Driving 3.0:
Emerging Developments in Vehicle (and Network) Infrastructure

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It's about the data . . . integrating 'Physical' and 'Digital'

The world is becoming INSTRUMENTED

Smart sensors on roads, in cars, connected cars, buses, trains, boats, bicycles and even parking spaces

The world is becoming INTERCONNECTED

Linking information on roads, in cars and railways, throughout the supply chain – *"the internet of things"*

The world is becoming INTELLIGENT

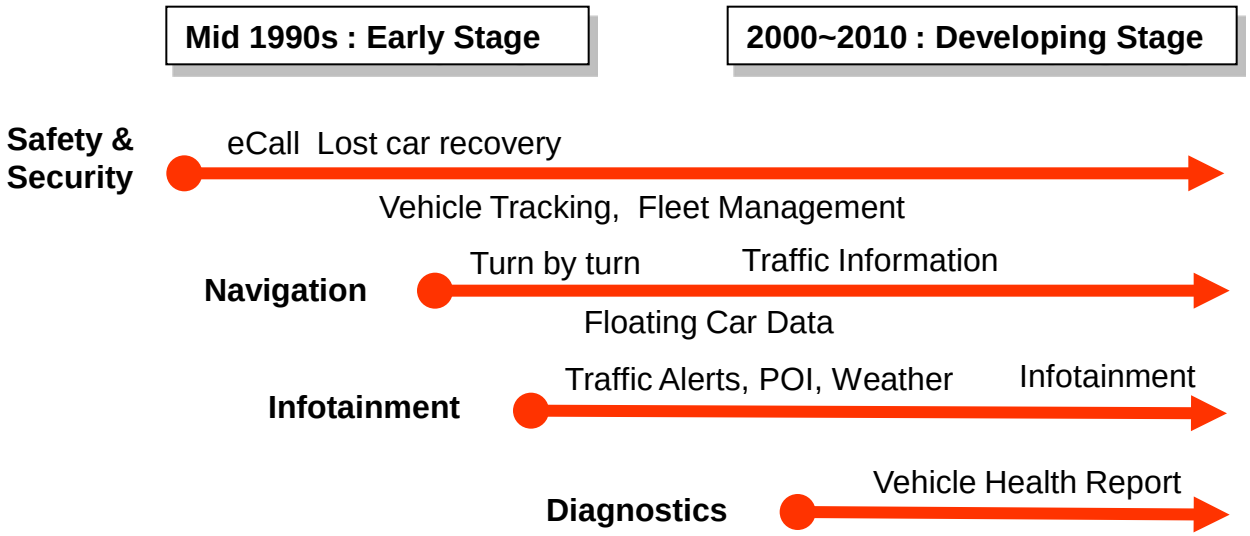
Cars talking to each other, sensors talking to each other, we can predict where traffic jams are, before and while you drive

A delayed train talking to the local buses to optimise their timing

Carriage loadings displayed in real time on platforms so people know where to stand to get a seat.

Connected Vehicles: The Advanced Mobility Framework

The evolution of connected vehicle services



Next Generation Telematics Services dictated by OEMs & TSPs, e.g.

- **Usage Based Insurance**
- **EV Services**
- **Remote Diagnostics**
- **Smartphone Integration**
- **Etc.**

Frost&Sullivan 2010

Market Characteristics			
	Single service providers	Some overlapping service providers	Ecosystems of service providers
	<10% connected	Exponential growth of connectedness	'Always on' becoming ubiquitous
	Low data volumes	Medium levels of data	Data explosion
	Simple applications	Application complexity increasing	v complex application environment
	Proprietary hardware	Growing use of Mobile technology	Multi-channel comms access

The trend is to massive amounts of data, complex ecosystems of service providers and the need for complex application and analytics

New services that could come with connected vehicles

Driver assistance

- User Profiling
- Advanced Routing
- Traffic Prediction
- Emergency & Breakdown
- Location Finder
- Help desk
- Vehicle Monitoring
- Location based Info

Operator assistance

- Vehicle-to-business process integration
- Performance Monitoring
- Asset Monitoring
- Asset Planing
- Asset Maintenace

