



Road charging systems and technology

Road User Charging 2006

- History of road user charging in Norway
- Stockholm : " The challenge"
- Technology of road side system, how does it work?
- Summary

Business idea

Supplier of technology and products that safeguard transport operators' cash flow



History of EFC in Norway

- 1987 The first EFC plaza in operation in Ålesund
- 1990 The first EFC City Toll Ring in Oslo
- **1991 The world's first unmanned Toll Ring in Trondheim**
- 1997 The AutoPASS project was launched
- 2000 The AutoPASS implementation started
- 2004-02-01 Full National Interoperability for EFC – one tag – one contract
- **2004-02-02 Introduction of fully automated, free flow toll plazas**
- Feb 2004: 42 toll projects, 22 has EFC, 300 lanes in total, 220 EFC
- Approx. 1,1 mill OBUs
- Transactions/year > 250 mill.
- Revenue/year: close to € 300 mill.

Basic EFC concept of EFC in Norway

- Central subscriber account
- Free flow lanes, no barriers
- Video enforcement and video charging w/OCR
- Pre payment gives discount
- Manned and unmanned toll plazas
- Manual and coin also available
- Two classes; < and > 3.5 tons allowed total weight
- Some vehicles are exempt from tolling
- **One tag – one contract**



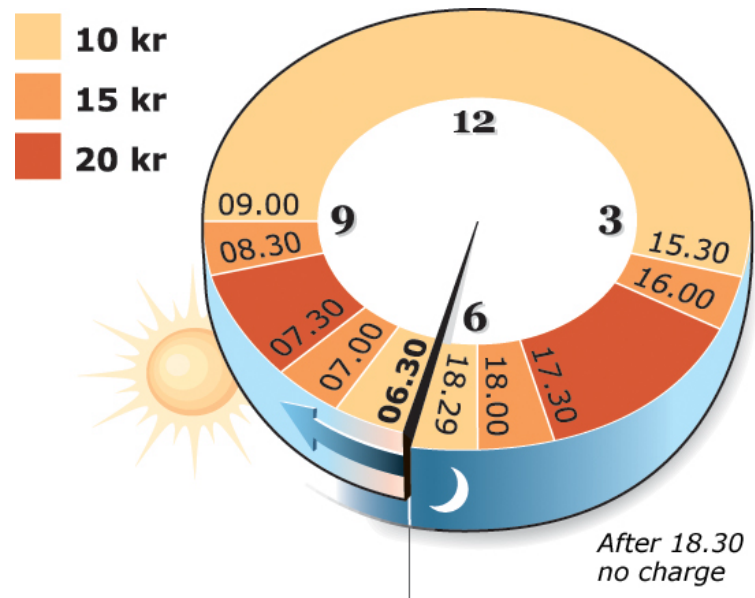
Stockholm road charging system

Stockholm charging system

- The congestion charging is a national tax
 - The revenue will be returned to the Stockholm region for investments in the public transport system and infrastructure.
- Congestion charging trial period
 - Trial period 3 January – 31 July 2006, referendum 16 September 2006
- Objectives
 - Reduce congestion (reduce traffic volume by 10-15 % during rush hour)
 - To improve accessibility for buses and cars in the inner city.
 - Invest in public transport equipment and park & ride facilities
 - Improve the environment
- Payment based on DSRC beacon system combined with video from front and rear linked to vehicle register
- Single lane, 2 lane, 3 lane up to 4 lane charging points
- **High precision, high accuracy system to collect the tax correctly from every vehicle at every passing**

Charging structure

- Charge in both directions
- Charge varies dependent on time
- **Maximum charge per day €7**
- No charge during evenings, Saturdays, Sundays and holidays
- Exemptions:
 - Emergency vehicles
 - Vehicles with disability permits
 - Foreign cars
 - Buses over 14 tons
 - Taxis
 - Motorcycles
 - Environmental friendly vehicles; electrical, ethanol, biogas



