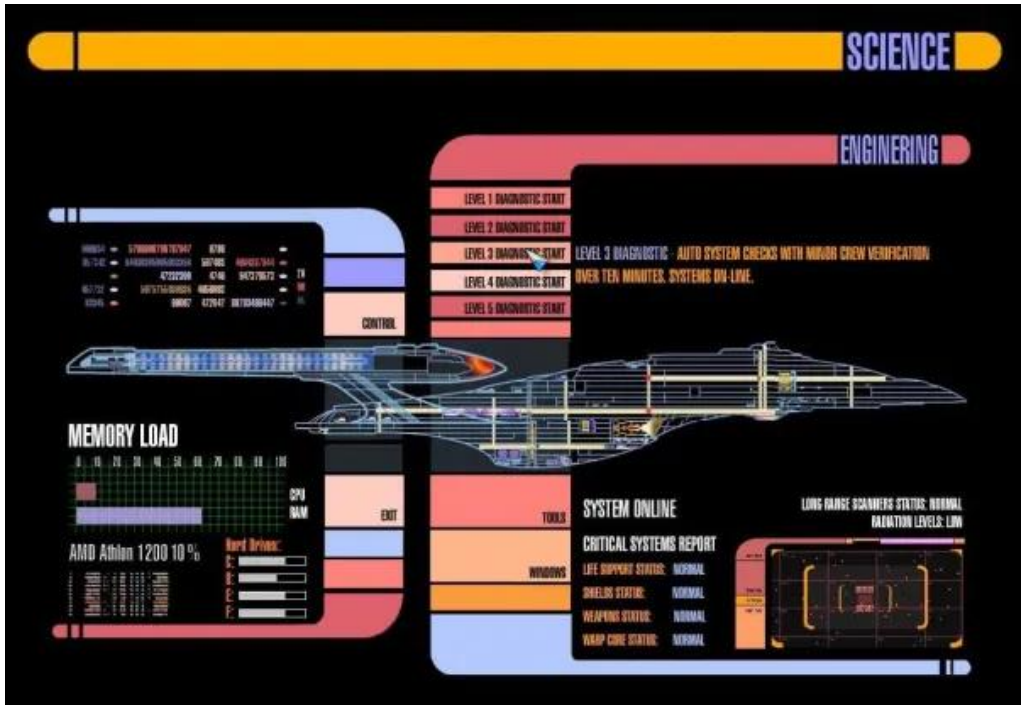
ESRF Accelerator Control System
G.U.I. Development Status And Future Challenges



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Nicolas Tappret

NOBUGS, 23rd September 2024

OUTLINE

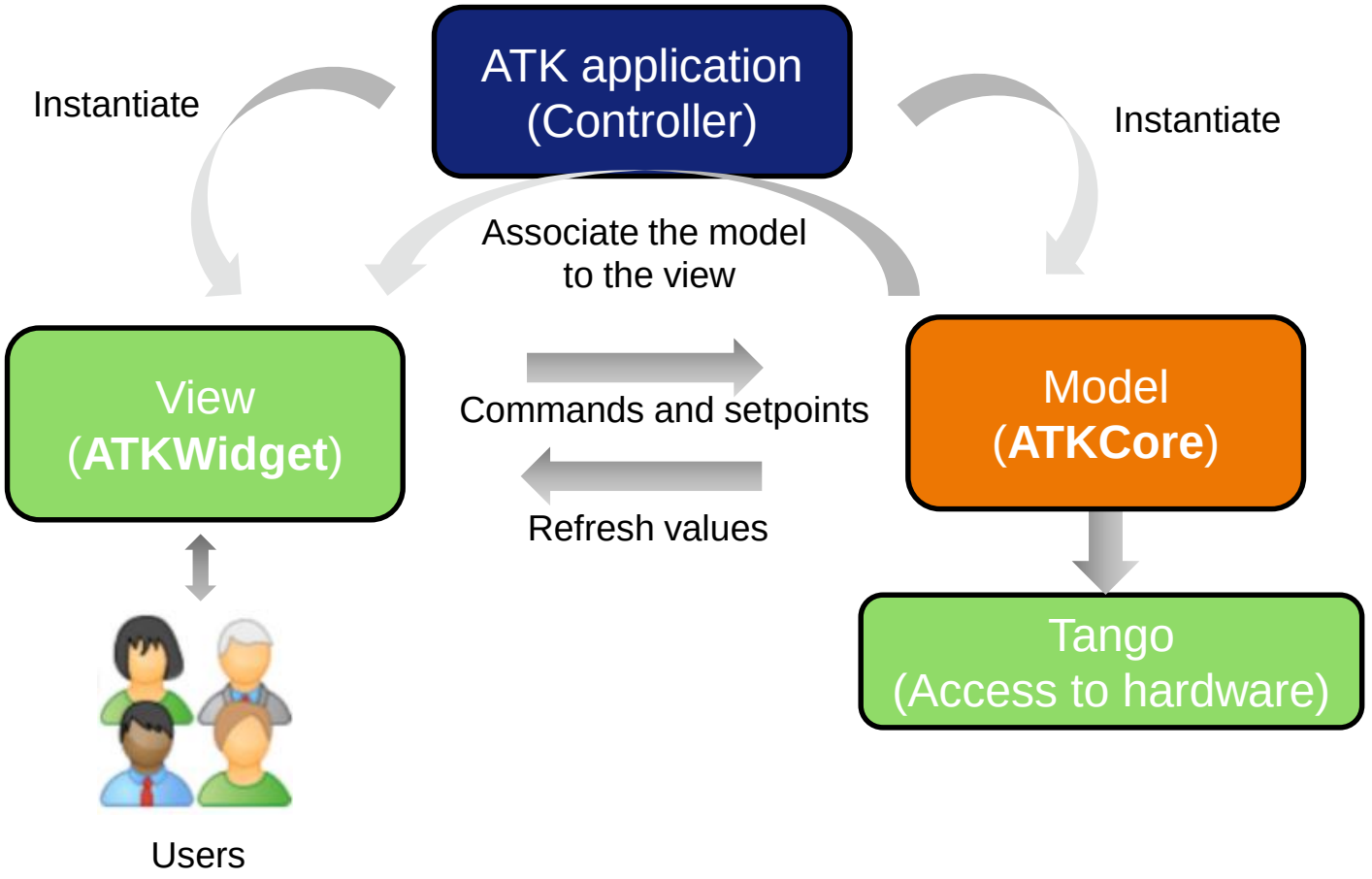
- Today
  - Java ATK
  - Netbeans
  - JDraw

- Future for the ESRF control system ?
  - GraphQL / WebATK
  - GraphQL / Taranta
  - Python / Taurus

- Conclusion

JAVA ATK AND MVC

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



ATK Core

Classes implementing Tango models

ATK Widget

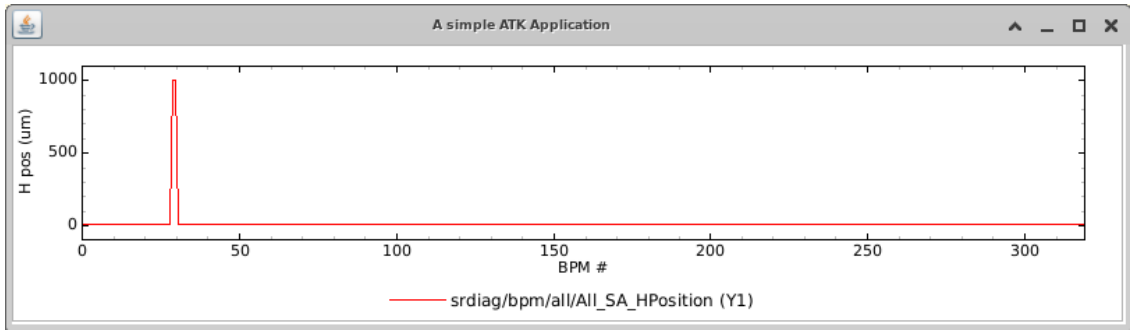
~ 80 attribute viewers/editors
~ 30 command handlers

