Robust & Secure Networks

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09.10.2015, IFI, UiO

Simula Research Laboratory, Norway

- **Government funded non-profit independent research organization**

- **Expertise within the fields of ICT**
- **Simula promotes**
  - **fundamental research, education, innovation**

- **Has very close tie with *University of Oslo***
  - **Student supervision, research collaboration, teaching**

Projects in Department of Networks

- Robust Networks
- NorNet
- MONROE
- DOMINOS
- TIDENET
- IoTSec
- PRONET
- MAXGREEN
- EVANS
- CROWN

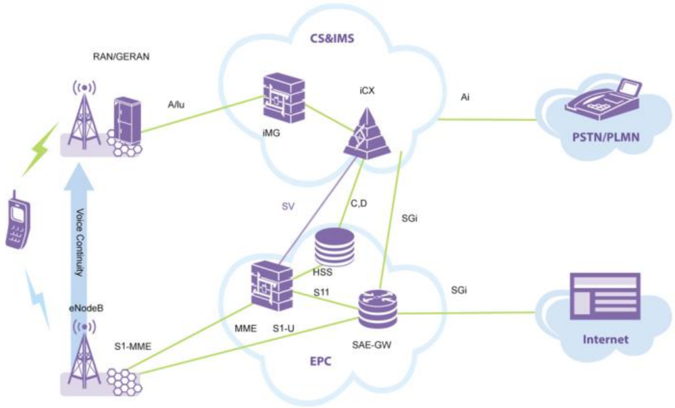
The Research Council of Norway

SEVENTH FRAMEWORK PROGRAMME

HORIZON 2020
THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

SmartGrids
ERA-Net

Our expertise



- **Communications Networks**

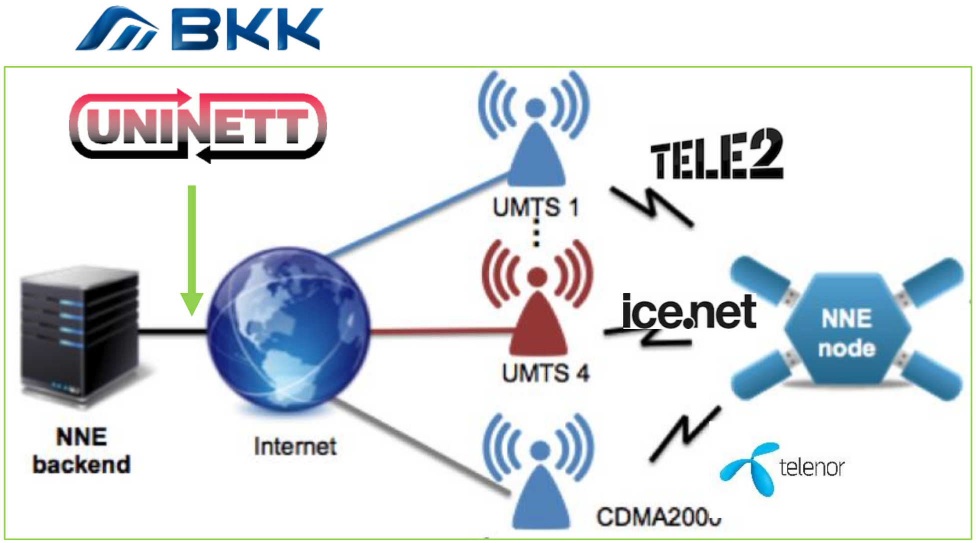
- **Control&Optimization**

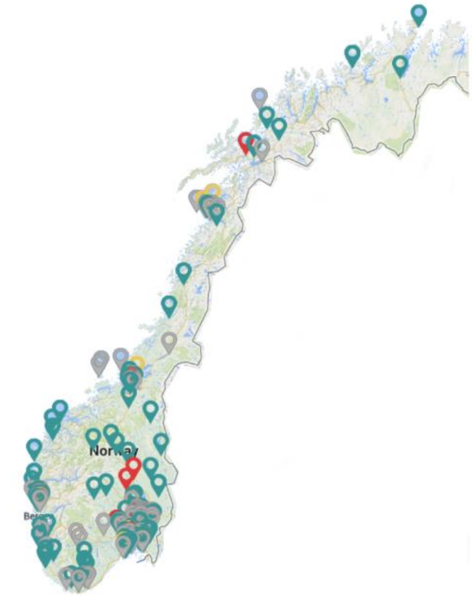
- **Smart Grid**

- **Data Analytics**

NorNet – a real-world testbed for measuring communications reliability in Norway cellular networks

