

An unified in-field measurement and alignment software for experiments and accelerators at CERN large scale metrology section.

IWAA 2016 (03-07 Oct.) - Grenoble - France

[P. SAINVITU](#), CERN – Geneva – Switzerland



ENGINEERING
DEPARTMENT

Content

• Introduction

- Context
- Motivation

• Constraints

- Use cases
- Multi-user modes
- Dependencies
- Coordinate systems
- Environment of use
- Different views of the data

• Method

- Development process
- Platform & development language
- Workflow
- Architecture

• Status of the development

- First iterations
- Next iterations

• Summary & Outlook

CERN complex alignment - geodesic measurements

- Theodolites, tachometers, trackers and reflectors

- Angles
- Distances

- Levels and staffs

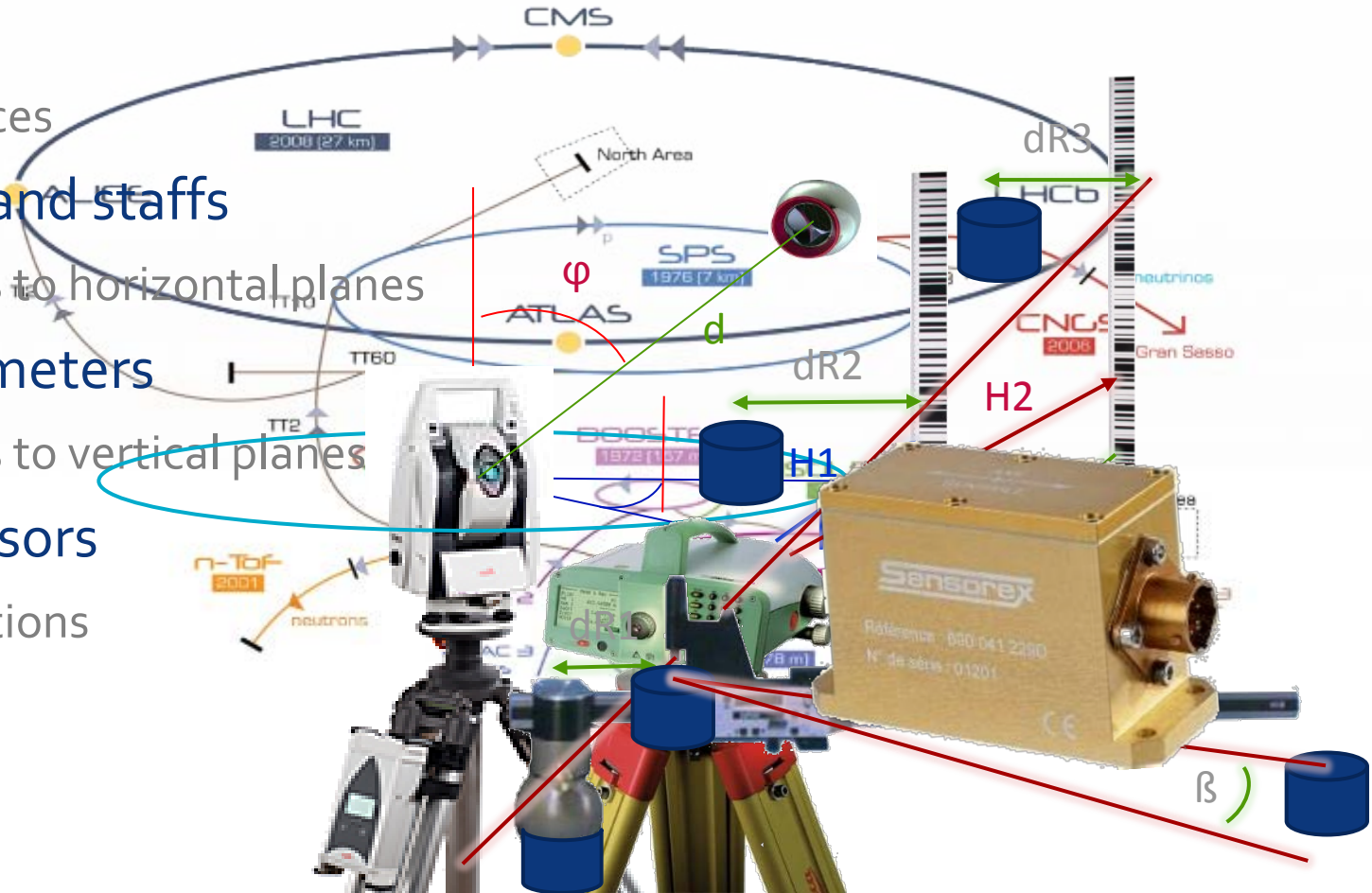
- Offsets to horizontal planes

- Ecartometers

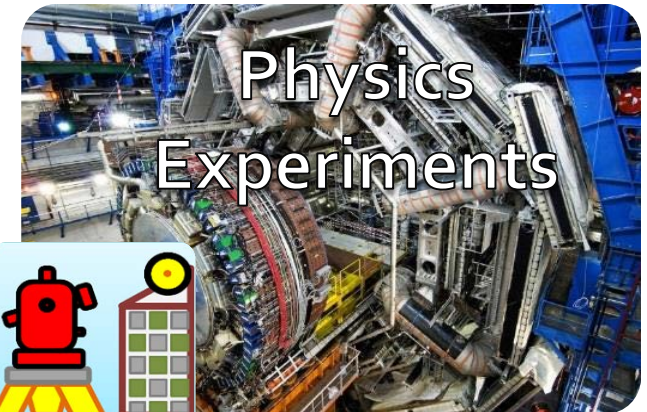
- Offsets to vertical planes

- Tilt sensors

- Inclinations



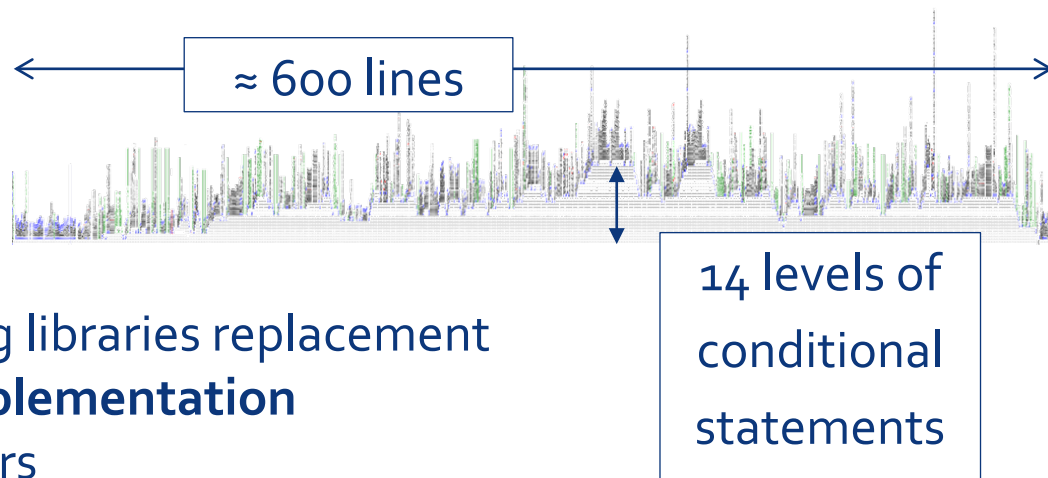
In-field acquisitions - Divergences & similarities



