

# Cadastre





# 1 EXECUTIVE SUMMARY

Many countries nowadays either have no reliable cadastre, or still have information written in thick books. in which it is highly impractical to maintain currency. Hence much of Sinergise's recent work has been to digitize cadastre data, from paper documents, guided by aerial photography, topographic maps, building outlines, streets etc. The primary goal was to establish initial digital land cadastre, which would allow continuous update and improvement.

Of course, any digital cadastre, by providing a full overview over land parcel ownerships, underpins land titles (Deeds) and Valuation (as implemented in LAVIMS- Mauritius). A close integration of Deeds, Valuation and Cadastre applications means efficient and quick synchronization of changes in all applications.





# 2 DATA DIGITIZATION

## 2.1 Aerial Photography and DEM

In LAVIMS, the cadastre needed to provide aerial photography, topographic map and land parcels along with owner's information. For this we had to prepare complete aerial map of Mauritius that had resolution of 15 cm, and DEM (Digital Elevation Model) with resolution of 10 m.



Figure 1: Aerial Photography



Figure 2: Digital Elevation Model

## 2.2 Building outlines and streets

These two inputs were used for creating building outlines and streets. The process for creating these was guite intensive and involved many interpreters carrying out heads-up digitisation at a large scale. Data had to be accurately digitised and topologically correct. For example, the street network needs to obey line-node digitisation in order to facilitate precise segment attribution, and to accommodate future applications, such routing for example. Buildings were digitised with 3D depiction off the stereo imagery, so contain and estimate of height (which can be loosely converted to storeys). All buildings had to be accurate, topologically correct and nonoverlapping, either with other buildings or with streets (except for some exceptions- overhanging buildings for example).



Figure 3: Building outlines (orange) with streets (yellow)

## 2.3 Land Parcels

- Buildings and streets, however, only form physical demarcations- the legal boundary of land parcels
   which were held on paper documents, were also
   needed in a basic digital cadastre. The conversion
- of paper documents into scanned versions, the storage, fast retrieval, geo-correction and manual interpretation/digitisation of legal boundaries all demanded considerable human and machine resources and development of efficient workflows and tools, including interactive and performant geo-rectification (see section 3.2.3).



Figure 4: Old plan and view of digized land parcels



# 3 CADASTRE EDITING APPLICATION

AAs well as preparation of all the basic data, the main essential part was to create an application that would allow edit existing parcels and its data to keep the base data up-to-date. The developed cadastre editing application is Java-based and is therefore truly cross-platform.

## 3.1 Main GUI

The cadastre application consists of the following parts:

- Toolbar
- Data Panel
- Graphical View (Main view)
- Layers panel
- Quick search
- Query/Locate results panel



Figure 5: Cadastre application main view









#### ► 3.1.2 DATA PANEL

The Data Panel permits the use to manage many different data layers. It also provides access to attribute data, georectification options, parcel editing options etc.

Dala	
Case 401	
0.0	0.10
el General Info	
Case Number:	401
Status:	Open
diber.	More etterment
Title:	Mitha Test Deploy
Permit Code:	1
Owner:	Miha Kadunc
Opened Or:	2011-01-18
Last Updated On:	2012-02-01
Closed On:	
Serveyor:	Grega Milčinski 🖌 🚱
Notes:	
Activativ Ca	50%
Close Cas	e 🔄 Save 🙆 Cancel
<ul> <li>Land Parcels (</li> </ul>	25)
Documents	
Survey Plans	
Locks (13)	

Figure 6: Data Panel



#### ▶ 3.1.3 GRAPHICAL VIEW

This window shows aerial photography with layers which can be enabled in the Layers Panel. It enables panning, zooming and feature querying.



Figure 7: Graphical View

#### ► 3.1.4 LAYERS

The layers panel shows all available layers. You can toggle on/off individual layers or whole layer groups. Some layers also have options to toggle only text, line and fill properties. To edit the layer style, you can also double-click on layer which will open Layer Customizer window. Here you can edit Line, Shade, Text, Symbol and Advanced properties.

