



Interoperability Program Update Advancing the Sensor Web

Sensor Standards Harmonization
Working Group – 27 February 2007

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OGC – Growing and Diversifying



- NFP Standards Development Organization advancing geospatial interoperability. Over 330 members from 35 countries & 6 continents
 - 141 European members
 - 35+ Asia-Pacific members
- Growth in new sectors - Insurance; Consumer / Mass Market; Architecture, Engineering and Construction; Sensor systems
- Nineteen approved, publicly available Implementation Specifications
- 20+ candidate Implementation Specifications in work
- Strong market built out, compliance certification program
- Growing collection of standards profiles, application schema and best practice documents



OGC

OGC Alliance Partnerships



- World Wide Web Consortium (W3C)
- Digital Geospatial Information Working Group (DGIWG)
- International Organization for Standards (ISO)
- OASIS
- Object Management Group (OMG)
- Open Mobile Alliance (OMA)
- Geospatial Information & Technology Association (GITA)
- Web3D
- Simulation Interoperability Standards Organization (SISO)
- International Alliance for Interoperability (IAI)
- IEEE Technical Committee 9 (Sensor Web)
- Spatial Data Infrastructure organizations (National, Regional, Global)
- Others



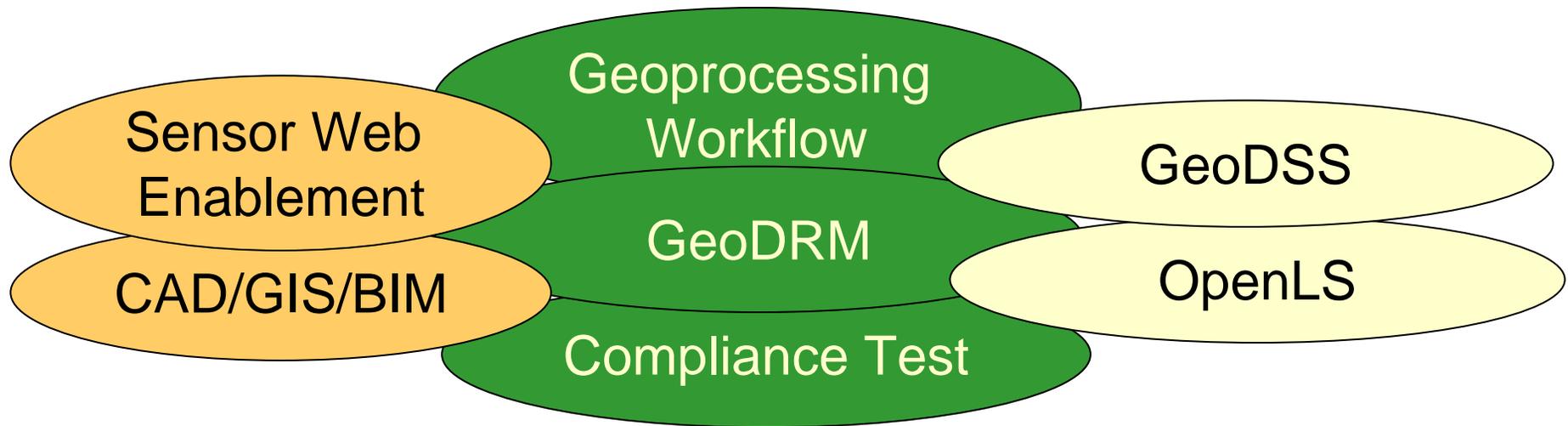


OWS-4 Closeout

OGC Web Services-Phase 4 (OWS-4) Testbed



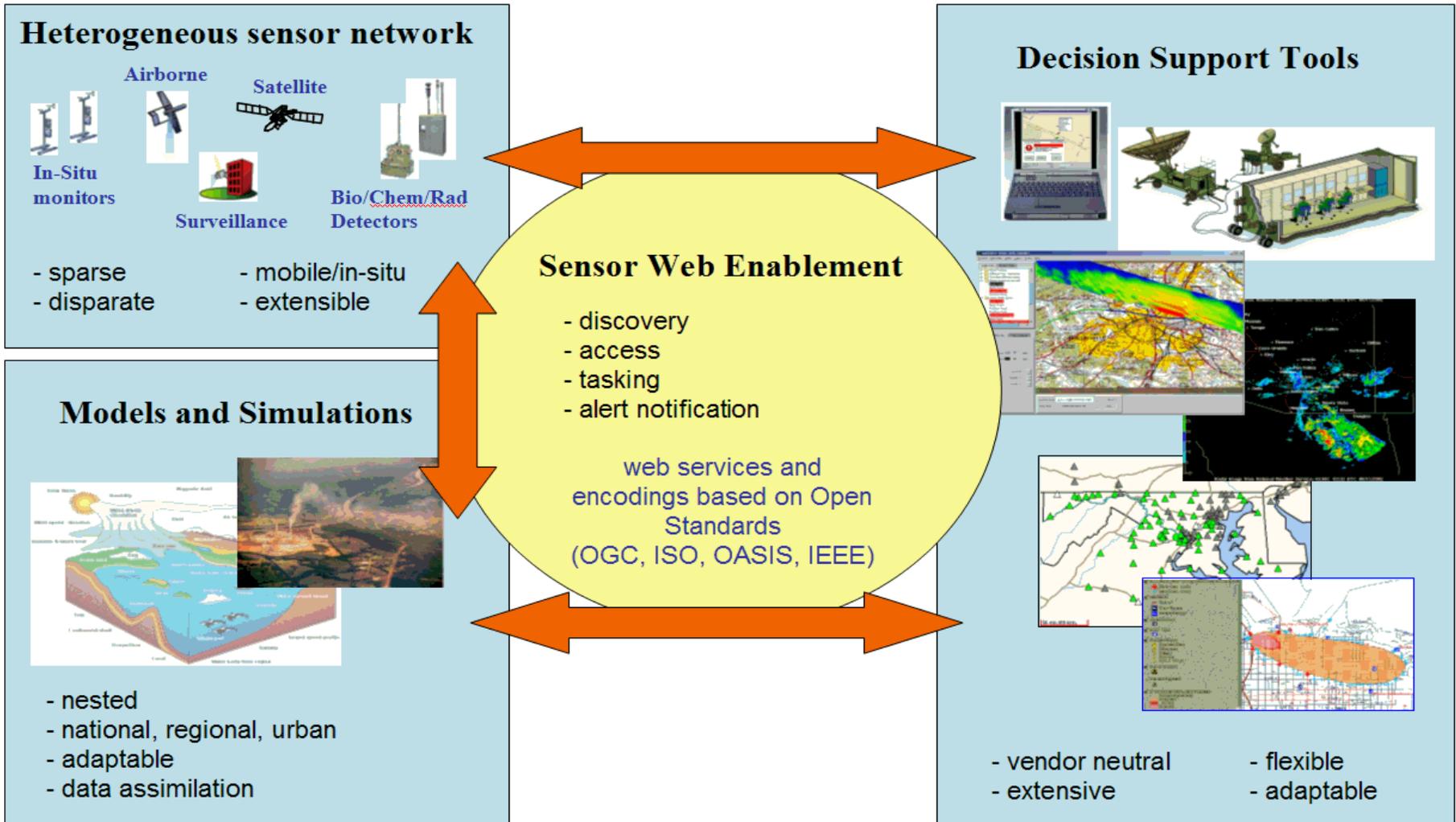
- Objective: Collaboratively extend and demonstrate OGC baseline for interoperable, multi-source decision support
- June 2006 to December 2006



