



# **The Danish e-cadastre**

## **A digital revolution in centuries old cadastral processes**

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## Contents

- What is the Danish Cadastre?
  - and what role does it play?
- Which business processes were necessary to renew?
- What were the targets?
  - and how well did we succeed to meet them?
- Where are we now?
  - and where are we going?



## History of the Danish cadastre

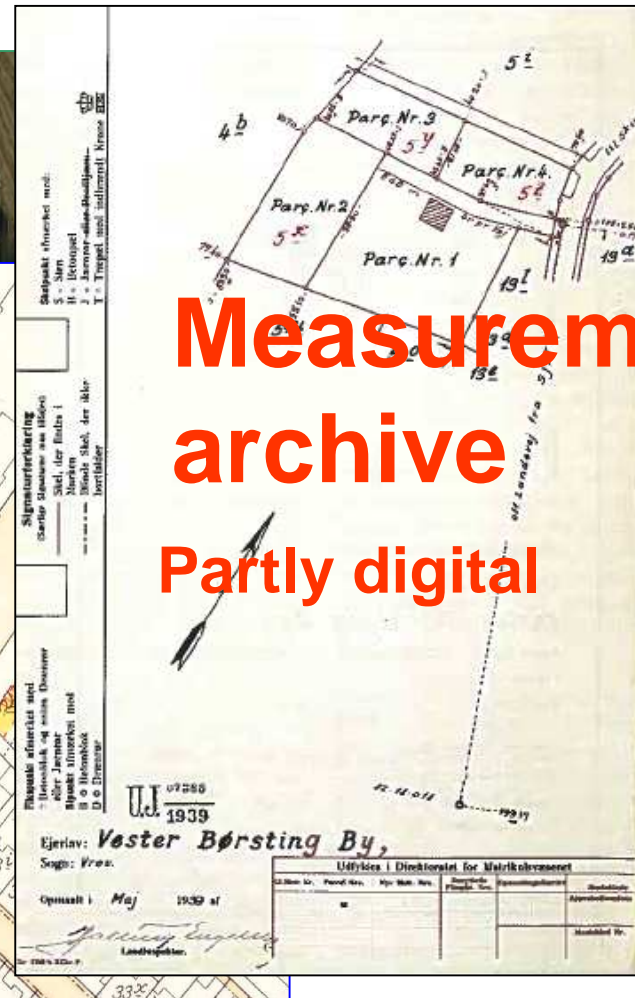
- The original purpose of the cadastre was for taxing property
- The first Danish cadastre was created in 1644 – the King was short of money after the war against Sweden
- Christian V Cadastre of 1688 only contained land which could be taxed. The Cadastre did not include a cadastral map
- The present cadastre was created around 1844. The surveys included survey of all land and at the same time all land parcels was valued according to the soils quality



**Cadastral register**  
**Digitally in 1986**



**Cadastral Map**  
**Digitally in 1997**



**Measurement**  
**archive**  
**Partly digital**



## The content of the Cadastre

- Cadastral numbers – identify parcels eg. 1a Ll. Skensved By, Højelse (numeric code:1a 050655) – approximately 2,5 million parcels
- Area of parcel including area of private road, etc.
- Restriction of public rights:
  - agricultural land - land designated for continued agriculture purposes
  - forest conservation areas
  - windfall - financial aid for rebuilding forests after windfall
  - coastal zoning – registration of seashores and dunes
  - soil contaminated areas