Measurement:	Repetitive	Diversify
Tolerances:	Well-defined	Variable
Sequence:	Controlled	Non-existent
Main user:	Industrial Support	CERN STAFF
Coord. System:	Global	Local
Most processing:	Postpone	Immediate
Business model:	Elements, points, networks, geodetic measurements,...	
Instrument:	Communication librairies	
Calculation:	Survey Software dependencies	

Main drawbacks

- From 90's, in VB6 and VBA
- GUI are French only
- Not "touch screen" friendly
- Maintenance
 - New instruments + computing libraries replacement
>>> **double implementation**
 - Performed by several surveyors
>>> **duplicate parts + Procedural and OO programming**



The challenge

- Unify survey data acquisition tools;
- Facilitate the maintenance;
- Open doors to more up to date interfaces.



The
Survey
Unified
Notebook for
Alignment and
Measurement
Interventions

Rewriting of a single application that fulfil all the constraints

Constraints

Use cases - Multi-user mode - Dependencies

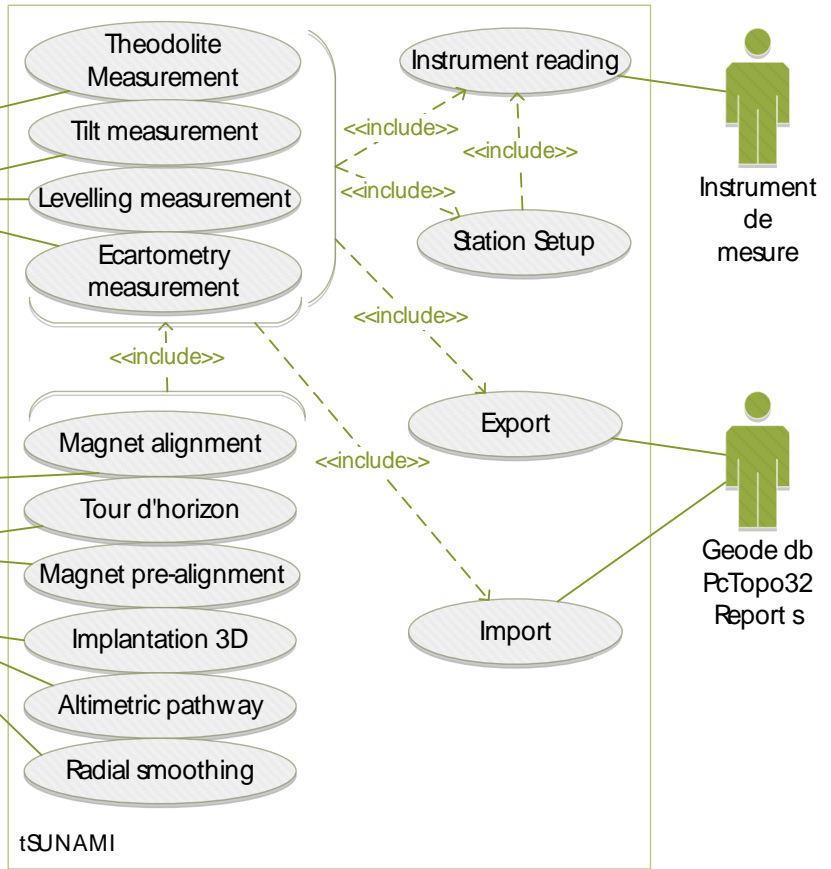
Coordinate systems - Environment of use - Data Views

