Q-FREE CAPITAL MARKET DAY
Technology, products and solutions

Presented by VP R&D, Dr. Jos Nijhuis

R&D - facts and figures

- The R&D activities within Q-Free are organized in 8 core groups that cover all key technologies as well as the integration of these key elements into system solutions.
- Current headcount: 57 persons

- Main locations:
  - Trondheim (Norway)
  - Beilen (The Netherlands)

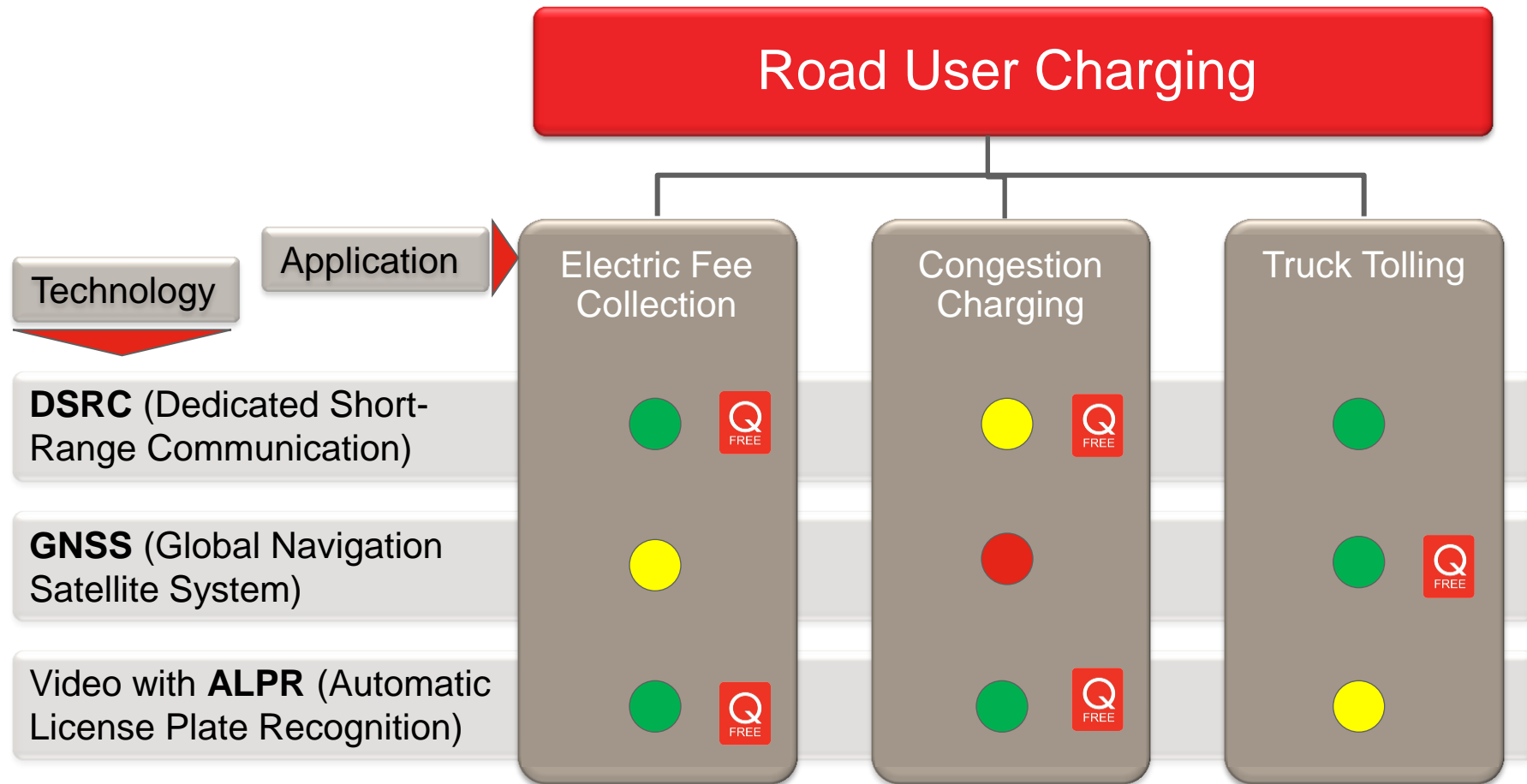- Permanent test track: Lånke
- Data entry service: Beilen

Data entry services

- Measuring processing performance is a complicated task

- Out of the box solutions will not deliver the minimal operational costs or might not even meet the minimal requirements

