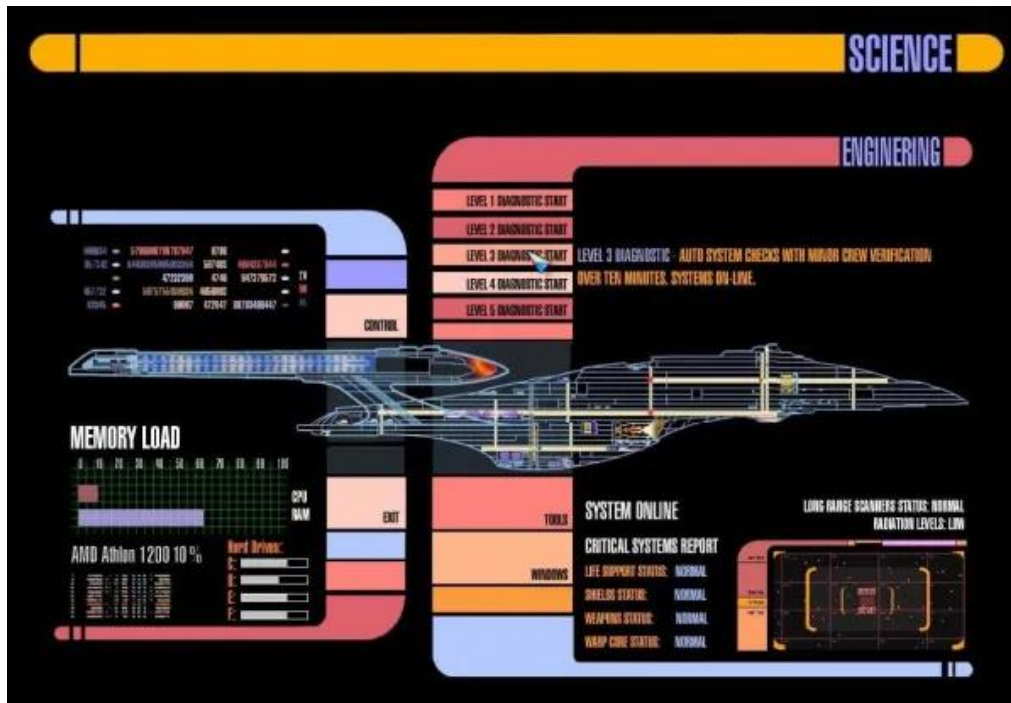


# ESRF Accelerator Control System G.U.I. Development Status And Future Challenges

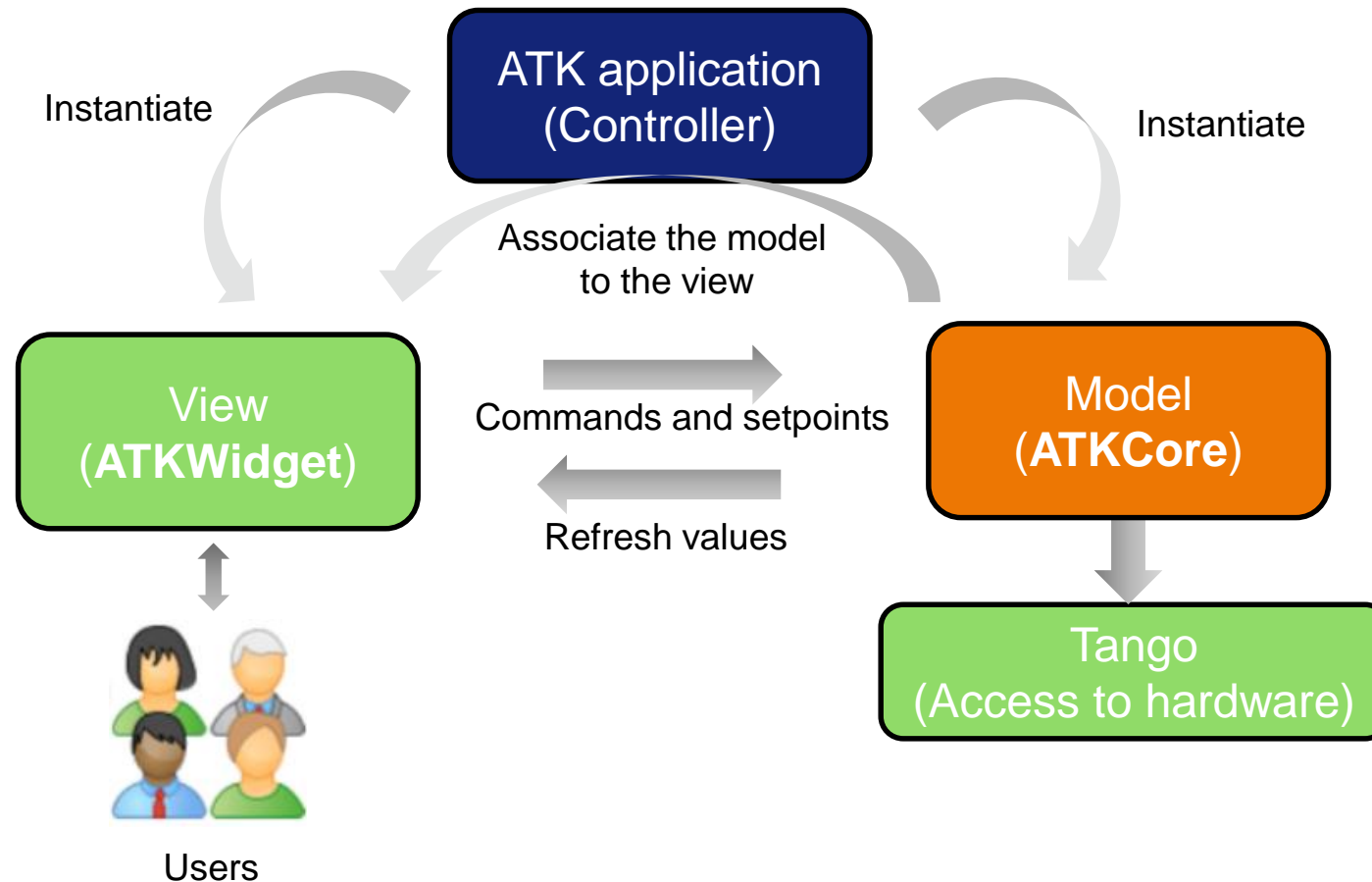


Jean-Luc PONS  
Nicolas Tappret

NOBUGS, 23<sup>rd</sup> September 2024

- Today
  - Java ATK
  - Netbeans
  - JDraw
- Future for the ESRF control system ?
  - GraphQL / WebATK
  - GraphQL / Taranta
  - Python / Taurus
- Conclusion

- ~100 graphical applications (Java Tango **A**pplication **T**oolKit)
- Few hundreds DashBoards (JDraw)



## ATK Core

Classes implementing Tango models

## ATK Widget

~ 80 attribute viewers/editors  
~ 30 command handlers

Advanced image viewers (used for emittance)  
Synoptic/DashBoard editor (JDraw)  
2D plot (JLChart)  
Advanced error handling  
Debugging/Diagnostic metrics

