

**Because Mobility Matters -**

**Development of Road Charing in Europe:**

**Trends and Experiences relevant for Finland**

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Dr. Uwe Leinberger  
[uwe.leinberger\(at\)satellic.com](mailto:uwe.leinberger@satellic.com)

# AGENDA

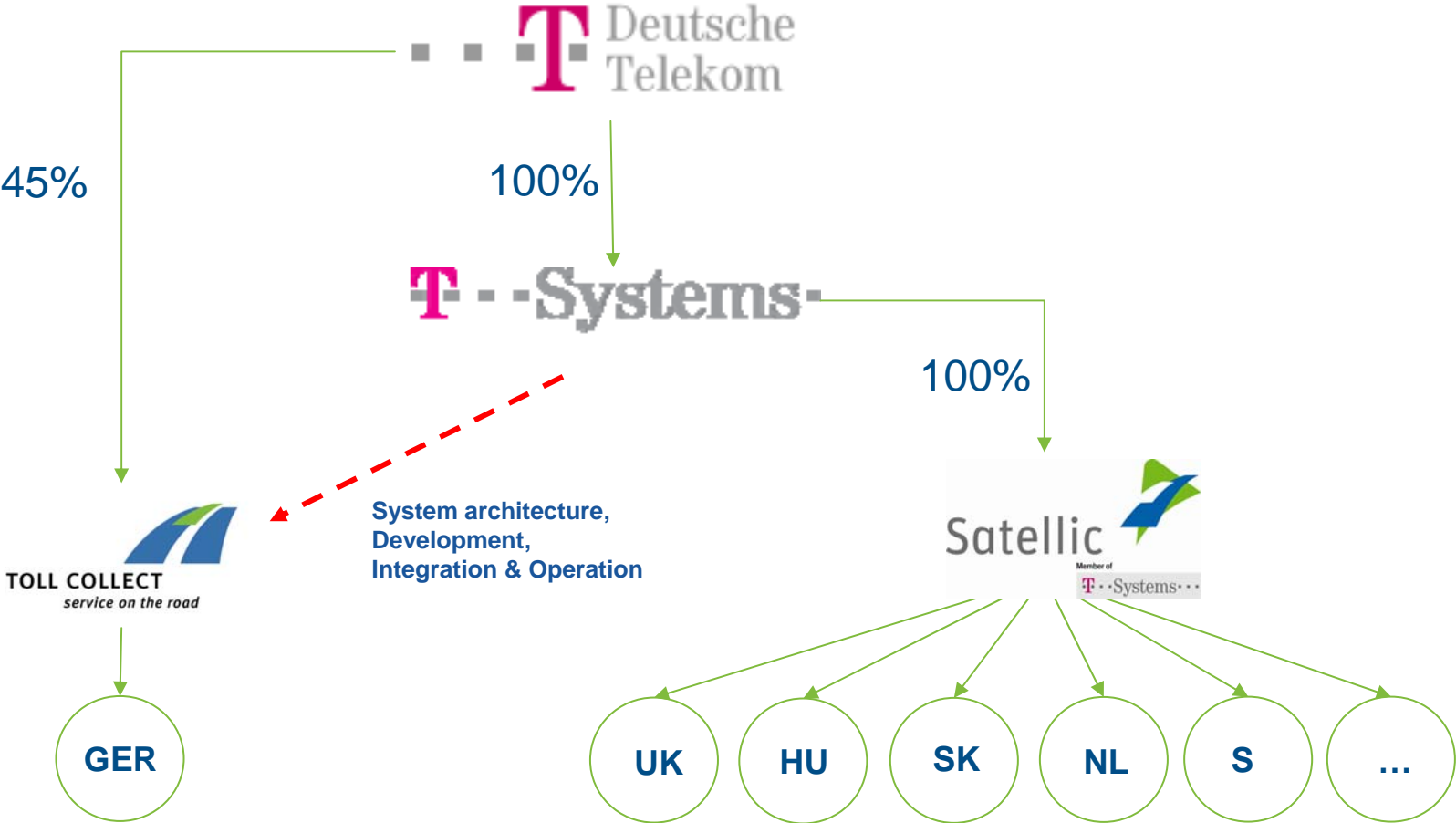


- 1 Introduction to Satellic
- 2 Developments and Trends in Europe
- 3 The German Toll Collect system – lessons learned
- 4 Implications for a possible LRUC approach in Finland



