

Origami Poster

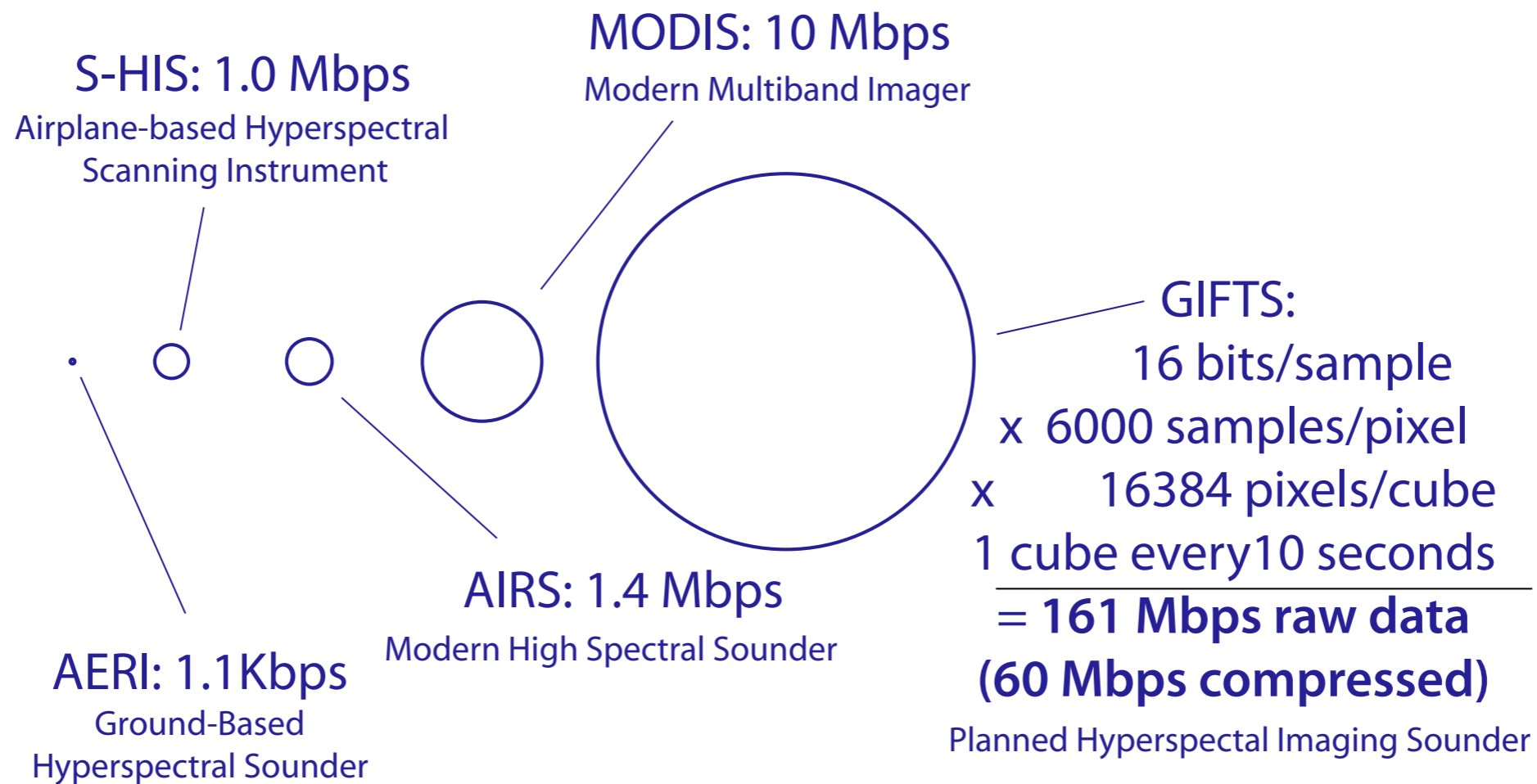
Presented at AGU 06 Fall Meeting

Poster at AGU 06

- Data size problem for hyperspectral obs
- shifting paradigms in computing
- origami: system diagram
- origami: web app
- origami: visualization
- list of technologies

AGU 06: Data size

The Problem: Managing Data Rate and Size Growth



Recent advances in detector hardware and greatly increased capacity of networks and storage have contributed to similar leaps in data generation rate from meteorological sounding and imaging instruments.

