Kepler/G-Pack: A Kepler Package Using the Google Cloud for Interactive Scientific Workflows (a.k.a. Koogle-Kuration Package)

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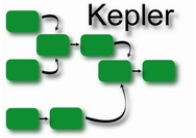
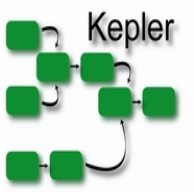


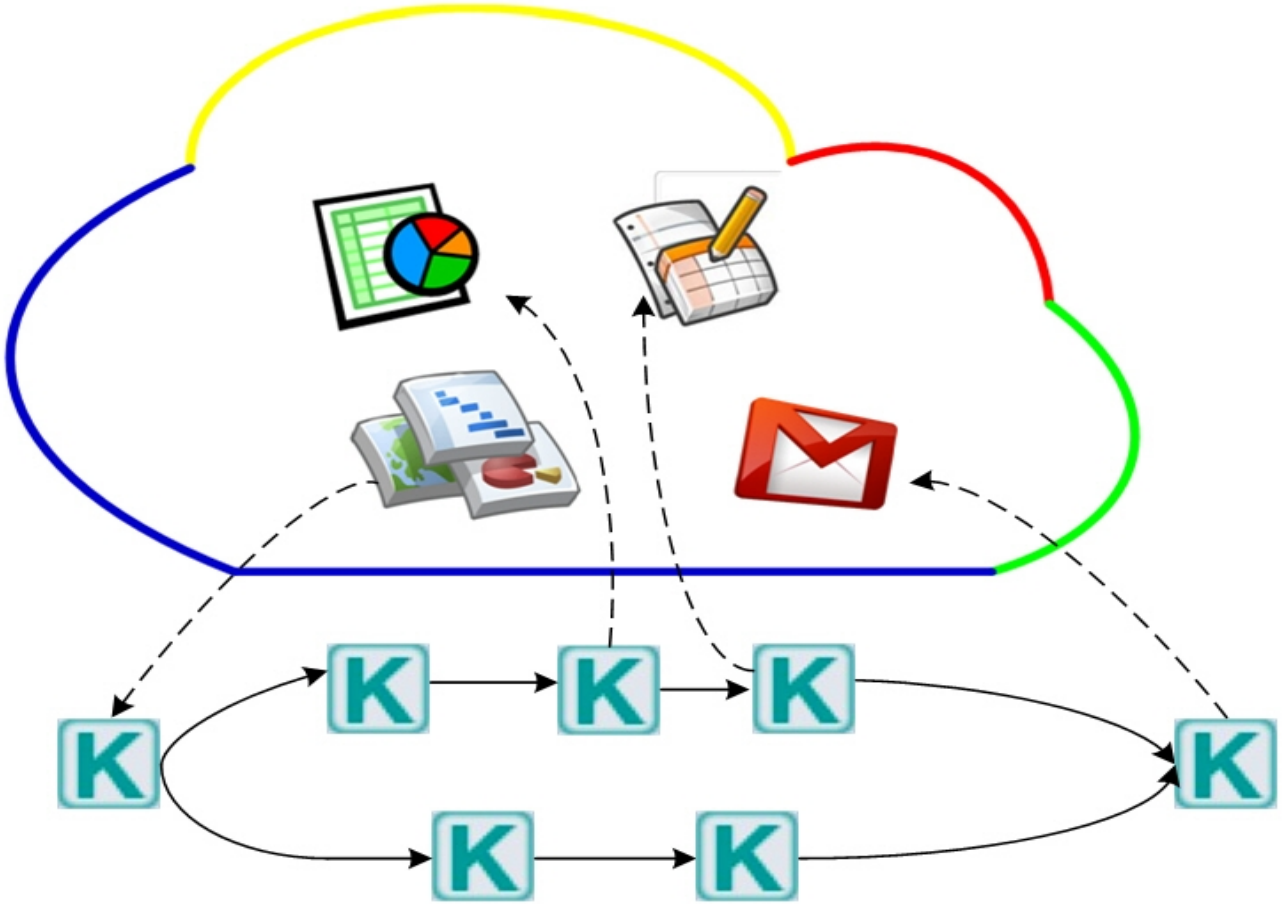


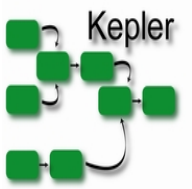
Interactive Scientific Workflows

- Requirements for human interaction in scientific applications
  - dynamic branching based on scientists' runtime decision
  - semi-automatic data curation
- Category of human interaction

