SIS14 - Towards Collaborative Mobility

SP2 EMPOWER, TEAM IP
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ITS WC 2013, Tokyo

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Agenda

Tomorrow's Elastic Adaptive Mobility

(1) SP2 Objectives and main innovations

(2) SP strcture and status

(3) LDM++ & Automotive Cloud Overview

(4) Positioning Overview

(5) Communication – V2X-LTE Overview

(6) Security Overview

Objectives and main innovations

Tomorrow's Elastic Adaptive Mobility

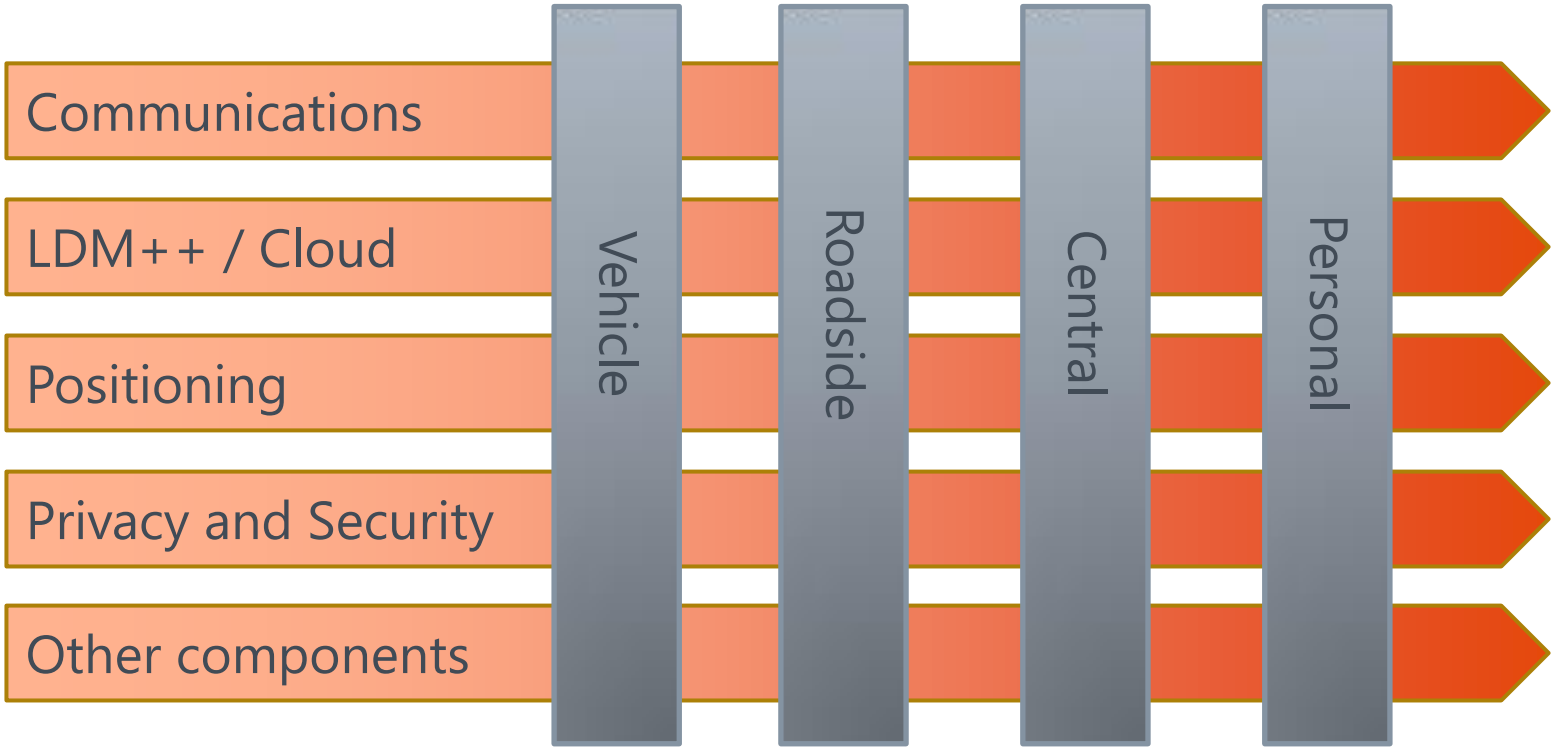
SP2 Objectives within TEAM

1. Build and Provide technology components common to SPs

2. Deliver enabling communication technologies and cloud services

3. Assure technical interoperability in all levels: vehicle, personal, central and roadside ITS subsystems

Objectives and main innovations



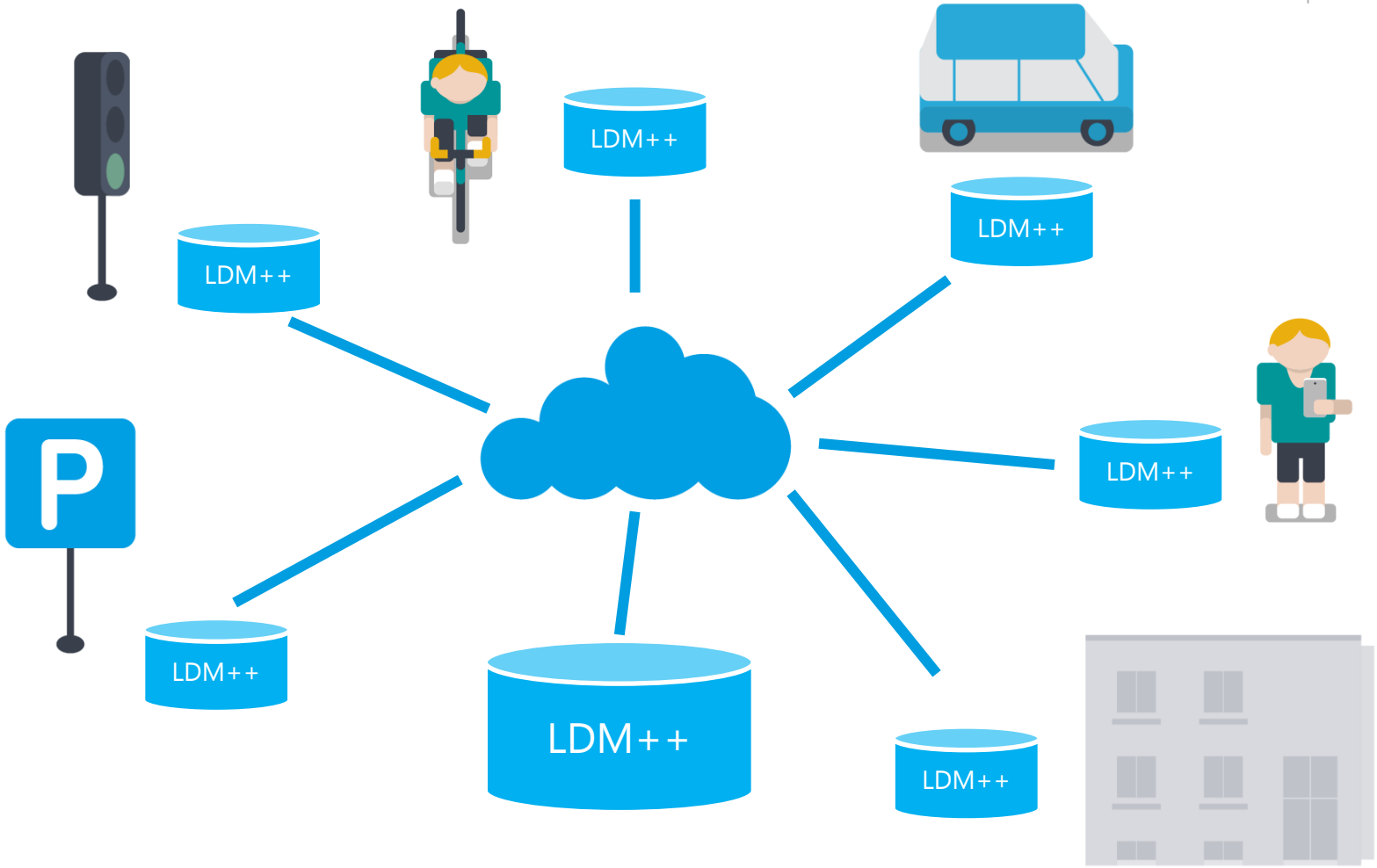
LDM++ & Automotive Cloud Overview

Tomorrow's Elastic Adaptive Mobility

