

# INFO216: Advanced Modelling

Theme, spring 2017:  
**Modelling and Programming  
the Web of Data**

Andreas L. Opdahl  
<Andreas.Opdahl@uib.no>



# Session 6: Visualisation

- Themes:
  - visualisation
    - data/visualisation types
    - task types
    - interaction dynamics
  - Sgvizler
    - visualising semantic data in web pages



# Readings

- Sources (available in the portal):
  - Shneiderman (1996): The eyes have it: A task by data type taxonomy for information visualizations
  - Heer & Shneiderman (2012): Interactive Dynamics for Visual Analysis - A taxonomy of tools that support the fluent and flexible use of visualizations
  - Skjæveland 2012: Sgvizler.
  - Sgvizler 0.6 web page  
(<http://mgskjaeveland.github.io/sgvizler/>)



# Visualisation



# Visualisation areas

- Data visualisation
  - Information visualisation
    - a broad area, common charts, graphs and maps, abstract or concrete phenomena, not necessarily spatio-temporal, many or few data points
  - Infographics
    - visual, data-based narratives or polemics
  - Scientific visualisation
    - concrete objects, spatio-temporal data, very many data points, specialised to area
- Visual analysis
  - supplements statistical analysis, identifying outliers, interacting with data points, browsing to identify candidate patterns



# Visualisation areas

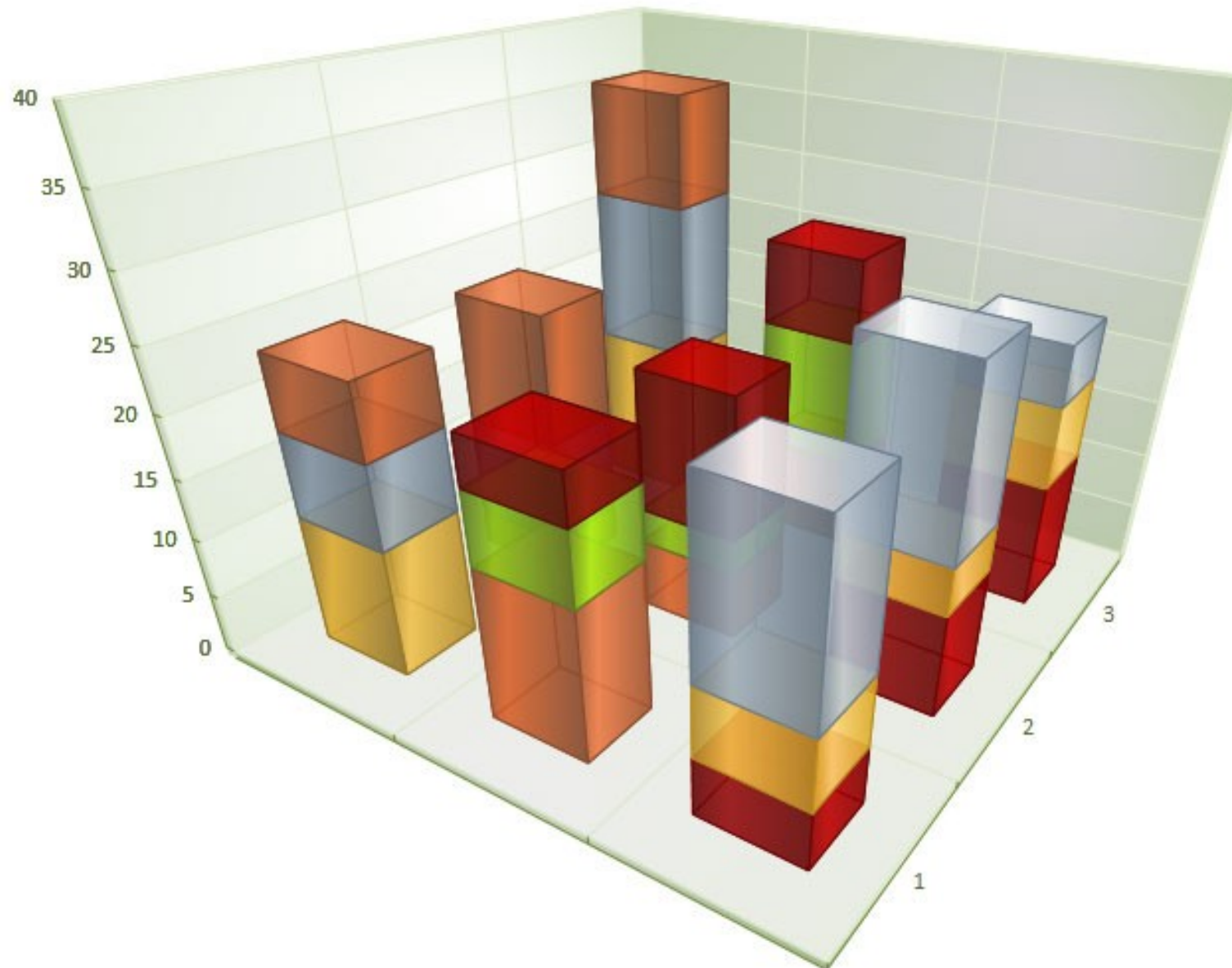
- Data visualisation
  - Information visualisation ← **We are (mostly) here!**
    - a broad area, common charts, graphs and maps, abstract or concrete phenomena, not necessarily spatio-temporal, many or few data points
    - Infographics
      - visual, data-based narratives or polemics
  - Scientific visualisation
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- Visual analysis
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# Data/visualisation type taxonomy

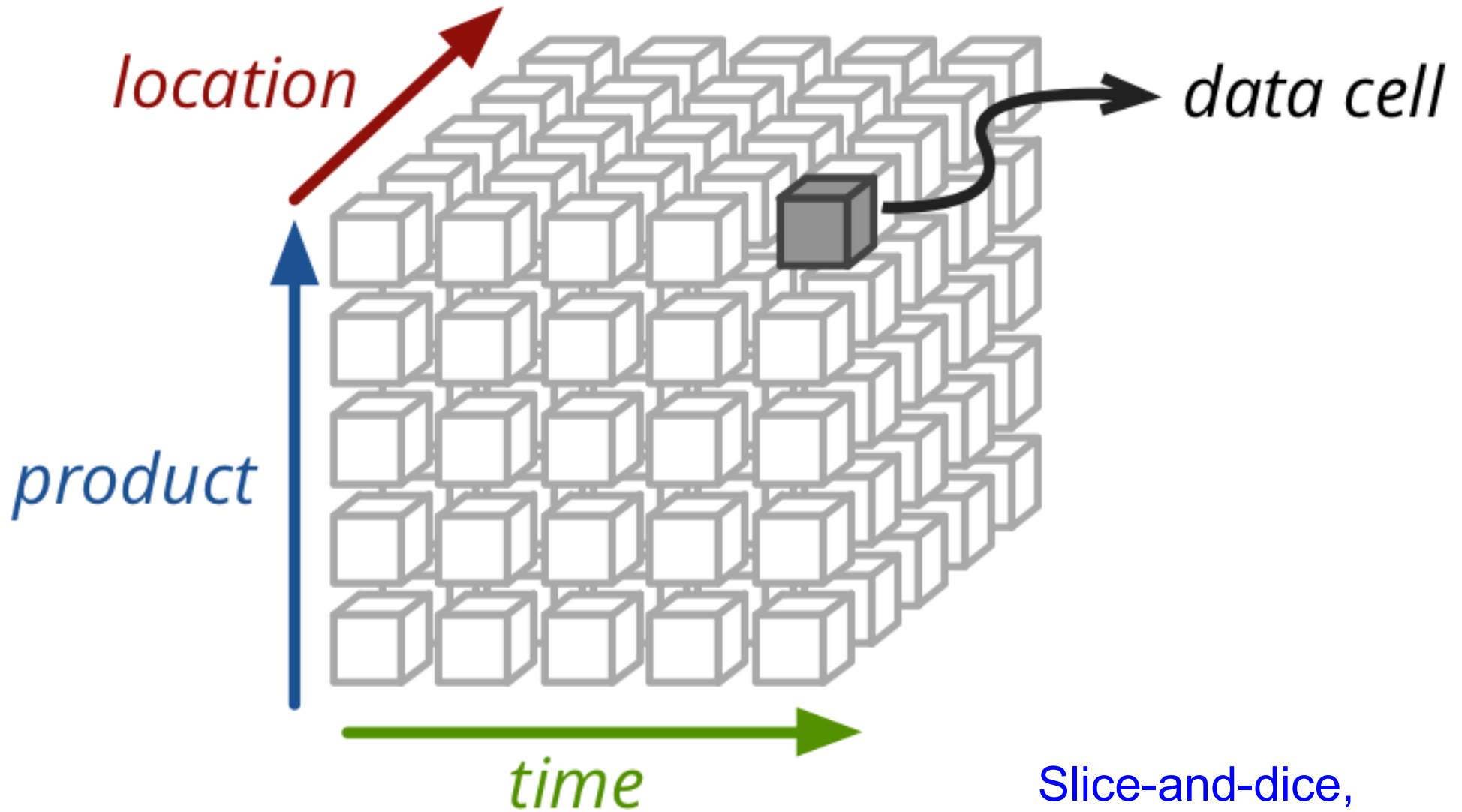
- 1-dimensional
- 2-dimensional
  - including maps, geo charts, graphs matrices
- 2.5-dimensional
- 3-dimensional data
- Temporal data
  - 1-dimensional, but usually enriched
- Multi-dimensional data
- Tree data
- Network data
  - less strict than trees, such as graphs
- *The different types are (very) often combined!*