# ATK FRAMEWORK (EXAMPLE)

```
import fr.esrf.tangoatk.core.*;
import fr.esrf.tangoatk.core.attribute.*;
import fr.esrf.tangoatk.widget.attribute.*;
import fr.esrf.tangoatk.widget.util.ATKGraphicsUtils;
import javax.swing.*;
import java.awt.*;

public class TestATK extends JFrame {

    private TestATK() {

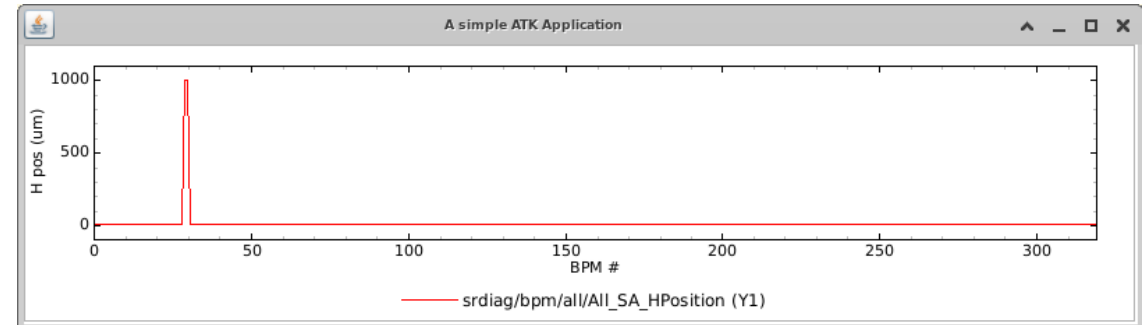
        AttributeList attList = new AttributeList(); // List of models
        attList.setRefreshInterval(1000);

        NumberSpectrumViewer orbitView = new NumberSpectrumViewer(); // Instantiate the viewer
        try {
            // Instantiate the model
            NumberSpectrum orbitModel = (NumberSpectrum) attList.add("srdia/bpm/all/All_SA_HPosition");
            // Associate the model to the viewer
            orbitView.setModel(orbitModel);
        } catch (ConnectionException e) {
            System.out.println("Fail: " + e.getMessage());
            System.exit( status: -1);
        }
        orbitView.setBackground(Color.WHITE);
        orbitView.getY1Axis().setName("H pos (um)");
        orbitView.getXAxis().setName("BPM #");

        attList.startRefresher();
        orbitView.setPreferredSize(new Dimension( width: 800, height: 200));
        setContentPane(orbitView);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        ATKGraphicsUtils.centerFrameOnScreen(this);
        setTitle("A simple ATK Application");
        setVisible(true);
    }

    public static void main(String[] args) { new TestATK(); }
}
```

## A simple ATK application example



# ATK ERRORS MANAGEMENT

- Filtering/Sorting functions
- Full Tango error stack
- Errors are managed using MVC model

The screenshot shows the 'Tango error manager (on raki1)' window. It features a table with columns for Time, Severity, Source, and Description. Below the table are filter controls (Stop, Clear, checkboxes for View panic, View error, View warning, View source) and a 'Sort by' dropdown. A 'Stack' panel on the right shows a tree view of error details for the selected entry.

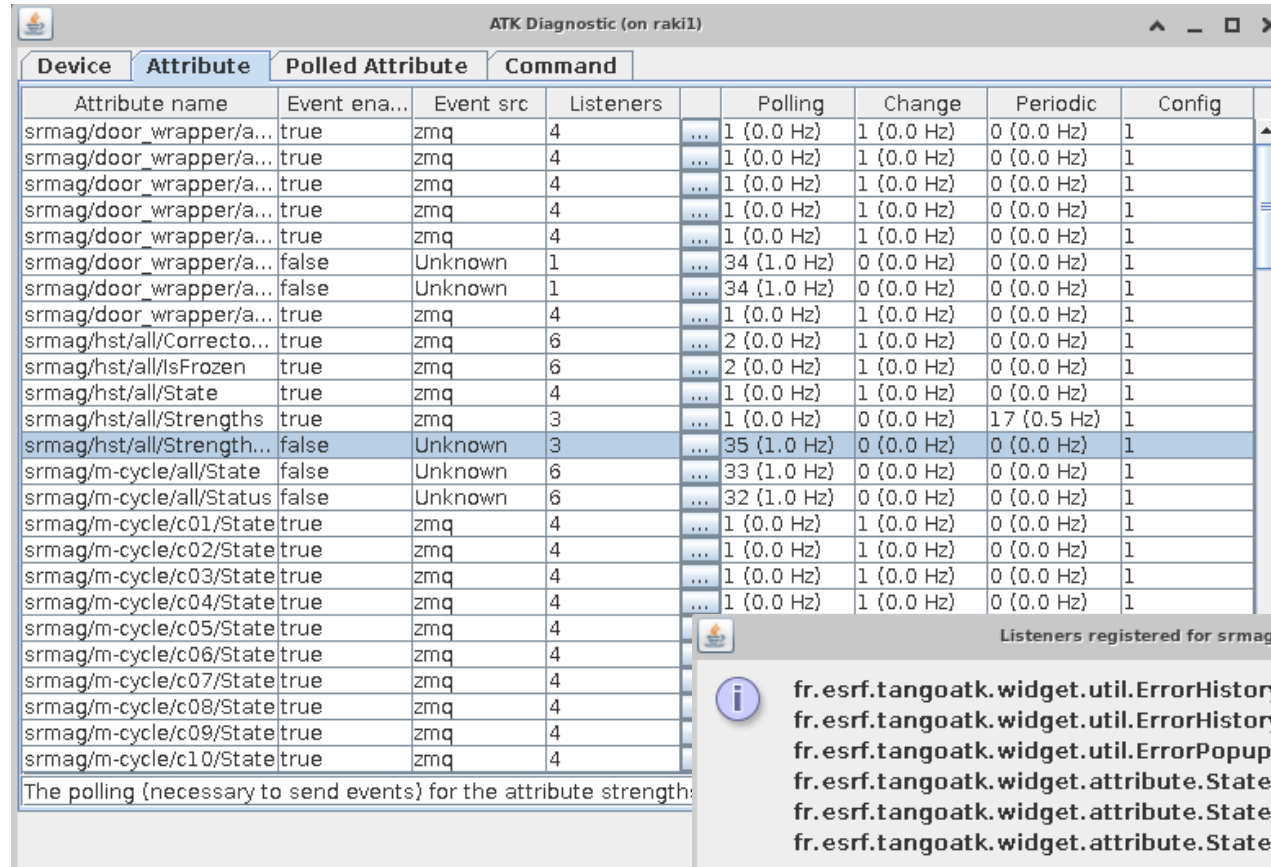
Time	Severity	Source	Description
20/Sep 10:11:04	ERROR	Timeout	Device (test/jlp/1) timed out (>3000 ms)!
20/Sep 10:11:04	ERROR	test/jlp/1/att_un	Not able to acquire serialization (dev, class ...
20/Sep 10:11:04	ERROR	test/jlp/1/att_un	The polling thread is late and discard this o...
20/Sep 10:11:08	ERROR	test/jlp/1/att_un	Not able to acquire serialization (dev, class ...
20/Sep 10:11:08	ERROR	test/jlp/1/att_un	The polling thread is late and discard this o...
20/Sep 10:11:15	ERROR	test/jlp/1/att_un	Not able to acquire serialization (dev, class ...
20/Sep 10:11:15	ERROR	test/jlp/1/att_un	The polling thread is late and discard this o...
20/Sep 10:11:04	ERROR	test/jlp/1/State	Not able to acquire serialization (dev, class ...
20/Sep 10:11:04	ERROR	test/jlp/1/State	The polling thread is late and discard this o...
20/Sep 10:11:08	ERROR	test/jlp/1/State	Not able to acquire serialization (dev, class ...
20/Sep 10:11:08	ERROR	test/jlp/1/State	The polling thread is late and discard this o...
20/Sep 10:11:15	ERROR	test/jlp/1/State	Not able to acquire serialization (dev, class ...
20/Sep 10:11:15	ERROR	test/jlp/1/State	The polling thread is late and discard this o...
20/Sep 10:11:21	ERROR	test/jlp/1/att_spectrum	The polling thread is late and discard this o...
20/Sep 10:11:21	ERROR	test/jlp/1/att_deux	The polling thread is late and discard this o...
20/Sep 10:11:20	ERROR	test/jlp/1/Status	Device (test/jlp/1) timed out (>3000 ms)!
20/Sep 10:11:05	ERROR	test/jlp/1/att_trois	Device (test/jlp/1) timed out (>3000 ms)!
20/Sep 10:11:08	ERROR	test/jlp/1/att_quatre	Device (test/jlp/1) timed out (>3000 ms)!
20/Sep 10:11:11	ERROR	test/ilp/1/att_cinq	Device (test/ilp/1) timed out (>3000 ms)!