# Introduction to Satellic

# Our hard-wired network enables technology expertise, experience, resources, speed, simplicity



# Satellic tailors traffic management services to the specific requirements of local and national governments



| Satellic's Core Business   |  |  |
|--|--|--|
| Establishment and management of local operator companies for electronic road charging systems (technology independent) | Technological migration from microwave to satellite technology | Development and operation of electronic road charging systems using satellite technology |

# Developments and Trends in Europe

# Developments in Europe: Drivers for new charging schemes in Europe



## Main Drivers:

Congestion – more and more traffic everywhere, many 100 Billion € per year lost in traffic jams, transport and mobility at stake

Environmental Issues – esp. road traffic is one of the largest sources of harmful substances, e.g. greenhouse gases and particels

Modal Split of Transport – strong political motivations to shift transport back to other modes

Safety – road traffic still is causing substantially more accidents, injuries, deaths and other damage than other modes

Productivity Increase to mitigate Traffic Growth – creating pressure to do business more cleverly and use transport more efficiently

How? Apply economic theory....

*Substantial Issues for Society, Economy and Ecology:  
Mobility and Substainability are at Stake => Governments need to act !*

# Developments in Europe: Drivers for new charging schemes in Europe

Netherlands, most Urban Areas:

huge congestion problems everywhere that can not be solved by more infrastructure, only by demand management.

“Even with unlimited funds we could not have the space to built enough roads”

New EU Member States in the East:

Massive increase of traffic due to opening of borders

Existing infrastructure can not cope with traffic (numbers & loads)

New infrastructure badly needed – limits economical growth

Established European States (e.g. D, NL, B, A, UK, S, FI...):

Increase of Road Goods Transport expected to double by 2020

Driven by - growth of economy (transported tons)

- increase of transportation distance

(“Europeanisation” and “Globalisation”)

Existing infrastructure maintenance at stake – no funds for extension

*Substantial Issues for Society, Economy and Ecology:*

*Mobility and Sustainability are at Stake => Governments need to act !*

## The Trends for the Future are clear:



Apply Road User Charging on Public Roads

Starting with

- Motorways
- Congestion Charging

then continue with

- Main Roads
- then all roads

Replace Flat Taxes

- annual car tax and registration taxes
- fuel tax

by highly differentiated charges

- area, type of road, direction
- speed, time,
- emission, class of vehicle,
- occupation,...

