Why C-ITS and V2X communication?

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Why V2X communication?

Mechanical Century

- Limited perception
- 100% driver-dependant
- Safety: reaction

Digital Era

- Enhanced perception (V2X)
- Autonomous driving transition
- Safety: anticipation

Electronical decades

- Extended perception (sensors)
- Assisted driving
- Safety: detection, warning and reaction

XX Century

2000-2020

2020 and beyond

AtoS

What are V2X communications for?

The vehicles must be aware of what they can't see

Communication

▶ **Exchange of messages** is the key

▶ V2X, V2V, V2I, I2V, etc.

3 Goals

Safer
Less accidents and deaths

Smarter
Less time, less traffic congestion

Greener
Less pollution

Interoperable Critical Services

▶ Full and **safe integration** of future **automated vehicles** in the overall transport system

▶ **Standardization:** All solutions must follow technical and security standards requirements

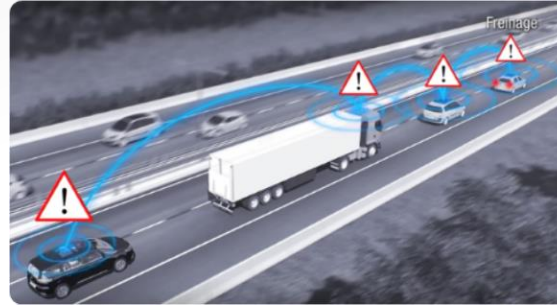▶ **Regulation:** National or supra-national institutions define regulations or guidelines
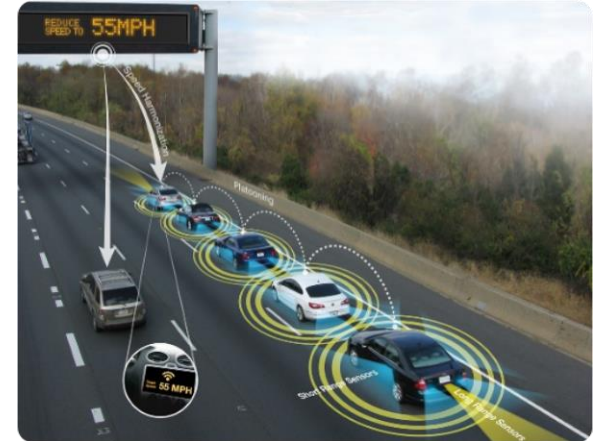
What are V2X communications for?
Use cases

Day 1
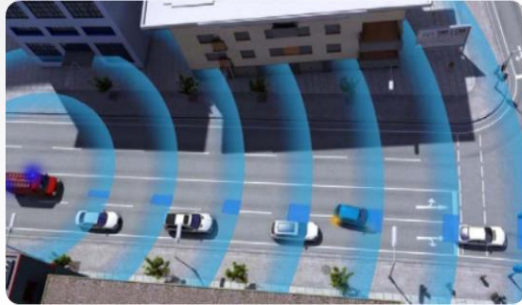
Day 2

Emergency Vehicle Approach

Emergency Electronic Brake Lights

Platooning

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What impacts do C-ITS services have?
European transport trends

C-ITS spare impact over time 2020-2030

Accidents + Urban Journey Time + Oil Consumption + CO_2 Emissions + Pollution

with **Day 1** services
= Close to **100 billion EUR** spared

with **Day 1.5** services
= around **3 times more**

Very strong impact on urban mobility
Strong impact on CO_2 emissions and oil consumption

Massive **Horizon 2020** funding = **6,3 billion EUR**
into "Smart, Green and Integrated Transport"

European Commission

Safety needs security

But if I want to send and receive messages…

… How can I guarantee **TRUST**?

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Foundation of Mobility Digital Trust

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Specific nature of the C-ITS PKI

C-ITS messages must allow almost
instantaneous reactions when facing
unexpected road events

Problematics

X.509 certificates formats are
not adapted to C-ITS needs:
high computation power, long delays

A new kind of PKI is required:
ETSI TS 103 097
Security requirements + C-ITS certificates format
ETSI TS 102 940/941
Architecture + related information exchange protocol

Solutions

The PKI is conceived as:
Foundation of security and trust
Cornerstone of interoperability

