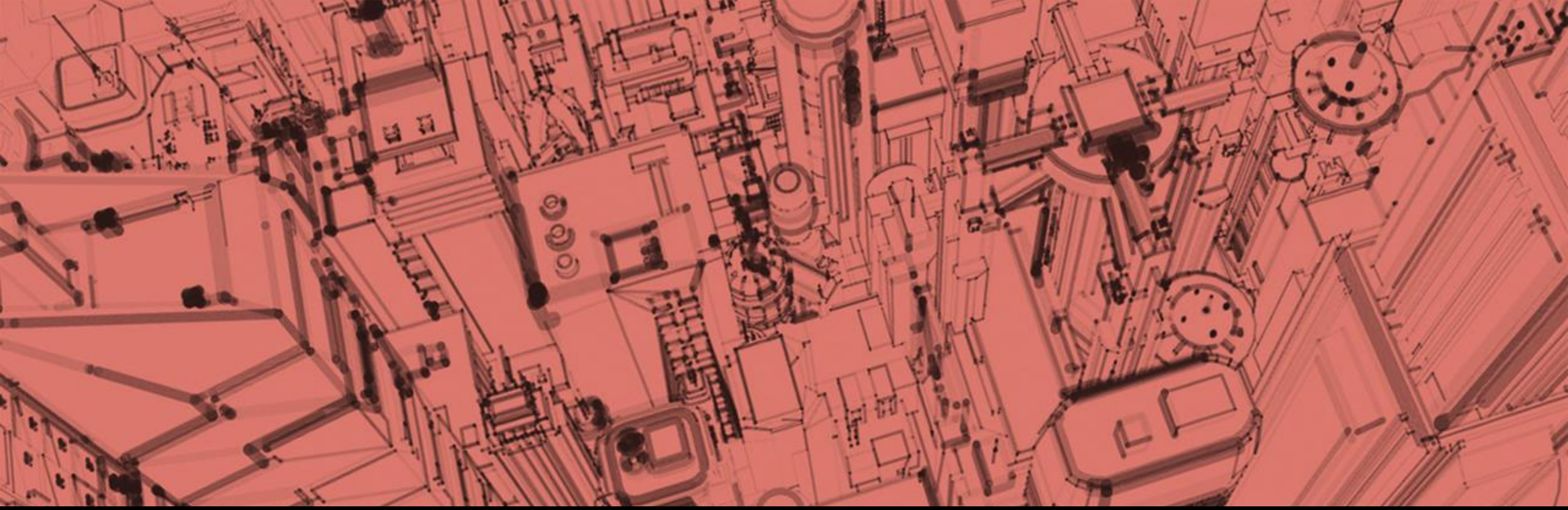


Smart City + Brno + Big Data = ?

Adam Kučera (Lasaris alumni)

Why to be interested?

- Smart city:
  - multifaceted, interdisciplinary area (Lasaris, CERIT SC)
  - Cyberphysical systems (Lasaris)
  - Ethical and legal issues (FI MU, PrF MU, C4E)
  - Sensor networks
    - Distributed (Lasaris)
    - Evironmental sensors (Recetox)
- Big data
  - New analytical methods needed (Lasaris)
  - Powerful infrastructure needed (CERIT-SC)
- Brno
  - Progressive openness policies
  - Smart city initiative
  - Open data at http://data.brno.cz
  - Experience with GIS applications
  - Interested in academic cooperation

Meanings of Smart

It‘s not just about technology!

