

# Geographic Information in Enterprise Architecture

**- Principles supporting e-Government business functions**

**Informi GIS A/S**



**Title:** Geographic Information in Enterprise Architecture

**Subtitle:** - principles supporting e-Government business functions

**Publisher:** Informi GIS A/S

**Copyright:** Informi GIS A/S

**Version:** 2

**Version date:** January 2009

**Editors:**

Ulla Skjelbo, Informi GIS

Jan Juul Jensen, Informi GIS

Lars John Jørgensen, Informi GIS

**Consultant:**

Allan Bo Rasmussen, EA Fellows

**Graphic Layout:**

Sarah Barrett, Informi GIS

**URL:**

[www.informi.dk](http://www.informi.dk)

Cover page picture:

Simulation of flooding of a small river near Christiansfeld, Denmark. For the flood analysis, we used a digital terrain model (DTM) and the results were visualised in a digital surface model (DSM) draped with an orthophoto.

Analysis and visualisation were made in ArcGIS 9.3 with ArcGIS 3D Analyst & ArcGIS Spatial Analyst extensions.

Data was provided by BlomInfo A/S and the Municipality of Kolding.

## Preface

Geographic information is a valuable common denominator in numerous business processes. A geographic approach may therefore provide significant leverage for improving efficiency, enhancing quality and strengthening collaboration within the public sector.

By focusing on the opportunities provided by geographic information systems in Enterprise Architecture, Informi GIS published its first edition of this whitepaper in the autumn of 2008. I am pleased to see that this paper has been well received by its readers - a paper illustrating the use of GIS as technology from an overall perspective. We have received many positive comments, which inspired us to publish this revised edition of the paper.

Being an IT company, Informi GIS wishes to contribute through this whitepaper with new ideas and methods for the modernisation of the public sector.

Charlottenlund, Denmark, 5 January 2009



Klaus Gerlich  
Chief Executive Officer

# Contents

GEOGRAPHIC INFORMATION IN ENTERPRISE ARCHITECTURE	6
THE E-GOVERNMENT STRATEGY	7
ADVANTAGES OF A GEOGRAPHIC APPROACH	8
THE GEOGRAPHIC DIMENSION IN PUBLIC ADMINISTRATION	9
DEVELOPMENT OF PUBLIC ENTERPRISE ARCHITECTURE	10
GIS IN SERVICE ORIENTET ARCHITECTURE	12
EXAMPLES OF APPLICATION OF GEOGRAPHIC INFORMATION	14
CASE 1: DONG ENERGY/NESA	14
CASE 2: THE TRAFFIC AGENCY MOVIA	16
CASE 3: MUNICIPALITY OF VEJLE, DENMARK, TECHNICAL DEPARTMENT	18
CONCLUSION AND RECOMMENDATION	20
SOURCES	23

# Geographic Information in Enterprise Architecture

Over the coming years, the public sector will be faced with various challenges – both business and technological.

The demographic development, which will result in fewer hands to handle the jobs, and the expectations of citizens and businesses with respect to efficient and intuitive digital solutions require innovative thinking in our application of digital information technology.

In recent years, many innovative private enterprises and public institutions have clearly recognised the value of using a geographic approach. Geographic information technology has proved to be of high financial and strategic value as the technology contributes to:

- Reduced costs through increased efficiency
- Stronger decision-making processes through better information basis
- Increased communication through strong visual media
- Optimised resource and asset management through improved overview

In this way, geographic information technology may provide essential leverage for fulfilling the objectives set out in the public sector's e-Government strategy with respect to *better digital service, increased efficiency and stronger collaboration*.

In order to fully exploit the utility value offered by a geographic approach, it will be a precondition to think in line of enterprise architecture (EA) where the goal is to ensure wide technological support for the business objectives and procedures. The realisation of the objectives of the digitalisation strategy does not only depend on better utilisation of the technology within the existing business procedures. It also depends on an efficient reorganisation of the workflow processes in order to fully utilise the new opportunities offered by i.a. geographic information systems (GIS).

In this whitepaper, we will demonstrate how geographic information systems (GIS) may act as a tool for creating coherence in an enterprise architecture (EA) and thereby contribute to the modernisation of the business models and information systems, required in order to implement improved digital services in the public sector.

## Business Model for Public Administration

A large effort has been made in the Danish public sector to optimise the application of IT. The 2003 Whitepaper on IT architecture and the subsequent handbook on architecture for e-Government from 2004 constitute important contributions to this optimisation. The OIO enterprise architecture method (the OIO EA method) published in 2007, provides further detailed guidance on how to effectively support the business by means of IT technology. This is called enterprise architecture. Recently, The Digital Taskforce initiated the work regarding a common public business reference model (FORM) as part of the implementation of the Digitalisation Strategy ("The Danish e-Government Strategy 2007-2010). This work, which involves a cross-sectional mapping of public services, is to form the basis for creating coherence between the public services (see fig. 1).

Seen in an international perspective, Denmark holds a leading position within e-Government. An important prerequisite for holding this position is that the majority of all administrative data, had already been digitalised at an early stage.

However, the fact that administration today is based on a vast number of individual systems is a challenge. What we need now to provide citizens and businesses with efficient digital services is coherence. Therefore, a top priority on the agenda for the modernisation of the public sector is the introduction of common solutions and standards, which can connect the different branches of public administration with each other.

This whitepaper will be based on the OIO EA method and will, by means of various examples, demonstrate how cross-sectional information structures and services – specifically geographic information technology - may create coherence in public services and form the basis for new, innovative services for citizens and businesses.



# Advantages of a Geographic Approach

Geographic information systems let you benefit from the fact that by far the majority of all information can be localised geographically.

By combining geographic information (where things are) with descriptive information (what things are), you will be able to view the business information from a completely new perspective. GIS is an information technology that enables us to understand, enquire, interpret and visualise data in new ways. The technology gives the opportunity to make decisions based on a better information level.

GIS may help organise data from a geographic approach, which means linking information to a geographic reference such as an address or an area. In this way, the physical world can be represented in a geographic data model in 2-D and 3-D as well as in time. Not only physical conditions such as a wind turbine, a road or a forest can be represented, but also things like routes, events and statistical data. In this way, GIS can create linkage between information that is normally used in different contexts and open up for new applications of existing data.

GIS contains a set of tools for data analysis in a geo spatial<sup>1</sup> context. A GIS analysis can, for example, provide answers to the following questions:

- Who will be affected by the gas leakage that has just taken place?
- Which areas will be affected by the water level increases?
- Which addresses can be reached from a given location when driving for 5, 10 or 15 minutes?
- Where do certain types of diseases occur most frequently and how do they relate to other factors?

The results of the analyses may be visualised through intuitive and informative digital maps. The information can be shown as real-time pictures, such as the present position of the workforce. GIS therefore constitutes a strong visual communication media.

Finally, GIS can support distribution and communication of geographic data, information and knowledge both within

and outside the organisation, for example, by publishing the results such as maps, globes<sup>2</sup> and online services in web-based applications.

