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
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).
Case 1: Dutch national cultural heritage portal

Filter 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 ability to filter based on a joined table
- Conclusion: Not without work around (denormalization)
- Highlight (one feature) 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

<table>
<thead>
<tr>
<th>Number of features</th>
<th>Response time in seconds</th>
<th>Response size in kB</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2.0</td>
<td>62</td>
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<tr>
<td>50</td>
<td>8.6</td>
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<td>1,682</td>
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<tr>
<td>500</td>
<td>45.2</td>
<td>3,366</td>
</tr>
</tbody>
</table>

Lightweight featureset with 5 data elements

<table>
<thead>
<tr>
<th>Number of features</th>
<th>Response time in seconds</th>
<th>Response size in kB</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>&lt; 0.5</td>
<td>7</td>
</tr>
<tr>
<td>50</td>
<td>0.6</td>
<td>35</td>
</tr>
<tr>
<td>100</td>
<td>0.9</td>
<td>73</td>
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<tr>
<td>250</td>
<td>1.6</td>
<td>197</td>
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<tr>
<td>500</td>
<td>2.7</td>
<td>403</td>
</tr>
<tr>
<td>1000</td>
<td>5.8</td>
<td>942</td>
</tr>
<tr>
<td>2500</td>
<td>15.2</td>
<td>2,696</td>
</tr>
</tbody>
</table>

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 custom component using SQL was needed.**
Case 3: discussion support system for the water domain
Case 3: discussion support system for the water domain

Define and run scenario’s
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 calculations

To invoke calculations a separate server side component was needed

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

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

In successful 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 are 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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