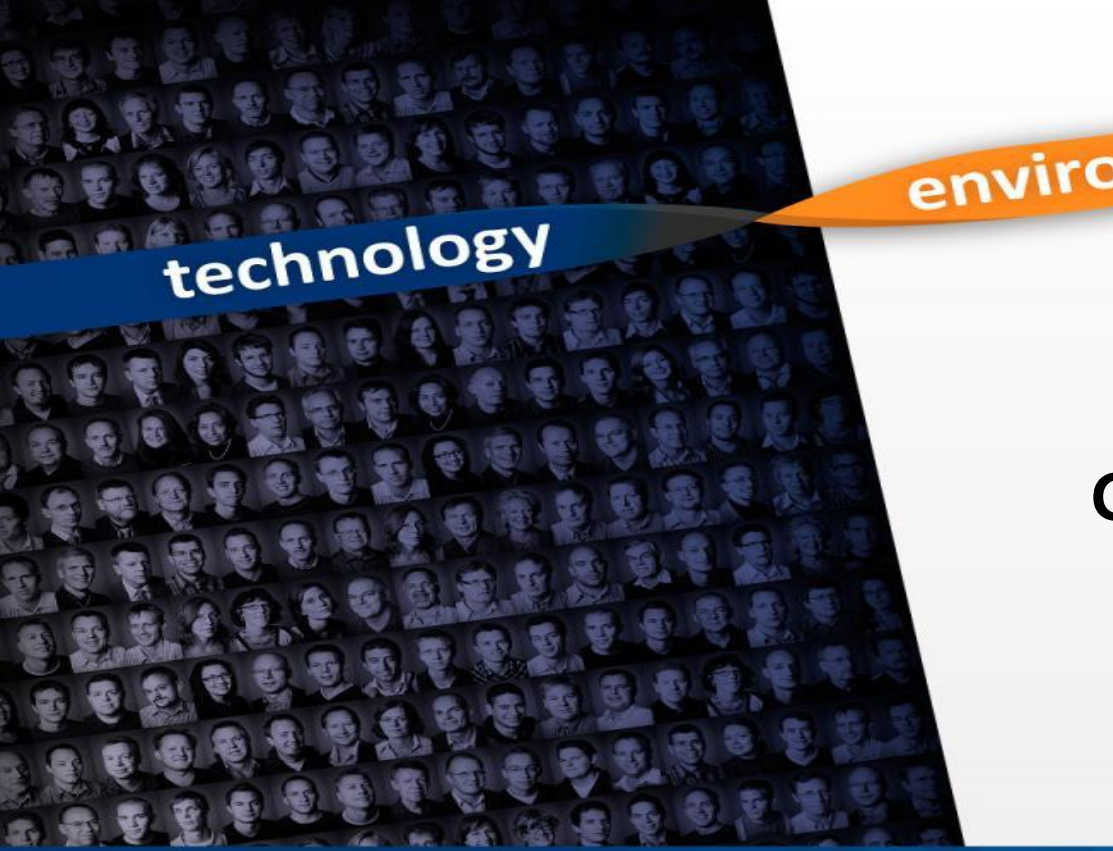


Internet of Things

Gives cost effective monitoring solutions

Winterwind 2017

COMBITECH

Patrik Jonsson

Ph.D.

patrik.jonsson@combitech.se

Internet of Things – according to Combitech

- Cost effective solutions
- Based on standardized hardware
- Reuse software developed in other projects
- Develop and use Opensource packages
- Quick development times, fast from idea to solution
- Combitech has many services that corresponds to IoT

