Location Based Service, LBS
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: LBS – IoT/M2M – Big Data
LBS Working Group

- Catapult
- FDC
- GMV
- NSL
… location data
… an enabler for numerous enterprise, consumer and public safety services. … fraud management and secure authentication services. Operators also leverage location data for advertising and analytical applications.
## LBS Topics Addressed

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<td><strong>Wearable &amp; Embedded Devices</strong></td>
<td>Potential for European players to participate as hardware / systems providers in novel and rapidly growing arenas (c.f. Smart phones)</td>
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<td><strong>Service solutions based on LBS</strong></td>
<td>Back office services to address specific communities e.g. advertising, location-based insurance, public transport, community workers, health applications, aging population, location-based gaming, …</td>
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<td><strong>Applications (Apps) development</strong></td>
<td>Lucrative market for those successful building Apps for existing and future hardware platforms for various markets.</td>
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<td><strong>Location &amp; Time - Authenticated services</strong></td>
<td>Special LBS subset, using authenticated E-GNSS signals. Important for Transactions and Evidential use. Special value brought by EGNSS.</td>
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Wearable & Embedded Devices (1/8)

- Potential for European players to participate as hardware / systems providers in novel and rapidly growing arenas. May be more attractive than addressing Smartphones where non-European incumbents dominate. This can include ultra-miniaturised technology as well as MCM-type devices.
Wearable & Embedded Devices (2/8)

- **Galileo/EGNOS added value:**
  - Improvement to performance (availability, accuracy) especially for Urban areas through multi-GNSS-systems Rx (GPS + Galileo + ...).
  - Galileo Pilot Tone may help positioning in difficult environments \(\text{(implementation in Rx unproven)}\).
  - Multi-Civil Frequency may improve performance \(\text{(implementation in Rx unproven)}\)
  - EGNOS/EDAS improves GNSS performance esp. accuracy

- **Relevant E-GNSS services:**
  - Galileo OS
  - EDAS (EGNOS) improves some performance aspects.
  - Potential role for CS? \(\text{(commercial feasibility TBC?)}\)
Wearable & Embedded Devices (3/8)

Action 1: Establish robust portfolio of “EGNSS Benefits” – Short-term

- Generate open portfolio of benefits
- Provide supporting evidence
- Ensure industry "buy-in" rather than State "sell"!
- EC should support and collate evidence through State, Industry, and Academic studies, theoretical works, lab studies, and implementation tests. Publication in open media should be encouraged
Wearable & Embedded Devices (4/8)

Action 2: Create Support Facilities – Short-term

- Support creation of technical, development, integration, & demonstration Centres, Facilities, Environments & Services
- These shall support European LBS Device Developers focused on (i) Wearables & (ii) IoT/Embedded domains
- Particular focus on items that SMEs struggle to access
- Particular focus on high-growth potential elements
- Collaborative effort
Wearable & Embedded Devices (5/8)

Action 3: Develop Roadmap for Implementation – Short-term

- Create Roadmap for Development & Implementation of (i) Wearables and (ii) Embedd / IoT
- Joint initiative with Companies already operating in Markets
- Solutions generally include integration with non-GNSS technologies (e.g. comms, monitors, …), and Roadmaps meaningful to Industry are multi-element
- Huge growth potential(s) for the right type of company(ies) focused on user needs (rather than State contracts). Very serious challenge to meaningfully engage them – concerns on IP, State interference when State is not their customer, spying on their innovations from rivals, fear of lock-in to one course of action when rapid reaction may be needed for changing markets)
**Wearable & Embedded Devices (6/8)**

*Action 4: Develop Pilot Projects – Short/Medium-term*

- Develop Pilot Projects for Implementation with (i) Wearable / (ii) Embedded Device Mass Market Co's to (a) prove performance benefits, (b) cost-effectiveness, and (c) for market awareness in sectors
- Concerns as Action 3
Wearable & Embedded Devices (7/8)

• **Action 5: Assess Value of Specific Development Support Actions – Short-term Assessment of Opportunity**
  - Short term action needed to credibly assess the potential for EC-supported activities addressing specific implementation aspects where EU industry could make a difference on a World stage
    - E.g. A: Integration of positioning with comms and multi-sensors
    - E.g. B: Integration of EGNSS with other multiple technologies for indoor / difficult environments,
    - E.g. C: Seamless transition zone,
    - E.g. D: "Always On" techniques.

