

INNOVATIVE GRAPHICAL USER INTERFACES DEVELOPMENT: GIVE THE POWER TO THE USERS

Gustavo Segura Millan, Adrien Ledoul, Alexandru Savulescu, Bartlomiej Styczen, Daniel Vasques Ribeira, CERN, Geneva, Switzerland



REMUS – Radiation and Environment Monitoring Unified Supervision

RADIATION AND ENVIRONMENT MONITORING INFRASTRUCTURE AT CERN

The Health Safety and Environment Unit at CERN provides a SCADA system for the radiation protection and environment monitoring of particle accelerators, experiments and the environment.

50 km Accelerator Tunnel - 60 Access Points - 160 Experiments
8,000 Radiation Workers

ENVIRONMENT MONITORING



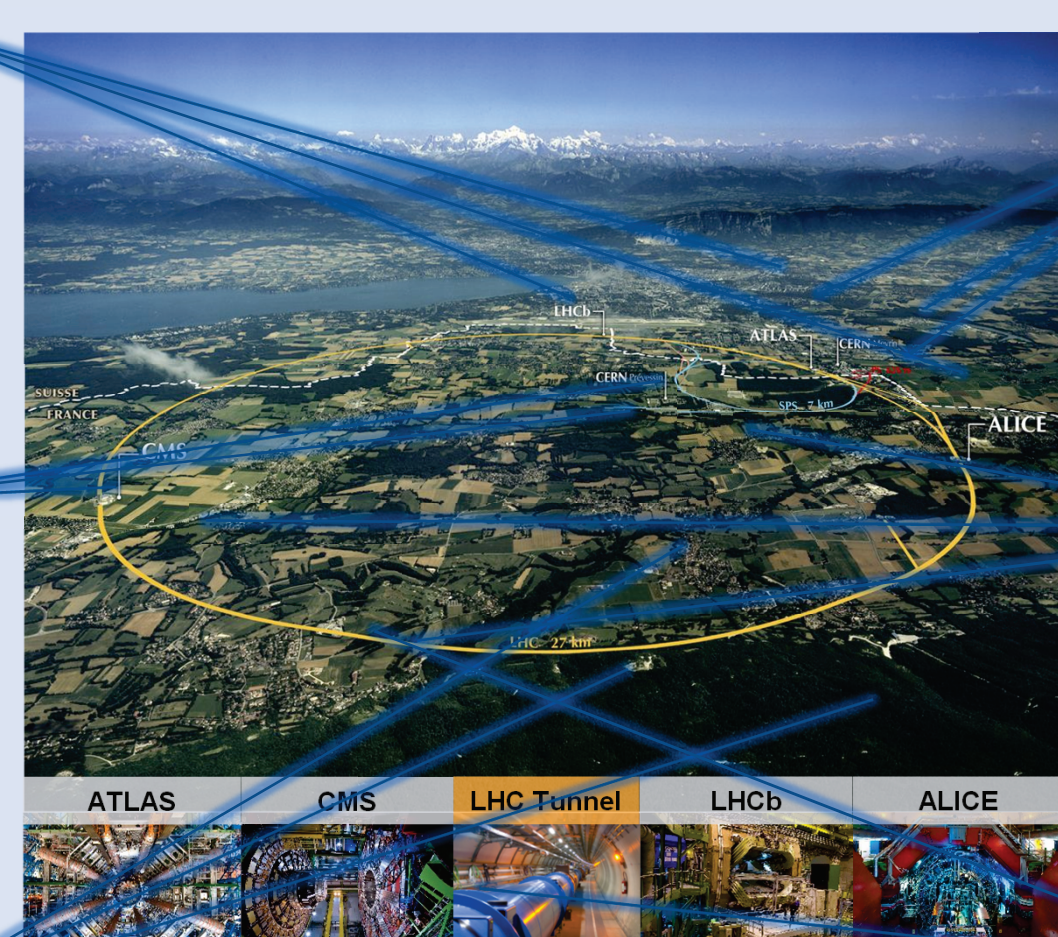
Stray Radiation



Water released



Ventilation



RADIATION PROTECTION



Gamma Radiation



Hand-Foot Contamination



Radiation + Alarm Units

~500 Monitoring Stations:

- 24 different types.
- Commercial Off-the-Shelf & Internally Developed Stations.
- Surface and Underground areas.