- Q-Free has recognized this and has implemented a unique and dedicated setup in their Beilen office to:
  - Support R&D during their search for new solutions, and optimizing existing ones
  - Support initial system tuning, monitoring and further optimization

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# Core Technologies for Road User Charging Applications

Road User Charging

Technology / Application	Electric Fee Collection	Congestion Charging	Truck Tolling
DSRC (Dedicated Short-Range Communication)	🟢 Q FREE	🟡 Q FREE	🟢
GNSS (Global Navigation Satellite System)	🟡	🔴	🟢 Q FREE
Video with **ALPR** (Automatic License Plate Recognition)	🟢 Q FREE	🟢 Q FREE	🟡

Products - DSRC

- **OBU 610**:
  - Smallest OBU on the market
  - Buzzer
  - Intelligent Wakeup
    - Enables transportation mode
    - Removal detection
  - Multiple applications
  - Free programmable data fields
  - OTA (Over-the-air) personalization

- **RSE650**:
  - Suitable for MLFF
  - Generic application development and integration into our system offering.
  - Low power and weight
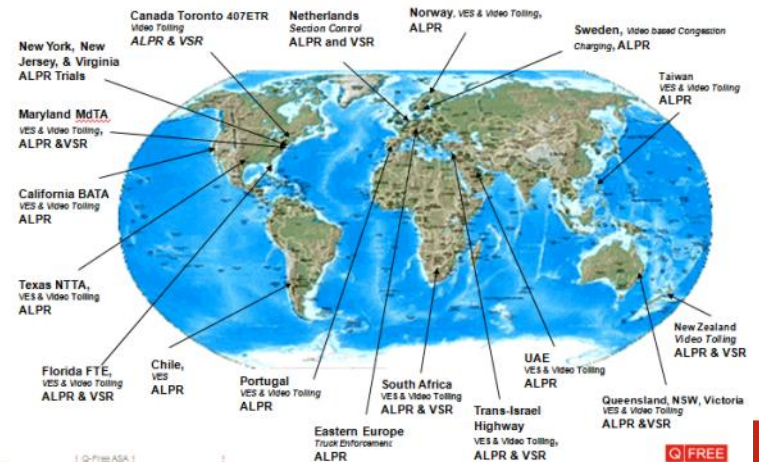 - PoE (Power over Ethernet)
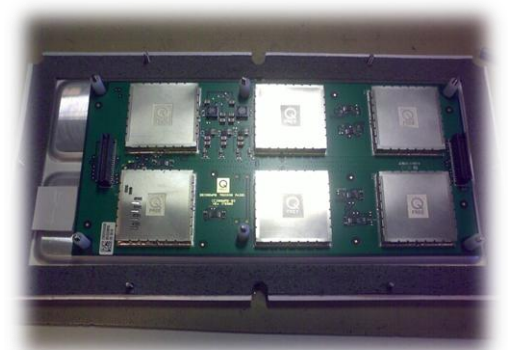
Products - GNSS

- GNSS tag:
  - Designed prototype that incorporates all basic functions
  - Unique small size

Product - Video

- VRE550
  - Live capture mode
  - Improve flash and processing power
  - Modular design

- ALPR software (Intrada)
  - World leading
  - New state identification techniques