	Synchronous	**Asynchronous**
time cost	short time, instantly	unknown
people involved in interaction	workflow executor	people other than workflow executor
workflow blocking	yes	not necessarily
implementation approaches	graphical window web page/browser	dedicated server mail, polling, callback

Google Cloud Computing in Kepler

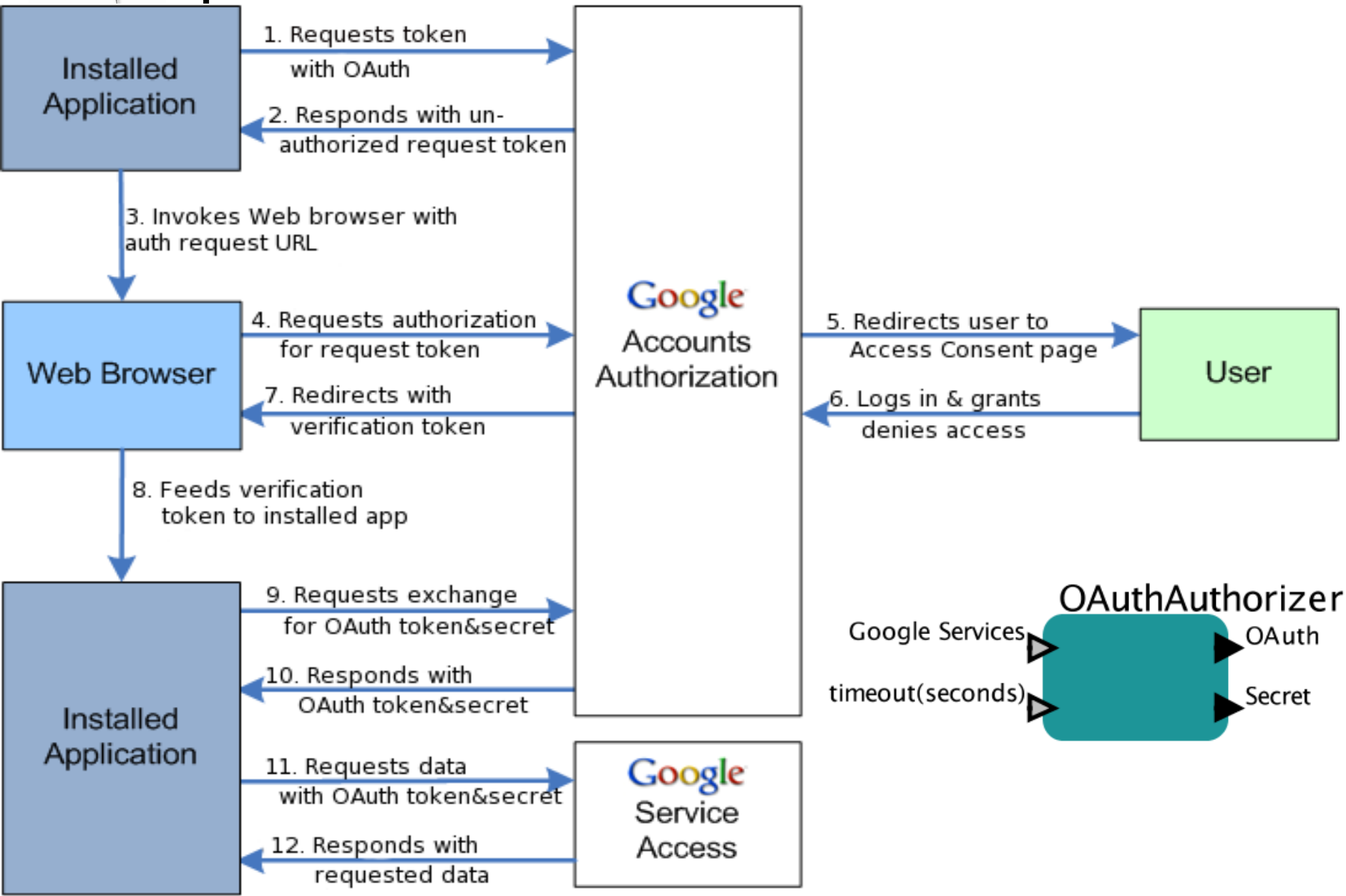




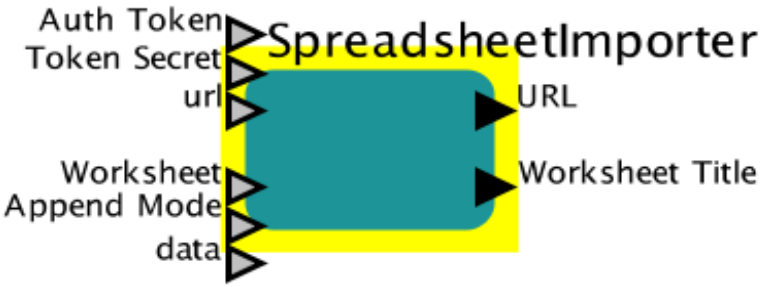
Actors in Kepler/G-Pack

- Authorization
  - 1st step to acquire access to Google services
- Spreadsheet Operations
  - Various manipulations on Google Spreadsheet, like copy, share, import, export, query, audit.
- Data Analysis
  - Various operations especially for data curation purpose, like duplicates identification and fuse, data boundary inspection.
