

The logo for MAX IV, featuring the text "MAX IV" in a light grey, sans-serif font. A yellow swoosh underline is positioned under the "X" and "I". The logo is set against a dark blue background with a white swoosh graphic that curves around it.

MAX IV

MAX IV Strategy regarding Graphical User Interface

GUI workshop, NOBUGS 2024

Vincent Hardion, 23/09/2024

Agenda:

Hybrid GUI Architecture

**Desktop and Web App
landscape**

Challenges

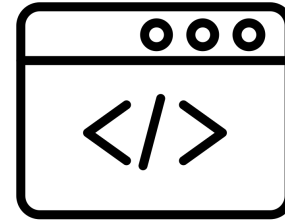


MAX IV hybrid GUI Architecture



~200 Desktop Applications
based on PyQt (taurus)

- Custom UI
- Users and Developers: mainly Accelerator Operators and Beamline staff



~20 Web Applications mostly
based on React

- General Services: Archiving ...
- Custom UI: ~80 Dashboard
- Developers: mainly Software Developers

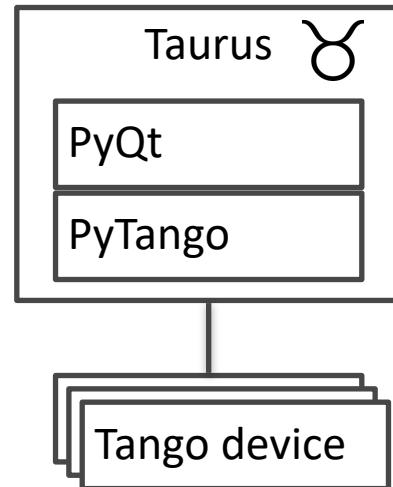
MAX IV hybrid GUI Architecture



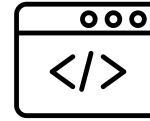
Standalone Application

Taurus framework

- Based on PyQt
- Widget oriented
- UI designer
- Generic Form
- Rich Client Application
- Plotting based on PyQtGraph
- Running RockyLinux
- Deployed with conda



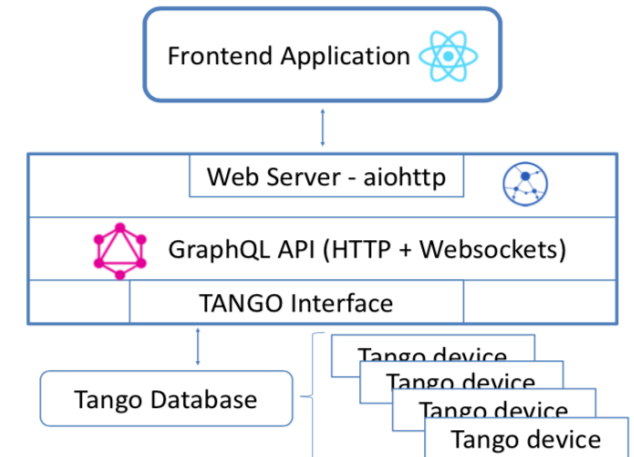
MAX IV could not be built on time without Taurus as it offers a very complete and ready GUI.



Central Application

Web Application

- Mainly based on REACT
- Widget oriented
- GraphQL
- Websocket, SSE
- Plotting based on plotly datashader, etc
- Running on K8S



