Strategic research at the Transport Systems Development Centre RODOS:

Getting nationwide traffic and mobility monitoring from BigData

Ing. Jiří Novobilský, M.A.
RODOS Big Data team leader

Czech – Korean ITS forum
Praha; May 28, 2015
**RODOS COMPETENCE CENTER**
**FOR TRANSPORTATION SYSTEMS**

### Focus Areas
Applied research on:
- Intelligent transport systems
- Traffic monitoring and traffic management
- Mobility monitoring and mobility management
  based on supercomputing infrastructure and methods.

### Supercomputer
- Operated by the Technical University of Ostrava
  - #6 in EU
  - #21 worldwide

### Stakeholders
- **Lead:** Czech national supercomputing center
- All major Czech technical universities (Praha, Brno and Ostrava)
- Major ITS industry players in the Czech Republic
- Collaboration with unique Big Data suppliers for traffic and mobility:
  - mobile operators and fleet management companies
- **Key public customers** – Road Directorate, Police, Prague, Brno

### Key aspiration topics
- Big Data for:
  - Smart Infrastructure
  - Smart Cities
- Smart traffic management and intelligent mobility

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**Project Phase:** 2012 – 2018
CONTENT OF THE PRESENTATION

• About RODOS Mobility model
• **Data** – without Big Source Data, there are no Big Data systems for Traffic and Mobility
• **Traffic** – measuring traffic flows, jams and delays on road network and proactively „fighting“ with the congestions... *when too many people are on the roads at a given place and time, jams are happening*
• **Mobility** – measuring where people are, from where to where they move ... *helping to answer why are people on the roads – demand for mobility*
• **Traffic and Mobility put together** – how these two phenomena are connected
RODOS MOBILITY MODEL
USING MOBILE AND TRAFFIC DATA

Complex mobility model

Mobility monitoring
Based on anonymized signaling data from mobile network

Traffic monitoring
Based on floating car data, detectors, toll data, meteo data
DATA SOURCES OF TRAFFIC AND MOBILITY MODEL

• Stream of GPS points generated by fleets of approx. 140,000 vehicles in the Czech Republic
  o covering thousands of kilometers of roads,
  o probed every minute,
  o representing about 5% of traffic flow

• Stream of anonymous positions of mobile phones from 4 mil. GSM network users
  o covering entire territory of CZ, on the resolution of cell ID of all BTS antennae regions
  o probed every few tens of minutes

• Streamed transactions from 220 toll gates from vehicles over 3.5 tons
  o covering 1,170 km
  o coded on each toll gate working based on DSRC technology

• Streamed data from ASIM detector (radar system, ultrasonic sensors, passive infrared detectors)
VIARODOS – NEW TYPE OF VISUALISATION OF TRAFFIC INFORMATION

- The challenge is **how to present our data in a modern way with current web technology**
- This application was designed in close cooperation with dispatchers from the **National traffic information center**

![Traffic Information Diagram](attachment:image.png)
ROAD VISUALIZATION ILLUSTRATING THE DYNAMICS OF TRAFFIC FLOW

### Intensity (veh. > 3.5t/5min)

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### LOS (%)

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### Speed (km/h)

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### Delay (total 00:21:16)

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### Segment Length (km)

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### History of Passability

- **Passability**
  - Current: 71 km/h
  - FreeFlow: 127 km/h
  - Level of service: 56%
  - Delay: 44s

- **Intensity**
  - Current: 36
  - Maximal: 99

- **Traffic cameras**
  - Two Axles Vehicles: 6
  - Three Axles Vehicles: 0
  - Four Axles Vehicles: 30

*Last 5 minutes data
SMART CITY: PRAGUE
CZECH NATIONAL TRAFFIC INFORMATION CENTER
TRAFFIC INFORMATION SERVICES
TRAFFIC BASED ON GPS PROBING – SERVICE FOR CZECH TV

Customers:

Also: FCD traffic monitoring project for the City of Prague
PORTABLE ACTIVE TRAFFIC MANAGEMENT