Stack view details for the selected error:

- org.omg.CORBA.TIMEOUT: client
- Severity - ERROR
- Origin - test/jlp/1.class fr.es
- Description - Device (test/jlp/1) timed out (>3000 ms)!
- Reason - org.omg.CORBA.TIMEOUT

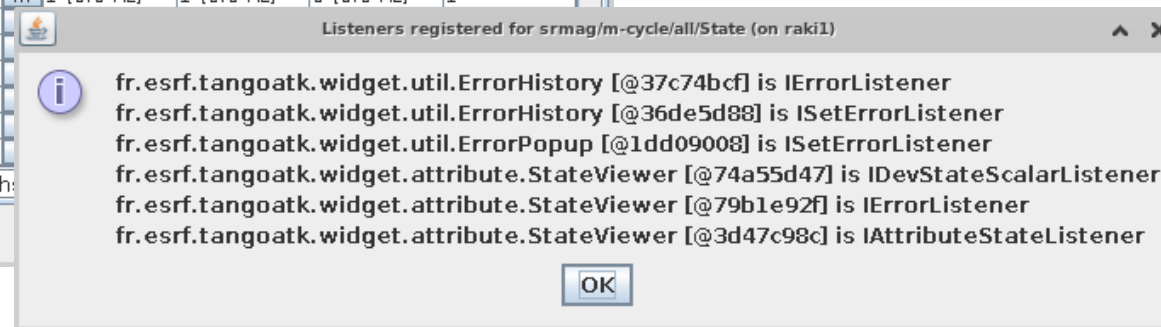
# ATK DEBUGGING/DIAGNOSTIC METRICS

Can be displayed by calling the static method from any ATK application  
`fr.esrf.tangoatk.widget.util.ATKDiagnostic.showDiagnostic()`



Device	Attribute	Polled Attribute	Command					
Attribute name	Event ena...	Event src	Listeners		Polling	Change	Periodic	Config
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	false	Unknown	1	...	34 (1.0 Hz)	0 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	false	Unknown	1	...	34 (1.0 Hz)	0 (0.0 Hz)	0 (0.0 Hz)	1
srmag/door_wrapper/a...	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/hst/all/Correcto...	true	zmq	6	...	2 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/hst/all/IsFrozen	true	zmq	6	...	2 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/hst/all/State	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/hst/all/Strengths	true	zmq	3	...	1 (0.0 Hz)	0 (0.0 Hz)	17 (0.5 Hz)	1
srmag/hst/all/Strength...	false	Unknown	3	...	35 (1.0 Hz)	0 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/all/State	false	Unknown	6	...	33 (1.0 Hz)	0 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/all/Status	false	Unknown	6	...	32 (1.0 Hz)	0 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/c01/State	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/c02/State	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/c03/State	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/c04/State	true	zmq	4	...	1 (0.0 Hz)	1 (0.0 Hz)	0 (0.0 Hz)	1
srmag/m-cycle/c05/State	true	zmq	4					
srmag/m-cycle/c06/State	true	zmq	4					
srmag/m-cycle/c07/State	true	zmq	4					
srmag/m-cycle/c08/State	true	zmq	4					
srmag/m-cycle/c09/State	true	zmq	4					
srmag/m-cycle/c10/State	true	zmq	4					

- Overview of all models instantiated in an application
- Track communication/subscription issues
- Track performance issues

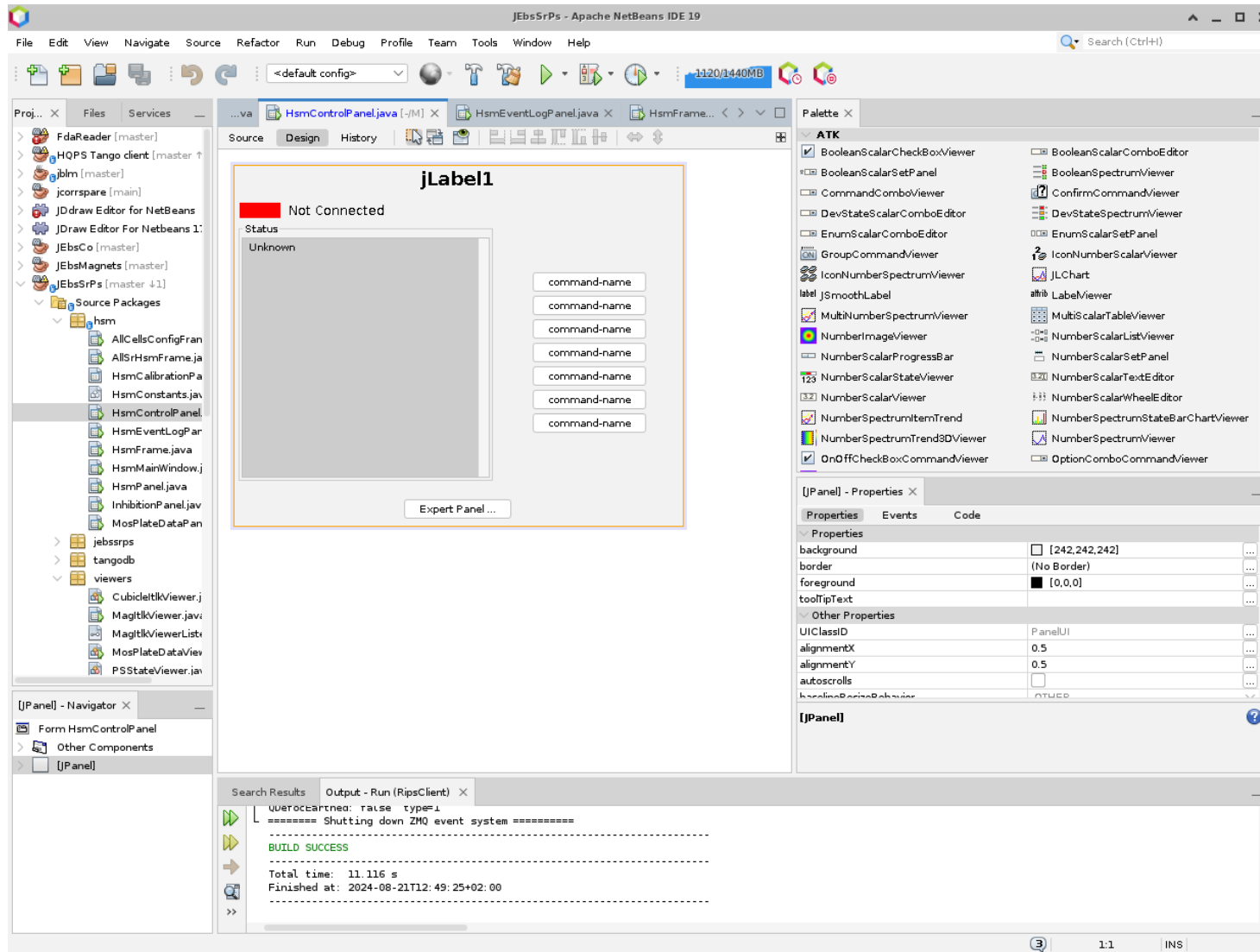


Listeners registered for srmag/m-cycle/all/State (on raki1)

- fr.esrf.tangoatk.widget.util.ErrorHistory [@37c74bcf] is IErrorListener
- fr.esrf.tangoatk.widget.util.ErrorHistory [@36de5d88] is ISetErrorListener
- fr.esrf.tangoatk.widget.util.ErrorPopup [@1dd09008] is ISetErrorListener
- fr.esrf.tangoatk.widget.attribute.StateViewer [@74a55d47] is IDevStateScalarListener
- fr.esrf.tangoatk.widget.attribute.StateViewer [@79b1e92f] is IErrorListener
- fr.esrf.tangoatk.widget.attribute.StateViewer [@3d47c98c] is IAttributeStateListener