MAX IV North Star

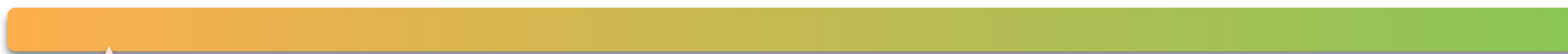
Desktop Landscape



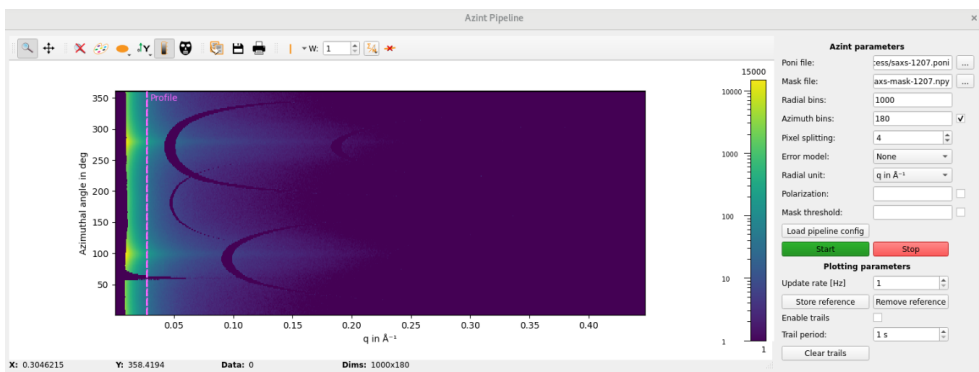
User Autonomy

STANDARD
AND STABLE

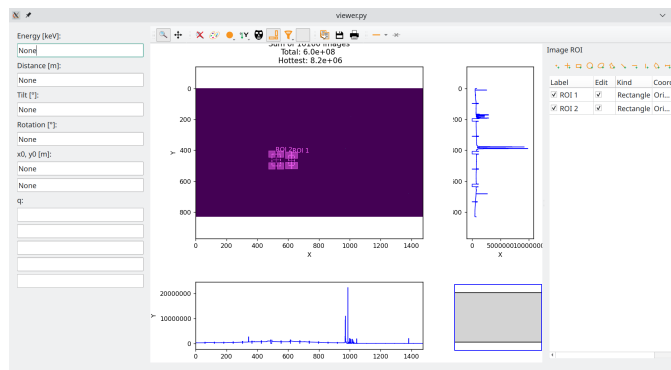
SPECIFIC AND
FLEXIBLE



UI Framework	Qt, Silx, ...
Competence	Expert
Developer	Software Engineer

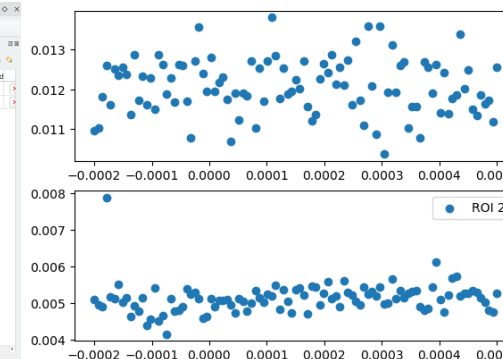


Live Analysis: simple tools, e.g. azint, crop,
time integration*



Time Over Threshold GUI: Pileup, ROI mean, ...

► CMOS Single Photon extraction*



* in courtesy of
Felix Engelmann,
MAX IV Laboratory

Expert Desktop Choice
based on:

- Existing libraries (silx)
- Python -> PyQt
- More control of own



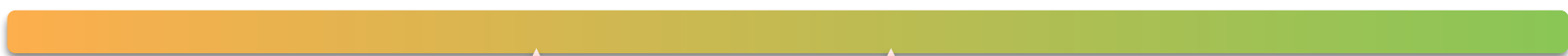
Desktop Landscape



User Autonomy

STANDARD AND STABLE

SPECIFIC AND FLEXIBLE



UI Framework

Qt, Silx, ...

