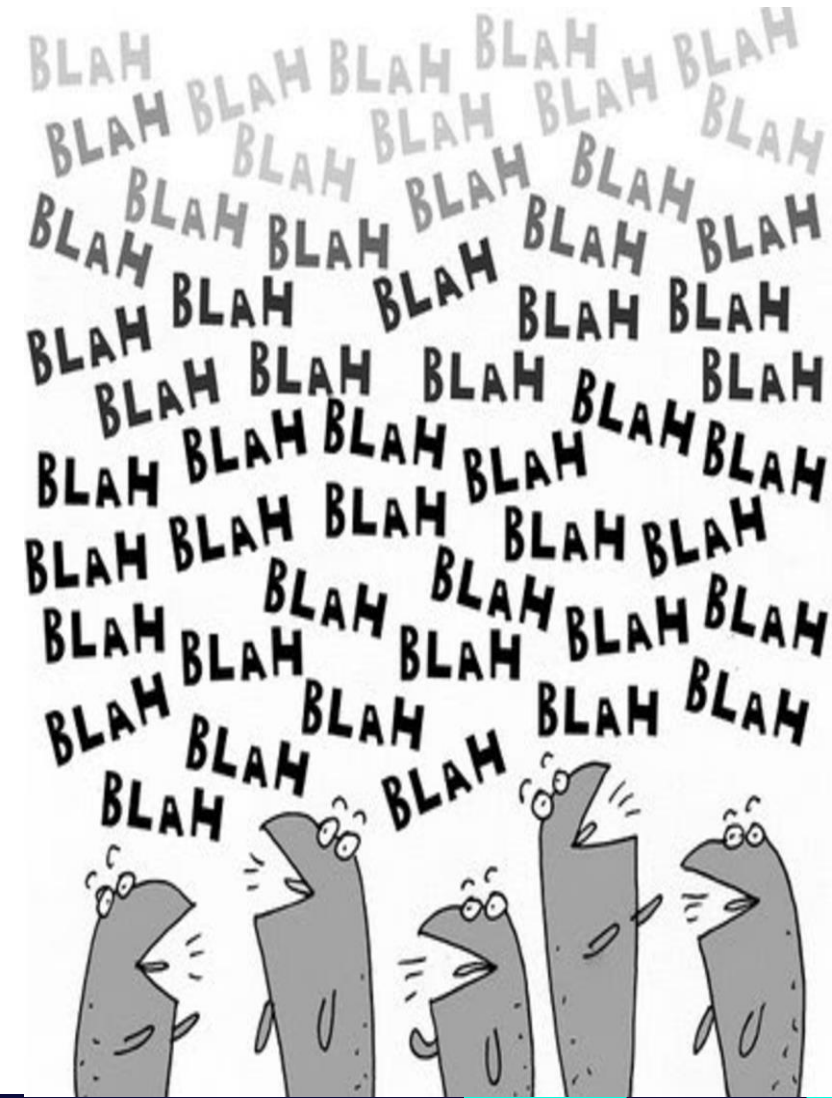


Datadriven innovation: Using trivial data in large quantities to provide new insights

Fagdager, Oslo 2018
23/04-18

Steen Garbers Enevoldsen, Head of Net R&D,
Fullrate

Big data: Lots of talk - little action



Of organizations who have invested in Big Data capabilities, only 8% is doing anything meaningful with their Big Data.

The rest is only using Big Data for incremental advances.

- Gartner 2014

Agenda - 3 items

Life as an ISP



Demonstration of CPEmon and
CPEmap



Payoff

Fullrate

- Subsidiary of Yousee

- 150.000 DSL and COAX-kunder
- 200.000 mobile customers
- 20.000 mobile broadband customers
- 30.000 IPTV customers
- DNA:
 - DIY
 - Agile
 - DevOps
 - Low cost

Agenda

Life as an ISP



Demonstration of CPemon and
CPemap



Payoff

The customer calls helpdesk...

“The Internet does not work”



Random error?



Is it an isolated fault?

- Or a systemic fault?

Types of faults

"THE NOISEFLOOR"

Isolated fault

- Only one customer affected
- I.e.: Same fault-type can occur at other customers, but are not correlated.
- Usually a local problem at the customer
- Or a mistake on Fullrate's part



Examples

- Router hardware fail
- Defective wire/connection in customer home
- The neighbor use a microwave oven.
- Moisture in installation
- Wallplug death by vacuuming (it happens more often than you'd think...)

Types of faults

Systemic fault

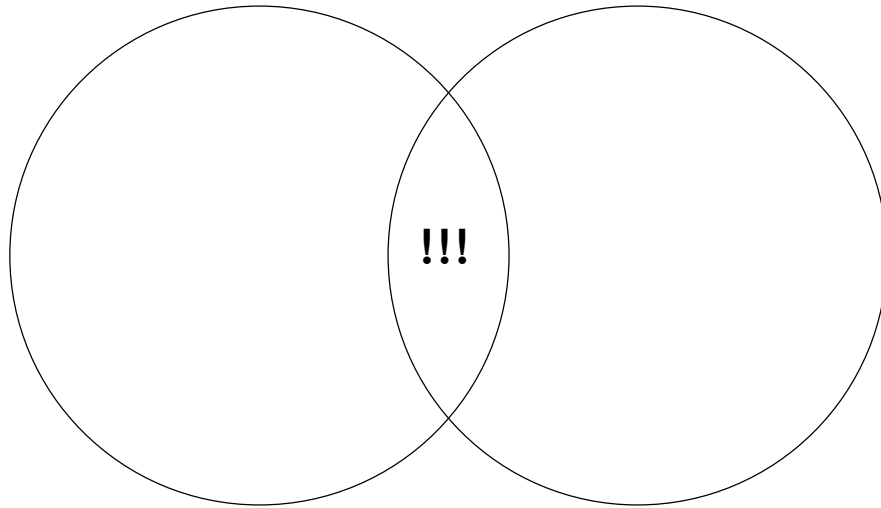
- Multiple customers affected
- Typically a fault further up in the network, or a physical problem in the neighborhood.
- Or a big mistake on Fullrate's part...



Examples

- Breakdowns in CO
- Cable dug over
- Lightning
- Power outages

Beware of the greyzone!!



The ex. From before: Router hw fault. You'd normally assume it's an unrelated event. But what if:

- Thunderstorms
- Over-voltage/transients in powergrid?
- Lots of new customers during short period, and all CPE's are from same production batch?
- ... Remember to keep an open mind! It is very easy to miss insights due to prejudice.

Agenda

Life as an ISP



Demonstration of CPemon and
CPemap



Payoff

CPEmon

- proactive surveillance of all lines

How to loose a customer in ten days



**"Issues with the TV
signal last night"**

**"We will send
you a new STB"**

**Hmm.....
DSL line
looks
perfect..**

NPS=10

NPS=Net Promoter Score (measure of customer satisfaction)

3-4 days later: The customer received the new STB



"The new STB didn't help. I still experience problems"

"We will send you a new router"

The DSL line still look perfect. If it is not the STB, it must be the CPE.