Ahmed Elmokashfi

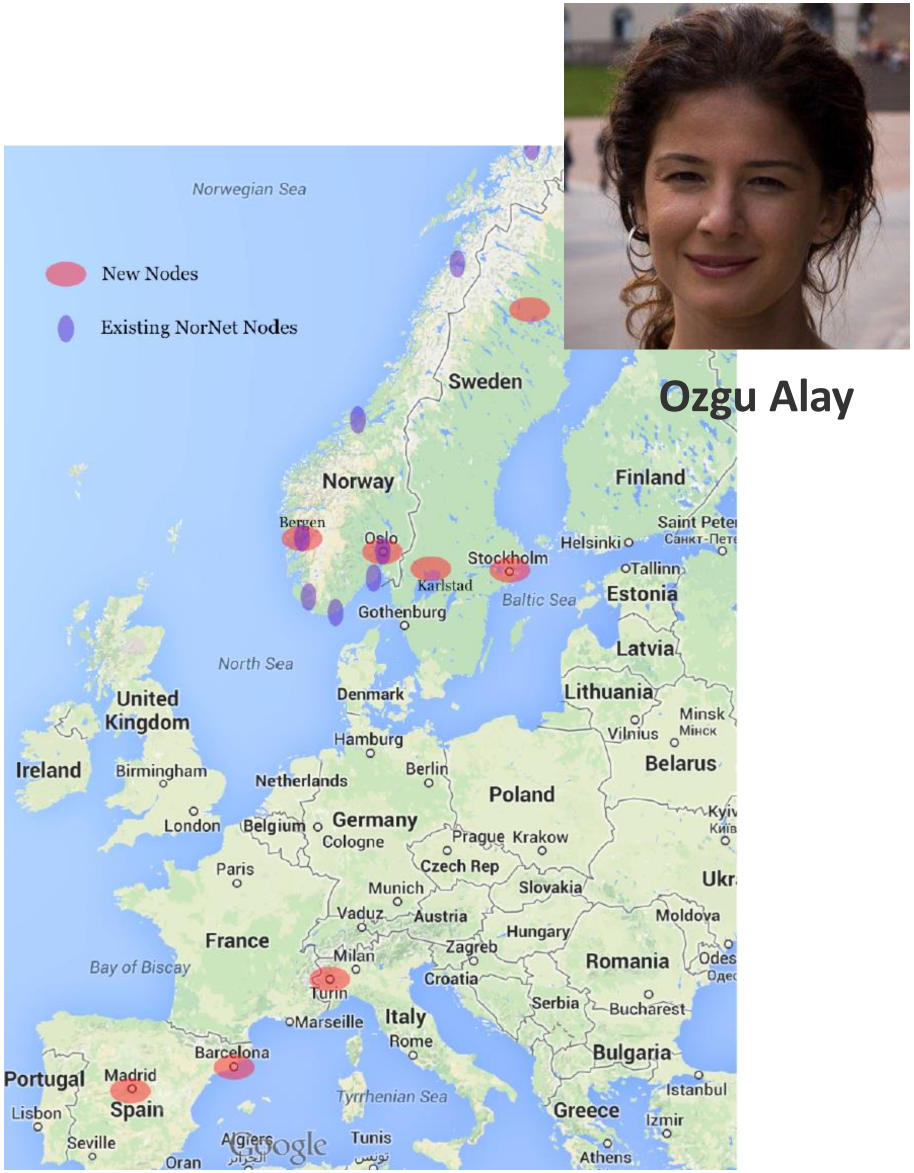




- **National-wide measurement nodes**
- **8+ years expertise in network traffic measurement and data analytics**

NorNet’s European version: H2020 project MONROE

- Granted 6.5M€ to extend NorNet to
  - Spain, Italy, Sweden
- Expertise
  - traffic measurement
  - data analytics
  - data storage



Ozgu Alay

PRONET project (supported by EU FP7 ERANET SmartGrid)

Protection of power electronically interfaced LV distributed generation networks

[simula . research laboratory]

AALBORG UNIVERSITY
DENMARK

TÜBİTAK
UZAY

YILDIZ TEKNİK ÜNİVERSİTESİ
1911

- **2012-2015**
- **Goal**: develop advanced communication technologies for protecting power systems

SEVENTH FRAMEWORK
PROGRAMME

TIDENET project granted by RCN FRINATEK program

Theoretical and Data-driven Approaches for Energy-efficient Networks

[simula . research laboratory]