~3,200 Measurement Channels:

- 1,000 measurements to archive / second.

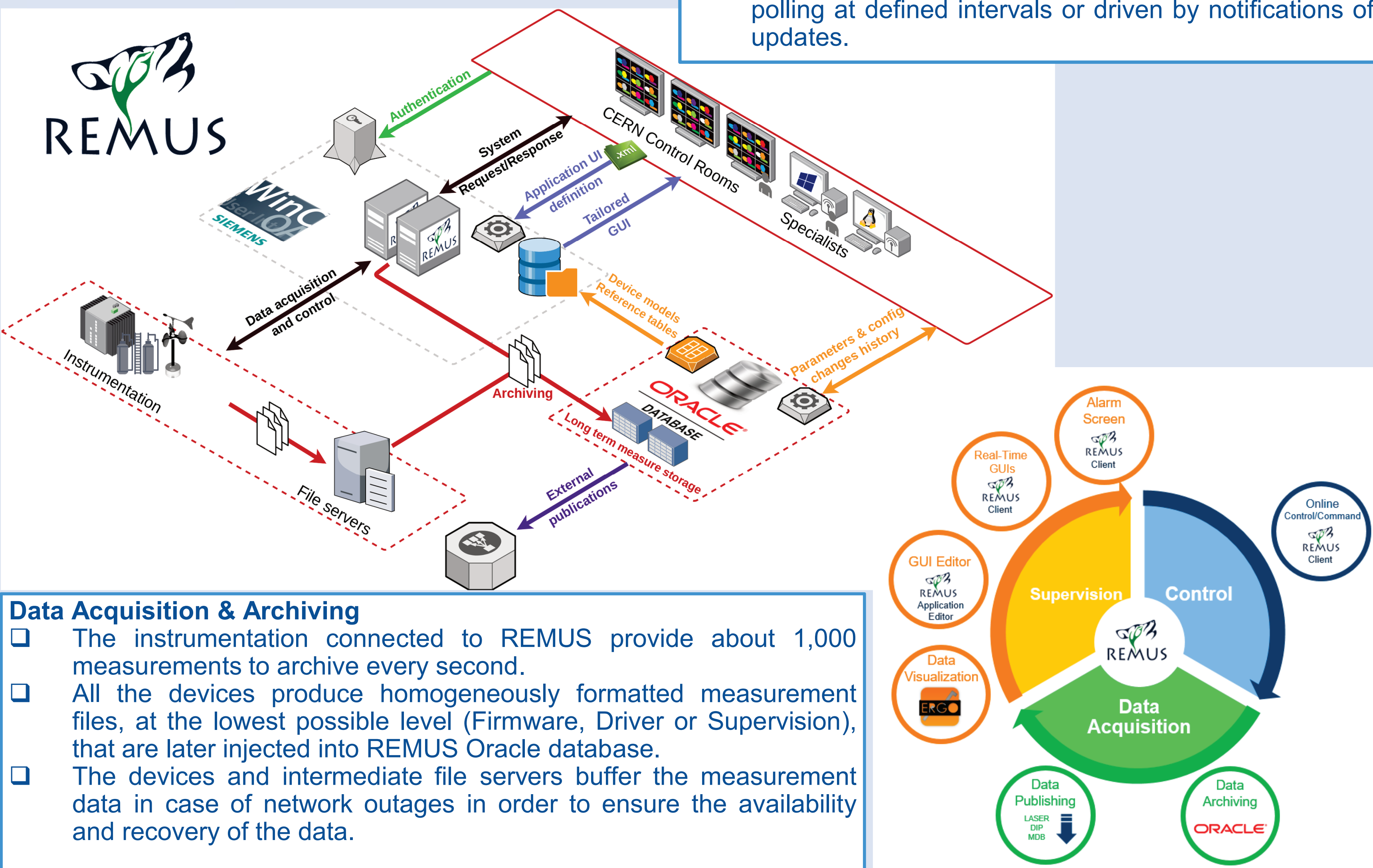
REMUS SYSTEM ARCHITECTURE

REMUS interface to instrumentation:

- In-house driver developed on top of WinCC OA API
- WinCC OA native driver (Modbus, S7)
- WinCC OA CERN driver (Controls MiddleWare)
- File exchange system
- OPC

Real time animation Graphical User Interfaces

- The drivers connected to the instrumentation send every second about 1,800 data updates requests to the REMUS servers.
- The redundant central servers replicate their respective internal databases. The REMUS Client GUI (Linux or Windows) requests all the data needed to animate the tailor-made GUIs either by systematic polling at defined intervals or driven by notifications of updates.



