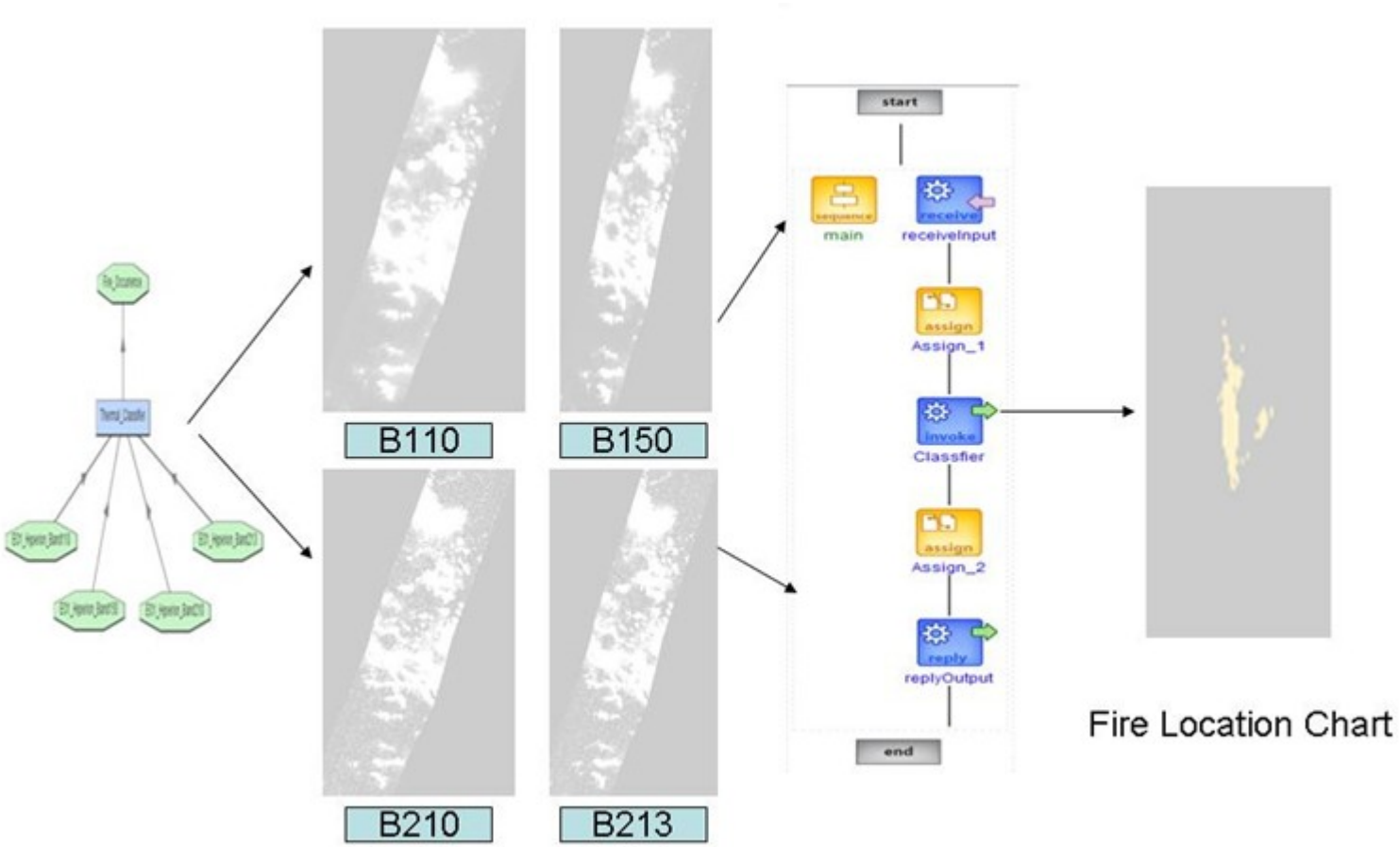
Case 3 - Collaborative Wildfire Monitoring

- collaboration
  - Standard web services
  - Automated workflow through BPEL/BPELPower