- Data Access
  - Google visualization datasource actor allows SQL-like access to Google cloud data
- Mail Service
  - MailSender Actor supports sending email through SMTP with UserName/Password or OAuth token/secret.

OAuthAuthorizer Actor



Spreadsheet Operation Actors



Actors	Functions
Importer	import data to a spreadsheet
Exporter	export data from a spreadsheet
Copy	copy a spreadsheet from a template
Share	share the spreadsheet with another user
Query	query data from the spreadsheet
Auditor PollingQuery	allow human interaction during the execution of the workflow

Data Access
VisualizationDataSource Actor

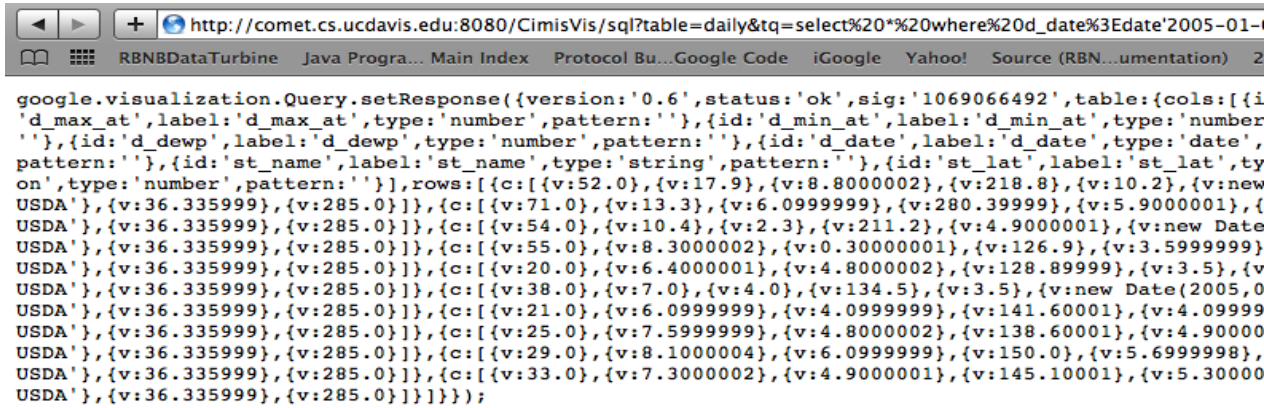
- Get the response from a servlet which is implemented with Google visualization datasource.

  e.g. servlet:

