

# Challenges in implementation of road user charging (RUC) in Norway



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SINTEF

# Content

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- Terms
- Challenges

- the terms

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Bruksuavhengige avgifter  
Miljøprising  
Vegavgift  
Omregistreringsavgift  
Engangsavgift  
Vektkomponent  
Fiskal avgift  
Lavutslippssone

Bilavgift  
Køprising  
Bilavgift  
Rushtidsavgift

Effektkomponent  
Årsavgift  
CO<sub>2</sub>-avgift  
Bompenger  
Miljø- og kjøprising

Vegprising  
Vektårsavgift  
Vegbruksavgift  
Bomring  
Miljøpakke  
Drivstoffavgift



# Toll collection

## *Bompengeinnkreving*

- Permitted by the § 27 in the Road Act
- The toll collected should be used for investment in road transport infrastructure
- The toll collected could also be used for infrastructure for public transport on rail, including tram and metro where these investments could replace or substitute investments in road infrastructure



Statens vegvesen





# Toll collection in urban areas

## *Bompenginnskrevning i byområder*

- Permitted by the § 27 in the Road Act
- In addition to the infrastructure investments, the toll may also be used for the *operation* of public transport
- The toll could be based on vehicle weight, the impact on choice of transport mode and means, time of day and vehicle environmental parameters
- The toll can be temporarily changed for specific periods in cities when the air quality is below certain limits



adressa.no



tekna.no



nrk.no

# Road user charges (RUC)

*Vegbruksavgift*

A charge (duty) that reflects the external costs of a vehicle using a road network



**delays**



**accidents**



**noise**



**Pollution (local and global)**



**road wear**

# Summarising the terms

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- **Tolling** is primarily and in general a measure to finance new road transport infrastructure (in some cases also rail infrastructure for public transport)
- **Tolling in urban areas** may also be used as a traffic regulation measure, e.g. to reduce peak hour traffic
- **Road user charging** shall compensate the costs a vehicle inflicts on other vehicles, the society and the environment concerning delays, accidents, noise, road wear and pollution. It could also be used as a traffic regulation measure.

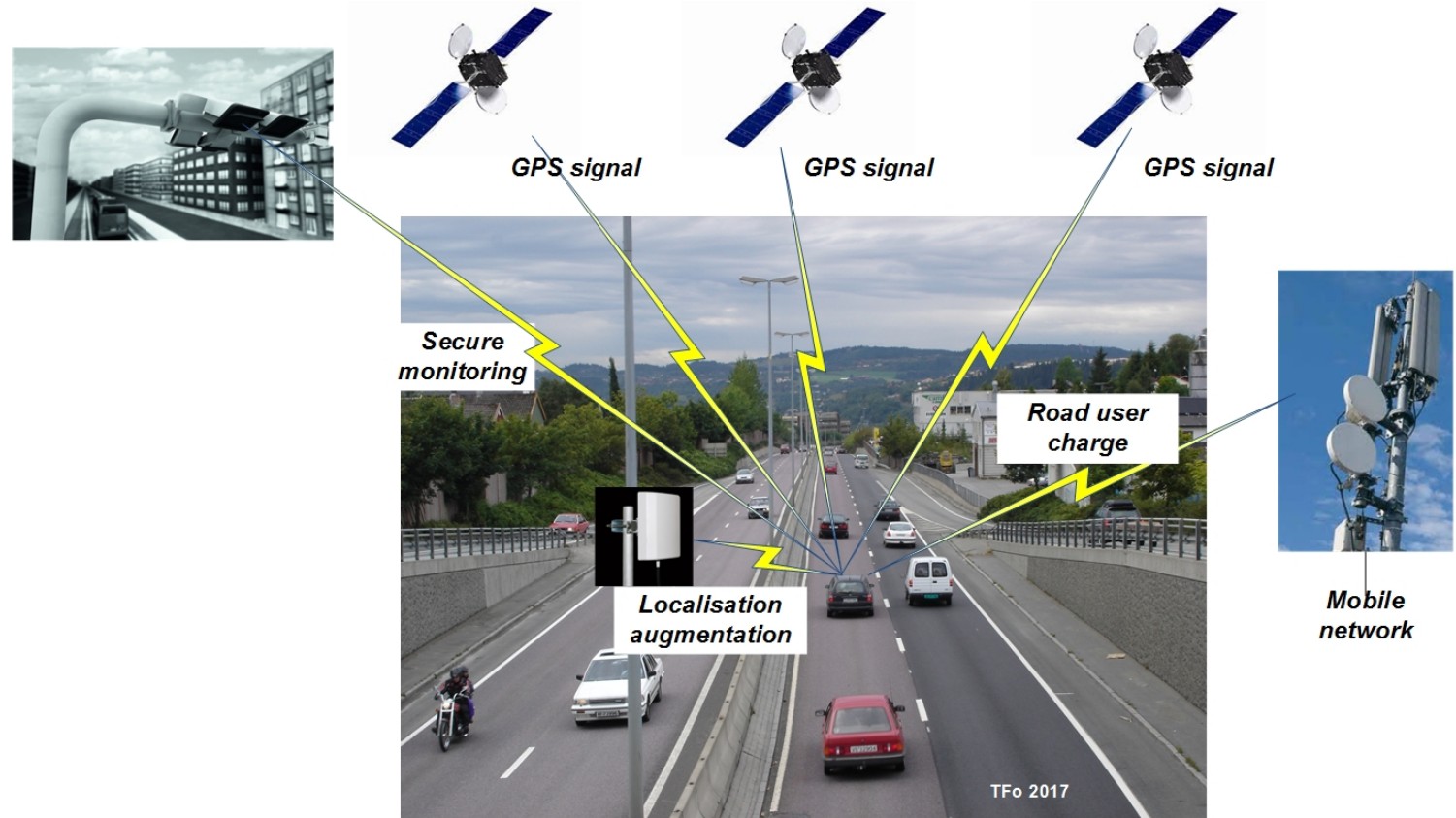


- and then the challenges

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# Technology

- We need accurate, reliable and available information (data) for calculating the road user charges in a correct, fair and user- accepted way
- We need high quality technology that can register, control, store, protect, handle and communicate data









# Foreign vehicles



## Solutions for Heavy Goods vehicles

### *Germany:*

- Payment using an On-board Equipment (OBE)
- Manual payment on terminal at Point of sales
- Manual payment via Internet

### *Austria:*

- Mandatory OBE

### *Switzerland:*

- OBE
- Manually at border crossings

## Solutions for Light vehicles

### *Several European countries:*

- Vignettes (e- or sticker) for main road network)



# Solutions?

- Mandatory on-board equipment?
- Fixed fee?
- Time dependant fee?
- Vignette?
- Vehicle dependant fee?
- No fee?

