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Real-time public transport information systems monitoring and analysis in the city of Amsterdam

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Simon Ric - Hansen
Data analyst | DITP

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A Bit About Me

Simon Ric - Hansen

- Data analyst with a background in GIS
- 2 years using Splunk
- 10 years working with transport data
- Big sports fan

Its not all disco and pancakes

Some times we do have to catch a bus

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The public transport company of Amsterdam

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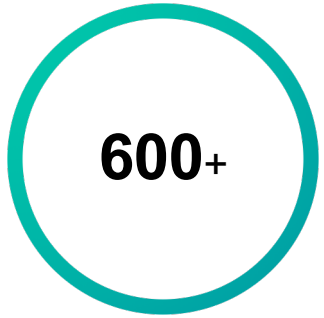
What do we do

Providing public transport to Amsterdam since 1900

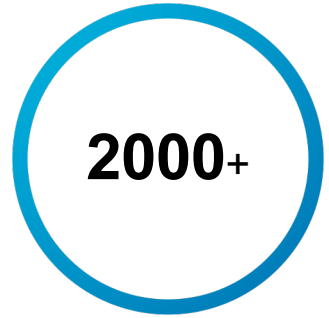
Km's Travelled Per year

Travelers Per day

Travel Information updates per day



Digital travel displays



Stations / stops

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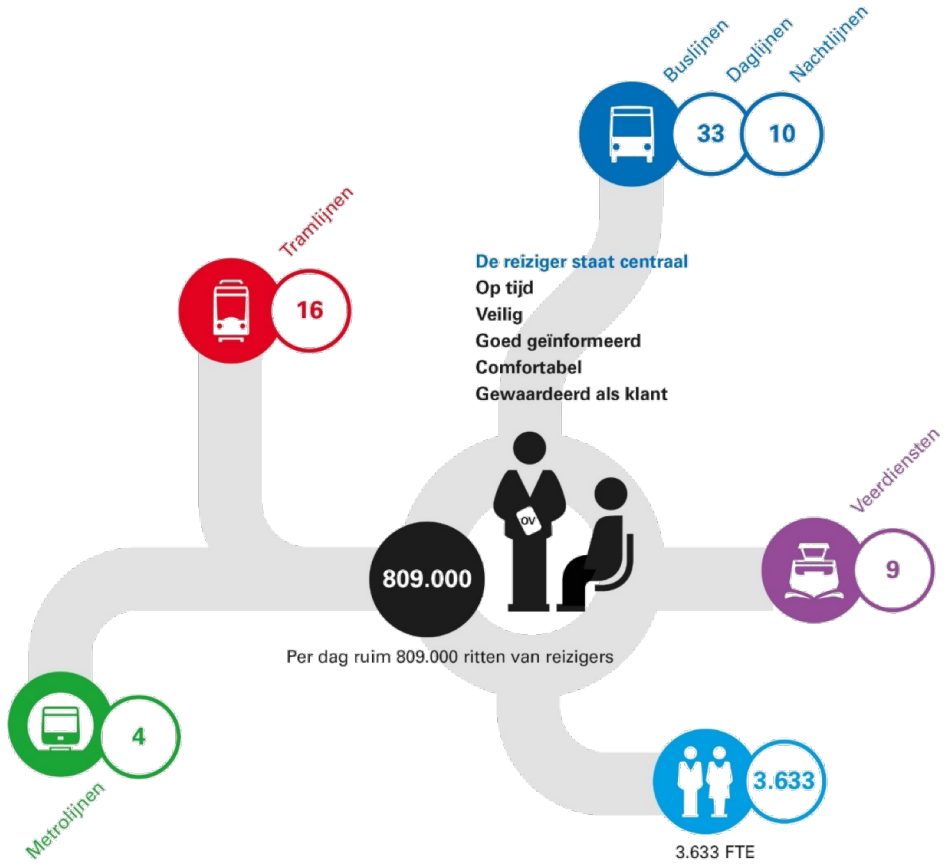
Routes and Vehicles

The current number of routes and vehicles



200
Trams

203
Busses

90
Subway Cars

18
Ferries

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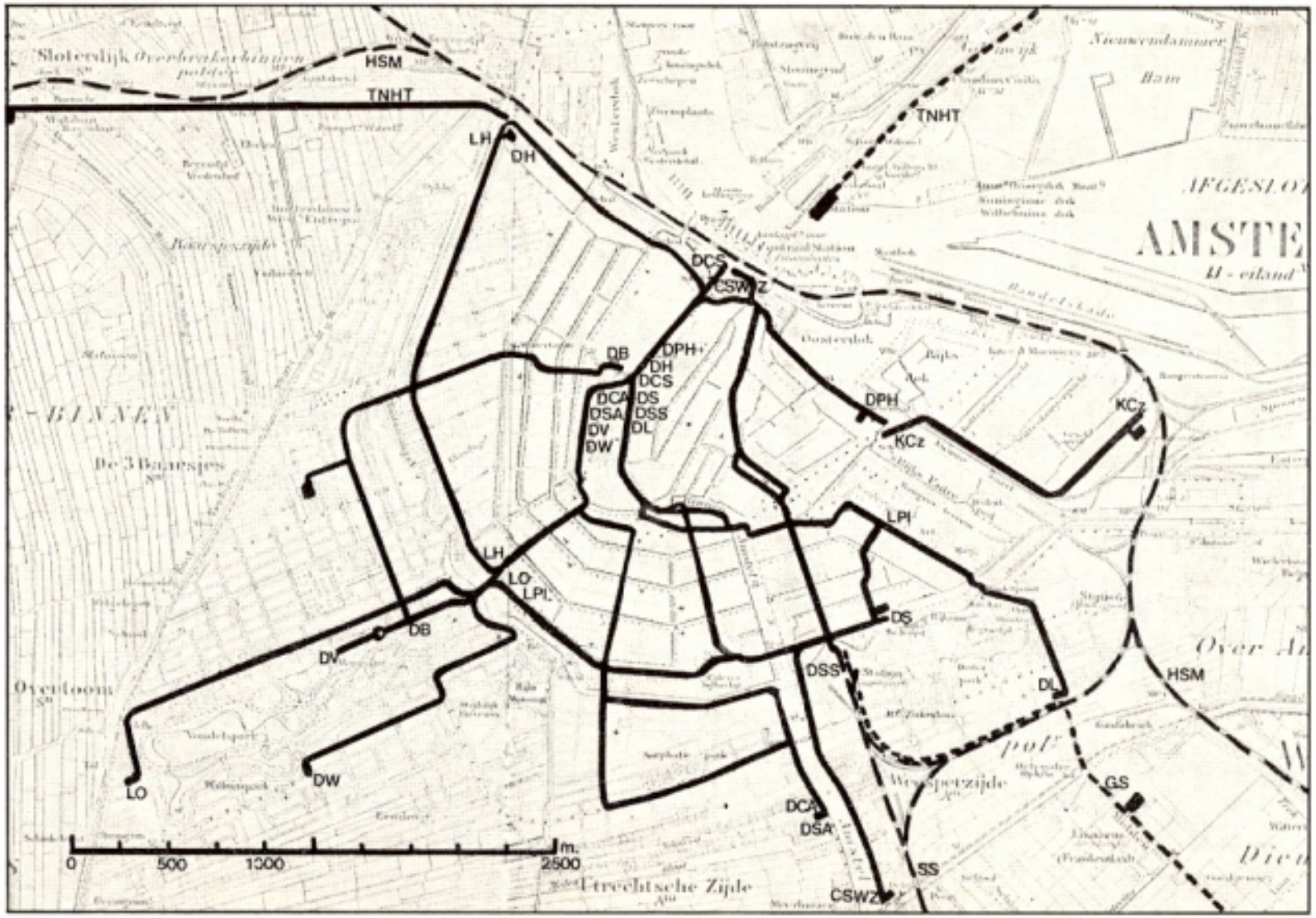
Tram Routes 1900

The original horse drawn tram lines offered by GVB in 1900.



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Tram Routes 1906

The electric tram lines and routes introduced in 1906.