# 2.5-dimensional bar chart





# 3-dimensional data cube



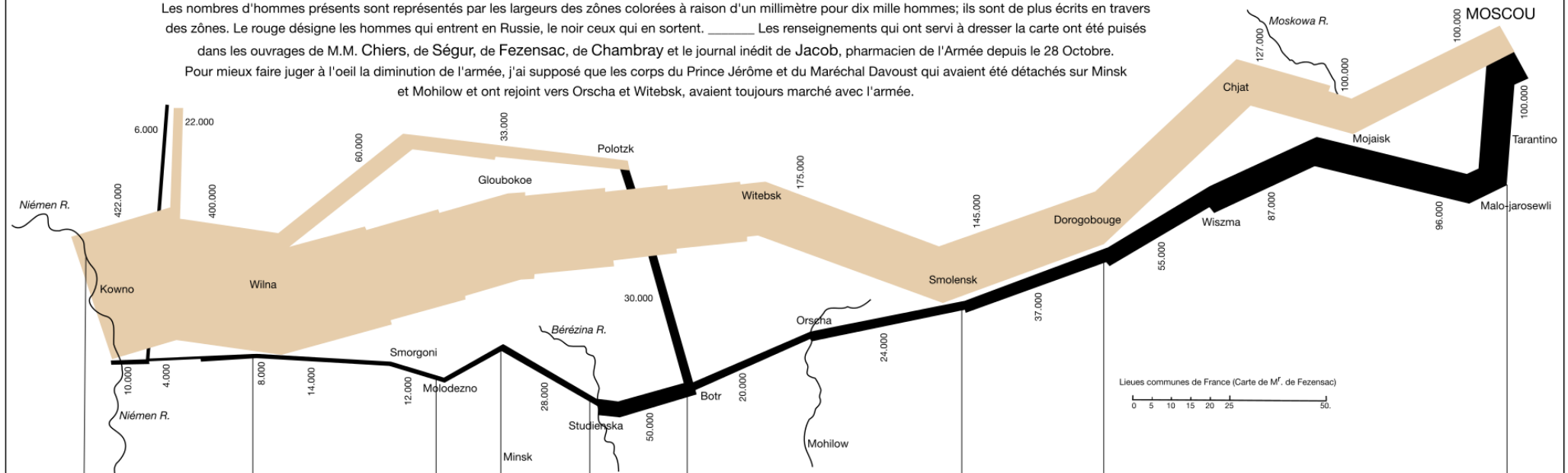
Slice-and-dice,  
drilldown



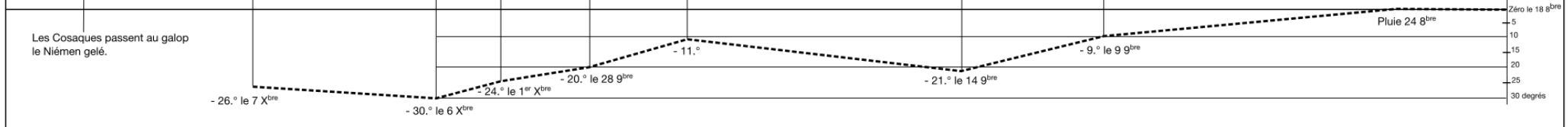
# Minard (1861): Napoleon's March on Moscow

**Carte Figurative** des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.  
 Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite. Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M.M. Chiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre. Pour mieux faire juger à l'oeil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mohilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.



**TABLEAU GRAPHIQUE** de la température en degrés du thermomètre de Réaumur au dessous de zéro.

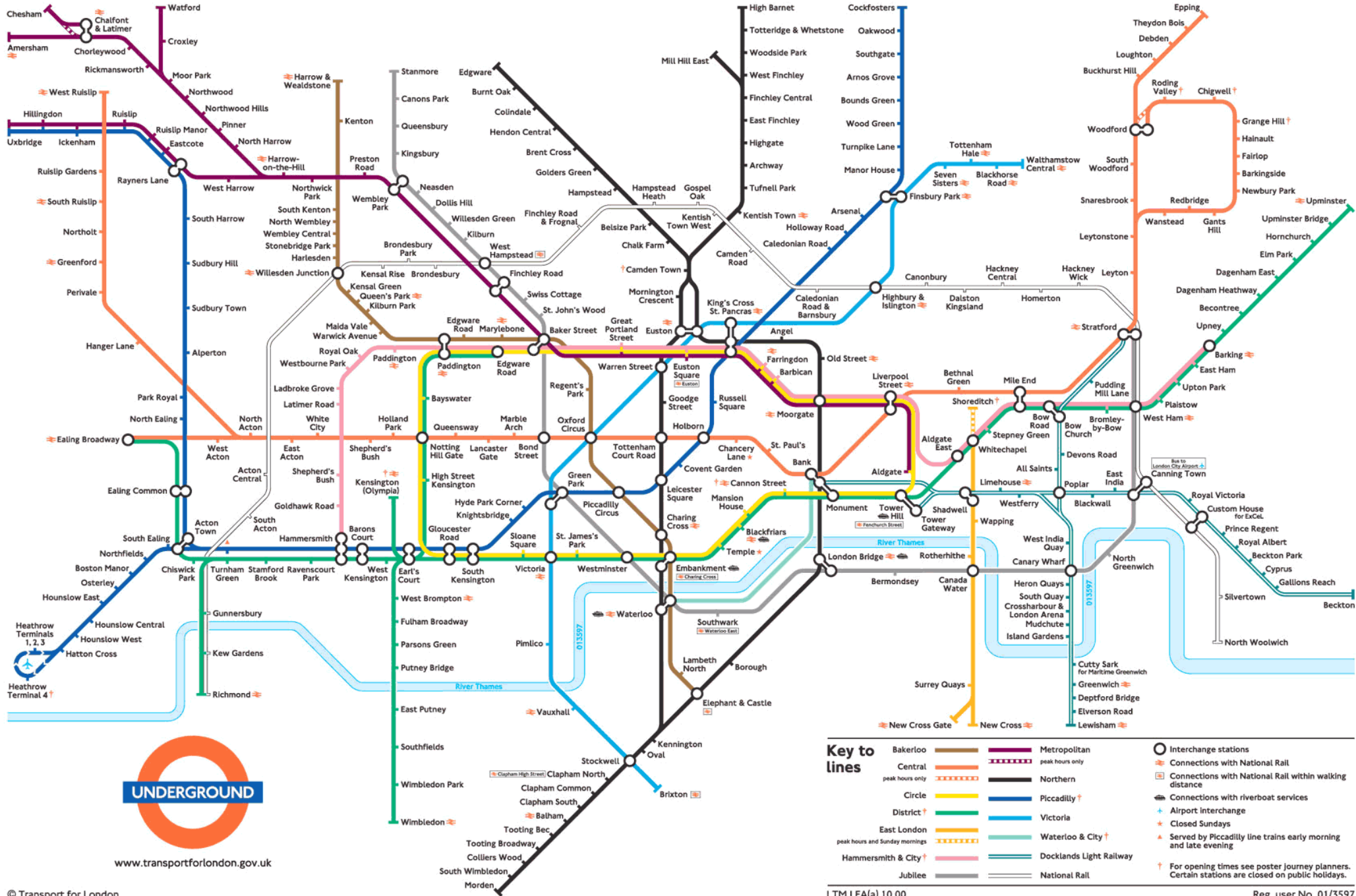


Autog. par Regnier, 8. Pas. S<sup>te</sup> Marie S<sup>te</sup> G<sup>ene</sup> à Paris.