  http://comet.cs.ucdavis.edu:8080/CimisVis/sql

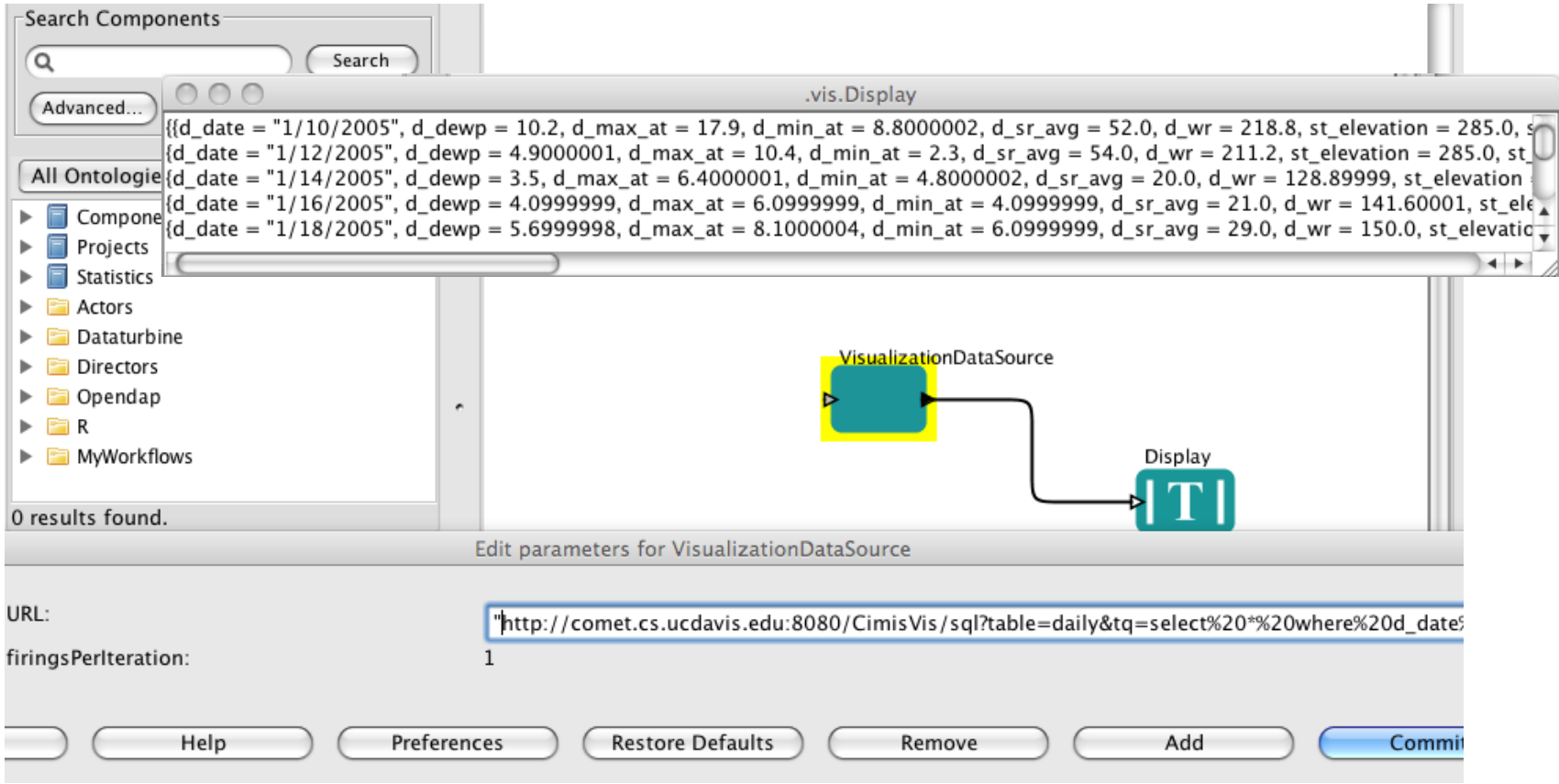
  Table: daily

  query:select * where d_date>date'2005-01-09' and d_date<date'2005-01-20'



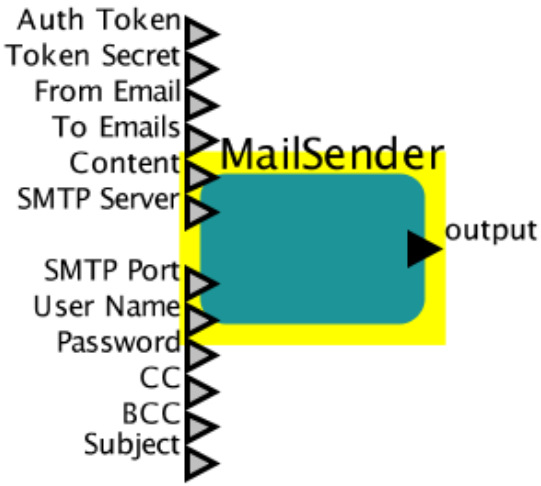
Data Access
VisualizationDataSource Actor

