

Strategic research at the Transport Systems Development Centre RODOS: Getting nationwide traffic and mobility monitoring from BigData

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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

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

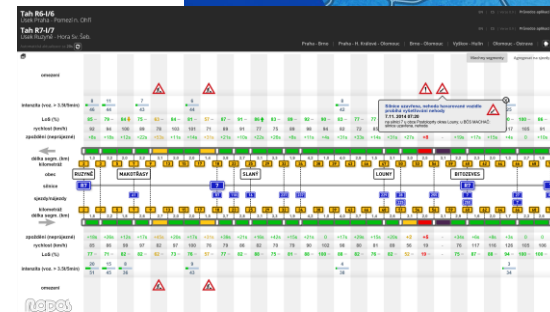
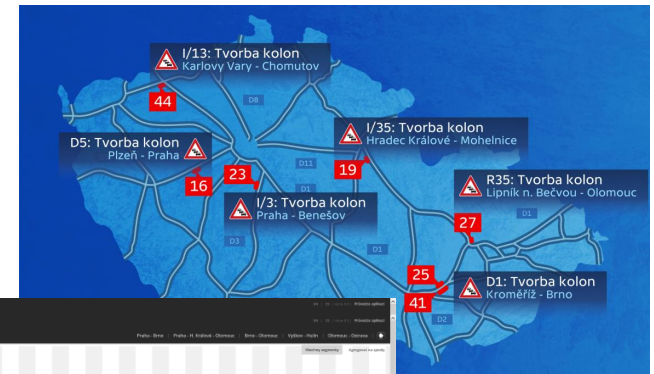
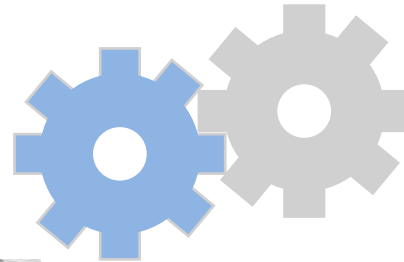
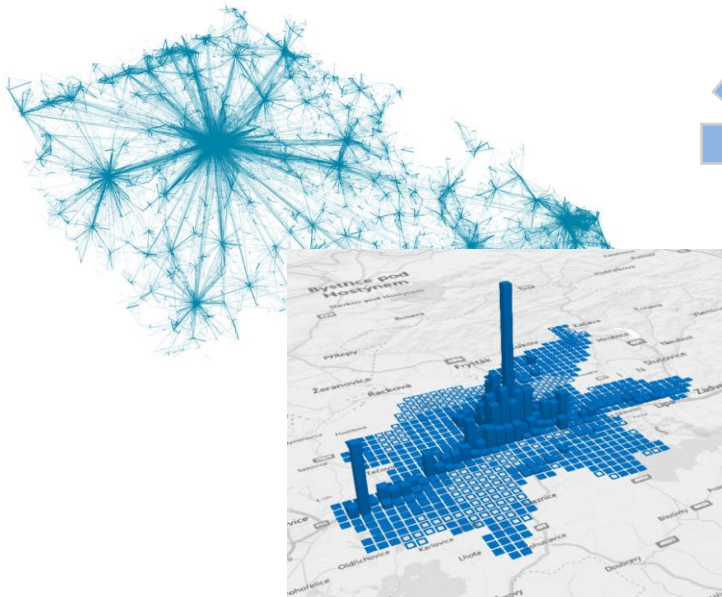
RODOS MOBILITY MODEL

USING MOBILE AND TRAFFIC DATA

Complex mobility model

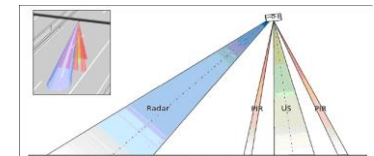
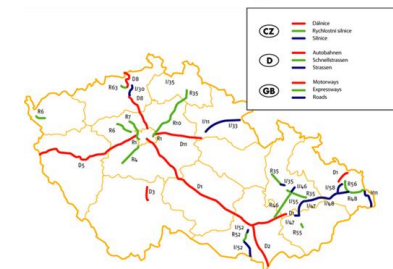
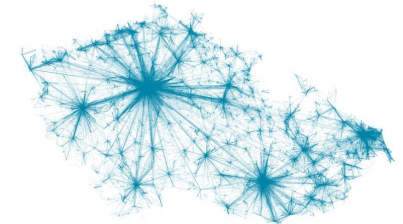
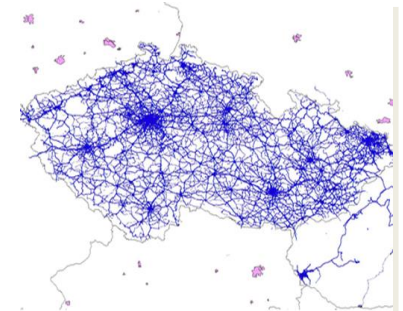
Mobility monitoring
Based on anonymized signaling data
from mobile network

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



DATA SOURCES OF TRAFFIC AND MOBILITY MODEL

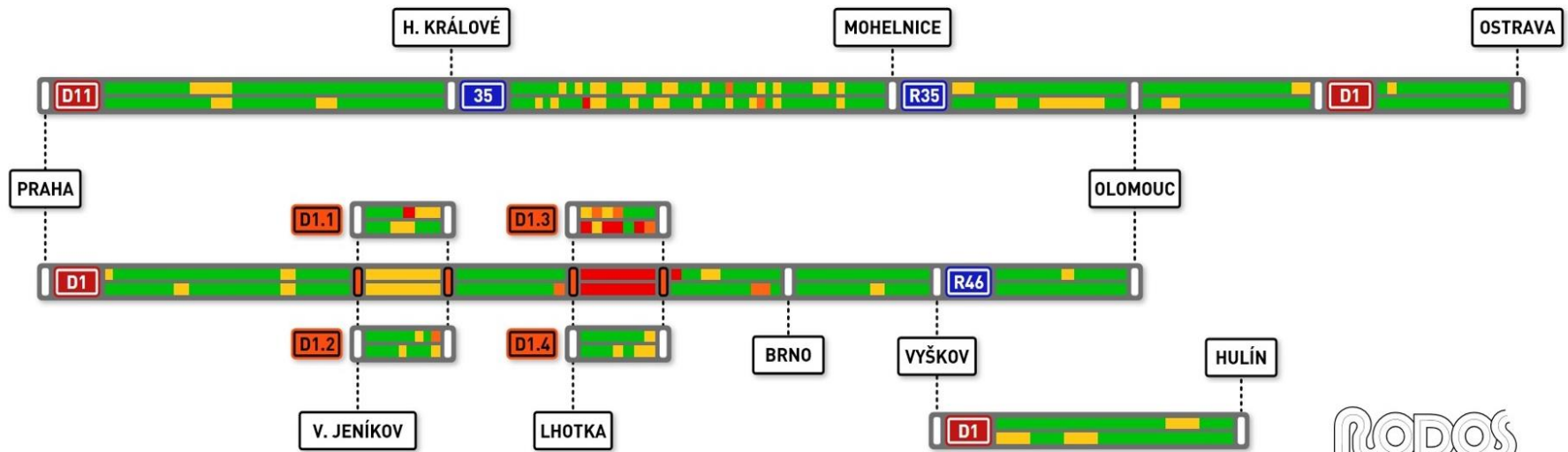
- Stream of GPS points generated by fleets of approx. **140,000 vehicles** in the Czech Republic
 - covering **thousands of kilometers of roads**,
 - probed **every minute**,
 - representing about **5% of traffic flow**
- Stream of anonymous positions of mobile phones from **4 mil. GSM network users**
 - **covering entire territory of CZ, on the resolution of cell ID of all BTS antennae regions**
 - probed every few tens of minutes
- Streamed **transactions from 220 toll gates** from vehicles over 3.5 tons
 - covering **1,170 km**
 - **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**

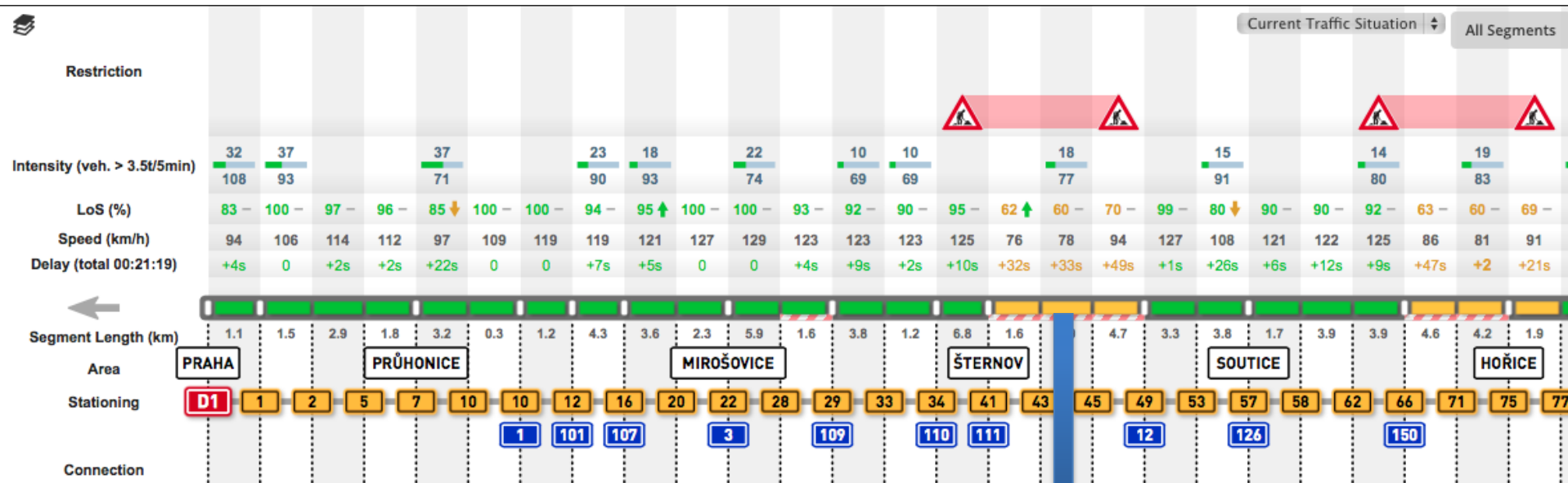
Praha - Ostrava
Automatická aktualizace za 23s
Praha - Brno | Praha - H. Králové - Olomouc | Brno - Olomouc | Vyškov - Hulín | Olomouc - Ostrava | Meteoradar ČR



