

CSP SIM Density Map Serving UAS Operation Safety

EASA Population Density Workshop
6th Oct 23

Per-Gunnar Andersson (Ericsson)

Network Location Business Development Manager

Philipp Eder (Swisscom)

Head of Drones & Robots Swisscom Broadcast

Gerdy Seynaeve (Proximus)

Innovation Manager

Lilly Wen (Ericsson)

Digital Airspace Service Exposure Expert



Content



- Introduction
- **Ericsson** – Global
 - European and Global Telecom landscape
 - Telecom industry SIM density capability yesterday, today and tomorrow
- **Swisscom** – Switzerland
 - Today real drone operation with SIM density map for flight planning and approval with SORA
- **Proximus** – Belgium
 - Today SIM density map in use with real case population studies on KPIs
- **Ericsson** – Global
 - Telecom Privacy and Security
 - Telecom API monetization and aggregation service consumption
- Conclusion Highlights

Ericsson 5G Global Map

Ericsson official

[Click here for Ericsson view of 5G live networks](#)

Fastest

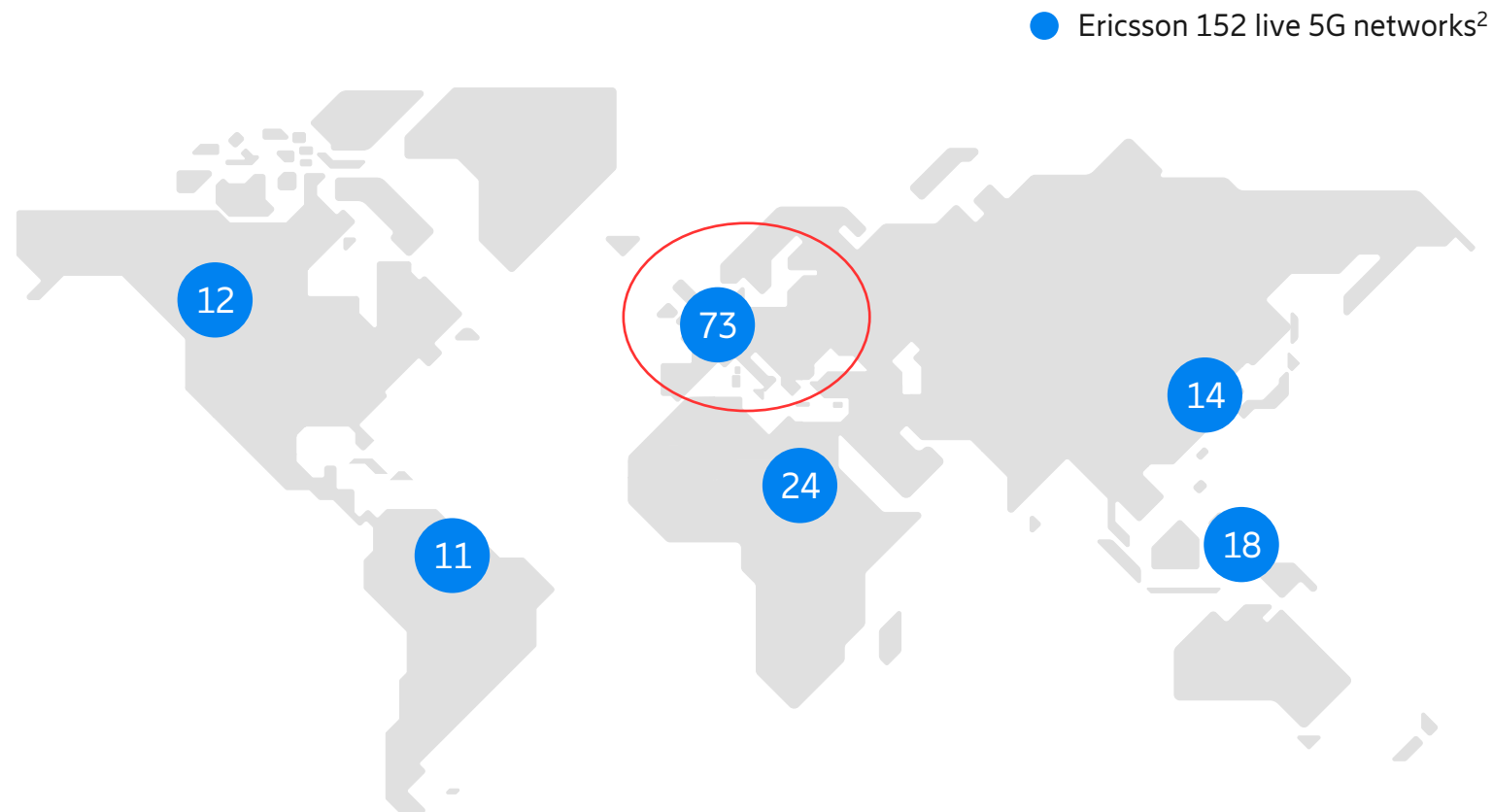
growth of any mobile generation with 1.5b subscribers in 2023 and 4.6b in 2028¹

50% traffic

Around 50 percent of the world's 5G traffic, outside China, is carried over Ericsson's radio networks

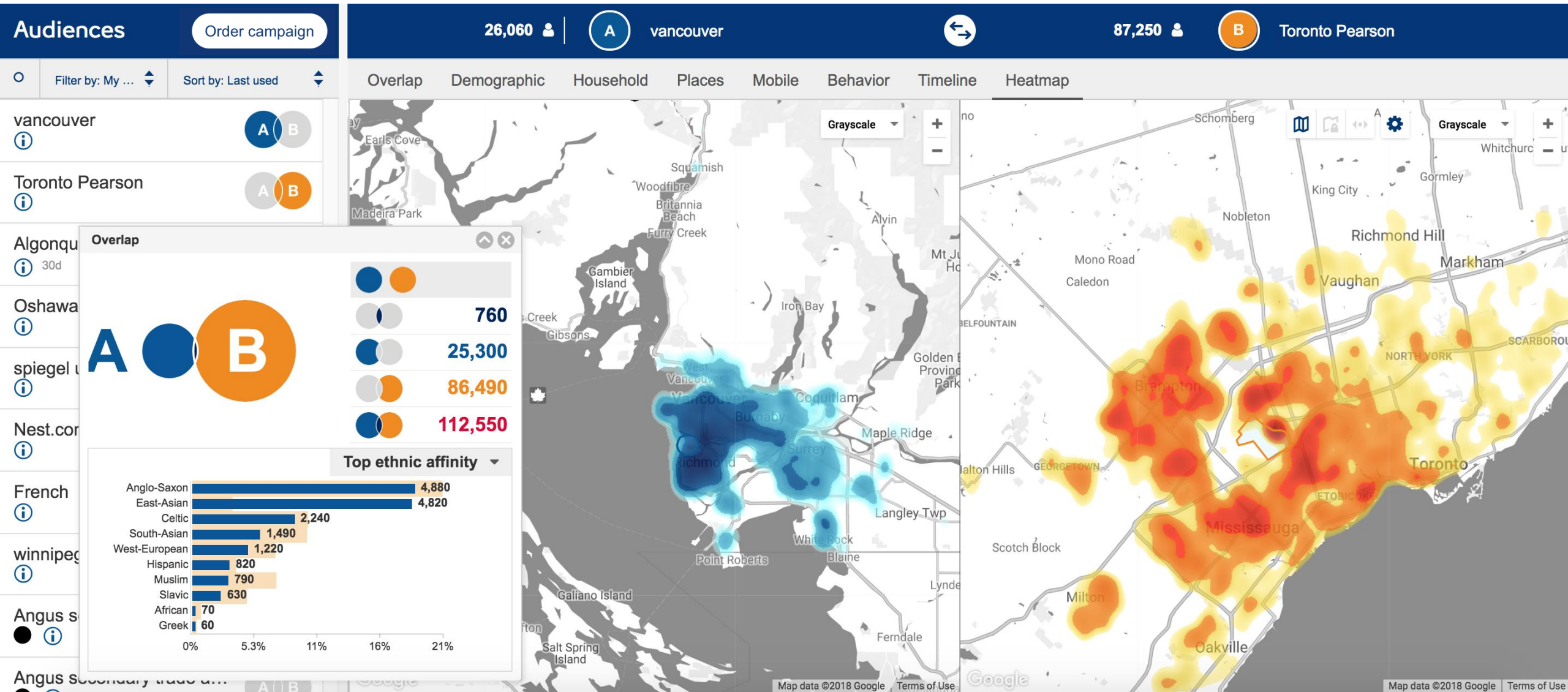
Performance leader

Gartner Magic Quadrant 2023, 5G NW infrastructure
Frost Radar™: Global 5G Network Infrastructure Market, 2023



Ground risk analysis – subscriber density

Historical, real time and prediction



Ericsson journey on location analytics



Real time traffic information
GSM



2000...



