PTOLEMUS in a nutshell

PTOLEMUS is the first strategy consulting firm focused on the connected vehicle and the Internet of Things

Our consulting services

- **Strategy definition**
  Vision creation, strategic positioning, business plan development, board coaching & support

- **Investment assistance**
  Strategic due diligence, market assessment, feasibility study, M&A, post-acquisition plan

- **Procurement strategy**
  Specification of requirements & tender documents, launch of tenders, supplier negotiation & selection

- **Innovation management**
  Value proposition definition, product & services development, architecture design, assistance to launch

- **Business development**
  Partnership strategies, detection of opportunities, ecosystem-building, response to tenders

- **Technology & project management**
  Deployment plans, complex / high risk project & programme management, risk analysis & mitigation strategy

Our fields of expertise

- **Car infotainment & navigation**
  Connected services (Traffic information, fuel prices, speed cameras, weather, parking, POIs, social networking), driver monitoring, maps, navigation, smartphone integration

- **Usage-based charging**
  Road charging / electronic tolling, PAYD / PHYD insurance, fleet leasing & rental, car sharing, Car As A Service, etc.

- **Telematics & Intelligent Transport Systems**
  ADAS, autonomous car, connected vehicle, fleet management, eCall, bCall, SVR, tracking, vehicle data analytics (OBD / CAN-bus), VRM, V2X, xFCD

- **Positioning / Location enablement**

- **M2M & connectivity**
PTOLEMUS in a nutshell

We help all players in the mobility ecosystem

Analytics providers
- Adobe
- Cognizant
- Google
- LexisNexis
- SAS
- TOWERS WATSON
- Wunelli

Automotive manufacturers & suppliers
- Agero
- Airbiquity
- Cobra
- DIRECT
- DAT
- HARMAN
- MICHELIN
- MTA
- QOROS
- QUALCOMM
- SIBI WIRELESS
- Telit
- TOYOTA
- TOYOTA TSUSHO

Mobile telecom operators
- SFR
- Sprint
- TELEKOM AUSTRIA GROUP
- SK telecom

ITS operators, regulators & fleets
- Arval
- Brisa
- Edenred
- EDF
- CGI
- egis
- EUROMASTER
- European Commission
- THALES
- ND
- Nomad Digital
- ORBIT
- SOFICO
- SICK
- URA
- VITRONIC

Applications providers
- BMJ Group
- censio
- CCC Information Services Inc.
- Commel
- Coyote
- TOMTOM
- ESRI
- MCVE
- ESRI
- RoadPilot
- wejo

Telematics solution providers
- ARKAN
- avento
- drivefactor
- Fleet Complete
- Fleetmatics
- Ellicity
- HiMex
- IMS
- Lysanda
- LO/JACK
- MobileXcess
- OCTO
- Orion
- Quartix
- Queclink
- Quindell
- SafeFleet
- SIMILH
- SISTEMA

Insurers, aggregators & assistance providers
- Aioi Nissay Dowa Insurance
- Allianz
- Allianz
- AON
- Ardian
- Baloise
- AXA
- BNP PARIBAS ASSISTANCE
- COEA
- Desjardins
- europ assistance
- Generali
- THE HARTFORD
- HUK COBAN ASSISTANCE
- IBERIA AUTOMOBILE ASSISTANCE
- IFFAS
- MONTREAL
- MINTL TAIWAN
- MENORA MIVTACHIM
- MONDIAL ASSISTANCE
- MONETA
- MONET
- OUT SURANCE
- RSA
- SMILE
- Telesure
- TOKOMARINE
- TM
- ZURICH

Device / location suppliers
- ANDREW
- CNE
- Clearfield
- gm
- NAVIZON
- NAVIZON
- ThalesAlenia Space
- TruePosition
- TechnoCom

Banks & private equity investors
- Amadeus Capital Partners Limited
- The Baupost Group
- Goldman Sachs
- Cinven
- RENOV
- Leonardo & Co.
PTOLEMUS published the most comprehensive analysis of the opportunities in road charging

