ALBA II Control System Stack
A Preliminary Design

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The **ALBA Synchrotron Lightsource** (Barcelona, Spain) is initiating its transition to a 4th Generation synchrotron lightsource. The upgrade of the accelerators will be accompanied of a renewal of the Control Software Stack. Some systems will be completely redesigned (magnet power supplies, timing, personnel safety system) while others will upgrade to new technologies and a new architecture.

Preliminary studies [TUPDP077] started in 2021 and pilot projects kicked off in 2022, to evaluate each of these technologies and develop the first prototypes. The commissioning of ALBA II is expected in 2031.

## ALBA II Controls Technology Stack

Current technologies under evaluation:

- Ansible
- CI/CD
- Conda
- Debian 12+
- Docker
- Elastic
- fandango
- Gitlab
- Grafana
- HDB++
- influxDB
- ipywidgets
- Jira
- JupyTango
- JupyterLab
- Kubernettes
- MariaDB
- Numba
- OPC-UA
- Panic
- plotly
- pytest
- PyQt6+
- PyQtGraph
- PyTango
- Python
- Python 3.11+
- Redis
- Salt
- Sardana
- Tango 10+
- Taranta
- Taurus
- TimeScaleDB
- Voilà
- ZMQ

High Availability Control Systems

ALBA II Control System (based on Tango, Python and ZMQ) will be a challenge due to a high increase in the number of devices and event pushing frequencies. Keeping the current architecture we identified risks as bottlenecks, timeouts and UI overloads.

In order to ensure high availability of the accelerators, the new architecture will stablish different availability layers. Supervision processes will use new Tango logging and open telemetry features, to ensure fitness functions validation between upgrades.
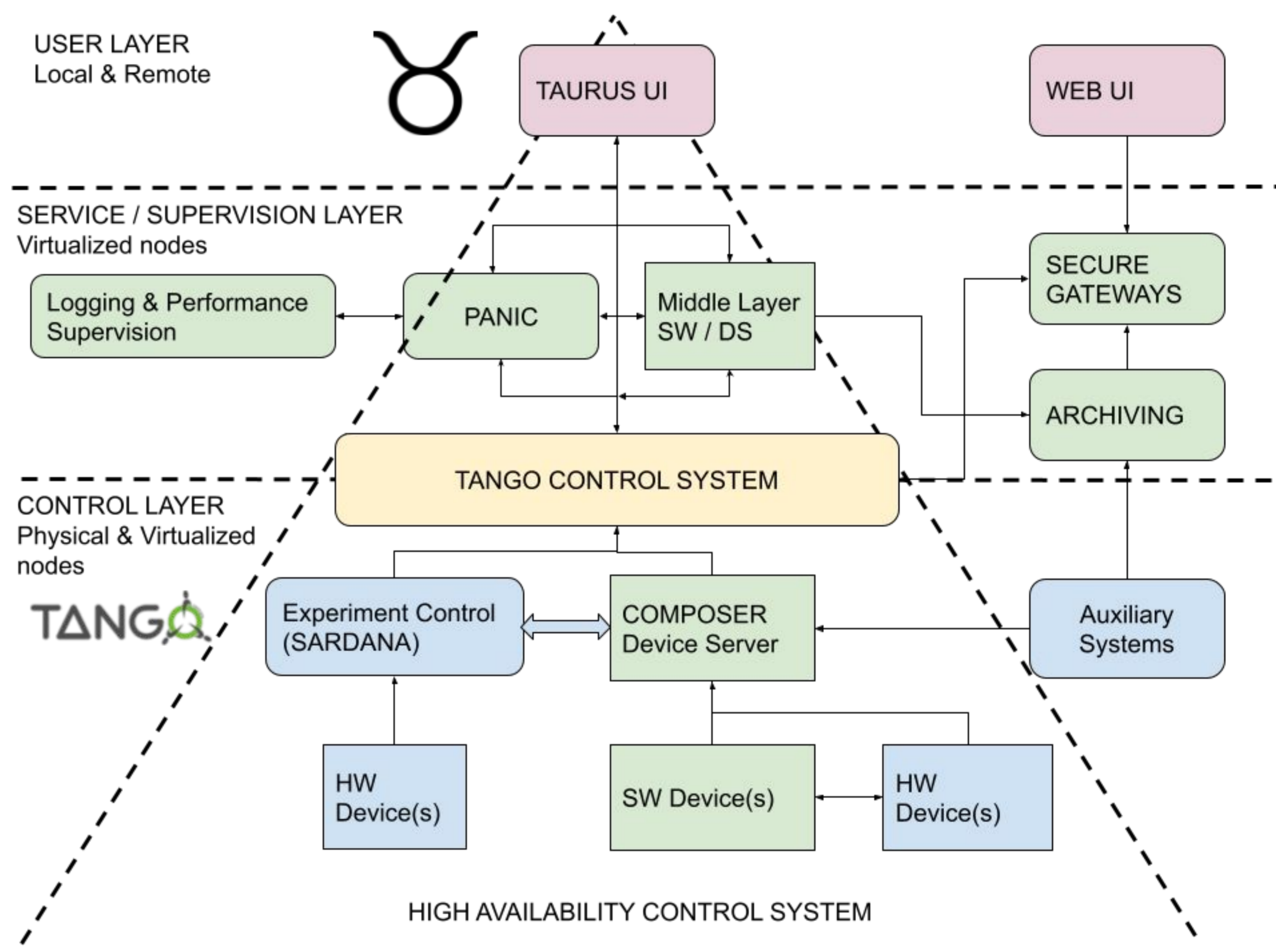
Preliminary Architecture for ALBA II Control System

Web Applications

Several web tools are already in use at ALBA (eGiga, IC@MS, mxCube) or under evaluation (Grafana, Taranta, jupyter, ..), focusing our tests in performance and security.

Although ALBA II Control Applications will be mostly based on Taurus library (python, PyQt), the control system will be open to the web using read-only accesses to the control system; enabling visualization of vacuum and other systems from mobile applications within ALBA network.

Web access to archiving (via Grafana or other frameworks) is being explored as a secure access to read-only attributes. HDB++ on TimeScaleDB is being evaluated as the future ALBA II Archiving.

www.albasynchrotron.eu
www.tango-controls.org