## Pay Congestion Charge

Select date



VH42556

Pay the Congestion Charge for this vehicle VH42556

Daily charges

**Pay for today**

Tue 17th October, 2017

£11.50 ☐

**Pay for the previous charging day**

Mon 16th October, 2017

£14.00 ☐

Other daily, weekly, monthly, annual and custom charges

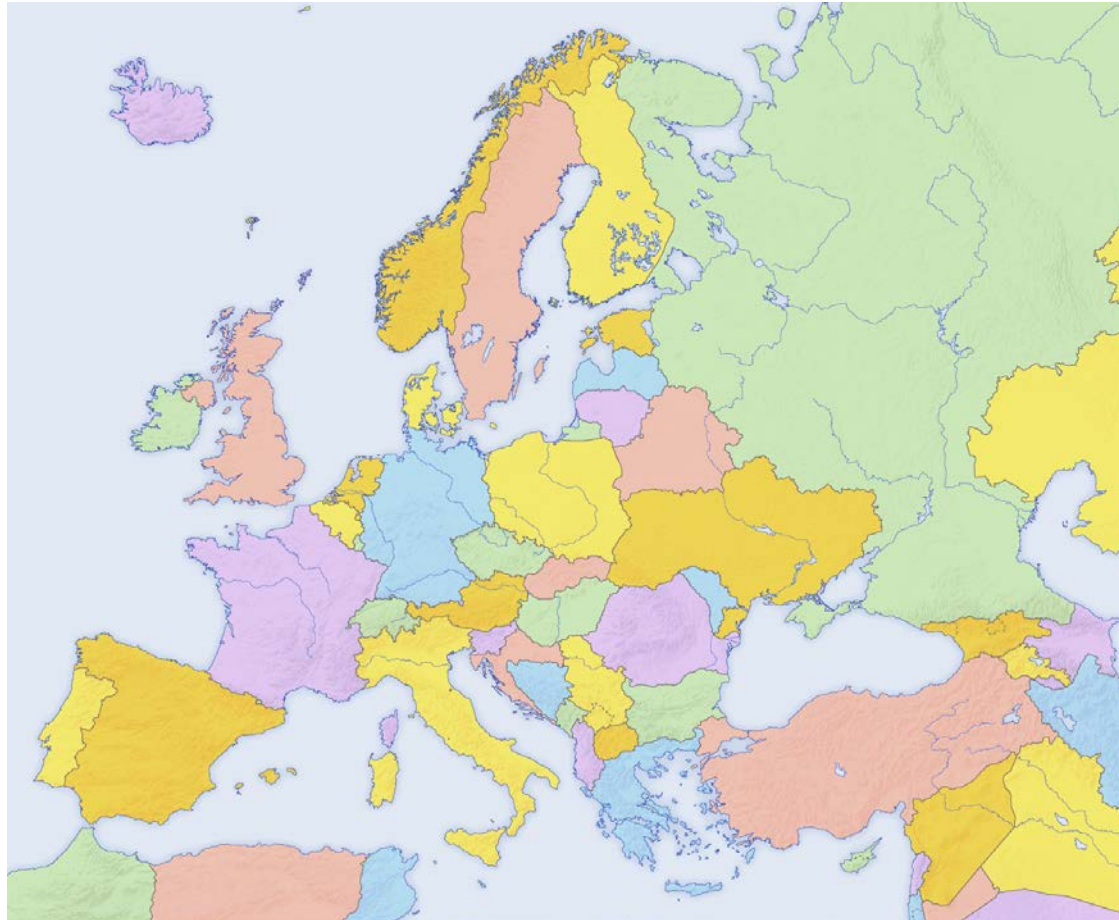


LONDON ROAD USER CHARGING

Sign In

# Compatibility with other road user charging systems in Europe

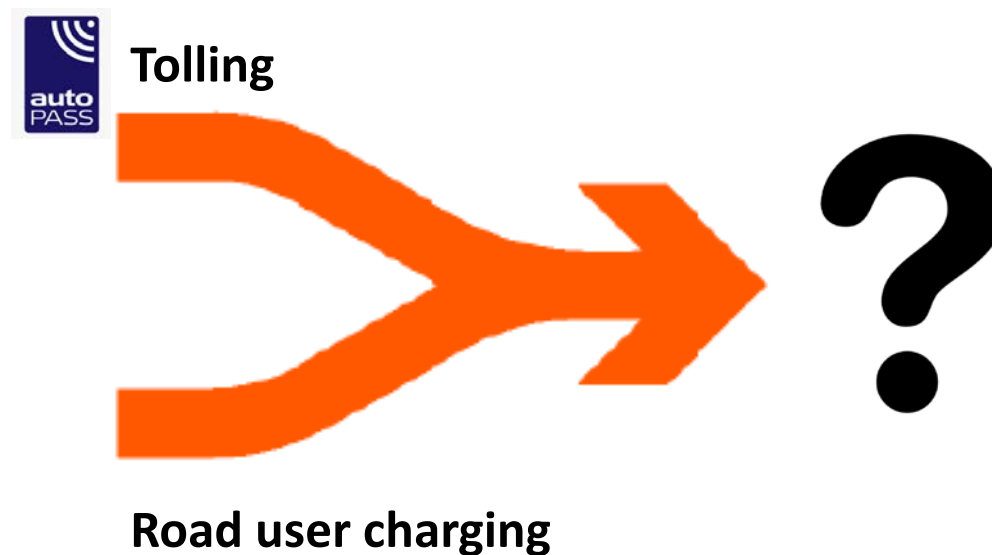
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# Compatibility with AutoPASS tolling



- Hundreds of millions NOK have been invested in Norwegian AutoPASS tolling systems for new roads, bridges, tunnels and urban transport systems for pedestrians, cyclists and public transport
- Tolling and Road user charging systems cannot be merged from one day to the next for technical and administrative reasons



# Some motivation for the last statement

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- Main objectives are different
  - Tolling: Road transport infrastructure financing
  - RUC: Cover external costs
- Technology is different:
  - Tolling: based on a simple vehicle tag and roadside equipment close to financed infrastructure
  - RUC: based on an advanced vehicle tag, vehicle digital infrastructure, all over roadside infrastructure (both for RUC operation and data collection) and global navigation satellite systems, e.g. GPS, GALILEO and on-ground localisation augmentation
- Interoperability
  - Tolling: European interoperability by EU Directives, EU regulations and CEN and ISO standards
  - RUC: ??
- Foreign vehicles
  - Tolling: Automatic Number Plate Recognition at toll stations used for payment
  - RUC: ??