Competence

Expert

Developer

Software Engineer

Qt

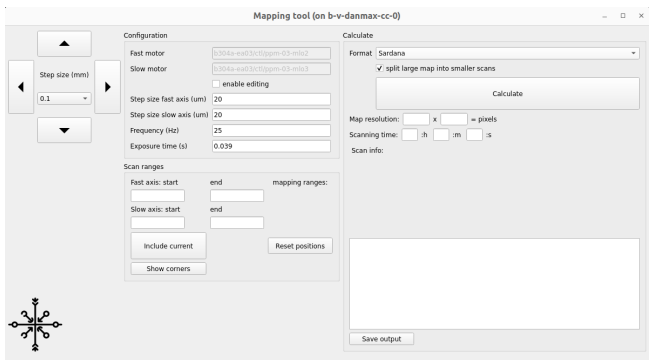
Taurus Designer, Taurus

Advanced

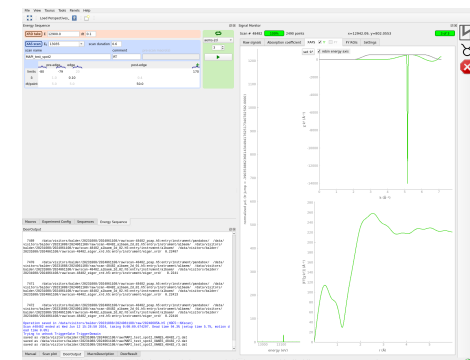
Basic Qt and python

Beamline staff

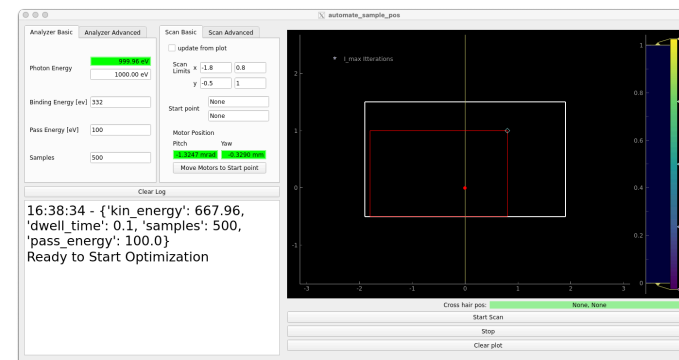
Beamline staff



DanMAX* 2D Mapping control:
2D flyscan made easy for external User.



Balder* Multi Modal EXAFS Scan:
Sequencing of flyscans and data live view.



Species* Sample Alignment: assist the external User to optimise the position of the sample.

* in courtesy of MAX IV Laboratory respective Beamline staff

Advanced Staff Choice based on:

- Convenience of Taurus
- More control

- Python knowledge -> PyQt



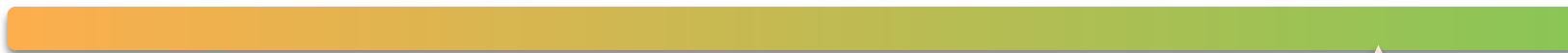
Desktop Landscape



User Autonomy

STANDARD AND STABLE

SPECIFIC AND FLEXIBLE



UI Framework	Qt, Silx, ...	Qt	Taurus Designer, Taurus	Taurus GUI, SVG Synoptic
Competence	Expert	Advanced	Basic Qt and python	Low Code
Developer	Software Engineer	Beamline staff	Beamline staff	

Qt, Silx, ...

Qt

Taurus Designer, Taurus

Taurus GUI, SVG
Synoptic
Low Code

Expert

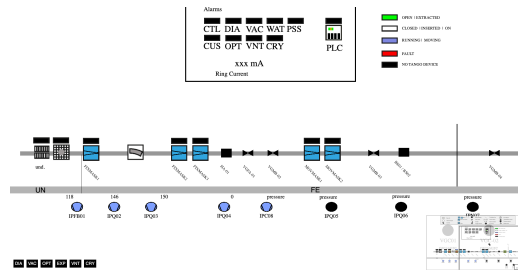
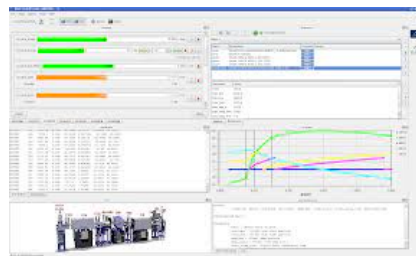
Advanced