AGU 06: Paradigm Shift

Scientist's Workstation

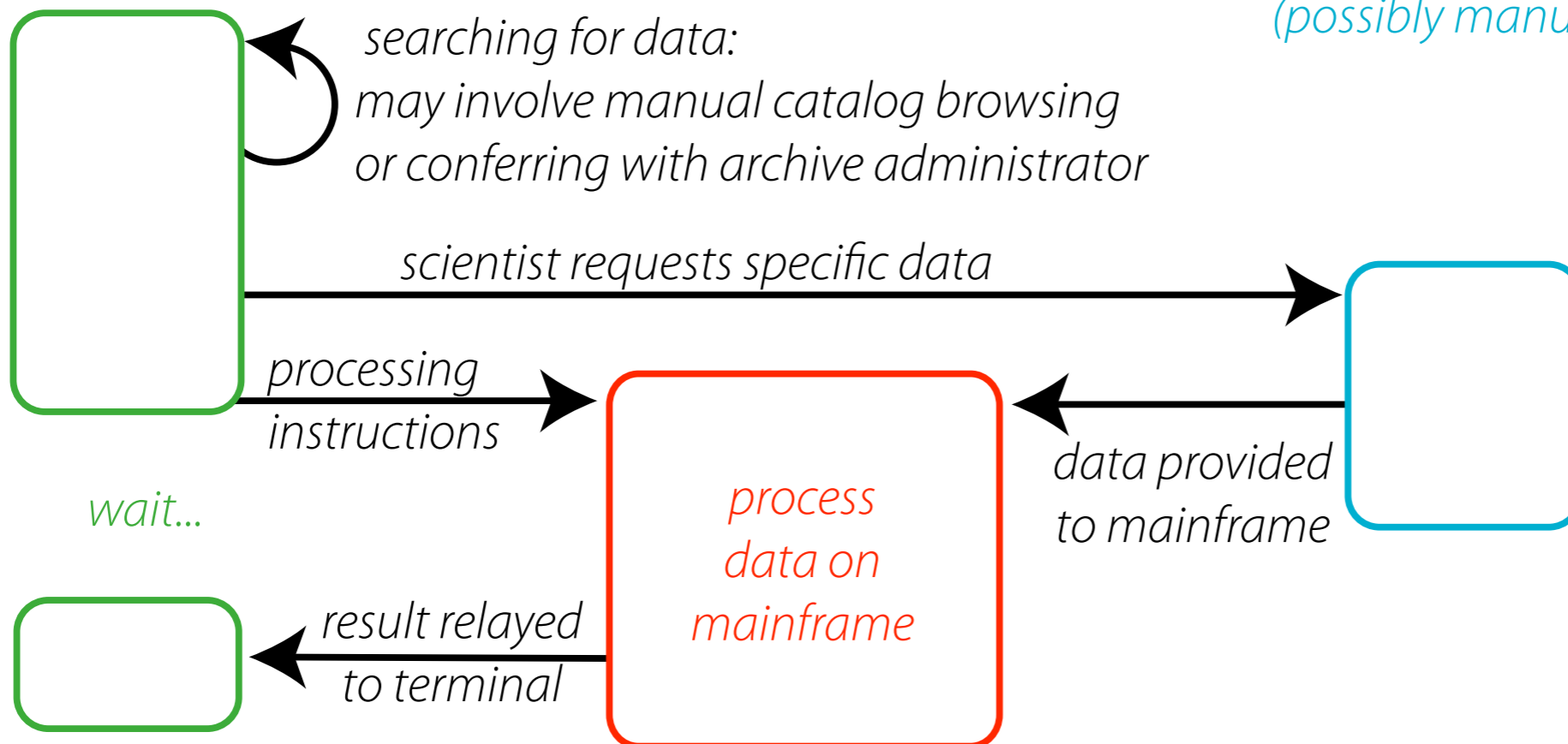
Centralized Computing Facility

Mass Storage

dumb terminals