#### ▶ 3.1.5 QUICK SEARCH

The quick search window is to quickly find desired block, PIN or deed.

🔍 Locate by PIN	N, Deed or block
<block, or<="" pin="" th=""><th>Deed&gt;</th></block,>	Deed>
	Q Locate
	1

#### Figure 9: Quick search

#### ► 3.1.6 QUERY/LOCATE RESULTS

This window is primarily empty and it shows results only when query or measurements are performed. In case of measuring another tab is dynamically added.

🏦 Measuremen	ts		
Length: 38.45 n	Area: 96.51	78 m²	
Location	Distance	Bearing	Angle
555188.265, 77_	1		
555192.546,77	11.20 m	157" 31" 44'E	
555195.179,77_	2.85 m	112' 31" 32' E	134" 59" 48'
555199.799.77	5.00 m	67* 31" 42' E	135" 0" 10'
555197.506,77_	6.00 m	22" 27" 59' W	90" 0" 19
555198.591,77_	5.00 m	12" 31" 57' E	214" 59" 56"
555100 207 77	8.40 m	86* 27" 52' W	81" 0" 11'



#### Satellite - Aerial ✓ Streets 1 2 2 V Buildings 8 😒 💆 Cadastre Blocks 1 2 Scanned plans V Digital plans - V D Polygons 1 8 m Lines 82 3 - V Points 883 Cadastre - Provisi Cadastre - Active Empty Seeds And V - Historic points OK Apply Cancel

Figure 8: Layers panel and Layer Customizer

## 3.2 Cadastre Editing Overview

# The Cadastre Editing Application has the following features:

- Case creation & attribution
  - ✓ List of land parcels
  - ✓ Reference documents / plans
- Preparation of reference maps
  - $\checkmark$  Import and geo-register scanned survey plans
  - ✓ Import digital surveys
  - ✓ Digitize survey lines from measured distances and angles
- Update of provisional cadastral topology
  - ✓ Lock affected topology
  - Perform changes (boundary editing, split/ merge parcel etc.)
  - ✓ Update attributes of topological elements
- Activation of changes made in the case

#### 3.2.1 CASE CREATION & ATTRIBUTION

When creating a case, you are automatically selected as owner. You need to select type of case and assign surveyor. Selecting surveyors is done via dialog box, where you can filter or sorted among existing registered surveyors (a dynamic list maintained by the representatives of the surveying professional body).

+ Add	G Remove	Filter:	\$
Name	ACT AVM	Notes -	
INCENT Charle	e.		-
UNLI EMAIN Fran	ncois.		
WILLIAMS WIAILIA	im Heat		
NILMANN Georg	e Gabriel		
VIN CHUN KIT P			
YONG KIN YEN			
VOUNG Rodolph	e		
ZEVANOR A.P			
de CHERMONT .	lules		
John Doe	Testac	babt	1
tane Dee	Testad	Ided	

Figure 11: Surveyors dialog box

After selecting a surveyor, it is visible in case's general info. Case details consist of 5 subpanels:

- General info
- Land Parcels
- Documents
- Survey Plans
- Locks

7apa	
Case 401	
9.9	3 3
U General Info	
Case Number;	401
Status:	Open
Туре:	Morceliement
Title:	Miha Test Deploy
Permit Code:	
Owner:	Miha Kadunc
Opened On:	2011-01-18
Last Updated On:	2012-02-01
Closed On:	
Surveyor:	Grega Milčinski 🙀 🔞
Notes:	hannah hannah
E Undo Cisi	
an other see	
Activiata Ca	90
Close Cas	e H Save O Cancel
Land Parcels (	25)
3 Documents	

Figure 12: Case details overview



Figure 13: Preview of area of interest



#### PROVISIONAL AND 3.2.2 **ACTIVE LAYER**

Cadastral processes can sometimes take several days or even weeks to complete as there might be some field measurement required or there are some contractual issues to be resolved. That is why there is a need to detach the editing process from the active data.