[ Vectorization CC-BY-SA [martingrandjean.ch](http://martingrandjean.ch) 2014 ]

Imp. Lith. Regnier et Dourdet.





www.transportforlondon.gov.uk

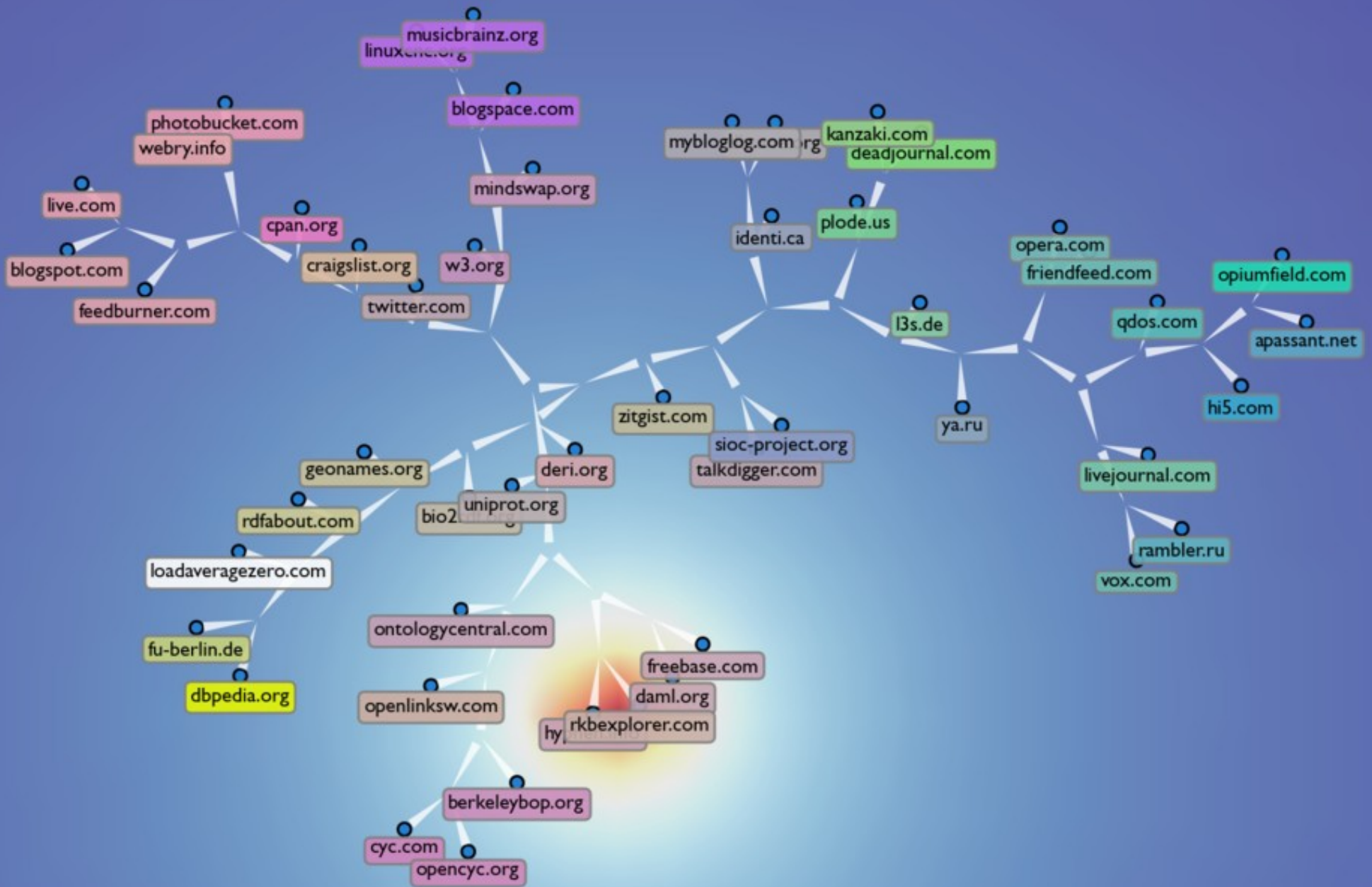
© Transport for London

Key to lines		Other symbols	
Bakerloo	Metropolitan	○	Interchange stations
Central	Northern	⚡	Connections with National Rail
Central peak hours only	Piccadilly	🚶	Connections with National Rail within walking distance
Circle	Victoria	🚤	Connections with riverboat services
District	Waterloo & City	✈	Airport interchange
District peak hours and Sunday mornings	Docklands Light Railway	★	Closed Sundays
Hammersmith & City	National Rail	▲	Served by Piccadilly line trains early morning and late evening
Jubilee		†	For opening times see poster journey planners. Certain stations are closed on public holidays.

LTM | FA(a) 10.00

Reg. user No. 01/3597





Top 50 domains publishing Semantic Web data, clustered by predicates used. <<http://gromgull.net/2009/09/heat/heat.html>>

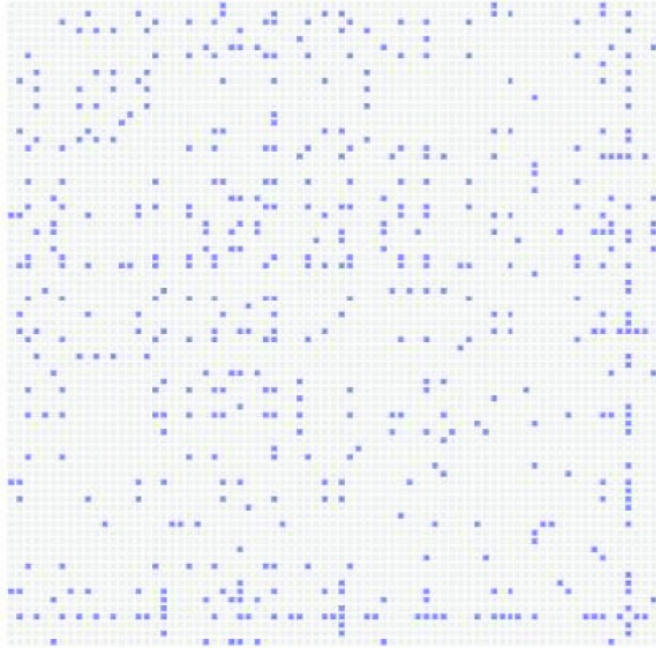
# Taxonomy of end-user tasks

- **Overview:** view the entire dataset
- **Zoom:** focus on interesting phenomenon(-a)
- **Filter:** hide uninteresting phenomena
- **Details-on-demand:** more information is always available
- **Relate:** search for patterns, view relations between phenomena
- **History:** searching for alternatives, backtracking
- **Extract:** smaller datasets and search parameters
- **Overview first, zoom and filter, then details-on-demand**
  - But also: **specific phenomenon first, then context**