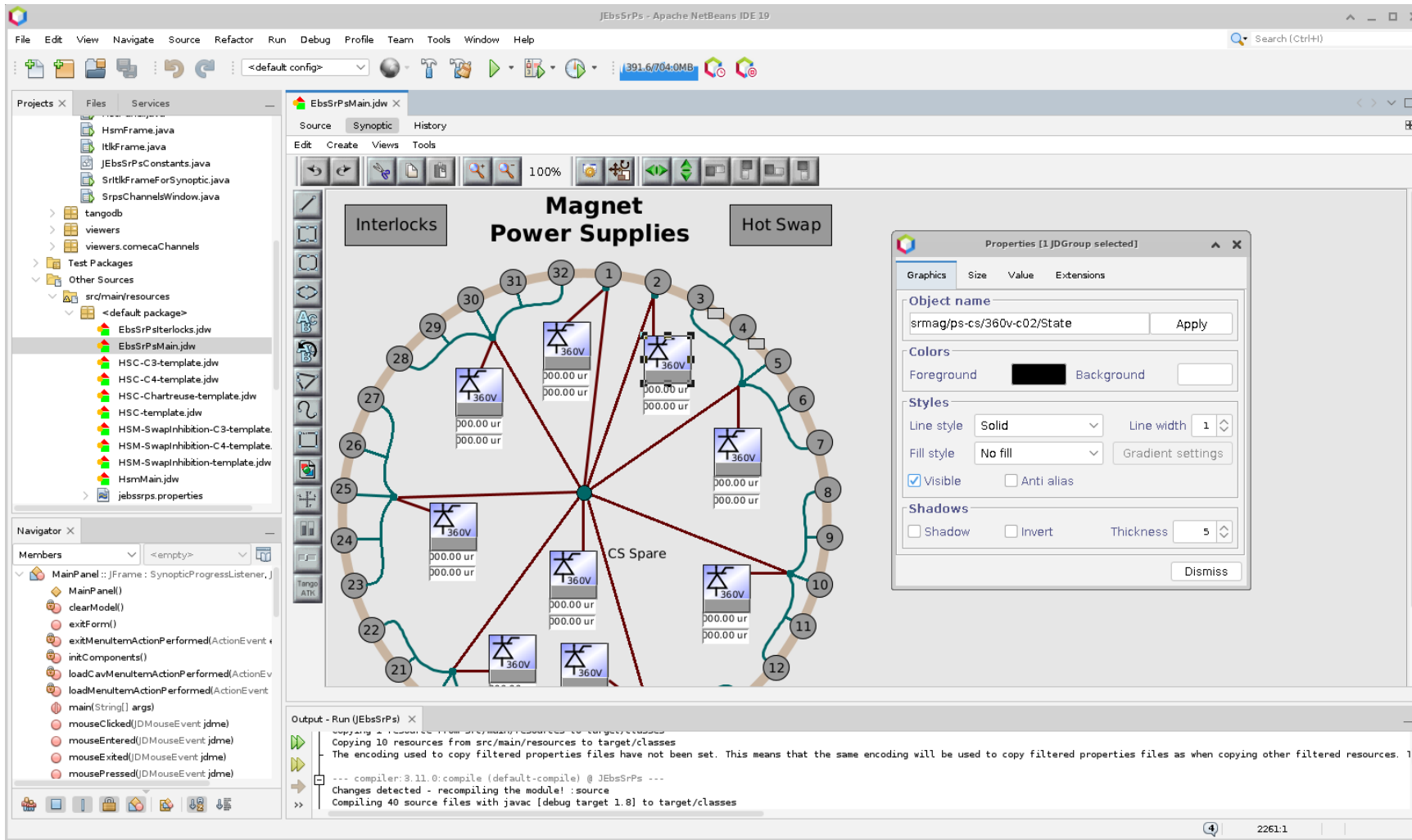
OK

# ATK AND NETBEANS



- Powerful form editor
- Powerful source code editor
- ATK Widgets available as JavaBeans
- Dependencies/Build management using maven

# ATK AND NETBEANS

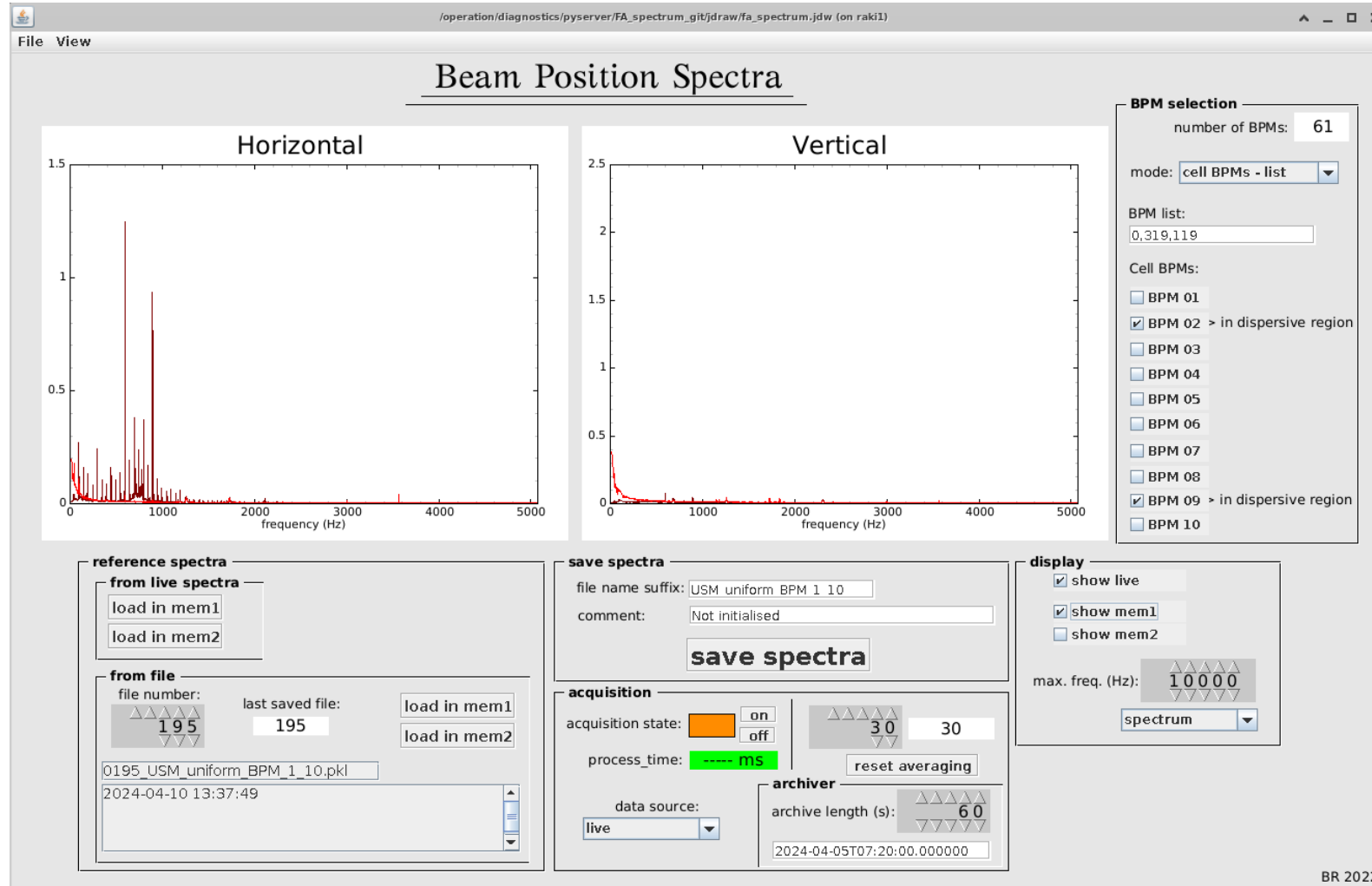


- JDraw plugin
- Dynamic objects  
(Drawing that can change according to a Tango attribute value)
  - Sliders
  - Cursors
  - Switches
  - ....
- Possibility to add Swing ATK components in a synoptic