- **2015-2018**
- **Find the fundamental interaction between smart grid and communication networks**
- **Explore the relationship to reduce energy consumption in ICT sector**

Smart grid
Communications networks

IoTSec project granted by RCN IKTPLUSS program:

Security in IoT for Smart Grids

UNIVERSITAS OSLOENSIS MDCCCXI

NR

HØGSKOLEN I GJØVIK

UNIK UNIVERSITETSSENTERET PÅ KJELLER

[simula . research laboratory]

smart innovation østfold

eSmart SYSTEMS

Fredrikstad energi

eB

MOVATION Moving Innovation Forward

- **2016-2020**
  - **Goal: build secure power network**
  - **Our role: enable privacy preservation an inherent component in the smart grid**

CYBER-PHYSICAL SYSTEMS SECURITY

Smart grid

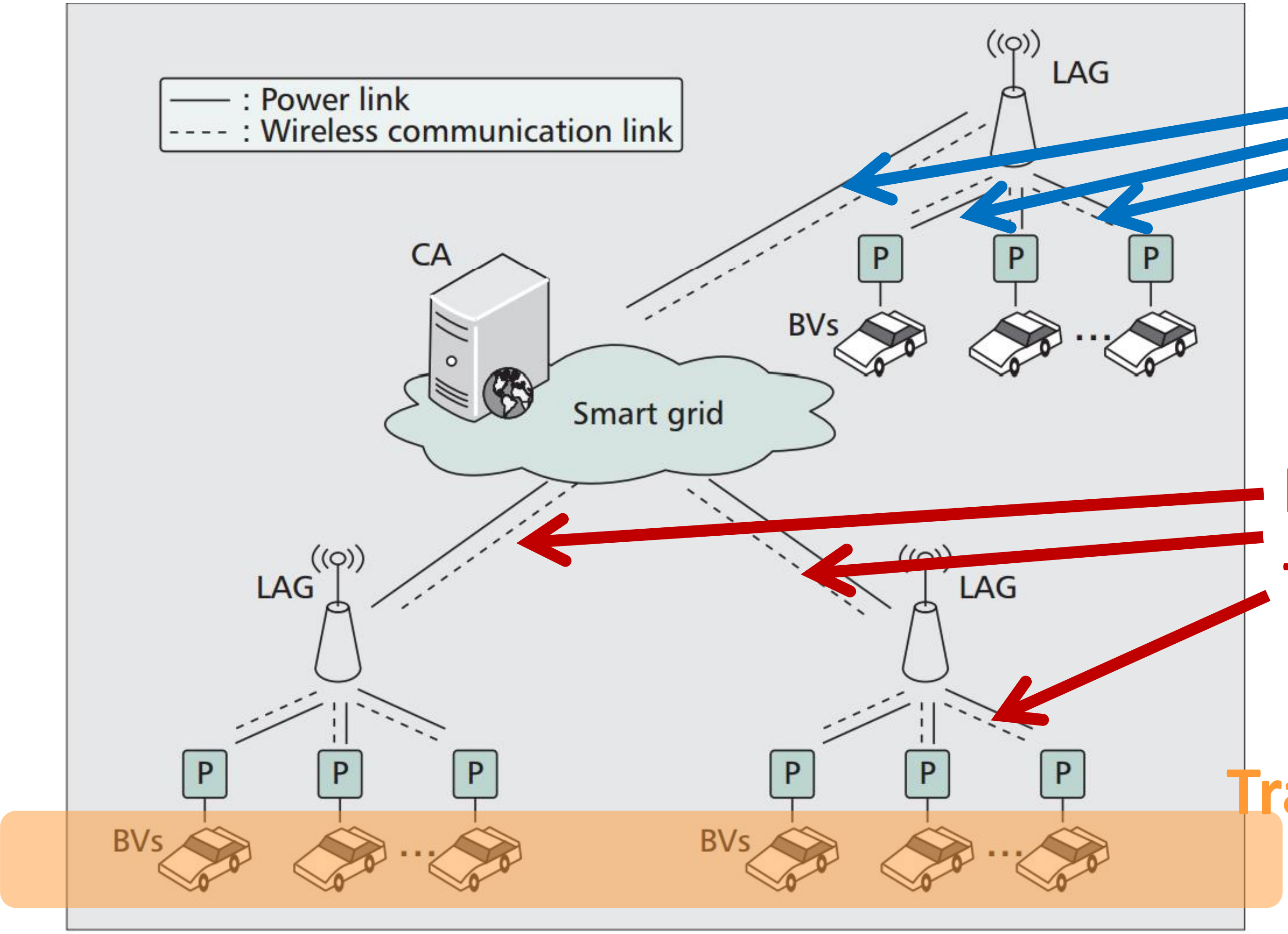
- New attacks, e.g., false data injection attack
- Privacy-preserved demand response management
- Game theory, big data for smart grid security
- Security in subsystems
  - vehicle-to-grid systems
  - energy storage systems
  - renewable energy systems (e.g., large-scale Photovoltaic (PV) and wind farms)
  - micro-grids