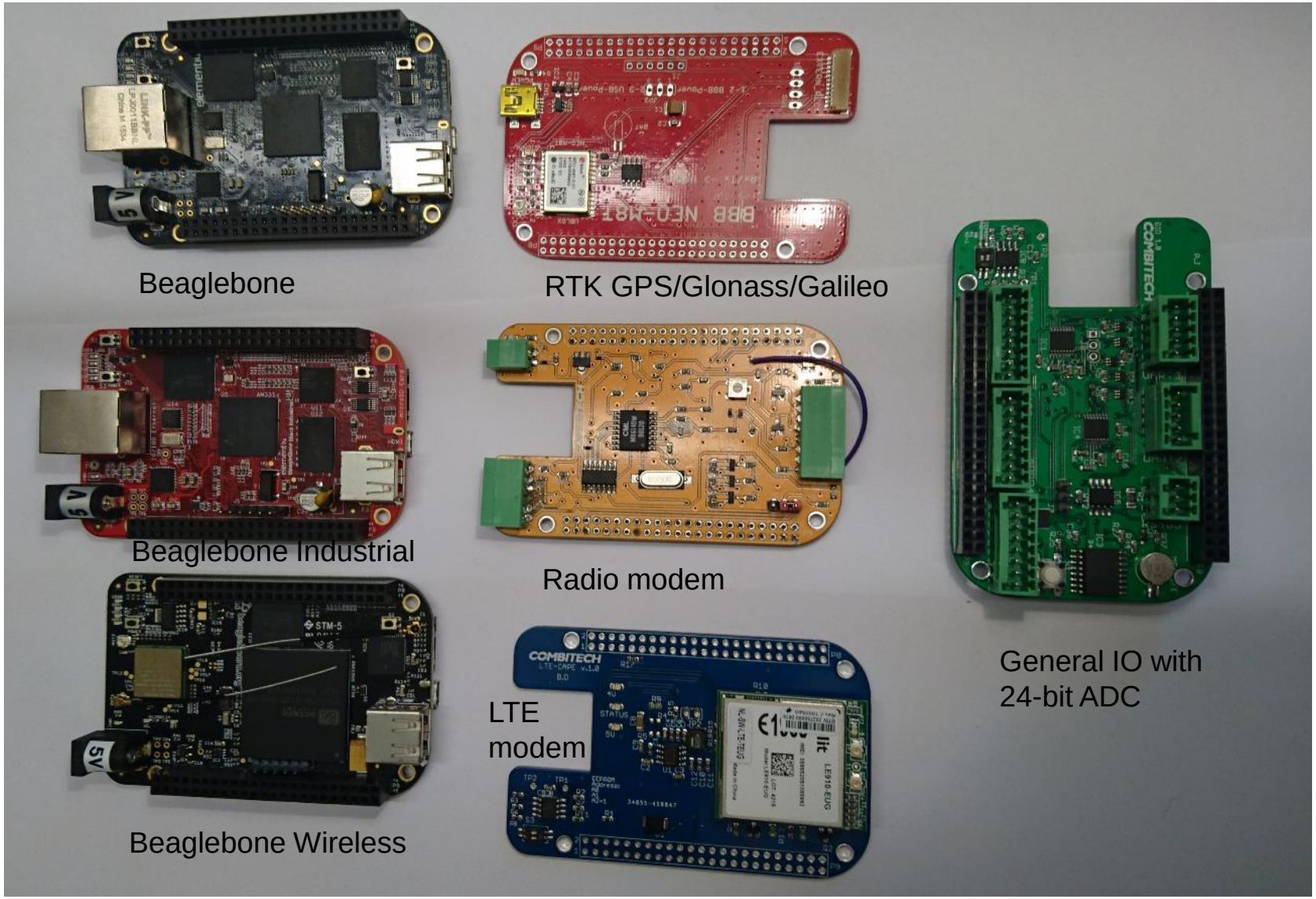
Combitech IoT measurement platform

Computer unit

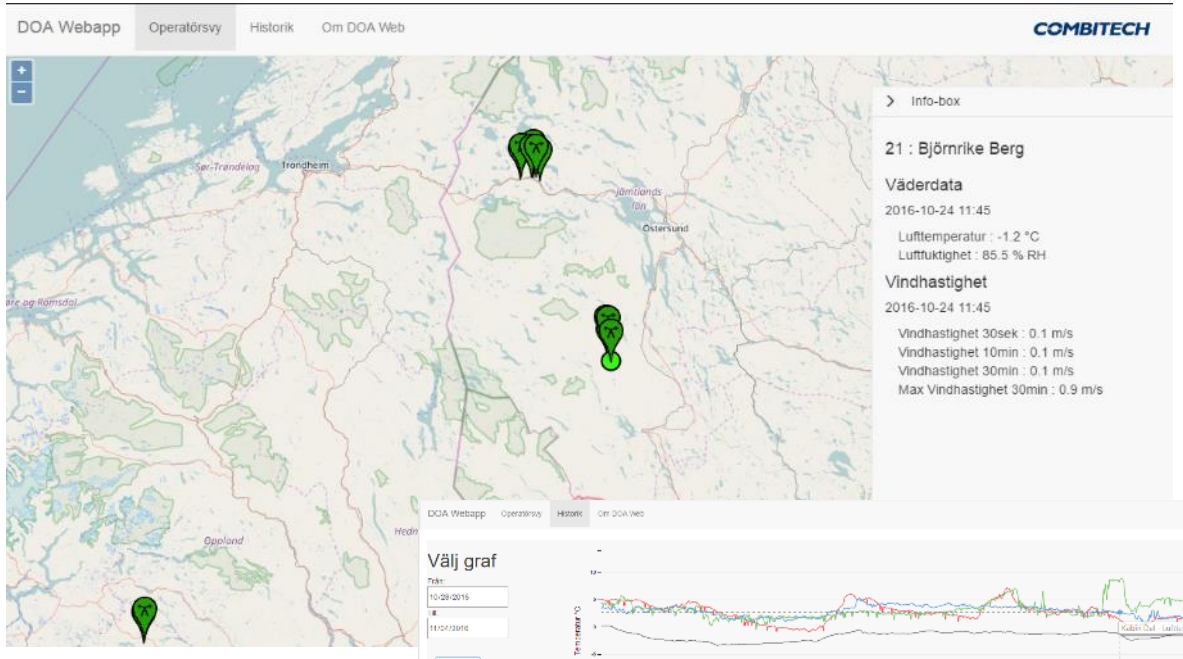
- BeagleBone Black standard IoT platform
  - Industrial version with temp range -40C to +55C
  - Wifi version with integrated WiFi and bluetooth
- New hardware functions are implemented as ***capes***