NPS=7

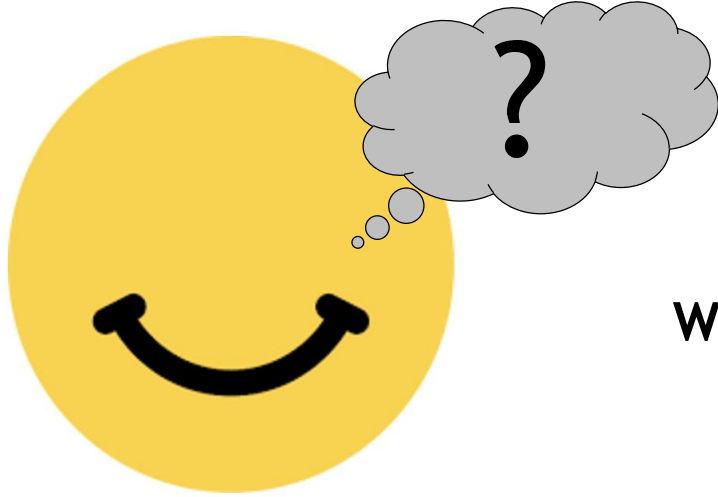
Again 3-4 days have passed



NPS=1

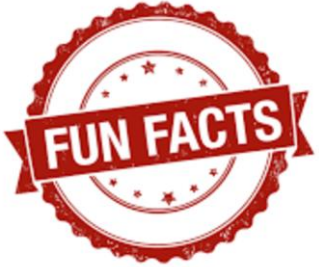
CPEmon

Proactive collecting of data



We need sufficient data for analysis

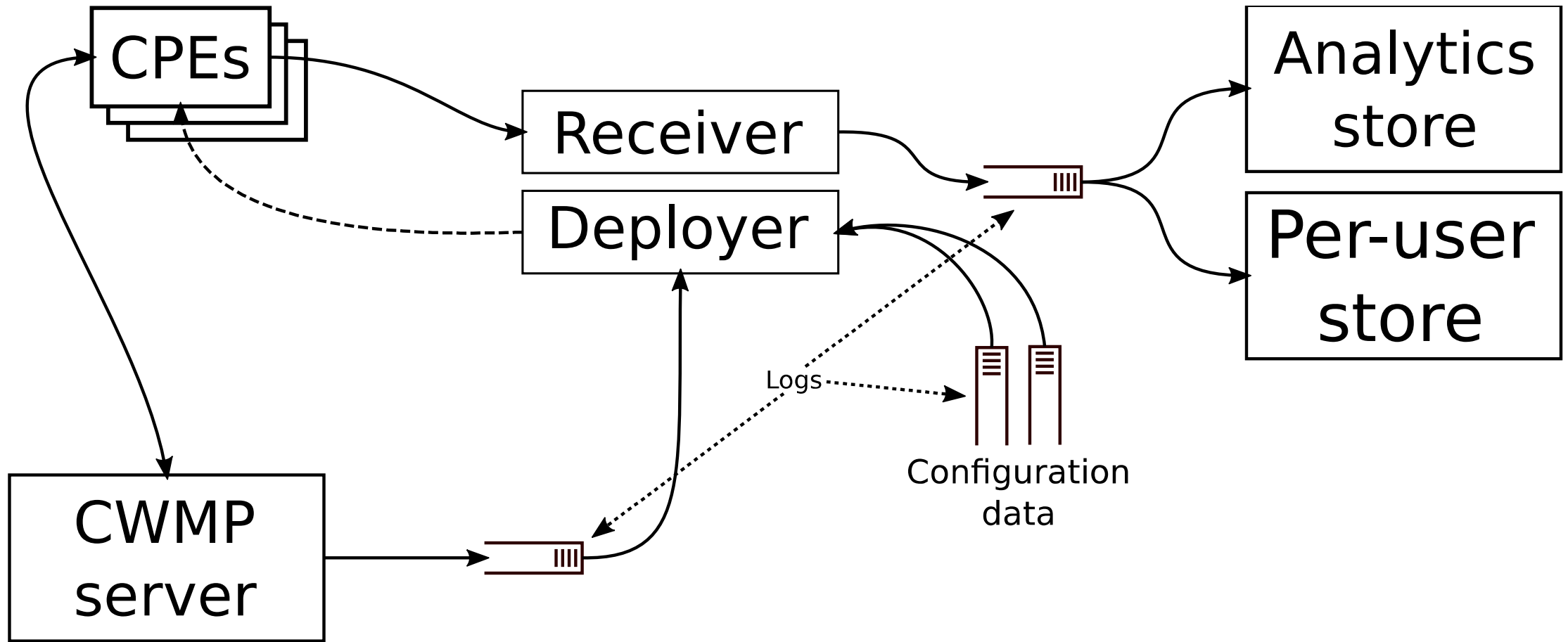
- Before the fault occur, so a history/baseline can be established and facilitate diagnostic/analysis
 - During the call
 - Better still, to resolve the issue before the customer makes the call.



Approx. 2,5 billion pieces of data collected every 24 hours

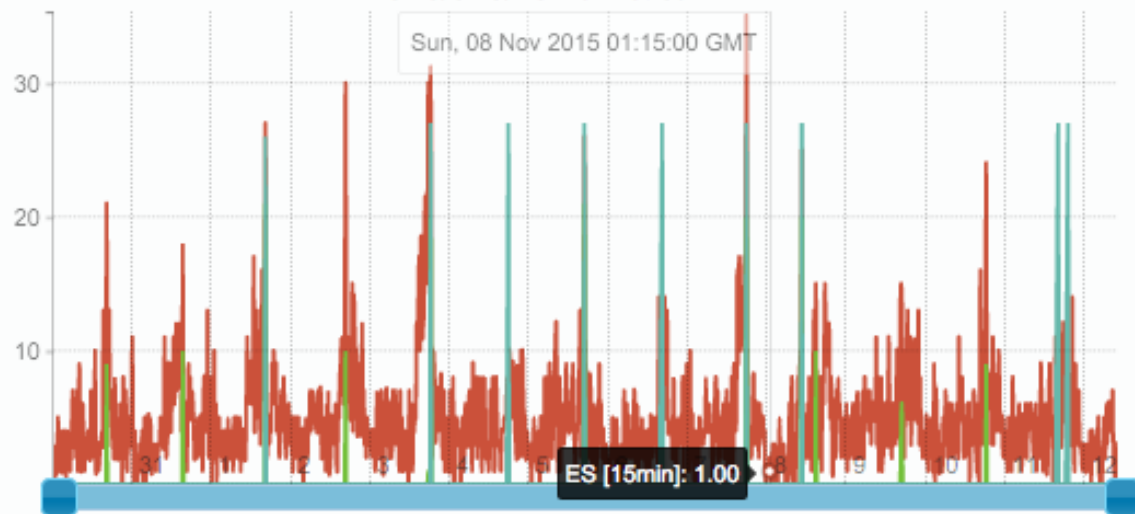
- Data from all customers
- Sample-interval: 15 minutes
- CRC, FEC, SNR, bitrate, CPUload, etc.
- 2-week history stored with customer ID as key, so support have easy access to history for specific customers.
- Aggregated data stored in Hadoop cluster with “infinite retention”

