Independent performance monitoring

Peter Buist
Galileo Reference Centre Manager
GRC Mission

- Perform **independent** monitoring and assessment of service provision
- When feasible, assess the compatibility and **interoperability** between Galileo and other GNSS
- Provide service **performance expertise** to Programme
- Support **investigations** of service performance and service degradations
- Archive service performance data over nominal operational lifetime of system
- Integrate **data and products** from EU Member States, Norway and Switzerland (MS)
Independent performance monitoring of Galileo Services

Service Provider
- GSA

Galileo Service Operator
- Contractor
  - Routine / KPI Reporting

Galileo Reference Center
- GSA+Contractor
  - Routine and On-Demand Reporting
KPI Cross-check and Reporting

- GSOp/SDDs/MS products/other GNSS
- GRC products (Core and MS)

**Process Flow:**
- GRC products -> Parser
- Parser -> KPI Comparison
- KPI Comparison -> Comparison report
- Comparison report -> Discrepancy
- Discrepancy -> Investigation
- Investigation -> GRC issue
- GRC issue -> Approved report
GRC Architecture and Operational Concept

Core Facility
- Stand-alone capabilities

MS Contributions
- Data
- Products
- Expertise
GRC Architecture and Operational Concept

• **Fully independent** of the system and of the Galileo Service Operator (GSOp)
  - Both technical solution and operations

• Automatic processes for continuous monitoring and data processing
  - Each Galileo service shall be monitored against a number of Figures of Merit (metrics)
  - Metrics are derived from SDDs (MPLs) and Galileo Service Operator KPIs

• Evaluate basic monitoring parameters for Galileo signals against values specified in Galileo **SiS ICD**

• Perform dedicated campaign-based analyses
  - Also taking advantage of data, products, facilities and expertise contributed by MS
Member States’ Contributions

• 24 organisations from 14 countries

• Including
  • Worldwide network of reference stations
  • Reference products
  • Timing labs
  • Radio telescopes
  • Laser ranging
  • Vehicles, vessels and airplanes
Implementation Approach

GRC V0
- Existing assets
- MS Contributions
- 2017 Q2+

GRC V1
- Core Facility
- MS Contributions
- 2018 Q1
Building Construction

November 2016

May 2017
Building readiness status
Contribution to International GNSS Monitoring

- Authoritative international GNSS monitoring and assessment system to benchmark the performance of available GNSSs (GPS, Glonass, Beidou, Galileo)
- Organized through the International GNSS Monitoring and Assessment Task Force of the United Nations Office of Outer Space Affairs
- Nominated Monitoring Analysis Centre for Galileo is the GRC.
  - European participation was confirmed by letter during ICG in Sochi 2016

NOTE TO THE IGMA TASK FORCE CO-CHAIRS

Dear co-chairs,

With reference to the Call for Participation for the international IGMA-IGS Joint Trial Project I am pleased to confirm our intention to participate.

The nominated Monitoring Analysis Centre (MAC) for Galileo will be the Galileo Reference Centre (GRC) of the European GNSS Agency (GSA). When fully operational, the GRC will carry out the independent monitoring of Galileo performance, based on observation and analysis of the Galileo signals in space. Monitoring of other GNSS is also foreseen. As the GRC core facility is currently under development, initial contributions to the trial project will be coordinated by the GSA under the umbrella of a
Conclusions

• The GRC plays a pivotal role in Galileo’s service provision, providing GSA with an independent system to evaluate the performance of the quality of the signals in space and the Galileo Service Operator.

• The GRC helps ensure that Galileo users are provided with very high-quality signals for use by an array of new navigation applications.

• The GRC has a stand-alone Core Facility and also benefits from expertise and assets from MS.

• The Galileo Reference Centre started monitoring the performance with V0 at a temporary location. V1 is expected to come Q1 2018.

• The European Commission has nominated the GRC as the European Monitoring and Analysis Centre for Galileo, part of a joint project of the United Nations that includes contributions from the United States (GPS), Russia (Glonass) and China (Beidou).
NOW IT’S YOUR TURN
How important is independent performance monitoring for the Galileo Services?

1. Not important at all
2. Slightly important
3. Important
4. Fairly important
5. Very important
In your opinion what is the reason that independent performance monitoring is important? It helps to:

1. Ensure that Galileo users are provided with very high-quality signals
2. Position Galileo (bench mark) relative to other GNSSs
3. Collect essential information for improving the service
4. All of the above
Thank you