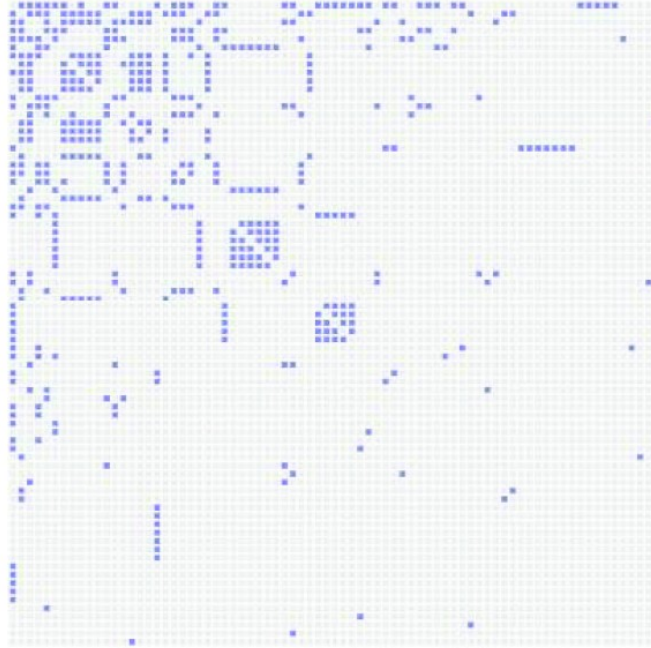


# Sorting a social connectivity graph

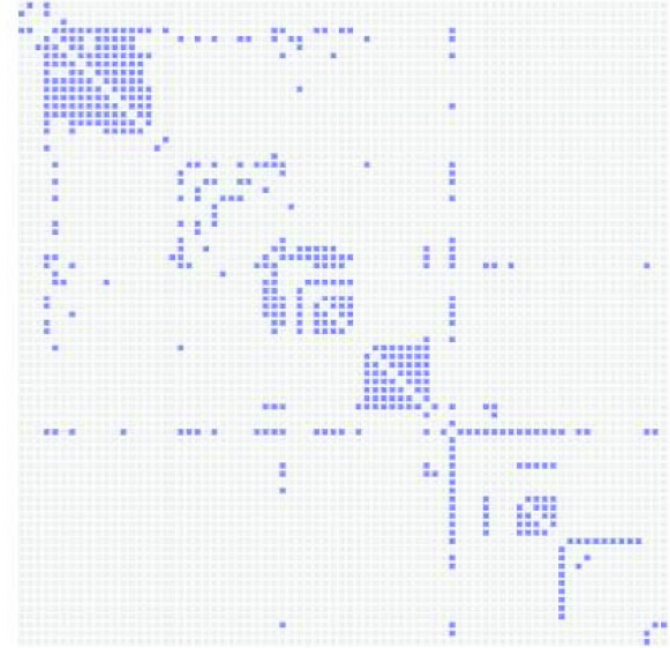
Sort by:



Sort by:



Sort by:



- Graph represented as a matrix
- Sorting the graph by clusters reveals connected sub-groups

# Taxonomy of interactive dynamics

- **Data & view specification:**  
visualise, filter, sort, derive
- **View manipulation:**  
select, navigate, coordinate, organize
- **Process & provenance:**  
record, annotate, share, guide



# Data & View Specification

- Visualize data by choosing visual encodings
- Filter out data to focus on relevant items
- Sort items to expose patterns
- Derive values or models from source data





# View Manipulation

- Select items to highlight, filter, or manipulate them
- Navigate to examine high-level patterns and low-level detail
- Coordinate views for linked, multi-dimensional exploration
- Organize multiple windows and workspaces



# Process & Provenance

- Record analysis histories for revisitation, review and sharing
- Annotate patterns to document findings
- Share views and annotations to enable collaboration
- Guide users through analysis tasks or stories



# Sgvizler

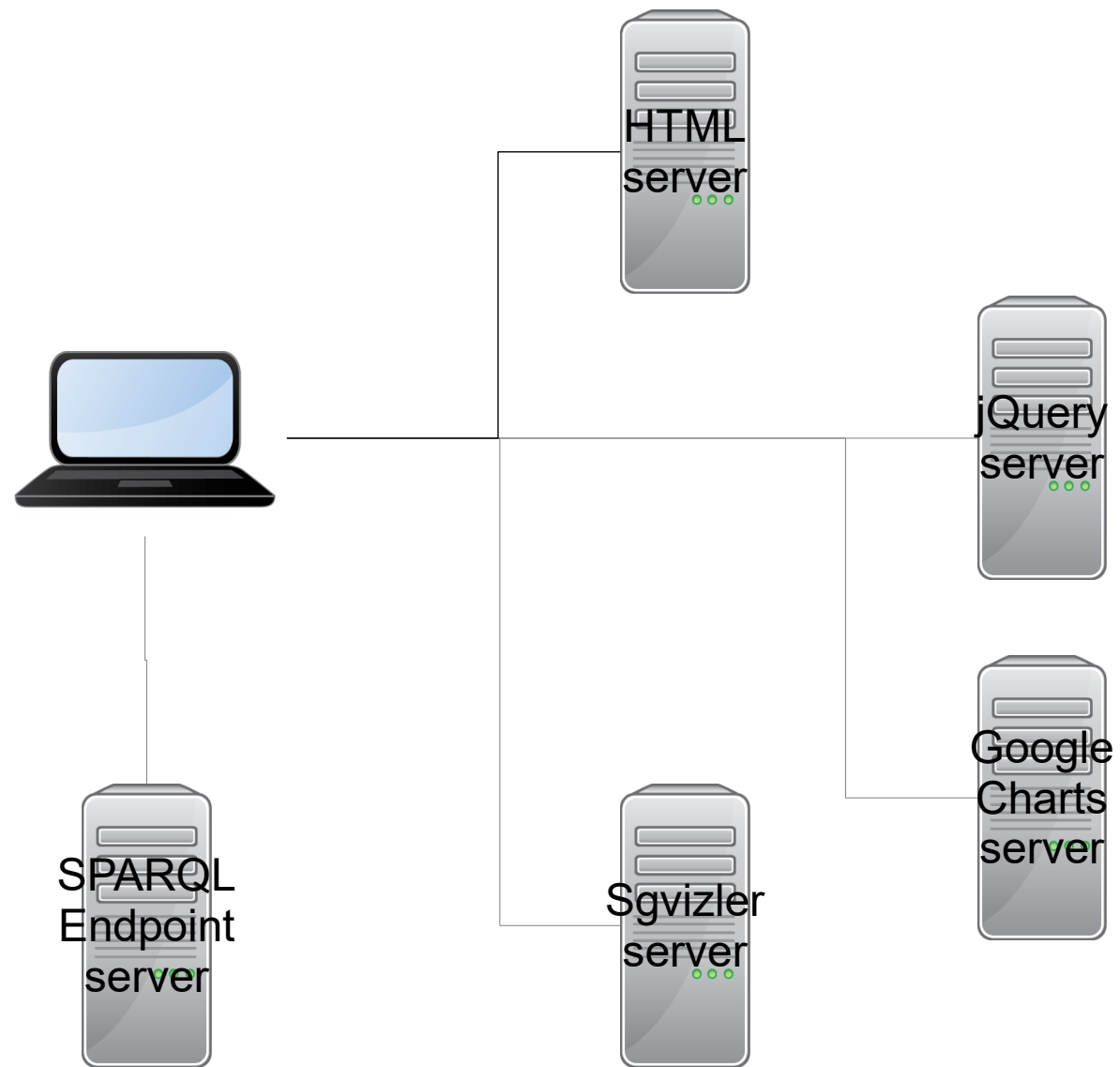


# Sgvizler

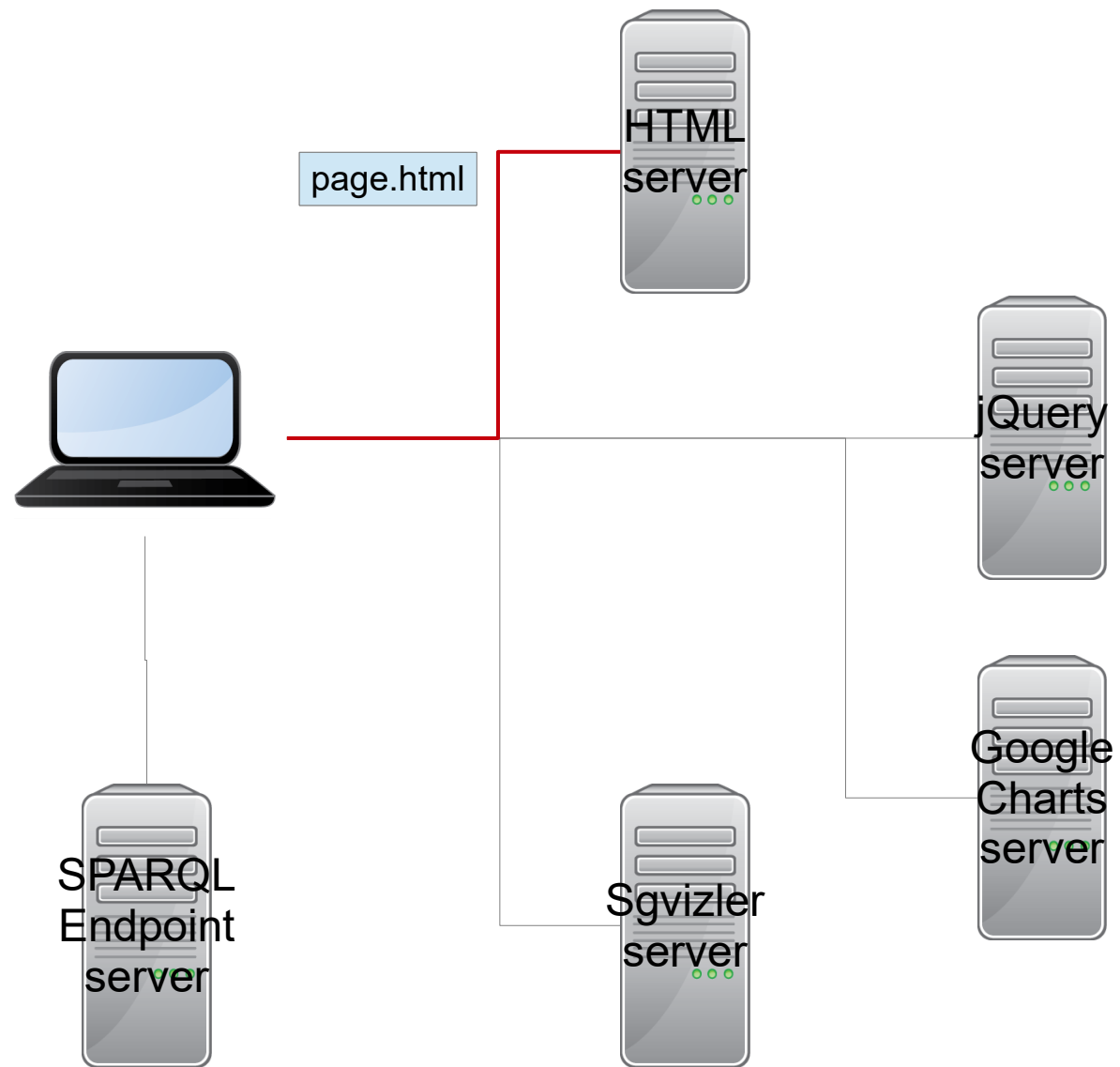
- An **open-source JavaScript library**
  - embedded in web page
  - submits SELECT queries to **SPARQL endpoints**
  - transforms the (JSON or XML) results into **data tables**
  - **visualises the data tables as charts** or in other ways
  - as part of web pages
- **SPARQL SELECT queries** can be:
  - hard-coded into the HTML web page
  - input by the user through HTML forms (fully or partially)
  - invoked from JavaScripts in the page (Sgvizler's API)
- Based on
  - Google Charts/Visualisation API (or other similar, e.g., D3.js)
  - jQuery – JavaScript utility library



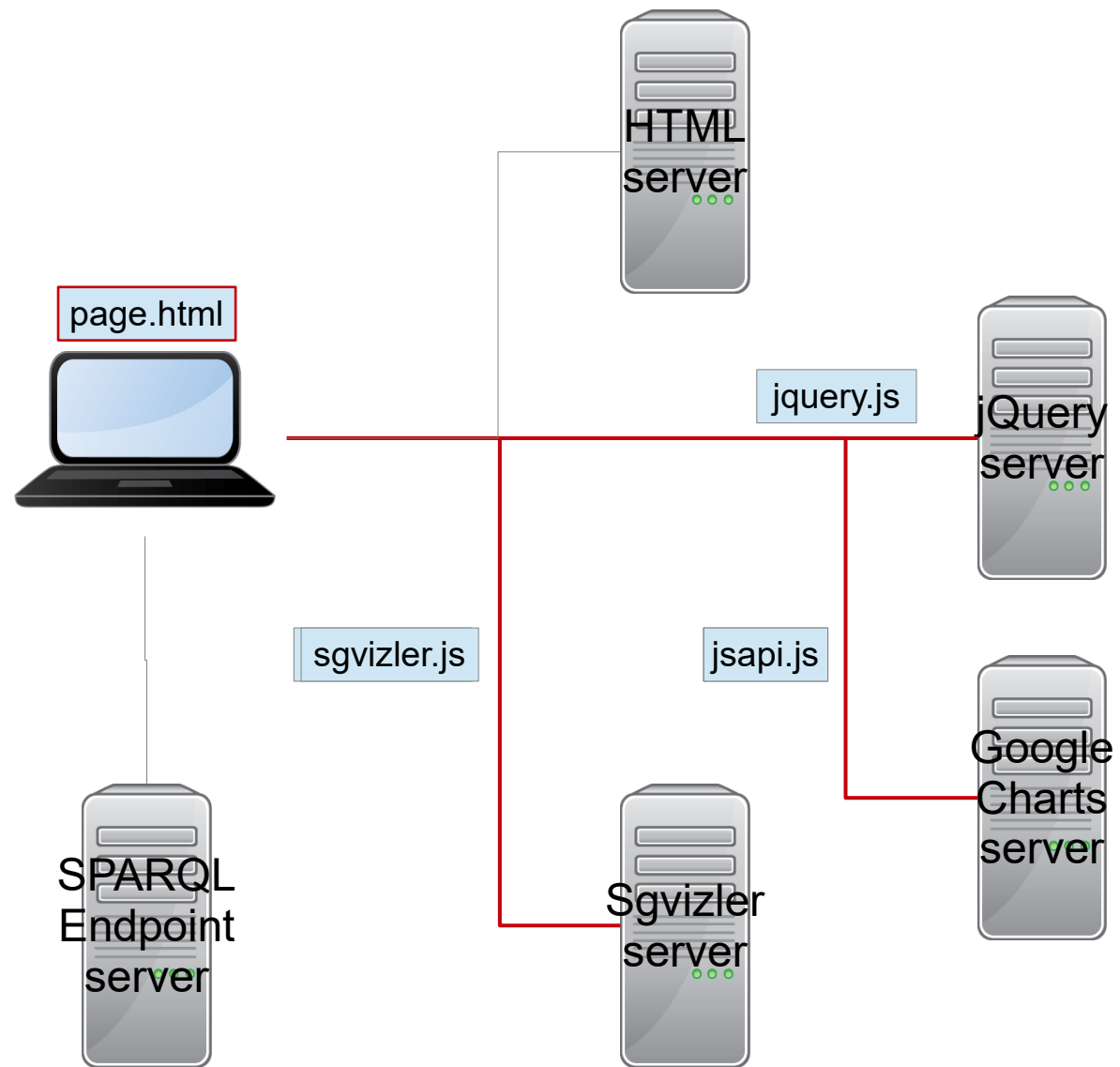
# Sgvizler architecture



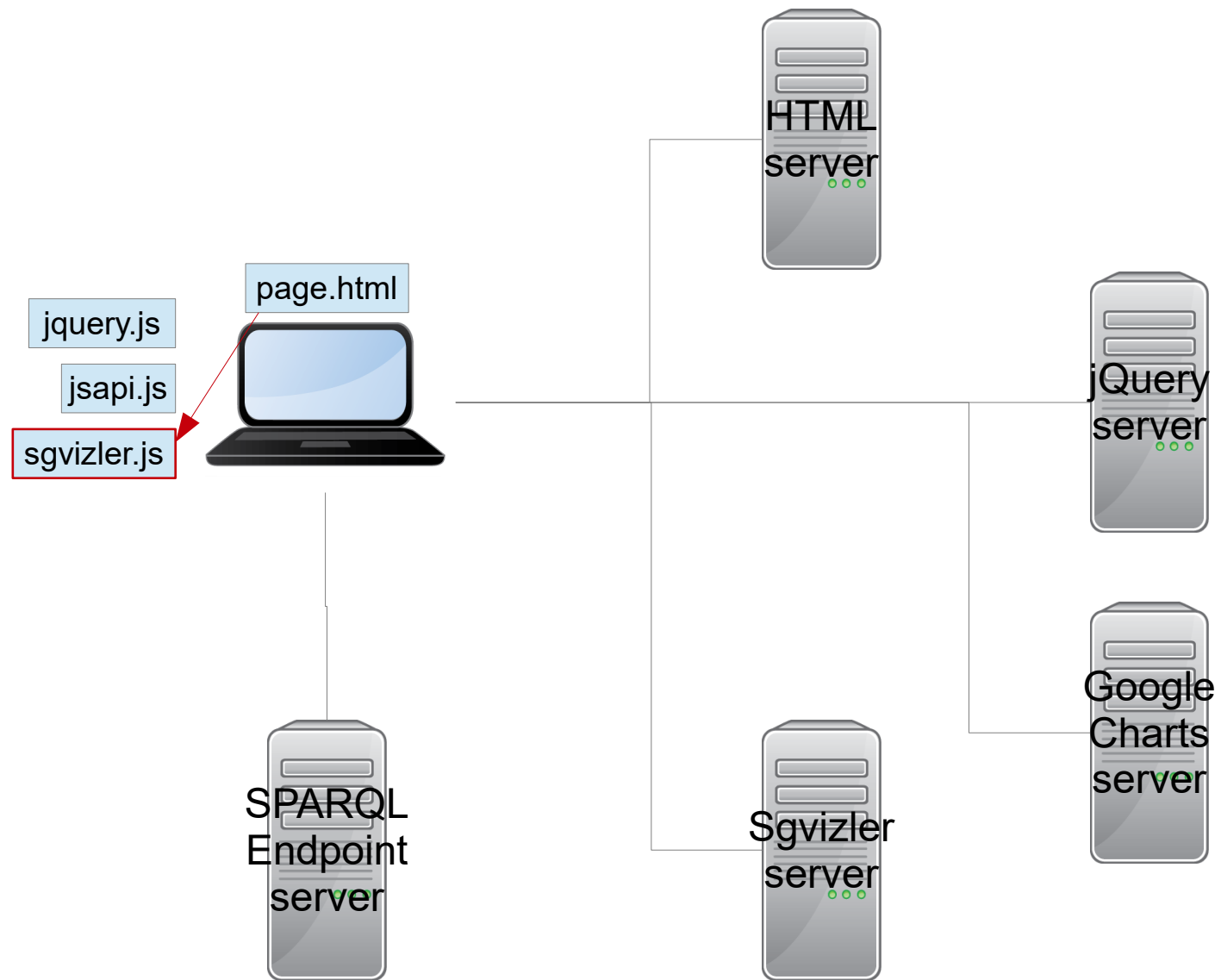
# Sgvizler architecture



# Sgvizler architecture

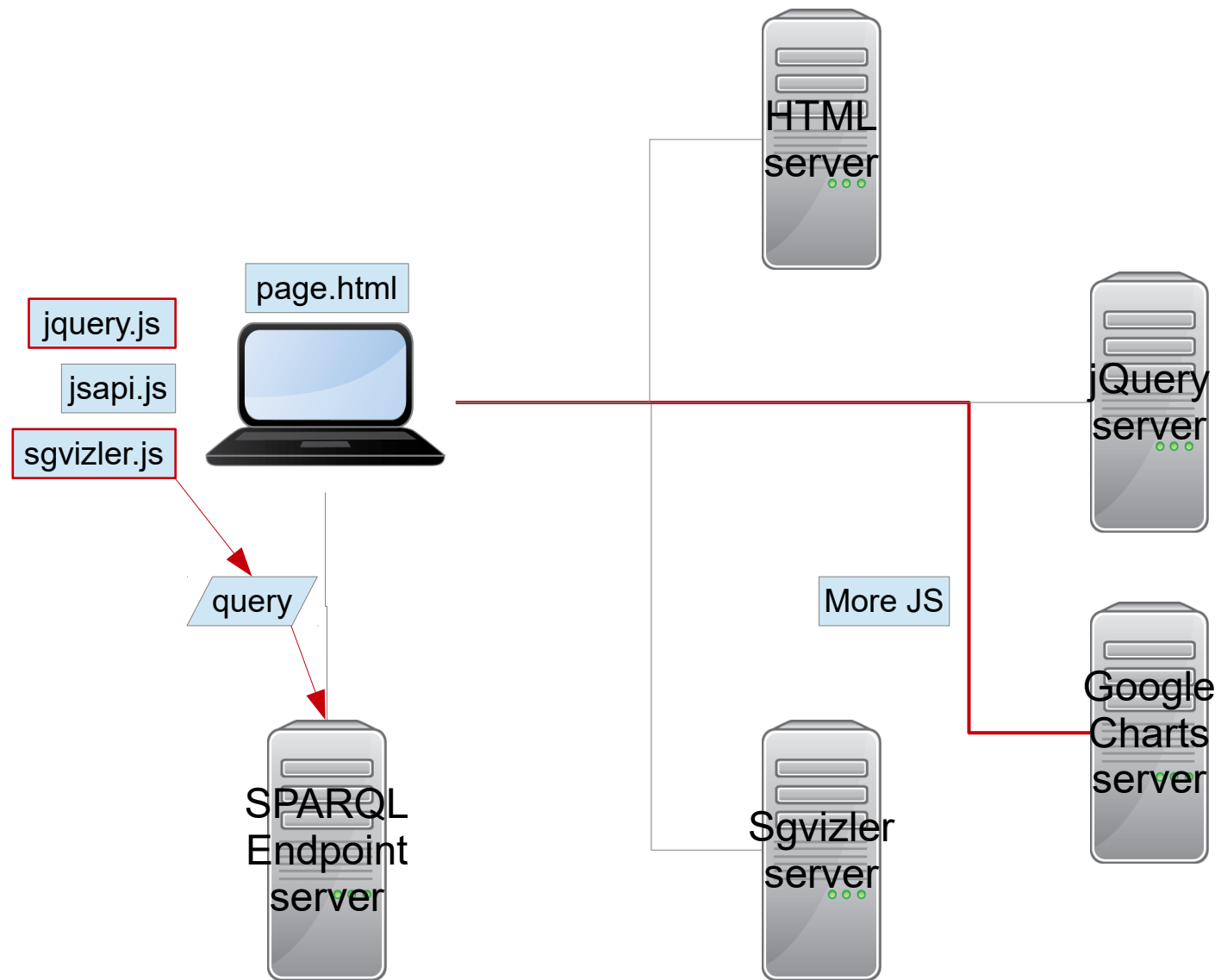


# Sgvizler architecture

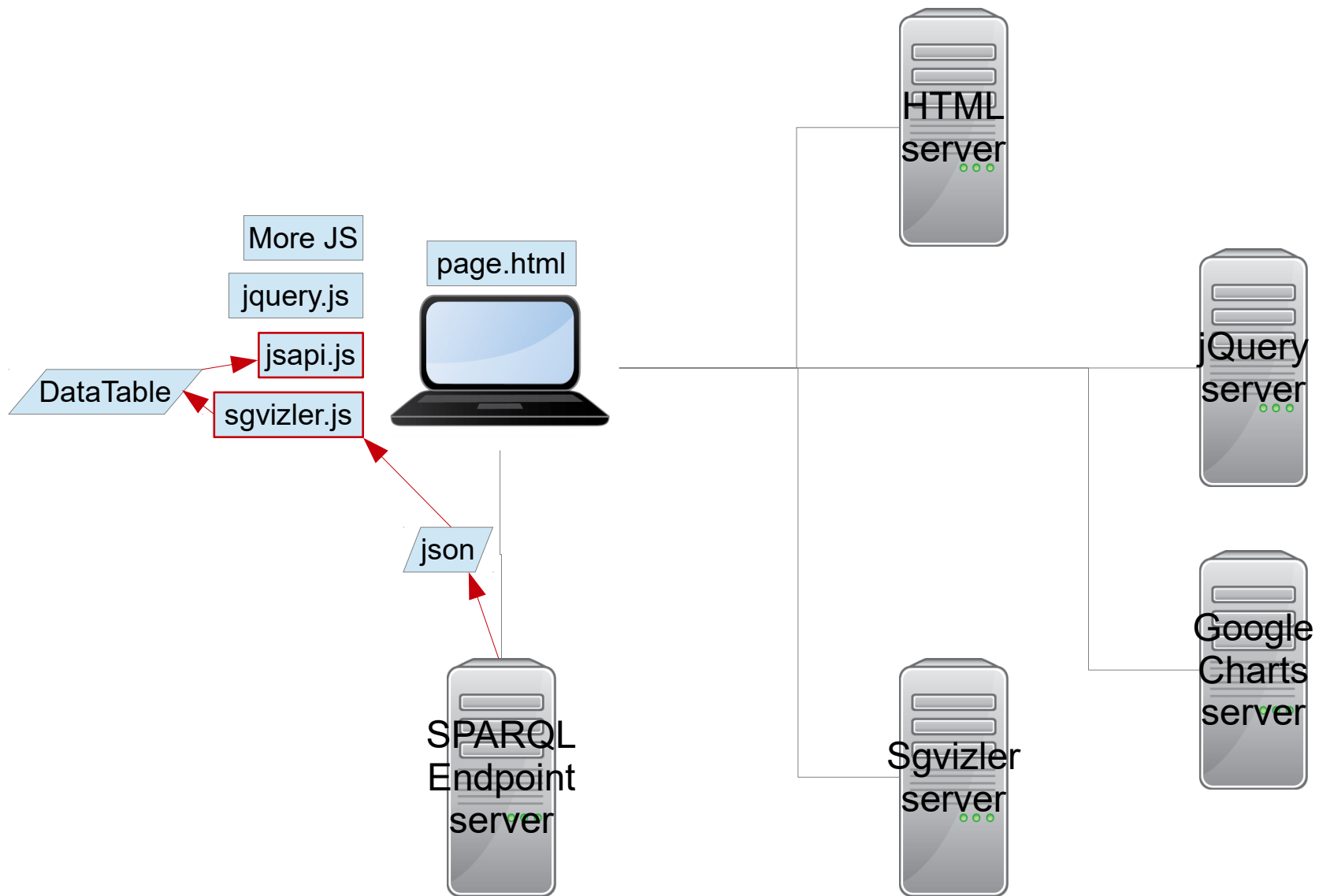




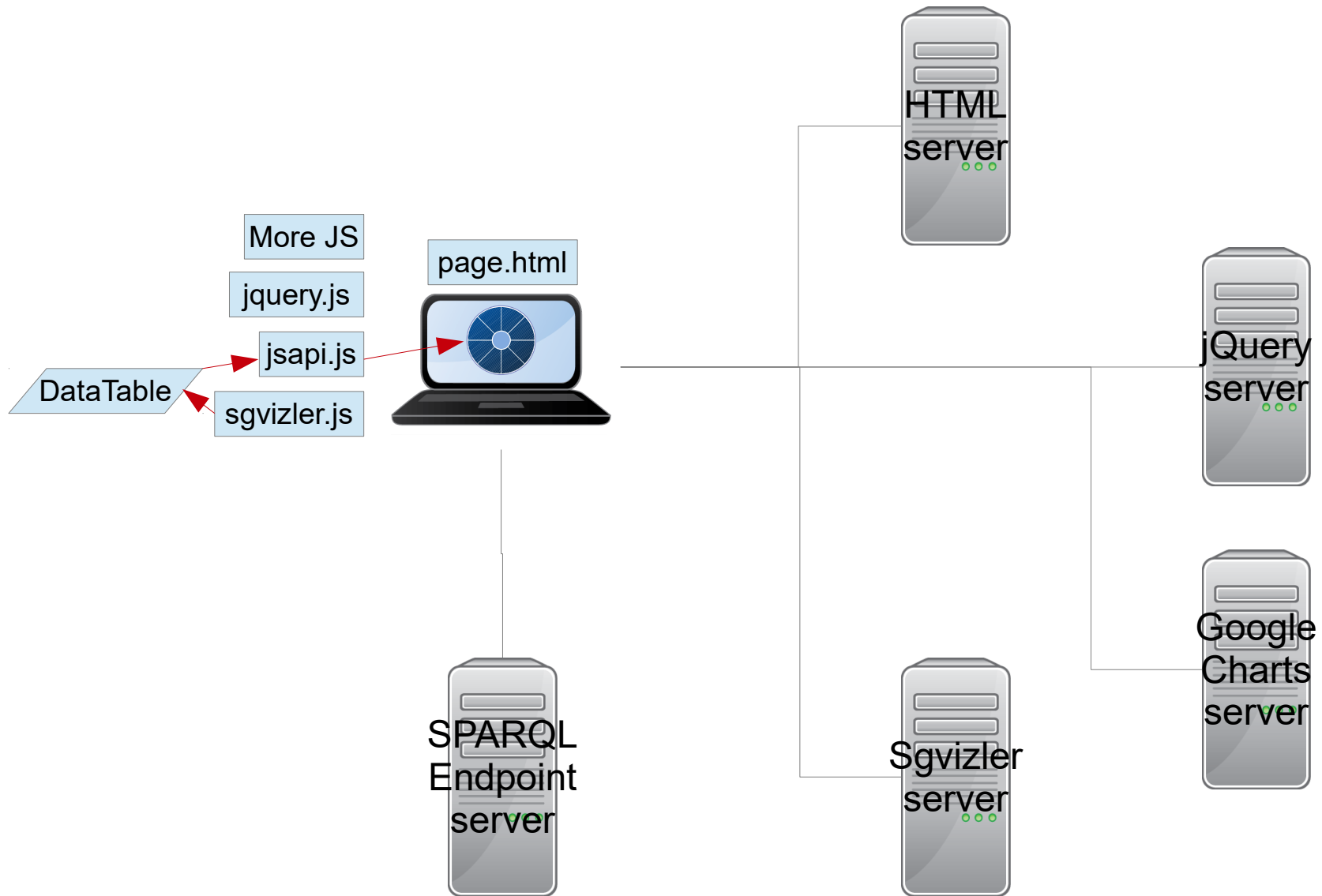
# Sgvizler architecture



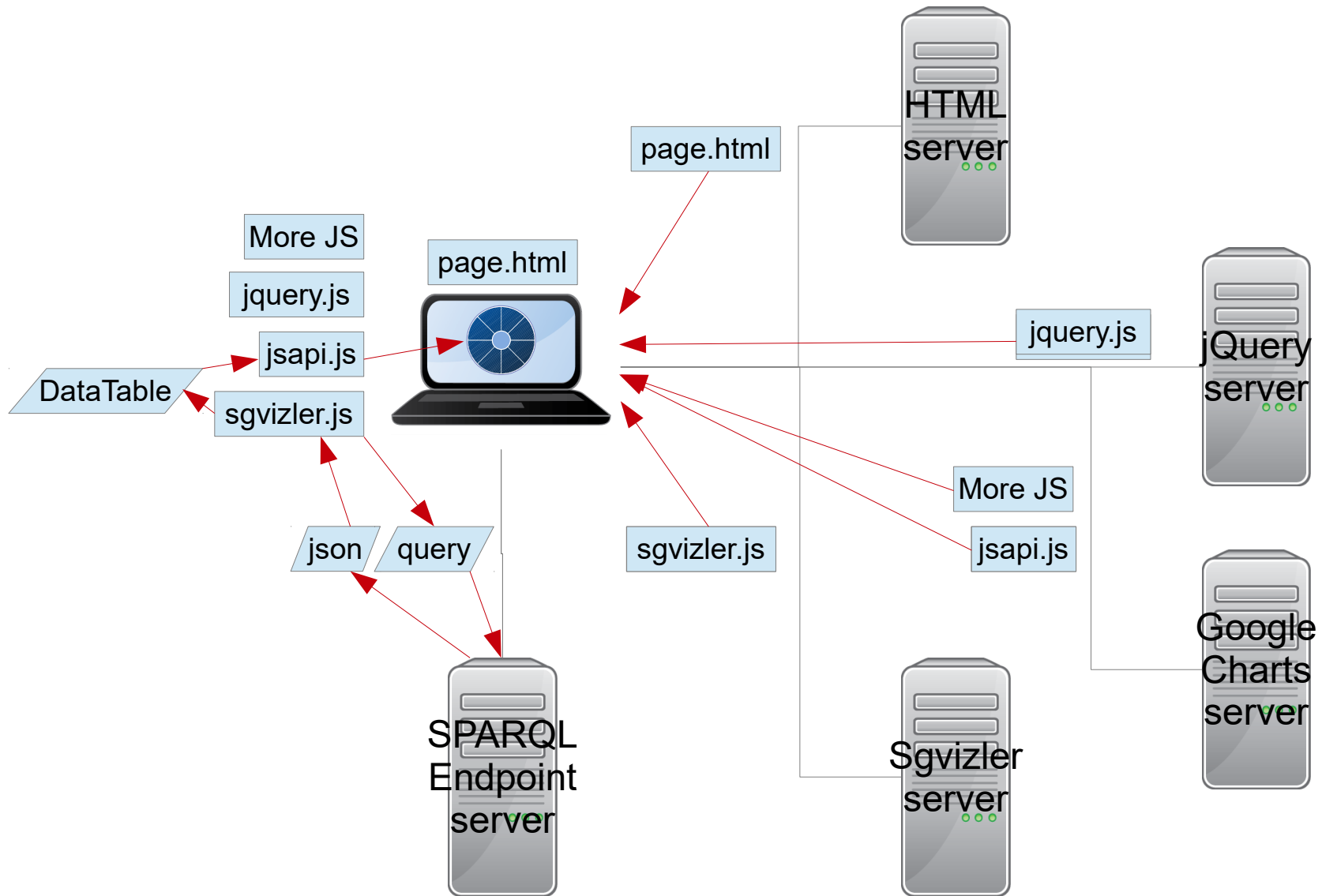
# Sgvizler architecture



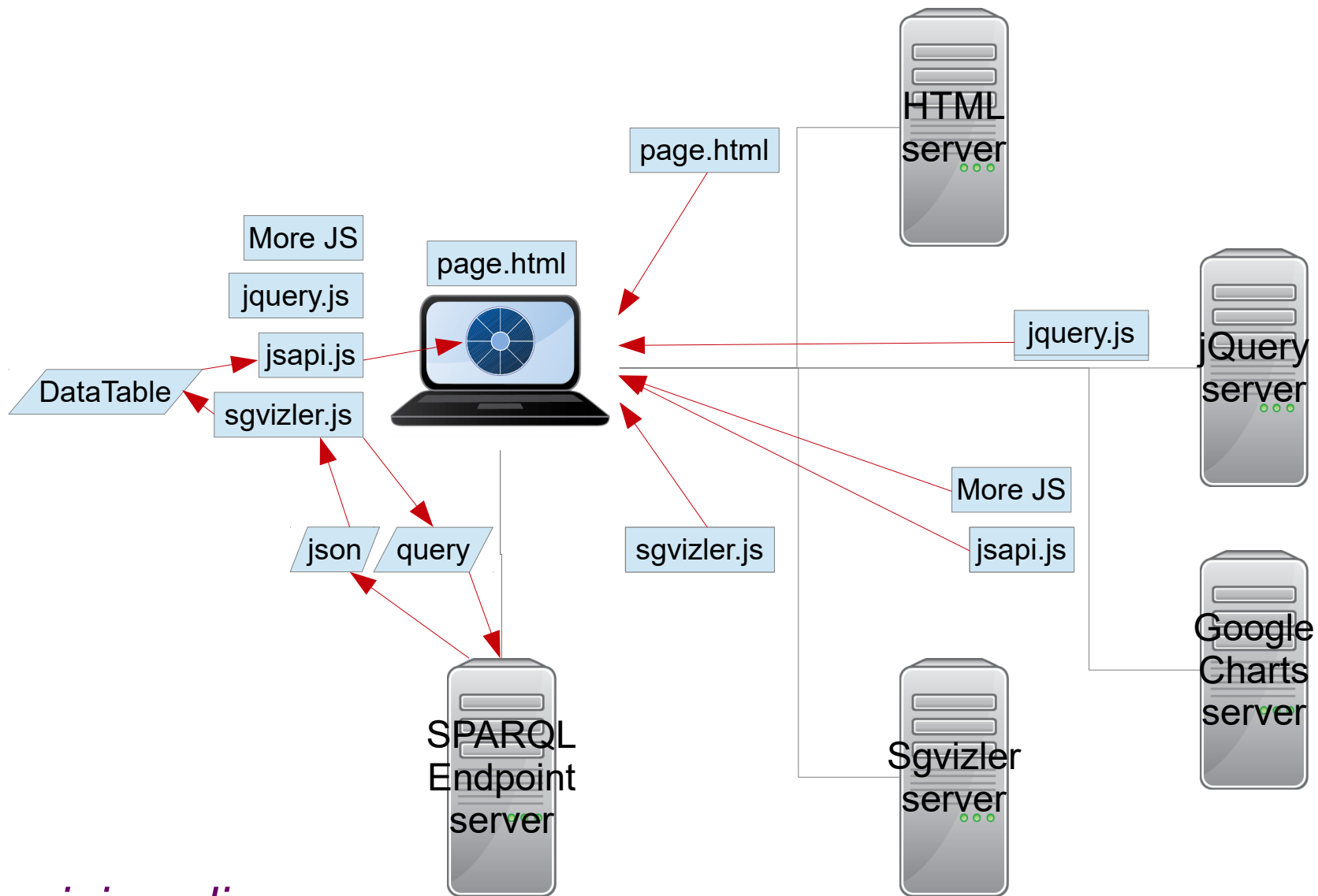
# Sgvizler architecture



# Sgvizler architecture



# Sgvizler architecture



*Same-origin policy  
may prohibit this!*

# Sgvizler markup

```
<html>
  <head>
    <script type="text/javascript"
      src="http://cdnjs.cloudflare.com/ajax/libs/jquery/1.9.0/jquery.js"></script>
    <script type="text/javascript"
      src="https://www.google.com/jsapi"></script>
    <script type="text/javascript"
      src="http://mgskjaeveland.github.io/sgvizler/v/0.6/sgvizler.js"></script>
    <script>
      $(document).ready(
        function () {   sgvizler.containerDrawAll();   }
      );
    </script>
  </head>
  <body>
    ...
  </body>
</html>
```



# Sgvizler markup

```
<html>
  <head> ... </head>
  <body>
    ...

    <div id="example"
