Advanced Software Technologies for the European Space Situational Awareness

ESA/ ESOC
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The Space Situational Awareness (SSA) is defined as a comprehensive knowledge, understanding and maintained awareness of:

- the population of space objects;
- the space environment;
- the existing threats/risks.
The European SSA Programme - Objective

- Support the European independent utilisation of and access to space

- Provide timely and quality data, information, services and knowledge regarding the environment, the threats and the sustainable exploitation of the outer space surrounding the Earth
The European SSA Programme – Phased Approach

- **Phase-1: The SSA preparatory programme, 2009 - 2011**
  - Specification of the System Requirements and the Architectural Design for the future European SSA System
  - Deployment and operation of SSA Precursor Services

- **Phase-2: The SSA full programme, 2012 - 2020**
  - Deployment and operation of the full European SSA system
The European SSA Programme – System Perspective

Sensors

Service Provision Layer

SSA User Community

Management and Planning Data Centre

SST
Space Surveillance & Tracking Data Centre

SWE
Space Weather Data Centre

NEO
Near Earth Objects Data Centre

SSA User Community
SSA Data Systems - Objectives and Constraints

- Rapid provision of SSA precursor services, already in 2010
- Federation of existing assets
  - Integration of legacy applications
- Provision of timely (highly available) and quality (QoS) services
  - Primarily focus on web-based service provision
- Handling of classified data and system critical applications
  - Implementation of strict security and safety requirements
- Geographically distributed setup for sensors and the data centres
The SSA Preparatory Programme - Precursor Services
SSA Services - An IT Perspective

- Data Archiving
- Security
- User Management
- Data Acquisition
- S&T Core Algorithms
- Communication
- Web Publishing
- Data Visualisation
- File Transfer

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Moving towards a Service Oriented Architecture

COSIF
Common SSA Integration Framework
Moving towards a Service Oriented Architecture

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Common SSA Integration Framework
Roadmap towards a Service Oriented SSA System

- Selection and deployment of the COSIF based on a commercial or open-source SOA framework
- Development and Deployment of the common enabling services
- Provision of interface requirements for service integration
- Provision of software development guidelines for new SSA services
- Integration of the SSA domain specific services on the COSIF
Reference Service Oriented Architecture for SSA

Source: Gartner Inc.
Common SSA Enabling Services based on the selected SOA Suite

Common SSA Integration Framework, COSIF

Monitoring, Data Acquisition, Data Distribution, Tasking, Scheduling, Planning

Transaction, Logging, Directory, Communication, Data Persistence, Security
SSA Service Provision – A Technology Perspective

- Service Implementation based on **Web-Services** Technology
- Business logic implementation based on **J2EE** technology
- Service provision to the users via **thin web clients**, i.e. JavaFX, JSF, AJAX
- Service Orchestration based on Service Component Architecture, **SCA**
- Utilisation of Business Process Management, **BPM** technologies
- Utilisation of Business Rule Management technologies
- Utilisation of Complex Event Processing, **CEP**, technologies
- Potential adoption of the **CCSDS MO** concept, based on the selected SOA suite
Where do we stand today:
Technology Assessment and Framework Selection Phase

- Extensive Evaluation of five SOA suits

  - Three Commercial SOA Suits
    - IBM WebSphere
    - Oracle WebLogic
    - SoftwareAG WebMethods

  - Two Open Source SOA Suits
    - RedHat JBOSS
    - SOPERA ASF

- Evaluation based on four Proof of Concept, PoC, Services
  - Two PoCs based on integration of legacy applications
  - One PoC as a new Space Weather Monitoring service
  - One PoC for adoption of the CCSDS MO concept on COSIF
Questions?

For any question please contact the authors.

THANK YOU

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