# Solutions for on-board equipment?

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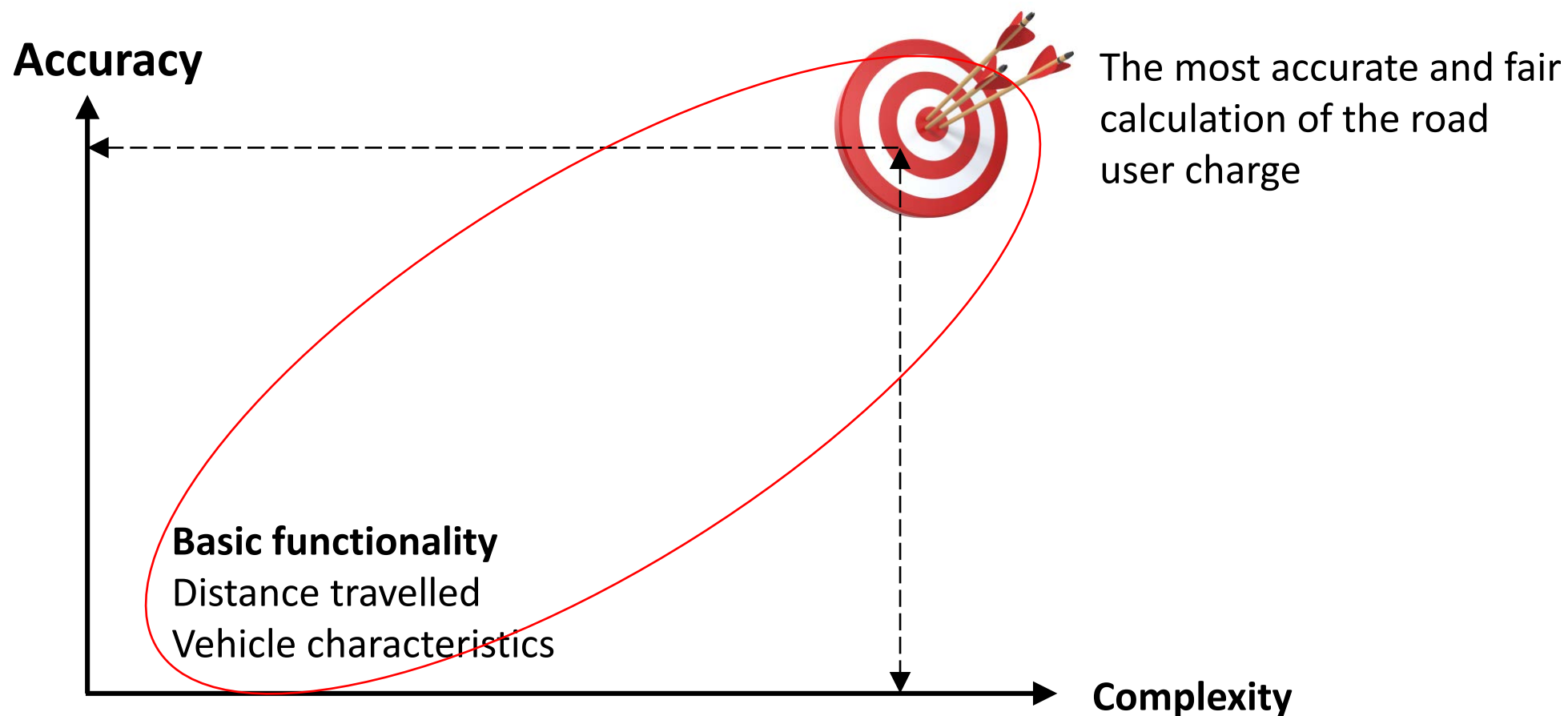
- A new RUC tag, i.e. two tags in the vehicle (should be avoided)
- Adaption of the road user charging algorithm to the existing AutoPASS tag (Phase 1?)
- A new AutoPASS tag that may be used for both tolling and road user charging (Phase 2?)