Basic Qt and python

Software Engineer

Beamline staff

Beamline staff



• Low-code Desktop Choice based on

• Quick and Easy

• Complete Widget libraries for Tango



Web Landscape



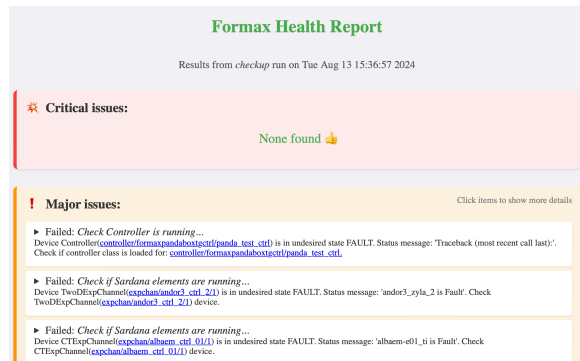
User Autonomy

STANDARD AND STABLE

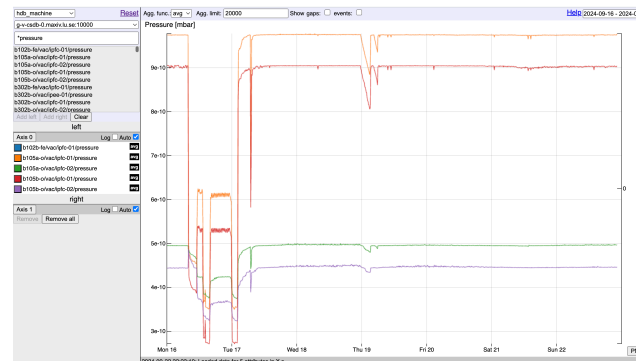
SPECIFIC AND FLEXIBLE



UI Framework	HTML, JS, REACT
Competence	Expert Web Development
Developer	Software Engineer



Beamlines System test: display the current operational state of the beamline



New Archive Viewer for Timescale DB

Name	State	Total	Nok	Pending	Error
https://s-csdb-0.maxiv.lu.se:10000/105/1/accelerator-01-timescale	ON	22			
https://s-csdb-0.maxiv.lu.se:10000/105/2/accelerator-01-timescale	ON	16			
https://s-csdb-0.maxiv.lu.se:10000/105/3/accelerator-01-timescale	ON	13			
https://s-csdb-0.maxiv.lu.se:10000/105/4/accelerator-01-timescale	ALARM	425	31		
https://s-csdb-0.maxiv.lu.se:10000/105/5/accelerator-01-timescale	ALARM	196	17		
https://s-csdb-0.maxiv.lu.se:10000/105/6/accelerator-01-timescale	ALARM	96	4		
https://s-csdb-0.maxiv.lu.se:10000/105/7/accelerator-01-timescale	ON	3			
https://s-csdb-0.maxiv.lu.se:10000/105/8/accelerator-01-timescale	ALARM	888	48		
https://s-csdb-0.maxiv.lu.se:10000/105/9/accelerator-01-timescale	ALARM	26	5		
https://s-csdb-0.maxiv.lu.se:10000/105/10/accelerator-01-timescale	ALARM	218	20		
https://s-csdb-0.maxiv.lu.se:10000/105/11/accelerator-01-timescale	ALARM	2166	207		
https://s-csdb-0.maxiv.lu.se:10000/105/12/accelerator-01-timescale	ON	130			
https://s-csdb-0.maxiv.lu.se:10000/105/13/accelerator-01-timescale	ALARM	31	31		
https://s-csdb-0.maxiv.lu.se:10000/105/14/accelerator-01-timescale	ALARM	283	8		
https://s-csdb-0.maxiv.lu.se:10000/105/15/accelerator-01-timescale	ON	14			

New Archive monitoring and diagnostic tool

Dedicated Web App choice based on

- Accessibility
- Deployment

- Integration (hyperlink)