- Actor parses JSON string to Kepler token
- array of RecordToken

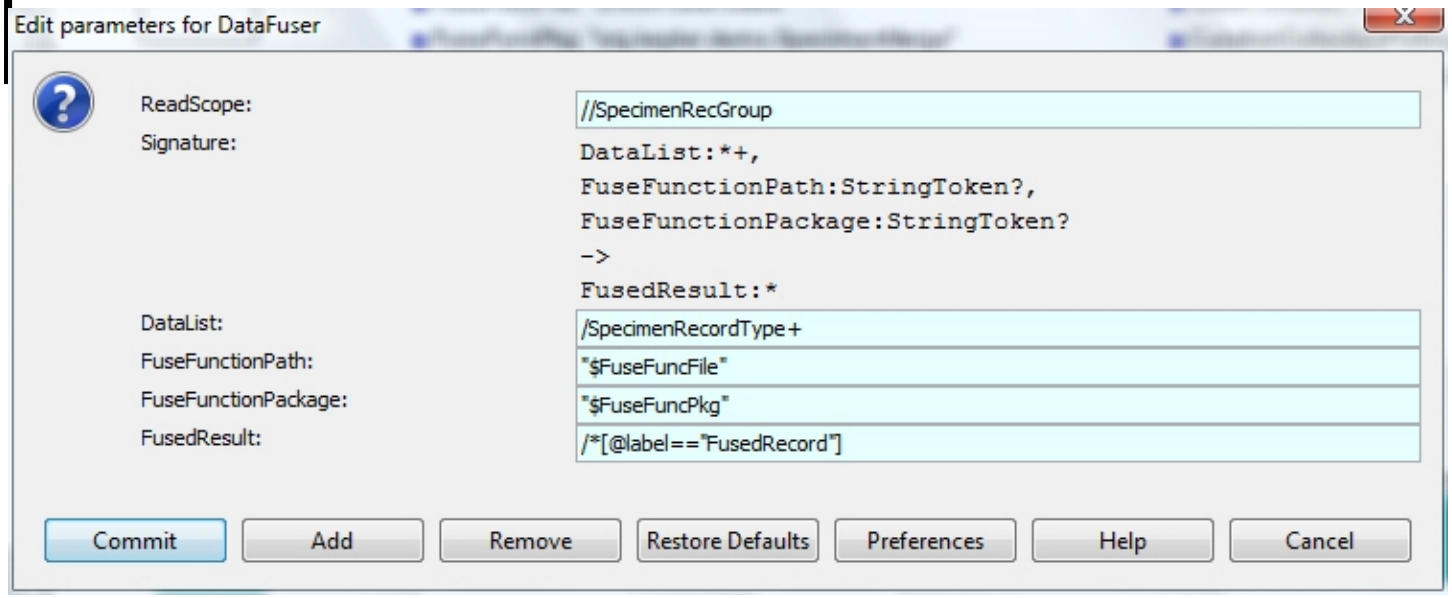


MailSender Actor

- Gmail and other mail server supporting SMTP protocol
  - It supports sending email through SMTP with UserName/Password or OAuth token/secret.



Data Analysis Actors (COMAD actors)