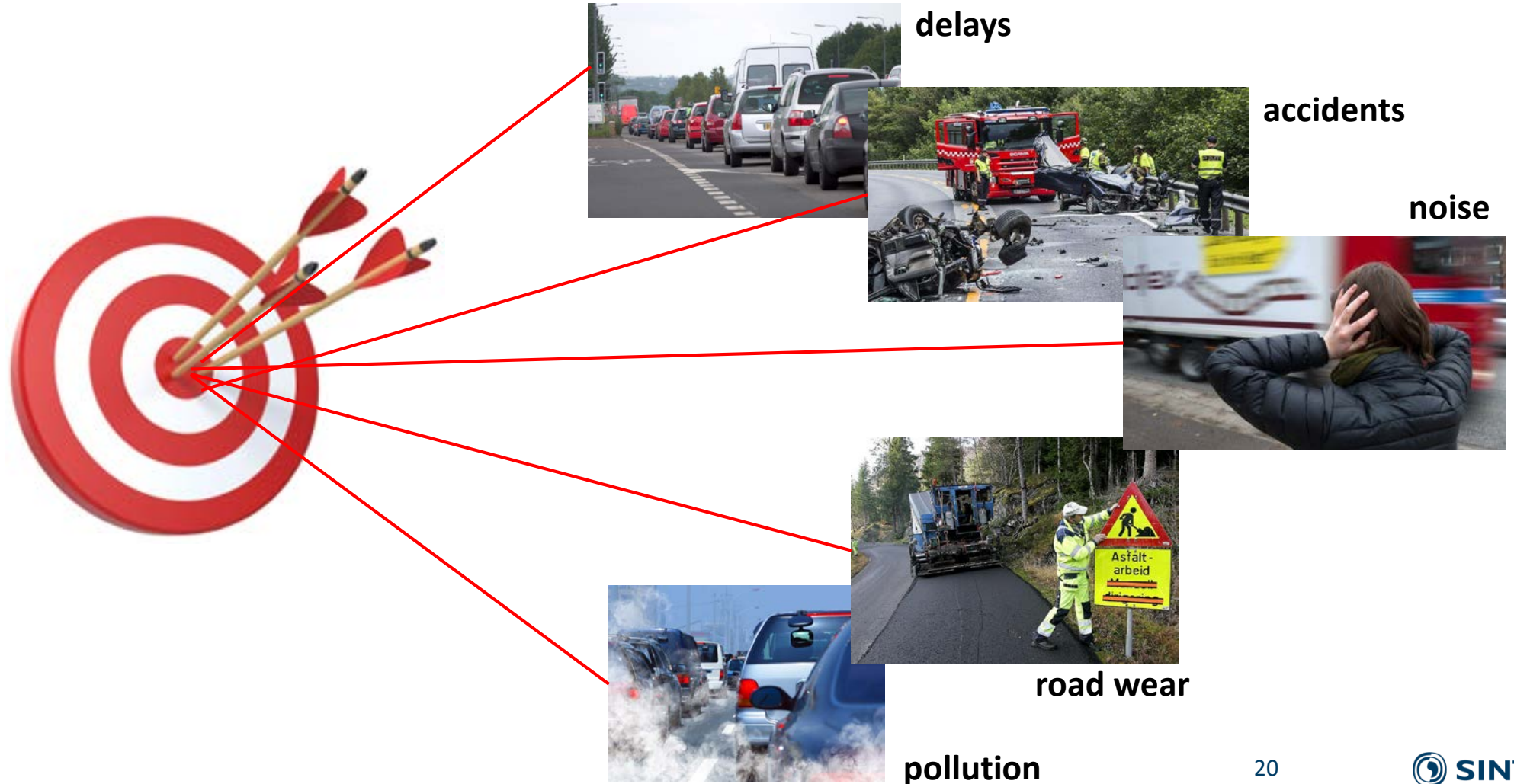
fjellinjen.no



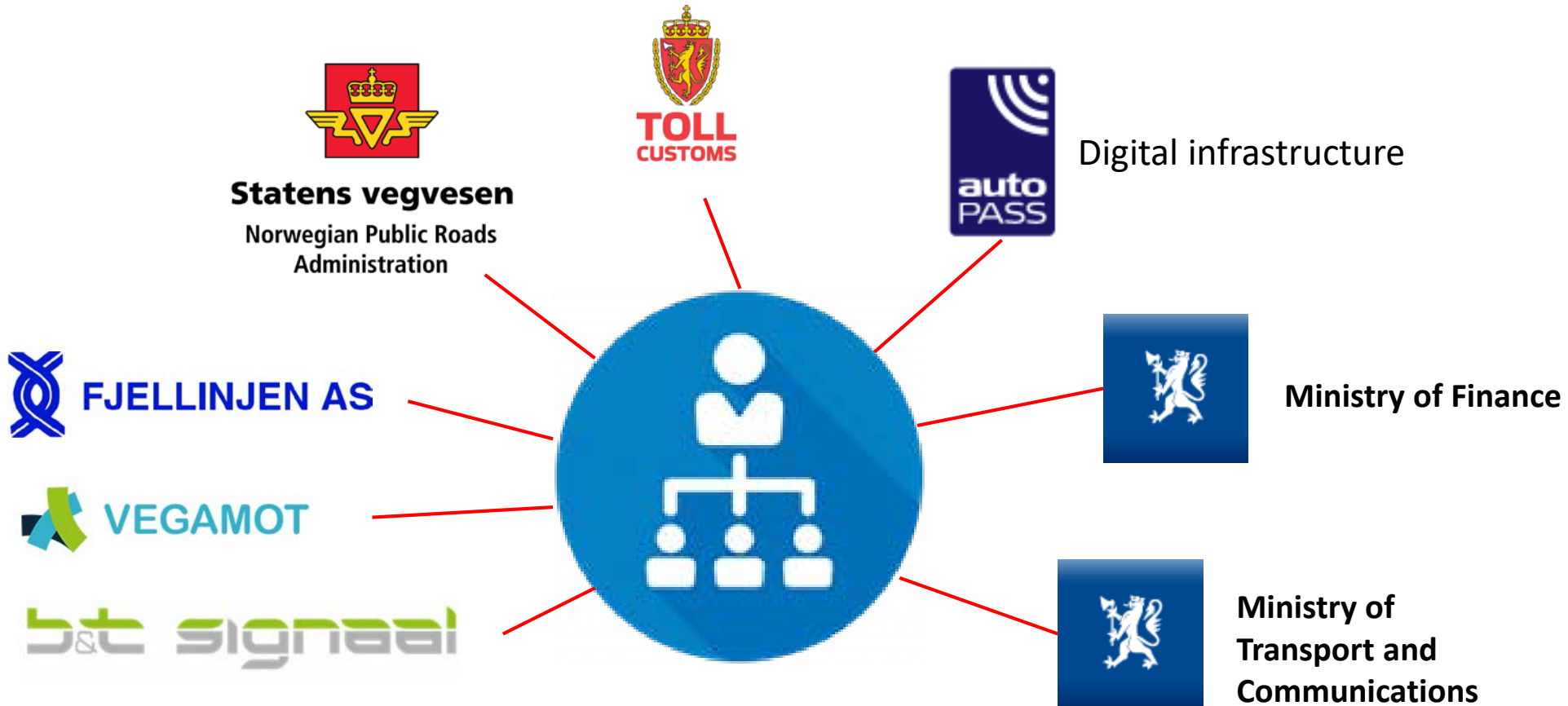
# Flexibility in implementation and development



