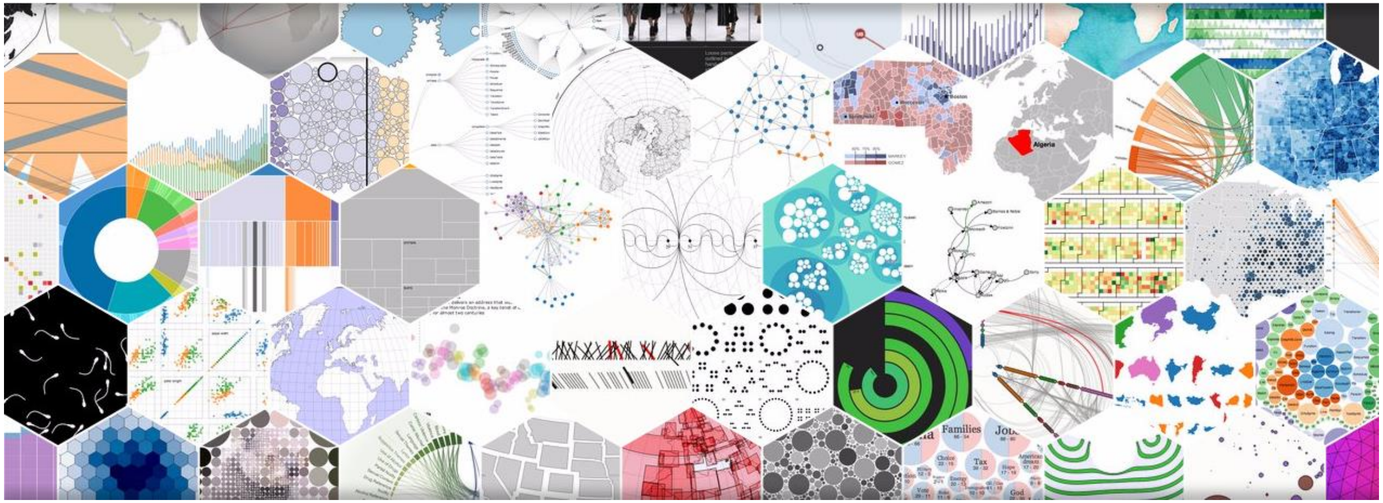
D3.js workshop

WhyR? 2017

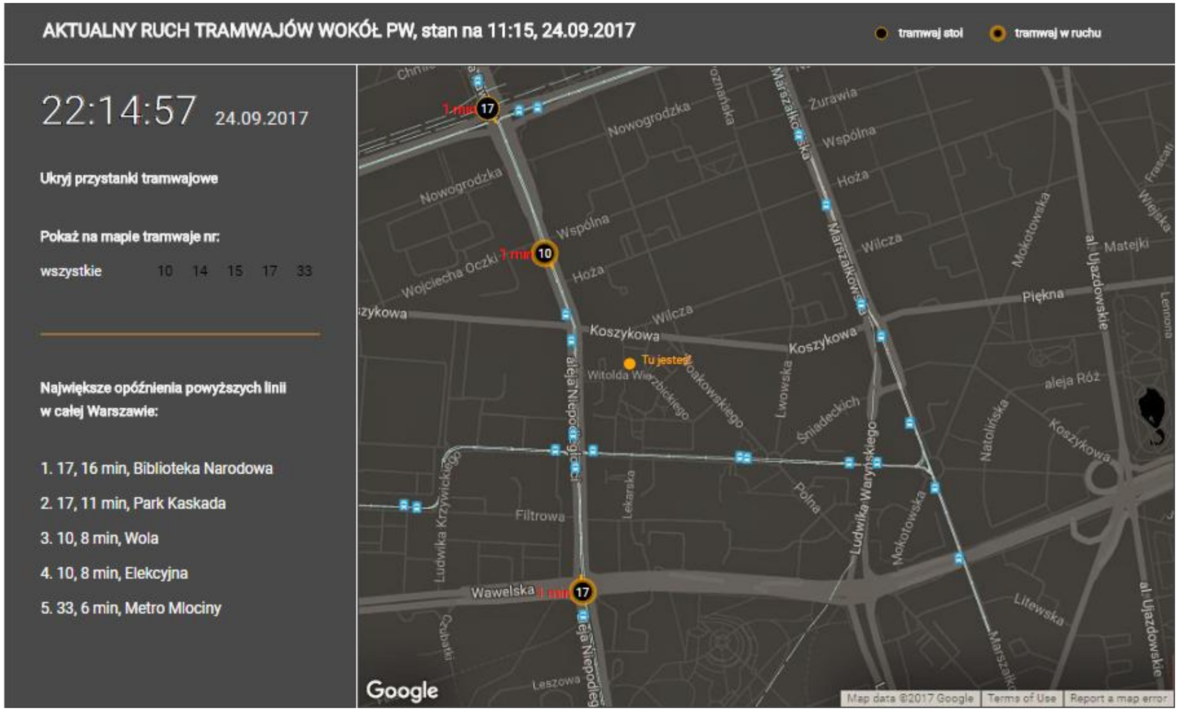
Data-Driven Documents



Ewa Baranowska

Agenda

1. Short introduction to D3.js (5 – 10 minutes)
2. D3 use case with Warsaw trams data (20 – 25 minutes)



AKTUALNY RUCH TRAMWAJÓW WOKÓŁ PW, stan na 11:15, 24.09.2017

● tramwaj stoi ● tramwaj w ruchu

22:14:57 24.09.2017

Ukryj przystanki tramwajowe

Pokaż na mapie tramwaje nr:

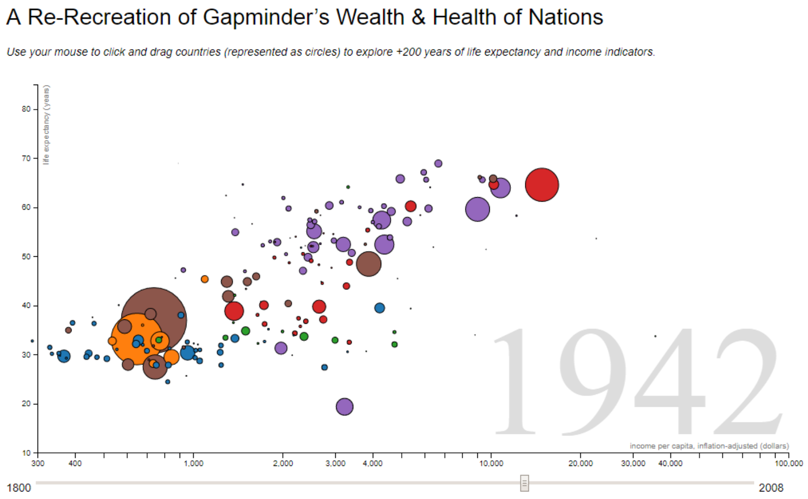
wszystkie 10 14 15 17 33

Największe opóźnienia powyższych linii
w całej Warszawie:

1. 17, 16 min, Biblioteka Narodowa
2. 17, 11 min, Park Kaskada
3. 10, 8 min, Wola
4. 10, 8 min, Elekcyjna
5. 33, 6 min, Metro Mlociny

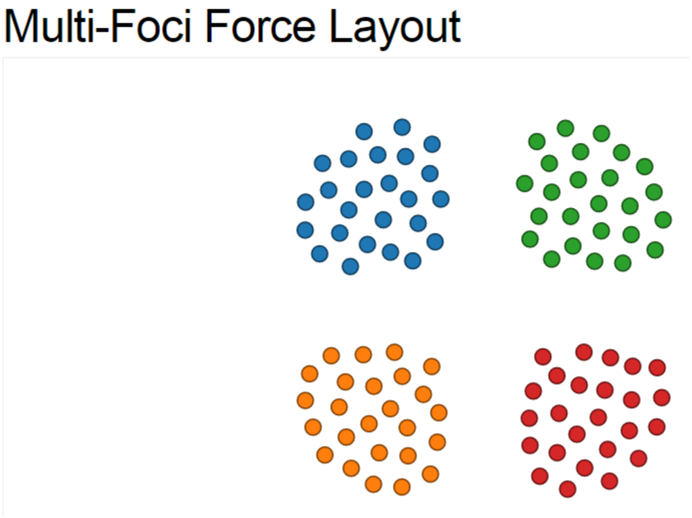
D3 - definition

D3 is a JavaScript library for creating personalized, interactive visualizations that work in web browsers



A Re-Recreation of Gapminder’s Wealth & Health of Nations

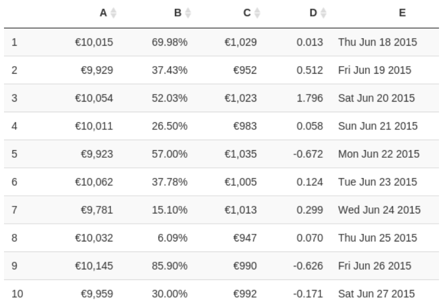
Use your mouse to click and drag countries (represented as circles) to explore +200 years of life expectancy and income indicators.



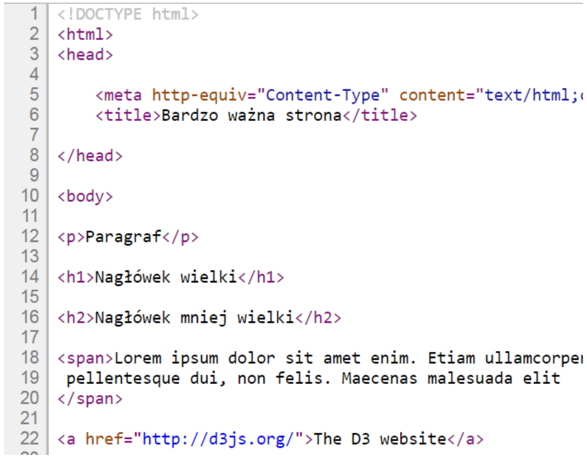
Multi-Foci Force Layout

D3 - name

D3 = **D**ata-**D**riven **D**ocuments



	A	B	C	D	E
1	€10,015	69.98%	€1,029	0.013	Thu Jun 18 2015
2	€9,929	37.43%	€952	0.512	Fri Jun 19 2015
3	€10,054	52.03%	€1,023	1.796	Sat Jun 20 2015
4	€10,011	26.50%	€983	0.058	Sun Jun 21 2015
5	€9,923	57.00%	€1,035	-0.672	Mon Jun 22 2015
6	€10,062	37.78%	€1,005	0.124	Tue Jun 23 2015
7	€9,781	15.10%	€1,013	0.299	Wed Jun 24 2015
8	€10,032	6.09%	€947	0.070	Thu Jun 25 2015
9	€10,145	85.90%	€990	-0.626	Fri Jun 26 2015
10	€9,959	30.00%	€992	-0.171	Sat Jun 27 2015



