CUSTOM MAPS WITH TOMTOM'S
# MAP STYLER

Olivia Vahsen

TomTom

Agenda

Day/Time: Wednesday, October 9, 3:00-4:30 pm
Location: Workshop Stage D

Speaker: Olivia Vahsen

Format:

📌 3-3:05 - Arrive

📌3:05-3:30 – Tech Talk

📌3:30-4:15 – Hands-on Demo/Breakout Session

📌4:15 - Closing

📌Questions: Please keep all questions until the breakout session, where I'll be able to interact 1-1!

📌I'll be around to help with all questions during the interactive portion as they come up – hand raising is encouraged.
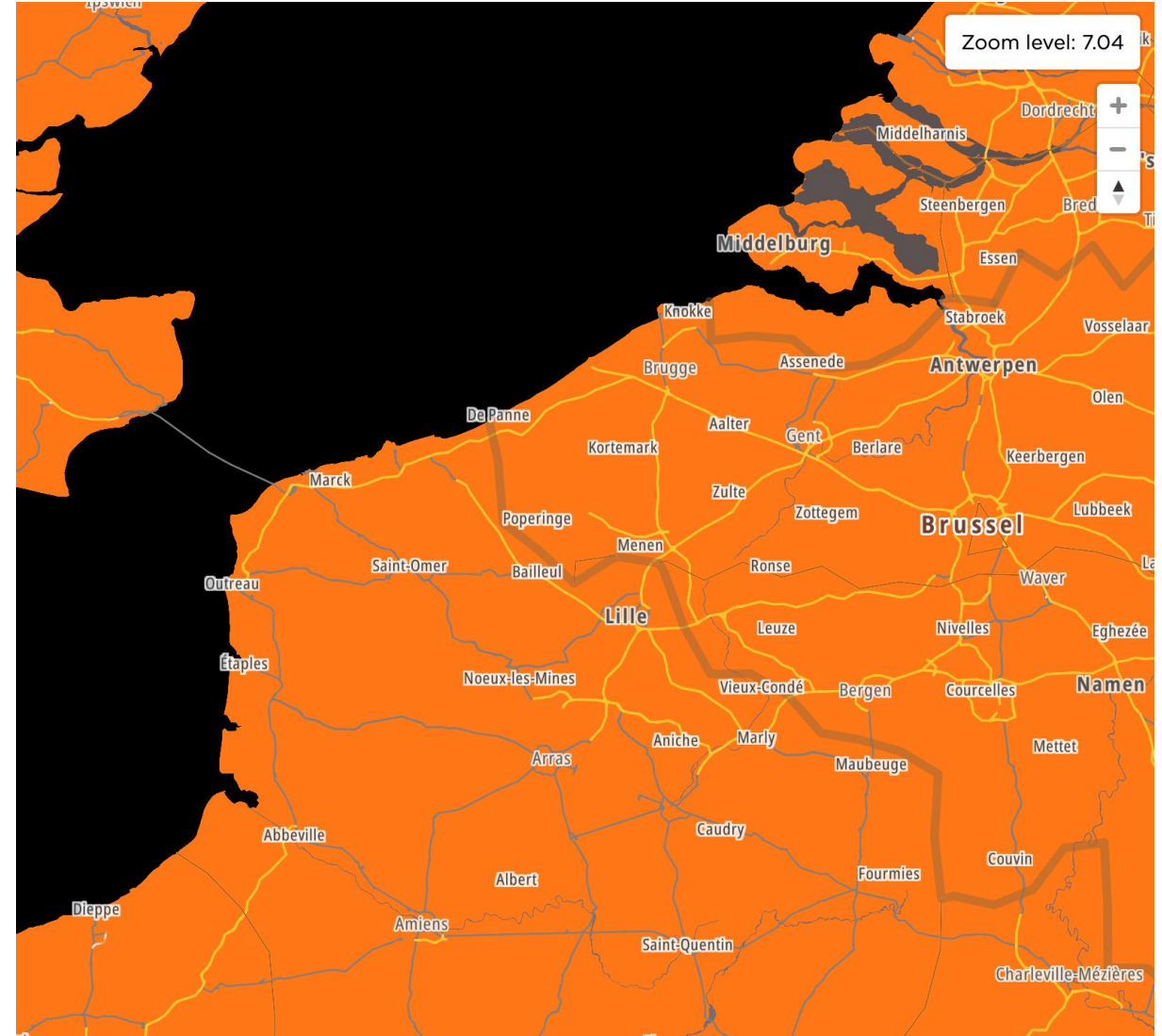
I'm here to show you what you can **build different** with the other location platform.

Olivia Vahsen

Developer Evangelist | @ovahsen

TomTom

2.4 BILLION MODIFICATIONS PER MONTH

Machine data sourcing

Our maps stay fresh through an automated data collection process that draws from government and private sources, aerial imagery, and field analysts.

Satellite imagery

We use AI, machine learning and image processing to extract highly accurate map features from satellite images.
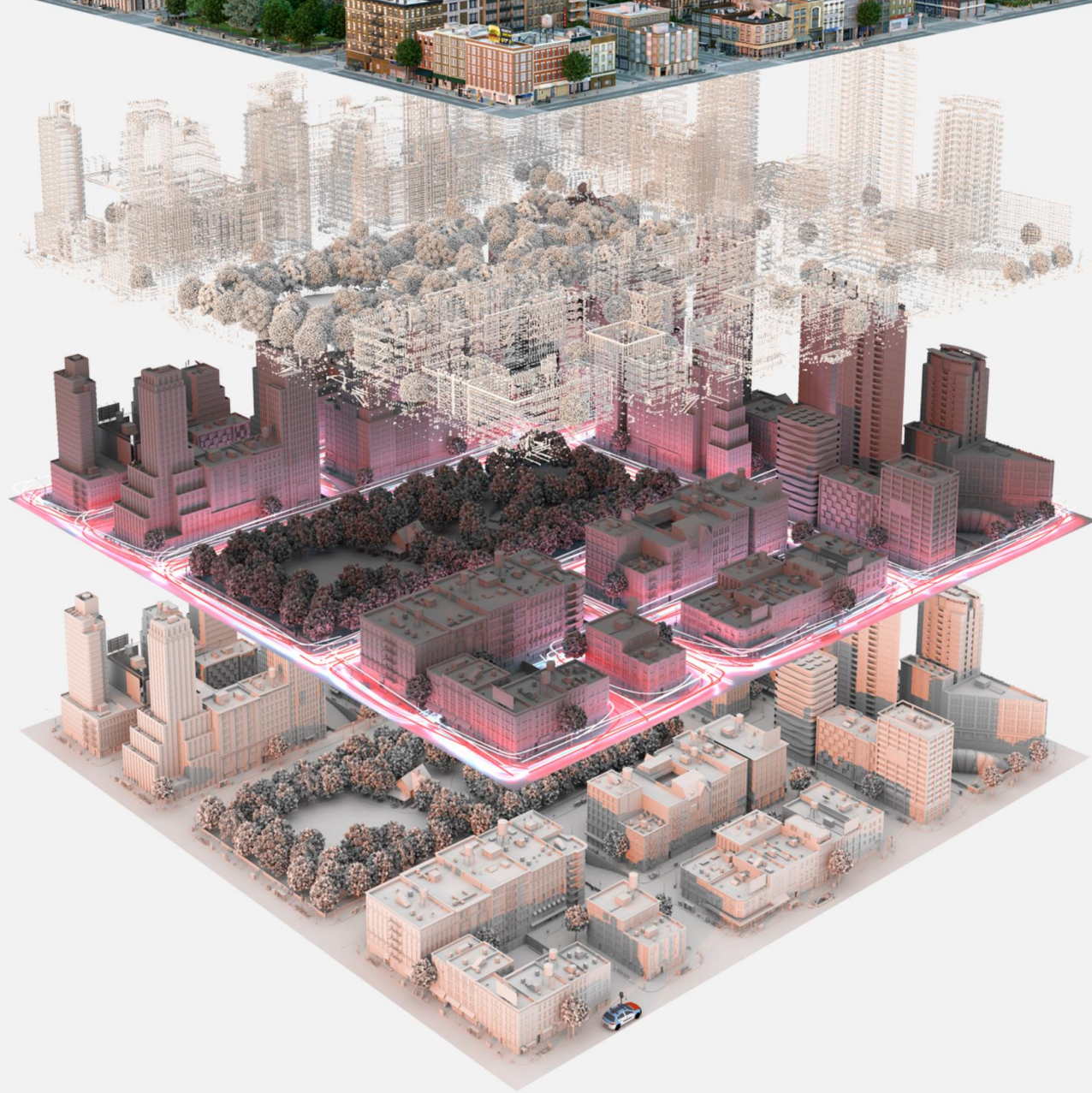
Sensors

We collect 5B+ pixels per kilometer to validate real-world changes and deliver highly accurate positioning.

Probe data

Sensors

We collect 5B+ pixels per kilometer to validate real-world changes and deliver highly accurate positioning.

Probe data

Thanks to more than 600M connected devices on the road, TomTom Maps reflect real-time, real-world conditions with up-to-date road and traffic information.

Mobile mapping imagery

Our vans drive more than 3M kilometers every year to ensure our maps reflect the road and are accurate down to a few centimeters.

We remap Berlin **every 20 minutes**

00:35

TomTom Maps APIs

How does it work?

TomTom Maps and Traffic content

TomTom Maps APIs Cloud platform

APIs & SDKs
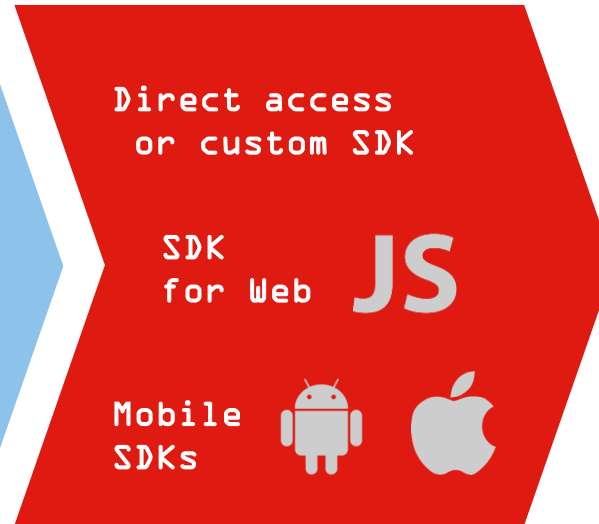
Client application

Direct access or custom SDK

SDK for Web **JS**

Mobile SDKs

TomTom real-time maps and traffic powered by our transactional map making platform

Served by our cloud platform with global availability, 99.9% uptime and low latency

Accessible directly via REST APIs or via one of our convenient Software Development Kit

Adding location to any web or mobile application.