Smart = Ubiquitous ICT hardware

- Public WiFi
- Smart benches
- Smart public transport stops
- Problems:
  - Maintenance costs
  - Vandalism
  - Technology progress x implementation speed

→ *Source: Jan Sedlák, Lupa.cz*

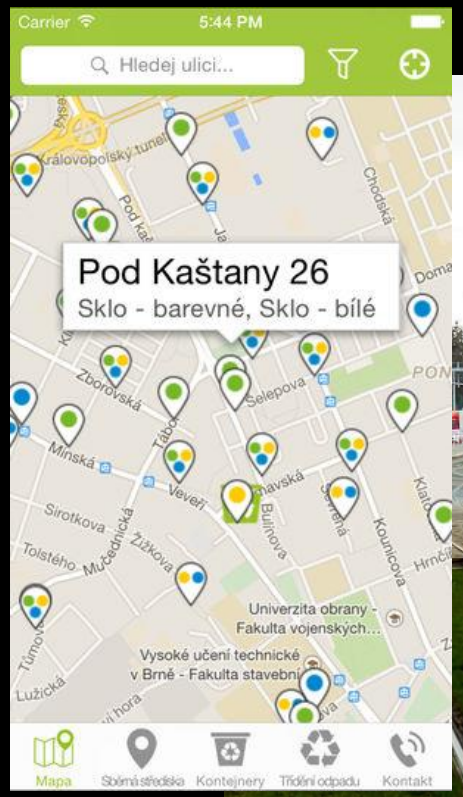
← *Source: Facebook page of DPMB*

Smart = Monitored

- Traffic monitoring
  - Public transport via in-vehicle units
  - Traffic via smart traffic lights
- Environmental sensors
  - Air quality
  - Noise
- Public infrastructure monitoring
  - Water mains
  - Gas mains
  - Smart grids
- Inhabitant movement
  - Cell phone data
- Security cameras
- Problems:
  - It‘s easy to get to data, but how to process them and make use of them?
  - Is it ethical to gather the data?
  - How to protect the data from misuse and abuse?

Smart = Optimized

- Waste collection management
  - Crowdsourced „full bin“ reporting
- Traffic control
  - Public transport vehicle priority
  - Congestion prevention



