

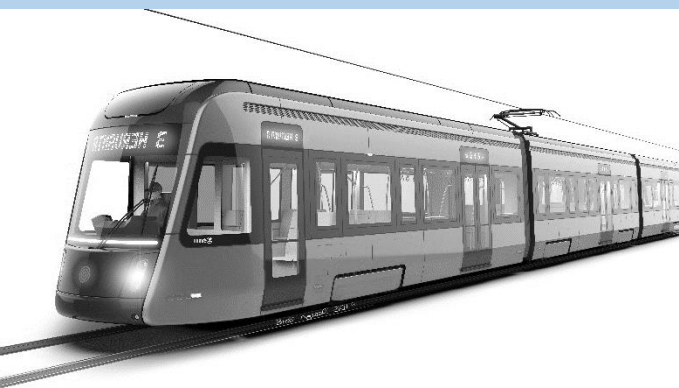


# Smart Tram Ecosystem

Skoda Transtech

19.3.2019

# Tampere Smart Artic

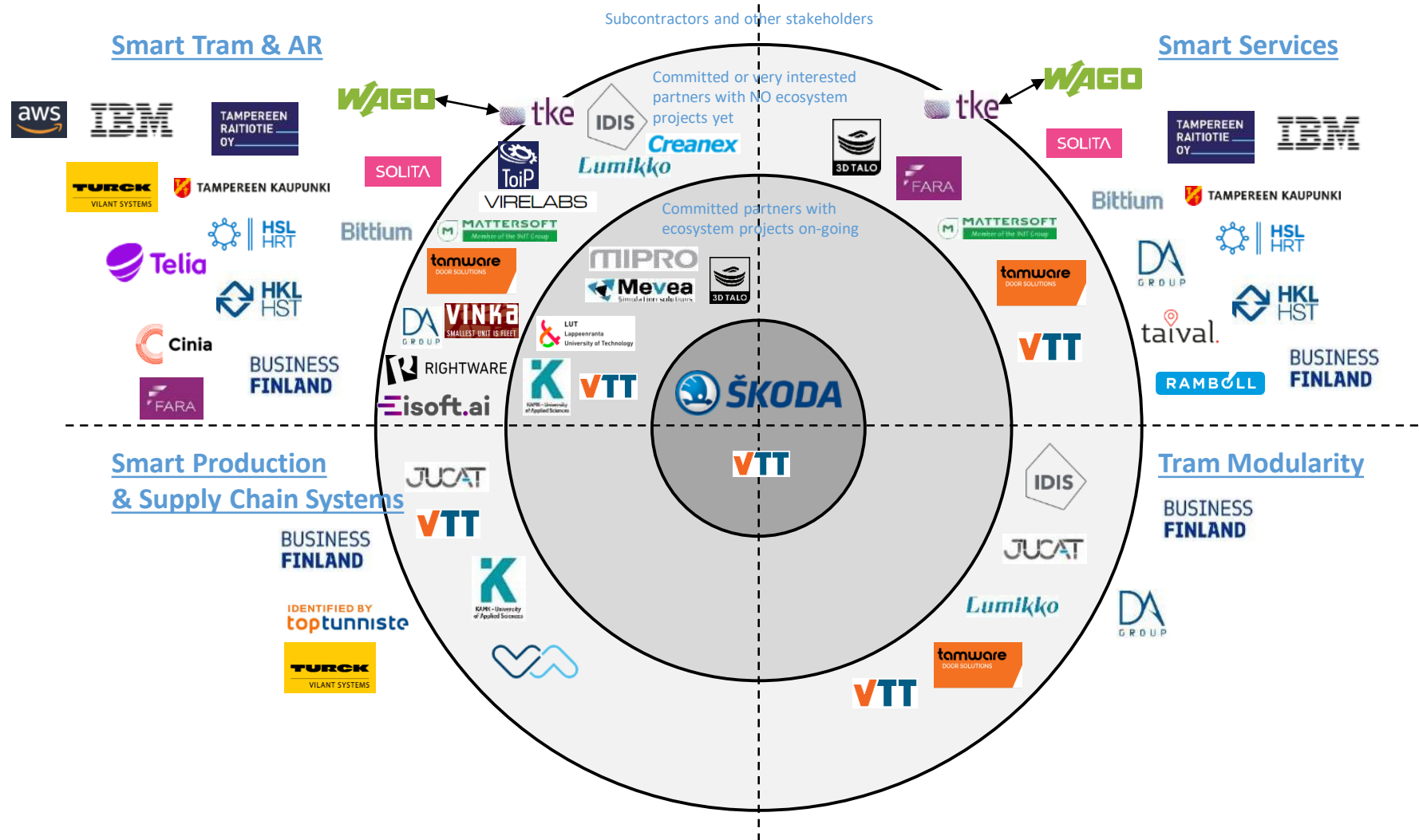


# Helsinki Jokeri



Työ- ja elinkeinoministeriö  
Arbets- och näringsministeriet

# Smart Tram Ecosystem partner status 19.3.2019



## SMART TRAM ECOSYSTEM COMPANIES



- R&D FOR OWN PRODUCTS
- NEW SOLUTIONS AND PRODUCTS TO ECOSYSTEM
- NEW BUSINESS MODELS
- NEW BUSINESS AREAS
- NEW PARTNERSHIPS
- LONG TERM DEVELOPMENT
- GLOBAL MARKETS
- CO-OPERATION WITH OTHER COMPANIES AND RESEARCH INSTITUTES



## FUNDING

- BusinessFinland

## ŠKODA TRANSTECH OY

- TRAM ENVIRONMENT (PILOTING)
- NEW SOLUTIONS TO TRAM
- TEST PLATFORM, SMART LAB AND TRAM
- FUTURE MAINTENANCE
- PRODUCTION DEVELOPMENT