CPEmon, systemarchitecture

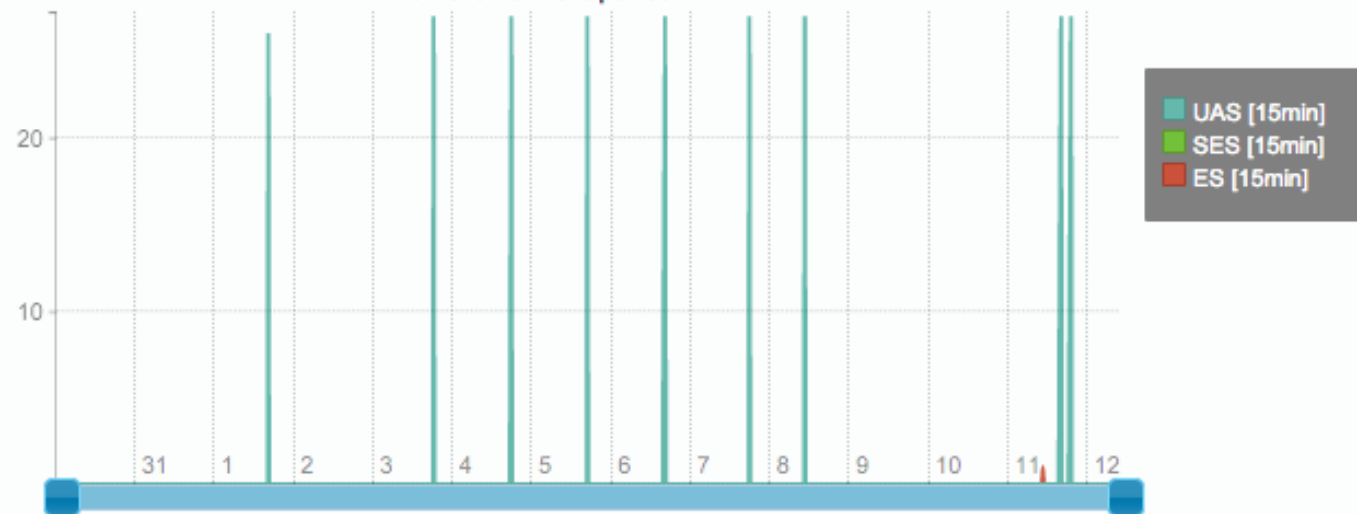


UAS/SES/ES Downstream

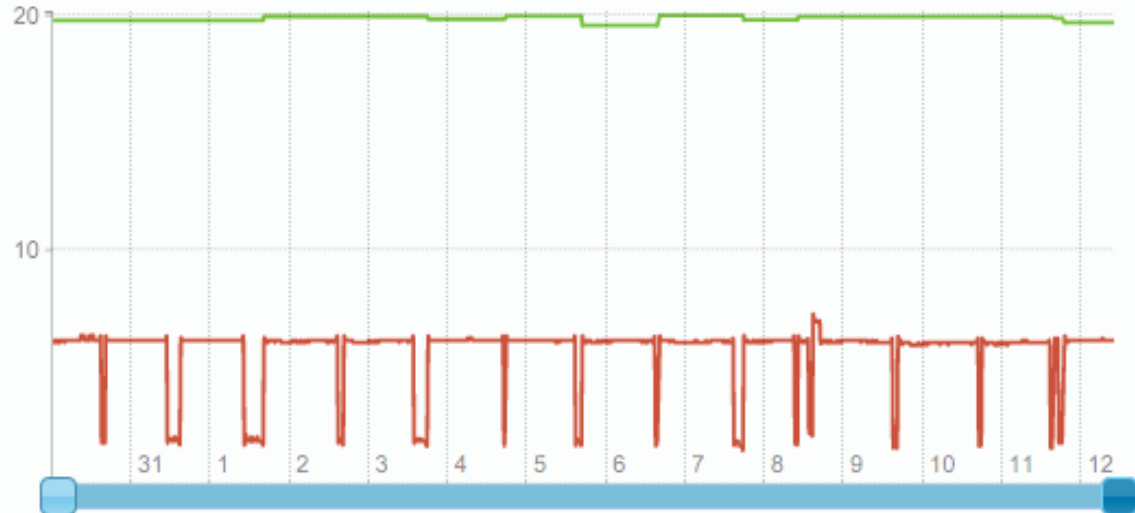
Sun, 08 Nov 2015 01:15:00 GMT



UAS/SES/ES Upstream



Rate/SNR Downstream



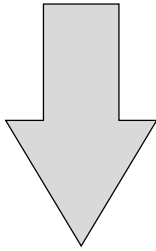
Rate/SNR Upstream



Helpdesk loved the tool!

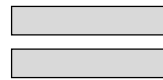


From prototype to production

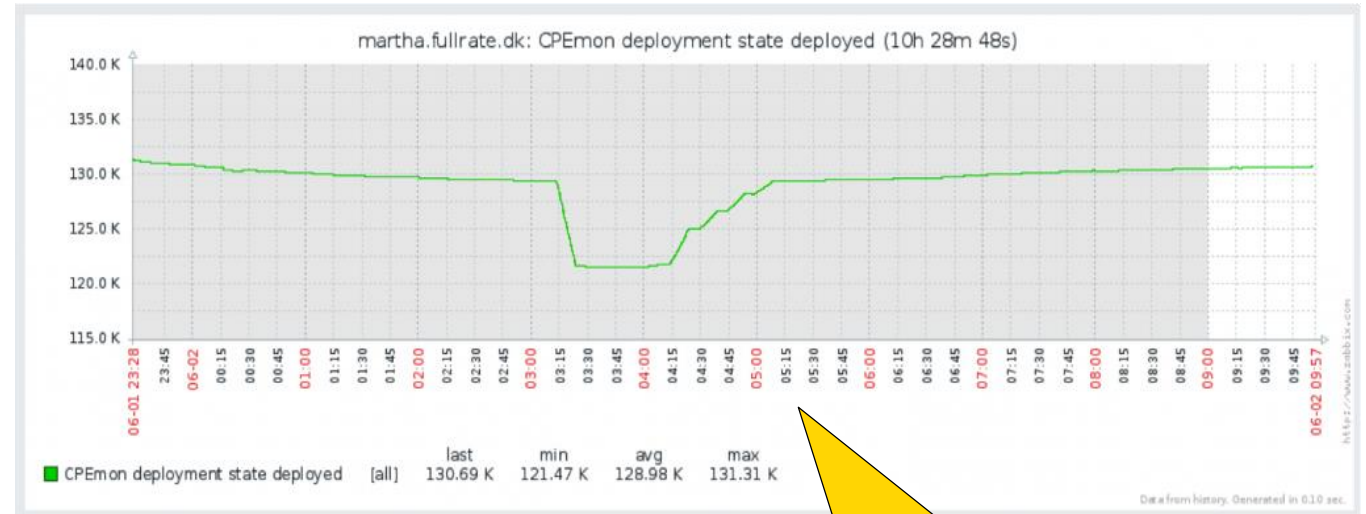


Stability, Accessibility, Uptime

(CPemon is volatile = disappear at boot)



Monitoring



“Data on the data-collection”
= METADATA



Metadata from CPEmon - An unforeseen spin-off

Meta data reduce risk of mistakes when doing network maintenance

Operating a network: Upgrading core routers, Reallocating IP groups, Capacity upgrades, etc.