Advanced user
Flexibility



<<extend>>

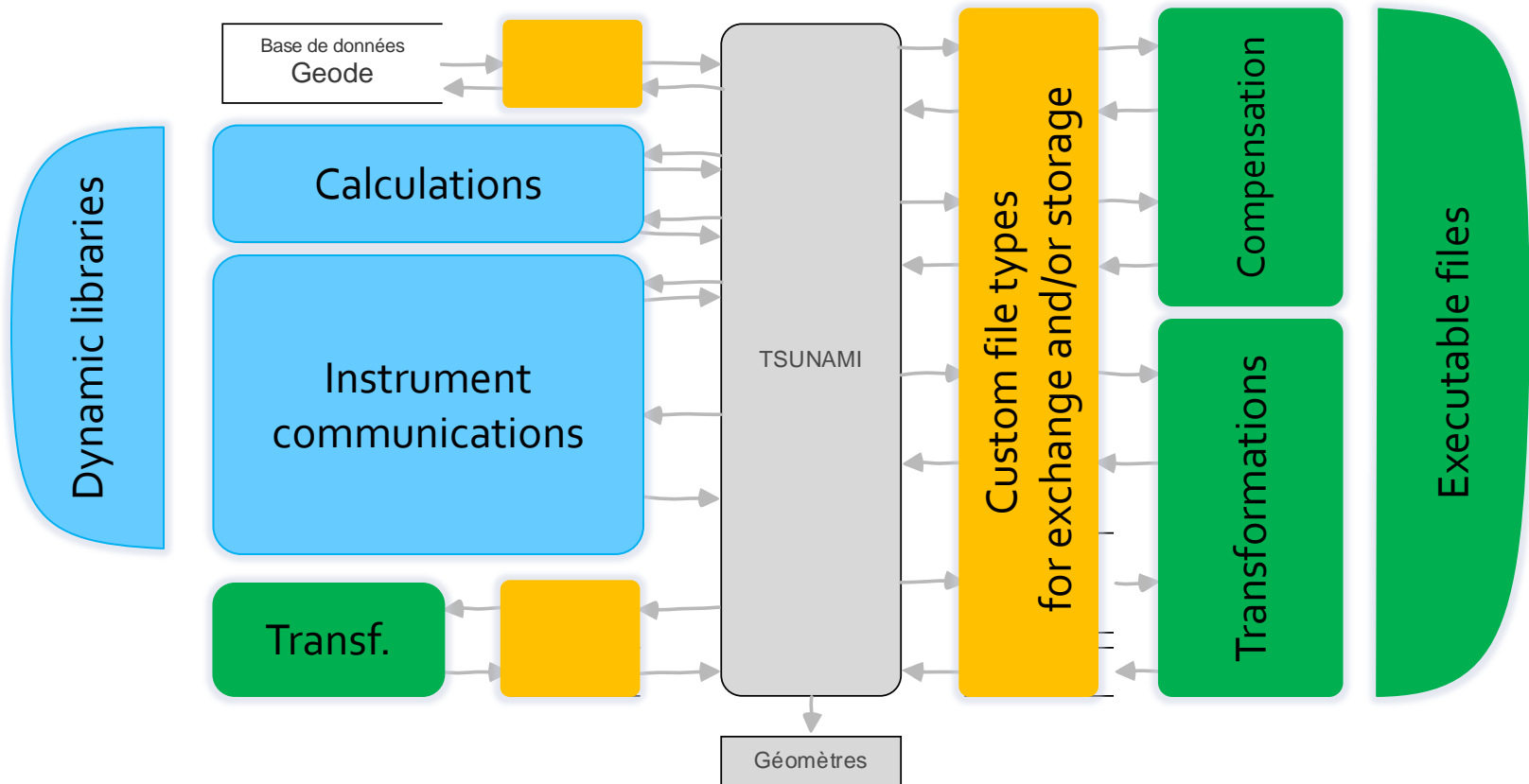
Guided user
Controlled step by step procedures



Constraints

Use cases - Multi-user mode - **Dependencies**

Coordinate systems - Environment of use - Data Views

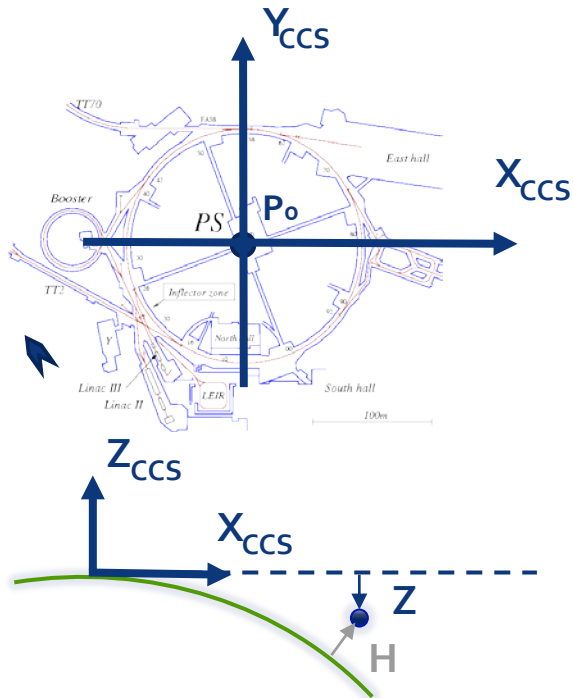


Constraints

Use cases - Multi-user mode - Dependencies

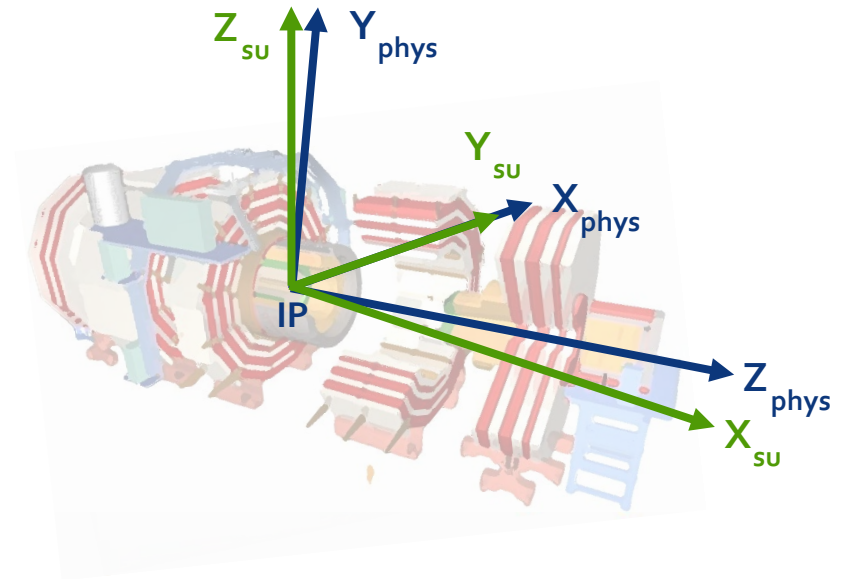
Coordinate systems - Environment of use - Data Views