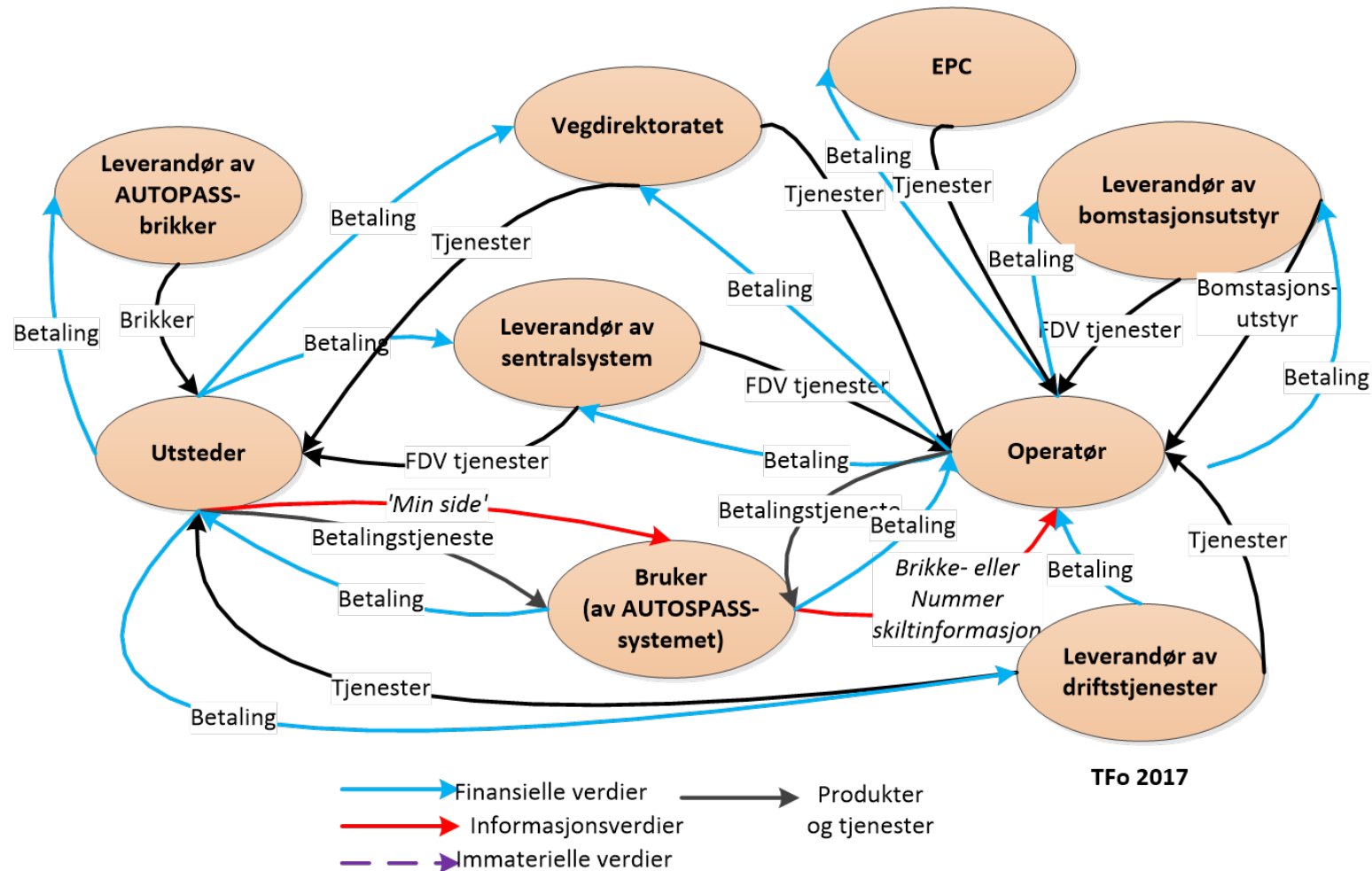
# Accuracy and fairness – what is perfect, what is enough and what is accepted by the users?



# How should it be organised?



# Value network for AutoPASS tolling



# Economy

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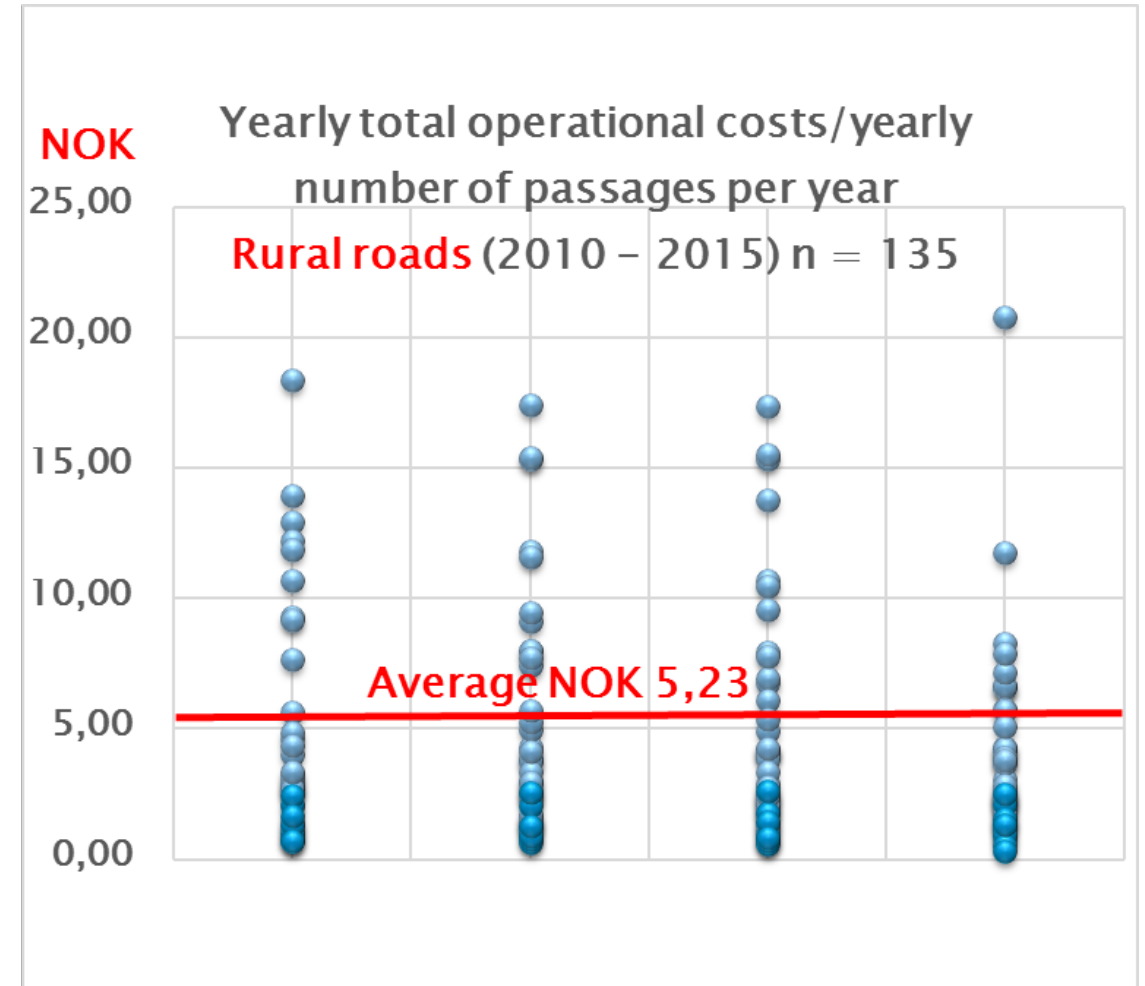
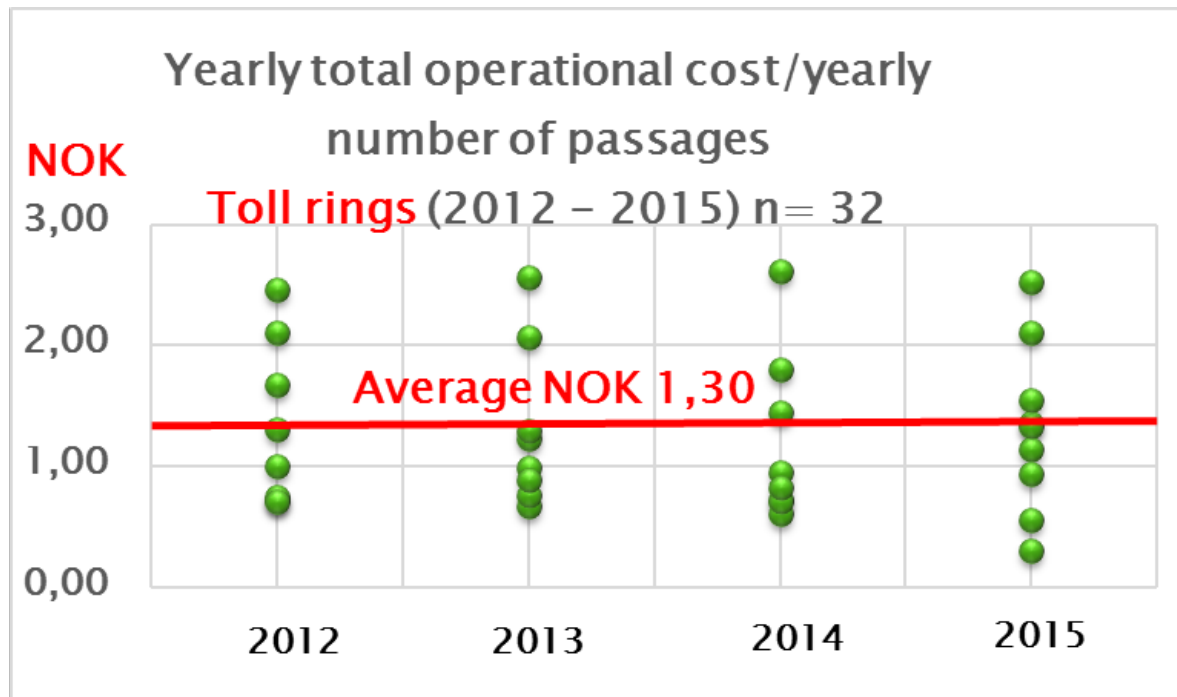
- A new RUC tag for all Norwegian vehicles is probably in the range of 250 – 350 mill. NOK.
- Costs related to data provided by 3<sup>rd</sup> parties?
- Investments and operational costs for Roadside and Central systems?





