Dynamic Tolling

Next-generation traffic management allowing to reduce traffic congestion and increase environmental protection based on variable and dynamic toll tariffs

Kapsch TrafficCom: Road Traffic Telematics Solutions Portfolio

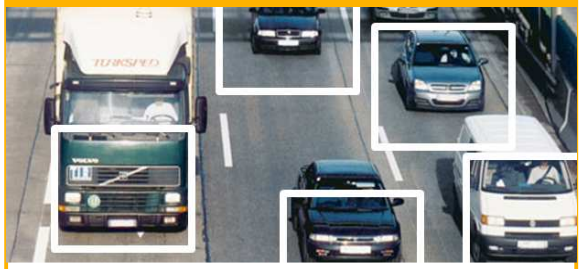
Tolling Solutions

- Highway tolling
- Area tolling
- E-Vignette
- Plaza tolling
- Toll enforcement

Urban Traffic Solutions

- City tolling
- Access restriction
- Low emission zones
- Open zone parking

Safety & Security Solutions



- Speed monitoring
- Weigh in motion
- Incident detection
- Traffic surveillance

Add-on Applications

Kapsch TrafficCom – Snapshot

Scope of business:	▪ Turn-key solutions, component sales and operations of road infrastructure related ITS / traffic telematics solutions (focus: electronic toll collection systems) ▪ 16 years of experience in electronic tolling (218 references in 35 countries)
Offering:	▪ Development and manufacturing of core technologies, systems & products; system concept & planning; system implementation, integration & roll-out, technical operations (support & maintenance); commercial operations, financing
Selected references:	▪ Truck tolling system A ▪ Truck tolling system CZ ▪ All vehicle tolling (Melbourne, AUS)
Number of employees:	▪ 1000+ worldwide
Locations:	▪ Headquarters in Vienna (Austria) ▪ Development centers in Austria, Argentina, Sweden and USA ▪ Sales offices in 23 countries

Agenda

Institut für Straßen- und Verkehrswesen TU Graz

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About the Project

Title:	Dynamic Tolling
Scope:	Feasibility of managing traffic on basis of toll tariffs
Partners:	- Kapsch TrafficCom AG - Technical University Graz (Institute for Transport Research)
Duration:	Nov 2008-Dec 2009
Work packages:	1) Study & Concept *(Kapsch + TU Graz)* 2) Simulation *(TU Graz)* 3) Demonstrator *(Kapsch)*
Funding:	FFG (Austrian Research Promotion Agency) KWF (Carinthina fund for supporting the economy)

FFG

Tolling Models

	STATIC	VARIABLE	DYNAMIC
TARIF	Fixed prices – same price over time	Variable (time depending) pricing scheme	Dynamic price model
	Predictable prices	Predictable prices	Prices vary between min / max
	No price-change	Price review after a defined time	Real-time price-change
EFFECTS	Avoid trips Influence transport mode choice	Avoid trips Influence route choice Influence departure time choice Influence transport mode choice	Avoid trips Influence route choice Influence departure time choice Influence transport mode choice
OBJECTIVES	Finance (Congestion decrease)	Finance Congestion decrease Smoothing peak traffic Environment (general traffic decrease)	Finance Congestion decrease (real time) Traffic Management Environment (traffic decrease on demand)
EXAMPLES	Austria, Germany, Italy, London	Stockholm, Singapore	HOT Lanes (USA)

Main focus of the research project

Institut für Straßen- und Verkehrswesen TU Graz

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Effects and objectives of toll tariff based traffic management

Traffic Control / Demand Management

- Reduce congestion
- Guarantee level-of-service

Environmental Protection / Quality of Life

- Reduce air pollution (PM_{10}, CO_2, NO_X)
- Noise protection

Effects on road traffic:

- Decreasing traffic volume
- Better geographical distribution of traffic
- Better distribution of traffic time-wise

Road User:

- Avoid trip
- Choose different route
- Choose different departure time
- Choose different transport mode