mainframe

*tape store
(possibly manual)*



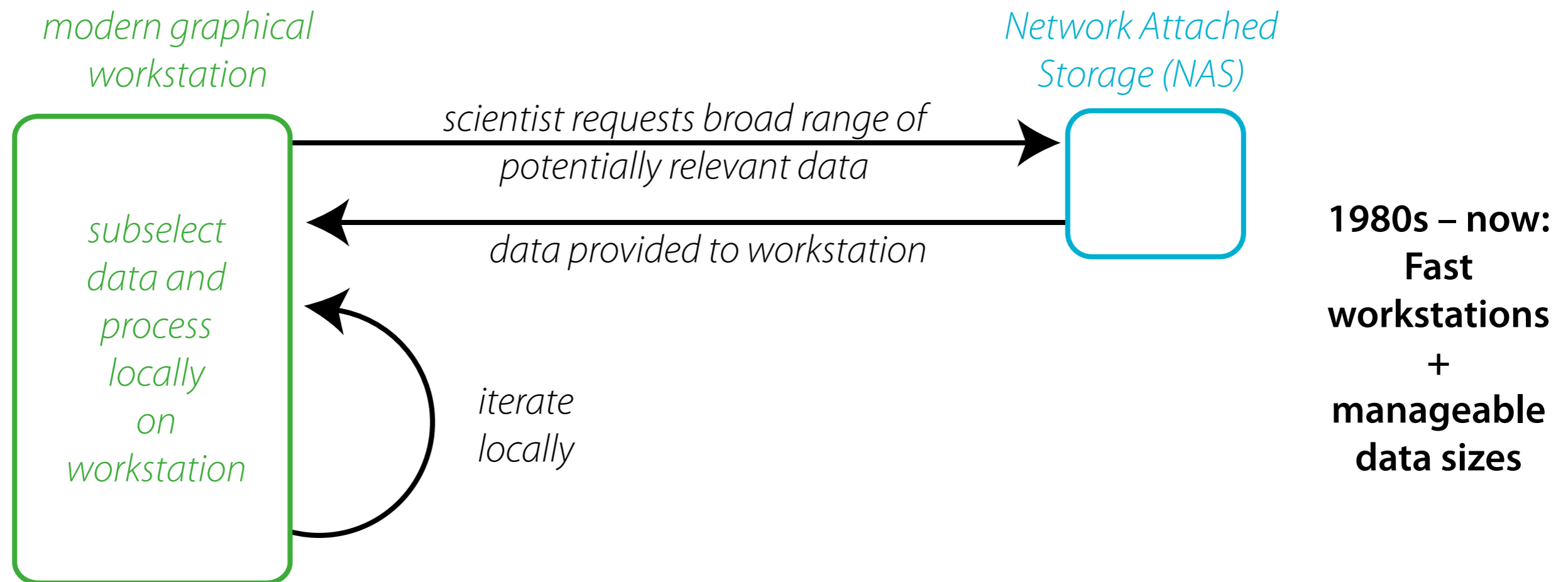
**1960s – 1980s:
Insufficient
desktop
processing
power**

