SIEMENS
Ingenuity for life

Connecting Society Through C-ITS

Impactech 2017

The Impact of IoT on Our Lives

siemens.co.uk/traffic

Siemens in the UK

Focusing on key business drivers of electrification, automation and digitalisation

Power and Gas (PG)

Strongly positioned in core markets

Business units:

- Large Gas Turbines, Generators
- Distributed Generation
- Steam Turbines
- Compressors
- Energy Solutions
- Instrumentation & Electrical

Wind Power and Renewables (WP)

Unique competitive position

Business units:

- Onshore wind
- Offshore wind

Power Generation Services (PS)

High margin / constant flow of revenue

Business units:

- Large Turbines
- Small, Medium Turbines & Compressors
- Wind Power & Renewables

Energy Management (EM)

Seamless offering

Business units:

- Medium Voltage & Systems
- Low Voltage & Products
- Transformers
- High Voltage Products
- Transmission Solutions
- Digital Grid

Building Technologies (BT)

Strong technology base & integrated solutions

Business units:

- Control products & Systems
- Solutions & Service Portfolio

Mobility (MO)

Strengthened Portfolio

Business units:

- Mobility Management (Traffic Solutions & Rail Automation)
- Turnkey Projects & Electrification
- Mainline Transport (High Speed & Commuter Rail)
- Urban Transport
- (Metro & Light Rail)
- Customer Services

Digital Factory (DF)

Shaping the future of manufacturing

Business units:

- Factory Automation
- Motion Control
- Product Lifecycle Management
- eCar Powertrain Systems
- Customer Services DF&PD

Processes Industries & Drives (PD)

Bundling process know-how

Business units:

- Large Drivers
- Process Automation
- Upstream & Midstream
- Mechanical Drives
- Metals Technologies

Healthcare – Separately managed (HC)

Personalised & affordable healthcare

Business units:

- Imaging
- Clinical Products
- Diagnostics
- Customer Solutions
- Audiology

Financial Services (SFS)

Combine industrial & financial logic

Business units:

- Commercial Finance
- PS* – Power, Oil & Gas
- PS – Energy Management, Mobility & Industries
- PS – Healthcare & Leveraged
- Treasury
- Financing & Investment Management
- Insurance

