Bending geographic maps for enhanced railway **space-time diagrams**

FOSDEM 2024, 3 February 2024

Railways and Open Transport devroom

I develop
dataviz web apps at

OuestWare

and since early 2021
we work for

to contribute to

OSRD

OSRD

Public Money
Public Code

Open Source Railway Designer

github.com/osrd-project

osrd.fr/en

at some point
we've been tasked to
enhance
the **Space-Time Diagrams**

what are

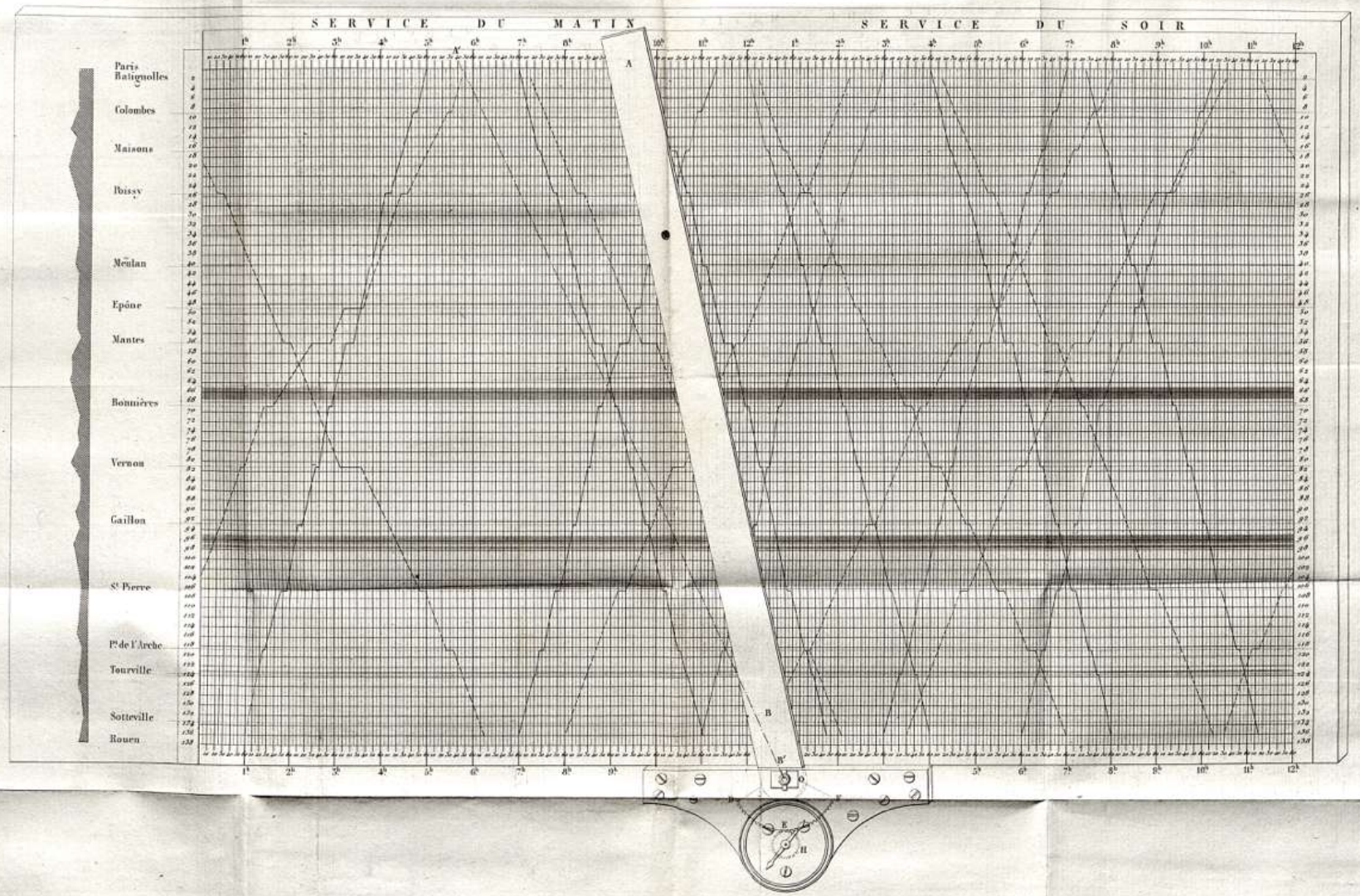
Space-Time Diagrams

...or Circulation Diagrams

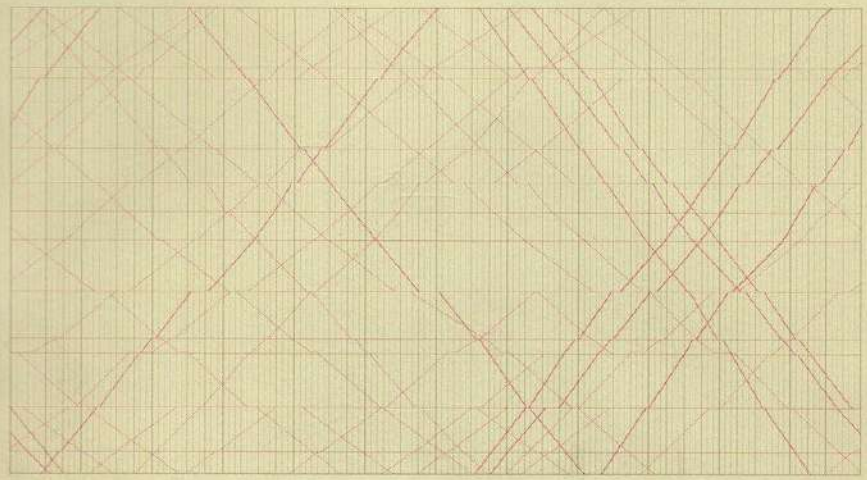
...or Graphical Timetables

...or Train Graphs

CHEMINS DE FER — RÉGULATEUR DE LA MARCHE.



