



Icecore – a portal for workflow execution

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BOF: Scientific Workflows in Astronomy



Workflow approach

- Sampo Project for ESO
 - As part of Finland's joining fee a contribution "in kind" of 6 people for three years (18 FTE) was made available. Sampo started in January 2005.
 - Aim: to assess the requirements for ESO data reduction and analysis software infrastructure over the next decade and beyond and produce a series of pilot softwares.
- Project result: Pilot of ESO Reflex
 - pilot project was developed on top of Taverna
 - released version is developed on top of Kepler



Problems in traditional desktop oriented data analysis

- Complexity of installing analysis software:
 - Data analysis pipelines for various instruments
 - Collection of data analysis tools
 - Collection of visualization tools.
- Huge amount of data
- Computing resources
- Platform dependency



IceCore Portal

- Executes scientific workflows in a workflow engine.
- Controls administrative tasks of workflow execution and resources.
- Manages Databases for workflows and results.
- Distributed System.



Portal elements

- Workflow models
- Workflow instances
- Executions
- Results



IceCore Portal

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Welcome **IceCore**

Liferay > Mikki Hiiri > IceCore

IceExecutions

Engine	Workflow	Status	Exeld	Create time	Start time	Stop time
mifsasEngine	ICE dataoutput multi 0	COMPLETE	76	13.3.2011 9:16:27	13.3.2011 9:16:33	13.3.2011 9:16:39
mifsasEngine	testi mifsas	COMPLETE	95	15.3.2011 9:39:02	15.3.2011 9:39:57	15.3.2011 9:40:03
mifsasEngine	ADASS-demo-workflow	COMPLETE	157	8.11.2011 10:51:01	8.11.2011 15:24:23	8.11.2011 15:25:04

1-3 of 3

update status Execute ReRun

IceModels

Model Name	Type	Engine type	Ice Model Description
UKDSS1	Test	Kepler	This panel will give a detailed description of the model. The Kepler User Manual is a comprehensive Kepler reference with chapters dedicated to the Kepler project and history; installing and running Kepler; scientific
IcdataOutput	Test	Kepler	
IcDataoutput-multi0	Test	Kepler	
GetTopics	Test	Kepler	
UKDSS-ADASS	Test	Kepler	

3-7 of 7

test create new workflow

IceResults

Name	Type	Status
workflow	application	OPEN
ICDataoutput	application	OPEN
VideoMessage	application	OPEN
TopicMessage	application	OPEN

1-4 of 4

Select application to listen

IceWorkflows

Name	Model Name	Status
ICDataOutputTest1	ICDataOuputTest1	OPEN
Astrodemo	UKIDSSastro	OPEN
ICE data output demo	IcdataOutput	OPEN
ICE dataoutput multi 0	IcDataoutput-multi0	OPEN
GetTopics and Tags	GetTopics	OPEN