Transaction volumes and system

- OBU penetration
 - Expected OBU penetration of ~85 - 90%; 600 – 700 000 OBUs
 - So far about 430 000 OBUs distributed
- Transaction volumes
 - Stockholm expect transaction volume to exceed 500 000 transactions per day
- Road Side installation
 - 44 payment portals comprising 77 lanes
 - 50 manual payment stations in
 - Gantry installations include DSRC system, classification system and video system for front and rear image.
 - CEN DSRC, EFC specification based on PISTA and CEN278

Time schedule – a complex law change and bid process

Competitors

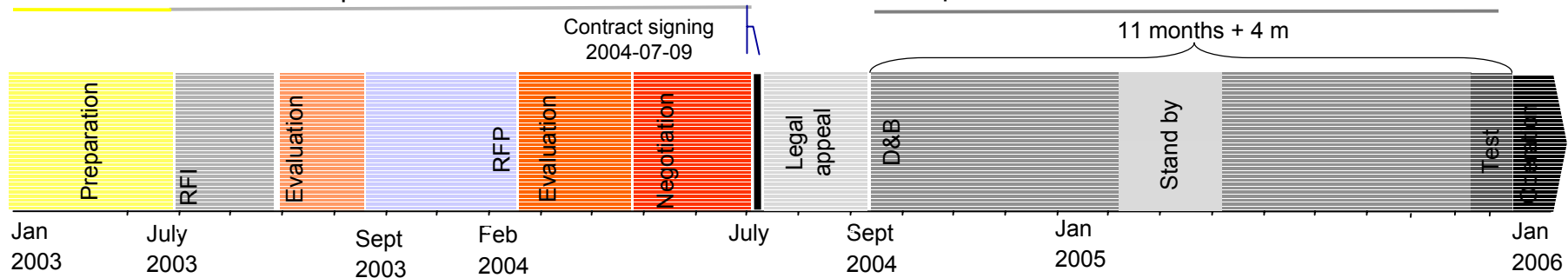
- IBM with Q-Free as main sub contractor
- Consortium Combitech (Kapsch, Atos Origin, Transurban)
- Consortium SMAK (Q-Free, Siemens, WM-data)
- Logica CMG Public Sector B.V. (Efkon)
- Consortium c/o TagMaster AB
- Consortium Appian Group

Law changes process

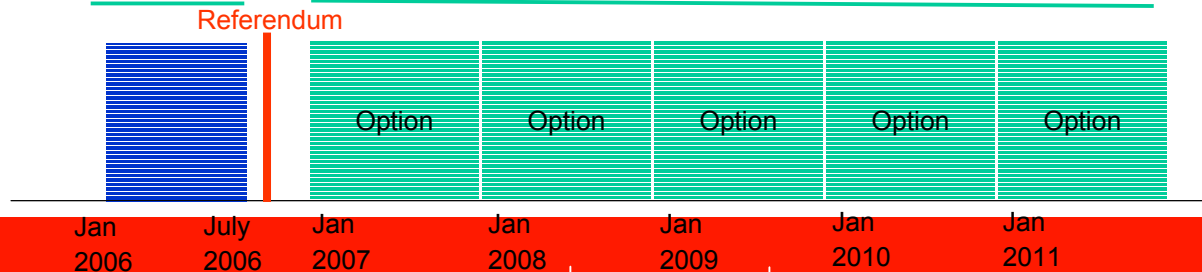
- Prime minister's keynote speech Jan 2002
- Decision municipal council June 2003
- Government decision about the Government law bill April 2004
- Parliament decision about the new law June 2004

Procurement phase

D&B phase



Operational phase



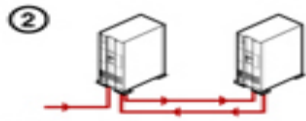
IBM on demand solution chosen for congestion charging

The Swedish National Road Administration has awarded IBM a contract to build an on demand solution for a full-scale congestion charging test in Stockholm, that will include wireless RFID technology.

A This is how it will work when the vehicle has a transponder



The driver passes a gateway without slowing down. The gateway registers that this vehicle has passed, and distributes information to central computers.



Through the computer system, vehicle information is matched with registered vehicle data and a fee is added to the vehicle owner's account.

This is what the transponder looks like. The transponder is attached inside the car, behind the inside rear mirror.



Stokab will provide the optical fibre networks connecting gateways and central computers.