- HELP COMPANIES TO JOIN ECOSYSTEM
- FUNDING ALTERNATIVES

## VTT

- GENERAL RESEARCH CENTER
- TEST LABORATORY
- COORDINATE PUBLIC RESEARCH INSTITUTES

2018

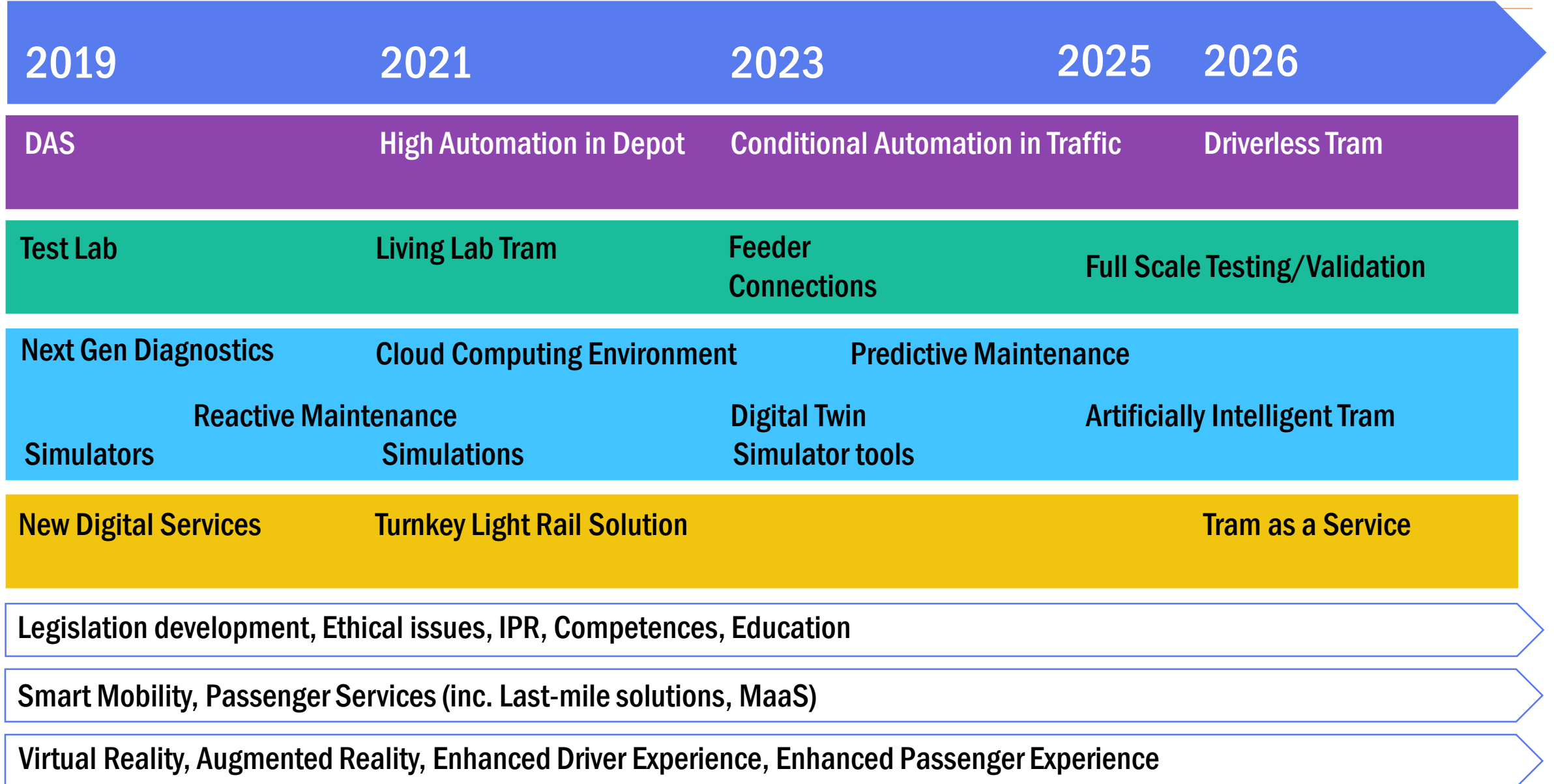
2020

2022

2024

2026

# Smart Tram Ecosystem Roadmap



# Smart Tram Ecosystem Current Projects

**SKODA** Future diagnostics of tram Ongoing Project

Diagnostics system collects maintenance diagnostics information from the entire tram and its subsystems. There are few essential paradigm changes when compared to the previous generation diagnostics.

- From reactive to proactive approach.
- From retrospective analysis to predictive analysis.
- From scattered files to centralized database with unified access.
- From troubleshooting of individual trams to fleet monitoring.

**SKODA** Training simulator Ongoing Project

Whatever the simulator purpose is, the same software engine is used for each one

- VR based training
- Desk based training
- Mock up based training
- Driver's cabin based training
- Web based training for citizens

**SKODA** Camera Solution (AI recognition) Ongoing Clarifications

**SMART TRAM**

- Passenger counting
- Camera information from/to Stops
- Camera information to operator center
- Maintenance support
  - Communication and troubleshooting
  - AI/ML technologies
  - Tram visual inspection
- Remote driving
- Camera information to authorities
  - Abnormal behavior of the passengers
  - Face recognition
- Camera views to driver / Autonomous driving
  - Detection of obstacles on the track
  - Collision observation and -detection

**SMART CITY**

- Passenger profiling