Although it will be natural to present results of calculations based on geographical data in a map, it will often prove very useful to present the calculations by text and figures, for example driving distance, route description or a statistical report. The GIS module is therefore not necessarily visible to the user.

## First Generation GIS: Digital Maps

Since the establishment of the natural gas grid, geographic information has been an applied technology in the public Denmark. The gas grid was commenced at the beginning of the 1980s and various opportunities naturally coincided in the development of geographically related IT solutions and the establishment of an advanced supply grid. Digital maps – as they were called – for the gas sector and later for the entire supply sector became a huge focus area for the public as well as the private sector.

As the natural gas companies were owned by the municipal authorities, the municipalities participated at an early stage in the development of a digital map basis. Therefore geographical technologies became widely used in the technical departments of the municipalities at a very early stage compared to other branches of public administration in Denmark.

## Administrative Integration

It is now more than 20 years ago that the municipalities were at the leading edge of the digital development within the GIS area. Today, large GIS solutions exist, nicely integrated with the administration's specialised systems, in a number of public authorities. Nevertheless, GIS is today primarily used as stand-alone tools which are only sporadically integrated with selected systems in the public sector. Accordingly, the utility value is limited and the costs are unnecessarily high.

In order to change this situation it is required that GIS is no longer seen as an isolated IT component, but rather as a shared service in the enterprise architecture of the public sector. We will illustrate how geographic information can create value for society.

---

1 of geo = earth and spatial, i.e. geographically referred spatial context

---

2 3D representation, i.e. Google Earth and ArcGIS Explorer

# The Geographic Dimension in Public Administration

There is increasing recognition in the public sector of the importance of spatial data and geographic information to e-Government.

The National Survey and Cadastre (KMS), fulfilling an important government function, is to initiate and coordinate the efforts of establishing a public spatial data basis. Parallel to the Danish e-Government strategy and as part of the focus areas for 2007-2010, the National Survey and Cadastre prepared the report: "LOCATION – a gateway to e-Government". The report emphasises that spatial data and geographic information are the backbone of an efficient e-Government. To support this function, the National Survey and Cadastre has for several years been making spatial data and maps available as internet services via the Digital Map Supply.

To support efficient integration, communication and collaboration in the public administration process, geographic information technology is a necessity. To achieve the best return on the investments it is important to develop these shared functionalities as standardised services. It could, for example, be demographic prognoses or mileage calculations that can be used across the administrations.

Public administration of i.a. environment, properties and businesses is based on 25-30 years of systematic registrations that can be compiled via embedded geographic keys – such as property number and address.

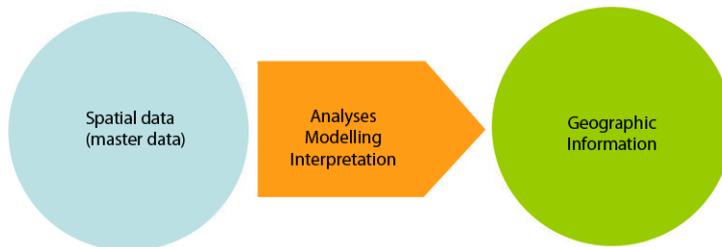


Figure 2: From data to information.

To enable public authorities to work with shared spatial data, standardisation is required. The FOT-project<sup>3</sup> is a collaboration project between municipal authorities and the National Survey and Cadastre. Under this project, a common spatial data reference system has been developed which is already coming into use in many GIS solutions created by modern administrations and enterprises to support their business activities.

Access to the raw spatial data alone is, however, not sufficient. In order to facilitate the use of geographic data, functionalities are needed for analysis and modelling of raw data and to make the results available as services for the e-Government.

The potential for coordination of these data in modern GIS solutions is huge. The compiled data will provide a much wider analytic basis – and therefore a better basis for making decisions.

This well-developed geographic data basis definitely

constitutes a solid administrative basis in e-Government, but its utility value is determined by how intelligently the data can be converted into relevant information as shown in figure 2.

3 FOT is a Danish acronym for Shared Object Type.

## Development of Public Enterprise Architecture

” LIKE A CIVIL REGISTRATION NUMBER, THE LOCATION IS A UNIQUE IDENTIFIER IN E-GOVERNMENT.

LINKING LOCATION TO INFORMATION IS THEREFORE ONE OF THE PRECONDITIONS FOR THE FURTHER DEVELOPMENT OF E-GOVERNMENT AND FOR MAKING THE PUBLIC SECTOR MORE EFFICIENT”

THE FOCUS AREAS OF THE NATIONAL SURVEY AND CADASTRE (KMS) 2007-2010

Based on a wide range of master data, it will be possible through analysis, modelling and interpretation to combine data in maps, graphs and reports (fig. 3). This enable us to deal with issues and make decisions based on a well-documented basis of geographic knowledge. Technically, this is a question of modelling the physical reality and developing a logic mindset suitable for the current administration purposes.

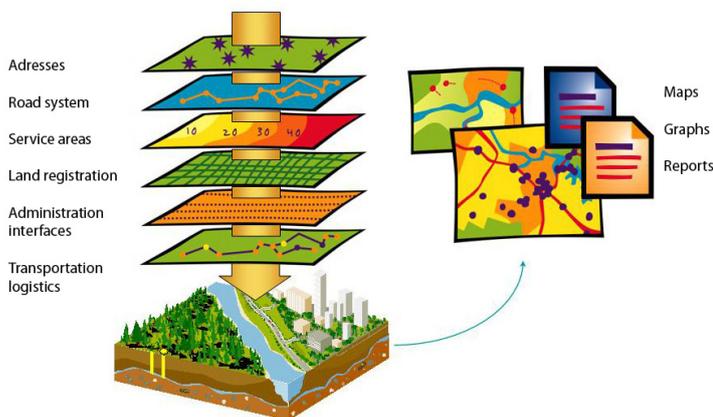


Figure 3: Spatial information – the backbone of efficient e-Government

Realisation of results within the three focus areas of the Danish e-Government strategy requires application of structured methods.

The National IT and Telecom Agency has therefore developed the OIO EA method. The main goal of this method is to ensure that technological decisions and technological projects are firmly anchored in the vision and strategies of the enterprise and that they are coordinated across the different branches. The method also is to ensure coherence between the enterprise and the IT architectures. This means that the business wants for e-Government are reflected in the technical realisation of projects and initiatives.

There has generally been much focus from the part of IT customers on data, applications and technology, but it is now becoming increasingly clear that the key to rationalisation of the administrative tasks will be to focus on business and strategy. In this way, it can be ensured that business procedures are optimised so that they can be effectively supported by the technological platform, the applications and the data available. The reasons for the IT customers' huge interest in the technical aspects of an IT solution might be the fact that it has been easiest to discuss solutions with one's IT supplier at this knowledge domain.

But if both customer and supplier focus on the technical aspects, there is a risk that the coherence with administrative processes is downgraded. It will therefore be necessary to consider that the customer holds great knowledge within the areas of strategy and business, whereas the customer's knowledge of applications and technology is often smaller. For the typical supplier, the opposite is often the case! This polarisation of knowledge has to be addressed by the customer and advisor/supplier to bridge the gap between business and technology.