After starting to work on a case, the operator first selects the parcels he/she will work on. These parcels are transferred to provisional layer, which is specific for each case. The features in the active layer are locked and cannot be changed until the whole action is completed. It is not sufficient to lock only the selected parcels but also all parcels, which share the same features (e.g. neighboring parcels).

In the image bellow the operator can see the locks - green parcels are locked for operator's editing, yellow ones are unlocked and red ones are locked to some other operator.



Figure 14: Cadastre rendering of parcel borders

#### ATTACHED DOCUMENTS 3.2.3 & SURVEY PLANS

In these two subpanels you can see attached documents and survey plans to the case. In Documents panel you see all attached documents. Here you can see uploaded document or you can add new documents.



*iqure 15: Documents panel* 

In the Survey Plans panel you can see uploaded plans. This panel enables changing opacity of each plan and also ordering of uploaded plans (useful for overlapping plans). You can also perform geo-positioning of each plan, a procedure which is described in the next section.



Figure 16: Suvey Plans panele

#### 3.2.4 GEO-POSITIONING **OF SURVEY PLANS**

This tool enables positioning and rectification of uploaded survey plans. First you can manage the plan itself by recoloring or removing/deemphasising its background. To recolor the plan you need to specify what original colour you want to replace with desired. Similarly you can remove its background (Figure 17); you only choose original colour that will be removed. You can also adjust opacity for whole plan.



Figure 17: Choosing colour to remove from plan



Figure 18: Survey Plan with removed background and remaining features coloured orange

To perform rectification you first need to define control point. It's advisable to create at least 3 points. You can also disable certain point if we see that there is big deviation from other points. After defining control points we can choose transformation options: lock aspect ratio and shearing (Figure 19). You can toggle both if you want. You can save transformation for the next time. In the bottom we can also see the root mean square error (RMSE) value which tells us the overall quality of fit of the geo-rectified data.



Figure 19: Geo-positioning of Survey Plan with lock aspect ratio and shearing



Figure 20 - Another look at the geo-positioning process, replacement of colours, removal of background

#### PARCELS LINKED TO CASE 3.2.5

The Land Parcels panel stores all parcels that are planned to be modified in the case. The user can simply add parcels by picking it on the map or creating new parcel. This table of parcels is showing locked and active parcels, and also the parcel's status. Each parcel has its own reserved PIN number, which is generated automatically.

9	
	8
General Info	
Land Parcels (7)	
Remove Selected	R Add
PIN - Lock Status	Active
602010250 3 LIVE	0
602010249 🥝 LIVE	
602010248 3 LIVE	- 23
602010247 🥥 RETIRED	- 63
602010067 🥥 LIVE	0
602010063 🥥 RETIRED	0
602010060 😳 LIVE	

Figure 21: Land Parcels panel

Senerate new PINs	×
Pick or enter block ID: (Cite	J. Kennedy)
172357	Pick
Number of PINs to generate: (Proposed starting PIN: 172357	3 ÷

Figure 22: Generating PIN number for parcel

#### LOCKED ITEMS ON A CASE 3.2.6

This panel shows list of parcels that are locked. This means that they have been locked due to recent editing or parcel has been retired. You can still activate or unlock them.

.ase	1585 Parc	el 1602010060		-	
1.1	-			8	3
G	ieneral Info				
L	and Parcels	(7)			
1 0	ocuments (0	)			
1 5	urvey Plans				
	ocke (AE7)				_
	OCKS (407)				
-	Coltra in	in	Olahus	1 at in	-
17	Entry -	1005010	Status	ACTIVE	۰.
+	Edge	1990018	LIVE	8	-
H	Edge	1990019	LIVE		-11
+	Edge	1996020	DETIDED	8	-11
+	Euge	1990021	PETIRED	0	-11
믕	Parcel	1602010063	RETIRED		-11
1	Parcel	1602010007	DETIDED	à	-
H	Parcel	1602010247	IVE	ä	
H	Parcel	1602010240	LIVE	ă	-
H	Parcel	1602010249	LIVE	ă	
H	Point	1598708	LIVE	Ö	-
V	Point	1598709	LIVE	0	
V	Point	1599039	LIVE	Ø	
V	Paint	1599040	LIVE	ă	-
	Activate	all	C link	ck selecter	d
	Activate	all	E Unio	ck selected	đ

Fiaure 23: Panel with locked parcels

## 3.3 Cadastre Rendering

For best quality of information system shows angles, lengths and bearing when editing parcels border. This way user sees changes in realtime when editing and facilitates the creation of parcels by coordinate geometry (CoGo) is required.