*...enabling policy to achieve sustainable transport and mobility in Europe!*

# GNSS/GPM based road charging systems enable future policy for sustainable transport and mobility in Europe....

Charging



1955  
Private Tunnels,  
Bridges, Roads  
Manual Charging  
Some DSRC Lanes

Charging  
Tracking



2000  
Small Motorway  
Network  
Multi-Lane Free-Flow  
Electronic Charging  
DSRC-based

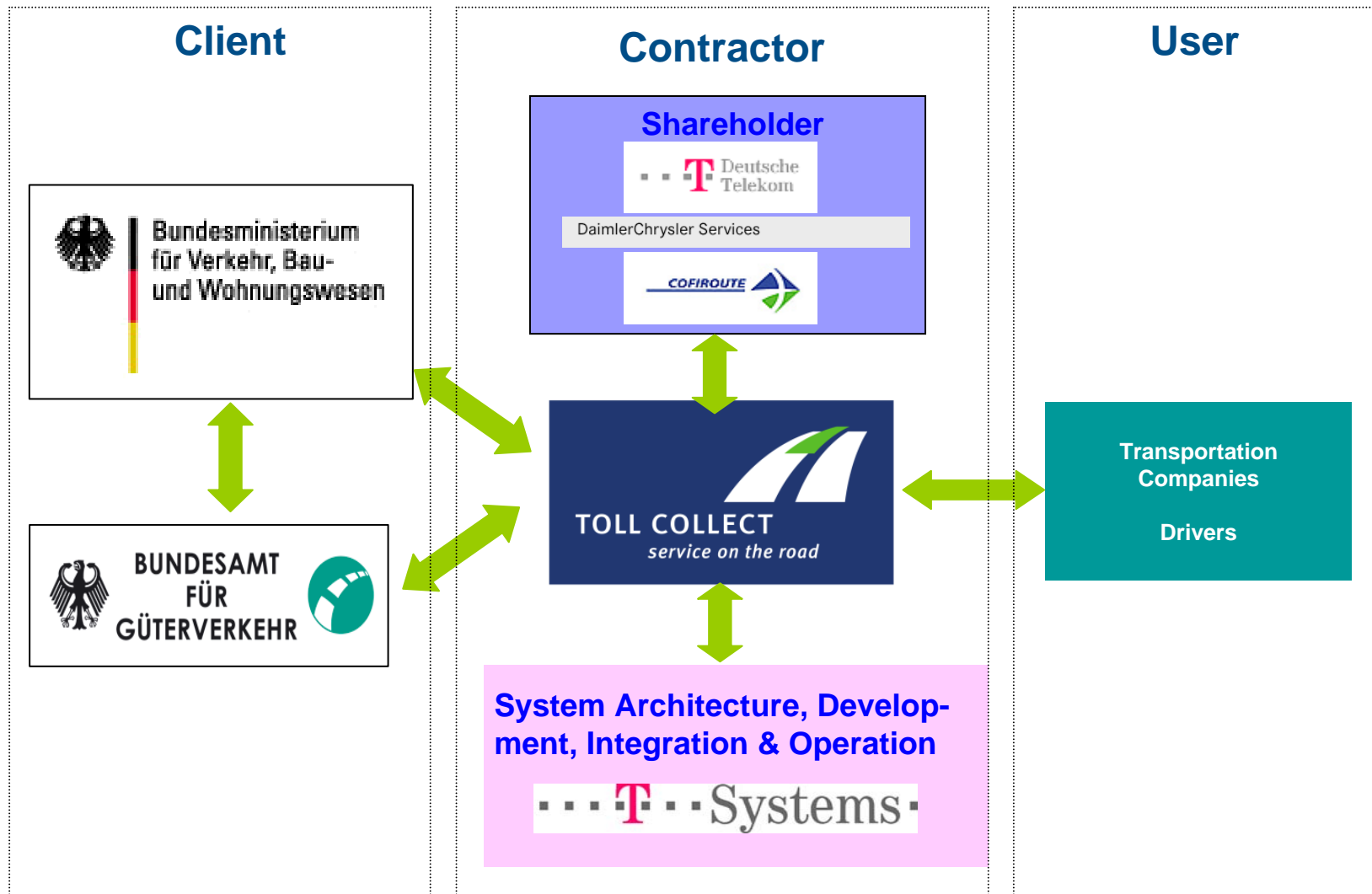
Charging  
Tracking  
Management & More



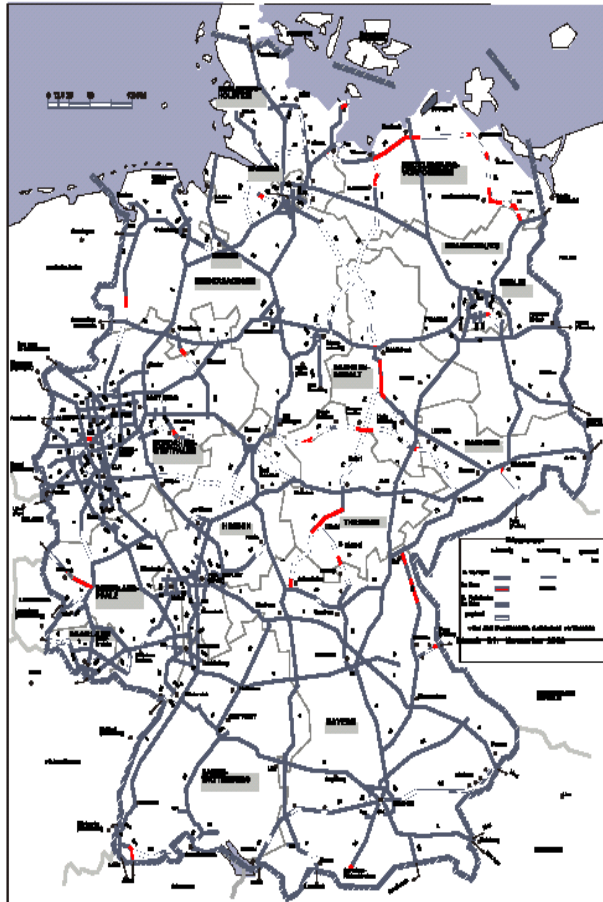
2005  
Large Public  
Motorway Network  
2010 & Future  
All Public Roads  
Complex Network  
Highly differentiated Charges  
(place,time,emissions,direction,...)  
Satellite-based