Many customers potentially affected, so work is done during night hours.

Are all customers online after change implemented?

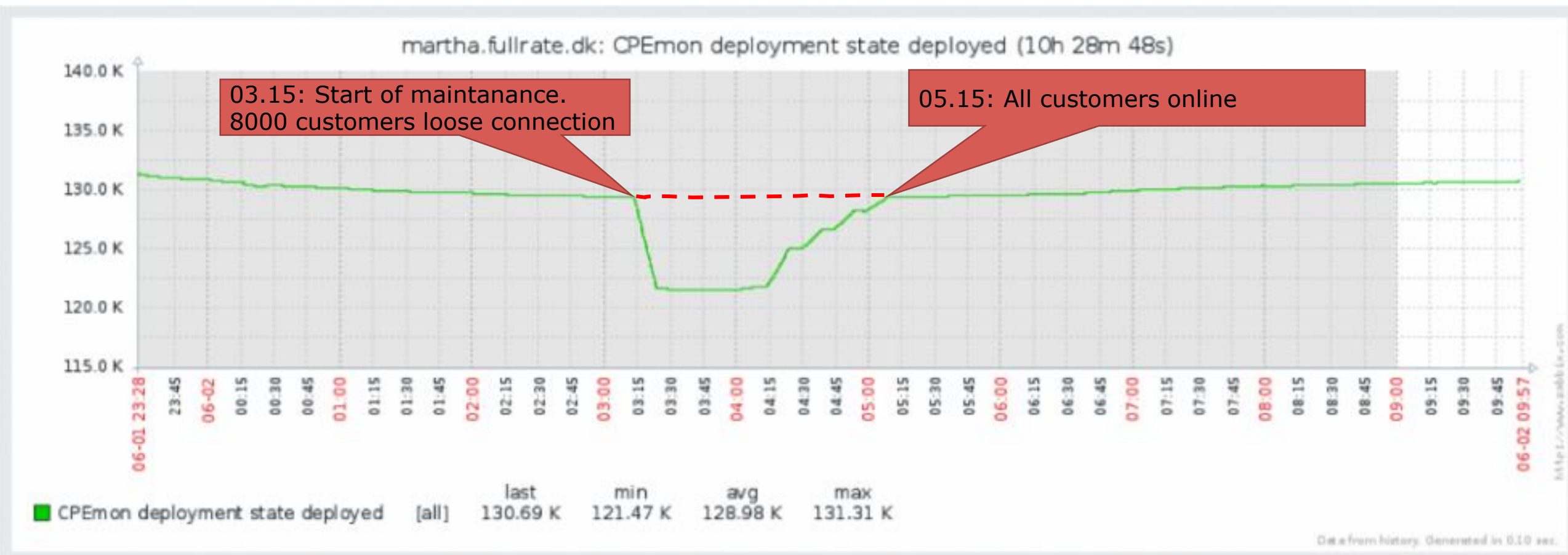
Impossible to manually check 10.000 customers.



Choose sample group and only verify those.

- Risk of missing group of customers
- Time consuming
- Network engineers tired
(Check typically happen at 4-5 am after hours of work)

Are all customers ok after completed maintenance?



Maintenance is planned, but how about unplanned events?

Link-down event detected



How many are affected?

(Assessing severity of problem)

Who are affected?

Precise and prompt service status updates
SMS directly to all affected customers

Unknown source of service outage

- Link-down or equipment failure: Quite easy to find affected customers
- “Many calls to helpdesk complaining about “no internet”... How to find the reason?



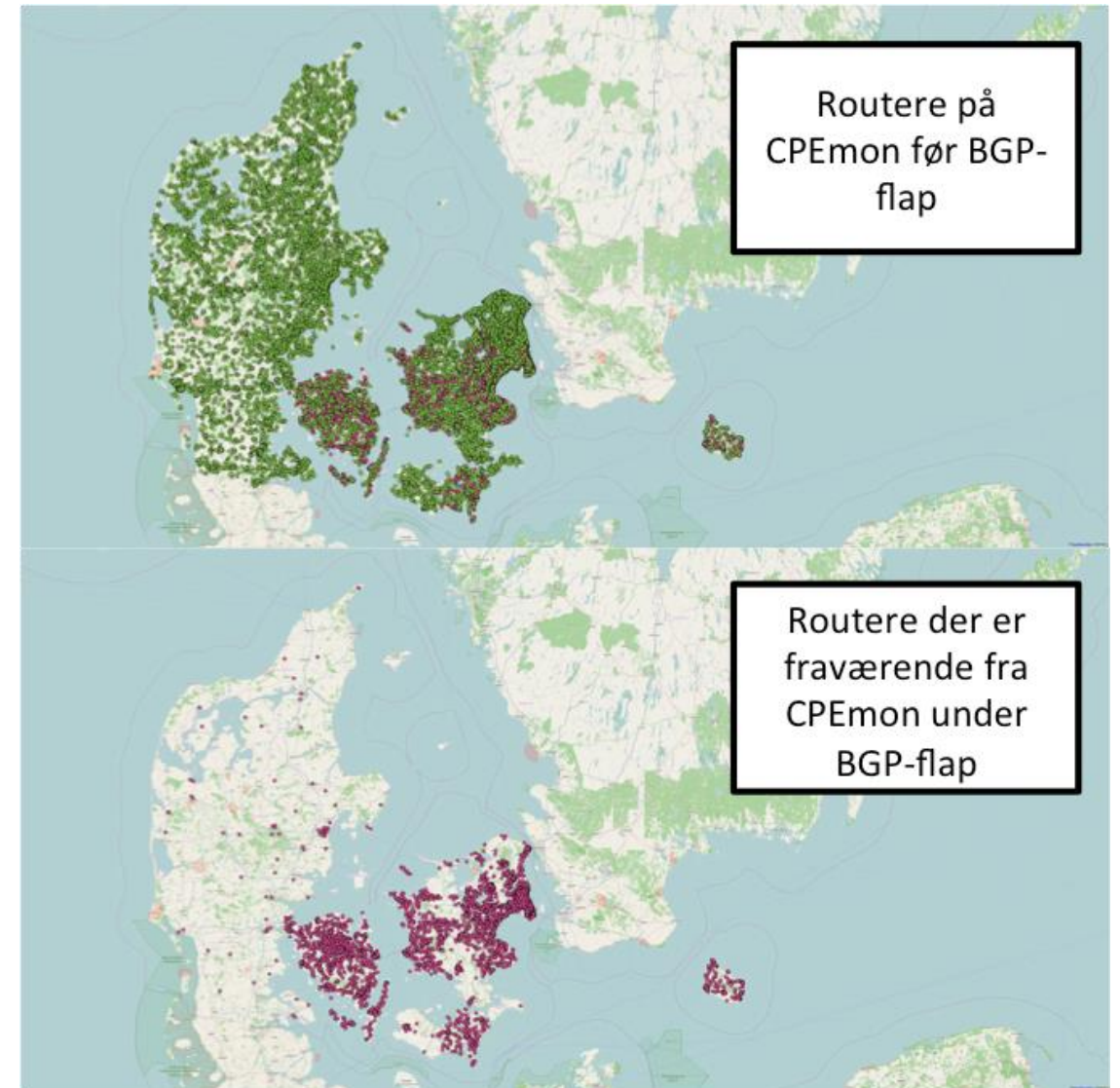
14.000 subs briefly offline, but who?