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

ATK FRAMEWORK (EXAMPLE)

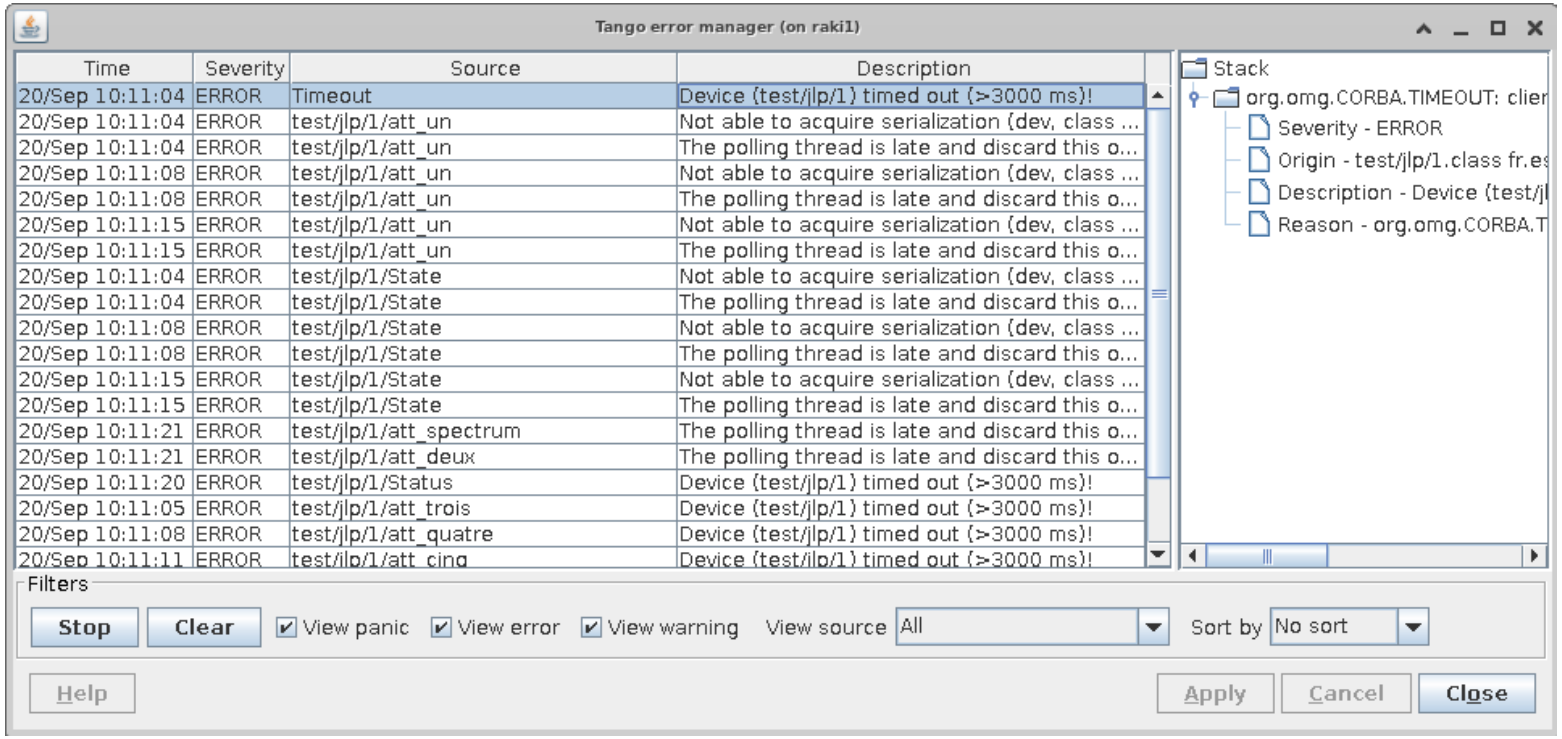
```
import fr.esrf.tangoatk.core.*;
import fr.esrf.tangoatk.core.attribute.*;
import fr.esrf.tangoatk.widget.attribute.*;
import fr.esrf.tangoatk.widget.util.ATKGraphicsUtils;
import javax.swing.*;
import java.awt.*;