← *Source: iTunes AppStore*

→ *Source: prazsketramvaje.cz*

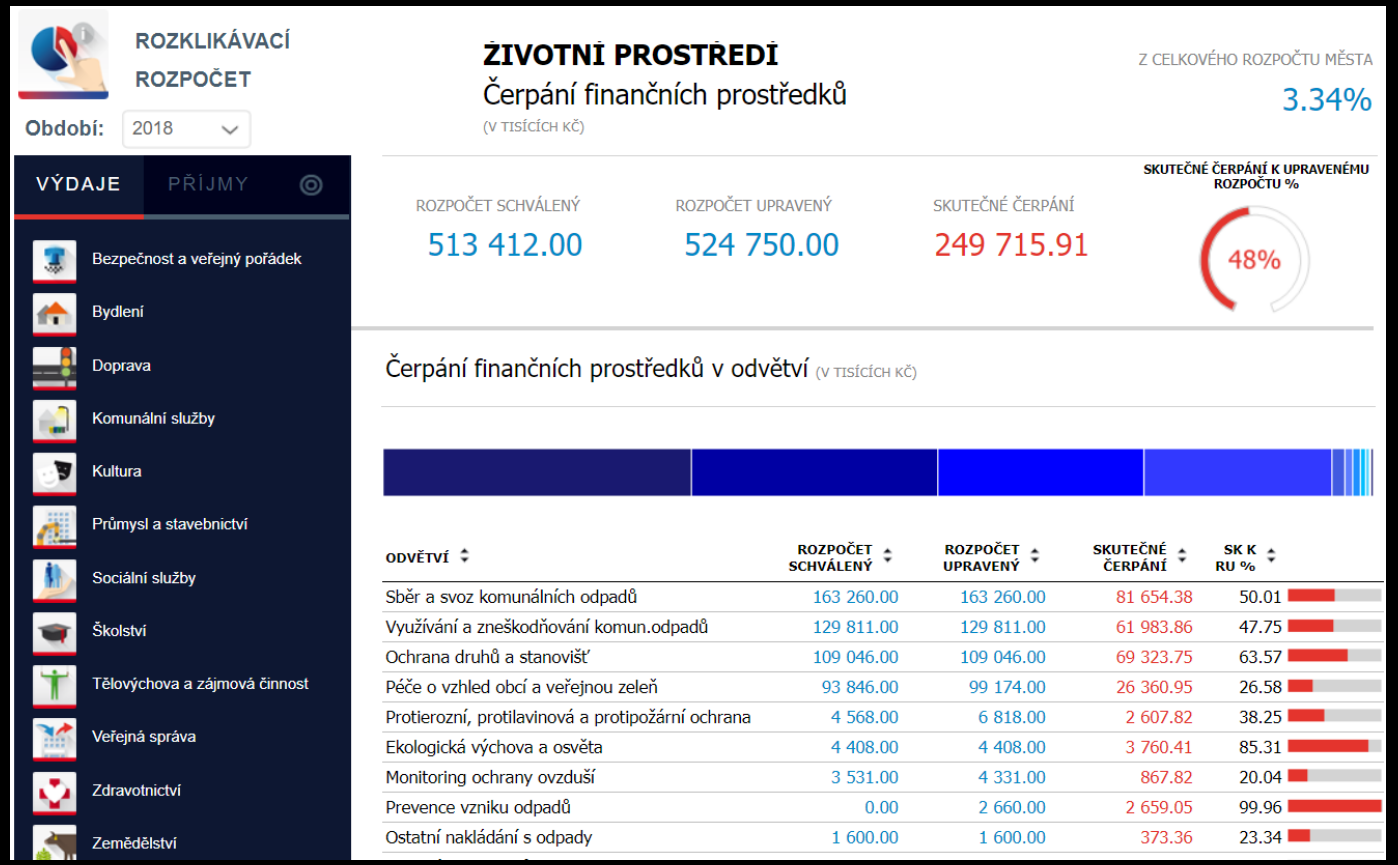
Smart = Integrated

- City-wide Enterprise Service Bus
- Emergency response services communication & cooperation
- Centro De Operacoes Prefeitura Do Rio de Janeiro, Brazil (IBM)

Source: George Magaraia, Último Segundo

Smart = Open

- Open Linked Data
- Data available to public
  - „Drill-down budget“
- Third-party developers can create their own applications



Source: Screenshot by the author, [Brno City]

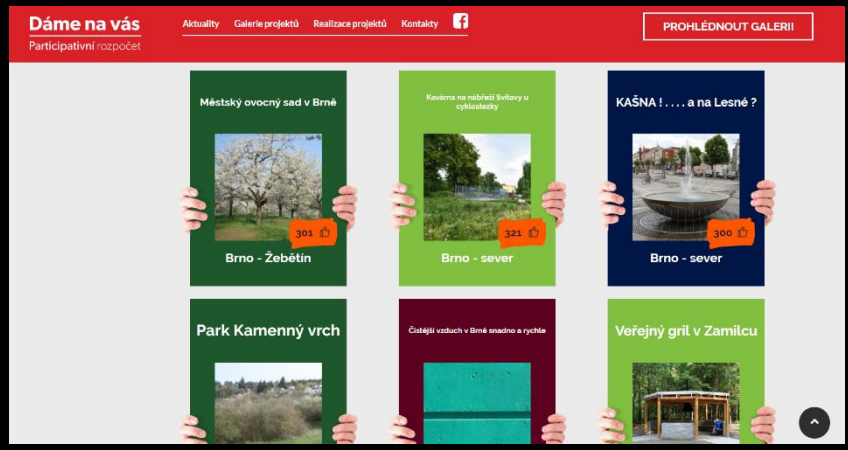
Smart = Barrier free

- Both physical and administrative barriers are removed
- Effective communication with public services and offices
  - Wheelchair accessible
  - On-line public transport card purchase
  - On-line communal waste fee payment