Enrichment of data!



Can we merge with other information?

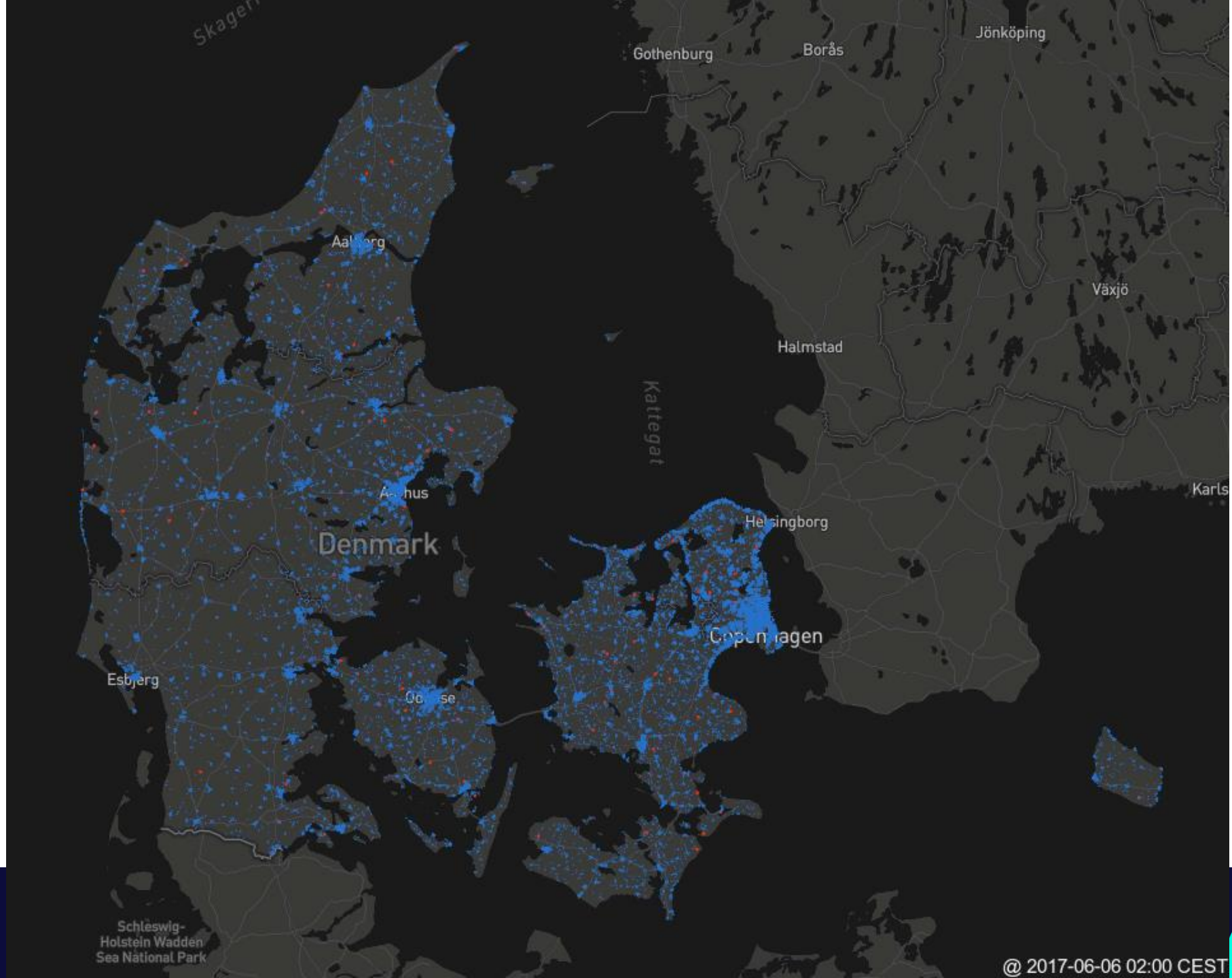
- Technology (RK / eBSA) ✗
- Router model ✗
- Address ✓