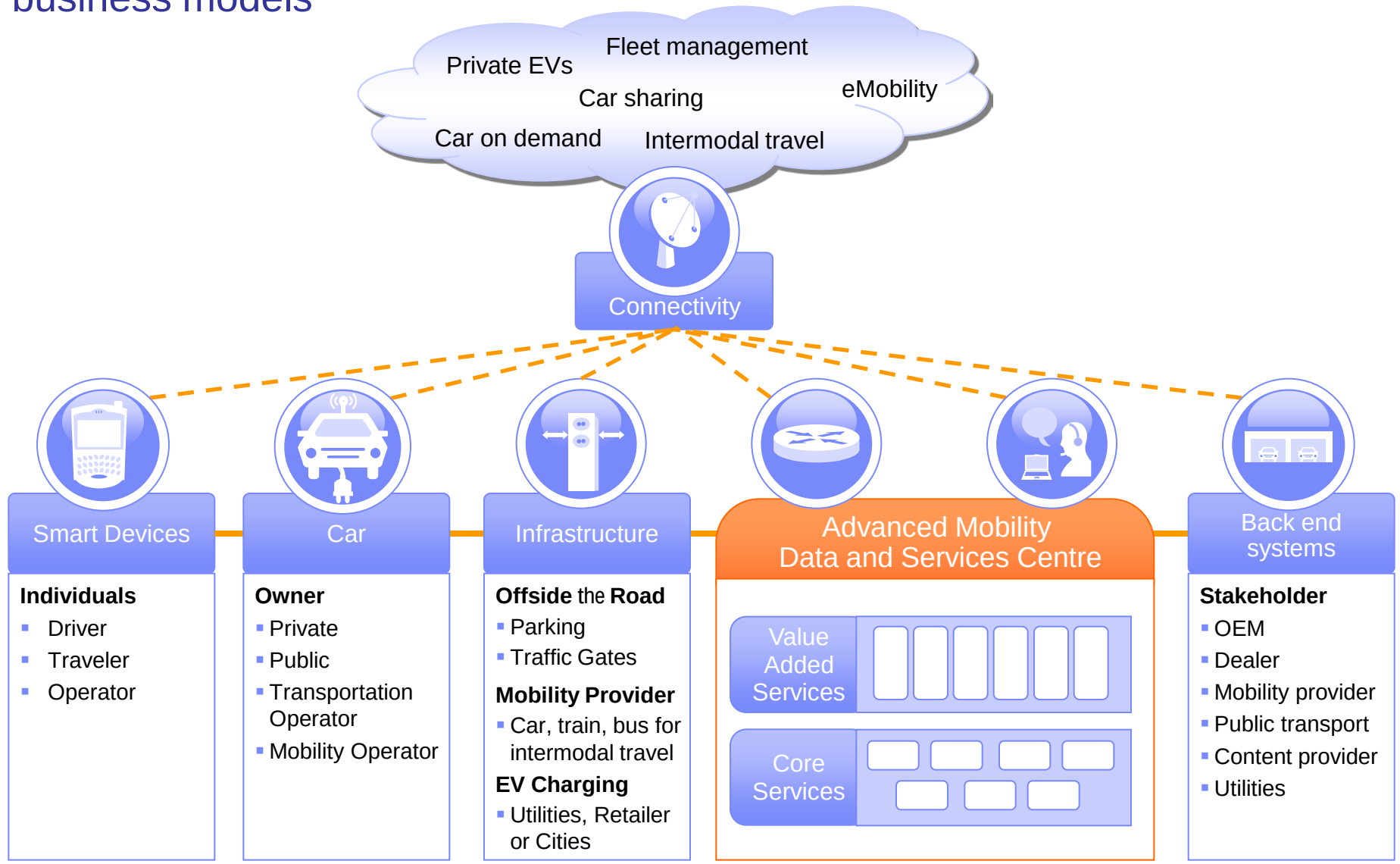
Access Services

- Parking
- EV Charging
- Ride Sharing
- Access to other travel modes
- Pay-as-you drive
- M-Commerce (App Store)
- Repair servcies

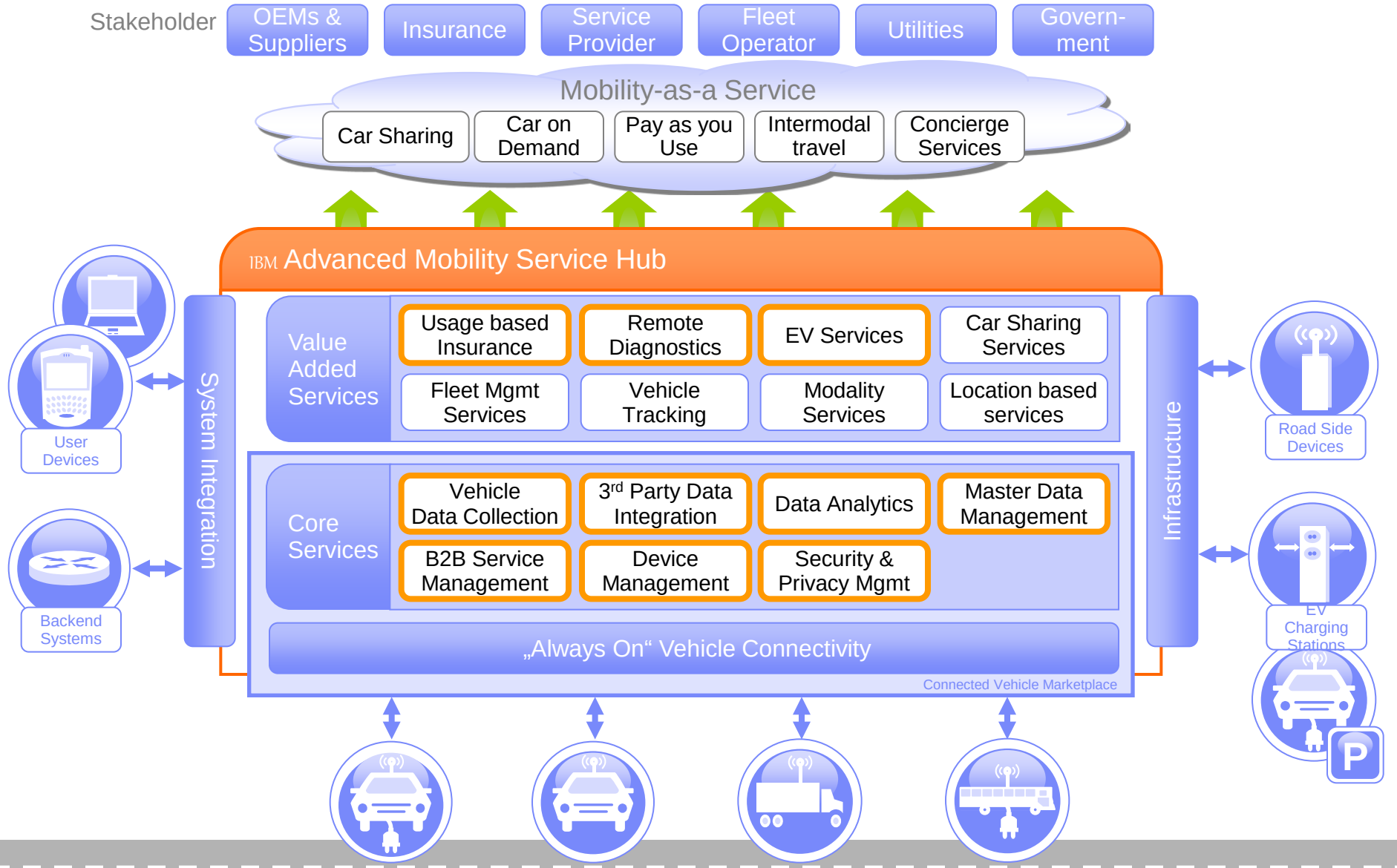
Adding services to a vehicle enables revenue streams and/or differntiated from competition

Source: xxx

Adding “always on“ connectivity to vehicles enables new services and business models



IBM Advanced Mobility Framework



IBM´s engagement in Advanced Mobility

anchor initiatives & projects

- Green eMotion (Europe, with Partners)
- Spitzencluster BW (Germany, with Partners)
- Edisson Bornholm (EU with Partners, Danmark)
- Pay-as-you-Drive (Eindhoven, Netherlands)
- Road User Charging (Stockholm, others)
- Car Sharing (Benelux)*
- V2X (OEMs, Japan)*