Solutions
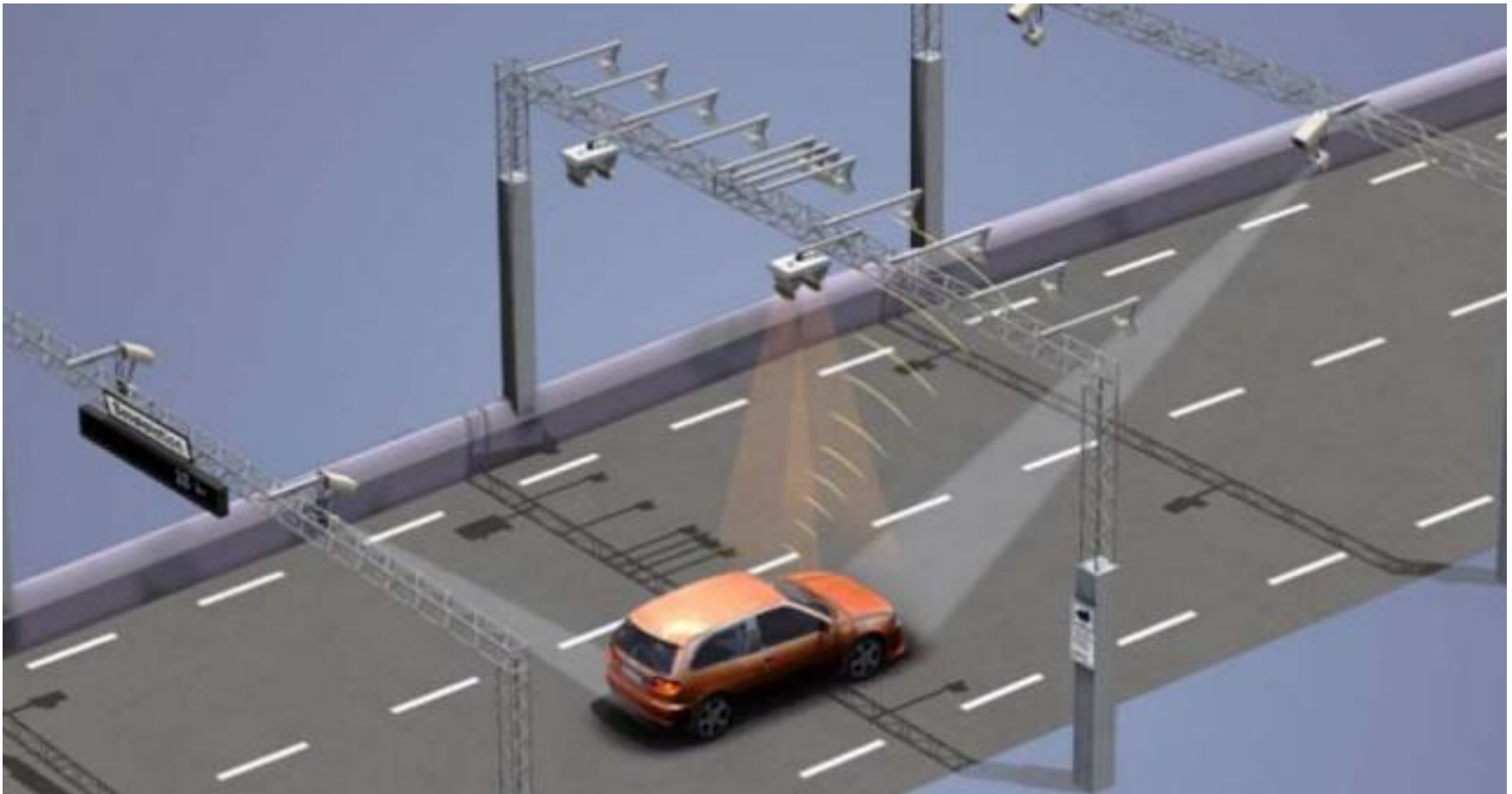
Solutions – next generation
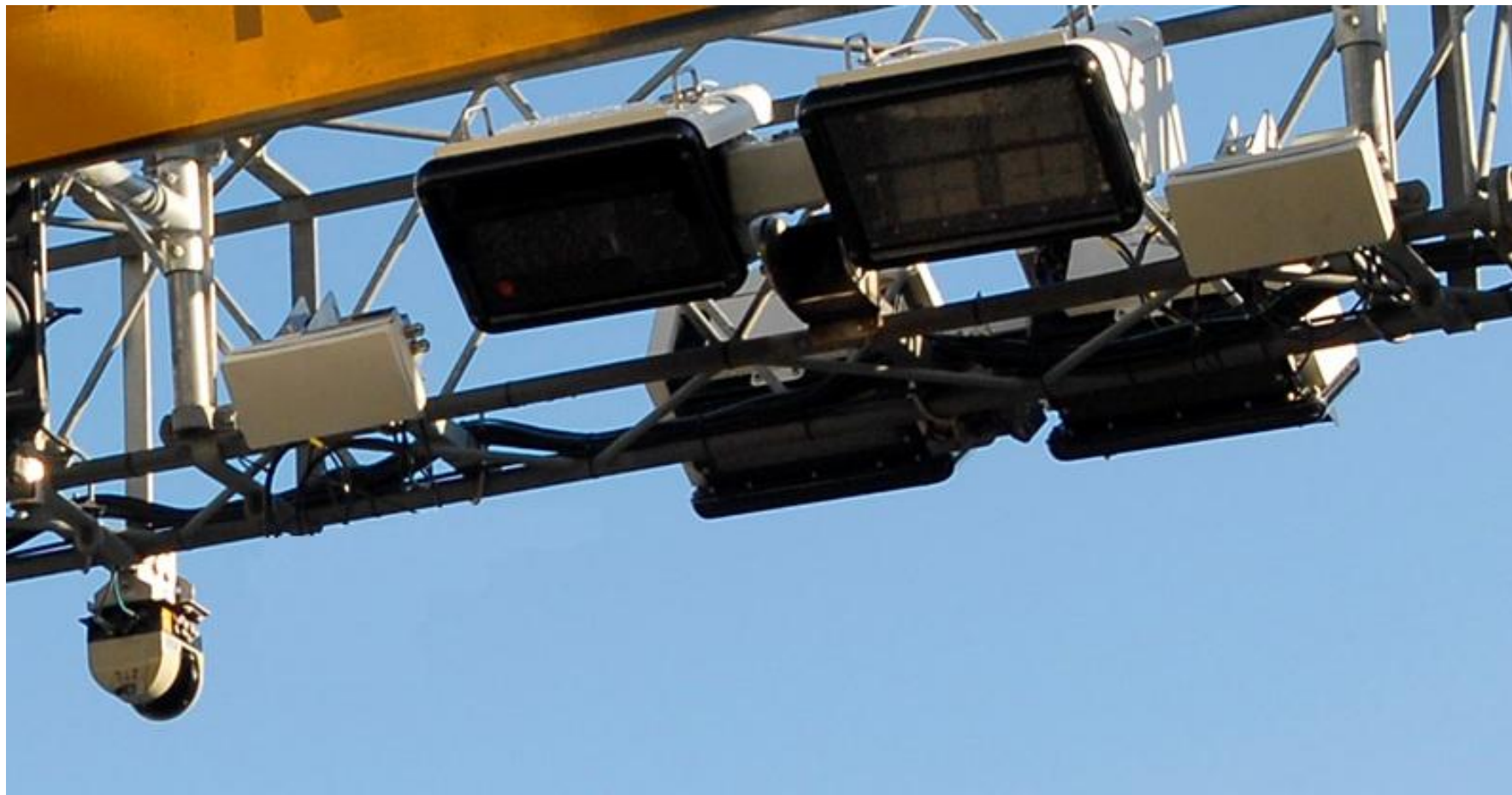
Solutions – Single Gantry