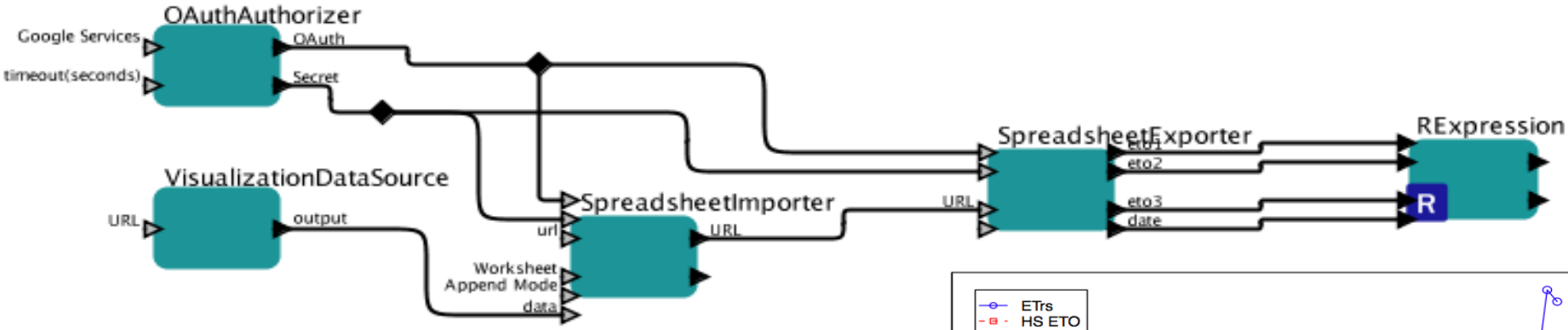


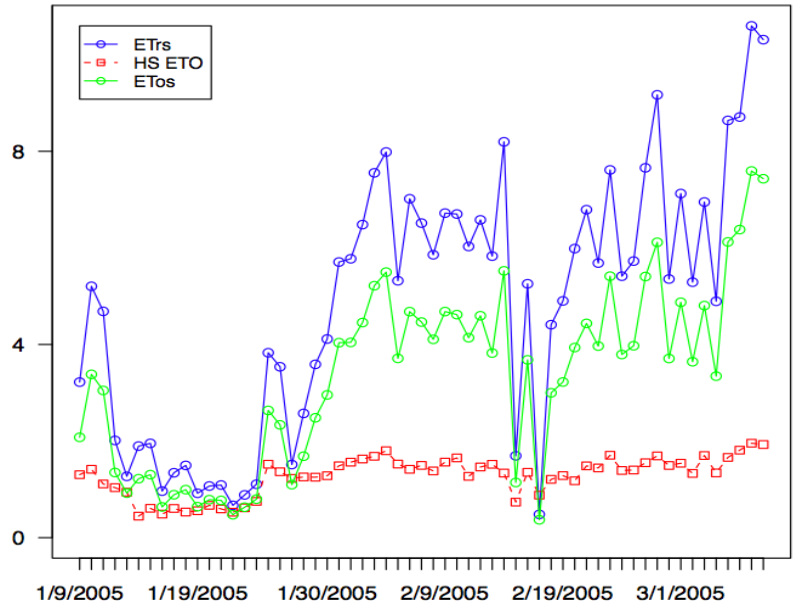
Actors	Functions
Clustering	Do clustering on a list of RecordToken by applying specified function for specified field.
DataFuser	Fuse a list of RecordToken with specified function
ConditionTester	Test whether specified condition is satisfied or not.

Evapotranspiration Workflow

Evapotranspotation Workflow – Koogle demo1

Spreadsheet is used as data storage and calculateation tool during this demo.
ETOs are calculated from CIMIS wheather station data according to different models



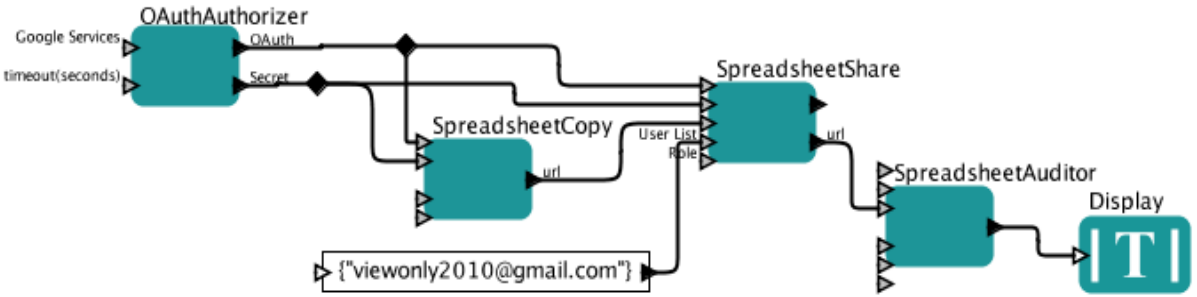


Biofuel Refinery Workflow

SDF Director

biofuel refinery workflow

This workflow allows users to copy a spreadsheet from a templete, then use the existing data or edit the spreadsheet to help them make dicision in building a biofuel refinery.