Charles Ibry, 1840s



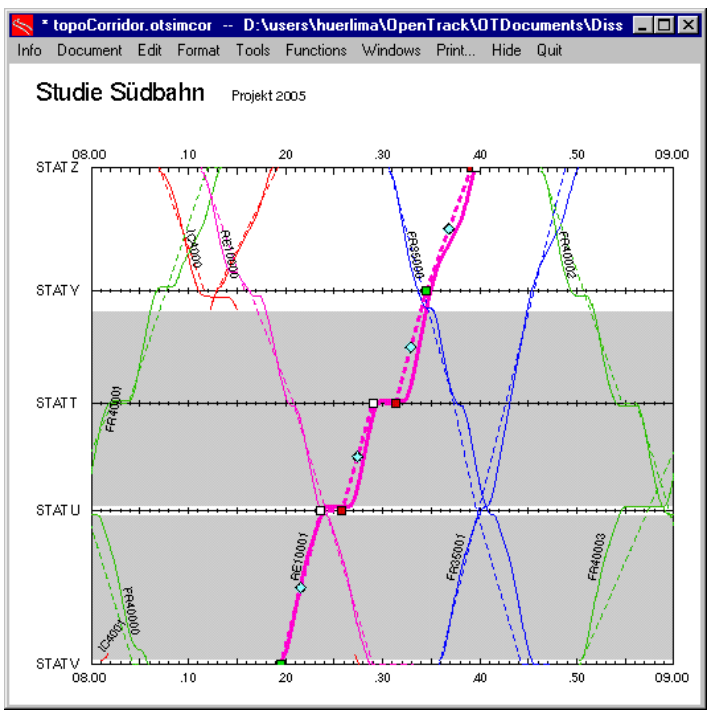
The Visual Display
of Quantitative Information

EDWARD R. TUFTE

a good enough graphic
to be the cover of a

field reference book

OpenTrack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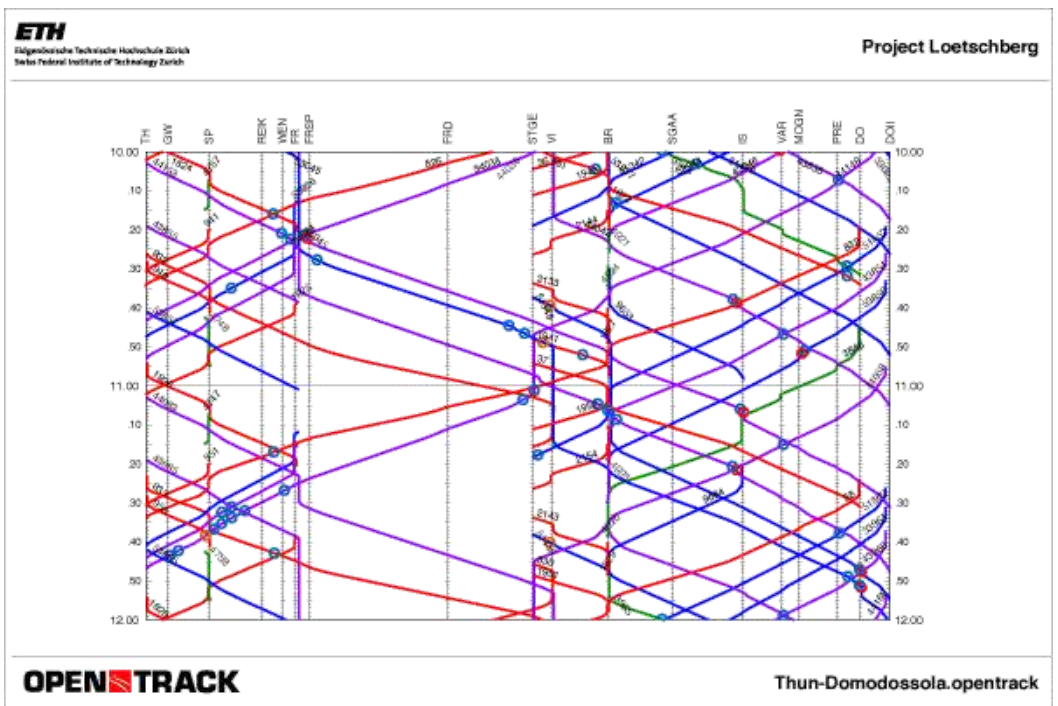
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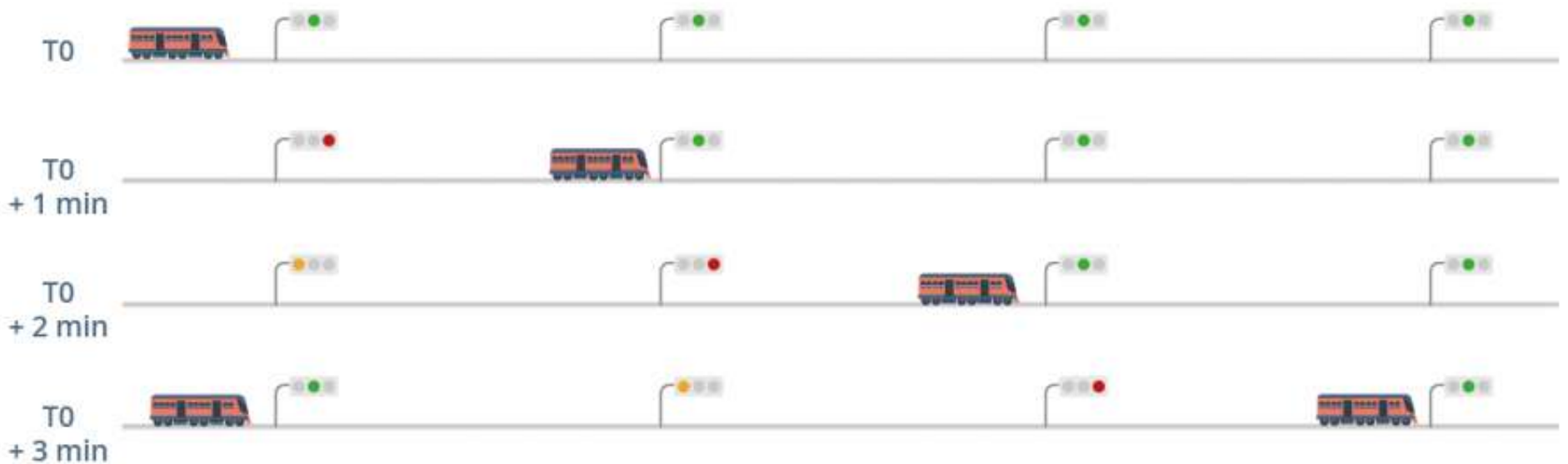
but this chart is actually