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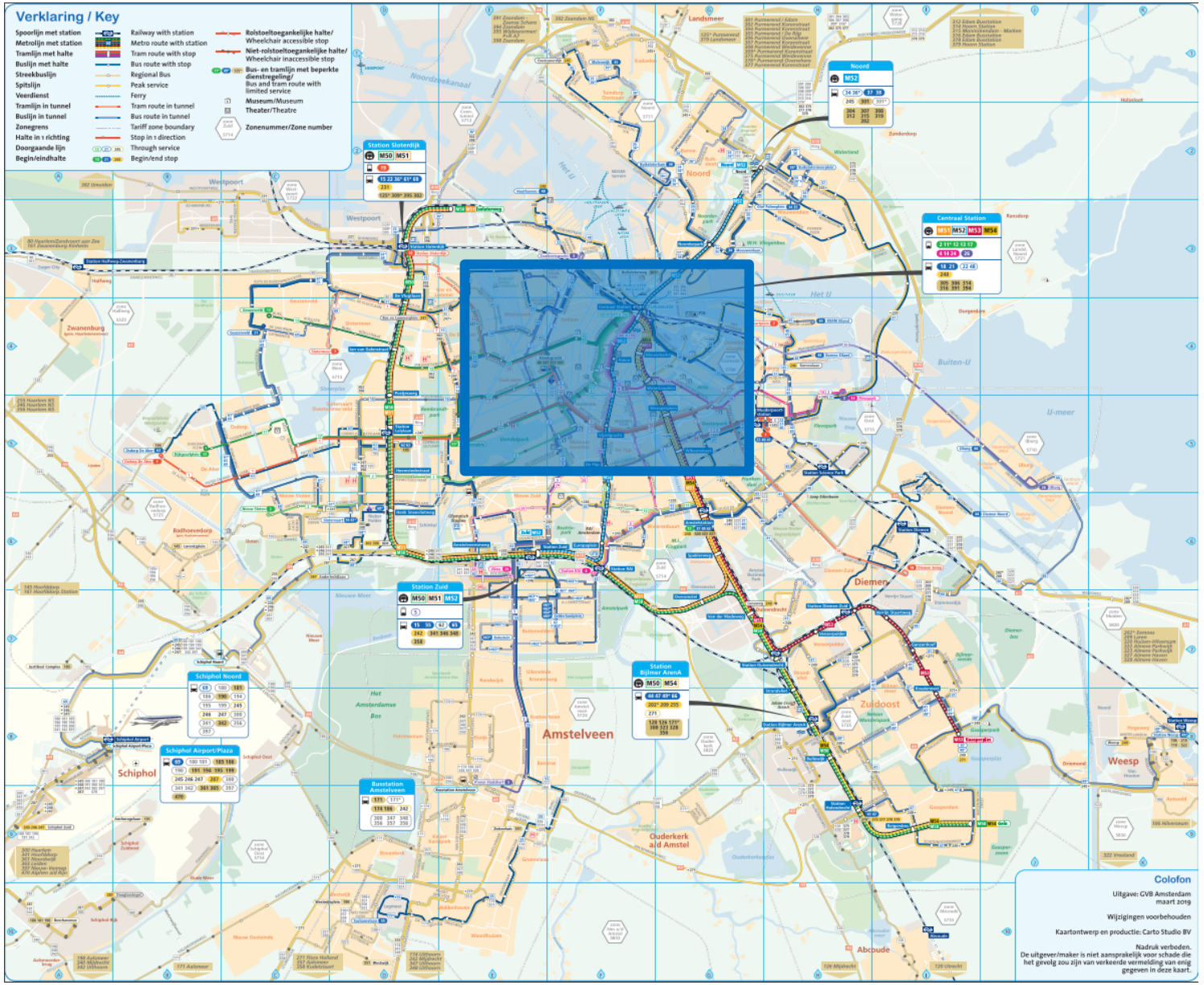
Current Network

Tram lines and routes currently offered by GVB.



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Our promise to passengers is to always provide **up-to-date, reliable** travel information.

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Public Transport Information

What is and how is the data generated and used

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The Customer Journey

How do travelers access and review travel information

Before Journey

Apps

Websites

What's my travel need?

What are the options?

What does it cost?

To Station

Apps

Any detours? Cancellations?

Will I still reach my destination on time?

At Station

Stop info

Apps

Personnel

PA

How do I get to…?

Is this were I get on?

Anything else I should know?

In the Vehicle

Displays

Personnel

PA

Am I in the right vehicle?

How many more stops? How long?

Interchange options?

After journey

Websites

What were my travels?

What did they cost?

How about next time?

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Challenges

An explanation of the issues involved in the generation of the transport information systems involved.

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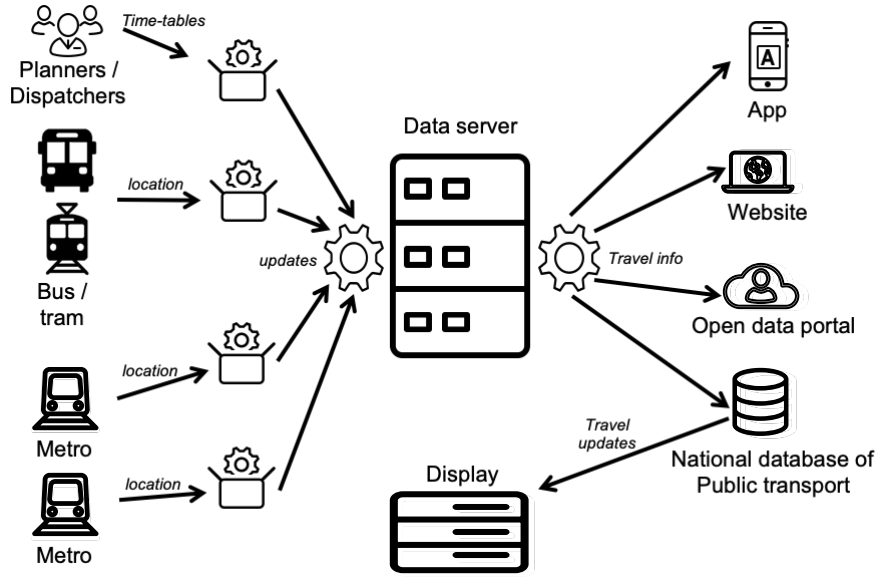
Challenges

The challenges in providing real–time transport information to travelers.

