

C-ITS

Intelligent Truck Parking

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23.10.2017

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- 🚗 Type of displayed notifications
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Intelligent Truck Parking

● Providing of parking information to the driver by RSU units via ITS G5 (I2V)

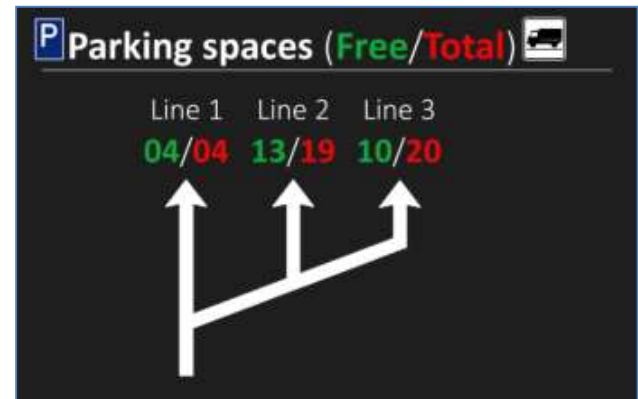
● Expected Benefits:

- Increased safety
- Increased parking spaces efficiency
- Increased economic activity
- Reduced parking search time
- Increased driving comfort
- Reduced accidents caused by:
 - Illegal parking
 - Fatigue



What does the driver want to see first?

- Where is a carpark?
- How far is that?
- How many free parking spaces are there?
- For which vehicle type are the spaces assigned?
- Where could I find them?
- How to get there?



How many free parking spaces are there?

● Detectors

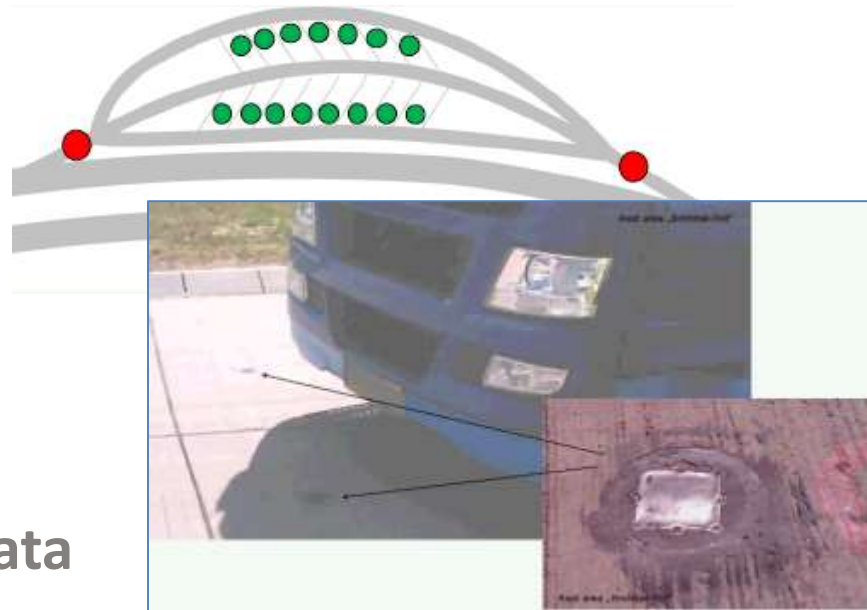
- Entrances/exits
- Individual parking spaces

● CCTV

● Staff of petrol station

● C-ITS → Probe vehicle data

- Based on **CAM**
- Definition of detection zones according to group of parking spaces
- requirement: **100 % penetration of equipped trucks**



Type of displayed notifications

📍 **Detailed** (displayed only on the parking area)

- 1) Topology of carpark
- 2) Navigate to the group of parking spaces
- 3) Map of carpark

📍 **General parking info**

P Parking Spaces (Free/Total)

2 km		Name 1	38/150
29 km		Name 2	24/90
52 km		Name n	34/50

P Parking spaces (Free/Total)

Line 1	Line 2	Line 3
04/04	13/19	10/20

Parking spaces (Free/Total)

P

Right Line 6/20

Topology of carpark

- Extend of ISO 14823 → IVIM

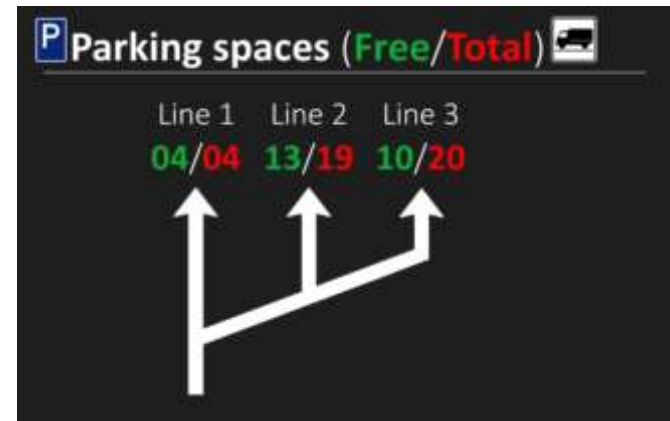
- New Data Element codes in ISO/TS 14823: Traffic and travel information (supported by IVIM)