- 650-page analysis of the global electronic tolling landscape based on:
  - 120 interviews in 12 countries
  - 230 figures and charts
  - 3 years of hands-on experience advising key players in the ecosystem
- A comparative assessment of all tolling technologies, models and trends
  - ANPR, DSRC, Infrared, GNSS, RFID & WAVE technologies & business models compared
  - Evolution path from toll gates, ETC to MLFF
  - The new trends: big car data, mobile tolling, mobility pricing and sustainable mobility
- An in-depth review of ETC markets worldwide
  - 35 countries in Europe, America, Asia & Africa profiled and analysed
  - 14 case studies including ATI, AutoPass, BroBizz, Ecotaxe, e-way, Hu-Go, LKW Maut, PrePass, Via Verde, etc.
- A decryption of regulatory evolutions
  - Bill 810, eCall, EETS, ERA Glonass, REETS, Resolution 005 AGEPAR
  - 43 standards & all major patents listed: 6C, ARTEFATO, CEN, ETSI, ISO, etc.
- A detailed analysis of all major players' strategies & solutions
  - Their development strategies in the new value chain compared

- Toll operator market models
  - Toll connected services opportunity analysis
  - Markets' readiness for connected services
  - Integration with 11 VAS and 5 connected services

- 2010-25 bottom-up market forecasts
  - Estimates of the number of devices sold, vehicles subscribed by technology & vehicle type
  - 36 countries covered in Europe, North America, South Africa, India, China, Japan, Korea and South East Asia

Note: A free 95-page abstract is available to download at www.ptolemus.com/etc-study
Based on a thorough investigation of the global ETC market
Comprised of 650 pages of facts, figures, examples, case studies, forecasts and recommendations

Table of Contents

LIST OF FIGURES

I. The concept of road charging and its global implementations
   A. What is road user charging (RUC)?
   B. Road charging around the world
   1. European market overview
   2. US market overview
   3. Overview of other major tolling markets globally

C. Why road pricing?
   1. Introducing the external costs
   2. Emissions reduction from traffic smoothing
   3. Rational differences in introducing DLC

D. The challenges to universal road pricing
   1. Clearly stating the purpose of the tolling project
   2. Privacy fears can destroy a project early
   3. Managing acceptance and liquor tolling issues
   4. The French Etoile saga
   5. The effect of the economic downturn: the Spanish roads example

E. Impact of the transportation market landscape on tolling
   1. Key factors affecting the transport industry
   2. The consequences of social dumping

II. The fundamentals of the evolving e-tolling service provision business

A. General directions and regulations
   1. Regulations governing road charging in Europe
   2. Equity and differentiation
   3. Regulations governing road charging in the US

B. Key ETC models and their evolution
   1. Free Flow (FF)
   2. All Electronic Tolling (AET)
   3. Manual toll booths
   4. E-gate Road Tolling (ERT)
   5. Evogate
   6. Other innovative solutions

C. Enforcement and treatment of occasional users
   1. Delinquent the ORUs
   2. Enforcement in practice
   3. Enforcement technology options
   4. How to build an economic model for enforcement
   5. Various fraud types and protection schemes

D. The economics of ETC
   1. Financing a tolling scheme
   2. Pricing strategy
   3. Costs benchmarks

E. How is the e-tolling technology evolving
   1. Dissemination and terminology
   2. Road tolling technology standards in use globally
   3. RFID tags of war
   4. DSRC standard technology
   5. OBU
   6. Communication technologies compared
   7. Image-based tolling and ASPM
   8. Infrared
   9. Bus office and transaction management
   10. Smartphone-based tolling
   11. Other tolling technologies: NFC and Wave
   12. Relevant technical standards and Protocols

F. How do the solutions compare: technical and economical aspects
   1. Demand-based assessment
   2. Environment-based assessment
   3. Other criteria affecting the choice of solutions
   4. Cost comparison criteria and figures
   5. Other ways to compare external efforts
   6. Who pays and is the cost competitive?
   7. Switching from Plate to Free Flow ETC in the US
   8. Migration paths: what are the options

III. The European and US case for toll network interoperability

A. Assessing the needs and demand
   1. The fundamentals drivers for unbundling the toll networks
   2. The different levels of interoperability