Data Acquisition & Archiving

- The instrumentation connected to REMUS provide about 1,000 measurements to archive every second.
- All the devices produce homogeneously formatted measurement files, at the lowest possible level (Firmware, Driver or Supervision), that are later injected into REMUS Oracle database.
- The devices and intermediate file servers buffer the measurement data in case of network outages in order to ensure the availability and recovery of the data.

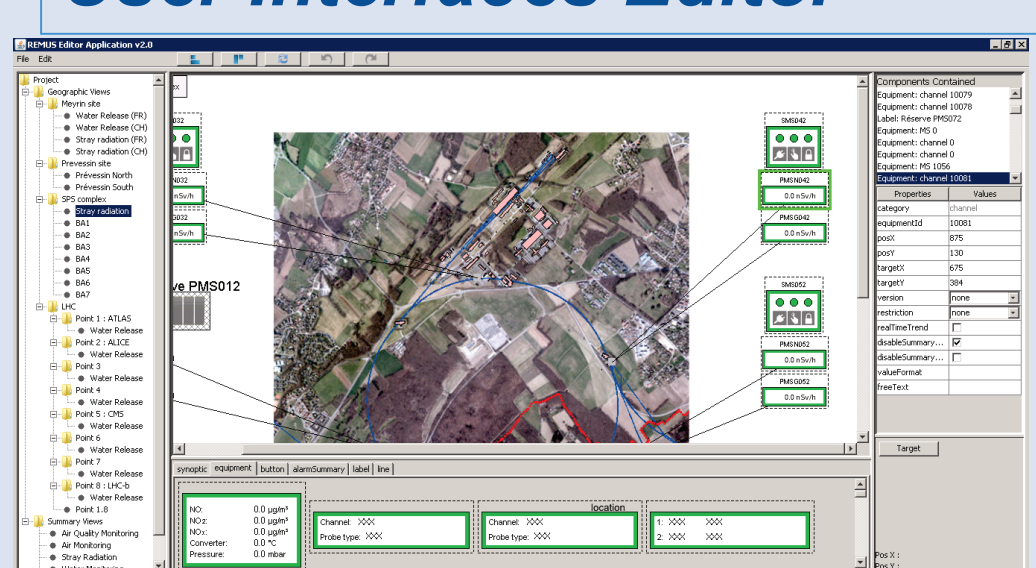
REMUS – FINAL USERS BUILD THEIR OWN GRAPHICAL USER INTERFACES