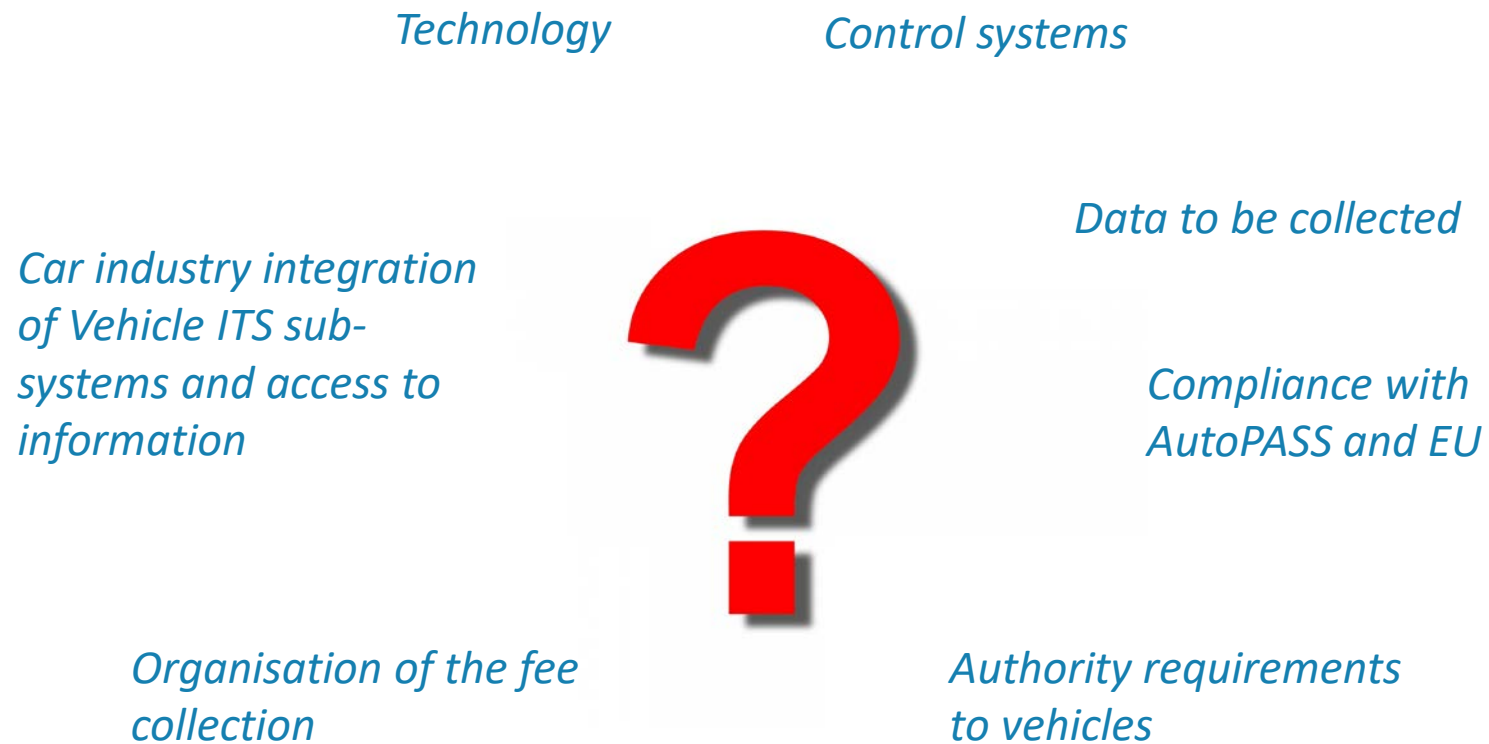
# Cost per passage in Norwegian tolling systems