- Geometry of Parking Spaces (GOPS)

- Code GOPS indicates the basic topology of carpark (by vehicle type)

- Qualitifiers:**

- Number of Parking Lines (NOPL)
 - Number of Acces Line (NOAL)
 - Vehicle Type (VT)



- Number of Parking spaces (NOPS)

- Code NOPS indicates number of parking spaces

- Qualitifiers:**

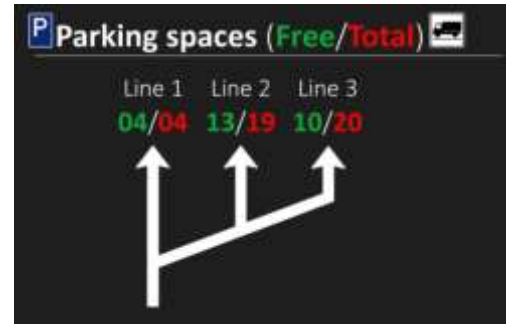
- Free Parking Spaces (FPS)
 - Total Parking Spaces (TPS)

Data Element	Data Source			
	Qualifier	Full Name	Data Format (Default)	Coded Value
GOPS	NOPL	Number of Parking Lines	nn	01 to nn
	NOAL	Number of Acces Line	nn	01 to nn
	VT	Vehicle Type	n	1: car 2: truck 3: bus
NOPS	FPS	Free Parking Spaces	nnnn	0-9999
	TPS	Total parking spaces	nnnn	0-9999

For example...

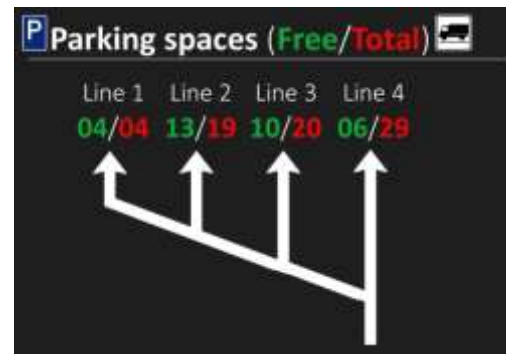
1. SITUATION

Data Element	Qualifier	Code	
GOPS	NOPL	3	
	NOAL	1	
	VT	2	
Data Element	Lane Number	FPS	TPS
NOPS	1	4	4
	2	13	19
	3	10	20



2. SITUATION

Data Element	Qualifier	Code	
GOPS	NOPL	4	
	NOAL	4	
	VT	2	
Data Element	Lane Number	FPS	TPS
NOPS	1	4	4
	2	13	19
	3	10	20
	4	6	29



3. SITUATION

Data Element	Qualifier	Code	
GOPS	NOPL	3	
	NOAL	0	
	VT	2	
Data Element	Lane Number	FPS	TPS
NOPS	1	4	4
	2	15	17
	3	10	20