TomTom Maps APIs

Location as a service

MAPS API	TRAFFIC API	SEARCH API	ROUTING API	MAPS SDK	GEOFENCING
• Raster Tiles • Vector Tiles • WMTS & WMS	• Incidents • Flow • Details	• Search • Geocoding • Reverse Geocoding • Batch • Additional data	• Routing • Consumption models • Reachable Range • Batch routing • Matrix routing	• Maps SDK for Android • Maps SDK for IOS • Maps SDK for Web (JS)	• Fence management • Fence reports

Add a map to your app

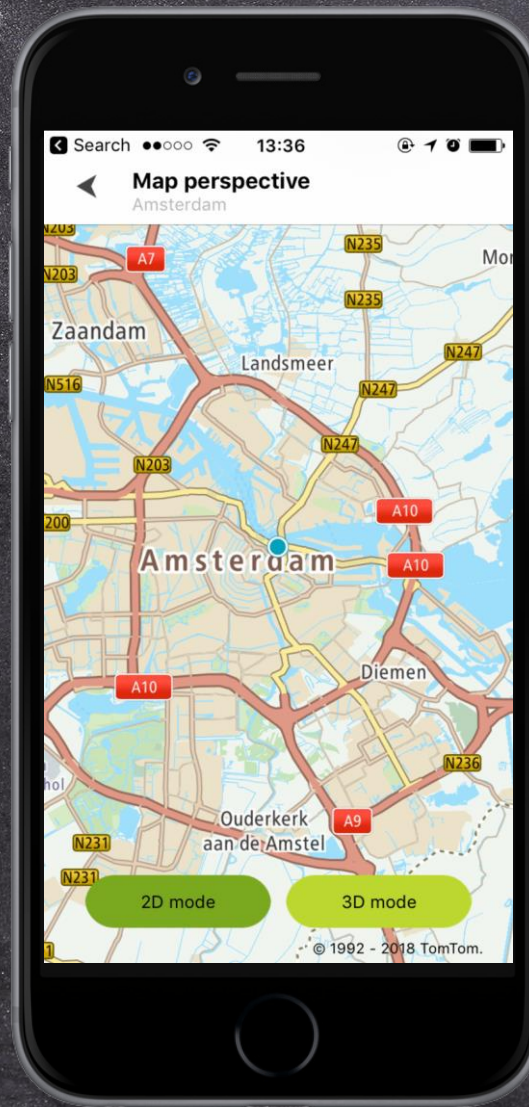## Highly customizable map service for web and mobile apps

Display detailed maps of the world in your application

Visualize your data on the freshest maps

Apply your look and feel to your maps

Add your own layers and markers

No need for hosting or storage on the device

FEATURES

- Pre-rendered raster tiles in .png or .jpg
- Vector tiles with client side rendering
- Customizable layers and style
- 23 zoom levels with 3D mode
- Detailed coverage in 173 countries
- 30 languages supported
- Geopolitical views
- Updated weekly

Vector Tiles

Vector tiles expose TomTom's global digital map content divided into gridded sections. The tiles are provided as map images in vector format.

You can combine them with your own custom style to draw them as you like. Vector tiles are fully customizable on the client side, you can switch on/off single layers or change the style without sending another request.
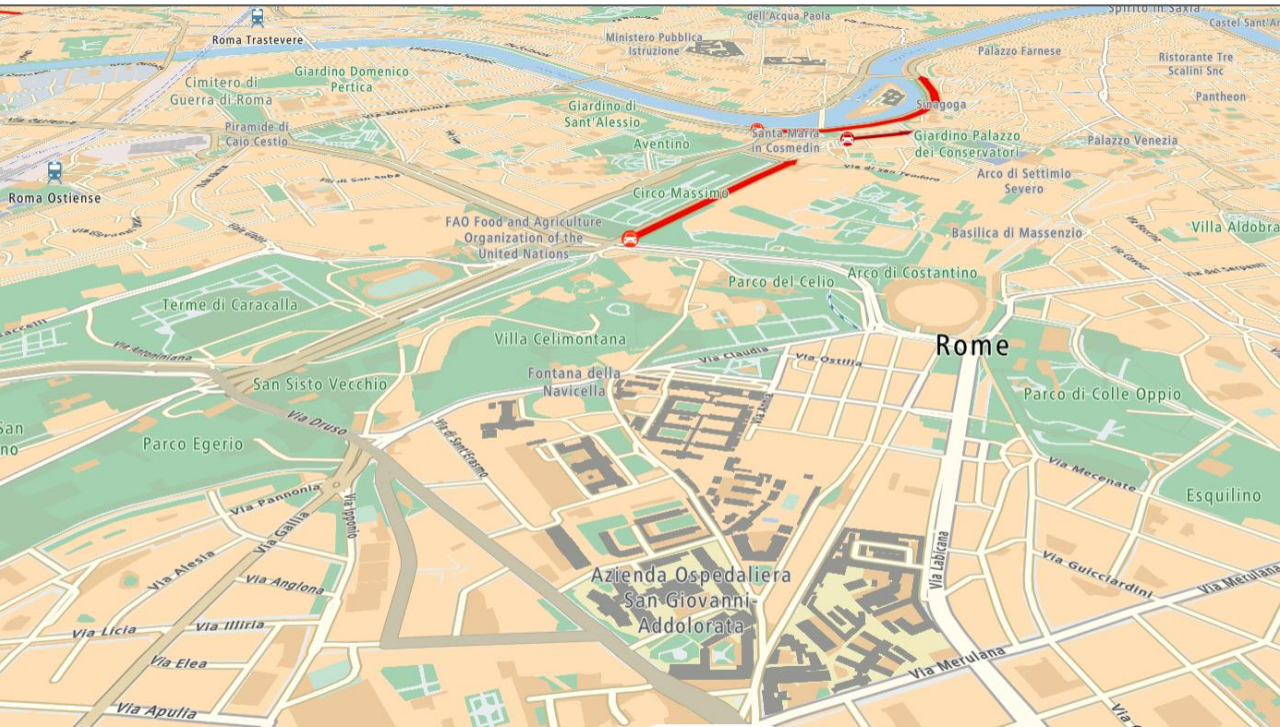
```javascript
// Creating map
var map = tomtom.L.map('map', {
key: '${api.key}',
source: 'vector',
basePath: '/sdk'
});

var marker,
positionElement = document.getElementById('position'),
radiusElement = document.getElementById('radius'),
radiusAmountElement = document.getElementById('radiusAmount');

document.getElementById('tomtom-example-submit').onclick = function() {
tomtom.reverseGeocode().position(positionElement.value).radius(radiusElement.value).
go(function(geoResponse) {
drawMarkerOnMap(geoResponse, positionElement.value, 14);
});
};

// Adds marker
marker = tomtom.L.marker([50.8515, 4.3705]).addTo(map).bindPopup('Click anywhere on
the map to get its address.').openPopup();
```


- Structured using the popular protobuf format

- Client-side rendering

- Custom styling

- 21 zoom levels

- 2D and 3D mode with tilting and rotating labels

- Set map labels language and behavior

Raster Tiles

Raster tiles are the easiest way to add a map to any web, mobile or GIS application. They expose TomTom's global digital map content divided into gridded sections.

The tiles are pre-rendered and delivered in raster graphic formats (png or jpg).

```javascript
// Creating map
tomtom.setProductInfo('MapsWebSDKExamplesSelfhosted', '4.47.2-SNAPSHOT');
var map = tomtom.map('map', {
key: '${api.key}',
source: 'raster',
basePath: '/sdk'
});

var languageLabel = L.DomUtil.create('label');
languageLabel.innerHTML = 'Maps language';
varlanguageSelector=tomtom.languageSelector.getHtmlElement(tomtom.globalLocaleServic
e, 'maps');
languageLabel.appendChild(languageSelector);
tomtom.controlPanel({
position: 'bottomright',
title: 'Settings',
collapsed: true,
closeOnMapClick: false})
.addTo(map)
.addContent(languageLabel);
```
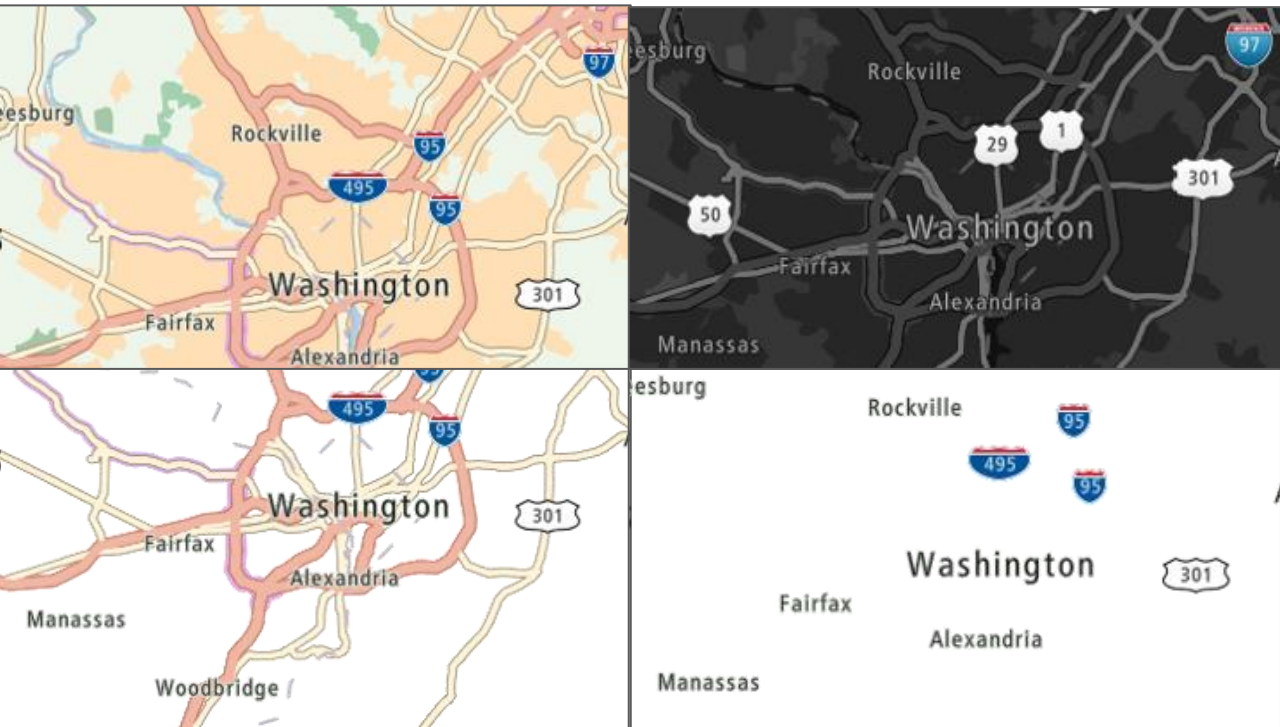
- Tiles rendered at various sizes, with 23 zoom levels