- 11 Sponsoring organizations
- Sponsorship total \$1.8M
- Total In-kind: \$2.7M

- 66 Participating organizations
- Deliverables
 - 59 Component implementations
 - 36 Reports/draft specifications

SWE Concept



SWE Scope



- Discovery of sensors, observations and processes
- Determination of sensor's capabilities and observation's reliability
- Access to parameters and processes that allow on-demand processing of observations
- Retrieval of real-time or time-series observations in standard encodings
- Tasking of sensors and simulators to acquire observations of interest
- Subscription to and publishing of alerts based on sensor or simulation observations
- Compatibility with leverage the broader standards environment

OWS-4 SWE - Objectives



- Shift focus from design (previous testbeds) to refinement/implementation (OWS-4)
 - Refine SWE architecture to clarify design tradeoffs
 - Feed into Geoprocessing Workflow Thread
- SensorML and TransducerML profiles for sensors and applications
 - Specific sensor instances: Quality, uncertainty of derivations
 - Continue deriving/refining Catalog profiles for discovery in SWE
- Mature SWE Service specs and implementations
 - Sensor Observation Service
 - Sensor Planning Service
 - Geo-Video Service
- Sensor Standards Coordination
 - Track results of coordination discussions: IEEE, OASIS, OGC, others
 - Alerts Harmonization (SAS, WNS, WFS, CAP/EDXL)
- Tie into Agency/Sponsor demonstration/exercises

OWS-4 Dirty Bomb Response Demonstration



- Act 1 - Radiation Event
 - Sensor Alert, Video Sensor Tasking
 - Collaboration with Regional Agencies
 - Weather and Environment Impact
 - Establish Common Operating Picture
- Act 2 - Preparing Temporary Hospital
 - Siting and and Aero Analysis and Updates
 - Hospital Construction Analysis and Updates
- Act 3 - Patient Tracking
 - OpenLS Tracking Service

OWS-4 Demo Location: EOC and Sensors

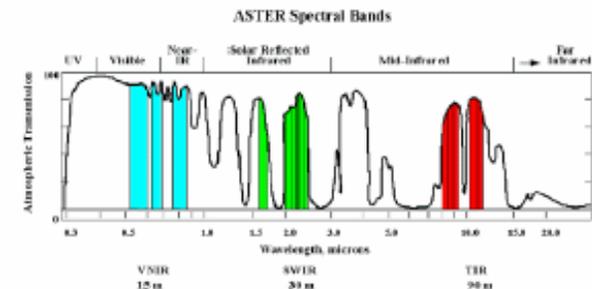
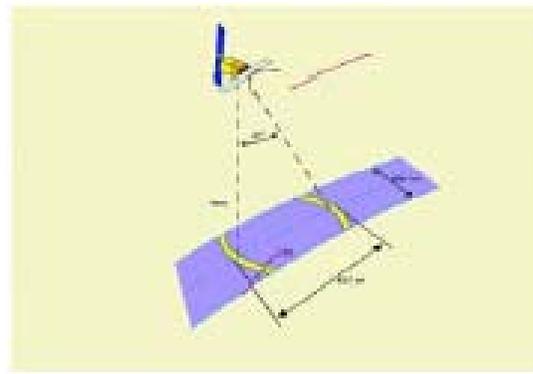


OGC

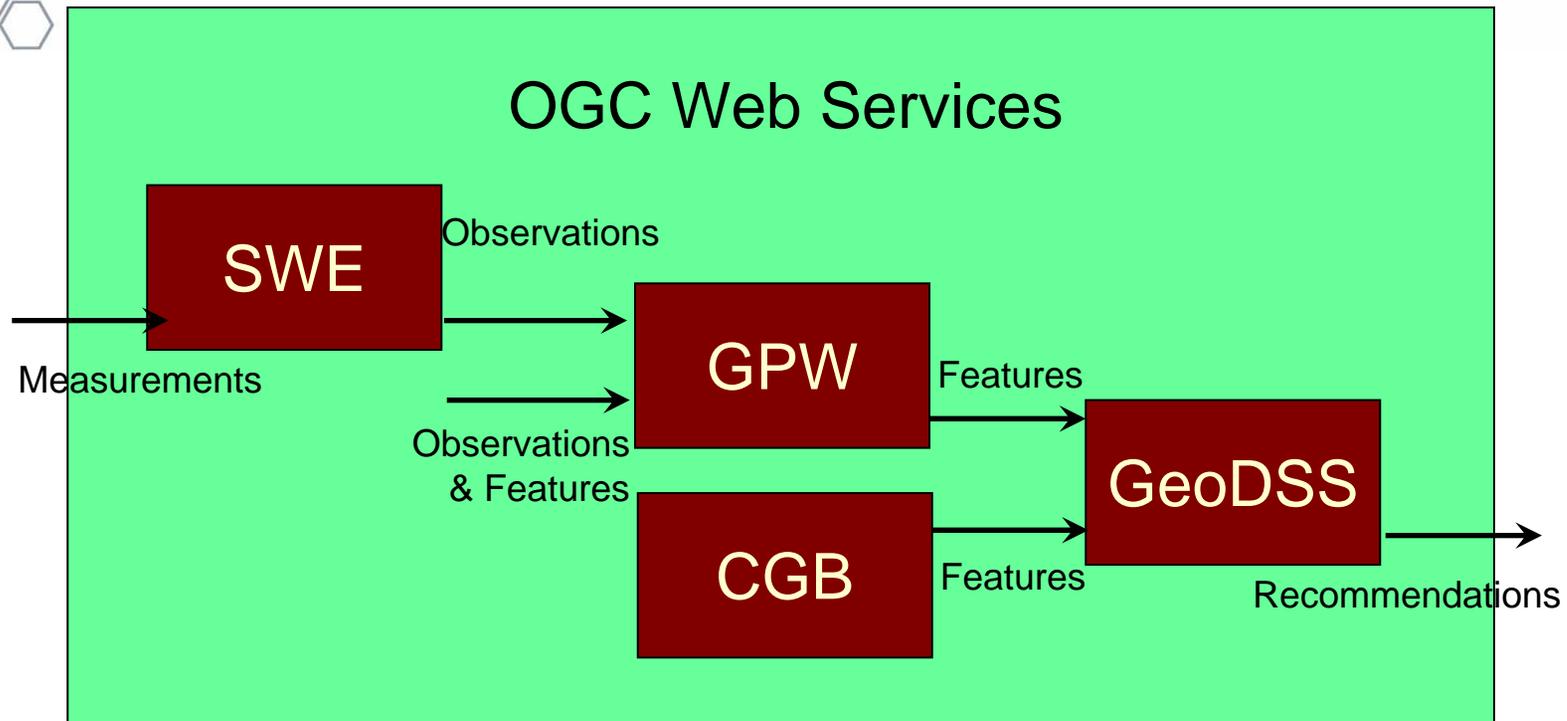
Sensors Integrated in the SWE Demo Network As Part Of OWS-4



- ORNL Radiation Sensor
 - ORNL-SAS, 3eTI-SOS
- IRIS and IFGI Video Sensors/Actuators
 - IFGI-SPS, 3eTI-SOS
- Smart Sensor Systems Light Sensor (TinyTIM™ 1451 Bluetooth)
 - 3eTI-SOS
- NASA EO1 Hyperion Imagery Sensor
 - Vighel-SOS, Vighel-SAS, Vighel-SPS
- Environment Sensors (Moisture, AmbTemp, SoilTemp, Solar Voltage/Current)
 - CSIRO-ICTC SAS and SOS
- NWS Weather Sensors
 - IFGI-SOS
- Doppler Radar Sensors
 - UAH-SOS
- GOES Imagery Sensor
 - UAH-WCS