* confidential

stakeholder groups

- NPE Nationale Platform Elektromobilität
- BMU Stakeholder Dialog

market insights

- IBV Studies

business concepts

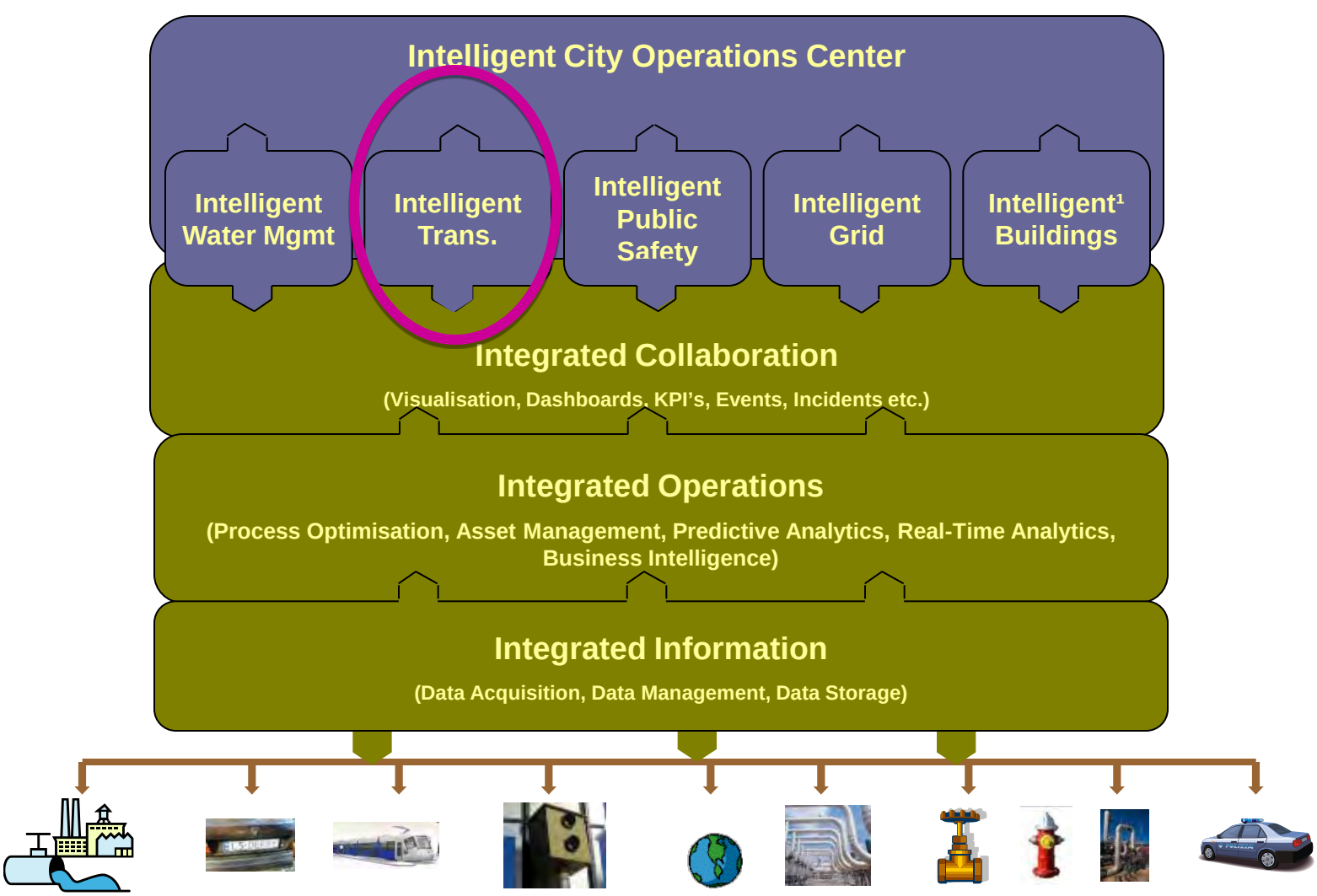
- e-fleet management / e-car sharing
- Pay-as-you-Drive
- Demand harmonization
- Charging infrastructure management
- Vehicle-to-grid adoption incl. dynamic pricing