ROADOS
ROZVOJ DOPRAVNÍCH SYSTÉMŮ

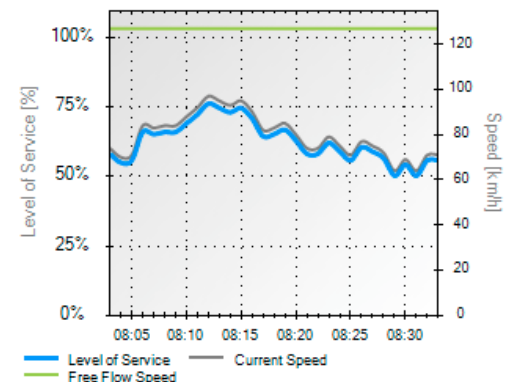
ROADOS
ROZVOJ DOPRAVNÍCH SYSTÉMŮ

ROAD VISUALIZATION ILLUSTRATING THE DYNAMICS OF TRAFFIC FLOW



D1: 43.3 km - 45.2 km

History of Passability



Passability

Current: **71 km/h**

FreeFlow: **127 km/h**

Level of service: **56%**

Delay: **44s**

Intensity*

Current: **36**

Maximal: **99**

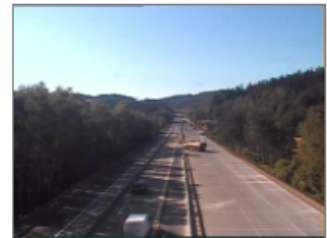
Two Axles Vehicles: **6**

Three Axles Vehicles: **0**

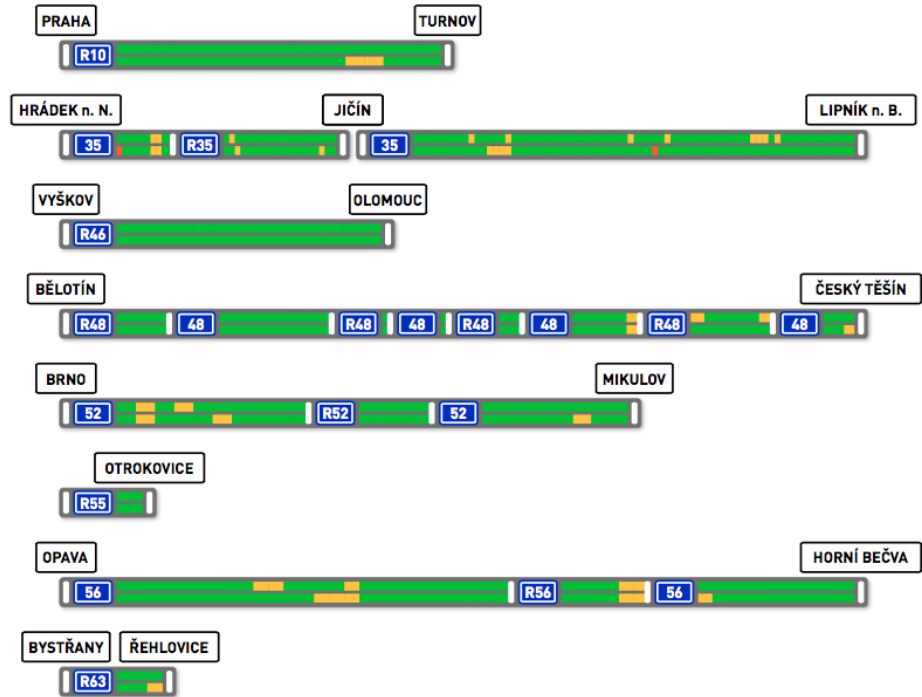
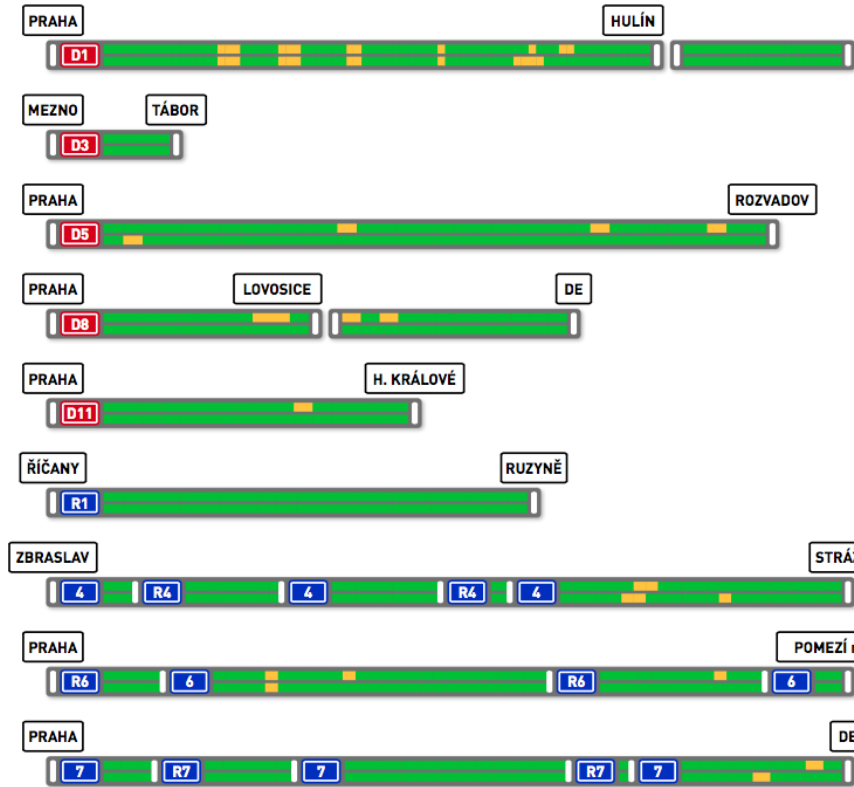
Four Axles Vehicles: **30**

*last 5 minutes data

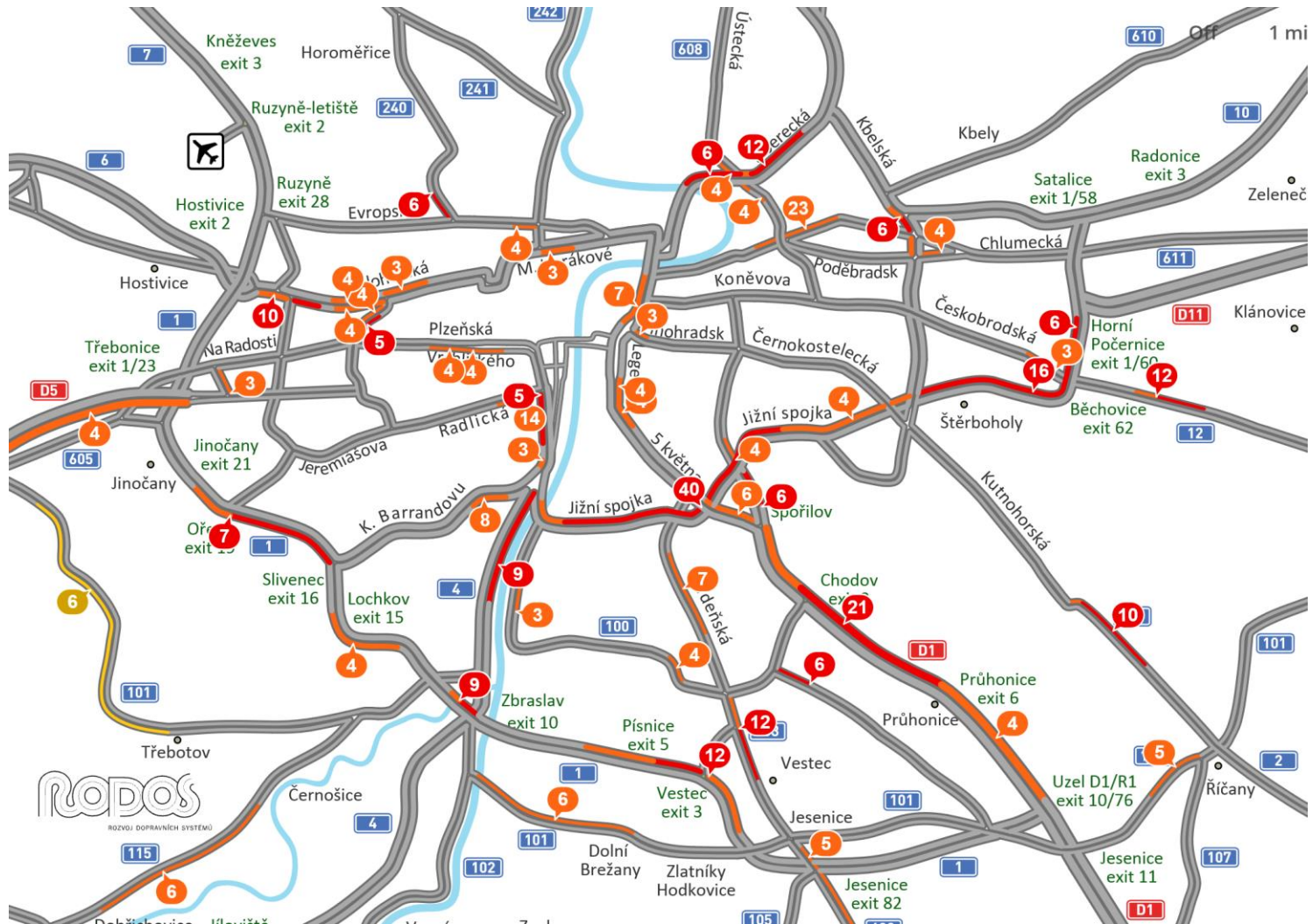
Traffic cameras



MOTORWAYS AND EXPRESSWAYS



SMART CITY: PRAGUE



RODOS
ROZVOJ DOPRAVNÍCH SYSTÉMŮ

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TRAFFIC INFORMATION SERVICES