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("srdiag/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



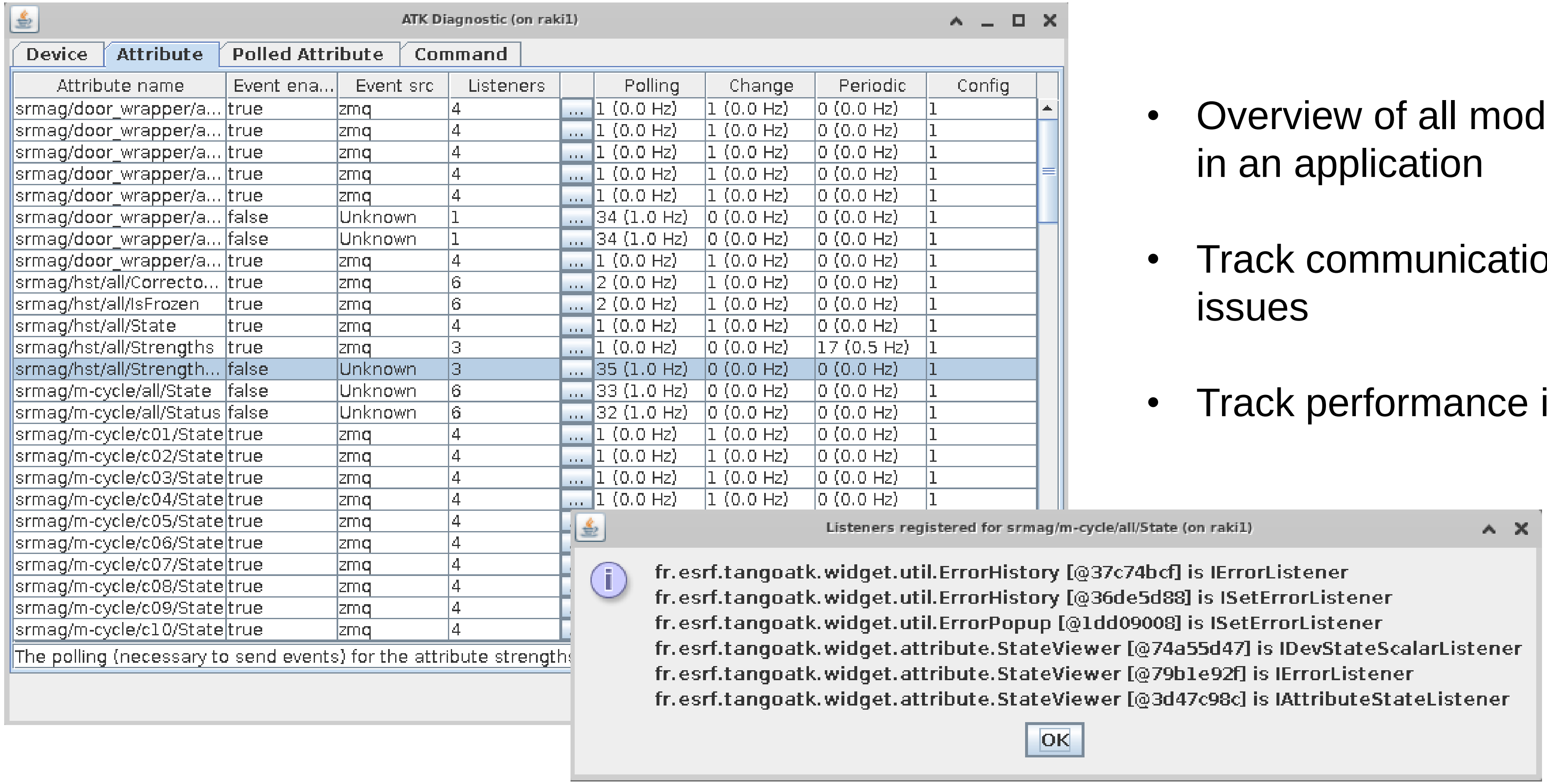
ATK ERRORS MANAGEMENT

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



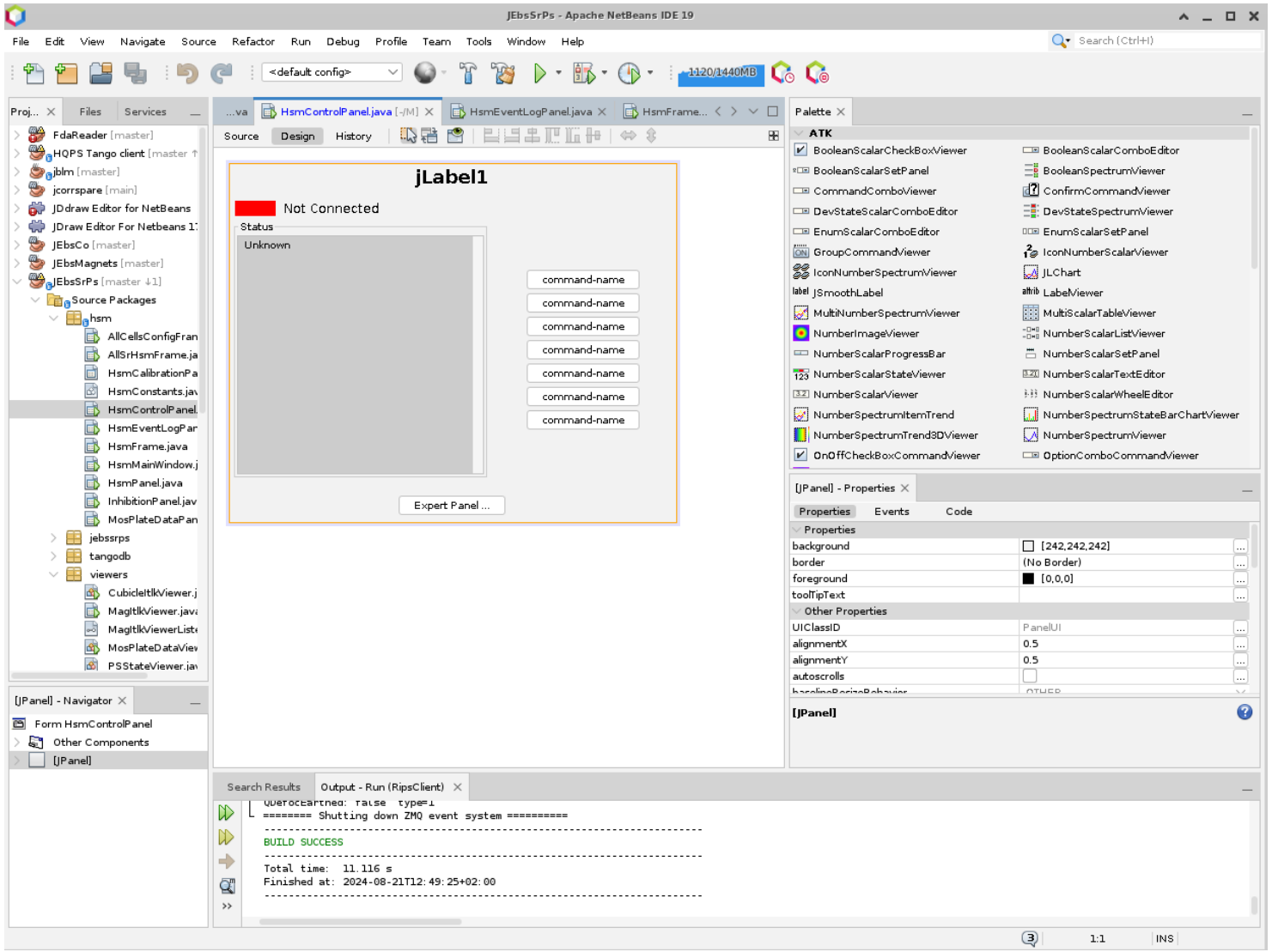
ATK DEBUGGING/DIAGNOSTIC METRICS

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



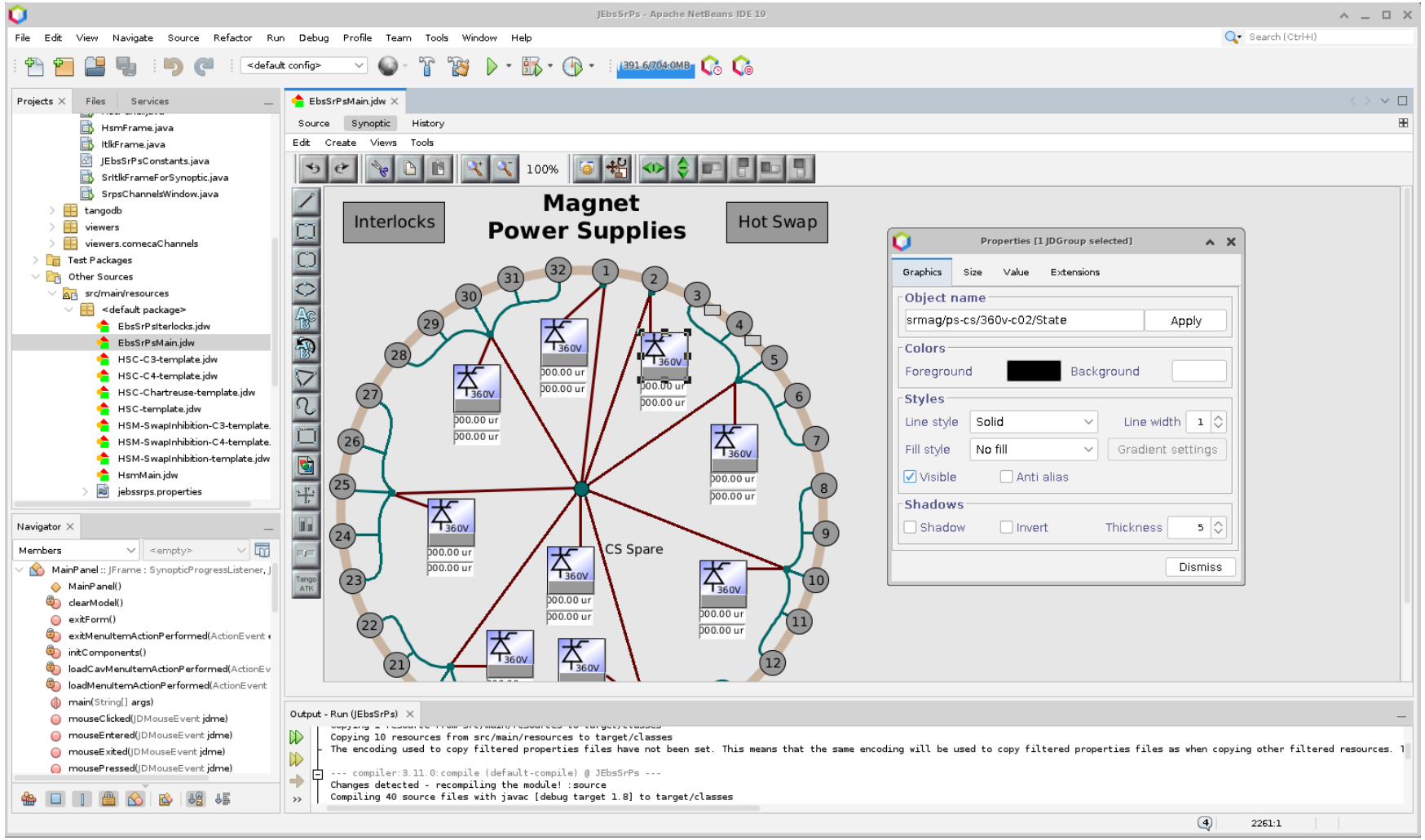