## A possible benchmark?



# Several uncertainties related to economy

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# Transparency

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- RUC primary objective is to cover external costs
- A secondary objective is to manage the road user demands for capacity and to reduce the negative impacts of road transport
- The RUC system has to be transparent enabling the road user to adapt his behaviour to the actual road user charge



# Solutions?

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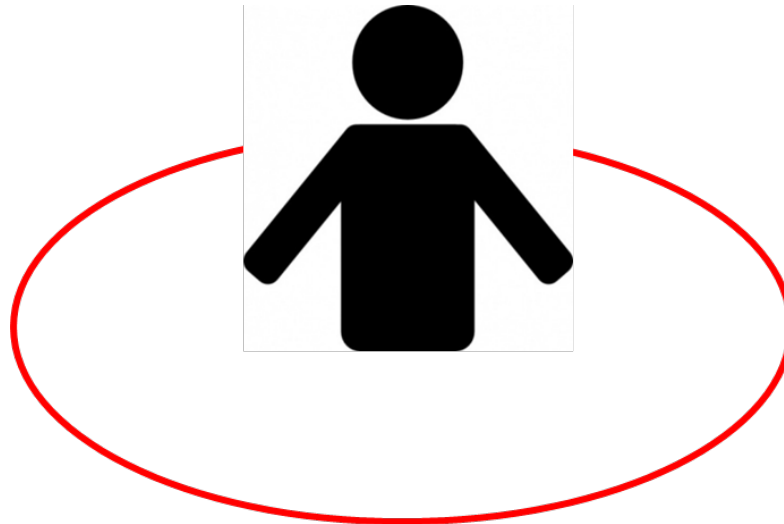


# Privacy

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Article 1 in The European Charter of Fundamental Rights (2009)

*"The dignity of man is untouchable. It is to respect and to protect"*





# GDPR

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## REGULATIONS

**REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**

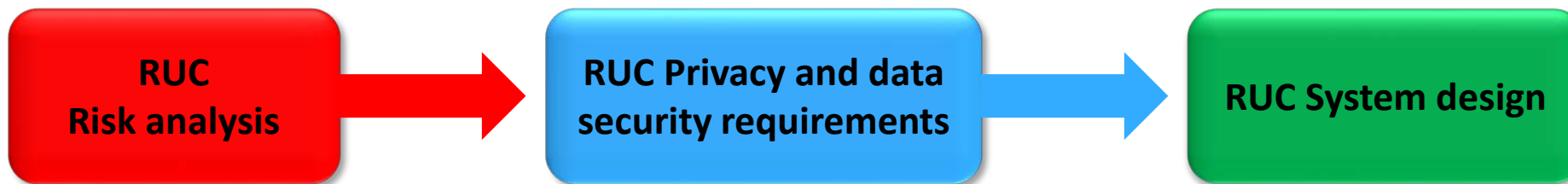
**of 27 April 2016**

**on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)**

# Two very simple advices

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- Work in very close co-operation with the Norwegian Data Inspectorate (Datatilsynet)
- *Privacy by design* shall be the default methodology from the very start