OWS-4 Information Flow



SWE = Sensor Web Enablement

GPW = Geo-Processing Workflow, including
Feature Application Schemas

GeoDSS = Geospatial Decision Support Services

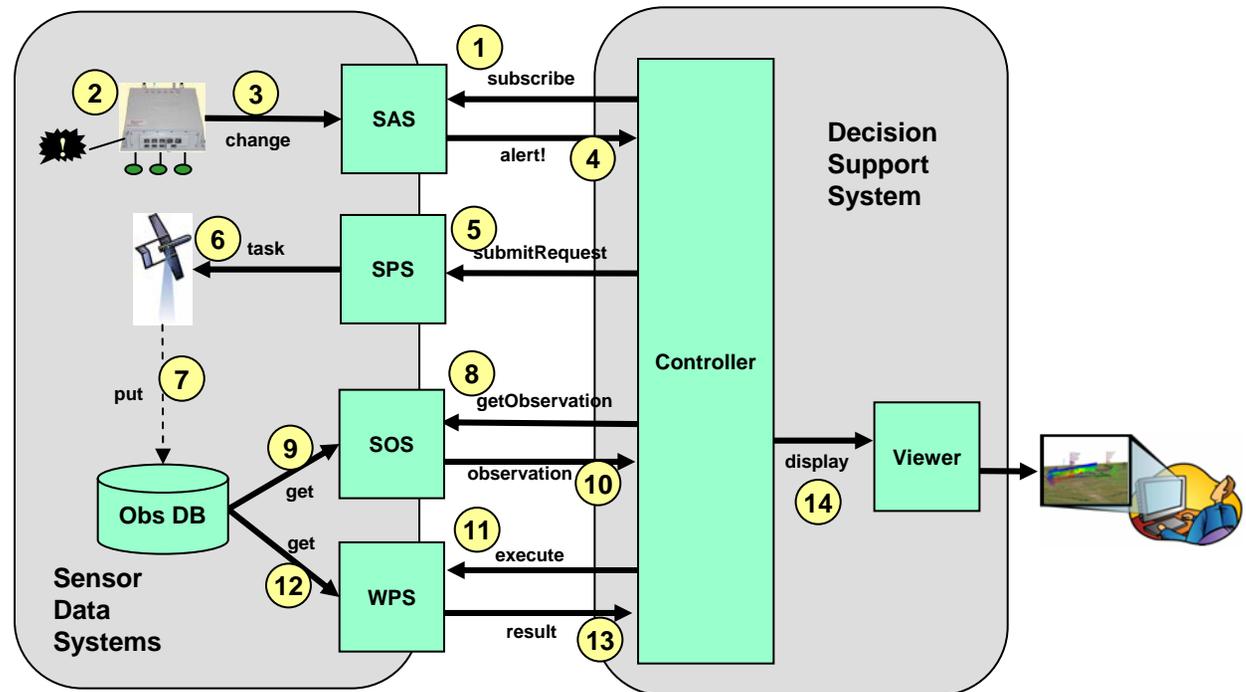
OWS = OGC Web Services

CGB = CAD / Geospatial / BIM

OWS-4 Scenario: Alert-driven Processing of Sensor Data

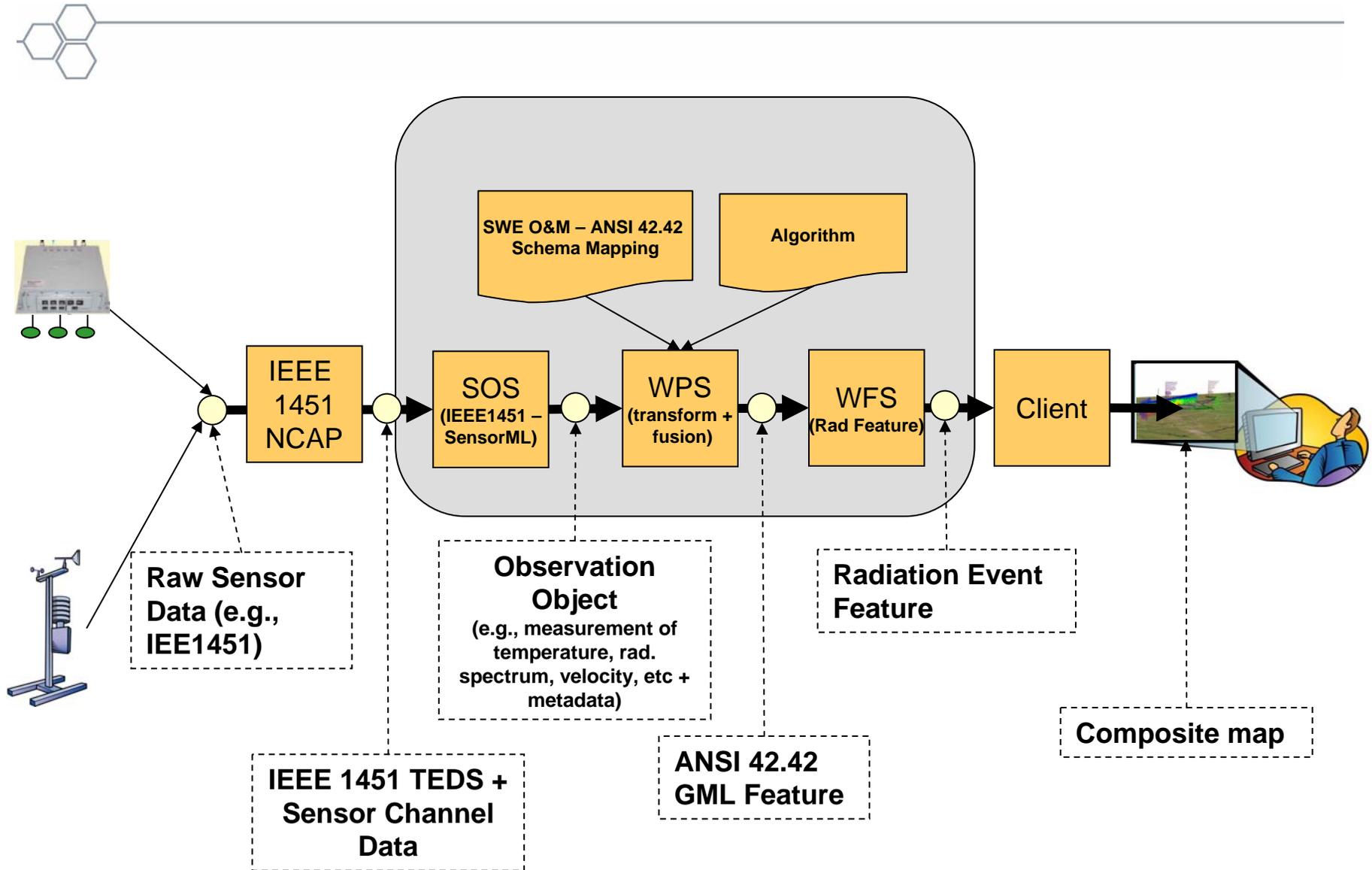


- Seek to automate and shorten the decision-action loop.
- Focus on:
 - automated sensor management and sensor data processing to produce actionable information for decision makers.

