

The iTETRIS logo, featuring the word 'iTETRIS' in a bold, yellow, sans-serif font. A white diagonal slash is positioned over the 'T', extending from the top left to the bottom right. The background of the slide is a photograph of a long, straight road with a metal guardrail on the left, receding into the distance under a cloudy sky.

The Integrated Wireless and Traffic Platform for Real-Time Road Traffic Management Solutions

Matthias Röckl (German Aerospace Center) et al.

- Distributed Traffic Jam Detection
- Travel Time Estimation based on (Extended) Floating Car Data
- Contextual Bus Lane Management
(e.g. for electric vehicles)
- Limited Access Control
(e.g. road closure)
- Regulatory and Contextual Speed Limit Information
(e.g. green light speed advice)
- Traffic Light Adaptation
(e.g. based on queue length)
- etc.

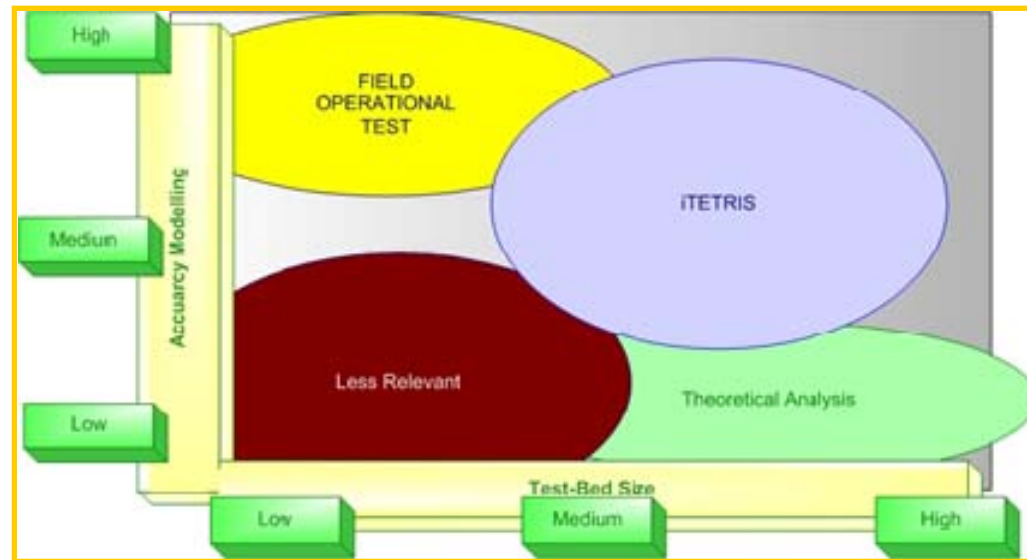
Problems:

- Local-scope geographic analyses shift problem to adjacent uninspected areas
- Short-term analyses shift problem to a later point in time

→ Large-scale (whole city-area), long-term (1-2 hours) analyses required

- Field-operational tests are too expensive and not reproducible
- Theoretical analyses use abstractions which reduce accuracy

→ Large-scale long-term **simulations** are required



iTETRIS targets large-scale long-term evaluations of performance and effect of V2X communications for traffic management.

- Development of a holistic closed-loop simulation environment
- Development of general traffic management strategies
- Development of data distribution strategies for V2V+V2I communications
- Evaluations with realistic traffic flows