even better

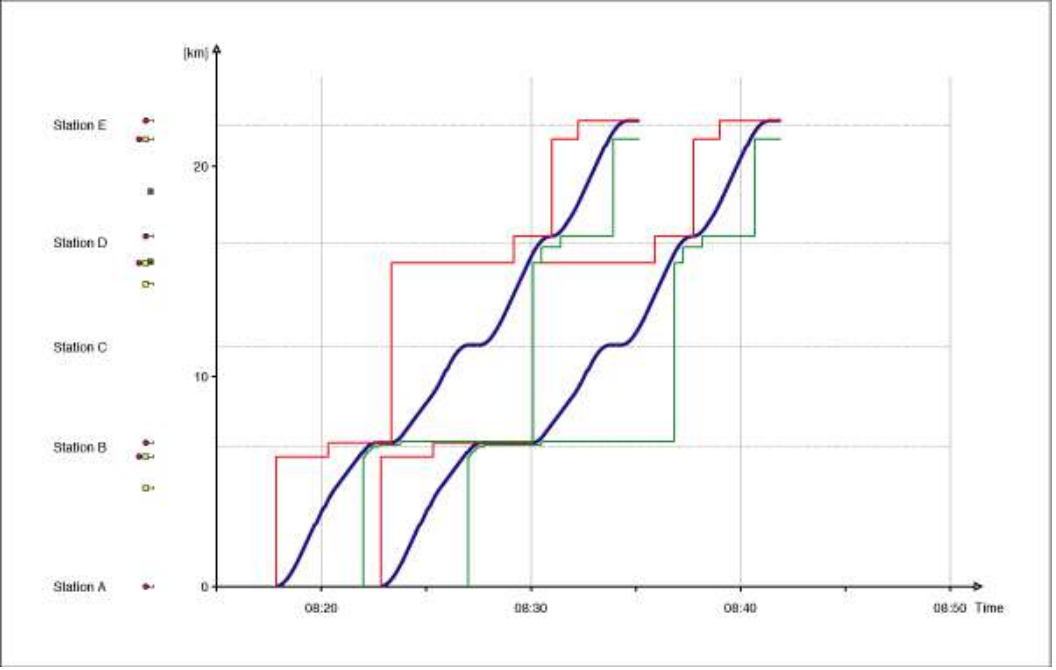
once we introduce

blocks

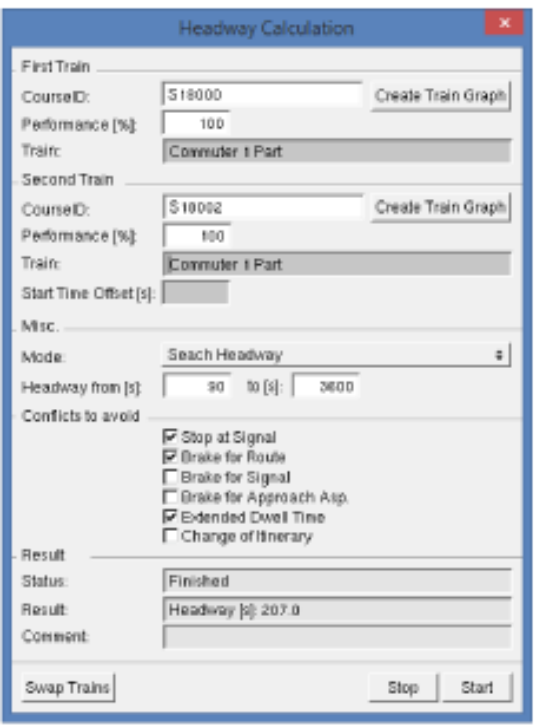
A quick word about **blocks**

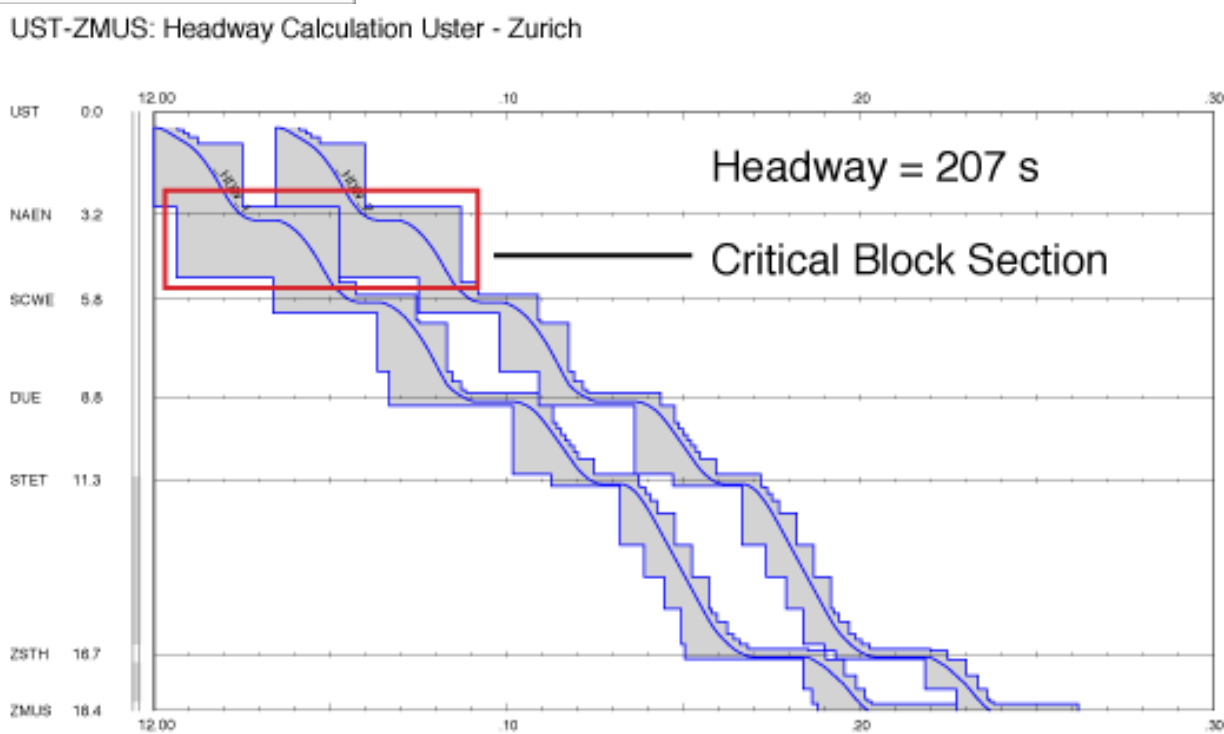


source (fr)

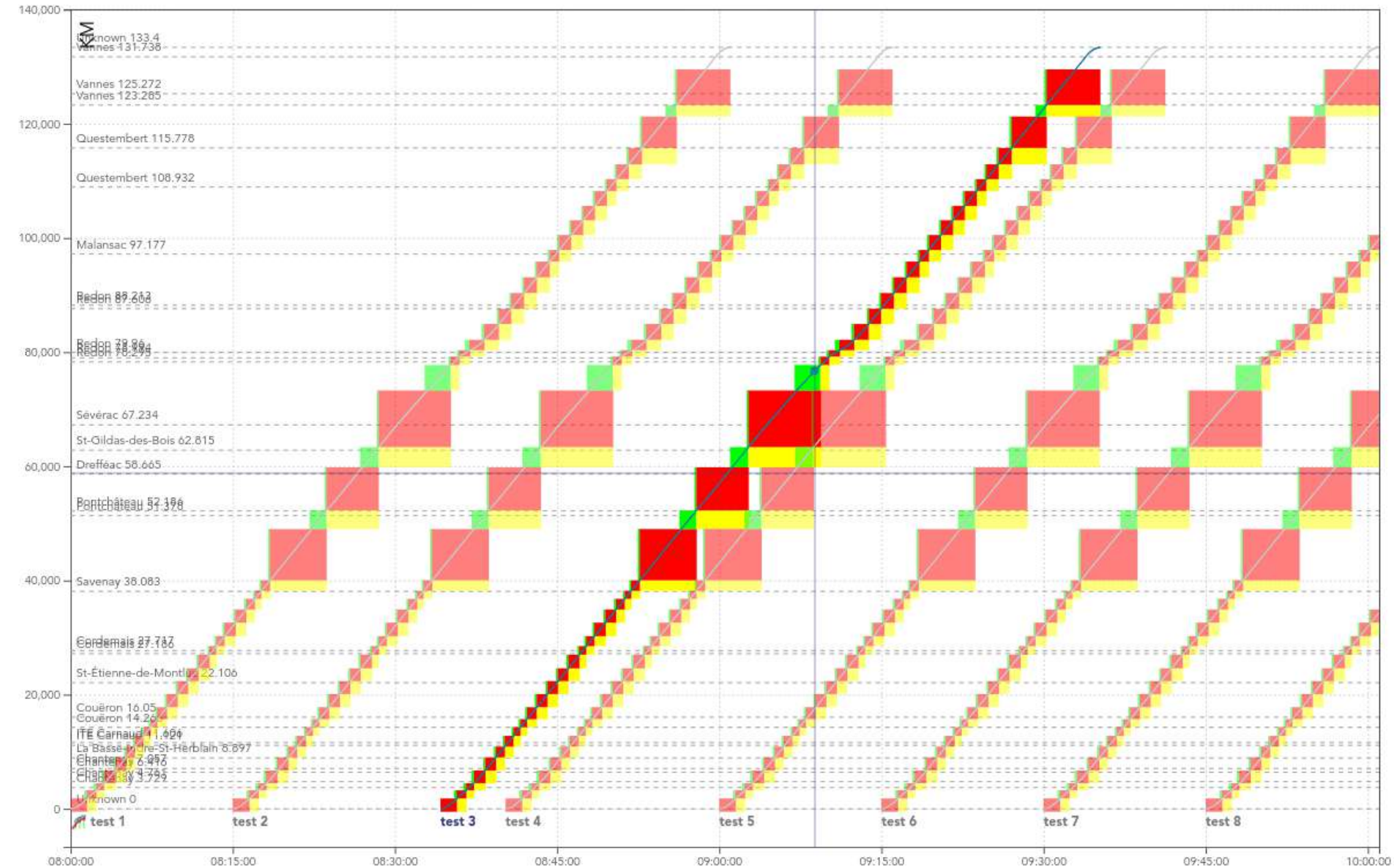


in OpenTrack





in OSRD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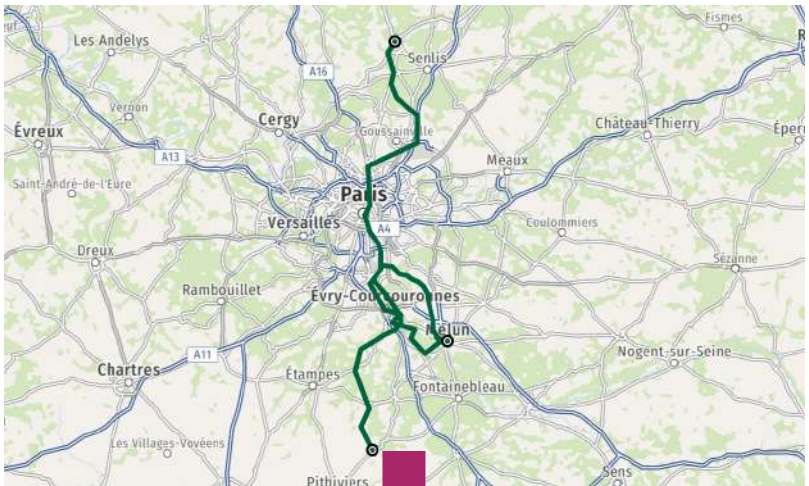
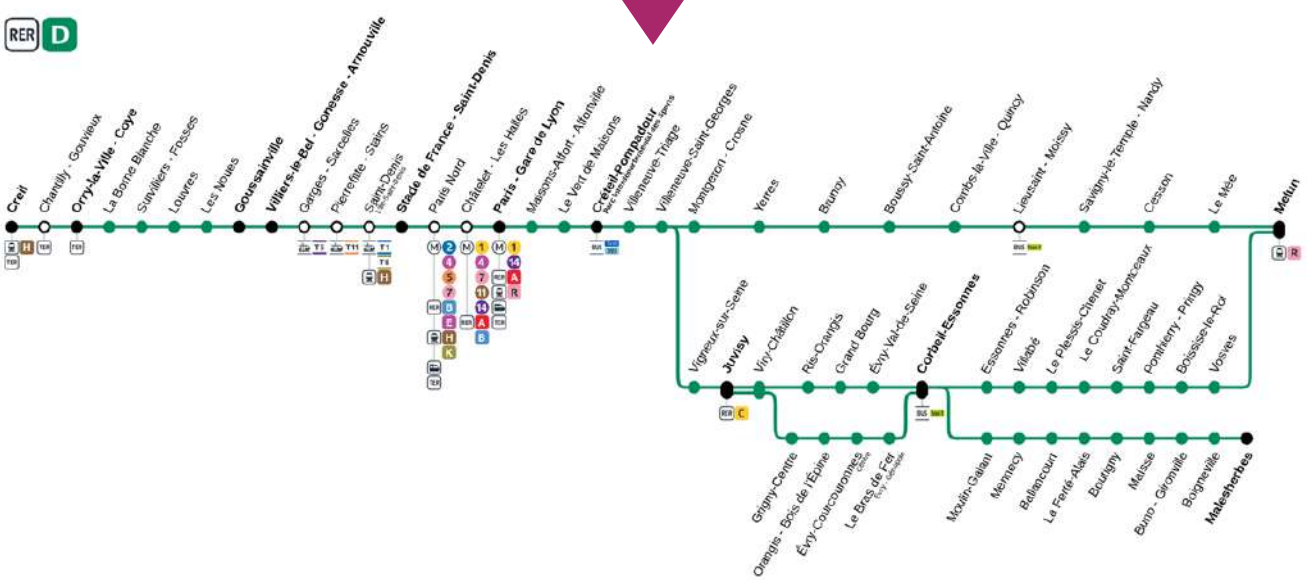
can we make it
even more informative?