Paying after use is an option and there are different ways to pay available; the Internet is one, chains of commercial service providers is another.



Manpower will provide customer services.



Posten will distribute the transponders.

Pressbyrån and 7-eleven will distribute transponders and handle payments.

Q-free will deliver the transponders, radio transmitters and cameras.

Bravida will install the gateways.

IBM will build, integrate, implement and run the congestion charging system.

B

If the vehicle does not have a transponder the driver can pay up to five days after use.



The vehicle passes a gateway without slowing down. The gateway takes a picture of the vehicle's licence plate.

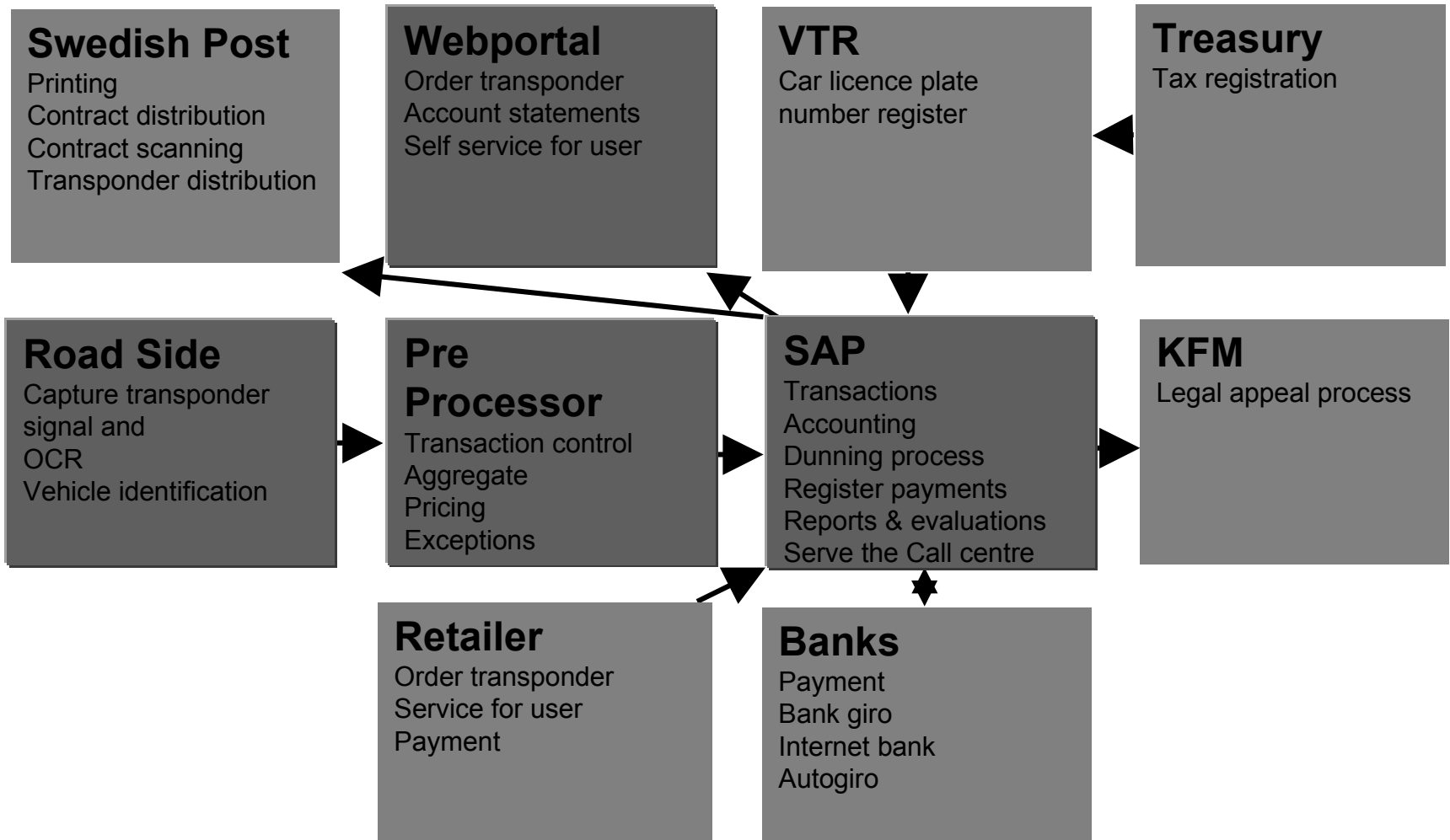


In central computers, the registration number is matched with registered vehicle data and a fee is added to the vehicle owner's account.