# The German Toll Collect system – scope, experience and lessons learned

# Introduction: Toll Collect.



# Toll Collect. Scope.



## Toll road network

- approx. 12,500 km on federal motorways
- approx. 2,500 junctions
- approx. 250 motorway interchanges

## Trucks required to pay the road toll

- 900.000 trucks  $\geq$  12t
- Including approx. 200,000 - 300,000 registered outside of Germany

## Toll road usage

- 27 billion vehicle kilometres per year
- 35% accounted for by vehicles registered outside of Germany

# The Toll Collect Project – a success



- Toll system has achieved highest sustained recording quota ever!
- Toll system has billed highest amount of driven kilometres ever!
- The introduction of Toll has positive effects concerning the reduction of empty runs (BMVBS)
- Entrepreneurs take into account the Toll concerning investments in new vehicles with better emission classes
- In average 250 Mio.€ toll income per month are transferred to the German ministry

# The Toll Collect Project – some KPIs

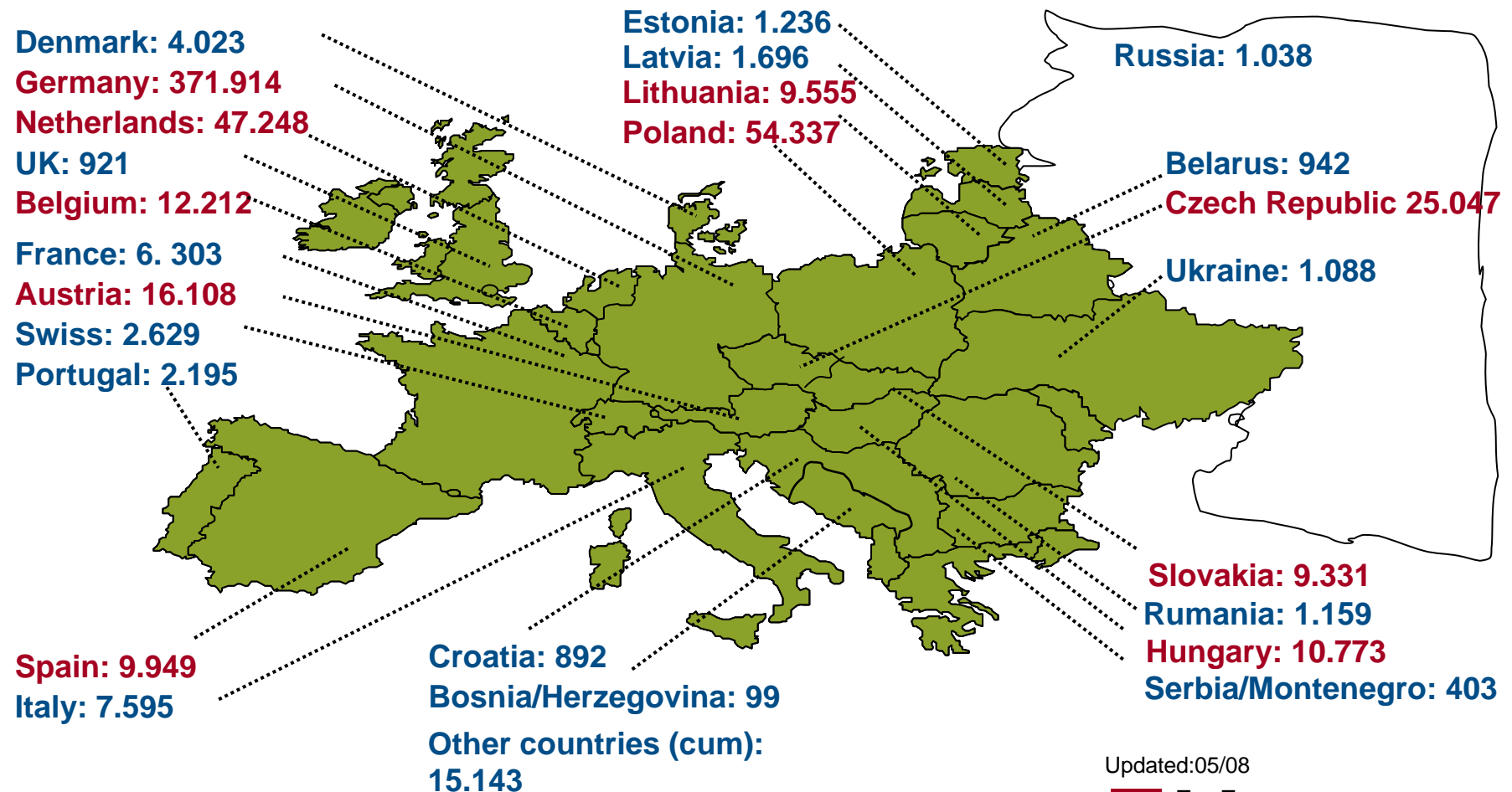


## Operational Status as of May 2008

- 10.5 billion € toll has been charged since January 1, 2005
- the amount of installed OBU raised from 320.000 (January 2005) up to 628.0

|   | 2005          | 2006           | 2007          | 01.-30.04.2008 |
|---|---------------|----------------|---------------|----------------|
| registered users in thousands /end of period      | 109.1         | 118.2          | 112.6         | 116.9          |
| registered vehicles in thousands/end of period    | 736.3         | 846.5          | 917.9         | 954.4          |
| mounted OBU in thousands / end of period          | 482.3         | 546.0          | 609.8         | 628.0          |
| availability / accuracy level of automatic system | 99%           | 99.75%         | 99,75%        | 99,75%         |
| toll income in billion €                          | 2.87          | 3.08           | 3.36          | 1,19           |
| toll kilometres in billion                        | 23.9          | 25.8           | 27.4          | 9.44           |
| quota automatic system                            | 86%           | 90%            | 90%           | 90%            |
| quota manual system                               | 14%           | 10%            | 10%           | 10%            |
| sent invoices to customers in thousands           | 1.004,5       | 1.043,2        | 1.128,9       | 410,7          |
| amount credit notes in thousand €                 | 86.9 (0.003%) | 108.1 (0.003%) | 79.0 (0.002%) | 16.7 (0.0014%) |
| controlled vehicles BAG+TC in million             | 17.6          | 18.2           | 18.4          | 6.28           |