Variable or dynamic adaptation of toll tariffs

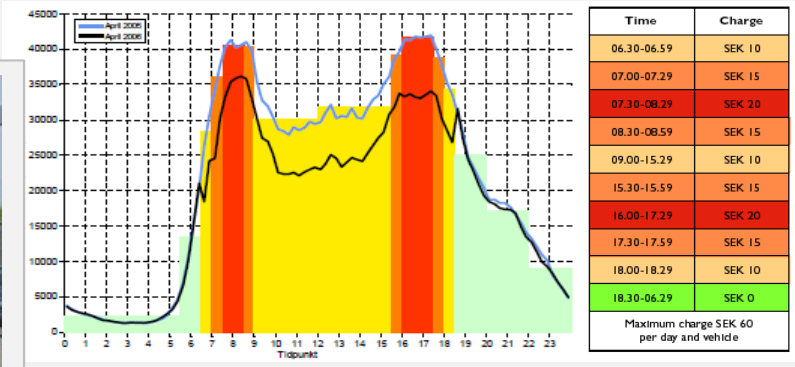
Existing sample systems of toll tariff based traffic management

France A5 & A6

- Different static pricing on two alternative routes
- A5: ~70 km longer, new highway
- A6: older highway, often congestion

Stockholm City Tolling

- Variable pricing
- Goals: reduce traffic & manage peak traffic
- Traffic reduced by ~15 % (less congestion better air quality)



Time	Charge
06.30-06.59	SEK 10
07.00-07.29	SEK 15
07.30-08.29	SEK 20
08.30-08.59	SEK 15
09.00-15.29	SEK 10
15.30-15.59	SEK 15
16.00-17.29	SEK 20
17.30-17.59	SEK 15
18.00-18.29	SEK 10
18.30-06.29	SEK 0
Maximum charge SEK 60 per day and vehicle	

HOT Lane Tolling (US)

- Dynamic pricing
- Tariff depends on traffic density and/or speed
- Goals: controlling throughput & maximize income

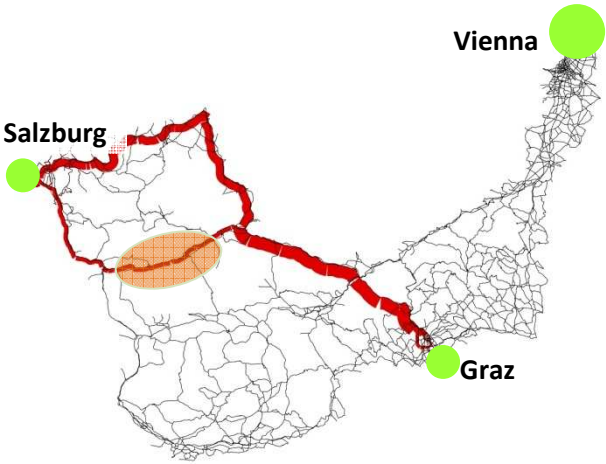
Use cases for toll tariff based traffic management

OBJECTIVE	Network tolling	Section Tolling	HOT lane tolling	City tolling	Low Emission Zones	Object tolling
Traffic control / demand management	**Load balancing of alternative routes** *Example: two highways going from A to B*	**Controlling throughput a bottleneck sections** *Example: section with road works*	**Controlling throughput on HOT lanes**	**Controlling access to city zones** *Example: peak traffic into/out of city zone*		**Controlling throughput at bottleneck objects** *Example: bridges & tunnels*
Environmental protection / improving quality of life		**Reducing traffic on sensitive routes** *Example: noise reduction at night time along a city highway*			**Reducing traffic in sensitive zones** *Example: general reduction of traffic in the entire city area*	

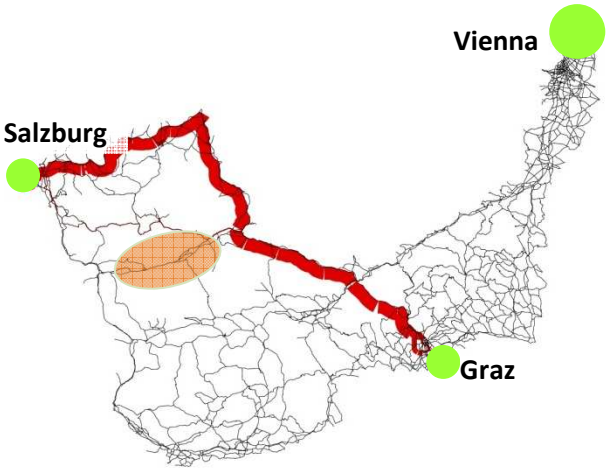
Simulation study 1: Load balancing on alternative routes

