

The Open Source Cadastral and Registry (OSCAR) Project



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Overview

- Land administration software needs
- Genesis of the OSCAR Project
- Use of open architecture and open source components
- Semantic Web use
 - Workflow manager
 - Bi-temporal data store
- Path forward

The need

- Need exists for **agile, robust** and **affordable** software in the land administration (LA) domain
- Current approaches require pre-definition of data models for relations between people and land
 - Models are **complex and non-stationary across both space and time**
 - Highly **variable across jurisdictions**
 - Requirements **evolve over time**
- Conventional approaches apply place-specific solutions or harmonize and standardize across jurisdictions
 - Loss of economy of scale, repetition of effort and expense

The need










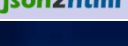
- Informal and secondary rights in land may be ignored
 - The poor and minorities become more marginalized
- Burden of system evolution and maintenance left for the future
 - Developers have to work with systems that were not built with **evolution** in mind
- Hence the need is for an approach that:
 - Directly addresses **domain complexity and evolution**
 - Uses new technologies for a more complete representation of the domain from end to end
 - More easily **evolvable and adaptable solution**

The OSCAR Project

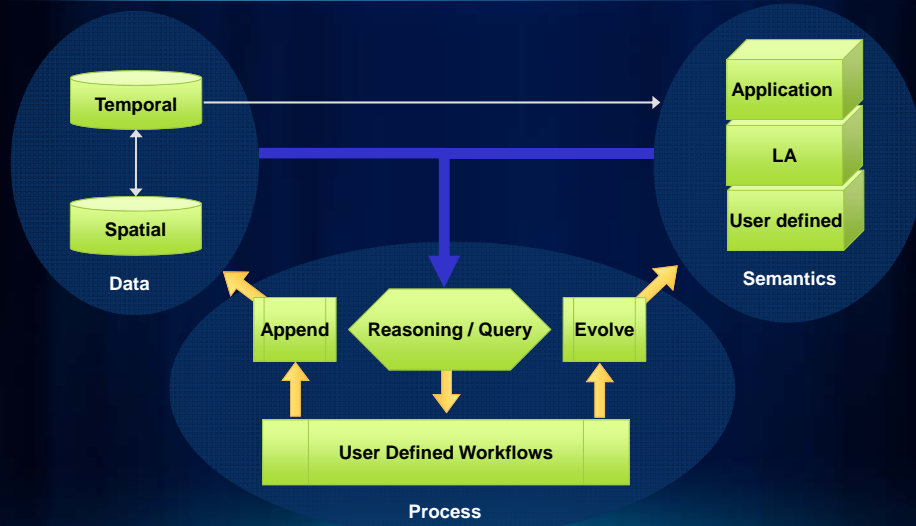
- Needs are encapsulated in the philosophy, design and implementation of the OSCAR Project
 - Initiated at the University of Otago, NZ in 2008
- Overall goal of the project is to build a **flexible** and **highly adaptable** system for land records administration
 - Location, time and data resources
- **Workflow management** provides this flexibility
 - Takes the emphasis off data and predefinition of schema
 - Puts emphasis on tasks that need to be completed

Use of Open Source Approach

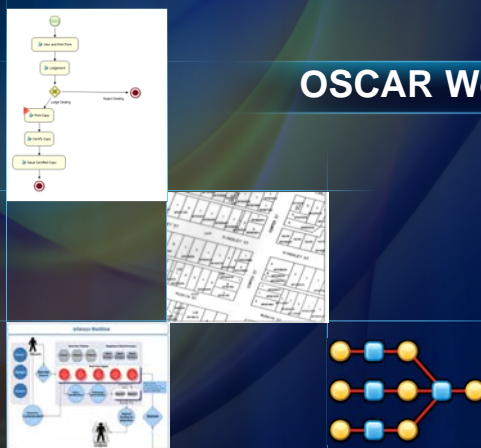
- Multiple Open Source software components are used in the OSCAR framework
 - Plus substantial additional custom code

