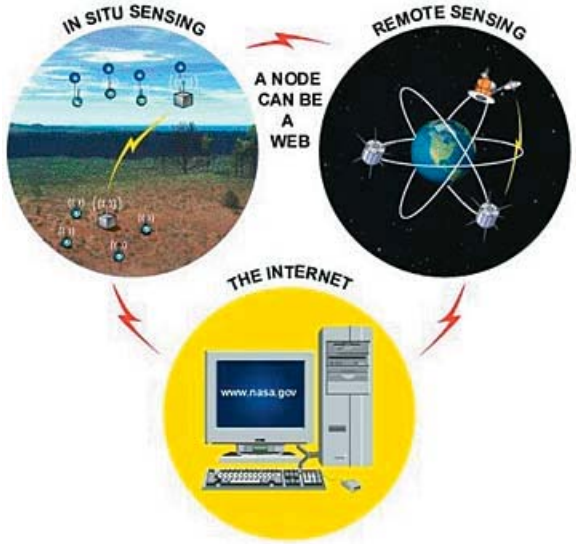
AIST Program
Sensor Web Meeting
Summary of Results

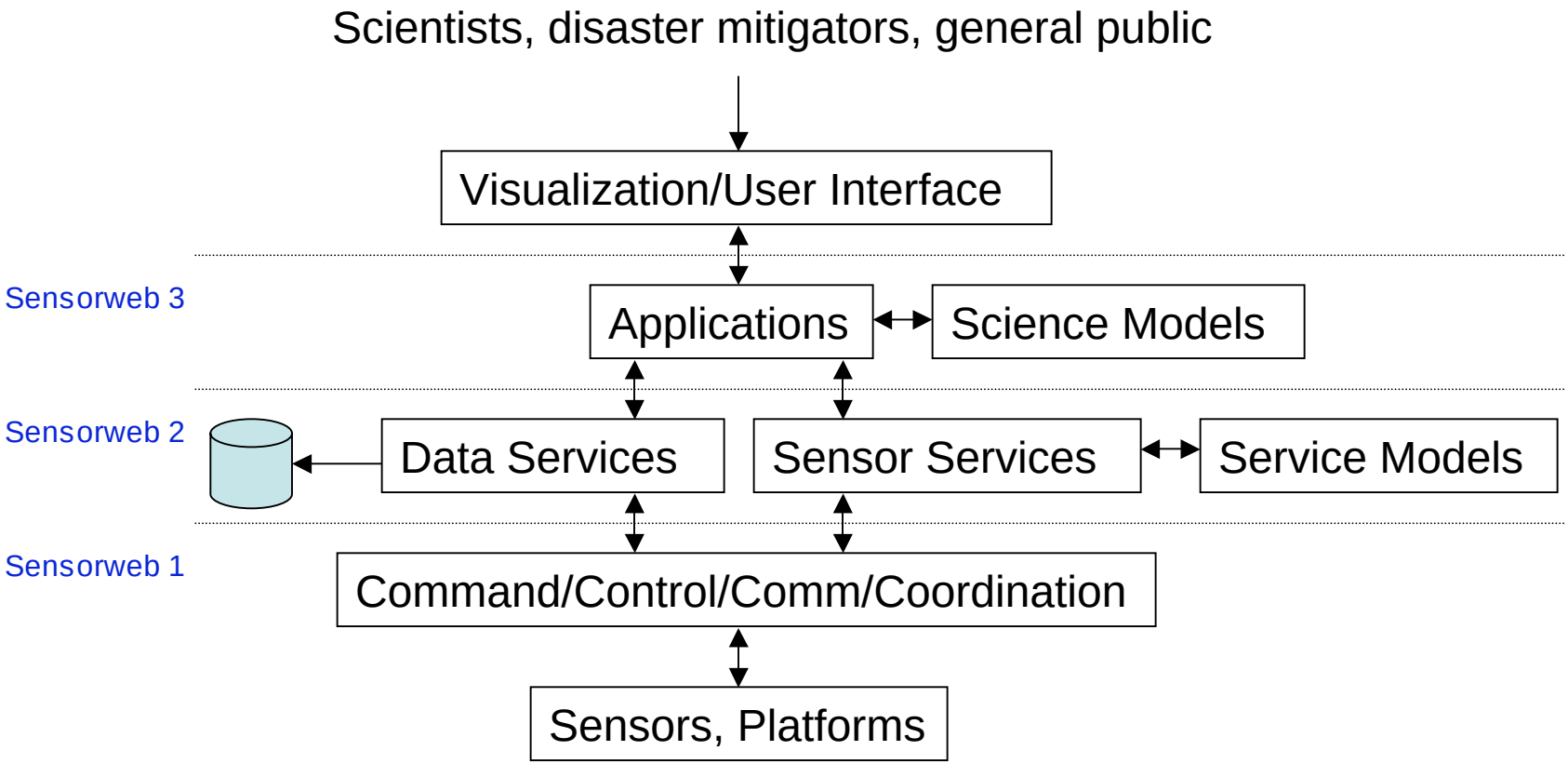


Working Group B

February 14, 2007

Solid-Earth Hazards

Sensorweb Architecture



Sensor Web Components

- Identify the components of the sensor web architecture in sufficient detail to ensure understanding
  - components of a system have generic interfaces through which they advertise their functionalities
- Sensors
  - Provides basic measurements and observations
    - Not just physical/geophysical phenomena, but also of the infrastructure itself
- Communication Resources
  - Networks: wired, wireless, acoustical, etc.
- Data/Metadata
- Command/Control/Coordination
- External
  - Users
  - Goals (input)
  - Information (output)
  - System Context
  - Resource Discovery (could be internal as well)

Key Features

- Describe the key features of your sensor web architecture
  - Describe the characteristics of a sensor web
- Characteristics of the measurements and observations
  - Fidelity and capacity
  - The quantity being observed
  - Diversity, density (spatial), frequency (temporal)
  - Latency
- Feedback
- Autonomy
- Mobility
- Access
- Event Driven Reconfigurability
- Data and Model Characteristics
  - Streaming, real-time, stored
  - Provenance well documented (QA/QC – in order to make decisions, you need a certain quality of data)
- Robust component capability (some capability exists if one sensor is removed)

Terms and Definitions

- Define sensor web terms specific to your architecture
- Sensor
  - A device that responds to a stimulus, and generates a signal that can be measured or interpreted
- Feedback
  - Information returned from the output of a machine or process intended for use as input in subsequent operations or for purposes of automatic control.
- Autonomy
  - Autonomy is the ability of a system to perform successfully for extended periods without human intervention. The ability to make decisions and exert control over a how a goal is achieved.
