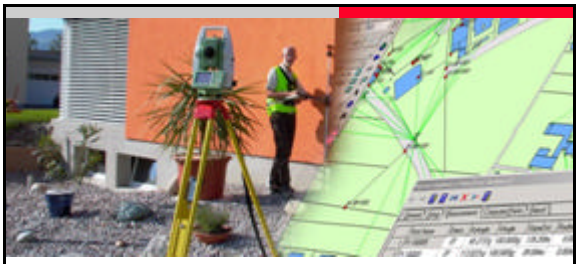
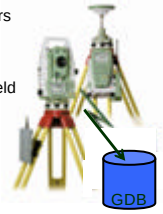


Mobile GIS for Surveyors and GIS Professionals Working for Cadastral and Mapping Agencies

Johannes Hotz

Mobile GIS
Overview

- Geodatabase gets close(r) to Surveying Sensors
- Need of more, better and accurate data
- Bring the office GDB into the field – enabling field forces with much more know-how
- All data stored in one system



Mobile GIS
Dominated Trends in mobile GIS

The trends of mobile field systems are dominated by:

- Wireless technology between sensor and TabletPC,
- Move to data acquisition, go away from simply collect X, Y, Z
- Field2Finish solution
- Quality and Completeness control in the field
- Seamless dataflow between office - field - office
- No redundancies in data and workflows
- With the approach of providing the entire geodatabase in the field, field crews can react on changing conditions
- For survey crews the GIS is a "silent" partner

Mobile GIS
GIS in the past

- The operation of GIS in its initial years was largely restricted to technically skilled operators.
- Highly trained GIS professionals did everything from building the database, scanning paper maps.

The role changed ....

- Nowadays, GIS is a centralized information system – rather than a useful cartographic tool like CAD.
- GIS is becoming a key component of business systems as a whole.
- An administrative role still exists, but has been changed in the past (Data Model Definition, Defining and allowing access rights, Managing check in/out processes)

Mobile GIS
Integration of field staff?

- In these days, GIS reaches many people within an organization, but the management and operation of GIS is still restricted to those within an office environment!
- Field workers are still required to return to their office to utilize or modify data that is managed and maintained within the enterprise database.
- With the current approach, field crews cannot react on changing conditions due to missing information in the field. What is the possibility to react on changing conditions without having all needed information available in the field?

Mobile GIS
Streamlined workflow

- With the streamlined workflow of mobile GIS, survey crews, emergency workers, inspectors, maintenance teams, and many other field workers should have real-time access to the enterprise data they require to do their job.
- Furthermore geographic data isn't only geometry, it is geometry linked with many attribute information. Leica MobileMatriX enhances this model with – the highly important - quality information. Who is these days not interested in the quality and reliability of his data?

Mobile GIS?

Multi-Sensor GIS

- As listed above, one of the key elements of a mobile solution is the interaction with a variety of different sensors. What kind of sensors should be used in order to fulfill customer's needs?
  - GPS
  - Total Station
  - Level
  - Laser Distancemeter
  - Tape
  - Other sensors?







Available computations

Survey computations are directly performed

Sensor intelligence is moved from sensor to software

- Survey Computations
  - Free Station
  - Traverse
  - Resection
  - Tacheometry
- COGO Computations
  - Basic
  - Curves
  - Intersections
  - Traverse
- Integration of GPS systems
- Level Computations

What is a GIS?

Height Modernization

- Height modernization for existing – height critical -features. By connecting level and GNSS sensors to the mobile GIS, field crews can measure accurate locations with GNSS and in parallel they can update the less accurate GPS height with a leveled height – this process is called Height Modernization and is easily possible bythe Multi-Sensor support in Leica MobileMatriX.
- The Height Modernization utilizes GNSS (Global Navigation Satellite System) and TPS technology together with level instruments to improve all mapping, surveying, and engineering activities – all within one mobile application.
- ***Conclusion***, a mobile GIS has to support also other sensors then GPS and provide algorithms to compute a final location for the measured feature (e.g. Free Station, Traverse, Level Adjustment)

Mobile GIS

System Integration

- Mapping agencies and other user requires Stanardized functionlity
  - based on world-wide used and approved solutions
- But also have the need for customizing the solution to their daily needs.

Mobile GIS?

Data Capturing

- The data capturing concepts in a mobile GIS must be specially designed for field crews – both in user interface and functionality:

  |1| GIS as a silent partner – it must be considered that field crews are not as trained as GIS Professionals, therefore usability and intuitive workflows must be ensured. The mobile GIS has to manage all Data Model rules (like Topology, mandatory attribute fields) without bothering the user in the field.

  |2| The mobile GIS must be specially designed for stylus usage.

  |3| The mobile GIS has to work as a data logger for connected sensors, e.g. TPS, GPS, levels, etc.

General

What you see is what you get

- Graphical representation of
  - Surveyed objects
  - Measurements
- Direct control whether **everything** needed has been acquired or not - **Completeness Control**.
- **Quality Control**

Data Collection
Repeating and Continuing Features

- Repeating feature
  - Use Clone (schema only copy) feature functionality to save time by repeating the attributes of previous identical feature
  - Performant when recording multiple similar features (such as power poles, trees, manholes, ...)
- Continuing feature
  - Collect points, lines and polygons while working with multiple features at the same time
  - Improves field data collection performance and efficiency

Data Collection
Multiple Feature Editing

- Creating more than one feature with just one measurement.
- Such functionality ensures economic field practices whereby one point is measured to extend/create multiple features.

Benefits
GIS functionality – Attribute collection

- More than X, Y, Z and shape
- Direct editing of attributes in the field
- All collected attributes are stored with the fetaure in the database
- Attributes can be edited and/or newly collected
- Hyperlink the object with a sketch, picture, form, ...

Dataflow
Seamless Dataflow

All data and feature are stored in ESRI's Geodatabase. When moving the feature back into the office system, no data conversion is needed.
That means, no complex data transfer is needed for **Office → Field → Office** workflow.

„No Conversion means no loss of data."

„Loss and error free data exchange."

Dataflow
Conclusion

- As the enterprise GIS goes mobile, location-enabled devices will become commonplace, the incorporation of locations into mobile devices enables data to be managed efficiently and seamlessly, resulting in higher productivity, less data handling errors and less redundant data.
- The efficient expansion of the enterprise GIS to the entire workforce of an organization depends on the seamless integration of locations into the applications used by the mobile workforces.
- Mobile GIS expands the enterprise to the entire workforce. Knowledge enables all decision makers where and whenever needed – as their colleagues in the office - and ensures all data is current, reliable and relevant.

Mobile GIS
Thank you for your Attention!