TRAFFIC BASED ON GPS PROBING – SERVICE FOR CZECH TV



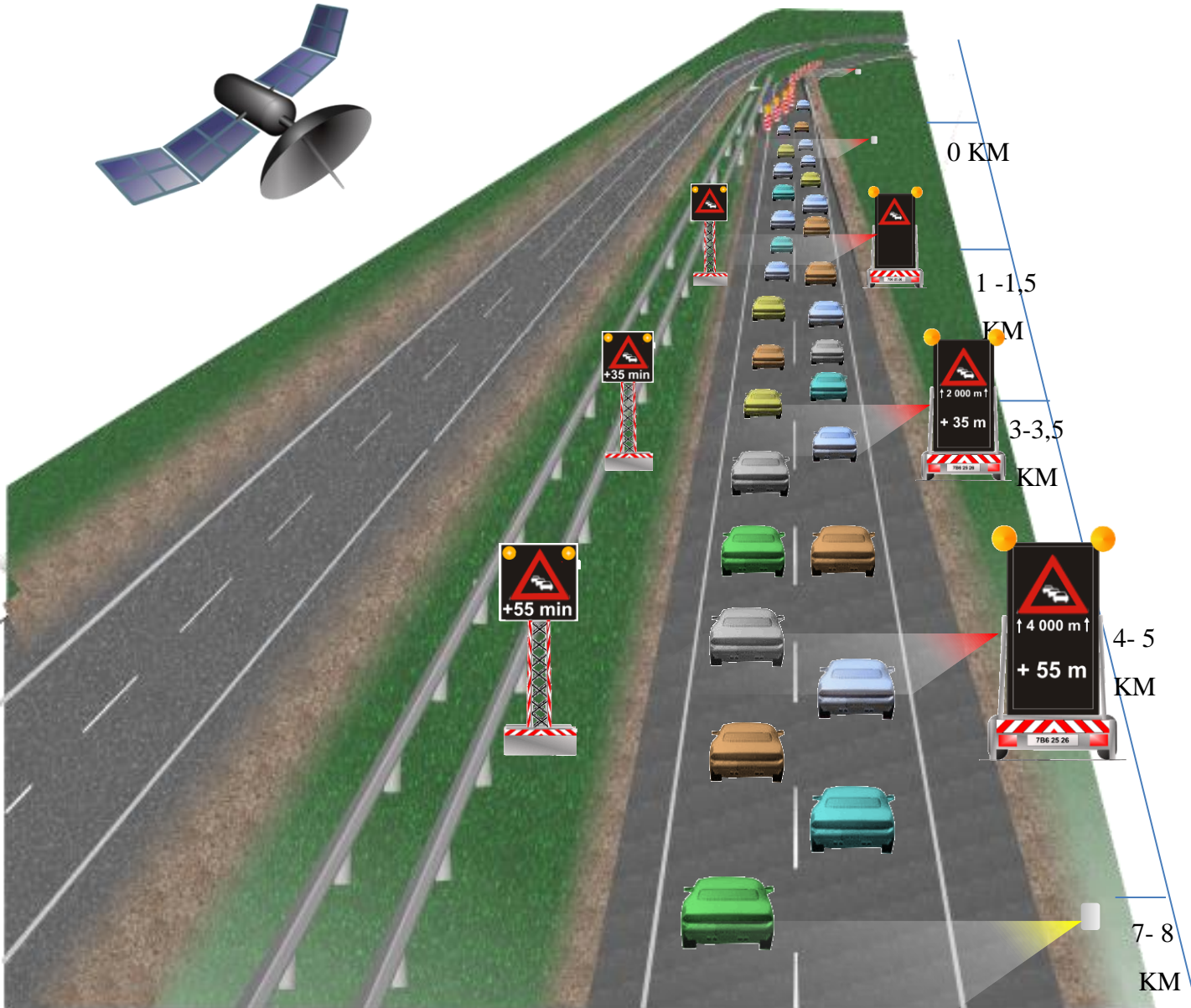
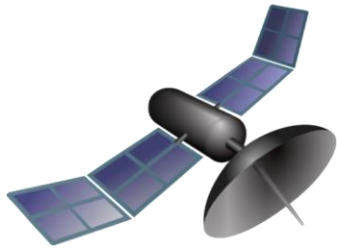
Customers:



Also: FCD traffic monitoring project for the City of Prague



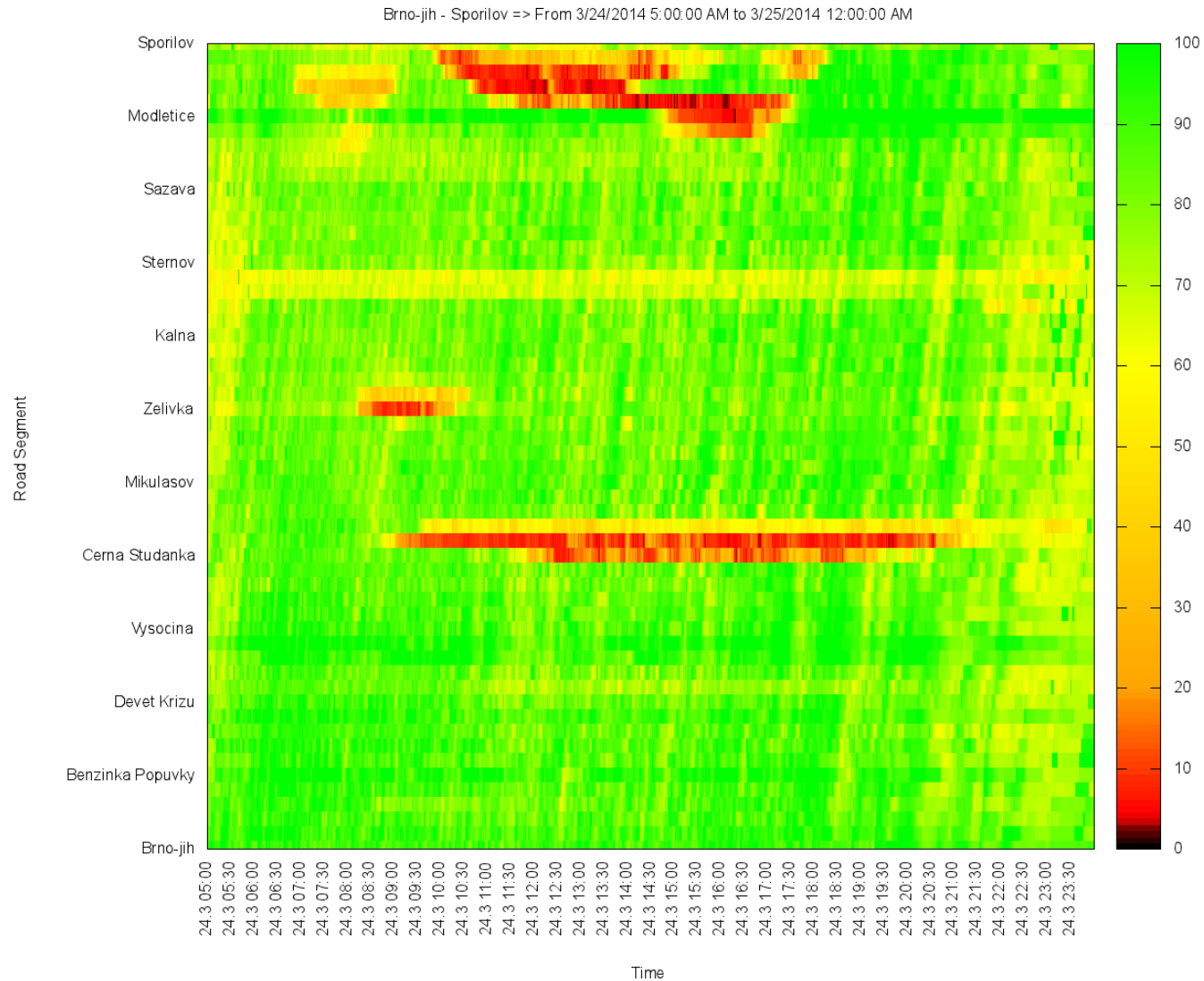
PORTABLE ACTIVE TRAFFIC MANAGEMENT



Congestion warning



DETECTION OF CONGESTION – 24 MARCH, 2014



DETECTION TRAFFIC FLOW DISPERSION – D1 IN THE „MIDDLE“



SUMMARY FOR „TRAFFIC PART“

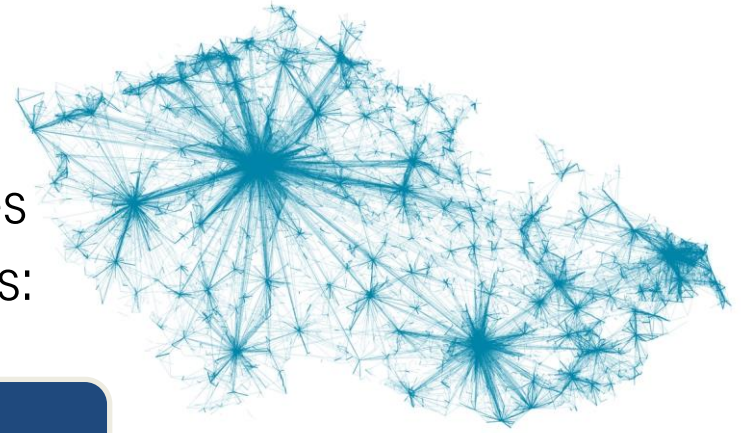
SELECTED APPLICATION SHOWCASES



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:

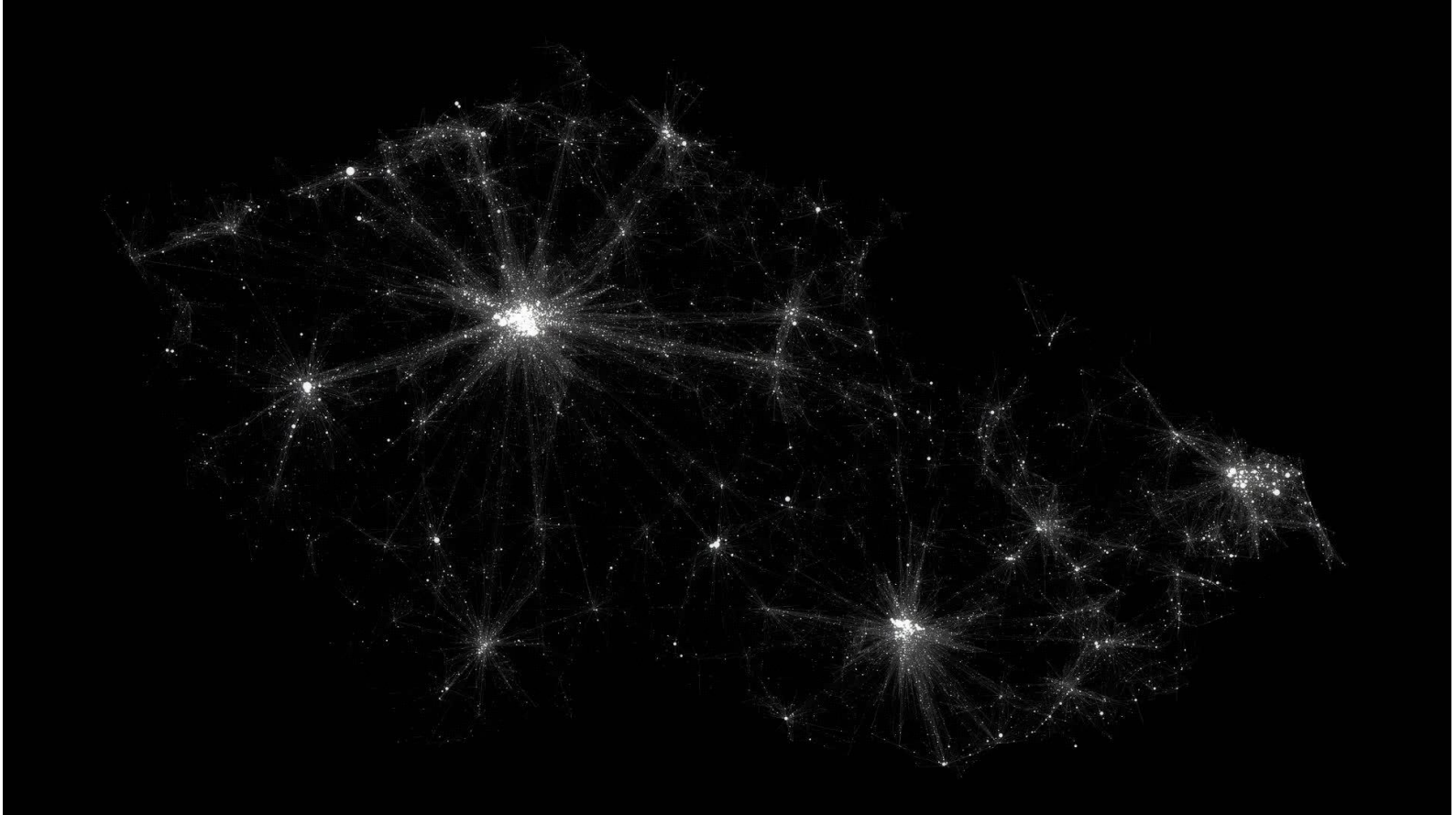


Distribution of people in time and space

Mobility of people in time and space

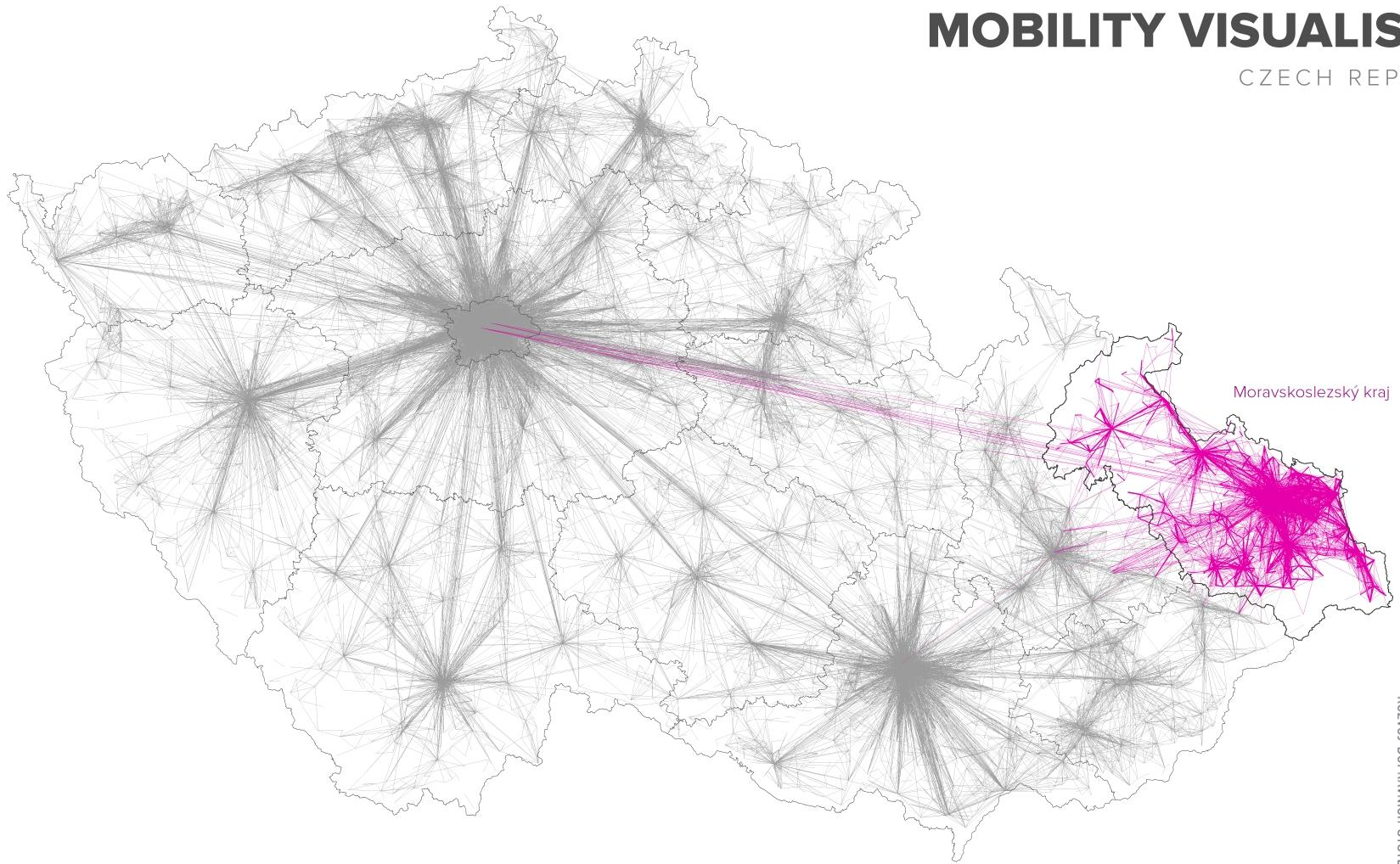
Spatial relations derived from mobility

VISUALISATION OF MOBILITY – CZECH REPUBLIC AGGREGATED ORIGIN-DESTINATION MATRIX



MOBILITY VISUALISED.

CZECH REPUBLIC



Moravskoslezský kraj

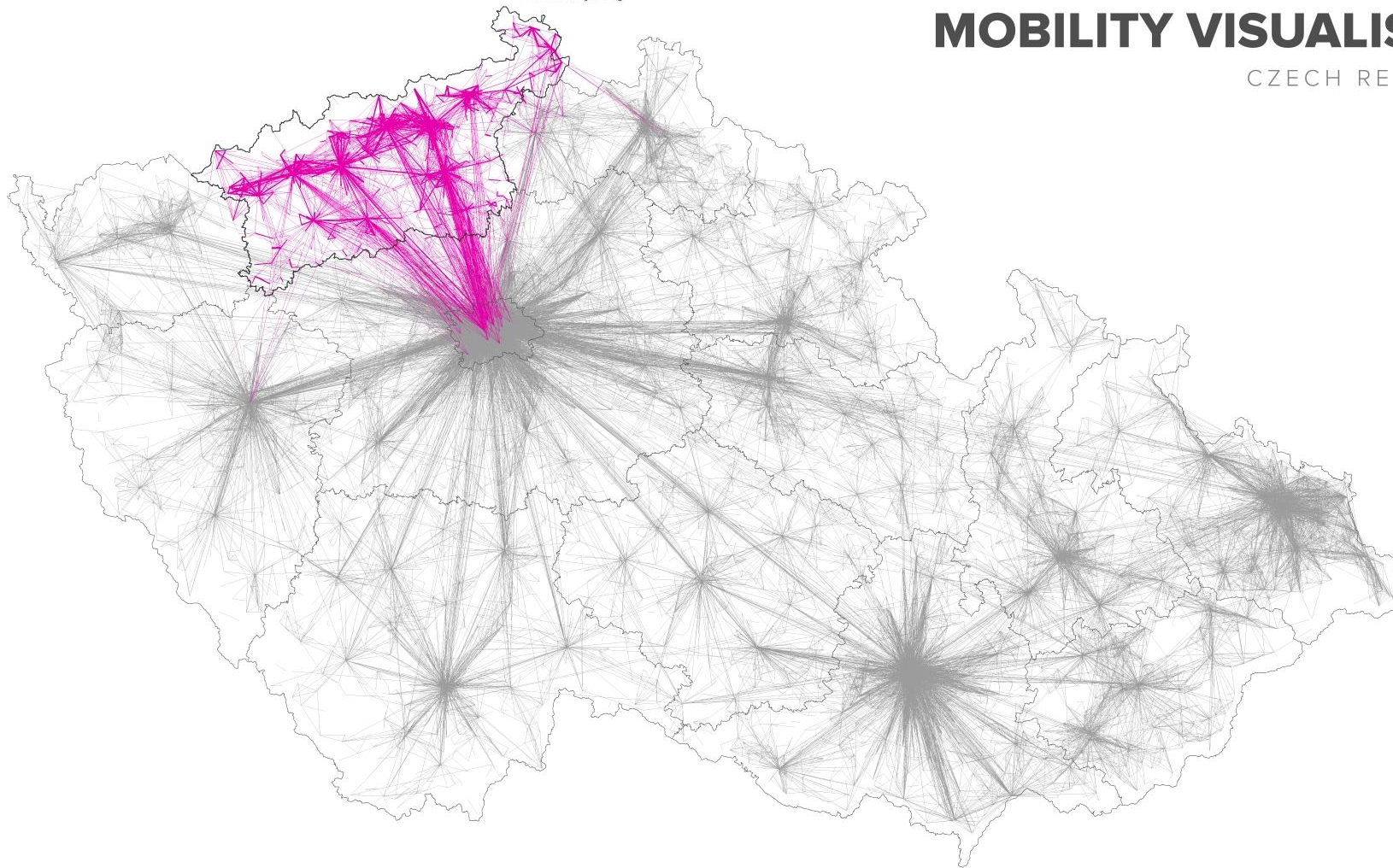
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Ústecký kraj

MOBILITY VISUALISED.

