Can WFS-T replace SQL?

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Background

Centre for Geo-information

Applied research, one of the main activities being the development of GIS web applications to run models and to access and visualize research results

Main area's: agriculture, land use planning, nature, environmental health

Can WFS-T replace SQL?

Of course not

Can WFS-T replace SQL when developing GIS web applications ?

Can WFS-T replace SQL?

Key elements of SQL:
select, insert, update and delete
where - clause

Key elements of WFS:
select features
transactional WFS: insert, update and delete requests
Filter Encoding Implementation Specification: filter

Can WFS-T replace SQL?

- Why would you want to replace SQL with WFS-T ?

- Searching for easy and quick ways to develop need GIS web application

- SOA, Service Oriented Architecture

- RIA’s, Rich Internet Applications

SOA

- Service Oriented Architecture promises cuts in development and maintenance costs

- Inside GIS web applications there is an important role for OGC services

- OGC Services are available as out of the box components

RIA

- RIA's, Rich Internet Application
- Part of the processing transferred to the client
- Geospatial applications require access to a server side geodatabase to select and manipulate data
- The usual approach is to use SQL inside a custom serverside component
- Tailor made components, need to be developed and maintained

So …

- Noticed the similarities between WFS-T and SQL
- Knowing OGC services can be used as out of the box components
- Knowing SQL needs tailor made server side components
- Cost reductions can be achieved if SQL can be replaced by WFS-T

So ...

Can WFS-T replace SQL?

Does WFS-T fulfil our needs to query and manipulate data which reside in a server side geodatabase?

Case study involving three GIS web applications:

- a national cultural heritage portal
- a track planning system for farmers
- a discussion support system for the water domain

Can WFS-T replace SQL?

The target systems are tailor made GIS web applications, running at the client inside the Flash player.

Alterra developed a framework for the integration of geospatial web services. All OGC standards are supported.

Criteria:

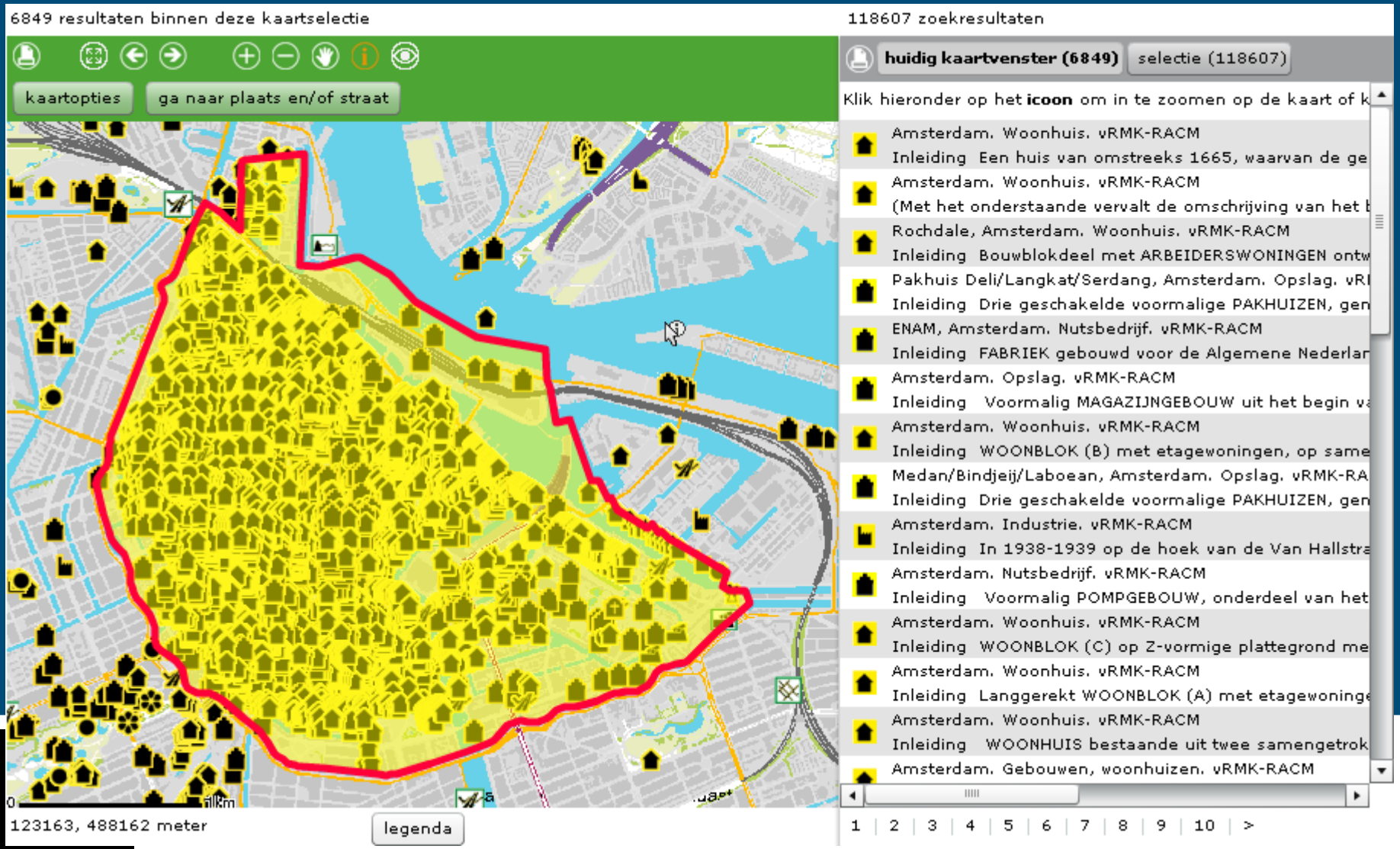
- Functionality
- Performance
- Maintainability

