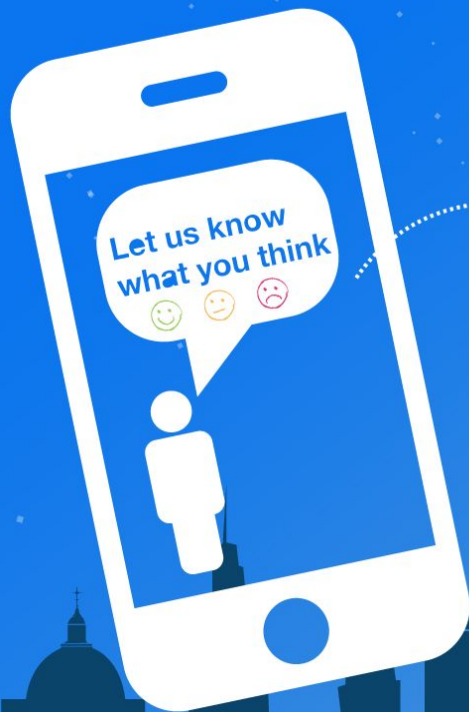


Building a cloud native Connected Cars platform

Troels Liebe Bentsen





**Click 'Rate Session'
to rate session
and ask questions.**





Me

- Consultancy company for 5 years
 - working with Maersk, CBS, IBM, HP, etc.
- Banking sector for 2 years doing “innovation”
 - Nordea(TouchID/Spam) and Danske Bank(June)
- Now trying my luck in the automotive industry



Connected Cars

- Connected Cars is funded and owned by Semler Group, the exclusive Danish importer of Audi, Volkswagen, Seat, Skoda, Porsche, Lotus, Bentley and Lamborghini.
- Part of Semler Innovation together with number of other startups focusing on mobility, including Autonomous Mobility that are working with self-driving cars.
- ... And we actually need to make money at some point



Engine issue detected. Please
text your autoshop for help.



Your workshop

Hi. My car just notified me about an engine issue. Can you help me?

Of course. I see you have a problem with your sparkplugs that we should fix to prevent any further damage.

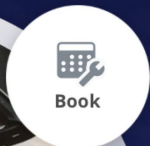
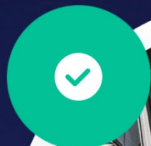
Alright. Can I schedule an appointment to have it looked at next week?

No problem. How does Monday at 9:00 AM sound?

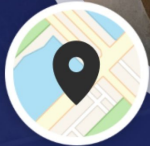
Perfect. Thank you!