- Distributed systems
- Various data types
- Different parties involved



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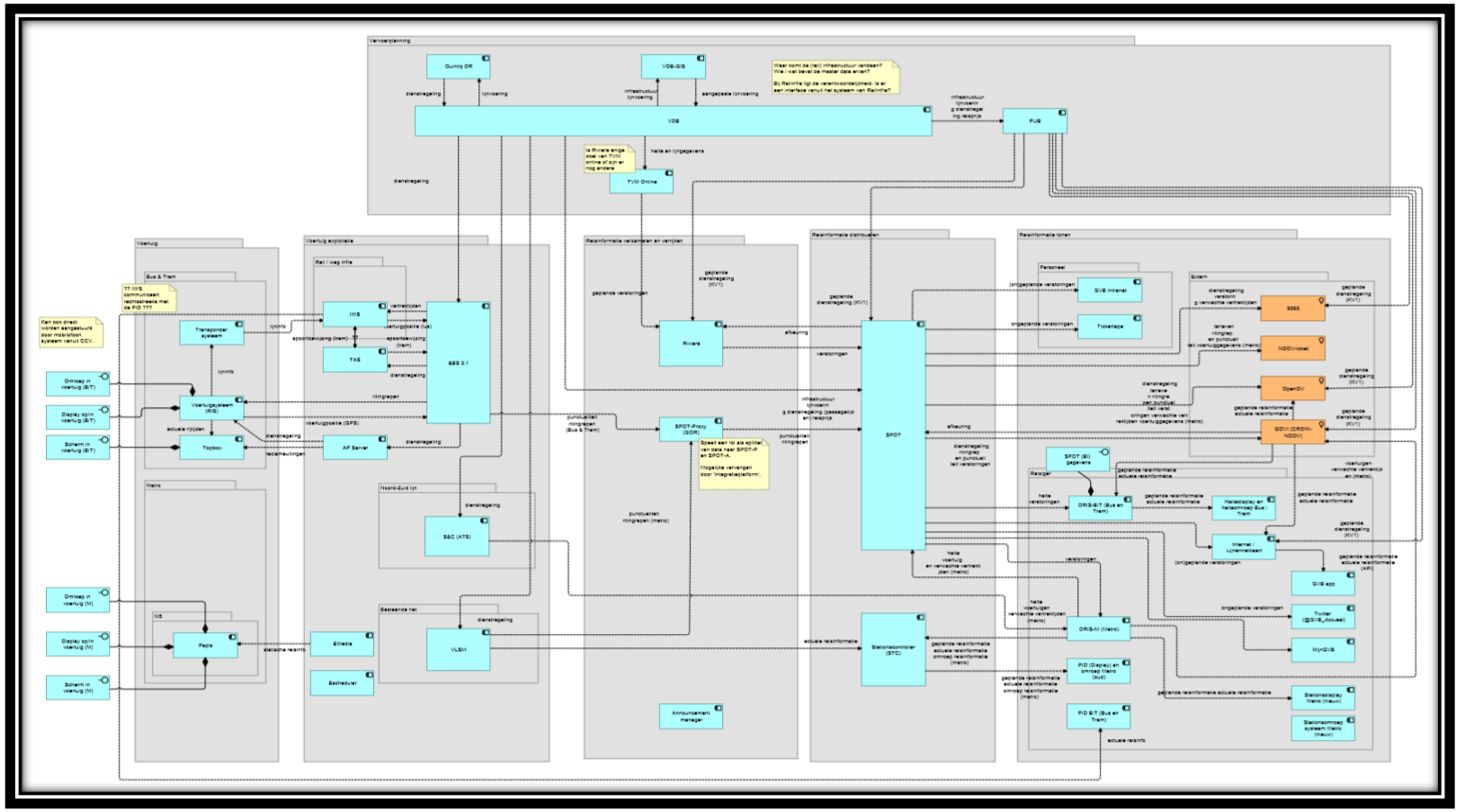
Information generation

The current information generation process diagram



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Requirements

The conceptual solution

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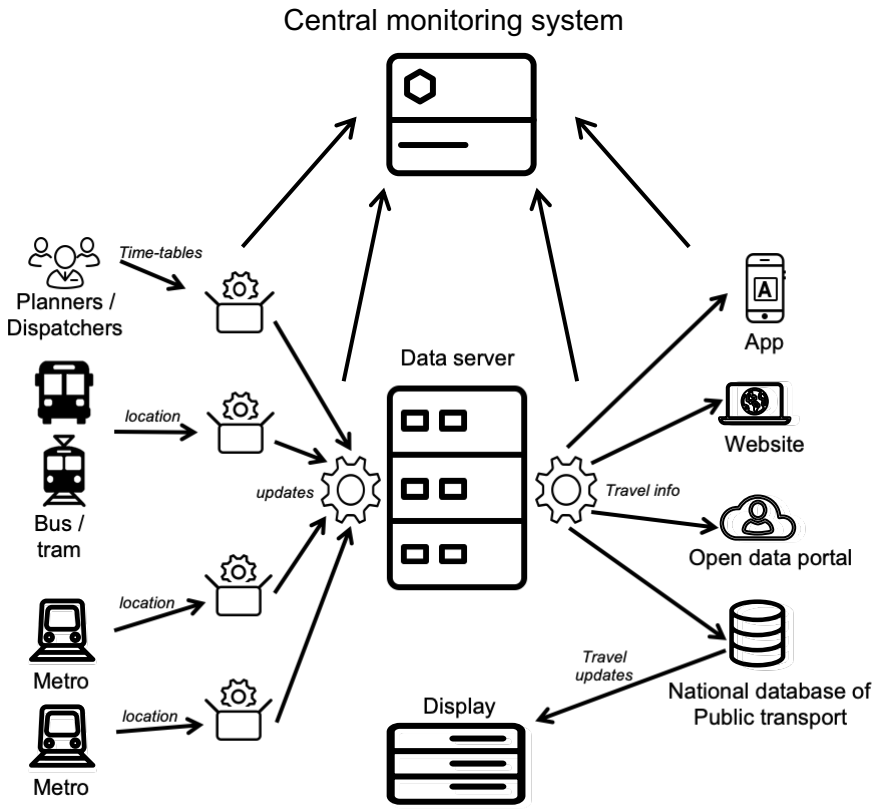
Requirements

The conceptual system required

- A central monitoring system
- All data in one format in one place
- Real-time and historical data



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Implementation

Outline of the Splunk implementation

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Implementation

The Splunk system implemented

The system

Data sources

Dashboards

Alerting

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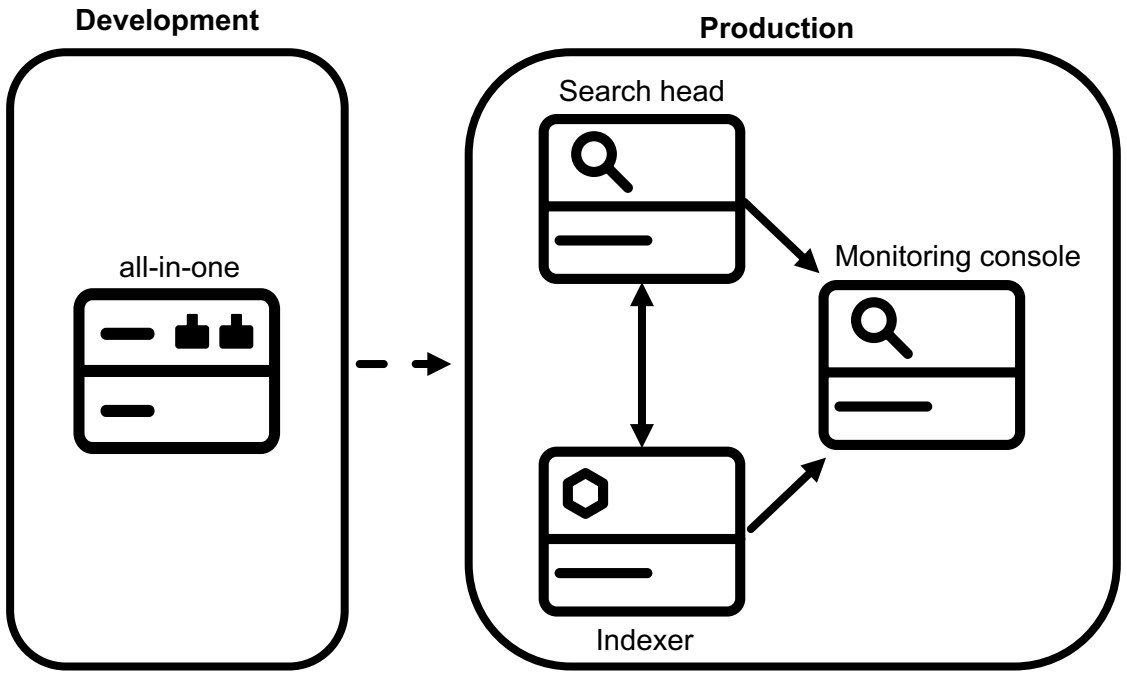
Requirements