- Low (256 x 256 pixels) and high resolution (512 x 512 pixels) tiles

- Two main styles with basic, hybrid and labels layers

- Compliant ant with WMS 1.1.1 standard for use in GIS applications

- Static image service to generate map images

Traffic API

The pulse of the road

The most detailed real time traffic API on the market

Easily overlay detailed traffic information on a map in your application

Retrieve a list of traffic incidents for a location, monitor traffic congestion as it happens

Retrieve detailed traffic speed information to use in traffic management applications
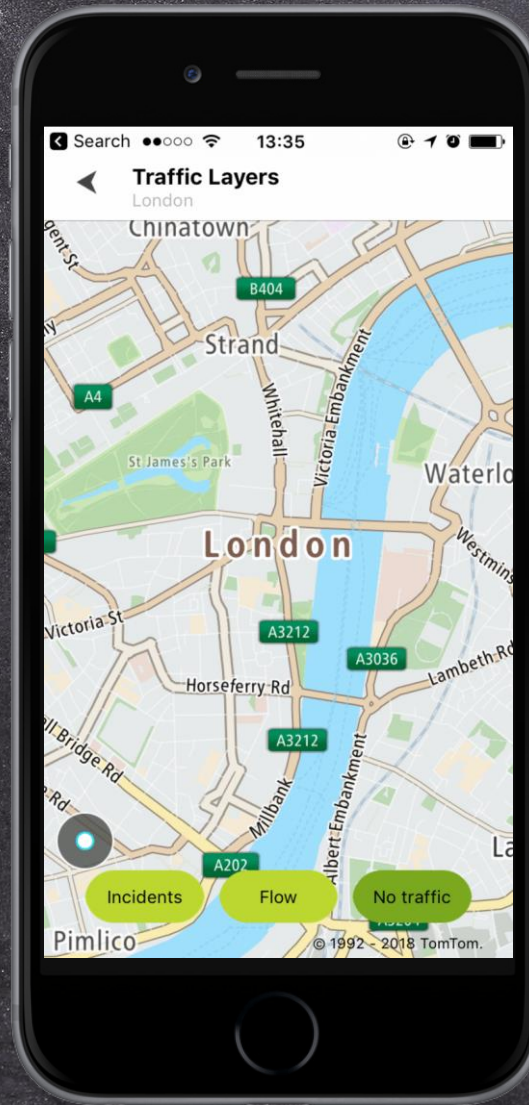
FEATURES

- Award-winning TomTom Traffic™, powered by 550 million devices

- Covering up to 77 countries

- Traffic Incident API with latest traffic incidents, including impact, cause and delay

- Traffic Flow API with detailed traffic speeds per road segment on the whole network

- Delivered as transparent tiles to overlay on a map

- Detailed data delivered as XSD file

Traffic Incidents

The TomTom Traffic Incidents API offers a view on the most significant incidents impacting traffic in an area.

The incidents can be delivered as tiles to visualize on a map and can be customized to fit any style.

The list of incidents with its full details can also be retrieved, enabling easy integration into traffic monitoring dashboards.
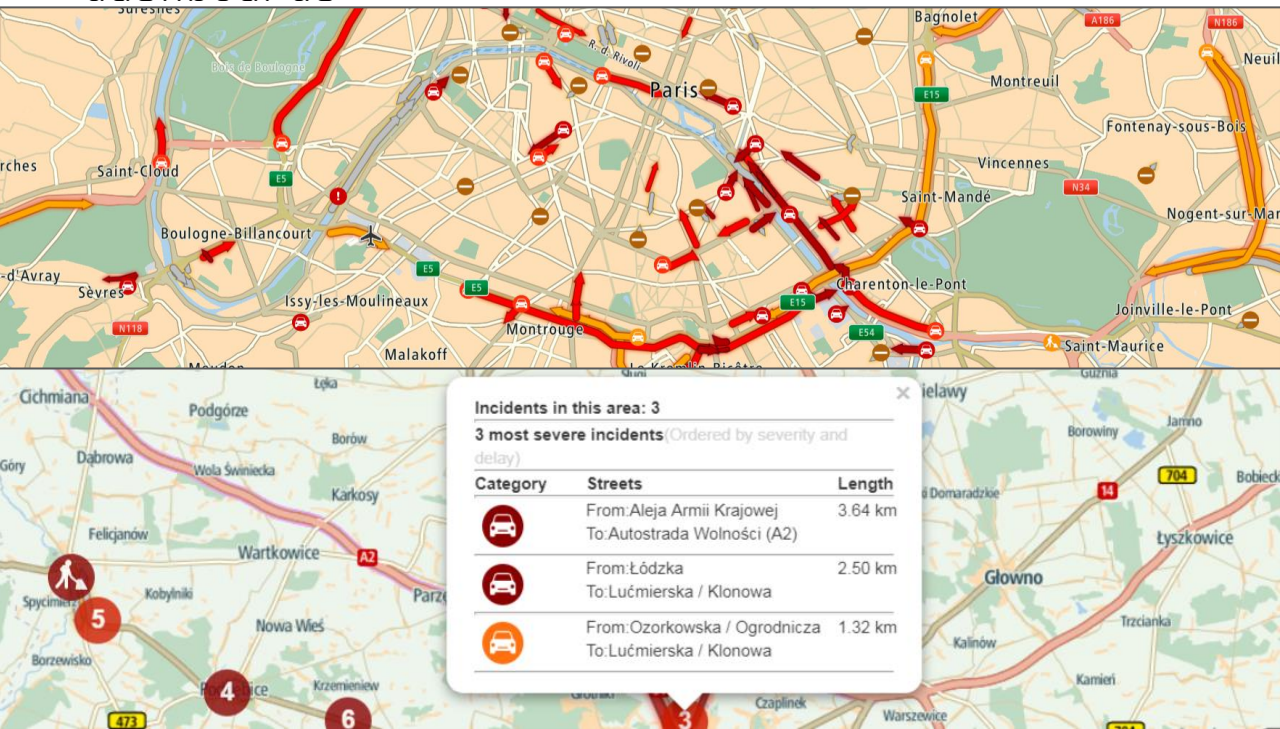
```
// Response body:
…{
"id": "europe_HD_NL_TTR116109461260864",
"p": {
    "x": 4.891665455854138,
    "y": 52.340088766914654
},
"op": {
    "x": 4.892598628997803,
    "y": 52.34188842773436
},
"ic": 8,
"ty": 4,
"cs": 0,
"d": "closed",
"f": "Europaplein - s109 (Rooseveltlaan/v109-111)",
"t": "Victorieplein - Vrijheidslaan (Rooseveltlaan/v109-111)",
"l": 615,
"r": "v109-111"
}, …
```

- Updated every 2 minutes in 77 countries

- Various types of incidents supported: traffic jams, accidents, roadworks, road closures

- The incidents include: incident type, severity, delays, location, length

- Transparent 256x256 tiles to overlay on a map

- Vector and raster format

- Possibility to customize vector tiles styles

- Incident details for a bounding box in XML

Traffic Flow

The TomTom Traffic Flow API offers real-time speed data for all the road segments in an area, updated every minute.

The speed data can be delivered as tiles to visualize on a map and can be customized to fit any style.

Detailed speed information can also be retrieved on a road segment to perform more advanced functions.
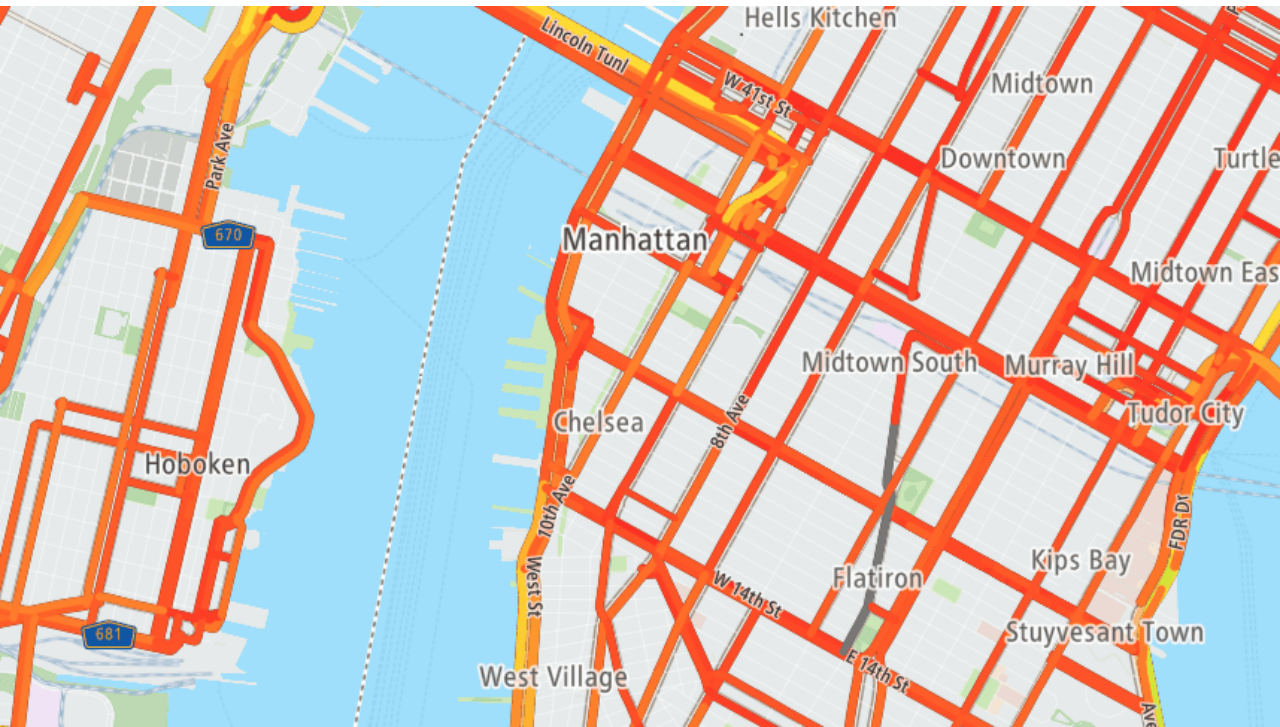
```
// Response body:
…,{
"flowSegmentData": {
"frc": "FRC3",
"currentSpeed": 71,
"freeFlowSpeed": 78,
"currentTravelTime": 29,
"freeFlowTravelTime": 32,
"confidence": 0.98,
"coordinates": {
    "coordinate": [
    {
    "latitude": 52.40393755626216,
    "longitude": 4.843389500128893
    },
    {
    "latitude": 52.40402070529196,
    "longitude": 4.843205768811345
    },…
```