Figure 24: Angles, lengths and bearings next to parcel border

When you zoom enough to the parcel we have also included the dynamic display of PIN, survey, deed and owner so you do not need to perform feature info. And if the view if too cluttered you can still turn off each of these features (Figure 25).



Figure 25: Parcel displaying additional information

2. 8.
E Topology points
Angles
C Lengths
E Bearing
Precision based styling

Figure 26: Managing rendering on the map



In 2011, we have carried out extensive research on the Uncertainty of LPIS (Land Parcel Information System) data and how to interpret ETS (Executable Test Suite) results (http://j. mp/ETS-results). This study showed that it is very important to know precision when digitising line representations. So now we have included features to include precision for each line and point. Once we have filled these precisions we can turn on Precision based styling which shows us how precise we were when digitising lines (Figure 27). The precision stored against every node and line also permits the logical and sensible upgrading of cadastral boundaries as the precision and reliability of measuring devices increase (e.g. the software can be configured to not permit the replacement of points by those of lower precision).



Figure 27: Precision based styling for points and lines

## 3.4 Points, Edges and Parcels

In this section we will describe attributes and actions for points, edges and parcels.

#### ► 3.4.1 FULL TOPOLOGY

Cadastre processes are unique in a way that the feature types (e.g. point, lines, polygons) are not solely geometries but rather objects with precise attributes, which do influence on the topology behavior - e.g. the point has a different meaning if it was measured with one or another kind of method. Additionally, there exists a relationship between the objects - points do compose an edge, several edges do build a parcel, an edge belongs to two parcels, etc. This kind of complexity requires precise topology rules, which should be taken into account for every specific action.



#### 3.4.2 POINT ATTRIBUTES

To each point we can assign source, precision, method type, monument type, monument ID and other additional notes. Below we also show information such as lock status, status of parcels, if it is active and in which case is it being used.

Data				Manutes		
Case 421 Point	11654747		-		-	5
\$ +			A R R	A	1000	1
<b>B</b> General			-	1000	- SOS7	10
D'	145,2107			HIS C		
Sourcec	Aerial Parcel		-	Carlos and	1000	10
Location	1550100 D01052514 7741	133 10 1200640	-10	and the second	12.0	6
Precision:	+ 04		-	150.000	323.8	
Mathead Tamer	- Jo -	1 100		1000	19 1 1 1 C	
success (194)	Drthophoto			The second second	Sec. Market	-
Monument Type:	Servey marker		-			
Monument M:	4123			1 (QA)		
Witness Marks:				Ser all		
Notes:						
Date From:	2011-02-21					
Date To:						
States:	11/4			12		
Active	false					
Case	421 (Owner: Teo Carouse)					
lei Save		00	ncel		a contract	
Documents				A 19 19		50
A Adjoining parc	els and edges			Current counter of	1.00	

Figure 28: Point general information

Below general information we also see two stacked panels for added documents and adjoining parcels and edges. In the last panel we see which edges and parcels are in touch with selected point.

	2.01			
Document	s (0)			
Adjoining (	parcels and ed	dges		_
Parcels:				
PIN .	GIS Area	Boundaryle	Source	Date From
1602010001	9808,46 m*	3846,05 m	Aerial Roa	d
1602010053	1279.17 m*	274.01 m	Aerial Roa	d
1602010079	406.27 mª	80,85 m	Morcellem	e
Edges:				
Edges:	Bounda	rý Type F	Yecison	Source
Edges: ID + 1925	Bounda	ny Type F	Trecision	Source Aerrai Road
Edges: ID - 1925 1925	Bounda 7770	ry Type F	frection	Source Aerial Road Aerial Road

Figure 29: Adjoining parcels and edges for selected point

#### ▶ 3.4.3 EDGE ATTRIBUTES

Similarly to point we also assign source and precision to edge. Here we also have the additional attributes of Boundary Type and Surveyed Length. Additional information is provided, such as bearing, GIS length, lock status, parcel status, active status and in which case is it situated.