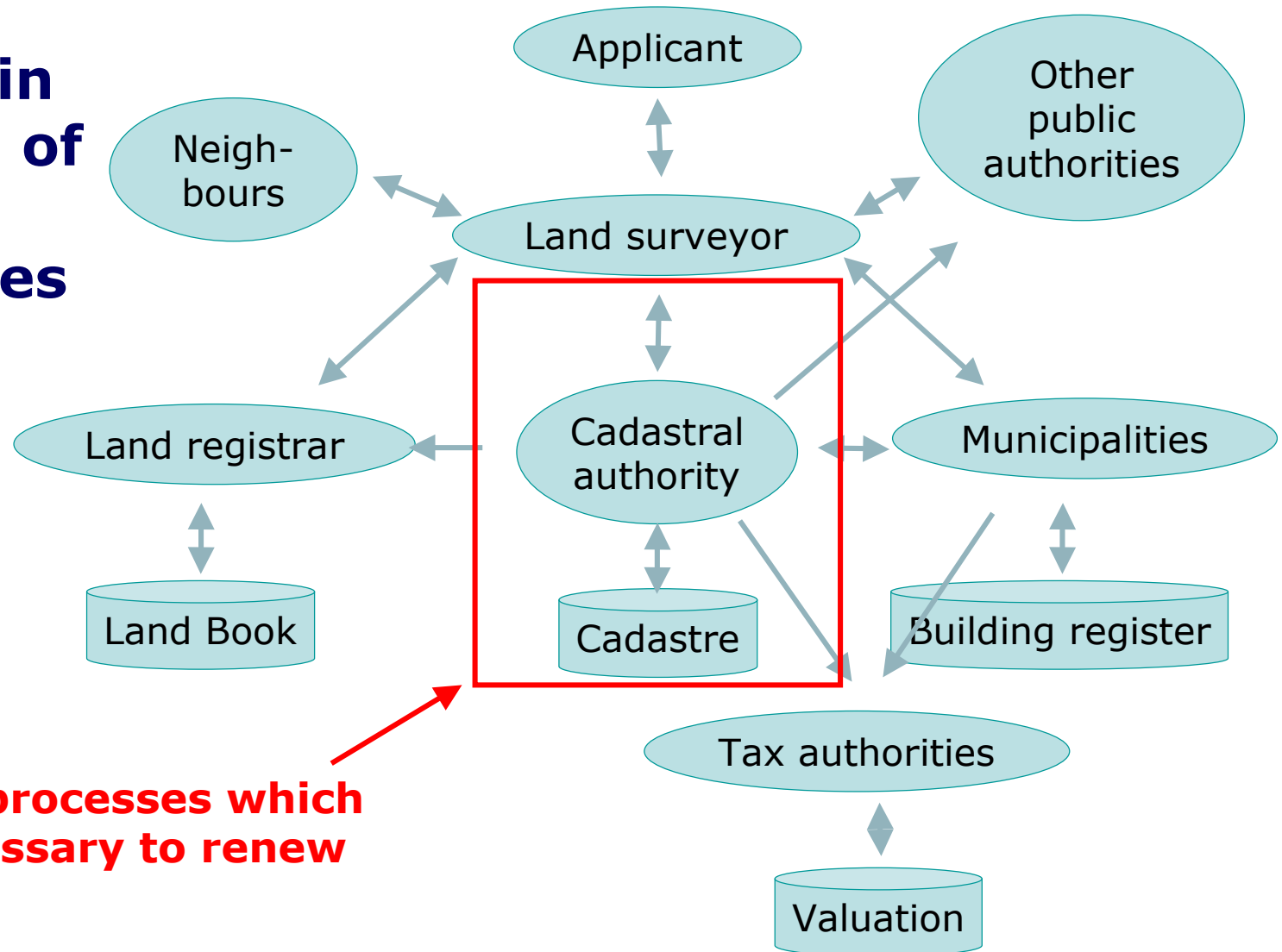


## The role of the cadastre

- The cadastre gives a reliable picture of the actual property situation – is kept up-to-date daily – and is thereby the basis for property marked in Denmark
- The cadastral information is the basis for:
  - Registering of rights and restrictions (Land Book)
  - Collection of property tax (Ministry of Tax)
  - Administration of land use and building control (municipalities)
- The cadastral data is daily distributed (automatically) to the Land Book, Ministry of Tax and municipalities



# Players in creation of new properties





## Goals for new cadastral system - miniMAKS

- Technological innovation
  - Existing systems are replaced by one new system
  - Integration of registry and map data in one database
  - Open formats to other systems
  - SOA (Service oriented IT Architecture) external and internal
- Streamline data flow and registrations
  - Use of digital data from private land surveyors
  - Direct use of data created internally and externally
  - Digital workflow in cadastral applications
- Expected performance
  - Reduction of human resources - 10-20%





## Were the goals fulfilled?

- Technological innovation
  - Existing systems replaced by one new system
  - Integration of registry and map data in one database
  - Open formats to other systems (XML/GML)
  - SOA external and internal

