



5G BLUEPRINT

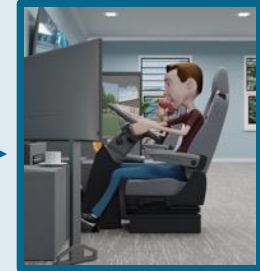
5G-BLUEPRINT: NEXT GENERATION CONNECTIVITY FOR ENHANCED, SAFE, EFFICIENT TRANSPORT & LOGISTICS

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and Water Management

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TELEOPERATED TRANSPORT



TECHNOLOGY – 5G NETWORK & ENABLING FUNCTIONS

Fast

Reliable

Secure

Guaranteed

Cross-border



C H A L L E N G E S



ECONOMICS

- Reduction of waiting time
- Reduction labour shortage
- Economic growth
- Safer driving
- Facilitator automated mobility
- Complex business model

GOVERNANCE

- MNO SLA's
- ToD service SLA's
- Legislation
- Certification
- Liability
- Data sharing and GDPR

5G-Blueprint designs and validates **technical architecture, business, and governance model** for uninterrupted cross-border teleoperated transport based on 5G connectivity.



TECHNOLOGICAL



BUSINESS



REGULATORY

TECHNOLOGICAL



- Design and implement a **5G network for CAM services**
- Develop and implement the **prototype of a TO system**
- Implement and deploy enabling functions **guaranteeing safety** and increasing value
- Validate the **end-to-end TO transport** solution supported by 5G in real-life cross-border scenarios

BUSINESS



- 5G TO transport **market analysis**
- **Commercial possibilities**
- Positions the **possible role** of TO transport based on 5G **in CAM**
- TO transport based on 5G connectivity **market adoption**

REGULATORY



- Identify regulatory issues
- Recommended actions

USE CASES

UC1: Automated barge control



Vlissingen and Antwerp port

UC4: Remote take over



Cross border on public road

UC2: Automated driver in loop docking

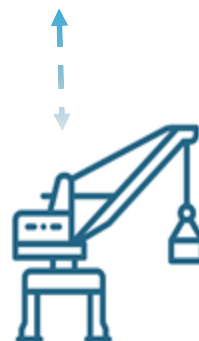
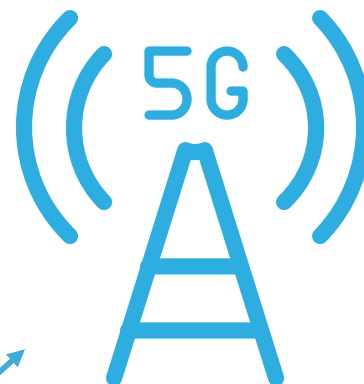