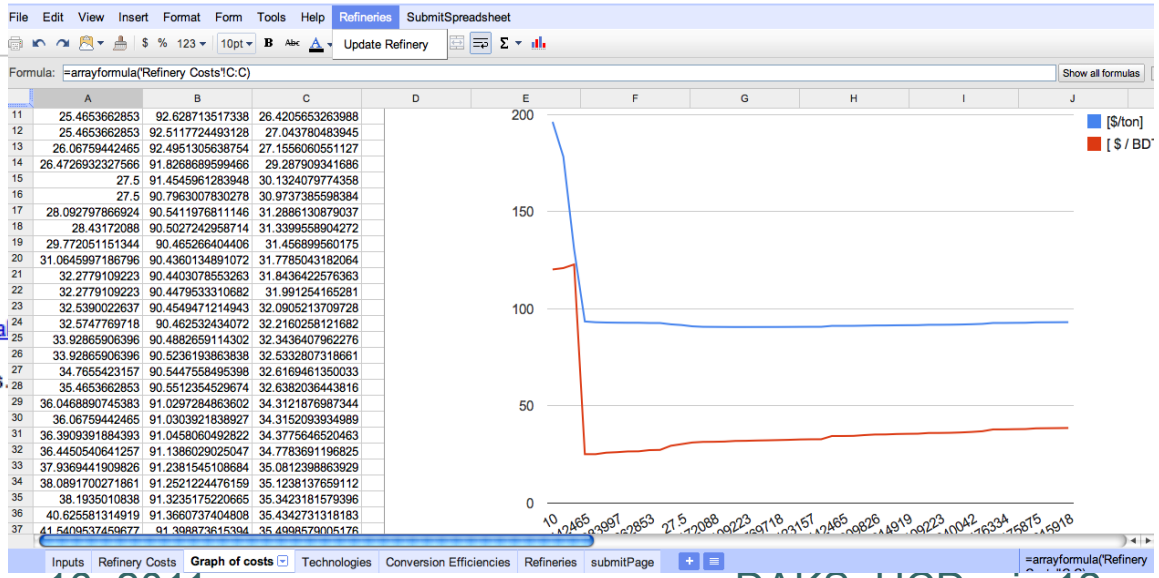
refinery-copy2 Inbox | X

from kepler.ucd@gmail.com
to viewonly2010@gmail.com
date Fri, Feb 11, 2011 at 9:06 AM
subject refinery-copy2
mailed-by doclist.bounces.google.com

I've shared a document with you:

refinery-copy2
https://spreadsheets.google.com/ccc?key=0AgT1sEGRa

It's not an attachment -- it's stored online at Google Docs.

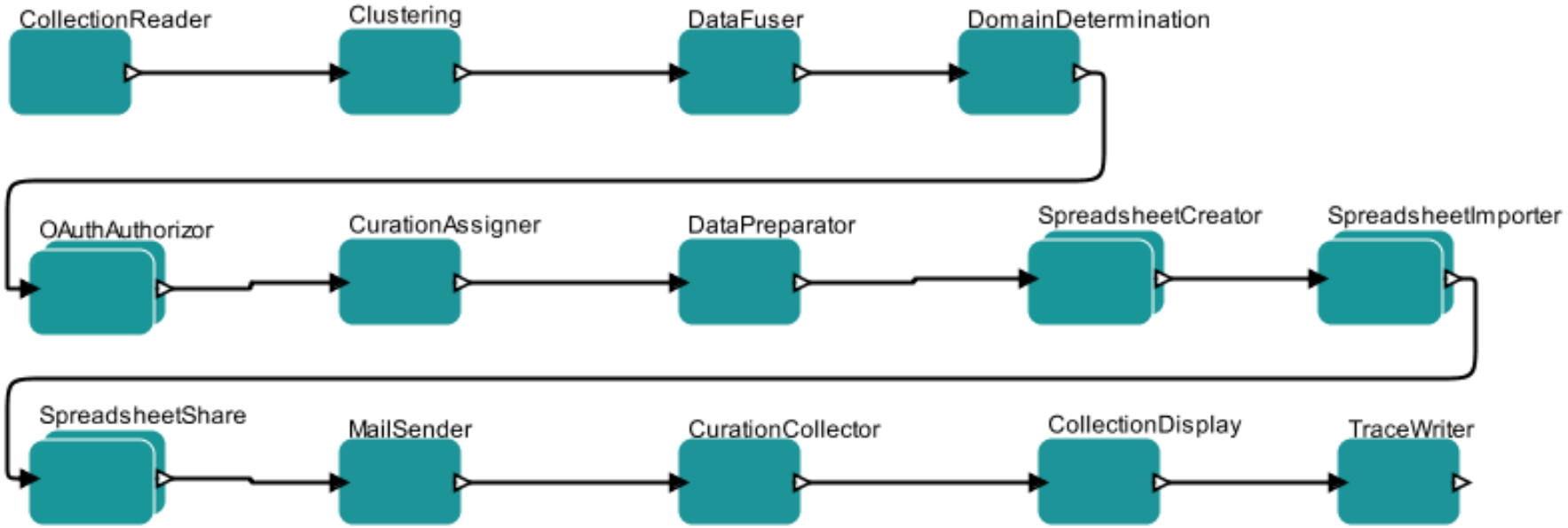


SpecimenRecordMerge Workflow

ComadDirector

This workflow demonstrates how specimen data with duplicates are fused and curated semi-automatically.