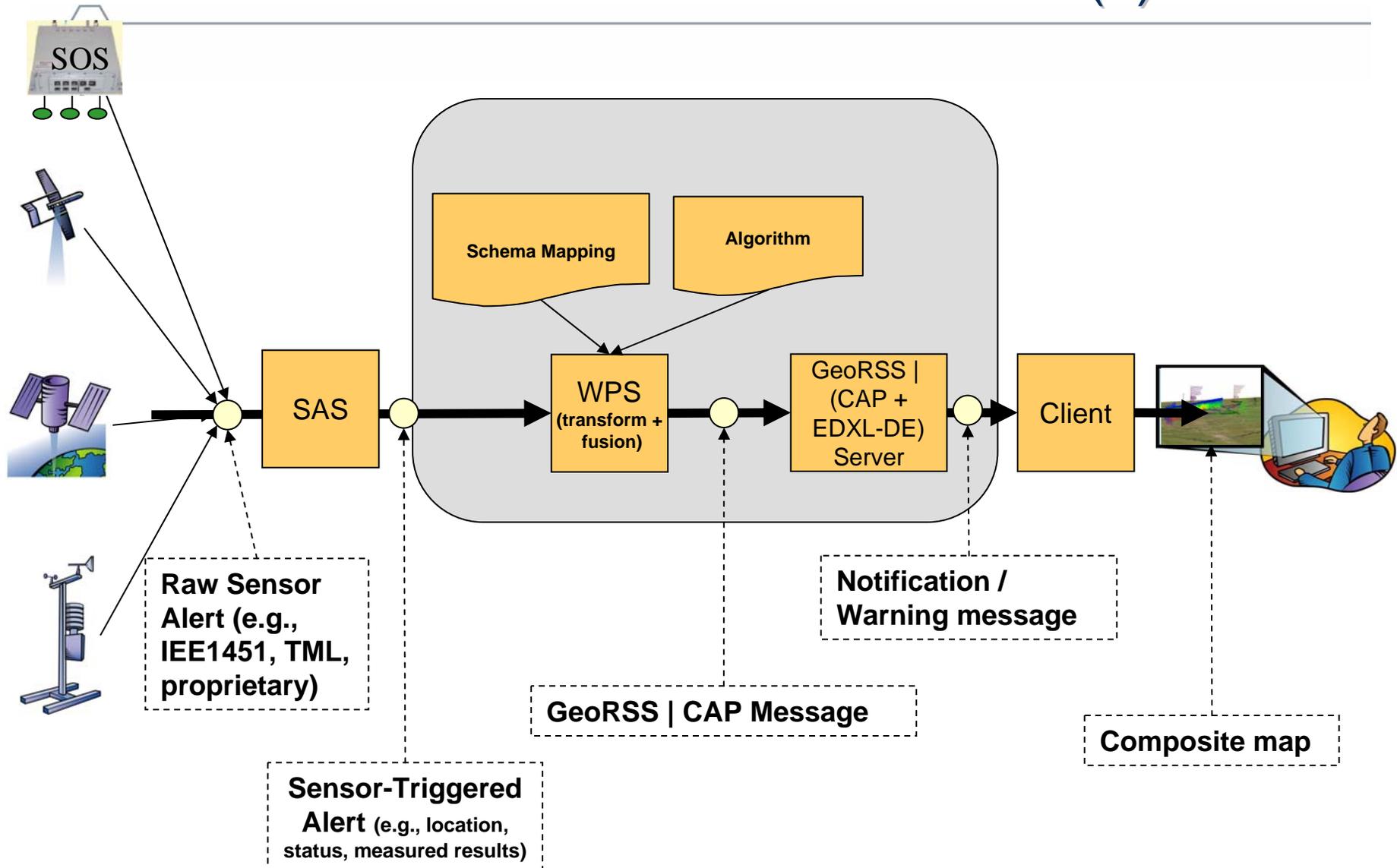


- The approach must be modular, extensible and standards-based (i.e., not a “point solution”)

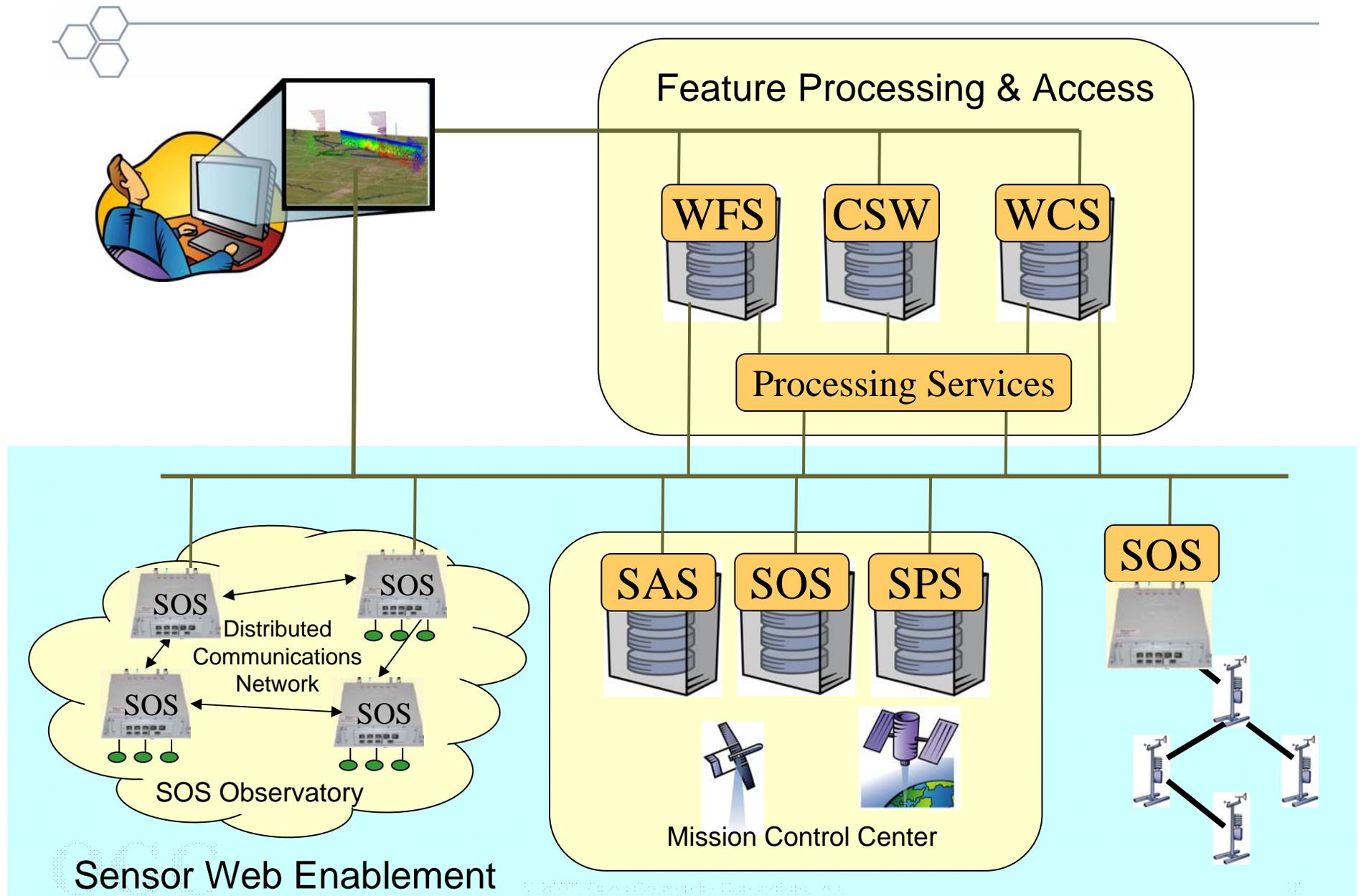
A SOA Workflow for Sensor Data



A SOA Workflow for Sensor Data (2)



