Science Goal Monitor

presented by
Sandy Grosvenor

Experiments with Sensor Webs using EO-1, March 2, 2004

SGM can be found at http://aaaprod.gsfc.nasa.gov/SGM
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• SGM and the EO-1 Sensor Web demos
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What is the Science Goal Monitor?

- Captures scientifically expressed goals and reactions for executing science campaign
- Autonomously processes goals: monitoring data from independent sources and reacting dynamically when specified goals are met
- Provides coordinated response to data received from multiple independent resources (missions, sensors, or theoretical models)
What is the Science Goal Monitor?

- Prototype designed for a distributed environment: some analysis onboard, some on the ground
- Low TRL, small development team
- Funded through NASA’s Computing, Information And Communication Technologies - Intelligent Systems (CICT-IS) program
SGM and EO-1, Rapid Fire Demo

Scientists select area of interest, initiates campaign

EOS DAAC / RapidFire System

MODIS data

Terra

Aqua

SGM Web Monitor

SGM
- monitors data for fires in target area
- coordinates with EO1 to initiate image requests
- monitors image status

EO-1

image request

EO-1 Ops Center

image data

image requests

status, image data

status, updates and (when ready) link to new image

goals, reactions

SGM and EOS

SGM can be found at http://aaaprod.gsfc.nasa.gov/SGM

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SGM and EO-1

- SGM provides data analysis and autonomous coordination between multi-mission data sources
- SGM web interface gives scientists ability to initiate campaigns and monitor status of campaign
- Can perform either short-term event driven campaign or longer term monitoring campaigns

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SGM Architecture

• Core monitor is 100% Java, OS independent
  - currently developing and testing in both Linux and Windows environments

• Development tools all open source or freely available
  - Java; Eclipse; Tomcat; databases such as mySql, PostgreSQL, HsqlDb

• “Plug-in” modules let SGM monitor multiple data sources including POP email text messages, FTP, or other protocols

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SGM Components

- **RapidFire Data**
- **EO-1 Image Archive**
- **Data Providers**
- **EO-1 scenario analyzer**
- **Analyzers**
- **EO-1 Mission Ops**
- **Actions**
- **EO-1 presentation**
- **SGM Web Front-End**
- **Campaign data**
- **Goal Manager**

- **SGM Components**
  - = Core SGM Component
  - = EO-1 Plug-In Component

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Data Providers/Analyzers

Data providers are interfaces to different sources of science data. SGM has “standard” interfaces for access such as FTP or POP-based email; or they can be customized for unique data formats.

Analyzers are background tasks that monitor data from providers and perform analyses, saving results in “buckets” that the SGM Monitor can query.

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The Goal Manager manages the progress of a campaign. It:
• handles requests from campaigns (e.g. starting/stopping data analyzers)
• monitors campaign’s active “goals” to see if their “criteria” have been met.
• fires “Actions” when a criteria is met (e.g. perform next step of campaign, send image request to EO-1 MOPSS, etc)

Campaign information and status is stored in a centralized, web-accessible database.
Sample Activity Diagram
Rapid Fire scenario

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Other Collaborations: SMARTESSMARTS

- **Small and Moderate Aperture Research Telescope System:**
  - 4 telescopes in Chile
  - Consortium of universities and organizations led by Yale
- **Observing schedule:**
  - currently manually generated on daily basis
  - fixed for the night once forwarded to the mountain
- **Goals:**
  - improve reaction time to unpredictable astronomical events
  - better understand risk, benefits, and costs to implementing an operational dynamic, autonomous observing schedule
- **SGM will:**
  - monitor alert sources or perform scientific analysis on an image
  - re-schedule rest of night’s schedule to handle new priorities

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Upcoming SGM Features

- Interface to ASPEN scheduler
- Improved ability to define new campaign templates
- Better handle multiple simultaneous campaigns, longer term campaigns
- Improved central database support and access from geographically disperse locations
Additional SGM Information

- http://aaaprod.gsfc.nasa.gov/SGM