- Software is developed in C++ on Linux Debian
- Implements the Combitech advanced software integration platform

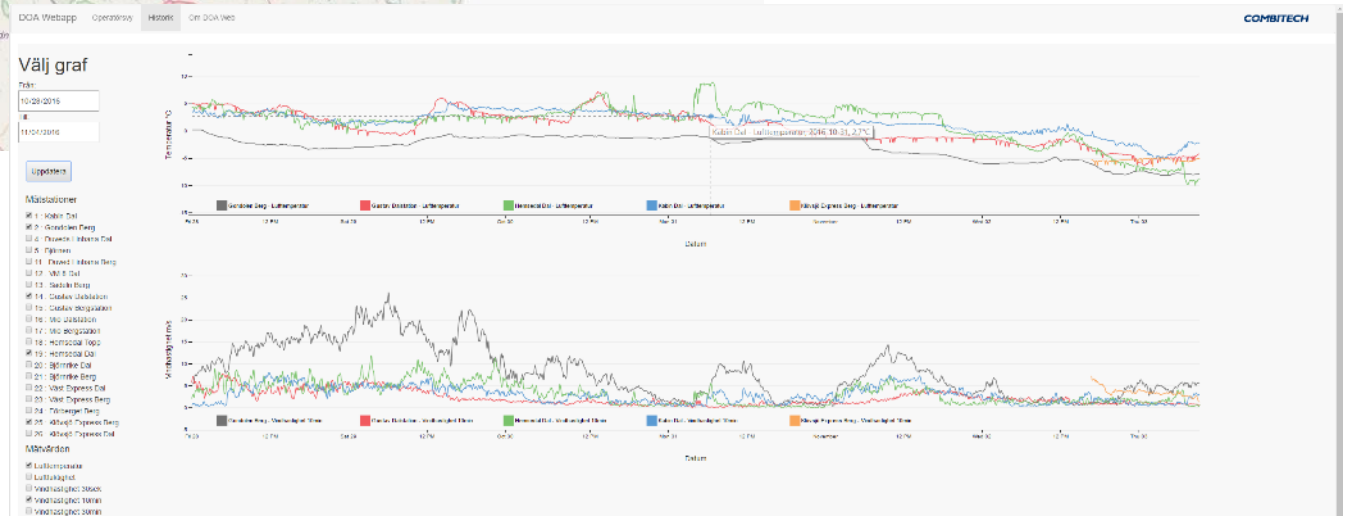
Hardware

- BeagleBone standard MCU
- Capes developed by Combitech for specific needs
  - RTK GNSS (GPS, Glonass, Galileo)
  - Radio modem
  - LTE modem (3G/4G)
  - General IO



