Application of Satellite Navigation & Communications in the View of the Czech Industry

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Content

- Digital World – quite vulnerable
- Global Navigation Satellite Systems
- Satellite Communications
- Intelligent Transport Systems
- ITS&S Czech Republic
- Galileo Opportunities & Success Conditions
We live in a Digital World, that is all around.
Measures of the digital world

- **Computing** = **GB** (usual PC)
- **Electronic Communications** (SDH: STM-16 = 2488.32 Mb/s = **2.5 Gbps**)
- **Wireless Communications** (3G – 1.8GHz, DVB-S - **12 GHz**)
- **1 GHz, 1 Gb** => **1 ns** (length of bit, pulse)

How reliable?
„Glory and Misery“
of the digital world

A little Example?
We fully depend on a production and distribution of the precise time and frequency!

Czech Republic
Czech etalon of time and frequency

- Primary network reference time (Academy of Science and Telefónica, 1993) – cesium generator
  - Synchronisation with International Bureau of Weights and Measures (BIPM) – **GPS**, 0,1 ns
  - Spare time generator = **GPS**

- Time and frequency distribution
  - Terrestrial **private networks** – Telefónica O2 CZ (former state owned telco incumbent)
  - Space technologies segment - GNSS: GPS, GNSS
Satellite Navigations: what is really critical?

We all depend on a digital world

Czech digital world depends on a technology, that is out of public/state control.

European digital world depends on technologies out of the European control.

We should not ignore this fact, may push for change.
European Satellite Navigation Future

- **History**
  - Year 1973: NAVSTAR (NAVigation Satellite Timing And Ranging global positioning system)

- **Present time**
  - „their“ GPS, „their“ Glonass
  - „our“ Galileo

- **Our Tomorrow**

Czech Republic
GNSS in Economy

- **Time & Frequency:**
  - electronic communication networks & media
  - energy production, transmission & distribution
  - industry & manufacturing – regulation, management

- **Geodetic receivers**
  - GIS and construction

- **Navigation receivers**
  - and their integration in many applications of the whole economy
GNSS

User terminals

- User GNSS functionality
  - Precise time and frequency
  - Precise position
- GNSS receivers are not universal, but specialized according to their purpose.
  - Receivers for time synchronization
  - Navigation receivers – military & civil (land, maritime, aircraft, space navigation),
  - Geodetic receivers (geodetic measurements, GIS)

This must be taken into the account when any architecture, system, services or application integration is considered.
Satellite communications
Satellite communications

History
- **1945**: Arthur C. Clarke: "Proposed to use satellites for communication".
- **1957-63**: experimental satellites (ECHO)
- **1965**: INTELSAT Early Bird (Intelsat 1)
- **1971**: INTERSPUTNIK
- **1978**: EUTELSAT, TELSTAR
- **1980**: INMARSAT
- **1990**: regional systems
- **1995 – 2000**: big success of GSM and fibre optical networks
  - Developed in the 1990s, it decelerated the development of satellite communications.

Fixed networks
- INTELSAT, GEO, max. 100 Mbit/s
- EUTELSAT, GEO, max. 55 Mbit/s
- Astra BBI, GEO, max. 38 Mbit/s
- INMARSAT, GEO, max. 32 kb/s
- DirecPC, GEO, max 3Mb/s
- New ICO, MEO max. 384 kb/s
- Astrolink, GEO max. 110 Mb/s
- SpaceWay, GEO, 108 Mb/s
- Euro SkyWay, GEO, 32 Mb/s
- Teledesic, LEO 64 Mb/s
- Private satellites/VSAT networks

Mobile services
- **1st generation**: Inmarsat & Euteltrack
- **2nd generation**: IRIDIUM, Globalstar, Thuraya
- **3rd generation**: Inmarsat R-BGAN, S-DBM (144kbps), S-UMTS systems

? Time of change
## Satellite vs. Terrestrial communication opportunities

<table>
<thead>
<tr>
<th>Satellite Communications</th>
<th>Developed, urban regions</th>
<th>Sparsely populated r.</th>
<th>Low developed regions</th>
<th>Terrestrial Communications</th>
<th>Developed urban regions</th>
<th>Sparsely populated r.</th>
<th>Low developed regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entertainment &amp; Media Broadcasting</td>
<td>Mass DVB-S</td>
<td>Mass DVB-S</td>
<td>Yes</td>
<td>Mass DVB-T</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fixed communications</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>xDSL Fibre</td>
<td>Wireless Broadband</td>
<td>Microwave, P-P</td>
<td>2,5G</td>
</tr>
<tr>
<td>Mobile communications</td>
<td>No</td>
<td>S-UMTS</td>
<td>Yes</td>
<td>3G/4G T-UMTS</td>
<td>2,5G-3G</td>
<td>2,5G</td>
<td>2,5G</td>
</tr>
<tr>
<td>Special appl. (military, rescue, recov.)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>TETRA TETRAPOL</td>
<td>TETRA TETRAPOL</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Aircraft communications</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>
We live in a Digital World, that has been integrated already.