Congestion warning

D1 60 min

45 min
PORTABLE ACTIVE TRAFFIC MANAGEMENT
DETECTION OF CONGESTION – 24 MARCH, 2014
DETECTION TRAFFIC FLOW DISPERSION – D1 IN THE „MIDDLE“
SUMMARY FOR „TRAFFIC PART“
SELECTED APPLICATION SHOWCASES

DETAILED AND ALWAYS FRESH TRAFFIC DATA FROM GPS PROBING (FCD)

FULL COVERAGE FOR URBAN AREAS - SMARTER URBAN TRAFFIC MANAGEMENT

FULL COVERAGE FOR INTERURBAN ROADS - SMARTER INTERURBAN TRAFFIC MANAGEMENT

ViaRODOS - NEW WAY OF VISUALISATION OF TRAFFIC IN REAL TIME

PORTABLE TRAFFIC MANAGEMENT

TRAFFIC ENGINEERING ANALYSIS

…
DIGITALISATION OF MOBILITY

- Signaling data of a mobile operator enables to analyze the following set of research tasks:

  - Distribution of people in time and space
  - Mobility of people in time and space
  - Spatial relations derived from mobility
VISUALISATION OF MOBILITY – CZECH REPUBLIC
AGGREGATED ORIGIN-DESTINATION MATRIX
MOBILITY VISUALISED.
CZECH REPUBLIC
WEEKLY DYNAMICS OF PEOPLE PRESENT: PRAHA 1 (OLD TOWN)
NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.

Very central urban location
WEEKLY DYNAMICS OF PEOPLE PRESENT: PRAHA – KOLODĚJE
NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.

Suburban people out for work
Shopping or trip

Suburban location – resident area near Prague
WEEKLY DYNAMICS OF PEOPLE PRESENT: ADRŠPACH
NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.

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Tourist attraction in rural area
CASE STUDY – METROPOLITAN AREA OF PRAGUE URBAN SYSTEM IN CENTRAL BOHEMIA AROUND PRAGUE
CASE STUDY – MANAGEMENT OF CRISIS
EFFECT OF FLOODS IN 2013 ON MOBILITY IN PRAGUE

blue – regular Monday
red – „flood“ Monday
**SUMMARY FOR „MOBILITY PART“**

**BUSINESS INTELLIGENCE FOR PUBLIC AS WELL AS CORPORATE SECTOR**

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<td>BETTER INFORMATION FOR CRISIS MANAGEMENT</td>
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<td>TOURISM STATISTICS</td>
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<td>VARIOUS OPTIMALISATION IN PUBLIC SECTOR (PUBLIC SERVICE „RETAIL“ NETWORK)</td>
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<td>RETAIL NETWORK OPTIMALISATION</td>
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TRAFFIC AND MOBILITY TOGETHER
CASE: MOTO GP BRNO, 2014

Number of visitors per day of the event

Number of people present and „newcomers“ during the event

Součet z přítomní | Součet z nově příchozí
2013 MOTO GP 2013: IMPACT ON TRAFFIC ON D1 HIGHWAY
TRAFFIC CONGESTION 25 KM LONG
2013 MOTO GP: COMPLEX EVENT ANALYTICS
TRAFFIC AND MOBILITY MONITORING COMBINED!

Number of people present on the event.
SUMMARY: APPLICATION AREAS FOR RODOS MOBILITY MODEL

**COMPLEX MOBILITY MODEL**

- **Traffic monitoring**
  Based on floating car data, detectors, toll data, meteo data

- **Mobility monitoring**
  Based on signaling data from mobile network

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**Application areas for the complex mobility model**

- Smart traffic management for cities
- Smart traffic management for highways and motorways
- Smarter tolling
- Management of crisis
- Advanced traffic and mobility modelling
Thank you

Jiří Novobilský
RODOS Big Data team leader
CE-Traffic, a.s. – corporate RODOS member
mail: jiri.novobilsky@ce-traffic.com

More info about project RODOS:
www.centrum-rodos.cz