- Overview of all models instantiated in an application
- Track communication/subscription issues
- Track performance issues

ATK AND NETBEANS



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

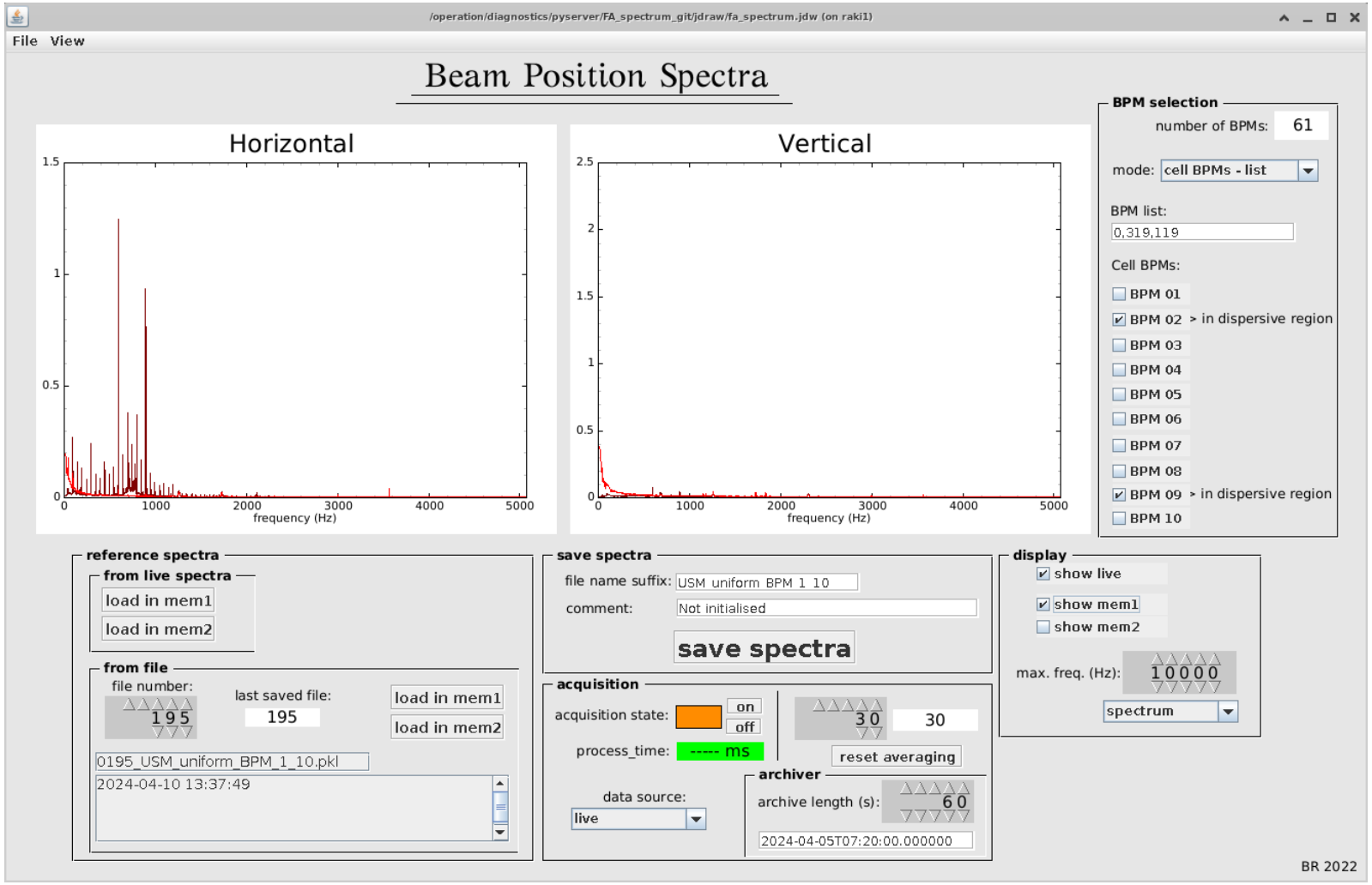
ATK AND NETBEANS



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

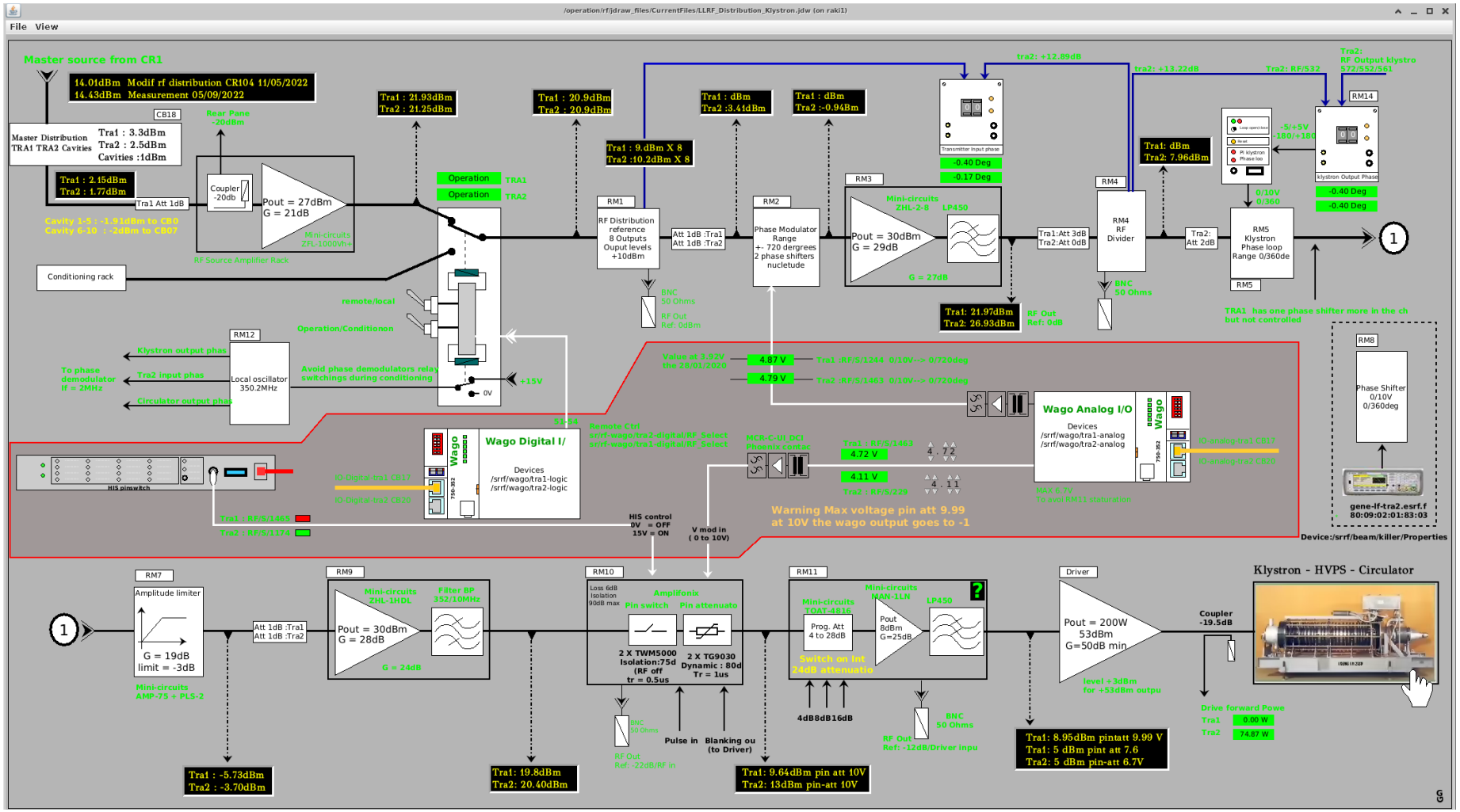
JDRAW DASHBOARD