AGU 06: Paradigm Shift

Scientist's
Workstation

Centralized
Computing
Facility

Mass
Storage



AGU 06: Paradigm Shift

Scientist's Workstation

Centralized Computing Facility

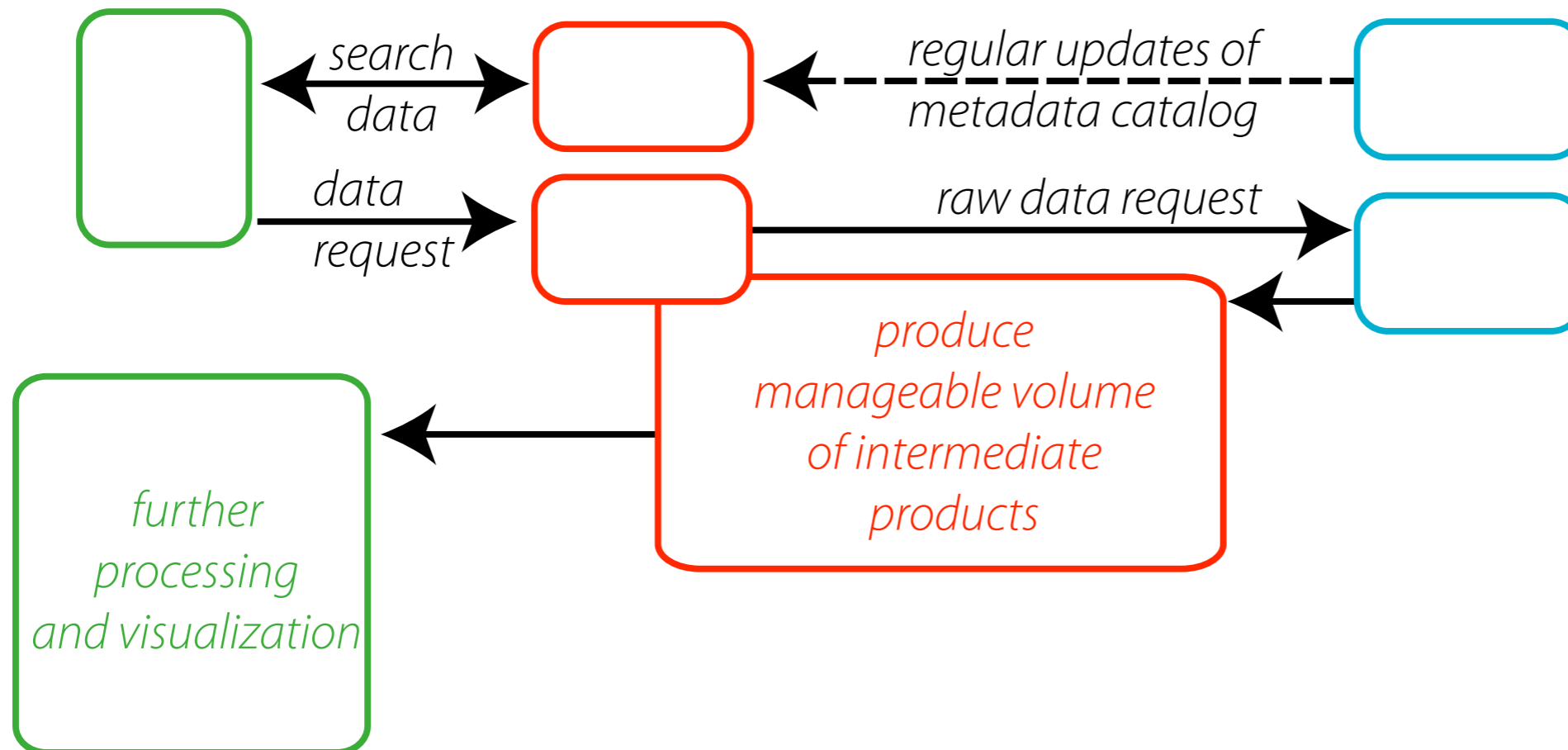
Mass Storage

modern graphical workstation

web application

cluster computing facility

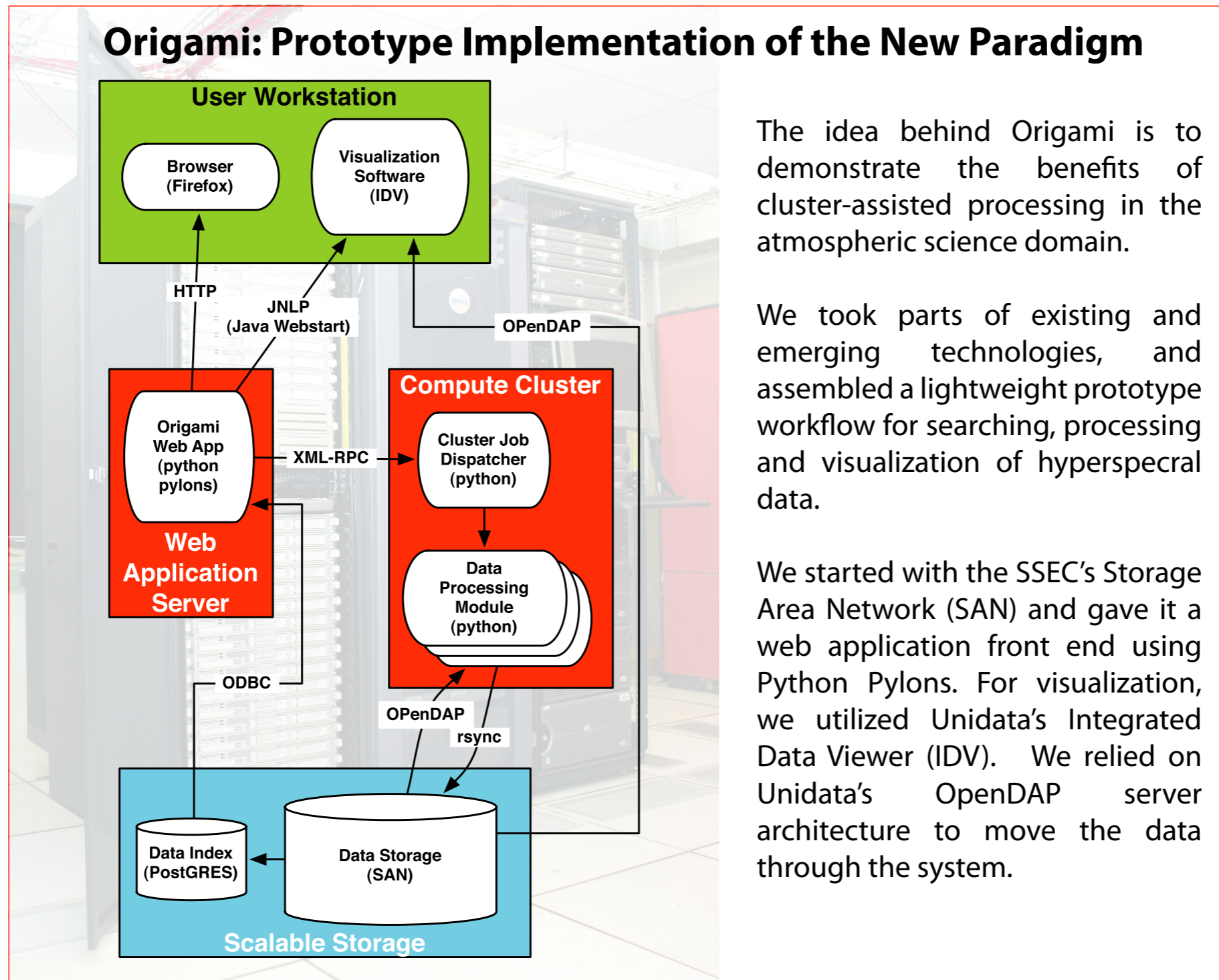
Storage-Area Network (SAN)



**2006 – future:
Fast
workstations
+
hyperspectral
data**

AGU 06: System Diagram

Origami: Prototype Implementation of the New Paradigm



The idea behind Origami is to demonstrate the benefits of cluster-assisted processing in the atmospheric science domain.

We took parts of existing and emerging technologies, and assembled a lightweight prototype workflow for searching, processing and visualization of hyperspectral data.

We started with the SSEC's Storage Area Network (SAN) and gave it a web application front end using Python Pylons. For visualization, we utilized Unidata's Integrated Data Viewer (IDV). We relied on Unidata's OpenDAP server architecture to move the data through the system.

AGU 06: Web App

SSECSAN Data Archive Origami Demonstration Application

Home
Search
Work Orders
Create
Status

Create a Work Order

Processing Task

Relative Humidity
Calculate relative humidity(RH) from water vapor mixing ratio(Q) and temperature(T) profiles. Both Q and T are required parameters. Pressure(P) will be loaded for specification if available. There will be an assumption that all data contain the same pressure levels. T is in degrees Kelvin, Q is in kg/kg, and P is in pascals.

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Starting point: Choose the task

SSECSAN Data Archive Origami Demonstration Application

Home
Search
Work Orders
Create
Status

Relative Humidity Work Order

Calculate relative humidity(RH) from water vapor mixing ratio(Q) and temperature(T) profiles. Both Q and T are required parameters. Pressure(P) will be loaded for specification if available. There will be an assumption that all data contain the same pressure levels. T is in degrees Kelvin, Q is in kg/kg, and P is in pascals.

Requester Information

Email:

Display Options

Type:

Contour Labels:

Contour Interval:

Level:

Search for input URLs

time (yyyymmdd-hhmm)

from: to:

extent(deg,min)

lat from: to:

lon from: to:

OpenDAP Input URL(s)

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Search for and select input files, specify job details

Origami: Data Discovery

The web application component of Origami is written in Python, using the Pylons web development framework. Creating a new work order sends a XML-RPC command to the processing cluster to generate the desired product from the indicated data on the SAN. Status of ongoing and recently completed requests can also be seen, and IDV visualization environments for the output can be started up directly from the status page by means of Java JNLP Webstart.

