

# FOTdanmark – Changing the Scope from Map Datasets to a National Geographical Administrative Dataset

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**Key words:** common public cooperation, basis of spatial infrastructure, specification and system architecture

## SUMMARY

With the project “FOTdanmark” the scene is set for a close co-operation between national and municipal government in order to standardise mapping in Denmark. This co-operation will be based on a common data specification and a shared data management system.

The aim of the project is to establish a national geographical dataset for administrative purposes in modern e-Government, incorporating spatial information into the public administration. Consequently, a more topical administrative data set is attained in order to achieve process improvements benefiting both public administrators and private users.

This paper describes the process of merging mapping requirements of the municipality (typically technical maps) with the requirements of national governmental mapping (typically topographical maps) into one common FOT-specification. In particular, the paper focuses on the metadata model and the specification of the objects that are elements belonging naturally in the administrative processes (e.g. buildings).

Furthermore, the paper describes the architecture of the shared system to manage data; in particular how the architecture is affected by updating requirements in the administrative processes of the authorities.

The issue is of immediate importance as 20 municipalities and the Danish Ministry of the Environment (represented by The National Survey and Cadastre) have already joined forces with a mapping company, and the first FOT-data are expected to be available by the end of 2006.

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## 1. INTRODUCTION

Over the past few decades the responsibility for mapping in Denmark has been separated between the National Survey and Cadastre (KMS), municipal governments and large utility companies. Historically KMS has been responsible for the topographical nationwide mapping, while municipal governments and large utility companies have taken on the more detailed and technical mapping.

All maps are maintained and updated separately and at different frequencies. In many cases the lack of coordination has led to parallel mapping activities in the same geographical area, which is neither efficient nor cost-effective. The parallel mapping has also caused problems for the users in public administration.

Worldwide, e-Government initiatives are focusing increasingly on the needs for a common, unambiguous and updated basic spatial infrastructure. These needs are intensified in Denmark where an existing well developed and integrated system of digital nationwide registers of spatial information are ready to be geo-coded to the digital map.

Danish e-Government initiatives have the same scope: Spatial data is the backbone in an effective digital administration and with the Danish structural reform around the corner this issue is becoming increasingly urgent.

Therefore the project FOTdanmark (<http://www.fotdanmark.dk/>) was established in August 2005 by the National Spatial Data Service Community (<http://www.xyz-geodata.dk/>) which is a governmental body established by the Project e-Government. The overall aim for the project FOTdanmark is:

- To define the specification of FOT-data (FOT is the abbreviation for Common Object Types).
- To develop a shared system to manage FOT-data.
- To develop a business model and organisational structure for project implementation and administration.

FOTdanmark is based on the fundamental principles of e-Government where data must be “born” and updated at the source, avoiding needless double registration. This will be ensured by a public administered, service oriented IT-architecture.

As mentioned above, FOTdanmark takes both a business model approach and a technical approach to the establishment of common data and a FOT-data management system. The scope of this paper is the technical part of the project, while: *FOTdanmark: a Danish cooperation project involving national and municipal government (0827)*, Bente Nerup, 2006, will deal with the business model of the project.

## 2. THE FOT SPECIFICATION

### 2.1 The History of Topographical and Technical Mapping in Denmark

KORT10 - The digital topographic base map covering Denmark was established from 1995-2000. The base map, which is captured by photogrammetry from photos in scale 1:25.000, is a well structured base map for mapping and GI-purposes with strict rules of topology (e.g. 2D/3D snap rules and no overlaps between area features). The content of the topographic base map is geometry (in total about 40 features), official place names, points of interest, a elevation model and administrative boundaries. The base map is updated in a cycle of five years.

The technical maps are produced from various specifications: The two most common specifications are the TK93 (technical map specification from 1993) and TK99 (revision 1999). Within the specification, data is produced with different accuracies and with a various numbers of features required; TK1 is technical mapping from photos in scale 1:25.000, TK2 from photos in scale 1:10.000 and TK3 from photos in 1:5000. The technical maps are updated in a cycle of 1-6 years, typically with the highest frequency in urban areas. The specification describes more than 40 features.