IoT applications – weather monitoring

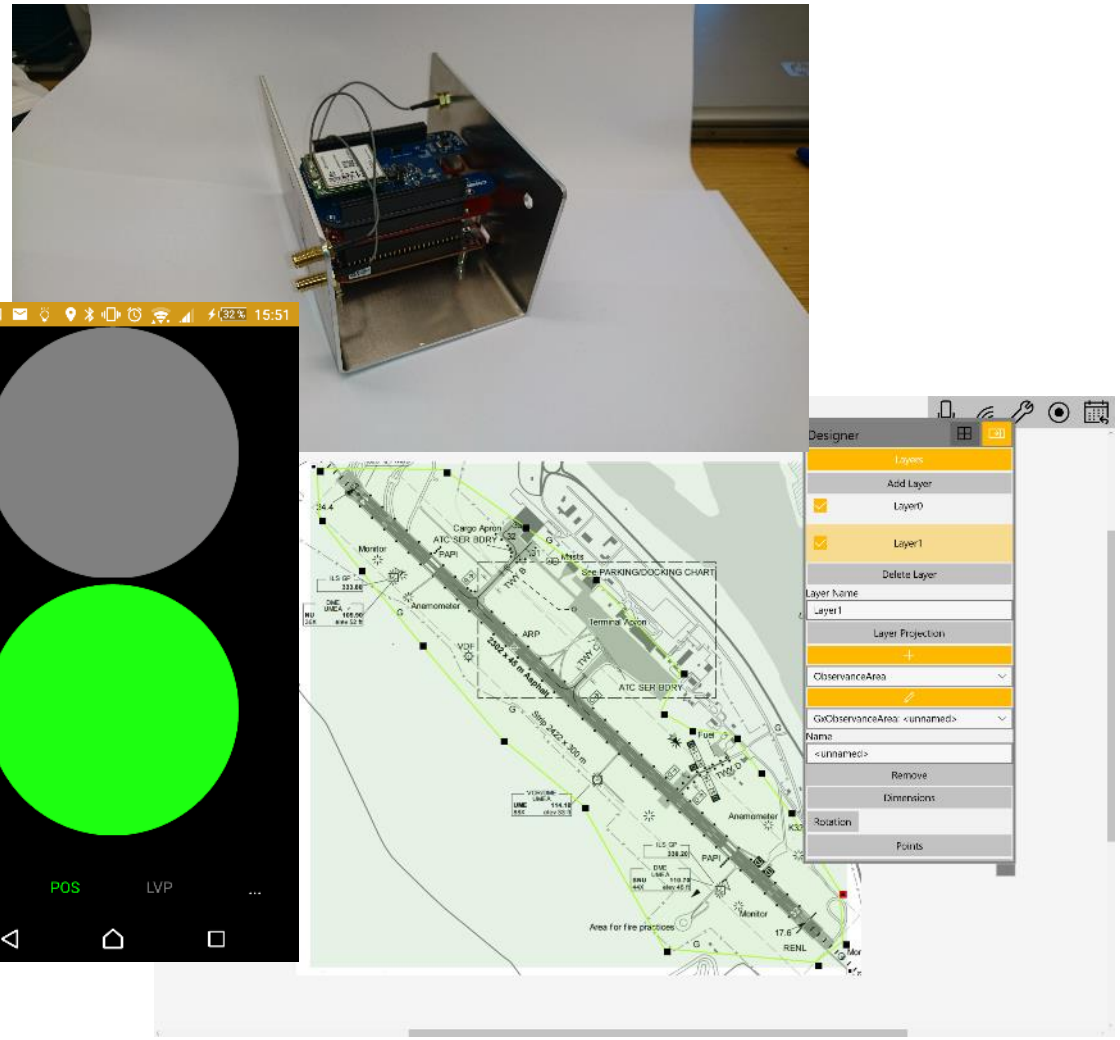




Internet of Things

IoT applications – vehicle tracking

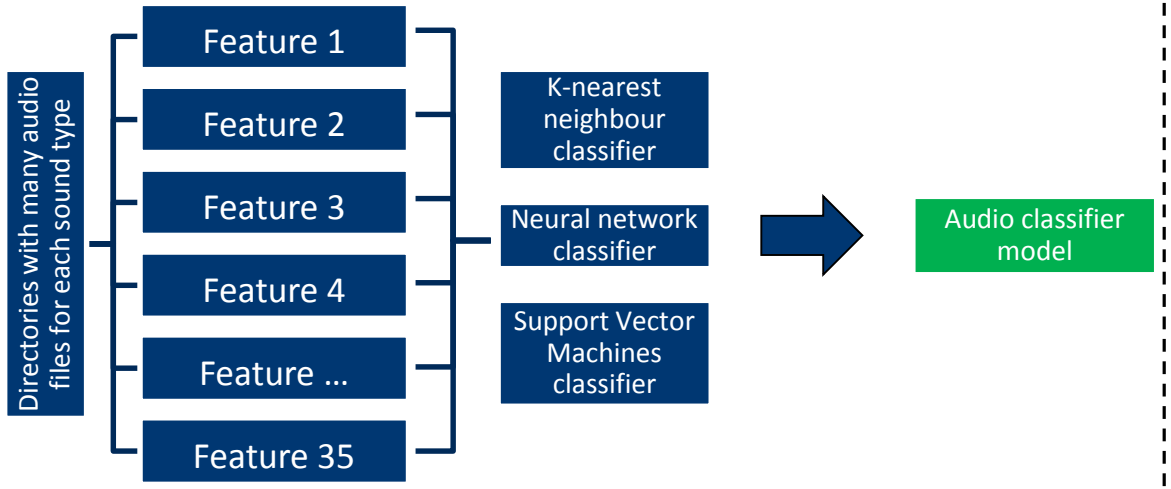
- Tracking and geofencing
- Vehicle computer unit with RTK GNSS positioning <1cm accuracy
- Vehicle smartphone with position information and communication interface
- Authorization to geofenced areas