Vlissingen and Antwerp port

UC3: CACC based platooning



Cross border on public road

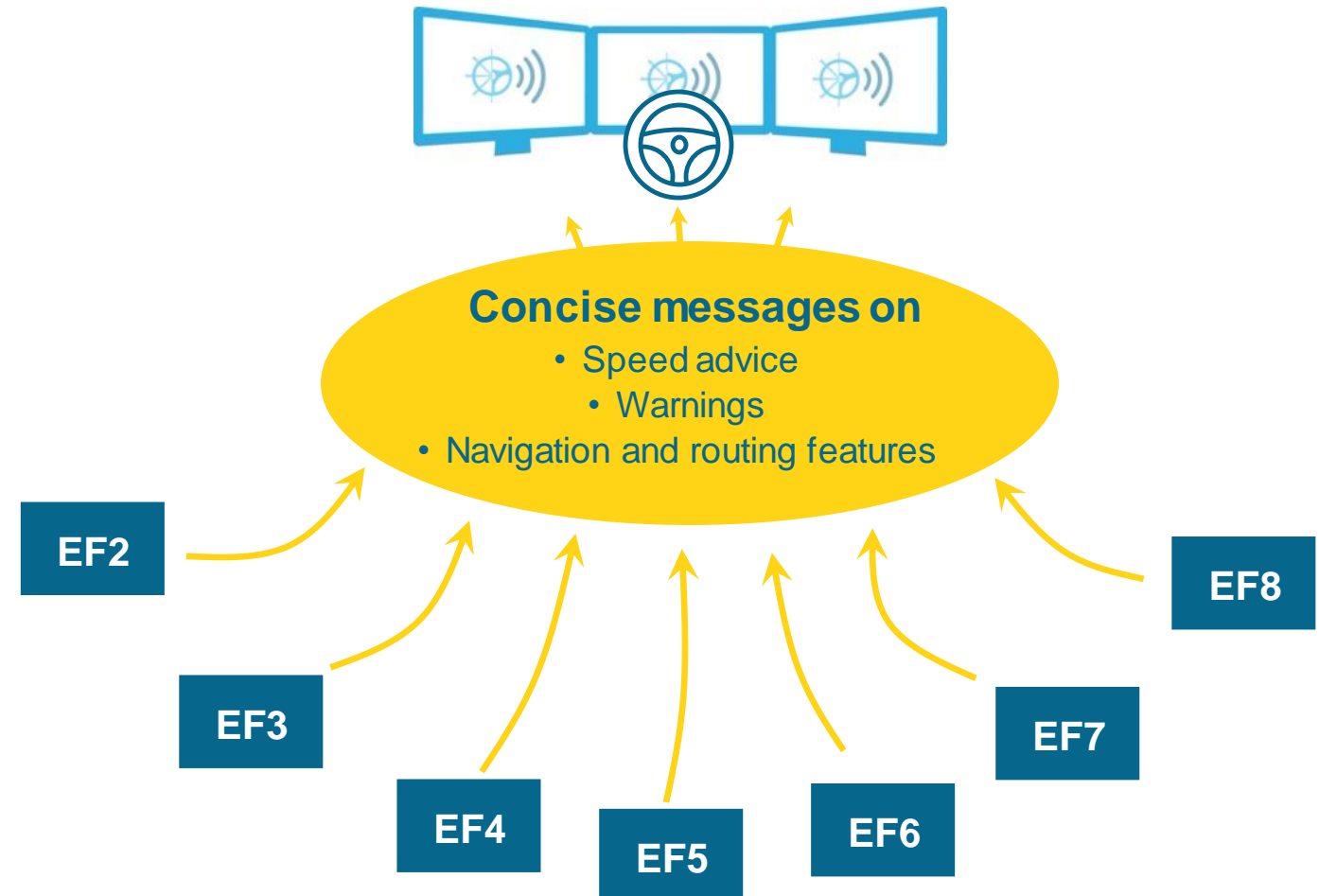


Tele-Operated crane

ENABLING FUNCTIONS

EF1	Enhanced awareness dashboard
EF2	Vulnerable Road User (VRU) interaction
EF3	Timeslot reservation at intersections
EF4	Distributed perception
EF5	Active collision avoidance
EF6	Container ID recognition
EF7	ETA sharing
EF8	Logistics chain optimization

TELEOPERATION COCKPIT



PILOT AREA - HIGH LEVEL DISTRIBUTION

NORTH SEA PORT-ANTWERP- ROTTERDAM TRANSPORT CORRIDOR

VLISSINGEN SITE

- Tele-Operation
- Gracefully degrading safety fallback
- Tele-Operation station for operator
- Cameras at terminal
- Docking service
- Logistics chain optimization

