Kapsch TrafficCom

Intelligent and automated Traffic Management

Transforming management of traffic and critical roadway infrastructure

Around the world, recurring and non-recurring congestion continues to decreased performance and throughput on critical roadway infrastructure – including highways, motorways, bridges, and tunnels. Additionally, steady population growth, combined with continued expansion of urban sprawl and limited roadway capacity, have significantly increased congestion over the last decade.

In most cases, adding new capacity to road networks to address congestion challenges is prohibitively expensive. This approach is also unable to address nonrecurring congestion caused by aggressive driving, lane closures, incidents, and adverse weather and road conditions.

In an attempt to address congestion challenges, transport agencies have deployed Advanced Traffic Management Systems (ATMS). These are central software platforms that process data from multiple sources to help agencies understand the performance of the roadway infrastructure in real time, and to effectively manage capacity, flow, and incident responses. Based on data analytics, ATMS can recommend mitigation strategies to counteract the negative impacts of congestion, facilitate command and control of ITS devices, disseminate notifications and alerts to key stakeholders, dispatch service vehicles, and share data with partners and stakeholders.

But while ATMS have the power to support real-time responses across the roadway infrastructure, many agencies still require users to manually verify reported events and to validate response plans before they are activated. Bearing in mind manual decision making is time-consuming, inefficient and inconsistent, event detection and incident responses can be slow, with negative impacts on traffic flow.
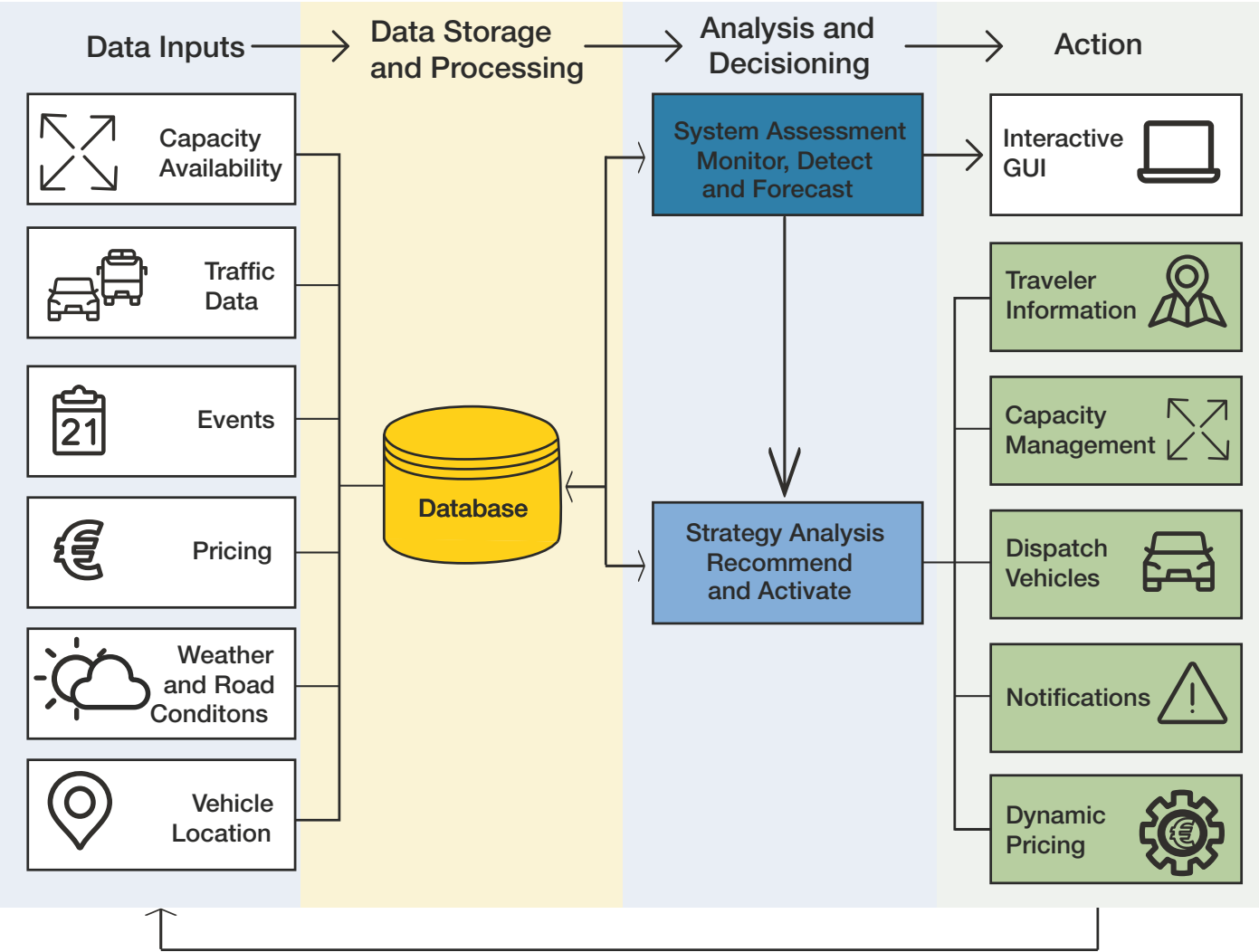
To manage traffic proactively and respond to incidents faster, agencies now need more intelligent and more automated decisioning as a core element of their ATMS. In the following sections of this folder, we look at why forward-thinking agencies are looking to transform their ATMS' and decision-making capabilities, and how the latest ATMS solutions can help to improve traffic-flow insights and outcomes going forward.