		144
General		
ID:	1926452	
Source:	LS Plan MF	
Boundary Type:	Wall Brick/Block	k
Precison:	*	m
Surveyed Length:		m
GIS Length:	10.35 m	
Bearing:	19* 30* 23 W	
Notes:		
Notes: Date From:		
Notes: Date From: Date To:		
Notes: Date From: Date To: Lock:	true	
Notes: Date From: Date To: Lock: Status:	true LIVE	
Notes: Date From: Date To: Lock: Status: Active:	true LIVE true	
Notes: Date From: Date To: Lock: Status: Active: Case:	true LIVE true 421 (Owner Teo	Cerovski)

Figure 30: Edge general information

#### ▶ 3.4.4 PARCEL ATTRIBUTES

The Parcel itself has many more attributes than its constituent (line and point) parts. Firstly we see parcel ID, PIN number and in which block is it situated.

Then we can choose Type, Source, assign owner and fill in deed area. We can also see same information for status as with point and edge.

Same 274	144630400003		
Case 421 Parc	el 1602010092		-
ф. н.		0 = 0	
General			
m.	220045		
PUE	1602010092		
Block	160201 (Bois Chan)		
Type:	State Land		-
Source:	LS Plan MF		+
Ownec			
Deed Area:	287.4	m*	
GIS Area:	348.30 m²		-
Boundary length:	86.94 m		
			Ten
Date From:			
Date From: Date To:			12
Date From: Date To: Lock:	tue.	_	1
Date From: Date To: Lock: Status:	tue LIVE		1
Date From: Date To: Lock: Status: Active:	1740 UVE 1744		10
Date From: Date To: Lock: Status: Active: Case:	true. LINE true. 421 (Owner Teo Cerossi	a)	12
Date From: Date To: Lock: Status: Active: Case:	true. LIVE true. 421 (Owner: Teo Ceronal	ci) Cancel	
Date From: Date To: Lock: Status: Active: Case: Log Save Documents	true LINE true 421 (Owner Teo Cerora)	a) Cancel	10 10
Date From: Date To: Lock: Status: Active: Case: Documents Documents Deeds and LS	tue LIVE tue 421 (Owner Teo Cerons) Plans	a) Cancel	E
Date From: Date To: Lock: Status: Active: Case: Documents Deeds and LS Adjoining Pare	true LIVE true. 421 (Owner: Teo Cerora) Plans cels and Roads	c) Cancel	10
Date From: Date To: Lock: Status: Active: Case: Documents Documents Deeds and LS Adjoining Pare Points and Ed	true. LIVE true. 421 (Owner Teo Cerores Plans cels and Roads ges	() Cancel	12 15

Figure 31: Parcel general information

Besides Adjoining parcels and Roads and Points and Edges panels we also have assigned Deeds and LS plans. Here we can provide links to Deeds or LS Plans. Each link is checked if there is record in the database.

Link Name	Type	Direction
12/005647	LS plan	Outgoing
TV 4682/46	Deed	Outgoing
Remove Sel New Link:	ected	Add Link
Remove Sel New Link: Target Type:	ected Target k	Add Link
3 Remove Sel New Link: Target Type: Deed	ected Target k	Add Link dentifier:
3 Remove Sel New Link: Target Type: Deed Notes:	Target k	Add Link dentifier:

Figure 32: Deeds and LS Plans linked to parcel

	PIN	Creation	Date	Area
2	1602010211	Split	2011-02-21	22.1_
	B 338414	Split	2011-02-21	33.9
	= 1602010208	Split	2011-02-21	59.9
	⊟ 1602010205	Split	2011-02-21	79.2
		Split	2011-02-21	142
	1602010098	Split	-	197

Figure 33: Parcel history

#### ► 3.4.4.1 Parcel history

At the bottom of parcel attributes we find also History panel which displays parcel history: ancestors and descendants (Figure above). Every time we make a topological change to a parcel, it is stored into history. Parcel provenance is stored separately. We can view each change by clicking on record or just by viewing colored parts.