ZELZATE CROSS-BORDER SITE

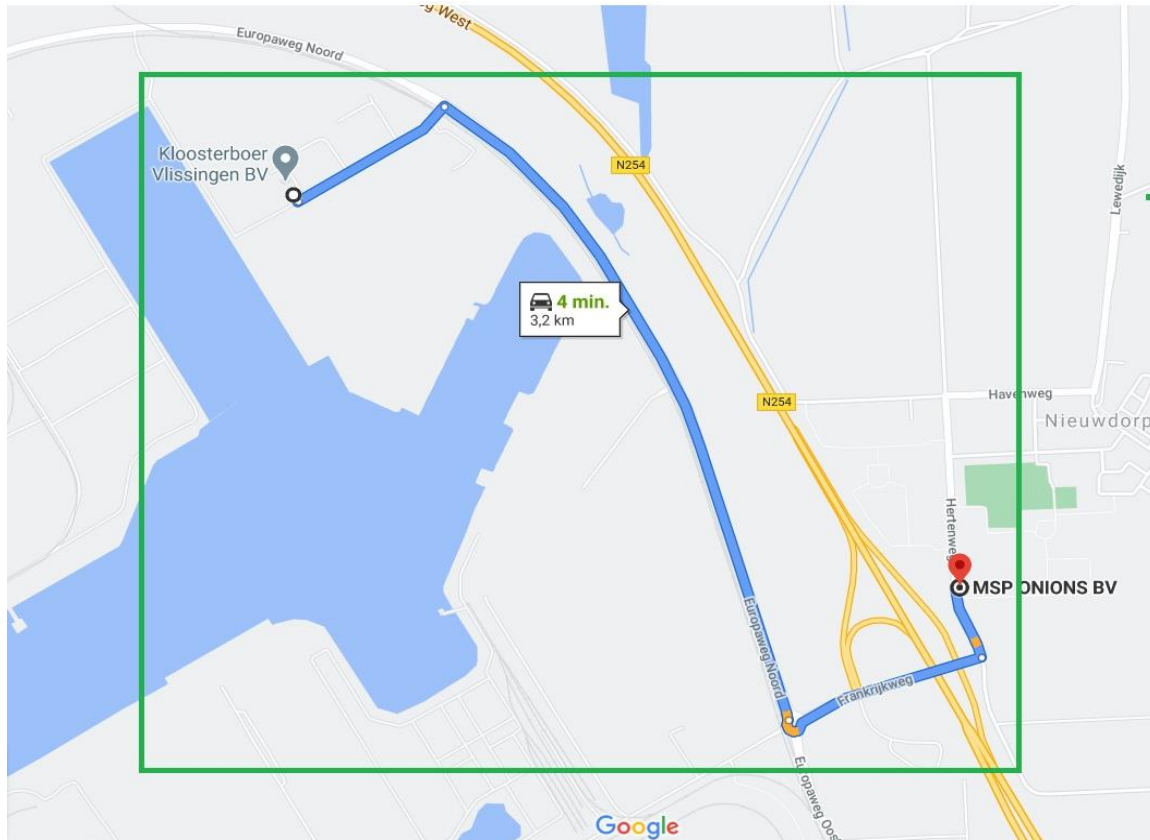
- Tele-Operation
- Gracefully degrading safety fallback
- Tele-Operation station for operator
- Cooperative Adaptive Cruise Control (CACC)