**miniMAKS-Sag**

Filer Funktioner Administration Hjælp

Sagsliste | Afgifter og gebyrer | BatchLog

Søgekriterier

Sagsstatus:  Sagskategori:  Fakturadata:   Tidsfrist overskredet

Team: Team 10001 Revisor: Anne Mette Teglgard Rekvirent:   Kun aktuelle sager

SagsID:  KMS journalnr.:

Matrikelnr.:  Ejerlavskode:  Ejerlavnavn:

Søgeresultat

SagsId	KMS journalnr.	Indkomstdato	Matr.nr	Ejerlavskode	Ejerlavnavn	Kommune	Bindinger	Sagskategori	Status
100001037	U2007-01037	23-11-2007	1a	420652	Rygård Hgd, Langå	Nyborg Kommune	0	Matrikulær sag	Under KMS be
100000676	U2007-00676	22-10-2007	738	2005551	Thisted Bygrunde	Thisted Kommune	0	Matrikulær sag	Under KMS be
100000709	U2007-00709	24-10-2007	10c	2005852	Grenaa Markjorder	Norddjurs Kommune	0	Matrikulær sag	Under KMS be
100000881	U2007-00881	31-10-2007	55	420651	Langå By, Langå		0	Minireovering	Under KMS be
100000714	U2007-00714	02-11-2007	2a	601258	Ulsted By, Ulsted	Aalborg Kommune	0	Matrikulær sag	Under KMS be
100000954	U2007-00954	02-11-2007	121	1550252	Lambjerg, Hørup		0	Kvalitetsforbedring af matriklen	Påbegyndt revi
100001116	U2007-01116	21-11-2007	4k	2005551	Thisted By, Thisted	Thisted Kommune	0	Kvalitetsforbedring af matriklen	Under KMS be
100001118	U2007-01118	21-11-2007	156a	2005551	Thisted By, Thisted	Thisted Kommune	0	Kvalitetsforbedring af matriklen	Under KMS be
100001122	U2007-01122	22-11-2007	84	2000552	Frederiksværk Markjorder		0	Kvalitetsforbedring af matriklen	Under KMS be
100001150	U2007-01150	27-11-2007	19b	340653	Marslev By, Marslev		0	Kvalitetsforbedring af matriklen	Under KMS be
100001152	U2007-01152	27-11-2007	6	431751	Ballen By, Ø. Skerninge	Svendborg Kommune	0	Matrikulær sag	Under KMS be
100001161	U2007-01161	27-11-2007	4a	770453	Over Hornbæk By, Hornbæk		0	Matrikulær sag	Under KMS be
100001208	U2007-01208	30-11-2007	8f	472051	Vigsnaes By, Vigsnaes		0	Kvalitetsforbedring af matriklen	Under KMS be
100001371	U2007-01371	19-12-2007	4b	190456	Næstved By, Næstved		0	Kvalitetsforbedring af matriklen	Under KMS be

Sagsresumé  
Matrikulær sag  
2 Jordstykker  
5 Ejendomme  
16 Dokumenter

Forandringer  
1 STORM1  
1 UDS

Dokumenter

Dokumenter fra landinspektør  
Lsp.erkl. oph. ldb.pligt  
SaglD100001037-4-15-1.pdf  
Lsp.erkl. hvid erklæring  
SaglD100001037-4-8-1.pdf  
Måleblad  
SaglD100001037-4-5-1.tif  
Oversigtskort  
SaglD100001037-4-3-1.pdf  
Skematisk redegørelse  
SaglD100001037-4-2-1.pdf  
Ændringskort  
SaglD100001037-4-4-1.pdf

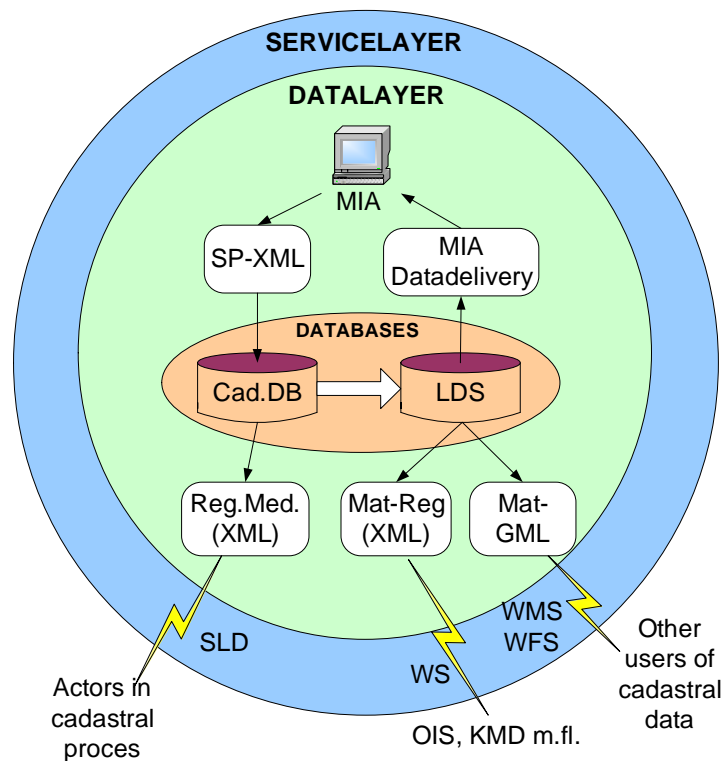
start | 2 Int... | 3 Mic... | C:\WI... | MMAKS... | miniMA... | Dokum... | DA | 08:53

One system

The screenshot shows a GIS application window titled "Sag" with a menu bar (Sager, Funktioner, Vinduer, Hjælp) and a toolbar. The main map area displays a yellow-outlined parcel map with labels like "1e", "1c", and "1a". A sidebar on the left contains a tree view of data layers: "Sag", "EFTERDATA", "ÆNDRINGER", "FØRDATA", "Kort10 WMS", "DTK Skærmkort WMS", "Ortofotos WMS", and "Målebordsblade WMS". Below the sidebar is a "Display Order" and "Groups" section. On the right side of the map, the text "Integration of registry and map data in one database" is overlaid in large black font. At the bottom of the window, a status bar shows coordinates "6.117.266,192N : 606.971,454E", a scale of "1:15954", and dimensions "2.228,814m x 2.347,008m". The Windows taskbar at the bottom shows the start button, several open applications, and the system clock at "09:06".



## Service oriented Architecture - open formats



## Service oriented IT Architecture

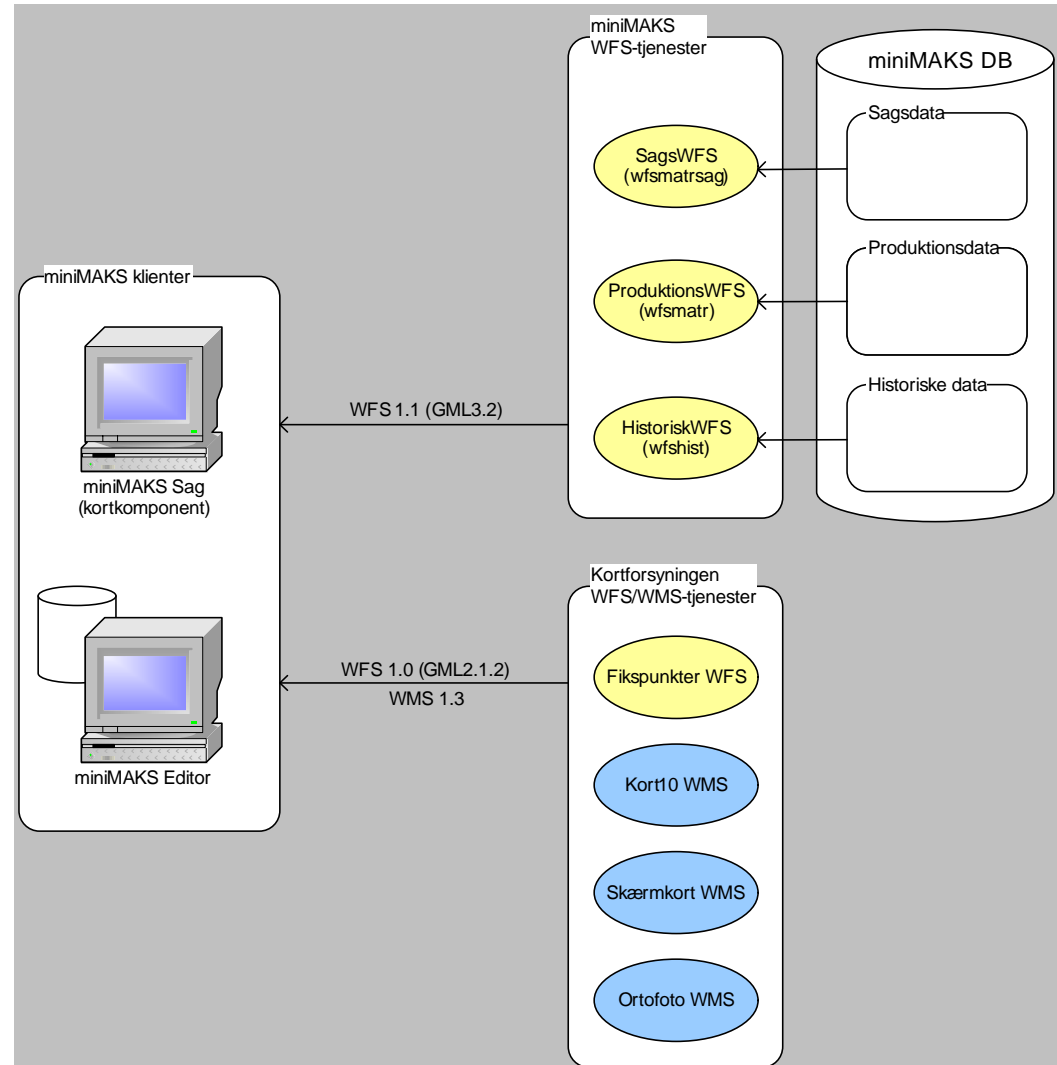
- External -  
standardize  
integration and  
services (OIOXML)

- Internal in the  
system



Use of WMS/WFS services as integrated parts of the system

Implemented with Websphere Process Server and Data Power





## Technological innovation

- ☑ One new system
- ☑ Integrated databases (Oracle 10G Spatial)
- ☑ Open formats to other systems (XML/GML)
- ☑ SOA – external and internal

### SOA experiences:

- Define problems before the solution (SOA does not solve any problems!)
- Do only use services where it make sense – to change all sub routines to lose connected services do not necessary give easier maintenance and better performance



## Spatial data is a challenge

- ☑ GeoMedia functions in a SOA environment. All service calls are made from programs developed to work with GeoMedia
- ☑ Map data are downloaded via WMS and WFS
- ➡ Performance in WFS is not that good as expected compared to direct call in a client/server solution (factor 2,5 slower). However, it is found acceptable
- ➡ The most challenging has been defining database views



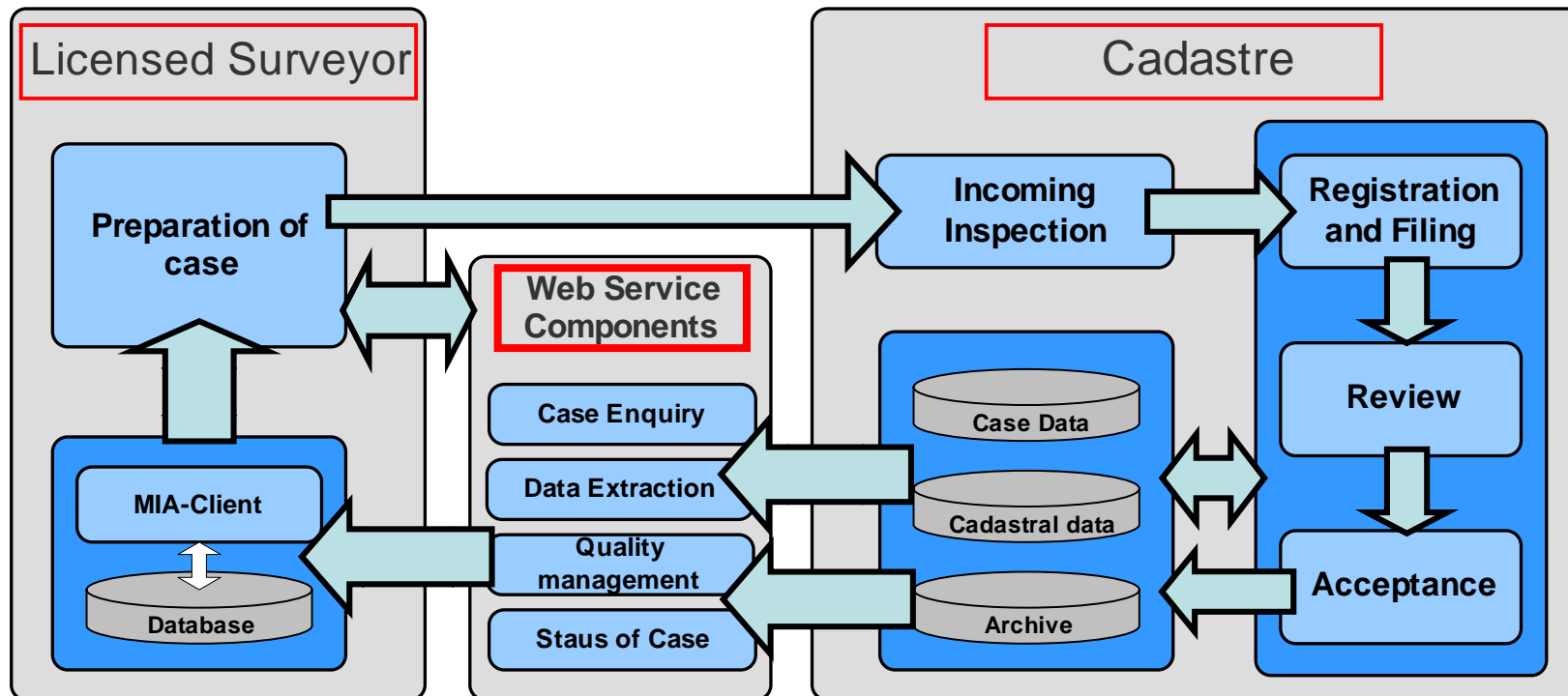
## Were the goals fulfilled?

- Streamline dataflow and registrations
  - Use of digital data produced by the private land surveyors
  - Direct use of data created internally and externally
  - Digital workflow in cadastral applications