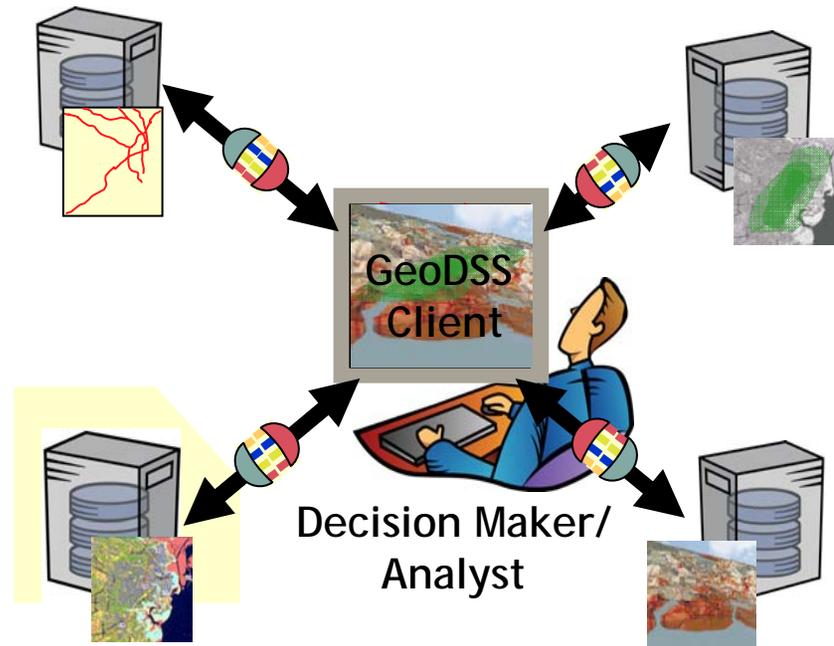
SWE and Geo-Processing Workflow



Sensor Web Enablement

GeoDSS Fundamental Concept

- *Decision maker at a single workstation, identifies resources anywhere, accesses the resources, brings into operational context, and integrates with other resources to support decision process*



*Access to WMS, WFS, WCS, CS/W, SOS, SPS, Workflow, Context
Feature & Coverage Portrayal in a multi-lingual, distributed services
environment*

OWS-4 DVD



- OWS-4 Movie:
 - “Advances Emergency in Response”
 - Dan Dubno, former CBS News
 - Filming, animations, screen captures
- Interactive Demos
 - Dirty Bomb Demo
 - Earth Observation demo
 - Other: Multilingual, CGB, GeoDRM
- GML Client Application & Data
- Delivery end of February
- DVD and web distribution



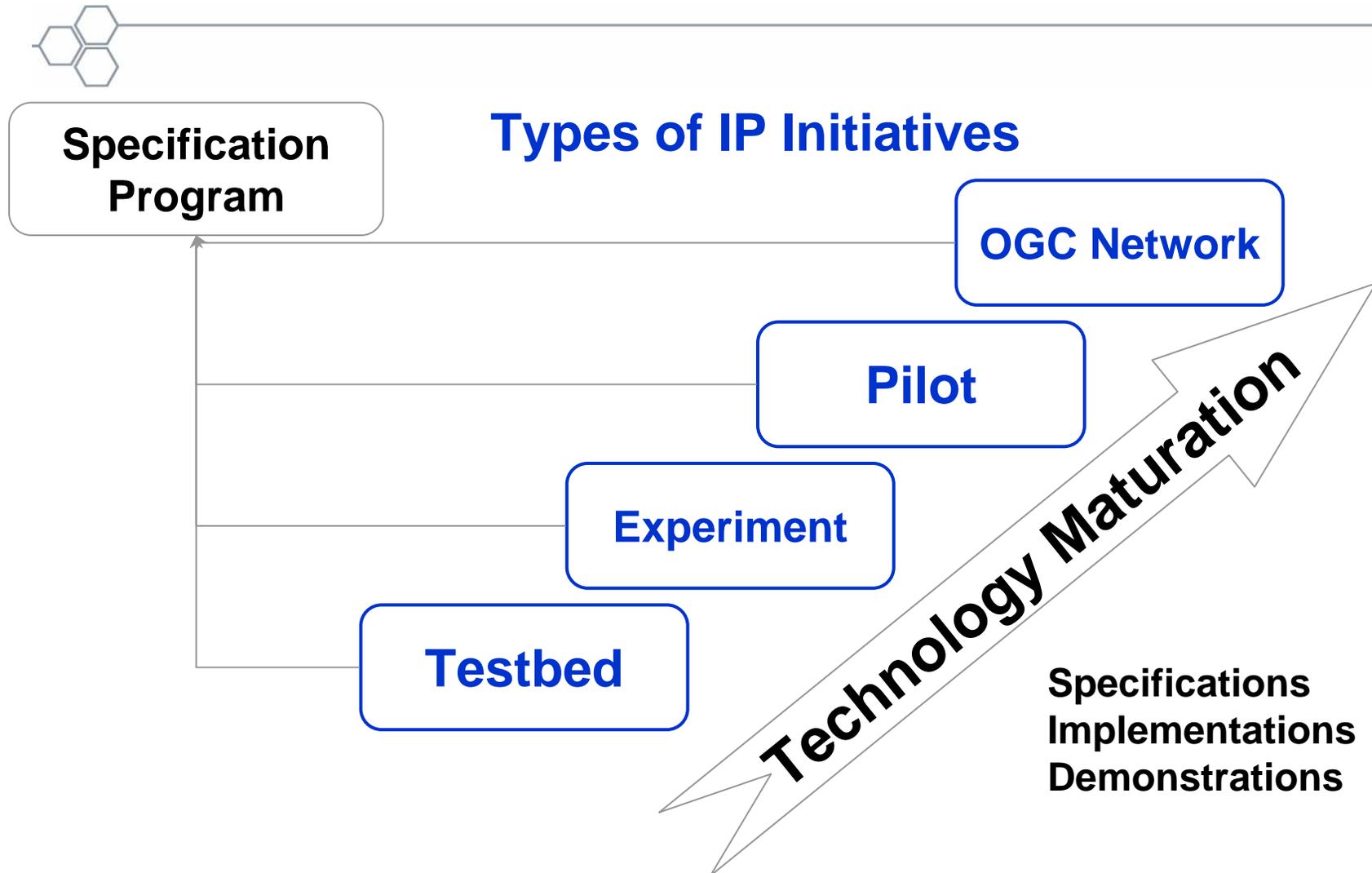
OGC



OGC-IP 2007 Planning

OGC Web Services Phase 5 (OWS-5)

