Menzies

Distributing the world.
Problem

The whole world in one server
GET `node/#id` Returns the XML for that node.
PUT `node/#id` Updates the node, returns new version number.
DELETE `node/#id` Deletes the node, returns new version number(?)
PUT `node/create` Creates the node, returns new node number.
GET `node/#id/history` Returns all versions of the node.
GET `node/#id/#version` Returns the XML for that version of the node.
GET `node/#id/ways` Returns the XML for all ways that this node is part of.
GET `node/#id/relations` Returns the XML for all relations that this node is part of.
GET `nodes?nodes=#id,#id,...` Returns the XML for all given node numbers.

GET `map?bbox=min_lat,min_lon,max_lat,max_lon` Gets all the way, nodes and relations inside a bounding box
Challenges

Optimize bounding box.
Distribute data amongst servers.
Splitting Nodes

Split nodes across multiple servers...

Which nodes go where?

Based on existing node density?

Based on access patterns?
Editing @ 2AM UTC
Editing @ 9PM UTC
Editing @ 10PM UTC
Static Latitude (3 servers)
Finding Nodes

R-tree: Spatial index implementation

Three levels of the R-tree containing Africa
Before Profiling
UW, London and Brazil at Once
Improvements

- Concurrent Database
- getWaysFromNode => getWaysFromNodes
- Thread => Forked
Post Improvements
More Improvements

- Do the hard work in C
  - Pickling
  - XML
<table>
<thead>
<tr>
<th>Final Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 seconds</td>
</tr>
<tr>
<td>10 seconds</td>
</tr>
<tr>
<td>20 seconds</td>
</tr>
<tr>
<td>30 seconds</td>
</tr>
<tr>
<td>40 seconds</td>
</tr>
<tr>
<td>50 seconds</td>
</tr>
<tr>
<td>60 seconds</td>
</tr>
<tr>
<td>70 seconds</td>
</tr>
<tr>
<td>80 seconds</td>
</tr>
</tbody>
</table>
Comparison

Bounding Box Queries

![Comparison Graph]

Query Time (sec)

- OSM
- Menzies

<table>
<thead>
<tr>
<th>Location</th>
<th>OSM Time (sec)</th>
<th>Menzies Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UW</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>London</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>Natal, Brazil</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>