Systems checked ok

Updated 6 hours ago



Book



MinVolkswagen



Status



Messages



Booking



Workshop



More



DASHBOARD

EVENTS

MESSAGES

EVENTS

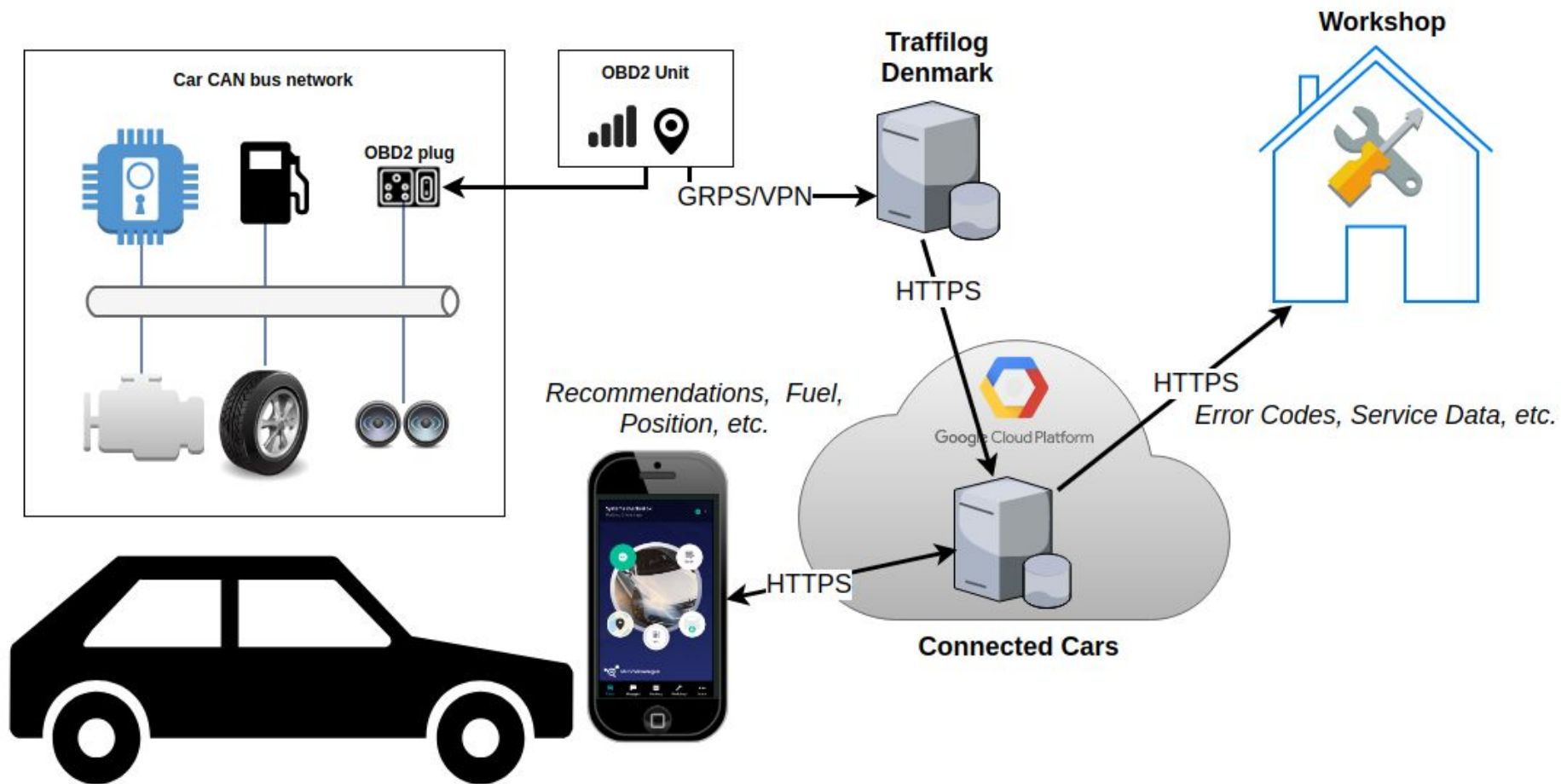
Open (9) ▾

LAST OCCURRED ▾	URGENCY	TYPE	NAME	COUNT	VIN
Today 14:08	●	Error code	P157000	4	WWW2223CZHE12
Today 11:46	●	Service reminder			WWW3445CZHE23
Yesterday 21:38	●	Error code	P263000	8	WWW2223CZHE12
02/03/2017 14:08	●	Error code	P157000	12	WWW1188CBHE87
02/03/2017 14:08	●	Error code	P157000	5	WWW2223CZHE12
02/03/2017 14:08	●	Warning light	Low oil	37	WWW2223CZHE12
02/03/2017 14:08	●	Warning light	Low oil	32	WWW2223CZHE12
02/03/2017 14:08	●	Error code	P173000	1	WWW2223CZHE12
02/03/2017 14:08	●	Service reminder			WWW2223CZHE12



Numbers

- 10,000+ units installed (2018: 100.000+)
- 75+ workshops
- Brands supported
 - Volkswagen
 - Seat (Soon)
 - ŠKODA (Soon)
 - Audi (Soon)







The problem

- 250,000 cars = 30+ million raw events per day
- 100+ million data points
 - Error code, Positions, Temperatures, etc.
- Logic heavy recommendations
- Lots of integrations
 - Leasing companies, Fleet management, workshops, insurance, etc.

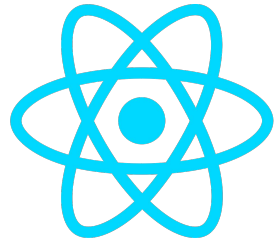


Cool new tech, right?

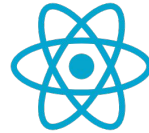
- MongoDB, Cloud Spanner, etc?
- How about Go, Rust, etc?
- Or Vue, Elm, etc?
- MQ/PubSub/Event Sourcing, etc?
- Serverless, Cloud functions/Lamdas, etc?
- ...