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



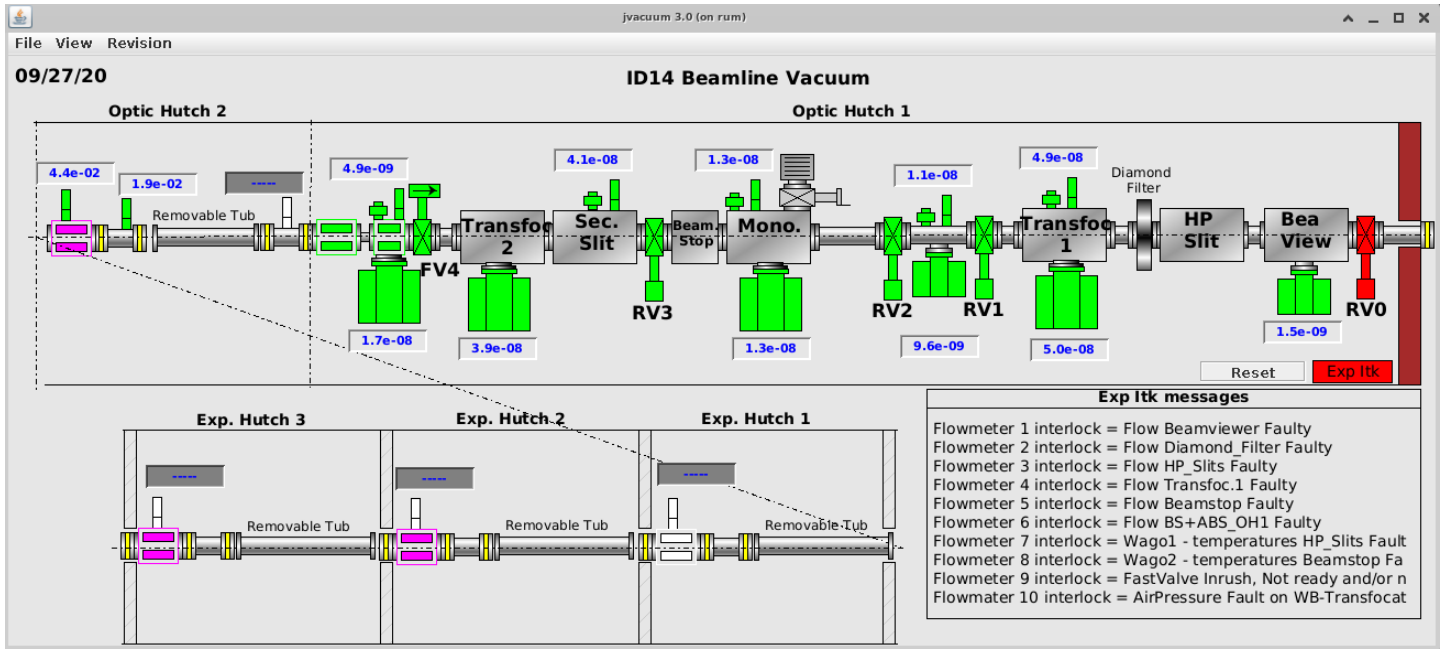
JDRAW DASHBOARD

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

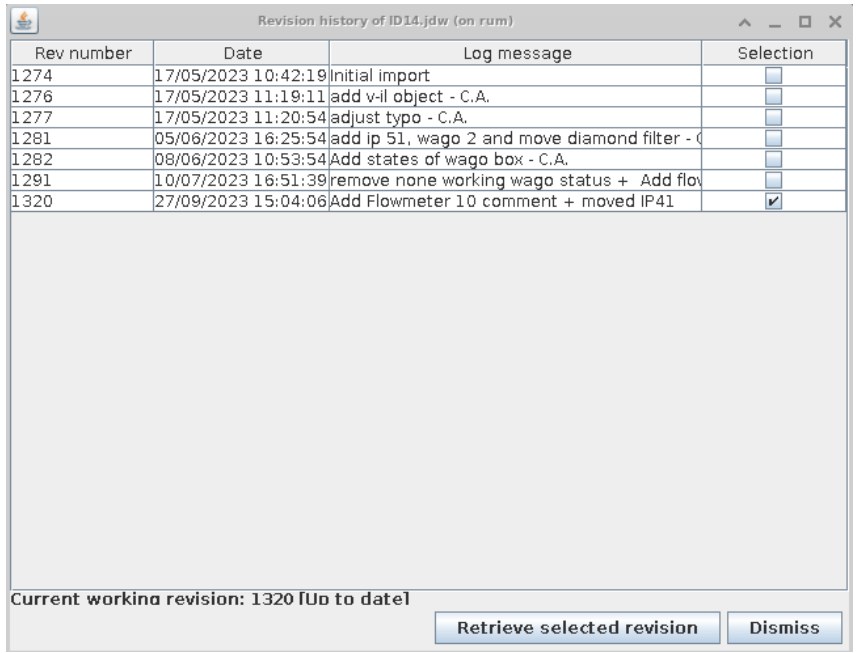


JDRAW DASHBOARD

Expert synoptics for beamline vacuum control

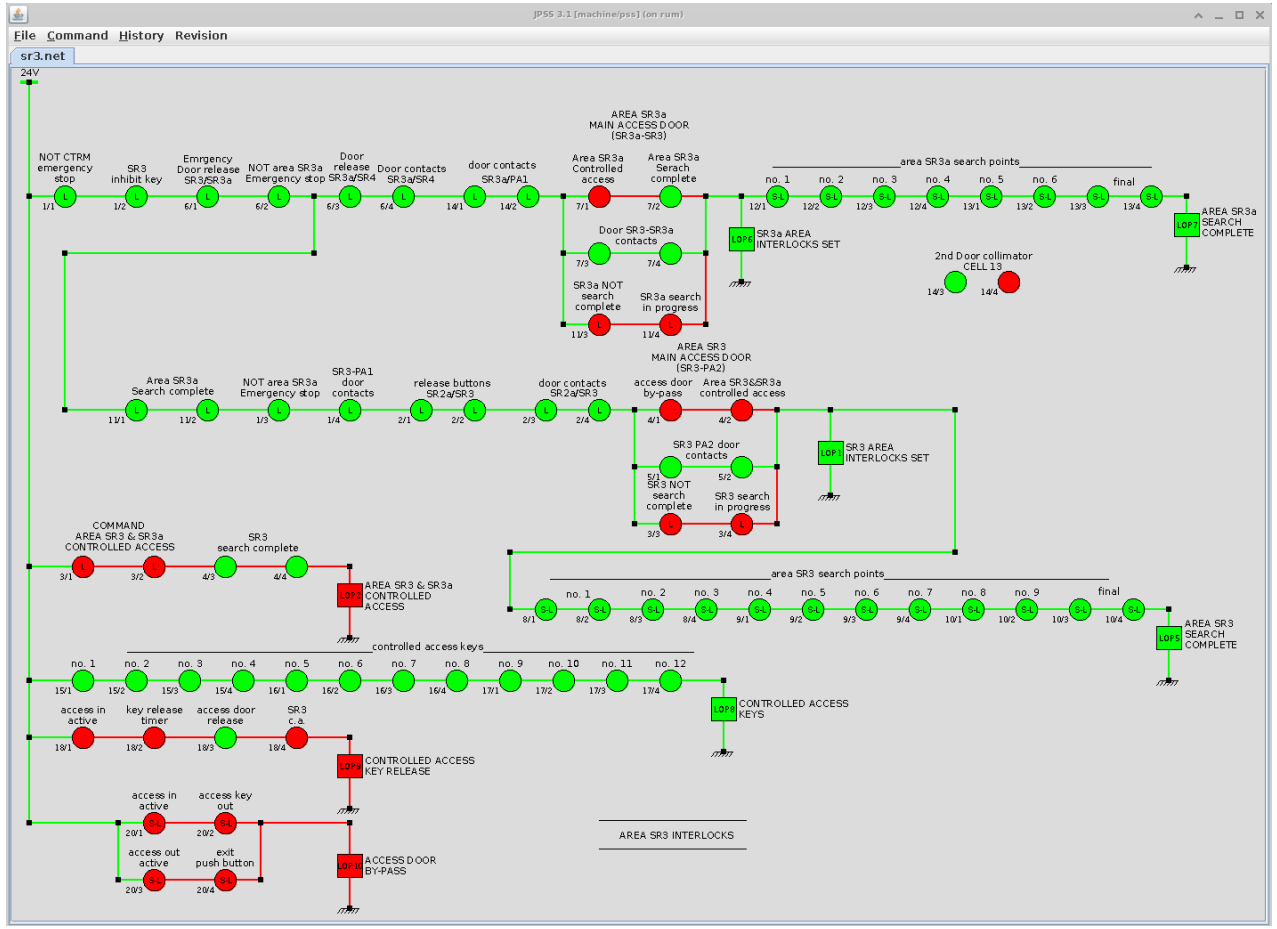


Versioning system for synoptic (svn)