Single Gantry

- New roadside offering that includes our new products and improvements of existing ones:
  - RSE650
  - VRE650
  - LDCS
  - ALPR
  - QMCS

- One common software architecture that enables:
  - Low level (engineering) data capture and play back
  - Reuse of existing solution components and experiences

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Front License Plate
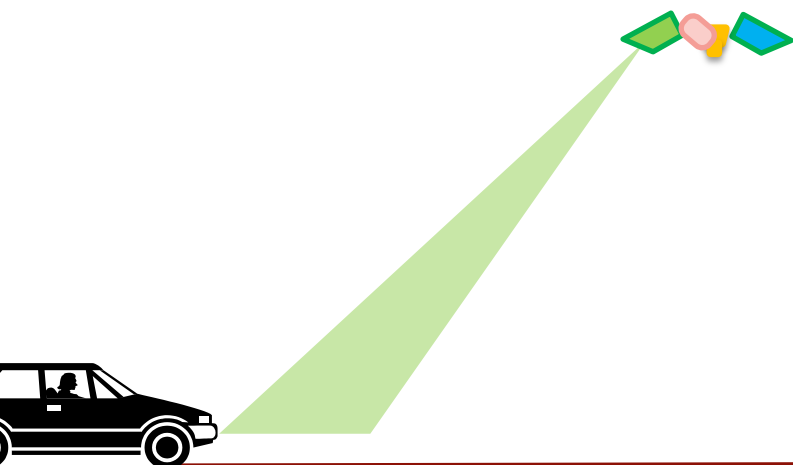
Discard