When the business needs to be optimised, it will not be sufficient just to analyse the connection between, for instance, workflow and IT support. It will be necessary to analyse the requirements posed by the surrounding world. For authorities, these requirements relate i.a. to existing and future legislation, financial budgets, and requirements and wishes from citizens and other interested parties. It will

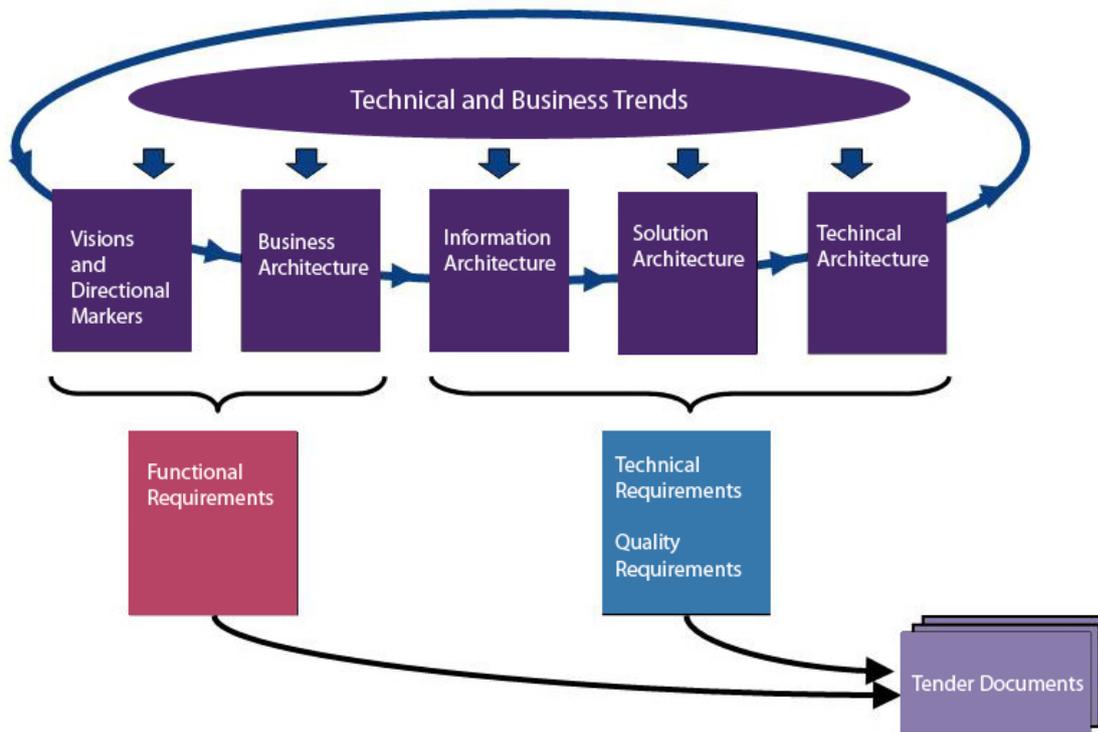


Figure 4: From enterprise architecture to acquisition

then be possible to lay down - or revise - mission, vision and strategy and to lay down more operational business objectives. Based on this, it will be possible to identify business processes and workflows as well as the required resource allocation.

At this stage, it will be possible to identify functional requirements for the potential IT systems and services that are to support business procedures and workflows. Following an analysis of existing and future infrastructures – taking technological trends into consideration – it will be possible to specify technical as well as quality requirements for these IT systems.

An enterprise architectural approach will therefore provide a good foundation for the specification of requirements - for example in connection with tenders. Figure 4 illustrates this analysis.

The infrastructure analysis is an important process and may prove to be the difference between success and failure. Particularly the future infrastructure is a potential determining factor for the feasibility of the IT supported business processes. The use of service-oriented architecture (SOA) –

which will be described in the following section – seems to be the most promising IT architectural approach to efficient and flexible business support. In practice, this means application of standardised and loosely coupled services offered and consumed by different systems locally via an integration platform such as an Enterprise Service Bus or globally via the Internet.

External requirements and expectations for public authorities are changing constantly. It is therefore important that the effort to create coherence between business objectives and IT solutions is not seen as a stand-alone project. In the same way as it is natural to take one's car to be serviced regularly, it ought to be natural to maintain one's business in a continuous process.

This maintenance work requires analysis and optimisation of coherence between the individual units of the enterprise architecture, for example between strategy and business or between workflow and IT solution.

# GIS in Service Oriented Architecture

The GIS technology is widely used within many different areas in many different organisations

Previously, the application in many organisations was limited to solutions of single issues within limited fields. This was partly caused by technical barriers. In recent years, there has been a huge development within GIS and the underlying IT technologies. Over the past 10 years, GIS technology has developed from a client/server structure into a world of web-published documents into the full-range service-oriented architecture (fig. 5).

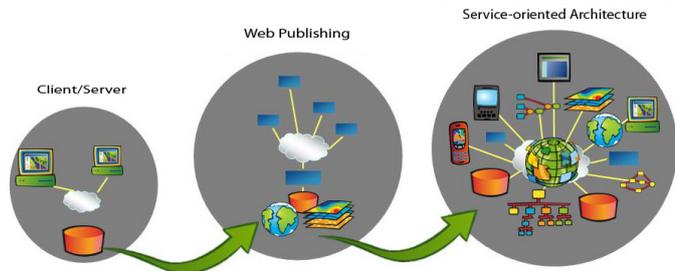


Figure 5: From client/server to SOA

In SOA-based GIS (fig. 6), close integration between desktop and server technologies allows the users through efficient business procedures to combine and offer the organisation's geographic information as reusable services. These services can be used in a wide range of client applications, such as desktop software, web applications, mobile phones and handheld units, or in GIS embedded in other business applications by means of open interfaces. Examples of generic geographic information services include traditional map services in 2D, global services with 3D representation, image services (aerial photos and satellite), geo processing services (e.g. flooding models, mileage analyses or CO2 forecast models) as well as data management services (spatial database replication, data extraction and conversion, etc.).

Today, GIS has achieved a technological maturity where it is natural to describe and use the technology in line with other enterprise information technologies (fig. 7), e.g. Enterprise Asset Management (EAM), Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM).

