

LGC: Open-Source initiative

G. Kautzmann (BE-GM-APC)

07/11/2024

LGC?

Main software for CERN Surveyors to determine position and align the accelerator for nearly 40 years (first version around 1985)

“Logiciel Général de Compensation” → “General Adjustment Software”

What does LGC do?

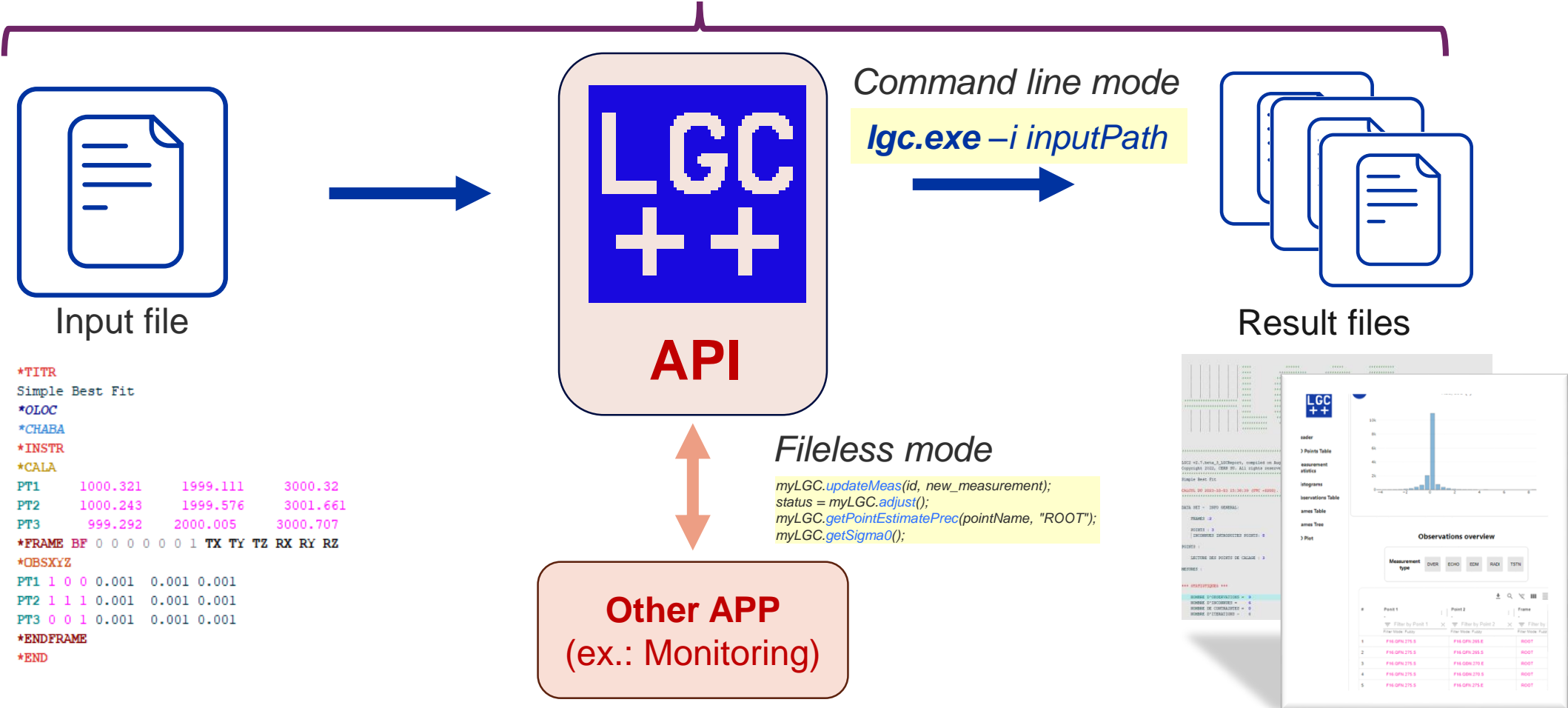
Process the position of objects (points, plane, reference system, etc...) and their associated precisions using geometrical observations (distances, angles, etc..) through a weighted least square statistical analysis

For what?