#### ► 3.4.5 POINT EDIT ACTIONS

Each point has 4 main topological actions to work with:

- Move: drag and drop function to move a point
- Merge with adjacent point: deletes edge between
- **Delete**: merge adjoining edges
- Break: splits node into two points, connected by a new edge

## ► 3.4.6 EDGE EDIT ACTIONS

Each point has 3 main topological actions:

- Split
- Merge with adjacent
- Reconnect



Figure 35: Edge edit actions



Figure 34: Panel showing when editing point

Each point has option to provide precision data.



Figure 36: Reconnecting edge

#### ► 3.4.7 PARCEL EDIT ACTIONS

Editing parcel has 3 main actions:

- Move Seed point
- Transfer, which is basically changing PIN number
- Splitting/Merging

When transferring parcel we first need to create new parcel, then use reserved PIN and use empty seed

When we split parcel we first choose two new seed points and then we split edge into two.

Data   Edit Action		
Merge Parcels		
Click finish button to c	ompliele this act	ion.
First parcel: 1602010210	-	
Second parcet 1602010207		Pick
Resulting parcel:		
Create new parcel		
C Keep first parcel		
C Keep second parcel		
C From existing seed	G Pick	
C Use Reserved PDI		-
Generate PtN		
How to remove common nodes	7	
· Retire		
O Hide		
How to remove common edges	17.	
Retire		
O Hide		
✓ Finish		@ Cancel

Figure 38: Merging parcels

#### 3.4.8 TOPOLOGY EDITING -CONTROL

When editing, we always have an action control panel where we can edit location or coordinates manually. This way we can provide exact coordinates. This is very important when creating new points or edges. There are also actions to take on deleting points/edges. But most important is that there are unlimited "undo" possibilities when editing.

Data Edit Action	4 Manutes
pit Parcel	
O Construct split boundary	12 208 1 10 1
Parcel to split: 1602010251	AND DECK DOWN AND USE
Parcel 1:	
Create New Parcel	
O the Reserved Pilly	
C I rest Lenting load	X X X
O North Located Parton	
555191.821, 7741124 1A @ Pick	
Generate PIN	
Parcel 2:	
Create New Parcel	
C the Reserved PM +	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
O from Leading Serol	
Keep Existing Parcel	
558196103.7741115002 @ Pick	A CONTRACT OF
Parcel 1602010251	AND A CONTRACTOR
Selected point	The second s
Location: 165192.012.7741117.607	A STATE OF A
Precision: ± 15	and the second se
Recently Freiht [	and the second sec
and a second sec	and the second s
Cancel	3

Figure 37 Splitting parcel into two parts



Selected point Location:	555191.823, 774111	18.572	3		A MARK
Precision:	± 1.5	m		9 <sub>44*</sub>	40L.
Monument TypeId.	Survey marker	SM-41234/12		18/1	100

Figure 39: Action control panel

Another option of editing geometry data is by entering geodetic measurement data - starting coordinate, bearing/angle and distance.



*Figure 40: geometry construction from geodetic measurement data* 

#### 3.4.9 TOPOLOGY EDITING – SNAPPING

Snapping is always enabled when editing, because it prevents accidental close points. The digitisation automatically snaps to provisional topology. Besides provisional topology we can also choose to snap to:

- Hidden topology
- Imported digital surveys
- Mark-up layers

Mark-up layers are constructed of lengths and angles (or bearings) when performing measurements. We can save them and use them whenever we want to.

## 3.5 Other features

Since the Cadastre application is so complex we needed to include some additional features or stuff to minimize mistakes when editing.