Technology stack - Frontend



React



React Native



Goals

- Minimum of dev/ops time on infrastructure
- Keep it simple
 - Everything is a container
 - Logging to stdout/stderr as JSON
 - Simple sharding on SQL
- Be able to move cloud provider
- Be able to evolve the platform as we grow
- High security and privacy



Technology stack - Backend



Google Cloud Platform

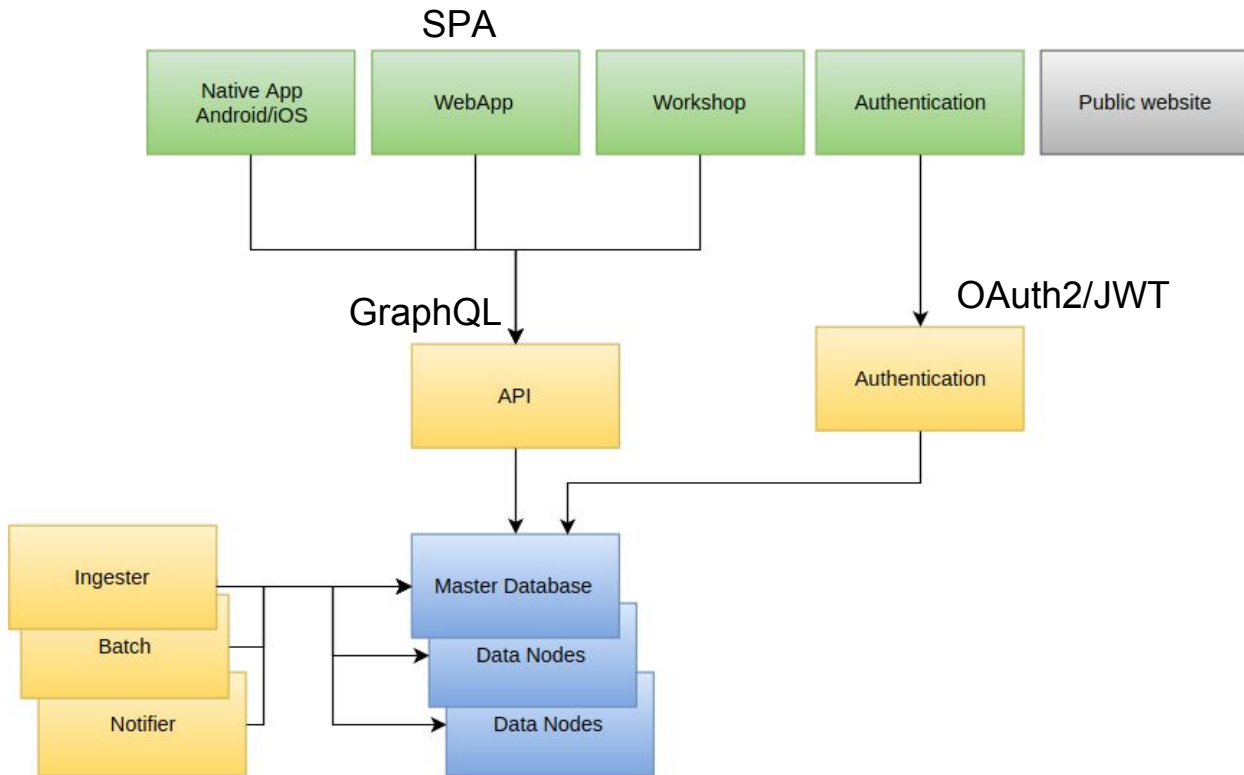


Kubernetes





Architecture overview





Cloud services

- Encrypted Storage (GCP)
- CI/CD (GCP, CircleCI)
- Kubernetes (GCP)
- Logging/Monitoring/Statistics (Slackdriver)
- MySQL (GCP)
- Load balancer/SSL termination/DNS (GCP)
- Mail (MailGun)
- Source code/Issue tracking (Github)
- SMS (SMSGateway)
- Support (Intercom)



Google Cloud Builder(1)

Source: **GitHub** Repository: <https://github.com/connectedcars/api>

[View triggered builds](#)

Name (Optional)

All branches

Trigger type

☒ Branch

☐ Tag

Branch (regex)

Matches the branch: master

master

Build configuration

☐ Dockerfile

Specify the path within the Git repo

☒ cloudbuild.yaml

Specify the path to a Cloud Build configuration file in the Git repo [Learn more](#)

cloudbuild.yaml location

/ cloudbuild.yaml

Summary

Changes pushed to master branch will trigger a build defined by the "cloudbuild.yaml" file.

Save

Cancel



Google Cloud Builder(2)

```
steps:
- name: 'gcr.io/cloud-builders/npm:current'
  args: ['install']
- name: 'gcr.io/cloud-builders/npm:current'
  args: ['test']
- name: 'gcr.io/cloud-builders/docker'
  args: ['build', '-t', 'gcr.io/$PROJECT_ID/api:$COMMIT_SHA', '-t', 'gcr.io/$PROJECT_ID/api:latest', '.']
images: ['gcr.io/$PROJECT_ID/api:$COMMIT_SHA', 'gcr.io/$PROJECT_ID/api:latest']
```



Google Cloud Builder(3)

☰

Google Cloud Platform

connectedcars-staging

🔍

📦 Container Registry

📋 Container Registry

➡ Build triggers

📋 Build history

⬅ Build History

🔍 Filter builds

?

Build	Source	Git commit	Trigger	Started
✅ ab471dda-cca2...	GitHub connectedcars/api	5ed638	Push to master branch	02/10/2017, 16
✅ 324fce28-8ff5...	GitHub connectedcars/debug	68283f	Push to master branch	02/10/2017, 16



Google Container Engine(1)

- Managed master node
- Integrated logging to Slackdriver
- Automatic upgrades
- Automatic node repair
- Autoscale of nodes



Google Container Engine (2)

Google Cloud Platform connectedcars-staging

Container Engine

Container clusters

Workloads

Discovery & load balancing

Configuration

Storage

Container clusters

← Container clusters EDIT DELETE CONNECT

connectedcars-staging

Details Storage

Cluster

Master version	1.7.6-gke.1
Endpoint	Show credentials
Client certificate	Enabled
Kubernetes alpha features	Disabled
Total size	3
Master zone	europe-west1-b
Node zones	europe-west1-b europe-west1-c europe-west1-d
Network	default
Alias IP ranges	Disabled
Stackdriver Logging	Enabled
Stackdriver Monitoring	Enabled
Master authorised networks	Disabled
Legacy authorisation	Enabled
Maintenance window	At any time

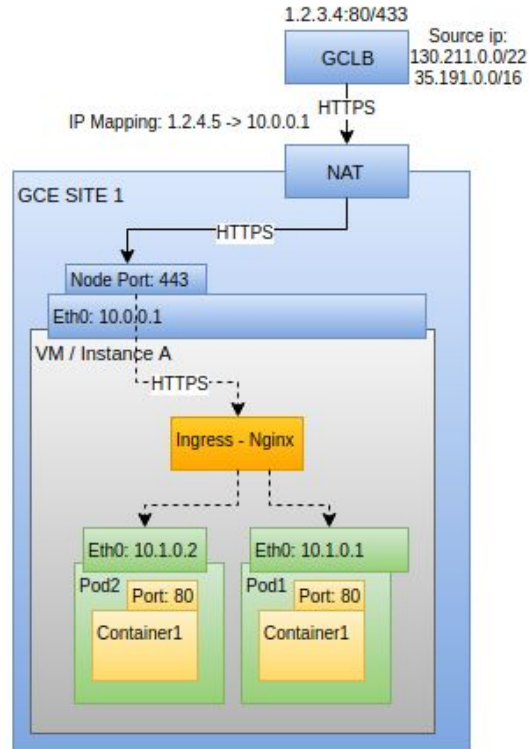
Labels
None

⌵ Add-ons

⌵ Permissions



Google Container Engine (3)





Google Load balancer/DNS

- Can use static global IP (unlike AWS)
- Has built-in CDN layer
- Integrates with Slackdriver for logging
- DNS is DNS
 - Latency based routing is handled at IP level



Stackdriver (1)

Google Cloud Platform connectedcars

Stackdriver Logging

Logs

Logs-based metrics

Exports

Resource usage

CREATE METRIC CREATE EXPORT

Filter by label or text search

GKE Container ingester Any log level Jump to date

2017-10-03 CEST View Options

00:37:15.000 Process handleEvent

Expand all | Collapse all

```
{
  insertId: "o539kfglsf9x8c"
  jsonPayload: {
    context: {
      duration: 22
      slow: false
      slowLimit: 10000
      tag: "ACCESS_LOG"
      url: " "
    }
    level: "INFO"
    message: "Process handleEvent"
    timestamp: "2017-10-02T22:37:15.840Z"
  }
  labels: {...}
  logName: "projects/ /logs/ingester"
  receiveTimestamp: "2017-10-02T22:37:19.182727786Z"
  resource: {...}
  severity: "INFO"
  timestamp: "2017-10-02T22:37:15Z"
}
```

00:37:18.000 Process handleEvent

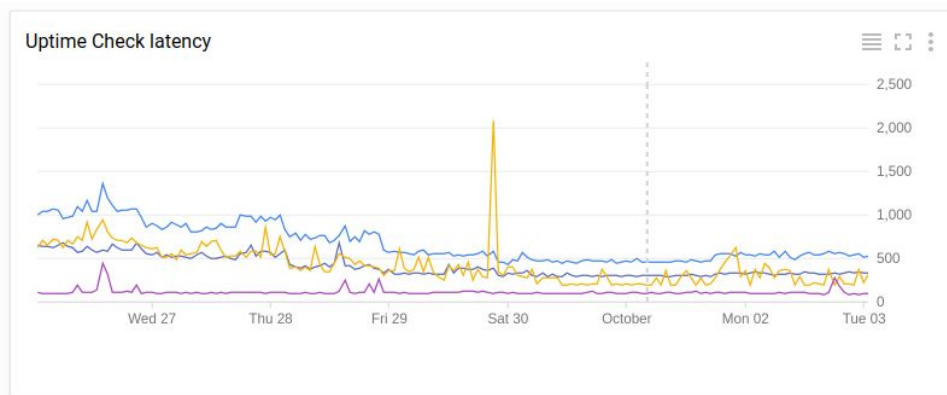
00:37:21.000 Process handleEvent

00:37:27.000 Process handleEvent



Stackdriver (2)

Sep 26, 12:44 am – Oct 3, 12:44 am [UTC +0200]



Conditions

More than 1 500 error a minute for 5 minutes

Violates when: `logging.googleapis.com/user/gclb_500_errors-connectedcars-production` is above a threshold of 0.1 for greater than 5 minutes



Cloud SQL (1)

- Managed mySQL/PostgreSQL
- 7 days automated backup
- Managed failover replicas/read slaves
- Automated upgrades
- Easy scaling



Cloud SQL (2)

✓ Configure machine type and storage

Machine type

For better performance, choose a machine type with enough memory to hold your largest table.



db-n1-highmem-4

vCPUs

4

Memory

26 GB

Change

Network throughput (MB/s)

1,000 of 2,000

Storage type

Choice is permanent.

SSD

Storage capacity

450 – 10230 GB. Higher capacity improves performance, up to the limits set by the machine type. Capacity cannot be decreased later.

450

GB

✓ Enable automatic storage increases

Whenever you're near capacity, space will be incrementally increased. All increases are permanent. [Learn more](#)

Disk throughput (MB/s)