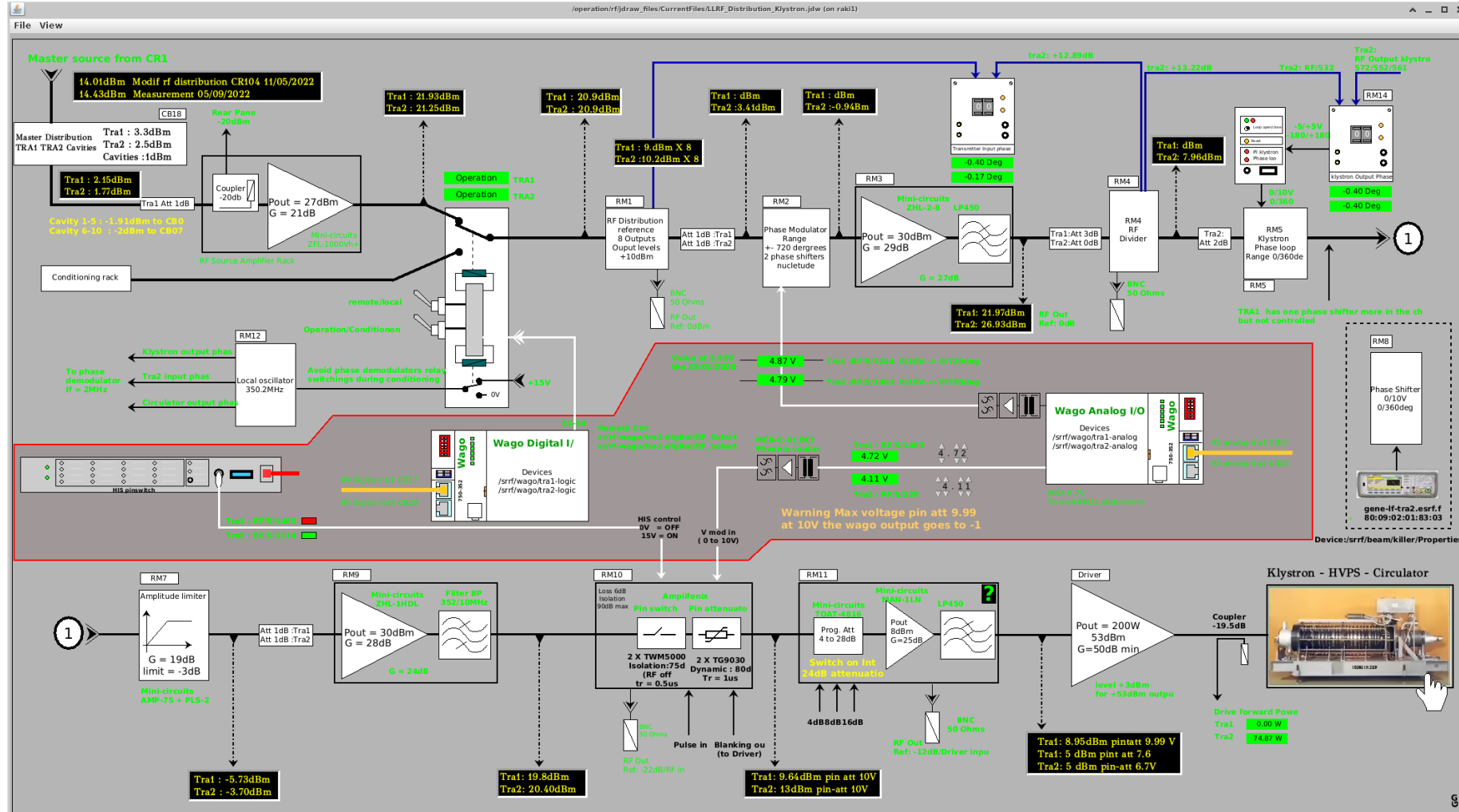
# JDRAW DASHBOARD

Dashboard application: No code written for this GUI (Fast Orbit Correction stability)



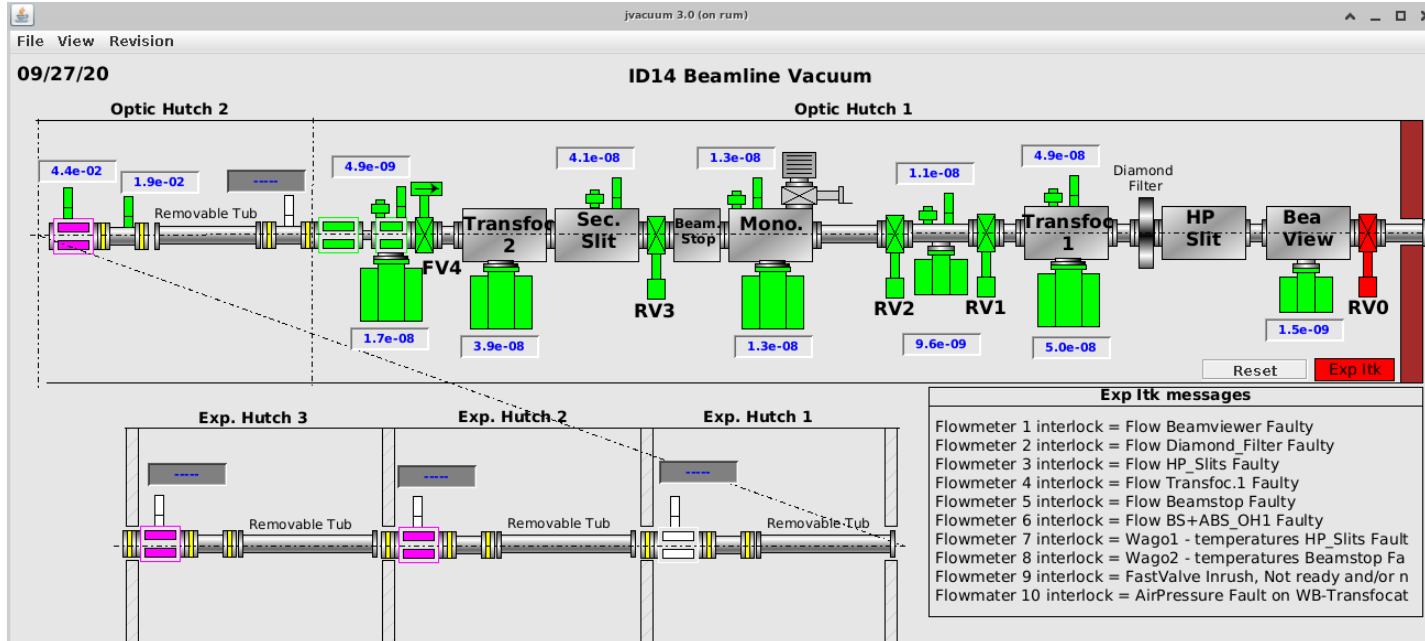
# JDRAW DASHBOARD

Dashboard application: No code written for this GUI (Detailed Radio Frequency)