A brief history of ATMS

ATMS currently in use are built on a range of architectures and technologies, from large-scale applications built around a single software platform, to modular platforms that integrate several systems and subsystems.

Irrespective of their architectural design, ATMS all consume data from multiple sources, including road capacity information, traffic data, events data, and more. This is then analyzed to support decision-making and incident response activities that improve traffic flow.

Data Inputs → **Data Storage and Processing** → **Analysis and Decisioning** → **Action**

Data Inputs: Capacity Availability, Traffic Data, Events, Pricing, Weather and Road Conditons, Vehicle Location

Data Storage and Processing: Database

Analysis and Decisioning: System Assessment Monitor, Detect and Forecast; Strategy Analysis Recommend and Activate

Action: Interactive GUI, Traveler Information, Capacity Management, Dispatch Vehicles, Notifications, Dynamic Pricing

Using ATMS for system assessment

The first key function of ATMS is 'System Assessment'. This monitors the current state of the transportation system, including available capacity (based on road or lane closure information), traffic flow, and any planned or unplanned events that are occurring. The objective of system assessment is to detect issues that negatively impact system performance, and to support better decisions about when and where corrective actions are needed.

Examples of events that could negatively impact road performance include congestion, new or unplanned incidents, planned events or work zones, malfunctioning field devices, or adverse weather conditions.

Agency personnel and/or Traffic Management Center operations staff rely on the ATMS to acquire and process large amounts of current and historical data, including video data and data from field devices and vehicles, to support their system assessment activities. Third party data providers, such as weather agencies, are also becoming key to manage traffic proactively and efficiently.

ATMS and strategy analysis

The second key function of ATMS is Strategy Analysis, which helps agencies to manage the negative impact of incidents or events on the roadway network. In Strategy Analysis scenarios, the ATMS combines known and predicted information about an event to generate one or more potential response strategies, including:

- Commanding ITS field devices to take measures to mediate the impact of events (e.g. using ramp meters, signals, lane control measures, or variable speed limits)
- Disseminating traveler information (pushing messages to motorists via field devices, mobile apps, or into the vehicle with connected technologies)
- Dispatching and tracking response teams (such as freeway service patrols)
- Sending notifications to partner agencies and stakeholders
- Sharing data with partners and third parties
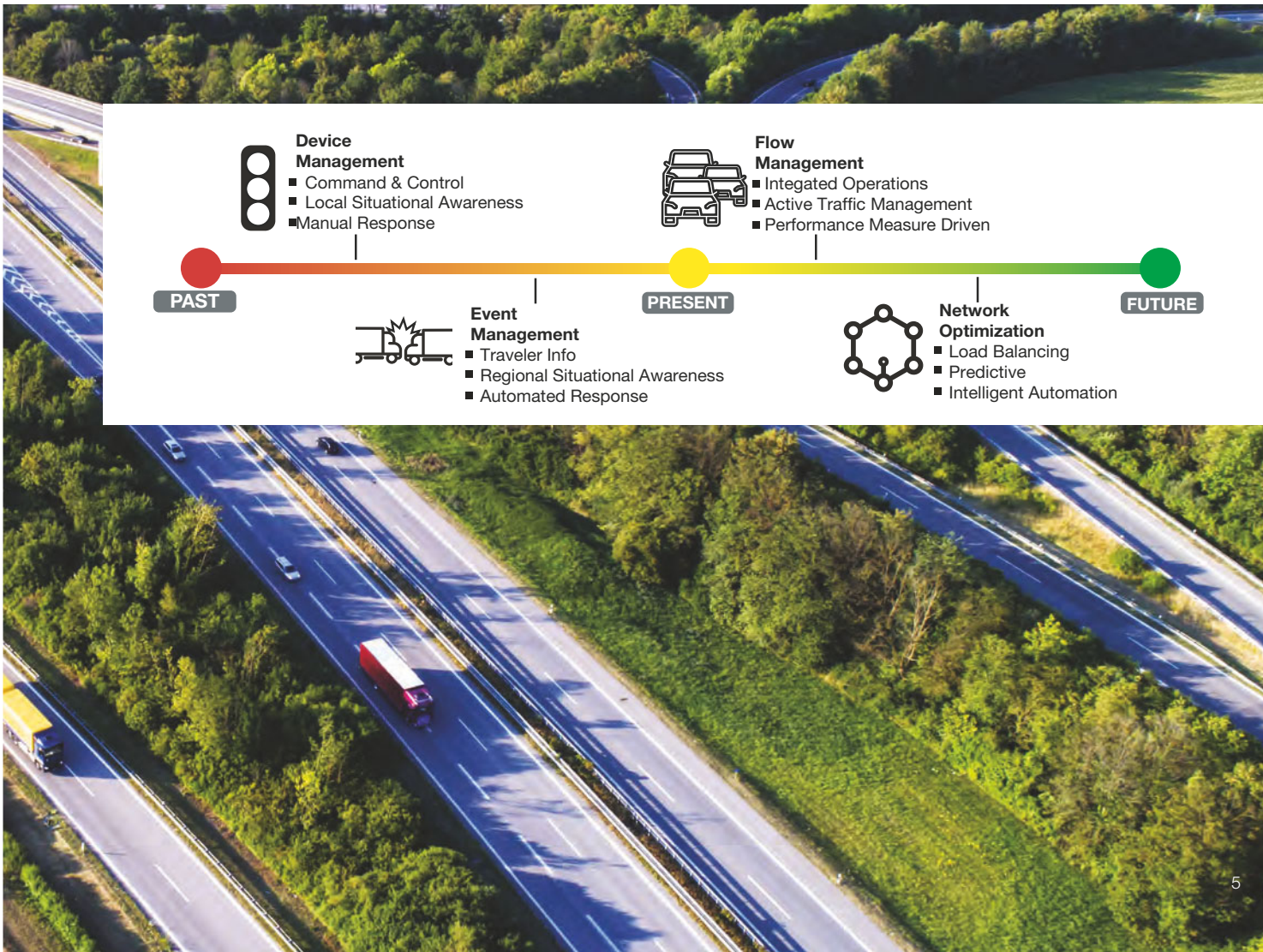- Initiating pricing changes

The pressing need for Intelligent and Automated ATMS

In recent years, ATMS have been collecting far greater volumes of data from external data sources than ever before. To make sense of this torrent of information, and to make the best traffic management decisions, agencies need access to automated data gathering, fusion, and processing technologies.

Automation in the data gathering and analytics processes also enables a far greater degree of collaboration and coordination between agencies who are working together to solve network-wide congestion problems. Automation also supports region-wide situational awareness, with data sharing between agencies at scale.

Most importantly, increasing congestion challenges require agencies to anticipate congestion hotspots before they occur. With automated data collection and analytics, predictive data modeling becomes possible, allowing agencies to predict changes in traffic conditions and to implement measures to optimize flow.

Finally, the introduction and rapid growth in connected and automated vehicles (CAV) demands a far more automated approach to ATMS. With CAV generating an ever-increasing range and volume of data to support real-time decision making, automated technologies create new opportunities to optimize traffic management and flow, and to effectively reduce congestion across entire roadway networks.

Device Management
- Command & Control
- Local Situational Awareness
- Manual Response

Event Management
- Traveler Info
- Regional Situational Awareness
- Automated Response

PAST

Flow Management
- Integated Operations
- Active Traffic Management
- Performance Measure Driven

PRESENT

Network Optimization
- Load Balancing
- Predictive
- Intelligent Automation

FUTURE

> *As the connected mobility ecosystem expands and produces greater amounts of data and more interactions between stakeholders, agencies will require faster, smarter, and more automated traffic management systems. Innovations in cognitive technology and business intelligence will provide the tools to process big data, support more accurate assessment and prediction of traffic flows and congestion, enable automated and more reliable decision making, and reduce the need for human intervention.*

Dr. Jeffrey Adler, PE, Vice President for ITS and Solution Consulting at Kapsch TrafficCom

Moving toward more automated, more intelligent traffic management

Advances in machine learning and artificial intelligence are expanding the capability to forecast and predict changes in traffic flow and risk of roadway events.
These intelligent solutions will help agencies optimize management of their critical infrastructure, improve traffic flow, and respond to critical events more quickly and effectively.