SSECSAN Data Archive Origami Demonstration Application

Home
Data Search
Work Orders
Create
Status

Work Order Status

* Indicates sortable columns

ID*	Owner*	Submitted*	Status*	Links
e7749506-26e6-4bcf-b94b-e3c746c9272	brucef@ssec.wisc.edu	2006-12-07 17:43:45	Complete	XML , ISL , JNLP
8c6a55e5-7ec8-4254-a5ea-bf6ce5901776	robert.knutelson@ssec.wisc.edu	2006-12-07 18:25:21	Complete	XML , ISL , JNLP
4fc18982-d0ab-4189-8b9b-0c6f7565a66a	robert.knutelson@ssec.wisc.edu	2006-12-07 18:29:13	Complete	XML , ISL , JNLP
ffd2020-6ecb-4878-bb57-0b5ea1d3a31a	davet@ssec.wisc.edu	2006-12-07 18:39:18	Complete	XML , ISL , JNLP
9dd7832b-c348-428a-b590-ee1484431093	robert.knutelson@ssec.wisc.edu	2006-12-07 19:27:35	Complete	XML , ISL , JNLP
9ea7fff-a780-42fa-9e98-1273bc95decb	robert.knutelson@ssec.wisc.edu	2006-12-07 19:47:01	Complete	XML , ISL , JNLP
10c67ce4-70b3-4bc3-8a02-d9da2519a08a	robert.knutelson@ssec.wisc.edu	2006-12-07 20:45:35	Complete	XML , ISL , JNLP
6b08a9d3-43c8-46ab-9554-18e3554515a1	kennethv@ssec.wisc.edu	2006-12-07 21:36:24	Complete	XML , ISL , JNLP
3382a70-7a72-4f6c-821d-946d43477fe	kennethv@ssec.wisc.edu	2006-12-07 22:07:31	Complete	XML , ISL , JNLP

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Status shows recently completed jobs

