Security and PRS
Introduction

- Inputs presented at a meeting with EC-GROW on 22nd February 2016

- Aim of the meeting: Provision of food for thought on a few GNSS applications per main segment to support the definition of a strategy
  - Selection of a few GNSS/PNT applications per main segment, as examples to support the definition of a strategy
  - ~1-month brainstorming process, ~15 experts involved
  - Results presented to be seen as samples of expert opinions
    → Recommendations not intended to be exhaustive
    → Many applications/segments are not addressed, and it is crucial to leave room for those applications as well as for totally new ideas

- Segment addressed: Security and PRS
Security Working Group

- Airbus D&S
- FDC
- Fugro
- NLR
- NSL
- QinetiQ
- SA Catapult
- Sogei
- Thales
Security and PRS

Application examples

Defence

Crisis Management

Energy

Cyber

Border Security & Customs
Security and PRS

Defence (1/5)

The provision of **authentic location, tracking & timing** for **unmanned assets** and **unattended sensors** (to provide assured time, synchronisation and position of observations). This applies to static and mobile assets operating on land, air, sea.
Security and PRS

Defence (2/5)

• Galileo/EGNOS added value:
  - EU sovereign capability for Defence which doesn't rely solely on non-EU capability, although also opens the door for multi-constellation capability to improve accuracy etc.
  - Enables protection of GNSS capability to be in the EU

• Relevant E-GNSS services: PRS
  both using receivers with security modules, and with security modules remoted to a single access server for tracking applications.
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Defence (3/5)

➢ Action 1: Public Procurement & Federation of regional and national user needs

- PRS will be expensive to develop and might be difficult to procure by smaller MS's. Even more so in Defence. The EC should assist the procurement phase by providing some technical assistance and technical specifications, and use EC instruments such as H2020, PPI and Fundamental Elements to help create turnkey solutions that can be used by the military. We suggest making more use of the EDA.

➢ Action 2: Support to R&D (1) – Short-term

- Whilst actions through the GSA FRAME, DISPATCH and PRISMA studies will move R&D much more downstream, they will only indirectly address any military need. A multi-national analysis of defence user needs should be undertaken. This would help the EC to:
  → take account of any critical military requirements,
  → help to rationalise and maybe federate these across the user communities,
  → help smaller MS's benefit from design and manufacture in this domain.
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Defence (4/5)

Action 3: Support to R&D (2) – Short-term

- Whilst threats to general satellite navigation are well known (jamming, interference, spoofing, meaconing, space weather etc.), those specific to military use are less well known outside the bigger EU MS’s. We propose that a multi-national study is undertaken to better understand the threats specific to Defence use of PRS, and to identify potential mitigations. This will assist smaller MS's in planning military use.

Action 4: Demo's & Pilot Projects – Medium-term

- Whilst these will more likely be individual MS's only, military / dual use pilot projects should be encouraged and the EC should continue to fund preliminary developments.

- A major project should be initiated to build and accredit the foundation for a European downstream PRS infrastructure as a key enabler for PRS use, which amongst other benefits will support smaller MS's. This infrastructure should be tailored towards both civil and military use.
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Defence (5/5)

Action 5: International Co-operation – Medium-term

- Multi-constellation GNSS for military use is inevitable, whether it be limited to the EU and NATO or wider. Non-EU countries will apply for PRS. We need to consider an analysis of potential military use by non-EU countries such as NATO, and more widely, how military use by non-EU countries, if allowed, might be controlled. The EC also needs to define an accessible and straightforward process for eligible third nations to get access to PRS.

Expected impact / Benefit for Europe

- Faster and bigger PRS market uptake
- Greater EU industry competitiveness i.e. supports EU industries rather than non-EU.
- Greater EU Defence industry growth
- Improved EU Sovereignty
- Greater global Market access
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Crisis Management (1/7)

➢ **Trusted PNT & tracking with secured comms** for NGO, security, rescue, relief & reconstruction teams during crisis events based on server solutions & autonomous devices. PMR can deliver secondary channel services in addition to supporting the main secured comms function.

➢ **Galileo/EGNOS added value**:
  - Trust, with authentication services
  - Improved availability as signals are less sensitive to interference, and spoofing

And consequently:
  - Improved safety; Improved situational awareness of the crisis team
  - Improvement of law enforcement operations
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Crisis Management (2/7)

Value Chain for PRS receiver application.

- **Chip Manufacturer**
  - Produce PRS chip

- **Receiver Manufacturer**
  - Extend receiver with PRS module
  - Produce safes for safeguarding of PRS equipment

- **Asset Manufacturers**
  - Add PRS receivers to assets (vehicles, goods, etc.)

- **Certification Authority**
  - Test & validation of user req.
  - Certification of assets

- **PRS Authority**
  - Licensing of PRS usage
  - Distribution of keys
  - Audit of applications

- **Marketing & Sales**
  - Product promotion
  - Pricing

- **Service**
  - Customer support
  - Training
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Crisis Management (3/7)

Value chain for PRS server application.

