

City AI System: a Smart mobility solution

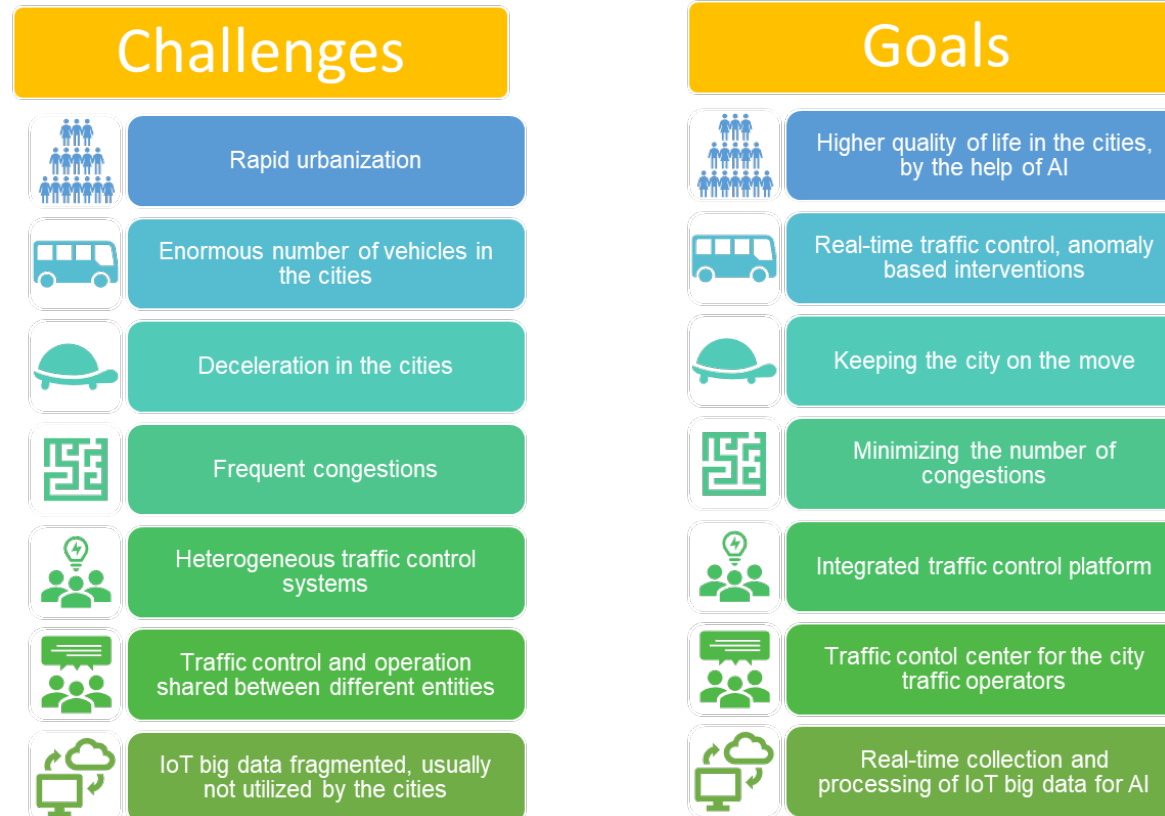
by Gamax, Racionet and the Budapest Technical University



City AI solution for smart cities



A new solution based on artificial intelligence, that enables substantial progress in real-life control of the city traffic, enabling city authorities to intervene in a timely and adequate manner and prevent traffic problems before they occur in the city. The system provides a complex system to gather and display all crucial traffic and traffic related information in one control center, while provides possibility to test different traffic services, based on different criteria (for example increasing the throughput of some areas, giving priority to public transport, electric or emergency cars, etc.), which can be implemented later for the entire city.