- Resource Discovery
  - To find resources which are registered with specific capabilities
  - Some mechanism that matches requests to assets
- Robust Component Capability
  - Some capability exists if one sensor is removed

Key Benefits

- Hides complexity from the user
- Shared resources
- Enables interoperability
- Empowers the user community
  - Focus on results not computer science
  - Enable new scientific understanding
  - Enables ad-hoc collaboration
  - Enables free composition of resources
- Autonomy provides
  - Rapid resource reconfiguration
  - Efficient use of resources
- Awareness of sensor locations/capabilities allows optimization in data collection strategy
- Expand the user base of your sensor web

Critical External Systems

- List and describe key systems external to the sensor web but critical to the concept
  - Users
  - Goals (input)
  - Information (output)
    - Data archive centers (could be internal as well)
  - Resource Discovery (could be internal as well)

Architecture Concept / Use Case Challenge

- Major Earthquake Aftermath
  - Goal: Deploy a sensor web to understand the post earthquake dynamic environment including earth deformation, aftershocks, damage assessment, changes in stress field, and to help forecast where future earthquake will occur.
  - Components
    - Seismometers
    - GPS Sensors
    - Satellite or airborne imagery
    - Interferometric Radar
    - Models (risk, forecast, stress/strain, workflow and processing)
  - Benefits
    - Generate customized on-demand results
    - Ability to forecast future earthquakes
    - Aid in planning disaster recovery
    - Assess the extent of the damage
  - Scenario
    - After the earthquake occurs, assess damage to discover functioning resources, then prioritize data collection strategy
      - task static sensors to take higher rate data, deploy new GPS sensors, retask radar sensors to image quake zone, collect data of water levels in wells, compare with previous historical data,

Sensorweb Use-Case Architecture