- **Chip Manufacturer**
  - Produce PRS chip

- **Receiver Manufacturer**
  - Extend receiver with PRS module

- **PRS server**
  - Secured environment
  - Processing of PRS signals
  - Provision of trusted positions

- **PRS Authority**
  - Licensing of PRS usage
  - Distribution of keys
  - Audit of applications

- **Marketing & Sales**
  - Product promotion
  - Pricing

- **Service**
  - Customer support
  - Training
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Crisis Management (4/7)

Value chain for OS authentication application.

- **Chip Manufacturer**
  - Produce CS chip

- **Receiver Manufacturer**
  - Extend receiver with authentication module

- **Asset Manufacturers**
  - Add receivers to assets (vehicles, goods, etc.)

- **Certification Authority**
  - Test & validation of user req.
  - Certification of assets

- **CS Server**
  - Generation of CS data
  - Distribution of public keys

- **Marketing & Sales**
  - Product promotion
  - Pricing

- **Service**
  - Customer support
  - Training
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Crisis Management (5/7)

- Relevant E-GNSS services:
  - PRS authentication as crisis teams are public bodies and could potentially gain access to PRS.
  - PRS authentication via a remote server (which could be operated by a crisis team itself).
  - OS authentication and Commercial Service.
    Could cost less and ease the operational implementation, especially for crisis team not used to working with classified information/keys (e.g. fire brigade) or not authorized.
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Crisis Management (6/7)

➢ Action 1: User Group – Medium-term
   ▪ Establishment of user groups to clarify user requirements of different crisis teams (police, fire brigades, etc.)
   ▪ Stimulate the establishment of **working groups within countries** (short-term) **and cross-border**

➢ Action 2: Standardization & Certification – Short-term
   ▪ Development of standards, Certification authorities, Testing facilities. Test facilities should be wide spread over Europe.

➢ Action 3: Pilot projects – Short-term (Cross-border: Medium-term)
   ▪ Pilot projects, involving crisis team, and **field testing**, and relevant governmental bodies. Might consider support to the development of **PMR equipment with Galileo PRS and remote PRS server**
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Crisis Management (7/7)

➢ **Action 4 : PRS management procedures – Short-term**
  - Support / coordinate procedure establishment for PRS management
    (examples: provision of PRS keys, audits, group management, etc.)

➢ **Action 5 : Pilot Project – Long-term**
  - Pilot project for the definition of new services with the support of EU
    financial instruments. MRD requirements input to GNSS evolution.

➢ **Expected impact / Benefit for Europe**
  - Market growth
Safety critical, dynamic positioning of offshore drilling rigs and vessels using GNSS guided thrusters (possibly as one of a number of independent positioning systems). Has direct read across to other offshore activities such as diving, ship to ship transfers, construction etc.

- Station keeping of offshore drill rig using Dynamic Positioning
- Other offshore or marine vessel station keeping using Dynamic Positioning where a spoofing attack could be fatal
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Energy (2/4)

Galileo/EGNOS added value:

- Ensuring that GNSS is **reliable** enough to remain a trusted and preferred positioning system also under adverse conditions in the future as GNSS attracts more attention also among hackers and criminals. It is today already the most **economic** and **accurate** system, and the trust may be added with authentication.

And consequently:

- Protection of safety critical operation.
- Lowering risk of accidents that may cause injuries to equipment, production time, environment and human life as well as substantial economic loss.
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Energy (3/4)

➢ Relevant E-GNSS services: Galileo CS authentication service

➢ Action 1: – Clarify PRS (vs CS) eligibility – Short-term
  ▶ Evaluate and communicate what category users can expect to have access to PRS and who cannot so that it becomes clearer how the market may be split between PRS based services and Galileo CS authentication services

➢ Action 2: – Open GNSS Risk analysis study/awareness – Short-term
  ▶ Initiate a study of likely risks and scenarios involved in use of Open GNSS services for handling valuable assets or performing critical operations. Include all threats such as interference, jamming, spoofing, space weather, … in order to create strong collateral and evidence to engage the user community, and to demonstrate the benefits of robust E-GNSS services
  ▶ A pilot project might be undertaken to demonstrate the possible severity of such threats, to explore possible innovative mitigations, and to demonstrate the value of Galileo CS.
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Energy (4/4)

Action 3: Regulation – Medium-term
- Development of EU directives on security of GNSS positioning in critical marine operations

Expected impact / Benefit for Europe
- Faster and bigger Galileo CS market uptake
- Development of new markets
- Development of value added services
- Reducing uncertainty in innovation
Security and PRS

Cyber (1/4)

- High accuracy legal time stamps for event logs, especially for determining sequences of events leading to a crisis

  - Challenge - the location and time of remote access into IT systems is vulnerable and can be spoofed/manipulated. The proposed solution would ensure that any/all remote users are monitored in terms of location of point of entry as well as all activities are time stamped.

  - Provision of location/time authentication services plus the development of new user equipment and services that utilize such capabilities
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Cyber (2/4)

- **Galileo/EGNOS added value** :
  - Provision of **location authentication** as well as **high precision time stamping** of activities

  allowing
  - Development of more secure accessibility from remote sites
  - Protection of critical infrastructure and services

- **Relevant E-GNSS services** :
  - PRS and Authentication services for provisional of legally admissible event reports
Cyber (3/4)

➤ Action 1: Demonstration Projects – Short-term
- Demonstration of the value within critical sectors (i.e. remote access to patient records, SCADA etc.). Identification of early beneficiaries, potentially looking at EU SatCom players (Inmarsat, Avanti, Hispasat, Eutelsat, SES ASTRA etc...)