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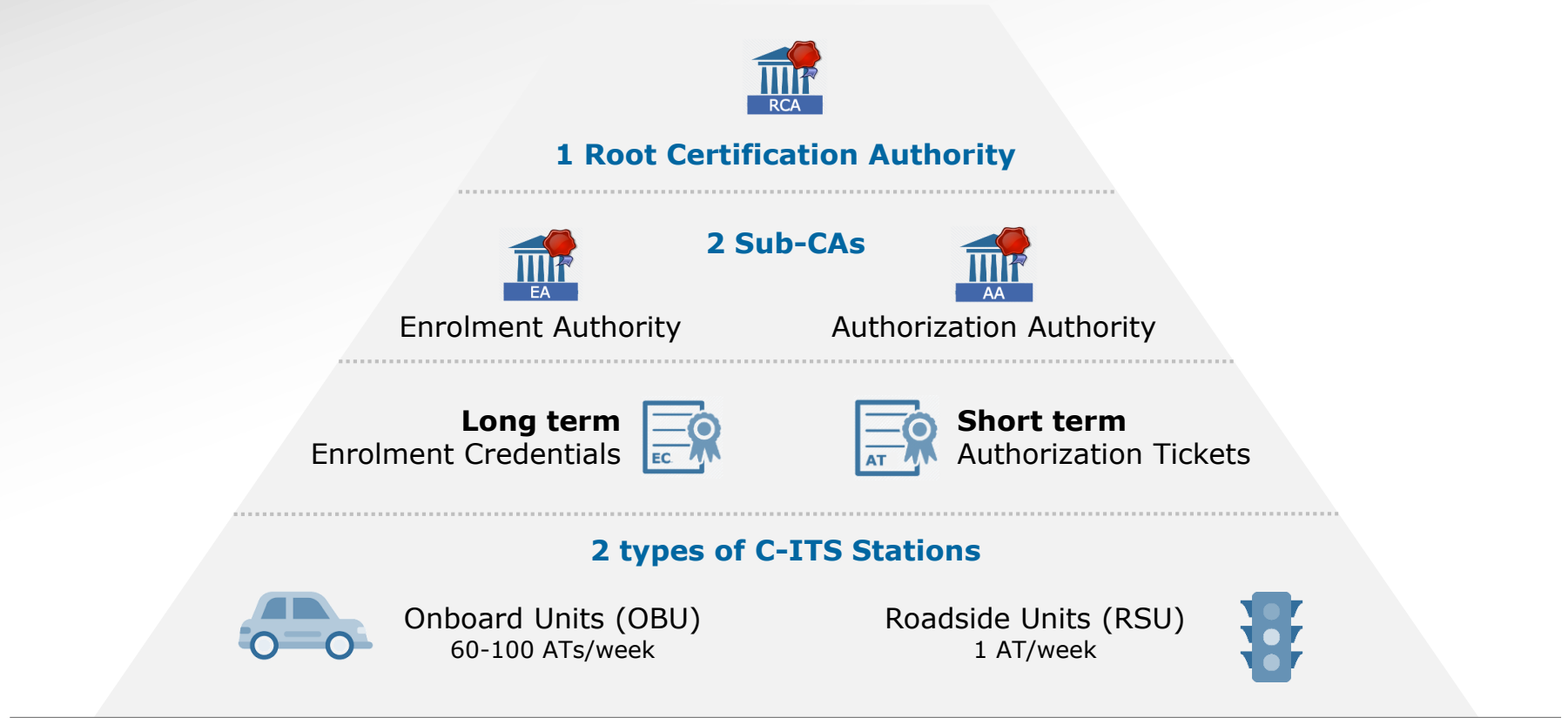# C-ITS PKI key functions

| ACCESS CONTROL to C-ITS applications | AUTHENTICATION & INTEGRITY of V2X communications | REVOCATION of misbehaving entities | PRIVACY No user's tracking |