1-5 of 9

test select workflow to be Executed

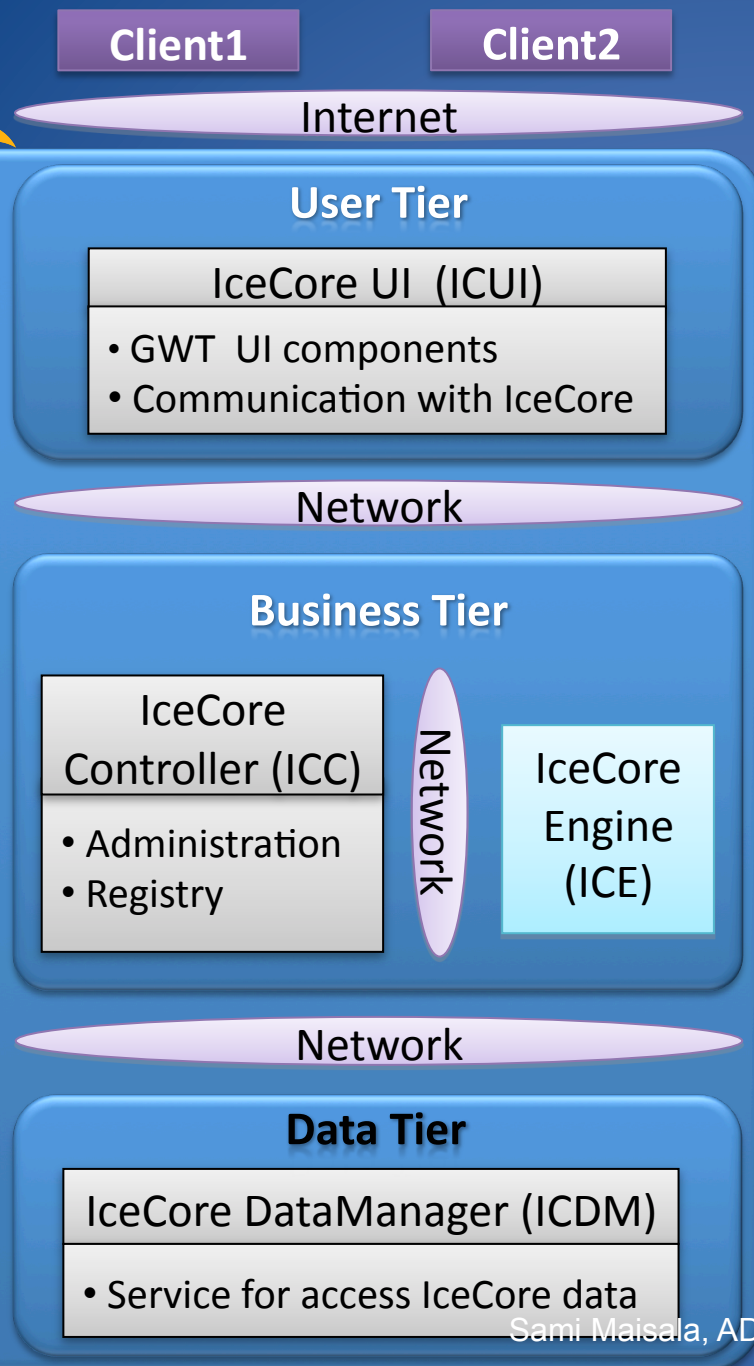


Architectural design

- Three –tier architecture extended with knowledge bus
- REST communication between tiers
- Spring Framework
- Hibernate for mapping of model to a relational persistence database
- JSP Portlets with GWT components



ICECORE ARCHITECTURE



The IceCore system used for workflow execution, follows the three-tier architectural scheme:

User Tier:

The user connects to the system through the portal UI (ICUI), where the execution of various workflows can be monitored or controlled, and data presented to the user.

Business Tier:

ICUI communicates with other components via the IceCore Controller (ICC) middleware component which holds a component registry.

IceCore Engine (ICE) is a web service extension to the execution engine (e.g. Kepler or Taverna).

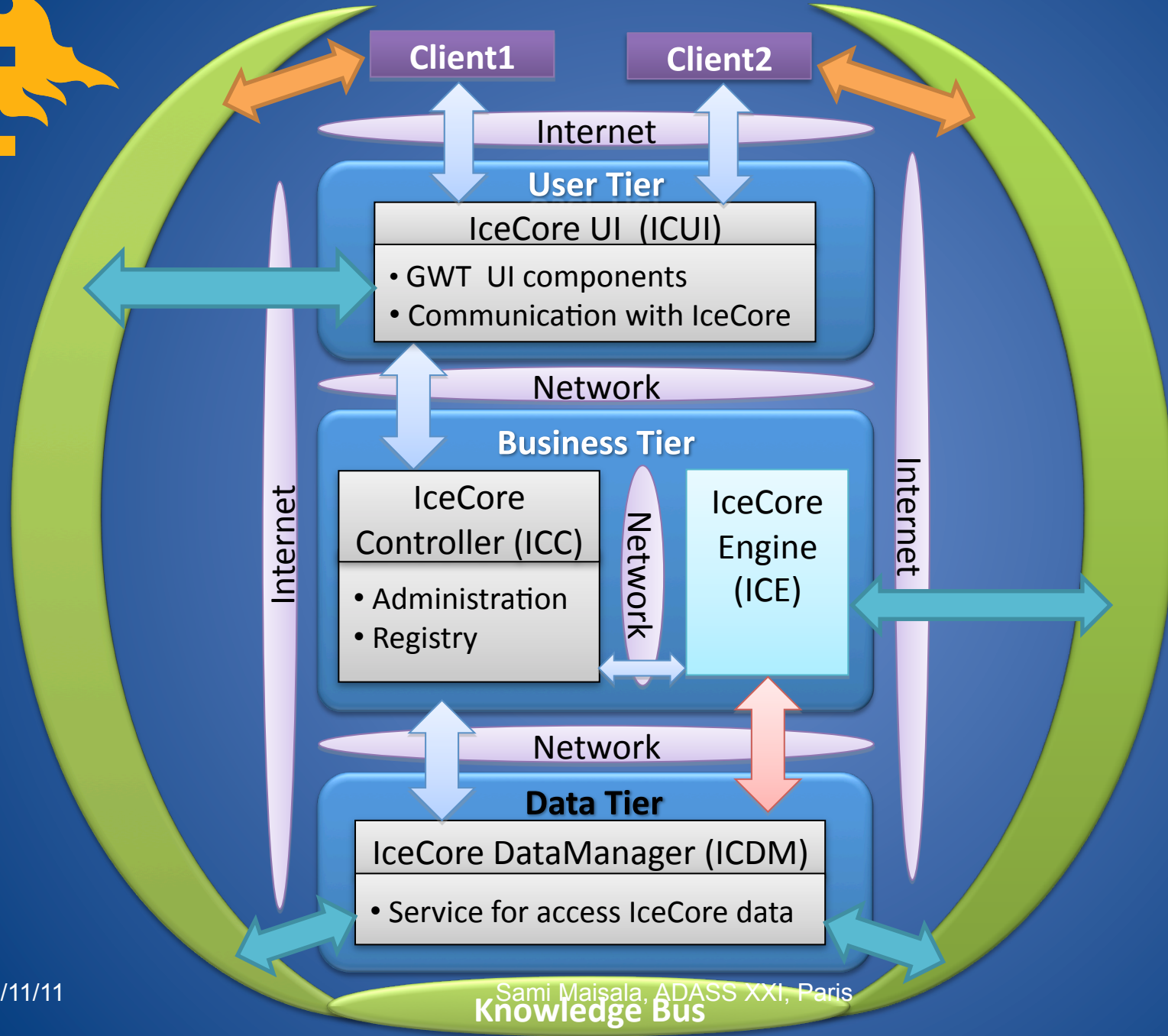
Data Tier:

On the bottom-level tier IceCore DataManager (ICDM) handles the data management for both ICUI and ICE.



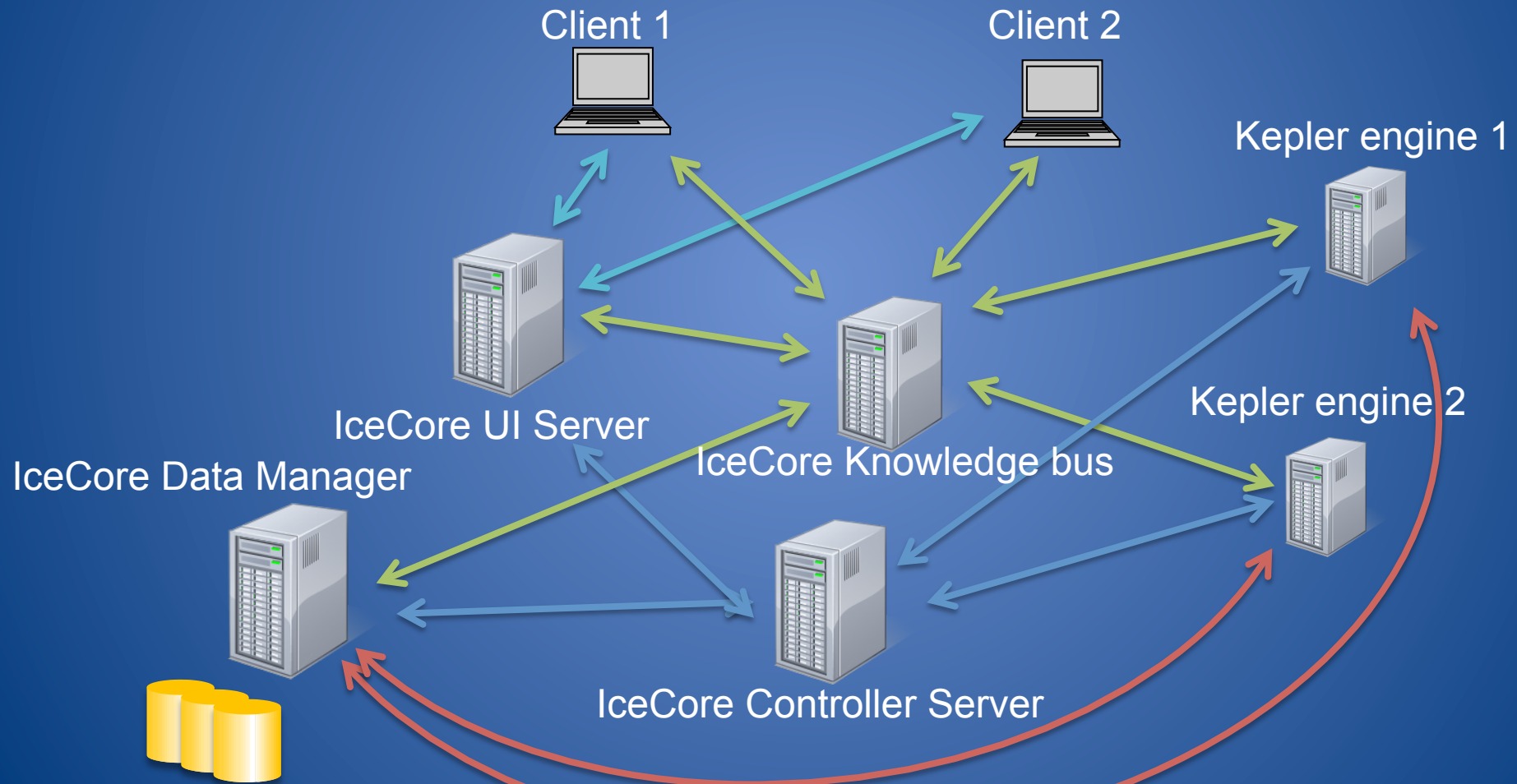
IceCore Knowledge Bus

- Knowledge Bus is a mixture of Web/Message-oriented middleware
- Provides message interoperability between applications which are working in both server-side and client-side.
- Knowledge Bus receives messages from different types of applications and forwards messages to applications which are registered to receive this particular type of data.





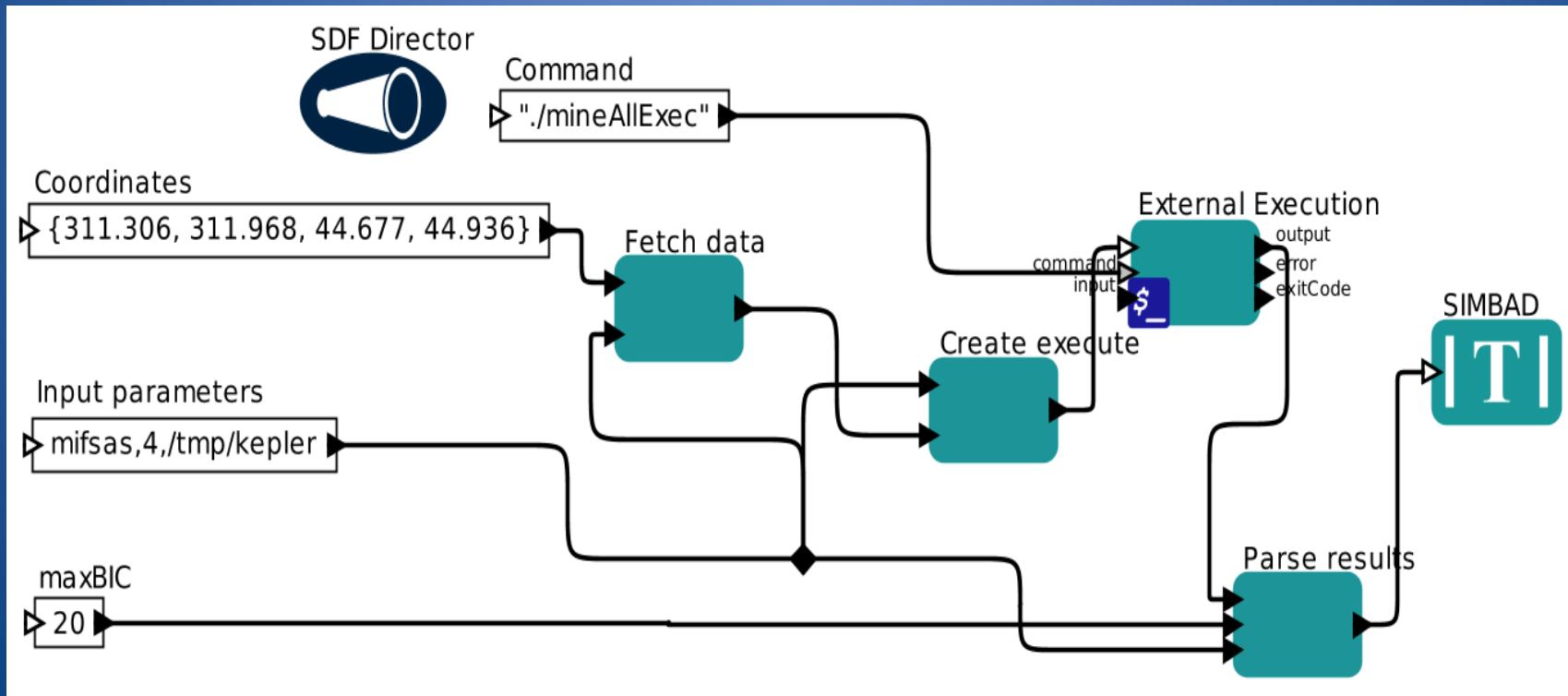
Distributed system





Star Cluster Workflow

This workflow runs an algorithm that aims at locating stellar clusters in the UKIDSS near infrared astronomical database. When the mining has been done, the images of the cluster candidates are fetched from the image database, with SIMBAD database information.





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IcDataoutput-multi0	Test	Kepler	
GetTopics	Test	Kepler	
UKIDSS-ADASS	Test	Kepler	

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Astrodemo	UKIDSSastro	OPEN
ICE data output demo	IcdataOutput	OPEN
ICE dataoutput multi 0	IcDataoutput-multi0	OPEN
GetTopics and Tags	GetTopics	OPEN

1-5 of 9

test select workflow to be Executed



IceModels portlet

Select a workflow available with models and their description and create a new workflow from it. You can give to the model a display name, a description, a workflow engine type, etc.

IceModels ⌵ - + x

Create new workflow from model

Model Name	Id	Workflow type	Engine type
UKIDSS-ADASS	39	Test	Kepler

Workflow name:



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IcDataoutput-multi0	Test	Kepler	
GetTopics	Test	Kepler	
UKIDSS-ADASS	Test	Kepler	

3-7 of 7

test create new workflow

IceResults

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workflow	application	OPEN
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1-4 of 4

Select application to listen

IceWorkflows

Name	Model Name	Status
GetTopics and Tags	GetTopics	OPEN
testi mifsas	IcDataoutput-multi0	OPEN
Astrodemo1	UKIDSS1	OPEN
UKIDSS working	UKIDSS1	OPEN
ADASS-demo-workflow	UKIDSS-ADASS	OPEN

5-9 of 9

test select workflow to be Executed



IceWorkflows portlet

Select workflow workflow instance with which will be added to existing selection of the engine which is used to execute the workflow. Records selected by the portlet will guide user to select workflow to be added in execution list of runnable workflows.

IceWorkflows ⌵ - + x

Workflow Name	Engine	Engine Name	Status
ADASS-demo-workflow	mifsasEngine	mifsasEngine	ACCEPTED

⏪ ◀ 1-1 of 1 ▶ ⏩

[Back to workflow list](#) [Add to execution list](#)

[test](#) [select workflow to be Executed](#)



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IceExecutions

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mifsasEngine	ADASS-demo-workflow	COMPLETE	157	8.11.2011 10:51:01	8.11.2011 15:24:23	8.11.2011 15:25:04
mifsasEngine	ADASS-demo-workflow	READY	158	8.11.2011 16:07:03	no value	no value

1-4 of 4

update status Execute ReRun

IceResults

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IcDataoutput-multi0	Test	Kepler	
GetTopics	Test	Kepler	
UKIDSS-ADASS	Test	Kepler	

3-7 of 7

test create new workflow

IceWorkflows

Workflow Name	Engine	Engine Name	Status
UKIDSS working	mifsasEngine	mifsasEngine	ACCEPTED

1-1 of 1

Back to workflow list Add to execution list

GeneralInfo



IceExecutions Portlet

Displays status of workflow executions with status and end times of execution while executable to choose workflow engine times.

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1-3 of 3

update status Execute ReRun

update status Execute ReRun



IceResults

Results
contain
mediato

st
acts as
ts portlet.

Results from workflow
Start querying data with minRa=311.306, maxRa= 311.968, minDec= 44.677, maxDec= 44.93
Data fetching ready. Start data processing.
Data processing ready. Now parsing results.

1
#1: IRAS 20445+4436
2
#1: IRAS 20453+4441
4
5

Link to data:
http://surveys.roe.ac.uk/wsa/tmp/MultiGetImage/upload4947029149343650884tmp_6dir/p001.html

Image:

Clear Reselect application

The results can be text, hyperlinks or images.



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mifsasEngine	ADASS-demo-workflow	RUNNING	158	8.11.2011 16:07:03	no value	no value

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GetTopics	Test	Kepler	
UKIDSS-ADASS	Test	Kepler	

3-7 of 7

test create new workflow

IceResults

Results from workflow

1

#1: IRAS 20445+4436

Link to data:
http://surveys.roe.ac.uk/wsa/tmp/MultiGetImage/upload6645016747956285074tmp_6dir/p001.html

Image:

IceWorkflows

Workflow Name	Engine	Engine Name	Status
UKIDSS working	mifsasEngine	mifsasEngine	ACCEPTED

1-1 of 1

Back to workflow list Add to execution list

GeneralInfo

GeneralEvent info

Getting session info
Info:A9768EDF19021D922D2D3443913DBEC
Application ID 93
Fetching applications