Partners

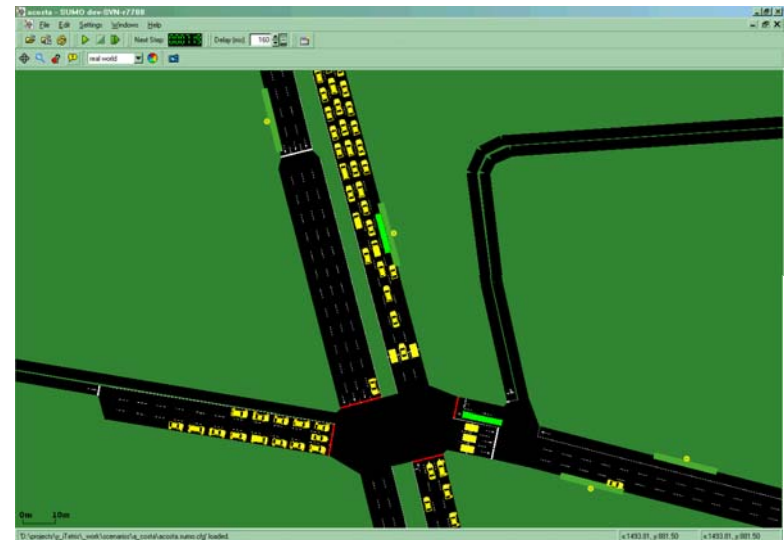
- Peek Traffic B.V. (The Netherlands)
- CBT Comunicacion & Multimedia (Spain)
- City of Bologna (Italy)
- German Aerospace Center – DLR (Germany)
- Hitachi Europe SAS (France)
- Innovalia Association (Spain)
- Institut Eurecom (France)
- Thales Communications (France)
- Universidad Miguel Hernandez (Spain)



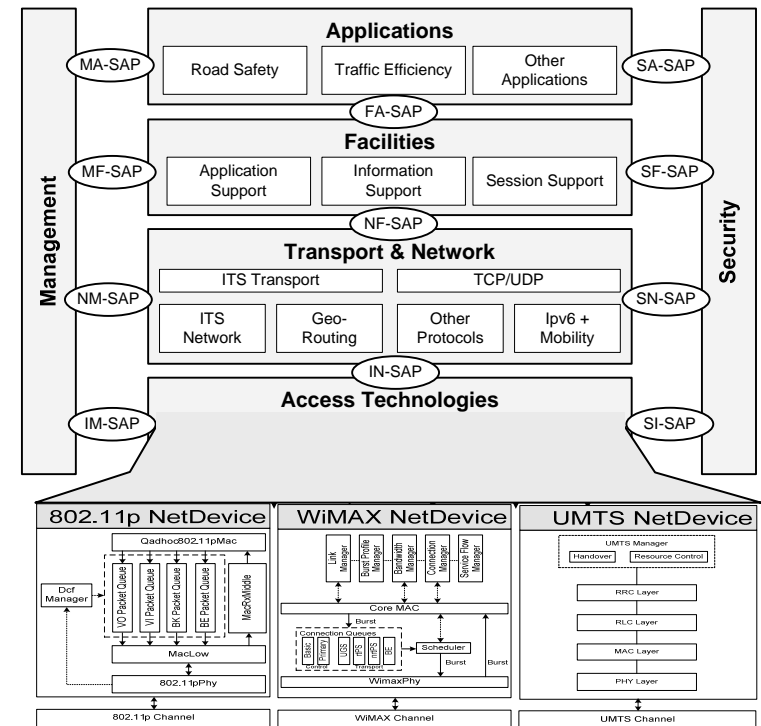
Project details

- Duration: 30 months (07/2008 – 12/2010)
- Budget/EC Funding: 4.42 M€ / 2.96 M€
- Website: www.ict-itetris.eu
- Contact: Thales Communications
coordinator@ict-itetris.eu