Interoperability Program Development





OWS-5 Planning

OWS-5 Strategy



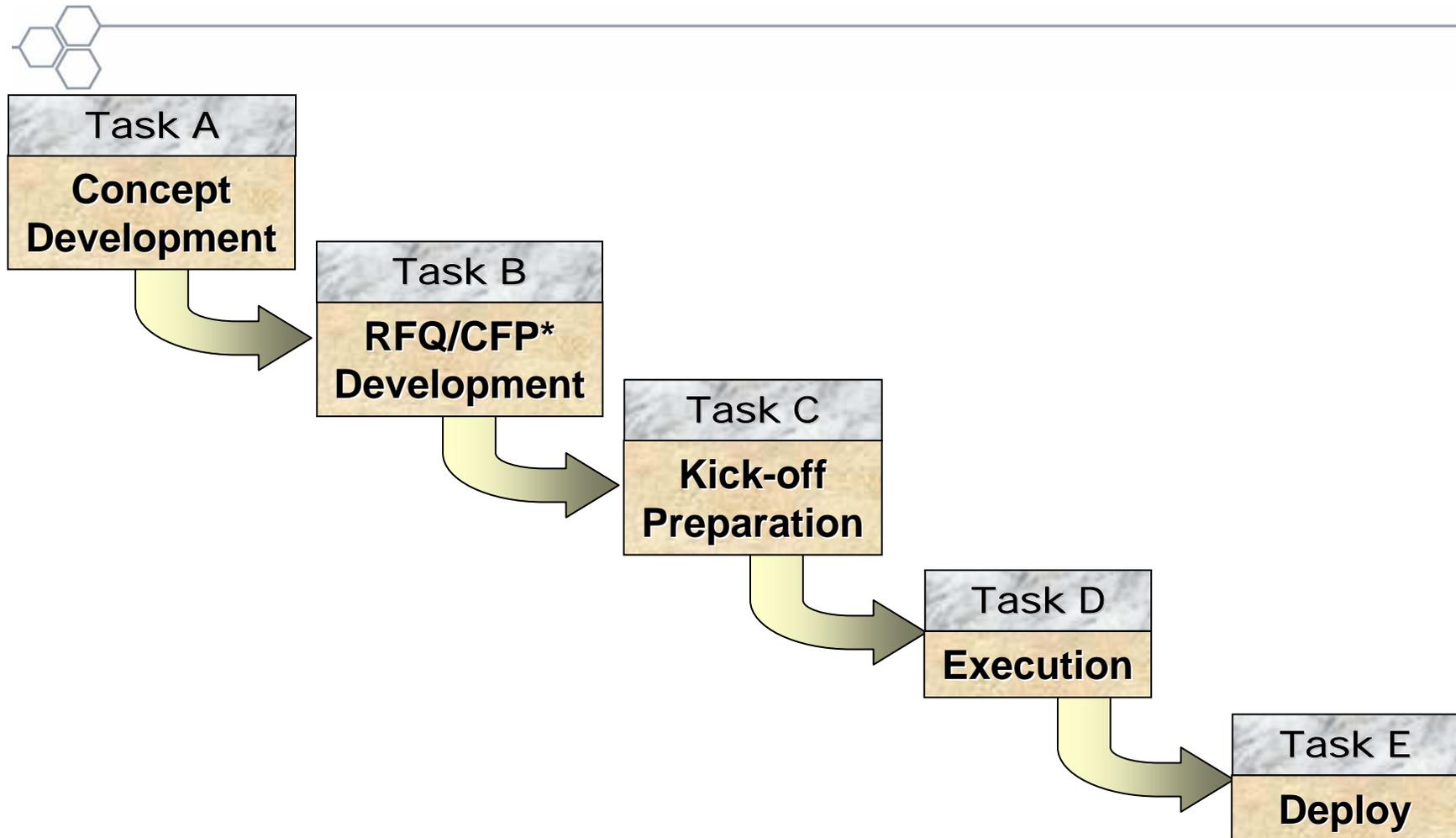
- Less new technology development, more solution-oriented services integration
- Emphasis on integrating sensor technology with mainstream business processing. Security and workflow become major areas of interest amongst others.

Proposed Threads



- **CAD/GIS/BIM**
- **Compliance Test Development**
 - SWE 1.0 tests
- **Workflow/Enterprise/Service Chaining:**
 - Focus on loosely coupled service chaining
 - Include Geospatial Digital Rights Management
 - Catalog work
- **Sensor Web Enablement**
- **Mass Market**

Testbed Approach



*RFQ/CFP = Request for Quotation/Call for Participation

OWS-5 Objectives (1)



- Security: WS-Trust, SAML-XACML, GeoDRM, Role-based authentication, other light weight (non-SOAP) alternatives
- Specification refinement
- SOAP implementations and updated specs to document normative bindings
- Enhance interoperability across sensor networks
- Coordination (or Joint Testbed) with OASIS and IEEE
 - OASIS Common Alert Protocol (CAP) & OASIS EDXL
 - Also with other sensor-related activities within DHS/DOD (e.g. CBRN Data Model, ANSI-42.42N, MASINT, etc)
- Integration with other IP activities: GEOSS, OCEANS IE, Where 2.0
- Consider Hurricane demo scenario in Texas using archived data
- Continue deriving/refining Catalog profiles for discovery in SWE

OWS-5 Objectives (2)



- **SWE enablement of DCGS (DIB)**
 - Establish interoperable SOA operations consistent with DCGS / DIB
 - Support for Empire Challenge '07 & '08
- **Demonstrate SWE's Enterprise Mission Management (EMM) capability**
 - Manage National and tactical space-based, ground-based, and airborne ISR collection systems.
- **Application of SWE to Airborne sensors**
 - Test SPS using ACTM
- **Indoor location / sensor integration for facilities management, security and safety**

Potential OWS-5 Objectives (3)



- Development of CITE tests for SWE
- Mass Market concepts: GeoRSS, CAP, KML, SWE concepts
- Integration with CAD / GIS / BIM work
- TransducerML and SensorML harmonization (SWE Common)
- Application of TML to SAR data

OWS-5 Concept Development - Plan



- | | | |
|--|------------------------|-------------|
| • <i>CD phase overall</i> | <i>Jan to Jun 2007</i> | <i>4 mo</i> |
| • Sponsor Meetings | Jan to Mar | 3 mo |
| – TC Meetings: San Diego, Dec 06; Ottawa, Apr 07 | | |
| • Call for Sponsors | Jan to Feb | 1 mo |
| • Sponsor Agreements | Feb to Mar | 2 mo |
| • RFQ development | Mar to Apr | 2 mo |
| • RFQ response period | Apr to May | 1 mo |
| • Participant Selection | May to Jun | 1 mo |
| • Kickoff meeting | Jun 07 | |
| – TC Meeting: Paris, July 2007 | | |