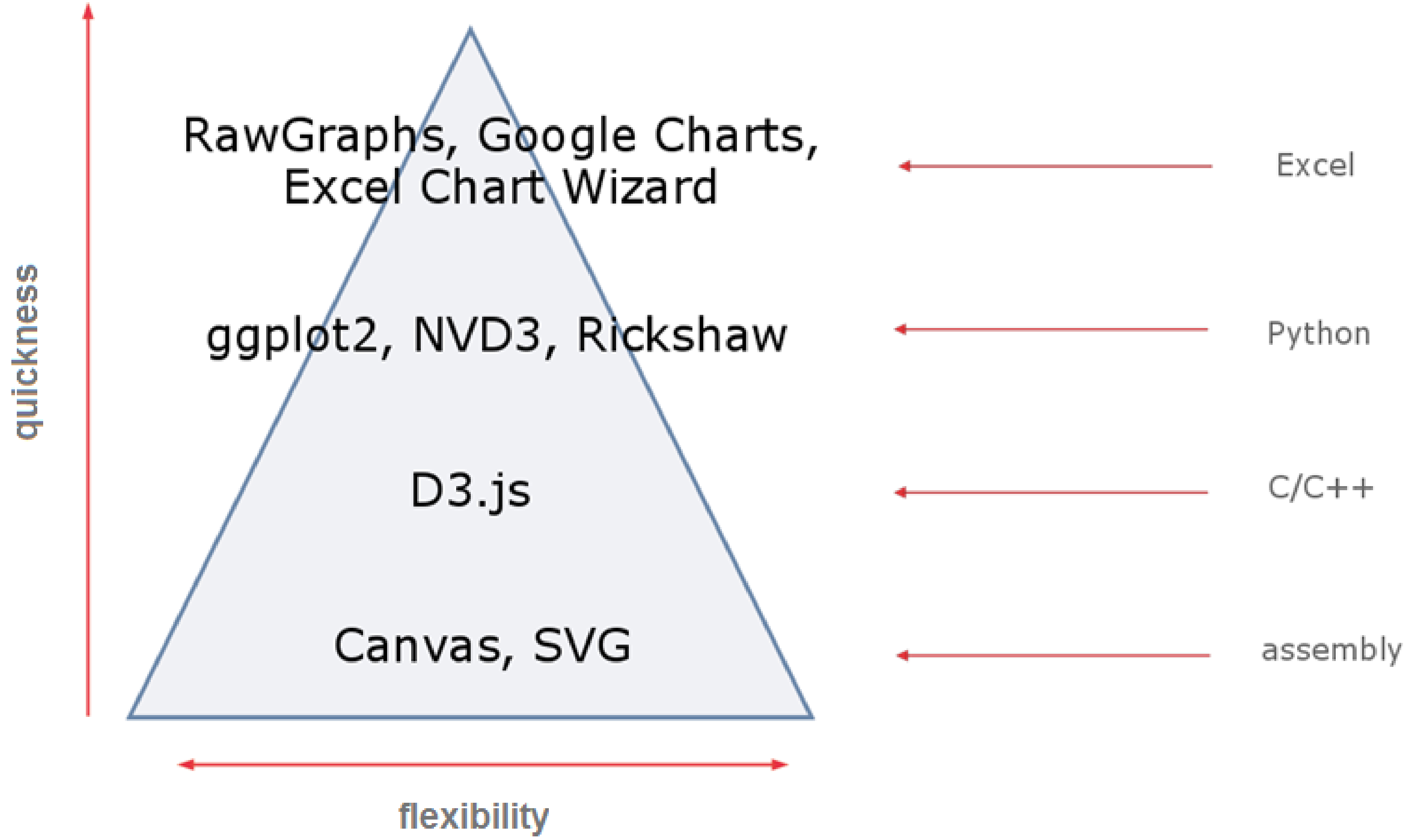
```
<!DOCTYPE html>
<html>
<head>

    <meta http-equiv="Content-Type" content="text/html;
    <title>Bardzo ważna strona</title>

</head>

<body>

<p>Paragraf</p>

<h1>Nagłówek wielki</h1>

<h2>Nagłówek mniej wielki</h2>

<span>Lorem ipsum dolor sit amet enim. Etiam ullamcorpe
 pellentesque dui, non felis. Maecenas malesuada elit
</span>

<a href="http://d3js.org/">The D3 website</a>
```