Case 1: Dutch cultural heritage portal, 120 000 features

Brought together based on standardized information model (IMKICH)

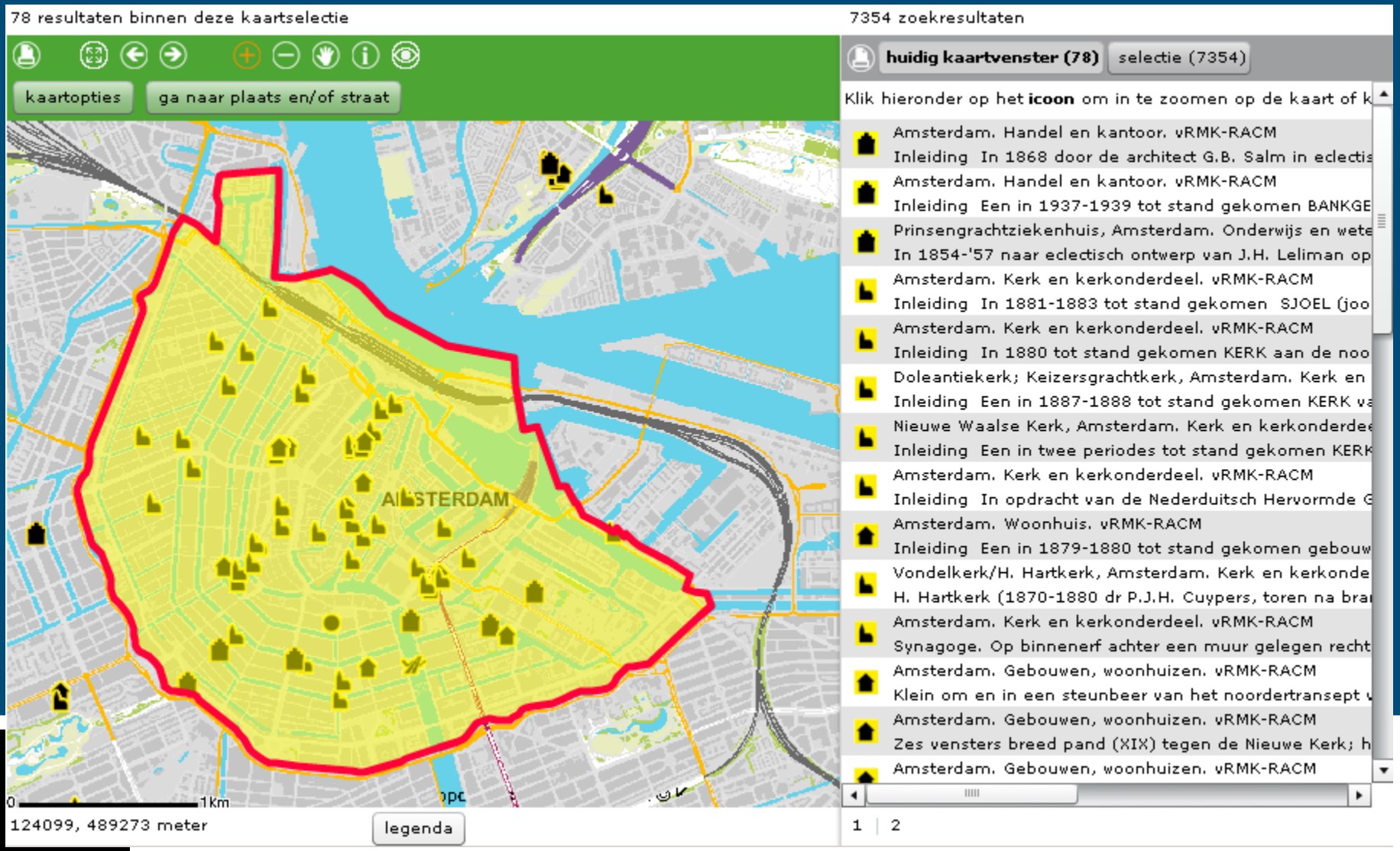
map

hitlist



Case 1: Dutch national cultural heritage portal

Portal functionality (filter on keyword ‘church’)



Case 1: Can hitlist be constructed using WFS ?

- Search on keyword (‘church’)
- Keywords can be multiple: at the server stored in a separate table with a 1-to-many relationship
- Filter Encoding Implementation Specification lacks the abilty to filter based on a joined table