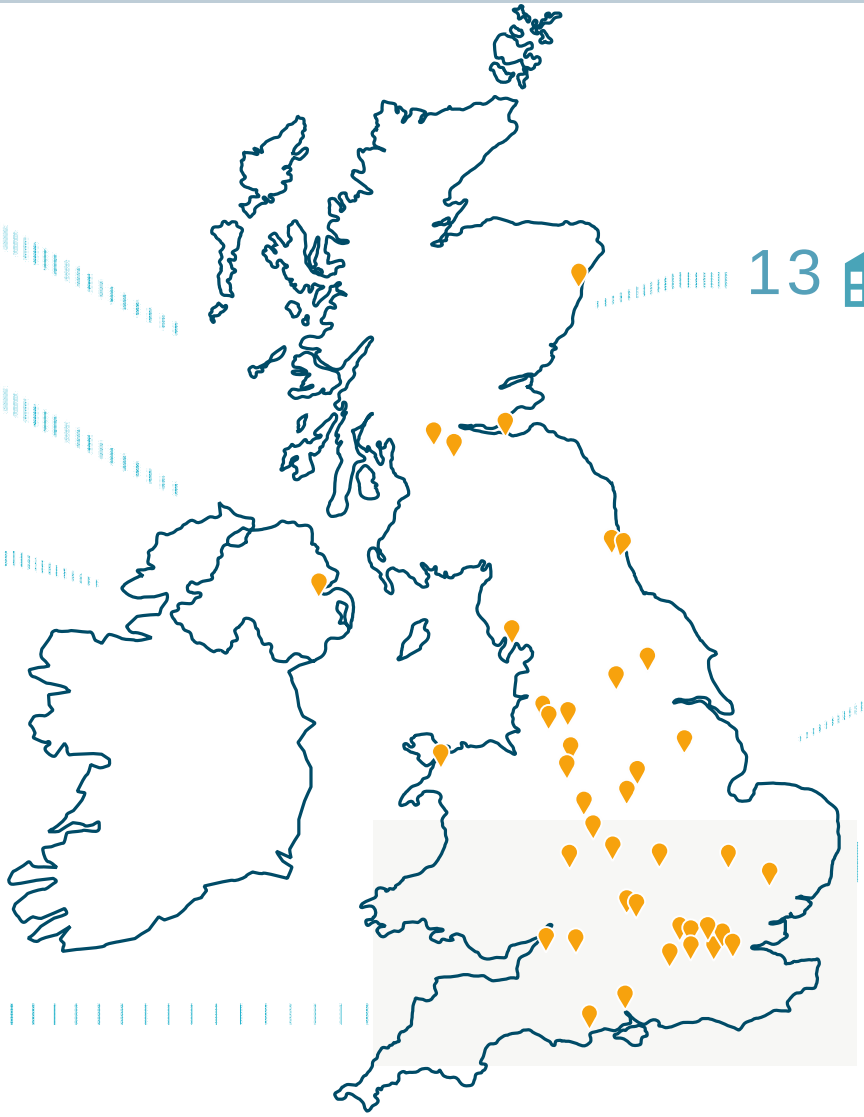
*Project & Structured Finance

Siemens in the UK

Established in 1843

14,000 Employees

£5bn Revenue



13 Manufacturing Facilities

28 Major Siemens sites

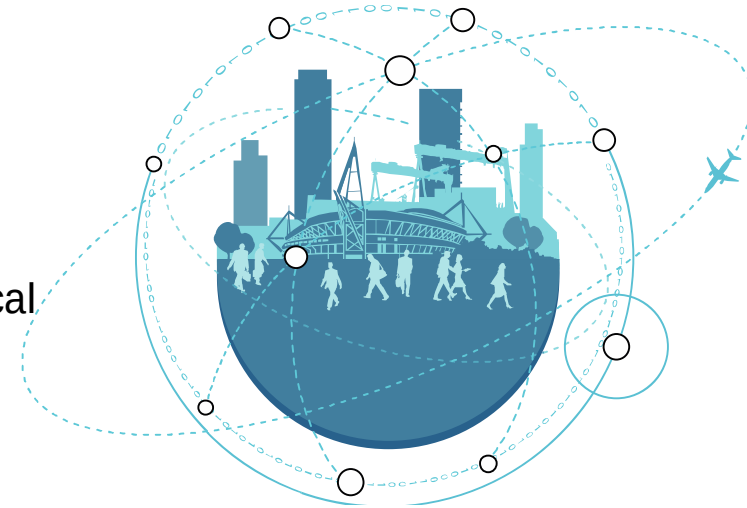
Figures FY15

Co-Operative Intelligent Traffic Systems