PORT OF ANTWERP SITE

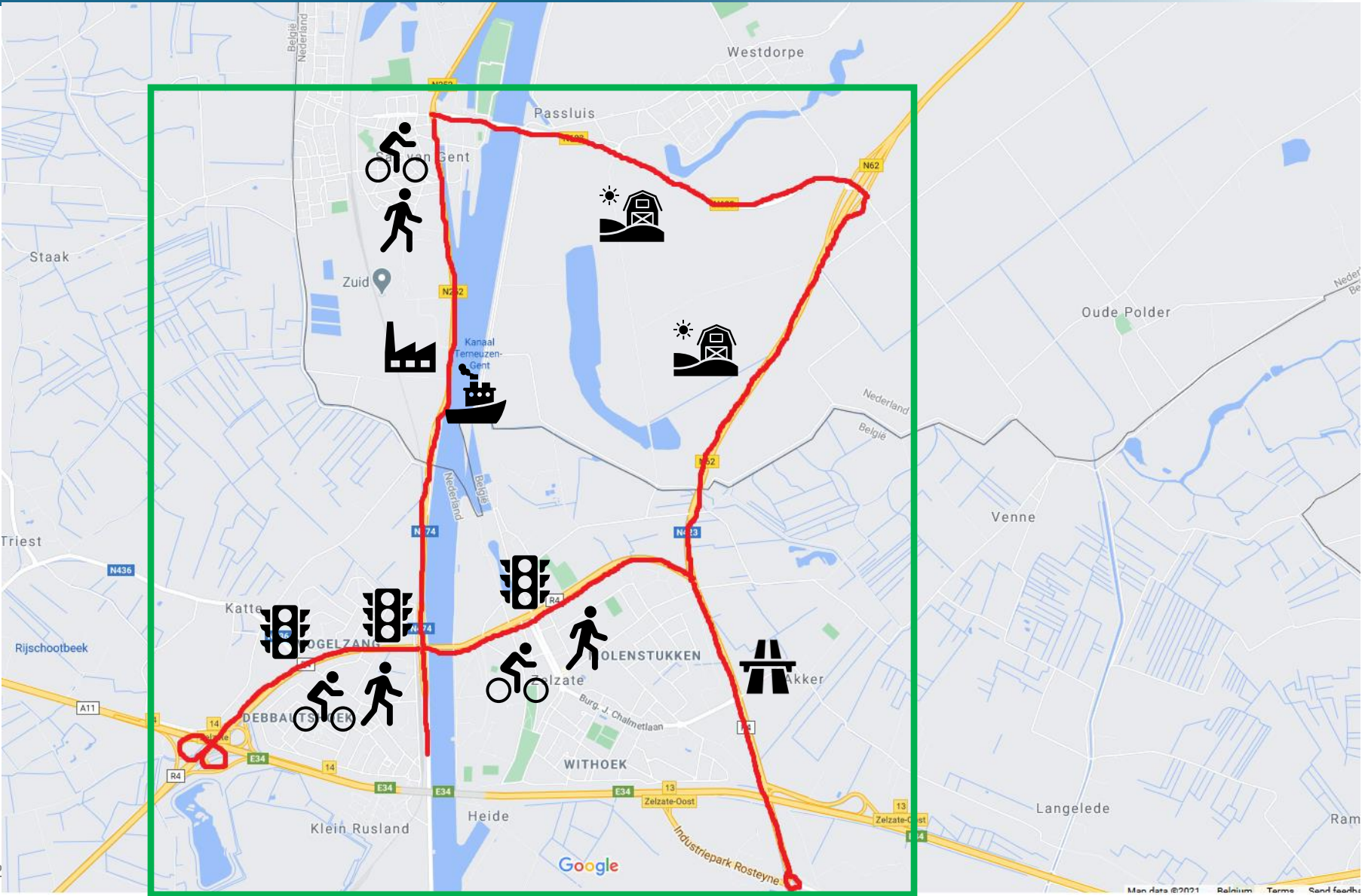
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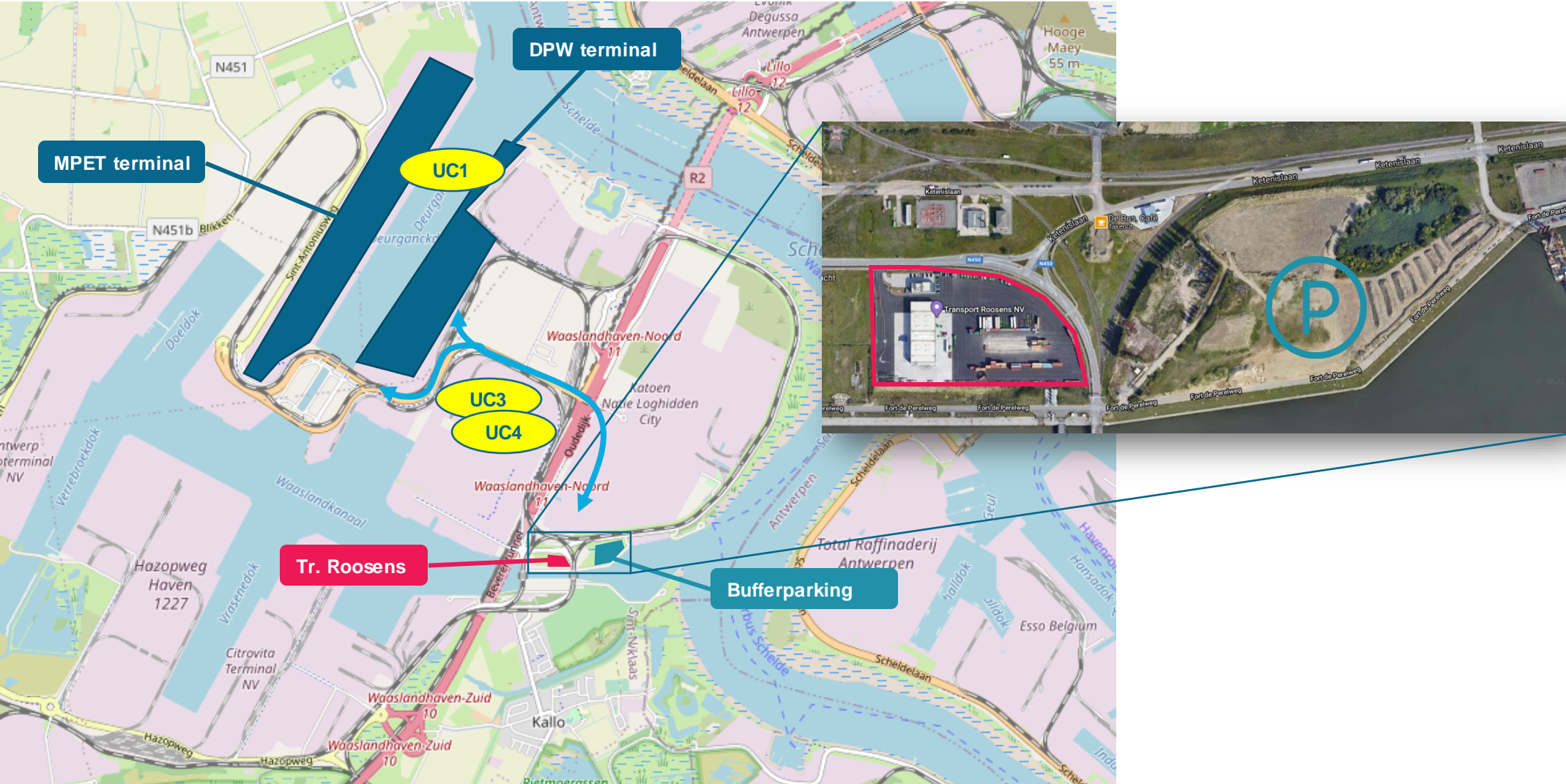
VLISSINGEN SITE DETAILS