service architectures

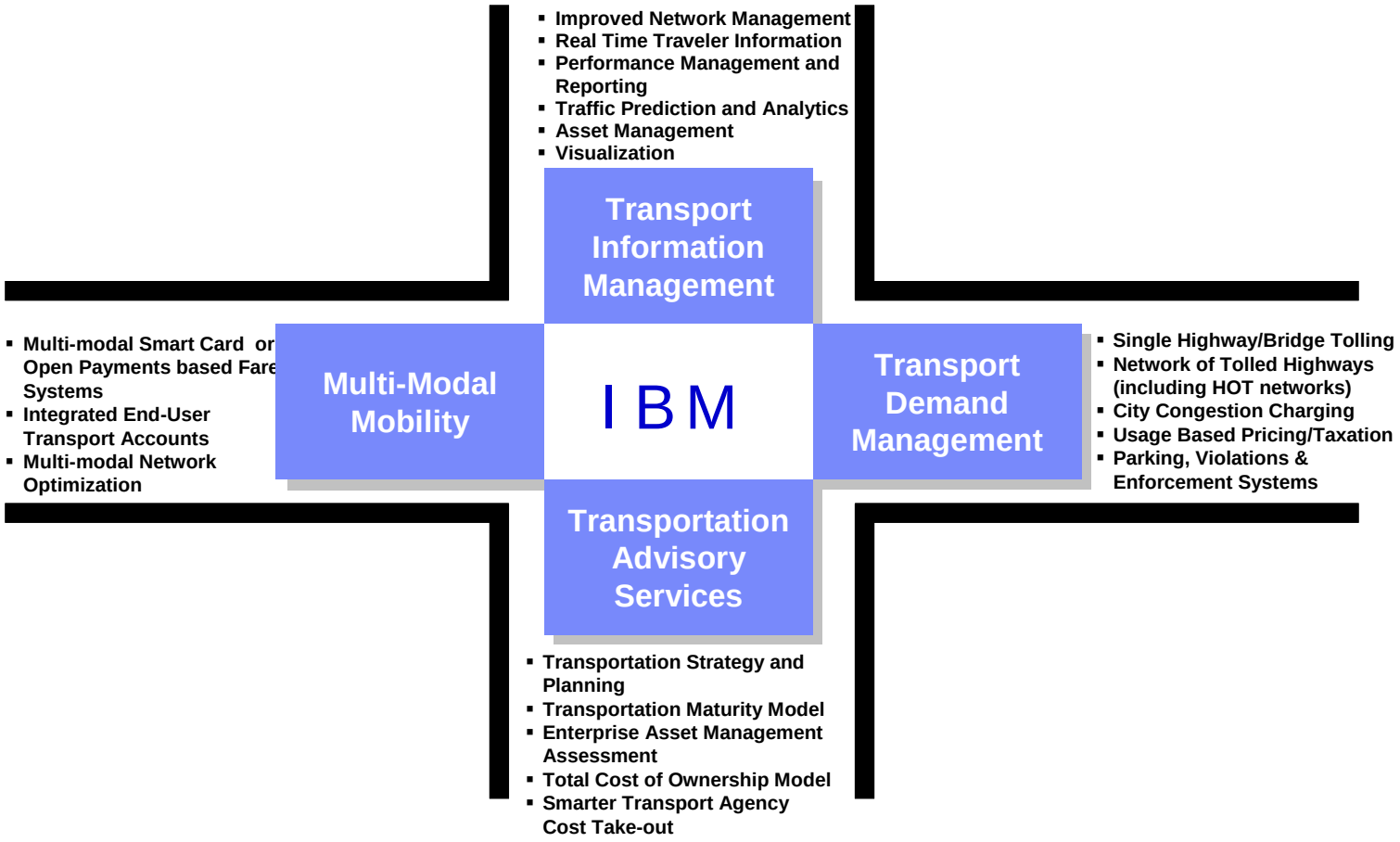
- vehicle connectivity (V2B2C/V2X)
- plug-in hybrid and electric vehicles (PHEV)
- smart charging (V2G)
- smart traffic management (ITS)