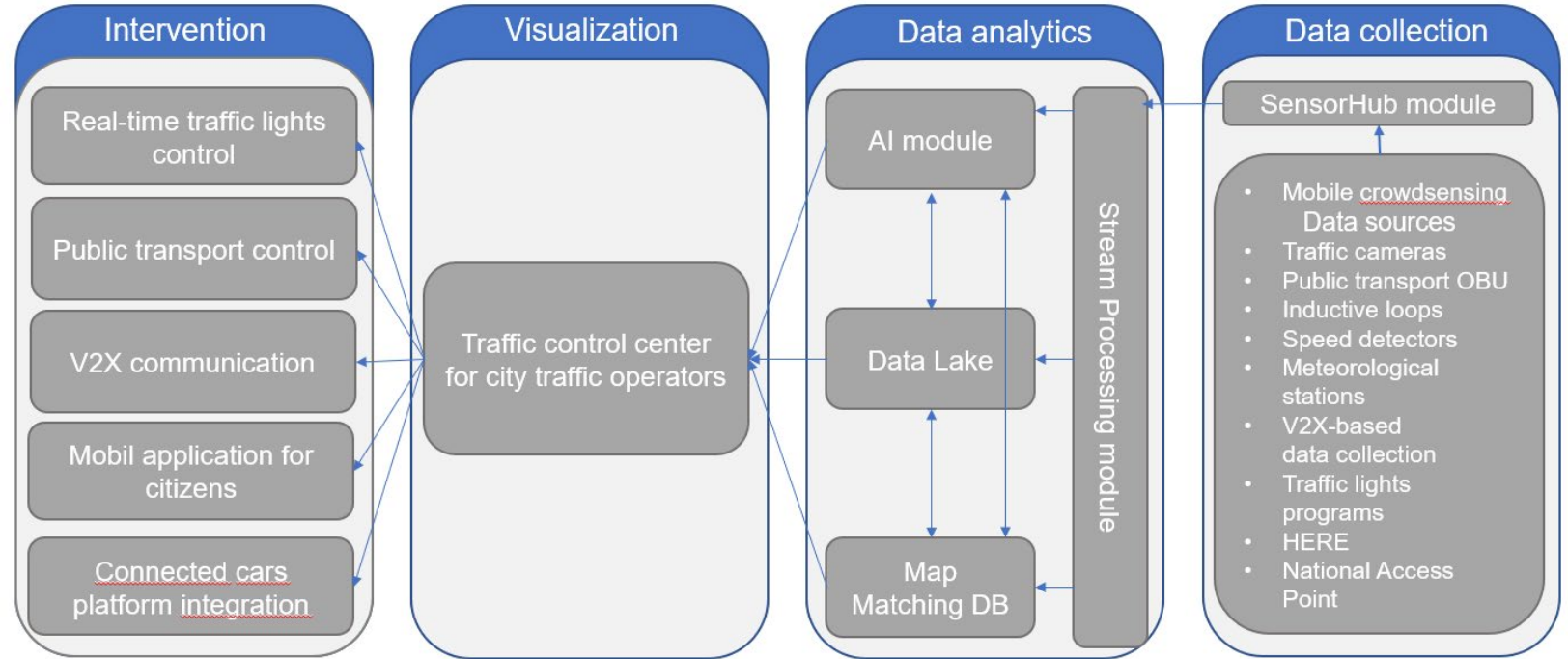
Main components

Extracting traffic data from city cameras:

By using AI based computer vision algorithms their module can extract traffic and weather data from the video streams, number and speed of vehicles, density, rain/snow/fog. Their detection algorithm can work both on traffic and general surveillance cameras.

Collection and structurization of heterogeneous data:

Traffic data extracted from traffic camera streams, OBU data from public transport, Data from inductive loops, Data from speed measuring city detectors, weather data from meteorological stations and cameras, trajectories from mobile crowdsensing, traffic lights program phases, V2X-based data collection, HERE data and national access point datasets



Stream Processing module:

Treads data as continuous, endless streams and performs real-time processing, with no significant delay in response. It gains insights from the updated data and detects patterns of possible identification of either opportunities or threats, taking immediate action, responding to an event, issue or scenario in the shortest possible span of time

AI module

- Predicts different traffic metrics (such as total flow or average speed) in real-time using data streams from the Stream Processing module
- Supports the fast integration of new data sources and estimation tasks
- Supports the implementation of real-time classification problems
- Utilizes well-known industrial technologies used by big tech companies like Alibaba, Amazon, Ericsson, eBay, or Huawei. These technologies provide high throughput, low latency, and fault tolerance.

Data Lake module

- Stores structured data in the cloud infrastructure
- Handles both raw and transformed data
- Handles prediction data and performance statistics
- Uses data compression methods
- Serves the market place
- Serves data analytics
- Serves other City AI modules

MapMatching

- Map and geoinformatics database
- Mapping IoT device positions with GEO coordinates
- Mapping data from IoT devices with GEO coordinates
- Mapping data with GEO coordinate to map objects
- Serving the AI module and the traffic control center with real-time GEO data
- Serving map layers with data
- Showing incidents and traffic flows on the map

Prepared for the V2X age

- V2X-ready: compatibility with C-ITS communication facilities and support for the foreseen proliferation of V2X-compatible vehicles (like the VW Golf 8) and environments
- Distributed data acquisition support: V2X-based data collection/aggregation throughout the city using the available messaging services (e.g., CAM, DENM) and future ones (e.g., CPM)
- Multi-vendor framework: advanced, transparent and vendor-independent middleware to support any V2X HW/SW product or implementation on the Roadside and Central ITS Station components

Traffic control center

Visualization on map layers:

- IoT devices
- Public transport vehicles
- Vehicles flows
- Incidents

Displaying AI module's anomaly alarms and predictions and initializing interventions:

- Traffic lights control
- Mobil app
- Passenger information for public transport
- V2X

Traffic planning

Traffic data analysis

Integrated with other City AI modules and cooperating units (police, public road authority, NAP portal)

Mobil app

- Collecting data from users
- Announcement of incidents (accident, roadblock, etc)
- Real-time orientation of the users
- Route planning and turn-by-turn itiner for users
- Displaying traffic conditions (using icons and colours)
- Displaying road tolls
- Reverse geocoding