      data-sgvizler-endpoint="http://sws.ifi.uio.no/sparql/npd"
      data-sgvizler-query="
        SELECT ?class (count(?instance) AS ?noOfInstances)
        WHERE{ ?instance a ?class }
        GROUP BY ?class
        ORDER BY ?class"
      data-sgvizler-chart="google.visualization.PieChart"
      style="width:800px; height:400px;"></div>

    ...
  </body>
</html>
```



# Same-origin policy

- Part of the web application security model, in our case:
- *when a web resource (page) contains a script, the script can access a second web resource, but only if the two resources have the same origin, i.e., only if they have the same:*
  - *IRI scheme, hostname, and port number*
- But <http://mgskjaeveland.github.io/sgvizler/v/0.6/sgvizler.js> received JSON from <http://sws.ifi.uio.no/sparql/npd> – how come?
  - Cross-Origin Resource Sharing (CORS)
  - used JSONP (JSON with Padding)
  - co-locate your SPARQL endpoint with a copy of `sgvizler.js`
  - use federated queries for external data
- ...we will just use localhost (127.0.0.1) in the lab





# Sgvizler through HTML forms

```
<html>
  <head>
    ... load jQuery, jsapi, and Sgvizler here ...
    <script>
      sgvizler
        .prefix("ex", "http://example.org#")