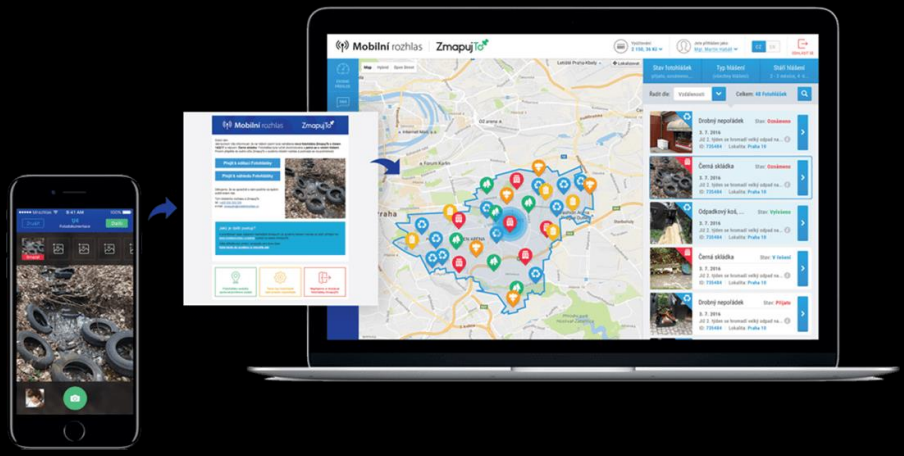
Source: Screenshot by the author, Brno City

Smart = Listening

- Helpful, listening, adjusting and reacting to citizens' **needs** and **wishes**
- Crowdsourcing:
  - Participative budgeting
  - „Feelings map"
  - (e-)Referendums (Joseph II. Statue)
  - Problem reporting (ZmapujTo/Mobilní rozhlas/Zlepšeme Česko – dr. Kubásek)



↑*Source: Screenshot by the author, [Brno City]*
↓*Source: [Mobilnirozhlas.cz]*



Smart = Environment & Citizen Friendly

- Traffic reduction
  - Bicycle/electric car sharing
- Noise reduction by speed limitations

Source: Kcida10, Wikimedia Commons

Source: Pierre Rudloff, Wikimedia Commons

Smart = Dangerous

- CCTV + Face Recognition + Police state = - Freedom
- Kitchin, Rob: The real-time city? Big data and smart urbanism. In GeoJournal, Springer 2013
  - Data are never **raw** or **objective**
  - Technocratic governance
  - Corporatization of governance
  - Buggy & hackable city
  - Ubiquitous surveillance

Source: Face++, Washington Post

Big data in Smart City

Where to find big data applications in Smart City?

The role of big data in smart city

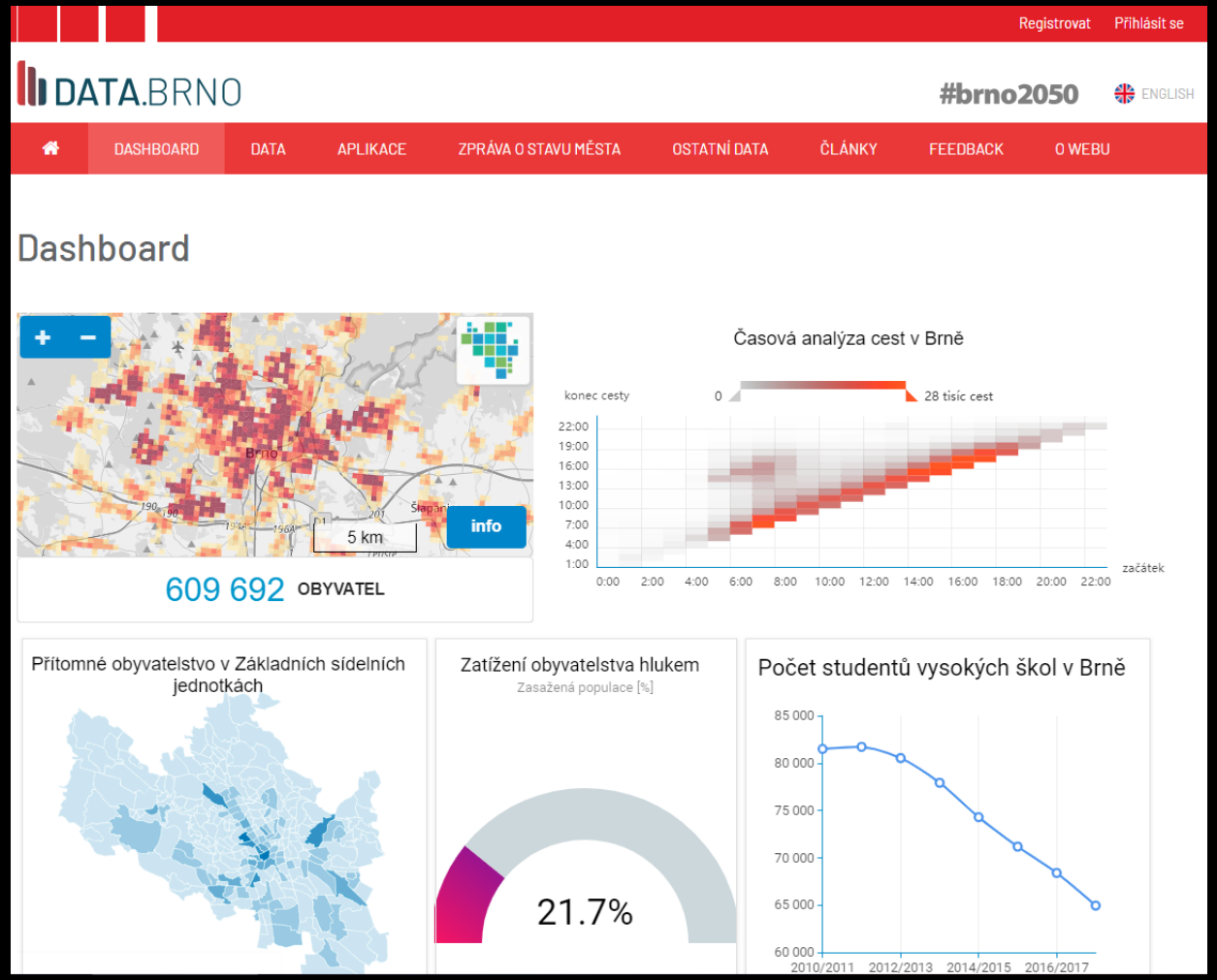
- Paper: The role of big data in smart city (Hashem, et al., 2016)
- Healthcare & Health monitoring
  - Data analysis for insurance
  - Predictions of epidemics
  - Wearable electronics
- Transportation & Route management
  - Reducing environmental impact
  - Increased safety
  - Effective shipping
  - Congestion prevention
  - Public transport data used to place bike-sharing spots
- Governance
  - Identification of agencies or organizations with common interests
  - Determining people needs
- Waste management
  - Optimization of waste collection routes
- Smart Grid & Energy Management
  - Prediction of the consumption
  - Analysis of the consumption and smart pricing
  - Fault detection
- Weather data
  - Agriculture
  - Prediction of floods, droughts, …

Data Science & Smart Brno

What can we use? What does Brno wants?

Open data & Apps

- http://data.brno.cz
  - Economy & Business
  - Housing
  - Population
  - Education, R&D
  - Tourism
  - Living quality
  - Environment & Energy
  - Transport
  - Cellphone data
    - Trips
    - Presence



Source: Screenshot by the author, Brno City

Projects & Initiatives & Ideas of Brno City

- Augmented reality – 3D models of city monuments
- 3D (elevation) model of the whole city
- Social network analysis
  - The most photographed („photogenic“) places
  - Changes of places over time (reconstructions,…)
- Cellphone data analysis
  - Actual presence in different parts of the city during different daytimes
- Public transport data analysis

Lasaris & CERIT-SC Research interests

- Data:
  - Air quality & Pollution data
  - Public transport data
  - Public vegetation data
  - Points of Interest
- Methods:
  - Big data processing
  - Machine learning
  - Processing of on-line streams
- Goals:
  - Traffic optimization
  - Air quality improvement
  - Life quality improvement

- Aims & Ideas:
  - Relations among public vegetation, traffic density and air pollution
  - Determining the traffic density from public transport delay data
  - Attractivity of different parts of the city (20 minute city)
  - Comparison the distance of two points and the time of the travel using the public transport
  - Prediction of delays of the public transport