# Pre-deployment of C-ITS services in Gothenburg using a hybrid communication setup

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Kristina Jensen
Project Manager
Urban Transport Administration, City of Gothenburg

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# Nordic Way 3 Collaboration 2020-2023

- NW3: C-ITS pilot projects enabling communication of traffic information between vehicles and infrastructure in the Nordic countries (Sweden, Denmark, Norway and Finland).
- POC Hybrid Initiation: Swarco, Monotch, Volvo Cars, KnowIT, Actia, City of Gothenburg
- Fully aligned with the C-Roads Platform
  - Authorities and Road Owners in Europe
  - Agreement to enable interoperable and seamless cross border C-ITS Services in Europe

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# Nordic Way 3 Proof of Concept

- **Goals & Purposes**

1. Demonstrate Hybrid Communication between vehicles and infrastructure

   to Prove that IP-based (long range) and Wi-fi based (short range) C-ITS solutions can be combined

2. Collect and Explore CAM-data

   to understand if and how CAM-data can be used to improve future traffic management

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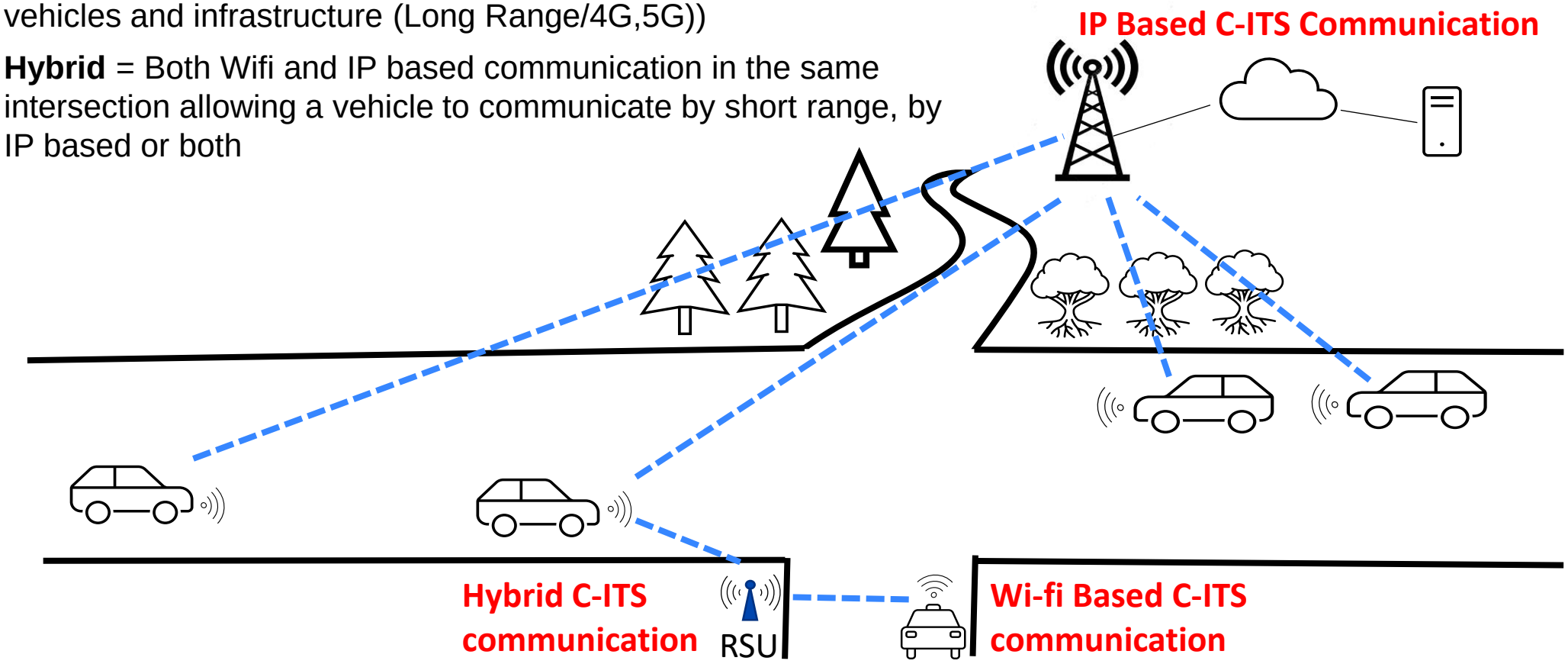
# Hybrid C-ITS Communication