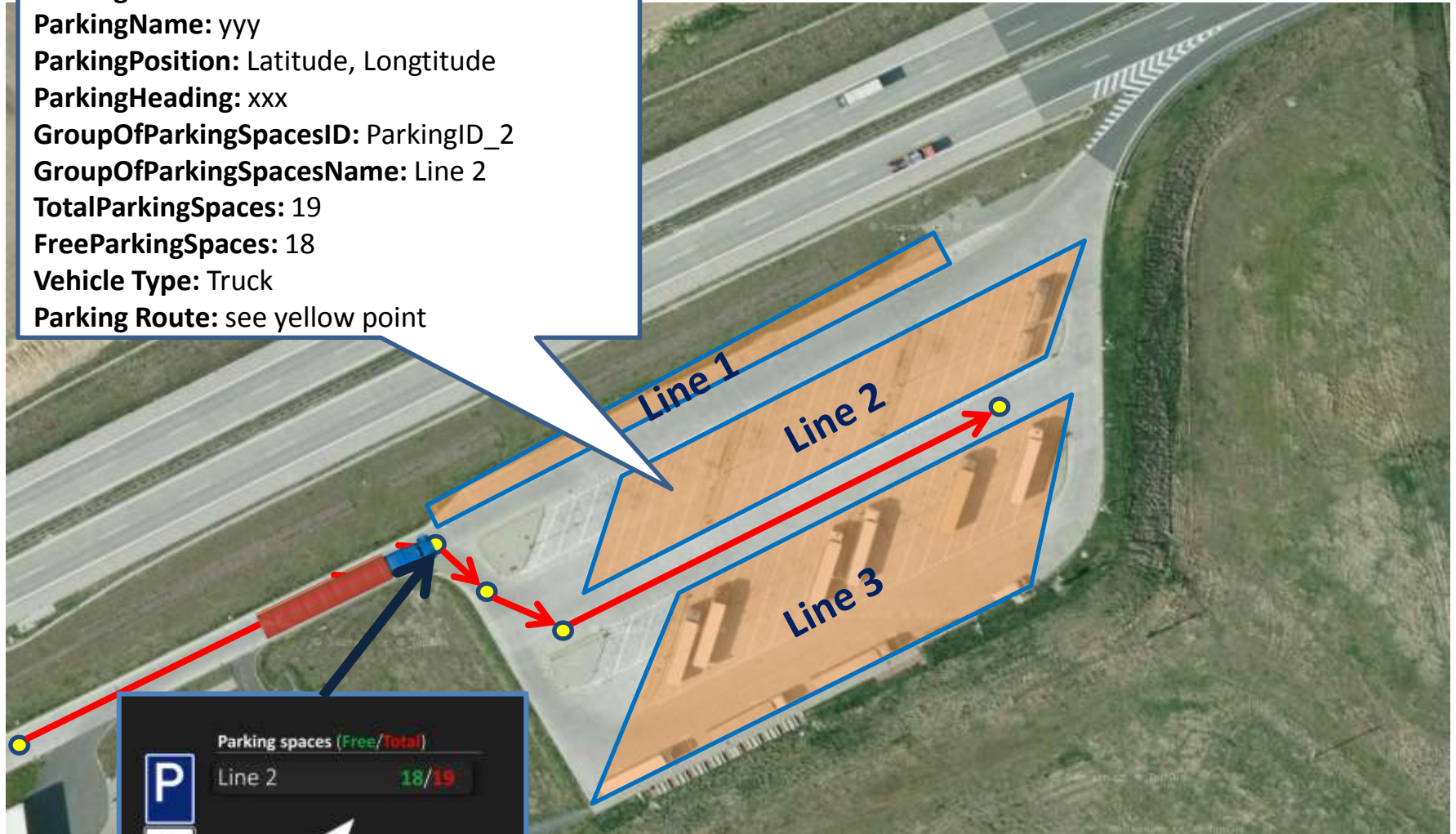
Navigate to the group of parking spaces

- New C-ITS message
- Direct navigation to group of parking spaces with the most free parking spaces (or to choosed group)
- Specific attributes:
 - ParkingID
 - ParkingName
 - ParkingPosition
 - ParkingHeading
 - GroupOfParkingSpacesID
 - GroupOfParkingSpacesName
 - TotalParkingSpaces
 - FreeParkingSpaces
 - VehicleType
 - **ParkingRoute = „Traces“ to the group of parking spaces**
- The arrow shall navigate the user to the next point of ParkingRoute to the Goup of parking spaces.



For Example...

ParkingID: xxx
ParkingName: yyy
ParkingPosition: Latitude, Longitude
ParkingHeading: xxx
GroupOfParkingSpacesID: ParkingID_2
GroupOfParkingSpacesName: Line 2
TotalParkingSpaces: 19
FreeParkingSpaces: 18
Vehicle Type: Truck
Parking Route: see yellow point



Parking spaces (Free/Total)

	Line 2	18/19
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Map of carpark

- Use of MAP message
- Basic describe of topology of all carpark
- Include Relevance zone (traces)



