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Seamless Science Workflow Development and Collaboration using the IDL Workbench and ENVI Services Engine

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"There are few scientific tools that support collaboration via sharing"

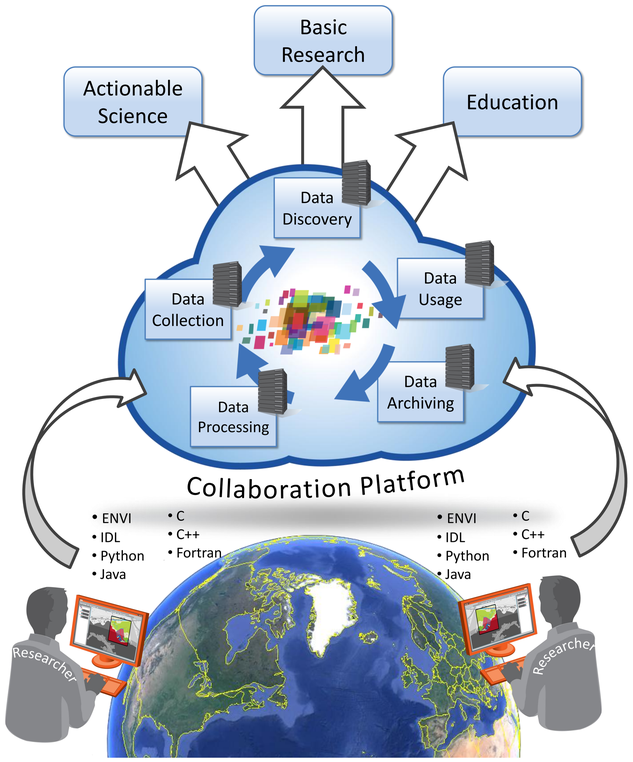


Figure 1. The Earth Science Collaboration Platform

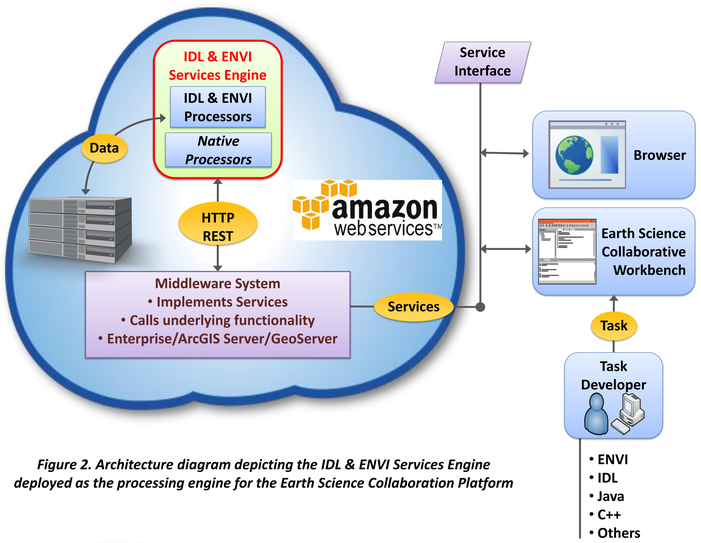


Figure 2. Architecture diagram depicting the IDL & ENVI Services Engine deployed as the processing engine for the Earth Science Collaboration Platform

Project Background

Earth and planetary scientists have a collection of powerful software tools at their disposal. Most often, these tools are used on a researcher's local computing network, are intimately tied to complex data and models, and are not easily shared with collaborators.

Although powerful in many ways, analytic software tools lack collaborative features out-of-the-box.

As part of the NASA funded project, *Collaborative Workbench to Accelerate Science Algorithm Development*, researchers at the University of Alabama in Huntsville have developed a cloud-based collaboration platform (**Figure 1**) that allows seamless research collaboration from within commonly used research environments like the IDL Workbench and PyDev for Eclipse.

Goals of the project include:

- Augment a scientist's current research environment to allow him or her to easily share diverse data and algorithms
- Leverage cloud technology for scalable and controlled collaboration
- Utilize social frameworks like Google + and Facebook Chat in the context of scientific collaboration
- Utilize the open source Eclipse framework, compatible with widely used scientific analysis tools such as IDL

IDL and ENVI Services Engine for Collaboration in the Cloud

The Exelis-developed IDL and ENVI software are ubiquitous tools in Earth science research environments. The ENVI & IDL Services Engine (ESE) is an Earth science data processing engine that allows researchers to use open standards to rapidly create, publish and deploy advanced Earth science data analytics within cloud infrastructures.