A Network of Networks: IBM Smarter Transportation

Smarter Transportation within the Smarter Cities Ecosystem

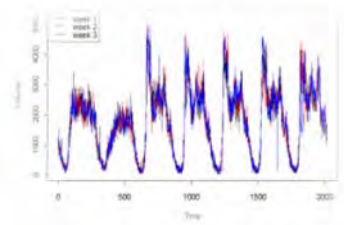


Approach to the Transportation Ecosystem



Key Areas of Focus for ITS

TRAFFIC PREDICTION TOOL



DISTANCE-BASED ROAD USER CHARGING

ENHANCED OCR ENGINE - LICENSE PLATE RECOGNITION

TRANSPORT INFORMATION MANAGEMENT

ASSET OPTIMISATION - MAXIMO LINEAR ASSET MANAGER

MULTI MODAL MOBILITY

LARGE-SCALE MULTI-AGENT TRAFFIC FLOW SIMULATION

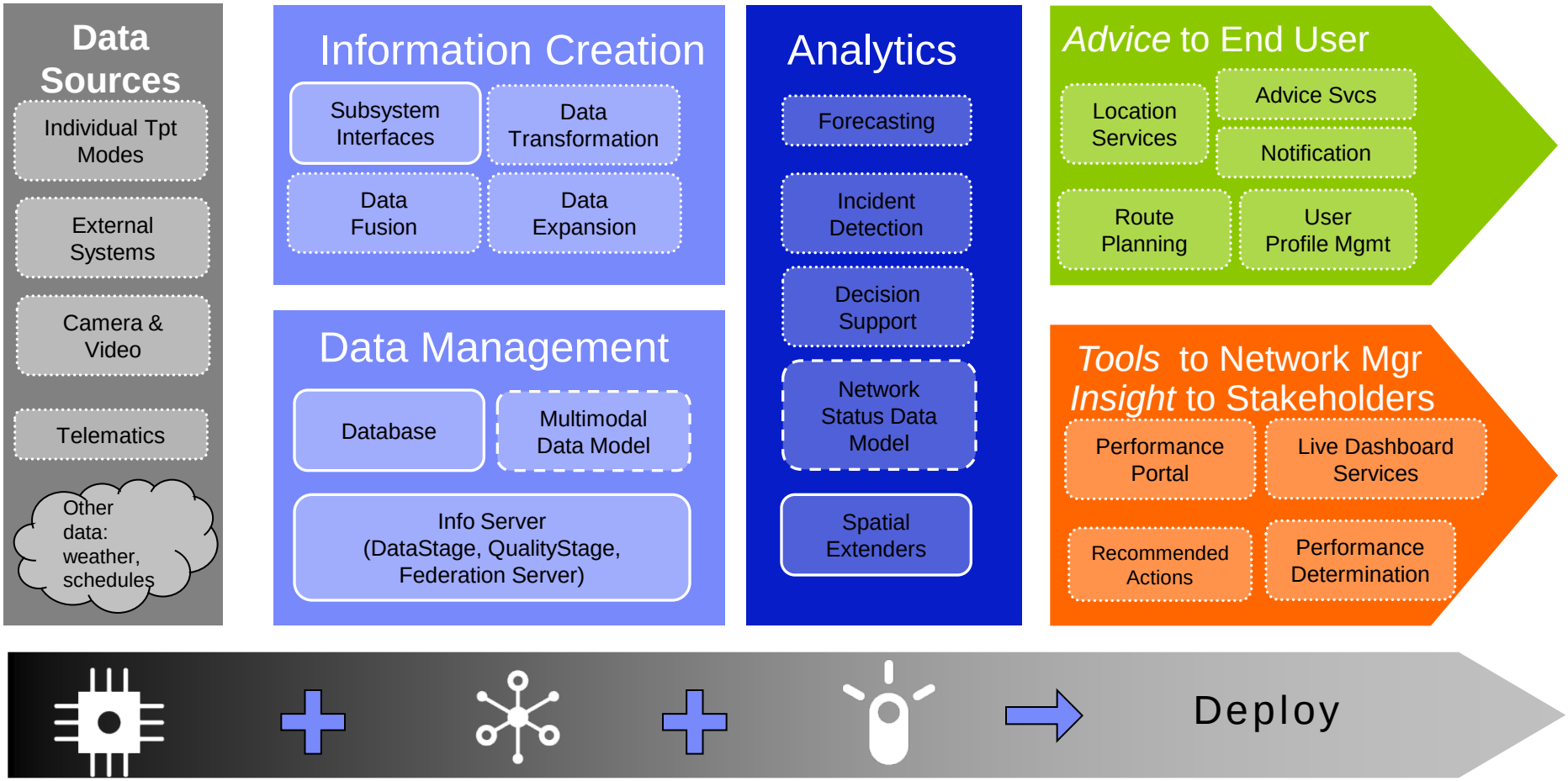
JOURNEY OPTIMISATION ANALYTICS

VIDEO ANALYTICS AND INCIDENT DETECTION

TRANSPORT DEMAND MANAGEMENT

Transport Information Management

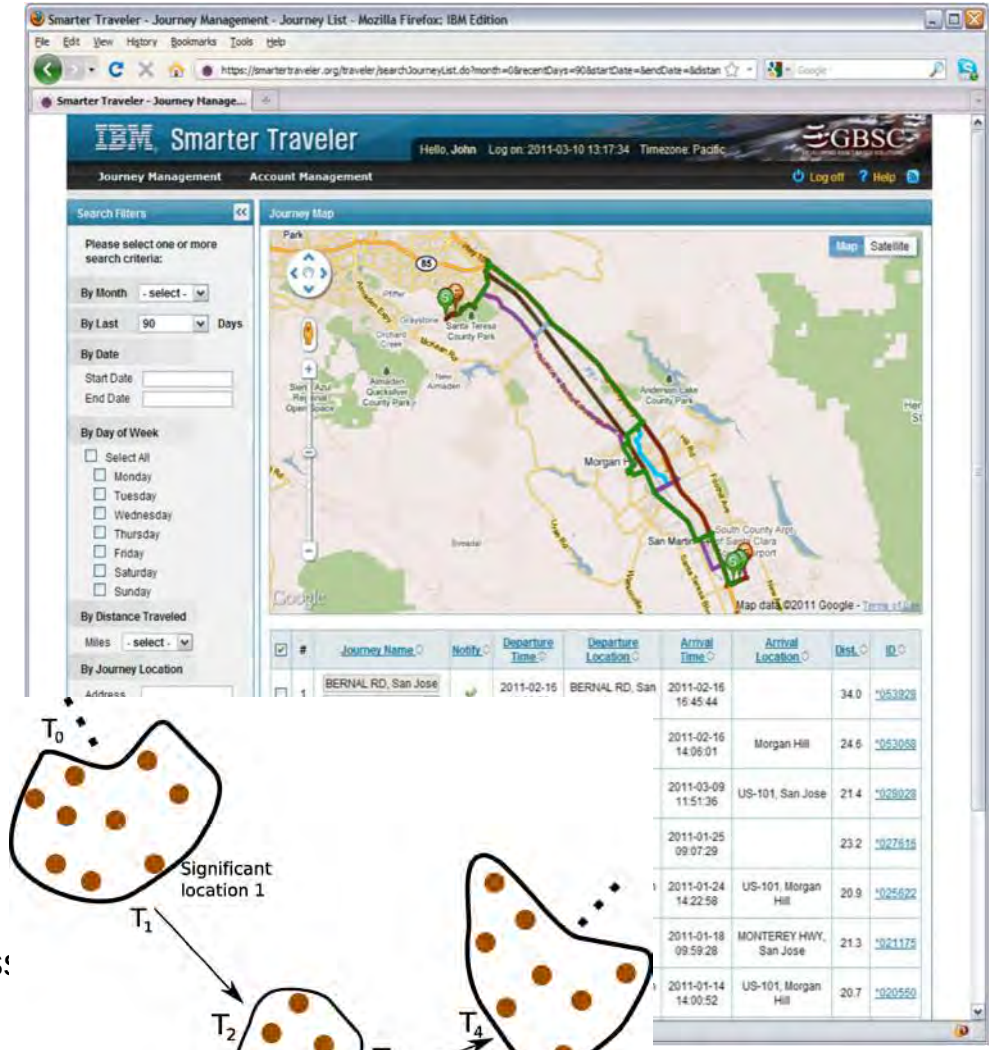
Integrate and analyze multimodal information in real time and develop tools to improve system operational efficiency and provide enhanced traveler information



‘Smarter Traveller ‘– Journey Optimizaton and Analytics

Web portal

- Gives the user a visual representation into their personal journey history.
- Enables annotation of journeys
- Searchable
- Enables activation of future notifications
- Specific journey endpoints are not shown

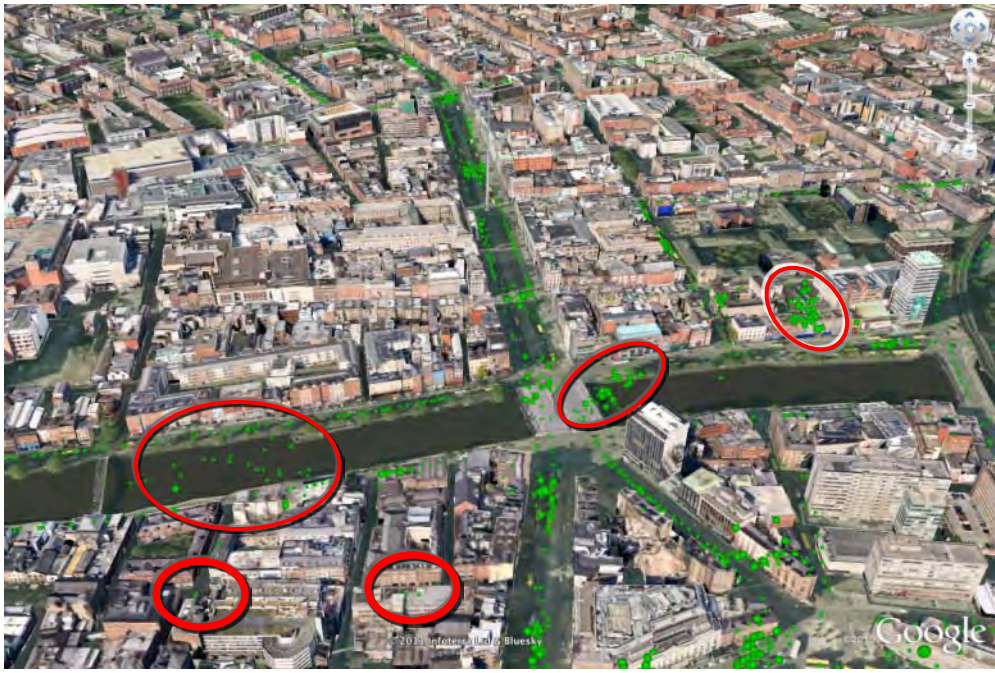


Route learning – goals:

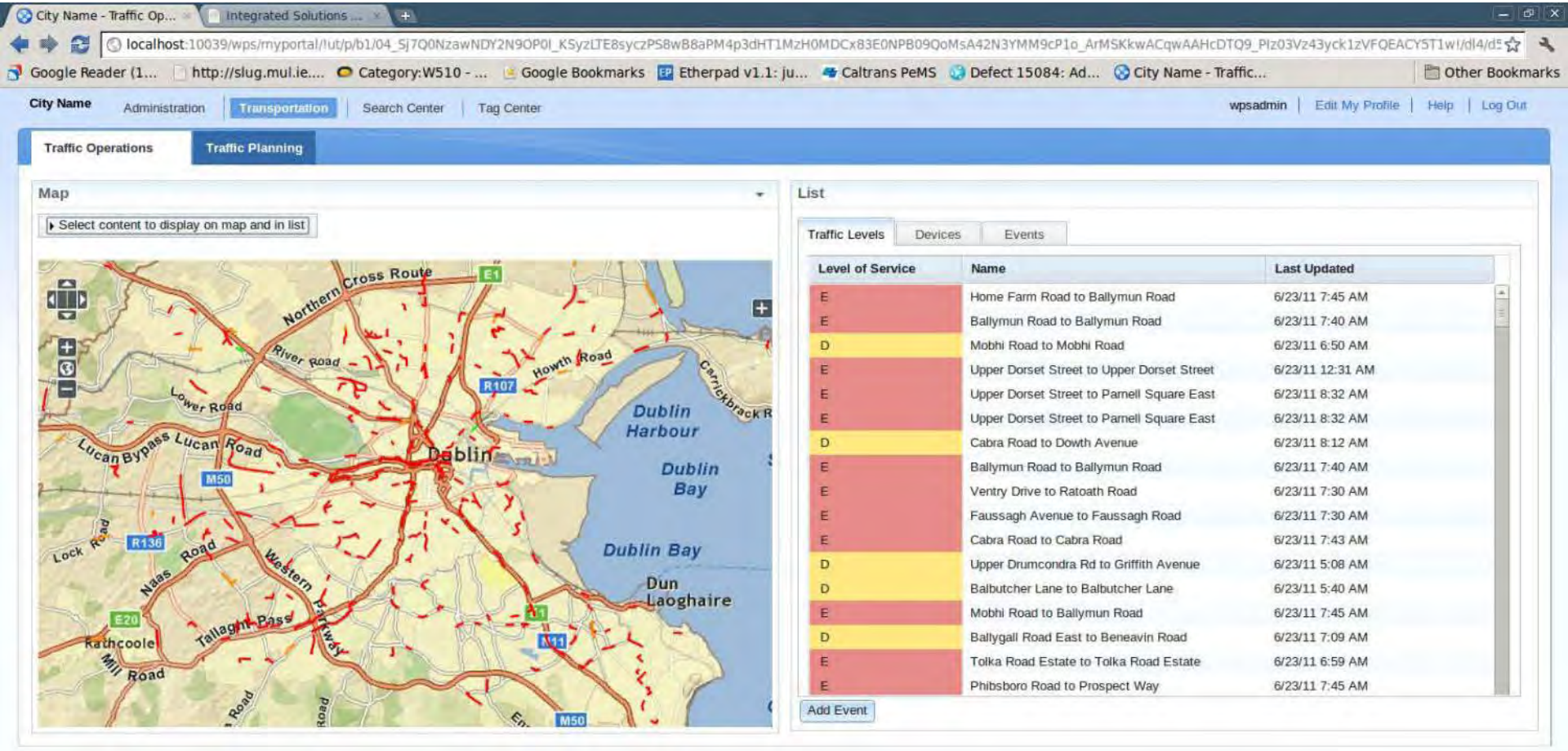
- Learn traveller patterns based on travel history
- Enable user annotation
- Predict likely upcoming travel
- Provide travel time predictions
- Enable integration of multi-modal options
- Encourage modal shift to balance loading across system and promote sustainability

City in Motion

- Gather data about real-time movement
  - Data collected from cell phones, GPS, traffic cameras, sensors
  - Data collected from buses, underground, taxis etc.
- Gather data about transportation and transit networks
  - Road networks: capacity, lengths, speeds, time-of-day volumes
  - Transit networks: routes, frequency, capacity, delays
- Data processing
  - People mobility models
  - Traffic flow models
  - Demand models
  - Congestion models
- Provide services to
  - Manage traffic, transportation and transit systems
  - Emphasise safety, quality, reliability and efficiency



Dublin route status dashboard
Red elements show slow traffic and status in listing on the right



