Illuminating the Darkness: Exploiting untapped data and information resources in Earth Science

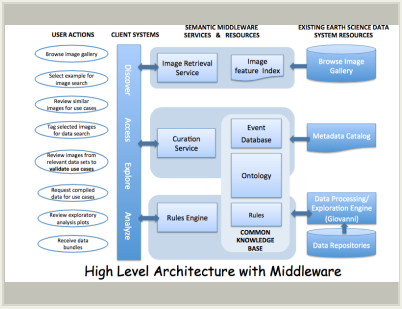
Completed Technology Project (2015 - 2017)

Project Introduction

We contend that Earth science metadata assets are dark resources, information resources that organizations collect, process, and store for regular business or operational activities but fail to utilize for other purposes. The challenge for any organization is to recognize, identify and effectively utilize the dark data stores in their institutional repositories to better serve their stakeholders. These metadata hold rich textual descriptions and browse imagery that allow users to review search results and preview data, but have not been fully exploited by information systems to serve the research and education communities. This proposed work looks at these metadata assets in a completely new and innovative light; it will result in a search tool built on semantic technologies to create new knowledge discovery pathways in Earth Science. This proposal brings together a strong team of informatics experts with a long history of research in data systems, scientific search and semantics, as well as a proven track record of previous collaborations: PI Dr. Rahul Ramachandran (NASA/MSFC), geoinformatics specialist and Manager of GHRC DAAC; Co-I Dr. Christopher Lynnes (NASA/GSFC), Information Systems Architect at the GES DISC; Co-I Dr. Peter Fox (Rensselaer Polytechnic Institute; RPI), Tetherless Constellation World Chair; and Manil Maskey (University of Alabama in Huntsville; UAH), lead designer and developer for multiple projects in Earth science information systems. The proposed work addresses the core AIST topic of Data-Centric Technologies, with a particular focus on utilizing semantic technologies to explore, visualize, and analyze representations of semantically identified information in order to discover new useful information ' directly addressing the subtopic, Alternative Approaches / Disruptive Technologies for Earth Science Data System. This project will develop a Semantic Middle Layer (SML) consisting of a content based image retrieval service to provide for visual search for events or phenomena in Earth science imagery; an ontology based data curation service which uses structured metadata and descriptive text to find data relevant to that event, phenomenon, or thematic topic; and a semantic rule based processing service to create curated data albums consisting of data bundles and exploratory plots generated on the fly. Together these components will allow users to identify events of interest in images and assemble a collection of pre-processed data to support scientific investigations focused on these events. We will design the SML and a demonstration Event Nexus Discovery Client using three science use cases developed in collaboration with Dr. Sundar Christopher, an expert in satellite remote sensing at UAH.

Anticipated Benefits

ICESAT-II



High Level Architecture with Middleware

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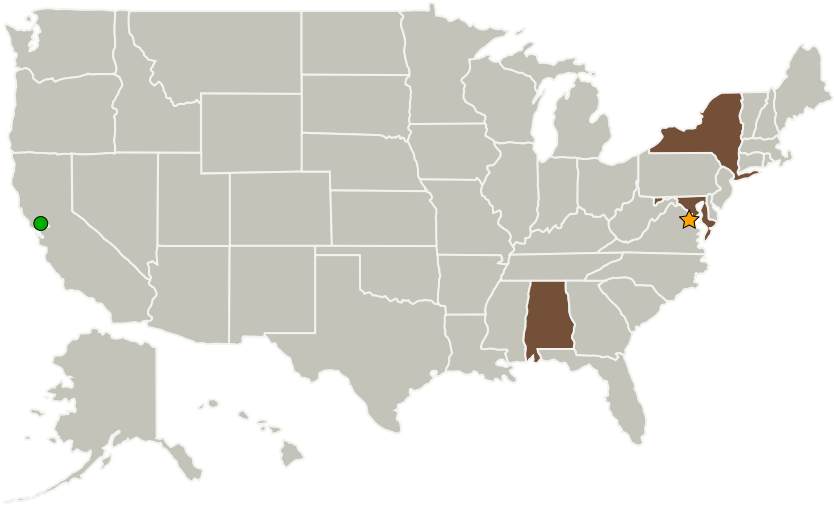
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
Alabama	Maryland
New York	

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Advanced Information Systems Technology

Project Management

Program Director:

Pamela S Millar

Program Manager:

Jacqueline J Le Moigne

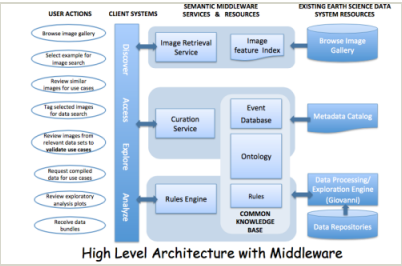
Principal Investigator:

Rahul Ramachandran

Co-Investigators:

Manil Maskey
Peter A Fox
Christopher S Lynnes
James L Smoot
Sundar A Christopher

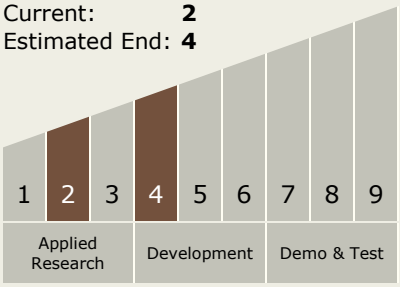
Images



Untitled
High Level Architecture with Middleware
(https://techport.nasa.gov/image/16561)

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **4**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  └ TX11.4 Information Processing
    └ TX11.4.2 Intelligent Data Understanding

Target Destination

Earth