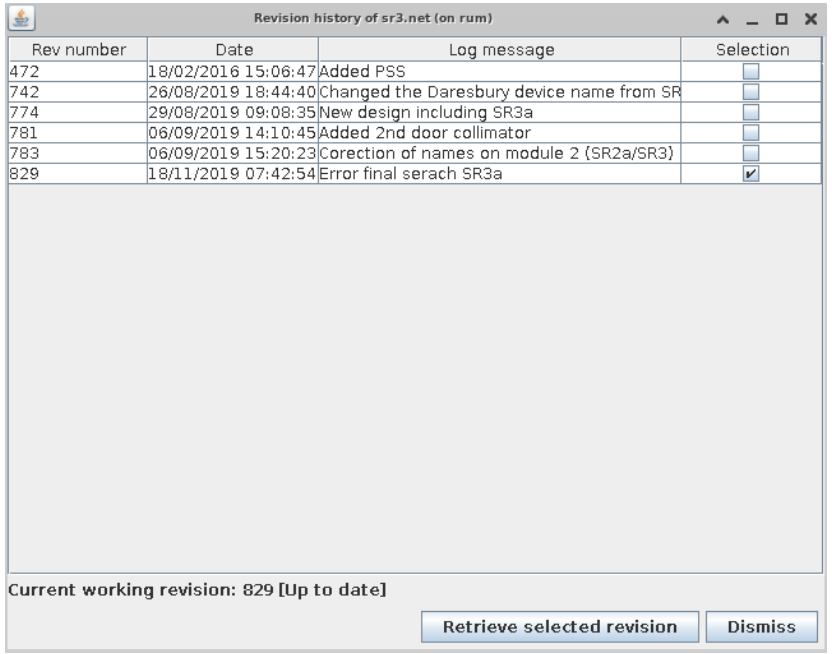


JAVA ATK

Expert synoptics for PSS control



Versioning system for synoptic (svn)



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

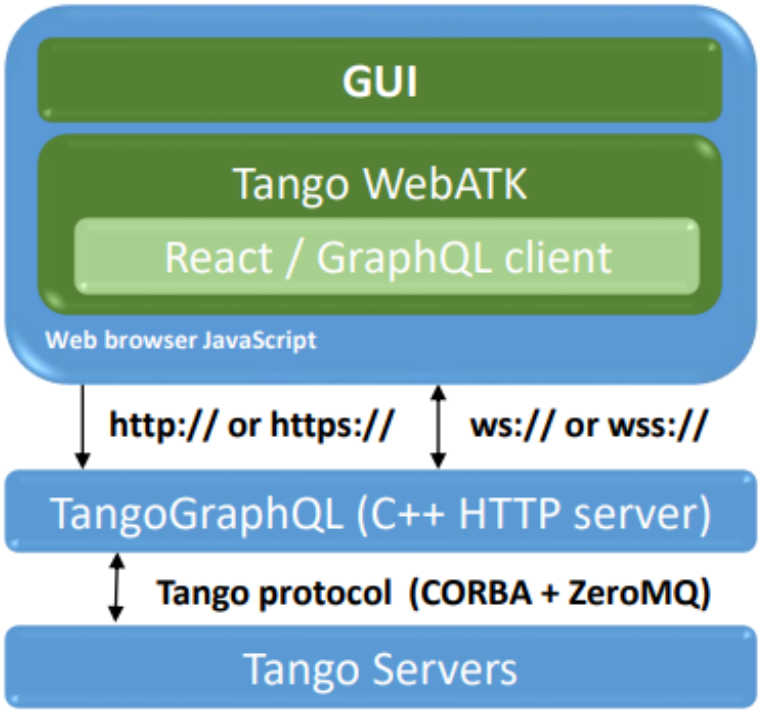
Need easy and intuitive way to build synoptic and handle versioning.

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)

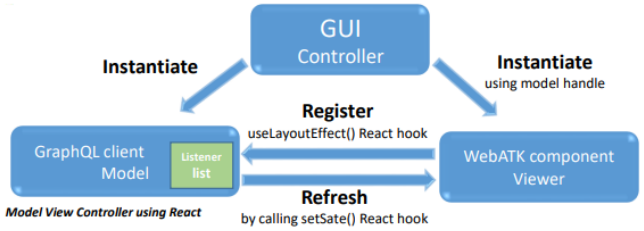