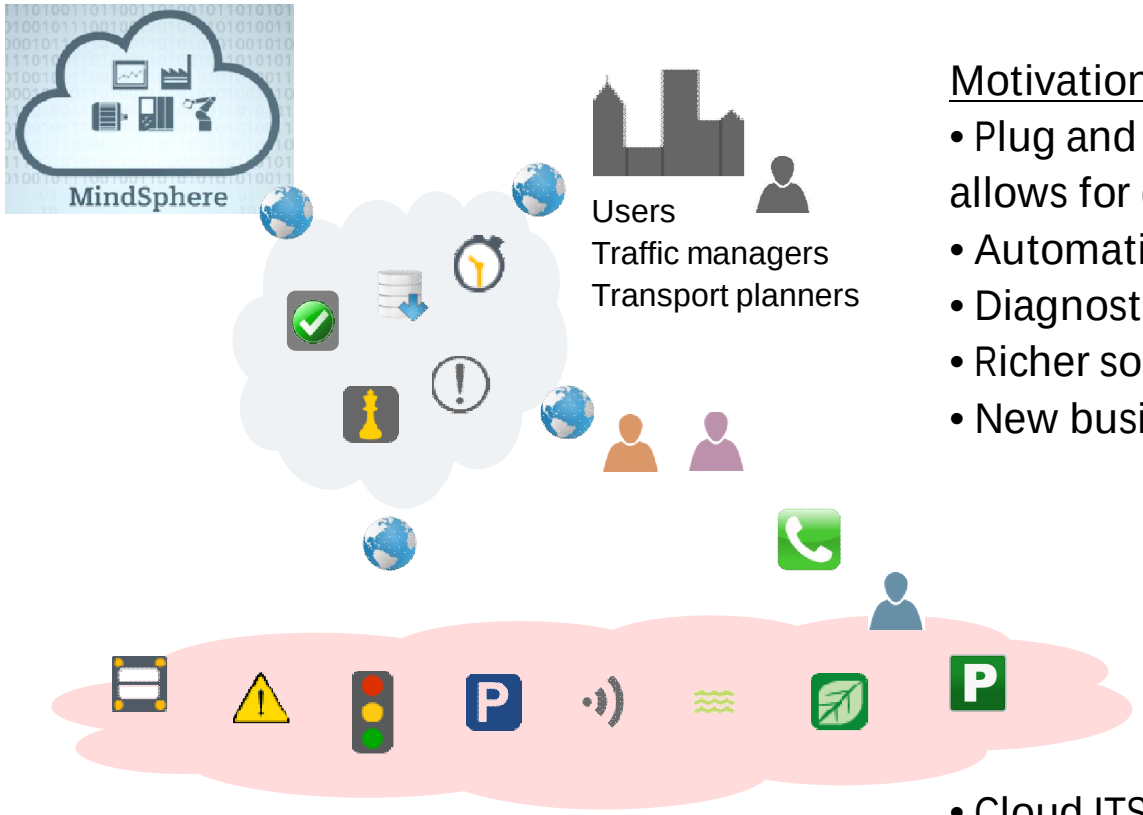
By implication of the Transport Act 2000, Local Authorities have to have control or influence over the use of their transport network in order to achieve the objectives of their local transport plan and comply with policy.