**Wifi based C-ITS**= Communication between vehicles and infrastructure via Road Side Units (Short Range/G5)

**IP based C-ITS** = Cloud to Cloud internet communication between vehicles and infrastructure (Long Range/4G,5G))

**Hybrid** = Both Wifi and IP based communication in the same intersection allowing a vehicle to communicate by short range, by IP based or both

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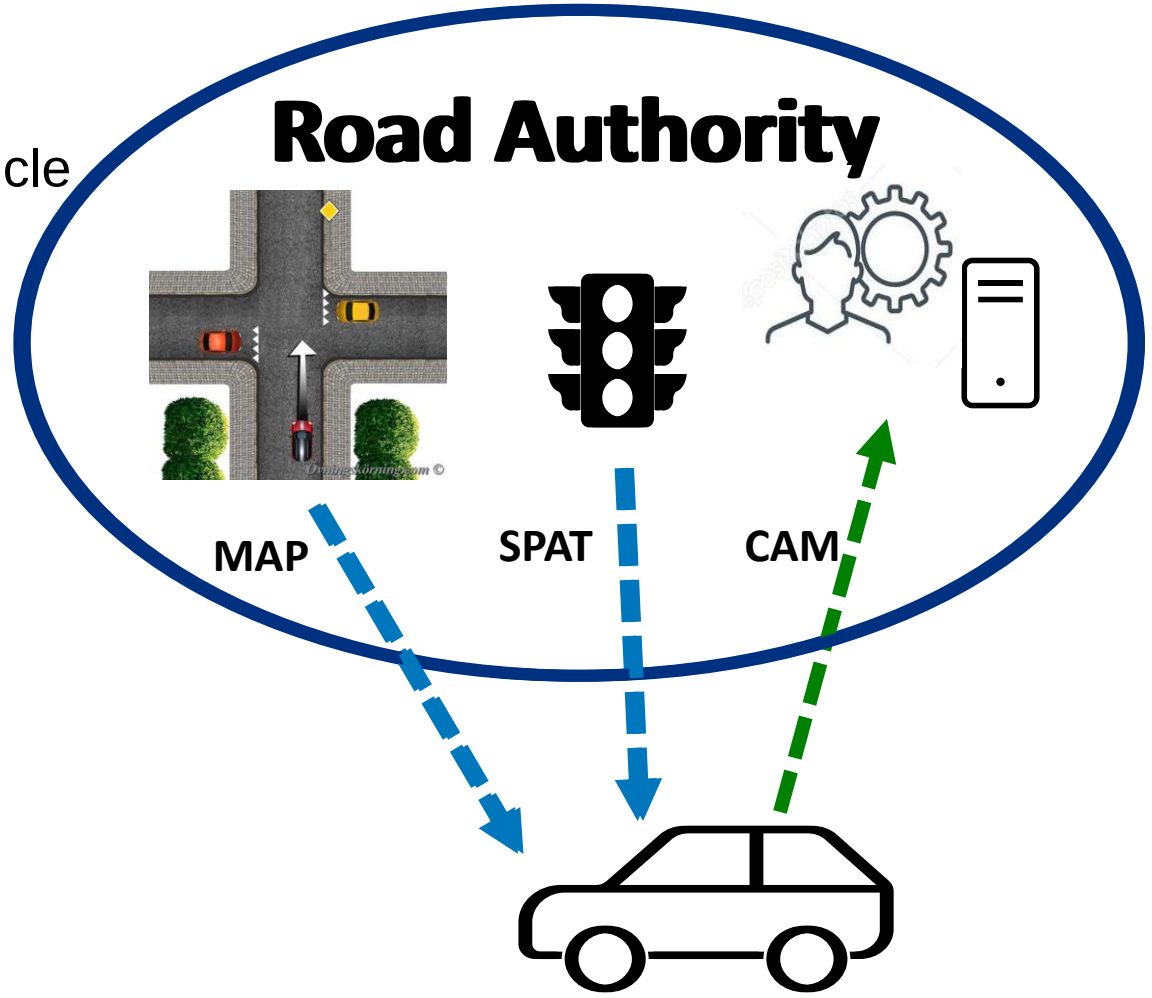
# Services to be piloted

Based on SPAT/MAP data from Infrastructure to Vehicle

- **GLOSA,** Green Light Optimized Speed Advisory
- **TTG,** Time To Green:
- **SI-SPTM,** Signal Phase and Timing Manoeuvrers