Motivation

1. Traffic Management Centers TMC common in major European cities
   a. operate traffic information and control systems,
   b. integrating information sources: detectors, floating car data, CCTV
   c. trigger control actions
   d. provide traffic information to stakeholders
   e. primary objectives: safety, improving traffic throughput, reduce congestion and emission
2. TEAM provides solution to allow a better connection of the TMC content and the travelers

LDM++ Vision

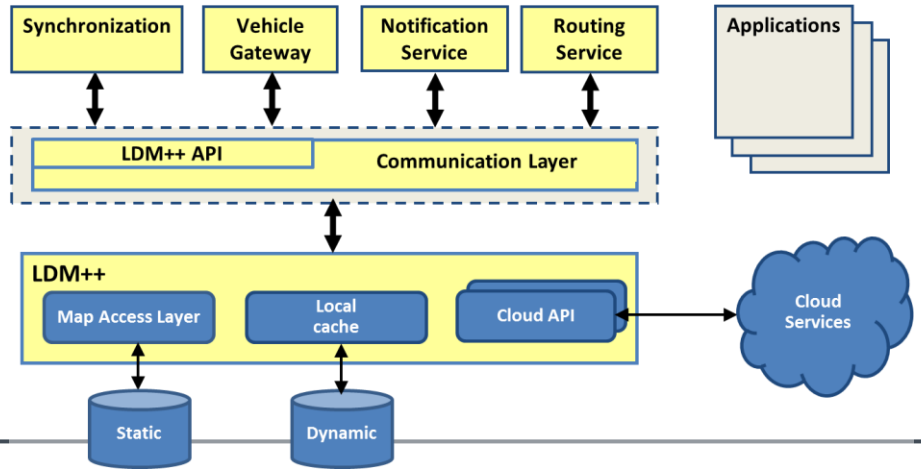


LDM++ & Automotive Cloud Overview

Tomorrow's Elastic Adaptive Mobility

Main Innovations

1. Local Dynamic Map (LDM), developed in SAFESPOT and CVIS
2. originally for cooperative systems, focusing on safety and traffic efficiency
3. LDM as a database for time critical highly dynamic data needs
   a. position of surrounding vehicles
4. Real time n-layer architecture
5. static and dynamic location-based cloud data store



LDM++ & Automotive Cloud Overview

Tomorrow's Elastic Adaptive Mobility

Main Innovations

1. Local View
   a. local components extracts data for the traveler
   b. Local data is centered around his position
   c. real-time database
2. Local generated
   a. local map content modifications
   b. add and update of dynamic data
   c. directly integrated in the central data store
3. cloud services with QoS requirements
   a. achieve seamless QoS performance
   b. provide certain levels of robustness wrt communication availability

LDM++ and Automotive Cloud

Tomorrow's Elastic Adaptive Mobility

Use Cases

1. Provide Storage for geo reference data
2. Layered map information
3. Map objects annotation
4. Map Matching and geocoding
5. Automotive Cloud data synchronization
6. Local Map Enviroment Broadcast
7. Pusch data to local LDM++ stub on an event
8. Map rendering
9. Specific layer routing

