



**CTU**

CZECH TECHNICAL  
UNIVERSITY  
IN PRAGUE

# **Faculty of transportation sciences (CTU) in the field of automated driving**

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*Prepared for*

*Cooperation Workshop with Czech Republic: Automated Driving*

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# Czech Technical University (CTU) in Prague

- Located in Prague, Czech Republic
- Founded in 1707, 8 faculties (colleges)
- Enrollment: 21,000
- QS World University Ranking: 491-500
  - For Engineering – Civil and Structural – 151st to 200th position





# FACULTY OF TRANSPORTATION SCIENCES

## Faculty Departments

Department of Applied Mathematics

Department of Transportation Systems

Department of Applied Informatics in Transportation

Department of Languages and Humanities

Department of Vehicle Technology

Department of Logistics and Management of Transport

Department of Mechanics and Materials

Department of Transport Telematics

Department of Air Transport

Department of Forensic Experts in Transportation

Department of Security Technologies and Engineering



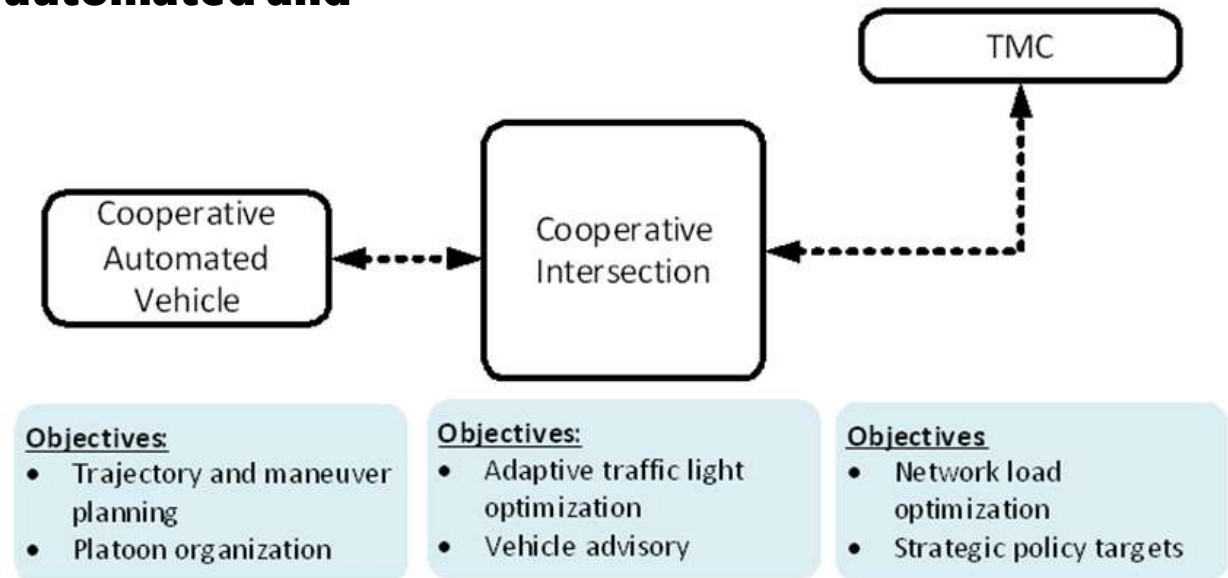
*Location also in Děčín*



# Are the cities ready for automated driving?



- **What happens with an automated vehicle in the city?**
- **Is the infrastructure ready?**
- **Can we really use the potential of automated and connected vehicles?**





# Project MAVEN Overview

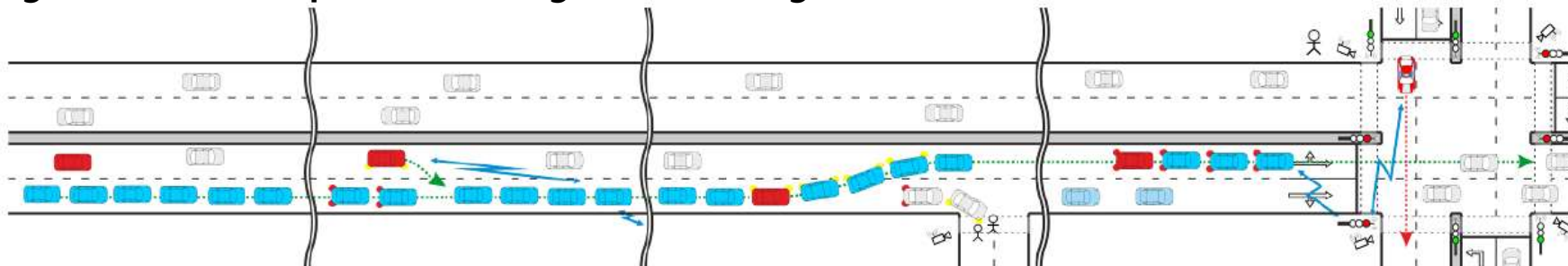


## H2020 project MAVEN (Managing Automated Vehicles Enhances Network)

**MAVEN will develop management regimes for highly automated driving in urban areas**

**Road infrastructure will be able to monitor, support and orchestrate vehicle movements at signalized intersections and corridors in urban areas**

- Advanced Driver Assistance Systems (ADAS),
- Green Light Optimal Speed Advisory (GLOSA),
- Lane change advisory,
- Local level routing (LLR),
- Cooperative platoon organization, and
- Signal plan negotiation to adaptive traffic light control algorithms.





# Impact assessment

## Conclusions

### **Proper integration of AVs into a road infrastructure has clear positive effects on**

- Emissions
- Travel time
- Traffic flow harmonization
- Safety
- And many others

### **Already lower levels of penetration influence positively the travel experiences**

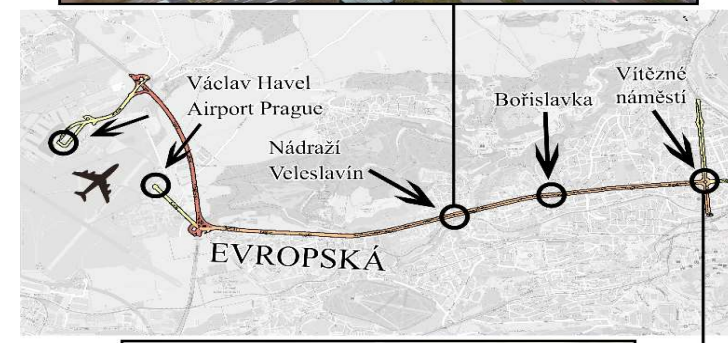
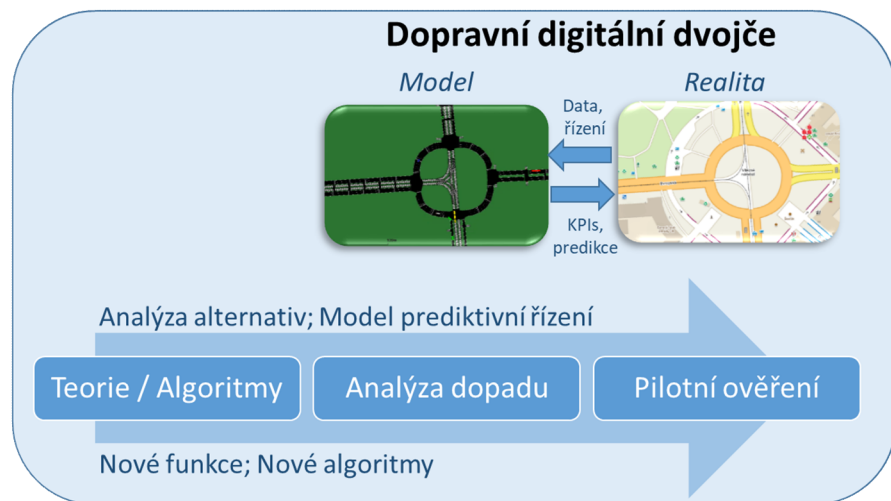
- 20% penetration (Effect of Speed change advice and Green wave optimization)
  - **9% delays** , - **6% queue length**, - **4% CO2**

### **The real impact of CAVs however depends on policies**

- Some use cases can be aiming on contradictory performance indicators
- Traffic managers must understand the big picture and integrate policies enabled by automation (car sharing, electro-mobility, and others)

# Living Lab – Smart Evropska

## Traffic digital twin project



VD/ chodci / cyklisté

- Detekce
- Priorita
- Bezpečnost
- Chování
- Řízení



Kooperativní systémy

- Nová data
- Platooning
- HMI
- GLOSA
- Sdílené vnímání
- Optimalizace řízení



Adaptivní systémy

- MAS
- LLR
- Bezpečnost



Řízení dopravy

- Optimalizace řízení
- Priority
- Ekologie
- Simulace



Dopravní chování

- Strategie
- Modelování
- MAS
- KPIs
- Vliv na dopravu



Integrace chytrých měst

- Urbanismus
- Reziidenční mobilita
- Ekologie
- Energetika
- A další



# Faculty of transportation sciences and CAVs

## Main competences (1)

- C-ITS Laboratory
- Laboratory of applied mathematics - LAMBDA
  - Mathematical algorithms
    - Local level routing
    - Queue length estimation
    - Traffic control, GLOSA
    - And others
  - Travel behavior research
- Research projects experiences
  - H2020
    - MAVEN - Management of automated vehicles
    - nuMIDAS – Traffic modeling
  - National projects
    - Traffic control
    - Agent-based highway management for C-ITS (INEP, SIRID)
    - VEXA - Automated train operation

Laborator Aplikované Matematiky v Dopravě a Logistice

**LAMBDA je kompetenční centrum, které řeší problémy dopravy a logistiky pomocí vhodných matematických nástrojů**

**ZNALOSTI LABORATÓŘE**

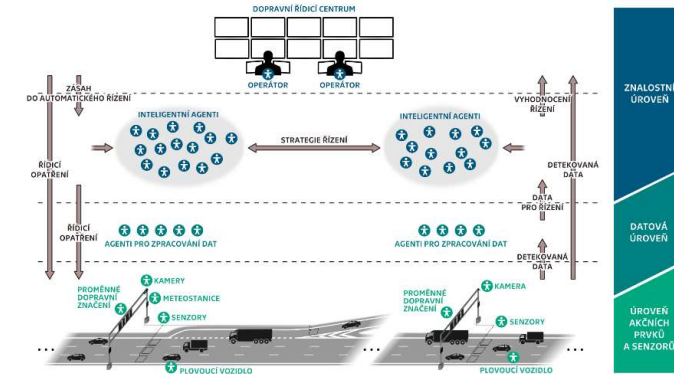
Matematické modelování    Statistické zpracování dat    Soft computing    Simulace    Klasifikační úlohy

**MOŽNOSTI SPOLUPRÁČE**

MEZINÁRODNÍ NÁRODNÍ PROJEKTY    STUDENTSKÉ PRÁCE    DOKTORSKÉ PROJEKTY    SMLOUVNÍ VÝZKUM

**Partneři laboratoře    ZAPOJTE SE    Kontaktujte nás**

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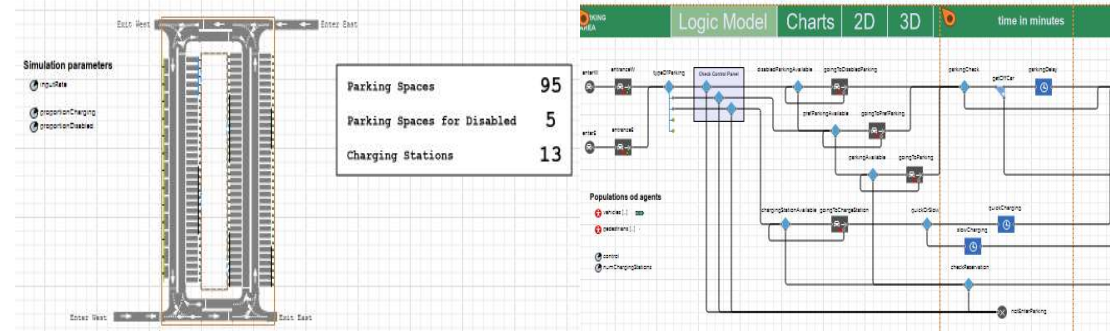




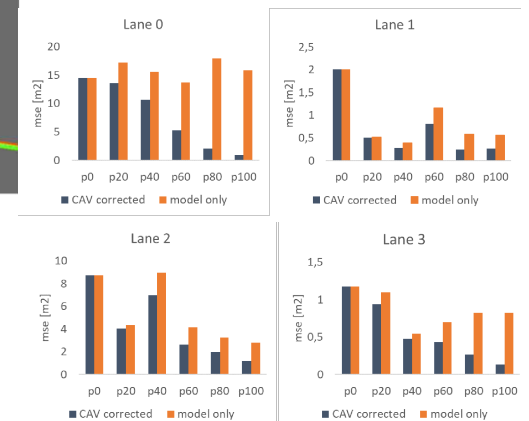
# Faculty of transportation sciences and CAVs

## Main competences

- **Impact assessment**
  - Microscopic simulations (SUMO and others)
  - Agent-based simulation (AnyLogic, MATSim)
  - Macroscopic simulation (VISUM)
- **Living Lab**
  - Traffic digital twin project started
  - Opportunity to test your solutions
- **Active members of EU organizations**
  - EARPA (European Automotive Research Partners Association)
  - ERTRAC (European Road Transport Research Advisory Council)
- **Independent research oriented organization**
  - Possible student involvement
  - Experts from different fields



UC 11: Flow 1800 - Scenario 1



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Addressing EU climate targets: Reducing CO<sub>2</sub> emissions using cooperative and automated vehicles

Ondrej Přibyl<sup>a,\*,</sup> Robbin Blokpoel<sup>b,</sup> Michal Matowicki<sup>a</sup>



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# Thank you for your attention!

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