The conceptual system required

- Implemented in Microsoft AZURE
- 4 server architecture
- Splunk Enterprise



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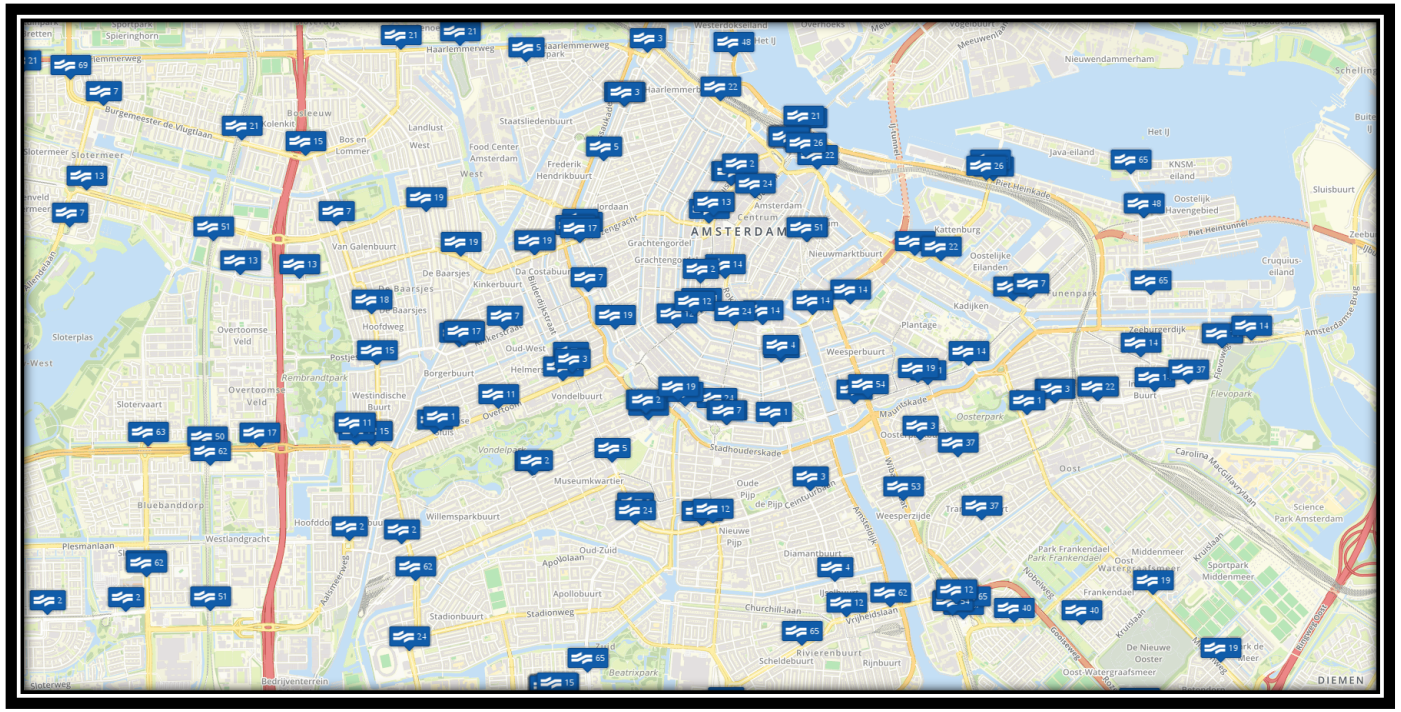
Implementation – Data sources

Internal GVB event chain data

- Vehicle and travel info, including:
  - System data
  - Real-time vehicle data
- Real-time Information messages
- HTTP events
- +- 600 vehicle events per min
- 5 separate systems



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Implementation – Data sources

National database of public transport data

- Travel info updates, including:
  - Real-time travel information updates
  - Real-time Information messages
  - Static time-table date
- ZeroMQ
- +- 2000 events per min
- Uses Dutch transport standards

Transport_type	Line	Direction	Platform	Expected departure time	Time till departure	status
TRAM	12	Amstelstation	-	15:42:00	0 min	Arrived
TRAM	17	Osdorp Dijkgraafplein	-	15:42:00	0 min	Departed
TRAM	11	Centraal Station	-	15:42:04	0 min	Arrived
TRAM	13	Centraal Station	-	15:42:26	0 min	Arrived
TRAM	12	Centraal Station	-	15:44:05	1 min	Under way
TRAM	11	Surinameplein	-	15:45:00	2 min	Arrived
TRAM	13	Geuzenveld	-	15:45:00	2 min	Arrived
TRAM	17	Centraal Station	-	15:47:00	4 min	Under way
TRAM	2	Nieuw Sloten	-	15:48:00	5 min	Arrived
TRAM	13	Centraal Station	-	15:48:53	6 min	Under way

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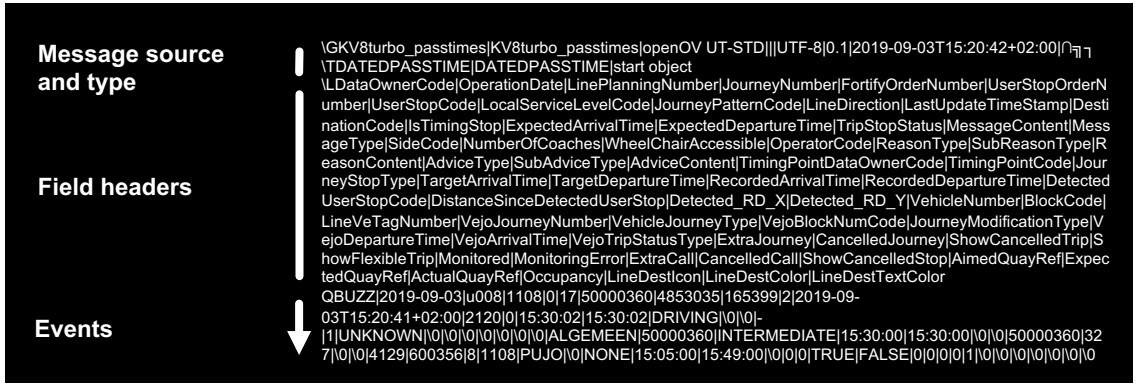
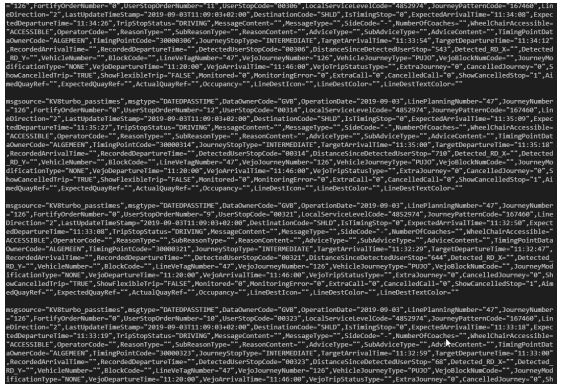
Implementation – ZeroMQ

Extracting messages and fields using a script

- Solution
  - Parsing with a python script
  - Inject the message type from the header (msgsource="KV7turbo_planning",msgtype="LINE")
  - Props and transforms to separate to events to different indexe
- Result
  - More streamline data from XML to CSV
  - Separated real-time and static data
  - The static tables linked back via auto-lookup





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Implementation – Dashboards

Dashboards

- Total Overview
- Real-time Monitoring
- Analysis
- Reporting

Implementation – Dashboards

Overview dashboards

- Main monitoring dashboard
- All KPI's on one screen
- Real-time
- Uses maps to highlight problems

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Implementation – Dashboards

KPI specific monitoring dashboard

- Real-time
- All points in the event chain

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Implementation – Dashboards

KPI specific monitoring dashboard

- External source
- Showing health metrics.