Accelerators



CERN CS : XYZ / XYH

Physics experiments

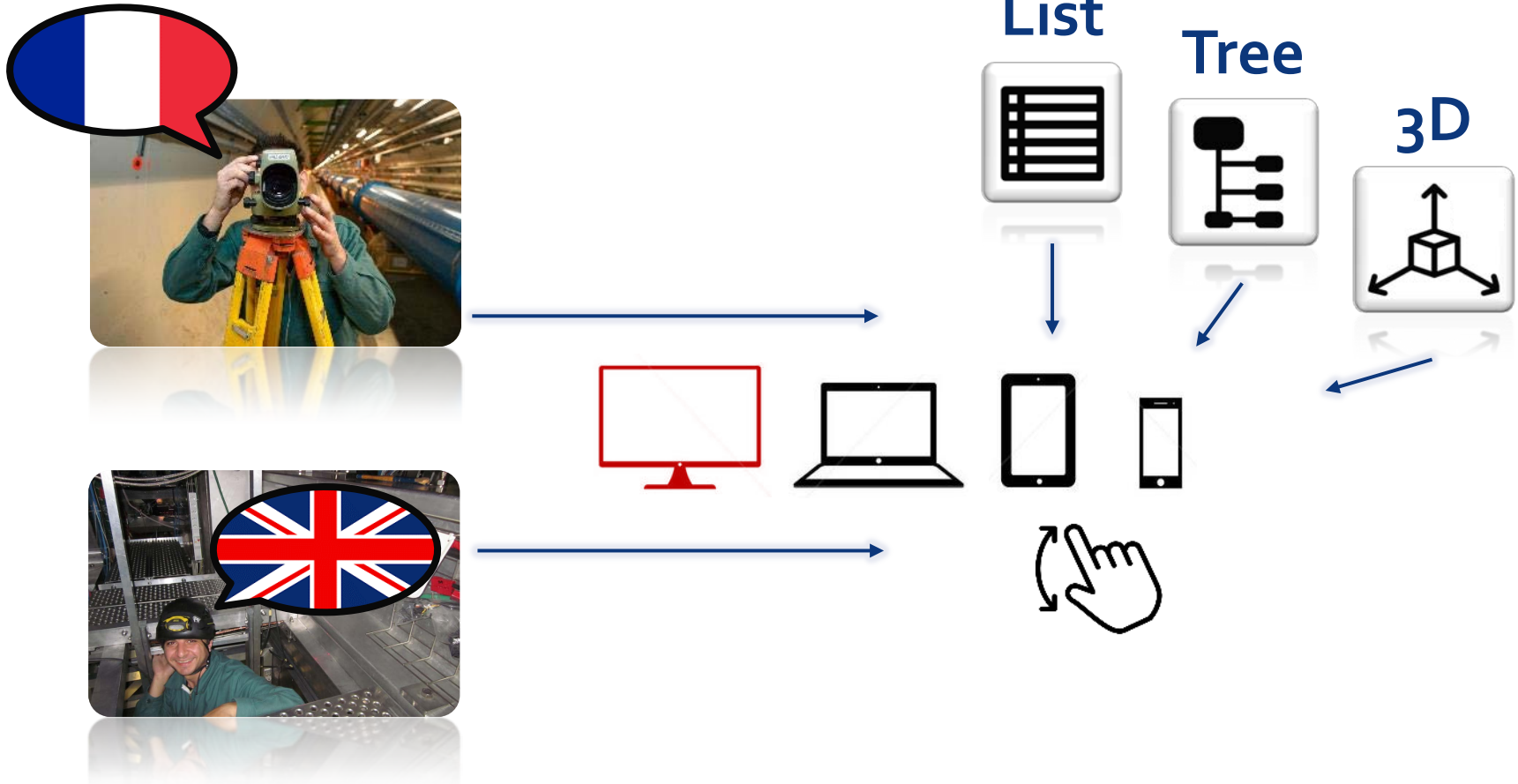


Physicist CS

Survey CS

Constraints

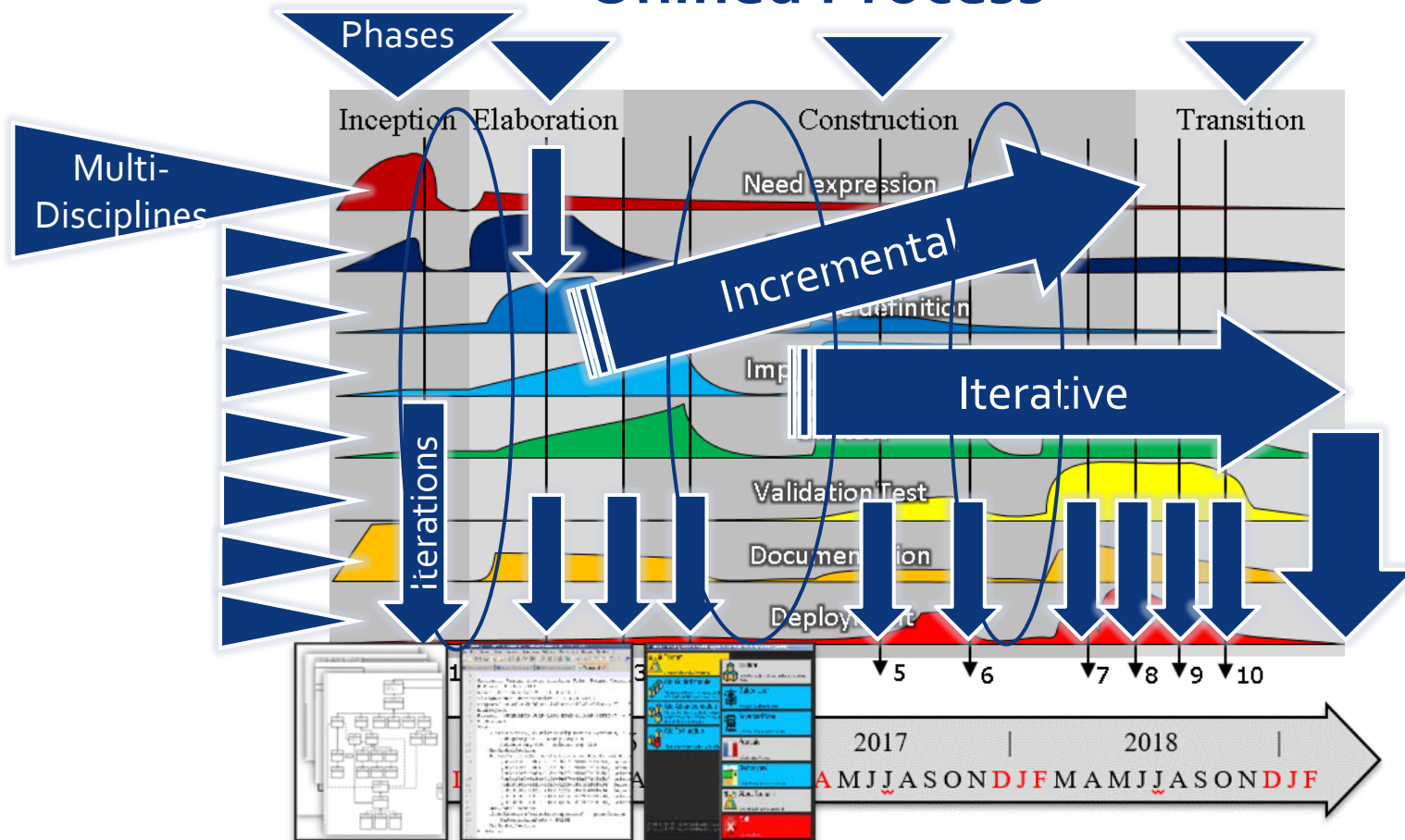
Use cases - Multi-user mode - Dependencies
Coordinate systems - **Environment of use** - **Data Views**