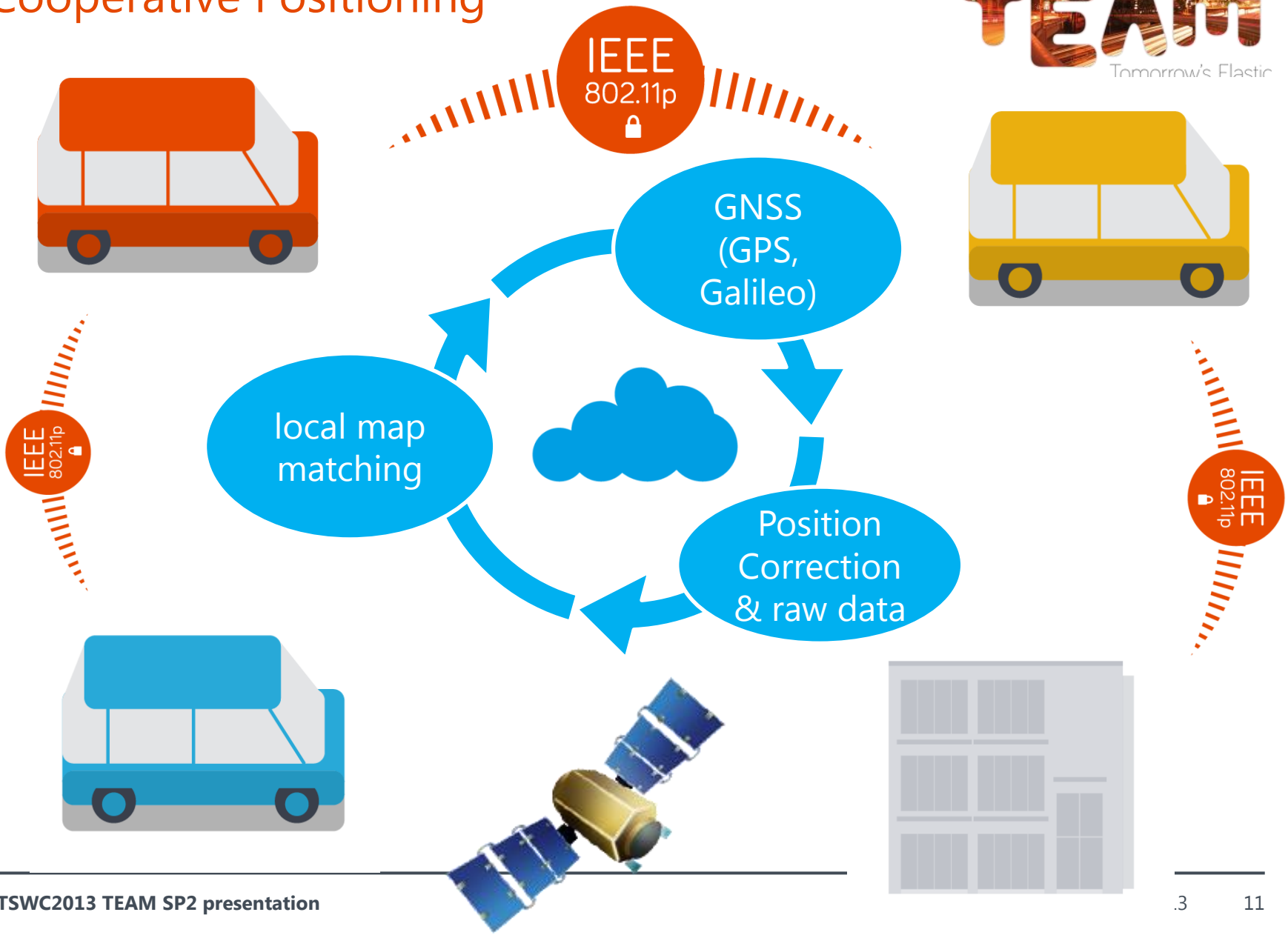
Cooperative Positioning Overview

Tomorrow's Elastic Adaptive Mobility

Motivation and background

1. Precise positioning
   a. for driver assistance and support systems
   b. with mass market receivers
2. CoVeL (co-funded by the European GNSS Agency) developed a precise positioning system based on :
   a. relative positioning
   b. cooperative map matching.
3. CoVeL used
   a. GNSS raw data among vehicles and infrastructure (802.11p)
   b. plus EGNOS and EDAS correction.
4. CoVeL has lane level position accuracy in extra-urban scenarios