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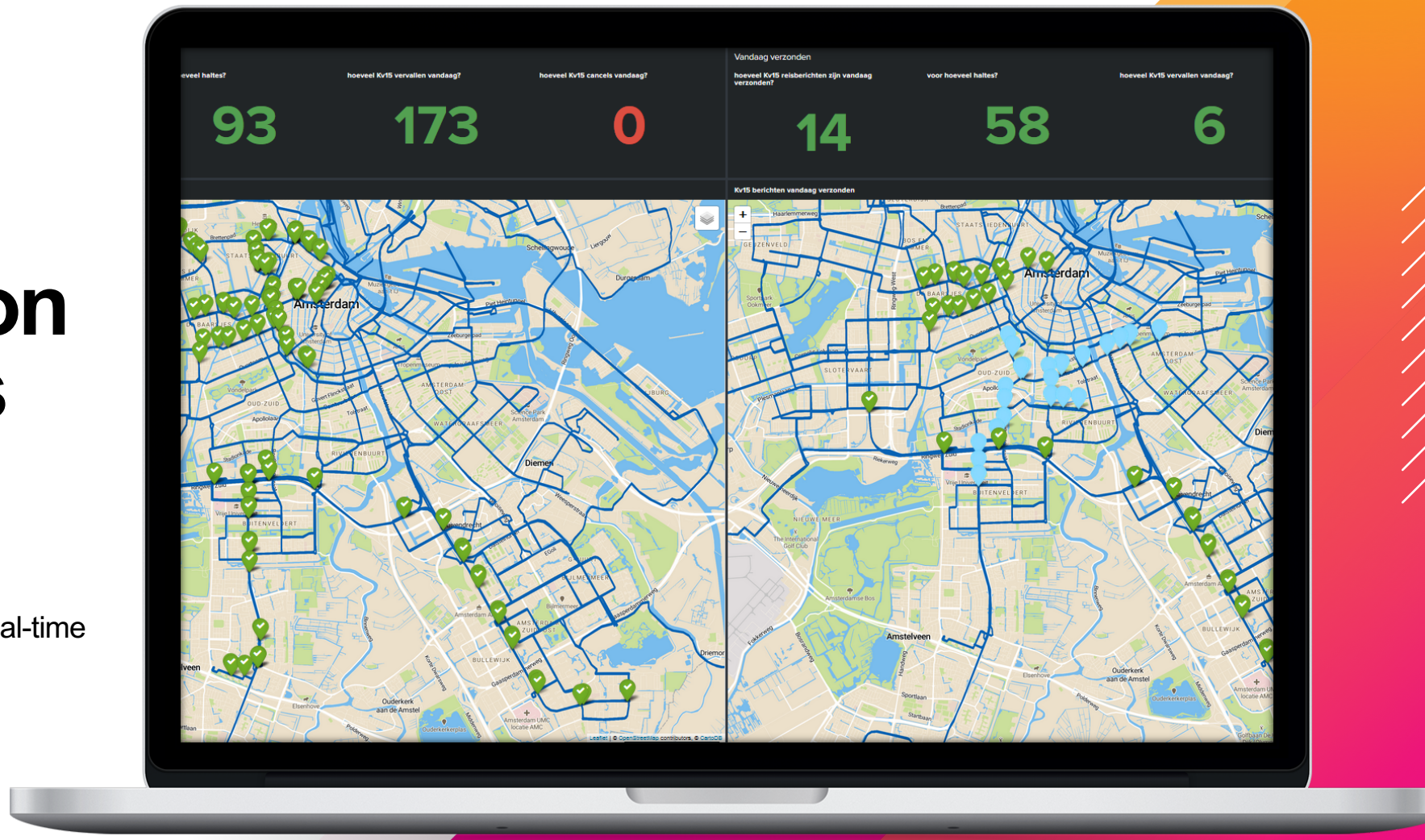
Implementation – Dashboards

KPI specific monitoring dashboard

- Highlighting impact on the traveler in real-time



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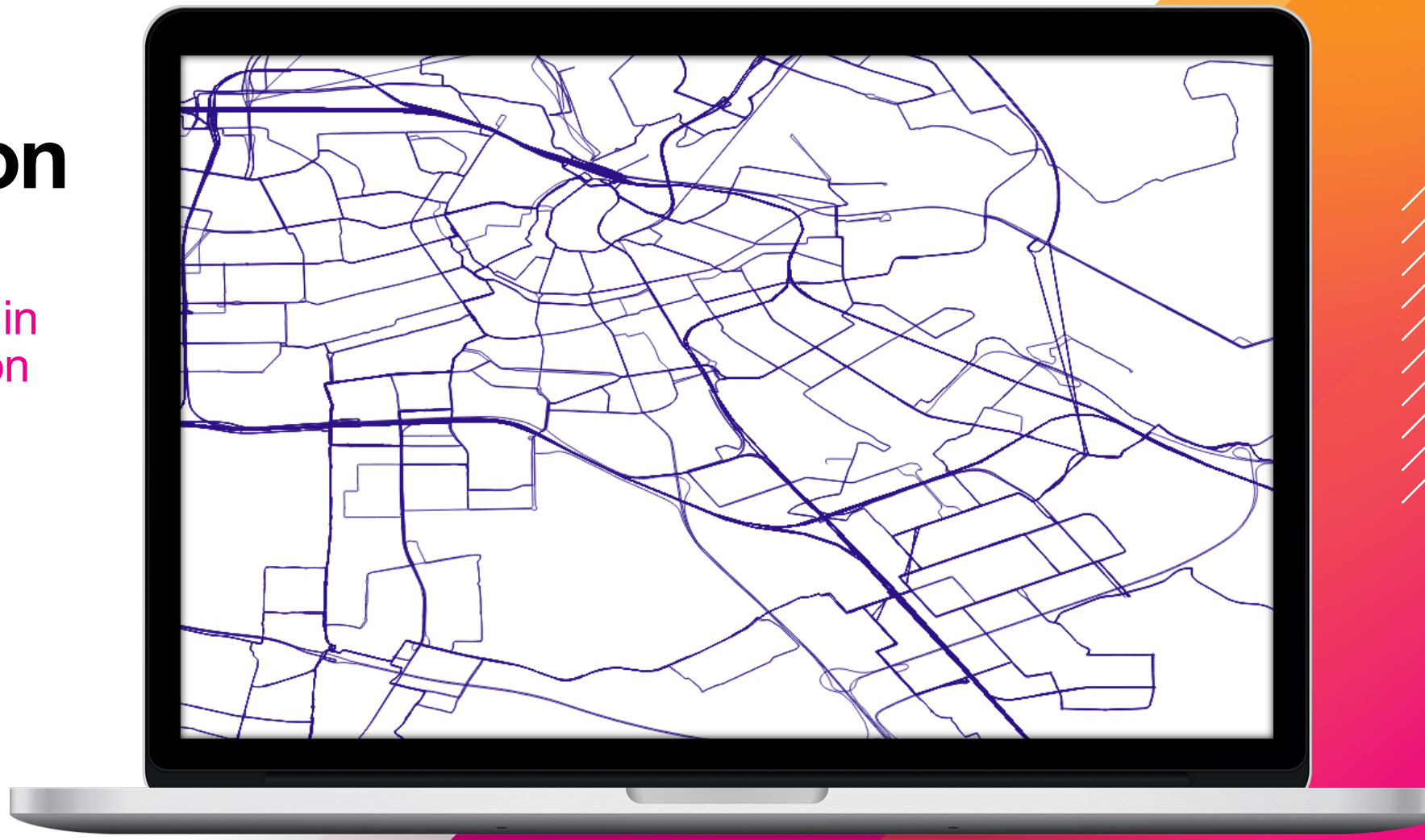
Implementation – Mapping

Process of mapping lines in the choropleth visualization

- Need a GIS software package
- Convert lines to polygons
  - Buffer
  - width based on map scale
- Simplify new polygons
- Export to kml
  - Remember to add the feature ID element
  - Steps for using custom polygons



