Intelligent Mobility Solutions.
From Highways to Cities.

Intelligent Mobility Solutions to reduce environmental impacts of transportation.

UNFCCC, Bonn.
At a Glance.
References in 44 countries on all continents.

FY 2015
- Revenues € 456.4 million
- Profit € 32.7 million
- Headcount 3,545 employees
- R&D centers on three continents (ARG, AÜT, CAN, ITA, ZAF, SWE, USA)
Polis Conduits KPI Decision support tool.

Wash-out of environmental benefits by potentially induced demand effects.

Conduits KPI DST

- Measure the effect of an ITS on pollution
- Polis, PTV, Bruxelles Mobilité, City University of London, TUM, Kapsch
- Tool has been tested in Brussels, Stuttgart, München, Ingoldstadt, Tel Aviv, Haifa, Paris, Rome

![Graphs showing bus average speed, number of stops at traffic lights, and global pollution before and after implementation.]

- Brussels case study
  - Impact of the planned introduction of bus priority at traffic lights on bus line 49 with micro-simulation (VISSIM)
  - Simulation scenarios: morning and evening peak, both directions before and after implementation (Figure ‘Mobility’ & ‘Pollution’ indicator, Figure ‘Sensitivity Analysis’)
  - Does not cover measures that aim to reduce car use, such as modal shift, suppression of trips by pricing, taxation or access control

5/18/2016 | UNFCCC, Bonn.
Urban Access charging.

Schemes.

Urban Access Charging schemes aim to reduce traffic and therefore pollution, and generate revenue to invest into sustainable modes of transport.

Cordon
Single Access
Charge per crossing in and/or out of the zone.

Zone
Day Access
Charge per day for accessing the zone.

Distance
Pay as you Drive
Charge based on distance travelled (within the zone).

Duration
Dynamic Parking
Charge based on duration of stay within the zone.

Corridor
Transit Passage
Charge per passage through a particular road.

Dynamically adjusted charges based on time of day (peak / off-peak) and day of week (weekends, holidays). Permit-based exemptions or reduced charges (e.g. residents, disabled, public services, commercial vehicles).
Urban Access restriction.
Schemes.

Urban Access Restriction schemes limit vehicular access to protect infrastructure & the environment, and to improve road safety.

- **Permit**: Limited Access Zone
  - Limit access to the zone to permit holders only.
- **Emissions**: Low Emissions Zone
  - Limit access to vehicles with low emissions only.
- **Dimensions**: Limited HGV Zone
  - Restrict HGV access based on weight & dimensions.
- **Dangerous Goods**: Protection Zone
  - Restrict access to HGV carrying dangerous goods

Flexible restrictions concepts based on time of day and day of week (weekends, holidays). Possibility of charging for HGV permits (LEZ, weight/dimensions).
Global Success Stories.
Tangible improvements.

<table>
<thead>
<tr>
<th>City</th>
<th>Traffic Volume</th>
<th>Travel Times</th>
<th>Public Transport</th>
<th>CO₂</th>
<th>NOₓ</th>
<th>PM10</th>
<th>Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockholm</td>
<td>-20%</td>
<td>-33% delays</td>
<td>+5%</td>
<td>-13%</td>
<td>-8%</td>
<td>-13%</td>
<td>$80M p.a.</td>
</tr>
<tr>
<td>Milan</td>
<td>-34%</td>
<td>-17%</td>
<td>n/a</td>
<td>-22%</td>
<td>-10%</td>
<td>-19%</td>
<td>$16M p.a.</td>
</tr>
<tr>
<td>Singapore</td>
<td>-44% (ALS)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>$51M p.a.</td>
</tr>
</tbody>
</table>

*PWC, Study on Urban Access Restrictions, 2010*

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**Jonas Eliasson on how to solve traffic jams**
*Director of the Centre for Transport Studies at Sweden’s Royal Institute of Technology, TED talk 2012*

- Create incentives, don’t plan details, people will figure out and adopt quickly
- Traffic is a non-linear phenomenon
- Public support for charges (40% → 30% → 70%)
- Travel patterns are not stable
- Don’t people tell to adopt, nudge them
**EcoTrafiX.**
Real-time traffic management to reduce emissions. **Traffic Signals Control, Traffic Information, Speed Enforcement, Integrated Corridor Management.**

## Emissions reduction summary

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Traffic Systems</th>
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EcoTrafiX.
Integrated Corridor Management. Dallas.