- Updated every minute in 77 countries

- Absolute speed, speed relative to free-flow conditions

- The flow includes: current speed, free-flow speed, travel times, confidence, coordinates and road class

- Transparent 256*x256 tiles to overlay on a map

- Vector or raster format

- Possibility to customize vector tiles styles

- Detailed data for a road segment in XML and JSON

Search API
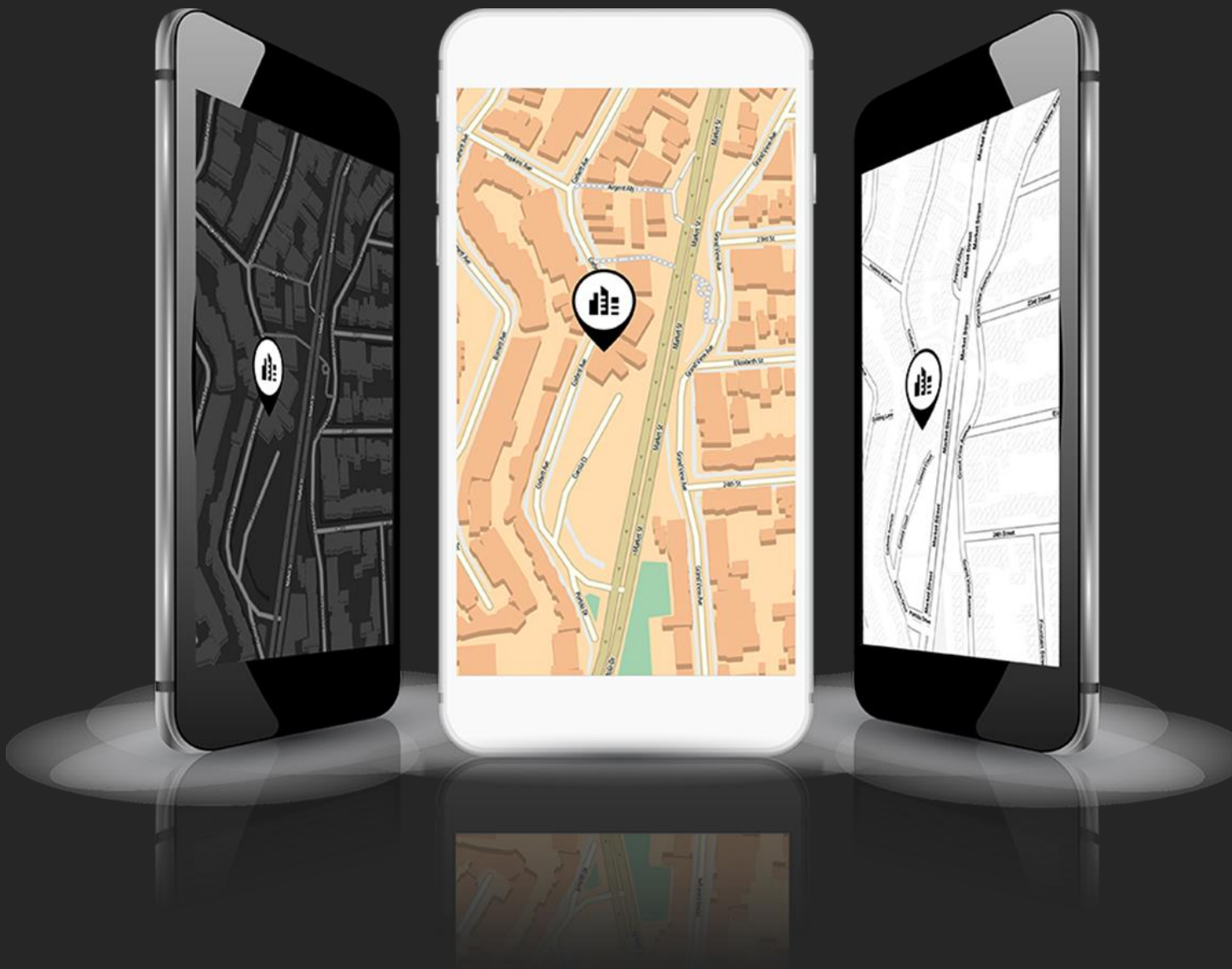
We know the where

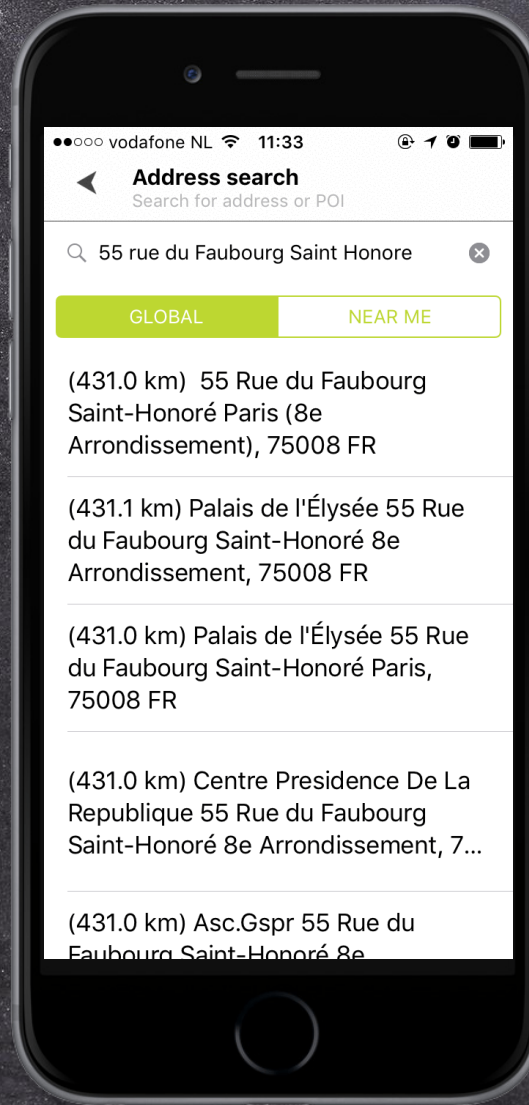## Global search engine for places and addresses

Offer the best search experience with predictive typing and error tolerance

Search for petrol stations along a calculated route

Validate and format addresses in batches

Track the location of assets using reverse geocoding

Retrieve detailed contextual data for a location including speed limits


FEATURES

- Powered by TomTom's extensive address and point of interest data

- Street level coverage in 164 countries, house numbers in 79.

- 37 languages supported

- High accuracy forward and reverse geocoding

- Autocomplete and typo tolerance

- Search for addresses, POIs, cross-streets

- Extensive search parameters and filters

- Batch geocoding for up to 10 000 addresses at once

- Retrieve shapes of geographical features

Geometry Search

The nearest coffee shop?

With geometry search, a developer can limit the search to one or several specific geometries, to make sure the results are the most relevant to the user. As an example, the search results can be limited to a radius or box around the user.
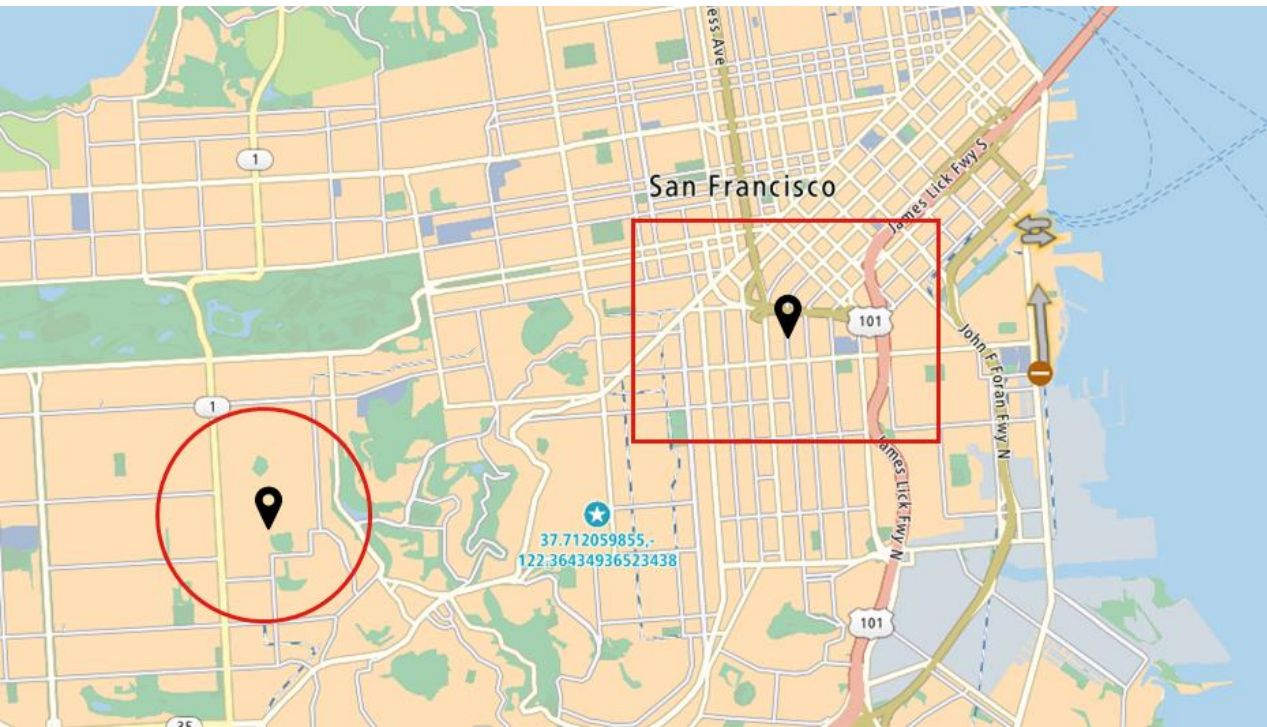
```
// Response body:
…"summary": {
    "query": "coffee",
    "queryType": "NON_NEAR",
    "queryTime": 333,
    "numResults": 99,
    "offset": 0,
    "totalResults": 114,
    "fuzzyLevel": 1
},
"results": [
{
"type": "POI",
"id": "US/POI/p1/433317",
"score": 2.145,
"info": "search:ta:840069006643625-US",
"poi": {
"name": "Chef Lis Cafe",
"phone": "+(1)-(415)-3494364",
"categories": [
"café",
"café/pub …
```

- Search for places within a specific area

- User defined shapes: circles, polygons

- Set the maximum number of results

- Get results with places meeting the criteria

Search Along Route

Coffee break during that long drive?