data

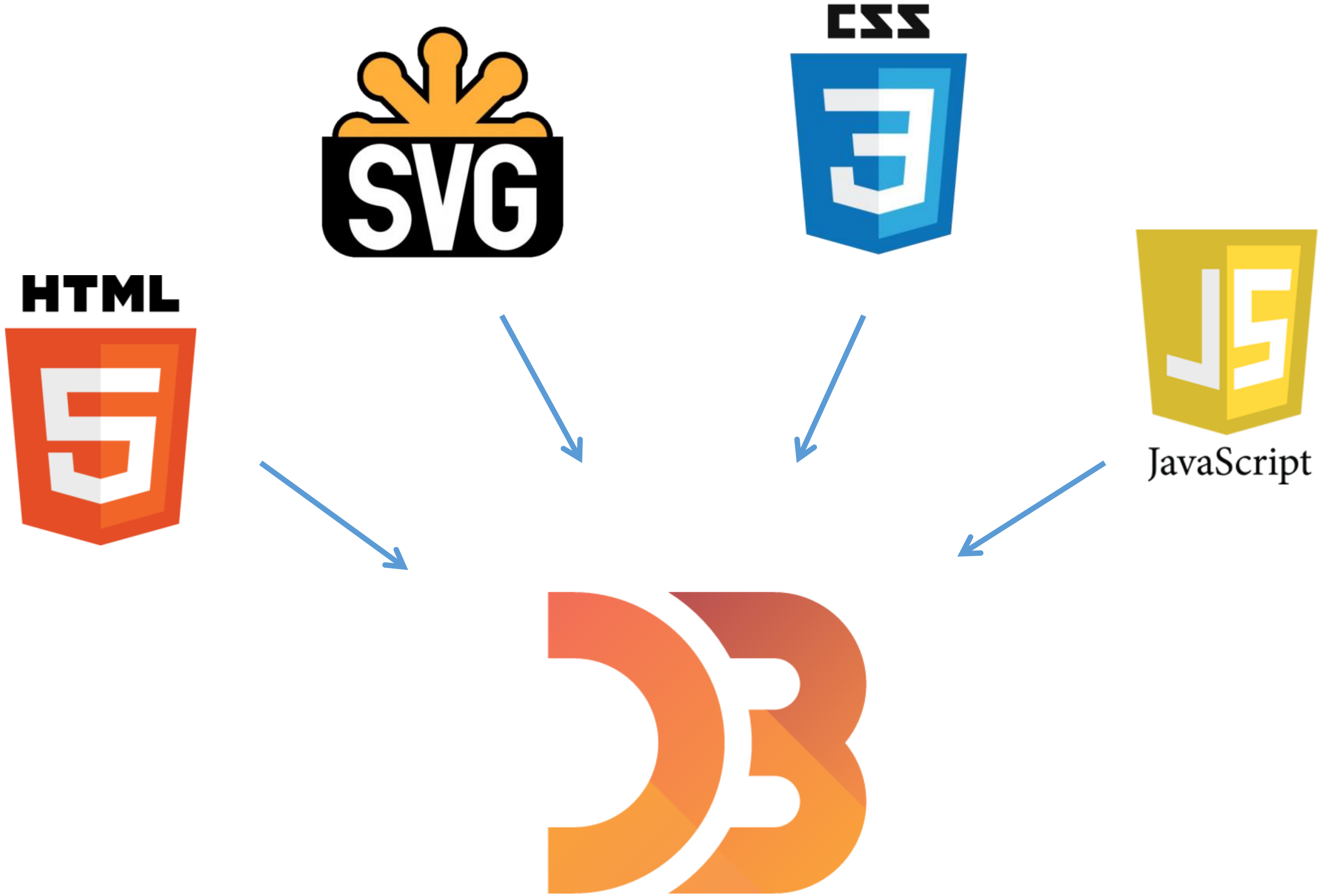
bonded by D3

with HTML documents

D3 – presentation, not exploration



Used web standards

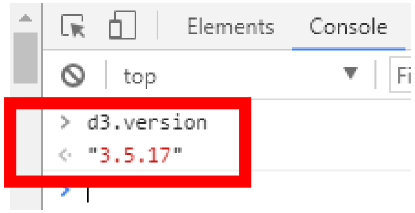


D3 – basic information

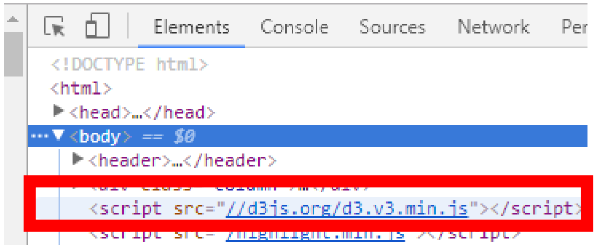
- free JavaScript library
- author: Mike Bostock
- https://d3js.org/ - home page
- https://github.com/d3/d3/wiki/Gallery - examples
- API reference D3 - documentation

Version of D3.js: v3 vs v4

- new version v4 since last year
- differences, including:
  - main library divided into modules
  - functions nomenclature (d3.scale.linear() -> d3.scaleLinear)
  - performance of selections (key D3 elements)
- **=> swapping one line in code is not enough**
- info about used D3 version:
  - d3.version command in JS console in browser
  - included JS script in the header of html file
- every change is described on github



```
> d3.version
<· "3.5.17"
>
```



```
<!DOCTYPE html>
<html>
▶<head>…</head>
…▼<body> == $0
  ▶<header>…</header>
   <div class="column">…</div>
   <script src="//d3js.org/d3.v3.min.js"></script>
   <script src="/highlight.min.js"></script>
```

Exemplary online materials

D3 examples: bl.ocks.org

D3 tutorials: tutorial from Scott Murray, http://d3indepth.com/

SVG: MDN documentation of SVG, W3 documentation of SVG

CSS: tutorial from MDN about CSS

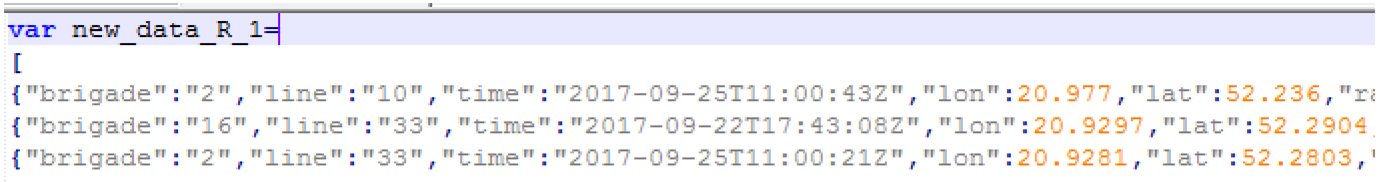
JavaScript: tutorials from MDN about JavaScript

