IU Bloomington

OGF-24 RISGE-RG
Singapore September 16 2008

The University of Sydney

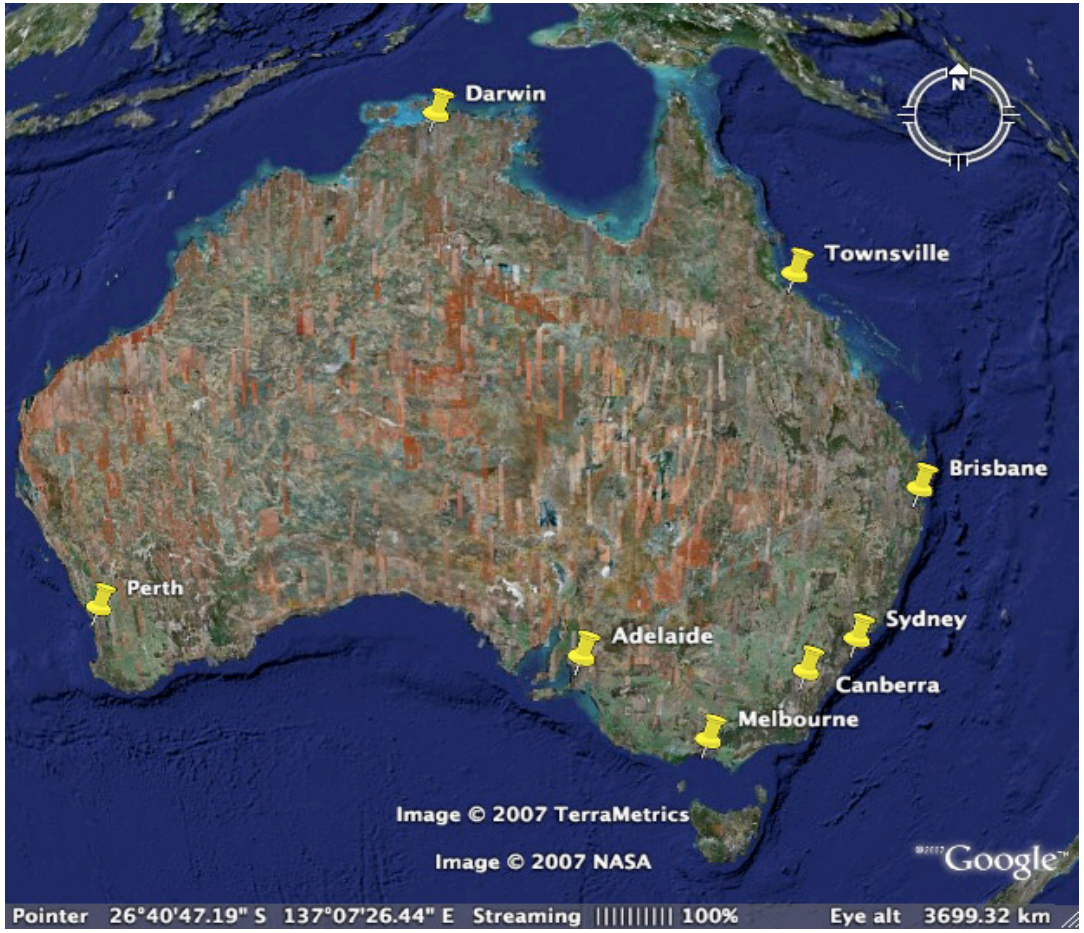
Developing a Common Instrument Middleware Architecture for Remote Instrument Operation

Douglas du Boulay, Sandor Brockhauser, Rick McMullen, Romain Quilici, Peter Turner

Part(s) collaboration between Indiana University, James Cook University, State University of New York (SUNY) at Binghamton, European Molecular Biology Laboratory (ESRF Outstation), Adelaide University and the University of Sydney.

Presentation Overview

- Introduction – context and motivation
- Common Instrument Middleware Architecture (CIMA) Overview
- USyd Contributions to CIMA Development
- Use of a Virtual Instrument Model
- Couple of Little Videos



Russia: 17 million sq km
pop. 141.4 million

China: 9.3 million sq km
pop. 1.3 billion

USA: 9.2 million sq km
pop. 301 million

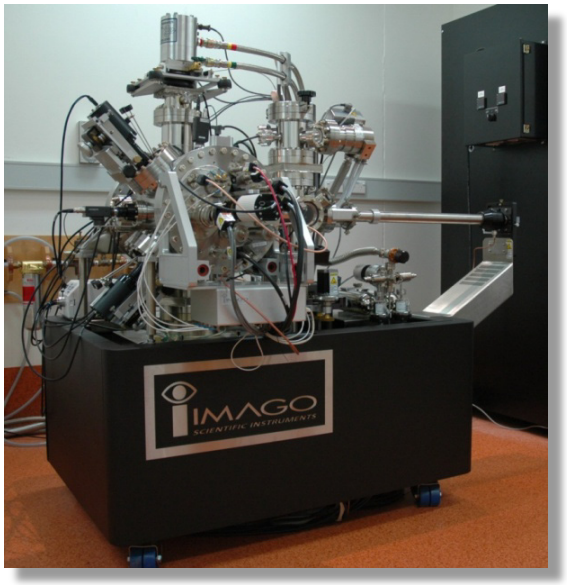
Canada: 9 million sq km
pop. 33.3 million

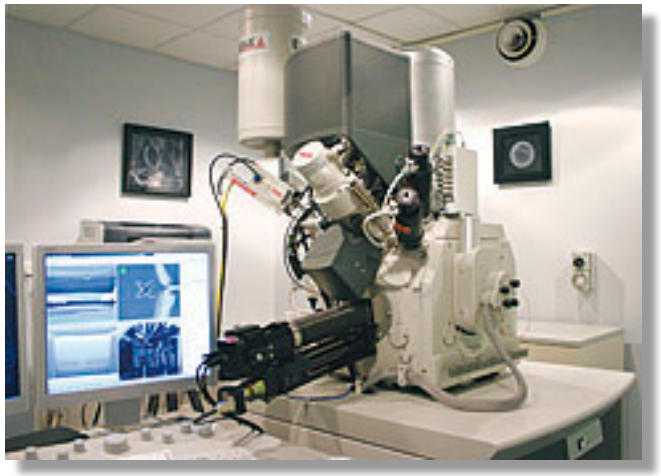
Brazil: 8.5 million sq km
pop. 188 million

Australia: 7.6 million sq km and 20.4 million people

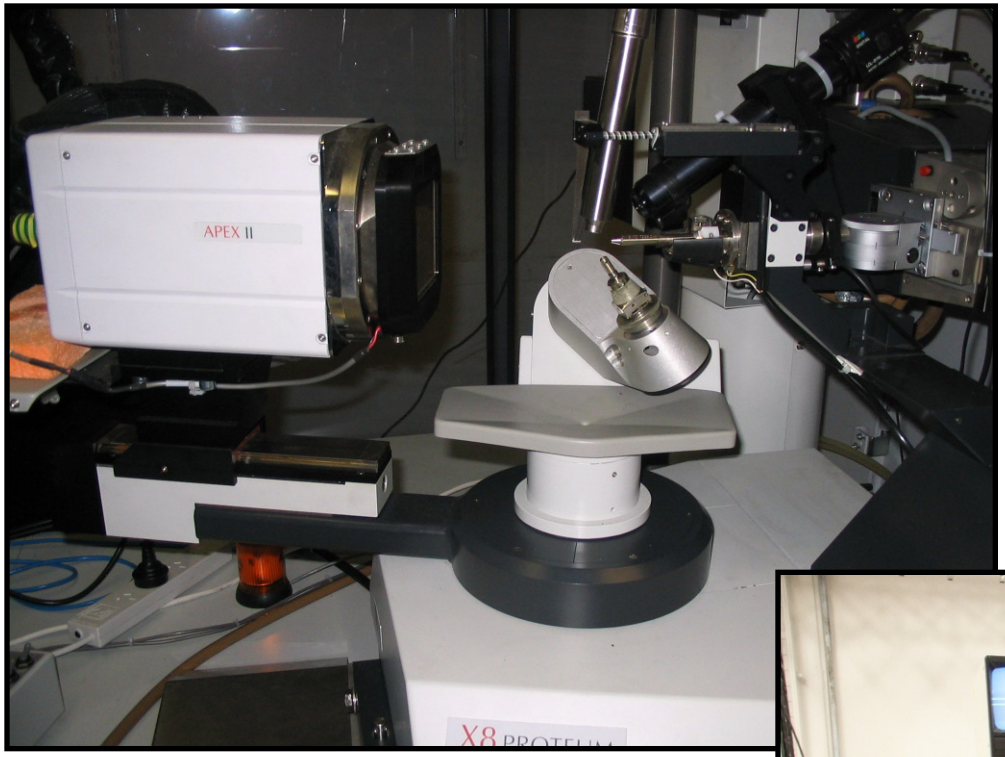
OPAL: Open Pool Australian Light-Water Reactor