- People flows around city
- Camera information to operator center
- Camera information from Stops
  - Abnormal behavior of the people
  - Face recognition
- Maintenance support
  - Visual inspection of infrastructure

**SKODA** Cloud Based Fleet View Ongoing Project

Cloud environment to the agile customization of diagnostics, maintenance and connections to all stakeholders.

**SKODA** New Experience Ongoing Project

Driver's enhanced information and real time views in Tram and operator room.

**SKODA** Different display and surface technologies Ongoing Clarifications

- Dome in roof
- Panel displays
- Leaflet displays
- Film displays
- Laminated displays

**SKODA** Dimensional management Ongoing Project

Improving the fitting of the parts in assembly phases concerning whole supply chain.

- Design process
  - Internal
  - Suppliers
- Same reference points
  - Machining
  - Welding
  - Assembly phases
  - Ign
  - Measurement
- Training

**SKODA** Accurate positioning system Ongoing Project

Enable:

- Automatic speed assistance
- Self calibration based on GNSS and RF-ID position system

Distance / ODO

GNSS

VCU

Vehicle Computer

RF-ID Reader

Id1 = position1  
Id2 = position2  
Id3 = position3

**SKODA** Autonomous / robotdriving Ongoing Project

Position and speed adjustment

- Energy measurement, economical driving
- Autonomous driving in depot
- Driver's assistance systems
- Environment awareness
- Regulations, regulations
- Autonomous control systems of whole city traffic
- People behaviour, safety and security
- Driver's tasks
- Mass thinking