## The Toll Collect Project: 628.012 heavy goods vehicles are equipped with On-Board Units



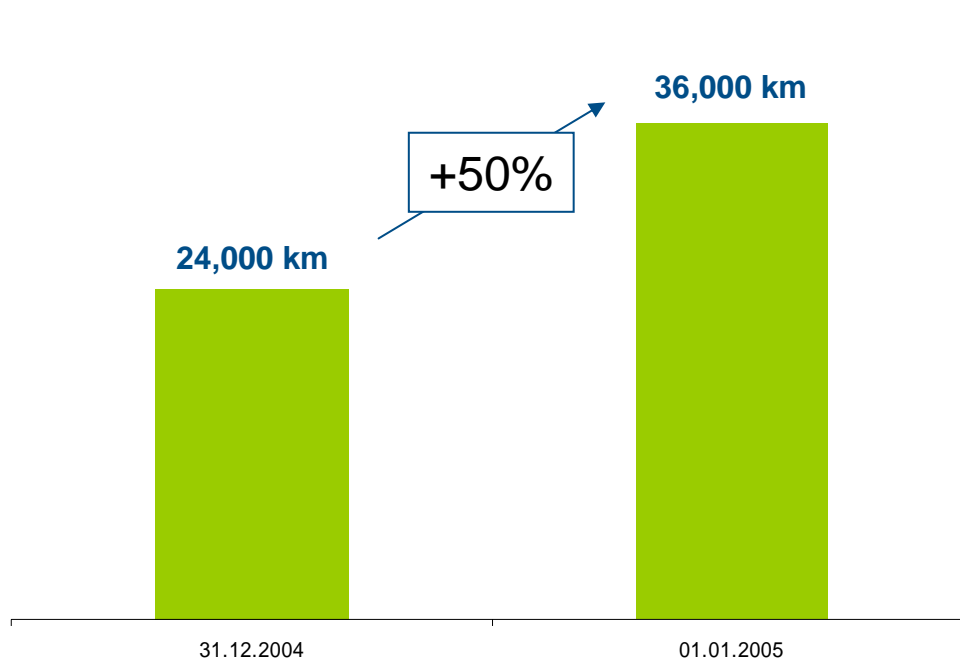
Updated:05/08

 Top Ten

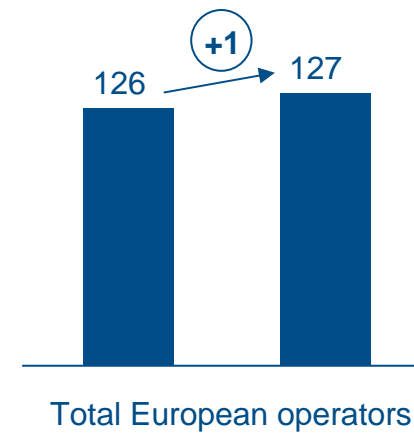
# GNSS/GSM based road charging systems accelerate implementation of charges –



## Start of „Lkw-Maut“:



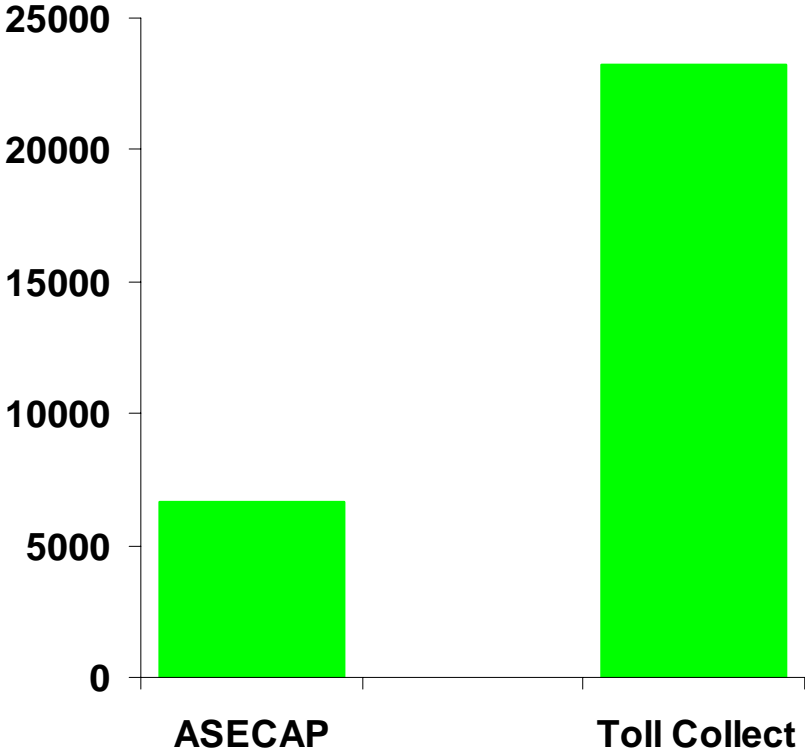
*Total European toll road network (ASECAP)*