General	Data	Workflow	GIS
Java 	Jena API 	jBPM/JBoss	PostGIS 
Eclipse 	Pellet		Open Layers 
J2EE 			GeoServer 
JSON-simple 			
JSON 2 html			

General Architecture



OSCAR Workflow Manager



Workflow Manager Design and Implementation

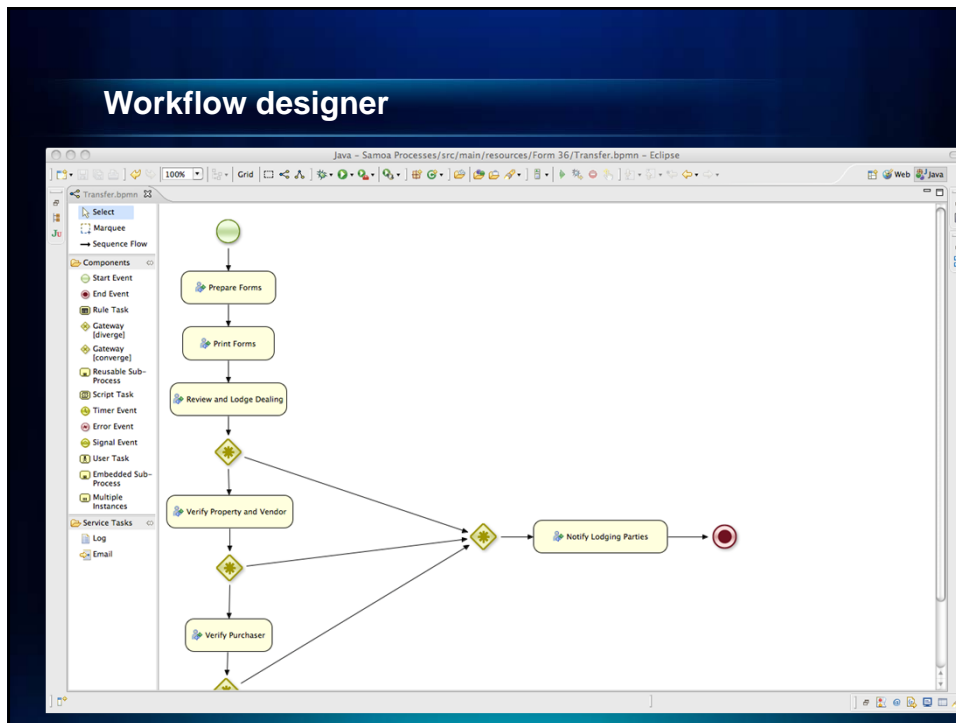
- **LA processes** are implemented as **workflows**
 - Workflows model the sequence of tasks carried out to complete LA processes
- The core of workflow design is determining **who** does **what**, and **when** they do it
 - From this we also see what information needs to be collected and processed
- Workflows must be **easy to create and to modify**
 - New laws/practices may require new workflows
 - Practices differ between countries

Workflow Manager Design and Implementation

- Workflows are designed by observing LA practices and consulting relevant local laws and regulations



Workflow designer



Basic Use Case – Samoa Land Registry Transfer

- Lodging party **fills out transfer form**, prints it and has it signed by the appropriate parties
- Land registry officer reviews submitted forms for correctness and completeness
- Also verifies the property, vendor, and purchaser information in the OSCAR data store
 - If errors are found, the dealing is rejected and appropriate **parties are notified**
 - If no errors, transfer information is reviewed and saved in the OSCAR data store
- Parties are notified and a **new title document** is issued and saved

Preparing the transfer form

(1)	LODGED BY	Name, Address Test User Sample Address Apia
(2)	FOLIO OF THE REGISTER	Parcel: [23] Plan: [12] or Volume: [] Folio: []
(3)	TRANSFEROR (VENDOR)	Name, Address, Occupation Sample Vendor Vendor Address Apia
(4)	CONSIDERATION ESTATE	The transferor acknowledges receipt of ST\$[250000] being consideration for the purchase of the land specified above and transfers to the estate in fee simple.
(5)		
(6)	SHARE TRANSFERRED	[full]
(7)	TRANSFeree (PURCHASER)	Name, Address, Occupation Sample Purchaser Purchaser Address Apia
(8)	TENANCY	[T/A] Specify any shares