• Challenge to **focus on** real development opportunities where rapid High-TRL value can benefit EU Industry and **Avoid**: (a) “pipe-dreams”, (b) battles that are already lost, (c) lobbying for EU funds that don’t support real market growth, (d) getting stalled in continuing Research, (d) low-return opportunities, …(many more pitfalls!)
Wearable & Embedded Devices (8/8)

- **Action 6**: Implement Specific LBS Development Support Actions – Medium-term
  - Implement support actions on the identified priority areas from Action 5 in (i) Wearables and (ii) Embedded / IoT sectors
  - Immediate need is to reserve/secure substantial funding for allocation when priorities are appropriately justified

- **Expected impact / Benefit for Europe**
  - LBS (Wearable) market growth – multi-€B annual revenues
  - LBS (Embedded Device) market growth – multi-€B annual revenues
  - EU industry competitiveness
  - Increased EU industry market share
Service solutions based on LBS (1/5)

- Use mass-market hardware from others, build back office services to address specific communities (e.g. advertising, location-based insurance (noting that the first incarnation of this is for cars but that other communities, e.g. healthcare may evolve), public transport, community workers, health applications, aging population, location-based gaming, ...)

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Service solutions based on LBS (2/5)

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Relevant E-GNSS services:
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Service solutions based on LBS (3/5)

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➢ Action 2 : Create Support Facilities – Short-term
  ▪ Support creation of technical, development, integration, & demonstration Centres, Facilities, Environments & Services
  ▪ These shall support European LBS Service Developers
  ▪ Particular focus on items that SMEs struggle to access
  ▪ Particular focus on high-growth potential elements
  ▪ Collaborative effort
Service solutions based on LBS (4/5)

- **Action 3**: Develop EC Regulation on Location-based Advertising – Medium-term
  - Develop EC regulation on Location-based advertising (taking account of EU addressable market potential and Actors as well as societal protection e.g. Personal Data / Privacy / …)

- **Action 4**: EC Directives on Certified Services (c.f. eCall) – Medium-term
  - Development of EC Directives for the implementation of certified Services (c.f. eCall)
  - NB: Avoid duplication of LBS Authenticated services (later!) – could be common item or common approach
Service solutions based on LBS (5/5)

Expected impact / Benefit for Europe

- LBS (Services) market growth – multi-€B annual revenues
- EU industry competitiveness
- Increased EU industry market share.
LBS Applications (1/6)

- Lucrative market for those that become successful building Apps for existing and future hardware platforms for various markets. e.g. location-based insurance, Health, Social apps., Transport esp Integrated Transport, aging population, location-based gaming, …
**LBS Applications (2/6)**

- **Galileo/EGNOS added value:**
  - Improvement to performance (availability, accuracy) especially for Urban areas through multi-GNSS-systems Rx (GPS + Galileo + …).
  - Galileo Pilot Tone may help positioning in difficult environments
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- **Relevant E-GNSS services:**
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**LBS Applications (3/6)**

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  Publication in open media should be encouraged
**LBS Applications (4/6)**

- **Action 2: Create Support Facilities – Short-term**
  - Support creation of technical, development, integration, & demonstration Centres, Facilities, Environments & Services
  - These shall support European LBS Application Developers
  - Particular focus on items that SMEs struggle to access
  - Particular focus on high-growth potential elements
  - Collaborative effort
Action 3: Assess relevance of EC Directives &/or Regulation for Certification of Applications – Medium-term

- Focused study with LBS Application developers and stakeholders to assess relevance of EC Directives &/or regulation for certification of Applications.
- Shall confirm whether this is a valid mechanism to stimulate the market or whether State-supported Apps undermine an already active development arena?
- Shall identify which market sectors this could be relevant for (e.g. Health, Finance-related, …)
LBS Applications (6/6)