OGC Use Case Discussion

Background



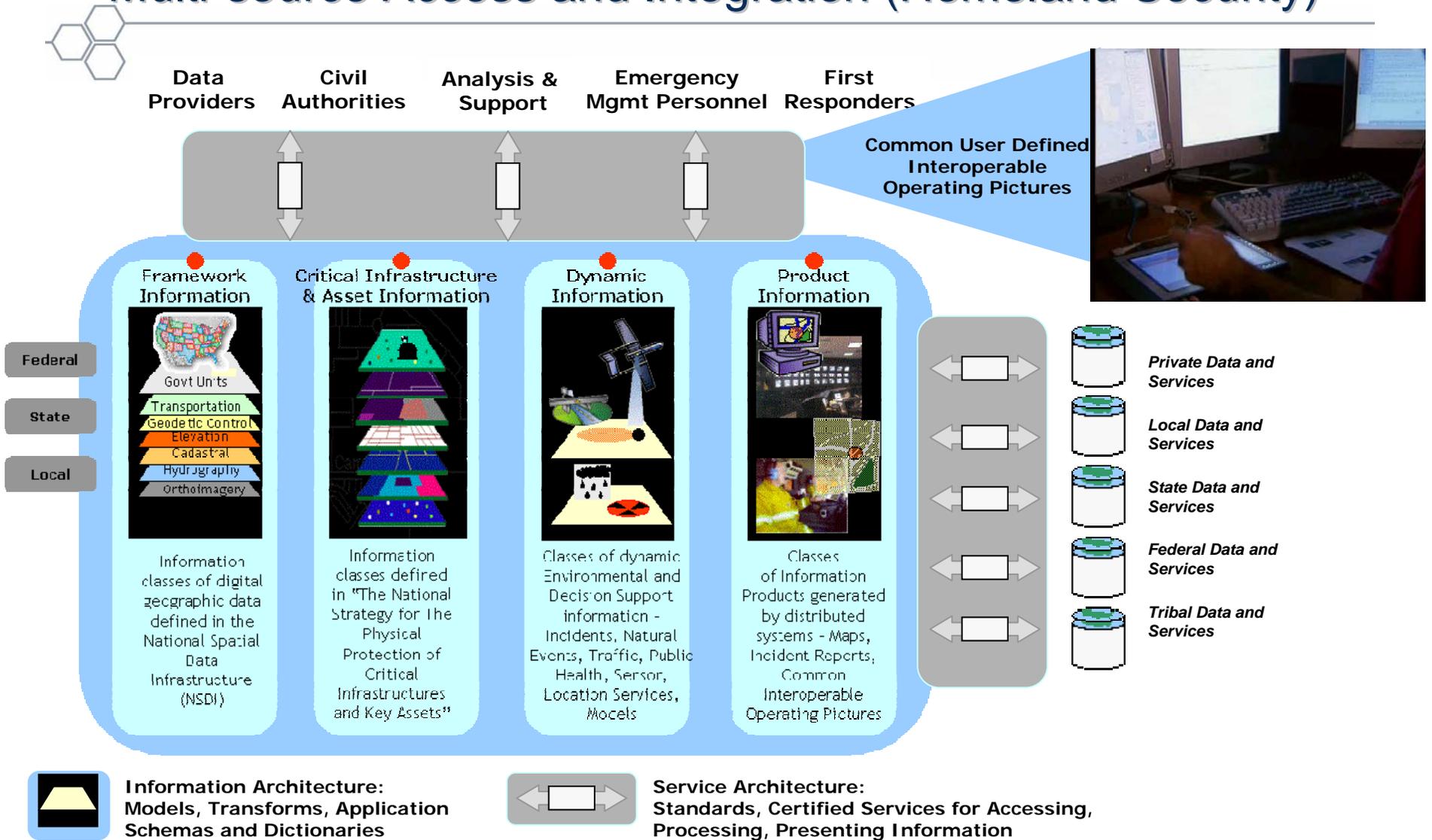
- Use cases emphasized for standards development, testing, validation and demonstration
- Identify, submitted and prioritized by OGC Members
- OGC processes work to:
 - Develop target architecture
 - Integrate use cases most effectively into OGC programs
 - link / relate similar use cases to maximize activity efficiencies

Use Cases - A Sample of Past OGC Initiatives / Focus Areas



- Web Mapping Testbed I/II
- OGC Web Services Testbeds
- Military Pilot Project
- Geospatial Fusion Services
- Critical Infrastructure Protection Initiative
- Emergency Management Symbology
- Open Location Services
- Civil Works Technology Insertion
- Multi-hazard Mapping Initiative
- Geospatial Semantic Web Interoperability Experiment
- Geospatial Digital Rights Management
- Ocean Science Interoperability Project

Common Geospatial Interoperability Framework Multi-source Access and Integration (Homeland Security)



Geospatial Interoperability Framework development is a key focus of ongoing OGC Testbeds to meet cross-organizational enterprise challenges.



OWS-3 Demo Capture Event - October 2005

OWS-3 is dedicated to John Vincent

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The Scenario



An Emergency Response Center in Southern California receives notification of a fire in the hills east of San Diego. It threatens to breach an industrial storage facility near some inhabited regions. Recognizing the risk that the resulting plume may contain toxic components in addition to the particulates and combustion products typical of a wildland fire, the professionals act quickly to find and deploy resources to track the plume and evaluate its composition, as well as to support the response effort.

The Actors:

- NG1 = National Guard #1 at ERC - Refrations
- FS1 = Forest Service #1 at ERC - Intergraph
- NG2 = National Guard #2 at ERC - UAH
- FS2 = Forest Service #1 at ERC - York
- EMT = Emergency Response Team - Skyline

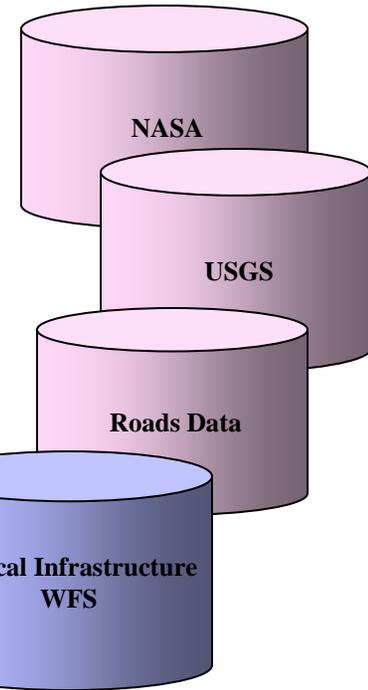
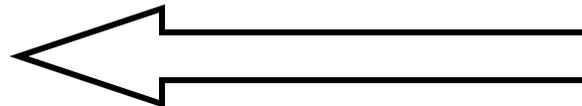
Scene 1



Alert / Notification. Establish Common Operational Picture

Alert arrives: probable fire in Pine Hills area

National Guard builds framework map from various interoperable data sources ...



... saves sharable context document

```
<Map>
  <More Info>
    <abc>
      def
    </abc>
  </More Info>
</Map>
```

Scene 1



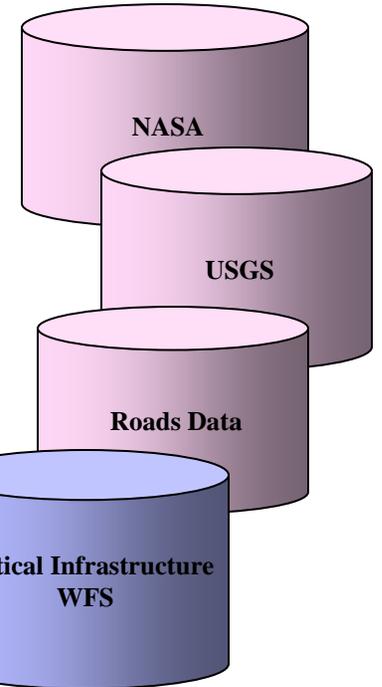
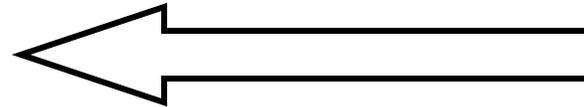
Establish Common Operational Picture

Forest Service reads context document ...

```
<Map>  
  <More Info>  
    <abc>  
    def  
  </abc>  
</More Info>  
</Map>
```