New transfer process in software interface

The screenshot shows a web browser window with the URL localhost:3000/tasks. The page header includes the OSCAR logo and the text "Logged in as totan@otago.ac.nz, logout". Below the header, there is a section titled "Pending tasks" containing a table with the following data:

Process	Task	Submitted on
Transfer	Review and Lodge Dealing	24/04/2012

Below the table, there are two buttons: "Open task" and "Start new process".

LA staff reviews transfer documents

OSCAR/ORKA
localhost:3000/tasks/2/render
OSCAR
Logged in as totark@otago.ac.nz. logout

Review transfer dealing

Lodged by	Test User Sample Address Aplia
Folio of the Register	23/12
Transferor	Sample Vendor Vendor Address Aplia
Consideration/Estate	ST\$250000 fee simple
Share Transferred	full
Transferee	Sample Purchaser Purchaser Address Aplia
Tenancy	
Date	24/04/2012
Receive Application	<input type="checkbox"/> Form received <input type="checkbox"/> Form filled correctly <input type="checkbox"/> Form signed <input type="checkbox"/> Form witnessed (if necessary) <input type="checkbox"/> Stamp duty paid
LR Staff Comments	

[Receive application](#) [Reject application](#)

LA official verifies data

OSCAR/ORKA
localhost:3000/tasks/2/render
OSCAR
Logged in as totark@otago.ac.nz. logout

Verify transferee

Transferee indicated	Sample Purchaser Purchaser Address Aplia
Matching records	Sample Purchaser Purchaser Address ✓ Aplia
LR Staff Comments	

[Used selected transferee](#) [Enter new transferee](#) [Reject dealing](#)

LA official records data

OSCAR/ORKA

localHost:3000/tasks/2/render

OSCAR
Logged in as tsark@otago.ac.nz. logout

Record new owner

Folio of the Register	23/12
Owner	Sample Purchaser Purchaser Address Aplia
Estate	fee simple
Share	full
Tenancy	
Effective Date	25/04/2012

Title and Land Parcel Data Store



Data Store Design and Implementation



- Designed to be transferrable across jurisdictions
 - Achieved by separating the data semantics (meaning) from the logical data storage using ontology
- Not a domain model
 - Event-based, bi-temporal model with a few general concepts (e.g. identity)
- Amendment-to-state model (append only), all data are retained (nothing deleted)
- Actual data storage implemented using semantic Web (RDF/OWL) and tooling

Data Store Design and Implementation



- Each country can have its own ontology
 - Supports the evolution of terminology and meaning through **concept versioning**
 - Use of OWL allows **complex phenomena** (customary RRR, language, terminology) to be represented
- Storage based on a **model of temporal amendments**
 - History is never deleted – temporal storage model never needs to change
- Everything is a process derived from a workflow
 - Allows users to define their own way of doing things
- Data store delivers all management routines
 - Update, evolve, temporal query, configuration

Data Store Design and Implementation

- Stored data can be combined with its meaning
 - Allows universality via evolution
- Workflow paradigm permits user-defined interaction
 - Design, build and execute
- Modeled on instruments
 - System evolution via incremental definition and versioning of instruments > workflow and semantics
- Supports human tasking and case-based LA as well as automated tasking and processing

Use Case - Samoa



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User: Geoff

LRS Ontology

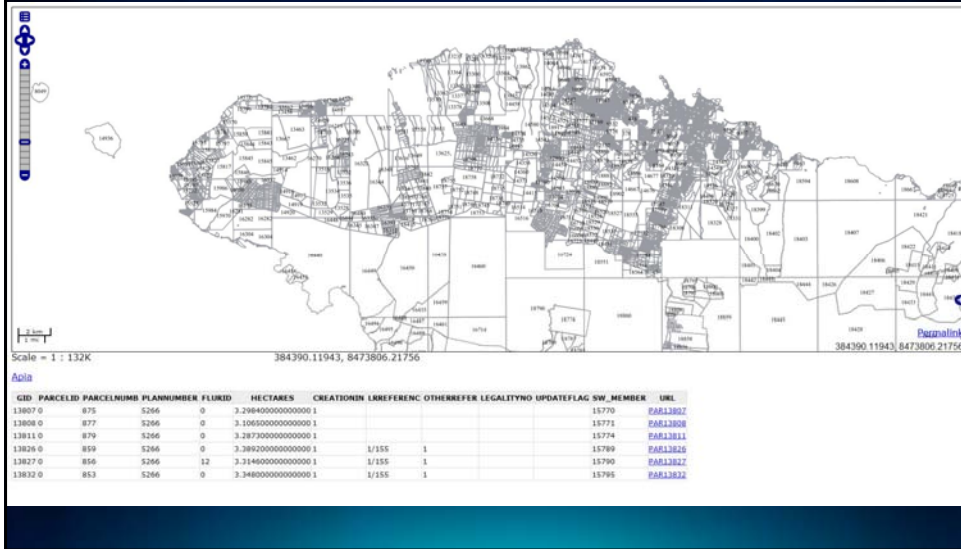
Label	LRS Ontology
URI	http://www.lrs.govt.ws/ontology/v1/samoaLRS.owl
Comment	LRS Ontology derived from Western Samoa Land Registry System database.
Version	Constructed: 30-11-2011 08:53:03
Current Configuration	Base Ontology
Direct imports	Land Administration Ontology

Import concepts from General LA Ontology – other jurisdictions may also import and use this although it was created in Samoa

Specialised Samoa concepts can include local language

Local Classes	Comment	URI
Status Event	Samoa LRS status change event superclass	http://www.lrs.govt.ws/ontology/v1/samoaLRS.owl#StatusEvent
Delete parcel	LRS ActionCodelist.type 13, LRS code:86 - please edit this field	http://www.lrs.govt.ws/ontology/v1/samoaLRS.owl#Deleteparcel
Registered Dealing	LRS code StatusCodeList:10 - please edit this field	http://www.lrs.govt.ws/ontology/v1/samoaLRS.owl#RegisteredDealing
CreateEncumbrance	LRS ActionCodelist.type 14, LRS code:8 - please edit this field	http://www.lrs.govt.ws/ontology/v1/samoaLRS.owl#CreateEncumbrance
Current InterestHolder or	LRS code StatusCodeList:40 - please edit	http://www.lrs.govt.ws/ontology

Land Parcel Map Service



Search Form



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Welcome geoff

Current Configuration
Samoa LRS Ontology
Current Database Statistics

Samoa Map

URI Lookup

Literal Search

Parcels Exact Match Ignore case

Search

Advanced Search

People, Agents, Organisations Include Sub-Properties

Exact Match Ignore case

Search

Spatial Table Field Search

DCDB Parcels

Search

Parcel 7501



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User geoff

Today 2012-04-29 14:28:26.546

Search for "7501"

Details

Search Value	7501
Table	Parcels
Match	Partial
Ignore Case	false
Records Searched	214197
Results Returned	1
Message	

Results

http://www.lrs.govt.ws/ontology/v1/parcels#PAR7501	hasDatabaseKey 7501
---	------------------------

Legal Object Type Information



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Object Information

Name	PAR7501
URI	http://www.lrs.govt.ws/ontology/v1/parcels#PAR7501
Declared Types	Primary Spatial Parcel
Inferred Types	Land Parcel Parcel Temporal Object Registry Object Spatial

Inferred to be a temporal object because it has events associated with it

It is inferred to be a LA Ontology land parcel because the Samoa Land Parcel is a sub-type of Land Administration Parcel