# JDRAW DASHBOARD

Expert synoptics for beamline vacuum control



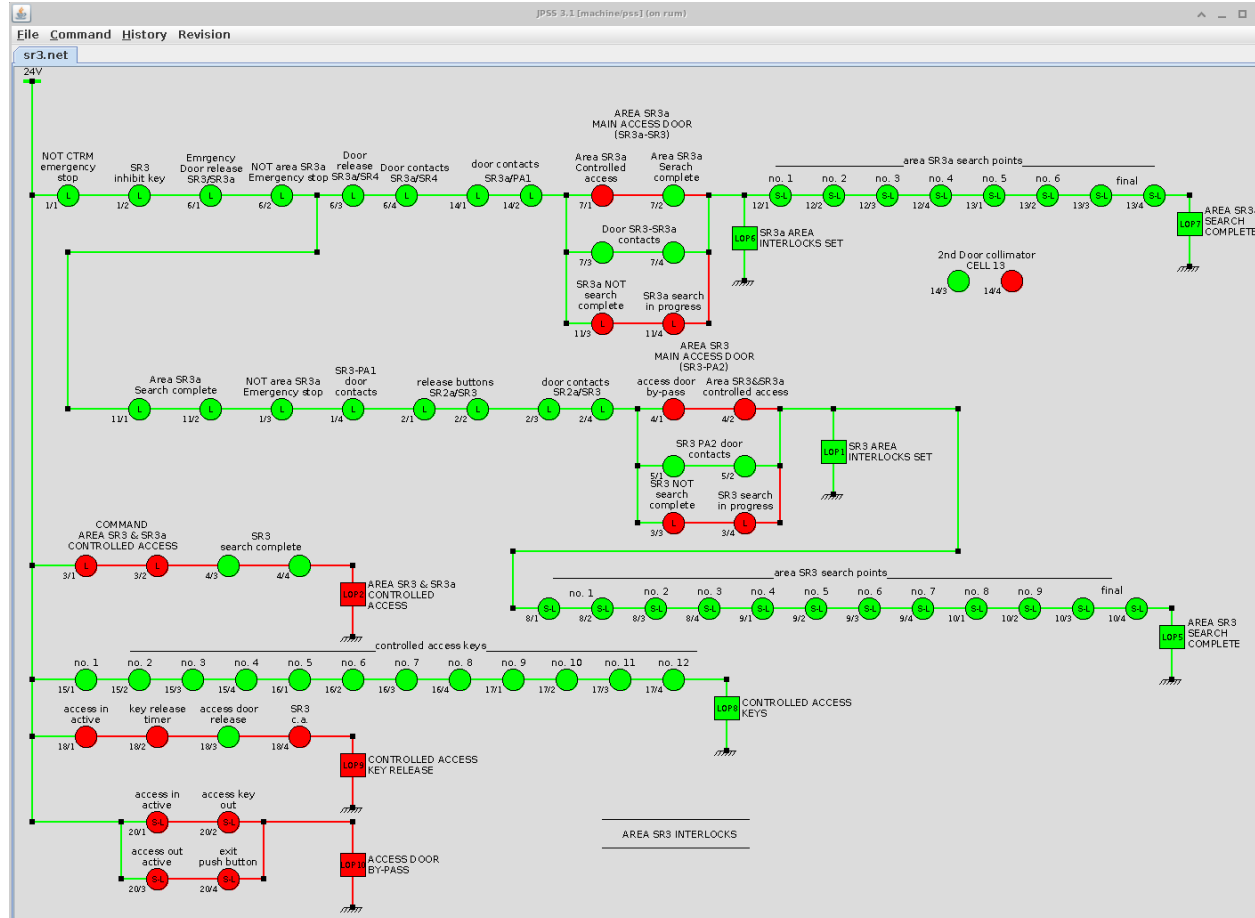
Versioning system for synoptic (svn)

Rev number	Date	Log message	Selection
1274	17/05/2023 10:42:19	Initial import	<input type="checkbox"/>
1276	17/05/2023 11:19:11	add v-il object - C.A.	<input type="checkbox"/>
1277	17/05/2023 11:20:54	adjust typo - C.A.	<input type="checkbox"/>
1281	05/06/2023 16:25:54	add ip 51, wago 2 and move diamond filter - C.A.	<input type="checkbox"/>
1282	08/06/2023 10:53:54	Add states of wago box - C.A.	<input type="checkbox"/>
1291	10/07/2023 16:51:39	remove none working wago status + Add flowmeter 10	<input type="checkbox"/>
1320	27/09/2023 15:04:06	Add Flowmeter 10 comment + moved IP41	<input checked="" type="checkbox"/>

Current working revision: 1320 [Up to date]

Retrieve selected revision    Dismiss

## Expert synoptics for PSS control



## Versioning system for synoptic (svn)

Revision history of sr3.net (on rum)

Rev number	Date	Log message	Selection
472	18/02/2016 15:06:47	Added PSS	<input type="checkbox"/>
742	26/08/2019 18:44:40	Changed the Daresbury device name from SR	<input type="checkbox"/>
774	29/08/2019 09:08:35	New design including SR3a	<input type="checkbox"/>
781	06/09/2019 14:10:45	Added 2nd door collimator	<input type="checkbox"/>
783	06/09/2019 15:20:23	Corection of names on module 2 {SR2a/SR3}	<input type="checkbox"/>
829	18/11/2019 07:42:54	Error final serach SR3a	<input checked="" type="checkbox"/>

Current working revision: 829 [Up to date]

Retrieve selected revision    Dismiss

Dashboards, expert PSS and VACUUM synoptics are edited by non software developers.

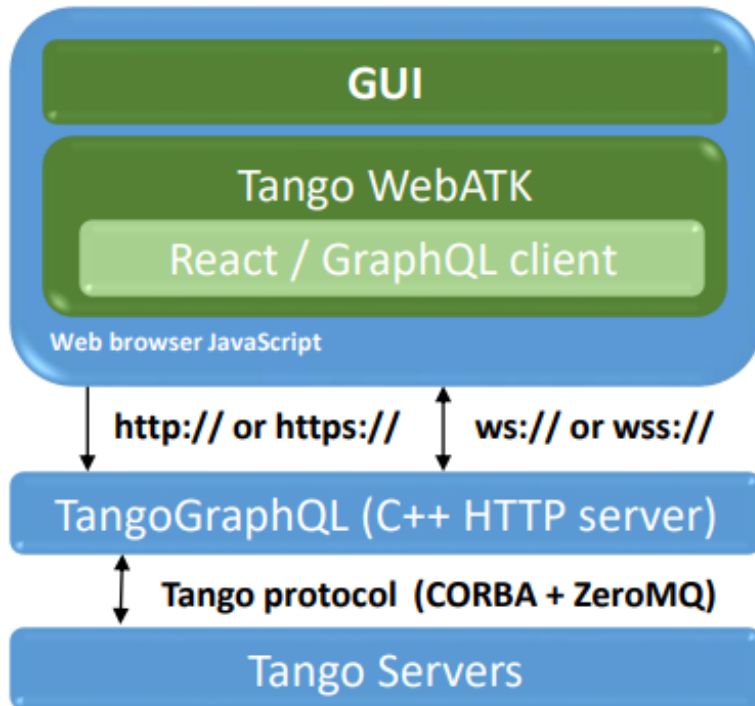
Need easy and intuitive way to build synoptic and handle versioning.