B. The regulations and programmes fostering interoperability
   1. Tolling interoperability in Europe: EETS
   2. The US interoperability programmes, timing and stakeholders
   3. Interoperability in practice: taking one step at a time

C. How to create a solid business case for the service providers
   1. Successful interoperability deployment
   2. Interoperability doesn’t always pay
   3. In the US, ATIS NUB is instrumental in promoting interoperability in North America
   4. The business case for toll roaming in Europe

IV. Tolling as part of the Connected Vehicle Landscape

A. Convergence initiatives and trends
   1. The main stakeholders involved
   2. The connected-car services today
   3. FMS as the main tolling mechanism
   4. The Oregon experiment in road user charging

B. Connected services opportunities relevant to the toll operators
   1. Telematics services with direct potential in the tolling industry
   2. Technology and market trends affecting the connected car services market
   3. New mobility pricing models
   4. How to create a solid mobility pricing business model
   5. ITS services: traffic, safety and ID
   6. Electronic Vehicle Identification (EVI)

V. Quantitative analysis of the road charging market worldwide

A. ETC Landscape
   1. Key players in the value chain and their roles
   2. How interoperability affects this value chain
   3. Key competitors and market shares

B. Quantifying the ETC market potential
   1. Overview of the current transport market globally
   2. Analysis of the main ETC segments
   3. Device sales forecast
   4. Country profiles: opportunity ratings

C. Market analysis of other countries of interest
   1. Australia
   2. Brazil
   3. Canada
   4. China
   5. Finland
   6. India
   7. Indonesia
   8. Japan
   9. Malaysia
   10. Mexico
   11. Philippines
   12. Russia
   13. South Africa
   14. South Korea
   15. Sweden
   16. Taiwan

VI. Conclusions and recommendations

Source: PTOLEMUS Consulting Group
We provided rankings as a strategic tool for road charging decision makers

- The rankings deliver an independent assessment of the leading suppliers across each stage of the value chain:
  - Systems integrators
  - Technology providers
  - Service providers

- The rankings were
  - Compiled with their customers in mind
  - Segmented by geographical market
  - Based on facts, company experience and expertise

- The only clear view on the leading suppliers in a complex global market, the rankings assess 50 companies, resulting in a unique tool for ETC purchasers and decision makers across all geographical areas

*These rankings should not be seen as a substitute for a formal RFP. In particular, we recognise that it is difficult to assess the service elements of each solution without an actual trial of the product.

**We would like to stress that the ranked providers are not all clients of PTOLEMUS, nor have the rankings been influenced by any client relationships.
Electronic toll collection supplier rankings

A core set of criteria was applied across all groups

- In order to collect the required information, a detailed questionnaire was provided to each of the companies we assessed.
- We have applied a number of core criteria across all groups. In all cases PTOLEMUS has evaluated a company’s available products and services and scale based on data provided by them and information available to us, placing particular emphasis on the company’s current activities, size and capabilities.

Criteria applied to all companies across each group included:

1. The focus on ETC, including share of revenue in ETC related activities and market entry date
2. Global footprint
3. Long-term sustainability, size, profitability and reliance on single markets
4. Market share, sales record and variety of customers
5. Innovative character of the company and the solutions offered
6. Experience and track record

*Due to the specific nature of the market, we have only included European service provider rankings*
A specific, fact-based methodology was then applied to individual groups

**Systems integrators**
- Range of toll technologies supported
- Range of toll styles and models catered for, including market specific designs such as HOV and HOT lanes
- The ability to produce and deliver own equipment such as tags and OBU
- The level of integration offered
- Enforcement capabilities
- Number of registered accounts
- Number of individual active tolling programmes
- Market reach
- Experience and track record

**Technology suppliers**
- Range of toll technologies provided across on board and fixed devices
- Range of toll styles and models supported
- Range of devices and equipment currently deployed
- Number of delivered devices
- Number of active tolling programmes supported
- Scale of activity
- Market strength