C-ITS PKI key parameters

1 Root Certification Authority

2 Sub-CAs

Enrolment Authority   Authorization Authority

Long term
Enrolment Credentials

Short term
Authorization Tickets

2 types of C-ITS Stations

Onboard Units (OBU)   Roadside Units (RSU)
60-100 ATs/week   1 AT/week

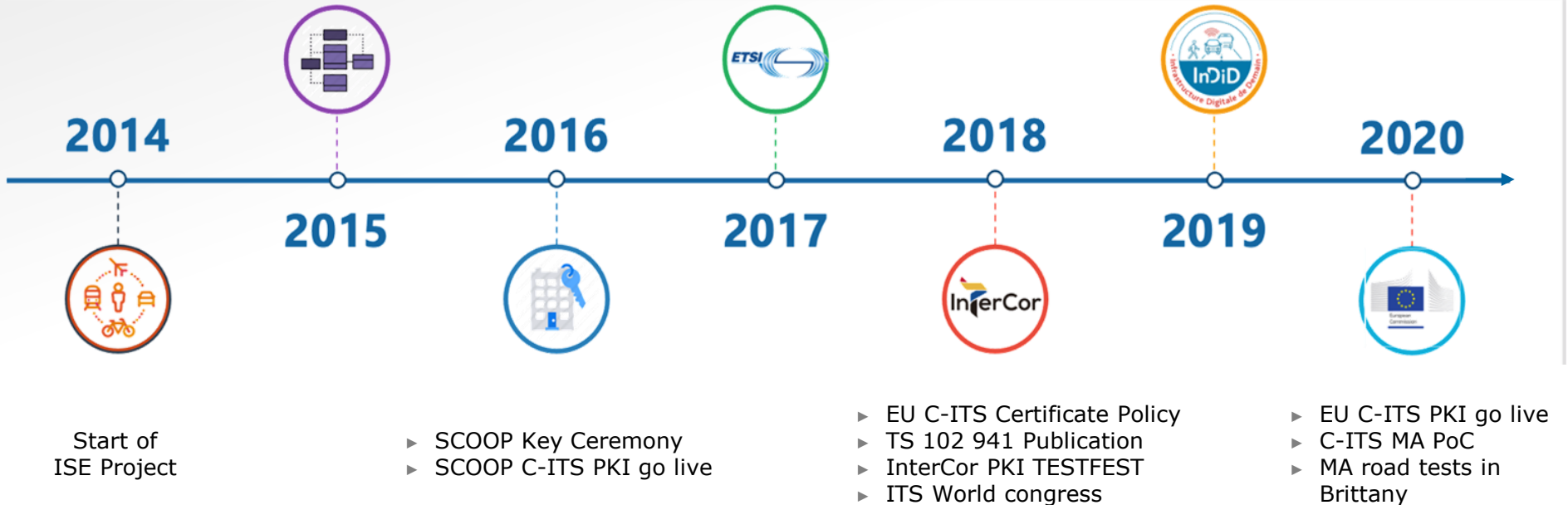# Research, pilot and EU central PKI projects

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Atos C-ITS History

- ▶ C-ITS PKI Specifications & PoC
- ▶ PKI Seminar for SCOOP partners
- ▶ ITS World Congress

- ▶ Start of SCA project
- ▶ TS 103 097 Publication
- ▶ ITS European congress

- ▶ ETSI Plugtests PKIv2
- ▶ Start of InDiD project

2014   **2015**   **2016**   **2017**   **2018**   **2019**   **2020**

Start of
ISE Project

- ▶ SCOOP Key Ceremony
- ▶ SCOOP C-ITS PKI go live

- ▶ EU C-ITS Certificate Policy
- ▶ TS 102 941 Publication
- ▶ InterCor PKI TESTFEST
- ▶ ITS World congress

- ▶ EU C-ITS PKI go live
- ▶ C-ITS MA PoC
- ▶ MA road tests in Brittany

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Atos current projects

Research

2021-2023

Trusted Autonomous Mobility (**TAM**) SystemX research project

Pilot

2016-2023

Infrastructure Digitale de Demain (**InDiD**) French C-ITS pilot project

Production

2020-2026

C-ITS EU Root CA
European C-ITS PKI service

Success story

EU Strategy for mobility of the future

Atos deployed and operates the World first continental C-ITS PKI. It makes it possible for any stakeholder from the EU ecosystem to access a central service to secure their V2X communications

EU C-ITS Central PKI
Scope

Different Needs = Different Models

Internal

▶ **Direct registration** of C-ITS stations in the internal C-ITS EU PKI

External

▶ Private **C-ITS Sub-CAs trusted** by the **EU Root CA**

Different Purposes = Different Services

L0

▶ **Testing** and integration works, less mature pilot projects

L1

▶ **Stable pilot** operation, full-scale production **not CP certified**

L2

▶ Full-scale **EU CP certified** production

IDnomic C-ITS PKI video

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Evolution and future developments

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What's next?