By using geography as a shared key, it will be possible to integrate services from different information systems in innovative solutions and thereby increase the utility value of the individual systems. Through integration of systems, you can automate and rationalise various procedures. For example, when creating a new customer in CRM it is possible to automatically make geocoding (geographic registration) of the customer's address. The address can then later be used

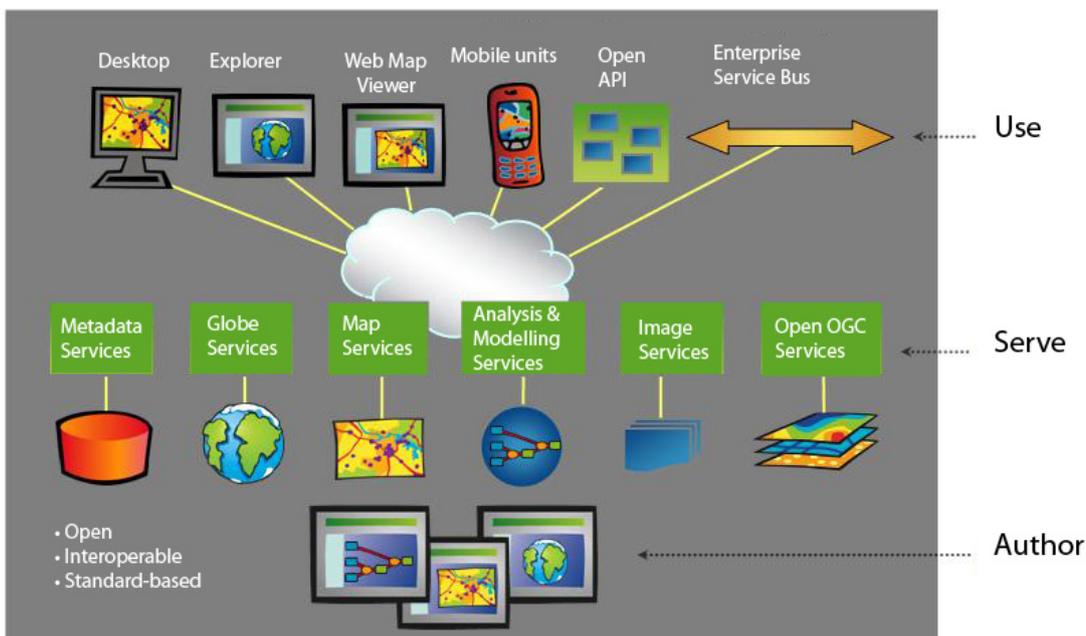


Figure 6: SOA-based GIS.

in connection with inquiries from their customer. For example, you can allocate the nearest resource (e.g. a service engineer), calculate the shortest route to the customer, or prepare and send job descriptions for the service engineer's mobile unit, including map and itinerary.

Shared GIS services may in this way provide interfaces so that specialised applications can add the geographic dimension in the administration process. This may be done by locating objects and events and by planning public services in a geographic perspective. SOA, which is based on a standardised infrastructure, will support coordination of the administration processes and make the public service more efficient as envisaged by the government's modernisation programme.

Harmonisation of interfaces will furthermore make it possible to reuse the same geographically related information in many different administration contexts.

“THERE IS CLEARLY A TREND TO MIGRATE DISPARATE LINE-OF-BUSINESS GEOSPATIAL SYSTEMS TO AN ENTERPRISE GIS ENVIRONMENT. THIS TREND FEATURES CORE GIS INFRASTRUCTURE MAINTAINED BY A CENTRAL IS ORGANIZATION, WITH DATA MANAGEMENT RESPONSIBILITIES HELD BY THE LINES OF BUSINESS THAT ARE THE PRIMARY USERS.”

GARTNER - US PUBLIC SECTOR GIS SURVEY

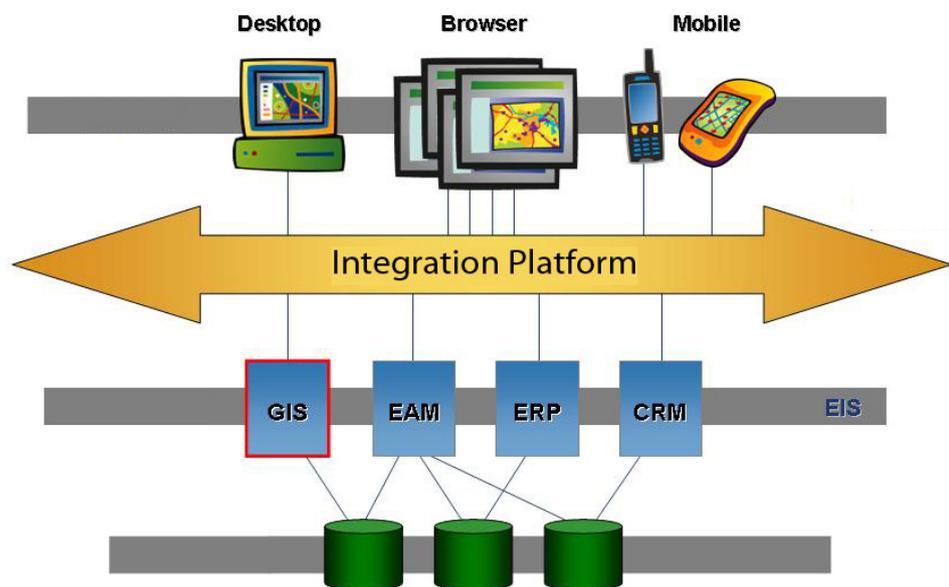


Figure 7: GIS - an essential part of enterprise information systems.

# Examples of Application of Geographic Information

## Case 1: DONG Energy/NESA

In 1999, NESA (today DONG Energy) was in a situation of uncertainty as to whether their existing customer system was geared to handle the requirements that would be made to products and services in a free market environment. An analysis quickly illustrated the need to build a stronger IT foundation to cope with the expanding business. They realised at an early stage that in order to efficiently support the business, it was necessary to take ownership at management level over the use of technologies that supported the business. An analysis was then initiated – partly of the existing business procedures and IT systems and partly of a future image of the business.

The analysis revealed several areas in need of improvements. A crucial point in the analysis was the recognition that all activities had a geographic reference and that it therefore was obvious to document grids and installations. There was a need for creating a coherent digital model to reflect the physical reality. Therefore, an IT platform was established in which GIS plays a central role in line with finances and personnel (fig. 8).

Another important issue was the customers' experience. Being able to provide the customers with the best service possible was a requirement - including self-service options. It became clear that the combination of customer information and geographic information would form a solid basis for the realisation of a better customer experience.

A system was then designed centred around the customer and resource management system (SAP), with attachment of other enterprise-critical systems, including GIS. The basic idea is that all activities start in the customer system and are then processed in specialised systems. All activities are closed in the customer system.

The overall solution builds on an architecture where integration between the individual systems mainly builds on loose coupling with application of services.