For Combination

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Electronic Fee Collection

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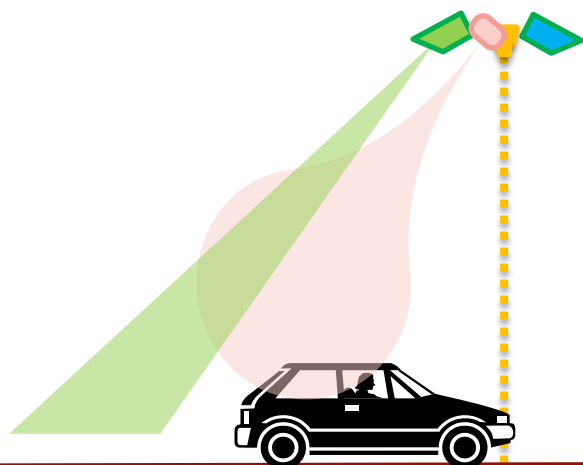743750661
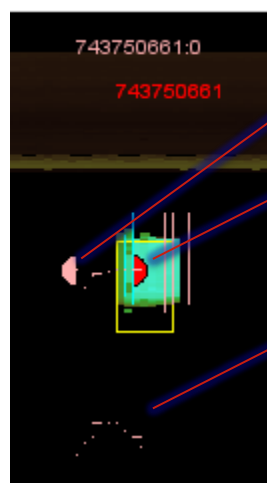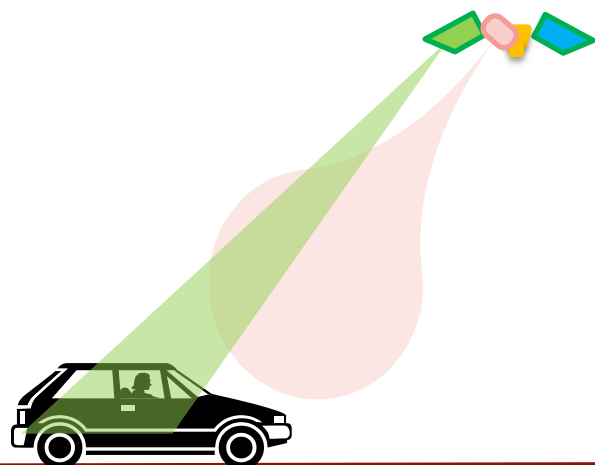
Data

Location

ETC Record
& Road Position

Track

For Combination
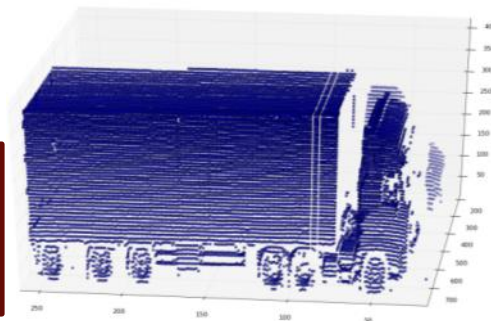
Q FREE

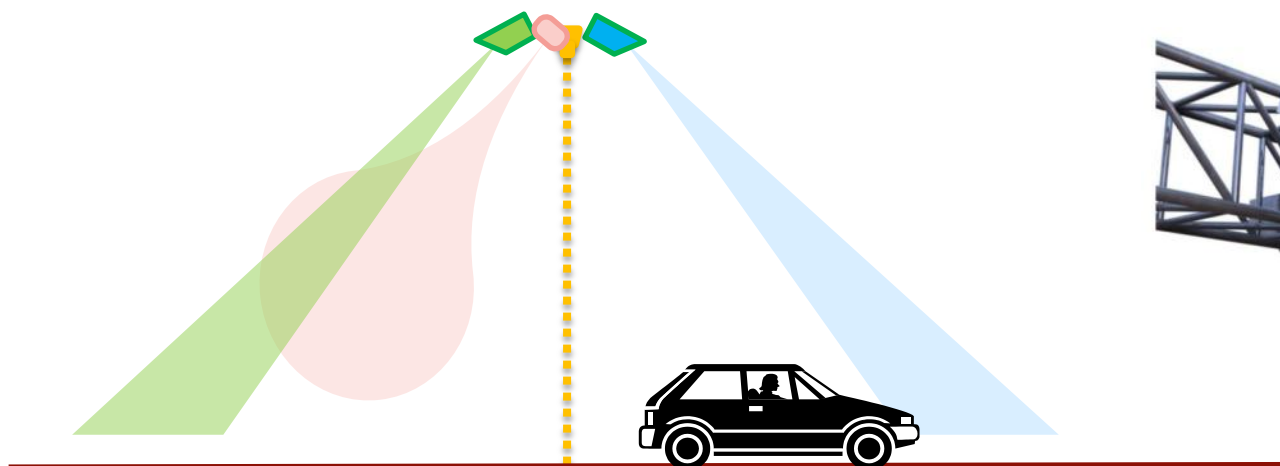# Vehicle Classification

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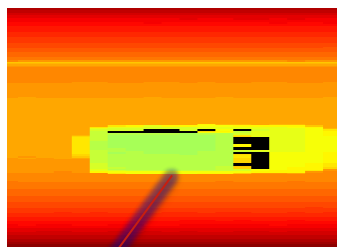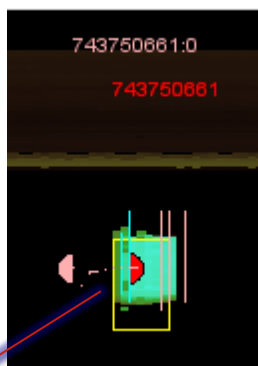
Volumetrics
Vehicle Class