**But new charging regimes are possible with new technology only....**



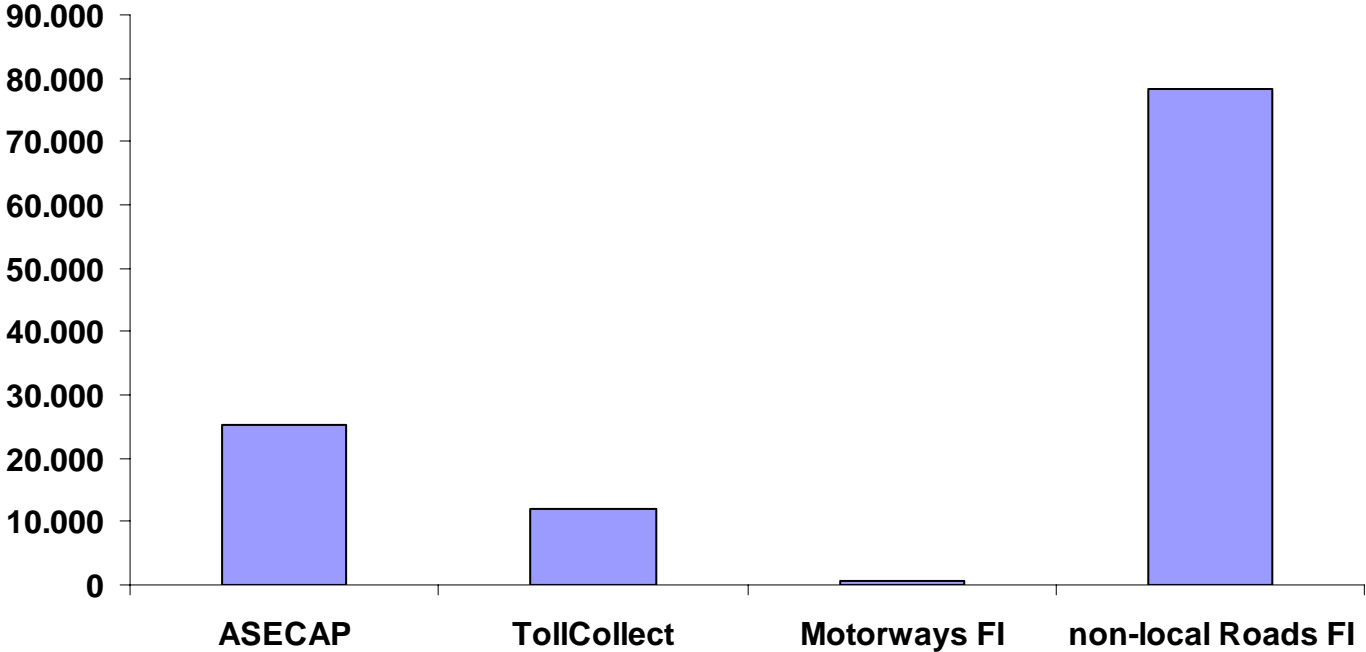
**EFC Lanes**



...it would impossible to do km-charging with tag&beacon technology...



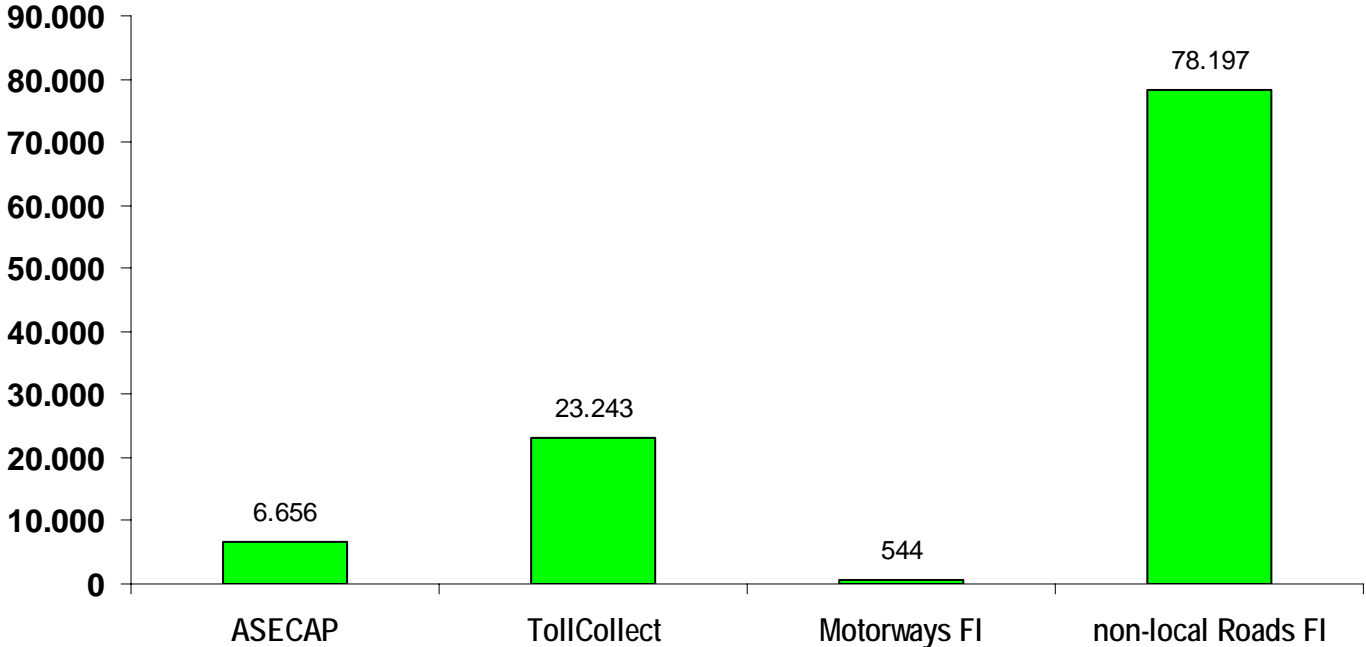
Road Network Length (km)