CZECH REPUBLIC



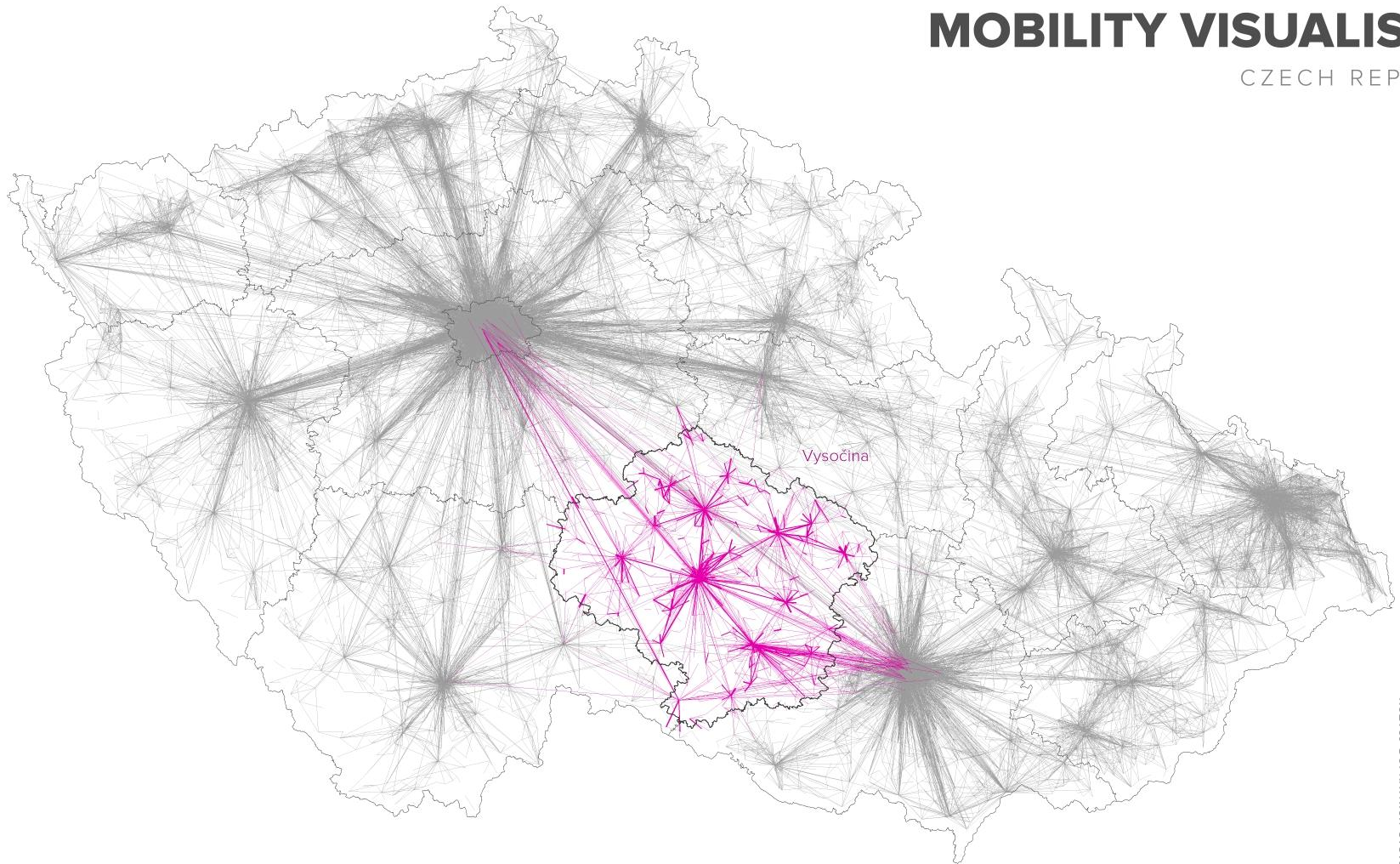
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MOBILITY VISUALISED.

CZECH REPUBLIC



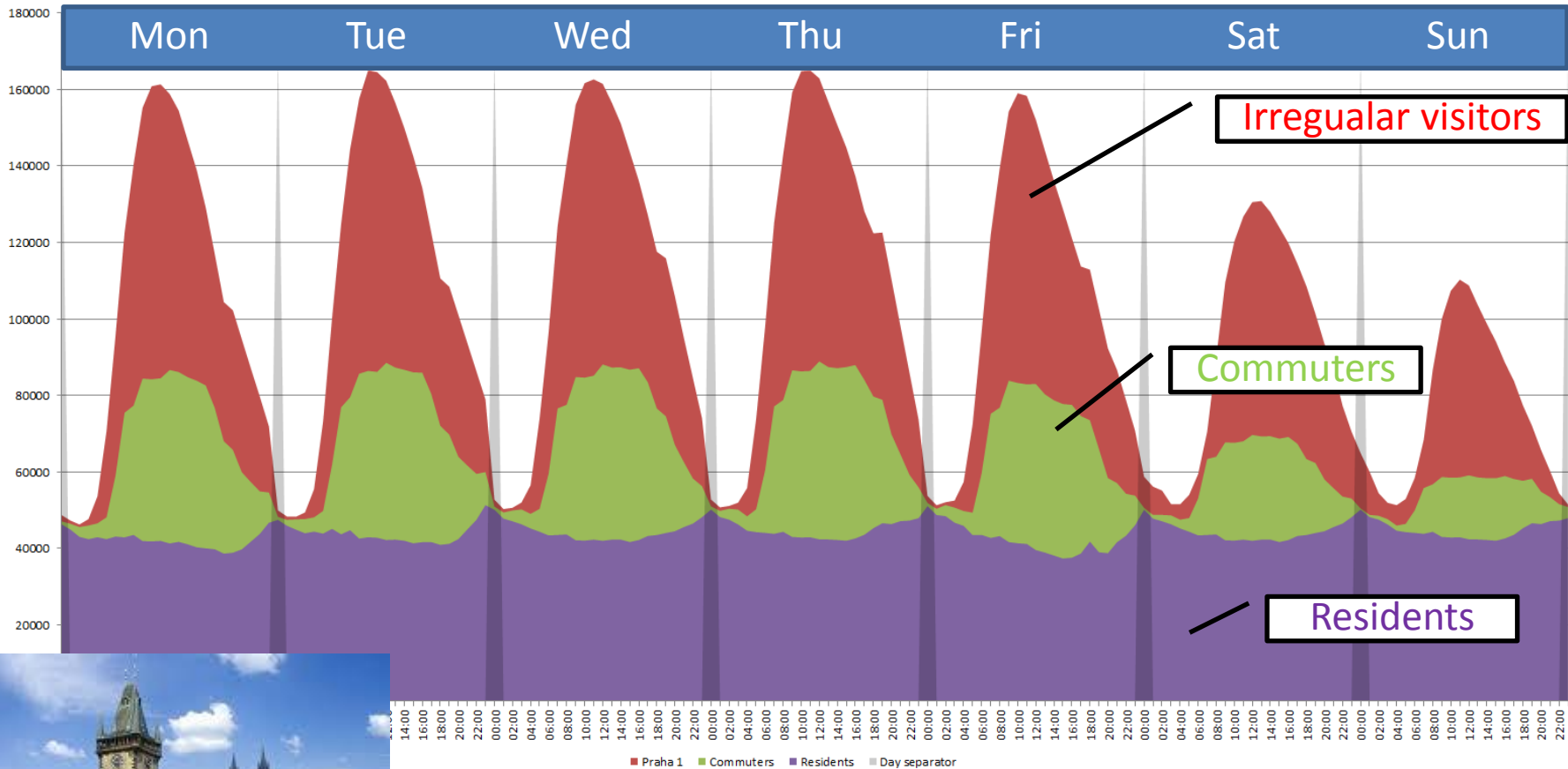
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WEEKLY DYNAMICS OF PEOPLE PRESENT: PRAHA 1 (OLD TOWN)

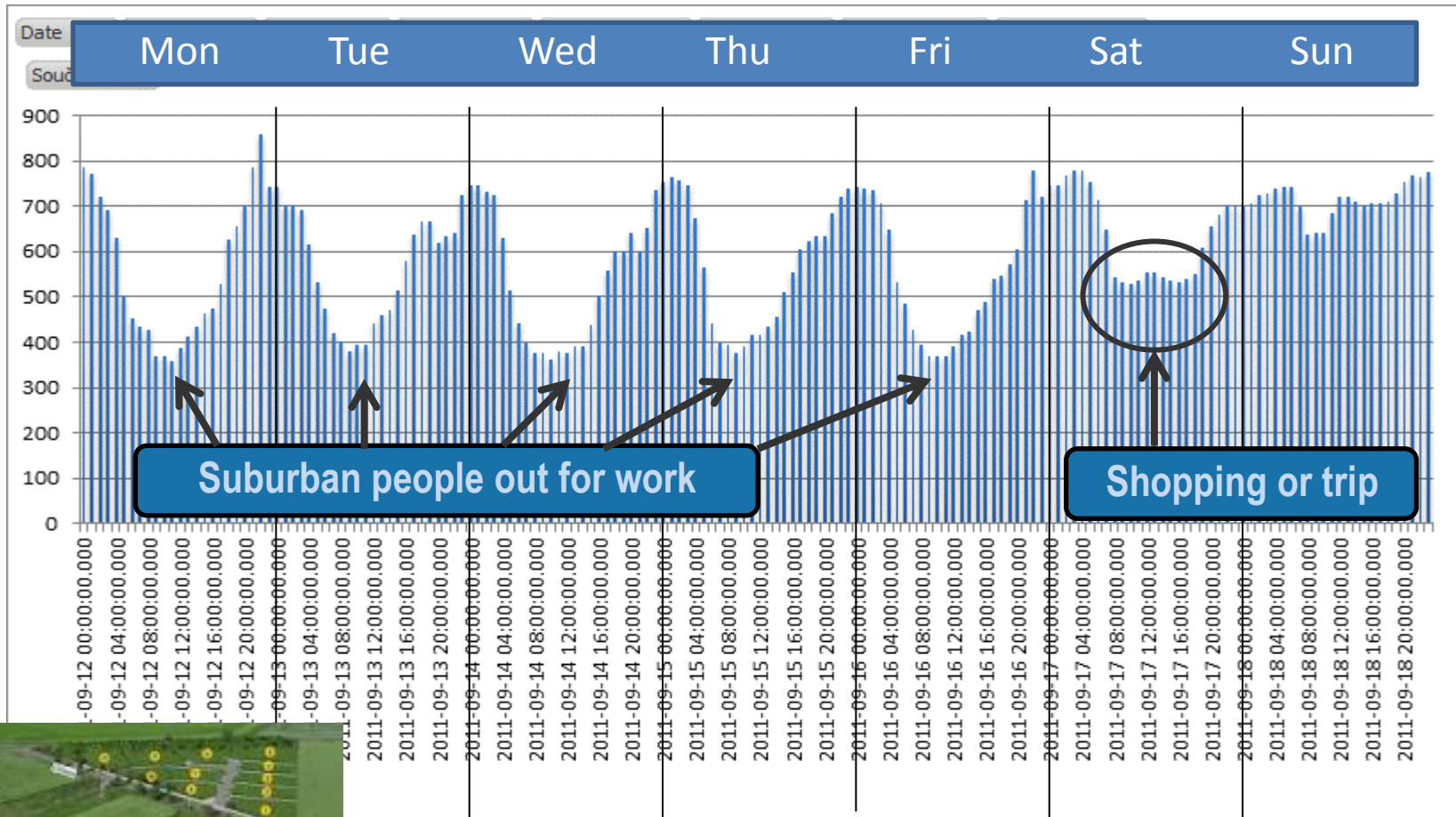
NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.