### 2.2 The Specification of FOT-data – not only a Map

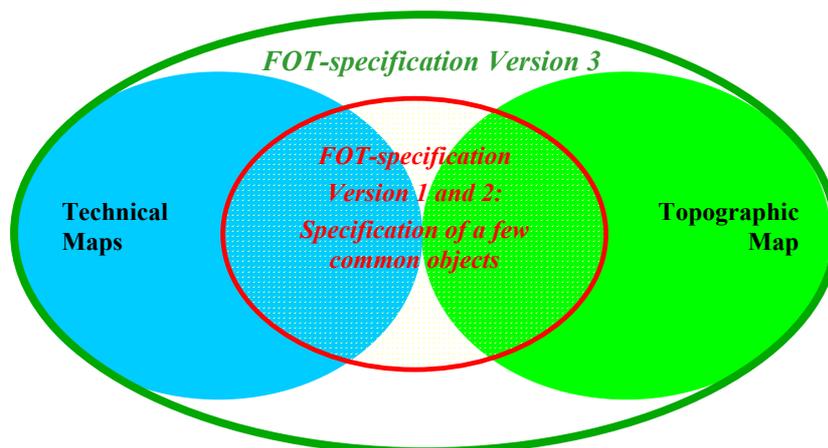
The topographical map and the technical maps have both fulfilled the mapping requirements at the **individual levels** of public administration. However - one base map to be used across **different levels** of public administration is desired. This need is approached in FOT-data specification.

Over the past 4 to 5 years different FOT-specifications have been developed. The first versions included only FOT-specification of the geographical objects that is (nearly) identical specified in the topographical and the technical specifications. Therefore the first versions of FOT primarily included definition of building, road centreline and hydrographical objects. The rest of the object definitions were still to be found in the two “old” specifications. The newest specification, FOT-specification version 3, brings the two mapping specifications into one common specification. Apart from that, the scope of the FOT-specification is changed from traditional mapping dataset perspective to have two scopes:

- A traditionally dataset for “mapping”.
- A dataset, which can be linked to the existing tasks in public administration.

The idea is to perform continuous case-oriented updating (or case-driven updating), where FOT-data is updated as an integrated process in public administration. FOTdanmark fundamental principle to “born” and update at the source can be reached.

The FOT-specification includes 57 features. Orthophoto is specified as a part of the FOT-data set. The specification was endorsed March 2006 and a Danish version can be downloaded from [http://www.fotlandmark.dk/NR/rdonlyres/BE05EFC8-5FA5-4F7F-B269-8BF9AE170279/0/EndeligFOTspecifikationversion3\\_20marts2006.pdf](http://www.fotlandmark.dk/NR/rdonlyres/BE05EFC8-5FA5-4F7F-B269-8BF9AE170279/0/EndeligFOTspecifikationversion3_20marts2006.pdf).



**Figure 1:** The development in FOT-specifications

Off course, the implementation of case-oriented updating of FOT-data is not achieved over night. In the first place FOT-data must be available, FOT-data management system has to be developed (see chapter 3) and dedicated user applications shall be developed on top of the administrative applications that are already used in public administration. Nevertheless the FOT-specification, version 3, is prepared for case-oriented updating on essential features in both public and private administration: Building definition and road centre line definition has been redefined to obtain match between the geographical representation of the object and the representation in public registers (e.g. the Danish building and dwelling register, governed by National Agency for Enterprise and Construction, and registers governed by the Danish Road Directorate).

### 2.3 Updating FOT-data at the Source – Privileges and Duties

Updating FOT-data as an integrated process in public administration (or the principle of updating at the source), requires unambiguous “ownership” of the individual FOT-objects. It may be awkward, but who knows most about, for instance, a certain building in a digital map? The answer lies at the staff at the local authority: The same staff that already today is responsible for maintenance of the Danish building and dwelling register. The staff knows all about new buildings and changes in buildings. They know about demolition of houses, and if they don’t know, maybe something illegal has happened. Similar for roads and road construc-

tions: If a road has a road name (and a road number) the authority is the Municipality or the Government.