# ...for non-local roads in Finland (state and provincial roads)



## EFC Lanes



Source: ASECAP Website 2007, TollCollect, Eurostat road data.2006 (for 2003)  
Assumptions: 3km segment length, 2.5 average lanes for Motorways, 1km segment length, 2 lanes for non local roads

# The Toll Collect project – lessons learned



- EU discussion on EETS provider – a major factor in structuring the toll operator
- Keep the central system simple and flexible
- Mobile Communication – a major cost driver
- Interoperability – more than a technical issue
- Privacy issues – a permanent legal constraint
- Updates in the field are helpful to obtain stable operation and protection of investment
- Enforcement – anywhere anytime a Must

# Implications for a possible LRUC approach in Finland

# Conclusions for Finland



1. Network, traffic and tariff structure define suitable charging system solution:
  - for km-charging of trucks on non-local roads, only GNSS-based autonomous OBU is possible
  - Once the fleet to be charged is GNSS-OBU equipped, DSRC gantries on Motorways are not needed any more
2. “Dumb Client” approach only seems simpler at first glance – but closer view yields: “Smart Client” approach should be taken
3. EETS will be a legal obligation soon – to take EETS architecture into account is strongly advised
4. EETS approach allows to (re-)use same invest in OBU fleet in many countries across Europe
5. EETS is defined as an „additional service“, so even EETS users are still free to use national system(s), even on a per-trip basis.
  - Users must be accepted irrespective of their nationality and financial standing / credibility
  - High probability for need of prepaid schemes
  - Fallback to national system also must be open for EETS users

# Comments on “Dumb Client” OBE approach



- Sending raw data requires Central system to be designed for high data volume due to time & space resolution requirements: amount of data to be stored and sent depends on most critical single point in whole network (sampling theorem) - amount of data could mount very high
- Amount of data to be sent could generate extensively high costs in mobile communication – consider GSM roaming cost
- Privacy issue: all movements will be recorded & sent, also for not eligible tracks (no distinction possible on-board). This is a breach of the need of data minimality in privacy directive 95/46/EG and thus poses a legal risk \*)
- Updateability of OBU is strongly recommended:
  - No system is error free
  - Optimisation is needed (in accordance with operational experiences)
  - The world changes – driving changes in system
  - Stable operation and protection of invest requires updates
- All strong arguments for “Smart Client” approach of TollCollect
  - the only proven approach in full operation!

\*) Hear Peter Hustinx, European Data Protection Supervisor on this issue at ITS Europe, Geneva in SS42, Fr June 6, 2008, 14h

# Enforcement



- Enforcement „anywhere, anytime“ is a must – and needs to be addressed in concept
- German Experience shows, that communications in car2car and in portable2car scenarios for mobile enforcement is very difficult using CEN DSRC 5.8Mhz without violation of restrictions
  - Thus Germany adopted DSRC based on CALM infrared
  - Very good experience with this technology
- General concept of checking a sample of traffic without stopping vehicles based on IR-DSRC and fairly high fines works well
  - Very low rate of incorrect payments – that also include human error
  - Stopping suspects on site is important esp. for foreigners
- Advise to check extensive Analysis of EU Expert Group 10 on Enforcement

# Interoperability



- General architecture should consider EETS conformity
  - Consider responsibilities of EETS provider as per CESARE III
    - ▶ Has obligation to accept all clients requesting EETS
    - ▶ Has to stand up for all charges
    - ▶ Needs thus a flexible and trustable pre-paid scheme that allows the OBU to check deposit against amounts due in near real-time
  - Consider Functional and Interface Specifications generated by RCI \*)
  - Operating under EETS also means
    - ▶ Operating under GSM roaming – communications may be very expensive
    - ▶ Flexibility to adopt other Toll Charger's schemes – i.e. flexibility of OBU
  - Do not forget that Directive 2004/52 obliges Toll Chargers not only to accept EETS clients, but to issue EETS contracts & OBU to any client

\*) Road Charging Interoperability Project, see <http://www.ertico.com/rci>



**Questions?**

[uwe.leinberger\(at\)satellic.com](mailto:uwe.leinberger@satellic.com)



**Thank you for your interest and attention!**

[uwe.leinberger\(at\)satellic.com](mailto:uwe.leinberger@satellic.com)