**Toll Service Providers**
- Number of countries covered by the payment solution and number of countries additional services are provided within
- Range of services in addition to tolling payment
- Range of financial services provided to fleet customers such as VAT return
- Range and combination of devices and equipment provided such as on board units and fuel cards
- Company structure and competition
- Scale of service and active portfolio
Kapsch TrafficCom and DKV are leading the pack

- Kapsch TrafficCom: #1 Worldwide systems integrator
- Kapsch TrafficCom: #1 Worldwide technology supplier
- DKV Euro Service: #1 European service provider
European integrators dominate the global market

Top worldwide systems integrators

#1 Kapsch TrafficCom
#2 Autostrade (incl. Electronic Transaction Consultants)
#3 Sanef ITS (Abertis)
A diverse range of systems integrators have found opportunities in Asia

**Europe**

#1
Kapsch TrafficCom

#2
Autostrade (Atlantia)

#3
Sanef ITS (Abertis)

#4
EFKON

#5
Q-Free

**The Americas**

#1
Kapsch TrafficCom

#2
Autostrade (Atlantia/ETC)

#3
TransCore

#4
Xerox

#5
Sanef ITS (Abertis)

**Asia-Oceania**

#1
Kapsch TrafficCom

#2
Mitsubishi Heavy Industries

#3
EFKON

#4
Q-Free

#5
Egis Projects
Suppliers offering a full range of technologies find the greatest opportunities

Top worldwide technology suppliers

#1 Kapsch TrafficCom

#2 Autostrade Tech

#3 Q-Free
Automotive specialists lead the way in GNSS technology

<table>
<thead>
<tr>
<th>GNSS</th>
<th>DSRC</th>
<th>RFID</th>
<th>ANPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Continental</td>
<td>#1 Kapsch TrafficCom</td>
<td>#1 Kapsch TrafficCom</td>
<td>#1 Kapsch TrafficCom</td>
</tr>
<tr>
<td>#2 Magneti Marelli</td>
<td>#2 Autostrade Tech</td>
<td>#2 TransCore</td>
<td>#2 EFKON</td>
</tr>
<tr>
<td>#3 BOSCH</td>
<td>#3 Q-Free</td>
<td>#3 3M</td>
<td>#3 Autostrade Tech</td>
</tr>
</tbody>
</table>
A highly competitive market split between tolling specialists and multi-service fleet providers

<table>
<thead>
<tr>
<th>Tolling specialists</th>
<th>Multi-service providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>#1</td>
</tr>
<tr>
<td>Telepass</td>
<td>DKV Euro Service</td>
</tr>
<tr>
<td>#2</td>
<td>#2</td>
</tr>
<tr>
<td>Eurotoll</td>
<td>Union Tank Eckstein (UTA)</td>
</tr>
<tr>
<td>#3</td>
<td>#3</td>
</tr>
<tr>
<td>Axxès</td>
<td>Shell</td>
</tr>
</tbody>
</table>

Note: Tolling specialists = Service providers offering tolling payments as their core proposition

Multi-service Providers = Service providers offering a wider range of fleet payments and services, which incorporate tolling alongside these
Plenty of competition and plenty of opportunities

- Europe and North America are well served by established integrators, in contrast to Asia-Oceania, which is far more open and lacking regional heavyweights
- The growth of GNSS systems will attract new players to the device market, challenging existing tolling providers
- Few DSRC technology suppliers are active in the RFID market
- Tolling specialists and fleet providers will continue to battle for market share in Europe

*Extract from the ETC Global Study*
The 650-page study is provided as a searchable PDF document with a global company licence.

<table>
<thead>
<tr>
<th>Reports</th>
<th>Full Study</th>
<th>Full Study with market forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents</td>
<td>• 650 pages</td>
<td>• 650 pages</td>
</tr>
<tr>
<td></td>
<td>• Electronic version (pdf format, password-protected)</td>
<td>• Electronic version (pdf format, password-protected)</td>
</tr>
<tr>
<td>Company-wide licence</td>
<td>€ 4,995 Approx. $5,300</td>
<td>€ 5,995 Approx. $6,400</td>
</tr>
</tbody>
</table>

For more information, contact Thomas Hallauer at thomas@ptolemus.com or call +44 7973 889 392

Click to download the 95 page ETC Global Study free abstract