More:

cheatsheet about D3 from Jerome Cukier
technical introduction for D3
opening JS console in different web browsers

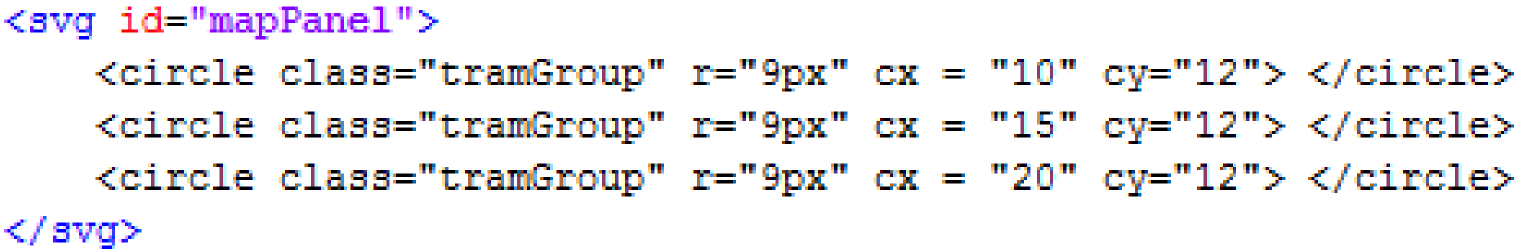
Key idea of D3 = data + DOM elements

- simple example – what do we have?
  - 3 observation from our dataset:



```
var new_data_R_1=
[
{"brigade":"2","line":"10","time":"2017-09-25T11:00:43Z","lon":20.977,"lat":52.236,"ra
{"brigade":"16","line":"33","time":"2017-09-22T17:43:08Z","lon":20.9297,"lat":52.2904,
{"brigade":"2","line":"33","time":"2017-09-25T11:00:21Z","lon":20.9281,"lat":52.2803,"
```

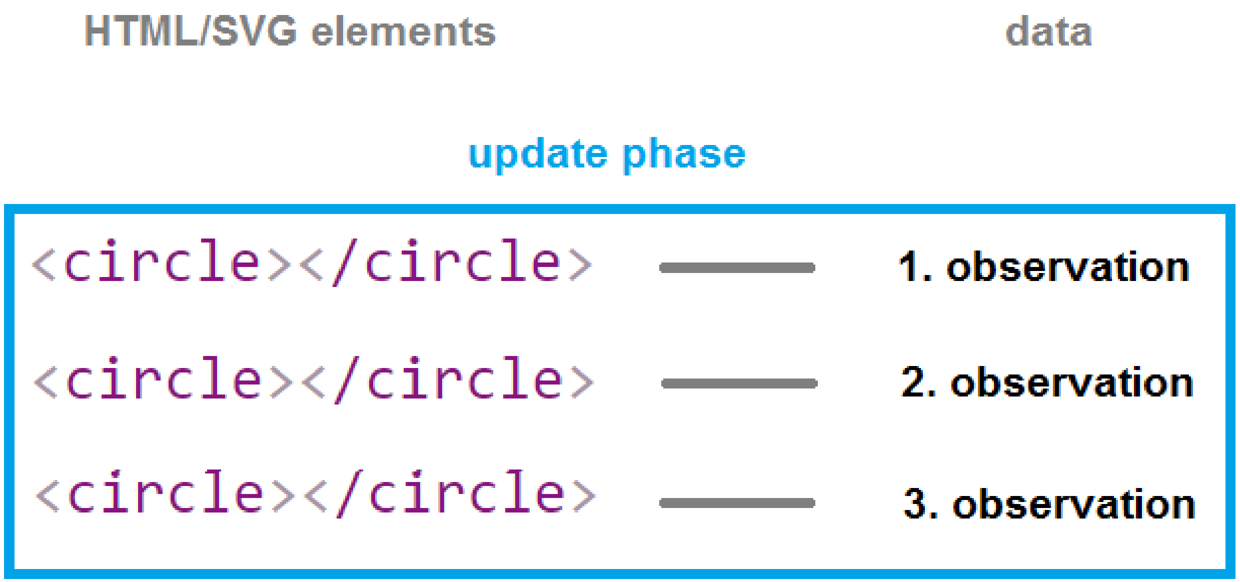
  - 3 circles:



```
<svg id="mapPanel">
    <circle class="tramGroup" r="9px" cx = "10" cy="12"> </circle>
    <circle class="tramGroup" r="9px" cx = "15" cy="12"> </circle>
    <circle class="tramGroup" r="9px" cx = "20" cy="12"> </circle>
</svg>
```

UPDATE phase

- the same number of observations and elements (circles)