For this project, researchers at UAH leveraged the capabilities of the ENVI & IDL Services Engine and the IDL Workbench to build plugins that enable a virtual collaboration environment. The ENVI & IDL Services Engine, which is designed to provide remote users access to the power of ENVI and IDL analytics across the web, was deployed to the Amazon Cloud, and configured as a processing engine to enable virtual collaboration between geographically diverse teams (**Figure 2**). The IDL Workbench, built on the open-source Eclipse framework, was extended to provide cloud collaboration capabilities, including project creation, publishing, management and social chat (**Figure 3**).

Using the collaborative IDL Workbench, coupled with ESE for execution in the cloud, asynchronous workflows can be executed in batch mode on large data in the cloud.

Using the Collaboration Platform

We envision that a scientist will initially develop a scientific workflow locally on a small set of data. Once tested, the scientist will deploy the workflow to the cloud for execution. Depending on the results, the scientist may share the workflow and results, allowing them to be stored in a community catalog and instantly loaded into the IDL Workbench of other scientists. Thereupon, scientists can clone and modify or execute the workflow with different input parameters. The Collaborative Workbench will provide a platform for collaboration in the cloud, helping Earth scientists solve big-data problems in the Earth and planetary sciences.

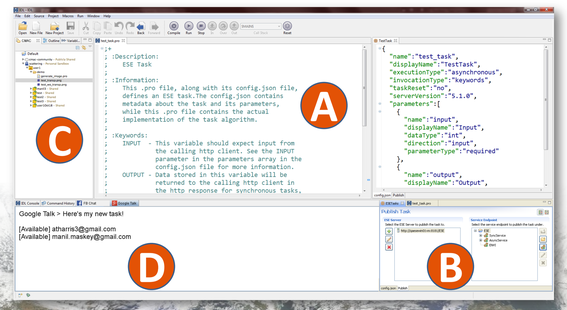


Figure 3. The IDL Workbench with the Earth Science Collaboration Workbench perspective view installed (CWB). Additional information about each of the components is included in the section 'Project Progress', at right.

This research is supported by NASA Computational Modeling Algorithms and Cyberinfrastructure (CMAC) Program.

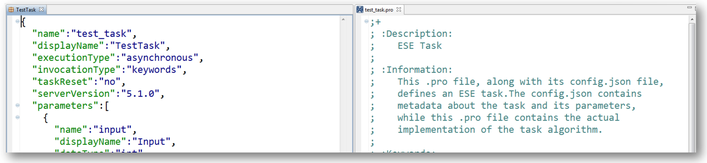
Footer image from NASA WorldView Alpha: https://earthdata.nasa.gov/labs/worldview/

Project Progress

- Initial cloud integration plugins successfully added to IDL Workbench 8.2
- Google Talk and Facebook chat integrated into the IDL Workbench
- IDL Workbench integrated with CMAC Portal for login and Amazon account creation

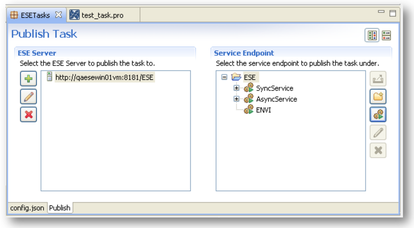
A IDL Workbench - ESE Task Creation

The IDL Workbench contains functionality to help you write and publish Tasks for use in ENVI Services Engine (ESE). This includes the ability to easily create JSON and PRO code, edit and validate JSON files, and publish Tasks from IDL directly to an ESE Server.



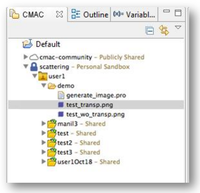
B Project Publisher

Once you complete writing your Task's .pro and config.json files, you can upload the Task directly to an ESE server from within the IDL Workbench using the **Publish** tab.



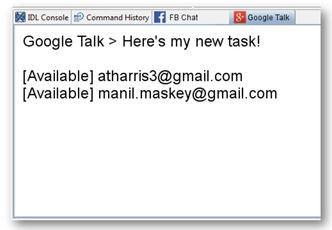
C Cloud Project Explorer

Share code as ESE Tasks on the cloud. Collaborative coding is an exciting capability enabled by the Earth Science Collaboration Platform, allowing multiple team members to work on projects simultaneously within an Amazon S3 storage bucket.



D Social Network Collaboration

Chat in real time with collaborators using Google + or Facebook Chat. Send URLs or share screen captures.



Open, Flexible Framework

IDL deployed within the Eclipse Earth Science Collaborative Workbench. Scientists can leverage the Collaborative Workbench in the environment they're most comfortable with.