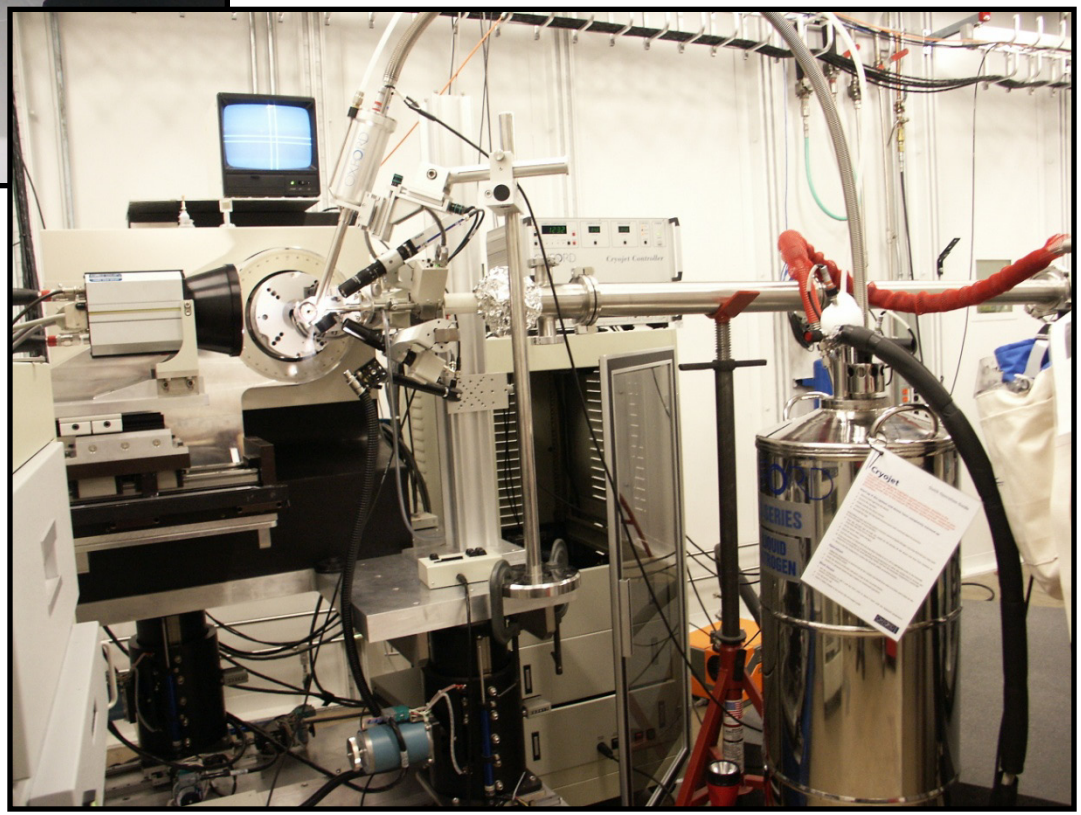
Australian Synchrotron

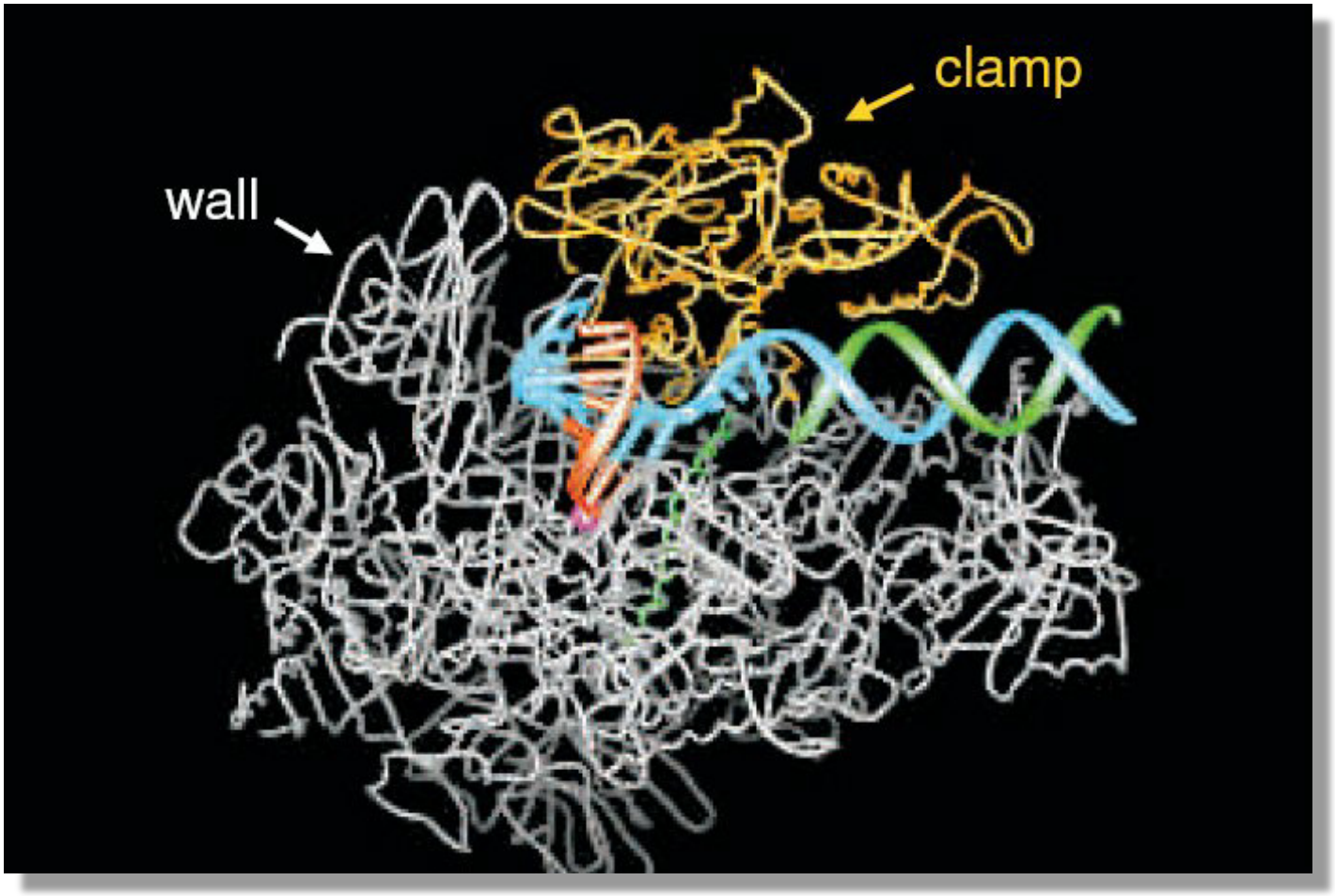




Australian Microscopy and Microanalysis Research Facility (AMMRF)


APEX II


Cryojet

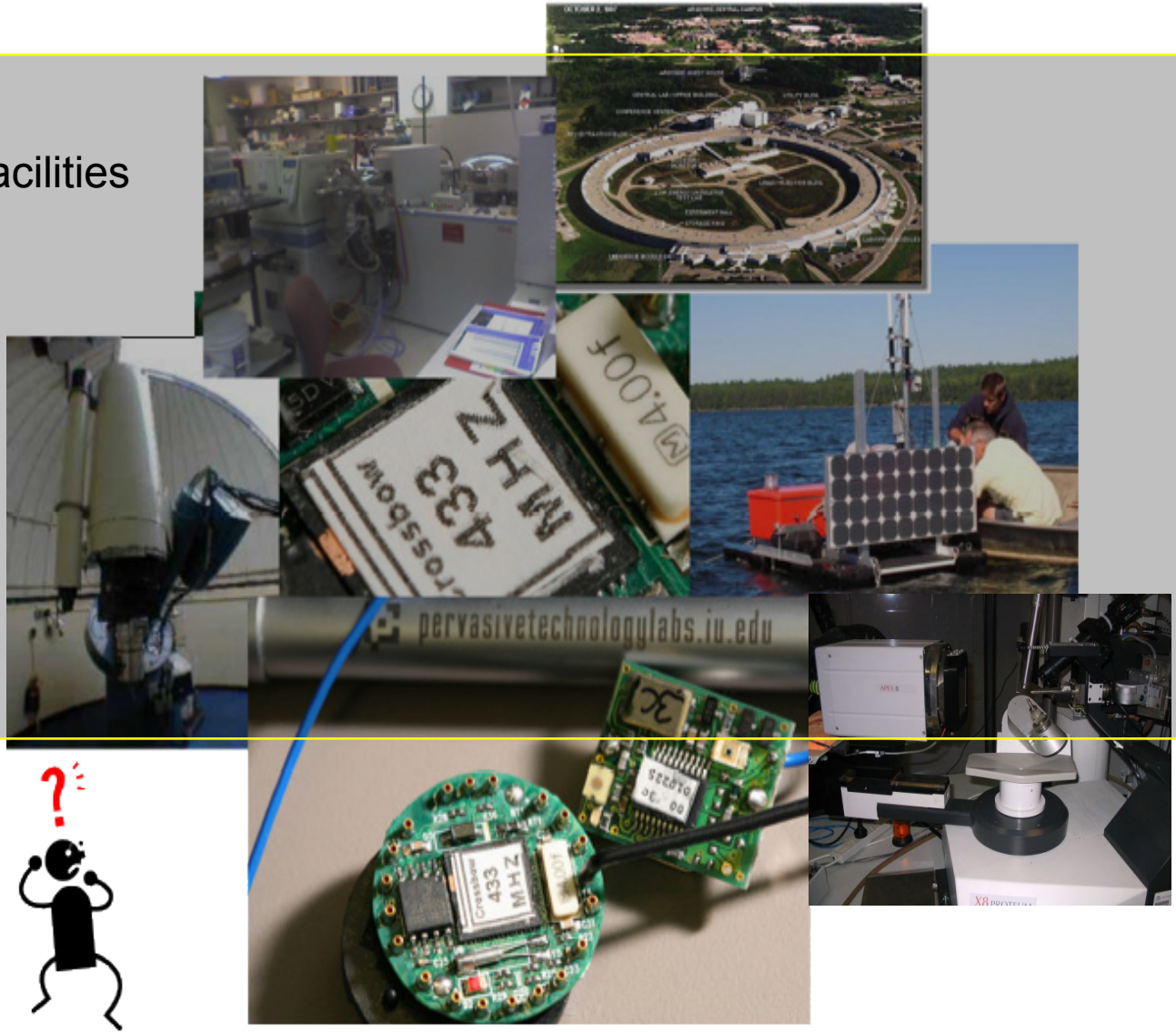


DNA transcription ‘caught in the act’
2006 Nobel Prize

CIMA: Common **I**nstrument **Mi**ddleware **A**rchitecture

Rick McMullen: "*We need a uniform way to describe, locate and access a broad range of instruments and sensors.*"

- Major shared research facilities
- Laboratory instruments
- Field instruments
- Robotic systems
- Sensor networks



Common Instrument Middleware Architecture (CIMA)

- Elegant, general and **re-usable model for instrument access through 'abstraction'**. Adaptable to different instrument settings. Facilitates code reuse. Basis for a standardised implementation/deployment system, and a common programmable interface

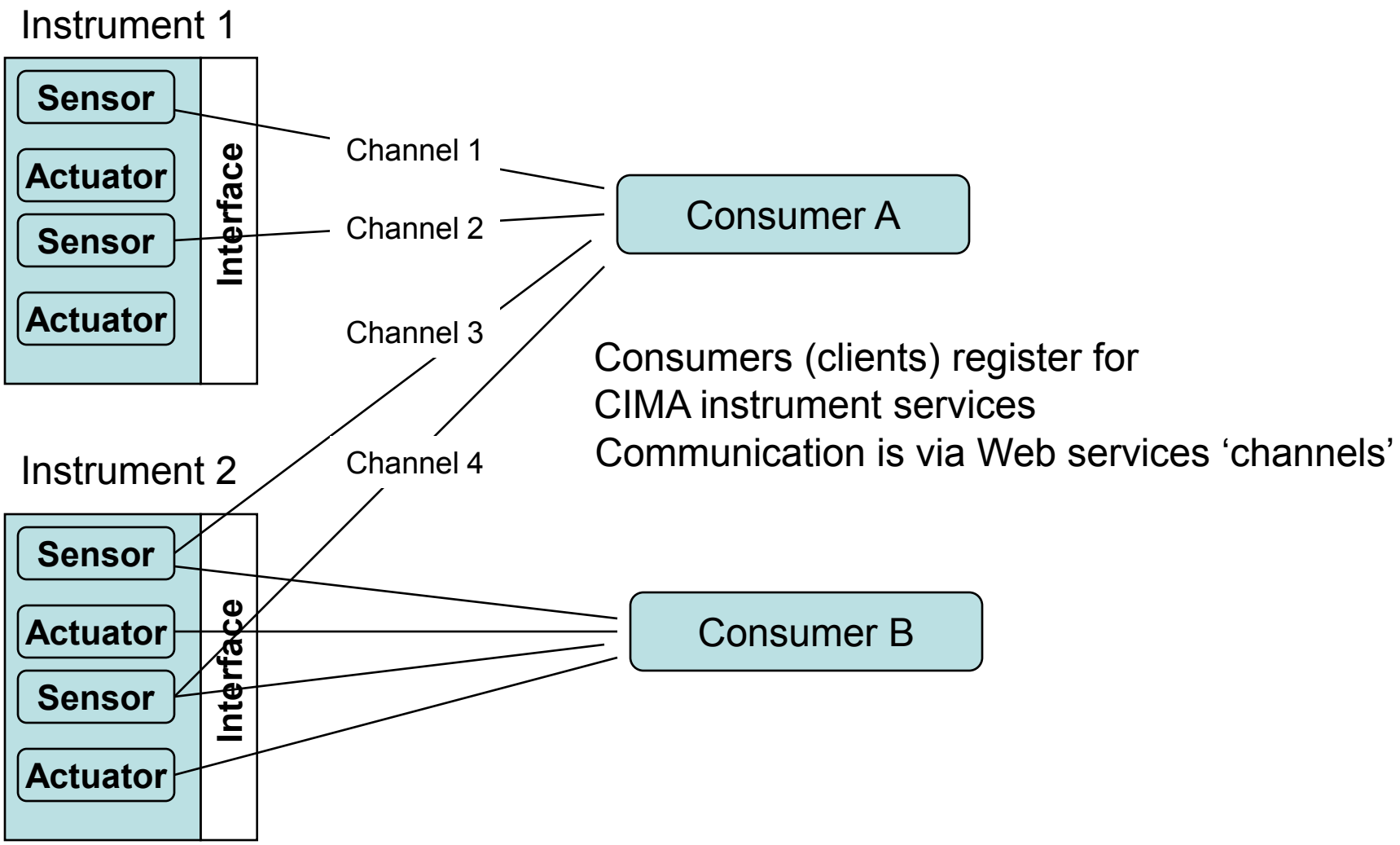
- Flexible and extensible with **modular use of plug-ins**

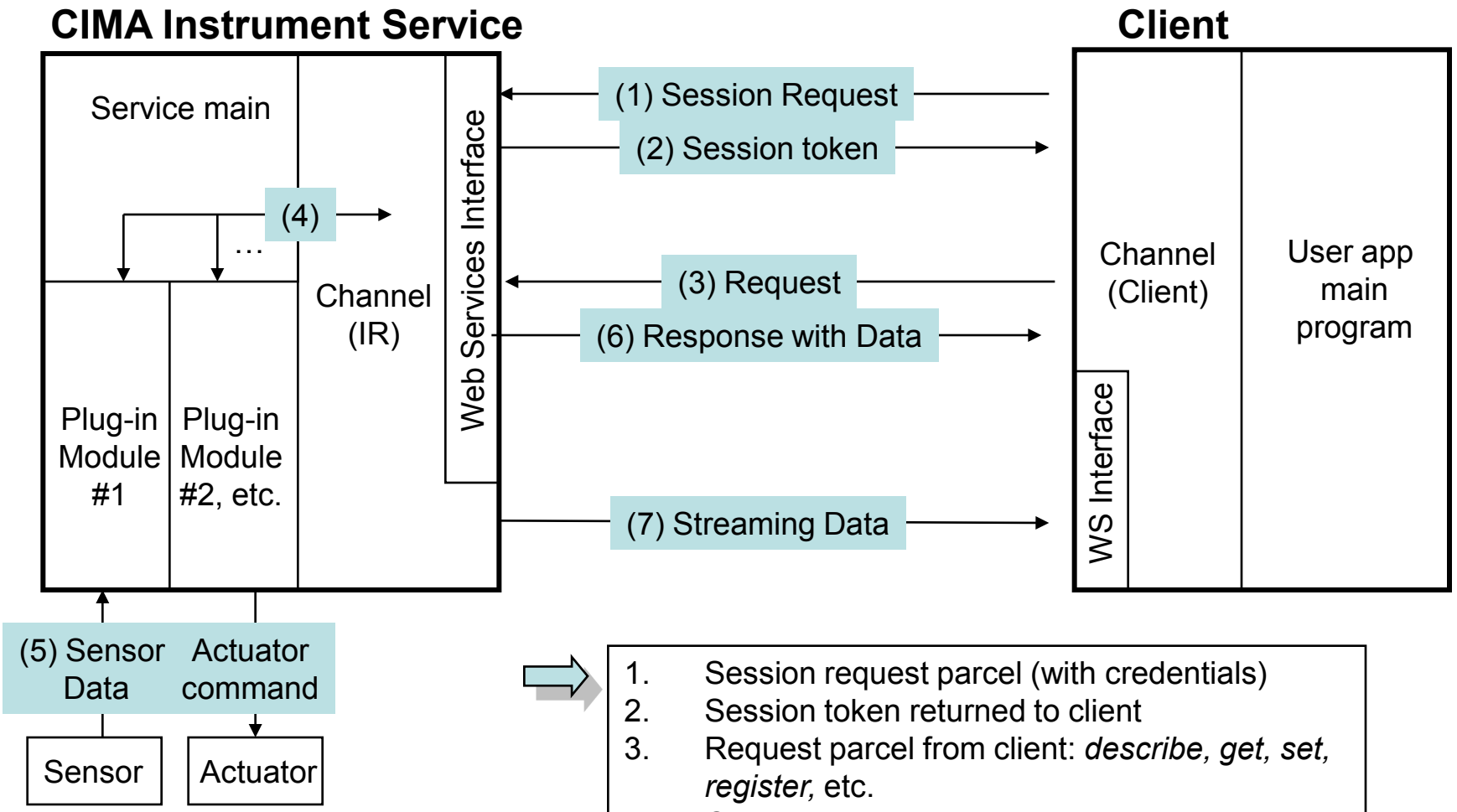
- Standard and reusable methodology to enable and **embed instruments as addressable Web and Grid resources** with the use **Web services** . Remote accès, management and processing using Web services.