VISION

ROADMAP 2019-2026

2018

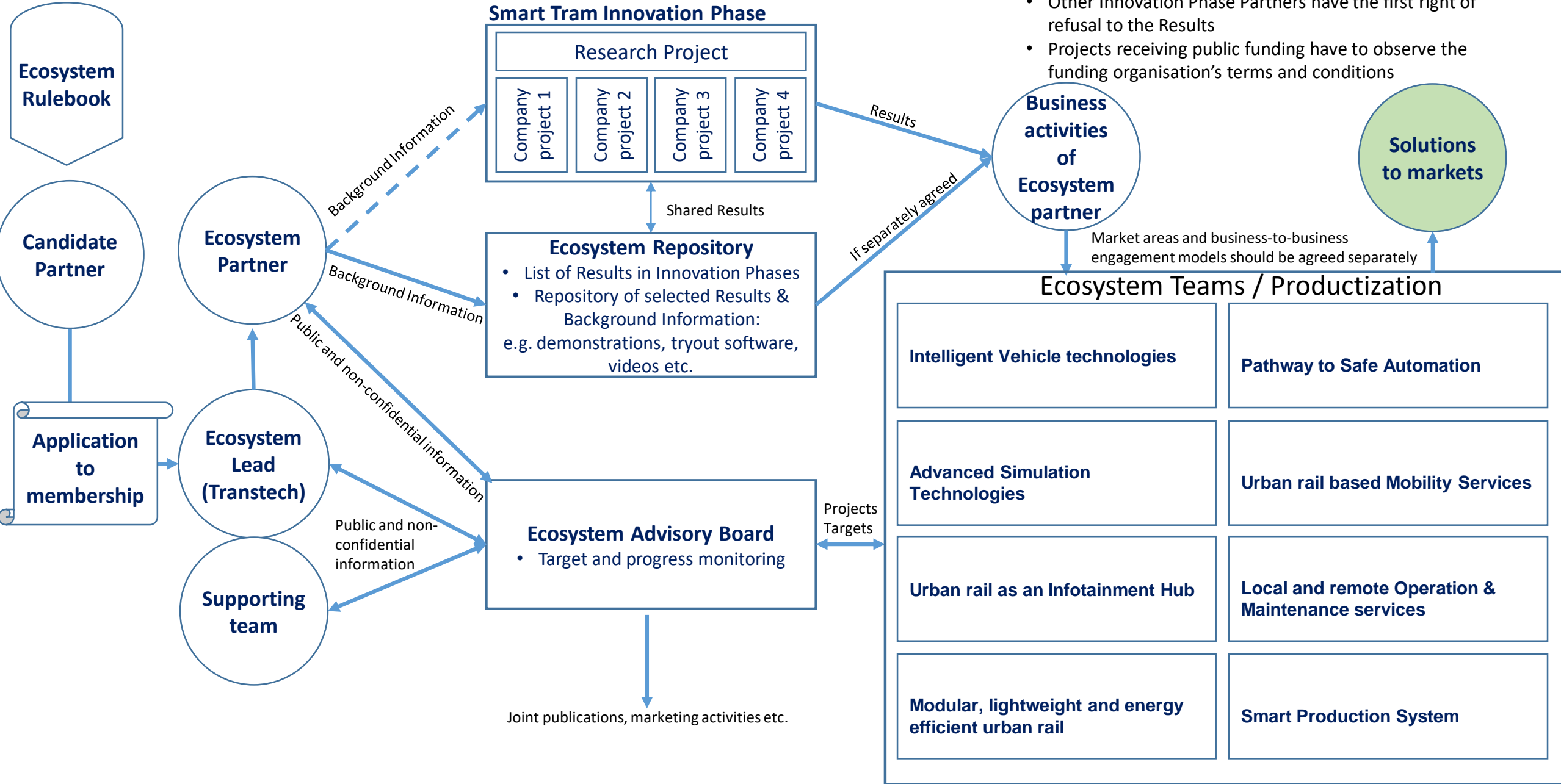
2019 Q1

2019 Q2

2019 Q3

2026

# Smart Tram Information/Knowledge Flow



# Ecosystem Teams/Thematic Groups

## Intelligent Vehicle technologies

- Drives's services
- Tram IT-Systems
- Sensor technologies
- Vehicle control

## Advanced Simulation Technologies

- Training simulators
- Digital Twins
- Traffic simulations
- Vehicle simulations
- Production simulations

## Urban rail as an Infotainment Hub

- Passenger information
- Smart stops
- Mobile applications
- Feedback channels

## Modular, lightweight and energy efficient urban rail vehicles

- Modular structures
- Energy storages
- Smart/light materials
- Mechanical solutions

## Pathway to Safe Automation

- Autonomous Depot
- Autonomous Driving
- Environment awareness
- Vehicle positioning system
- Communication technologies
- Legislation, regulations, standards

## Urban rail based Mobility Services

- Mobility solutions
- Ticketing solutions
- Feeder connections
- New mobility concepts
- Impact assessment