Let’s improve the functions to achieve better:

safety & quality of people’s life and clean environment.
- **Transport telematics (ITS)**
  
  integrates telecommunication and information technologies (ICT) with transport engineering in order to optimize transport and forwarding processes.
  
  It is an instrument of a sustainable transport in Europe helping to better economy, ecology and safety.
Innovating ideas for practice

- **Intelligent Service**
  - On-line Traffic management
  - Co-modality
  - Smart logistic
  - Travel assistance
  - Safety services (like E-Call)
  - Security
  - Infotainment

- **Intelligent Infrastructure**
  - Sensors, actors
  - Visualisation
  - Beacons & Gates
  - GNSS infrastructure
  - Control & Management systems

- **Intelligent Vehicles**
  - Wide range of advanced automotive electronics
  - V2V, V2I on-board EQs
  - Eco-driving, trip planning
  - Security & Safety features
About
ITS&S Czech Republic

- ITS&S CZ (Sdružení pro dopravní telematiku CR) is a **successful sector cluster**
- in the area of transport telematics with a multiyear tradition
- Representing Czech Transport Telematic Industry in the Czech Republic and also abroad

- Founded 2000
- **75 companies**, institutions on board
- Representatives with a legal power: president and Vice-president: prof. Miroslav Švítek, Roman Srp
- 3 other presidium members
Structure
ITS&S Czech Republic

- Public sector: Prague city hall, Road & Highway directorate
- Universities, R&D: CTU Prague, CDV, UDI, Telematix
- Domestic consulting: KPM Consult, BABTIE, PBA, TRANIS, TECHNOLOGIES & PROSPERITY
- System integrators: PVT, XT Card, ČD Telematika
- Transport operators: Prague, Brno
- Car manufactures: Škoda Auto
- Domestic suppliers: AŽD Praha, CEDA, Camea, Cross, ELTODO, FCC, Mikroelektronika, Princip, Spell, VARS, Značky Praha
- International corp.: Alcatel, Kapsch, Navteq, Siemens
- Telco: O2 Telefonica, Radiocomunications, T-Mobile CZ
- Construction comp.: Metrostav, VIS
Representing
Czech Telematic industry over Europe

- **Sensors & actors:** gate crossing signals, cameras, active and passive detectors, radar
- **Communications:** GSM-R, GSM, GPRS, EDGE, DSRC, RFID, WIMAX, CALM
- **Positioning:** GPS, Glonas, Galileo, EGNOS, gantry systems
- **Data processing:** GIS, billing, management, expert systems
- **End user devices:** on-board units, chip-cards, user terminals
- **Services:** technical, financial consulting
Priorities

- **Promote** members’ activities over Europe
- **Educate** and train ITS professionals and users
- **Support** new associations in Eastern Europe, 2007
- **Co-operate** with international organizations (EC, ERTICO, ITS national platforms)
- Projects support via **working groups**
- Strategic marketing, product development and **co-ordination** of member’s projects outside the Czech Republic

**Action samples**

- Education of domestic market
- Czech industry promotion in Slovakia & Bulgaria
- Lobby & media support of electronic hybrid tolling principles
- Interoperability of electronic ticketing in public Transport in the CZ
- **Supporting Galileo project in the CZ**
Galileo opportunities

EU/Czech Republic
- Europe owned global timing & positioning & com. infrastructure
- Fulfill high demand on precision, integrity and availability
- Shared infrastructure under international control
- **No dependence on the USA and others…**
- Employment
- Economic growth

Czech Industry
- Continue in the Czech industry tradition
- **Participation on R&D, deployment and operation the of GNSS**
- Development & production of GNSS user segment
- GNSS integration over the Czech economy
- Export of the products and services
General Conditions of Czech Industry Success in Galileo

- Active involvement of national governments on an international level
- Have a common understanding within industry
- Integration of the national industry (no fragmentation any more!)
- Set up an intensive co-operation between industry & state administration
- Empower the role of professional associations
- Looking for partners abroad, establish cross border co-operations
- Support international networking
- Develop new marketing strategies for Galileo to obtain a broad public support
- Efficient public relation policy
Looking forward to our co-operation!

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