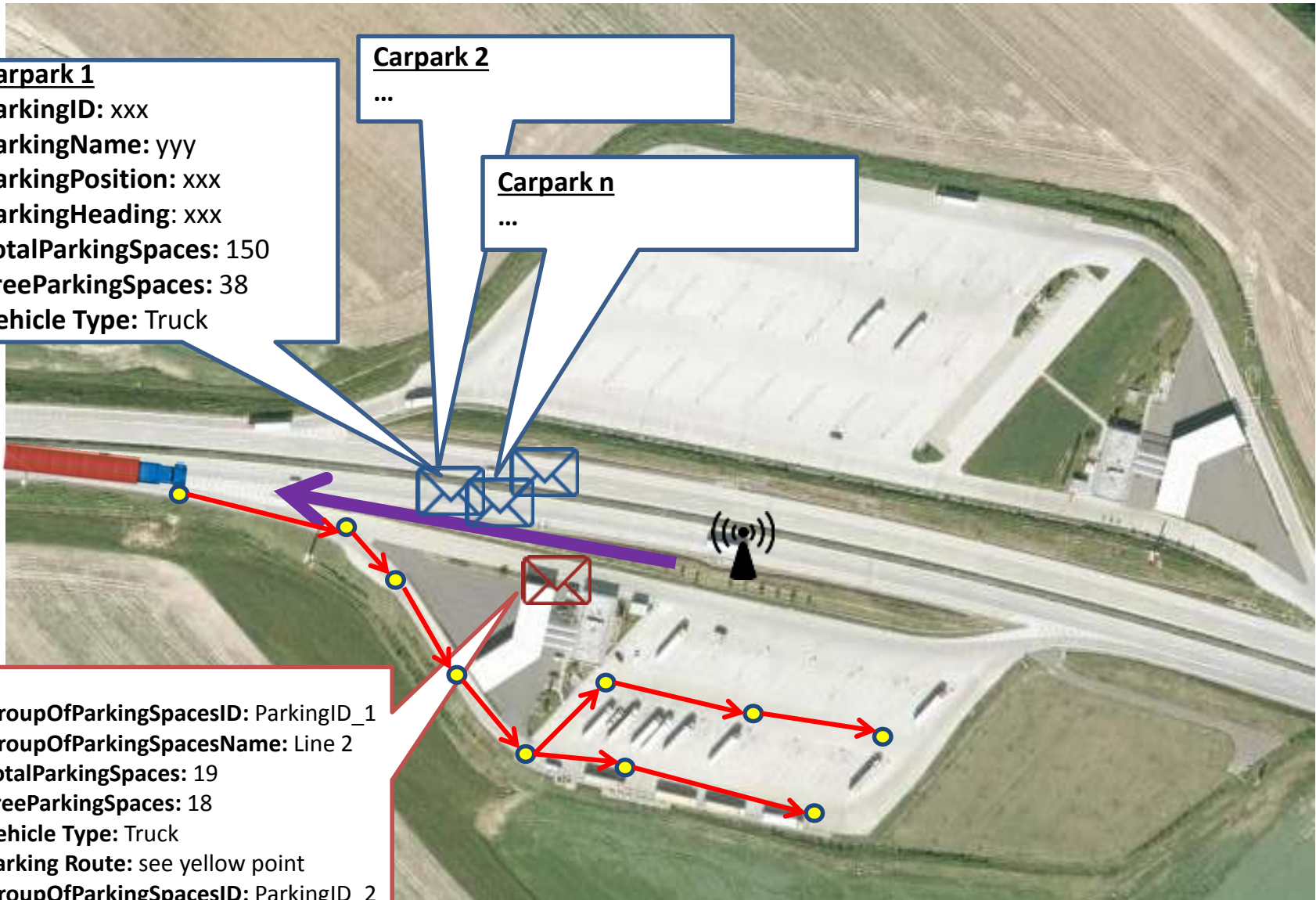
Illustrative Example

Carpark 1
ParkingID: xxx
ParkingName: yyy
ParkingPosition: xxx
ParkingHeading: xxx
TotalParkingSpaces: 150
FreeParkingSpaces: 38
Vehicle Type: Truck

Carpark 2
...