(photo from ife.no)

V2G (Vehicle-to-Grid) key components

- **Electric vehicles (EVs)**
- **Charging stations**
  - **Power charging**
  - **Power discharging**
  - **Information exchange**
- **Power grid**

V2G (Vehicle-to-Grid) systems

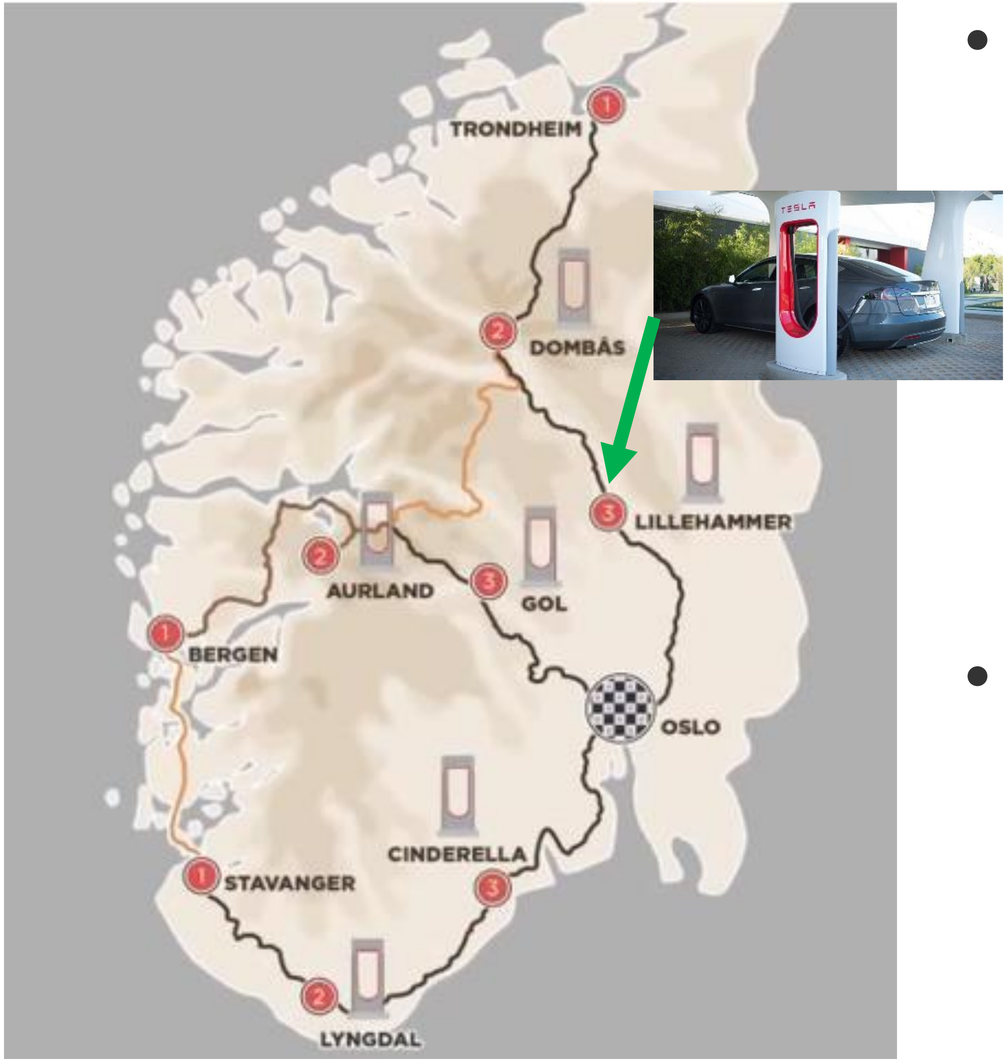


Energy flow

Information flow

Transport domain

Privacy issue: We know where you are…



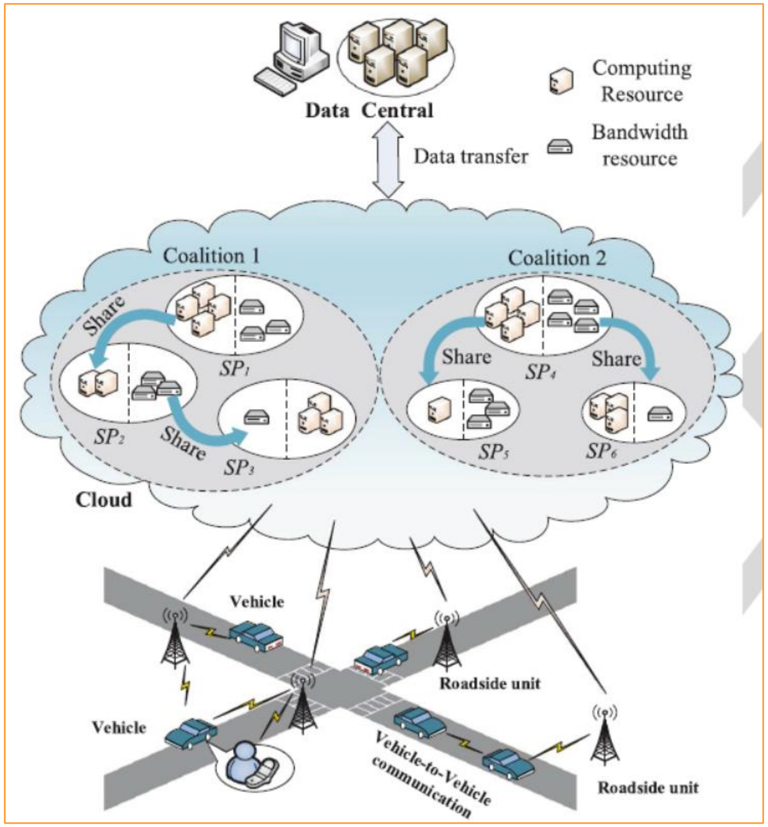
- Location privacy
  - When you connect to a charger in Lillehammer, we know your location
- Need authentication solutions

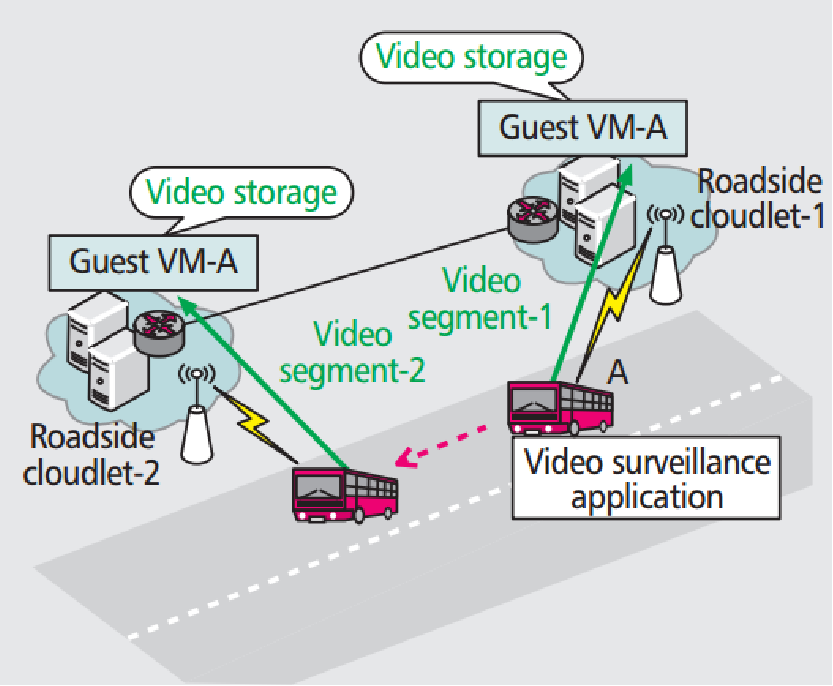
Many new privacy concerns

- **Location-related privacy**: A Electric Vehicle (EV) location information should not be correlated with the EV's identity during its connections with chargers
- **Interest-related privacy**: chargers cannot obtain the detailed response to deduce a EV's interest
- **SOC (State of Charging)-related privacy**: chargers should not obtain a EV's detailed power status

- New authentication scheme is needed for privacy-preservation in different battery status and states transition

Vehicular Cyber-Physical Systems





- **Location privacy**
- **Communications security**
- **Vehicle cloud security**

Thanks a lot!

Questions?