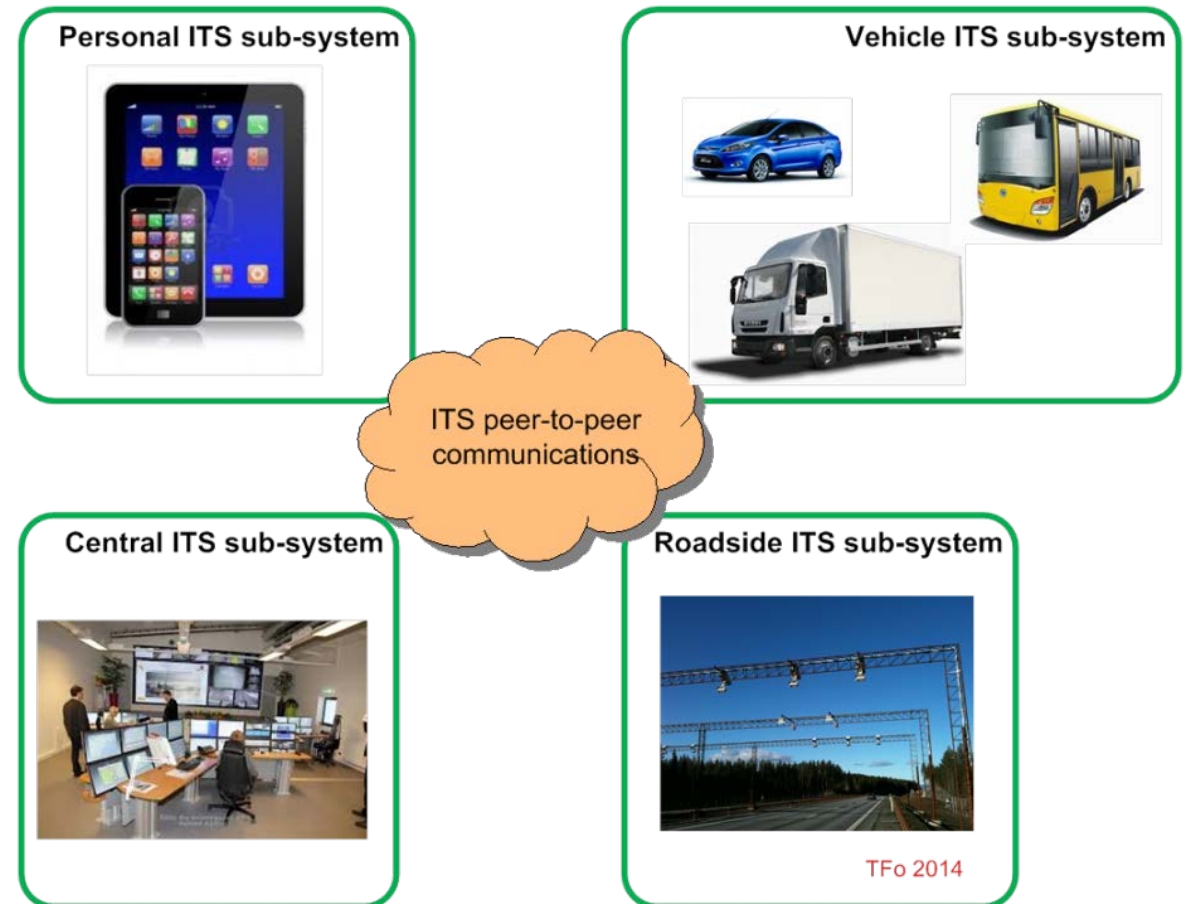
# Information security

## Potential attackers:

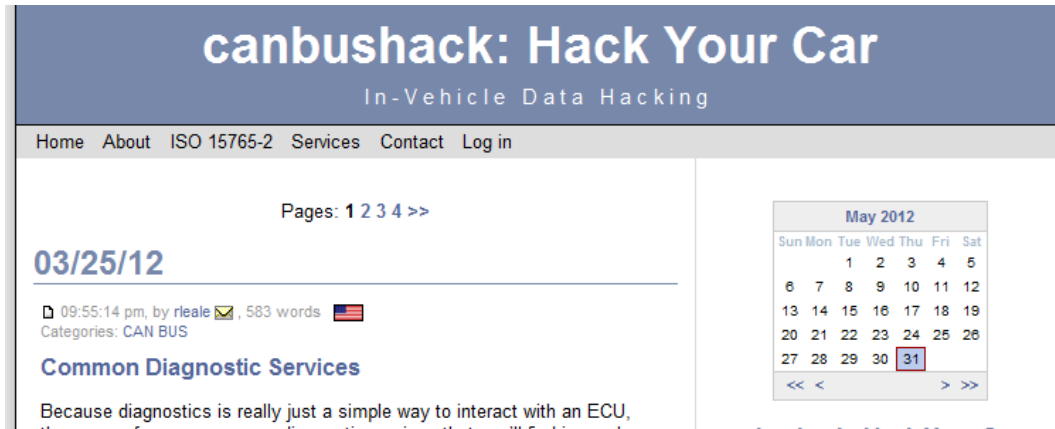
- Hackers
- Vehicle owners and drivers
- Activists
- Terrorists
- Criminal organisations
- Operators
- Authorities
- Foreign powers

*Attacks  
against sub-  
systems and  
interfaces*

## RUC digital infrastructure



# How to get access to the Vehicle ITS sub-system?



www.canbushack.com



www.hackaday.com



www.caranddriver.com



Kategori: Verktøy

## Volvo On Call

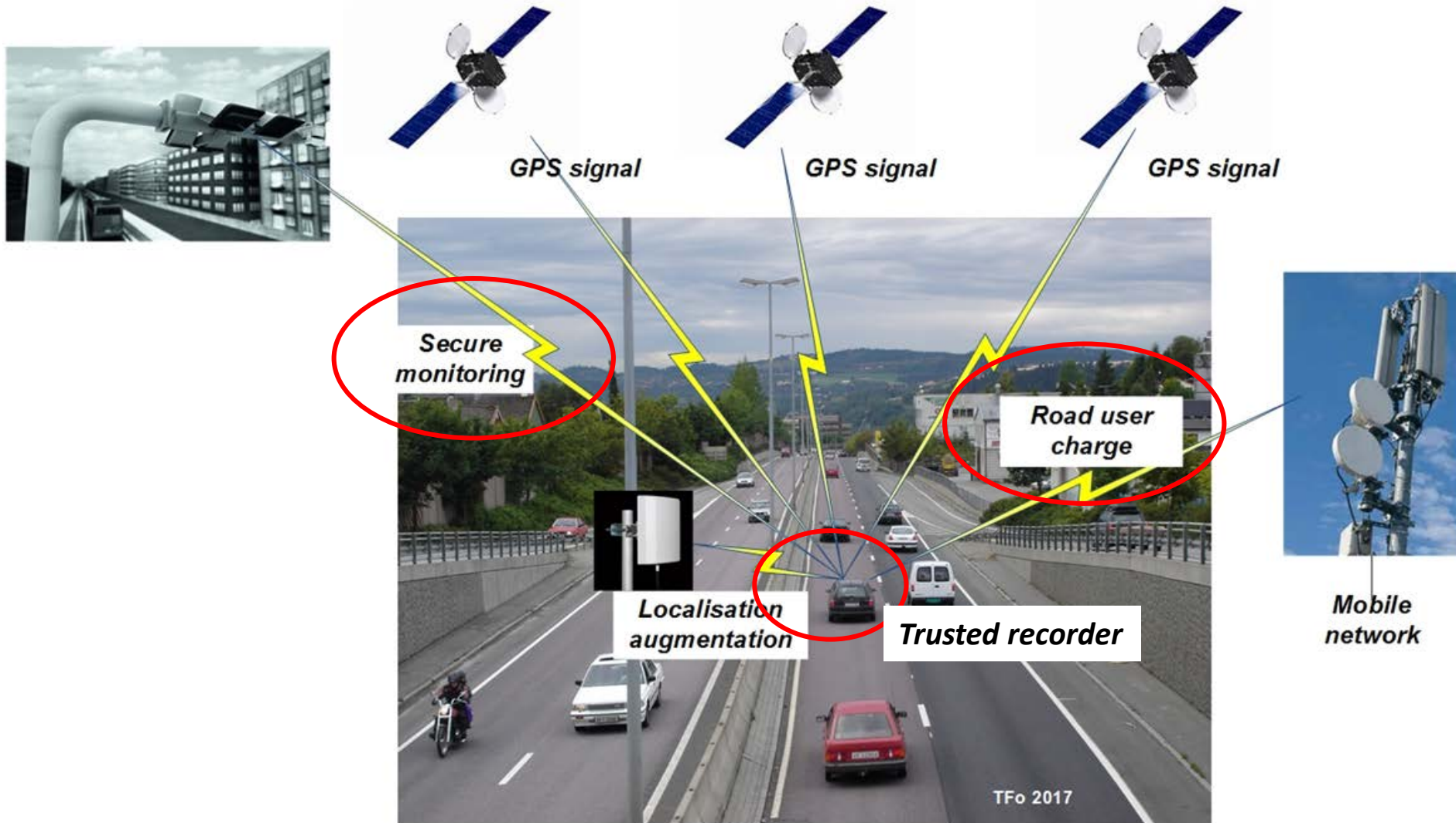
### Beskrivelse

Starting from model year 2012, Volvo now brings you the ability to access your vehicle from your iPhone, iPad or iPod touch. Volvo onCall Telematics unit. If your vehicle conforms with these requirements you will, depending on your model be able to

- See vehicle dashboard values, such as fuel level, trip meters, and more, in the App.
- Control your fuel fired parking heater, if the vehicle is equipped with a fuel fired parking heater.
- Locate your vehicle on a map or using the vehicle signal horn and turn indicators.
- See the current status of doors, windows and locks for your vehicle.
- Lock and unlock the vehicle.
- Request road side assistance from the App.
- Have an electronic driving journal, that will create trip reports for every trip made with the vehicle.

iTunes Appstore

# Solution?



Thank you for your attention!

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*Technology for a better society*