Giving surveyors a reliable way to process and analyse their measurements with a non-black box software

Interacting with LGC today

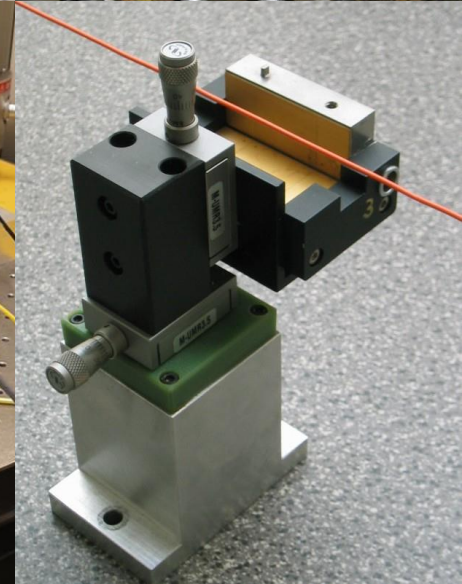
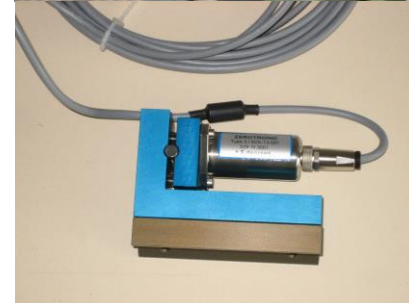
SurveyPad Interface (v1.1.0 official release in May 2024)



Specificity

21 observation models implemented today

- Total Station / Laser Tracker
- Levels
- Distance measurement
- Offset to wire
- BCAM
- Basic Coordinate Measurement Machine
- Inclinometers
- Gyroscope
- HLS
- WPS
- ...