```
subscription {
  subscribe(attNames:"simu/powersupply/1/current",
            modes:PERIODIC) {
    full_name
    index
    event
    value {
      value
      quality
      timestamp
      error
    }
    subscription_error
  }
}
```

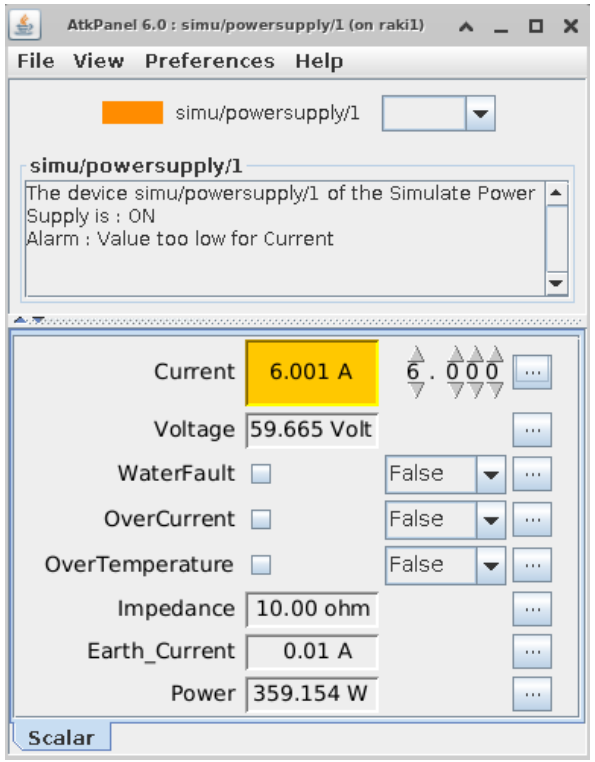
```
{
  "full_name": "simu/powersupply/1/current",
  "index": 0,
  "event": "periodic",
  "value": {
    "value": 0,
    "quality": "ATTR_ALARM",
    "timestamp": "1633601964.304923",
    "error": null
  },
  "subscription_error": null
}
```

FUTURE (WEBATK)

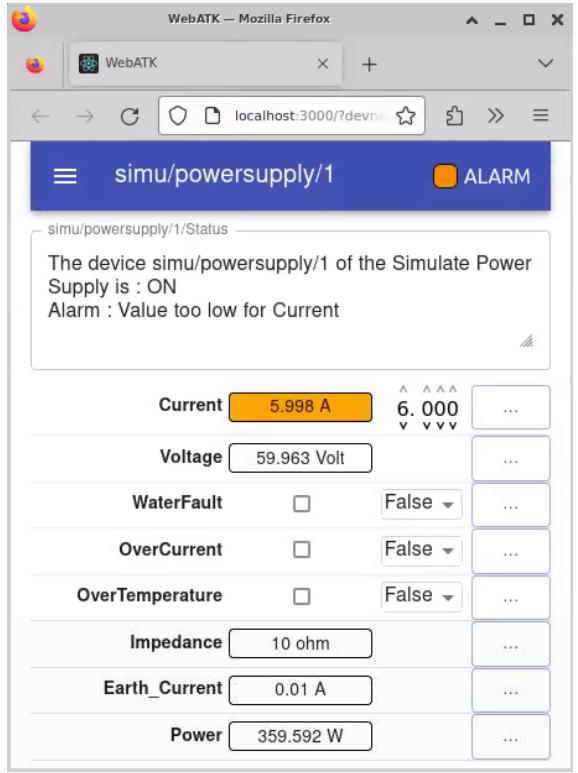
- **WebATK** (ongoing evaluation) is designed to be as close as possible to JavaATK
- Written in TypeScript
- On top of React / MaterialUI
- MVC implemented using React hooks