- Expected impact / Benefit for Europe
  - LBS (Applications) market growth – multi-€B annual revenues
  - EU industry competitiveness
  - Increased EU industry market share
LBS Location & Time - Authenticated services (1/6)

- Special subset of LBS that includes authentication, part of which should be derived from the GNSS signals (e.g. might be derived from networked PRS or from other signals with authentication).
- Important for Transactions, also for Evidential use.
- Special value brought by EGNSS.
LBS Location & Time - Authenticated services (2/6)

- **Galileo/EGNOS added value:**
  - Authentication services support protection against spoofing-type attacks, adding credibility (reliability? traceability? evidential quality?) to the GNSS timing product and/or GNSS positioning product. May derive from Authenticated Galileo OS or CS. (PRS challenging if military-grade approach).
  - Improvement to performance (availability, accuracy) especially for Urban areas through multi-GNSS-systems Rx (GPS + Galileo + ...).
  - Galileo Pilot Tone may help positioning in difficult environments.
  - Multi-Civil Frequency may improve performance.
  - EGNOS/EDAS improves GNSS performance esp accuracy.
LBS Location & Time - Authenticated services (3/6)

• Relevant E-GNSS services:
  - Authenticated OS and Authenticated CS.
  - EDAS (EGNOS) might also be relevant for SIS "Integrity" (not to confuse with authentication).
  - (PRS may be possible for certain markets subject to Security & CPAs)

• Action 1: Establish robust portfolio of “EGNSS Benefits” – Short-term
  - Generate open portfolio of benefits
  - Provide supporting evidence
  - Ensure Stakeholder (industry / user / other) "buy-in" rather than State "sell"!
  - EC should support and collate evidence through State, Industry, and Academic studies, theoretical works, lab studies, and implementation tests. Publication in open media should be encouraged
LBS Location & Time - Authenticated services (4/6)

**Action 2: Create Support Facilities – Short-term**
- Support creation of technical, development, integration, & demonstration Centres, Facilities, Environments & Services
- These shall support European LBS (PNT) Authenticated Service Developers
- Particular focus on items that SMEs struggle to access
- Particular focus on high-growth potential elements
- Collaborative effort

**Action 3: Develop Regulation on proof of position / time data logs – Medium-term**
- Develop National/EU/International regulation on the proof of positioning and / or timing data used for special purposes
  - Tracking & tracing, Legal enforcement, Financial transactions, Medical logs, …
- Make case for “Quality of data” used for these purposes and supported by authenticated GNSS
LBS Location & Time - Authenticated services (5/6)

➤• Action 4 : Develop Robust GNSS Spectrum Protections – Short-term
  ▣ Develop Europe-wide protection, monitoring and enforcement policies, standardisation, and implementation capabilities
  ▣ National and EU level, and linked to International Policy
  ▣ Support Robustness of "high-value" authenticated services that are otherwise potentially vulnerable to “low-cost” service denial.

➤• Action 5 : Support industry development of solutions for Authenticated GNSS applications – Medium-term
  ▣ Support industry development of
    → Solutions for Authenticated GNSS applications
    → Spectrum monitoring
    → Support solutions for spectrum enforcement
  ▣ Initiate focused Actions under appropriate Entities: ESA, GSA, …,
  ▣ Support National Initiatives, Actions, and Entities in this domain
LBS Location & Time - Authenticated services (6/6)

- **Action 6**: Support development of Standards, Certification, and Testing Facilities for Authenticated GNSS applications
  - Support development of Standards and Certification for Authenticated Services
    - Legal Enforcement / Financial transactions / Medical Services / …
  - Support development of Accredited Test Facilities for required Authenticated GNSS applications

- **Expected impact / Benefit for Europe**
  - LBS (Authenticated Services) market development and growth
  - EU industry competitiveness
  - Increased EU industry market share.
  - Better, more reliable position & time for legal / financial / medical / …
  - EU "Leadership" in these sectors
  - Recognition of EGNSS (Authenticated Services) Value