HTML/SVG elements

data

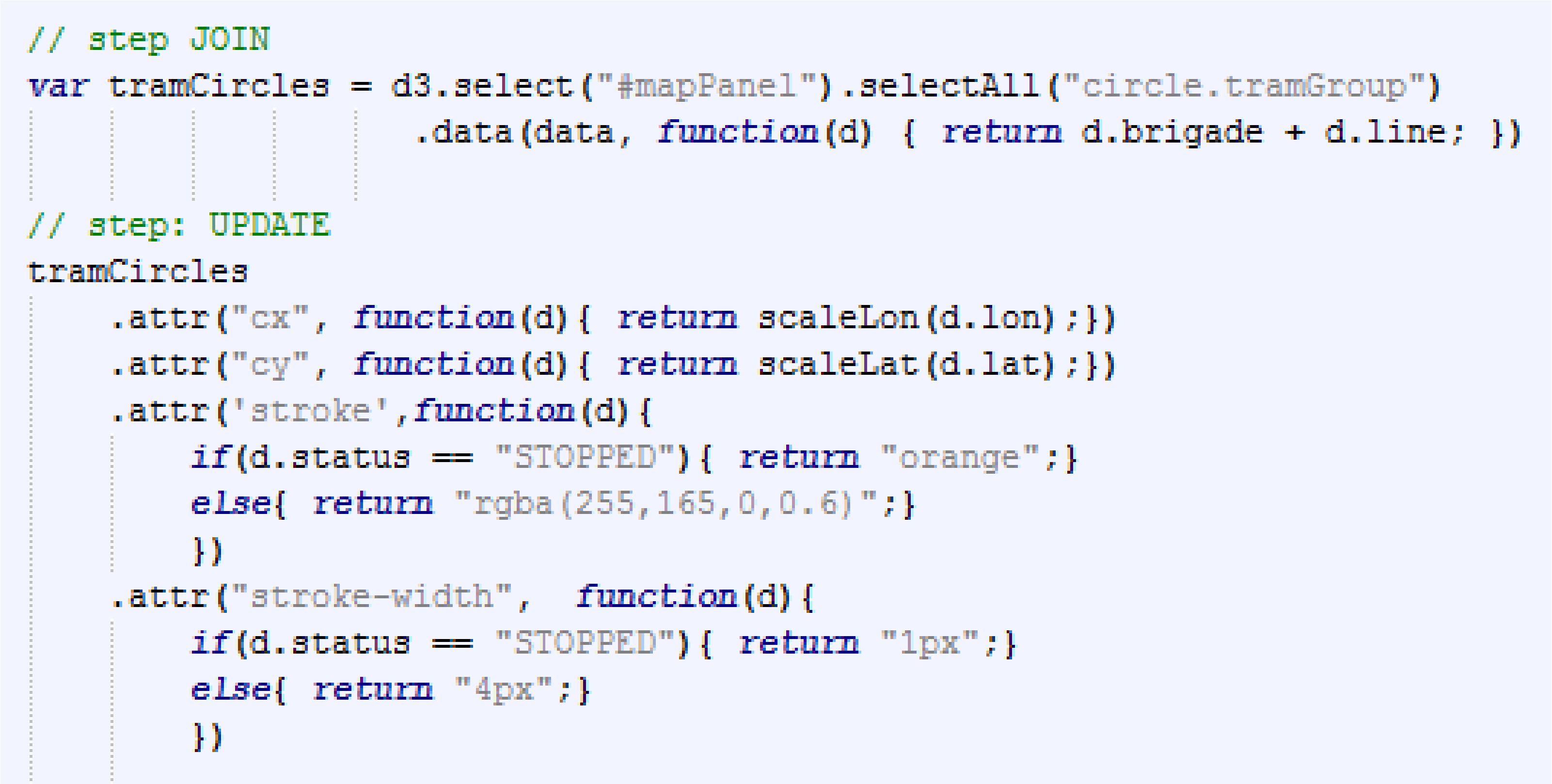
update phase

<circle></circle> 1. observation

<circle></circle> 2. observation

<circle></circle> 3. observation

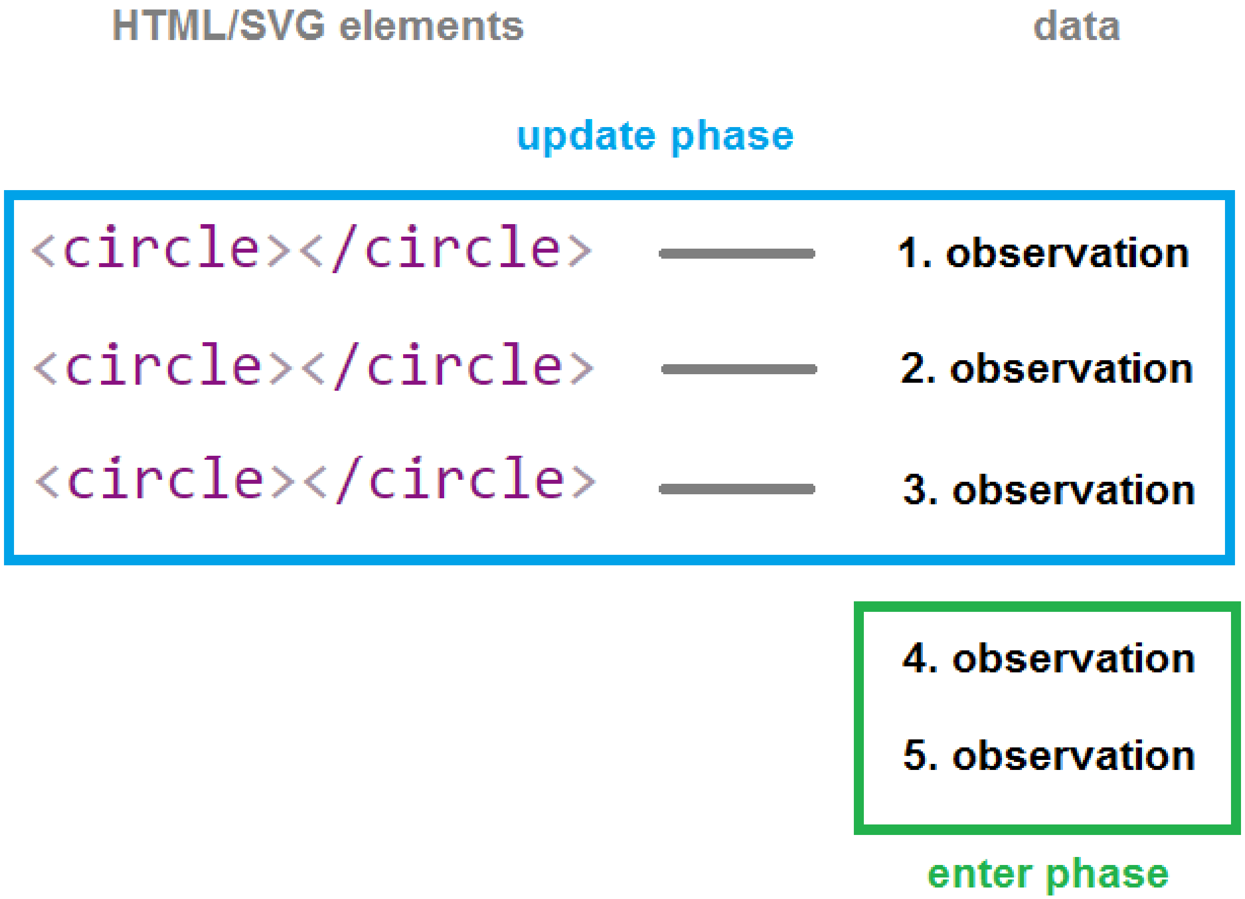
UPDATE phase



```
// step JOIN
var tramCircles = d3.select("#mapPanel").selectAll("circle.tramGroup")
                   .data(data, function(d) { return d.brigade + d.line; })

// step: UPDATE
tramCircles
    .attr("cx", function(d){ return scaleLon(d.lon);})
    .attr("cy", function(d){ return scaleLat(d.lat);})
    .attr('stroke',function(d){
        if(d.status == "STOPPED"){ return "orange";}
        else{ return "rgba(255,165,0,0.6)";}
        })
    .attr("stroke-width",  function(d){
        if(d.status == "STOPPED"){ return "1px";}
        else{ return "4px";}
        })
```