How lightning affect DSL lines

DEMO





CPEmap

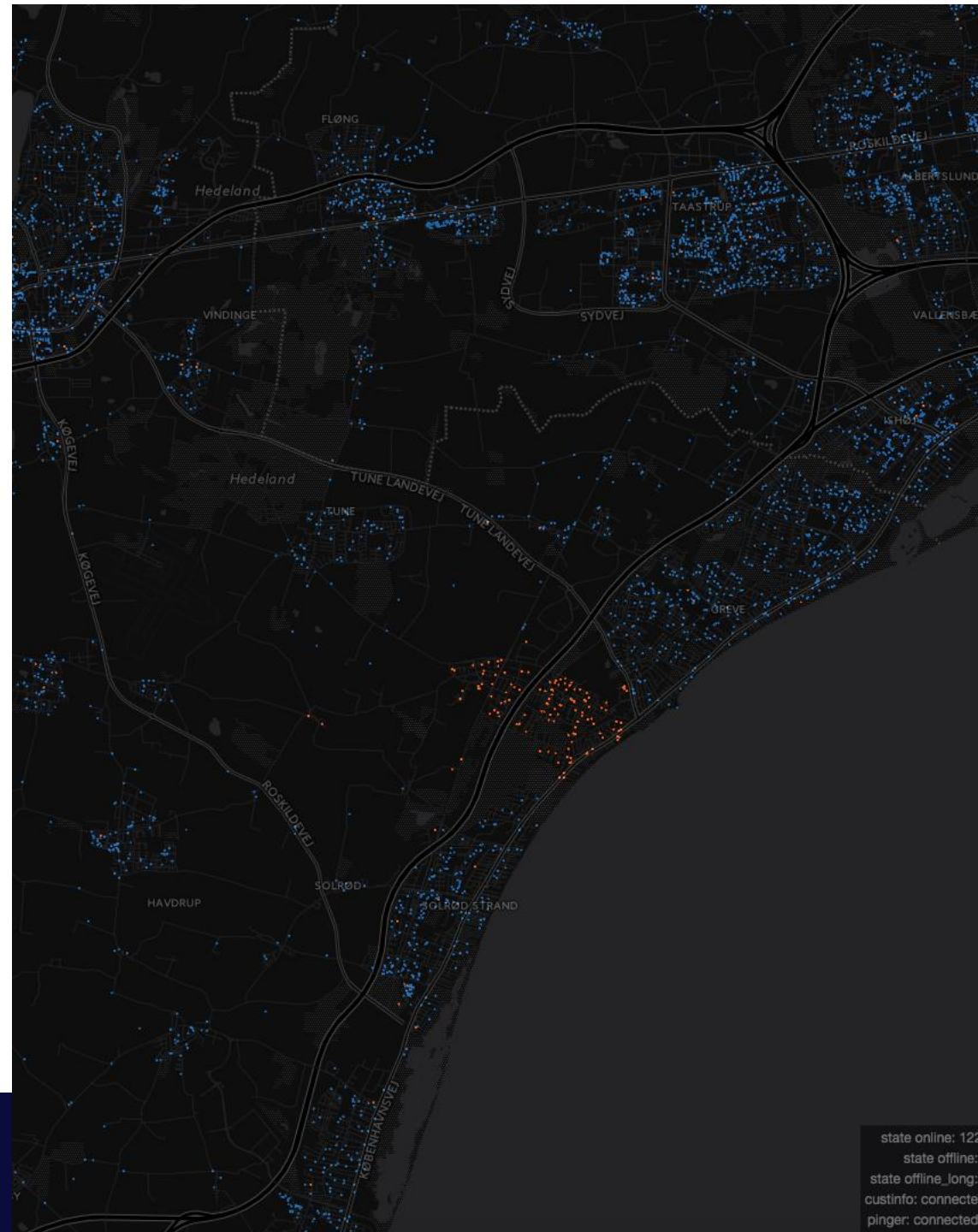
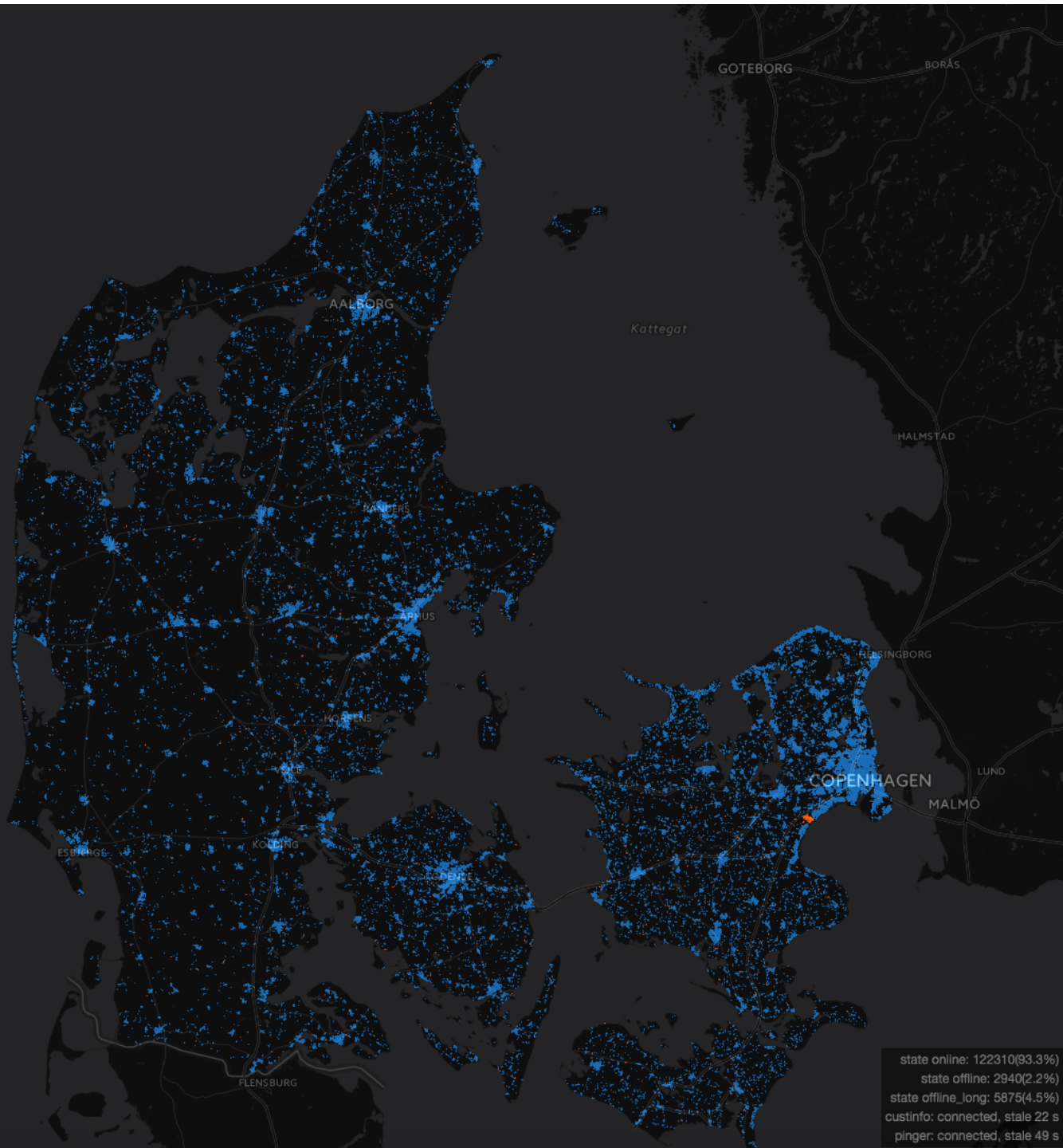
- Yet another unforeseen spin-off