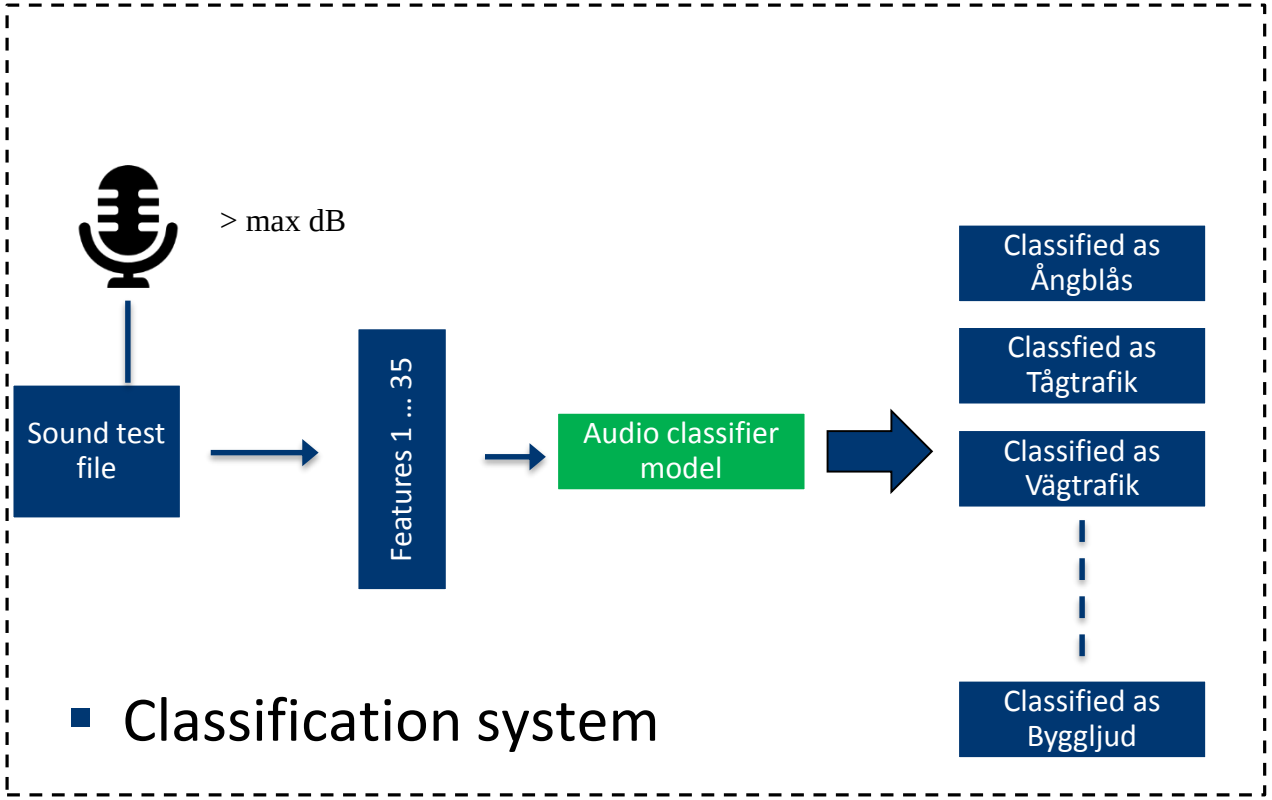
Cost effective RTK positioning

Internet of Things - Gives cost effective monitoring solutions

IoT applications – sound analysis



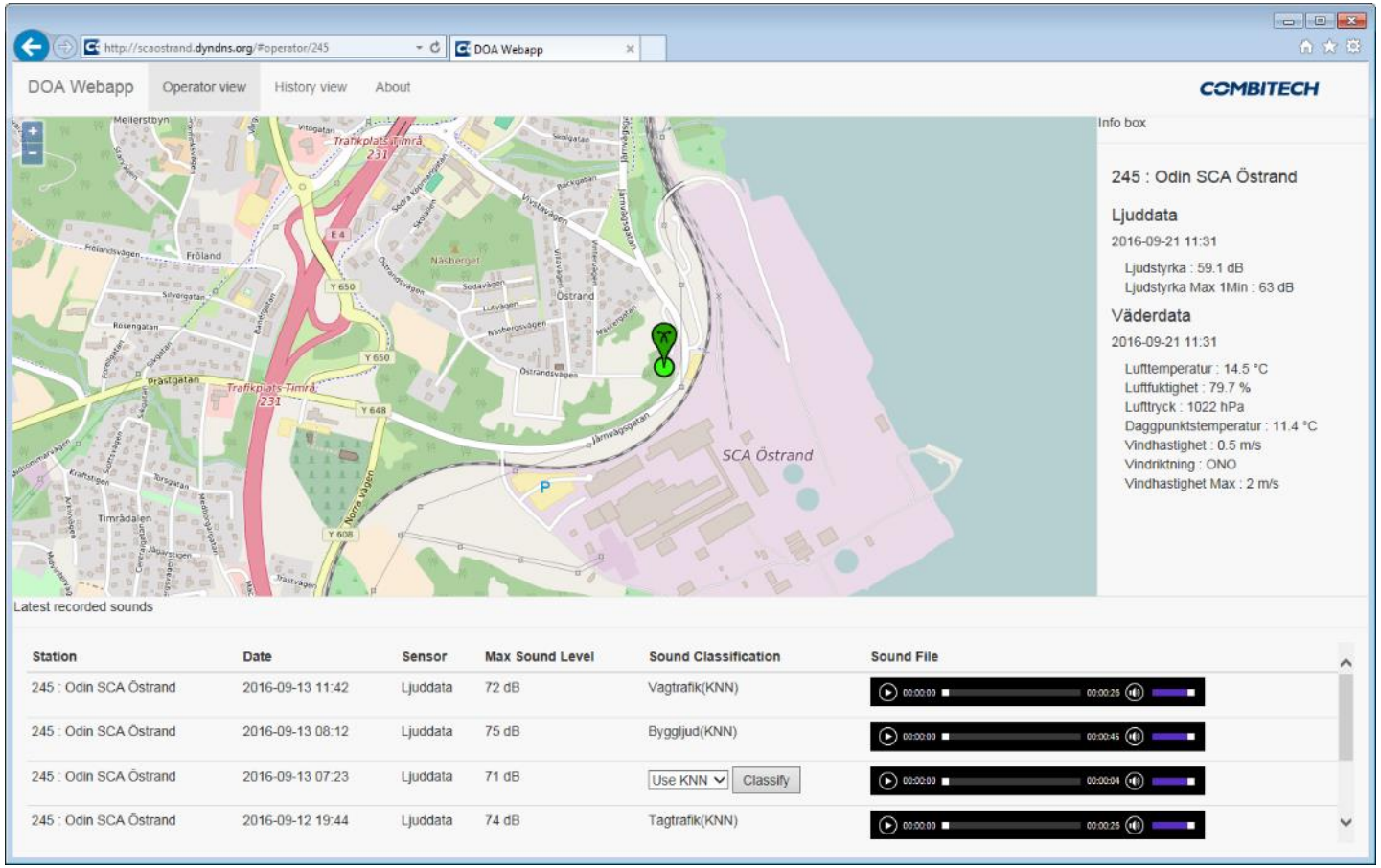
- Training system



- Classification system

IoT applications – sound analysis

- Web based user interface
- Recorded audio files are retrieved and can be replayed for user
- Classification system can be run on each audio file
- Any sound profile can be trained to detect, for example **wind turbine noise**



IoT - LWC and MVD measurement system

- Icing is related to the amount of atmospheric liquid water and the size of the droplets.
- The Droplet Imaging Instrument was developed by Mid Sweden University in co operation with Combitech and SMHI.
- Tests with this instrument shows that it is possible to make high precision measurements of LWC and MVD using a simple and robust hardware.

Droplet Sizing for Ice Detection

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Droplet Sizing for Ice Detection

- Tests with the prototype was done at SMHI weather station at Klövsjö, Sweden during the winter 2016-2017.
- Through image processing both LWC and MVD can be derived with high accuracy and precision.
- An IoT instrument based on the design can be deployed at weather stations, wind farms, mobile masts etc.
- Data from this instrument can be used to confirm and improve current weather models.