## ▶ 3.5.1 BLOCKS

The Block was invented to perform geometry recalculations on parcel change. We would also provide lookup and editing dialog box for blocks. This dialog enabled to create new block or rename it.

Fitter:		0
Create new B	lock 23	MVCA name
		1112 Town of Port Louis W6 2
Pick or enter M	IVCA code:	1112 Town of Port Louis Wd 2
146.00	(2) Dick	1112 Town of Port Louis Wd 2
11004	C Pick	1112 Town of Port Louis Wd 2
MVCA name: E	Bots Cherl VCA	1112 Town of Port Louis Wd 2
Block name:		1112 Town of Port Louis Wd 2
		1112 Town of Port Louis Wd 2
(Proposed blog	- ID: 1602261	1112 Town of Port Louis Wd 2
h inhora not		1112 Town of Port Louis Wd 2
Create	Cancel	1112 Town of Port Louis Wd 2
		1112 Town of Port Louis Wd 2
TTTE IO	r on coald the	1112 Town of Port Louis Wd 2
111216	Port Louis (pro	1112 Town of Port Louis Wd 2
111217	Bell Village	1112 Town of Port Louis Wd 2
111218	Port Louis (pro	1112 Town of Port Louis Wd 2
111219	Cassis	1112 Town of Port Louis Wd 2
111220	Cassis	1112 Town of Port Louis Wd 2
111221	Cassis	1112 Town of Port Louis Wd 2
111222	111222	1112 Town of Port Louis Wd 2
111223	111223	1112 Town of Port Louis Wd 2

Figure 41: List of blocks

#### ▶ 3.5.2 PRINTOUT

Users can also print certain areas on paper. To print area we would open print dialog box and then:

- choose template type
- choose scale
- choose paper size (A3, A4)
- provide title
- provide creator
- provide identifier



Figure 42: Print dialog box



Figure 43: Printed sheet

## ▶ 3.5.3 QUICK SEARCH

As mentioned in the beginning we built in quick search to perform quick search on:

- PIN
- Block ID
- Deed number



Figure 44: Quick search results

#### ▶ 3.5.4 DEM RENDERING

For DEM we pre-processed pyramid tiles in size of 512x512 pixels. We also included 1px overlap to prevent edge artefacts when calculating slope. Great compression was provided for best performance (we reduced 65 MB to 16 MB which is only 25 % of original size). Shading for slope is performed on-the-fly and it takes only 15 milliseconds per tile.











#### WEB VIEWER 4

Since the Cadastre Editing application is allowed only to certain people (editors) we needed to build a public viewer with external and public access. It is mainly used for cadastre and valuation modules. It provided basic functionality for anonymous users and advanced functionality for logged-in users.



Figure 45: Public Web Viewer

## 4.1 Rendering

Just like in Editing Application we also included separate rendering of outline, fill and text for land parcels. Text rendering also had separated selection for PIN, TV number, LS Plan number and Owner.



Figure 46: Rendering of outline, text and fill in Web Viewer

#### **4.2 TOOLS**

We further included two tools into public viewer:

- Length and Area Measurement tool
- Coordinate Transform tool

CADASTRE Une Martin	an D
🔂 Layers 🖉 Controls 🖻 Abroutes	
eature into	
Aughical Query	
azetteer havigation	
an And Mpa Melananovi -	
Langer: 7403 m 4 Area 256.5 m² Sections: sate (12.41 m) 1317 m 10.4 m) 14.21 m (6.03 m)	-
ayer Abroute Overy	_
September Transform	
Seurce GDM 2008 . 20/25/30 91' 5 57'3145.82	
Target Mauntus Grid	Fig
Zoom	
Move To	

Figure 47: Tools in Web Viewer

#### 4.1.1 BASIC QUERY

Since we are dealing with cadastre it was important to include query tools. There are two main query tools:

- Gazetteer quick search: we can enter address (town, street), landmark (school), parcel or FPU (11103\*, TV 3885/\*)
- Attribute Query: we can choose on which layer w to perform search and then we specify condition



Figure 48: Query tools

#### **GRAPHICAL QUERY** 4.1.2

- Graphical is used to search on the map. First we can choose on which layer we will perform search (we can also select all layers). Then we choose area of interest:
- point (feature info)
- circle
- polygon
- line string

Finally we specify the condition of search. We can decide whether query will return results that:

- intersect,
- are within (features completely inside),
- or overlap (features intersect boundary).