Cooperative Positioning

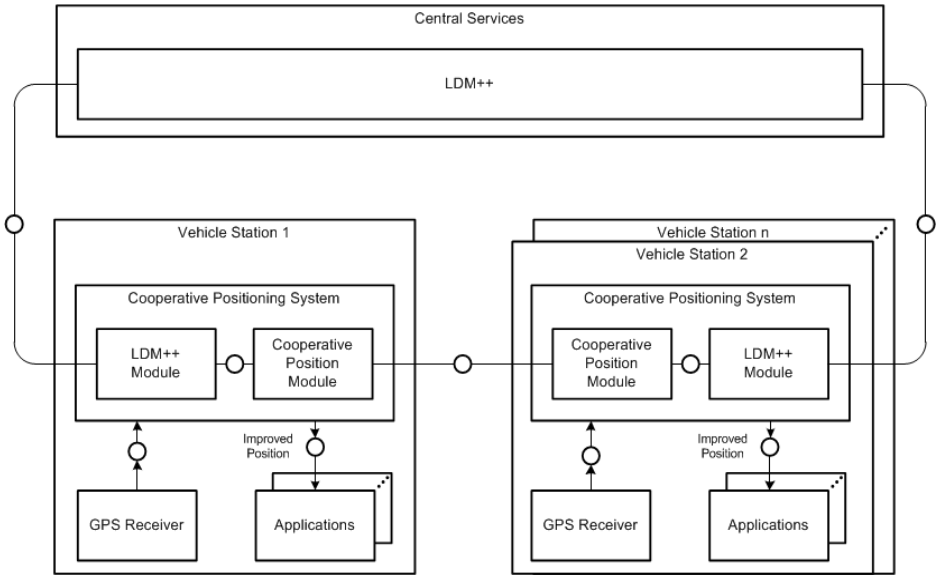


Cooperative Positioning Overview

Tomorrow's Elastic Adaptive Mobility

Main Innovations

1. TEAM starts from CoVeL project (ended in December 2011)
2. development on cloud-based cooperative map matching
3. Combination
   a. local map matching among vehicles
   b. differential positioning, supported by the infrastructure
4. Distribution of corrections at local level
5. Seamless integration of the European Union's Galileo GNSS system.



Cooperative Positioning

Tomorrow's Elastic Adaptive Mobility

Use Cases

1. Cooperative Position with infrastructure
2. Cooperative Position with mobile units
3. Cooperative Position with parked vehicles

Communication – V2X-LTE Overview

Tomorrow's Elastic Adaptive Mobility

Motivation

1. ETSI and CEN/ISO are currently specify V2X protocols and application models
2. LTE promises wide-area connectivity, low latency and high bandwidth
3. LTE deployed in most parts of Europe providing broadband coverage
4. LTE is designed for human-based, communication in low-to-medium vehicular scenarios
5. LTE not designed for ITS
   a. inefficiency in the transportation of data generated by automotive applications
6. interaction and interdependency between communication infrastructure and the automotive applications