# FUTURE (GraphQL)

**TangoGraphQL** Tango bindings for interfacing WebApp using GraphQL

<https://gitlab.com/tango-controls/TangoGraphQL>

<https://accelconf.web.cern.ch/icalepcs2021/papers/mopv025.pdf> (ICALEPCS2021)



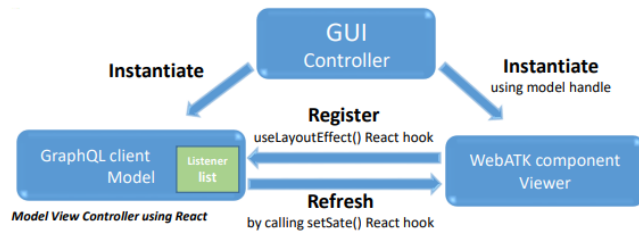
```
subscription {
  subscribe(attNames: "simu/powersupply/1/current",
    modes: PERIODIC) {
    full_name
    index
    event
    value {
      value
      quality
      timestamp
      error
    }
  }
  subscription_error
}
```

↓

```
{
  "full_name": "simu/powersupply/1/current",
  "index": 0,
  "event": "periodic",
  "value": {
    "value": 0,
    "quality": "ATTR_ALARM",
    "timestamp": "1633601964.304923",
    "error": null
  },
  "subscription_error": null
}
```

# FUTURE (WEBATK)

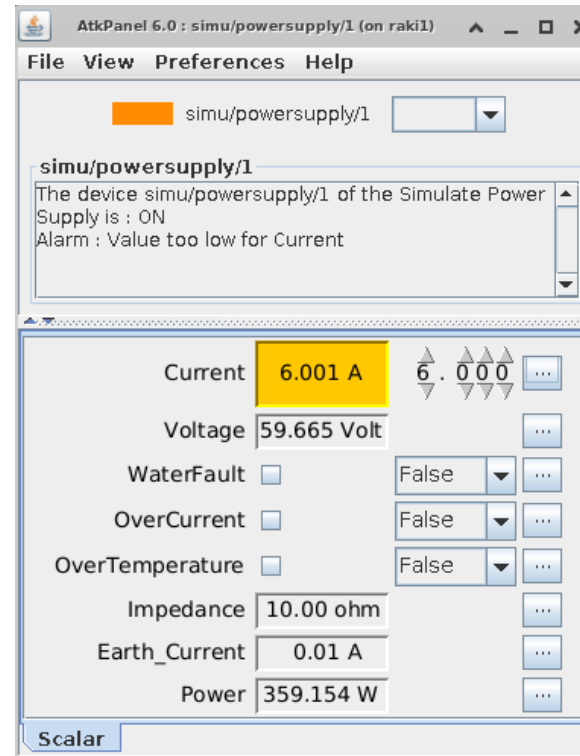
- **WebATK** (ongoing evaluation) is designed to be as close as possible to JavaATK
- Written in TypeScript
- On top of React / MaterialUI
- MVC implemented using React hooks



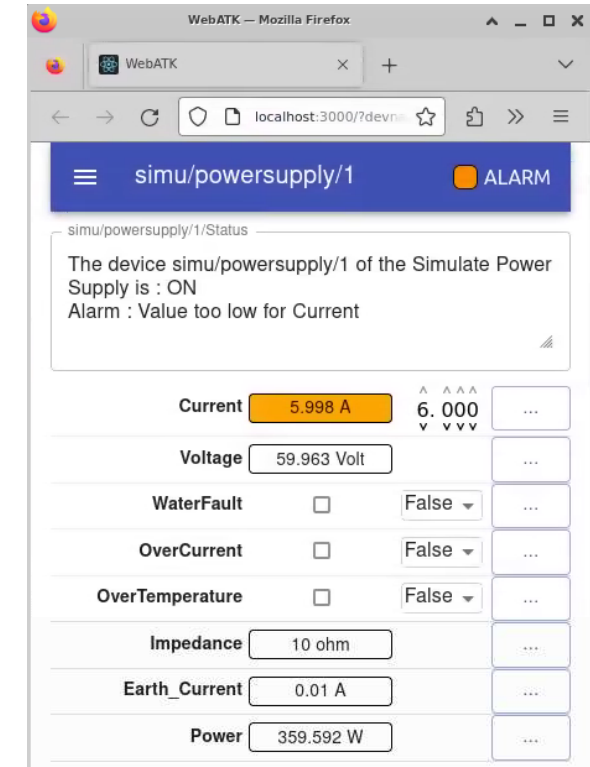
```
export function useData(atts: Array<DataSource>): DataSource | undefined {
  // Create the dispatcher. React ensures that the setSource function is
  // stable (its handle won't change) during the component lifecycle
  const [source, setSource] = useState<DataSourceState>({ source: undefined });

  // Use useLayoutEffect, because in some case listeners need to be registered
  // immediately when the component call useData for the first time.
  useLayoutEffect(() => {
    //Component is mounting (or list of models has changed)
    atts.forEach(a => {
      a.addListener(setSource);
    })
    return () => {
      //Component is dismantled (or list of models has changed)
      atts.forEach(a => {
        a.removeListener(setSource);
      })
    };
  }, atts); // eslint-disable-line react-hooks/exhaustive-deps

  //console.log("useData() returned:" + util.inspect(source.source));
  return source.source;
};
```



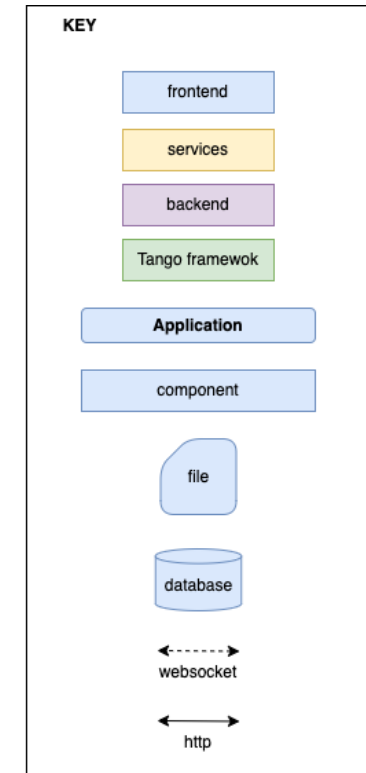
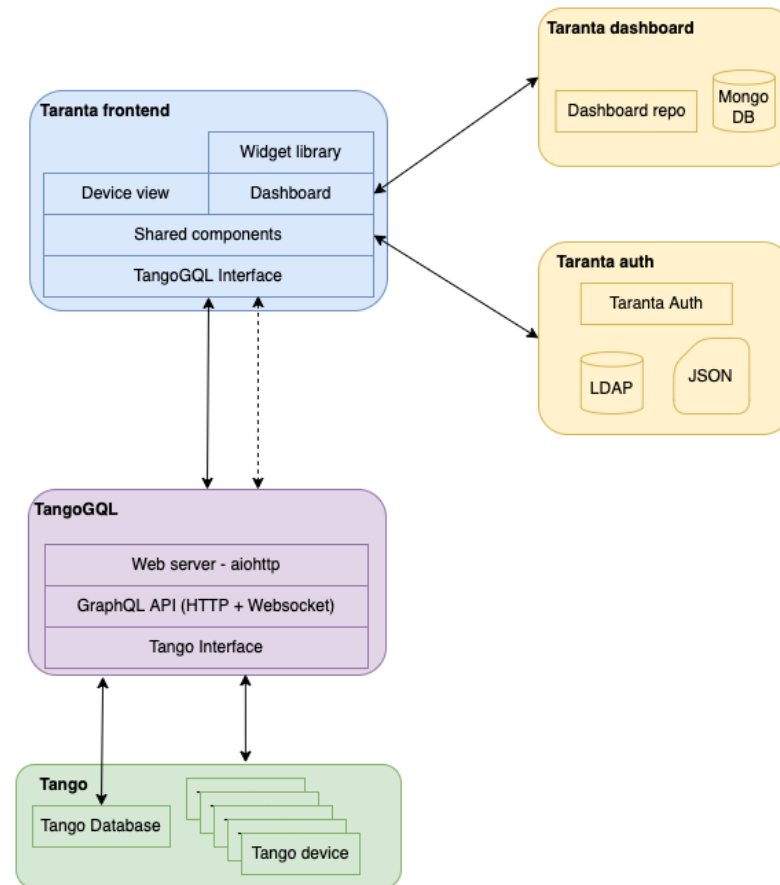
ATKPanel