REMUS APPLICATION EDITOR

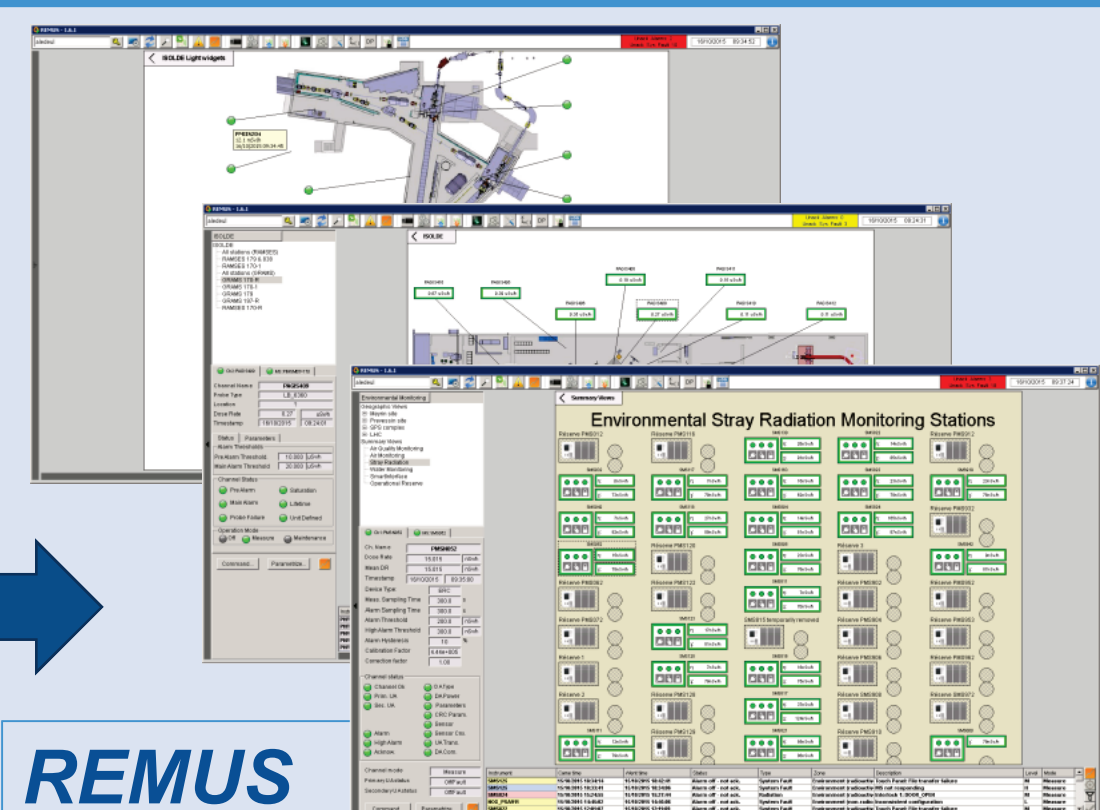
REMUS final users can build their own user interfaces

- REMUS provides users with a tool to build their own tailor-made GUIs.
- Graphical tool to draw user interfaces with "drag and drop".
- No knowledge of programming languages necessary.
- User interfaces can be modified in minutes.
- New or modified user interfaces can be deployed at run-time.
- User can control access and user roles (visualization, parametrization, etc.)

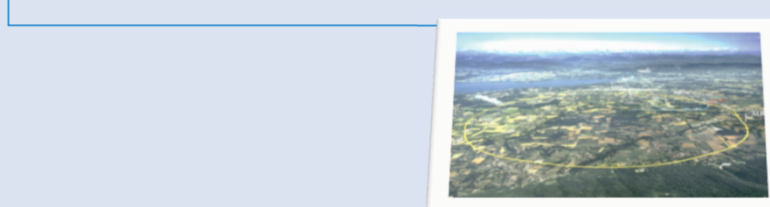
REMUS User Interfaces Editor



Users build their own synoptic views hierarchies



REMUS Tailored User Interfaces



The GUI editor proposes a catalogue of widgets to drag and drop into synoptic views

Access control and user roles (visualization, parametrization, administration, etc.)