Paying after use is an option and several means of payment are possible, e.g. the Internet or selected chains of service providers.

Central system and partners

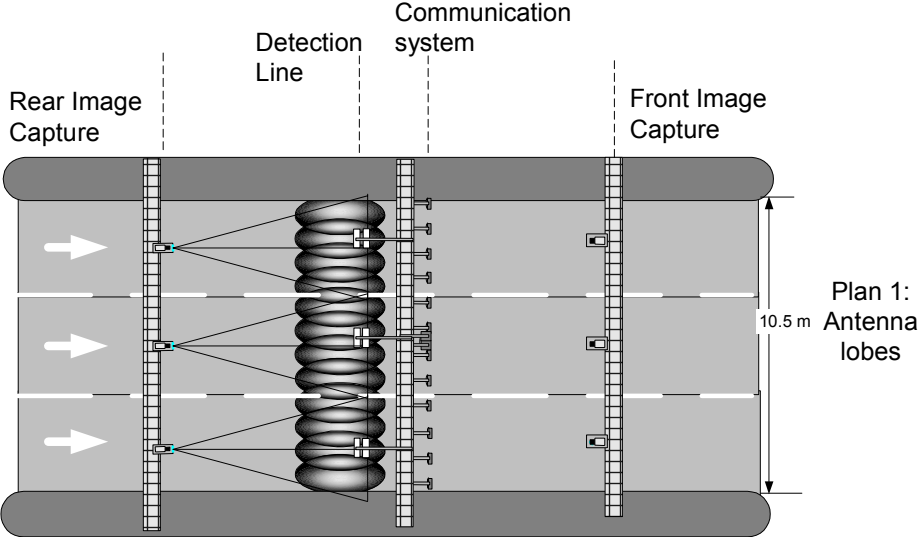


Road side system

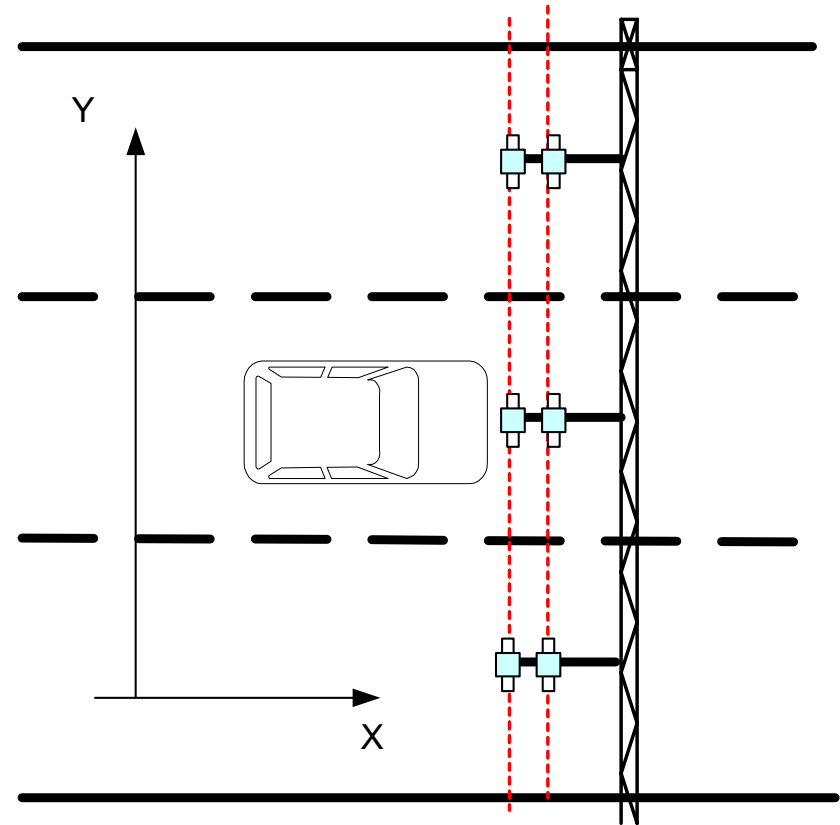
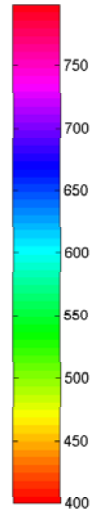
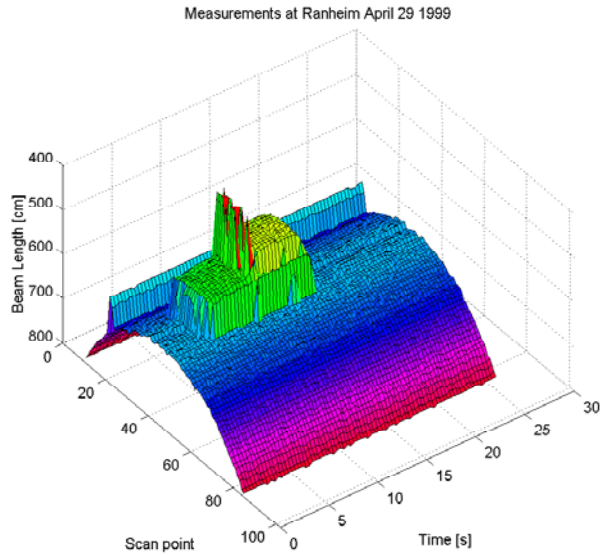
Charging point sub systems