... loads data to present same view

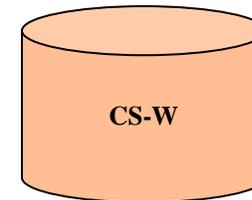


... queries symbol catalog



DAS

...and translates using
Data Aggregation Service



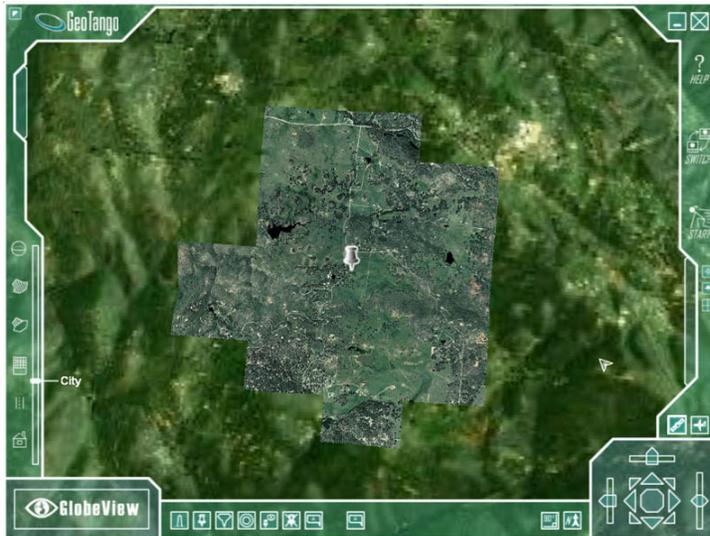
CS-W

Scene 1



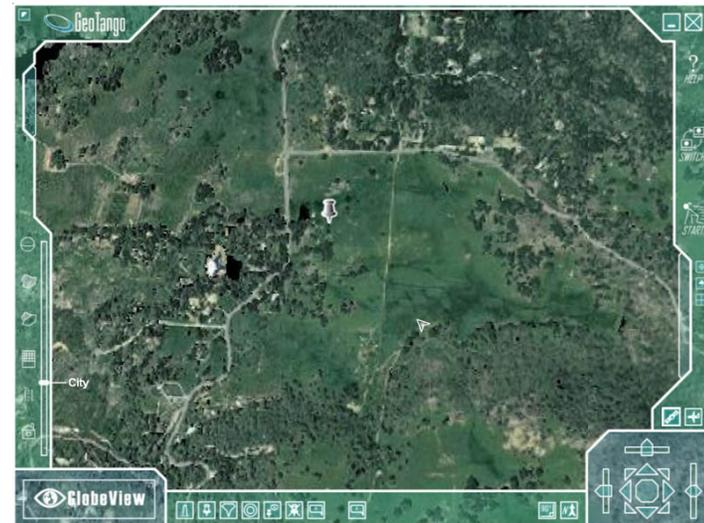
Establish Common Operational Picture ...

National Guard and Forest Service use their Sensor Web (SWE) clients to view Area of Interest from high-altitude ...



“Forest Service” SWE Client

... and zoomed-in perspectives



Scene 2

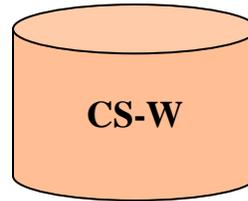
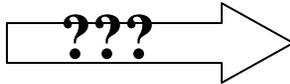
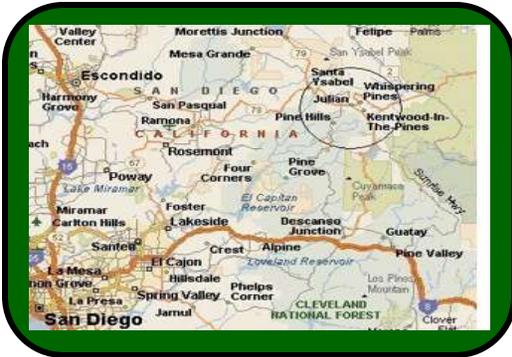


Prepare to Deploy - Identify Resources

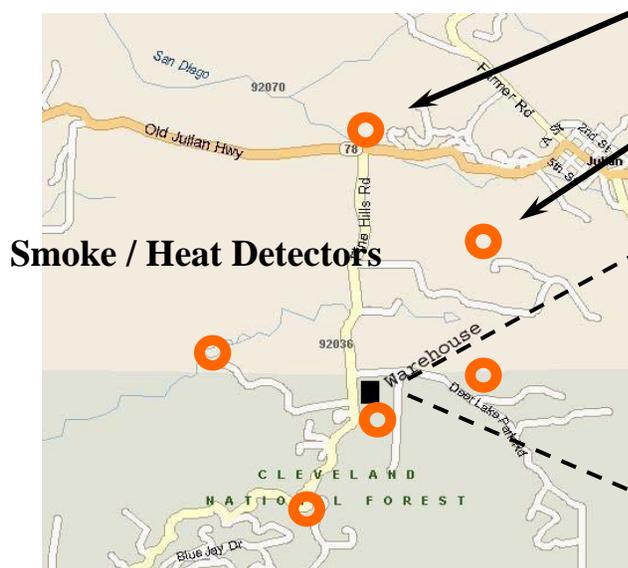


Web Cam

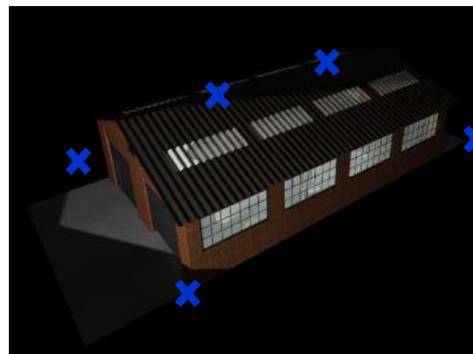
Query for sensor systems



UAV-Based Cameras and Scanners



Smoke / Heat Detectors



Airborne Toxin Sensors



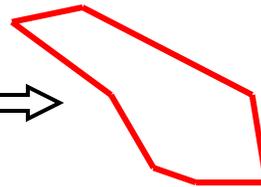
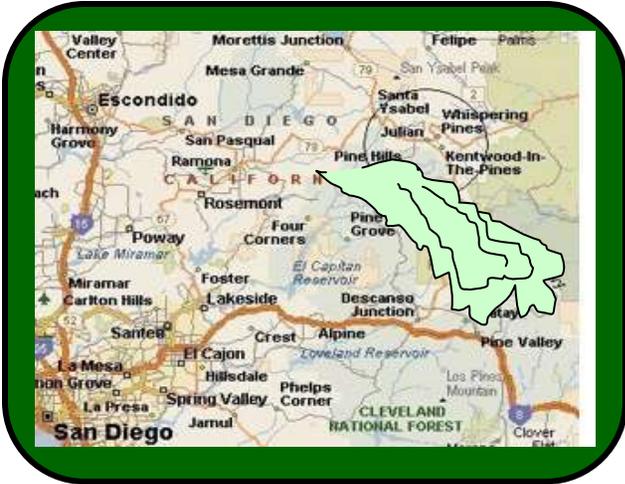
Mobile Video Unit

Scene 3



Plan Deployment

Analysis



Sensor Client detects plume,
develops polygon representation ...

... for viewing in DSS Client
... to develop evacuation areas
... and avoidance zones for ERT

Tasking



OGC

Scene 4

ERT Deployment