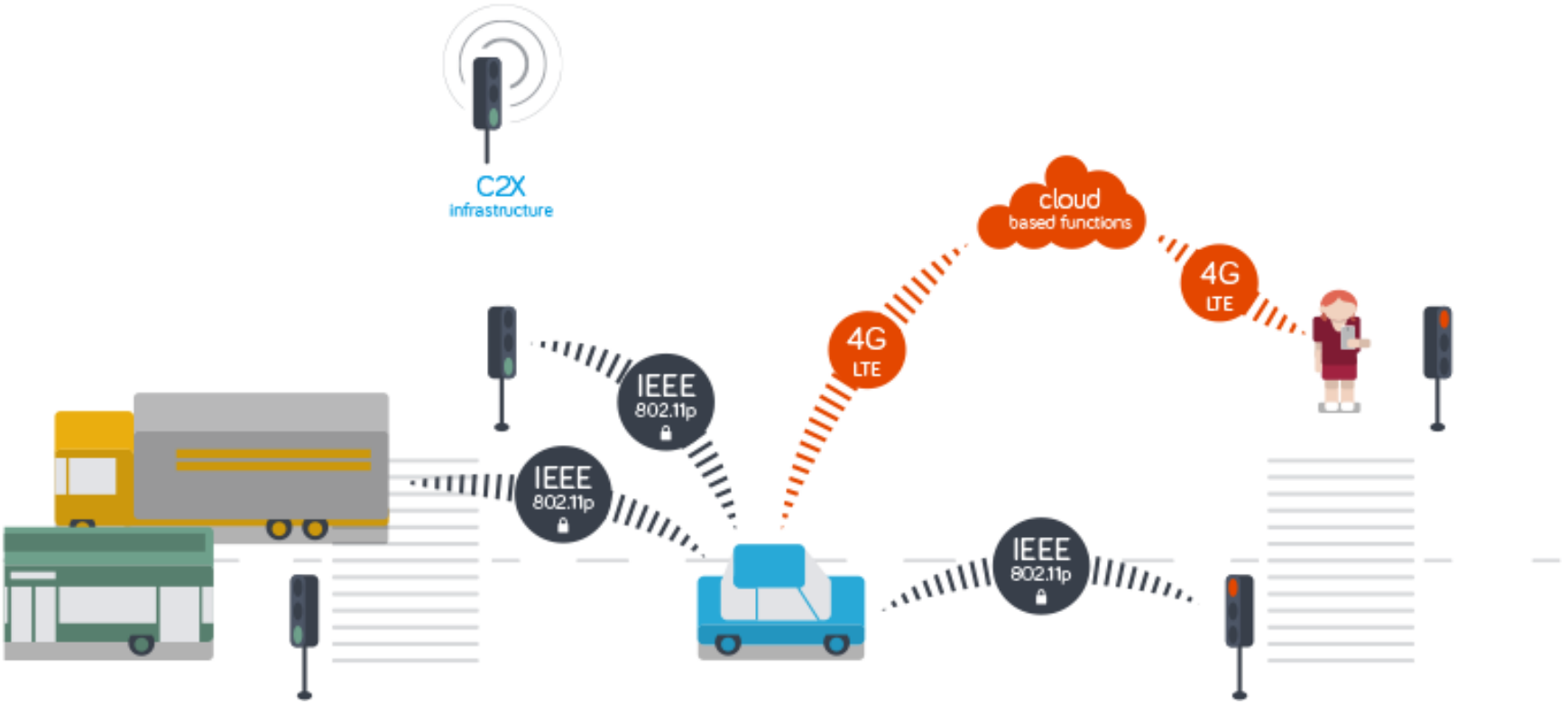
LTE

C2C

Cloud

C2I

Tomorrow's Elastic Adaptive Mobility



Communication – V2X-LTE Overview

Tomorrow's Elastic Adaptive Mobility

Main Innovations

1. Combination of LTE, 802.11p and GeoNetworking

2. Combine and complement these technologies
   a. achieve low latency, wide coverage, and high scalability

3. Analysis of effect of communication delays on distributed algorithms