The individual FOT-objects have to be “owned” by the specific authority that maintains the public register. The “owner” has the privileges and also duties to perform changes in a FOT-object.

The “ownership” of FOT-object is naturally divided between different public authorities. The table below is an example of how “ownership” can be divided:

Building	Municipality
Roads	Municipality and the Danish Road Directorate
Hydrographical features	Municipality and the Danish Ministry of the Environment
Ancient monuments	National Heritage
Topographic “features”	National Survey and Cadastre

**Table 1:** "Ownership" to FOT-data (not approved in FOTdanmark)

## 2.4 Future Versions of the FOT-specification

The specification of FOT-data, version 3, is just the beginning. Success in using case-oriented updating of FOT-data as an integrated process requires agreement and harmony between 1) the task to be performed in public administration, 2) the FOT-specification and 3) the public registers to be used in the task. Case-oriented updating will only be performed if an administration level can derive advantage from it, or if a law or a circular instructs the administration level to perform new public tasks. The FOT-specification has to correspond to these changes.

A permanent FOTdanmark working group is established to maintain and develop the FOT-specification. One of the first tasks is to analyse the possibility of using the mechanisms of case-oriented updating of FOT-data when administrating the protection of nature. The conclusions will be ready in the beginning of 2007 – and perhaps this will cause changes in the FOT-specification.

## 3. THE SHARED FOT-DATA MANAGEMENT SYSTEM

### 3.1 A Systematic Process

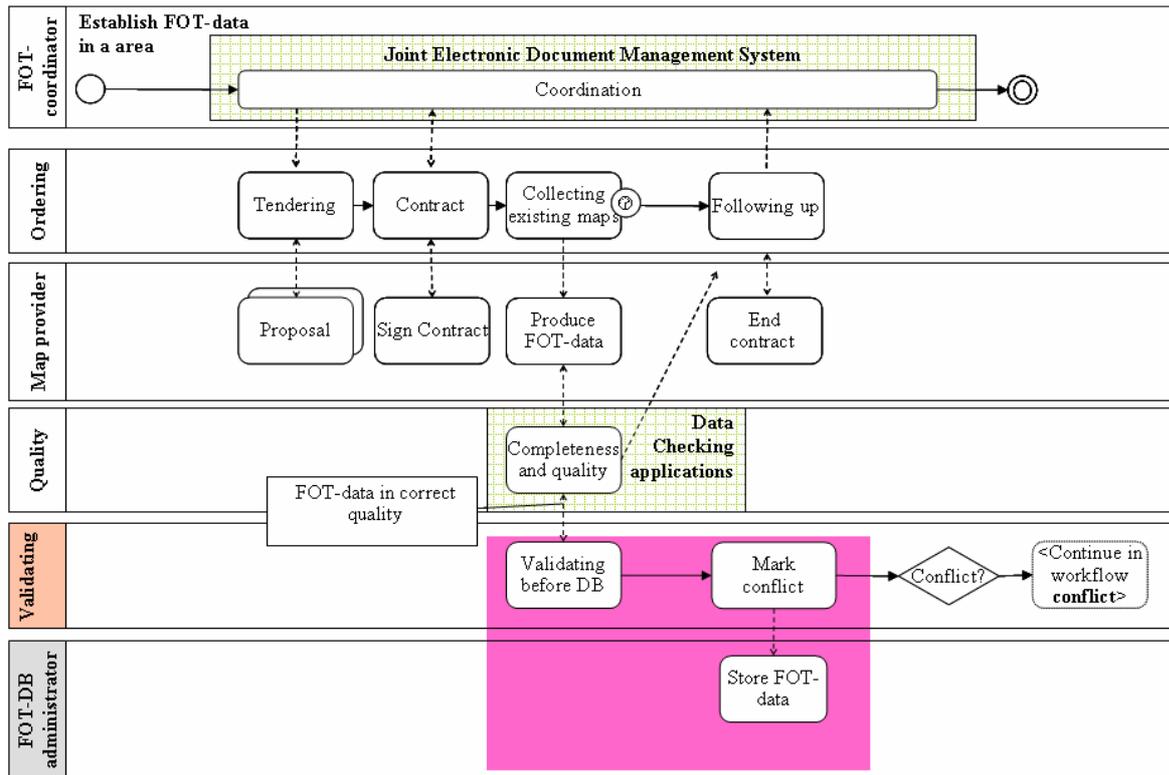
From January to March 2006, a FOTdanmark project group determined the demarcation of the shared system to manage FOT-data and decided the overall architecture. The result is a sketch to be used when the final system to manage FOT-data is specified later on.