```
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 dismounted (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;

};
```



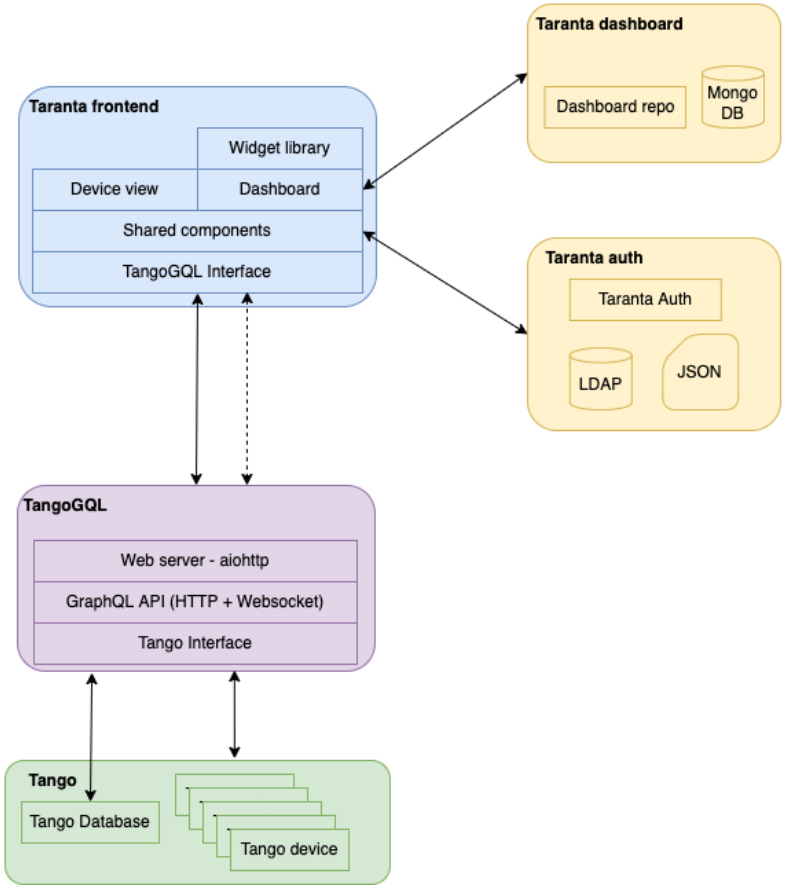
ATKPanel

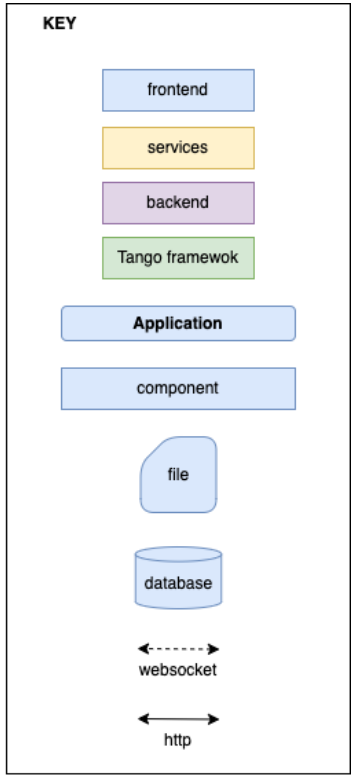


WebATKPanel

FUTURE (TARANTA)

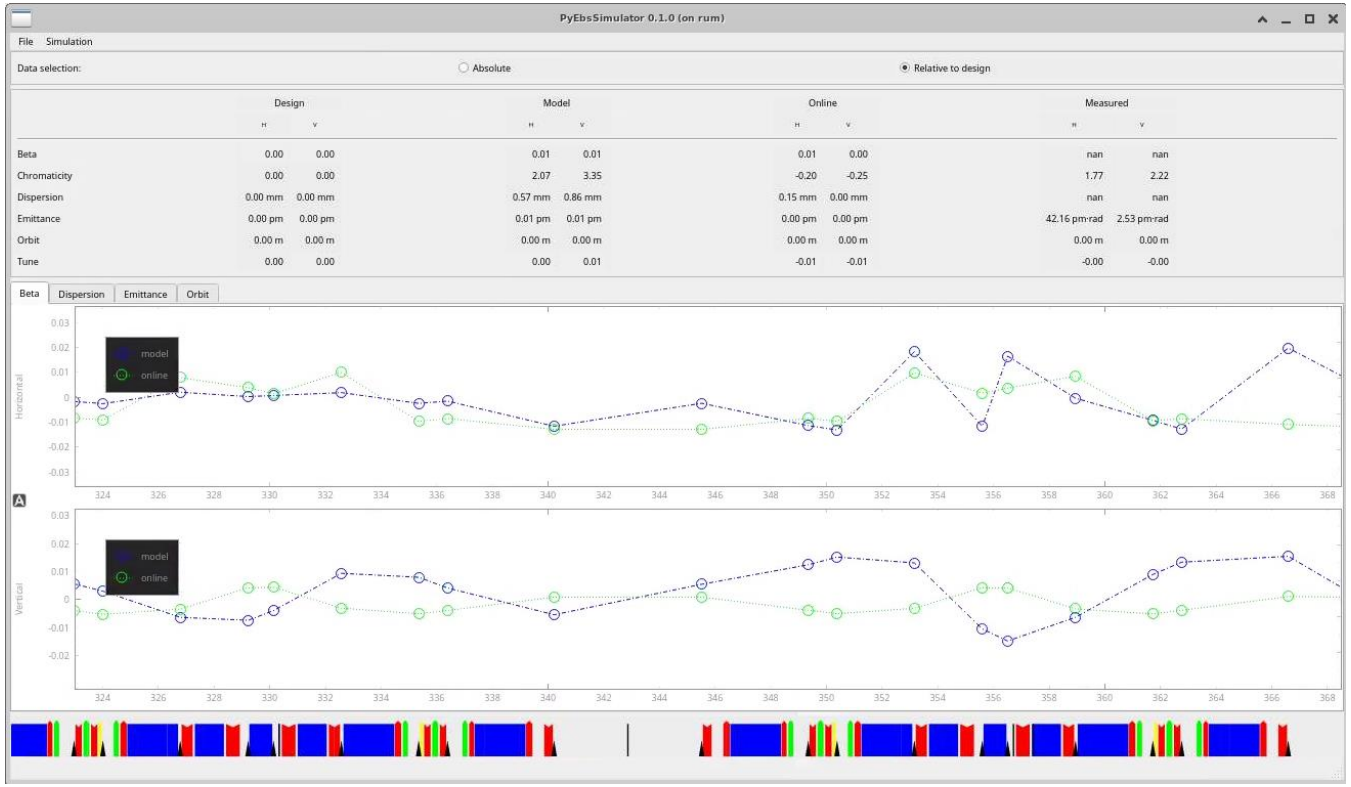
- DashBoard oriented Web application
- Rich Web component library (including SVG)
- TangoGQL backend is written in python
- Needs:
  - Backends abstraction (Tango and DashBoard)
  - Authentication abstraction





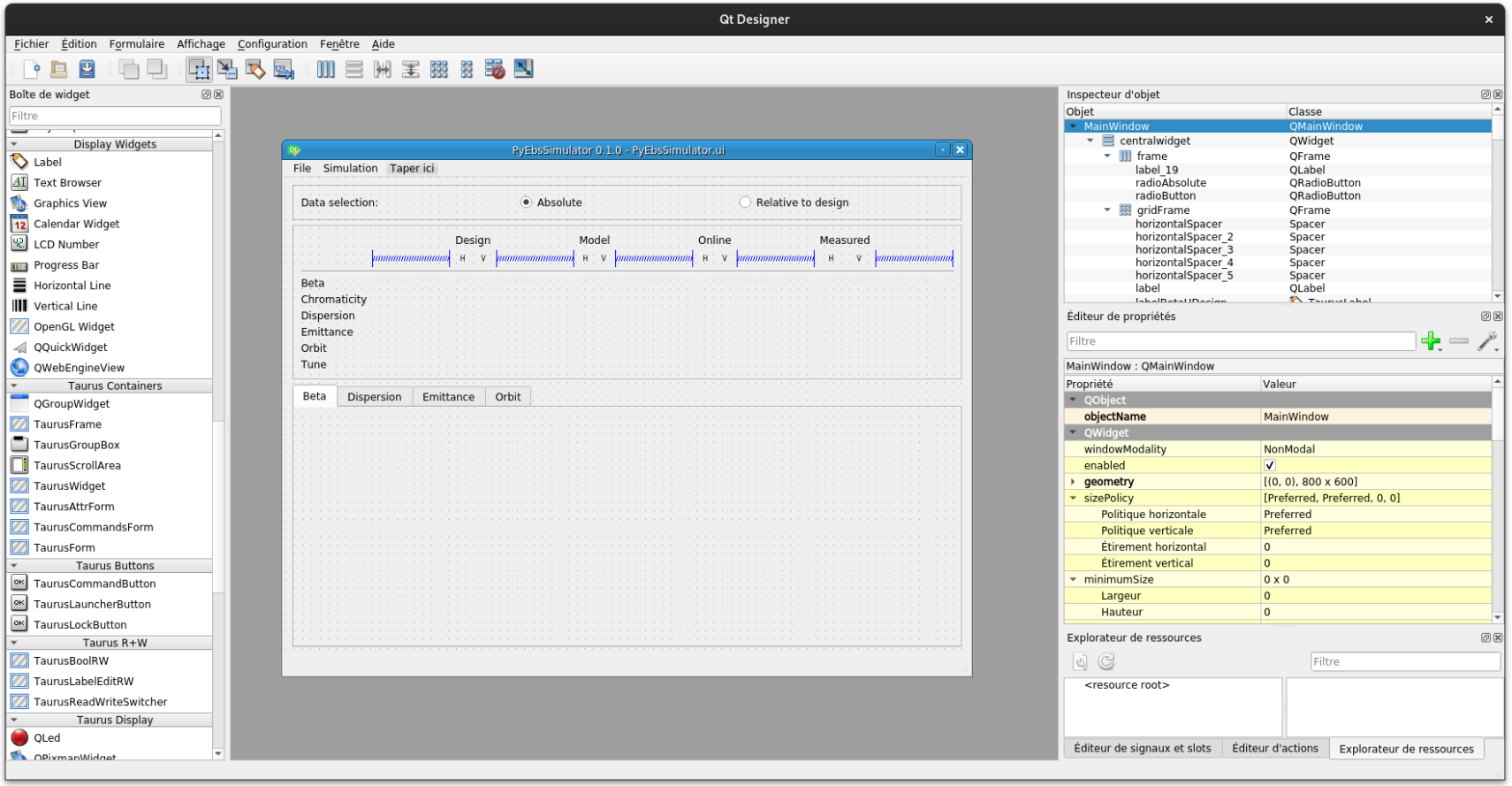
FUTURE (PYTHON TAURUS)

- Based on pyQt / QtDesinger
- 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

Thank you