4. impact of congestion on the dynamic ad hoc communication networks

Communication Use Cases

Tomorrow's Elastic Adaptive Mobility

Use Cases

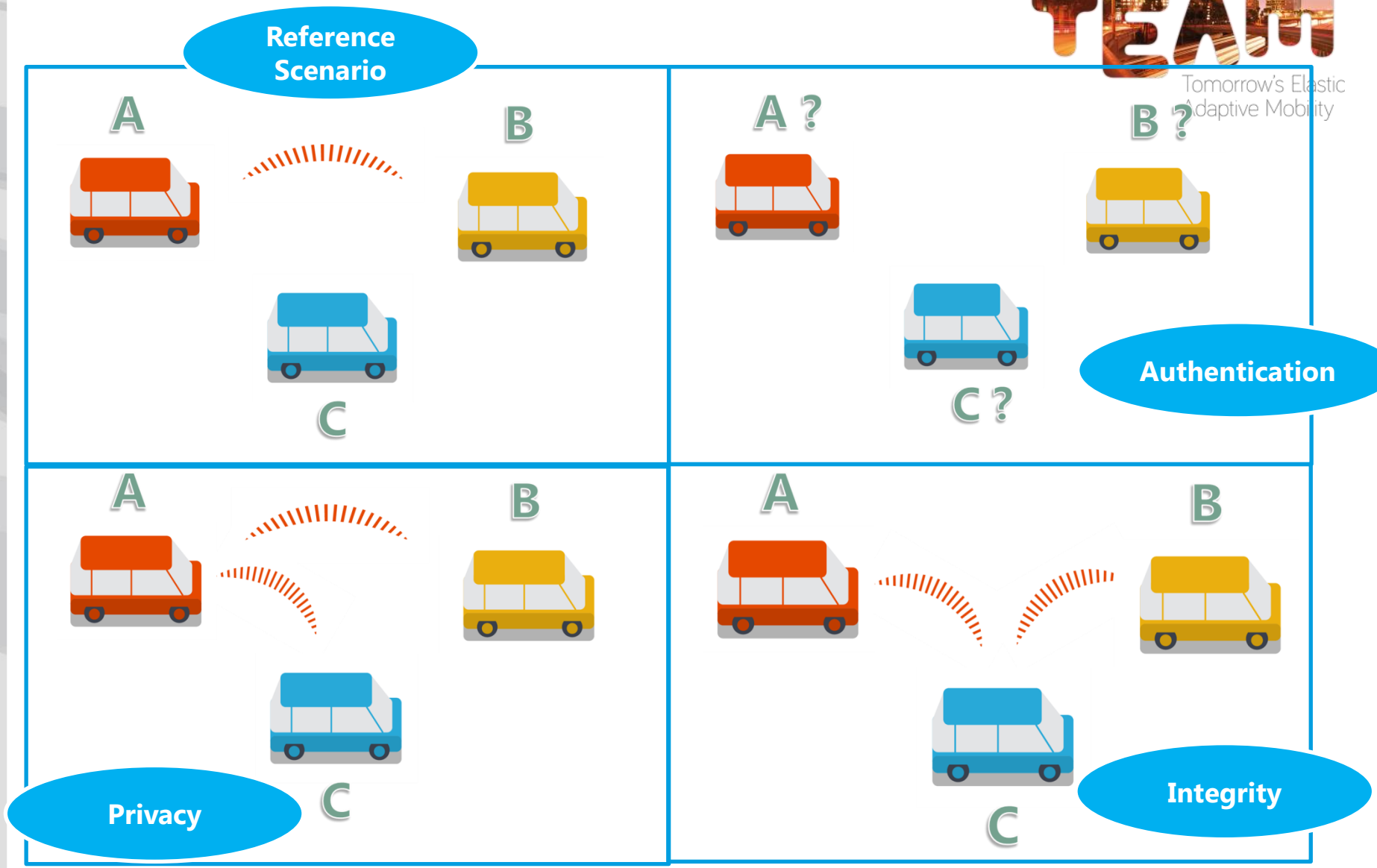
1. V2X wireless communication Support
2. Communication support for safety purposes
3. Geo-casting communication
4. Seamless mobility between areas covered from different base stations and/or different technologies
5. Information dissemination support