Traditional ITS provides tools to control the flow of traffic, set strategies to deal with events/ incidents and provide helpful information upon which travellers may act.

- Traditional ITS : closed networks containing controlled devices
- Mobile phone apps are disrupting in this space by using processed, crowd sourced data to automatically provide (uncontrolled) information to travellers.
- Is this Trustworthy? Does the information conflict with or support the objectives of the local transport plan? What safeguards are in place?



Control v Trust : Cloud ITS, Heading Towards IoT



Motivations

- Plug and play – Device provisioning (certificates + “phone home” technology) allows for quick and easy installation saving money
- Automatic device patching and configuration management saves time on street
- Diagnostic, location, environmental and status data enrich the ITS system
- Richer sources of data provided to the public
- New business models (B2B) for data sharing

- Cloud ITS authenticates users & devices, controlling permissions
- Trust is required for every 3rd party system and internet connected device

- Multi-tenants : neighbouring local authorities share device data
- They retain control of their region but trust neighbours to use their devices

Integrated Mobility, Managing Mobility Ecosystems
e.g. SiMobility Connect

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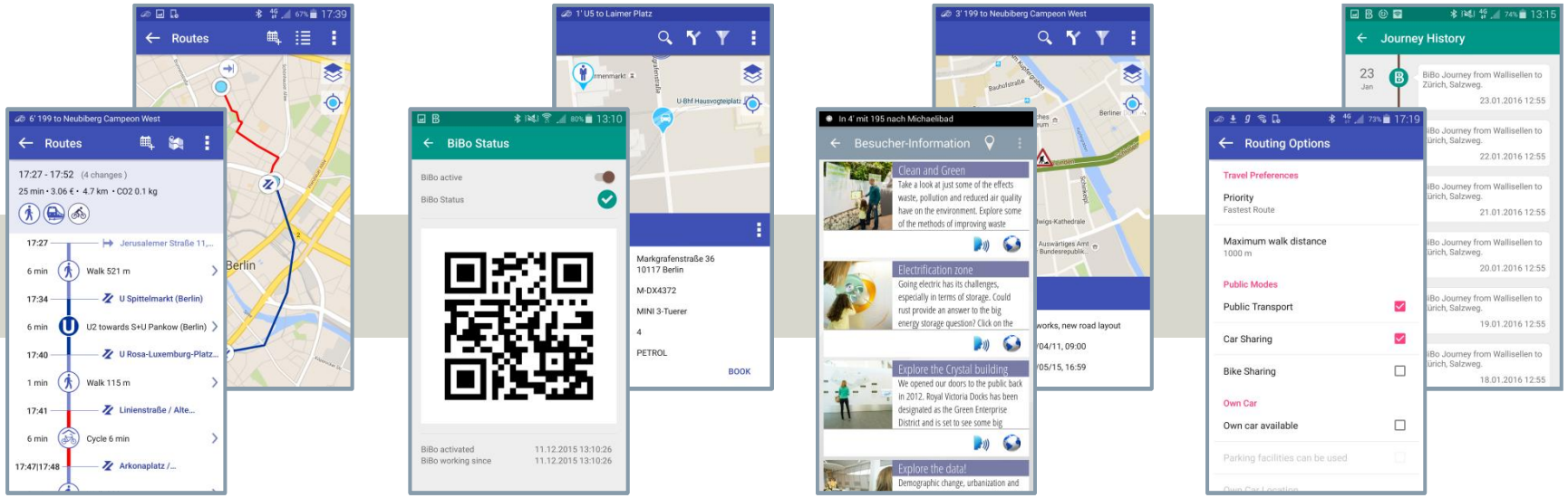
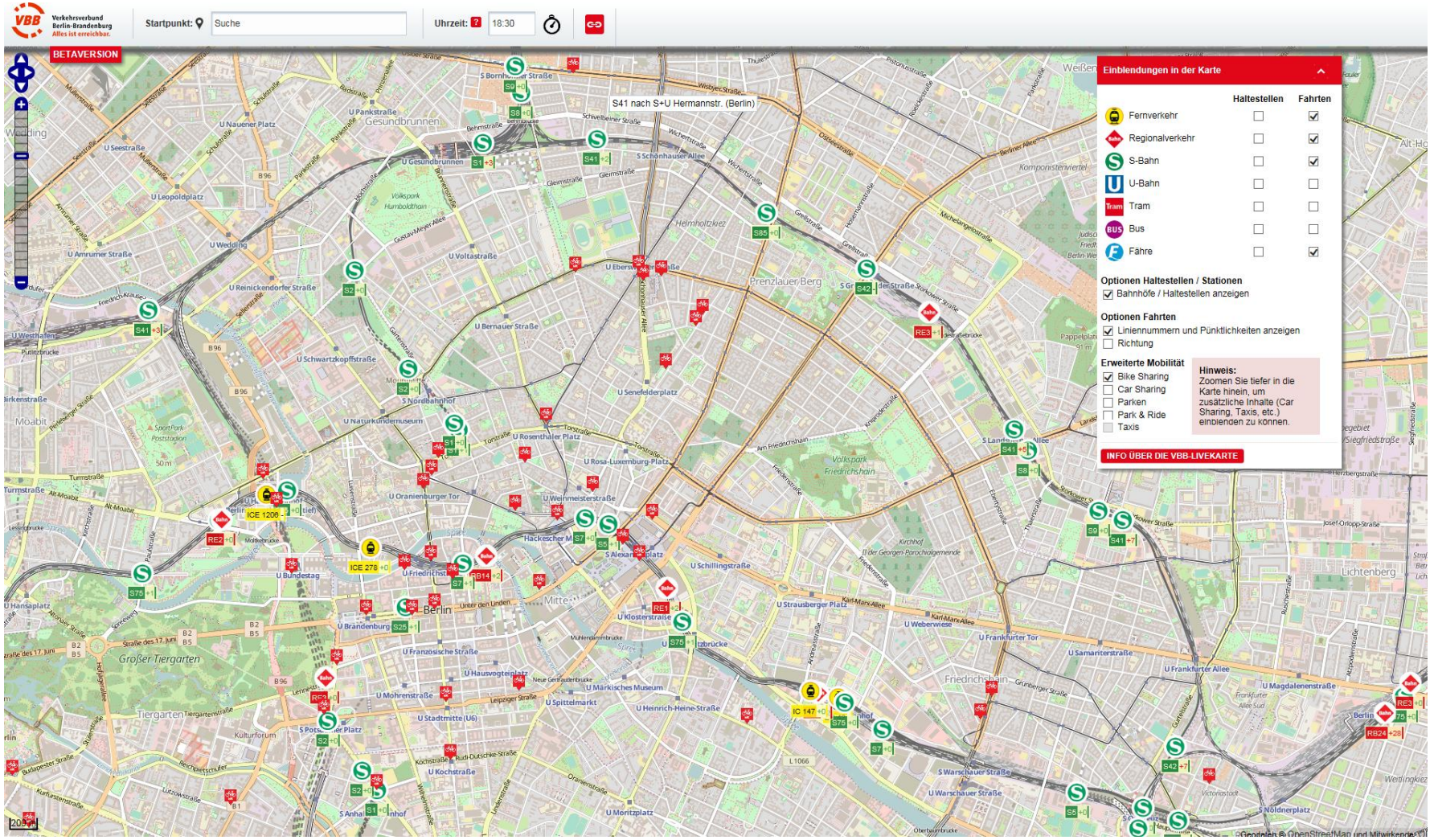
Travelers

Inform & Plan | Book & Pay | Travel | Manage



SiMobility Connect middleware integrates proprietary systems and presents an open API to the mobility store front providers

SiMobility Connect : Example



"Things" include:

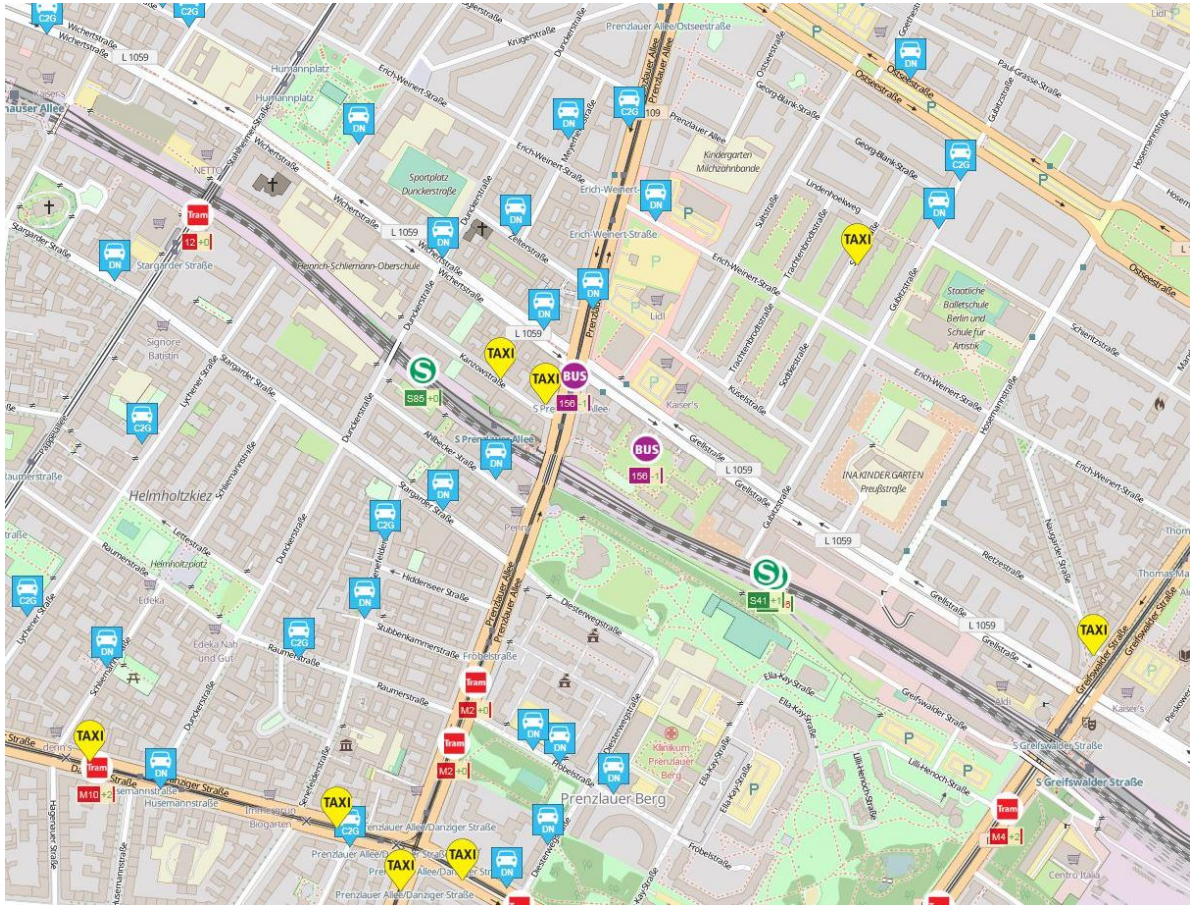
- Trains
- Underground trains
- Buses
- Trams
- Taxis
- Car club cars

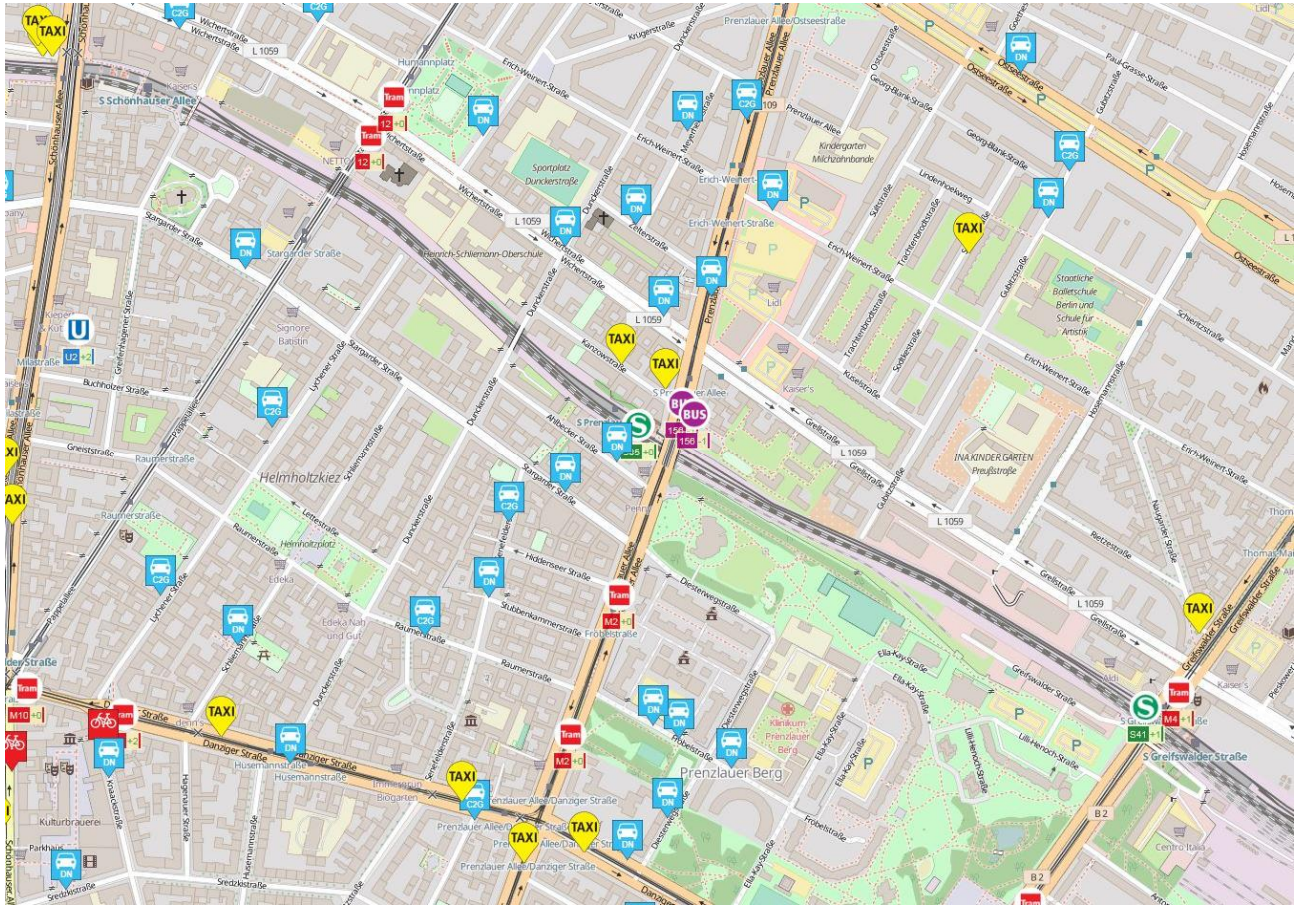
The journey planner gets real time data from the traffic management system, the various passenger information systems etc.

IoT could extend this further.

http://fahrinfo.vbb.de/bin/help.exe/dn?L=vs_mobilitymap&tpl=fullmap&tabApp=show

Updates in Real Time





Protocols Migration – Work in Progress...

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There are many proprietary protocols in use within the Global ITS industry. Many were conceived before the IP communications era and are closed systems, not accessible by public networks. e.g.

UK : UTMC
US : NTCIP
Germany : OCIT

Whilst completely incompatible, they contain data dictionaries and methods which provide a good starting point for the migration to IoT style protocols such as REST APIs or MQTT topics.

Hypercat's standardised discovery mechanism coupled with more standardised device profiles could bring benefit to device sharing. Contractual and privacy issues could be handled through embedded block chain technologies.

Middleware becomes lighter. Central systems manage device updates and contract management. B2B happens at the device level….?

ETSI – V2X Protocols of Road Side Units
IEEE 802.11p / Two channel 5.9 GHz

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URBAN

HIGHWAY

CAM Cooperative Awareness Message

Car → X

- Vehicle ID
- Positioning
- Speed

DENM – Decentralized Environmental 09 Message

Car → X / X → Car

- Incident messages (accident, black ice,…)
- Location
- Incident type

Map of intersection / topology

X → Car

- Lanes
- Driving directions

SPAT Signal Phase and Timing

X → Car

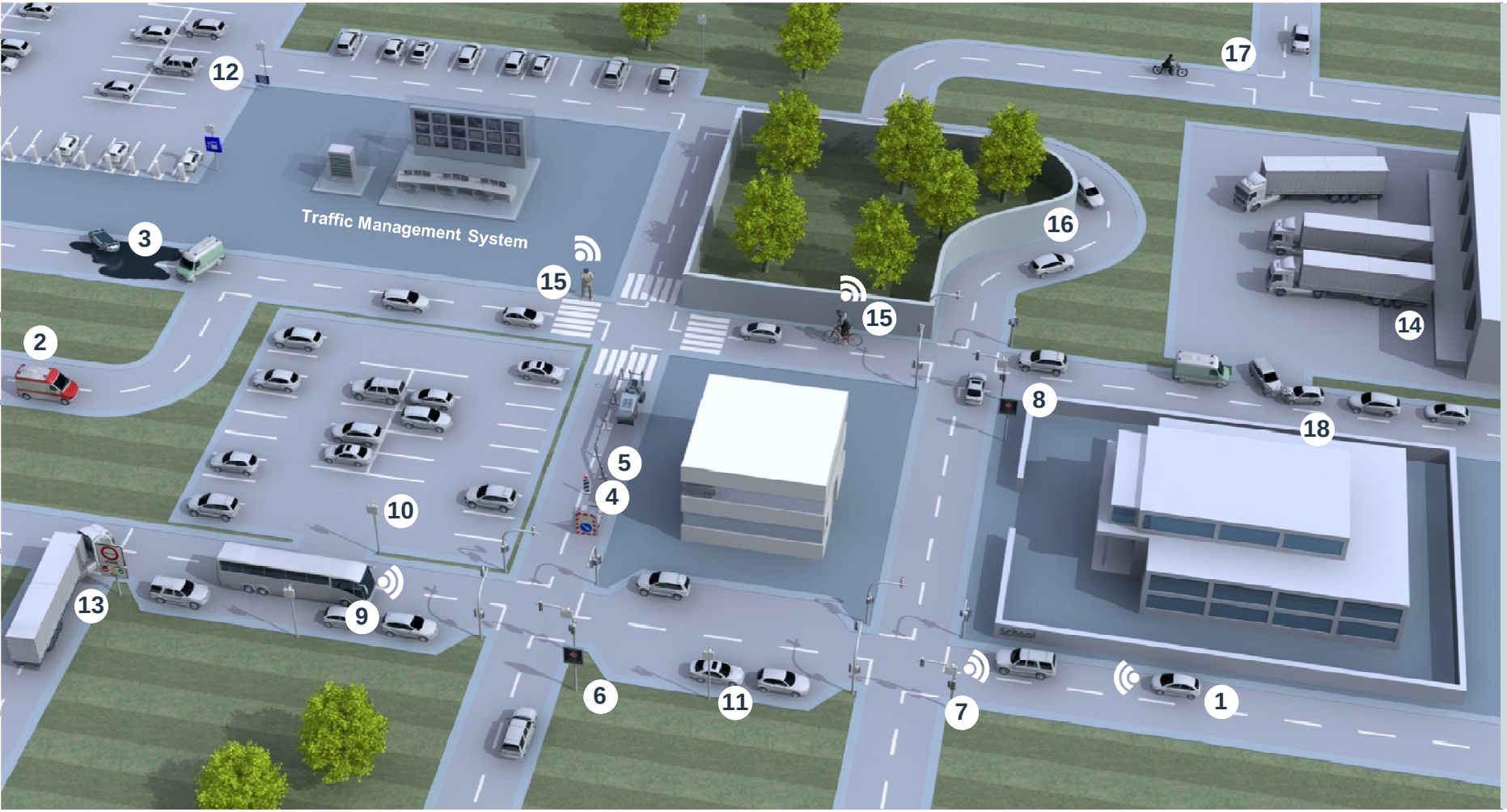
- Signal groups
- Signal phase and remaining green/red times

IVI – In-Vehicle Information

X → Car

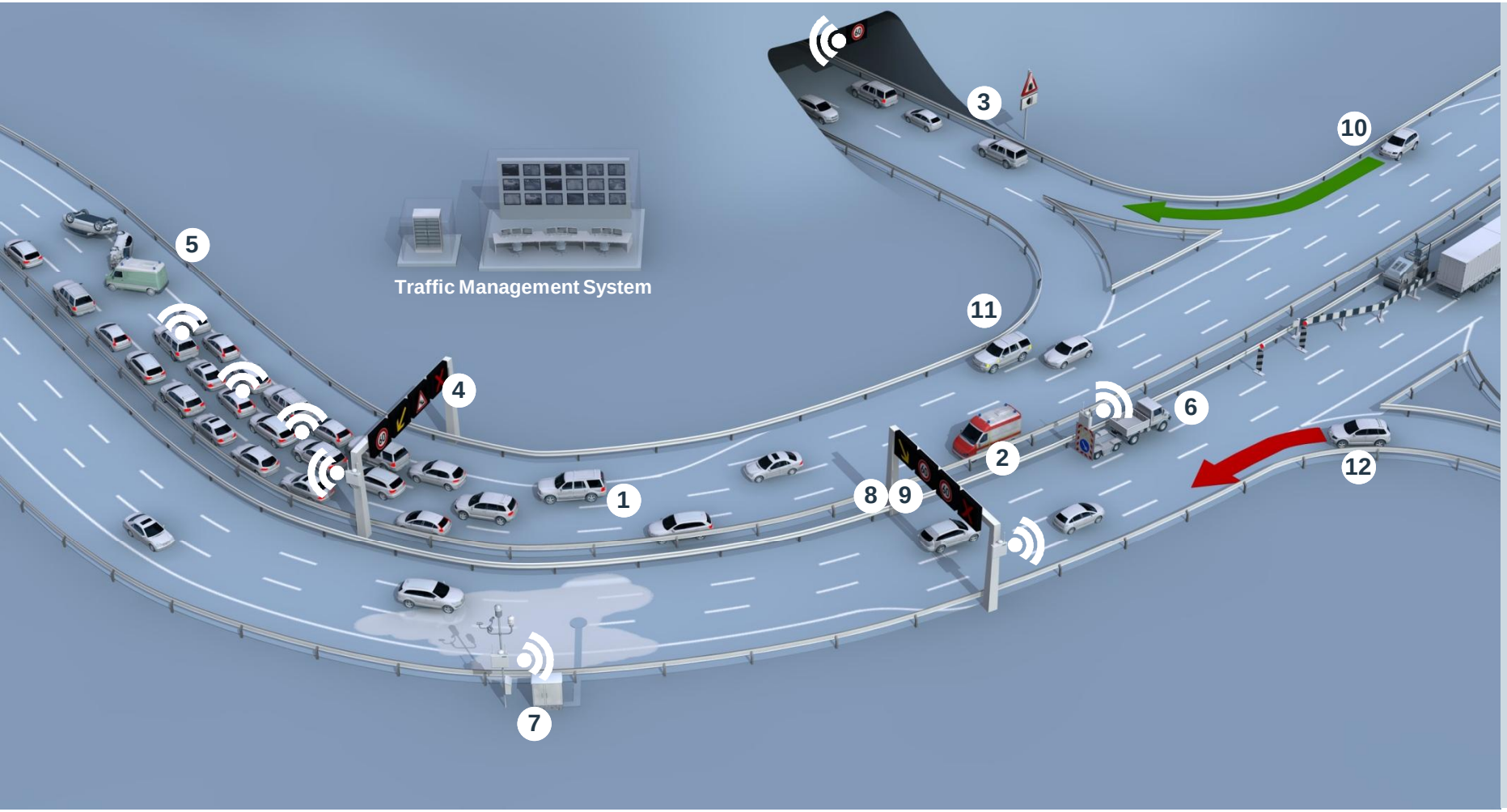
- Traffic signs
- Variable traffic signs