The activities and the terminology used for the architecture follows best practice described in manuals from the Danish Ministry of Science, Technology and Innovation ([www.oio.dk](http://www.oio.dk)).

To ensure the connexion in business model and system architecture the business model group and the system architecture group worked closely together to make the workflow diagrams for FOT data management processes. The diagrams of different workflow are the background material of defining the architecture of the shared system to manage FOT-data.

The outcome of the systematic process is:

- Detailed documentation of the conditions on which the business model and technical system shall operate.
- Technical drivers for the shared system. Technical drivers (and drivers for the business model) are objectives, opportunities and limitations, which give the framework for the architecture.
- Principles for the architecture. Principles are statements, which for example is a translation of the technical drivers into more specific requirements to the system. Five principles in the manuals from the Danish Ministry of Science, Technology and Innovation are taken into account:
  - Interoperability.
  - Security.
  - Openness.
  - Flexibility.
  - Scalability.
- Workflow diagrams, by incorporating requirements FOT-specification (data model and meta data description), for the processes:
  - Establishing FOT-data (first time establishment).
  - Photogrammetric revision of FOT-data.
  - Administration of references connected to FOT-objects.
  - Continuous case-oriented updating, where FOT-data is updated as an integrated process in public administration.
  - Detection of changes to FOT-data.
  - Errors and mistakes in FOT-data.
  - Distribution of FOT-data.
- Defining the roles that are needed to accomplish the workflow diagrams. This is done by using a simple BPMN notation, where the abstract roles are represented as a “lane” in workflow diagrams (figure 2 below shows part of workflow diagram for the process “establishing FOT-data”).
- Context diagrams for each individual working process, including detailed description of the interface between the people using the shared system, and description of the interface to other data systems.
- Definition of the logical components in the shared system to manage FOT-data.