Keys to building smarter ATMS include:

1

Modular platforms built on open architectures

The world is moving away from proprietary platforms and vendor lock in, to ATMS platforms that are modular, scalable, and built around open architectures and standard APIs and interfaces. To ensure success, agencies need the ability to quickly, easily, and cost-effectively integrate these into their ATMS platforms.

2

Automated decisioning

Based on AI and advanced data analytics technologies, next-generation ATMS are able to automate critical tasks like incident verification, reviewing and approving response plans, posting messages on signs, and sending notifications to partners. By automating activities that are currently manual, agencies can greatly improve the speed and consistency of decision making for better traffic management outcomes.

3

Predictive and proactive traffic management

Next-generation ATMS integrate sophisticated algorithms and models to analyze data from vehicles, sensors, video footage, mobile phones, social networks, and more. In doing so, they enable transportation agencies to predict and effectively manage fluctuations in traffic volumes for better management of both recurring congestion and congestion caused by specific events. By predicting how traffic conditions are likely to change in the coming 15 to 30 minutes, agencies can manage traffic proactively by implementing routing strategies, using user-facing apps to suggest alternative transport options or routes, and by implementing a range of other measures. This capability is especially useful when predictive models show that traffic conditions are about to become abnormal, which is when controls are most needed to reduce congestion and ensure the best road-user experiences. With this kind of predictive capability, measures are taken to avoid traffic jams before they even occur.

4

Integration of CAV data

By using data from vehicles' onboard systems, or from drivers' mobile devices, it's possible to create more intelligent, effective traffic management strategies. Vehicle data, for example, can be used to power innovative navigation applications that route traffic more effectively as well as to streamline compliance with traffic authorities' standards. Vehicle data combined with AI and machine learning can also be used to support smartphone and in vehicle apps that allow drivers to recognize rapidly expanding queues or lane blockages, better harmonize their speeds, and anticipate adverse road conditions to increase safety.

5

Accurate performance assessments

Smart, Next-Generation ATMS give administrators the tools they need to assess decision-making performance and to calibrate algorithms to deliver even better outcomes in the future. In the longer term, as technology advances, ATMS intelligence will also incorporate feedback and self-calibration capabilities.
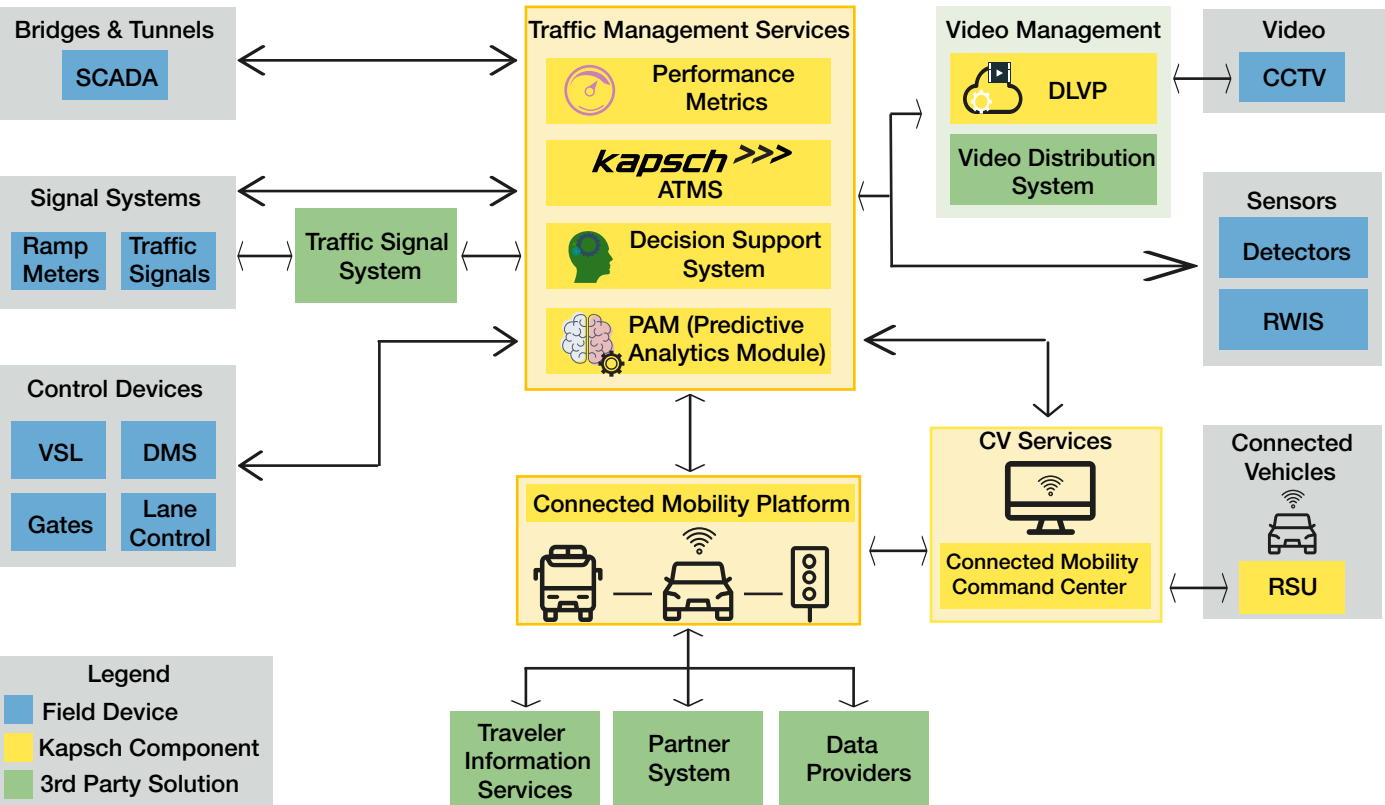
Kapsch is a Global Leader in Intelligent Highway Traffic Management Solutions