SSECSAN Data Archive Origami Demonstration Application

Home
Data Search
Work Orders
Create
Status

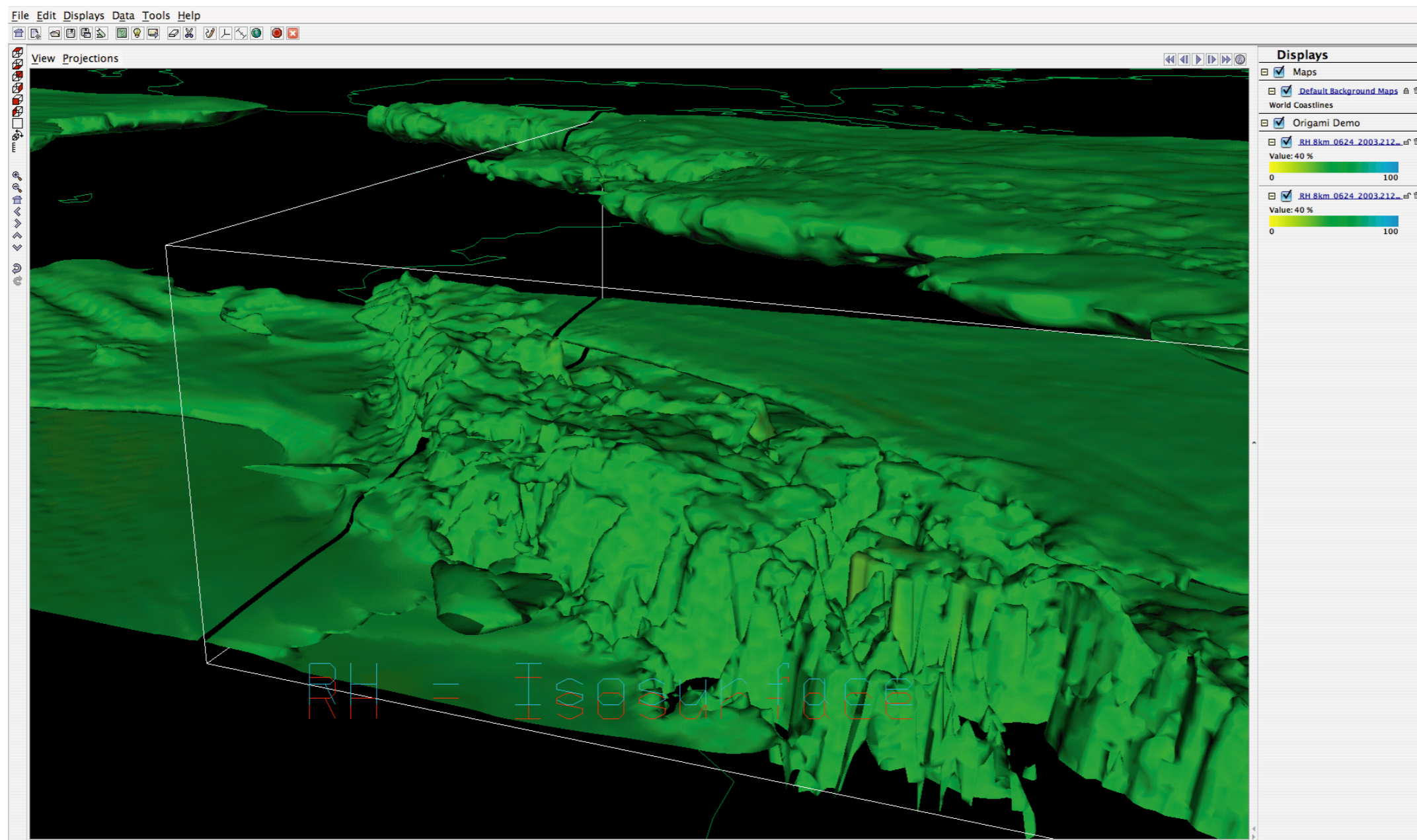
Work Order Detail

WO ID	Owner	Submitted	WO Status	Links
9ea7fff-a780-42fa-9e98-1273bc95decb	robert.knutelson@ssec.wisc.edu	2006-12-07 19:47:01	Complete	XML , ISL , JNLP
Job				
Calculate relative humidity(RH) from water vapor mixing ratio(Q) and temperature(T) profiles. Both Q and T are required parameters. Pressure(P) will be loaded for specification if available. There will be an assumption that all data contain the same pressure levels. T is in degrees Kelvin, Q is in kg/kg, and P is in pascals.				
Input	8km_0624_2003.2120utc_6_6.nc			
Input	8km_0624_2003.2120utc_7_6.nc			
Output	rsync://sands.ssec.wisc.edu/origami-cache/9ea7fff/9ea7fff-a780-42fa-9e98-1273bc95decb			
Level	0.00499999988824			