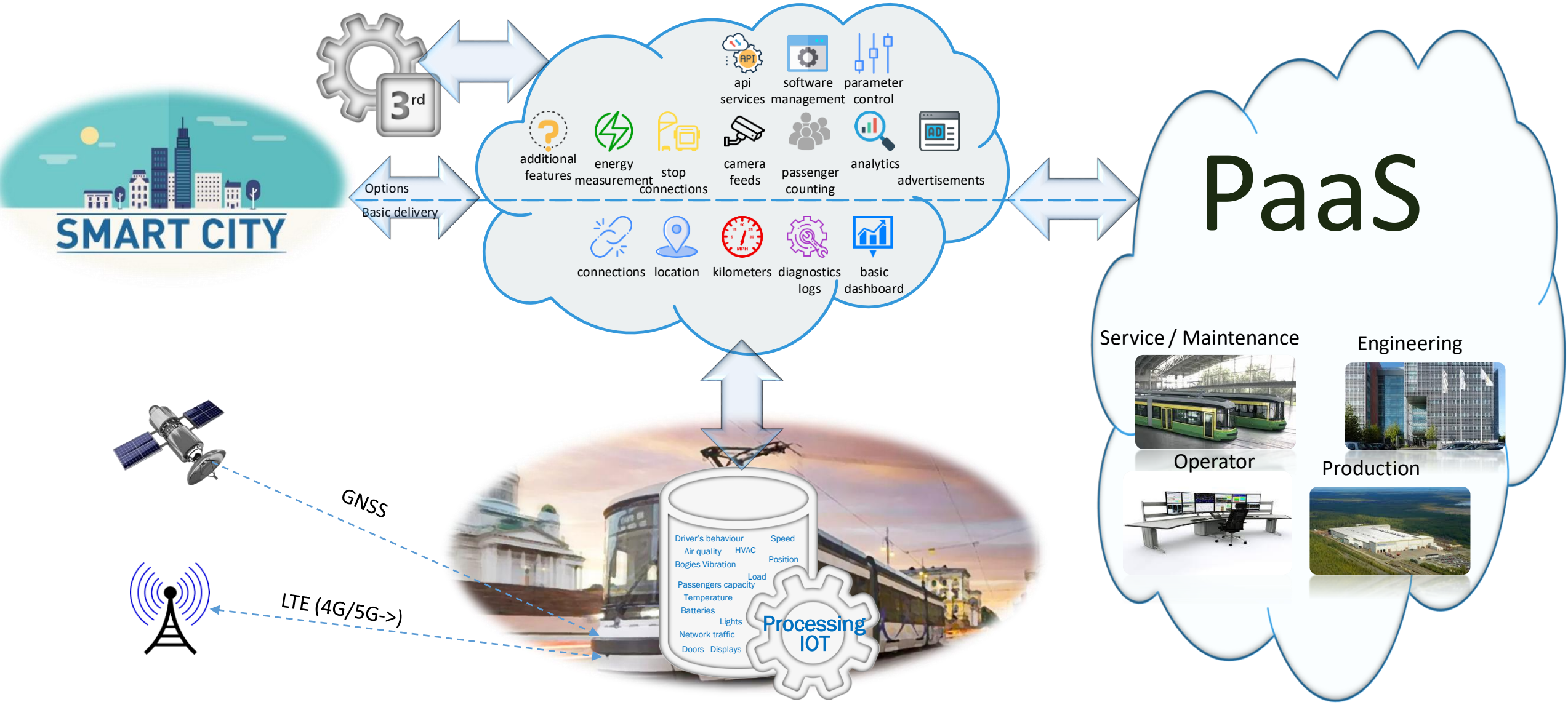
## Local and remote Operation & Maintenance services

- Diagnostisc systems
- Data driven maintenance
- Operator rooms
- Field service
- Fleet management
- Data analytics

## Smart Production System

- Supply chain mng.
- Factory automation
- Digitalization services
- Measuring and inspection
- Robot technologies

# Tram technical evolution (IOT, New Services)





# Pilot TRAM (2021-2024)

Tampere

## Use cases

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### Tram environment

- Doors
- HVAC
- IT-Systems
- Displays
- Breaks
- Panel solutions
- Sensors
- Autonomous Tram

Suppliers / Testing environment

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### Events / City

- Cultural events
- Festivals
- Charter trips
- Private events

Different events in City

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### Marketing purposes

- Customers
- Expos

Marketing

## Use cases

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### Authorities / Research centers

- Practical tests
- Testings
- Approvals
- Safety features
- Cyber security

## Authority

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### Operators

- DAS
- Stops
- Advertising services
- Entertainment
- Maintenance
- Conditioning monitoring of Infra
- Training

## Service view (passenger, user, etc.)

Lets start building future platform  
business for the Smart Cities!