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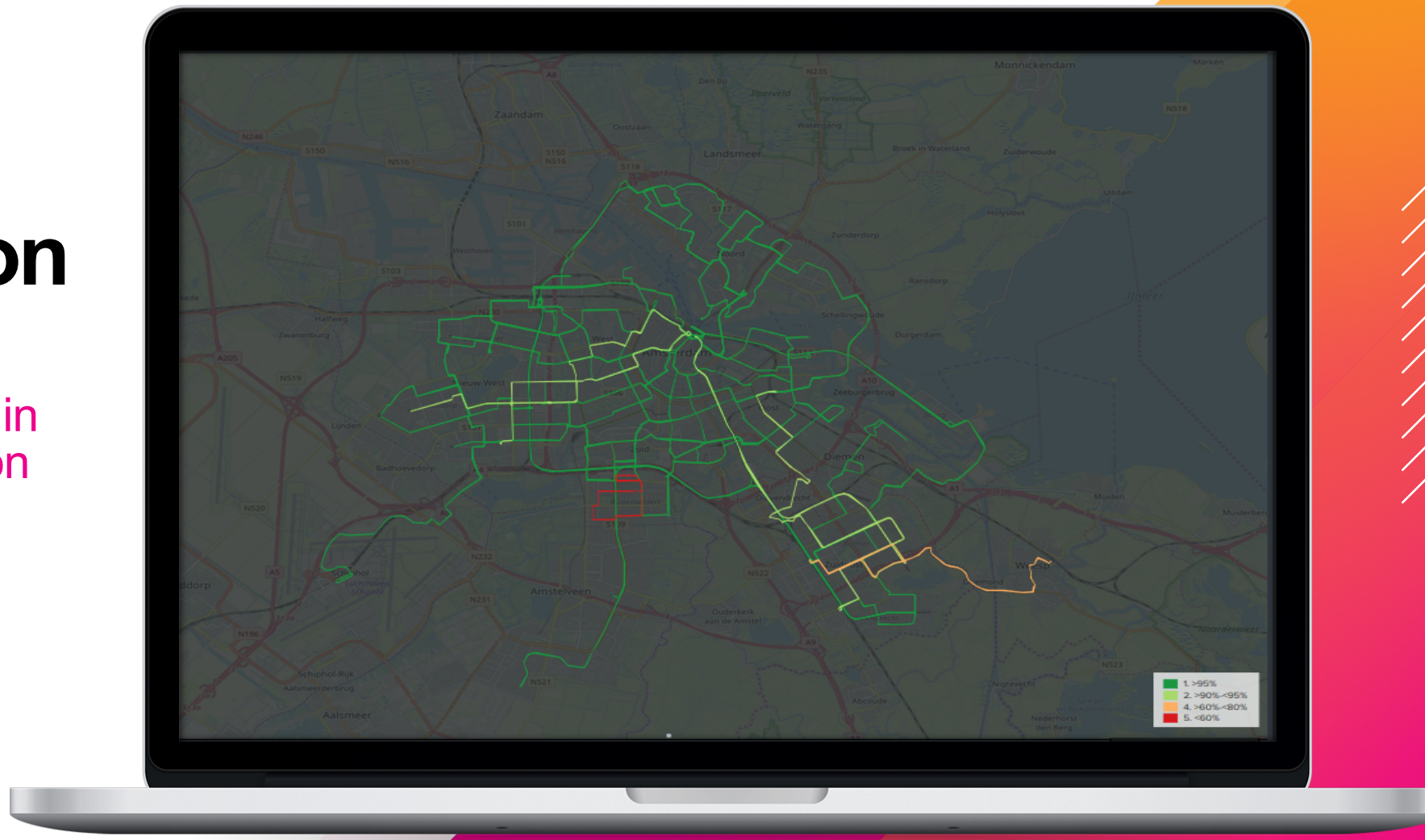
Implementation – Mapping

Process of mapping lines in the choropleth visualization

- Allows real-time updating
- Fast draw speeds
- Can result in big lookup files!



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Implementation – Dashboards

Per KPI analysis dashboard

- Drilldown within all KPI's
- Logical groupings
- Time selectable
- Allows event level comparisons from an overview….

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Implementation – Dashboards

Per KPI analysis dashboard

- DrillThrough the logical data layers

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Implementation – Dashboards

Per KPI analysis dashboard

- To line specific information
- Showing key metrics

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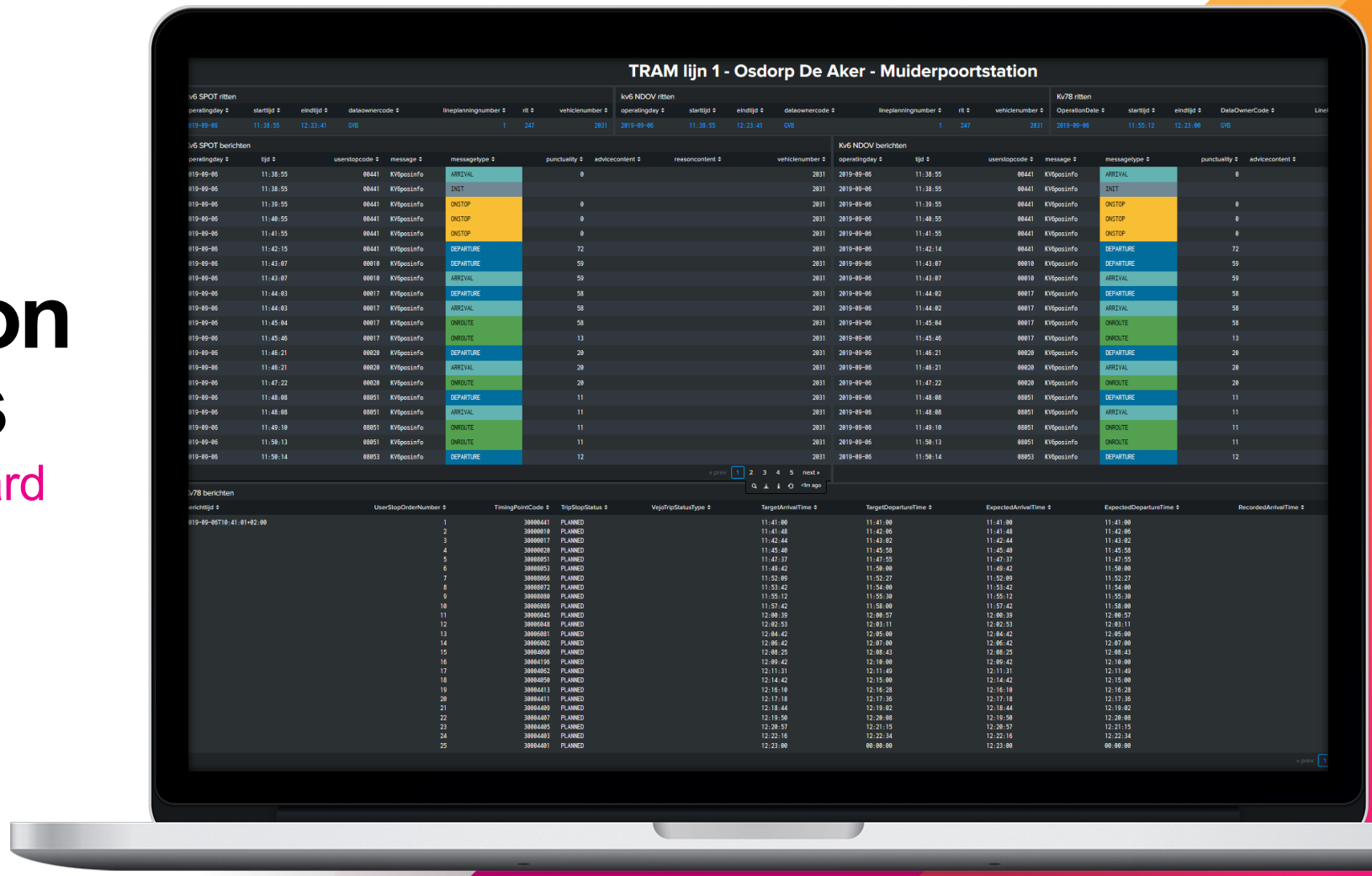
Implementation – Dashboards