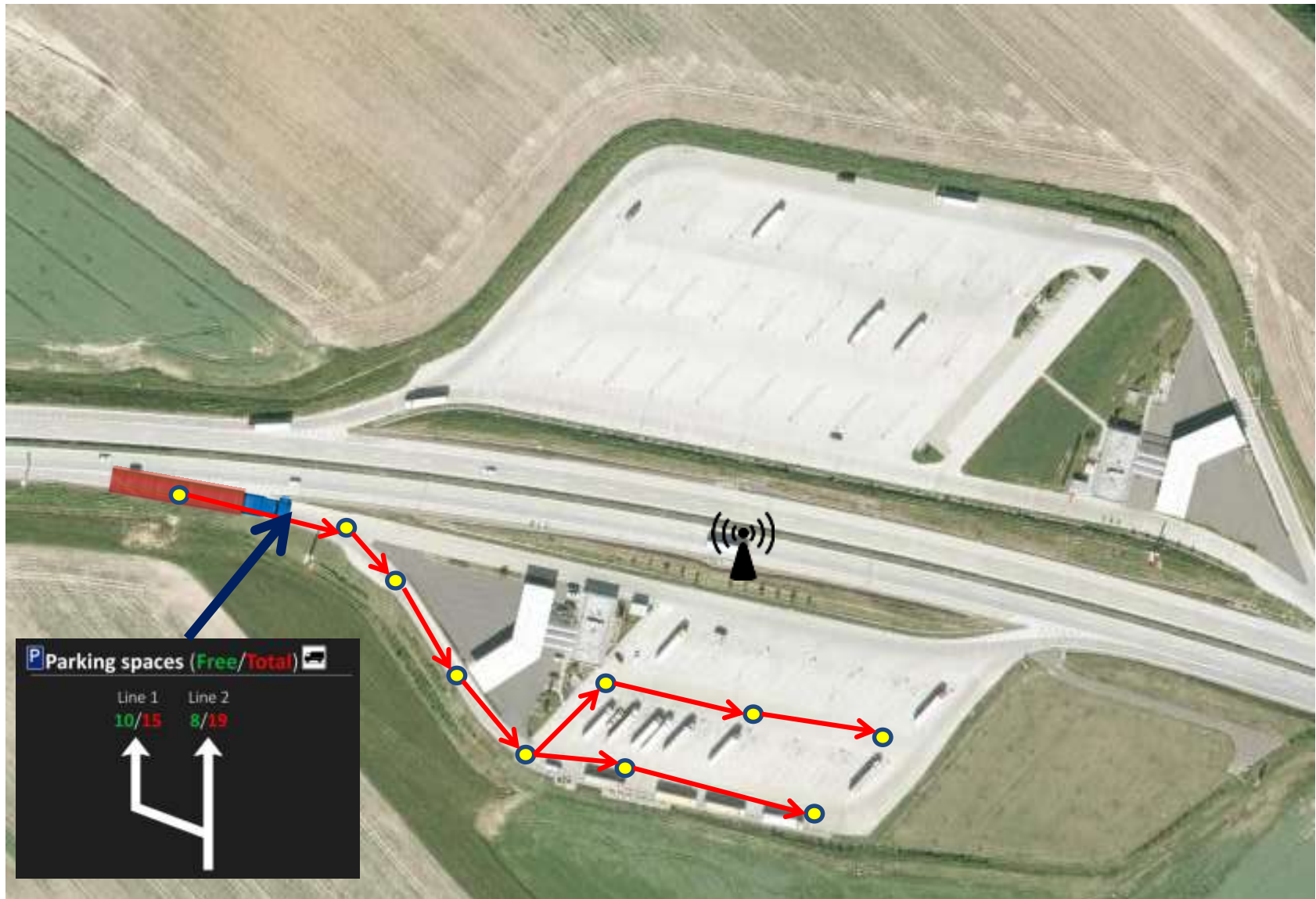
Carpark n
...

...
GroupOfParkingSpacesID: ParkingID_1
GroupOfParkingSpacesName: Line 2
TotalParkingSpaces: 19
FreeParkingSpaces: 18
Vehicle Type: Truck
Parking Route: see yellow point
GroupOfParkingSpacesID: ParkingID_2
....