a **schematic** strategy

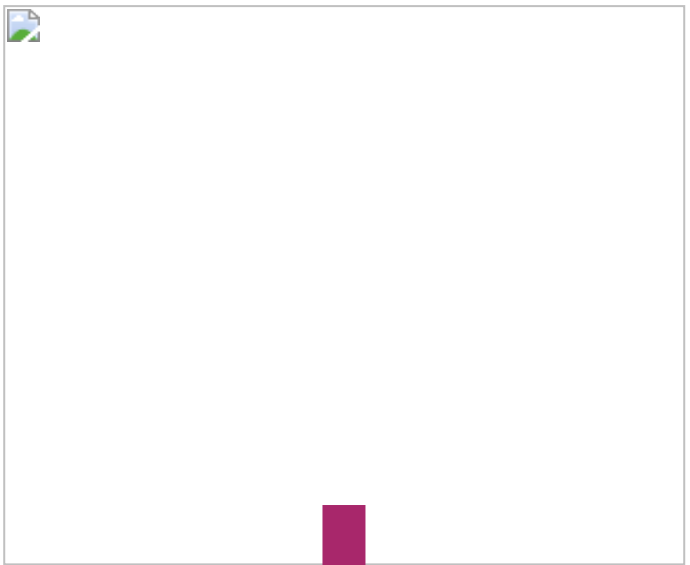




allows rendering **exactly** what we want/need

requires to know the **exact** topology

a **cartographic** strategy



we show everything a map would show

we show everything a map would show

it's called **Strip maps**

source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so...