1. Firstly the specimen records are imported from a file in csv format.
2. Secondly the duplicated sets of specimen records are identified through specific clustering function and for each duplicate set a fused record is generated.
3. Thirdly the original specimen records and the fused record are imported into a google spreadsheet for human curation. Meanwhile the corresponding curators are informed of such curation request.
4. Finally, the human curation result is collected once it's finished by the curator.

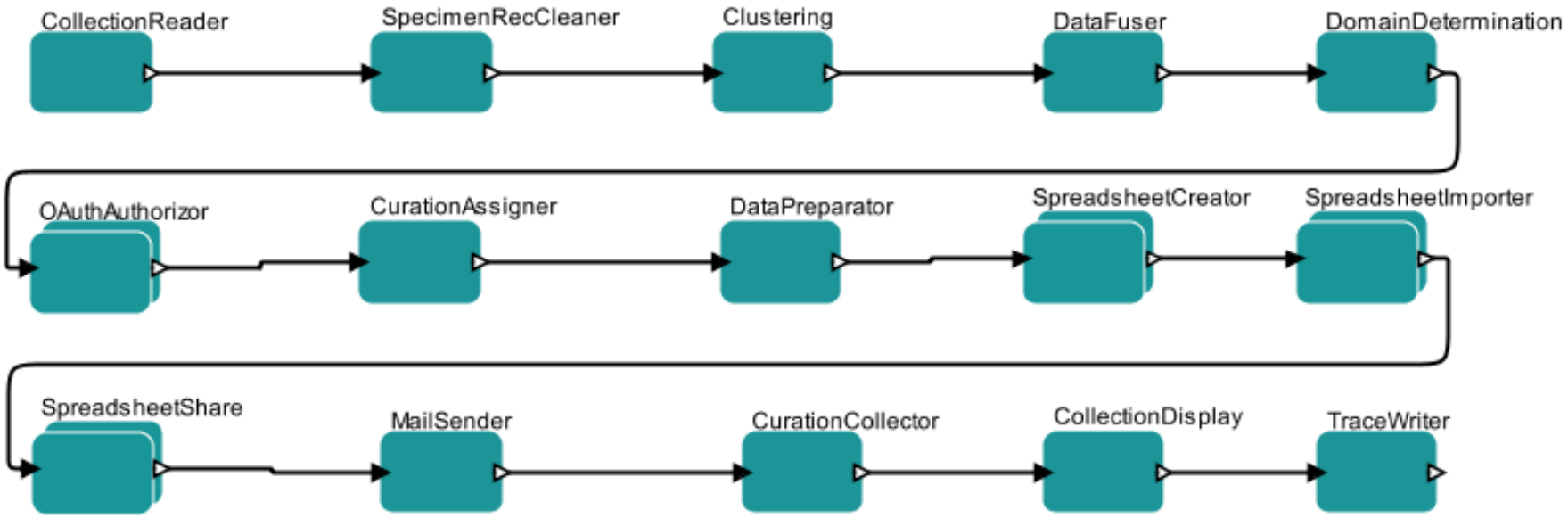


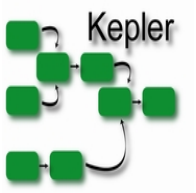
AdvancedSpecimenRecordMerge Workflow

ComadDirector

This workflow makes the following improvement of SpecimenRecordMerge workflow.
It's demonstrated how easy it is to reconfigure COMAD workflow to adapt to new functionalities.

1. Insert SpecimenRecCleaner actor to clean source data by removing "bad" specimen records with unclear collector of "et al."
2. Reconfigure Clustering actor to cluster specimen records against collector field with fuzzy match method. Therefore the specimen records collected at the same time and the same location but by different collector of "E. L. Morris" and "E. Morris" could be identified as duplicates.





Thanks & Question