C-ITS "Day 2+" Services

Based on collective perception
**Vulnerable Road User (VRU),
Cooperative Adaptive Cruise
Control (CACC), etc.**

New security challenges

By relying on technological trends
**AI-based misbehavior detection
Crypto-agility with Post-Quantum
Cryptography
Hybrid communication ITS-G5/5G
etc.**

Regulation

Technical and organizational
measures
**UNECE WP.29
GDPR
etc.**

Standardization

Development of new standards
**ISO
ETSI
IEEE
etc.**

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Beyond the C-ITS ecosystem
Cross-ecosystem PKI concept

Prerequisite

The need for **security** and **trust** becomes more and more **critical** in **heterogeneous environments and industries** that require information exchange between **numerous independent stakeholders**

Transport

- ▶ Smart-city integration
- ▶ Rail
- ▶ Urban air traffic
- ▶ Smart-ports

Others

- ▶ Health
- ▶ Finance
- ▶ Legal sector
- ▶ And more

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Key Take Aways

Business Outcomes

▶ World 1st continental certified C-ITS PKI

Certified Solution

▶ ETSI C-ITS standards compliant

▶ EU CP compliant

Pioneer

▶ Experience since 2014

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Thank **YOU**

For more information please contact
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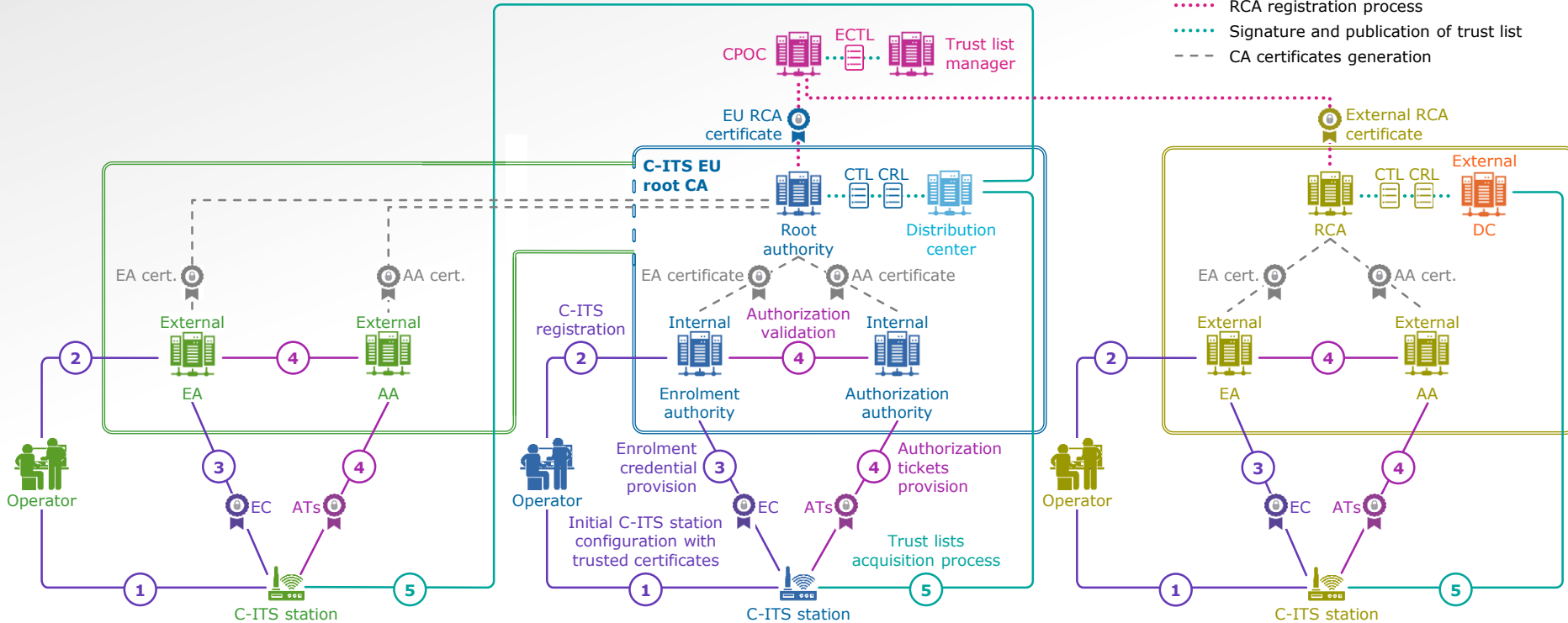simone.glenat@atos.net

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Architecture schemes

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Architecture schemes
Global V2X PKI overview (L1 & L2 services)

Architecture schemes
L0 service