NASA AIST-05 Sensor Web
PI Meeting - Feedback

Concept Diagrams - C, B, A
Scenario Diagrams - C, B, A
Project Mapping - Group C
Capabilities Roadmap - Group A

February 14, 2007
Architectural Concept - Group C1

- Prediction Models
- Decision Support Systems
- Science Users

Data Acquisition

Data Processing

Communications

Command & Control

Autonomous

External
Architectural Concept - Group C

- Command & Control
  - Autonomous
  - External

- Data Acquisition
- Data Processing
- Modeling
- Storage

- Prediction models
- Decision support systems
- Data processing

- Science users

- Comm Stds & Protocols

- Commands/Requests
- Data/Information

- Sensor
- Platform
- Sensor Web
Sensorweb Architecture - Group B

Scientists, disaster mitigators, general public

Visualization/User Interface

Applications © Science Models

Data Services © Sensor Services © Service Models

Command/Control/Comm/Coordination

Sensors, Platforms
Architectural Concept - Group A

Outside Network

Sensor Web

Compute Nodes

Storage Nodes

Composite Nodes

Sensor Nodes

Communications Fabric

Events or state

Environment
Architectural Concept (cont.) - Group A

Environment

Events or state

Sensor Layer

Models:
- Sensor
- Environment
- ...

Service Layer

Service 1

Service 2

Service n

Service Layer

Data / information

Processing:
- algorithms
- agents
- data fusion

Service request

Control:
- Workflow
- Resource Mgmt
- ...

Data / information

raw data

state data

change of state command

Data / information

observation request

Observation

Request

Data / information

Data / information
Use Case Scenarios
• **Goal:** Improve weather forecasting on a regional basis.

• **Problem:** Not collecting data where we need to collect data. Need to collect and assimilate complex heterogeneous data more intelligently.

• **Opportunity afforded by the sensor web:**
  - Targeted observations
  - Dynamic allocation of data collection assets
  - Intelligent spatial (3-D), temporal and spectral coverage
  - Collecting data from multiple viewing angles simultaneously
  - Prediction based measurements drive targeted observations
Sensorweb Use-Case Architecture - B

Scientists, disaster mitigators, general public

Visualization/User Interface

Applications

Science Models

Data Services

Sensor Services

Service Models

Command/Control/Comm/Coordination

Sensors, Platforms

Map showing pipeline stresses

Deformation Model gives strain over the area

Seismometers
GPS Sensors
Satellite or airborne imagery
Interferometric Radar
Biomass Measurement Scenario - A

- Sensors
- Weather
- Soil Moisture
- Vegetation

- Retask Sensors
- Biomass (x, y, z, t)
- Model Calibration

- Estimate of Uncertainty
- Map of Biomass + Uncertainty

- Assimilate with Model to Predict Future Ecosystem parameters (e.g. CO₂)

- Utility of Data Decision Making
Architecture Concept / Project Mapping - C

- Command & Control
- Autonomous
- External
- Data Acquisition
- Data Processing
- Modeling
- Storage
- Prediction models
- Decision support systems
- Data processing
- Science users
- Commands/Requests
- Data/Information
- Commands/Requests
- Sensor Web
- Platform
- Sensor
- Comm Stds & Protocols
Evolutionary Sensor Web Capabilities
(potential to drive NASA road map) - Group A

Class 1
- Event detection and notification (e.g., Swift GRB and the Gamma Ray Burst Coordinates Network - GCN)
- Coordinated data collection and reporting, science data fusion, information synthesis, and decision making.

Class 2
- Data collection and reporting (e.g., river water levels, incident solar radiation, lightning detection network, GOES DCS for data dissemination)
- Data sharing (e.g., GPS-based time and location dissemination)

Class 3
- Collaborative system level reconfiguration (e.g., run new algorithm based on node data collected; deploy additional sensors/interrogate other sensors to refine forecast and alerts)
- Intelligent sensor web predicts phenomenon, controls resources to perform collaborative observations, possibly even takes actions to modify effects of phenomena (e.g., predicts flash flood; monitors rainfall conditions; accesses GIS data; opens flood gates when flash flood detected)