- Conclusion: Not without work around (denormalization)
- Highlight (one feauture) has been implemented with a WFS GetFeature request

Doubts about WFS performance, when asking for a hitlist with a bigger size

Case 1: Performance test WFS

GetFeature

Features following the IMKICH Model

Number of features	Response time in seconds	Response size in kB
10	2.0	62
50	8.6	310
100	16.7	612
250	21.8	1,682
500	45.2	3,366

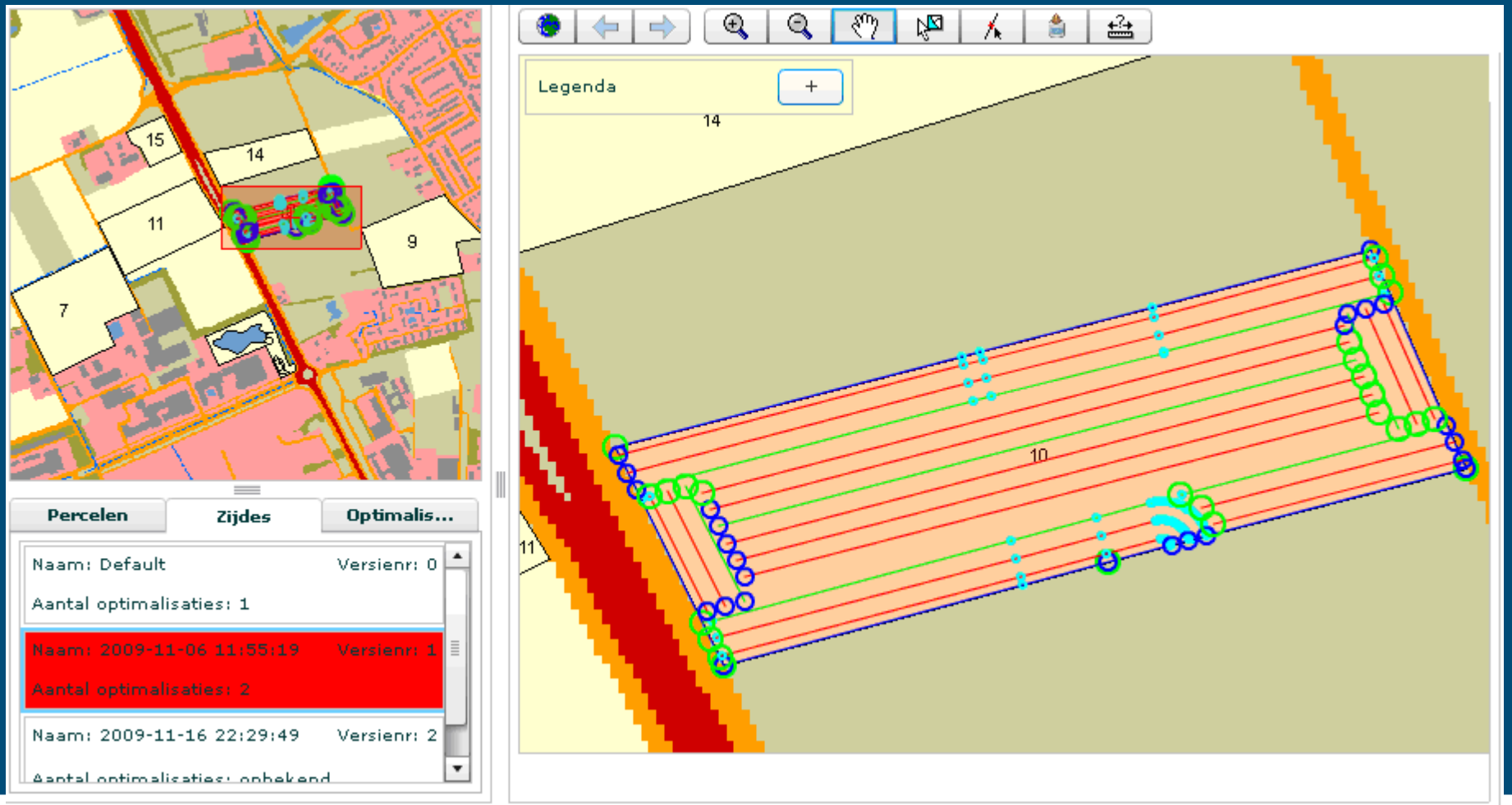
Lightweight featureset with 5 data elements

Number of features	Response time in seconds	Response size in kB
10	< 0.5	7
50	0.6	35
100	0.9	73
250	1.6	197
500	2.7	403
1000	5.8	942
2500	15.2	2,696

Conclusion: decided not to implement the hitlist with WFS

Case 2: track planning system for farmers

Select and manipulate parcels and tracks



Case 2: Results

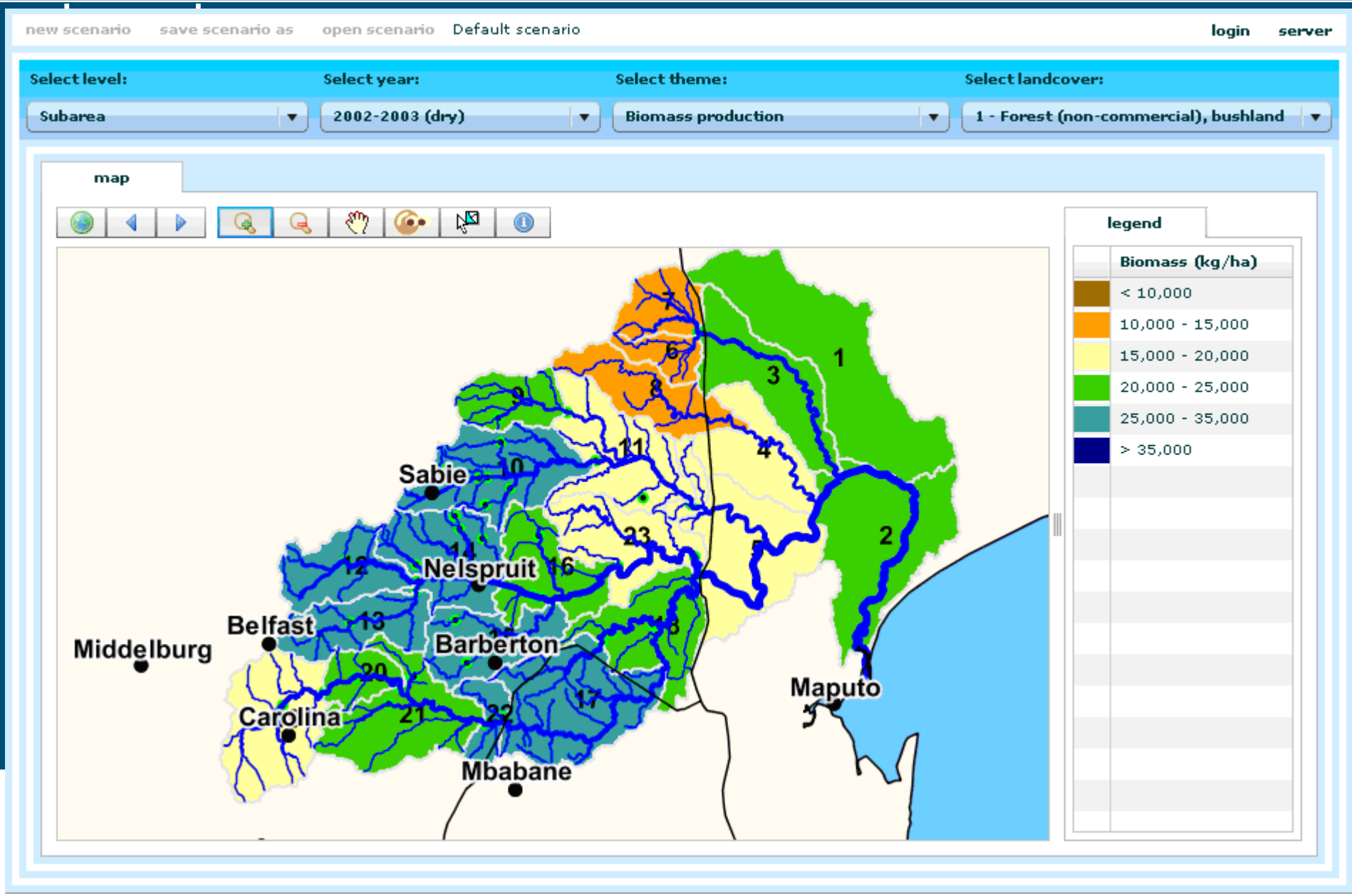
The track planning system for farmers entirely depends on WFS for inserting, updating and deleting

Since the farmer manipulates single parcels and single tracks the performance is good

Results of the track planning algorithm are provided to the client by WFS as well

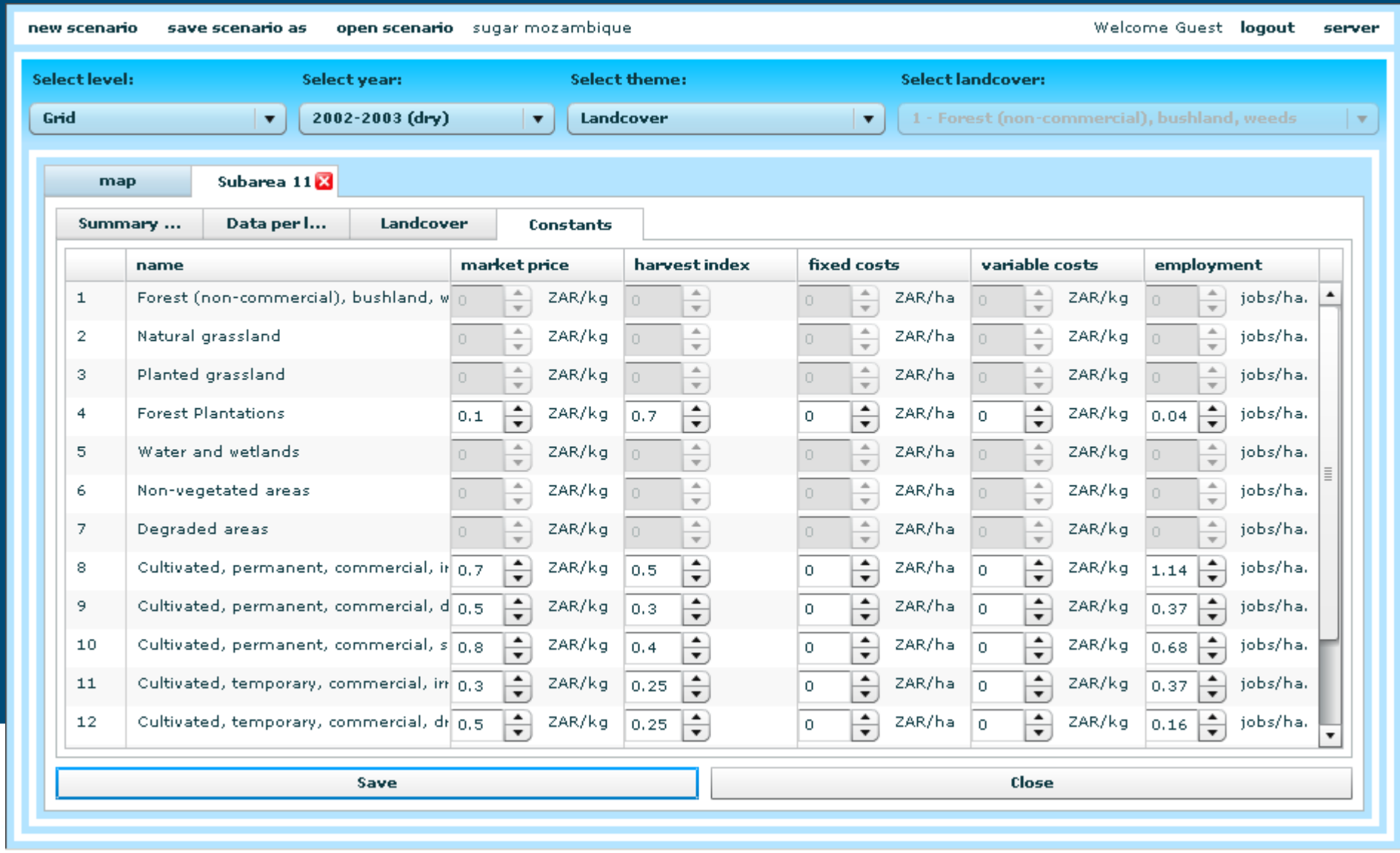
Conclusion case 2: WFS totally fulfilled the needs, and no server side custum component using SQL was needed

