Working Group Software
3rd Meeting: LGC Development Perspectives

Francis KLUMB
04/03/2022
WG Software – LGC Development Perspectives

New LGC development team:

Guillaume
Surveying Engineer (Staff, January 2022)

Jürgen
Mathematician, PhD (Fellow, March 2022)

Vasileios
Surveying Engineer, PhD (Temp, April 2021)

Przemyslaw
IT-Engineer (Fellow, April 2021)

Supervision & developments

IT Support (C++, GitLab,...)
WG Software – LGC Development Perspectives

Main orientations (precise development plan not fixed yet!)

- **Maintenance & Consolidation:**
  - Many issues/inconsistencies related to free adjustments
  - Other known issues? Input Data Format simplifications? Complete documentation with more examples?...

- **Support & Trainings**
  - Full 3D calculations for the accelerator components (FRAME, INCLY, DLEV…)

- **New Developments:**
  - Handling new types of observations: HLS (partially done) and WPS.
  - Optimization strategies for monitoring systems (HL-LHC)
WG Software – LGC Development Perspectives

Optimization & Automation strategies for monitoring systems
=> New algorithms and mathematics (non linear predictive model?)

• *Drastically improve calculation time!*

• *Automated analysis and detection of outliers*

• *Export structured output data (serialization)*

Important for the communication with other software or post-processing tools!
General principle (simplified):

\[ X_1 = X_0 + \Delta X_1 \]

Next steps calculation time

\[ X_i = X_{i-1} + \Delta X_i \]

Raising alarm to the monitoring system

Network configuration and measurement conditions unchanged

Acquisition Time

Solution \( X_0 \)

Automated statistical analysis
WG Software – LGC Development Perspectives

Export of structured output data object files (XML/JSON/YAML..)
Structured output data object files (XML/JSON/YAML..)

First C++ design done by Przemyslaw and Sylvain (BE-CEM)

- Serialization methods will be implemented this year for every output data class/structure in LGC
- Documentation

Still under investigation: how to keep information such as variance-covariance matrices?
Structured output data object files (XML/JSON/YAML..)

Communication with other software using LGC results:
- **GEODE**
- **TSUNAMI**

**SURVEYPAD:**
- Easier maintenance of the output data visualization (suppressing grammar rules!)
- Introduce specific data sorting tools
- Graphical renderings based on those structured data (histograms, plots, …)

Opens the possibility to build simple scripts (Matlab, Python, …) to **post-process or visualize LGC data** (ex.: history of selected criteria for monitored data)
Collaboration with IGN is foreseen this year:

- **Comparisons with “Comp3D” Software in terms of:**
  - Input/output data content
  - Reports provided to the user
  - Ergonomic features, usability
  - Calculation results
  - ...

- **First common technical seminar planned in June (2 half days)**
What are your needs or expectations about LGC?