Kapsch has been delivering highway traffic management solutions for more than 30 years. Our Advanced Traffic Management Solutions are powerful, web-centric software platforms for managing critical transportation systems and infrastructure, all built on the latest open-architecture standards and open-source software components.

We are the only vendor to offer a multi-purpose ATMS platform that supports a wide range of operational needs, from extensive regional, state-wide, and national highway networks, to dedicated transportation infrastructure facilities (e.g., managed lanes, tunnels, and bridges). We have collaborated with state agencies and authorities to design and build some of the most advanced traffic management solutions.

Our Intelligent Traffic Management platform is a powerful open architected, modular, and extensible platform for operating and managing critical highway infrastructure. Kapsch offers a broad toolbox of systems that can be deployed together or separately to support intelligent and automated traffic management.

Bridges & Tunnels
- SCADA

Signal Systems
- Ramp Meters
- Traffic Signals
- Traffic Signal System

Control Devices
- VSL
- DMS
- Gates
- Lane Control

Traffic Management Services
- Performance Metrics
- kapsch >>> ATMS
- Decision Support System
- PAM (Predictive Analytics Module)

Video Management
- DLVP
- Video Distribution System

Video
- CCTV

Sensors
- Detectors
- RWIS

Connected Mobility Platform

CV Services
- Connected Mobility Command Center

Connected Vehicles
- RSU

- Traveler Information Services
- Partner System
- Data Providers

Legend
- Field Device
- Kapsch Component
- 3rd Party Solution

The Kapsch Intelligent Traffic Management solution at a glance

Our Integrated suite of Traffic Management solutions incorporates:

- **Our highly scalable, enterprise-class ATMS platform**

- **Decision Support System (DSS)**
  Our rule-based engine for supporting real-time operational decision making and multimodal multiagency mobility management

- **Deep Learning Versatile Platform (DLVP)**
  Our video analytics solution that detects incidents and captures traffic data from video streams

- **Connected Mobility Control Center (CMCC)**
  Our solution for handling all communications with roadside units, and for acquiring, processing, and warehousing data from these devices

- **Predictive Analytics Module (PAM)**
  Our machine-learning-powered tool for forecasting and predicting roadway travel times and incident risk

- **Performance Metrics**
  Our business intelligence platform that provides dashboards and visualizations to support real-time and off-line planning

- **Connected Mobility Platform (CMP)**
  Our big data and analytics platform for traffic management

Kapsch Next-Generation ATMS in action: Georgia Department of Transportation (GDOT)

The Opportunity:

**GDOT**
Georgia Department of Transportation

The Georgia Department of Transportation sought to replace a 20-year-old legacy ATMS with a next generation solution. Key requirements for the new ATMS were improved event management, multi-system interfaces, and the ability to manage all critical highways including express lanes, support for transformational technologies including connected vehicles, and expanded integration and data exchange with stakeholders and partners.