- Communication system, DSRC beacons
- Vehicle classification system
- Vehicle registration System
- Coordination and control system


Charging point - DSRC communication system



Charging point – Vehicle Classification System



Legend:

 Laser Detection sensor

Vehicle registration

- High resolution cameras with infra red flash
- Each registration picture can be signed with a digital signature
- Information about the actual detected width of the vehicle in each picture.
- OCR can run in camera or at back office.



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Turin example



London example



London example



Changhai example



Summary

Reflections some weeks after launching date

Major Challenges

- **Challenges charge tax legislation VS the request for proposal**
- **Short delivery time in combination to fixed start date**
- **Dimensioning**
 - Communication capacity
 - Hardware / Software
 - Call centre & Back office
- **Transaction volumes**
 - 450000 passage to register per day
 - 1miljon photos to process per day
 - 400 000 transponders to distribute and register direct debit accounts within a number of weeks
- **Integration of all external partners**
 - Business processes in between all partners
 - Driving licence register, Swedish Post, Tax Authority, Banks, Manual service sights...

Most positive for experience

- The system worked
- The client is happy
- The partners are happy
- Hired specialist consultant (been involved in many RUC systems implementations) are impressed by approach, methods and skill

Operational key figures after 5 months in Stockholm

- Number of passages 34.047.400
- Number of payments 10.589.500
- Downtime less than 0,01% in average during the trial
 - January 0,05%
 - February 0,2%
 - March 0,02%
 - April 0%
 - May 0,01%
 - June 0%
- 10% of estimated trouble
 - Number of calls to call center 1800 per day, estimated to 30.000 per day
 - Less than 1% tried to cheat the system
 - Appeals to court 5 persons persons per day, estimated to 100 per day
 - Appeals to tax authoroties 115 persons per

Q-Free Reliability

- **DSRC charging technology is working and well proven**
- **High performance, high accuracy system**
- **Requires no alterations to the existing road infrastructure**
- **DSRC combined with video and ANPR gives lowest investment and operational cost**
- **Great flexibility in terms of charging models and price structures.**
- **Real time classification of each vehicle can be included**
- **ANPR rate above 90% is proven on real traffic**
- **High OBU and ANPR rate decreases operational cost, less than 7% of transactions handled manually, proved in Stockholm**
- **A platform for value added services such as smart card payment, parking and petrol fueling**

Thank you!

Move On™