New Solution Offerings

TIM- Traffic Data Gateway

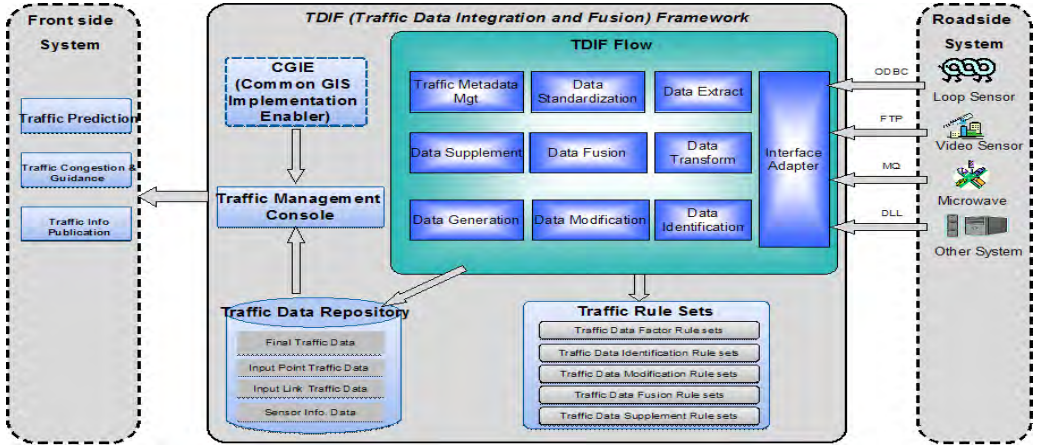
Value Proposition

•**Transportation data gateway transforms** multi-source traffic data into a **uniform traffic data model**, standardizing different data collection units across different data sources.

•It applies **algorithms** to standardize the time interval of the traffic data and to counteract time drift between different data sources

•It **identifies** false data, abnormal data, unreliable data, missing data, normal data, and provides real-time consistent estimates of traffic volumes on the road network when and where real-time data is not available.

•It supports different traffic data interfaces base on IBM InfoSphere DataStage, including MQ, FTP, ODBC and DLL.



Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM InfoSphere DataStage
- IBM InfoSphere Information Server
- IBM DB2

Non-IBM Software

- N/A

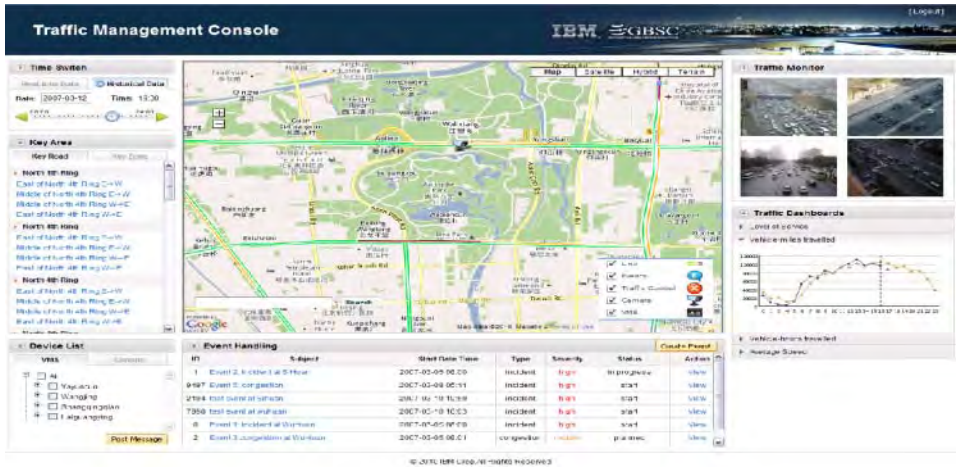
TIM - Traffic Management Console

Value Proposition

Traffic Management Console (TMC) is an important part of Traffic Information Management system used by the traffic operator in traffic management authority internally to monitor the traffic status, handle the traffic emergency, etc.

Traffic Management Console has the following **key features**:

- TMC has a **GIS based map** to visualize the road network, traffic volume, speed, density in real-time, or in a historical time.
- TMC can display the installed VMS device, camera, open event, traffic control as an icon. By clicking the icon, the detail information can be displayed
- TMC has a set of real-time **dashboards** to show the traffic KPIs, such as vehicle mile traveled, average speed curve, etc.
- TMC has a set of **decision making services** to generate **response plan** by referencing strategy rules and real-time traffic status for event handling.
- TMC can **identify congestion** from the traffic raw data in real-time.
- TMC can **execute** the response plan, including setting the VMS message, initiating a traffic control, adjust the lane signal, etc.



Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM ILOG JRules
- IBM DB2

Non-IBM Software

- N/A

TIM - Traffic Information Warehouse

Value Proposition

Traffic Information Warehouse (TIW) is an important part of Traffic Information Management system used by the traffic operator in traffic management authority internally to well organize the traffic historical data. It also provides various pre-defined traffic KPIs and Dashboards for traffic analysis.

Traffic Information Warehouse has following **key features**:

- TIW can collect data from various operational systems by **extracting, transforming, and loading (ETL)**. The traffic information are various, including tolling, vehicle registration, driver license registration, traffic violation, road accidents, emergency calls, road network, traffic flow, roadside device availability, and so on.
- TIW well organizes the data into fact based data and dimension based data, and then TIW expose the data warehouse in **cube service** with a set of **OLAP** interfaces.
- TIW has a set of well-defined **KPI**s, and corresponding **dashboards** and **reports**. It can be integrated into the traffic management console, or any other web application for traffic data analysis.
- TIW also has a dedicated web based Analytical Portal to display pre-defined dashboards and reports.

Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM InfoSphere Warehouse
- IBM Cognos BI

Non-IBM Software

- N/A

TIM - Traffic Information Portal

Value Proposition

Traffic Information Portal (TIP) is an important part of Traffic Information Management system used by the public travelers via web browser to view the real-time traffic status, incident, traffic control information, etc.

Traffic Information Portal has following **key features**:

- TIP has a **GIS based map** to visualize the road network, traffic volume, speed, density in real-time.
- TIP can display the installed VMS device, camera, open event, traffic control as an icon. By clicking the icon, the detail information can be displayed
- TIP supports the **road and zone navigation** with quick link. The map can be switched to the corresponding area by clicking the quick link.
- TIP can publish the key traffic messages in a **prioritized order** in color mode.

Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM DB2

Non-IBM Software

- N/A

TIM - ITS Mobility Service Platform

Value Proposition

ITS Mobility Service Platform Solution is an open platform to deploy various traffic information services, a smart channel to connect road infrastructure, vehicle and traveler and a system to distribute real-time and predictive traffic information to driver.

It **enables location-aware traffic application in automobile world**, for example, the notification of current and predicted traffic conditions along planned route; the dynamic re-routing based on road conditions, and the ability to reserve parking.