**BENEFITS**

**Benefits to the public administration**
- Enhanced cooperation between agencies and operators.
- ‘Integrated cockpit view’ into a single interface of all existing traffic & transport systems, increasing operators’ situation awareness and efficient operation.

**Benefits to the citizens**
- “My city is taking care of my day-to-day traffic problems!”. The solution enables citizen to touch the benefits of getting real-time information to best plan their mobility, save time and money, while feeling an improved level of safety.
- It makes citizen feel they are part of a more sustainable region which invests to improve the quality of living, while optimizing its own systems.

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**TANGIBLE IMPROVEMENTS**

**Benefits by type**

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Conclusions.

Tests & Studies. Initiatives.

Studies, projects and tests

> EU “ICT-Emissions” project
  > Developed a generic methodology to simulate and quantify real impact of ICT measures on fuel consumption and CO2 emissions of current and future vehicle fleets, combining micro scale (i.e. driving profile) and macro scale (i.e. network)
  > Considering all basic categories of measures (e.g. traffic management and control, demand and access management)
  > Testing “ON” and “OFF” modes to have real-world scenarios (Madrid, Rome, Turin etc.)
  > Target groups: local authorities, automotive industry, OEMs.

> “ITS for climate“, French initiative to promote ITS applications to climate change action and policies with the view to contribute to COP21’s objective.

> U.S. National Center for Sustainable Transportation, supported by the U.S. DOT, Intelligent Transportation Systems for Improving Traffic Energy Efficiency and Reducing GHG Emissions from Roadways, 2015
  > ITS programs to reduce energy and emission on the order of 5% to 15%
  > Benefits range widely due to type of application, pre-existing conditions etc.
  > To counteract undesired effects, programs may have to be coupled with some specific travel demand management measures such as pricing.

> ERTICO, Study of Intelligent Transportation Systems for reducing CO2 emissions for passenger cars, 2015
Conclusions.

Balanced approach. To do’s, Policy action needed.

Further policy action should

- Consider greenhouse gas mitigation as part of the bigger picture of automated, connected, electric and shared mobility
  - Connected and automated vehicle technologies offer great potential to improve road safety, traffic flows and environmental performance of the transport system (EU Amsterdam Declaration on the Cooperation in the field of connected and automated driving, April 2016)

- Take into account that most of the environmental-ITS programs are additive and therefore greater benefits may be achieved when a multitude of these programs are put into place

- Couple environmental-ITS programs with specific travel demand management measures such as pricing

Your contact.

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International Relations & Government Liaison

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Gilbert.konzett@kapsch.net

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Further EcoTrafiX solutions and Kapsch Solutions Portfolio.

EcoTrafiX, Smart Tram, Kapsch TrafficCom AG solutions portfolio and references.
**EcoTrafiX.**

Real-time traffic management to reduce emissions. Traffic Signals Control, Traffic Information, Speed Enforcement, Integrated Corridor Management.

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**EcoTrafiX.**

**Controller.**

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### BENEFITS

#### Benefits to the public administration

- Redesigned signals controller
- Sustainability considerations at the manufacturing process
- Specifically adapted to low-power traffic-light LED modules
- Reduced internal power consumption, to low-power lighting
- Yearly power cost reduction

#### Benefits to the citizens

- “My city is controlling traffic in efficient and sustainable way!”. The final power cost and emissions directly affects funding needs for city services
- Citizen get part of global emissions reduction and a sustainable city, while maintaining and even increasing the expected services.