Per KPI analysis dashboard

- Event level tables
- Dissect though the event chain



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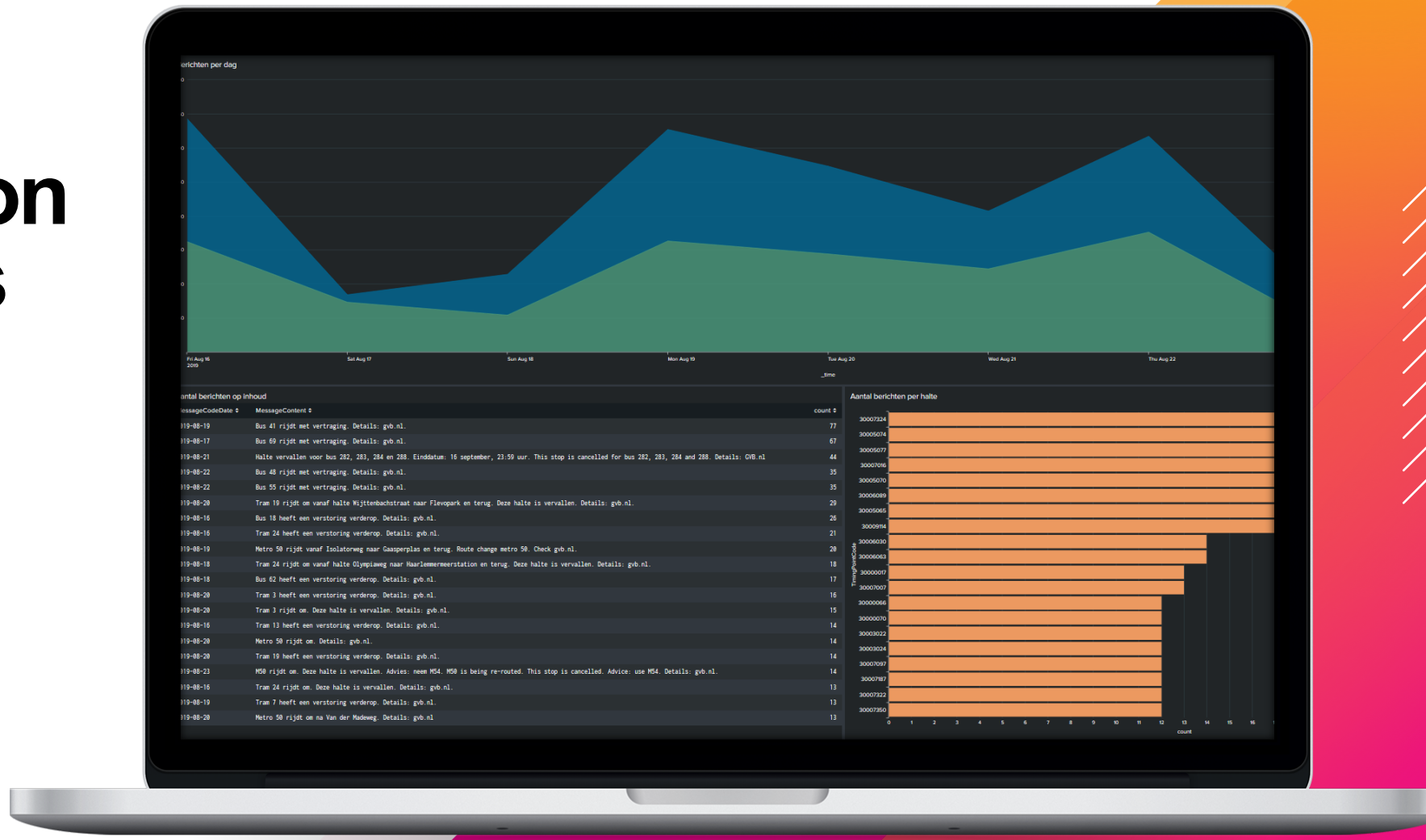
Implementation – Dashboards

Management reporting dashboards

Management overviews

Trend reporting on

- Alerting
- Bad actors



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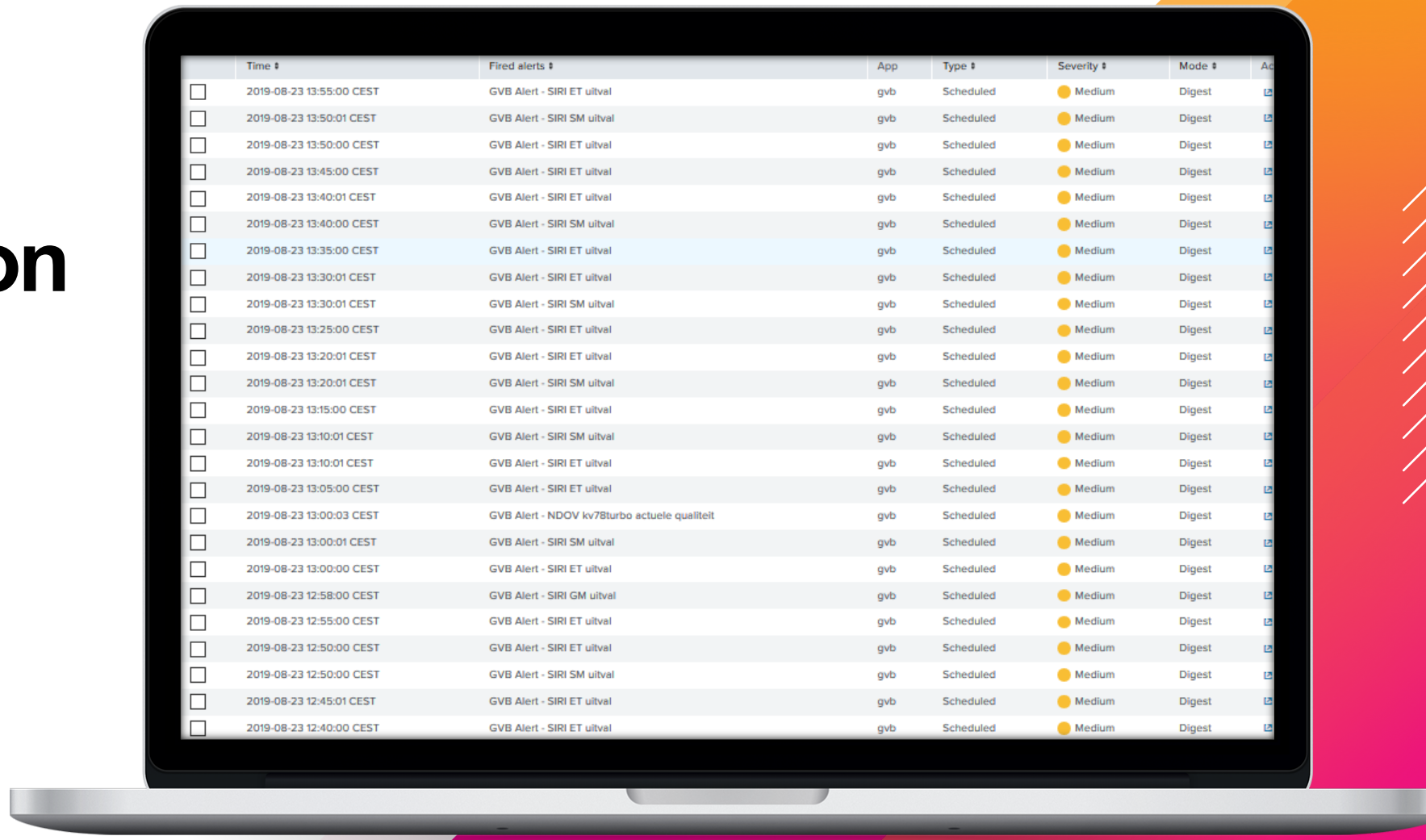
Implementation – Alerting

Real-time alerting

- Data availability
- **DATA QUALITY!**
  - Historical average event counts
- E-mail, Splunk Mobile



	Time	Fired alerts	App	Type	Severity	Mode
☐	2019-08-23 13:55:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:50:01 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:50:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:45:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:40:01 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:40:00 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:35:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:30:01 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:30:01 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:25:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:20:01 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:20:01 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:15:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:10:01 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
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☐	2019-08-23 13:05:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:00:03 CEST	GVB Alert - NDOV kv78turbo actuele qualiteit	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:00:01 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 13:00:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:58:00 CEST	GVB Alert - SIRI GM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:55:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:50:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:50:00 CEST	GVB Alert - SIRI SM uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:45:01 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest
☐	2019-08-23 12:40:00 CEST	GVB Alert - SIRI ET uitval	gvb	Scheduled	Medium	Digest

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Results

1. Central point of monitoring
2. More insight into problems/data across the chain
3. Shorter time to resolution
4. Business result for GVB

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Results

Expanded business result for GVB

1. Improved customer satisfaction.
2. Less impact on the customer service desk.
3. More effective and efficient technical support.