        .defaultEndpointURL("http://dbpedia.org/sparql")
        .defaultQuery("SELECT * { ?a ?b ?c, ?d, ?e } LIMIT 7")
        .defaultChartFunction("sgvizler.visualization.Table")
        .defaultChartWidth(500).defaultChartHeight(500);
    </script>
  </head>
  <body>
    <div id="myForm"></div>
    <script type="text/javascript">
      $(document).ready(function() { sgvizler.formDraw("myForm"); });
    </script>
  </body>
</html>
```



[http://mgskjaeveland.github.io/  
sgvizler/example/usage-query-form.html](http://mgskjaeveland.github.io/sgvizler/example/usage-query-form.html)



# Sgvizler's API

```
<script>
var Q = new sgvizler.Query();           // Create a Query instance.

// Values may also be set in the sgvizler object - but will be overwritten here.
Q.query("SELECT * {?s ?p ?o} LIMIT 10")
  .endpointURL("http://dbpedia.org/sparql")
  .endpointOutputFormat("json")       // Either 'xml', 'json', 'jsonp'.
  .chartFunction("google.visualization.Table") // Function to draw the chart.
  .draw("myElementID");              // Draw chart in HTML element.
</script>

<div id="myElementID"></div>
```



# Google's Chart Tools

<https://google-developers.appspot.com/chart/interactive/docs/>