Very central urban location

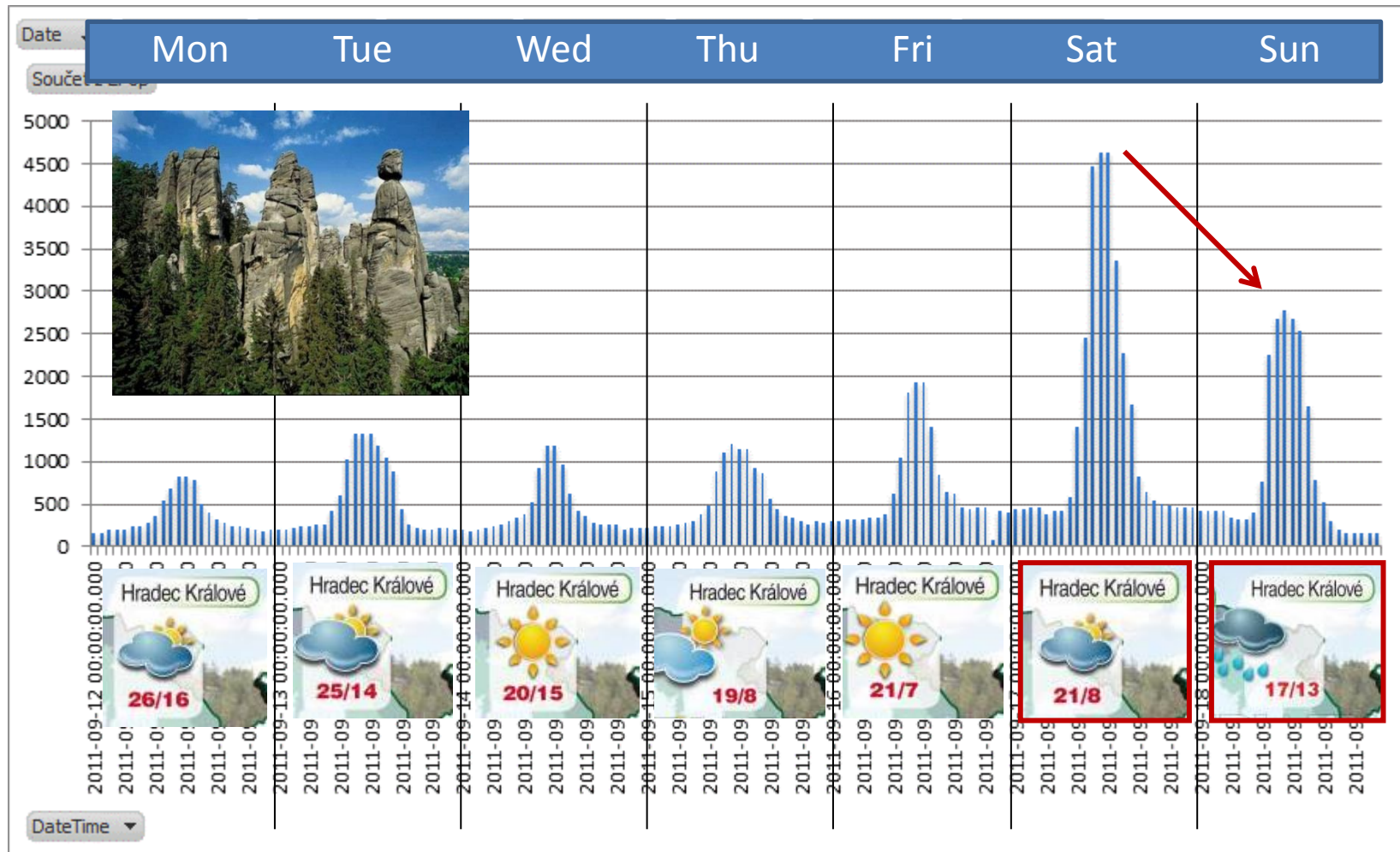
WEEKLY DYNAMICS OF PEOPLE PRESENT: PRAHA – KOLODĚJE

NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.



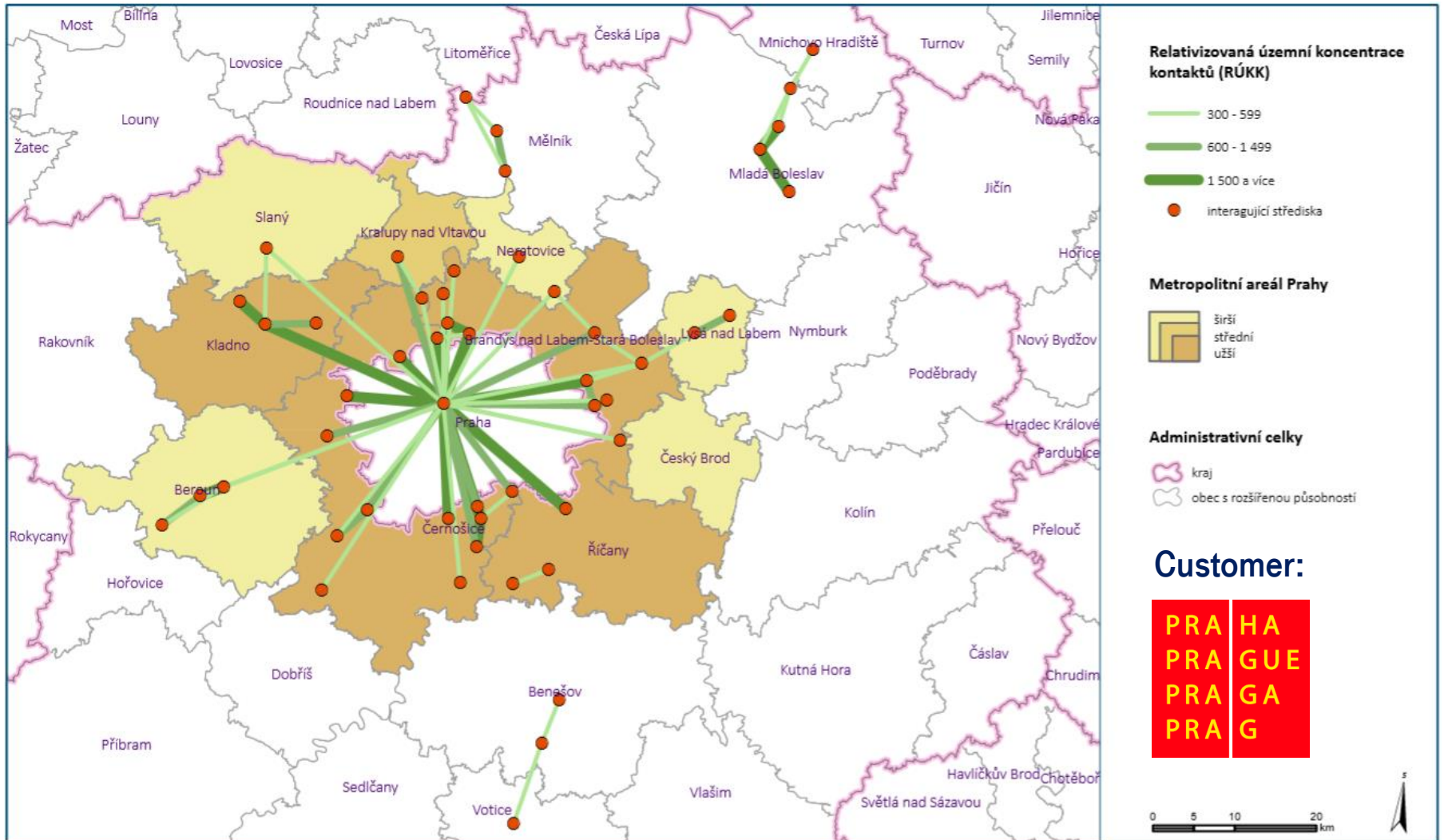
Suburban location – resident area near Prague

WEEKLY DYNAMICS OF PEOPLE PRESENT: ADRŠPACH NUMBER OF PEOPLE PRESENT ON WEEK 12.-18.9.



Tourist attraction in rural area

CASE STUDY – METROPOLITAN AREA OF PRAGUE URBAN SYSTEM IN CENTRAL BOHEMIA AROUND PRAGUE



Metropolitní areál Prahy

- užší (ORP): Černošice, Říčany, Brandýs nad Labem-Stará Boleslav, Kladno
- střední: Kralupy nad Vltavou
- širší: Beroun, Slaný, Český Brod, Neratovice, Lysá nad Labem

RÚKK - relativizace byla provedena vůči průměrné ÚKK v celém souboru existujících relací v rámci Středočeského kraje (mezi středisky, která vstupují do analýzy - KV > 2,5 a další obce s populací nad 2 500 ob.), do průměru nebyly započítány relace s nulovou ÚKK, průměr = 100.

Zdroj dat: CE - Traffic a.s., CSÚ (2013): Sčítání lidu, domů a bytů 2011, Praha, Český statistický úřad, Hampl, M. (2005): Geografická organizace, společenost v České republice: transformační procesy a jejich obecný kontext, Praha, UK, 147 s.