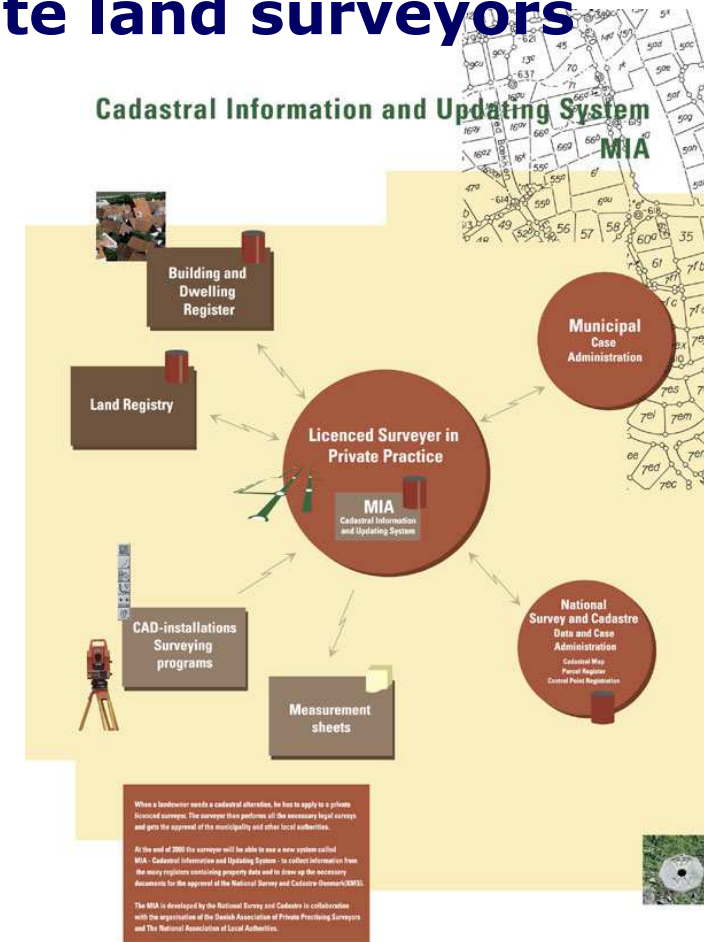
# Streamline dataflow





## Use of digital data from private land surveyors

- **'MIA'** cadastral information and updating system
- Made available by National Survey and Cadastre and has been compulsory since 2005
- Used by all private land surveyors in Denmark





# Use of external created data and digital exchange of data

Kortvindue - sag 2005-05-16-1 - importeret d. 11-10-2004

Vindue Udarbejd sag Kortindstillinger Bediger Find Hjælp

Bandholm By, Bandholm

Ejendom før	Matrikulære ændringer	Ejendom efter											
Der sker følgende matrikulære ændringer													
ESR ejendomsnr.	Ejerlavskode	Matr.nr.	Delnumre	Nyt nr.	Matrikulære ændringer	Ber.	Areal	Vejareal	Vandareal	Skovareal	Strandareal	Klitareal	fo
	480251	3o	3		tilgår matr. nr. 2a Bandholm By, Bandholm, ved ejendomsberigtigelse mod s		8938						
	480251	2bd	2	Delnr. 2	arealoverføres til "Matr. nr. 2a Bandholm Hgd."...		19520	0					
	480251	5a	10	Delnr. 10	udstykket	o	3684	0					
	480251	5a	7	Delnr. 7	udstykket	k	6976	0					
	480251	5a	6	Delnr. 6	udstykket	k	6395	0					
	480251	5a	8	Delnr. 8	udstykket	k	6672	0					
	480251	5a	8	Delnr. 8	udstykket	k	7786	0					
	480251	5a	4	Delnr. 4	udstykket	k	7610	0					

Start | C:\Præsentationer\... | MIA Applikation | Præsentation1 | MIA engelsk.ppt | 11:12

Data is registered as changes

MIA creates transaction data (XML)

The application contains:

- documents
- data extraction
- measurement sheets



## **Big-bang implementation 10 September 2008**

- miniMAKS implemented
  - New version of MIA version 3
  - All type of cadastral applications
  - The hole country in one go
  - 50 users at National Survey and cadastre - 400 external MIA users
- ➡ Recommendation:  
Consider alternative solutions to big-bang!



## **Streamline dataflow and registrations**

- ☑ Use of digital data from private land surveyors
- ☑ Direct use of data created internally and externally to updating the cadastral databases
- ☑ Digital workflow in cadastral applications
- ➡ It is problematic (made more complicated) using two systems (MIA/miniMAKS)



## Were the goals fulfilled?

- Expected performance
  - Reduction of human resources - 10-20%





# Expected performance

- ➡ Backlog of cadastral applications up to the implementation of the new system (Upswing in the market (2005-2008))
- ➡ Huge problems in processing the applications (most major errors solved during the first months – few errors left)
- ☑ App. 11.500 applications processed since Sep. 2008
- ☑ Time of transactions lowered from 9 to 4 months
- ☑ Number of processed applications are higher now than on the former system – expecting even better performance



## Success or failure ???

- ➡ Time schedule exceeded with 27 months
  - time schedule was estimated to 13 months
- ➡ Budget exceeded with almost 100%
  - This include improvements – total cost approximately US 8 million
- ☑ The solution is ahead of comparable systems in Denmark and international
- ☑ The system solves what it was designed to do
- The project succeeded because:
  - commitment by the IT deliver on a management level
  - the willingness to cooperate by both parties





## Perspective for e-Government

- More intelligent data from MIA (documents)
- Use of data from MIA in local authorities in their workflows
- Closer connection to e-Land Book
- Introduction of a new common property identifier, which links all property related registers together
- Cadastral data (via web-services) as reference data in solving administrative tasks in the public sector



## Questions???



Thank you for your attention