Regulation of RTK Services in Denmark

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Outline

• Background
• Norm for RTK-services
• Recommendations on Good GNSS survey practise
• The process
RTK – Real Time Kinematic

• High accuracy GNSS positioning in real time
  – RTK data is often transmitted to users from an RTK service provider

• Areas of application:
  – Land surveying
  – High precision navigation
  – Agriculture
  – Offshore surveying
  – etc.
National Survey and Cadastre - Denmark

- Is a government organisation under the Ministry of the Environment

- National authority for maps, charts, and geo-data, and for the spatial infrastructure for eGovernment in Denmark

- Approximately 300 employees
Denmark

• Area is about 1/3 the size of Georgia

• 5 million people

• Lots of RTK-users
Coordination and regulation

• The National Survey and Cadastre is responsible for coordination of activities related to mapping and surveying in Denmark

• Also responsible for development and operation of the Danish Cadastre, and for laws and regulation of cadastral land surveying
  – Including requirements to procedures and documentation for GNSS based cadastral surveying
RTK in Denmark

• In Denmark, RTK-GNSS positioning is used as a very important 'tool' for most mapping and land surveying

• The development is driven by two competing companies, both providing nationwide RTK-services in Denmark
  – Based on Trimble and Leica solutions respectively

• Denmark was (probably) the first country with a nationwide RTK service
  – First nationwide service in 2001
Regulations of GNSS services

• Regulation of GNSS services is carried out:
  – at sea, by IALA and national authorities
  – in the air, by ICAO and national authorities

• No previous Danish regulation of positioning and navigation on land
  – neither for high accuracy applications (surveying)
  – nor for low accuracy applications (vehicle navigation)
Norm for RTK services, purpose

- **Purpose:**
  To ensure quality of performance for *public* land survey activities

- Because the quality of surveying is of vital importance for the society (infrastructure, mapping, construction works etc.)

- The law of the National Survey and Cadastre provides the opportunity to introduce norms and standards for public surveying and mapping
Norm for RTK services, content

- The norm for RTK services focuses on:
  - Accuracy
  - Integrity
  - Continuity
  - Availability

- With RTK services for land surveying, there are no safety of life issues
  => weaker requirements than for air applications
Norm for RTK services, content

• Requirements to the RTK service provider with respect to:
  – Documentation of coverage area
  – Quality of coordinates for reference stations
  – Obtainable user accuracy, horizontal and vertical
  – Monitoring of accuracy and integrity
  – Distribution of warnings and error messages
  – Availability on weekdays at 98%
  – etc.
Use of Norm for RTK services

• Registration of property boundaries in the cadastre
  – If land surveying is carried out using RTK GNSS, coordinates will be accepted only if an RTK service provider complying with the norm has been used

• It is further envisioned that land survey activities funded by public authorities will require RTK services complying with the norm
Good GNSS survey practise

• Quality of positions determined by RTK is also dependent on qualifications of the user
  – But no education is necessary to use the equipment

• Therefore a set of recommendations to be followed by RTK-users have been developed

• Purpose is to reduce the risk of poor quality caused by ’human errors’
Good GNSS survey practice

- Examples of good GNSS survey practise:
  - Always perform control surveys
  - Be aware if surroundings provide much multipath or signal blockage (urban and forest areas)
  - Be aware during poor DOP conditions
  - Be aware if only 5 satellites are visible
  - Be aware if initialisation is slower than ‘usual’
  - Only use positions based on fixed solutions (no float or DGPS solutions)
The process

• Norm for RTK services will be effective this fall

• The two year long process included:
  – Dialog with existing RTK service providers in Denmark
  – Dialog with the National Land Survey of Sweden
  – Dialog with RTK users in Denmark
  – Dialog with layers
  – Hearing with a large number of organisations including universities, government organisations, and professional associations
Discussion

• The “Norm for RTK Services” and “Recommendations for Good Survey Practise” are new initiatives in Denmark
  – Lessons have been learned during the process

• A professional relationship between RTK service provider and user / customer is still required
  – for instance with respect to liability and pricing