Read: 216.0

Max.: 800.0

IOPS

Read: 13,500

Max.: 15,000

Write: 216.0

Max.: 303.0

Write: 13,500

Max.: 15,000

Close

MySQL queries

1 hour

6 h

12 h

1 day

2 d

4 d

7 d

14 d

30 d

Queries/sec

300

200

100

27 Sep

29 Sep

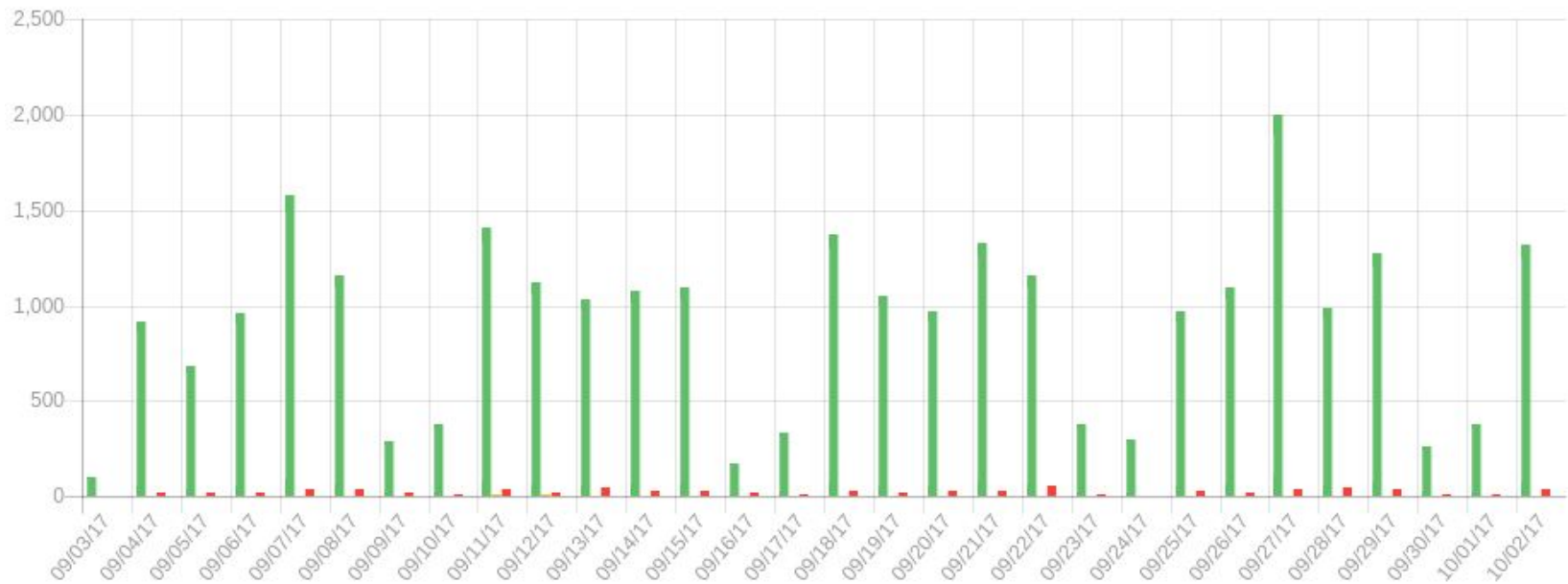
1 Oct

3 Oct, 00:55

MySQL queries: 101.886



Mailgun





Issues (1)

- Stackdriver Logging
 - Nested JSON makes it block the logging
 - Large message throws logs away (Fixed)
 - Not indexed (Slow for specific searches)
- Cloud support, get what you pay for
 - Being told to update to newest version even if it does not fix the issue
- Better help on github/google cloud slack



Issues (2)

- Cloud SQL
 - Failover single threaded, can't keep up at load
- Mailgun
 - Hotmail/outlook.com goes to SPAM by default
- Network setup much better than AWS, other services can be a bit less mature



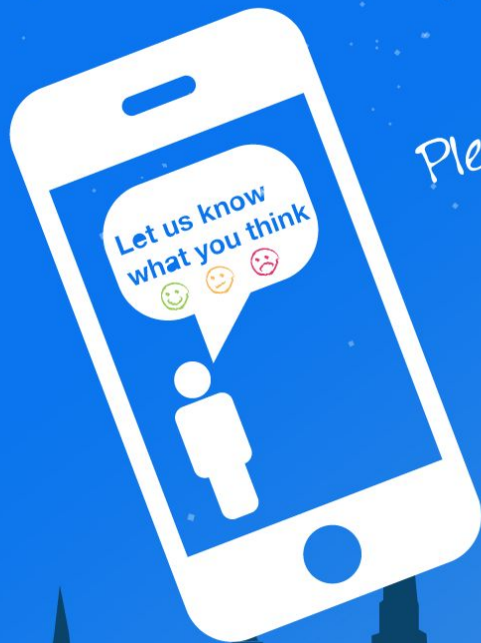
Not covered

- Source code/Issue tracking (Github)
- SMS (SMSGateway)
- Support (Intercom)
- Sorry...out of time (I hope)



Join us

- React native developer
- Lead Front-end developer
- Full stack developer
- Back-end developer



Please

**Remember to
rate this session**

Thank you!



Connected Cars:

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Troels Liebe Bentsen:

<https://www.linkedin.com/in/troelsliebebentsen/>

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