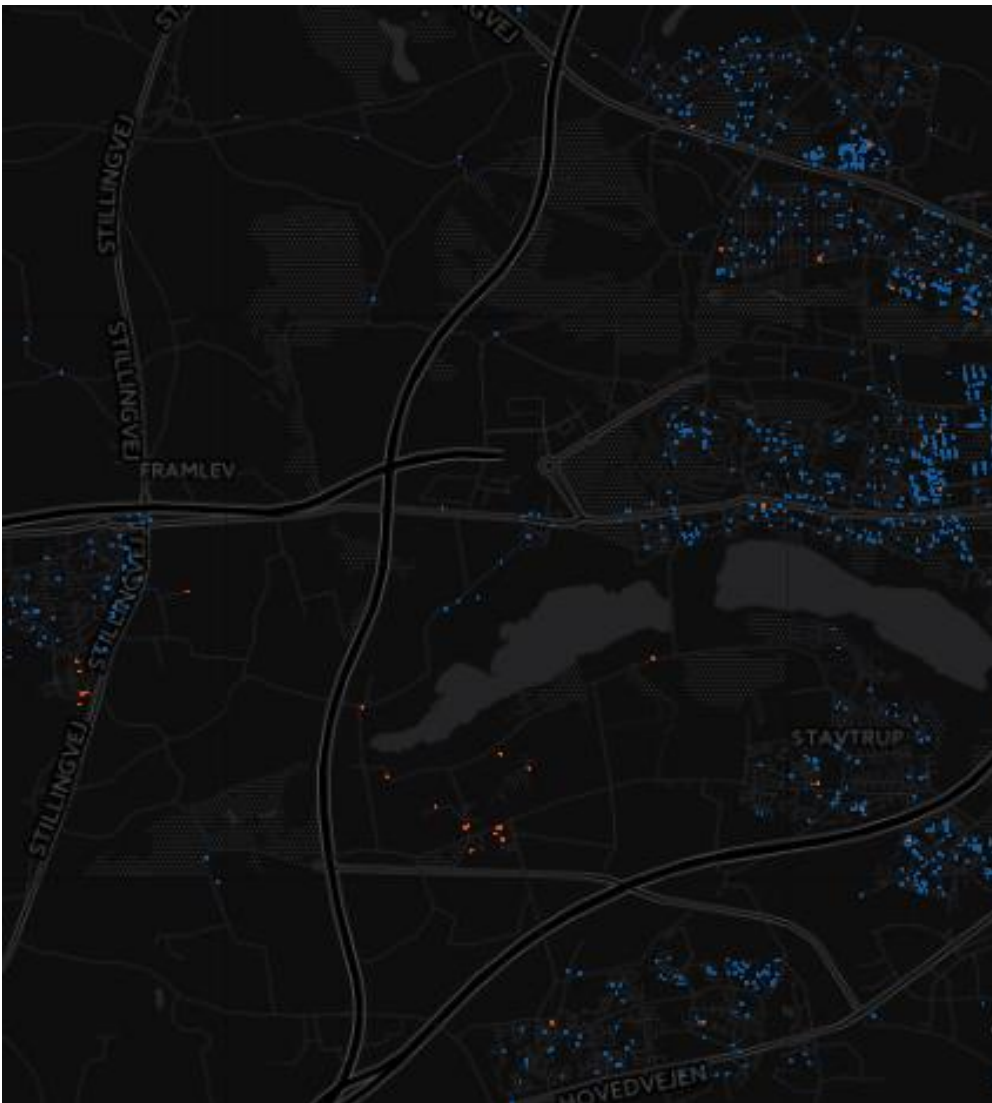
Merging trivial data
with geo lokation

- *in realtime!*

DEMO



Power outage

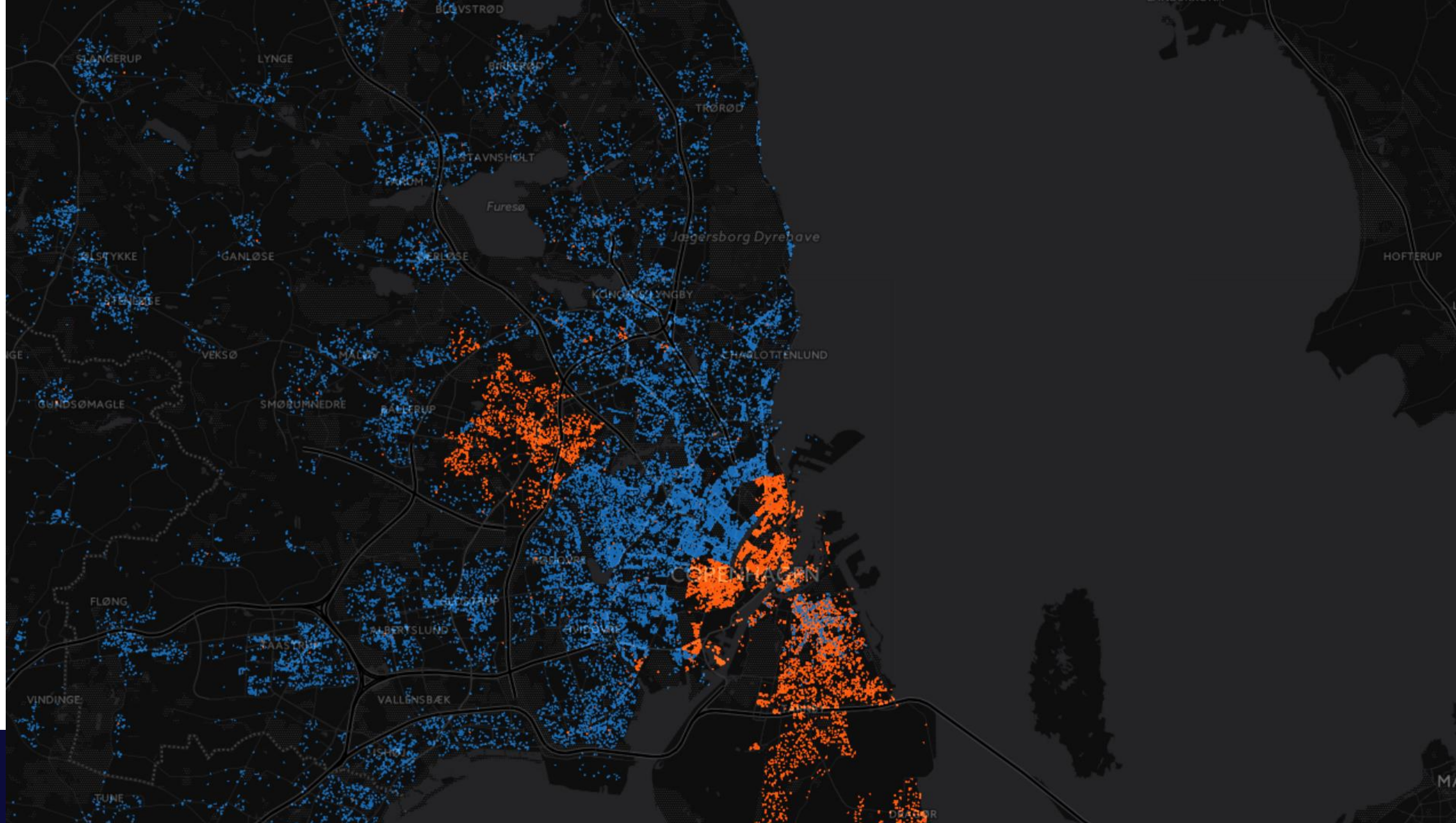


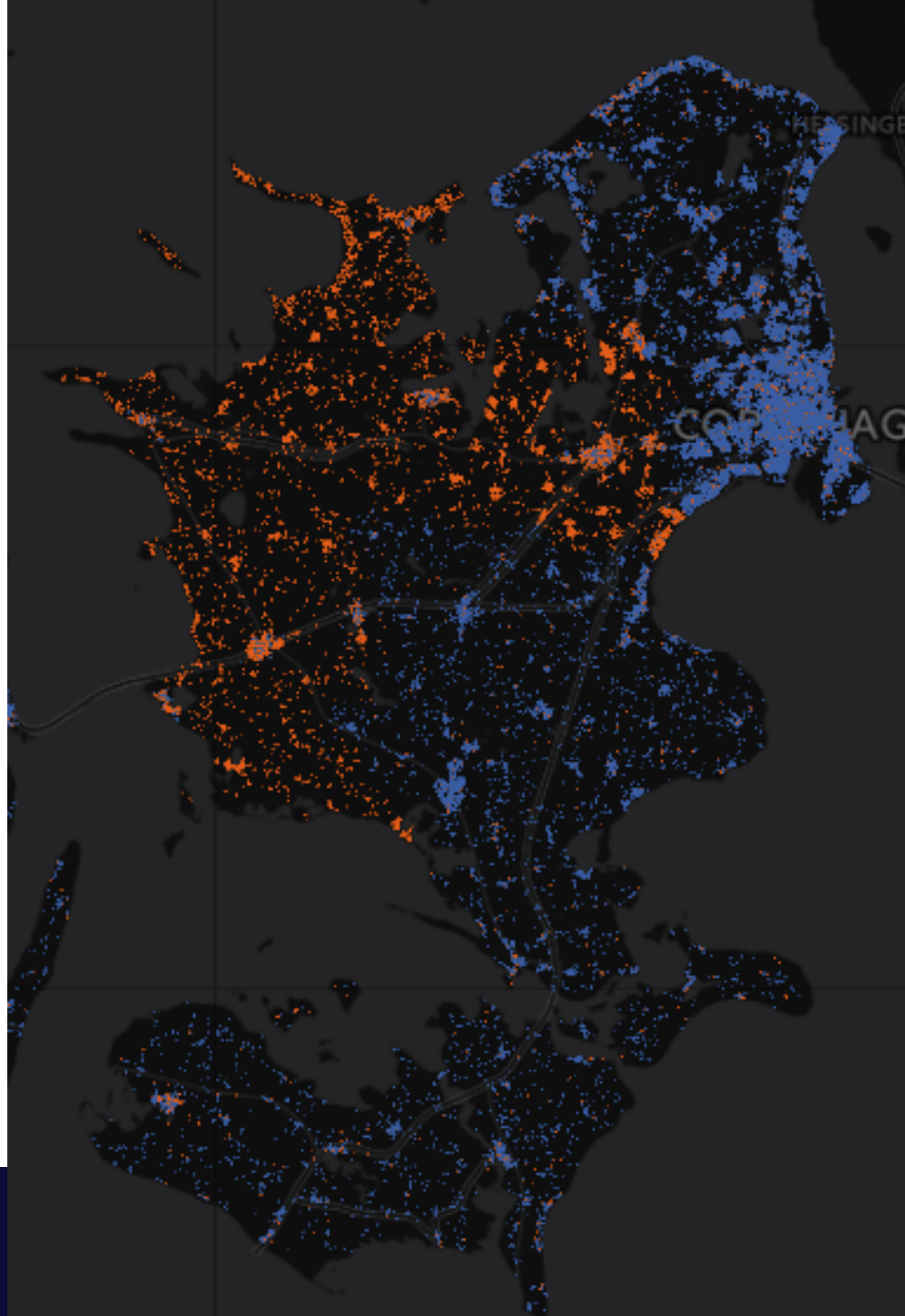
Forventet slutdato: 22-08-2016 kl 09:30
Årsag: 10 kV. Kabelfejl
Afbrudte kunder: 438
Type: Uvarslet
Kommentar: 10 kV. kabelfejl i området omkring Harlev

Netselskab for dette område
AURA El-net
Tlf: (+45) 87 92 55 66
elnet.aura.dk

AURA
el-net

A map showing the location of the power outage. A red lightning bolt icon is placed over a red-shaded area. The map includes labels for 'Harlev', 'Ornslev', 'Årslev Engsø', 'Brabrand', 'Gellerup', 'Stavtrup', 'Gellerupparken', 'Brabrand', 'Seholmvej', and 'Tilst'. A red pin is located near 'Brabrand'.



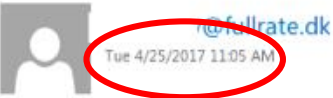


CPEmap = Visualization

- Because humans have an extraordinary ability to spot deviations in patterns

... but an algorithm never sleeps and is always vigilant

Power outage in Tølløse



Tue 4/25/2017 11:05 AM

To: Steen Garbers Enevoldsen;

1 alert for alertname=cpemap_co_outage

[View in AlertManager](#)

[1] Firing
Labels
alertname = cpemap_co_outage
co = toe
poi = hk
severity = warning
state = online
tech = EBSA
Annotations
description = Only 56(43.1%) of daily max 130 users online on CO toe(POI hk).
summary = Many users (56.9%) offline on CO toe