Based on data from vehicles to Infrastructure

- **Digital Notification**

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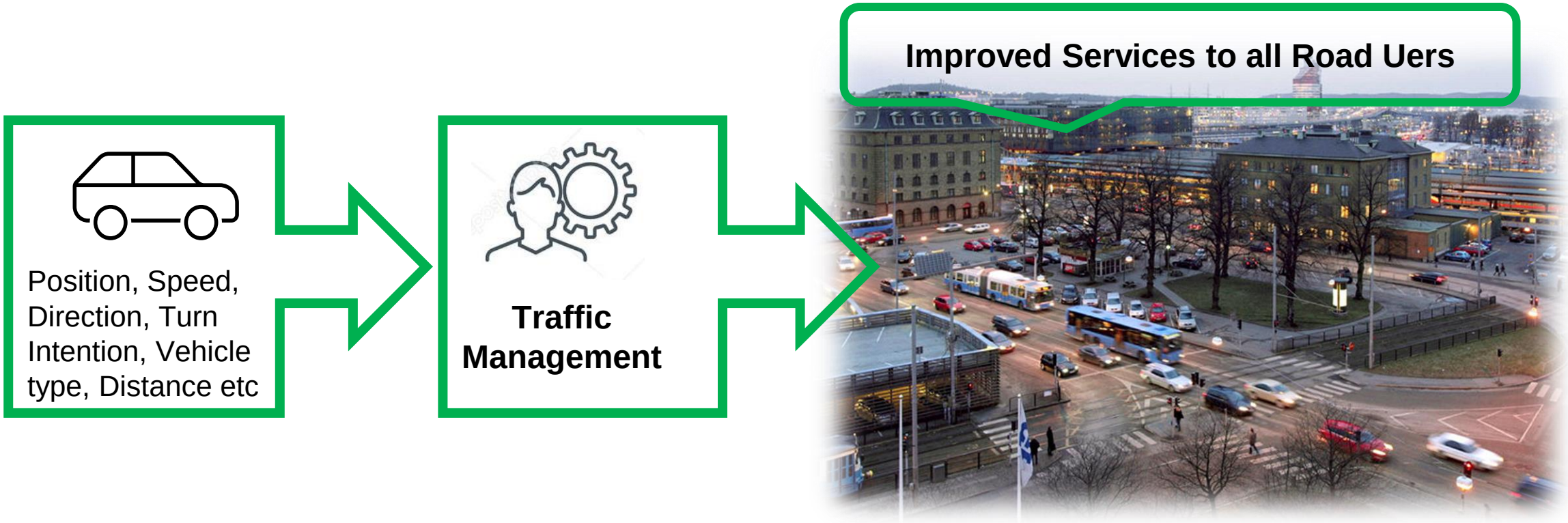
# Data From Vehicle to Infrastructure

City of Gothenburg



# Digital Notification

- **New C-ITS Use Case Proposal to C-Roads Signalized Intersection**
  - Digital Notifications are made from Vehicles to Infrastructure

- **First step: Collect and Analyse CAM data**
  - Explorative phase
  - Compare short and long range messages
  - Latency and Accuracy in different urban environments

- **Next step: Use Vehicles as virtual detectors for control of the Traffic Signals**
  1. **Inductive Loops can be replaced**
     - Reduced Maintenance and Costs
  2. **New traffic management services based on CAM Data**
     - Optimized signal group phasing
     - Green Time extension
     - Prioritization of selected vehicles (delayed bus, heavy traffic)