The Impact of the Internet of Connected Vehicles – Urban Scenarios



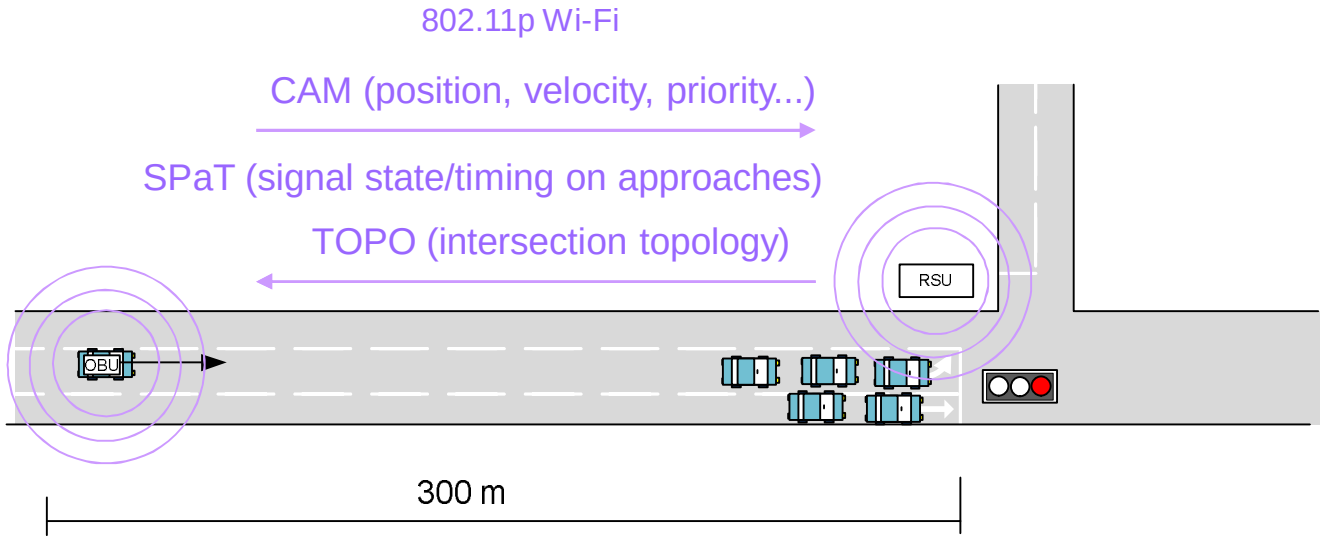
1. Emergency electronic brake light
2. Emergency vehicle approaching
3. Hazardous location notification
4. Road works warning
5. In-vehicle signage
6. In-vehicle speed limits
7. GLOSA / Time To Green (TTG)
8. Signal violation/Intersection safety
9. Traffic signal priority request by designated vehicles
10. Off street parking information
11. On street parking information and management
12. Park & Ride information
13. Zone access control for urban areas
14. Loading zone management
15. Vulnerable road user protection (pedestrians and cyclists)
16. Cooperative collision risk warning
17. Motorcycle approaching indication
18. Slow or stationary vehicle(s)

The Impact of the Internet of Connected Vehicles – Inter-urban Scenarios



1. Emergency electronic brake light
2. Emergency vehicle approaching
3. Slow or stationary vehicle(s)
4. Traffic jam ahead warning
5. Hazardous location notification
6. Road works warning
7. Weather conditions
8. In-vehicle signage
9. In-vehicle speed limits
10. Traffic information and smart routing
11. Cooperative collision risk warning
12. Wrong way driving

V2X Technology – A Real Life Example
802.11p ITS-G5 Equipped Siemens Traffic Controllers in Newcastle



Summary

Traffic management systems have evolved to combine legacy, fixed infrastructure systems with cloud and IoT based solutions

The migration to cloud has brought with it, the first deployments of IoT enabling technology and real business benefits within the ITS sector

Sensor data from physical infrastructure is being augmented by data from floating sources (such as phones and connected cars)

Some physical infrastructure is being digitalised (traffic light timing information, message sign data) but this needs to be trusted to be useful

Middleware systems have been built to bridge the legacy and IoT worlds to provide new business models and give the first taste of IoT style services enabling Mobility as a Service (SiMobility Connect)

Trust, Access Control, Scalability, Resilience, Confidentiality, Integrity and Availability are the language of today's connected ITS

Most days it feels like I run and IT department and not an engineering design team !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