Case 3: discussion support system for the water



Case 3: discussion support system for the water domain

Define and run scenario's



	name	market price	harvest index	fixed costs	variable costs	employment
1	Forest (non-commercial), bushland, w	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
2	Natural grassland	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
3	Planted grassland	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
4	Forest Plantations	0.1 ZAR/kg	0.7	0 ZAR/ha	0 ZAR/kg	0.04 jobs/ha.
5	Water and wetlands	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
6	Non-vegetated areas	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
7	Degraded areas	0 ZAR/kg	0	0 ZAR/ha	0 ZAR/kg	0 jobs/ha.
8	Cultivated, permanent, commercial, ir	0.7 ZAR/kg	0.5	0 ZAR/ha	0 ZAR/kg	1.14 jobs/ha.
9	Cultivated, permanent, commercial, d	0.5 ZAR/kg	0.3	0 ZAR/ha	0 ZAR/kg	0.37 jobs/ha.
10	Cultivated, permanent, commercial, s	0.8 ZAR/kg	0.4	0 ZAR/ha	0 ZAR/kg	0.68 jobs/ha.
11	Cultivated, temporary, commercial, ir	0.3 ZAR/kg	0.25	0 ZAR/ha	0 ZAR/kg	0.37 jobs/ha.
12	Cultivated, temporary, commercial, dr	0.5 ZAR/kg	0.25	0 ZAR/ha	0 ZAR/kg	0.16 jobs/ha.

Case 3: Results

User can set parameter values. These are sent to the server by WFS

Unlike SQL a WFS insert or update request cannot perform calcultations

To invoke calculations a separarate server side component was needed

Conclusion case 3: WFS partly fulfilled the needs. A server side custum component using SQL was needed to perform calculations

Conclusions

Inside GIS web applications, which run client side, WFS-T has been succesfully applied to select and manipulate server side data

In succesfull applications the number of features involved in one user action is limited

In those cases no custom server side component using SQL was needed

Conclusions

Shortcomings of WFS are:

- The filter capabilities ae lacking the ability to define a filter expression based on a joined table.
- Unlike SQL the WFS-T insert or update request cannot perform calculations on the fly.
- When a larger number of features is involved in one request - a couple of thousand features or more - WFS-T tends to end up with a bad performance.

Larger datasets should be processed server side because downloading large amounts of data and processing them client side is too time-consuming.

Questions?

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