Method

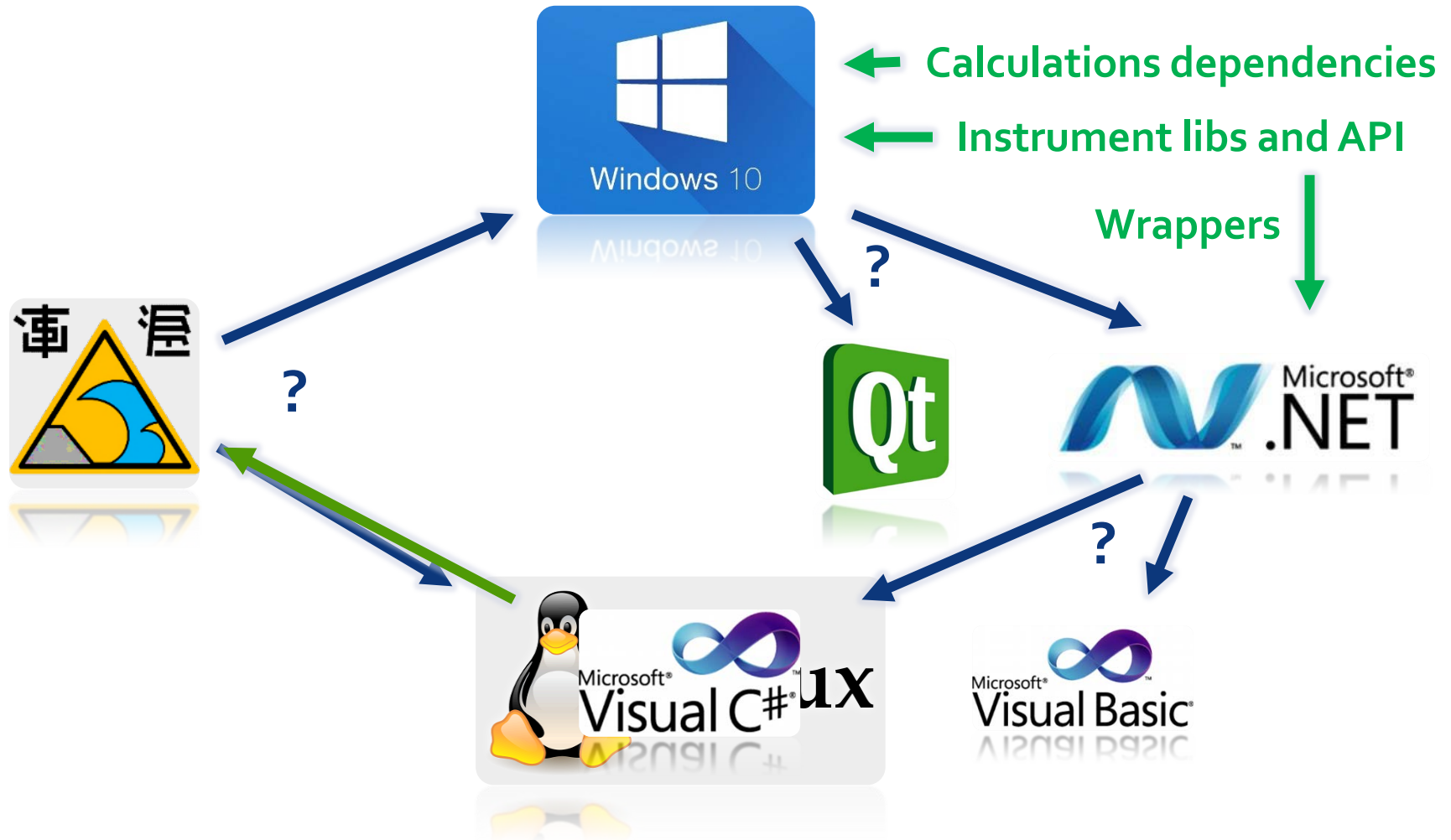
Development process - Platform & language - Workflow - Architecture