The Search Along Route endpoint allows developers to perform a free form search for places along a specified route.

Developers can specify the maximum detour time to filter out places that add too much to the journey time.
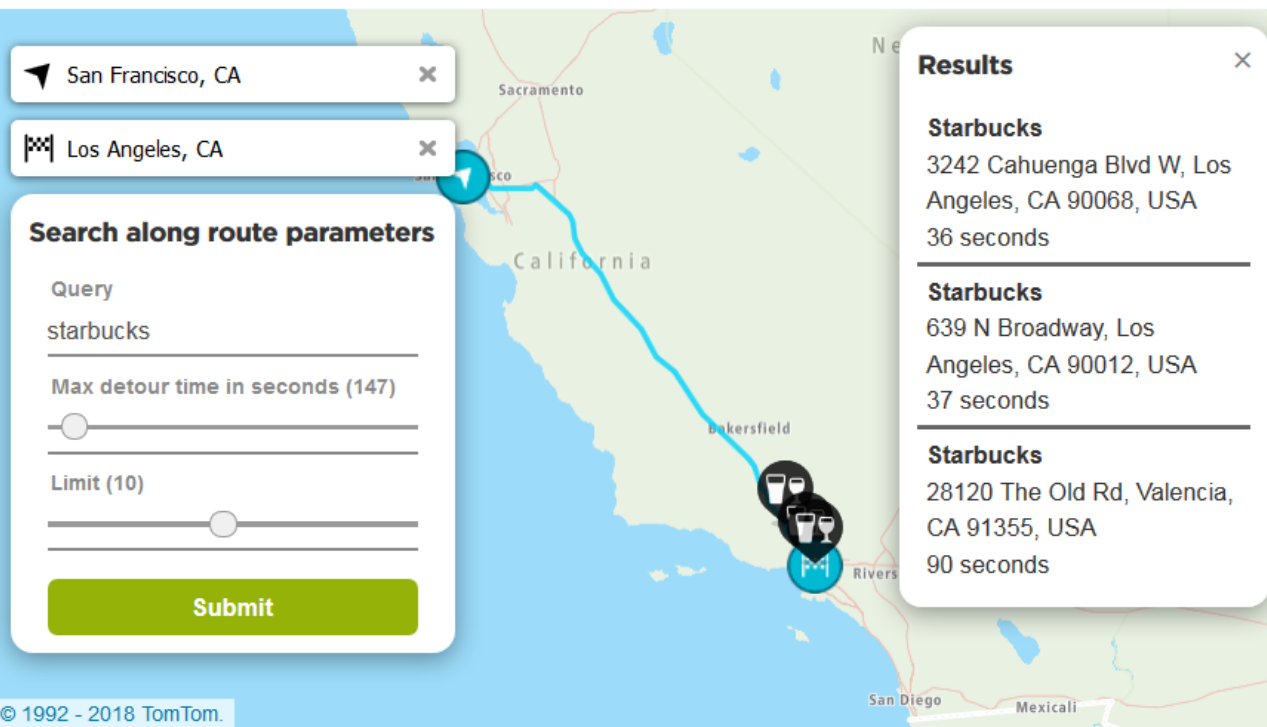
```javascript
AlongRouteFinder.prototype._hideLoader = function() {
    this._loader.style.display = 'none';
};

AlongRouteFinder.prototype._createRangeInput = function(min, max, currentValue) {
    var rangeInput = tomtom.L.DomUtil.create('input');
    rangeInput.setAttribute('type', 'range');
    rangeInput.setAttribute('min', min);
    rangeInput.setAttribute('max', max);
    rangeInput.setAttribute('value', currentValue);

    return rangeInput;
};

AlongRouteFinder.prototype._createFormInputFields = function() {
    var mainContainer = tomtom.L.DomUtil.create('div', this._classes.sidepanel);
    var resultsLabelContainer = tomtom.L.DomUtil.create('div');
    this._queryInput = tomtom.L.DomUtil.create('input');
    this._queryInput.setAttribute('required', 'true');
    this._queryInput.setAttribute('type', 'text');
    this._queryInput.addEventListener('keypress', function(event) {
```

- Search places a along a specified route

- Set the maximum detour time allowed

- Set the maximum number of results

- Get results with places meeting the criteria, along with extra travel time

Search in Batches

Thousands of address records that need geocoding?

For large queries, the Search API offers a batch functionality that can handle thousands of requests in a synchronous or asynchronous manner.
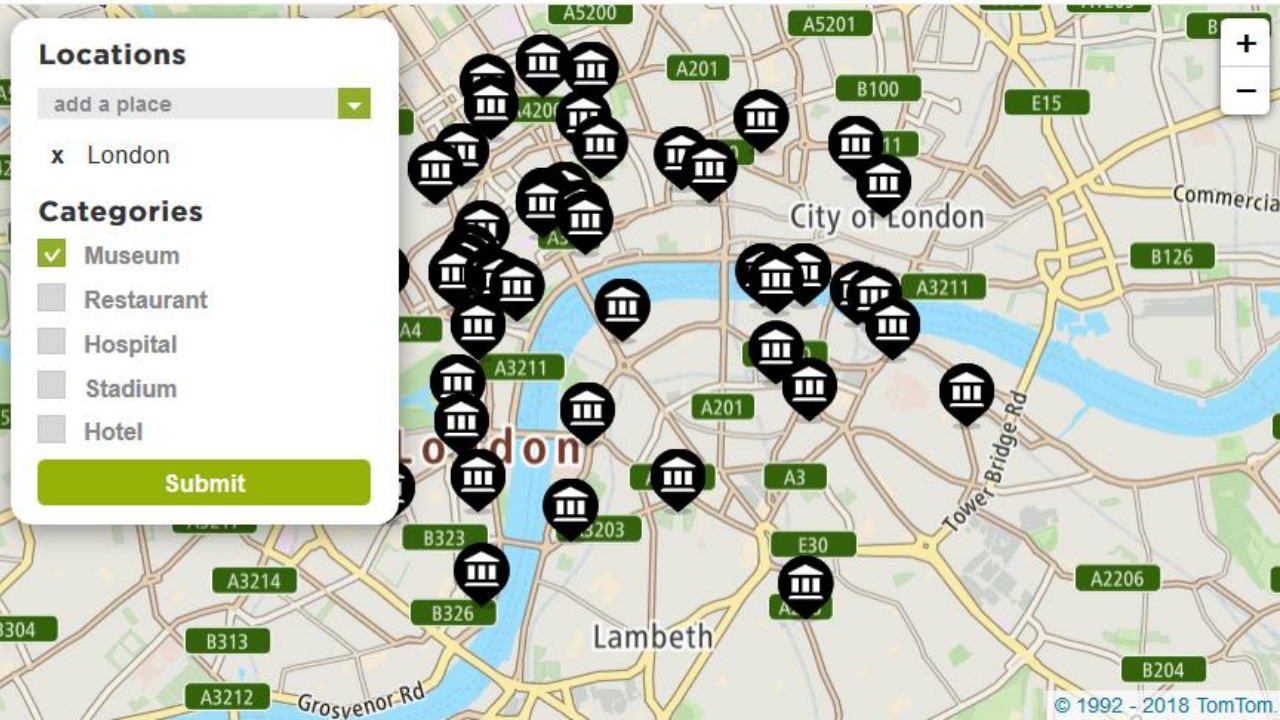
```javascript
var parameters = getParameters(this);
var currentRequest = ++requestCount;
loader.classList.remove('hidden');
tomtom.categorySearch(parameters).go()
    .then(function(results) {
        if (currentRequest !== requestCount) {
            return;
        }
        loader.classList.add('hidden');
        var points = results;
        if (results.length && results[0].length) {
            points = results.reduce(function(acc, curr) {
                return acc.concat(curr);
            }, []);
        }
        markersLayer
        .clearLayers()
        .setMarkersData(points)
        .on('click', function(marker) {
            var mapSize = map.getSize();
            var offset = {
                x: mapSize.x * (2 / 3) - (mapSize.x / 2),
```