The Kapsch Solution:

Kapsch was selected to design and implement the next-generation, state-wide ATMS based on our intelligent traffic management solution.

The Kapsch ATMS is being configured to support extensive command and control of all ITS field devices and event management activities. New functionality being implemented includes a new module to manage, track, and dispatch freeway service patrols, along with a new mobile app that will allow remote staff to help manage events more effectively. Additionally, the Kapsch ATMS is integrated with a new video management and distribution system to improve the delivery of video streams and images to GDOT staff.

CMP is being deployed as the new statewide data exchange platform to integrate and process third-party data sources. New data analytics and reporting will improve performance monitoring and the agency's ability to manage critical events. CMCC will enable integration with GDOT's roadside units to bring connected vehicle data into DYNAC.
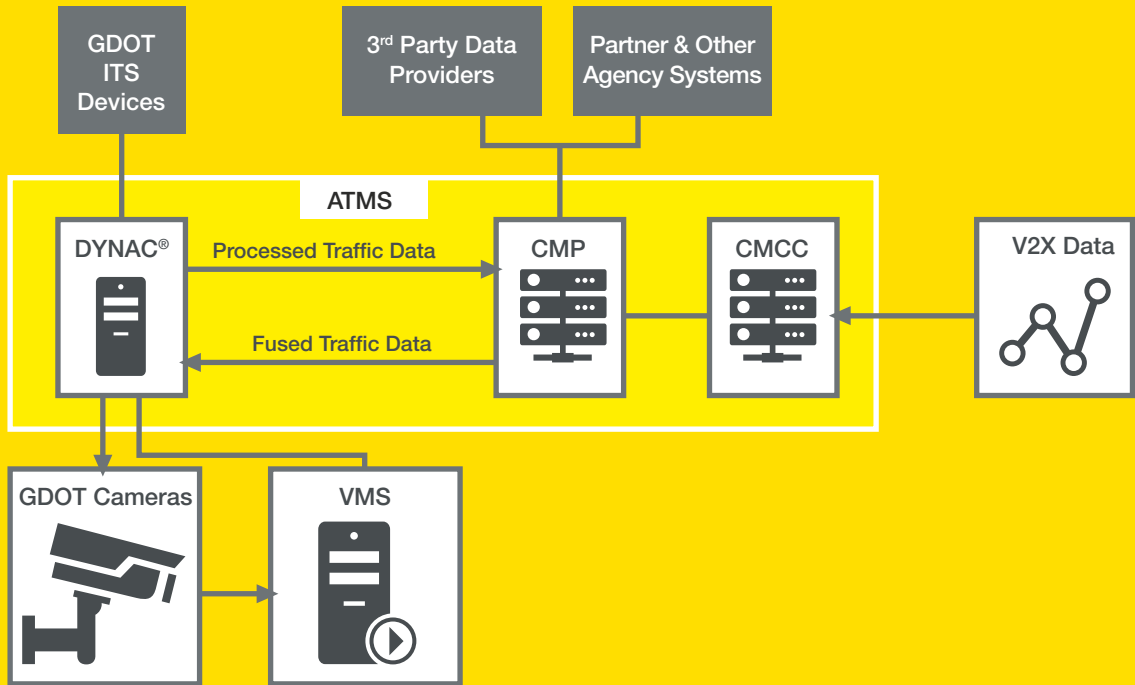
To find out more

To find out more about the Kapsch Integrated suite of traffic management solutions and how it can help you reduce congestion and support the connected mobility ecosystem, please contact us today at *ktc.info@kapsch.net* or on *+43 50 811 0*.

You can also read more about our Highway Traffic Management solutions at: *https://www.kapsch.net/en/solutions/traffic-management*

Kapsch TrafficCom

Kapsch TrafficCom is a globally renowned provider of transportation solutions for sustainable mobility with successful projects in more than 50 countries. Innovative solutions in the application fields of tolling, tolling services, traffic management and demand management contribute to a healthy world without congestion.

With one-stop-shop-solutions, the company covers the entire value chain of customers, from components to design and implementation to the operation of systems.
Kapsch TrafficCom, headquartered in Vienna, has subsidiaries and branches in more than 25 countries and is listed in the Prime Market segment of the Vienna Stock Exchange (ticker symbol: KTCG).

>>> www.kapsch.net

Visit us on: