David Chevrier Canadian Light Source Inc. October 8th, 2010

### Road Map

Where we're headed

- Introduce who and why
- Examine beamline software
- Outline a vision
- Contemplate acquisition, data, and beamline management
- Talk about programming
- Consider the future
- (Apologize for speed talking)

### Introduction

#### Meet the players





David Chevrier SGM Science Associate



Tom Regier SGM Beamline Scientist

Mark Boots Synchrotron User

### Motivation

### Setting the stage



 Right now, there's a steep learning curve to start doing science

Paradigm time

- The CLS has a lot of beamline software
- Beamline software follows a machine paradigm





• We're considering experiment software

### **Experiment Based Software** Paradigm time The CLS has a lot of *beamline* software Beamline software follows a machine paradigm Measuring Browsing Old Data Exporting, Graphing Planning Visualization Managing Samples Acquiring Data Analysis Comparing Push to Spin **Crank Adjust** Depth

• We're considering *experiment* software

A comparison

Let's look at one of the simplest user interfaces

Energy Tracking		11	80 100
Undulator (OFF) Grating (C	ON) Exit Slit (ON)	60	
Grating Selection			120 160
Low Medium	High		km/h 200*
Entrance Slit E	xit Slit	-40	
Set Point 250.0 um	Set Point 50.0 um	- 20 - 0	240
Feedback 249.4 um	eedback 50.0 um	- 0	MIP
Open Close	Open Close		

• Now, let's look at a beamline user interface

A comparison

• Let's look at one of the simplest user interfaces

Energy Tracking		A1611-4-13
Undulator (OFF) Gratin	ng (ON) Exit Slit (ON)	EA1 lo 4.263256e-14 A
Casting Calenting		A1611-4-14
Grating Selection—		EA2 lo -2.380318e-13 A
Low Med	lium High	A 16 11 - 4 - 15
Entrance Slit	Exit Slit	TEY -3.907985e-14 A
Set Point 250.0 um	Set Point 50.0 um	A1611-4-16
Feedback 249.4 um	Feedback 50.0 um	FLY -9.947598e-14 A
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- Now, let's look at a beamline user interface
- I guess that would be like

A comparison

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### Vision

#### What we asked ourselves

- Wouldn't it be great if users could just sit down and start doing experiments?
- Wouldn't it be nice if software could help users with their experiment?
- Wouldn't it be lovely if users could do their entire experiment with one software package?

### Vision

What we want to do

"Our vision is to offer all of these opportunities to users regardless of their experience level or background so they can focus on the science they know."

\* We'd also like to do in a way that if as pleasant and efficient as possible.

• We evolve from *engineering* software to designing a user experience

# **Acquisition Management**

Putting the focus on science

- Scientists are technique experts, beamline staff are beamline experts
- A new beamline means new expertise but the same technique
- Can we explicitly support the technique in software?

		Acquaman	
le	1		
SEAMLINE CONTROL	A = 0.5	A = 0.05	4 = 0.5
👩 SGM Sample Posi	Δ = 0.5	Δ = 0.05	Δ = 0.5
👩 SGM Sample Tran	920	950 960	1000
EXPERIMENT SETUP			
📕 Absorption Scan	Start Delta End		Tracking
🔳 SGM XAS Scan	<b>0</b> 920 0.5 950		
EXPERIMENT TOOLS	1 950 0.05 960		Mono Tracking On ~
🕑 Workflow	2.060 0.E 1000		Exit Slit Tracking On 🗸
NOW PLAYING	Add Region Delete Region	n	
🛓 Scan Editor			
DATA			
📑 Runs	Flux/Resolution		XAS Detectors
Experiments	43.99 Medium First More De	etails	TEY 🖸 Details
			TFY Details
			SDD Details
			Start Scan
			Start Start
			Add Scan to Queue
			Queue Director

# **Acquisition Management**

#### Keeping the focus on science

- Let's think about beamline settings
- You're interested in choosing your flux and resolution
- Can we put it in terms of what they know?







# **Acquisition Management**

Managing many

- How do users really do their experiments?
- Many scans and many scans and many scans
  samples
- Support for users to automate common tasks



### Organizing data

- What are our users accustomed to?
- Collecting, moving, ulletand re-starting
- Assist users in organizing their data

SGM Ream

BEAM ON

Reamline Enerm

\*\*\*\*\*\*\*\*\*\*

Grating Sele

Low

Entrance Slit-

HV Group is ON Some HV is O

MOVING

Visible Light On/OFF

1138.000 eV

1137.841 eV

Stop Run

Julator (ON) Grating (ON) Exit Slit (ON

-Exit Slit Set Point 250.0 um Set Point 30.0 um Feedback 244.0 um Feedback 30.0 um Open Close Open Close

High

utes 8 seconds remaining. Scan 1 of 1



#### Viewing data

- What do users want to do as data comes in?
- Viewing, comparing, and manipulating
- Give users convenient tools to quickly examine their data



- What about all the data users have already collected?
- Need tools for old CLS data, across beamlines, and other facilities
- Give users convenient tools to quickly examine their data



- What about all the data users have already collected?
- Need tools for old CLS data, across beamlines, and other facilities
- Give users convenient tools to quickly examine their data
- Even away from the beamline?







### Beamline Management Managing samples

- What else do users need to manage on the beamline?
- Samples, transfers, and manipulations
- Integrate sample management into interface



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- Samples, transfers, and manipulations
- Integrate sample management into interface



- Looking at beamline feedback again
- Already have information about beamline flux



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- Looking at beamline feedback again
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- What visuals are our users used to?



- Looking at beamline feedback again
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- Looking at beamline feedback again
- Already have information about beamline flux
- What visuals are our users used to?





Making it easier

### Inheriting Structure



### **Decoupling Features**





Making it easier



### **Decoupling Features**





Making it easier



Bridging the gaps

- Platform Independence
- Vast toolkit (widgets, containers, video, etc)
- Signals and Slots (Goodbye callbacks)
- Model/View Architecture
- Unit Testing
- Scripting Capability
- Animations, Drag and Drop, Gestures ...



- Remote Source Management
- Integrated Documentation
- Ready for Collaboration

### **Future Directions**

What to do next

- Implement more features
  - Multi-Dimensional Detectors
  - Periodic Table
  - Data Export
- Expand to REIXS and beta test
- Open up the project

### Questions

#### Thank you for your attention