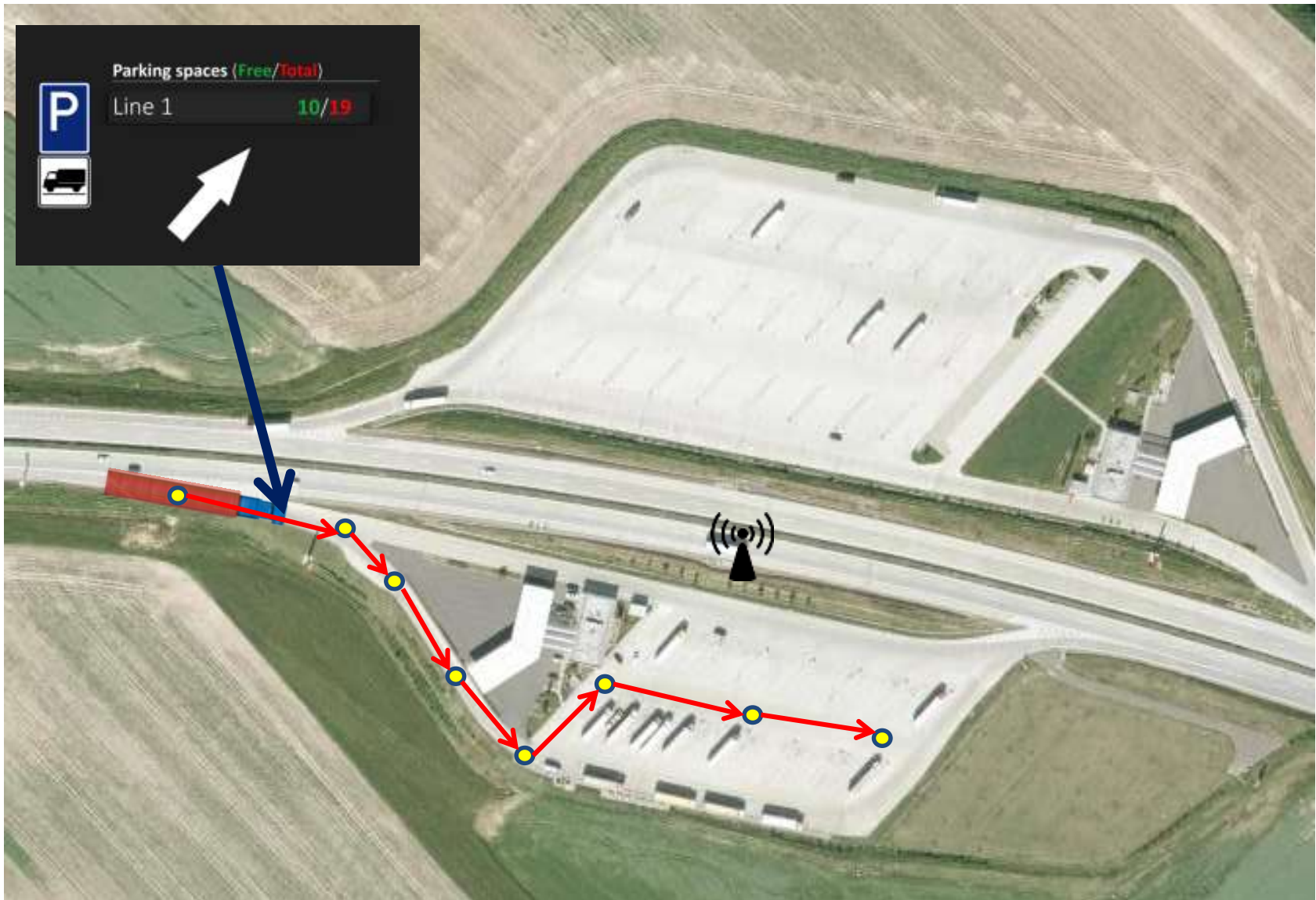
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Topology of the carpark



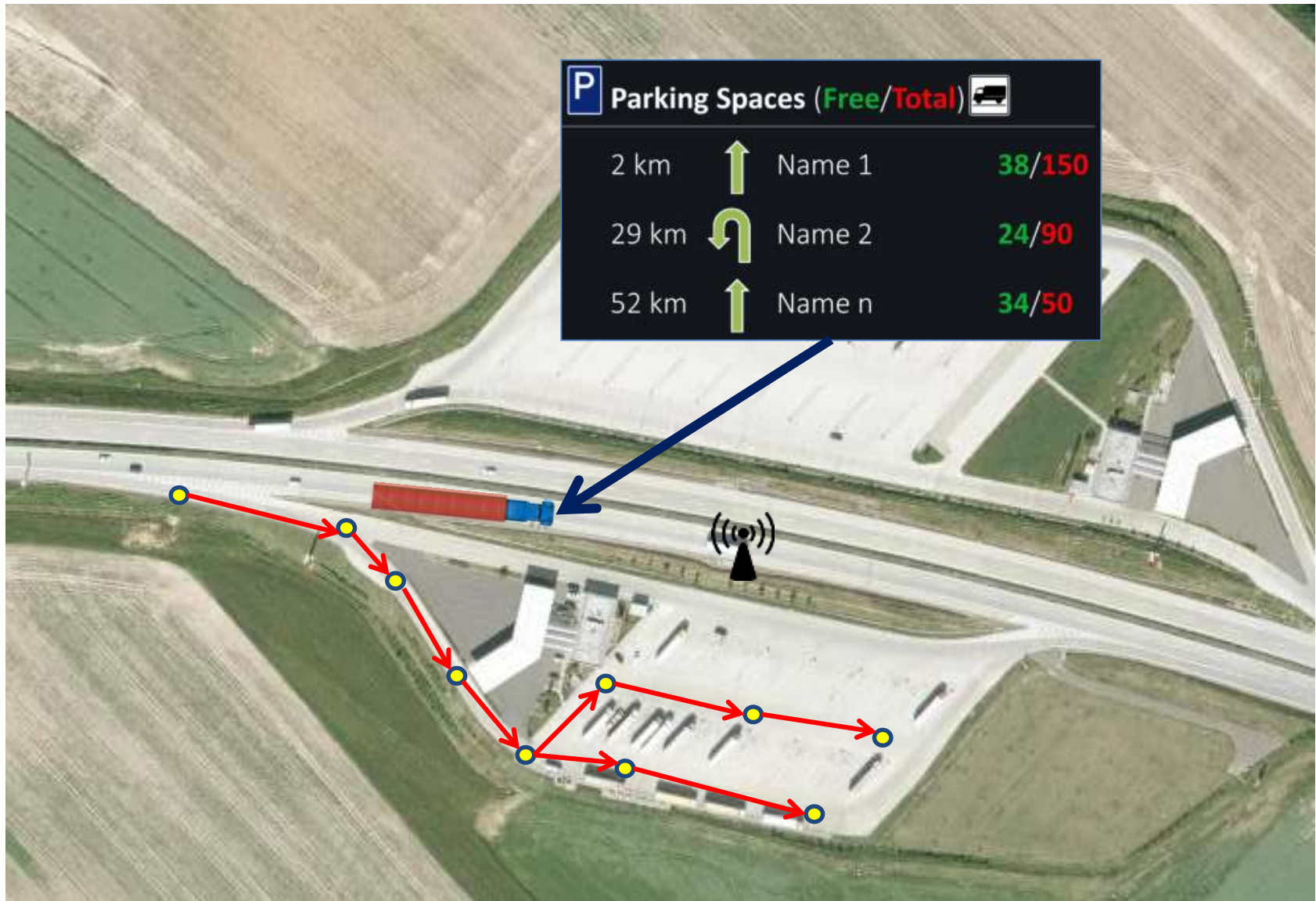
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Navigate to the group of parking spaces