Web Landscape



User Autonomy

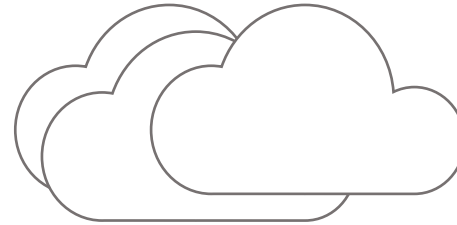
STANDARD
AND STABLE

SPECIFIC AND
FLEXIBLE

UI Framework HTML, JS, REACT

Competence Expert Web
Development

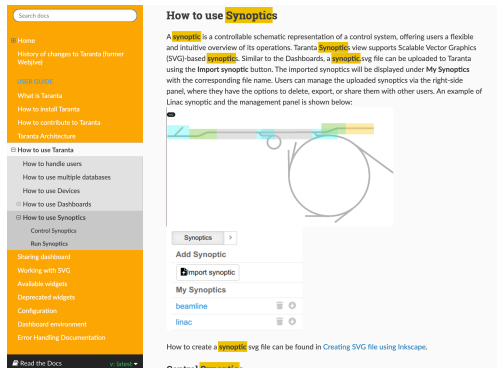
Developer Software Engineer



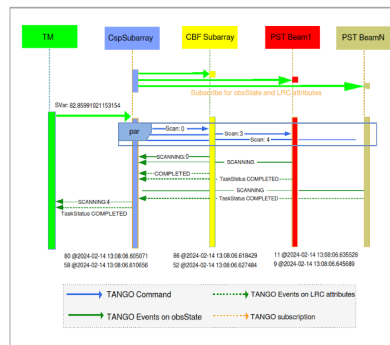
Taranta

No-Code

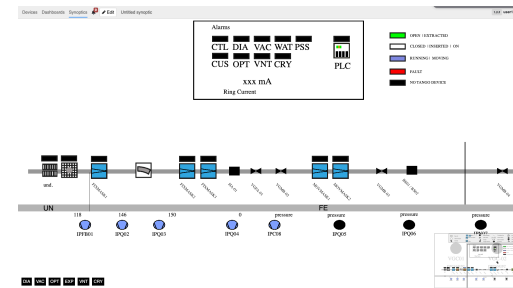
Beamline Staff and
Operator



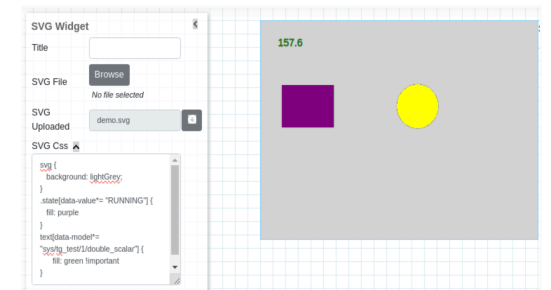
Taranta: SVG Widget and Synoptic documentation



Taranta: Complex SVG Widget representing the state of a workflow



Taranta: A complete synoptic view à la g00gle maps



Taranta: CSS setting for the SVG

Dedicated Web App
choice based on

- Accessibility
- Deployment

- Integration (hyperlink)



Scientific Web UI Strength

Strengths

Run everywhere

Deploy Once

Junior Staff primary UI

Security easier to implement

Application focus, No OS

UI sync naturally

Debugging, logging and monitoring very standard

Front End / Back End easier to maintain

Remote operation is a piece of cake

Easier integration between web app

Resilient

Scalable ...

Scientific Web UI Challenges

Challenges

Increase Widget Library for no-code

Latency

Initial Deployment cost

Qt and Python are popular in Science world.

Hell of open tabs

Architecture more complex

Deploy specific version

Program logic

Taranta Roadmap

Item	Start	End	Progress	Assignee
Use of the existing...	Q1	Q2	100%	John
Functional...	Q1	Q2	100%	John
New feature...	Q2	Q3	50%	John
Deployment...	Q3	Q4	0%	John
Support...	Q4	Q1	0%	John

variable STATE ●

double_scalar: undefined

variable/ampli: ... unit

ampli: undefined

testdb://variable/double_spectrum_ro

4
2
0
-2
-4

0 5 10 15 20

Widgets Dashboards Layers >

Dashboard Options

dashboard dashboard

My Dashboards

TangoTest Widget

Dashboard using CraftWidget

Devices Dashboards Synoptics 24 ▶ Start Dashboard using CraftWidget

Example with Tango Test Widget

sys/tg_test/1 RUNNING ●

double_scalar: -181.02

sys/tg_test/1/ampli:

ampli: 13

testdb://sys/tg_test/1/double_spectrum_ro

200
100
0

0 100 200

TangoTest Widget with device from another Database

sys/tg_test/1 RUNNING ●

double_scalar: -177.83

sys/tg_test/1/ampli:

ampli: 3

testdb2://sys/tg_test/1/double_spectrum_ro

200
100
0

0 100 200

Clone

Widgets Dashboards Layers >

Dashboard Options

New dashboard Import dashboard Expor dashb

My Dashboards

TangoTest Widget

Dashboard using CraftWidget

Taranta Craft widget: allow any user to create their reusable widget. The idea is to be able to design yourself widget similar as a dashboard with variables as input.

Conclusion

New Desktop Applications are still developed
Still early phase of Web for scientific software (Jupyter, ...)

No changes on the strategy:

“hybrid” desktop and web UI strategy mainly due to maturity of competence and technology

More Development in Web technology, part of the MAX IV strategy

More User Autonomy with more No/Low-code

Question?