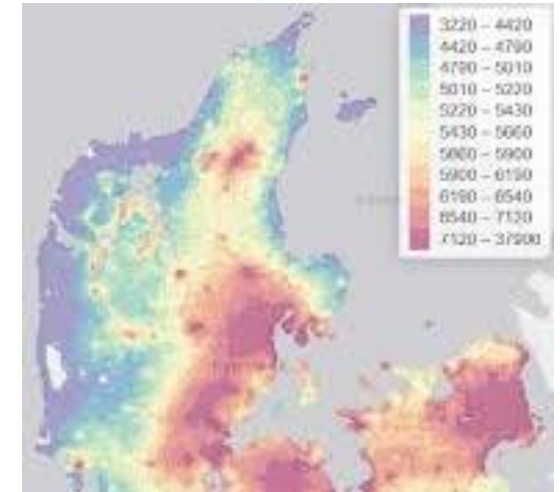
Location based mass SMS
+WCDMA



2010...



SIM density
+LTE



2020...

ANONYMOUS NETWORK LOCATION FOR SIM DENSITY (GROUND RISK ANALYSIS)



Fully Anonymized Data

- › **Unique scrambled identity** with managed time duration to support trajectories

All subscribers included

- › **All connected device** creates events – radio network generated
- › Including roaming devices (travelers)

Real time

- › Location API stream provided **within seconds** from time of event

Frequent updates

- › **updates every minute**, typically, but varies somewhat with user behavior

Enhanced accuracy

- › **Accuracy Range 200m-1000m** with Enhanced Cell ID
- › optionally boosted by fingerprint database with Adaptive Enhanced Cell ID. **Accuracy range 50m-500m**

Flexible Deployment

- › Local Area, State and / or Nation wide (all radio)



Real Time Data



Secure & Anonymized



Open application interface



Statewide Coverage

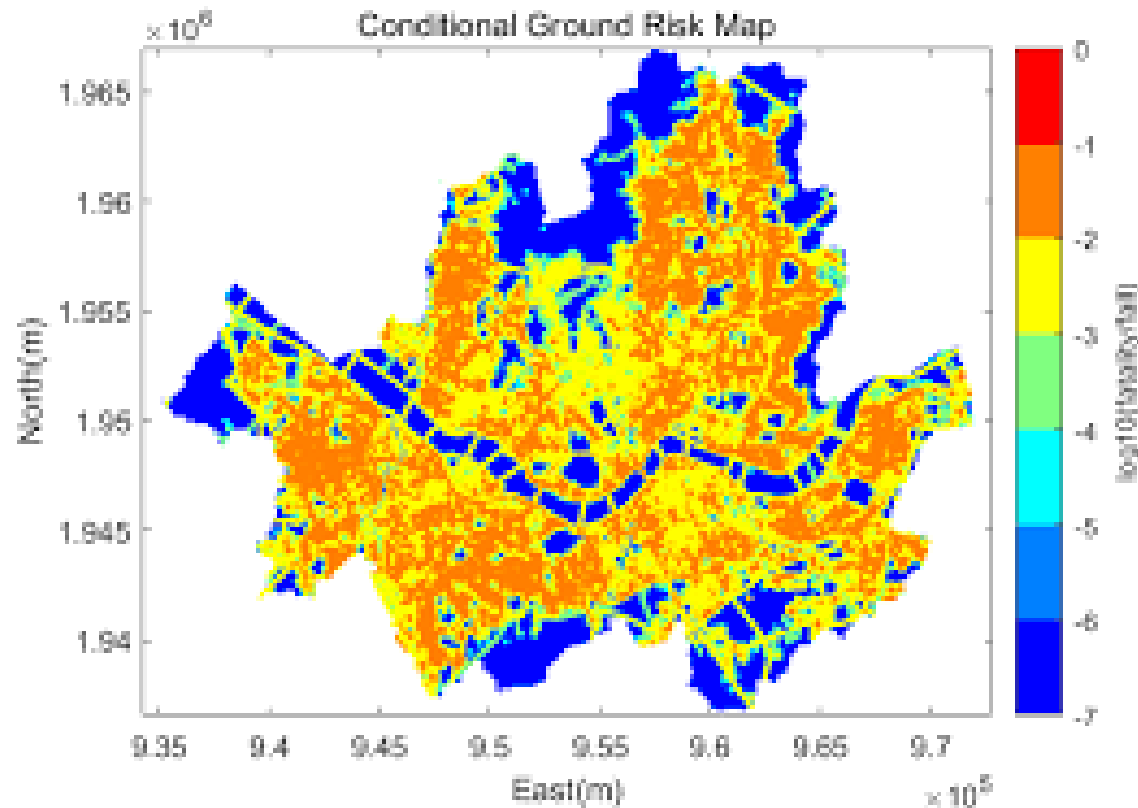


All Subscribers



Accurate and Frequent

Ground risk analysis – potential evolution steps



- Today we can evaluate location data in real time (as well as historical data)
- There's more to explore
 - Is the subscriber
 - Indoor & outdoor?
 - On a train/bus/etc?
 - Accuracy improvements



Drones Services

Philipp Eder

Head of Drones & Robots

Swisscom Broadcast

swisscom



**Support from a
bird's eye view**



«Good Guys»



«Bad Guys»



Using drones
for more safety
and efficiency.



Trespassing

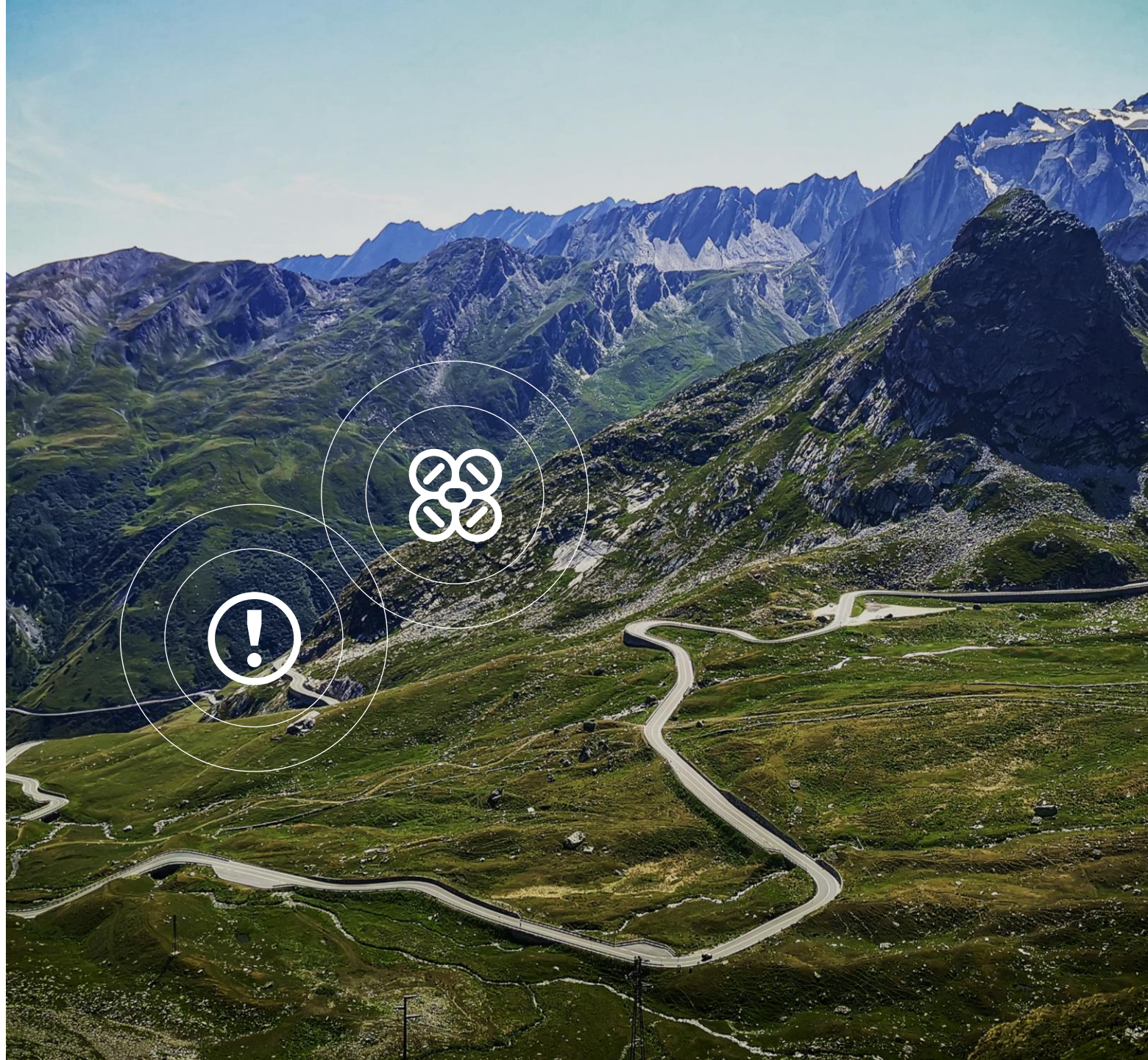
Intruder or just the postman?





Patrol in rough terrain

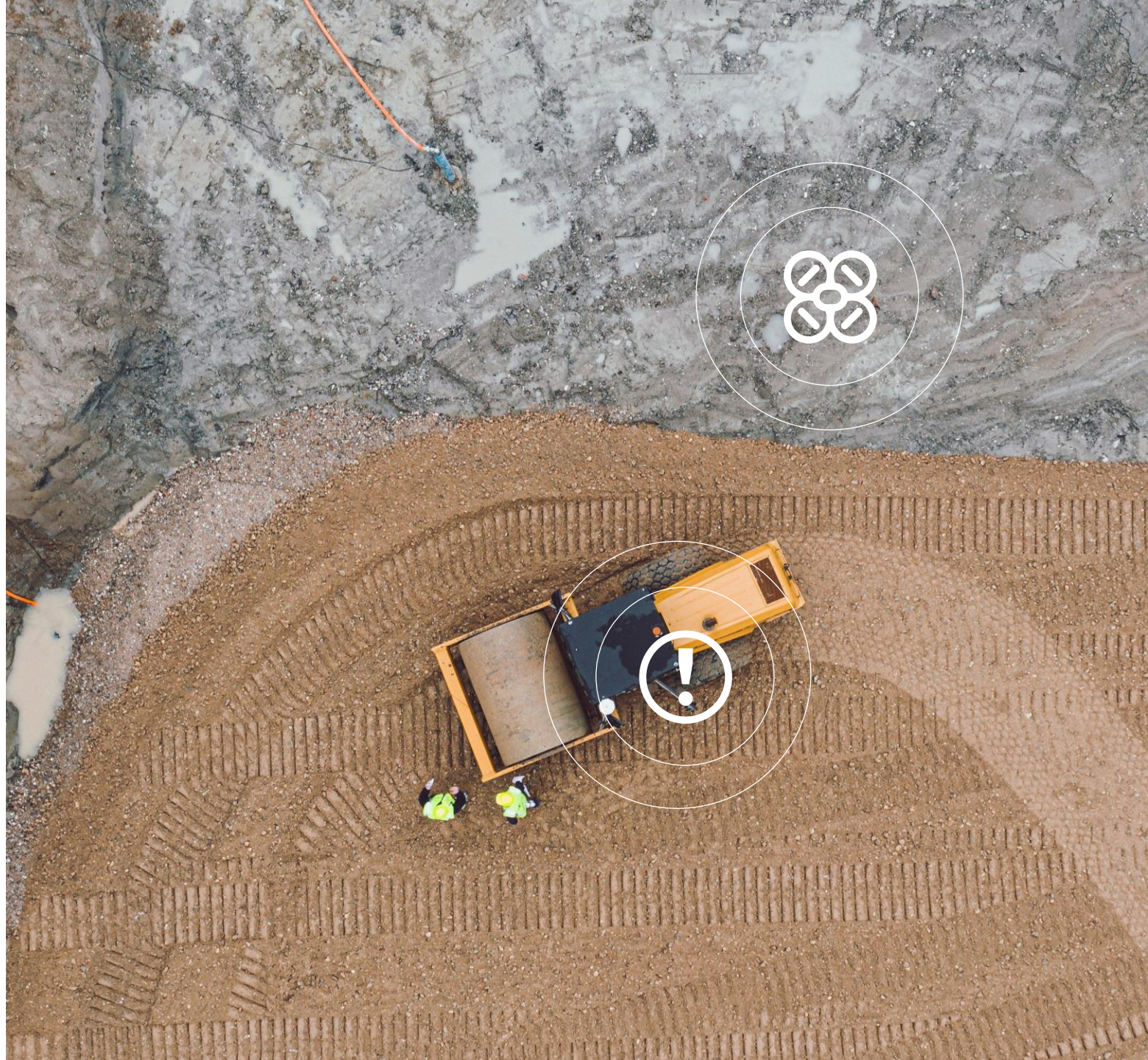
or automated
inspection?





Construction site monitoring

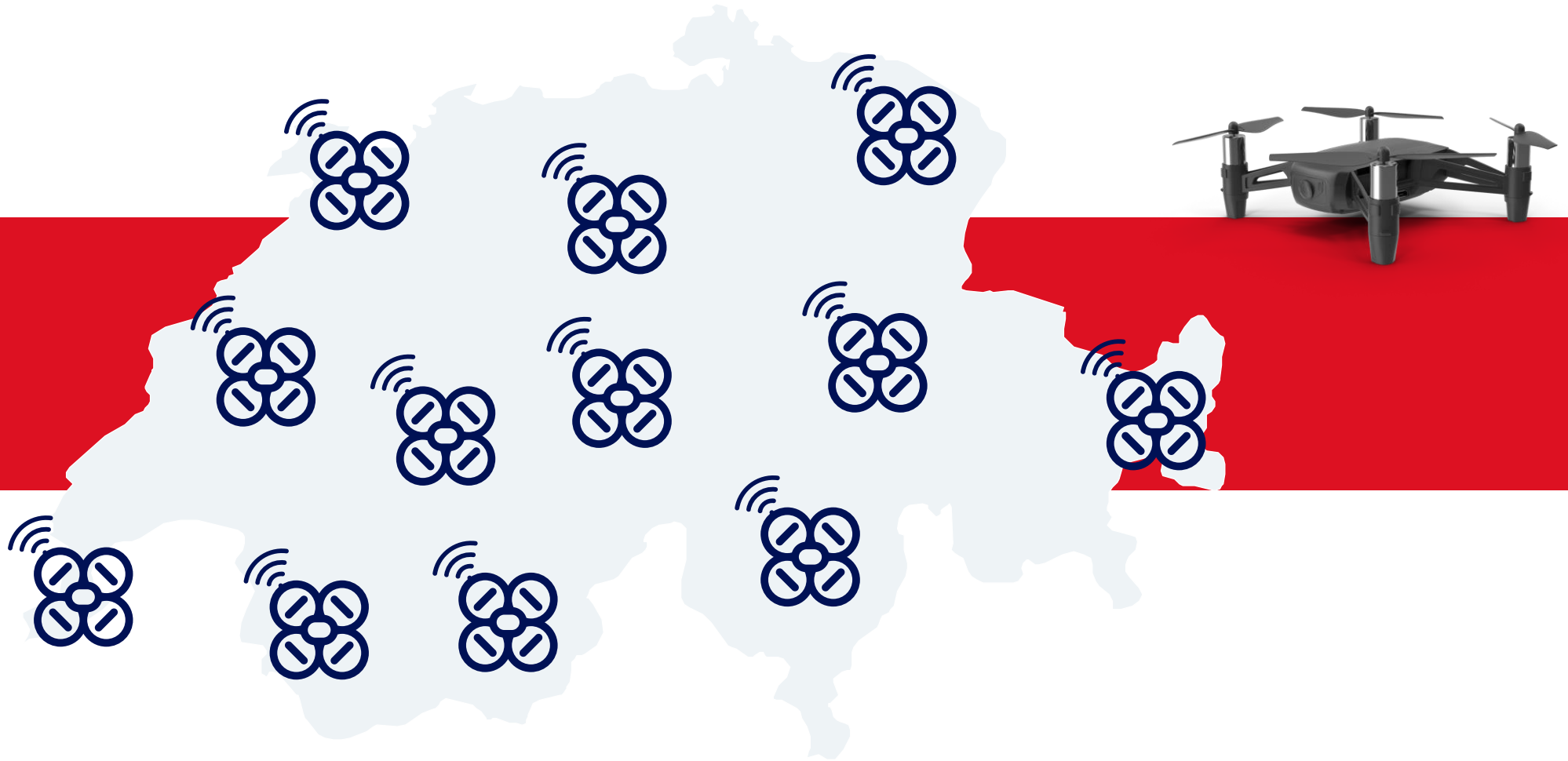
Drone-based
asset tracking





Outlook Drone Operation Services

Scaling via 5G-based drone network (BVLOS Operations)

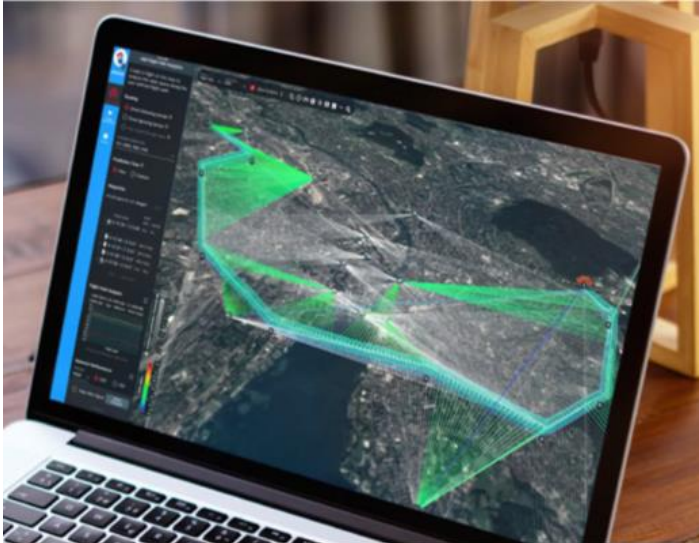




Drone Operation Services

Safe conduct of a drone flight

Mobile Coverage



Secure connection

People Density



Minimise risk

AirScout



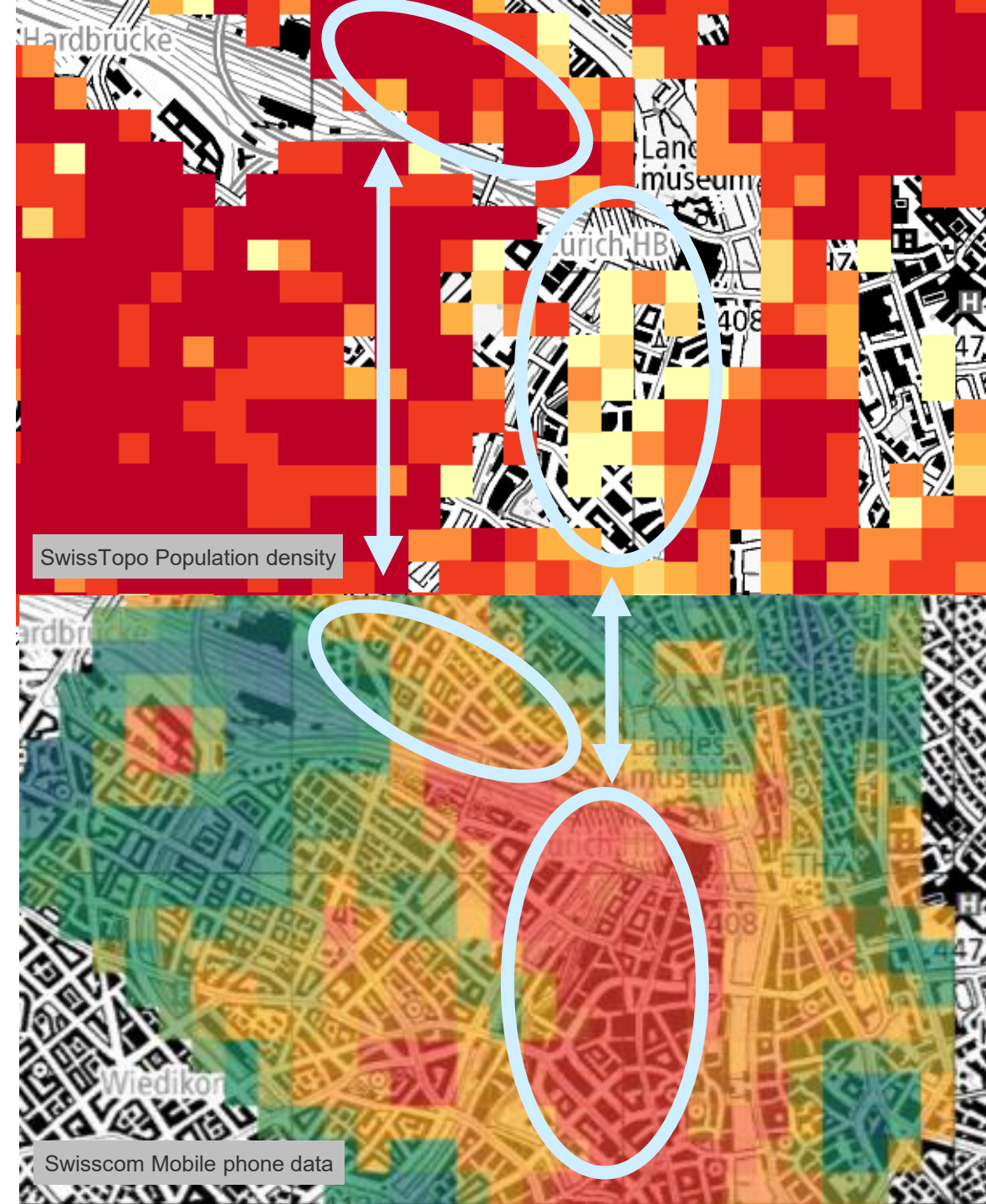
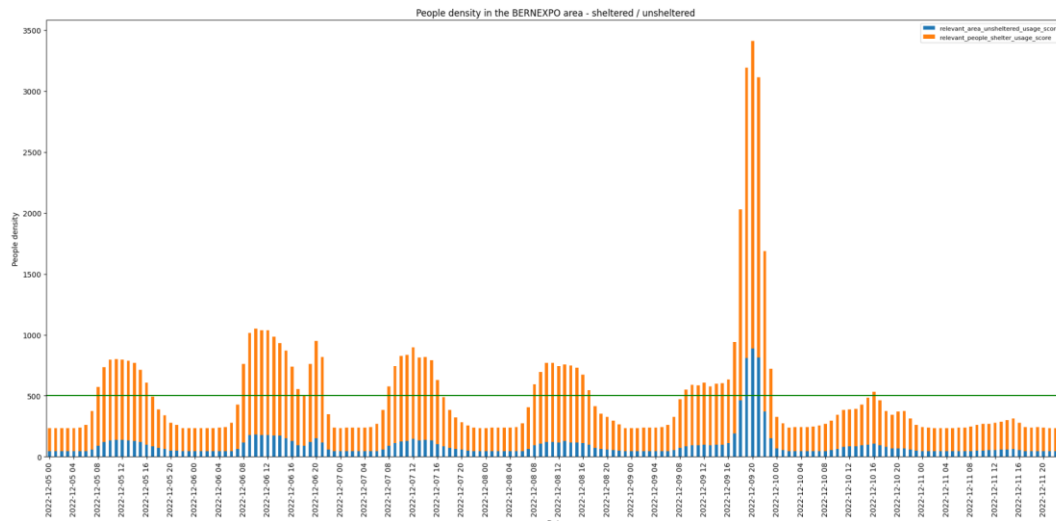
Monitor airspace



Determine ground risk based on dynamic personal density data

Importance

- Static population density data inappropriate
- Dynamic person density data suitable
- Unavoidable for populated areas
- There can be big differences during the week





Calculate person density from mobile phone data

- Evaluation of existing antenna data of the mobile radio operators
- Extrapolation to 100% mobile phone subscribers
- Deviation in extrapolation is small thanks to known market share
- Diverse evaluations Density of persons, number of different persons, demographics, origin, length of stay

Swisscom offers the People Density Prediction service for ground risk clarification.





What is density of people?

Definition

The person density is the total time spent by Swisscom SIM cards in a square of 100x100 metres, extrapolated to the total number of mobile phone subscribers in Switzerland.

The values are calculated in the same way throughout Switzerland and are therefore easily comparable in terms of time and space.

Data protection

anonymised + aggregated = no conclusions about individuals possible

- No output of values below 21 (value = NaN))





Person density historical and forecast

Historical

- Historical data up to 2 years back

Prediction

- Machine learning algorithm calculates a forecast based on historical mobile phone and weather data
- The following day and up to one year
- For the next 7 days weather forecast is included

Date

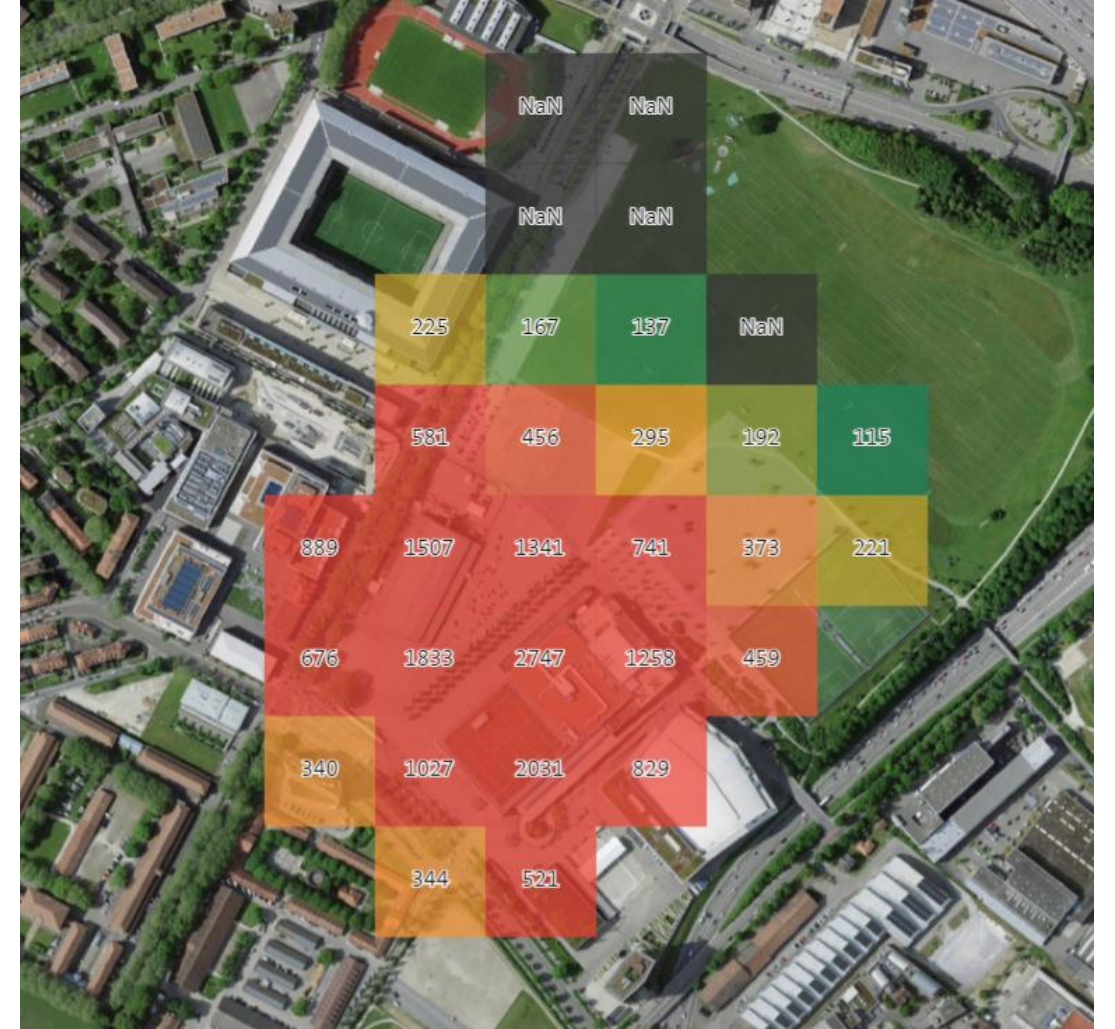
08.06.2023



Juni 2023						
Mo	Di	Mi	Do	Fr	Sa	So
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9



Use Case BERNEXPO





Demo

Thank you for your attention

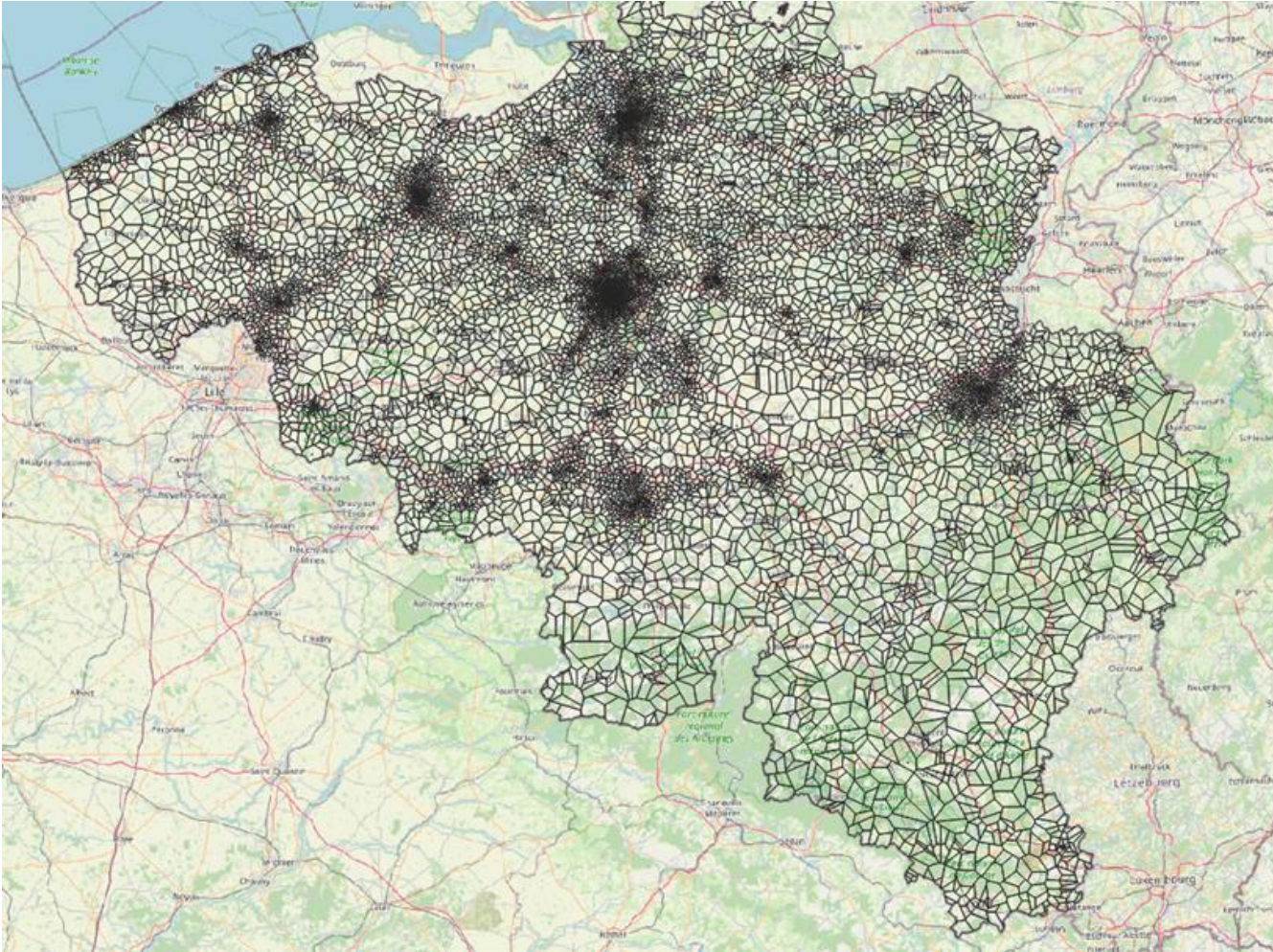


GROUND RISK ASSESSMENT

Using mobile network data
Proximus implementation & experience

Gerdy Seynaeve

Proximus

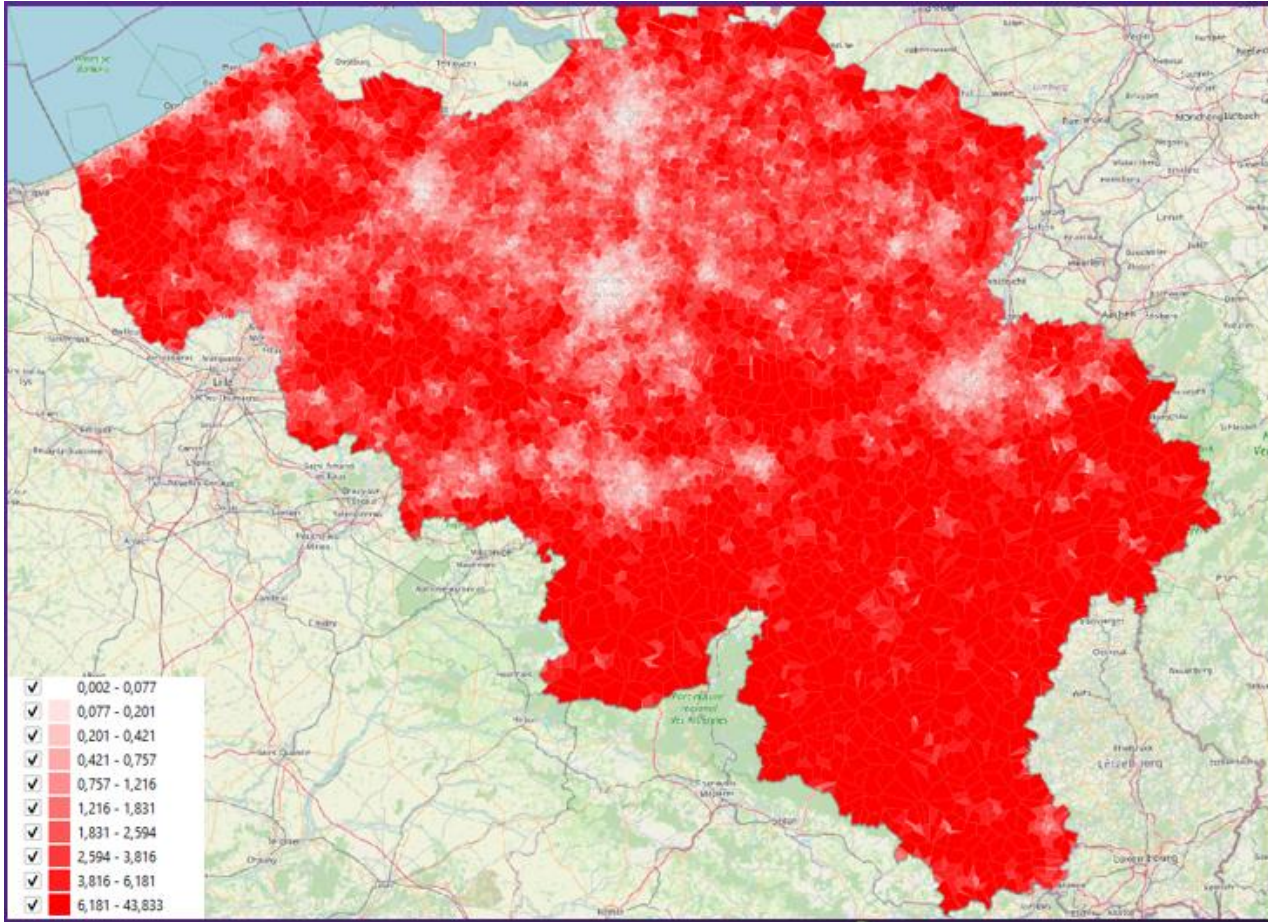


- Passive monitoring on signalling interfaces
- 5M devices, 2B+ location records
- 24/24 7/7
- Realtime (counting) vs historical (profiling)
- Filtering (e.g. M2M)
- Appr. 40% market share, covering average profile of Belgian market

Proximus



Which is the minimum dimension of a cell in populated vs. sparsely populated area?



- +/- 11000 'locations'
- Abstraction 2G/3G/4G

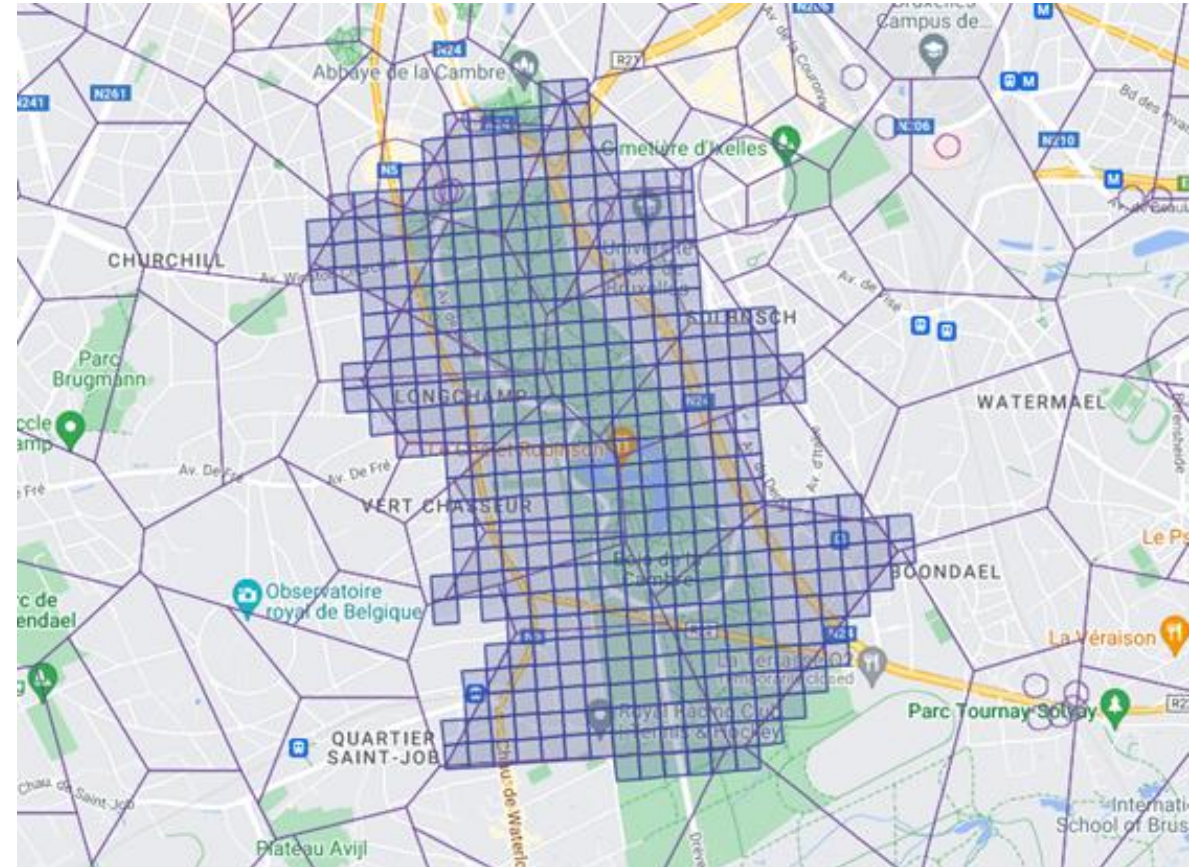
Proximus RTCM

Real Time Crowd Management

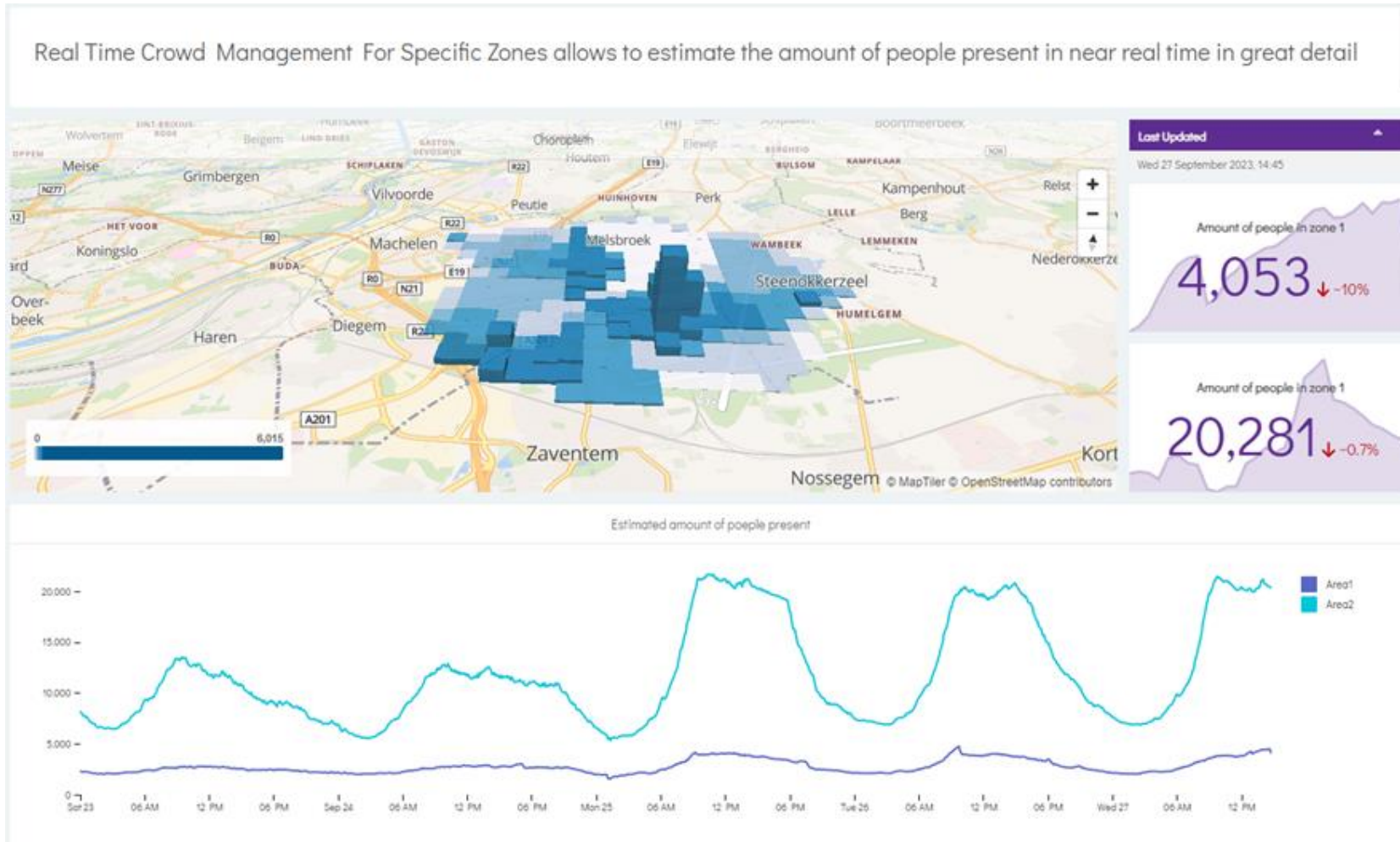


Mapping to a EAA standard grid

- Mobile network changes
- Quantity of information
- Underlying cell sizes
- Area based redistribution of counts
- “Binsize” depends on size of area to be measured
- Privacy (aggregation)
- Extrapolation



Proximus



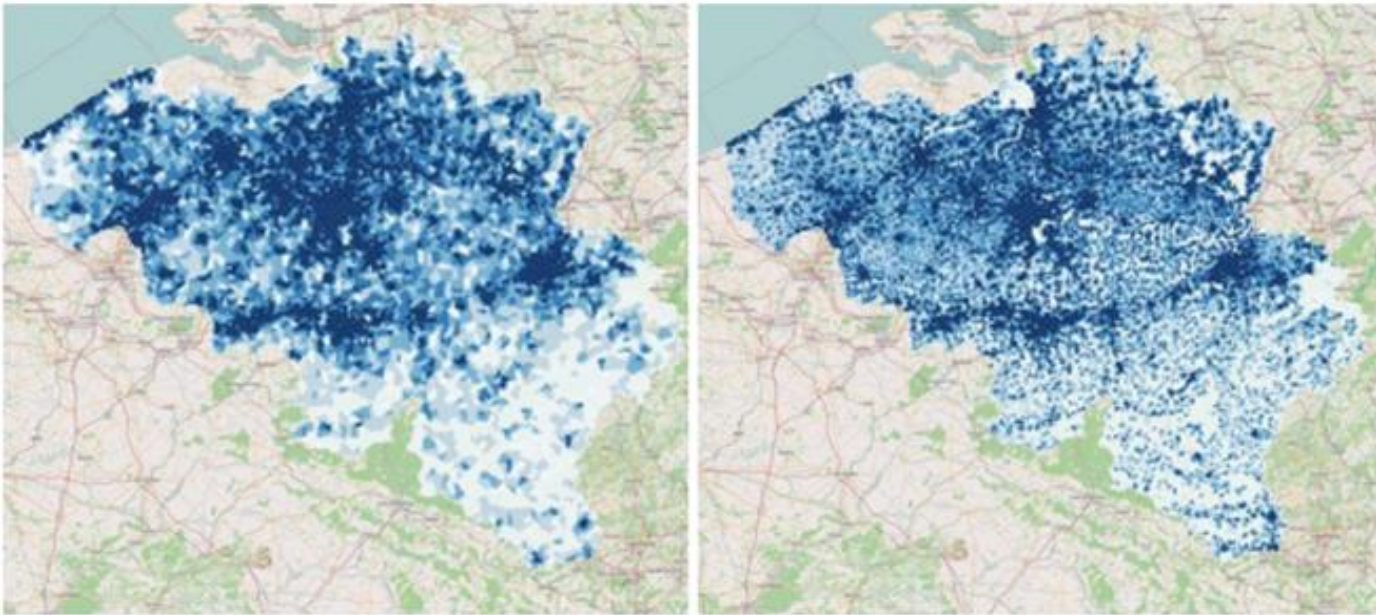
Existing service based upon RTCM
API <https://proximusapi.enco.io/asset/rbcm/overview>

Proximus – Level of confidence

study on in cooperation with Eurostat & statbel



Fig. 3: Population density per km² based on mobile phone data (left) and 2011 Census (right).



Which methodology we may use to assess the declared level of confidence of the data?

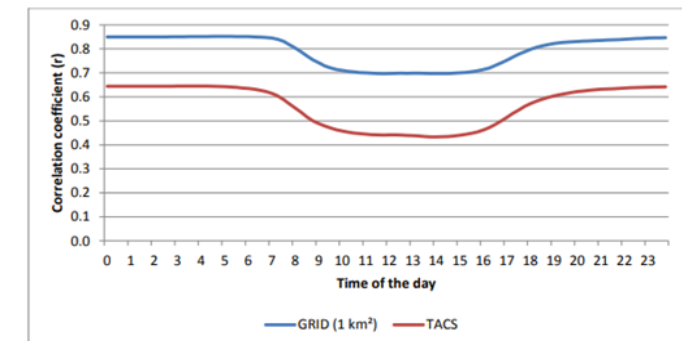
Which KPIs may be used to evaluate the reliability of population density data?

Challenge = define ground truth

Good correlation between 'registered' population & 'actual' population

Good explanation for deviations
e.g. harbour

Fig. 4: Pearson correlation between mobile phone and Census data every 15 minutes on Thursday, for 1 km² grids (blue, above) and TACS (red, below).

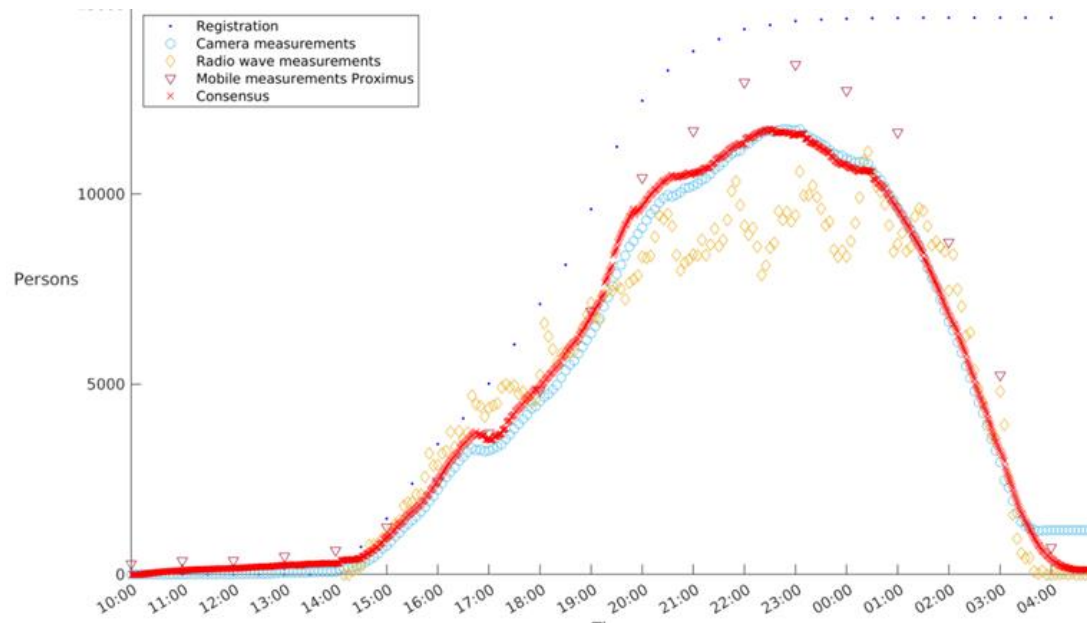


Proximus – level of confidence



Comparison between different technologies

Controlled environment



Which methodology we may use to assess the declared level of confidence of the data?

Which KPIs may be used to evaluate the reliability of population density data?

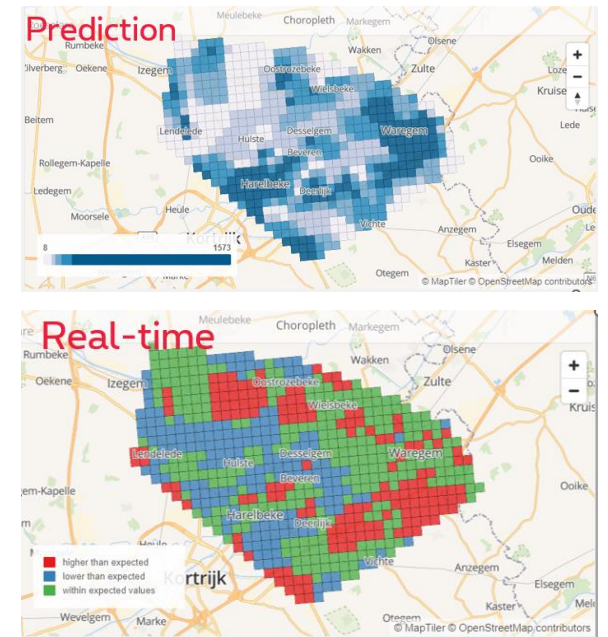
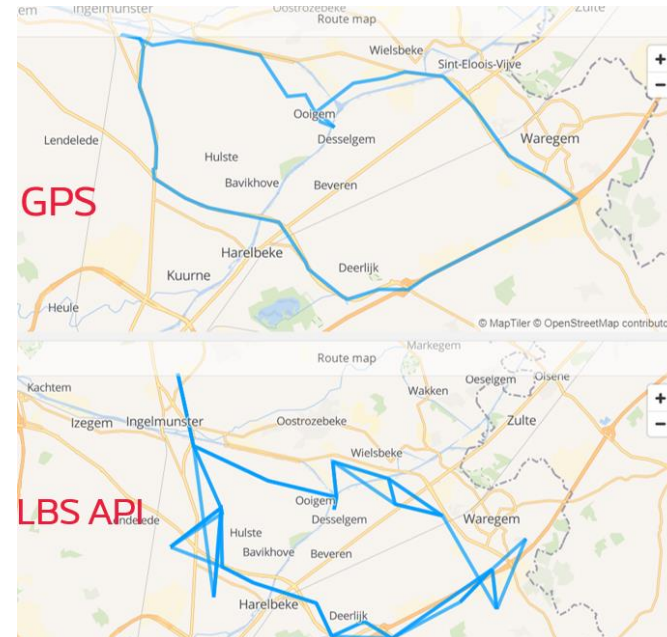
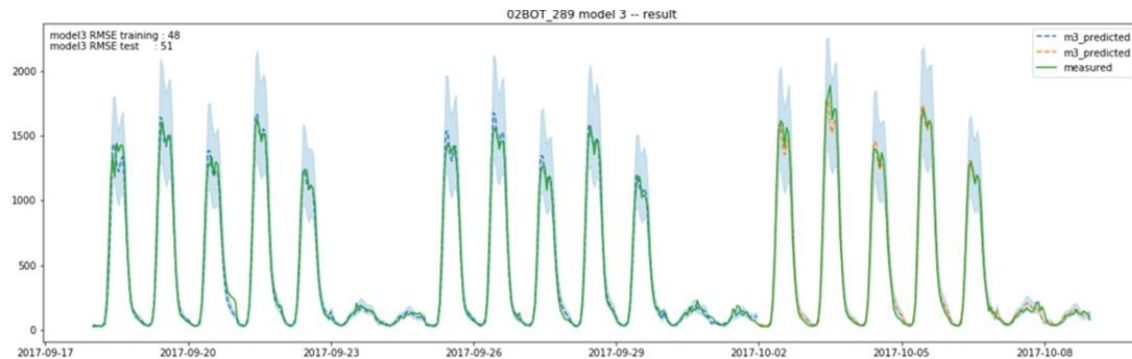
Proximus – privacy aspects

- Short lived ID – enables crowd density
Typically allowed to X with other datasets (NOT in Proximus)
- Longer lived ID – enables profiling (geographical, duration & frequency)
Not allowed to X with other datasets on 1-2-1
- Privacy protection through aggregation
- Only “TACS” counts > 30 (prior to extrapolation) can be used

Proximus – about predictability



- Depends on the 'seasonality' of the area



- Predicted vs realtime density
- SIM based position vs GPS position

Referring to historical dynamic data, how long back in time you need to accumulate data in order to get a good forecast?

A telecom network today needs to be secure across multiple contexts and use-cases



The telecommunications industry is subject to highly regulated security measures with a variety of security standards and regulations that are designed to protect the privacy and security of users' data.



Telecommunication Industry and Ericsson

Security and Privacy



Privacy :

European Telecom operators by default need to ensure compliance with **General Data Protection Regulation (GDPR)** and protect their subscriber privacy.

Ericsson develops, deploys and operates product in a privacy by design fashion, according to the European Union GDPR regulation, international standards and industry best practices

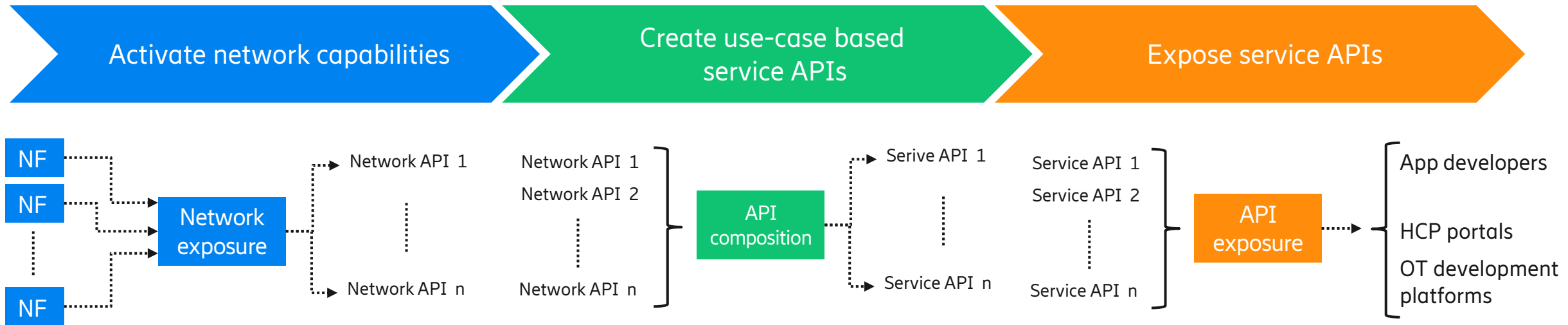
Security:

The telecommunications industry is subject to highly regulated security measures with a variety of security standards and regulations that are designed to protect the privacy and security of users' data.

Ericsson product security lifecycle follows multiple standards and best practices. Some examples of these industry standards are ISO 27001, European Telecommunications Standards Institute (ETSI) with National Institute of Standards and Technology (NIST) , GSMA's Network Equipment Security Assurance Scheme (NESAS).

Ericsson is a leading contributor to network security standards forum and has a long history of systematically incorporating security and privacy considerations into all relevant aspects and phases of our product value flow. Our efforts in this area follow a well-established internal control framework known as the [Security Reliability Model \(SRM\)](#).

Telecommunication Industry API Harmonization Effort: GSMA Open gateway, CAMARA and TMForum



- Standard network capabilities activated and exposed
- APIs defined by standards from e.g. 3GPP, TMF

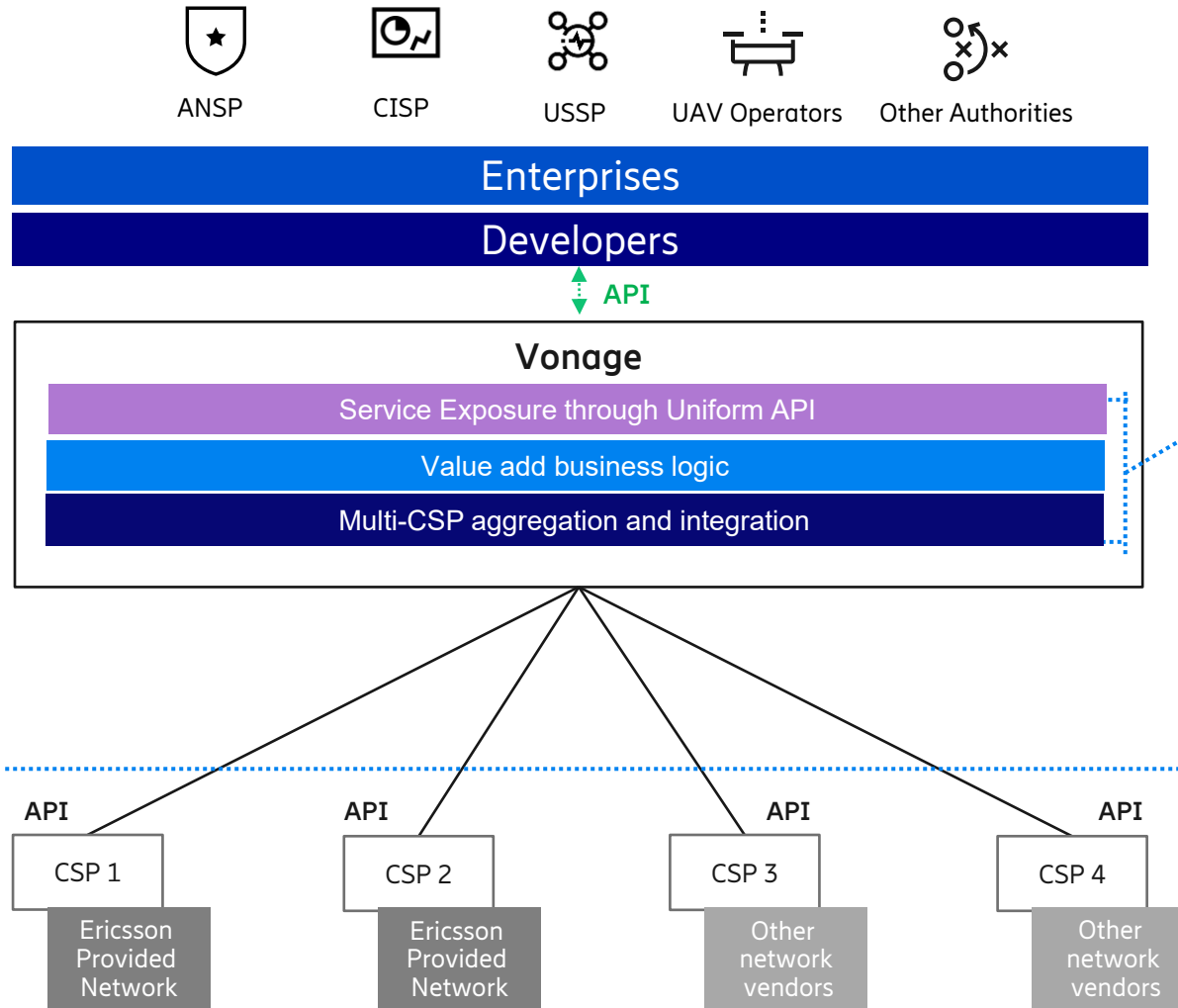
- Use cases supported by composition of technical APIs
- Service APIs adopted de-facto when proved valuable

- Integration with HCP and OT vendor developer environments
- APIs secure pricing, LCM and security mechanisms
- Integration done based on SDK and APIs

Based on standards where available and efficient
Strive for de-facto adoption and open source based to ensure momentum

Aggregated Exposure of SIM Density Map

Service Vision



Aggregated SIM Density Exposure

- Aggregation of multi-CSP Network Capabilities & Services
- Global Unified Service Exposure Developer & Ecosystem Engagement
- Basic & Advanced value add services

Local CSP SIM Density Exposure

CSP Network Service Exposure for SIM Density per operator, including exposure functionality and associated capabilities like provisioning, privacy, security

- Network readiness key to offer capabilities, quality and performance

Communication Service Provider SIM Density Map

Telecom approach for Population Density



Proven dynamic real-time technology in global telecom network TODAY



Unique population dataset with least possible bias



Serving various industries today: drone, civil and event planning, national security etc.



Fulfilling SORA 2.5 requirement with privacy consideration



Unique harmonized API exposure capability globally in both single and aggregation manner