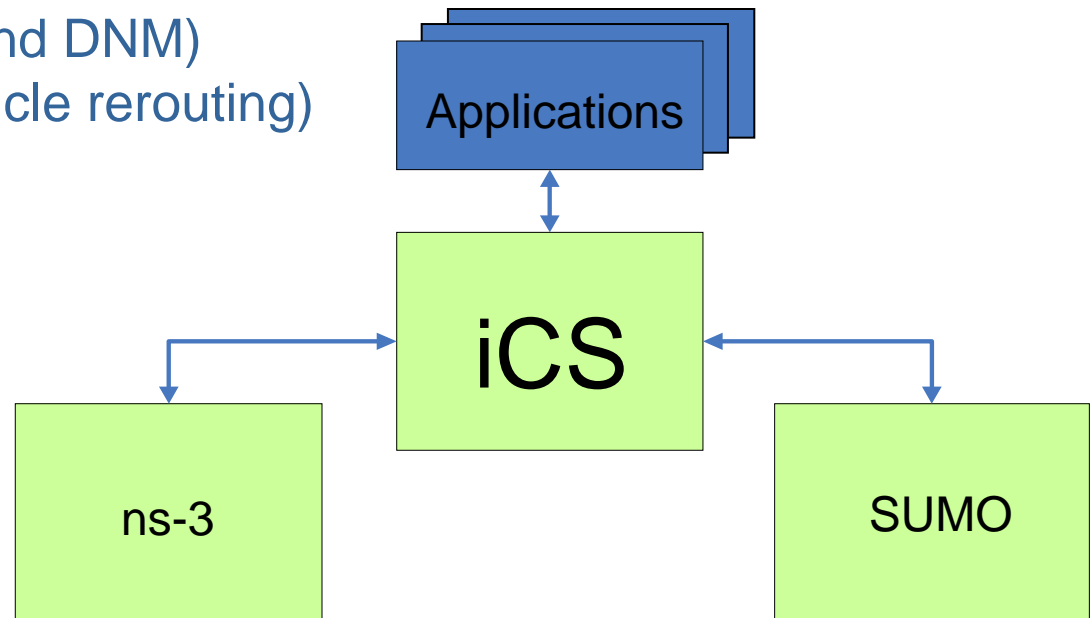
- Microscopic open-source traffic simulator **SUMO** (<http://sumo.sourceforge.net>)
- Simulation of realistic traffic flows with multiple vehicle classes (cars, busses, electric vehicles, etc.)
- SUMO allows simulation of up to 500 000 vehicles in real-time
- Extensions for:
 - Emission modeling: CO₂, NO_x, particles, noise, fuel consumption, etc.
 - Adaptive Vehicle Rerouting/ Traffic Light Control: closed-loop simulations

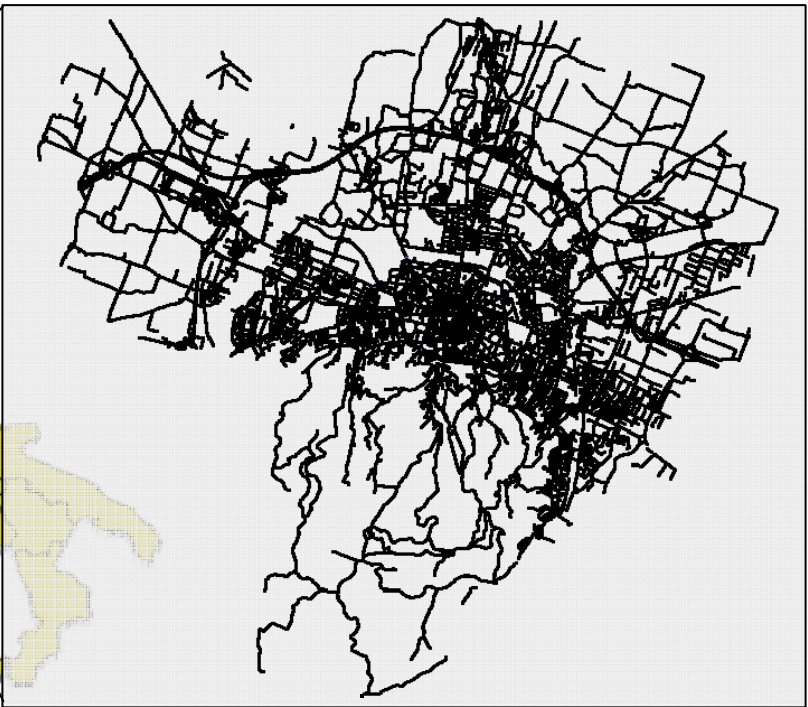


- Discrete-event network simulator **ns-3** (<http://www.nsnam.org/>)
- Good scalability, modularity and multi-technology support (ns-2 not capable of simulating more than 8000 nodes)
- Ongoing NSF funded project
- Optimizations:
 - More effective interfering packet list management
 - Interference range reduction
 - Packet rate reduction
- Extensions:
 - Implementation of IEEE 802.11p, ETSI TC ITS profile standard, UMTS, WiMAX and DVB-H