ENTER phase

- more observations than elements



HTML/SVG elements

data

update phase

<circle></circle> 1. observation

<circle></circle> 2. observation

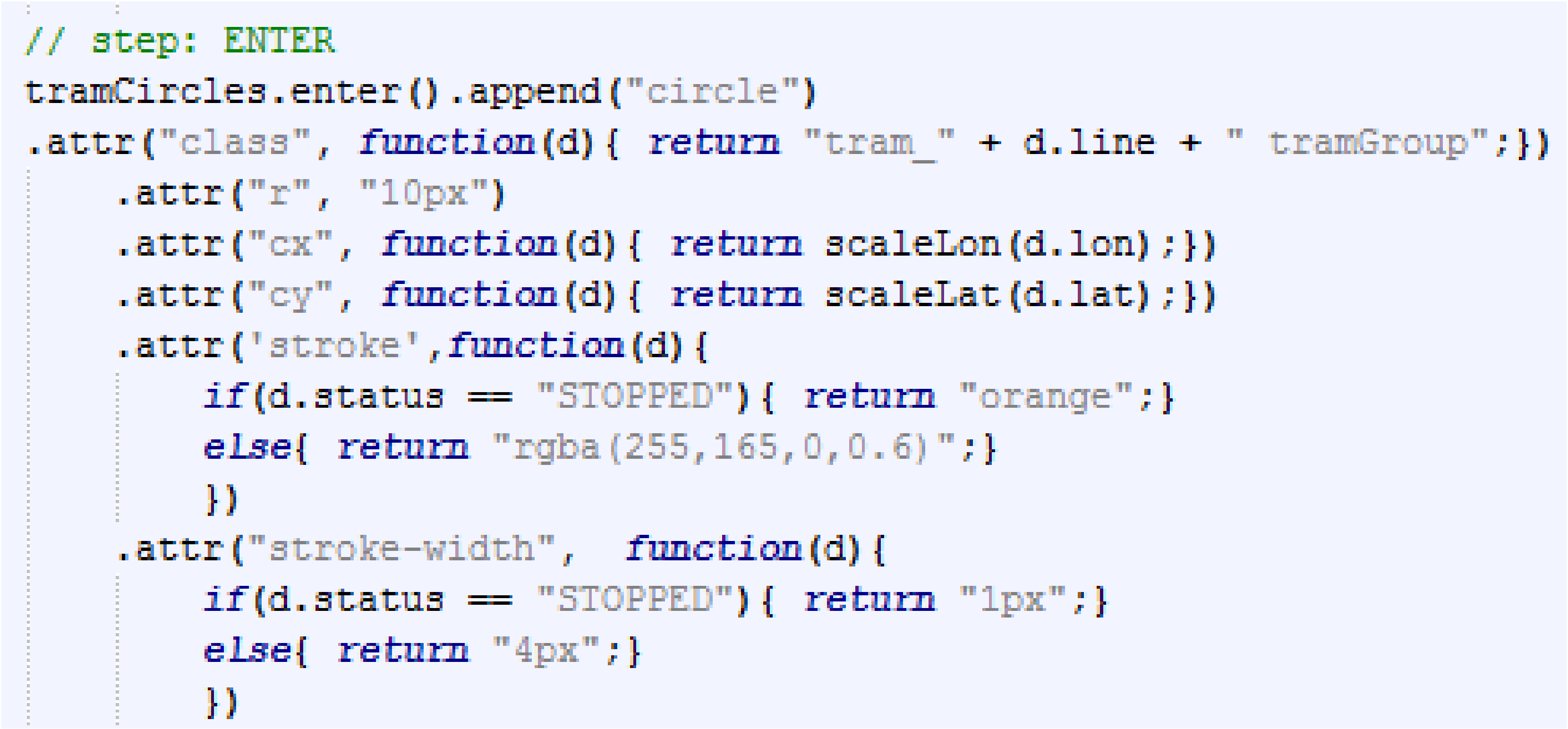
<circle></circle> 3. observation

4. observation

5. observation

enter phase

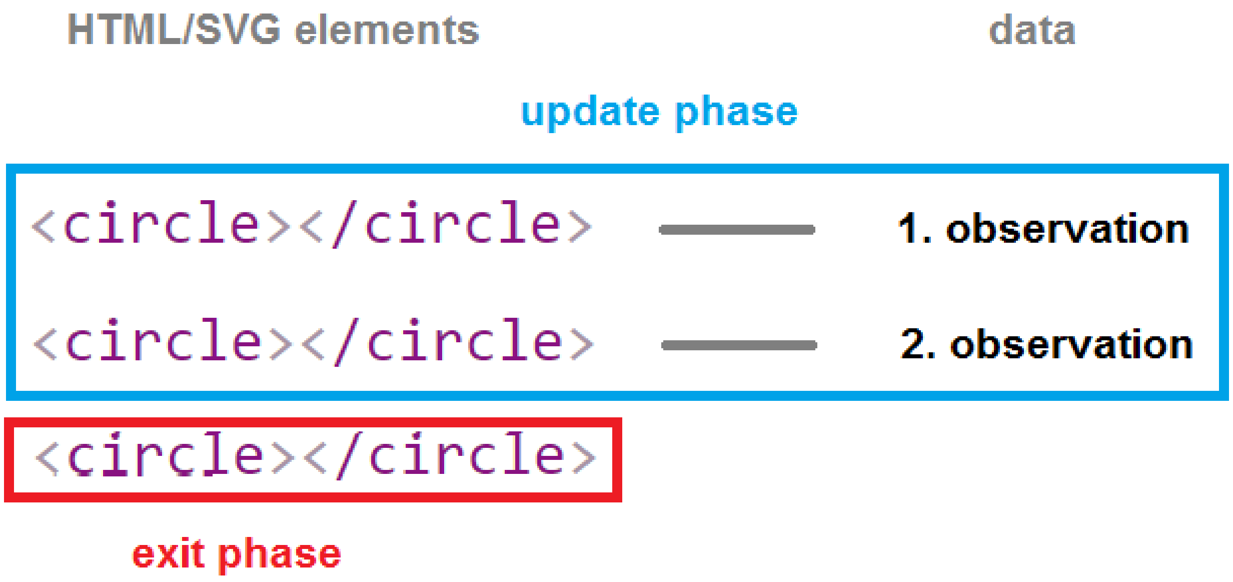
ENTER phase



```
// step: ENTER
tramCircles.enter().append("circle")
.attr("class", function(d){ return "tram_" + d.line + " tramGroup";})
    .attr("r", "10px")
    .attr("cx", function(d){ return scaleLon(d.lon);})
    .attr("cy", function(d){ return scaleLat(d.lat);})
    .attr('stroke',function(d){
        if(d.status == "STOPPED"){ return "orange";}
        else{ return "rgba(255,165,0,0.6)";}
        })
    .attr("stroke-width",  function(d){
        if(d.status == "STOPPED"){ return "1px";}
        else{ return "4px";}
        })
```

EXIT phase

- less observations than elements



HTML/SVG elements

data

update phase

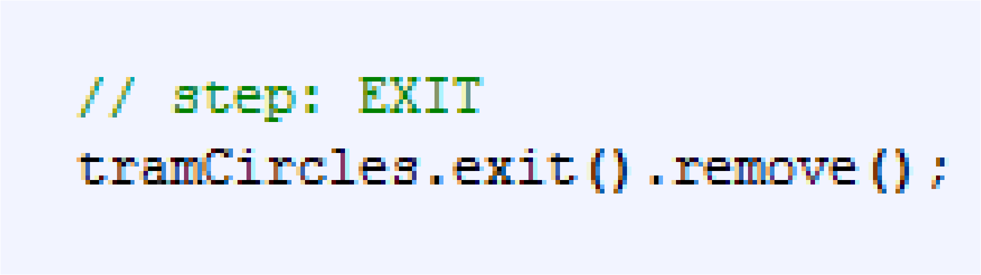
<circle></circle> 1. observation

<circle></circle> 2. observation

<circle></circle>

exit phase

EXIT phase



```
// step: EXIT
tramCircles.exit().remove();
```