➤ Action 2: Standardisation (EU, Global bodies...) – Short-term
- Establish partnerships with key international players to develop de-facto standards and to ensure admissibility in legal proceedings.
- Experimentation and validation of business case through pilot projects..

➤ Action 3: Industry groupings – Medium-term
- Development of user forum and working groups
- Availability of standards (technology agnostic)
Cyber (4/4)

➢ Action 4: Identify champions – Medium-term
- Integration into early adopters systems and services

➢ Action 5: Government as a first customer – Long-term
- Wide spread integration into user authentication methods and tools for remote access. Preferably EU industry players

➢ Action 6: Promotion and further projects/studies
- Development of new markets for (i) GNSS legal service (ii) user equipment (iii) applications and services that utilise the new capability
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Border Security

Applications addressed
- Customs Operations and Interport Management
- Automatic Driving Cargo and Trucks Systems and Unmanned Navigation for Intermodal Freight Transport Optimisation
Security and PRS

Border Security – Customs Operations and Interport Management (1/3)

- Automatic Customs Clearance and Interport Management: implementation of efficient Automatic Customs Procedures System at European and International Level through GNSS based Freights Tracing and Tracking
- Border Guards Vehicle Management (Military application, Galileo PRS only)

- Galileo/EGNOS added value:
  - Transport Optimisation; reduction of pollution, reduction of freight parking within Interport Warehouse; reduction of Frauds; law enforcement
  - with Authenticated Services for preventing Frauds and assuring an Efficient Freights Movements Tracing and Tracking

- Relevant E-GNSS services:
  - OS Authentication for Antifraud and Anti-spoofing
  - Galileo CS
  - Galileo PRS Remote Server
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Border Security – Customs Operations and Interport Management (2/3)

➢ Action 1: Pilot Project – Short-term
  ■ Development of Pilot Projects on
    → 1 - Customs Procedures through GNSS, involving National Customs and DG-TAXUD
    → 2 - supporting the development of PMR based tracking and tracing systems with Galileo (PRS remote server or CS)

➢ Action 2: User Forum – Short-term
  ■ User Forum on how EU GNSS Services might bring about transport efficiencies and reduction of transaction costs, involving all the Value Chain Stakeholders
  ■ Liaison btw National Border Guard bodies and World Customs Organisation

➢ Action 3: Regulation – Medium-term
  ■ Introduction of GNSS Tracing and Tracking in Customs Operations
  ■ Involvement of EC DG-TAXUD for the implementation of new directives
Border Security – Customs Operations and Interport Management (3/3)

• Action 4: International Agreements – Long-term
  - International Agreements for the implementation of a Worldwide systems for Freights Movements Tracing and Tracking (World Customs Organization and CSI)

• Action 5: Regulation – Short-term
  - International regulation on the proof of tracking and tracing logs that makes a case for court valuable once Galileo CS and PRS are used for enforcement purposes

• Expected impact / Benefit for Europe:
  - PRS market growth
  - EU autonomy
  - Industry competitiveness
  - Increased EU industry market share
Security and PRS

Border Security – Automatic Driving Cargo and Trucks Systems and Unmanned Navigation for Intermodal Freight Transport Optimisation (1/3)

- Freights movements Tracing and Tracking within Interports and Warehouses. This also to cover for the so called environmental areas in cities and timeframes in cities when specific HGV types are allowed.

- **Galileo/EGNOS added value:**
  - Huge Transport Efficiency and improved Safety; reduction of Transport and Freight Costs; Costs huge pollution reduction
  - with High Precision and High Integrity Services through EGNOS/EDAS and Local Augmentation integration

- **Relevant E-GNSS services:**
  - OS authentication, Commercial Services, CS, EGNOS, EDAS
Border Security – Automatic Driving Cargo and Trucks Systems and Unmanned Navigation for Intermodal Freight Transport Optimisation (2/3)

- **Action 1: User Forum – Short-term**
  - Establishment of a Cross-Application User forum for the implementation of High Precision and High Integrity Local Augmentation at System level

- **Action 2: Pilot Project – Short-term**
  - Development of a Pilot Project on Efficient Transport Implementation at European Level with the involvement of all the application sectors stakeholders (Trucks and Ships Manufacturers, EC DG-Move, High Precision and High Integrity Augmentation SP, Transport Operators)

- **Action 3: Regulation – Medium-term**
  - Development of EC Directives for the implementation of certified Automatic Driving Systems
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Border Security – Automatic Driving Cargo and Trucks Systems and Unmanned Navigation for Intermodal Freight Transport Optimisation (3/3)

• Action 4: Customs Procedures – Medium-term
  - Liaison with Customs Procedures Simplification activities and Regulation updates at National and International level

• Expected impact / Benefit for Europe:
  - Market growth
  - European industry competitiveness