Autor návrhu: Jakub Novák

Kartografické zpracování: Jiří Nemeškal

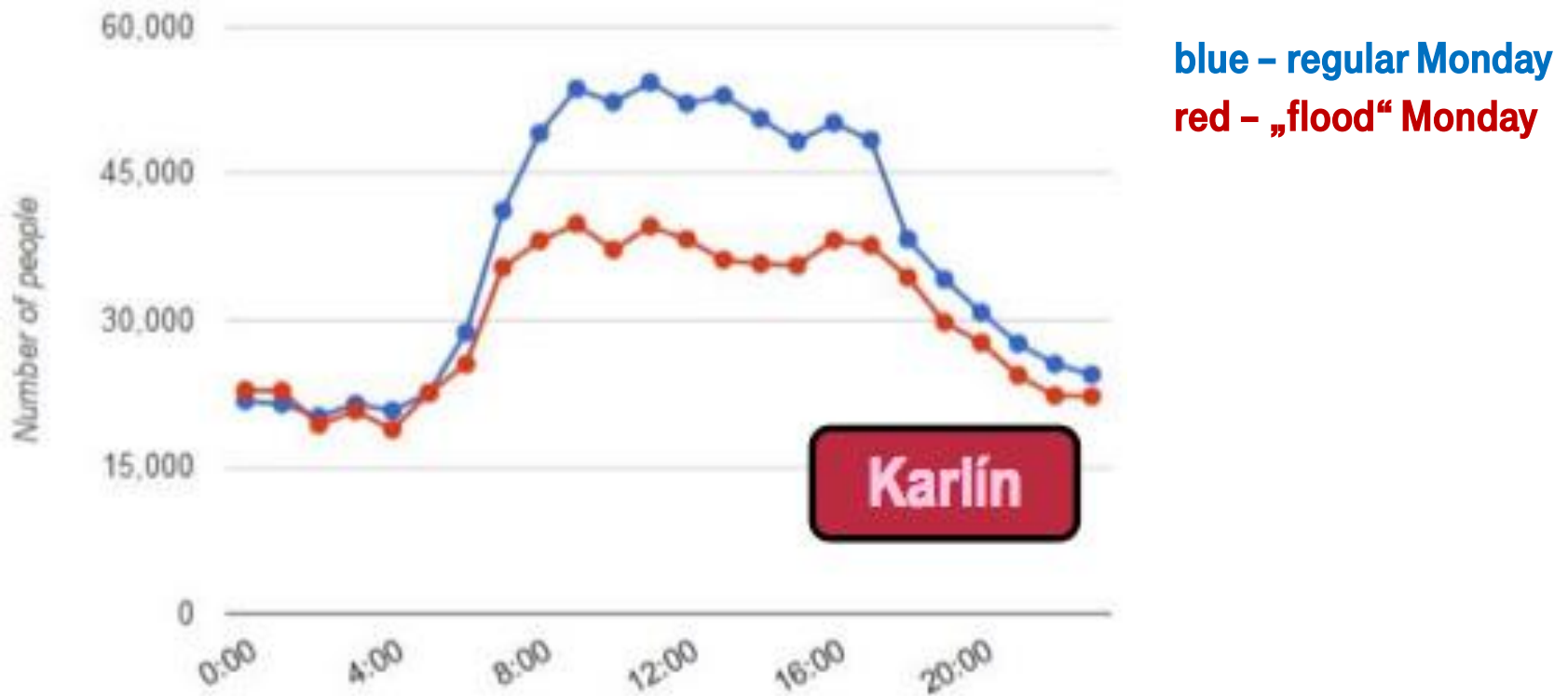


UNIVERZITA KARLOVA V PRAZE
Přírodovědecká fakulta
katedra sociální geografie a regionálního rozvoje



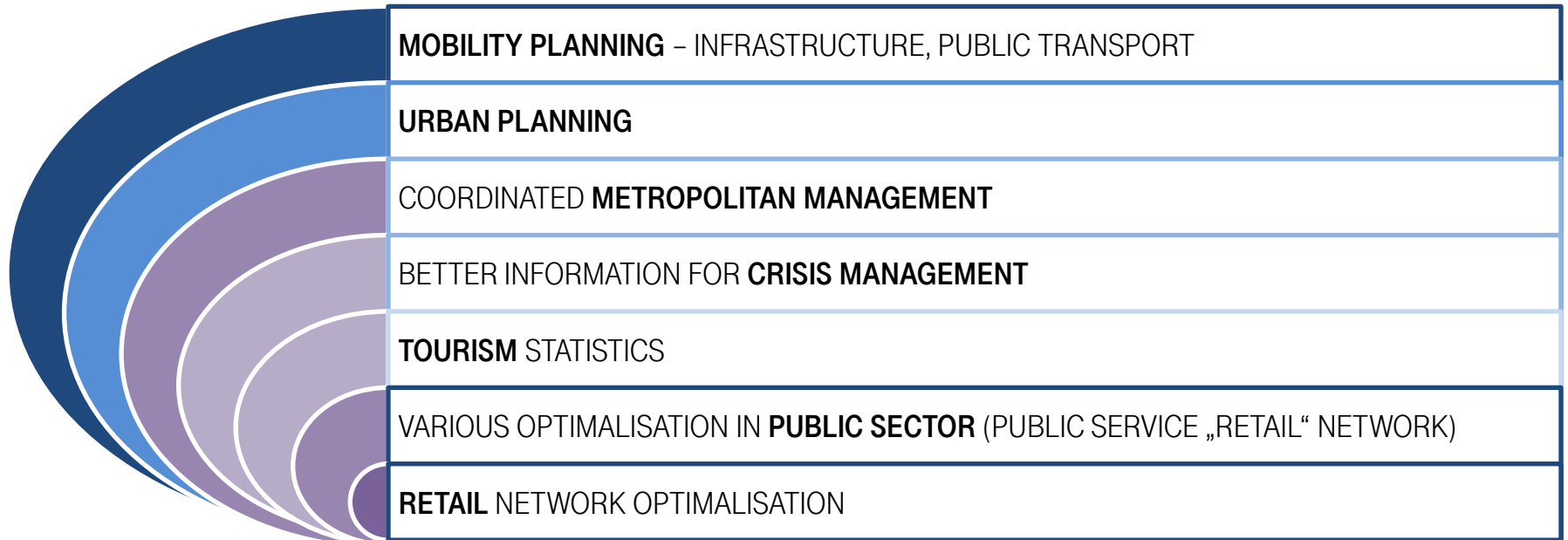
CASE STUDY – MANAGEMENT OF CRISIS

EFFECT OF FLOODS IN 2013 ON MOBILITY IN PRAGUE



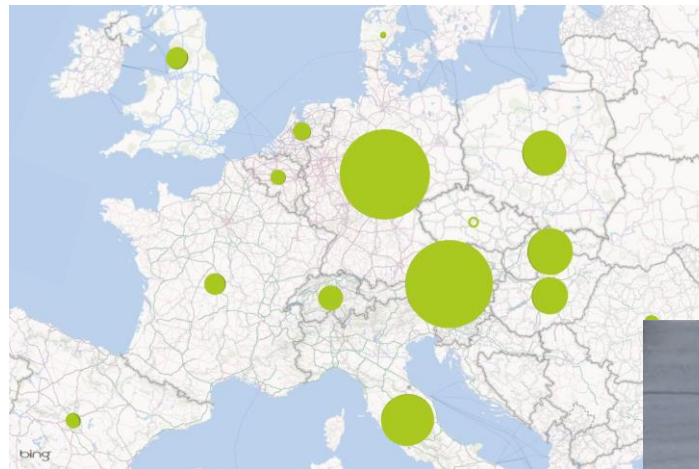
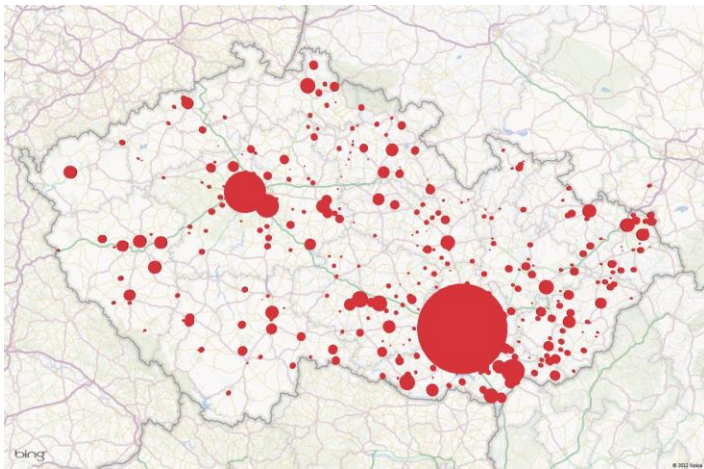
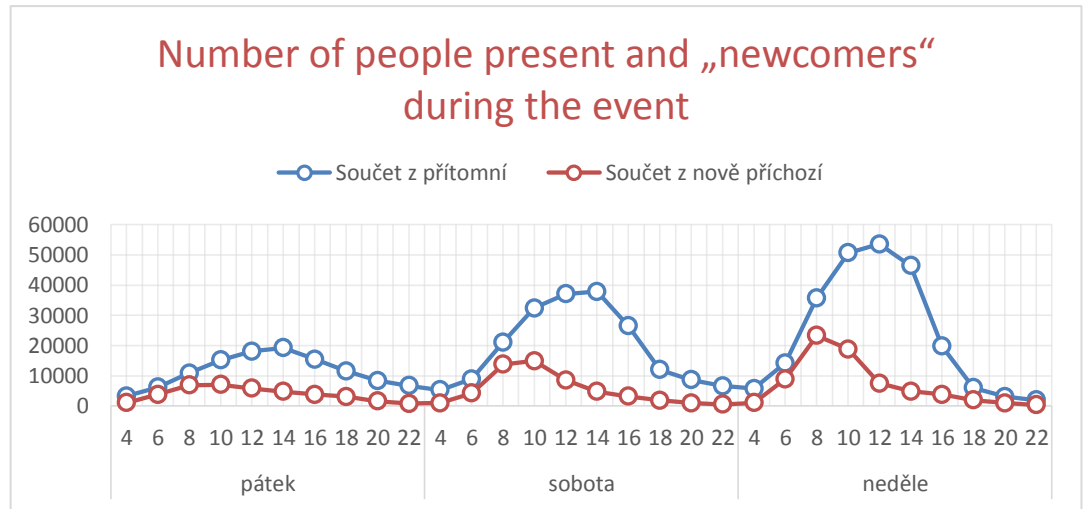
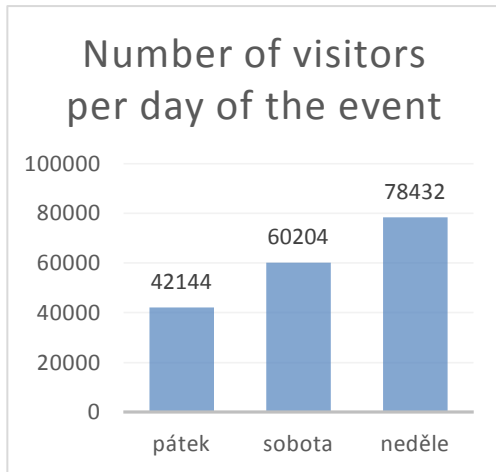
SUMMARY FOR „MOBILITY PART“

BUSINESS INTELLIGENCE FOR PUBLIC AS WELL AS CORPORATE SECTOR



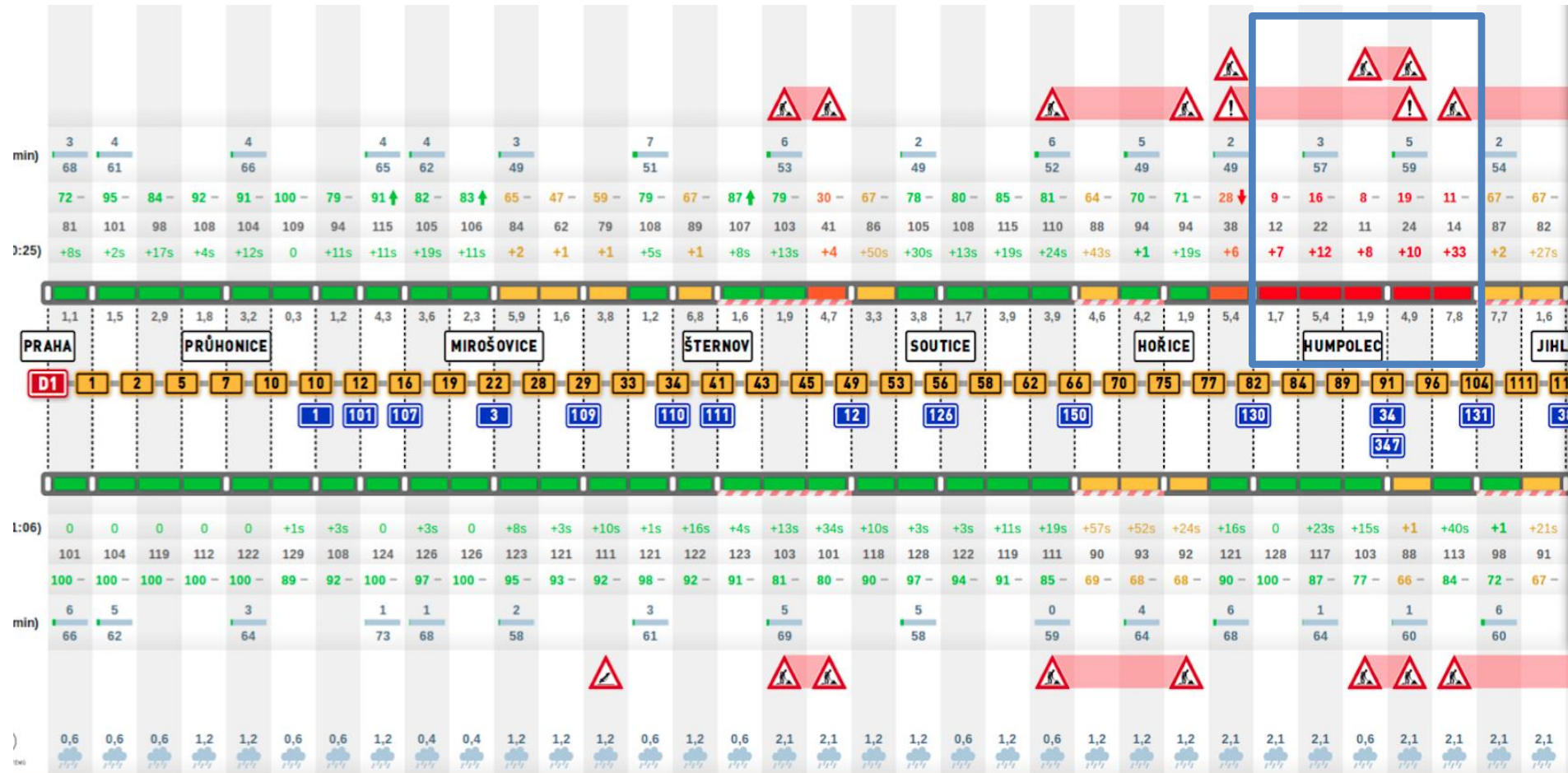
TRAFFIC AND MOBILITY TOGETHER

CASE: MOTO GP BRNO, 2014



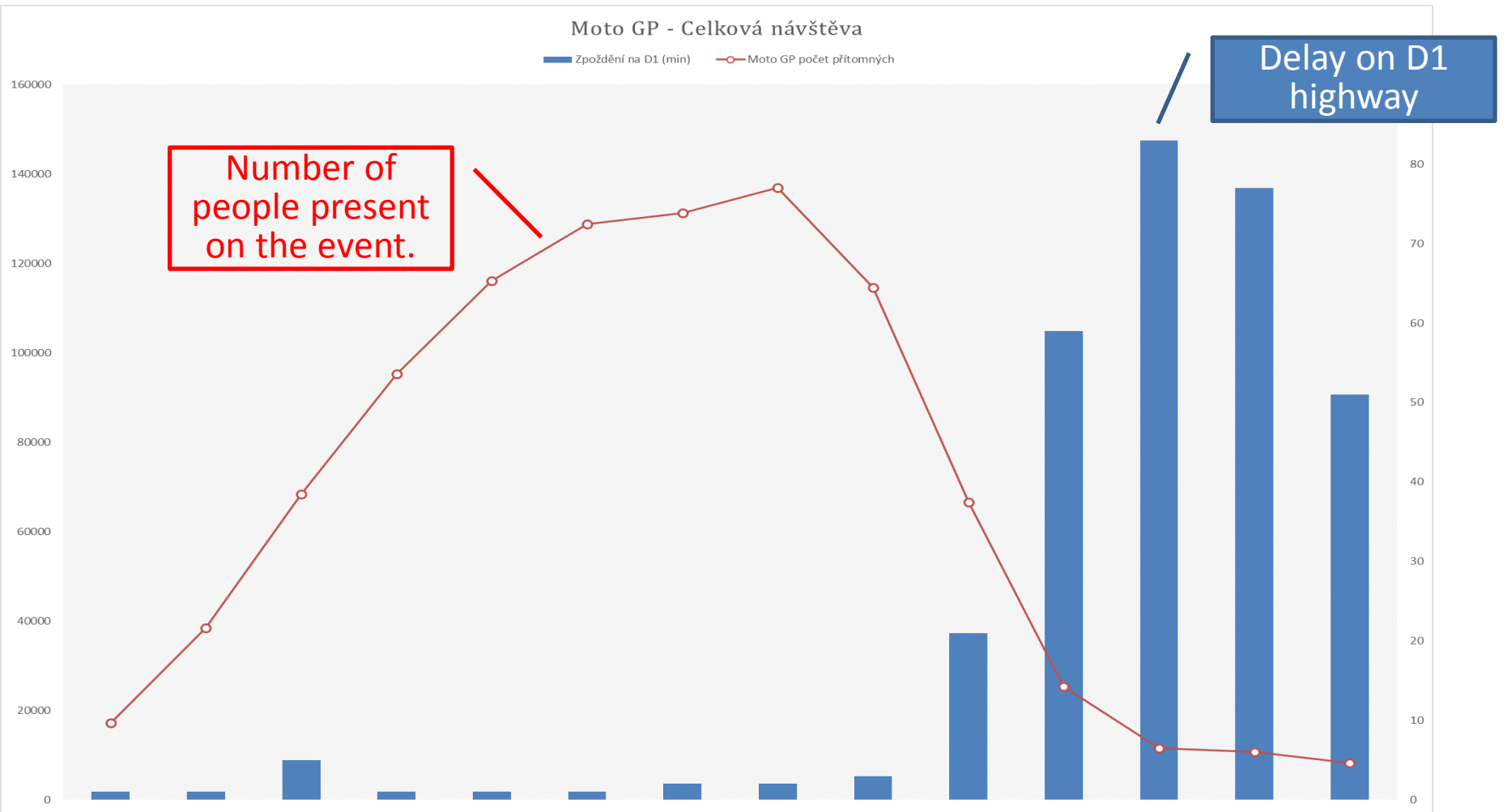
2013 MOTO GP 2013: IMPACT ON TRAFFIC ON D1 HIGHWAY

TRAFFIC CONGESTION 25 KM LONG

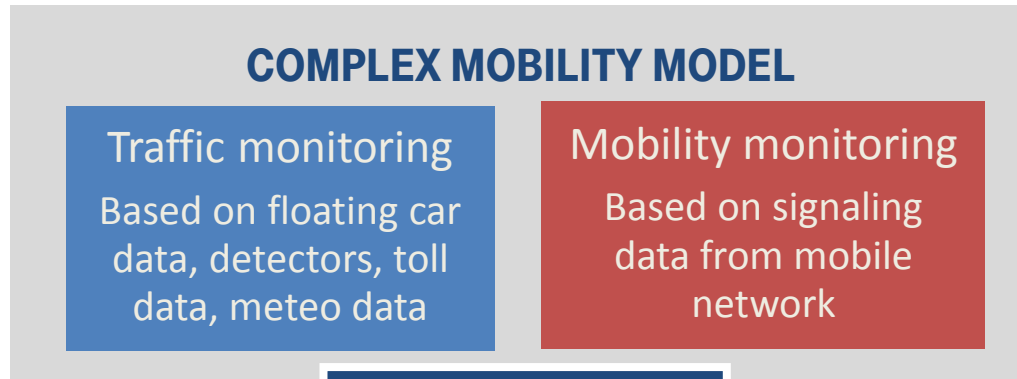


2013 MOTO GP: COMPLEX EVENT ANALYTICS

TRAFFIC AND MOBILITY MONITORING COMBINED!



SUMMARY: APPLICATION AREAS FOR RODOS MOBILITY MODEL



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

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More info about project RODOS:

www.centrum-rodos.cz