Unified Process



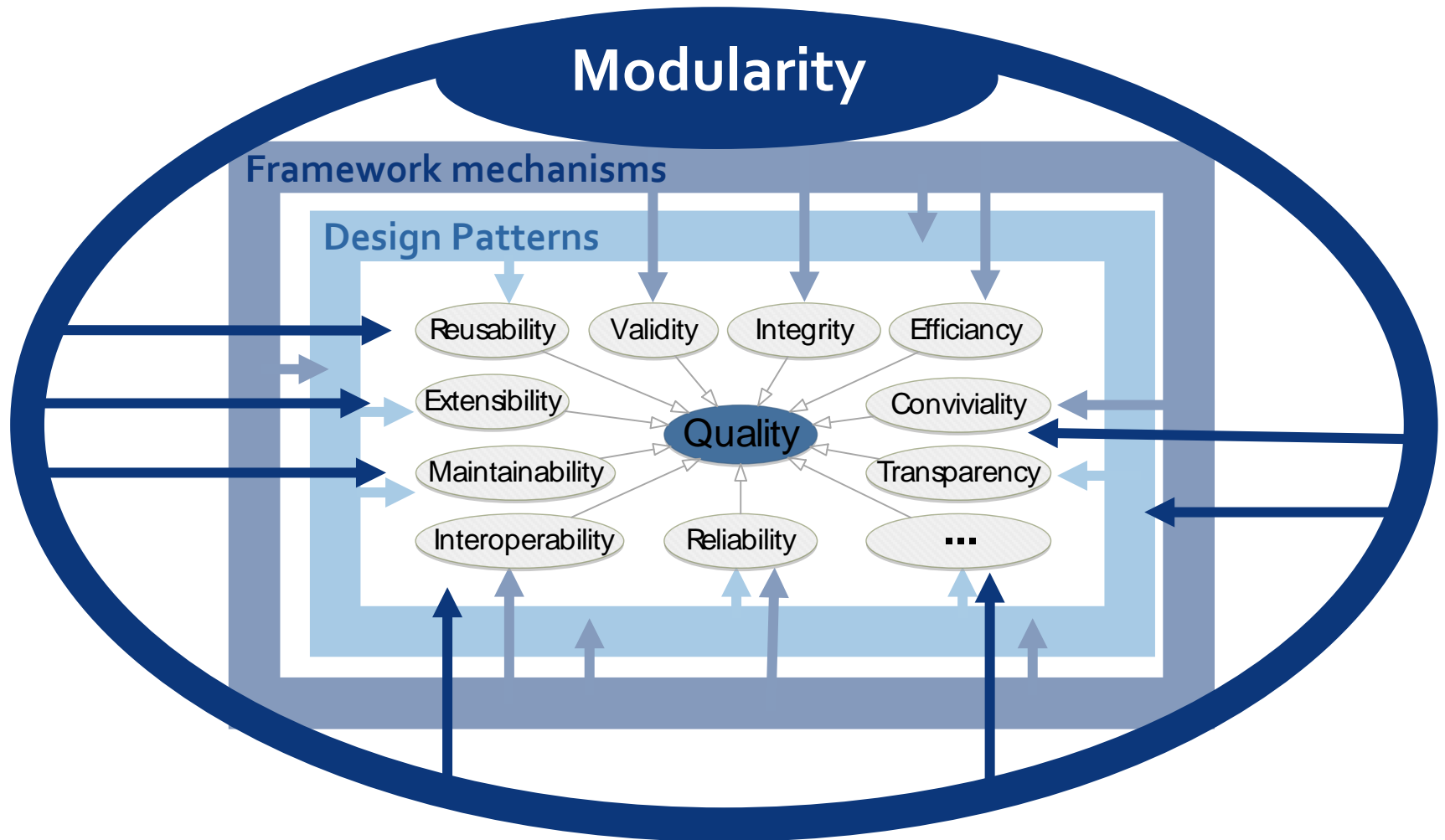
Method

Development process - **Platform & language** - Workflow - Architecture



Method

Development process - Platform & language - Workflow - **Architecture**



Method

Development process - Platform & language - Workflow - **Architecture**



TSUNAMI

Manager

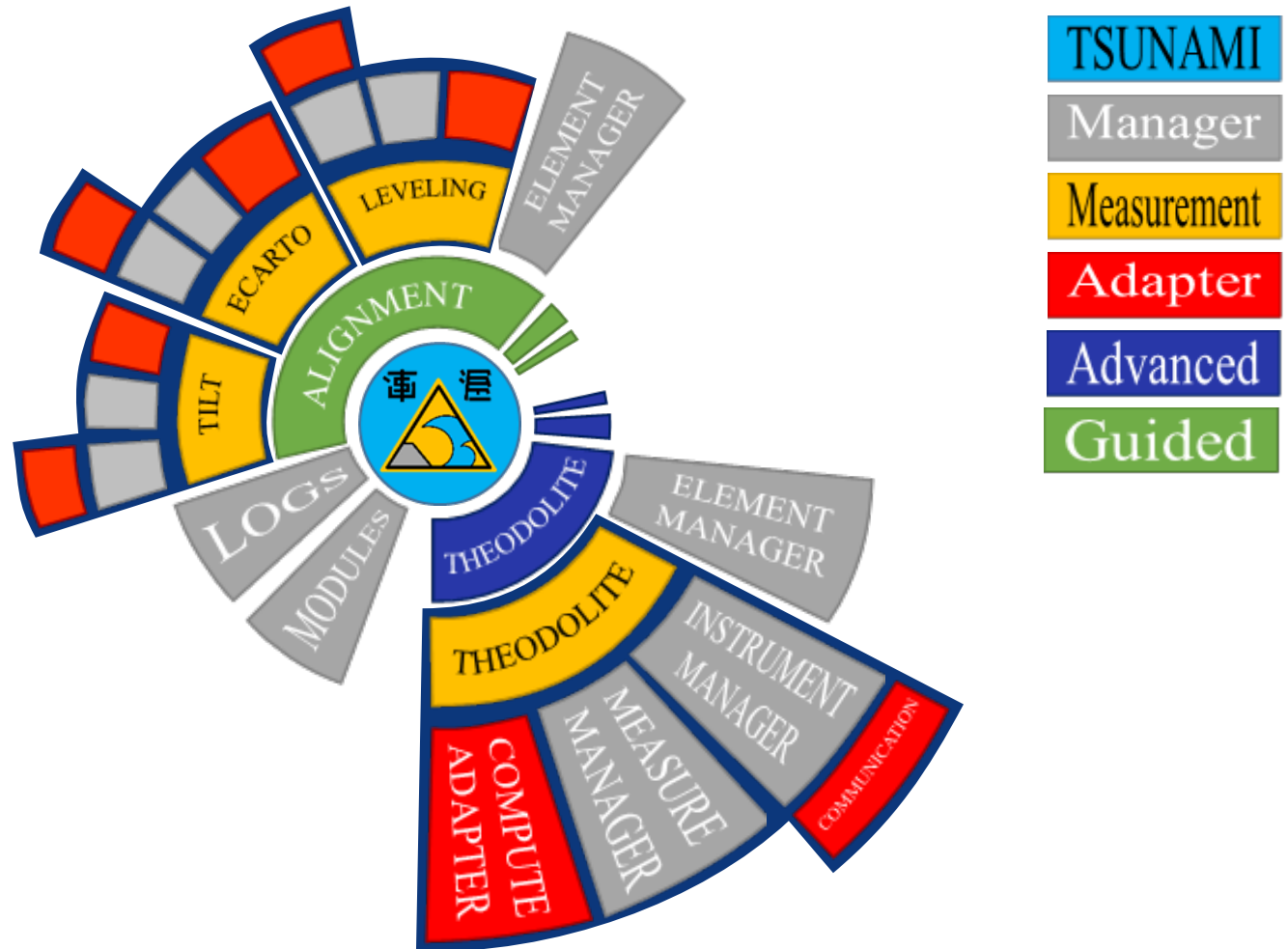
Measurement

Adapter

Advanced

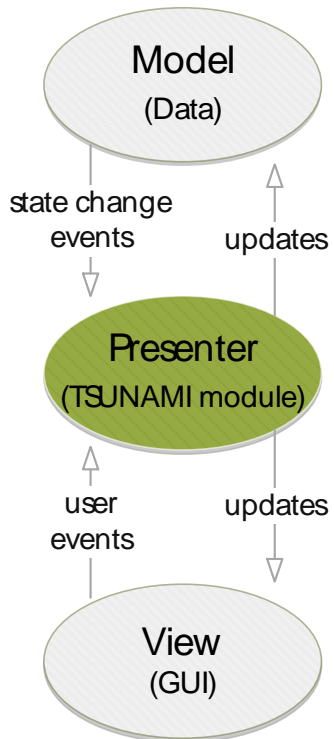
Method

Development process - Platform & language - Workflow - **Architecture**



Method

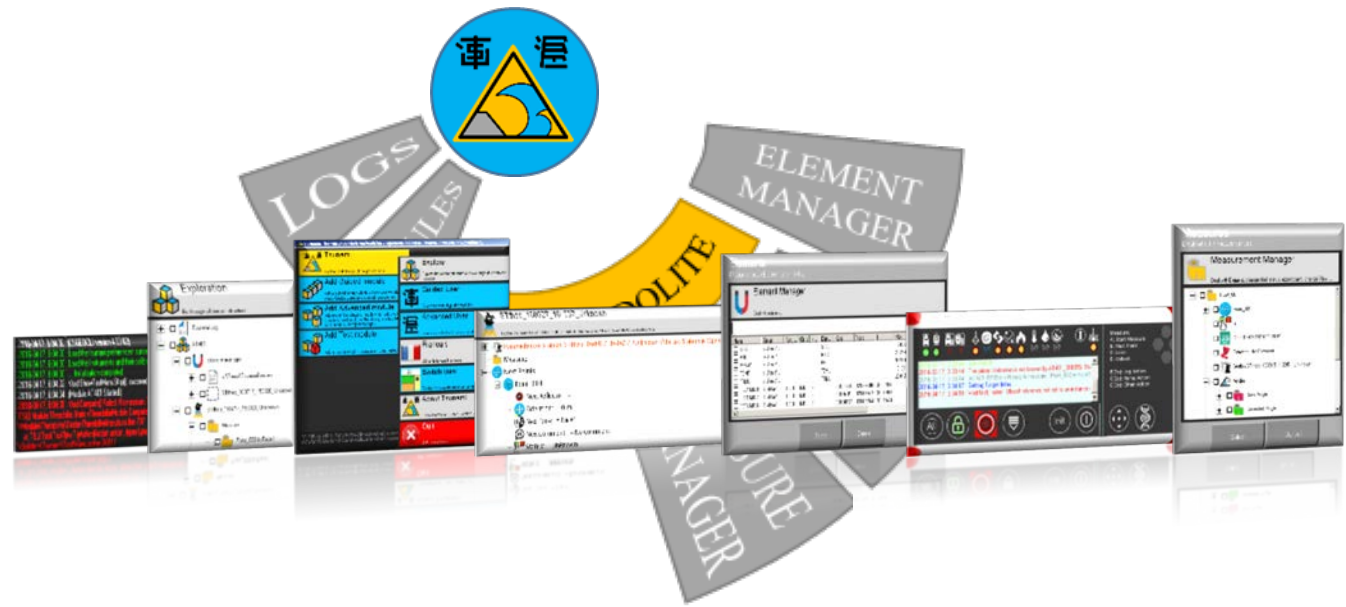
Development process - Platform & language - Workflow - **Architecture**



Advanced

Add an Advanced module
Add one of the following module which will give you complete ...

Add an Advanced module
Add one of the following module which will give you complete freedom of use: theodolite, levelling, tilt or offset module, or object managers



Status of the development

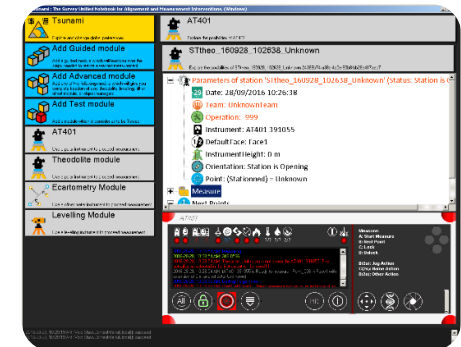
First iterations

- Design Artefacts
- Prototype
 - *Managers & dependencies;*
 - *Ecartometry, levelling & Theodolite.*



Next iterations

- Architectural choices + implementation:
 - *Tilt measurement;*
 - *Guided modules.*



Summary & Outlook

2 data acquisition software >> TSUNAMI (2 user modes)

- **Development in progress...**

- Global architecture delivered >> Satisfy constraints + ensure quality
- Most core functionalities implemented

- **Full-scale tests (next year)**

- CERN survey team >> feedback >> Corrections and adjustments

- **First version >> next long shutdown**

- **Architecture + documentation** >> ease the maintenance

- **Achieved modularity** >> stimulate extensions
>> reuse of code in future projects.