Variations of toll between Radstadt - Trautenfels ~ 55 km:

Toll = 0,00 € / km
(64%-0%-36%)



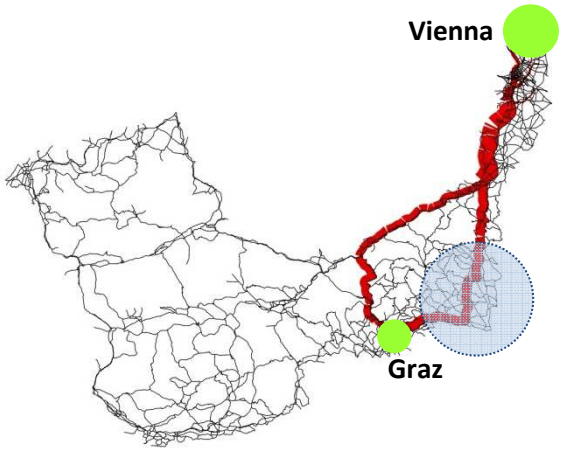
Toll = 0,06 € / km
(34%-0%-66%)



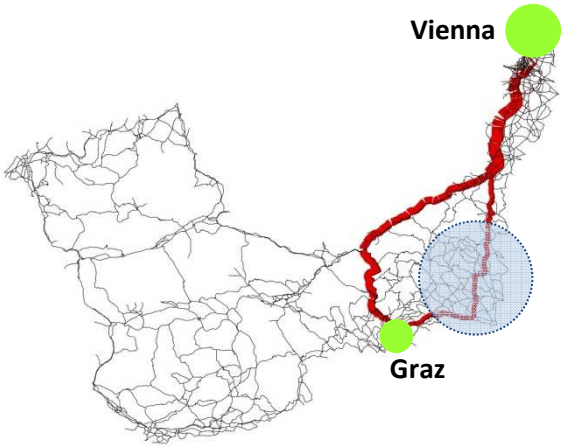
Toll = 0,22 € / km
(5%-5%-90%)

Simulation study 2– Reducing traffic in low emission zone

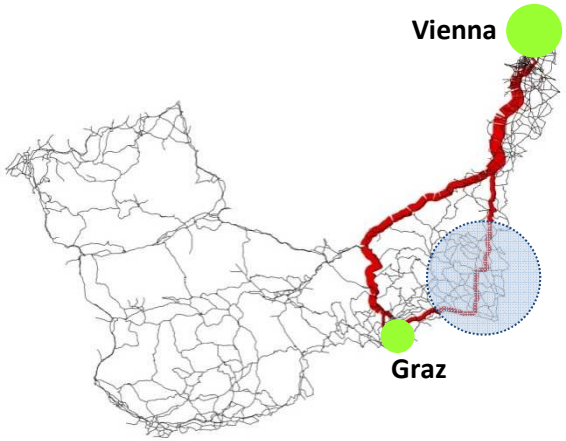
Low Emission Zone radius 40 km:



Toll=0,00 € / km
(44% - 56%)



Toll=0,06 € / km
(64% - 36%)



Toll=0,10 € / km
(80%- 20%)

Further aspects of toll tariff based traffic management

Legal Situation in EU (TEN)

- In the EU on the TEN tolls covering external costs are not allowed yet
- The planned Euro-Vignette III directive would provide a basis for toll tariff-based traffic management (only for trucks, only on TEN roads)

Success Factors

- All vehicle tolling <> truck tolling: in order to be effective traffic management based on toll tariffs requires a high rate of users which are subject to toll (> all vehicle tolling)
- Sufficient road user information: easy-to-understand tariff model, full information (tariff information, traffic information, alternative route information etc.)

Technology

- Modern ETC systems already support variable and dynamic pricing
- Integration of ETC system and Traffic Management system is needed
- Advanced means for road user information are required (e.g. navigation systems displaying real-time tariffs and possible alternative routes)

Questions and discussions

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