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General parking info



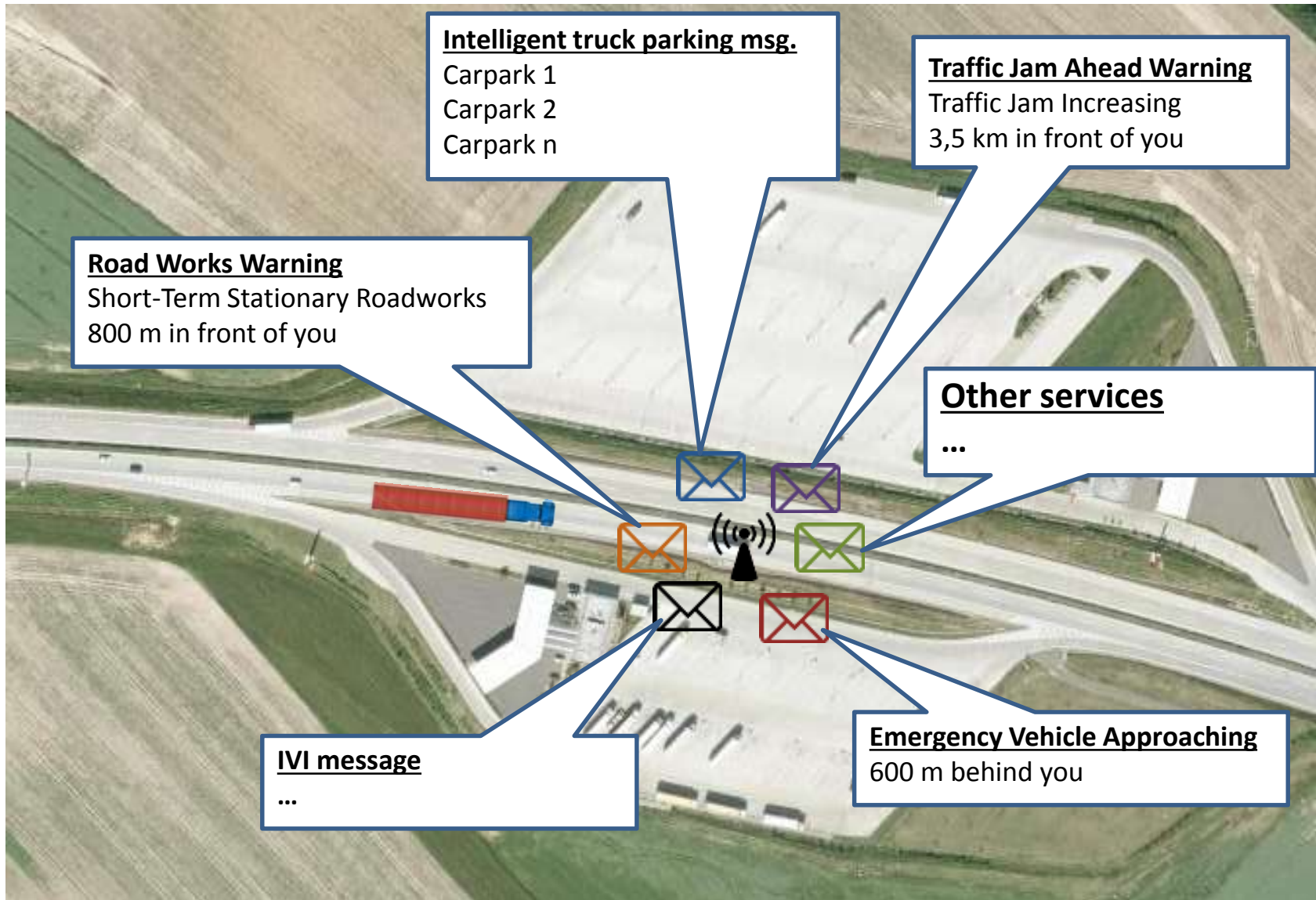
- **Opening status**
- **Truck parking facilities:** restaurant, hotel, petrol station, WiFi, ...
- **Parking security:** Security level, CCTV, Lighting, security staff, ...
- **Permits and prohibition:** smoking, camping, handling hazardous material
- **Payment or reservation**
- ...