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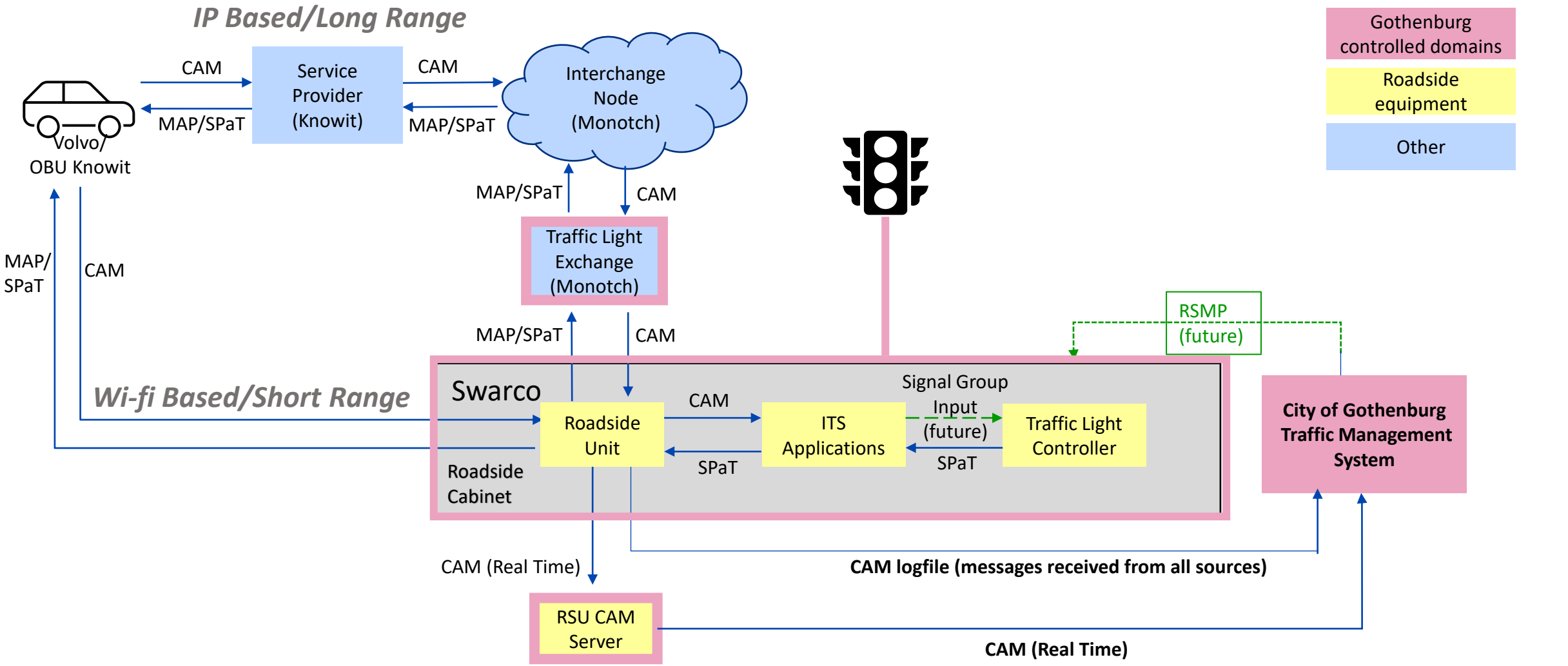
# Combined use cases

Nordic WAY 3

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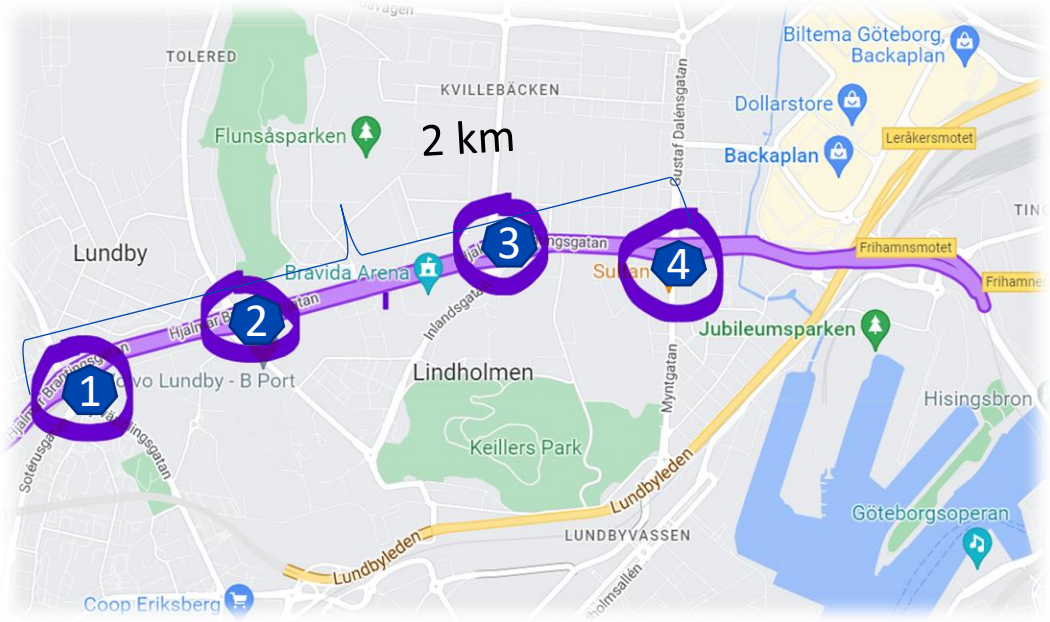
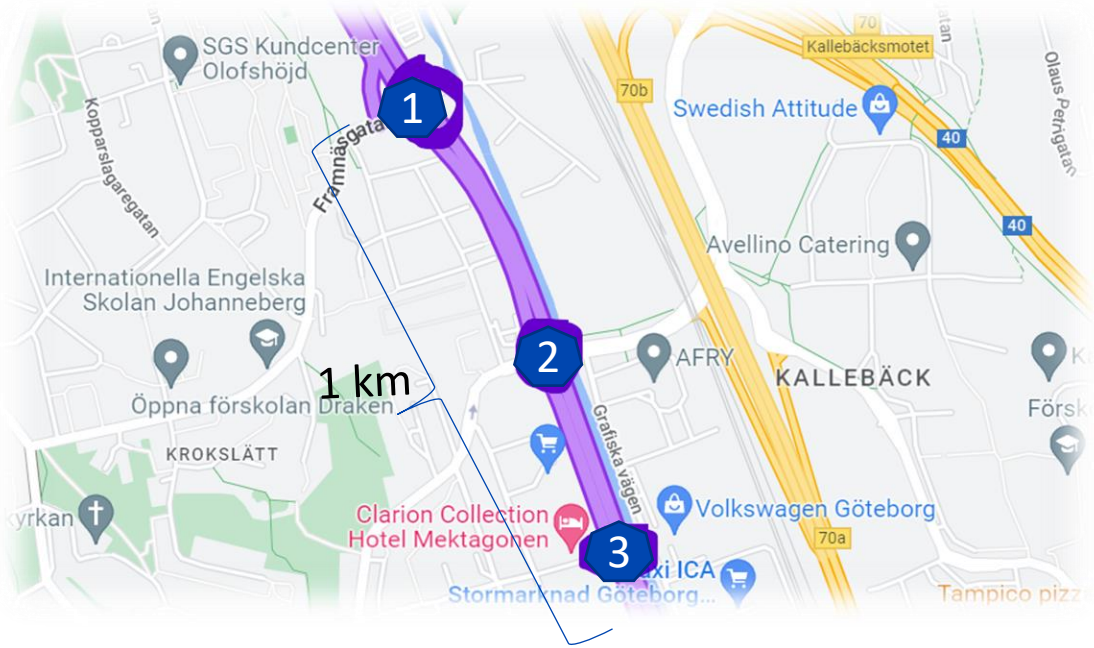
# Gothenburg Test Routes