TSUnami: The Survey Unified Notebook for Alignment and Measurement Interventions. (Windows)

Ecartometry Module
Explore the possibilities of Ecartometry Module

Ecartometrie
Ajout éléments ou fils. Sauvegarde des fils

Parameters of station 'Unknown' (Status: Instrument to be selected)

Elements
Please choose Element(s) in the list

Element Manager
Deal with elements

Type filter key here...

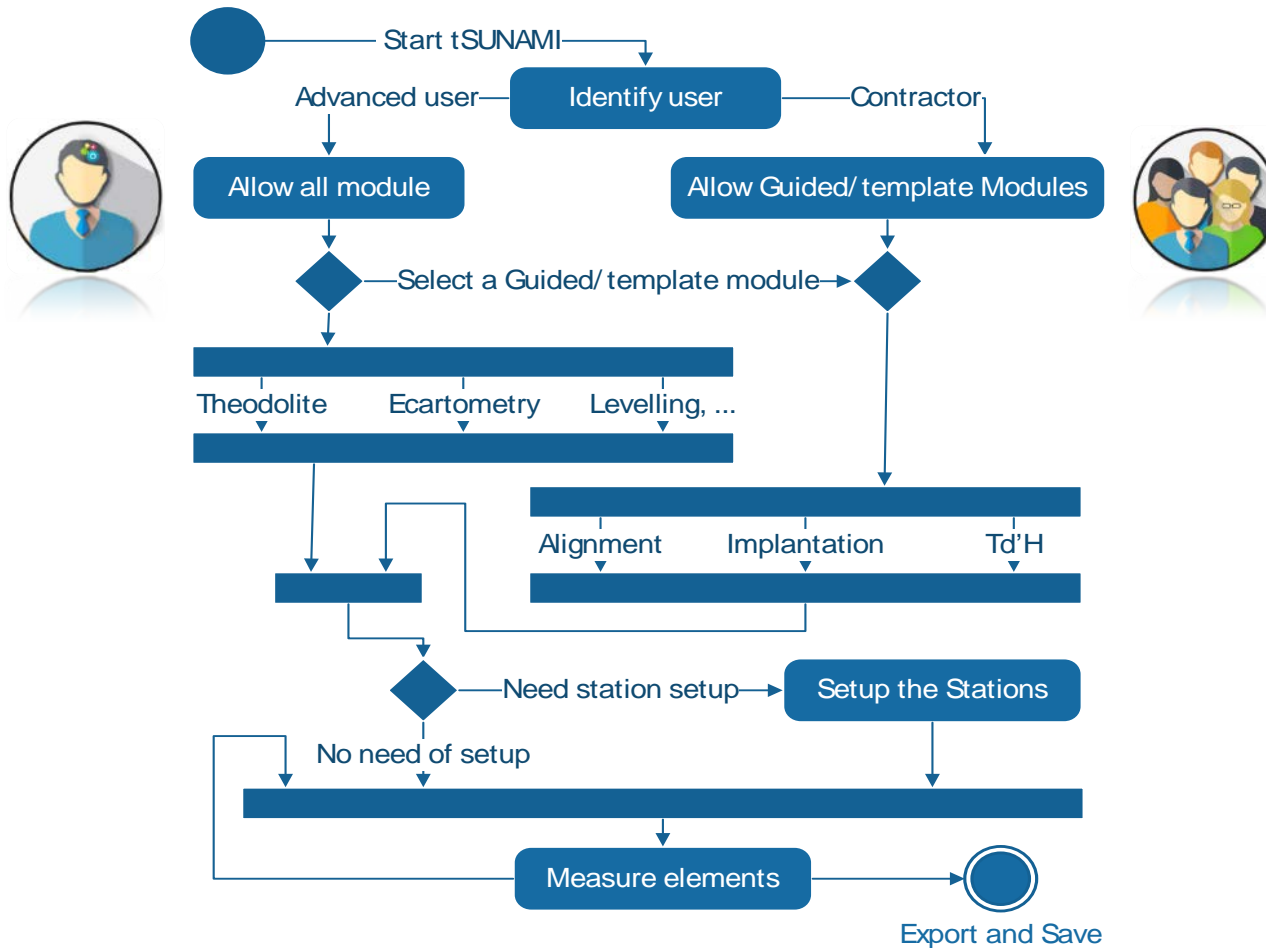
Name	Group	Acc...	Class	Num...	E...	Xccs
<input type="checkbox"/> TCC4.NID.8	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	8		3080.16305
<input type="checkbox"/> TCC4.NID.7	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	7		3083.52412
<input type="checkbox"/> TCC4.NID.6	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	6		3089.81978
<input type="checkbox"/> TCC4.NID.2	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	2		3074.82988
<input type="checkbox"/> TCC4.NID.1	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	1		3074.96746
<input type="checkbox"/> TCC4.NID.3	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	3		3082.98066
<input type="checkbox"/> TCC4.NID.4	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	4		3085.99215
<input type="checkbox"/> TCC4.NID.5	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NID	5		3086.44528
<input type="checkbox"/> TCC4.NIV.1	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NIV	1		3082.76349
<input type="checkbox"/> TCC4.NIV.2	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	NIV	2		3082.80077
<input type="checkbox"/> TCC4.GGPSO.819	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	GGPSO	819		3077.91457
<input type="checkbox"/> TCC4.GGPSO.827	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	GGPSO	827		3079.91310
<input type="checkbox"/> TCC4.GGPSO.829	C:\data\150824_AWAKE-theo - Copy.dat	TCC4	GGPSO	829		3087.64422

Select Cancel

2016-05-27, 4:45:42 PM. Load the Instruments and their calibrations. succeed

Method

Development process - Platform & language - **Workflow** - Architecture



TSU-NAMI