ZELZATE SITE DETAILS



ANTWERP SITE DETAILS



PROPOSED SCENARIO DISTRIBUTION ACROSS SITES

Use-case	Vlissingen	Zelzate	Antwerp
UC1 Automated Barge Control		Cross-border <i>passive</i> 7 <ul style="list-style-type: none"> Navigating canal with obstacle (bridge) at the border location 	“Hard” conditions 4 <ul style="list-style-type: none"> Navigating busy port 7
UC2 Automated driver-in-loop docking	Full use case 4 5 6 7 8 <ul style="list-style-type: none"> Truck docking Crane operation 		<i>no test/demo only deployment</i> 1 2 4 5 7
UC3 CACC based Platooning	Milk run <ul style="list-style-type: none"> Between terminal and MSP factory (same trajectory as UC4) 1 2 3 4 5 7	Cross-border (tentative) <ul style="list-style-type: none"> PC5 Mode 3 or UU CACC handover (tentative) 1 2 3 4 5 7	Full use case <ul style="list-style-type: none"> Platooning on different road types Co-existence with ITS-G5 signals
UC4 Remote Takeover Operation	Terminal traffic & basic milk runs <ul style="list-style-type: none"> Confined area (terminal) Short route over 50 km/h public roads and with limited traffic between terminal and MSP factory 1 3 4 5 7 8	Cross-border, high speed, urban <ul style="list-style-type: none"> Crossing the border on 50 km/h public road, 90 km/h in Flanders Urban environment with presence of iTLCs <i>no own streams</i> 1 2 3 4 5 7 8	Milk runs with tunnel <ul style="list-style-type: none"> Short route over 50 km/h public roads, including 2 parallel locks, between terminal and Transport Roosens 1 2 3 4 5 7 8

Enabling functions:

1

Enhanced awareness HMI

2

VRU interaction

3

Time slot reservation intersection

4

Distributed perception

5

Active collision avoidance

6

Container ID recognition

7

ETA sharing

8

Logistics chain optimization

- 5G-Blueprint is
 - Tackling challenging teleoperation-related use cases
 - Exploring the capabilities of 5G regarding not only eMBB but also URLLC requirements
 - Investigates the feasibility of teleoperation over 5G in the context of transport and logistics from a technical, business and governance perspective
 - Aiming to deliver the roadmap to enable future deployments in Europe



5G BLUEPRINT

THANK YOU FOR YOUR ATTENTION



5GBlueprint.eu

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5G PPP WWW.5G-PPP.EU

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