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Next Steps

Where to in the future

1. Real-time monitoring and analyses of
2. traveler digital check-ins and outs.
3. Further data quality checks on external sites.
4. Splunk Flow
5. Splunk AR and Mobile

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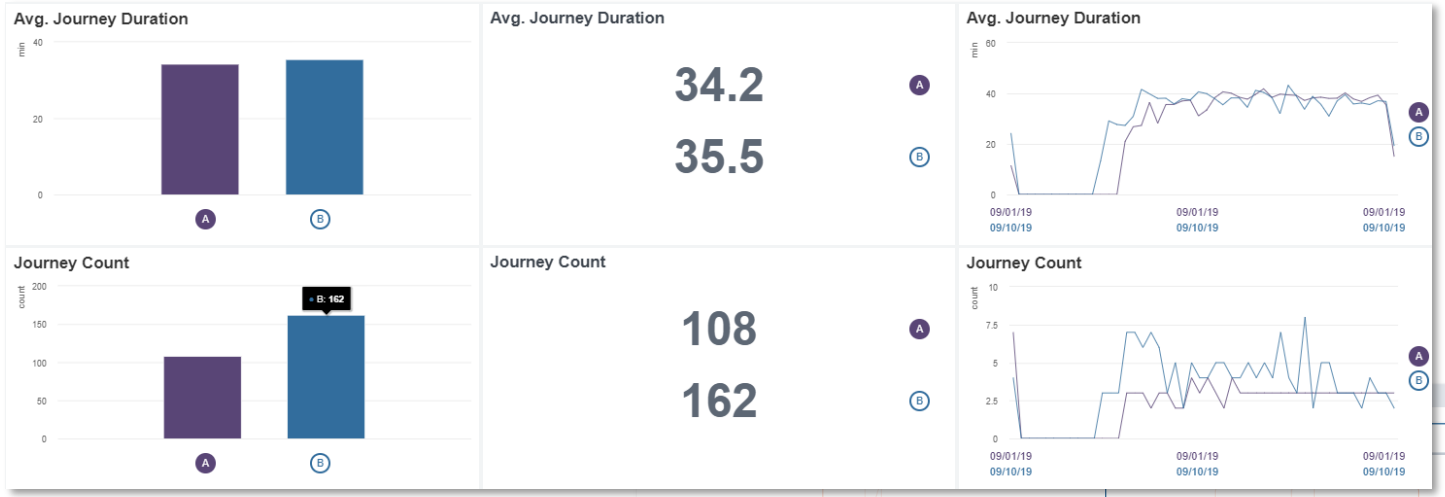
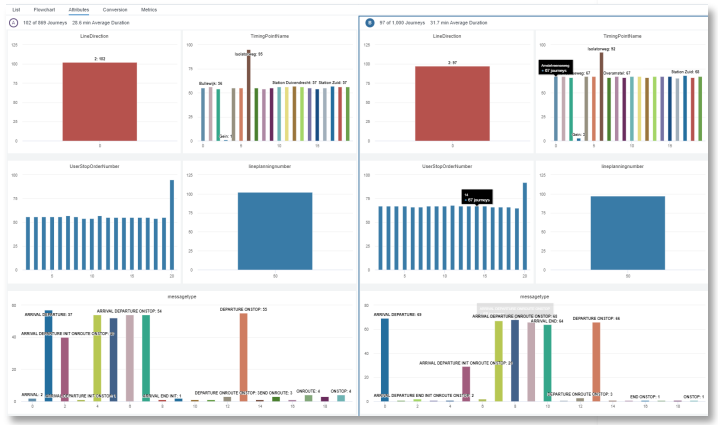
Next Steps

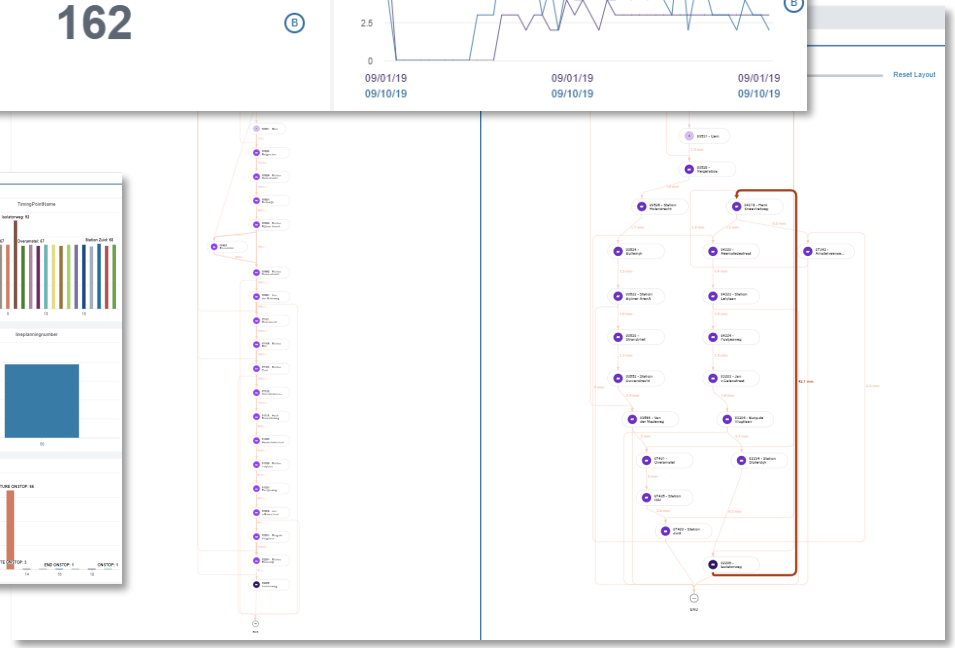
Where to in the future

Splunk Flow

Line analytics







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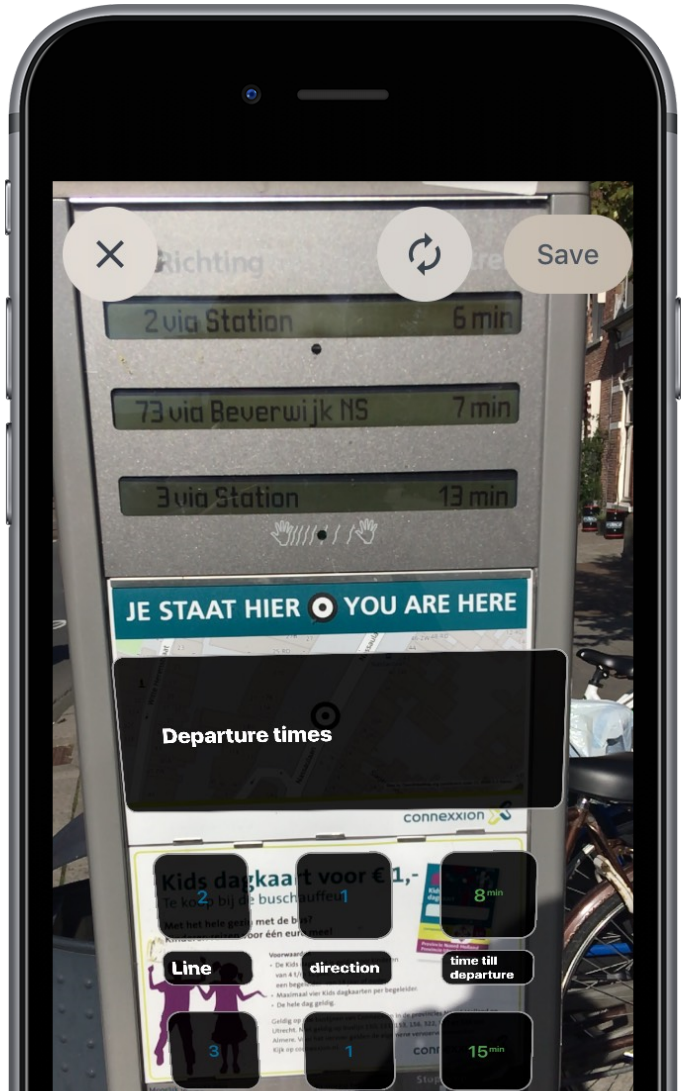
Next Steps

Where to in the future

Splunk AR and Mobile

Mobile alerting, monitoring and AR based field-checks



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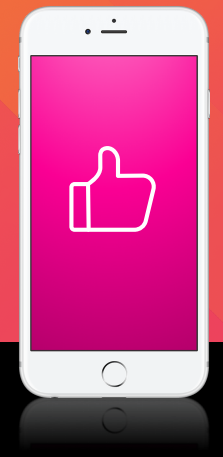
Go to the .conf19 mobile app to

RATE THIS SESSION