- Synchronizes the individual simulators in time and space
- Integrates information-related facility layer components
- Provides interfaces to applications to:
 - Retrieve information from ns-3 (e.g. CAM, DNM) and SUMO (e.g. ego vehicle position, traffic light status)
 - Control ns-3 (e.g. send DNM) and SUMO (e.g. vehicle rerouting)





- City of Bologna
- ~373.000 inhabitants
- ~170 controlled intersections
- ~1000 induction loops
- Realistic traffic flows from OD-matrices and induction loop data

Car-2-Car Communication Consortium Forum
November 3rd 2009 – Wolfsburg, Germany

A.Costa	Ringway	Imerio	Highway

Pasubio – A. Costa



Problems:

- Events such as a football match or a concert
- Reachability of the hospital

Goals:

- To manage the traffic in an area that offers few alternative routes
- Emergency vehicle priority

Strategies:

- Adaptive Traffic Light Control
- Adaptive Rerouting
- Regulatory and contextual speed limit information
- Bus lanes management
- Limited Access

Irnerio - Open Market Fair



Problems:

- Traffic condition analysis when road traffic is modified due to open market fair
- Induction loop malfunctioning or road yards

Goals:

- Traffic congestion detection in real time
- Travel time estimation

Strategies:

- Adaptive Traffic Light Control
- Adaptive Rerouting
- Regulatory and contextual speed limit information
- Bus lanes management
- Limited Access

Inner city ring-way



Problems:

- Traffic condition analysis
- Induction loop malfunctioning or road yards

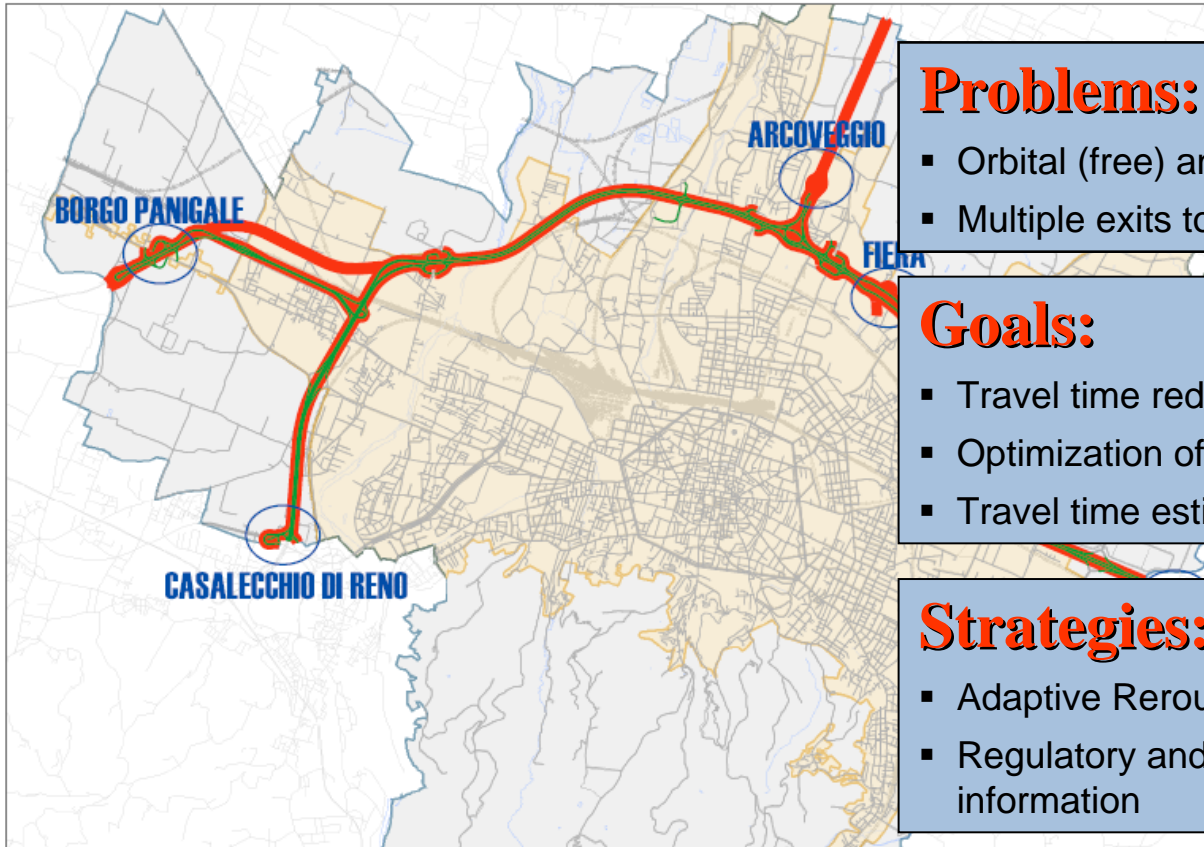
Goals:

- Traffic congestion detection in real time
- Travel time estimation

Strategies:

- Adaptive Traffic Light Control
- Adaptive Rerouting by covering the ring way clockwise or anti-clockwise
- Regulatory and contextual speed limit information
- Bus lanes management
- Limited Access

Orbital + Highway



Problems:

- Orbital (free) and Highway (toll)
- Multiple exits to the city center

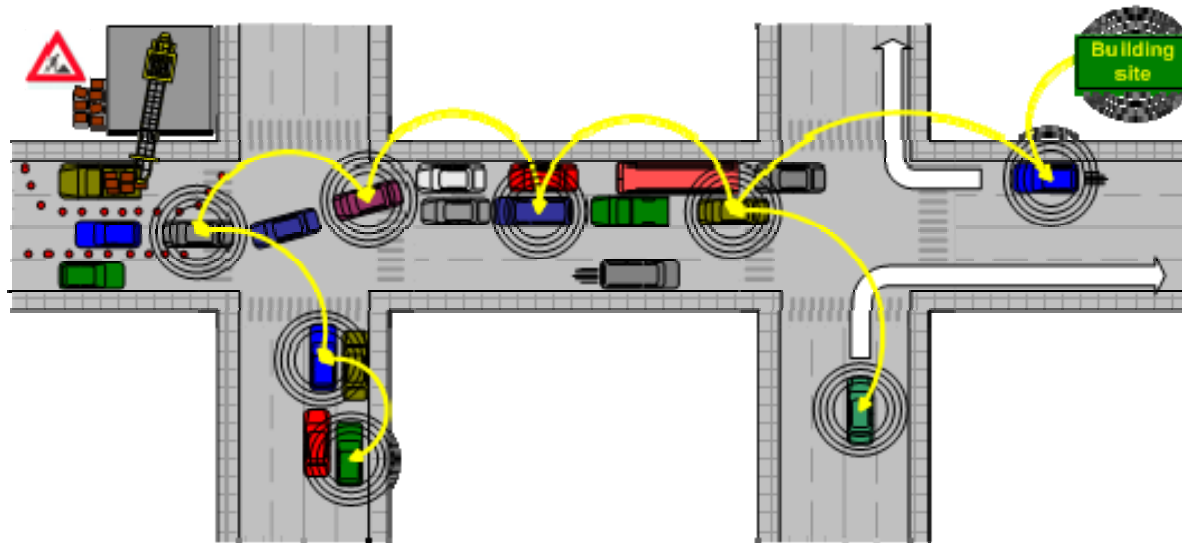
Goals:

- Travel time reduction
- Optimization of the orbital congestion
- Travel time estimation

Strategies:

- Adaptive Rerouting
- Regulatory and contextual speed limit information

- Development of next generation reliable & contextually dynamic vehicular communication protocols for V2V+V2I
- Delay- and Disruption-Tolerant Networks (DTN) with store-and-forward functionality over multiple radio access technologies
- Geo-unicast, geo-anycast and geo-broadcast communication protocols



Future usage of the iTETRIS platform:

- Performance evaluations of communication protocols
- Evaluation of the effect of traffic management applications
- Simple integration of novel applications and scenarios
- Open to future enhancements (open-source)

Feel free to visit our website <http://www.ict-itetris.eu> or contact one of the project members directly



Thank you for your attention!
Questions?

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