- 2 Hybrid Test Routes in Gothenburg, Sweden
- Both Wifi- and IP Based C-ITS communication

**Hjalmar Branting, 4 fixed time intersections**




**Mölndalsvägen, 3 actuated intersections**





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# Test Route Hjalmar Branting

*Fixed time Traffic Signals*


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# Test Route Mölndalsvägen

*Actuated Signals*


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# Challenges

- No detailed C-Roads definitions of
  - Hybrid C-ITS Communication Use Cases & Test Cases
  - Digital Notification in Signalised Intersection Use Cases & Test Cases
- GDPR Various interpretations

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# Opportunities

- Hybrid C-ITS enables fast scaling up of services
- High Quality C-ITS Communication when 2 methods supporting each other
- Digital Notification: More efficient Traffic Management & Less Emissions

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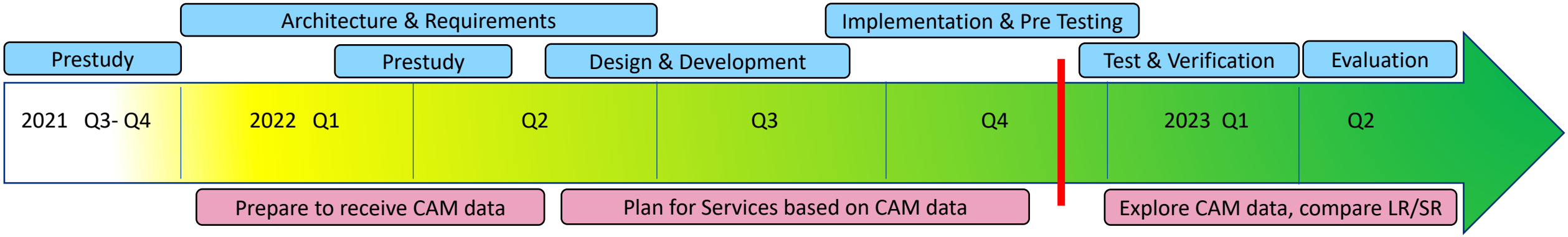
# Timeline – Hybrid Communication POC

- Implementation and Pre Testing Q4 2022
- Test and Verification Q1-Q2 2023
- Evaluation Q2-Q3 20

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