  Facilitate the integration of instruments and sensors (*e.g. as* real-time data sources) into a Grid environment with Web Services interfaces

- Message oriented architecture based on **XML messages (parcels)** defined wrt schema and sent **via *channels.*** *E*asy to extend, adapt, maintain the use of parcels. **Single method – receive parcel**.

- Production of metadata as close to instruments as possible and facilitate the automatic harvesting of metadata

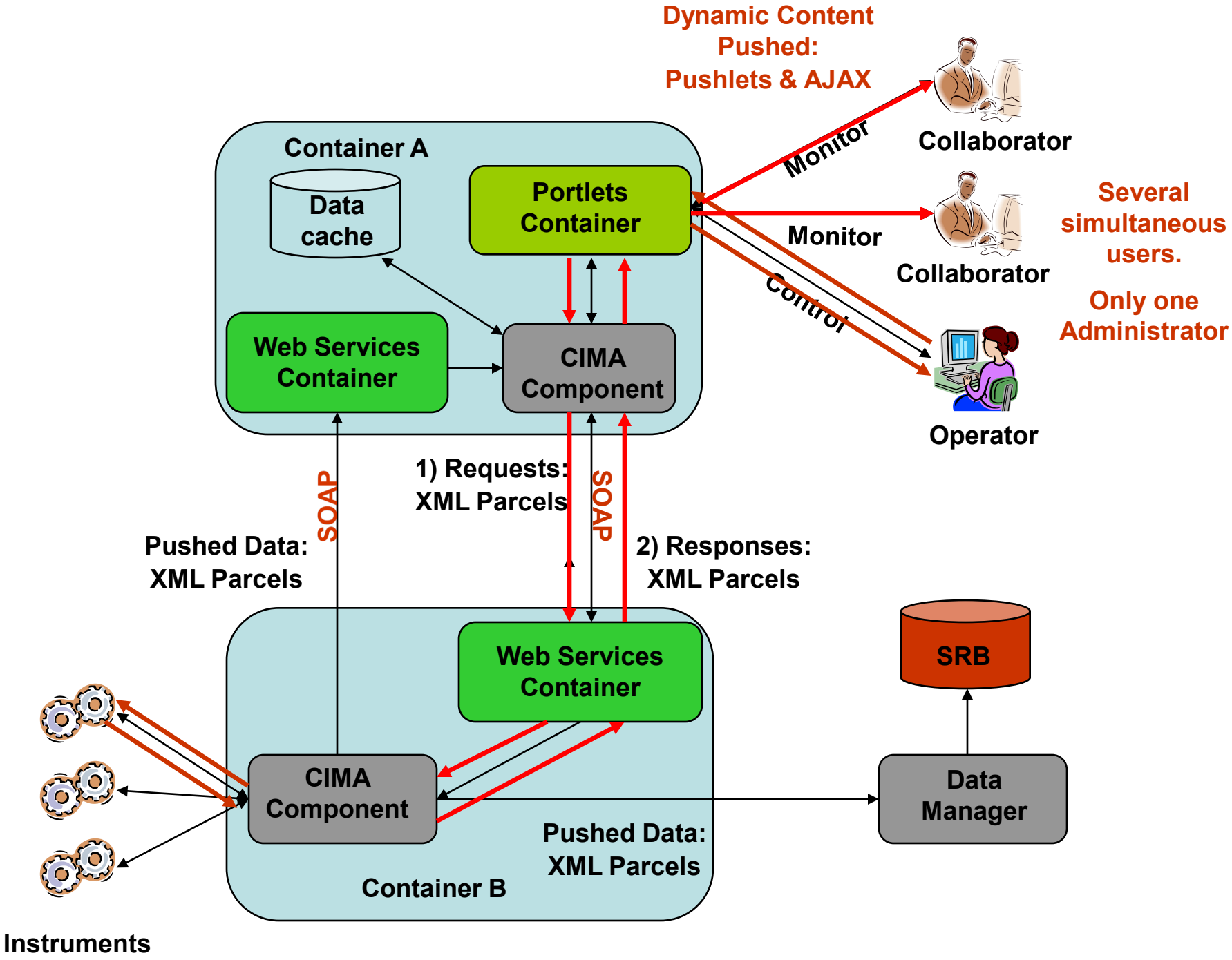

Instrument 1
Sensor
Actuator
Sensor
Actuator
Interface
Channel 1
Channel 2
Channel 3
Channel 4
Consumer A
Consumers (clients) register for
CIMA instrument services
Communication is via Web services ‘channels’
Instrument 2
Sensor
Actuator
Sensor
Actuator
Interface
Consumer B

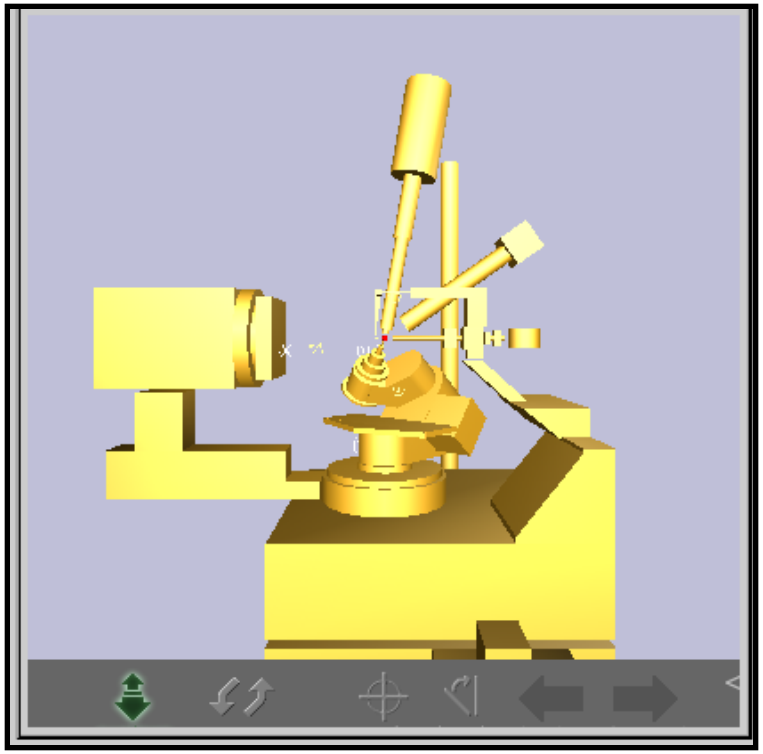


1. Session request parcel (with credentials)
2. Session token returned to client
3. Request parcel from client: *describe, get, set, register,* etc.
4. Channel used to call plug-in appropriate for request type and data source
5. Plug-in retrieves data or runs actuator
6. Response parcel is returned to client (data or operation result code)
7. If Client *register*s for event or streaming data Service calls client periodically or when data is available (timer or event-driven from plug-in)

Contributions from University of Sydney …

- Development of instrument control via CIMA – architecture extension – synchronous and asynchronous channels – new parcel types.
- Plugin development – including plugin control
- Use of AJAX and Pushlets to enable 'real time' data push from the instrument to the client.
- Image processing/conversion - proprietary format into JPG for Web display. Push-pull model for large data (image) transfer.
- Collaborative image viewing
- Virtual model and simulation – use of X3D


Dynamic Content Pushed: Pushlets & AJAX
Container A
Data cache
Portlets Container
Web Services Container
CIMA Component
Monitor
Collaborator
Monitor
Collaborator
Control
Operator
Several simultaneous users.
Only one Administrator
SOAP
1) Requests: XML Parcels
SOAP
2) Responses: XML Parcels
Pushed Data: XML Parcels
Web Services Container
CIMA Component
SRB
Data Manager
Pushed Data: XML Parcels
Container B
Instruments



Virtual Instrument Use:

A low-bandwidth, interactive and readily interpreted view of the current state of the instrument (updated by Pushlets).

Offsets ‘dark lab’ problem

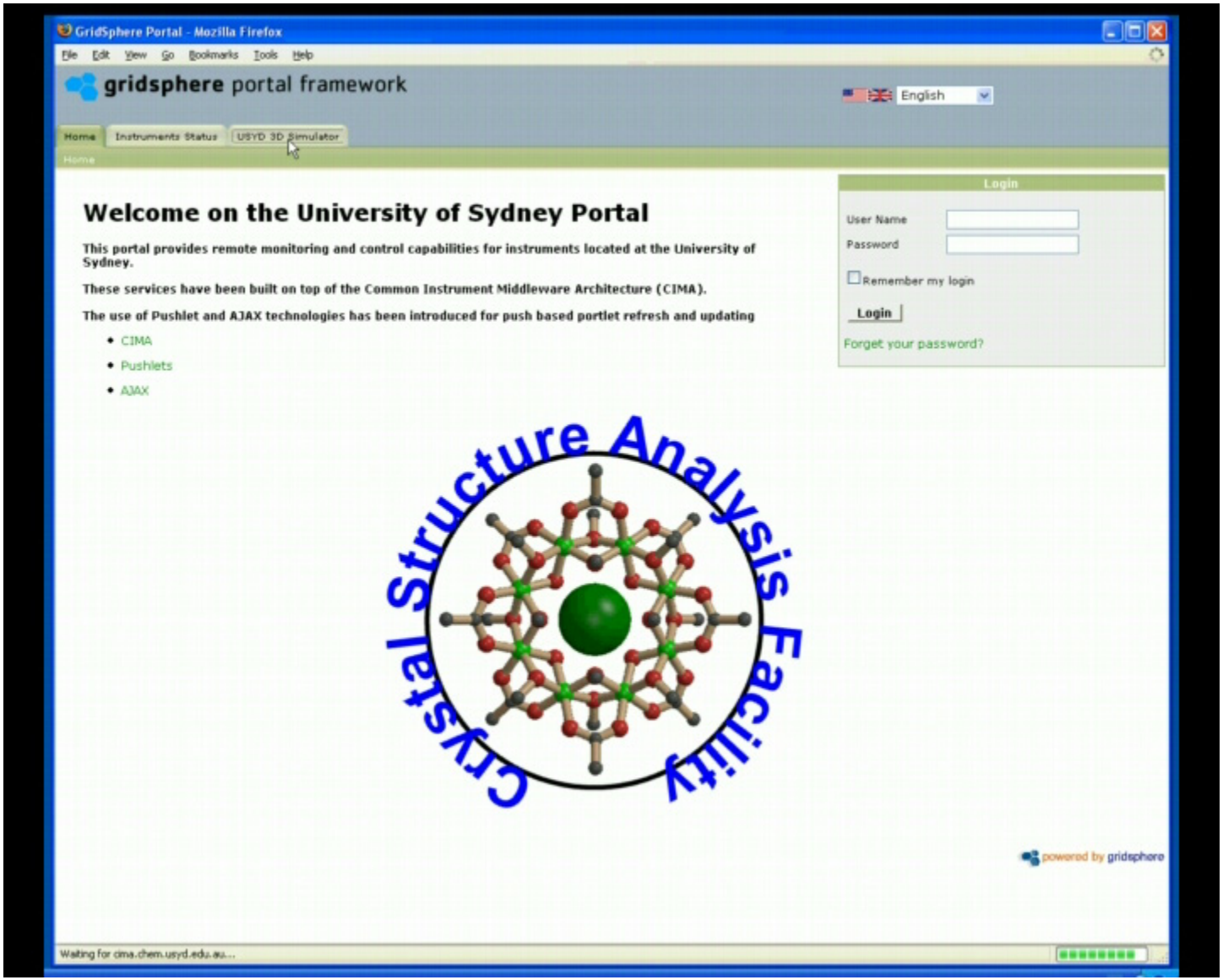
Visually assess collection safety or viability

Safely test new remote access services

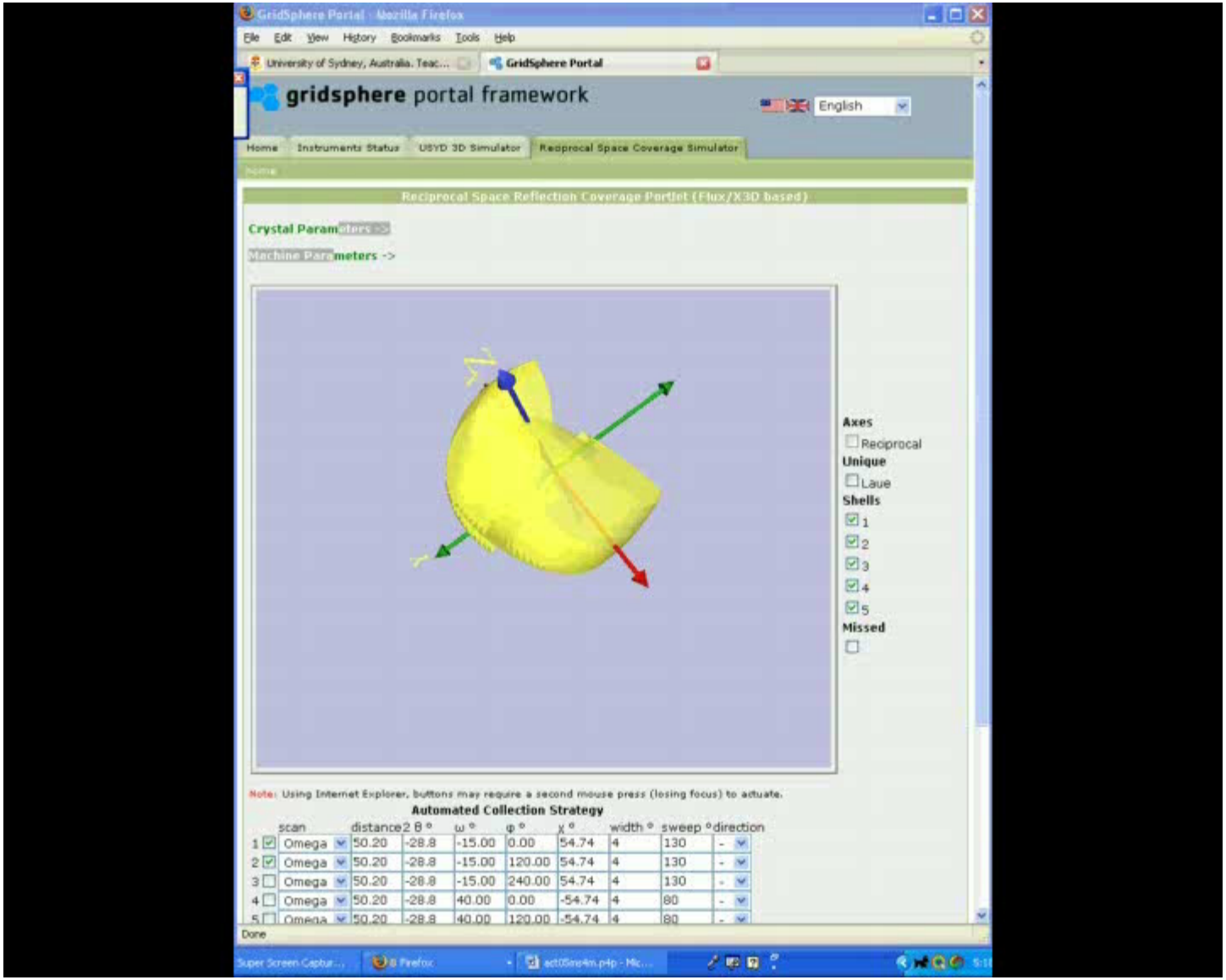
Safe auto collision map determination

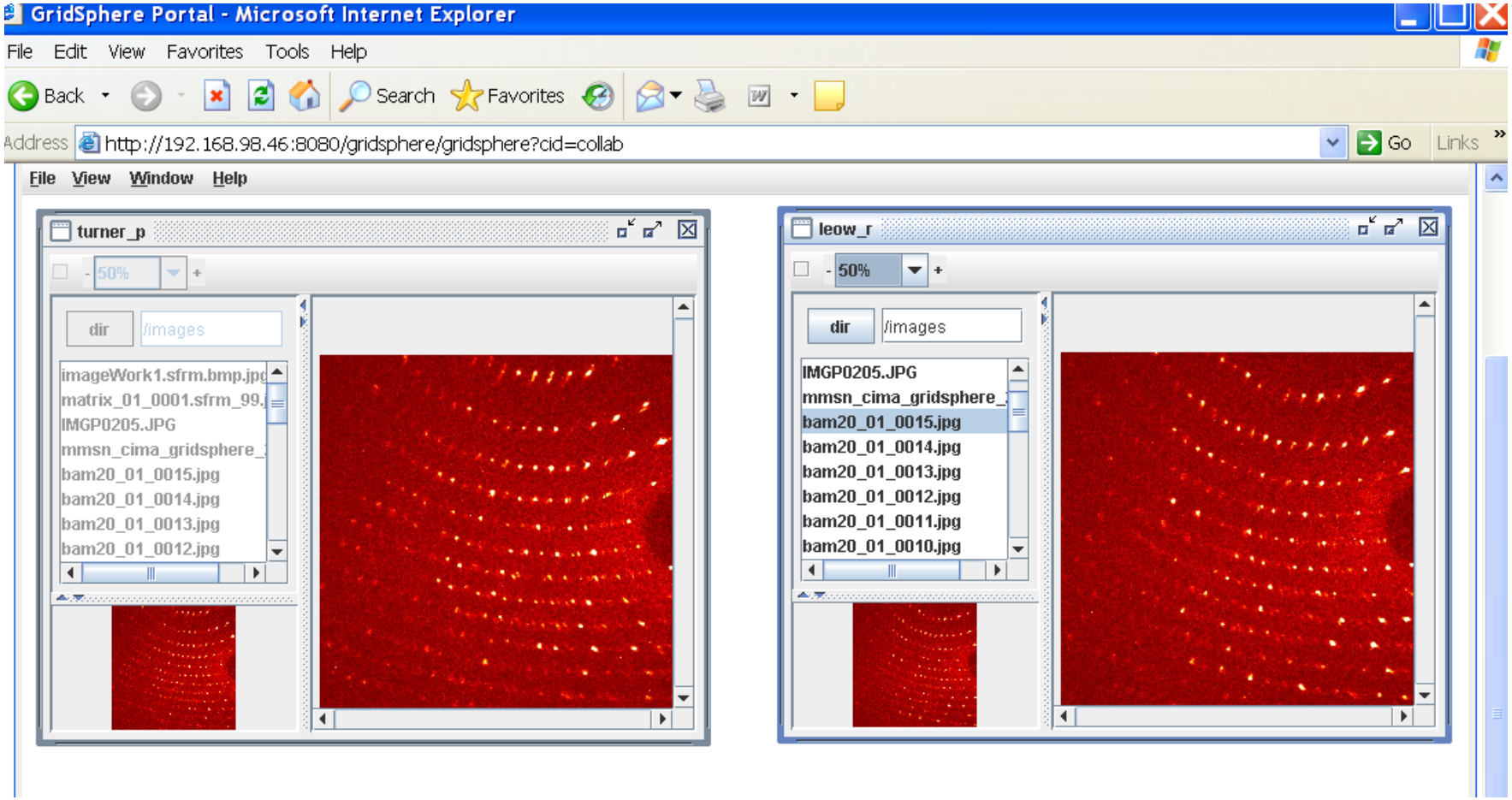
Safe means of training users

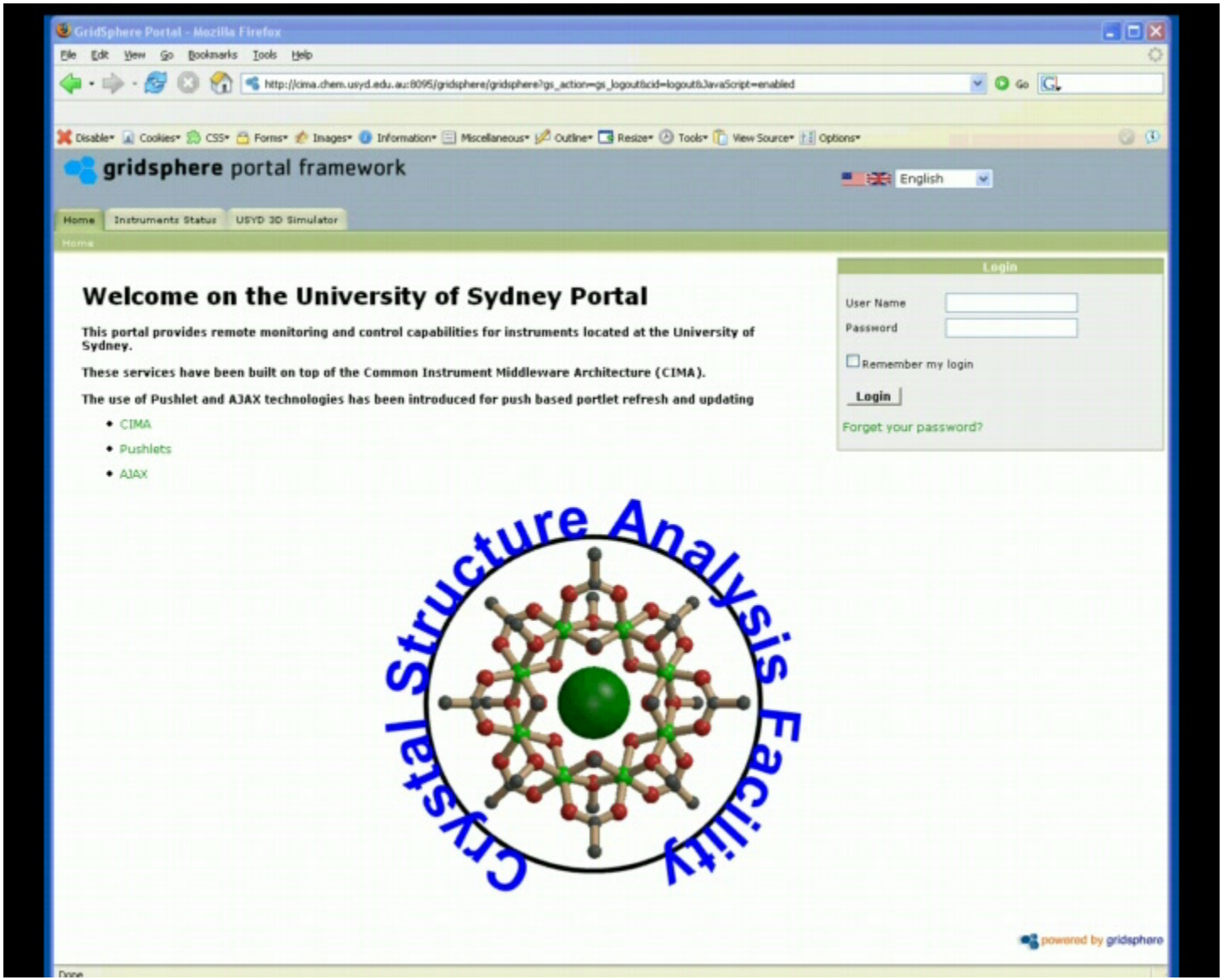
Use ISO standard and XML schema based X3D virtual model format. Can be externally scripted by javascript.



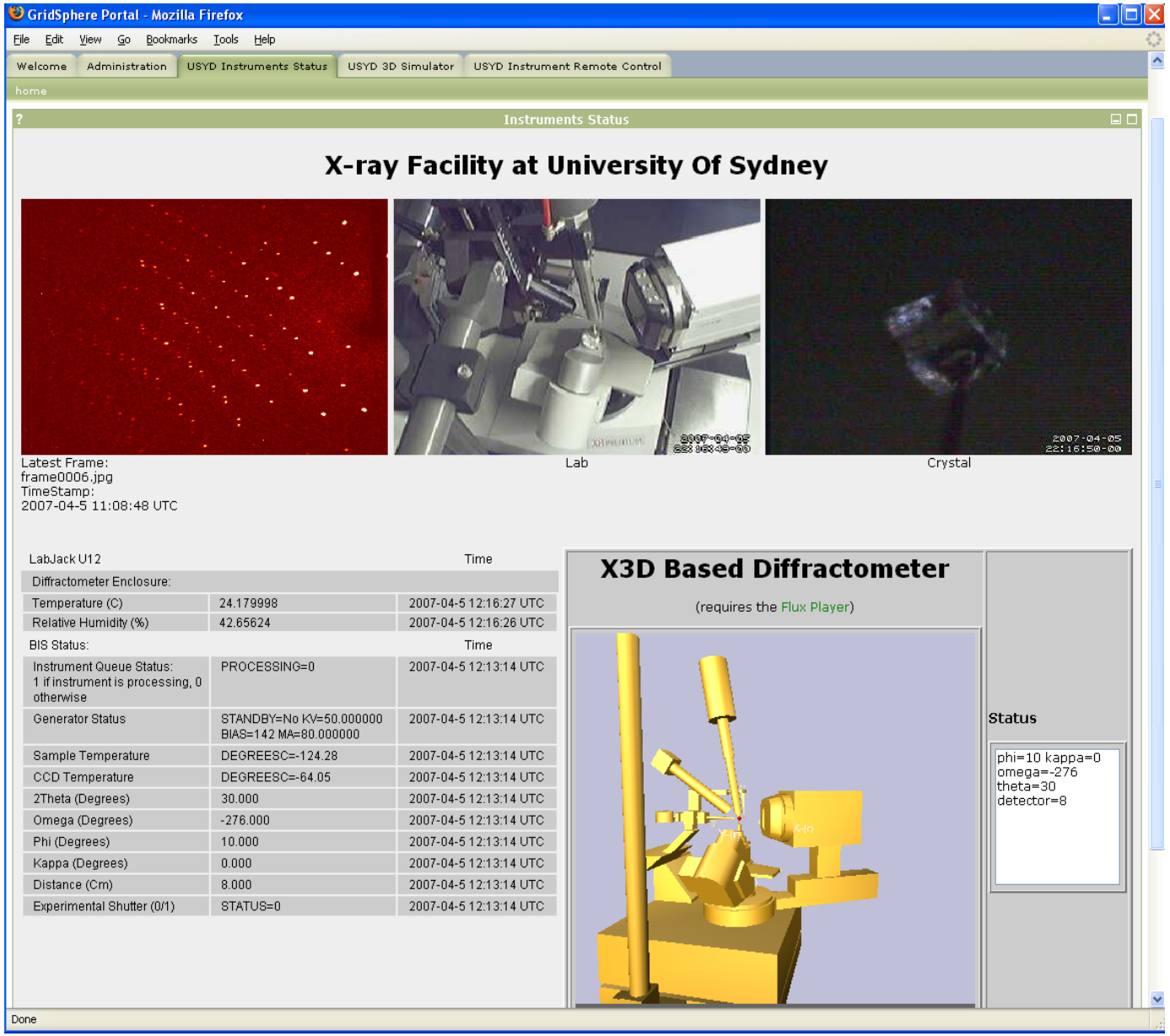
Virtual Instrument Portlet


GridSphere Portal - Mozilla Firefox
File Edit View History Bookmarks Tools Help
University of Sydney, Australia. Teac...
GridSphere Portal
gridsphere portal framework
English
Home
Instruments Status
USYD 3D Simulator
Reciprocal Space Coverage Simulator
Reciprocal Space Reflection Coverage Portlet (Flux/X3D based)
Crystal Parameters ->
Machine Parameters ->
Axes
Reciprocal
Unique
Laue
Shells
1
2
3
4
5
Missed
Note: Using Internet Explorer, buttons may require a second mouse press (losing focus) to actuate.
Automated Collection Strategy
scan distance 2 θ ° ω ° φ ° χ ° width ° sweep ° direction
1 Omega 50.20 -28.8 -15.00 0.00 54.74 4 130 -
2 Omega 50.20 -28.8 -15.00 120.00 54.74 4 130 -
3 Omega 50.20 -28.8 -15.00 240.00 54.74 4 130 -
4 Omega 50.20 -28.8 40.00 0.00 -54.74 4 80 -
5 Omega 50.20 -28.8 40.00 120.00 -54.74 4 80 -
Done


GridSphere Portal - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.98.46:8080/gridsphere/gridsphere?cid=collab
Go Links
File View Window Help
turner_p
50%
dir
/images
imageWork1.sfrm.bmp.jpg
matrix_01_0001.sfrm_99.
IMGP0205.JPG
mmsn_cima_gridsphere_
bam20_01_0015.jpg
bam20_01_0014.jpg
bam20_01_0013.jpg
bam20_01_0012.jpg
leow_r
50%
dir
/images
IMGP0205.JPG
mmsn_cima_gridsphere_
bam20_01_0015.jpg
bam20_01_0014.jpg
bam20_01_0013.jpg
bam20_01_0012.jpg
bam20_01_0011.jpg
bam20_01_0010.jpg



Instrument Control Portlet



Instrument Monitor Portlet

iGoogle

http://www.google.com/ig

Google

Latest Headlines | Slashtmp | Wikipedia | Weather | Travel | Scaling Wiki | ISDEC – BluWiki | post to del.icio.us | Agenda for Sensor In... | Welcome to uExpress... | NSF FastLane Home

iGoogle

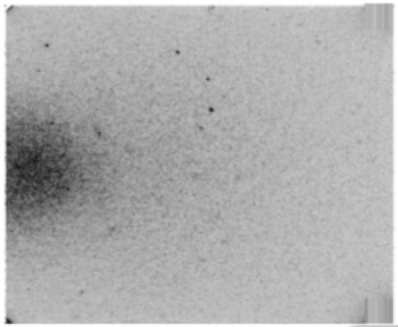
Google Search | I'm Feeling Lucky

Advanced Search
Preferences
Language Tools

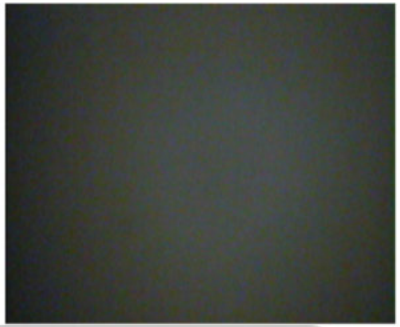
Home | Add a tab

Select theme | Add stuff »

IUMSC Bruker S6K current CCD image



IUMSC Bruker S6K Crystal Camera



IUMSC Bay 1 Overview

Exception Conditions IUMSC

- IUMSC Atom Feed – Abnormal Data

No abnormal data now.

view link »

- IUMSC Atom Feed – Abnormal Data
- IUMSC Atom Feed – Abnormal Data
- IUMSC Atom Feed – Abnormal Data
- IUMSC Atom Feed – Abnormal Data
- IUMSC Atom Feed – Abnormal Data

IUMSC Atom Feed

Yu(Carol) Deng Aug 10, 2007 - Show original item

FrameBuffer_F_Usage 2007-08-09 23:10:10Z 89.8
FrameBuffer_E_Usage 2007-08-09 23:10:10Z 55.3
Bay1Temp 2007-08-09 23:10:12Z 16.7
CampCWInTemp 2007-08-09 23:10:25Z 13.5
LN2Levl 2007-08-09 23:10:15Z 41.5
LabCWInTemp 2007-08-09 23:10:25Z 16.4
LabCWOutTemp 2007-08-09 23:10:18Z -10000
CrystalTemp 2007-08-09 23:10:18Z -122
FrameBuffer_D_Usage 2007-08-09 23:10:13Z 84.4
DEHumid 2007-08-09 23:10:15Z 41.4
Bay1Humid 2007-08-09 23:10:18Z -10000
DETemp 2007-08-09 23:10:25Z 22.4

from IUMSC Atom Feed

Date & Time

Bay1Temp IUMSC

- IUMSC Bay1Temp Atom Feed

sensor=Bay1Temp date=2007-08-14 time=04:49:31Z value=16.1

Google Calendar

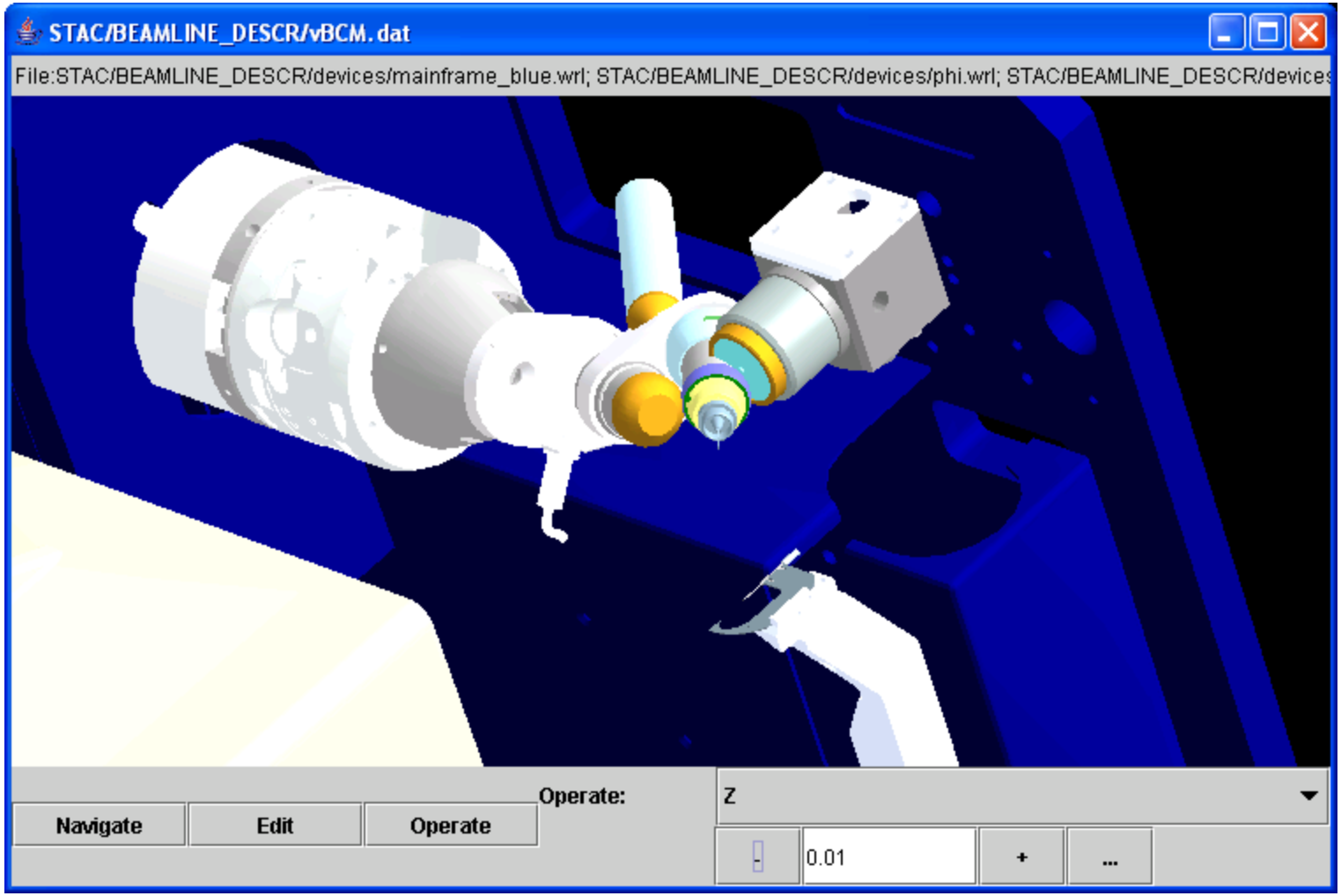
« August 2007 »

Su	M	Tu	W	Th	F	Sa
22	23	24	25	26	27	28

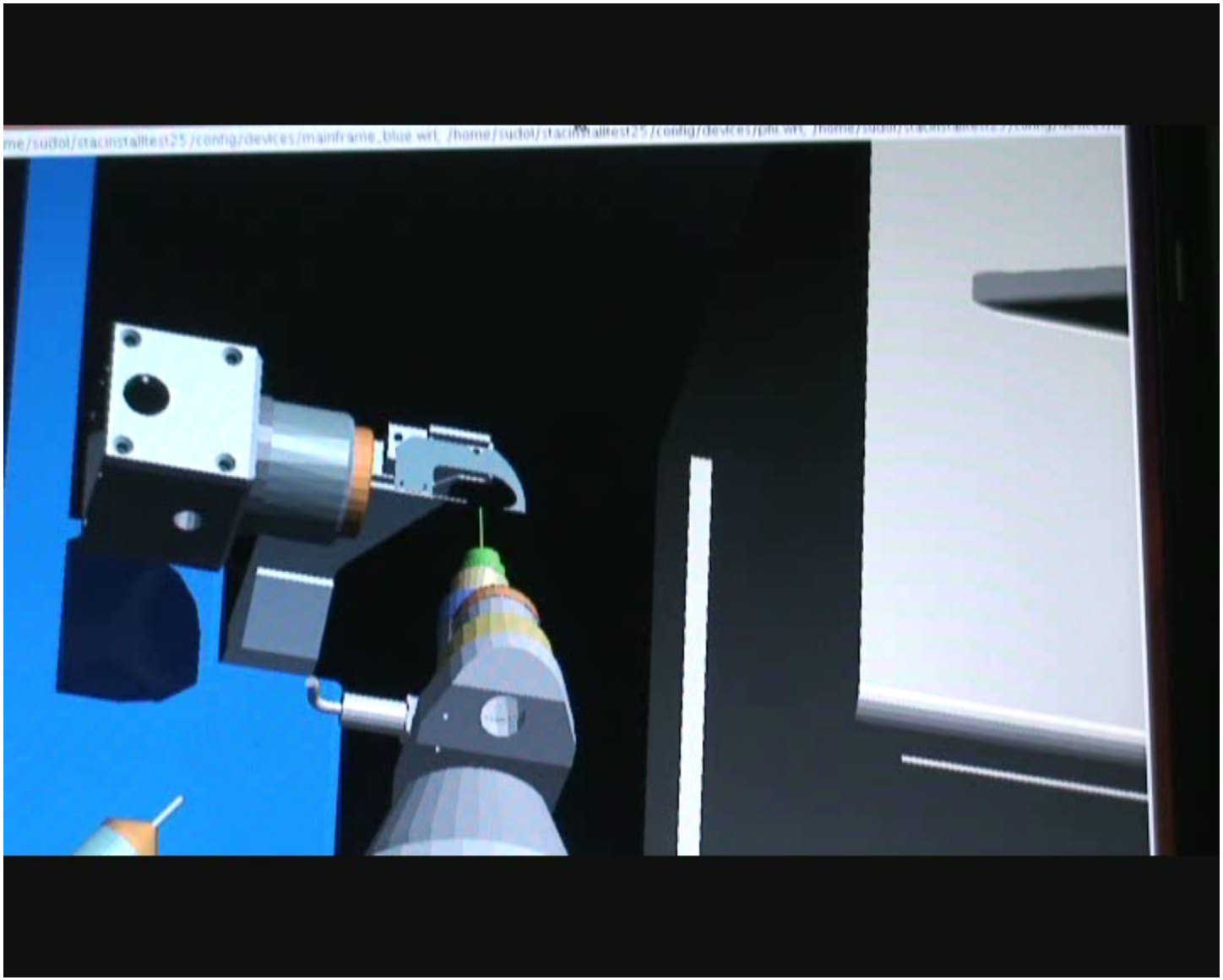
Done

STAC - STrategy for Aligned Crystals - Object Oriented Software for Automated Kappa Collections.

Sandor Brockhauser, EMBL Instrumentation Group at the European Syndhrotron Radiation Facility

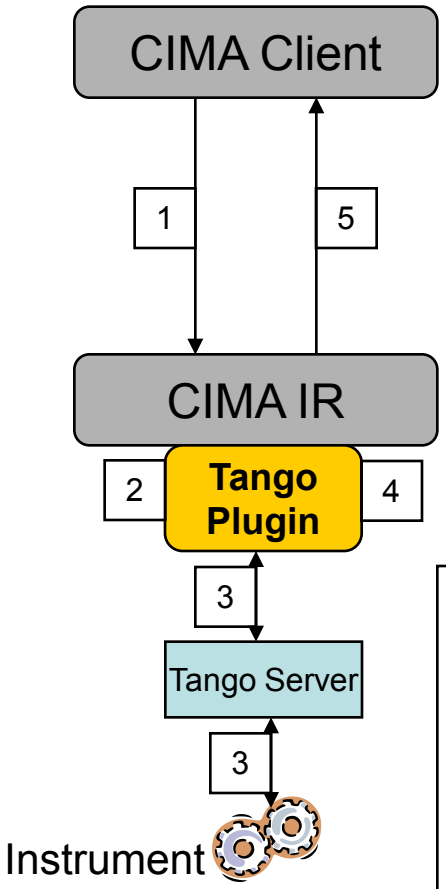


A Collision in Real Space …



Collision map building using a virtual instrument.
STAC (**ST**rategy for **A**ligned **C**rystals) - Sandor Brockhauser

Tango as a CIMA plugin




```
<?xml version="1.0" encoding="UTF-8"?>
<parcel>
  <type>http://www.usyd.edu.au/2007/Get</type>
  <body>
    <sender>
      <url>http://mymachine:myport/myservice</url>
      <name>senderPluginName</name>
    </sender>
    <channel>
    <time>2002-05-30T09:00:00</time>
      <plugin>Tango</plugin>
      <variable>
        <name>Omega</name>
      </variable>
      <variable>
        <name>Kappa</name>
      </variable>
    </channel>
  </body>
</parcel>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<parcel>
  <type>http://www.usyd.edu.au/2006/Get_Response</type>
  <body>
    <sender>
      <url>http://mymachine:myport/myservice</url>
      <name>senderPluginName</name>
    </sender>
    <channel>
    <time>2002-05-30T09:00:00</time>
      <variable>
        <name>Omega</name>
        <value>10.0</value>
        <unit>degree</unit>
      </variable>
      <variable>
        <name>Kappa</name>
        <value>0.0</value>
        <unit>degree</unit>
      </variable>
    </channel>
  </body>
</parcel>
```

1) Get Parcel sent by the Client

2) Helper is retrieved with variables name

3) Read_attribute called on Tango Server, variables read

4) Values converted from Double to String

5) Get response Parcel returned to the client

DS X3D updated by streaming pushlet - Mozilla Firefox

File Edit View History Bookmarks Tools Help

SakaiVre/PlanningProgress/200610... | Guanxi:About - Guanxi | DS X3D updated by streaming pu...

Simulator Variables

Speedup: 5

Auto delay: 300 (s)

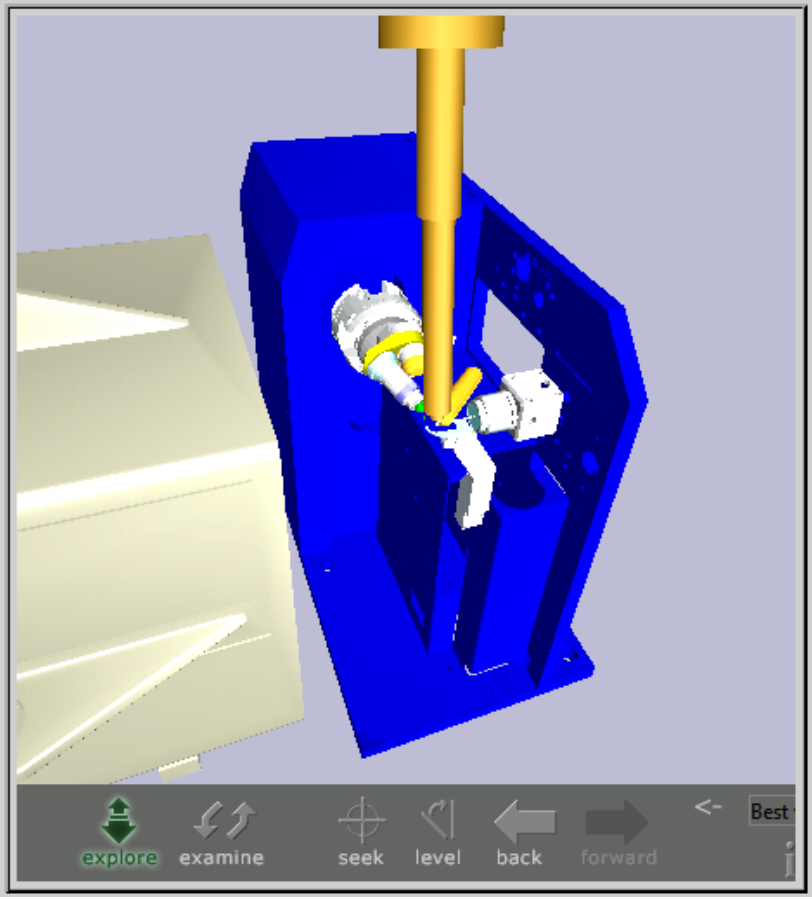
X3D duty-cycle: 3

Geometric Variables

Kappa mode

Omega	0.00	(-720 ... 720°)
Kappa	90.00	(0 ... 250°)
Phi	0.00	(-720 ... 720°)
Z	0.00	(-10 ... 30mm)
Y	0.00	(-10 ... 10mm)
X	0.00	(-10 ... 10mm)
Beamstop	0.00	(0 ... 500mm)
Detector	150.00	(0 ... 500mm)
Xflash	0.00	(0 ... 500mm)

Drive Reset



Reflection Calculation

In auto mode: no Calc now

Whole sphere: no Erase refs

Animation Control

Pause Resume Abort

Done

CIMA Project People

Adelaide Uni	*JCU*	*Indiana and SUNY*	*USyd*
P. Coddington	I.M. Atkinson	R. McMullen	P. Turner
A. Wendelborn	R. Feroze	K. Chiu	D. du Boulay
D. Zhang	M. Morgan	T. Devadithya	Clinton Chee
	A. Sharpe	K.Huffman	R. Leow
	M. Wyatt		R. Quilici

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