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### TANGIBLE IMPROVEMENTS

#### Benefits by type

<table>
<thead>
<tr>
<th>Benefits by type</th>
<th>Benefits quantified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audited average energy consumption reduction</td>
<td>- 55W</td>
</tr>
<tr>
<td>kWh saved in yearly consumption for each junction</td>
<td>- 480 kWh</td>
</tr>
<tr>
<td>Tons of Mobile Emissions Saved Annually per junction (EU average 380gr/kWh)</td>
<td>- 182 kgCO2eq</td>
</tr>
<tr>
<td>Tons of Mobile Emissions Saved Annually for typical city (400 junctions)</td>
<td>- 72.8 tCO2eq</td>
</tr>
</tbody>
</table>
| Yearly power cost reduction | 62.4€  
- per junction  
- for the city | 25 k€ (- 60%) |
EcoTrafiX.
Traffic Signals Control.

**BENEFITS**

**Benefits to the public administration**
- Implement traffic-responsive and traffic-adaptive control
- Reduced periodic recalculation of timing plans

**Benefits to the citizens**
- Reduce delays and Stop&Go effects, by smoothly adapting traffic light timing to existing traffic, increase mean speed
- Lower congestion levels
- The city lowers traffic-related contamination both noise and emissions, increase quality of life

**TANGIBLE IMPROVEMENTS**

**Benefits by type**

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<tbody>
<tr>
<td>Audited results:</td>
<td></td>
</tr>
<tr>
<td>- Average speed increase</td>
<td>+ 17%</td>
</tr>
<tr>
<td>- Delays &amp; Stops</td>
<td>- 8%</td>
</tr>
<tr>
<td>Effect on air quality (before/after adaptive mode)</td>
<td></td>
</tr>
<tr>
<td>- CO2 emissions</td>
<td>- 12%</td>
</tr>
<tr>
<td>- PM25 emissions</td>
<td>- 17%</td>
</tr>
<tr>
<td>Consumption reduction for 1M cars /year</td>
<td>- 18 M liters</td>
</tr>
<tr>
<td>Mobile Emissions Saved Annually for 1M cars /year</td>
<td>- 45,000 tCO2eq</td>
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EcoTrafiX.
ITS Traffic Information services.

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<tbody>
<tr>
<td><strong>Benefits to the public administration</strong></td>
<td><strong>Benefits by type</strong></td>
</tr>
<tr>
<td>➢ Assure information dissemination to citizen, including critical situations (events, incidents)</td>
<td>Delays and stops average reduction</td>
</tr>
<tr>
<td>➢ Leverage existing systems data towards public information visibility, website, DMS, radio broadcast</td>
<td>- 5%</td>
</tr>
<tr>
<td>➢ Enable, as possible, alternatives to private car by promoting public transit modal shift</td>
<td>Average consumption reduction vehicle/100km</td>
</tr>
<tr>
<td></td>
<td>- 0.05 l</td>
</tr>
<tr>
<td><strong>Benefits to the citizens</strong></td>
<td>Consumption reduction for 2.5M cars/year in wide area or city (daily trip 50km)</td>
</tr>
<tr>
<td>➢ Increase awareness of general traffic situation</td>
<td>- 22.8 M liters</td>
</tr>
<tr>
<td>➢ Reduce travel times and fuel consumption with suitable selection of trip period</td>
<td><strong>Mobile Emissions Saved Annually</strong></td>
</tr>
<tr>
<td>➢ Access to public transit information and services</td>
<td>- 57,000 tCO2eq</td>
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EcoTrafiX.
Speed Enforcement.

**Benefits**

**Benefits to the public administration**
- Assure law compliance, mostly on speed and red-light
- Efficiently process infractions, reduce impunity feeling
- Revertion of incomes to traffic safety improvements
- Reduced Social cost of injured people

**Benefits to the citizens**
- Increase awareness of mobility rules
- Benefit from increased safety traffic conditions
- Reduced noise effects and emissions in periurban/urban areas.

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<tbody>
<tr>
<td>Mean speed reduction on highways - Before enforcement system</td>
<td>135 km/h</td>
</tr>
<tr>
<td>Mean speed reduction on highways - After enforcement system</td>
<td>122 km/h</td>
</tr>
<tr>
<td>Average consumption reduction per enforced car and 100km</td>
<td>- 0,8 l</td>
</tr>
<tr>
<td>Consumption reduction for 10,000 over-speeding cars/day (average daily trip 100km)</td>
<td>- 8,000 liters</td>
</tr>
<tr>
<td>Mobile Emissions Saved Annually</td>
<td>- 7,300 tCO2eq</td>
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EcoTrafiX.
Integrated Corridor Management. Dallas.

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Smart Tram.
Linz Linien. Mobi.efficiency.

Our solution
Delivery of mobi.efficiency for Linz Linien to increase resource efficiency of trams in 2014/15.

- 10-18% energy reduction of heating system
- -53% sanding duration while accelerating
- -32% sanding duration while breaking
- Improvement of efficiency of maintenance
- Monitoring of recuperated energy (30%)

10.2 %
Reduction of energy requirements

85 tons
Reduction of CO2 per year

300 households
Electricity savings potential for the entire vehicle fleet
Kapsch TrafficCom
Solutions & Products Portfolio.
**Kapsch TrafficCom at a Glance.**

*Key Facts.*

<table>
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<td>Subsidiaries and representative offices in 33 countries</td>
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<th><strong>Headcount</strong> (as of March 31, 2015)</th>
<th>R&amp;D Centers</th>
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<td>Ten R&amp;D centers on three continents (ARG, AUT, CAN, ITA, ZAF, SWE, USA)</td>
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<tr>
<th><strong>Global Headquarters</strong></th>
<th>Leading ITS Supplier</th>
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<tr>
<td>Vienna, Austria</td>
<td>#1 ETC solution supplier globally, broad spectrum of ITS solutions</td>
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Strategic Roadmap.
From ETC to ITS to IMS. From Highways to Cities.

ETC
Electronic Toll Collection
Initial phase
Provider of primarily ETC

ITS
Intelligent Transportation Systems
Strategy 2016
From ETC to ITS (e.g. ATMS, CVO, V2X)

IMS
Intelligent Mobility Solutions
Strategy 2020
From ITS to IMS and from highways to cities
**Our Portfolio.**

*Intelligent Mobility & Data Services*

---

**Platforms & Products**

**Tolling**
- Electronic Toll Collection
- City Tolling
- Plaza Tolling

**Traffic Management**
- Highway Traffic Management
- Managed Lanes
- Tunnel & Bridges
- Traffic Management

**Smart Urban Mobility**
- Urban Traffic Management
- Integrated Mobility Management
- Smart Parking

**Safety & Security**
- Road Safety Enforcement
- Commercial Vehicle Enforcement
- Electronic Vehicle Registration

**Connected Cars**
- V2X Automotive
- V2X Infrastructure
- Connected Services

---

**Integration Layer “Multi-Application Suite”**
**Tolling Solutions.**

**What we do**
ETC solution provider
Offering: In-vehicle Products, Field Equipment, Back Office, System Integration, Technical & Commercial Operations, Project Financing

**Selected References**
- National Truck Toll System, Czech Republic
- National Toll System, Poland
- Tolling and Managed Lanes, LBJ and NTE, Texas, USA
- E-ZPass component delivery, USA
- Toll roads in Melbourne, Sydney, Brisbane, Australia
- Toll roads in Chile
- Toll Service Provider Axxes, France / Belgium

**Highlights**
Pioneer in ETC solutions (start of activities in the mid 80s)
#1 ETC Solutions Provider globally*
Core technologies and products produced in-house
Multi-technology approach

**Target Applications**
(DSRC) MLFF Tolling
HOT Lane Tolling
Satellite Tolling
Mobile Tolling
E-Vignette
Plaza Tolling
City Tolling
Traffic Management Solutions.

What we do
ATMS solution provider
Offering: Back Office (Dynac), Field Equipment (3rd-party), System Integration, Technical Operations

Highlights
35y+ experience in design, build and maintenance of mission critical automation applications
300+ systems deployed globally
World-class solution
Impressive references
V2X ready offering

Selected References
- New York City bridges & tunnels, USA
- Boston Central Artery, USA
- New Zealand State Highways, NZ
- Cross Israel Highway
- M2 Highway Sydney, Australia
- TxDOT’s LBJ and NTE Managed Lanes, USA
- NL and UK National Traffic Management Centers

Target Applications
- Highway Traffic Management
- Tunnel & Bridge Management
- Managed Lanes
Smart Urban Mobility Solutions.

What we do
Vendor of selected urban mobility solutions
Offering: Back Offices (EcoTrafiX, Streetline), Traffic Light Controllers, Parking Sensors, System Integration, Technical Operations

Highlights
Modern urban traffic management suite
Impressive urban references
Pioneer in Smart Parking

Target Applications
Urban Traffic Management (Telvent)
Integrated Mobility Management (Telvent)
Smart Parking (Streetline)

Selected References
- Madrid Transport Authority, Spain
- Barcelona Transport Authority, Spain
- Buenos Aires Transport Authority, Argentina
- Sao Paulo Transport Authority, Brazil
- Rio de Janeiro Transport Authority, Brazil
- Dallas Transport Authorities, USA
- Los Angeles Parking Authority, USA
Safety & Security Solutions.

What we do
Vendor of selected safety & security solutions
Offering: Enforcement Back Office, Enforcement Field Equipment (Section Control, e.g. Weigh-in-Motion, Speed/Red light) System Integration, Technical & Commercial Operations

Selected References
- Johannesburg Police Authority, South Africa
- 20+ other cities in South Africa
- Treviso (Traffic Surveillance), Italy
- Rio de Janeiro Transport Authority, Brazil
- Various Commercial Vehicle Enforcement Sites, USA
- Dallas Transport Authorities, USA
- Los Angeles Parking Authority, USA

Highlights
- Modern urban traffic management suite
- Impressive urban references
- Pioneer in Smart Parking

Target Applications
- Urban Traffic Management (Telvent)
- Integrated Mobility Management (Telvent)
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- ASFINAG (Weigh-in-Motion), Austria
- Kazakhstan (Weigh in Motion)
- Indiana Department of Transport, USA
- Montana Department of Transport, USA

Highlights
- Broad spectrum of enforcement solutions
- Over € 80,000 worth of infringement payments are collected per day in single major metropolitan deployment

Target Applications
- Road Safety Enforcement
- Commercial Vehicle Enforcement
- Electronic Vehicle Registration

5/18/2016 | Solutions & Products Portfolio.
**Connected Cars Solutions.**

### What we do
- Envisioned vendor of V2X in-vehicle equipment to the Automotive Industry
- Envisioned vendor of selected connected cars services
- Vendor of V2X infrastructure solutions (roadside, back office)

### Highlights
- Forerunner in V2X technology
- Participant in V2X “light-house” projects (e.g. Testfeld Telematik, European Corridor Project, Platooning Trails)
- Very active in standardization (e.g. ETSI)

### Selected References
- European Corridor Project, EU
- Testfeld Telematik, Austria
- RelCommH – Reliable Communication for Heavy vehicles (Platooning trial), Sweden
- US-DoT Safety Pilot, USA
- Various trials with the automotive industry, EU