[Source](#)

Sent by AlertManager

Forventet sluttid: 25-04-2017 kl. 13:30

Afbrud i Ringe
Type: Planlagt
Starttid: 19-04-2017 kl. 12:00
Forventet sluttid: 19-04-2017 kl. 15:00

Afbrud i Tølløse
Type: Uvarslet
Starttid: 25-04-2017 kl. 11:21
Forventet sluttid: 25-04-2017 kl. 13:00
Faktisk sluttid: 25-04-2017 kl. 12:01
Berørte postnumre: 4340
Afbrudte kunder: 1620
Årsag: Strømafbrydelse i Tølløse

Netselskab for dette område
SEAS-NVE Net A/S
(+45) 70 29 20 24
www.seas-nve-net.dk

seas-nve
Net A/S

Afbrud i Brovst
Type: Varslet
Starttid: 25-04-2017 kl. 09:00

The payoff



The payoff

- As always, difficult to calculate exact amount, but
 - Reduced number of unnecessary equipment-swaps, and hence savings on {hardware, p&p, refurbishment, handling}
 - Fewer 2nd calls to helpdesk
 - Shorter telephone queue/duration of calls
 - Higher NPS
 - Lower churn
- Customers love proactivity!!
- Drives data-centric culture inside org.



EOF

Questions/

comments: ste@fullrate.dk (tel: +45 42124288)

SoMe:

Youtube: <https://www.youtube.com/c/nørdoteket>

Blog: <http://www.nørdoteket.dk/>

Linkedin: <https://www.linkedin.com/in/steen-garbers-enevoldsen-6662235/>

Facebook: <https://www.facebook.com/en.noerds.b>

Twitter: <https://twitter.com/steenenevoldsen>

Instagram: <https://www.instagram.com/noerdoteket/>



If there is time...