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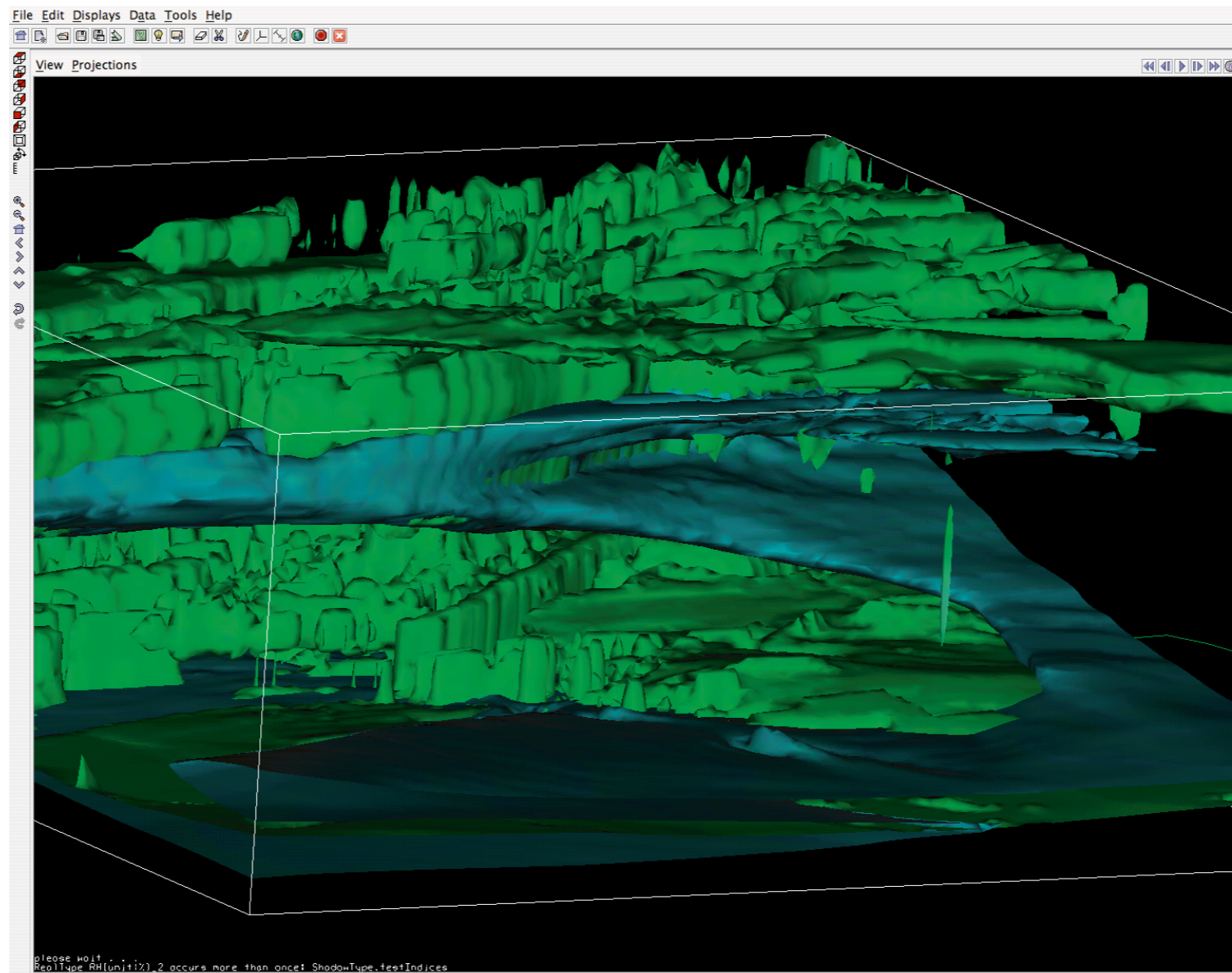
Selecting a particular job brings up its details page. Clicking on the JNLP link brings up the IDV application for this set of outputs by means of Java Webstart.

AGU 06: Visualization



Viewing multiple data blocks (cubes or granules) as part of a single visualization request across a larger geographic area.

AGU 06: Visualization



Comparing 65% relative humidity isosurfaces from model (green) versus retrieval based on computed top-of-atmosphere radiances (blue)

AGU 06: Laundry List

Technologies Used in Assembling the Origami Demo

Python -- <http://www.python.org>. The open-source Python scripting language combines an expansive library of free, easy-to-use modules with a consistent syntax. It permits the rapid development of high-quality scientific software, and is especially suited for applications like Origami.

IDV -- <http://www.unidata.ucar.edu/software/idv>. The Integrated Data Viewer is a Java application which permits three-dimensional manipulation of atmospheric datasets from a wide variety of sources. We have worked with the IDV team to include capabilities needed for applications such as Origami in future releases of IDV.

NetCDF/OPeNDAP -- <http://opendap.org>. The OPeNDAP libraries, servers and protocols provide data slicing and delivery capability needed to deliver the required pieces of data (and nothing more) to both the data processing applications as well as to the end-user visualization.

Pylons -- <http://pylonshq.com>. This is a Python web application development framework which allows software deployment, testing, packaging, and design using the model-view-controller paradigm.

XMLRPC -- <http://www.xmlrpc.com>. The XML-Remote Procedure Call protocol provides a simple way for a distributed application to span multiple systems on a network. Origami principally uses it as a bridge between the computing segment and the web application.

Reactions to poster

- How to handle failed processing?
- Expand to user-submitted tasks
 - even Matlab jobs, if compiled
- Package app for external use
- Start project website - Plone?

Thanks!

Bob Knuteson: The idea

Ray Garcia: Choice of Technology

Bruce Flynn: All the hard work

Erik Olson: Data for demo

Kris Bedka: Interface ideas