- Post a request and download the results when ready

- Synchronous mode for light requests

- Asynchronous for complex queries

- Up to 10 000 records in one query

Routing API
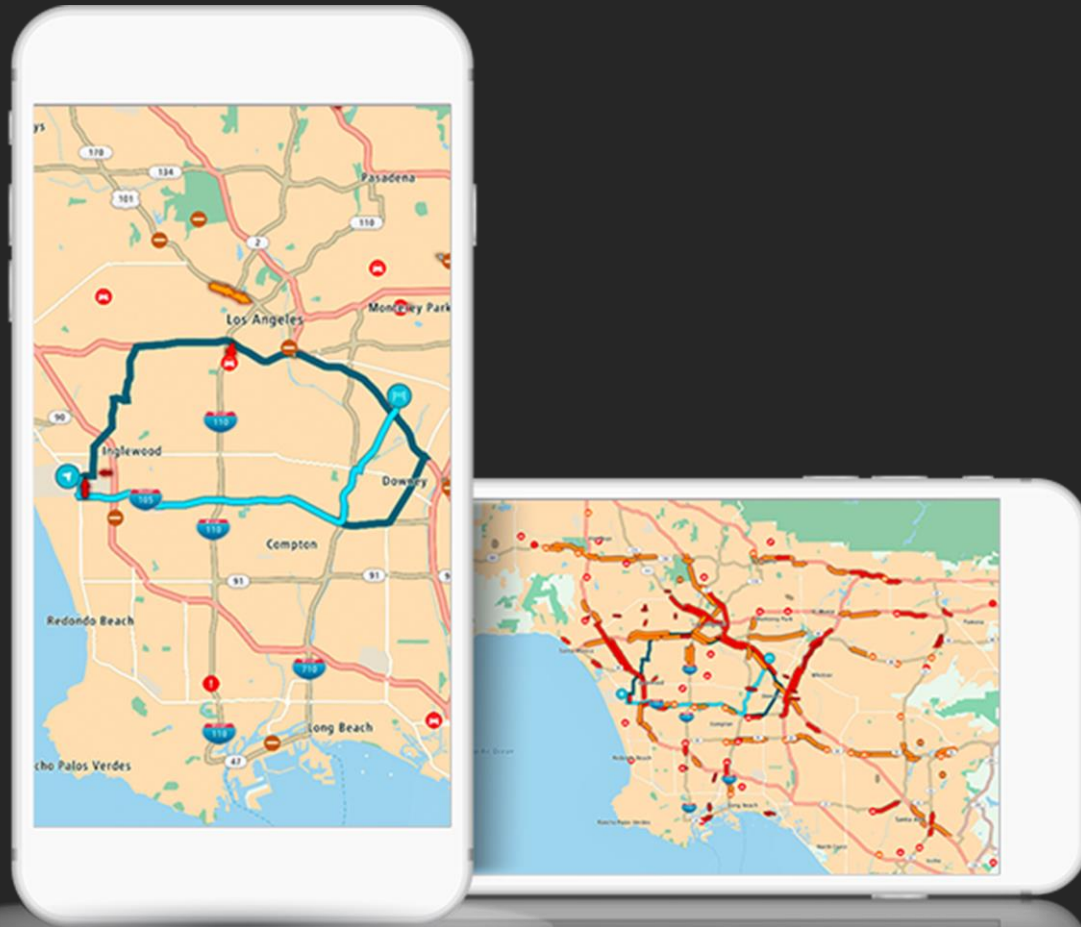
We know the way

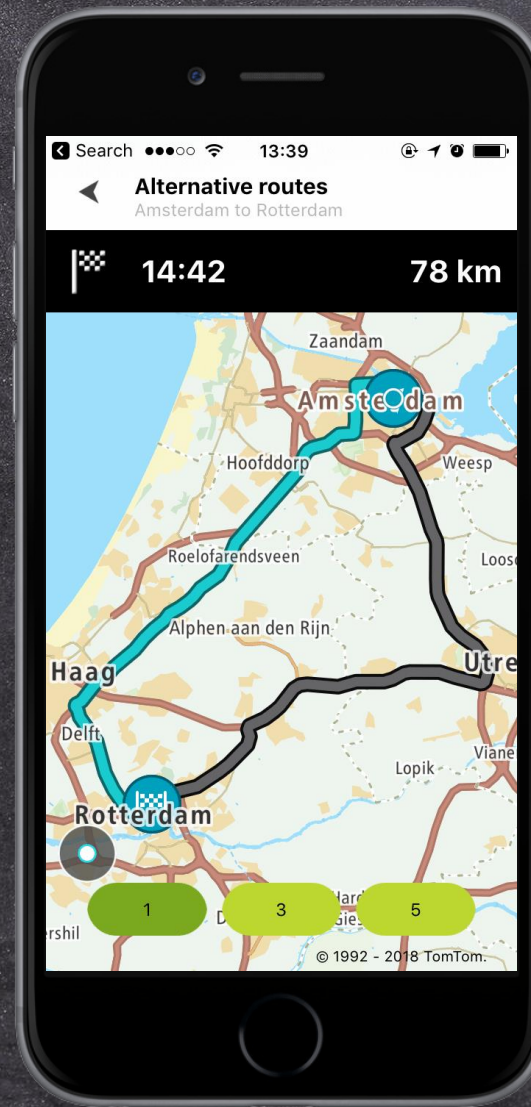## 25 years of navigation experience in one API

Calculate routes for different transportation modes, including trucks

Get accurate travel times and ETAs for your drivers

Optimize routes with waypoints for trucks

Calculate the energy and fuel required for a trip

Estimate the exact range of a an electric vehicle

FEATURES

- Powered by predictive and real-time traffic

- 8 travel modes including bikes and trucks

- 4 route types, including exclusive Eco routing for energy efficient routes

- Routes with up to 150 waypoints

- Advanced consumption models for combustion and electric engines

- Avoid criteria: toll roads, vignettes, ferries, motorways, custom areas

- Time and fuel based isochrones

- Batch and Matrix routing

Route types

With the TomTom Routing API, there is no one-route-that fits all. Whether you want to save fuel, minimize the distance traveled or just get there the fastest, Route Types allow you to get the route that fits your needs.
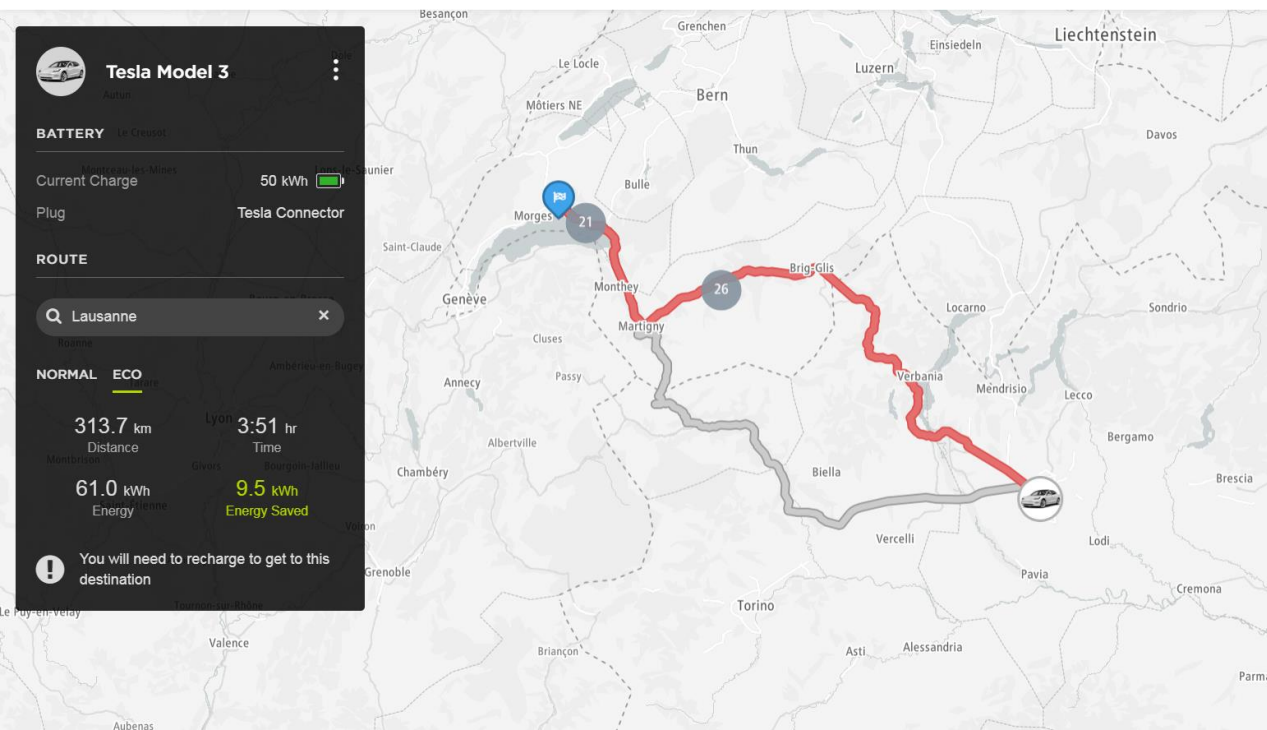
```javascript
tomtom.controlPanel({
    position: 'topright',
    title: null,
    close: null,
    show: null,
    collapsed: false,
    closeOnMapClick: false})
        .addTo(map)
        .addContent(document.getElementById('map').nextElementSibling);
function calculateRoute() {
    var routeType = document.getElementById('routeType').value;
    tomtom.routing({traffic: false})
        .routeType(routeType)
        .locations('41.89237,12.49261:40.25307,16.6987')
        .go()
        .then(function(routeJson) {
            if (route) {
                map.removeLayer(route);
            }
            route = tomtom.L.geoJson(routeJson, {
                style: {color: colors[routeType], opacity: 0.8}
            }).addTo(map);
```

- **Fastest** offers the fastest route using real time and/or predictive traffic

- **Shortest** offers the shortest route by distance

- **Eco** minimizes fuel consumption while balancing travel times

- **Thrilling** maximizes challenging or interesting routes, with hilliness and windingness parameters

Optimize waypoints

One driver, dozens of parcels, and customers waiting: how to solve it? With the TomTom Routing API, you can find the best order to visit up to 150 waypoints, so you can save on fuel, time and deliver a better service to your customer.

```javascript
function calculateVignetteRoute() {
    var routingHandle,
        selectedCountries,
        allowVignette = vignetteAllowAvoidInput.value === 'allow';
    try {
        if (route) {
            map.removeLayer(route);
        }
        showLoader();
        selectedCountries = getSelectedCountries();
        routingHandle = routing();
        if (allowVignette) {
            routingHandle.allowVignette(selectedCountries);
        } else if (selectedCountries !== '') {
            routingHandle.avoidVignette(selectedCountries);
        }
        routingHandle.go().then(function(routeJson) {
            handleRouteJsonForVignettes(routeJson);
        })
            .catch(handleError);
    } catch (error) {
        handleError(error);
```


- Calculate routes with up to 150 waypoints

- Compute the best order for up to 150 waypoints to minimize distance and time

- Takes real-time and predictive traffic into account

Travel modes

With 25 years of experience in navigating millions of drivers, TomTom knows how to tailor the route to the vehicle.

The TomTom Routing API Travel modes calculates routes taking into account applicable restrictions, dimensions, cargo for 8 vehicle types.

That means safer, faster routes and less unpleasant surprises.
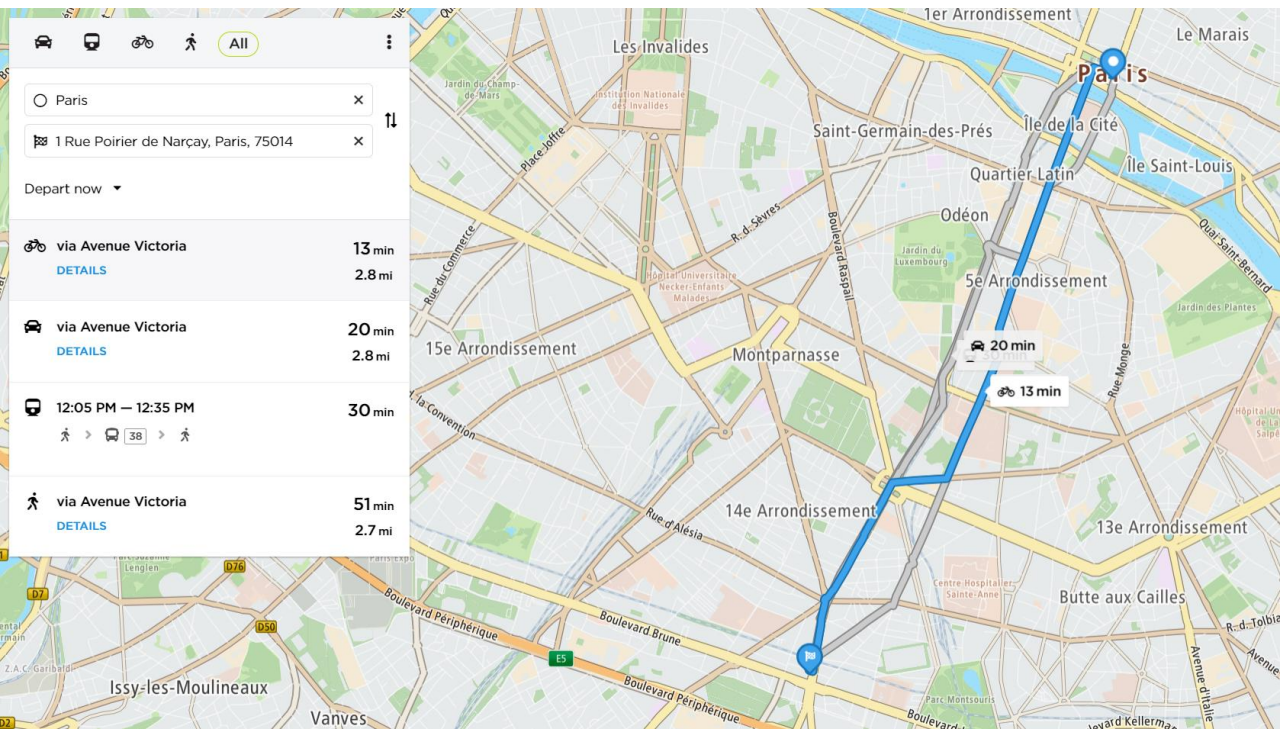
```javascript
function calculateRoute() {
    var vehicleWeight = document.getElementById('vehicleWeight').value,
        vehicleAxleWeight = document.getElementById('vehicleAxleWeight').value,
        vehicleLength = document.getElementById('vehicleLength').value,
        vehicleWidth = document.getElementById('vehicleWidth').value,
        vehicleHeight = document.getElementById('vehicleHeight').value;
    if (route) {
        map.removeLayer(route);
    }
    ShowLoader();
    try {
        tomtom.routing({traffic: false})
            .travelMode('truck')
            .vehicleWeight(vehicleWeight)
            .vehicleAxleWeight(vehicleAxleWeight)
            .vehicleLength(vehicleLength)
            .vehicleWidth(vehicleWidth)
            .vehicleHeight(vehicleHeight)
            .locations('52.529098,19.656761:52.541826,19.685137')
            .go()
            .then(function(routeJson) {
                route = tomtom.L.geoJson(routeJson, {style: {color: '#06f',
```

- Travel modes supported:
  - Car
  - Truck
  - Bicycle
  - Pedestrian
  - Taxi (beta)
  - Bus (beta)
  - Van (beta)
  - Motorcycle (beta)

Matrix routing

From dispatching the right driver to finding the closest hospital, Matrix Routing enable developers to process multiple origins and destinations in one request to compare travel times and distances.

```javascript
function request() {
    try {
        if (layers.length) {
            layers.forEach(function(layer) {
                map.removeLayer(layer);
            });
            layers = [];
        }
        showLoader();
        createMarkersAndArea();
        matrixWithPostParams().then(function(batchMatrixResult) {
            return batchRouting().then(function(batchResponse) {
                var routes = [];
                batchResponse.forEach(function(record, index) {
                    routes.push(buildRouteOnMap(record, index));
                });
                renderResults(batchMatrixResult, routes);
                hideLoader();
            });
        }).catch(handleError);
    } catch (error) {
        handleError(error);
    }
}
```


- Many-to-many routes (up to 700 elements) all retrieved in one go

- One-to-many and Many-to-one also available

- All routing parameters can be applied to the request

- Real-time traffic enabled for the best decision

Map Styler Overview

- Layers

- Filters

- Properties:

  - Line
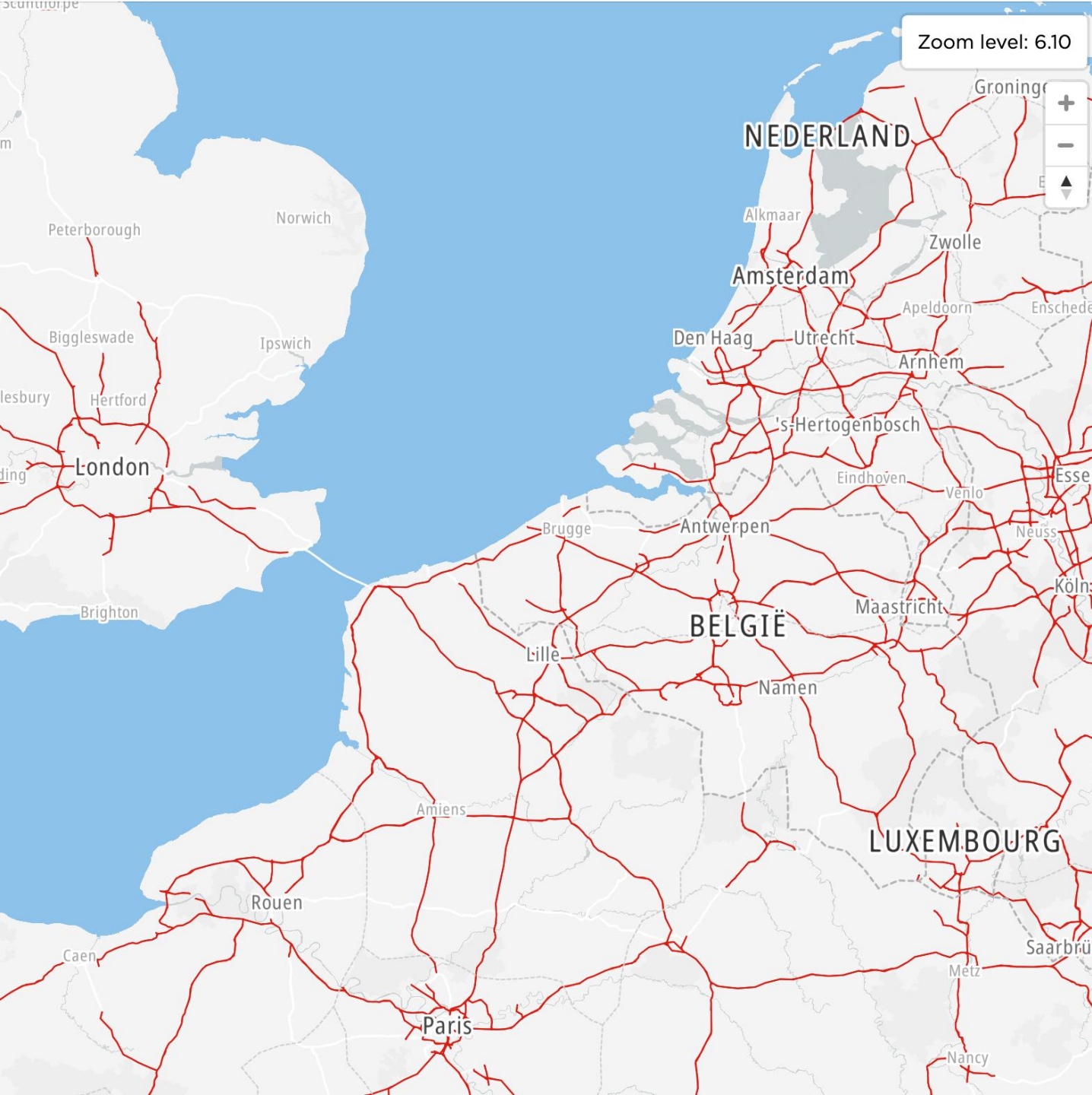 - Symbol
  - Fill
  - Raster

  - Circle
  - Hillshade
  - Heatmap
  - Fill extrusion

Layers

📍ID

📍Type

📍Source

📍Source Layer

📍Minzoom

📍Maxzoom

Zoom level: 6.10

Filters

Existential Filters

```
1. ["has", key] feature[key] exists
2. ["!has", key] feature[key] does not exist
```

Comparison Filters

```
1. ["==", key, value] equality: feature[key] = value
2. ["!=", key, value] inequality: feature[key] ≠ value
3. [">", key, value] greater than: feature[key] > value
4. [">=", key, value] greater than or equal: feature[key] >= value
5. ["<", key, value] less than: feature[key] < value
6. ["<=", key, value] less than or equal: feature[key] <= value
```

Set Membership Filters

```
1. ["in", key, v0, ..., vn] set inclusion: feature[key] ∈ {v0, ..., vn}
2. ["!in", key, v0, ..., vn] set exclusion: feature[key] ∉ {v0, ..., vn}
```

Combining Filters

```
1. ["all", f0, ..., fn] logical AND: f0 ∧ ... ∧ fn
2. ["any", f0, ..., fn] logical OR: f0 ∨ ... ∨ fn
3. ["none", f0, ..., fn] logical NOR: ¬f0 ∧ ... ∧ ¬fn
```
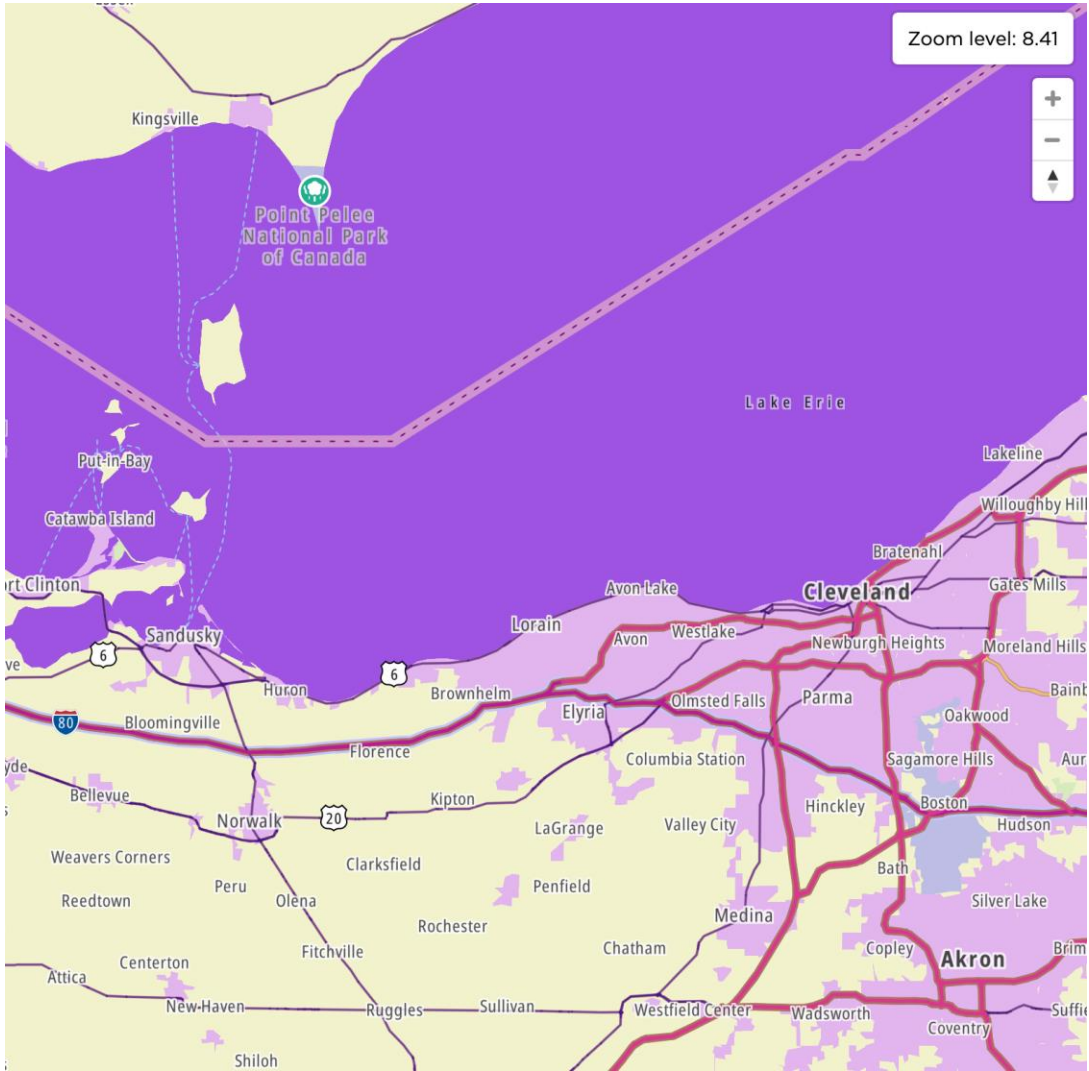
Background properties

☜Visibility

   ☜Layer displayed?

☜Background-color

☜Background-pattern

☜Background-opacity

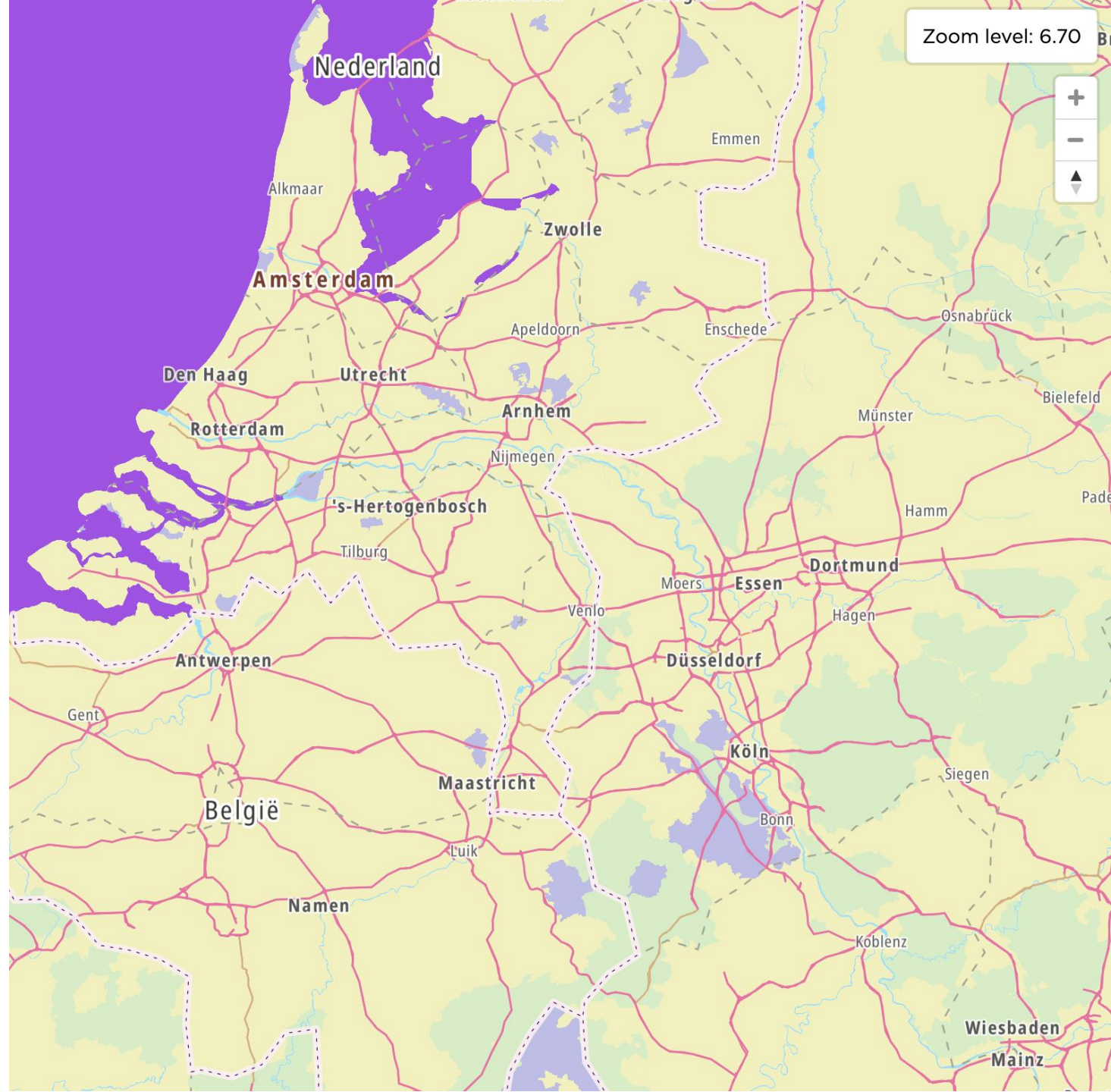# Line properties

- Visibility
  - Line displayed?
- Line-cap
  - Display endings
- Line-join
- Line-opacity
- Line-pattern
- Line-translate

Symbol properties

👈Symbol-placement

👈Spacing

👈Icon-allow-overlap

👈Icon-size

👈Text-field

👈Text-font

👈Fill-pattern

Symbol Properties contd.

Property name	Description	Condition	Values	Default value	Category
`visibility`	Whether this layer is displayed.		"visible", "none"	"visible"	Layout
`fill-antialias`	Whether the fill should be anti-aliased.		true, false	true	Paint
`fill-opacity`	The opacity of a fill layer.		Number between 0 and 1 inclusive.	1	Paint
`fill-color`	The color of a fill layer.		Color	#000000	Paint
`fill-outline-color`	The outline color of the fill.	fill-antialias = true	Color	Value of fill-color	Paint
`fill-translate`	The offset of a fill layer's anchor from its original placement.		Array of numbers in the format [X, Y].	[0, 0]	Paint
`fill-translate-anchor`	The frame of an anchor for 'fill-translate'.	Requires fill-translate.	"map", "viewport"	"map"	Paint
`fill-pattern`	Name of the image in a sprite to use for drawing image fills.		Name of image in sprite.		Paint

Raster properties

Property name	Description	Condition	Values	Default value	Category
`visibility`	Whether this layer is displayed.		"visible", "none"	"visible"	Layout
`raster-opacity`	The opacity at which the image will be drawn.		Number between 0 and 1.	1	Paint
`raster-hue-rotate`	Rotates hues around the color wheel.		Number between 0 and 1 inclusive.	0	Paint
`raster-brightness-min`	The minimum brightness of the image.		Number between 0 and 1 inclusive.	0	Paint
`raster-brightness-max`	The maximum brightness of the image.		Number between 0 and 1 inclusive.	1	Paint
`raster-saturation`	Saturation of the image.		Number between -1 and 1 inclusive.	0	Paint
`raster-contrast`	Contrast of the image.		Number between -1 and 1 inclusive.	0	Paint
`raster-resampling`	Used for overscaling / texture magnification filtering.		"linear", "nearest"	"linear"	Paint
`raster-fade-duration`	Fade the duration of the new tile.		Non-negative number.	300	Paint

Sign up...

...and start colorizing ☺

What's next?

➤ Let's divide the room into 4 sections.

➤ Set up developer portal accounts - free API key will appear instantly.

➤ Based on the themes given… let's make some maps!

developer.tomtom.com

bit.ly/TomTomWorkshop

Frankenstein

Halloween Dark

Candy Corn

Snow Globe

Let's get going!

Olivia Vahsen
@ovahsen

developer.tomtom.com

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TomTom Maps APIs

5 reasons to switch

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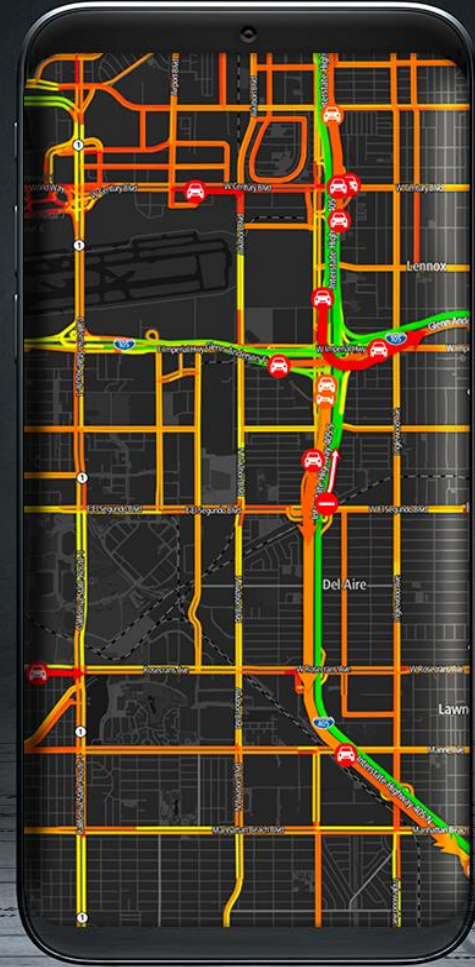
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