Detailed parking information



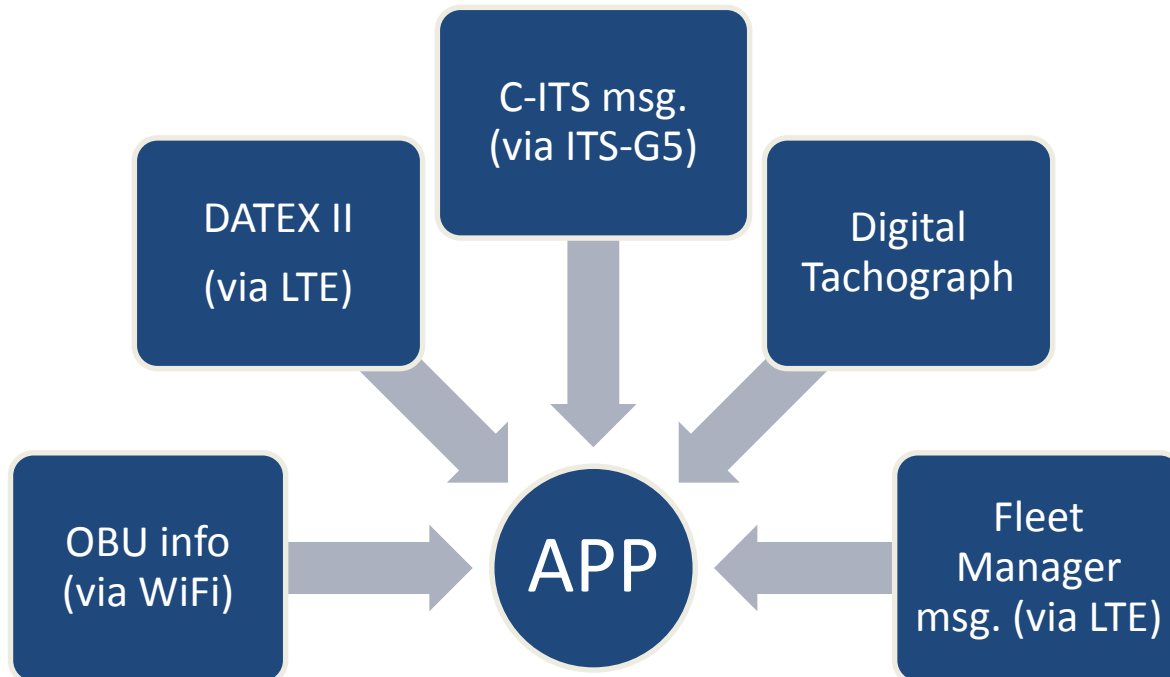
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Other C-ITS services



Potential Hybrid Application

- ❶ **OBU info:** Position, Speed, Heading, Vehicle Type, Dangerous Goods...
- ❷ **DATEX II:** Detailed Parking Info
- ❸ **C-ITS msg.:** DENM, IVI, CAM, ...
- ❹ **Digital Tachograph:** Information about the driving time → automatic navigation to free parking spaces
- ❺ **Fleet Manager msg.:** Msg to a specific truck driver (e.g. Change the route, Load Capacity Exceeded, The max allowed driving time exceeded,...)



Thank you for your attention

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