Key functionalities include: Traffic Information Collection, Location-aware Traffic Information Dissemination, Zone Management, Service Management, Rating & Billing, Account Management

Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM WebSphere Message Broker
- IBM ILOG JRules
- Tivoli LDAP Server
- IBM DB2

Non-IBM Software

- N/A

TIM - VMS Monitoring and Control Application

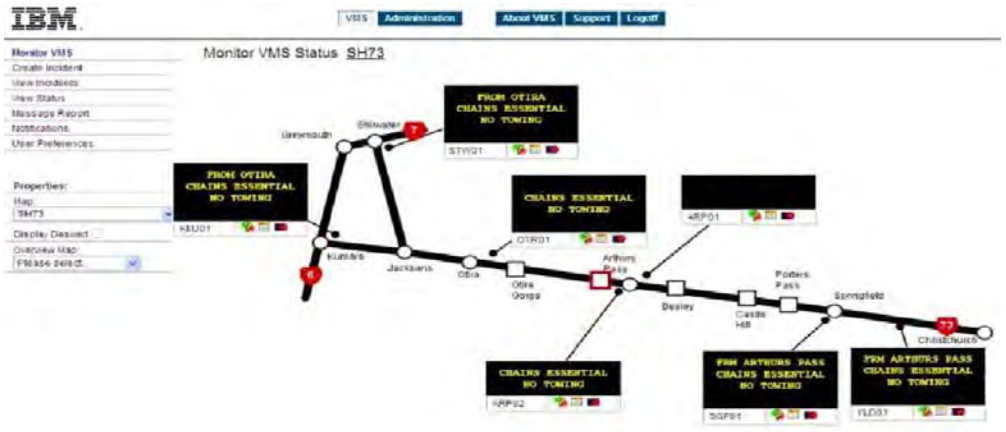
Value Proposition

•IBM **Variable Message Sign Monitoring and Control Application** (VMS MACA) provides graphical, internet-based VMS control and monitoring services, including VMS enable, disable, reset, status monitor, message post, etc, for large scale of any NTCIP-compliant network-connectable VMS from different manufacturers

•It consists of two key components: the **VMS Application** supports various types of users to perform various actions through a browser-based interface. For example, an administrator could perform VMS message set etc and a supplier could perform VMS add action through the application.

•**Message Sign Gateway** is responsible for all communication with the signs. It interacts with the FCD (Field Controller Device) component of a sign assembly using the SNMP protocol over UDP transport layer. The actual sign interactions are described by the NTCIP 1203 (DMS) standard.

•Reference case: **New Zealand Transport Agency**



Prerequisite

IBM Software

- IBM WebSphere Application Server

Non-IBM Software

- WebNMS SNMP API 4 (AdventNet)

RUC- ITS Enforcement System

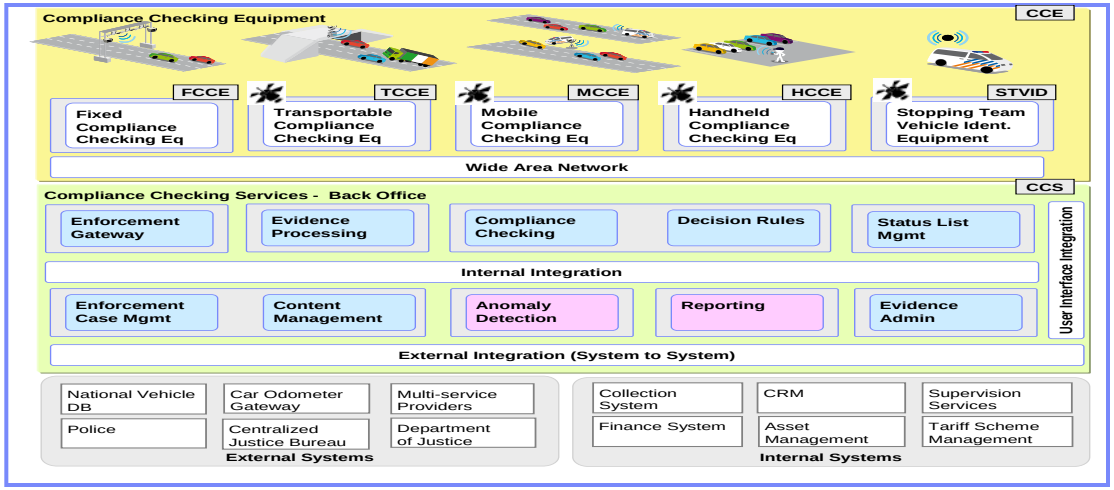
Value Proposition

ITS enforcement system is to **ensure that system fraud and abuse are prevented,** detect potential violations based on evidence data collected from roadside infrastructure.

The core functionalities include: detect potential fraud, collect evidence into an evidence package, generate enforcement cases and keep tracking of the cases. It **supports flexible compliance checking,** providing a flexible compliance rule infrastructure to determine potential violations and detecting anomaly behaviors based on large scale of historical evidence data

It consists of the following key components:

•Enforcement Gateway, Evidence Processor, Compliance Manager, Status List Manager, Enforcement Case Manager, Evidence Admin, Reporting



Prerequisite

IBM Software

- IBM WebSphere Application Server
- IBM ILOG JRules
- IBM File Net
- IBM DB2
- Tivoli LDAP Server
- IBM Cognos
- IBM SPSS

Non-IBM Software

- N/A

IBM Intelligent Operations Center for Smarter Cities

Integrating the most repeatable best practice patterns to allow leaders to:

- **Leverage information** across all city agencies and departments
- **Anticipate problems** and minimize the impact of disruptions
- **Coordinate resources** to respond to issues rapidly and effectively

Integrates with IBM partners

Sample Partner Ecosystem

AECOM VEOLIA esri TELVENT Badger Meter virtualagility

The IBM Intelligent Operations Center for Smarter Cities enables city leaders to apply global best practices

Inspired By

Public Safety

- Predict, monitor, and mitigate crisis situations
- Automatically analyze video streams for threats
- Analyze data to detect and act on criminal patterns

Transportation

- Improve traffic management
- Optimize roadway capacity
- Enhance travel experience

Water

- Analyze water use and consumption patterns
- Predict asset failures to reduce costs
- Optimize work orders to improve service

Over 25 new and enhanced use cases based on lessons from inspirational leaders.