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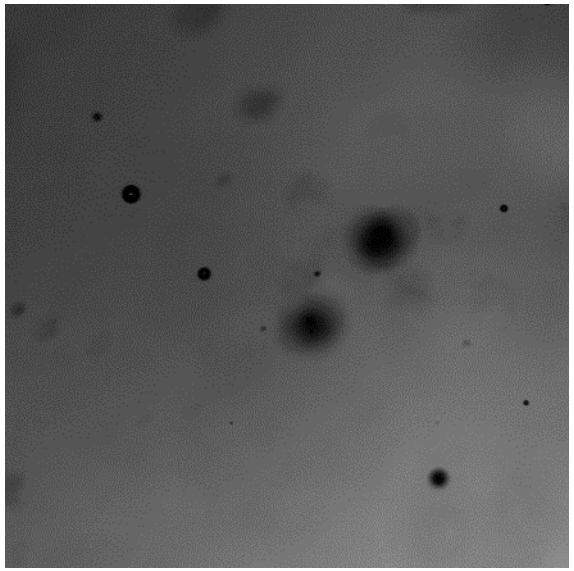
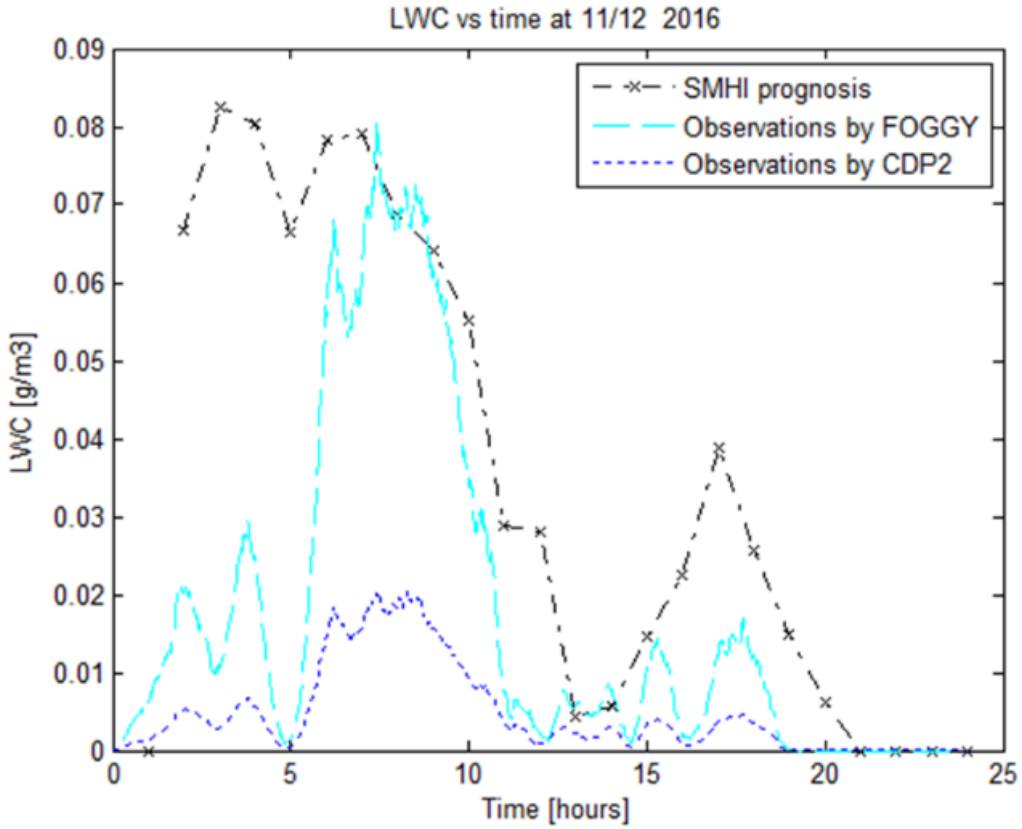
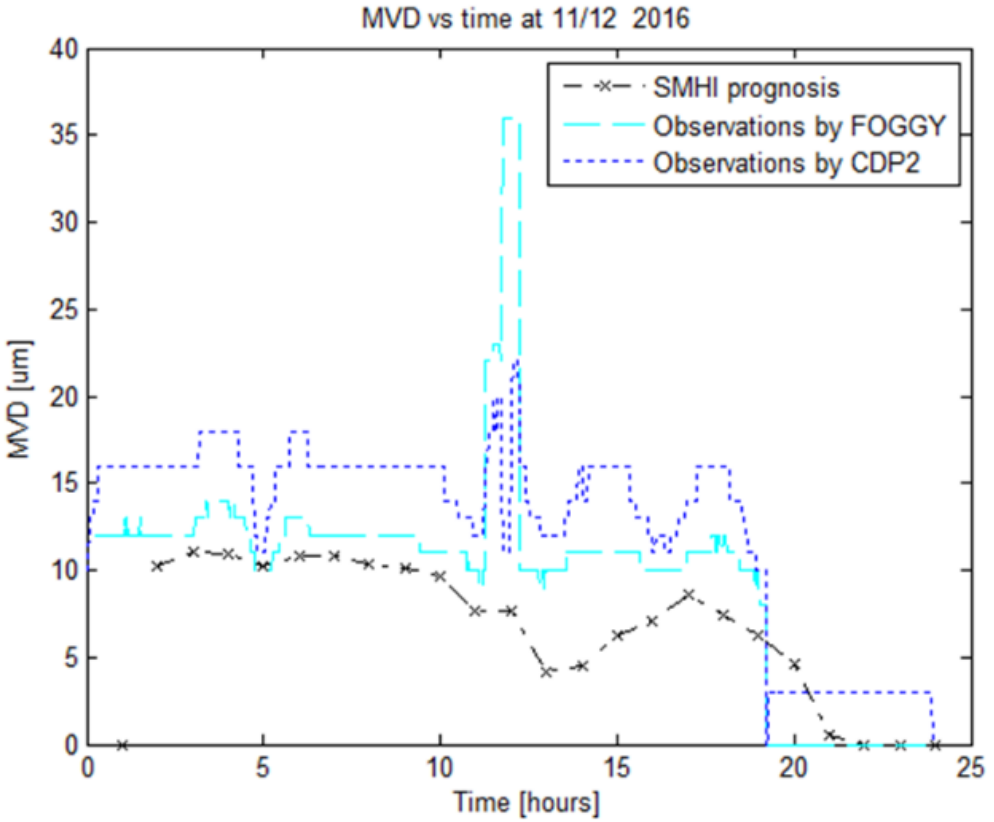


Droplet Sizing for Ice Detection





Successful results - consistent measurements, reference sensor CDP-2 and SMHI predictions

For further information - contact

- Patrik Jonsson

- Björn Ollars

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