Security Overview

Tomorrow's Elastic Adaptive Mobility

Motivation

1. Securing communications and privacy preserving are key in communications systems
2. ITS is ad-hoc nature
   a. communications technologies: LTE, ITS G5A, 3G
   b. multimodal environment
3. TEAM Uses:
   a. PRE-DRIVE C2X security architecture
   b. Threat, Vulnerability and Risk Analysis of ETSI
   c. ETSI TS 103 097 security standard
4. ITS elements require security
   a. communication, positioning, LDM++, cloud services…

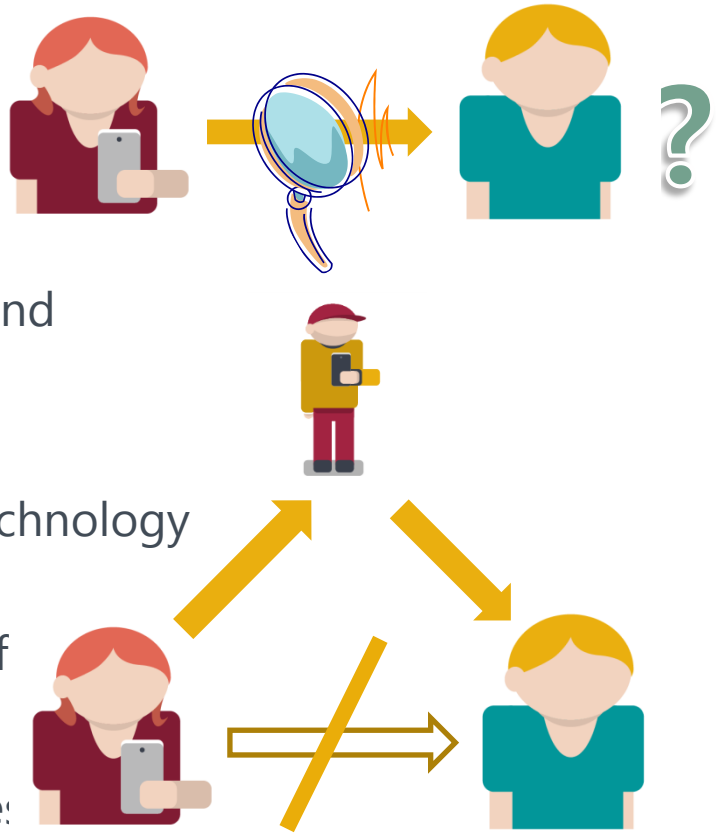

Reference Scenario
A
B
C
A ?
B ?
C ?
Authentication
A
B
C
Privacy
A
B
C
Integrity

Security Overview

Tomorrow's Elastic Adaptive Mobility

Main Innovation / Approach

1. Three primary services:
   a. authentication, integrity and confidentiality
2. security and privacy-preserving categories:
   a. systems security, communications security and location privacy protection
3. multimodal security solution for ITS
4. Uses of result from singular communication technology modes
5. integrate different PKI solutions for cross-certif
6. employing a trust hierarchy for ITS
7. balanced processing effort on bounded device



Security, Privacy, and Reliability

Tomorrow's Elastic Adaptive Mobility

Use Cases

1. Privacy protecting use cases
   a. User profile data privacy
   b. Preservation of location privacy
   c. Prevent pseudonym linkage
2. Protection of V2X communication channels
   a. Protection of broadcast V2X communication
   b. Protection of unicast V2X
   c. Protection of aggregated V2X
3. Protection of local data and systems
   a. Secure storage of local data
   b. Secure installation of TEAM applications
   c. Safe interconnection with external
4. Derived security use cases
   a. Deployment of security credentials

Thank you!

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