Figure 49 Performing graphical query

#### QUERY RESULTS 4.1.3

V	e	ē	
s			

After performing any of the queries we receive
results grouped by layer.

Calendar								1	24
ID Û	NAME	MVCA	-		DCMC			DIST.	HOS
160213	Bois Chen	1602	Bois Ch	eri VCA	22	Grand Port / Sa	avannés	1600	TKS
DD							tr	ins Tit. To	
Active Ford								17	国
POL	-	DEED AR	EA.	GIS ARE	5A	LIVE DATE	BND.	LENGTH	
16	02130031		3165	2	61.5892			20	3.628
15	02130046			2	292.9594			71	9.212
15	02130051			1.13	380 1533			7	15.974
15	02130055			1	65.5725			- 14	24.06
13.13							- 6	era 3-4, To	ui:4 🔘
SREET COM								1	14
CODE	16	AME	_			MYCA		CMC	-
	M	AMBAHAL	ROAD				1602		23
00								es 1-1, To	car't 🧿

Figure 50: Results grouped by layer

We can highlight or zoom to all results in one layer.

#### • 4.1.3.1 Result details

To open details for specific result we can click on underlined text and we are presented with result details. We can also zoom or highlight this specific result.



Figure 51: Details for one result

Result details are pinned as tab so we can perform new search and compare with last result. Some results have subpanels that have links to referenced features. There are also advanced details for some types (parcel, edge, point).

#### ▶ 4.1.3.2 Linked deeds

Some parcels have links to deeds. If there is a link with some deeds, there is visible to which deeds there is a link. User can then click on deed number and see deed details.

Parcel informatio			10	A -
C General				
PIN		1602050083 (LIVE)		_
Owner;				
Deed Area		2118.87 m <sup>it</sup>		
GIS Area		1895.74 m*		
Boundary Length:		315.13 m		
Cadastral Block		100205 Bols Chell		
Bource:		LS Plan MF		
Documents				
d Luke				
Incoming links:				
Deed No.		N	ote	
50/003591				
TV 5351/72				1
Outgoing links:				
0 No deeds were	e found			
FPUs:				
1 No FPUs were	found.			
🤨 Adjoining Parc	nts and Roads			
Adjoining Parcets				
PIN	Deed Area	Gis Area	Bad. Lea	
1002050004		224.81 m <sup>4</sup>	60.07 m	
1602050043		264.6 m <sup>4</sup>	05.40 m	

Figure 52: Parcel link to deed

DEEDS	S LS Rep	orts/Plans	IF Dashboard	Reports	Aliases 🖄 Int	ox
Search LS 50/002591						
🖋 L 5 Report Details		(L	\$ 50:003591			- 6
Cutgoing Links (0)	S Add	Source Type	Source ID	Relation	Derived From	Notes
Theorem (1) Inka (1)	1 8	Land Parcel	1602050083	Refers To	LAVIMS-CAD	

Figure 53: Deed detail information

#### • 4.1.4 PRINTING

In Web Viewer you can also perform printing. We have included option to print current window view or parcel report.

Template:	LS Plan 💽 Scale:	Auto 💌
aper Size:	• A3 A4	Auto
Title:		250
Creator:	John Doe	500
Identifier:		5000
	OK Cancel	10000
	OK Cancel	1000000

Figure 54: Print dialog box

Like in editing application here we also select template, paper size and provide additional information.





**Sinergise d. o. o.**, Teslova ulica 30, 1000 Ljubljana, Slovenia T: +386 [0] 1 477 66 76 | F: +386 [0] 1 477 66 10 | E: info@sinergise.com www.sinergise.com

Ljubljana, december 2013