let's **bend** geographic maps

the strategy is to

generate a **triangles grid**

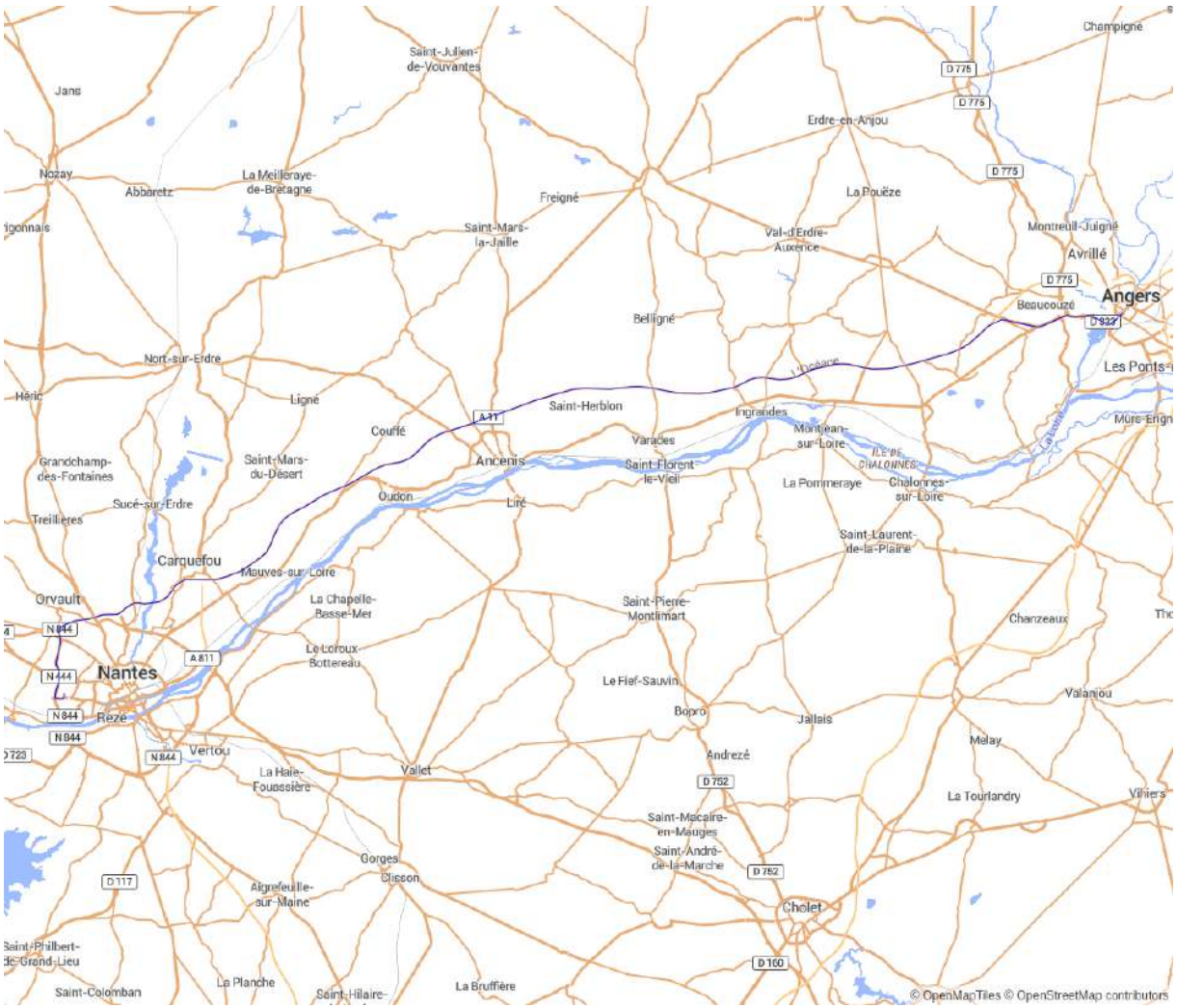
along the path

and another **straight grid**

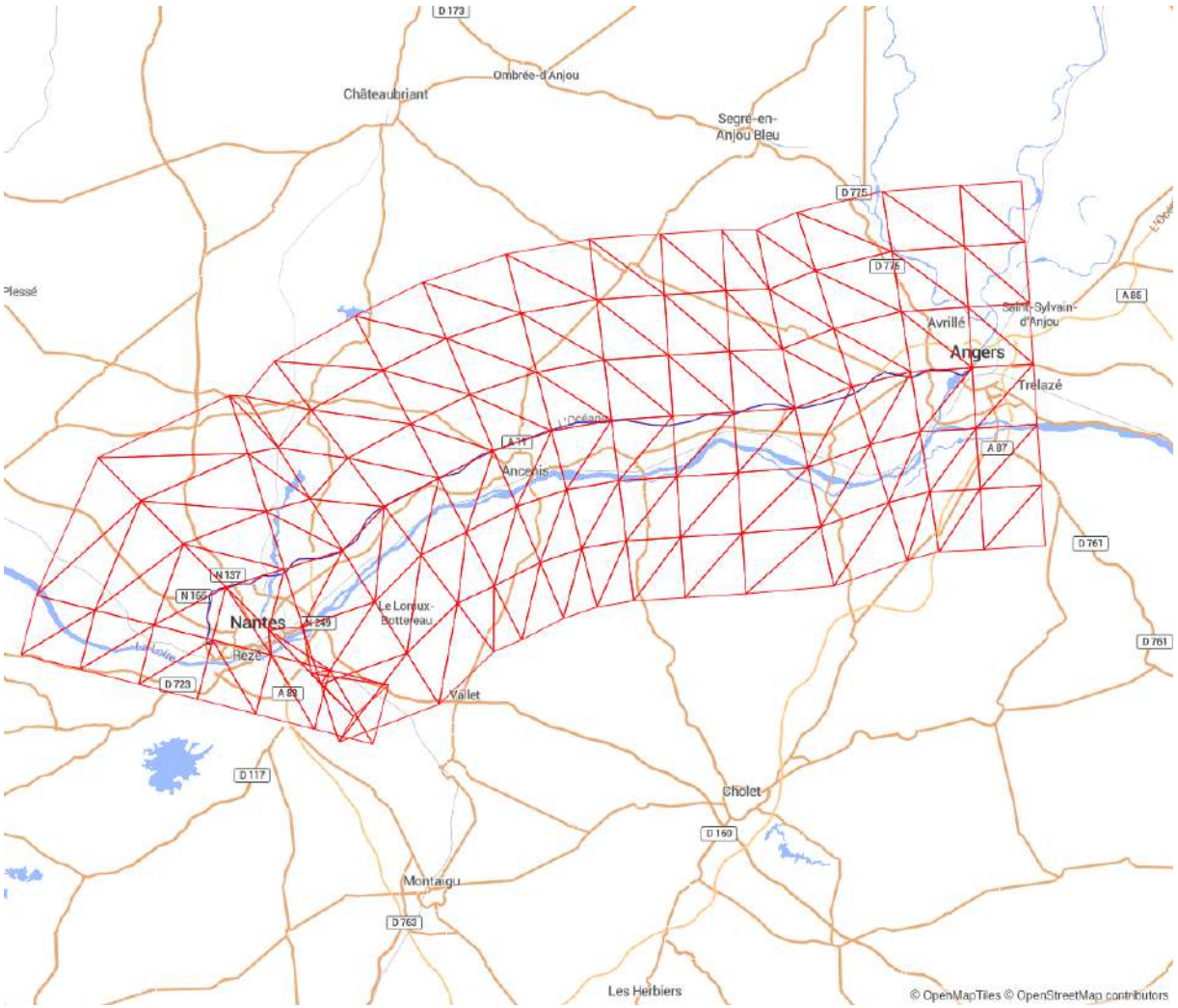
and to translate coordinates

between the grids

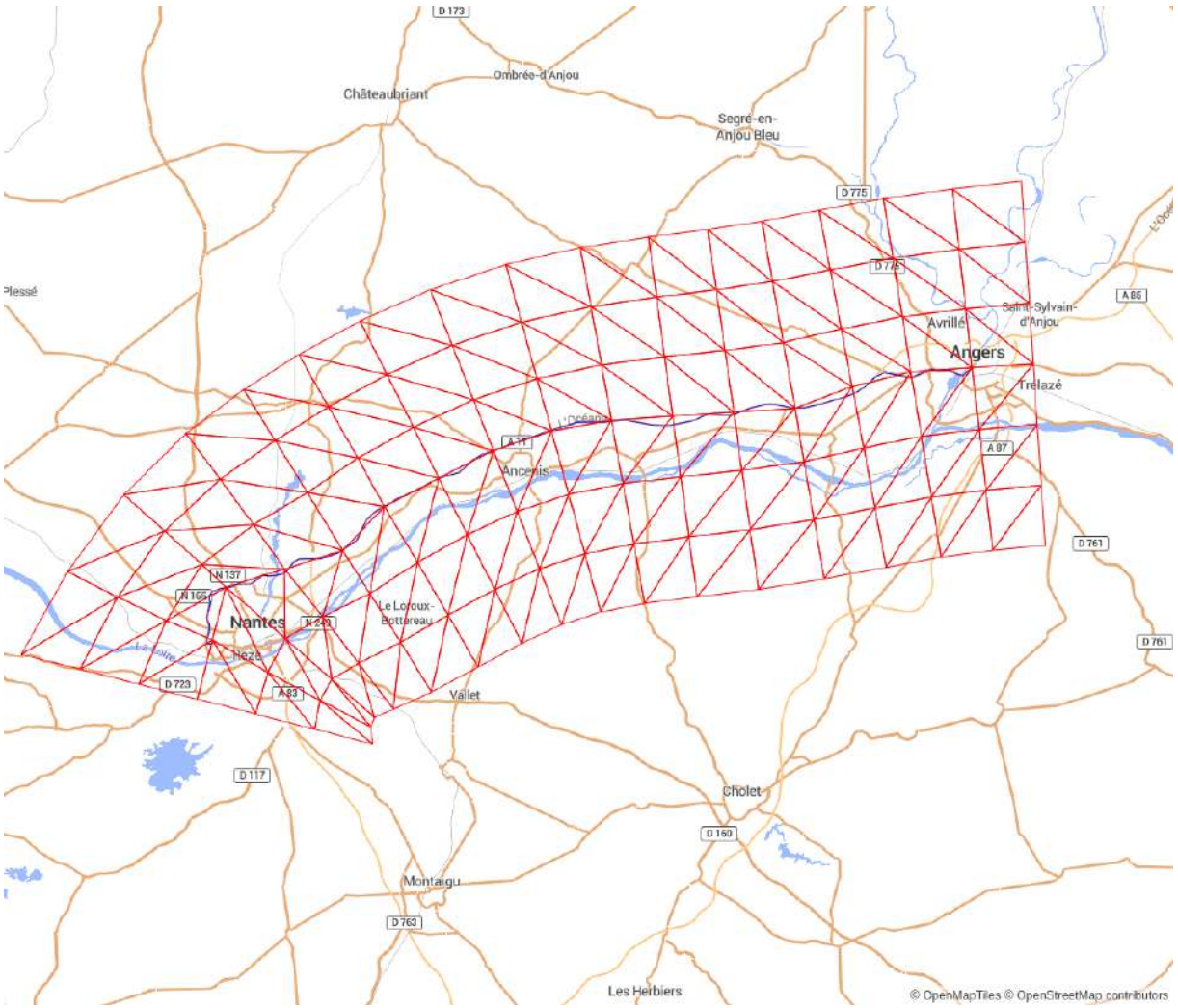
here's our initial path



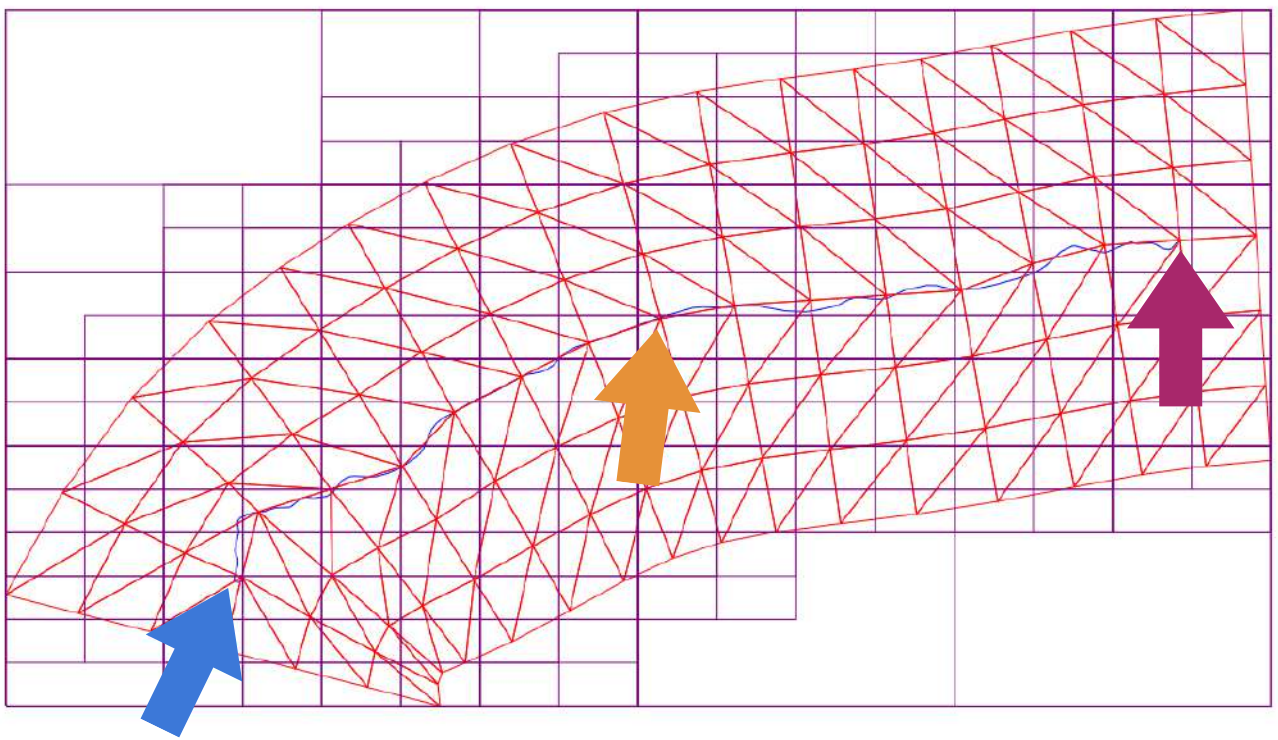
we build a grid along the path

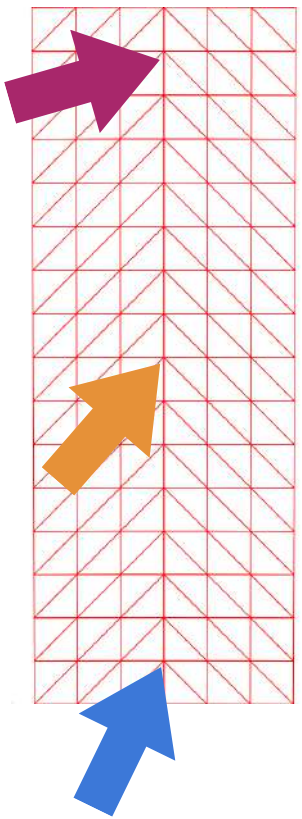


we smoothen the grid



we index the grid, and generate a straight similar grid





we have a **projection** \o/

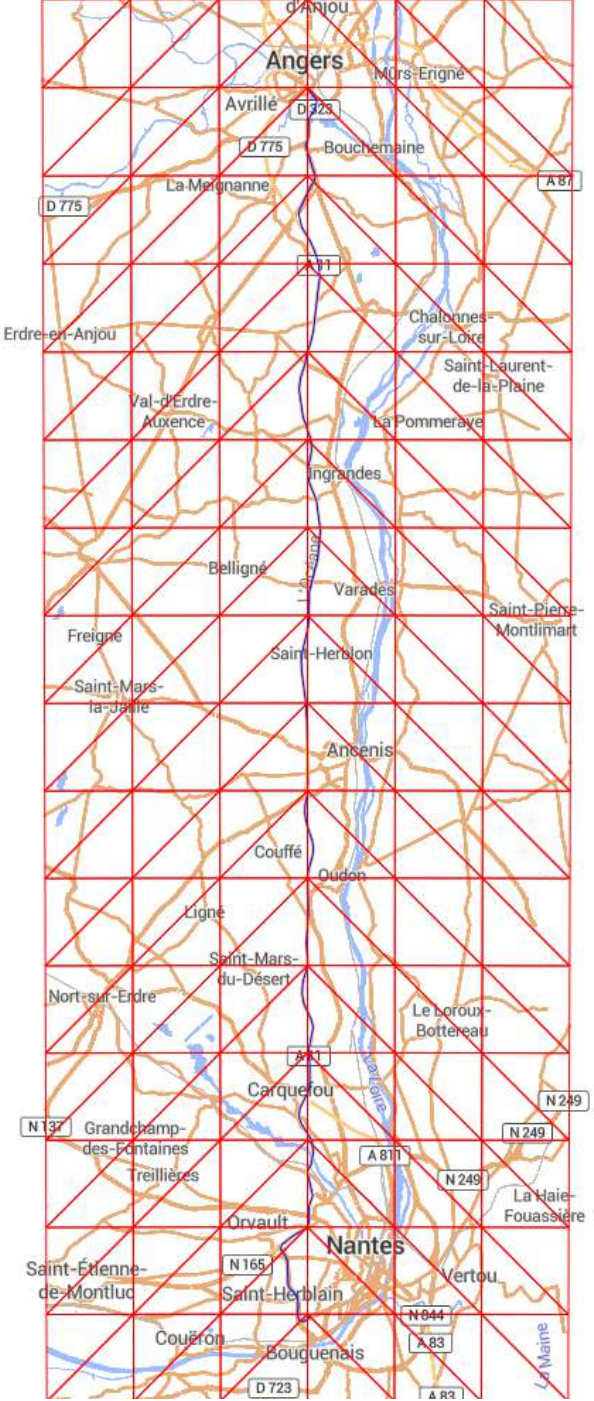
For a given point **P**

1. Find the quad that contains **P**
2. Find the triangle **T** (indexed in the quad) that contains **P**
3. Find the related triangle **T'** in the straight grid
4. Transpose coordinates from **T** to **T'** to obtain **P'**, using barycentric coordinate system

So, to get a map

Using react-map-gl and MapLibre

1. Render a hidden map that contains the full grid (with layers from OSM and OSRD)
2. Wait for every features to be rendered (the map's `"idle"` event)
3. Query all the rendered features (with `map.querySourceFeatures`)
4. Project every features
5. Render a new map with the projected features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Saint-Laurent-de-la-Plaine
Val-d'Erdre-Auxence
La Pommeraye
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Belligné
Varades
Saint-Pierre-Montlimart
Freigné
Saint-Herblon
Saint-Mars-la-Jaille
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Couffé
Oudon
Ligné
Saint-Mars-du-Désert
Nort-sur-Erdre
Le Loroux-Bottereau
Carquefou
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Grandchamp-des-Fontaines
Treillières
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La Haie-Fouassière
Orvault
Nantes
Saint-Étienne-de-Montluc
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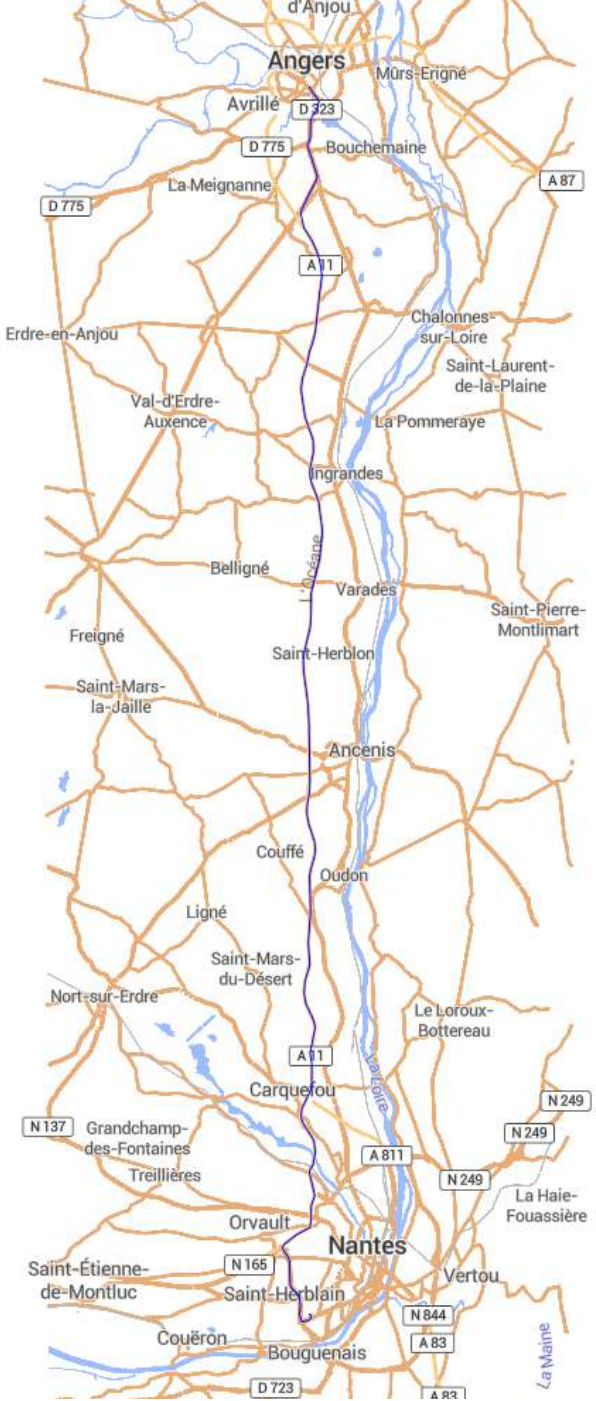
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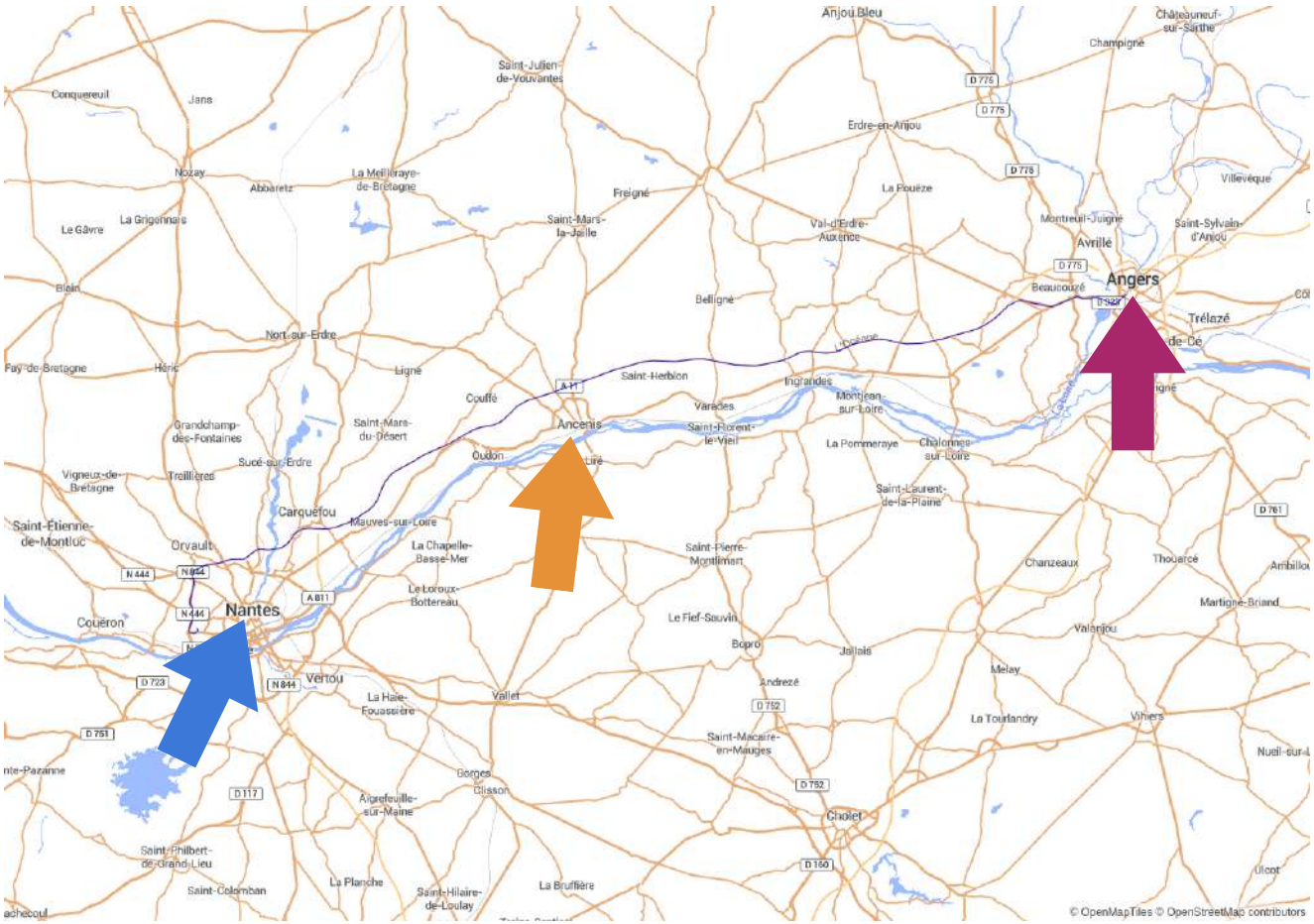
the two maps side by side



how it looks like in OSRD

it works for *almost* any path

it does bring context

we lose zoomable data

it is quite slow atm

(demo time)


thanks!