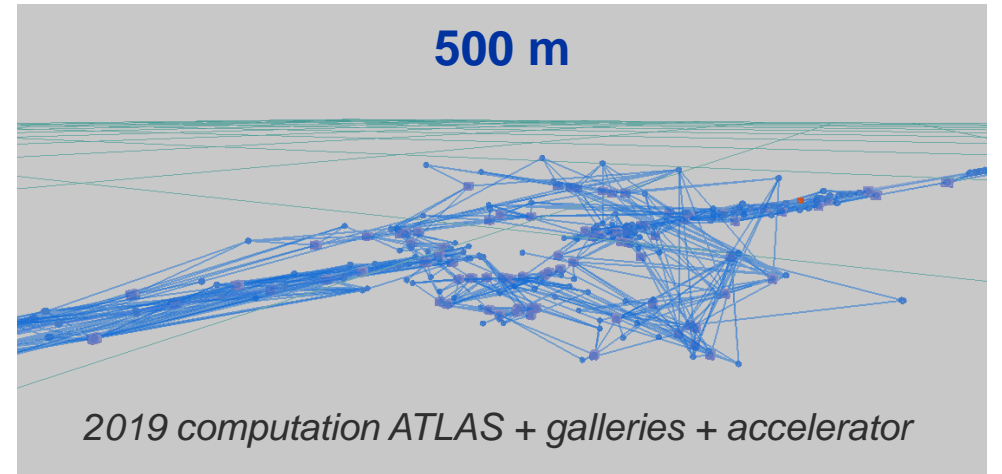
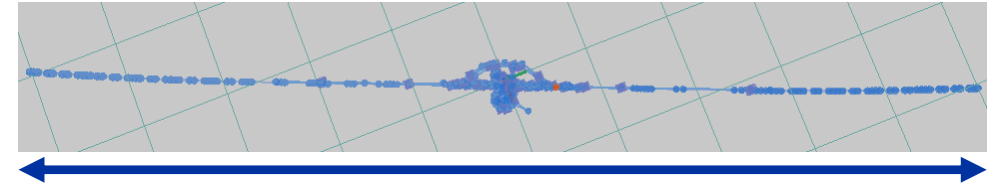
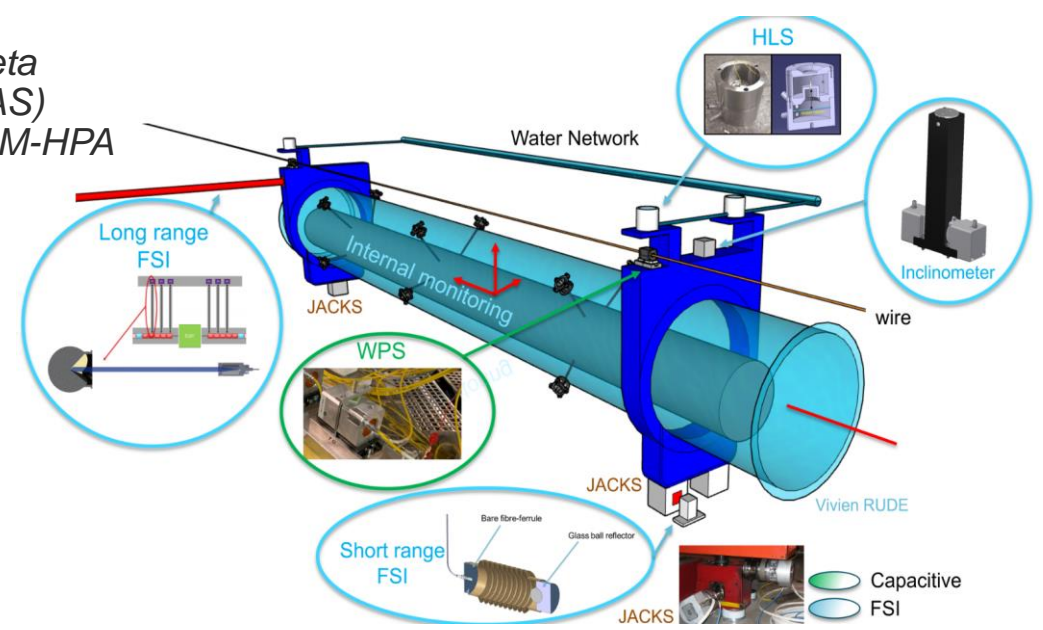


LGC usage

Used daily by CERN Surveyors

- Main adjustment software
- GUI : **SurveyPad** (in-house dev.)
- Files creation and upload via:
 - **GEODE** (web interface to CERN Survey Database)
 - field acquisition software **TSUNAMI**
- Computation core for **Monitoring Systems** (HIE-ISOLDE Cryomodule, LHC Low Beta, etc.)
- Used for **R&D** projects (HL-LHC, FCC, etc.)

HL-LHC Low Beta monitoring (FRAS)
Courtesy: BE-GM-HPA



Open-Source: Motivations?

European Surveying Accelerator Seminars held in 2023 and 2024 (9 facilities).

wish to use and contribute to a common adjustment software based on transparent/documented algorithms

Allow external (physics institutes / university / industry) to use and contribute to LGC.

Potentially have a bigger LGC community to get contributions, bug reporting, improvement ideas, potentially resources, etc. → more use cases and mutual aids!

Develop an open ecosystem of post- and pre-processing tools shareable within the community.

Overall increase LGC quality, transparency and functionality.

Open-Source: What have been done?

Official request to the OSPO in May 2024 to help with the transition

Audit and recommendation under finalisation by the OSPO (contact: P. Elson)

Outreach efforts

- Presentation at the International Workshop on Accelerator Alignment 2024 @SLAC
- Discussions with interested external partners from academia, accelerator surveying groups and industry
- Beginner training session in the pipeline

Binaries distribution (with access to sources) to interested partners for LGC and GUI
ESRF, SOLEIL

<https://gitlab.cern.ch/apc/suofts/processing/LGC2>

<https://gitlab.cern.ch/apc/suofts/interfaces/SurveyPad>



home.cern