WebATKPanel

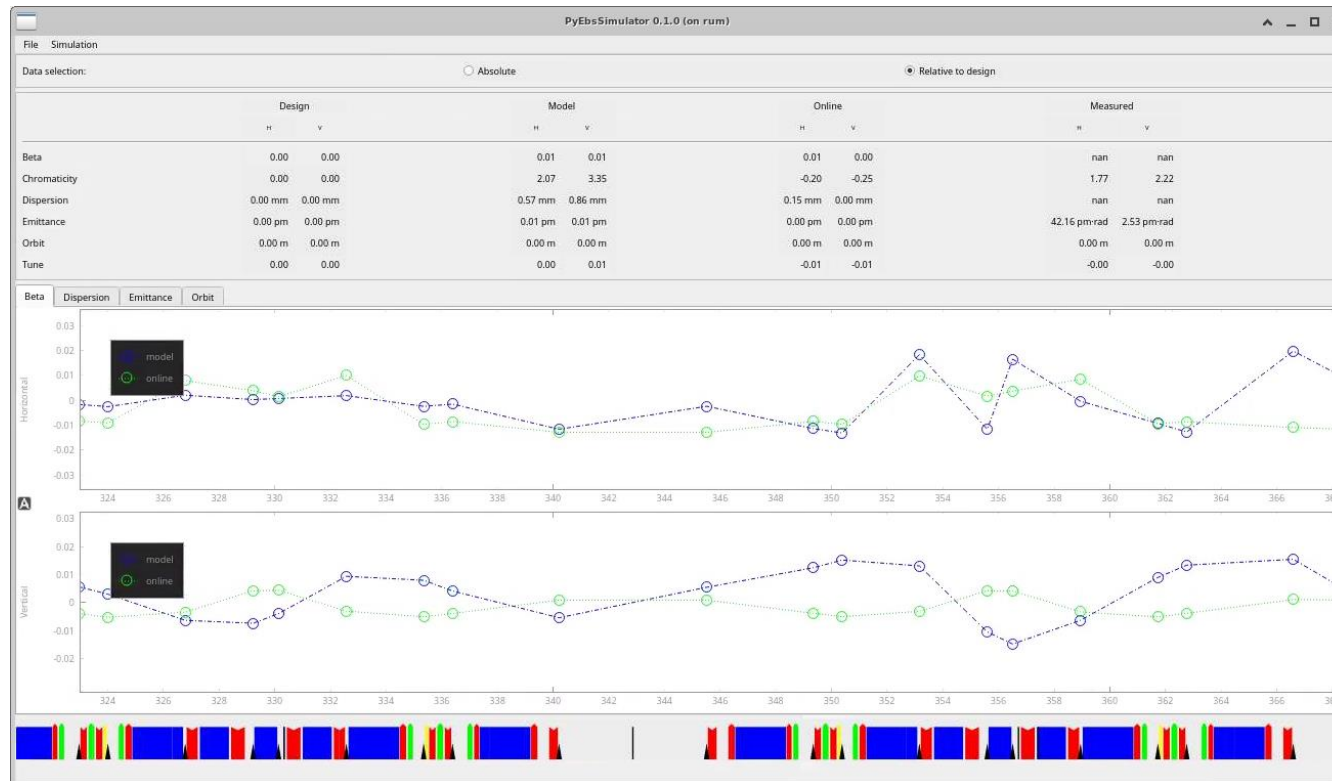
# FUTURE (TARANTA)

- Dashboard oriented Web application
- Rich Web component library (including SVG)
- TangoGQL backend is written in python
- Needs:
  - Backends abstraction (Tango and Dashboard)
  - Authentication abstraction



# FUTURE (PYTHON TAURUS)

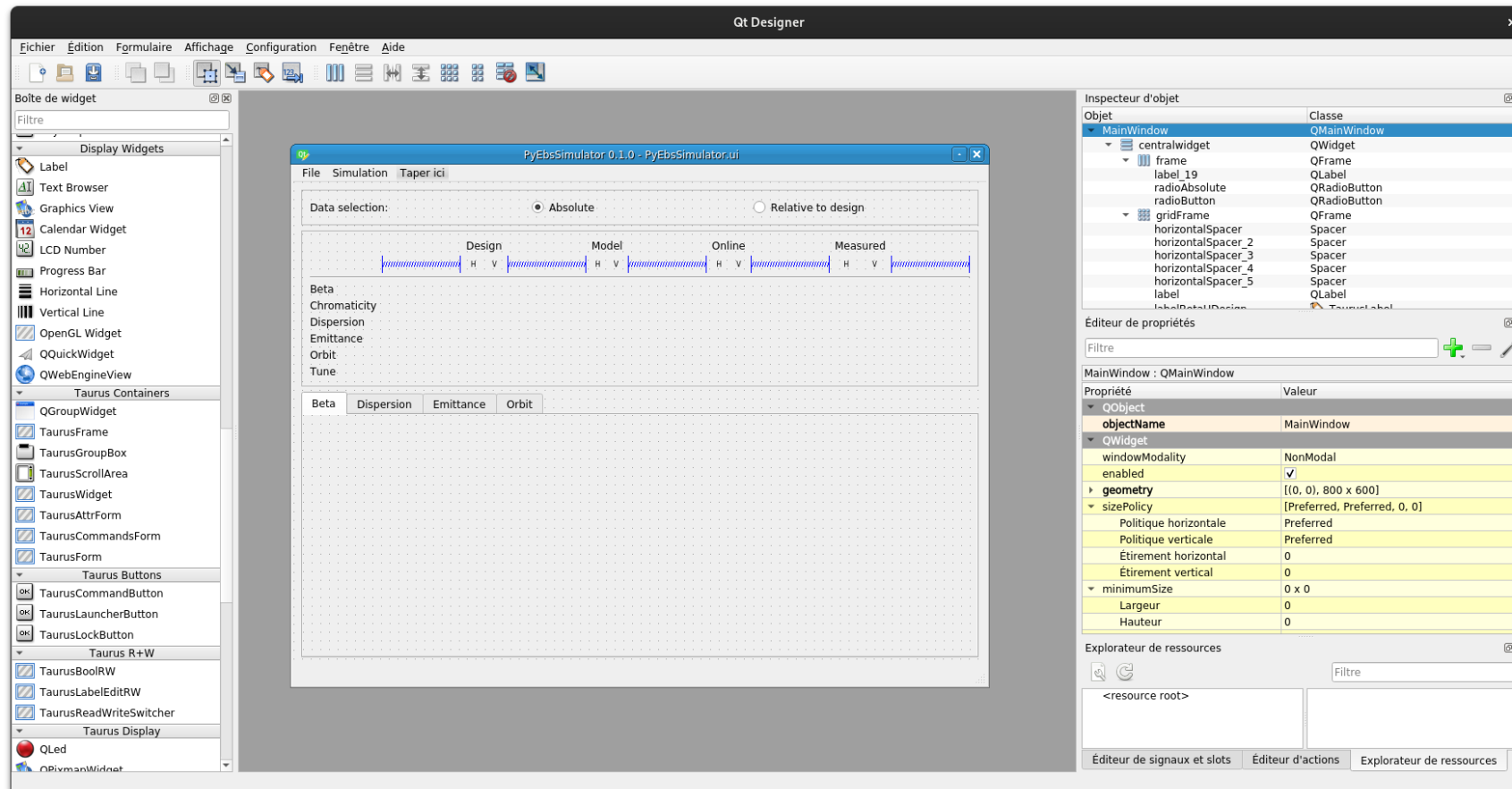
- Based on PyQt / QtDesigner
- One application under evaluation (EBS online optics viewer)
- MVC based
- Performance problems (solved by the community)





# FUTURE (PYTHON TAURUS)

- QtDesinger



# CONCLUSION

- We need a powerful development environment such as java/netbeans
  - TypeScript (vscode, strong typing, moving technologies, GraphQL/json is in text format)
  - python (pycharm, dynamic typing completion with python3, QtDesigner, C++ Tango API)
- We need an intuitive dashboard editor including versioning
  - SVG (also available in python)
  - Inkscape is a powerful SVG editor but needs to be customized for Tango
- We need good performance and debugging metrics
- We need good error management
- Position in ACU  
*[https://esrf.gestmax.eu/1791/1/8224-accelerator-control-software-engineer/en\\_US](https://esrf.gestmax.eu/1791/1/8224-accelerator-control-software-engineer/en_US)*

Thank you