**Figure 2:** Part of workflow diagram for the process "establishing FOT-data"

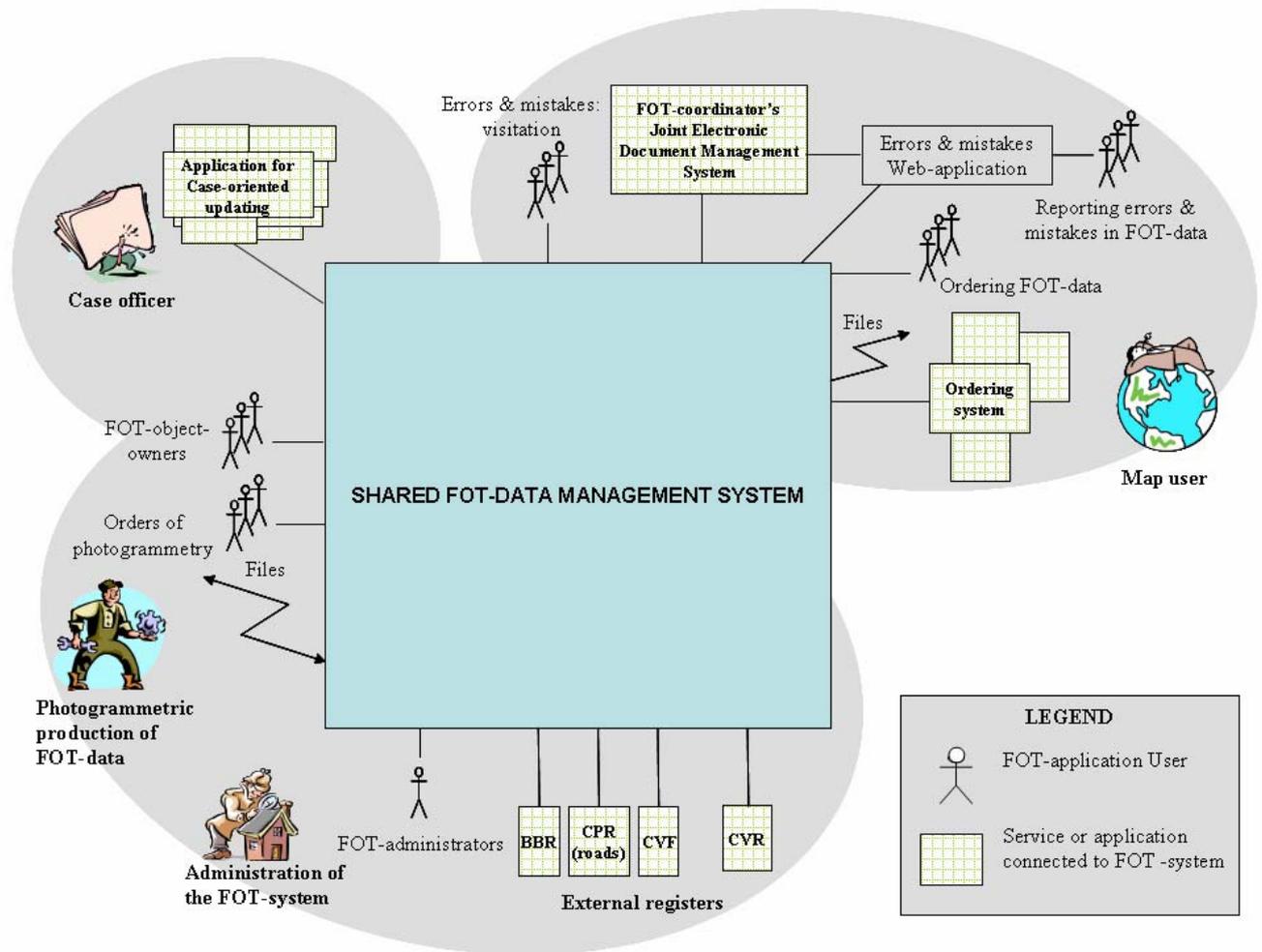
### 3.2 Challenges for the Shared FOT-data Management System in the Near Future

Case-oriented updating of FOT-data is essential when specifying the FOT-data. It's also essential when the overall architecture of the shared FOT-data management system is to be designed. The data management system will not include the user applications needed for case-oriented updating, but well defined interfaces to the system can be used for web-application developers.

As mentioned earlier, case-oriented updating of FOT-data will be performed when there is an advantage (in time and/or money), and dedicated web-applications will be demanded accordingly.

Introducing case-oriented updating in the shared FOT-data management system has caused a number of reflections with regard to:

- Demands to performance (loading and distribution of FOT-objects).
- Consequences of "ownership" to the individual FOT-objects.
- Requirement of detailed metadata information on FOT-data, due to the fact, that multiple persons in multiple administrative levels are updating FOT-data (who has made the change, when and why).
- Access control.



**Figur 3:** The overall context of the shared FOT-data management system

## REFERENCES

The project “FOTdanmark” (<http://www.fotlandmark.dk/>).

Working papers from a working group to develop a FOTdanmark business model and organizational structure for project implementation and administration (not published).

On [www.oio.dk](http://www.oio.dk), a series of tools are contributing to secure the basis and coherence of the public sector's use of IT and to enhance effective public sector communication.

Working papers from a working group to develop and establish the shared FOT-system to manage data (not published).

## **BIOGRAPHICAL NOTES**

Member of FOTdanmark project team: Technical project manager.

Member of the working group to develop a FOTdanmark business model and organizational structure for project implementation and administration.

Chairman of the FOTdanmark working group to develop and establish the shared FOT-system to manage FOT-data.

## **CONTACTS**

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