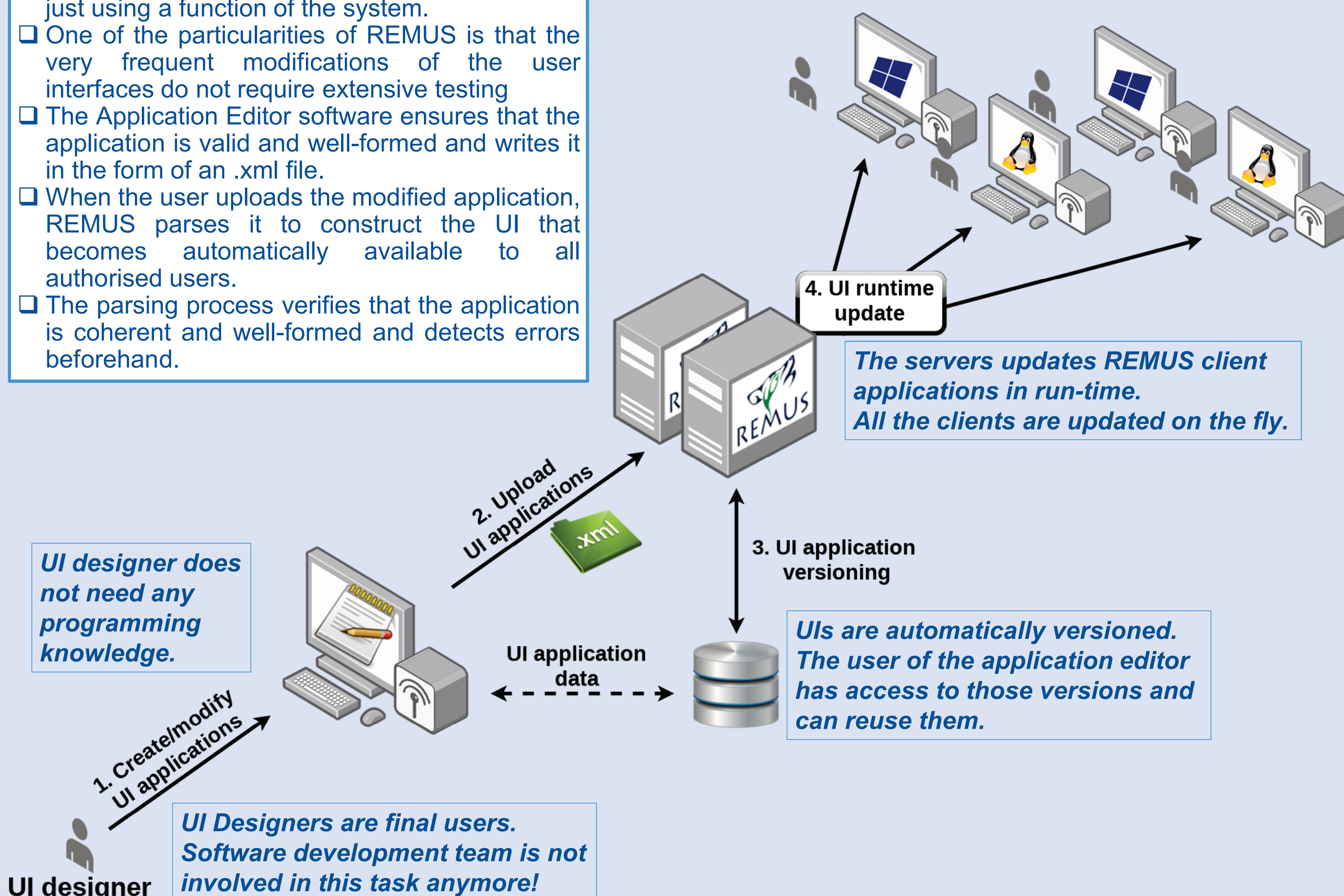
REMUS APPLICATION RUN-TIME MODIFICATION AND UPLOAD

GUI for Safety Systems

- Changing or modifying a REMUS application is just using a function of the system.
- One of the particularities of REMUS is that the very frequent modifications of the user interfaces do not require extensive testing
- The Application Editor software ensures that the application is valid and well-formed and writes it in the form of an .xml file.
- When the user uploads the modified application, REMUS parses it to construct the UI that becomes automatically available to all authorised users.
- The parsing process verifies that the application is coherent and well-formed and detects errors beforehand.

UI designer does not need any programming knowledge.

UI Designers are final users. Software development team is not involved in this task anymore!



REMUS Users interfaces in numbers:

- 18 different applications (accelerators operation, experiments, environmental protection, fire brigade, instrumentation maintenance).
- 600 Synoptic views, all of them designed and built by final users. No involvement of the software development team.
- 200 users (operators of accelerators and experiments, physicists, instrumentation specialists, radiation protection engineers, environmental engineers, CERN Fire Brigade, instrumentation maintenance teams and the software support team).
- An average of 50 users run REMUS clients simultaneously at any moment 24/7, 365 days per year.
- User interfaces are modified by final users every week.

The REMUS approach for the management of GUI has proven to be very versatile, bringing many benefits to the system:

- Reduced software development and maintenance costs.
- Increased user satisfaction.
- Fast user adoption.
- Decreased "time to market" of new GUIs releases.