GIS is, among other things, included in the following of DONG Energy's applications:

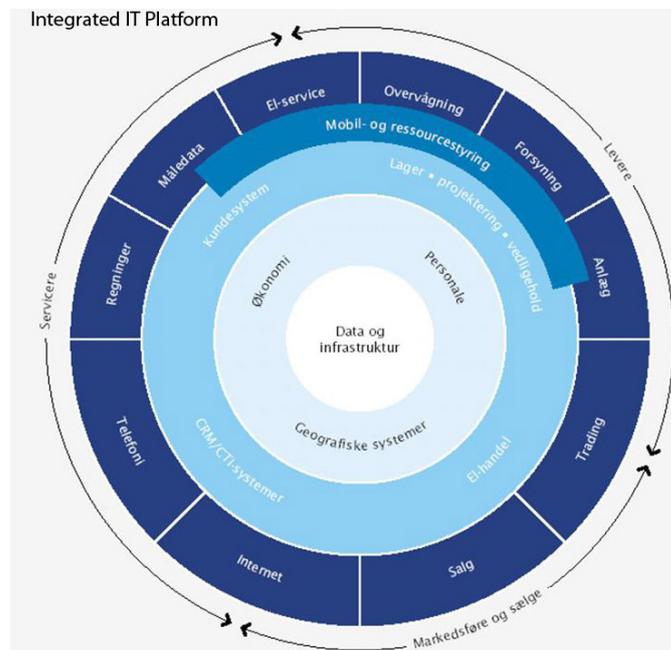


Figure 8: GIS is a core element in DONG Energy's integrated IT platform

- Draft project – an application for preliminary projecting of new installations in which the users can sketch the first and approximate positions of components in connection with the draft projecting.
- OMS – abbreviation for Outage Management System. An application for analysing and grouping related enquiries regarding irregularities in the electricity supply and for tracking these against similar distribution network problems. The system is also applied for validation of any subsequent enquiries compared to a list of outstanding service tasks.
- Distribution of cable plans – a web-based application for generating and distributing cable plans.
- Grid monitoring and control centre where maps displayed in GIS, combined with underlying applications that analyse the grid, provide a comprehensive view of the operational situation and are used for planning of the work (fig. 9)

In connection with the establishment of the existing IT system, DONG Energy has greatly benefited by placing the responsibility for business processes and IT into the same department: Business Processes & IT. With this organisation it has been natural to give the business procedures highest priority and support these by means of IT – including GIS.



Figure 9: GIS – a mission-critical system

## Case 2: The Traffic Agency Movia

The need for a flexible public transport system has never been more pronounced. On a global scale, inner-city traffic is increasing and so is the travelling time of commuters.

Requirements made by commuters for relevant information about traffic on time have never been higher. An obvious way to meet these requirements is by using advanced geographic information.

For a number of years, GIS has been a business-critical core system in the transport agency Movia and has constituted an essential tool for traffic planners; the position of bus stops can be inserted and the routes of the buses calculated in the GIS solution.

Based on the geographic location of the bus stops, it has been possible to implement real-time display for the buses.

By comparing compiled passenger data with a number of demographic data, advanced calculations of the bus customer potential are possible. This facilitates the decision-making with respect to creation of new bus routes/stops or changes in existing ones based on a highly qualified basis.

Movia started working intensively with geographic information at the end of the 1990s - at the time of HT (Greater Copenhagen Bus Company). After 10 years of operation, a major modernisation was decided upon in 2008.

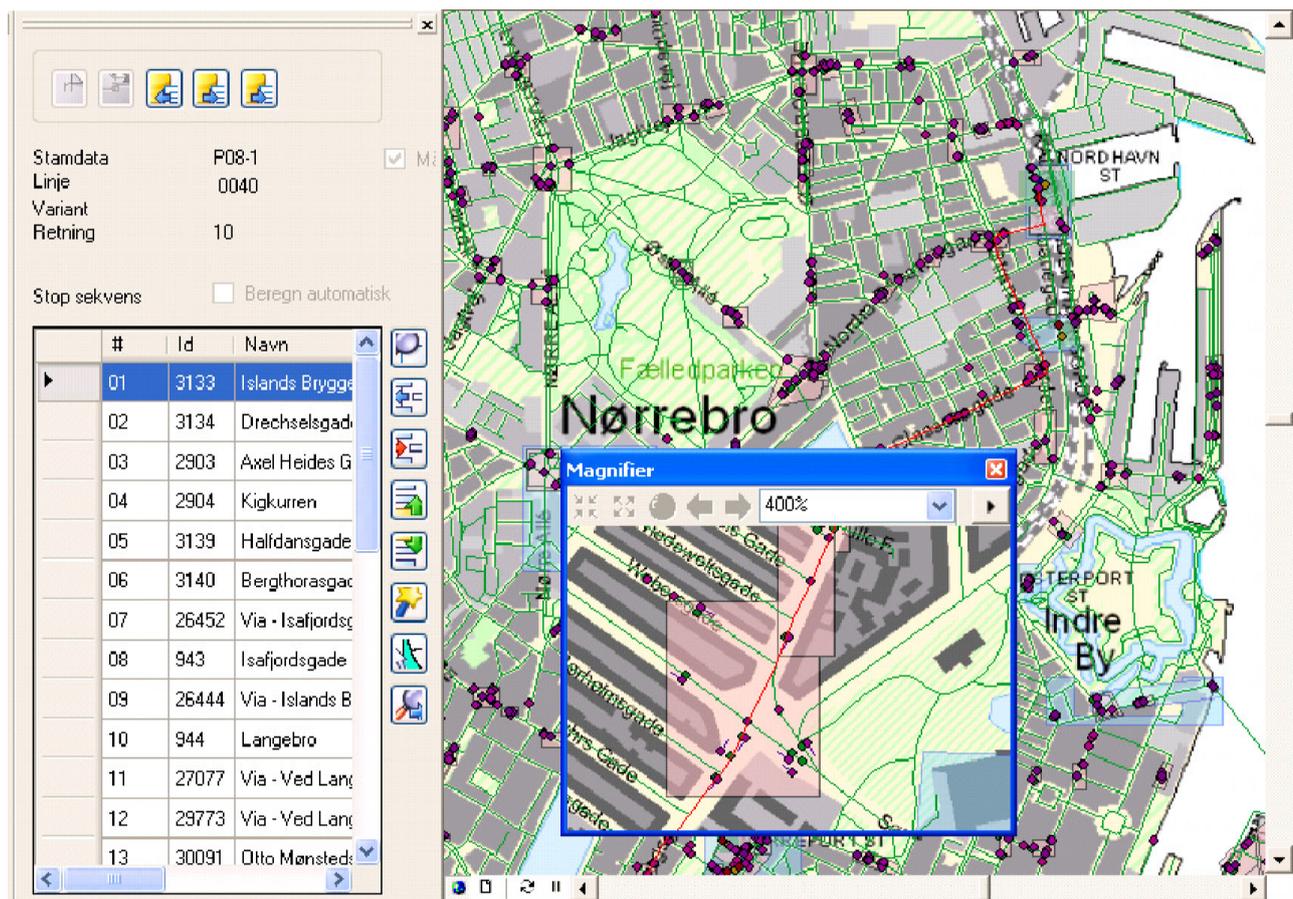


Figure 10: Creation of a specific route, a so-called line variation, is one of the processes that have become more efficient in the new GIS system.

The modernisation offers completely new opportunities for simplifying processes, improving data quality and reducing maintenance costs; all of which results in significantly higher efficiency. The new technology allows the company to offer a number of new web products to both customers and cooperation partners.

According to the Danish Local Government Reform in 2007, the municipal authorities became responsible for the operation of local buses. In the future, the municipal authorities will therefore, via "WebGIS", be granted access to relevant planning and analytic data. This will ease the decision-making processes regarding planning of bus operations and create the foundation for strong collaboration between the transport agency

and the municipal authorities.

At Movia's website, customers will experience significantly improved digital services. Customers will have the opportunity to see advanced and personalised displays of departure times at selected bus stops or information on specific sections of routes, etc.

The modernisation and the related upgrade of the GIS platform provide the first leverage towards a complete service-oriented architecture in Movia. Most importantly, this allows for delivery of attractive bus operations at a high service level which is a prerequisite for attracting contemporary city people as bus passengers.

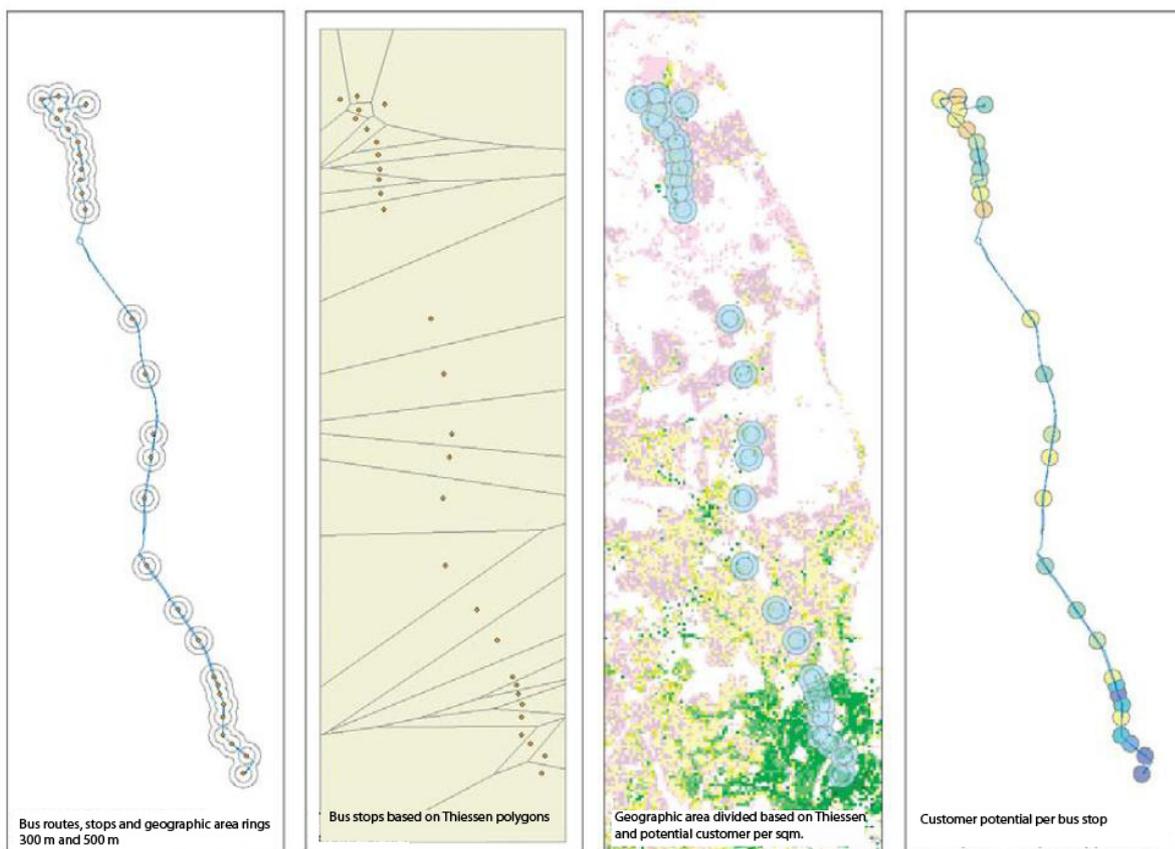


Figure 11: Calculation of buscustomer potential based upon both geographic and demographic data.

# Case 3: Municipality of Vejle, Denmark, Technical Department

The Municipality of Vejle, Denmark, may also look back at some turbulent years with the winds of change blowing. Particularly, the Danish Local Government Reform in 2006 – where five municipalities became one – posed challenges which ideally required structured methods to achieve optimum results. Establishing the organisation of the new municipal authority was, however, given first priority. Therefore, it was deliberately decided to postpone the use of an EA-based analysis to determine the need for the tasks of the new municipality to be supported by IT.

At management level, the municipal authorities had at an early stage taken ownership of IT, including GIS. As a consequence, a server-based, scalable and inter-operational GIS based on open standards, was acquired in connection with the Local Government Reform – fully in compliance with the recommendations of the IT whitepaper.

All of 2007 was earmarked for the project “Safe Operations”. The aim of this project was to structure existing and new tasks in a way that could gradually be determined as a invariable operational situation.

In 2008, the Municipality of Vejle started to look ahead and

prepared the streamlining of its IT supporting the business. One of the municipality’s visions is to be an attractive workplace in order to retain and attract competent employees.

A job satisfaction survey carried out in 2007 for all employees in the Technical Department showed dissatisfaction with some of the internal workflow processes. Issues such as; too much duplicated work and unclear definition of where information and competencies were located, were criticised.

## EA in Practice

To support the vision, the Technical Department launched a project regarding e-Government. In practice this has been done by optimising three processes:

- The green property datasheet
- Land registration case
- Building case

An EA approach was applied to structure the optimum progress of the project. For each workflow process, the Municipality of Vejle chose to document:

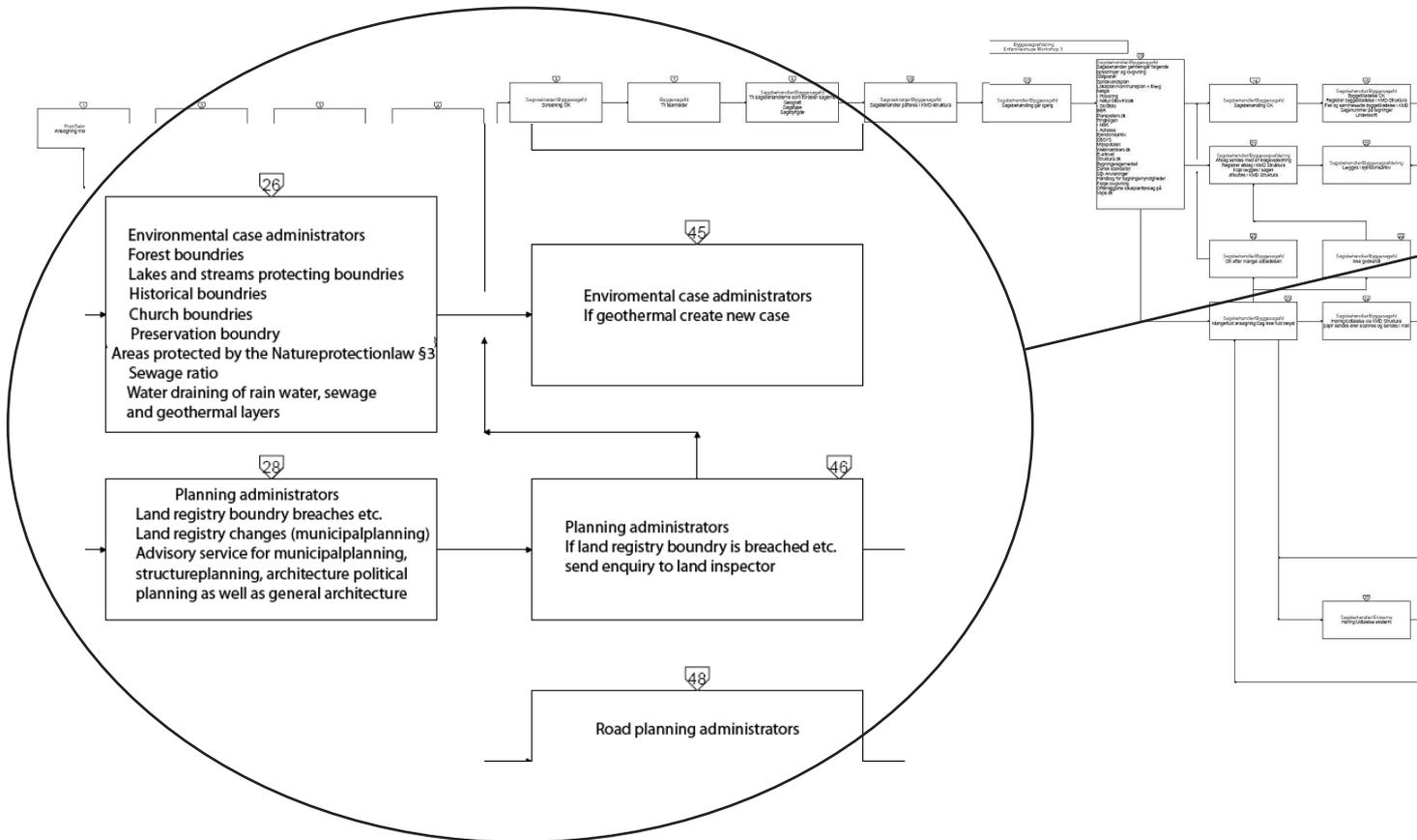


Figure 12: The complexity of a building case illustrated as workflow

1. Workflow
2. Information requirements
3. Application requirements
4. Preconditions for efficient data maintenance
5. Preconditions for implementation of changes in the workflow processes

These three workflows provided a unique overview of potential bottlenecks and pitfalls and essentially, the importance of the database in high quality administrative procedures. At the same time, the advantages of intensive use of geographic information were verified.

A modification of the workflows was afterwards carried out in order to eliminate duplication work, to ensure (if possible) that processes run parallel instead of serially and furthermore, there is considerable focus on applying the most appropriate data basis in every part of the process. In this connection, the Municipality of Vejle realised that data is such an important part of the administrative procedures that it is necessary to conclude written data management agreements regarding the contribution of the departments to the shared data ownership. At the same time a better overview over which of the approximately 500 GIS teams (hereof 250 from the former county and 250 from the

former municipalities), that has relevans to the day-to-day case administration.

In connection with its adjustment of workflows, the Municipality of Vejle chose not only to comply with statutory minimum requirements for case administration. When possible, the workflow processes have been organised to result in a higher service level for internal as well as external interested parties. There has, however, been particularly high focus on automating workflow processes so as to reduce repetitious work to a minimum. The time saved release resources for the case administrators to provide an extraordinary service while utilising and developing the competencies of the individual.

Acquisition of a server-based GIS platform in the Municipality of Vejle was made according to an enterprise approach. Together with the electronic records management system (ESDH), GIS forms the foundation for the administrative procedure: Location and Case.

This case illustrates how EA methods can be used to constantly ensure coherence between business and IT support. This work of maintaining the system is a natural process in an enterprise organisation - EA is not a project, but a fundamental philosophy.

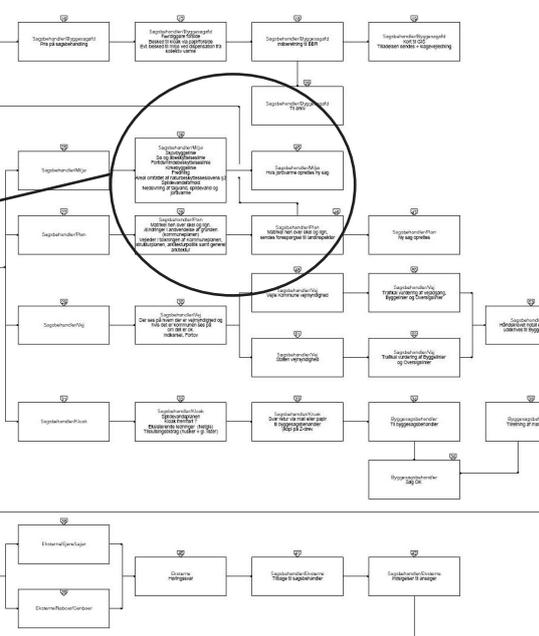


Figure 12a: Vision of daily work in municipality of Vejle

# Conclusion and Recommendation

Public administration can be regarded as an enterprise whose objective is to delivery competitive in-demand services through efficient resource allocation. It is important first to focus on identifying *what* is to be delivered and then *how* it is to be delivered.

Vision, mission and strategy are defined based on the external wishes followed by planning of workflow processes and services. This is where technology starts to become interesting as a business supporting tool.

Public administration is constantly faced with new requirements and wishes. This requires systematic planning of IT applications and presupposes that new business requirements are integrated with the possibilities offered by new technology.

Therefore it is important to be aware of business and technological trends that may prescribe how administrative tasks are to be solved. One of these trends is to apply a geographic approach or, in words of the National Survey and Cadastre, make "location" the backbone of e-Government.

This whitepaper documents how geographic data, geographic information and geographic information technology – GIS – in combination with traditional IT support the business for the realisation of efficient administration. A geographic approach provides important leverage for the fulfilment of the three main objectives in the Danish e-Government strategy: *Better digital service, increased efficiency and stronger collaboration.*

Having flexible and loosely linked tools are an invariable requirement when administration procedures need to be efficient, coherent and value-adding. Using business-supporting tools that can be part of a SOA is necessary in order to create solutions that are interoperable across organisations.

The technological development has removed the technical barriers for implementation of GIS, as part of an overall enterprise information system that makes geographic data and tools widely available in or across administrative departments as services. Unique for GIS is the fact that it constitutes a framework for collaboration and communica-

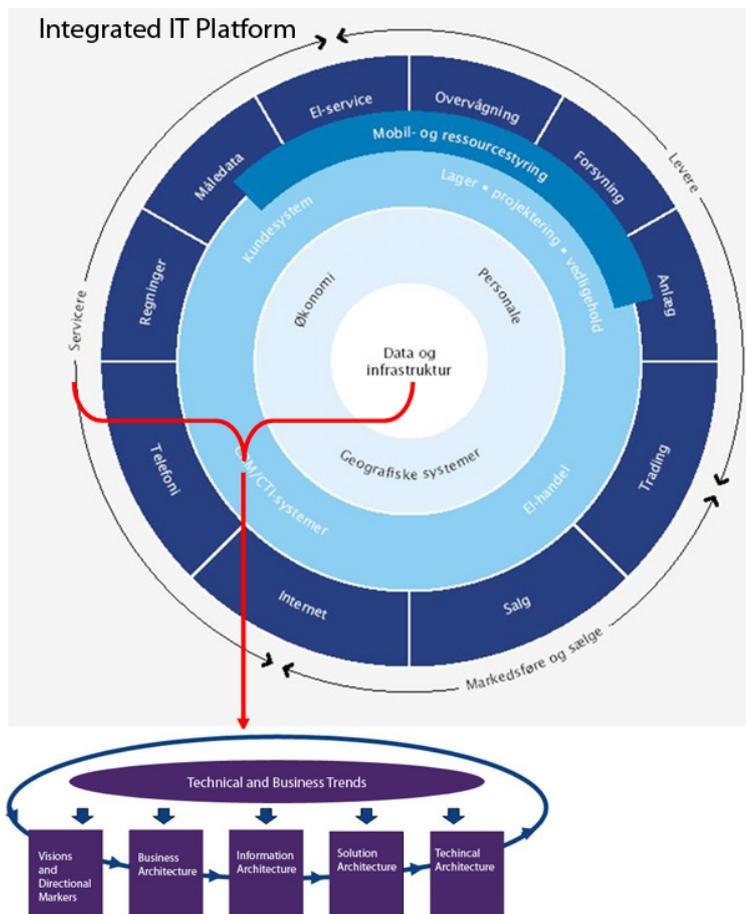


Figure 13: Realised EA model for the utility company DONG Energy.

tion by organising and sharing data and information based on a common reference – the “location”. GIS supports a number of generic geographic services such as maps and address services. However, GIS can also provide geo-processing services which automate and rationalise more complex workflows.

The challenge of this service-oriented architecture is to identify business processes and services to be implemented as shared services and used in various administration contexts. To support this work, the National IT and Telecom Agency prepared the OIO enterprise architecture method. Work based on the OIO EA method may result in shared public GIS services, based on public reference models and standards and documented in a common public service catalogue (including both administrative services and IT services).

Redemption of the full potential of a geographic information technology requires that the above work has a strong anchor within the organisation. In a cross-public organisational context, a natural anchor could be the domain committees established as a result of the FORM-work. The domain committees mission is to establish and implement a solution-oriented action plan that defines the busi-

**“... PUBLIC POLICY IS BEING SHAPED BY THE AVAILABILITY OF HIGH QUALITY GEOSPATIAL DATA. THIS INCREASING EMPHASIS HIGHLIGHTS THE NEED FOR COORDINATION, COLLABORATION, AND AN ENTERPRISE VIEW OF GIS MANAGEMENT.”**  
**GARTNER - US PUBLIC SECTOR GIS SURVEY**

ness objectives for the domain area and designate the overall digitalisation course. An important task consists in coordinating the digitalisation projects of the domain area.

It is obvious that over the coming years the public sector will make an effort to integrate – and to establish ownership of – the e-Government strategy in their own businesses, to exploit the digital possibilities even better. There is an increasing necessity for highlighting the needs and expectations of the citizens so that efficient and targeted services can be provided without consuming extra resources.

Enterprise architecture is not a new concept. However, enterprise architecture seems more relevant than ever before. The complexity of modern society and the world’s expectations require methods for modelling and simulation of “the Business Denmark” to produce the required foundation for control and administration.

GIS has proved a valuable technology to support enterprise architecture based on service-oriented principles. By means of GIS, collaboration can be strengthened by exchanging vital information across organisational boundaries, be made more efficient by streamlining processes and automating tasks and improve services to citizens through new innovative geographic approaches to e-Government.

# Sources

[1] ESRI Inc. (June 2007).

Geospatial Service-Oriented Architecture (SOA). Redlands: ESRI Inc.

[2] ESRI Inc. (December 2007).

Enterprise GIS for local government. Redlands: ESRI Inc.

[3] Danish Ministry for Science, Technology and Innovation (2003).

Whitepaper on IT architecture. Copenhagen: Danish Ministry for Science, Technology and Innovation.

[4] The National IT and Telecom Agency (2007).

Introduction to OIO Enterprise Architecture Method (OIO EA) (version 1.0). Copenhagen: The National IT and Telecom Agency.

[5] IBM Cooperation (October 2006).

Igniting innovation through business and IT fusion. Somers: IBM Cooperation.

[6] Danish IT Society (2007).

"Kravspecifikationen" (Requirements specification, 1st edition, 4th printing). Copenhagen: Danish IT Society.

[7] KMD A/S (May 2006).

DANMARK A/S (Den Offentlige Forretningsmodel/The Public Business Model) (1st edition, 1st printing). Ballerup: KMD A/S.

[8] The Spatial Data Service Community (2006).

Specification of Shared Object Types (FOT) version 3.0 Copenhagen: The Spatial Data Service Community.

[9] The Digital Taskforce (2008).

FORM opgavenøgle v. 1.1. Copenhagen: The Digital Taskforce.

[10] Doucet, G., Gøtze, J., Saha, P., Bernard, S. (2008).

Coherency Management: Using Enterprise Architecture for Alignment, Agility and Assurance. Journal of Enterprise Architecture, May 2008.

[11] NES A/S (2003).

Annual Report 2002. Gentofte: NES A/S.

[12] Government, Local Government Denmark (KL) and Danish Regions (2007).

Strategy for digitalisation of the public sector 2007-2010. Copenhagen: Government, Local Government Denmark (KL) and Danish Regions.

[13] Kreizman, G. (2002).

Gartner: U.S. Public-Sector GIS Survey.

[14] The Danish Ministry of Environment (2007).

LOCATION – a gateway to e-Government. Copenhagen: The Danish Ministry of Environment.

[15] The Danish Ministry of Environment (2004).

Architecture for e-Government. Copenhagen: The Danish Ministry of Environment.



### **About Informi GIS A/S**

Informi GIS A/S was founded in 1993 as an IT company providing professional GIS solutions for the Danish market. Its solutions are based on software and technology from a select group of leading international software vendors. Informi GIS is ESRI's distributor in Denmark, and has its focus on the distribution and use of GIS software within companies and organizations. Informi GIS also distributes one of the leading solutions for the telecommunications industry, Network Engineer, created by Telcordia, as well as ArcFM and Designer from Telvent Miner & Miner whose solutions build on ESRI's platform. Informi GIS' goal is to develop the company's growth in accordance with customer demands, emphasizing quality and close personal relations. Informi GIS is the leading GIS Company in Denmark and employs more than 100 full-time professionals and a range of freelance, specialized consultants. Visit Informi GIS at [www.informi.dk](http://www.informi.dk).