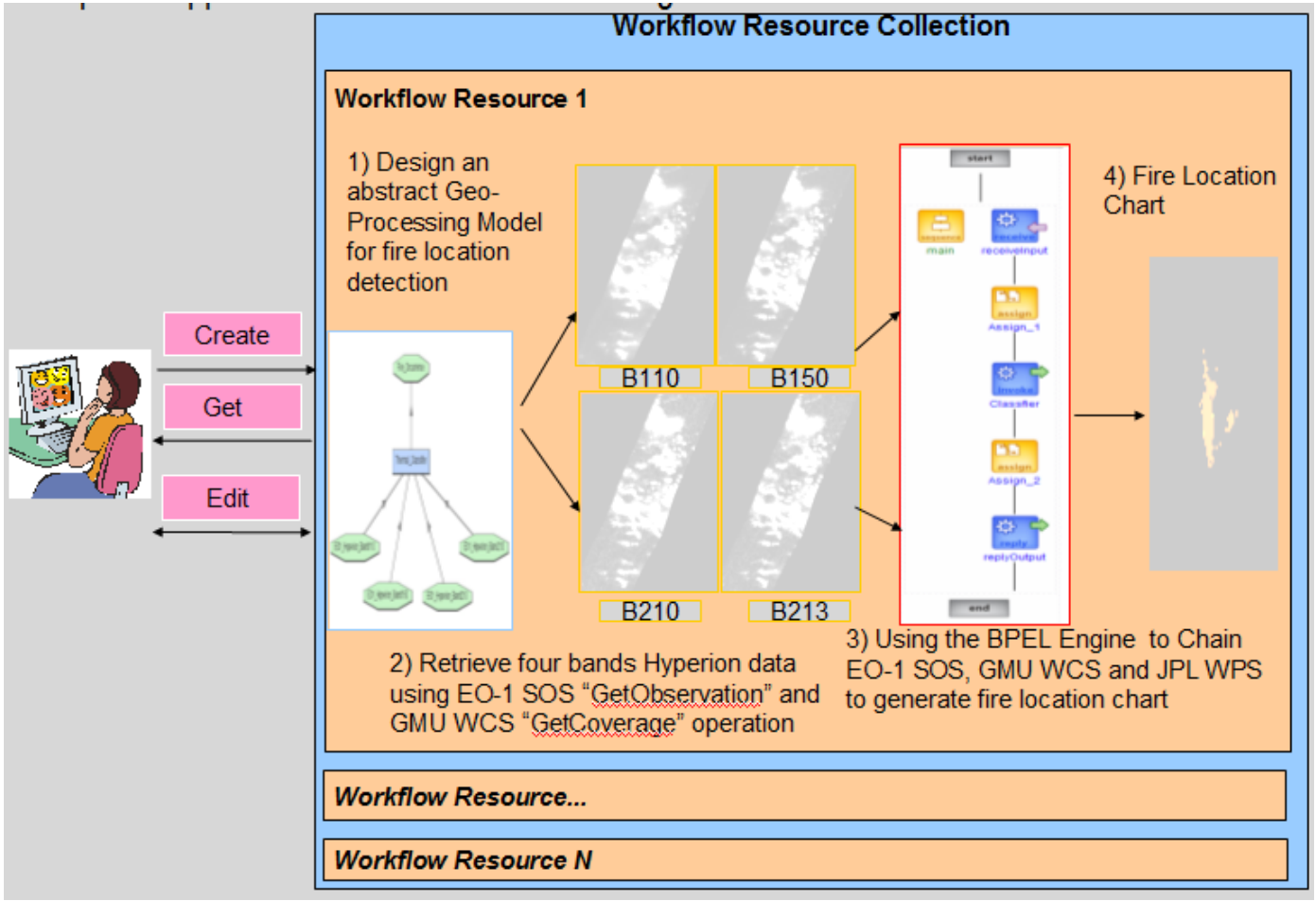
Abstract model instatiation

- Abstract model
  - On-demand automatic generation of fire products



RESTful service interface

- RESTfull support
  - RESTfull interfaces to use workflows as resources



Case 4 – air quality

- Air quality workflow
  - Abstract model designer for designing the abstract model
  - Air quality was represented in assimilated WMS representation

Lessons learnt

- Complexity of GML
- Newly-supported message encoding/decoding
  - KML
  - SensorML
- Further developments should enhance the support of OGC specifications
  - WNS
  - SAS
  - OWS framework: getCapabilities
- Specification extension
  - BPEL4OWS
    - Fully utilization of getCapabilities
    - Complete support of OGC-specific message notification mechanism, e.g. WNS, SAS
    - Message encoding/decoding, e.g. KML, GML

Conclusions

- BPEL can be used for describing geospatial workflow
- BPELPower engine has been efficiently applied in many cases
  - Loosely coupled
  - Heterogeneous services

Further information

- Websites
  - http://geobrain.laits.gmu.edu
  - http://csiss.gmu.edu/sensorweb
- Demonstrations
  - http://geobrain.laits.gmu.edu/doc/ows4Demo/demo.swf

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