Spatial Detail



Land parcel map (WMS) attached to the legal parcel object

415260.05146, 8469238.65460
Scale = 1 : 400

Spatial Detail

```

SRID: EPSG 32702 Projection:UTM Zone 2 Datum:WGS84 Units:m
FD: 7501
Num Points: 5
Type: MULTIPOLYGON
Area: 989.253515625
Comment: Parcel multipolygons from the Samoa DCDB data, originally from the valid LRS Parcels table
Lengths: (a) 32.661 (b) 29.877 (c) 32.701 (d) 30.121
Label: DCDB Parcels Table
Table: ddbparcels
Points: (1) 415291.521753103 415291.521753103
(2) 415266.949137101 415266.949137101
(3) 415246.994339905 415246.994339905
(4) 415271.434876398 415271.434876398
(5) 415291.521753103 415291.521753103
Connection: jdbc:postgresql://localhost:5433/Samoa
Database URI: http://www.lrs.govt.ws/databases/DCDB/tables#parcels
    
```

Spatial information associated with the parcel

Parcel state

Model State

Valid Date Based State Generated: 2012-04-29T14:36:02

```

Has Plan Number: 5936
Parcel Court Grant Number: 438
Primary Spatial: http://www.lrs.govt.ws/databases/DCDB/tables#parcels:7501
Has Amendment: jpd_52bef552-6eb4-4cad-8470-ce018d1b6582
Has Amendment: jpd_c8ebbac8-0285-48d9-9e22-06e37347d849
    
```

Current state of parcel including 2 amendments - clicking on the links reveals details in the **parcel history** (in this case they are mortgages)

History

Complete History Generated: 2012-04-29T14:36:02

Label	Value	Value Detail	Types	Temporal Detail	Event	Transacted
Parcel Court Grant Number	438		Creation by Upload First Current Creation Amendment	Valid from 2010-01-20 12:00:00.000	EVT7501 Event	2010-01-20 12:00:00.000
Has Plan Number	5936		Creation by Upload First Current Creation Amendment	Valid from 2010-01-20 12:00:00.000	EVT7501 Event	2010-01-20 12:00:00.000
Primary Spatial	http://www.lrs.govt.ws/databases/DCDB/tables#parcels:7501		Amendment First Current Primary Spatial Spatial	Valid from 2010-01-20 12:00:00.000	EVT7501 Event	2010-01-20 12:00:00.000
Has Amendment	jpd_52bef552-6eb4-4cad-8470-ce018d1b6582		Amendment First Current	Valid from 2007-05-07 09:57:54.000	EVT9129 Register Instrument	2010-01-20 12:00:00.000
Has Amendment	jpd_c8ebbac8-0285-48d9-9e22-06e37347d849		Amendment First Current	Valid from 2007-05-07 09:57:16.000	EVT9791 Register Instrument	2010-01-20 12:00:00.000

Types & Details



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Object Information

Name	TIT13731
URI	http://www.lrs.govt.ws/ontology/v1/00lex#TIT13731
Declared Types	Title
Inferred Types	Status Title

Types

Details

TIT13731	Title
hasTitleParcel	PAR7501
Estate	EST7461
Original Title Reference	V93/280
Title Status	Cancelled Title
Title Reference	V93/380
Superseding Title	TIT10993
Instrument	INS5607
Instrument	INS1519
Instrument	INS1072

Title detail

Additional Details

EST7461	Freehold
Shares	SG2458
Title	TIT13731

Share detail

Estate Shares



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Object Information

Name	SG2458
URI	http://www.lrs.govt.ws/ontology/v1/sharegroup#SG2458
Declared Types	Share Group
Inferred Types	

Details

SG2458	Share Group
Share	SH10717
Shared Estate	EST7461

Additional Details

SH10717	Share Part
Share Description	All
Shares	SG2458
Share Reference	4852
Encumbrance Holder	SamoaCommercialBank
Estate Holder	ToluonoFatiToluono

Path Forward

- Complete work on user interface(s) for OSCAR
- Write installer that binds the FOSS components to be configured on first install
- Release code base to Open Source community

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Warm thanks to the Ministry of Natural Resources and Environment, Government of Samoa