3d Image
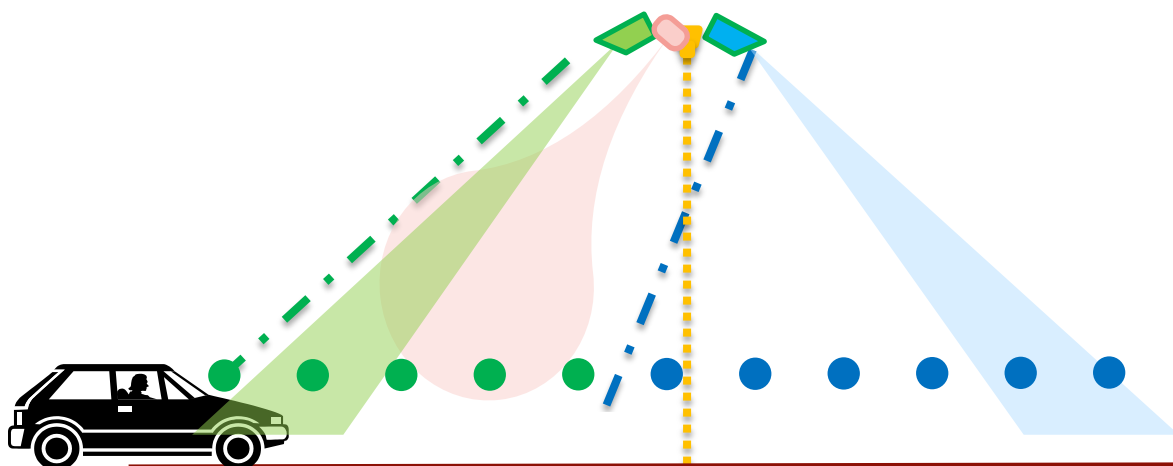
Profile

For Combination

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Rear License Plate

Discard

For Combination
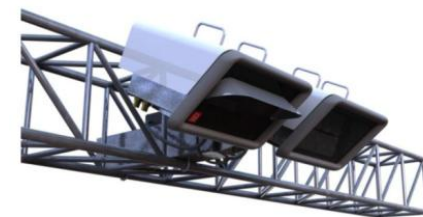
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Passage Tracking

Tracks
For Combination

*Discard
Images*
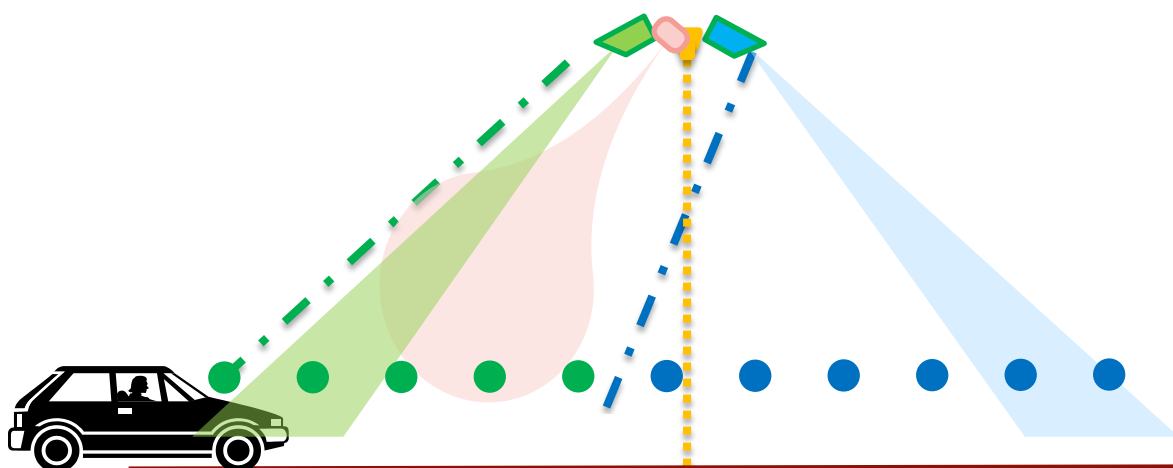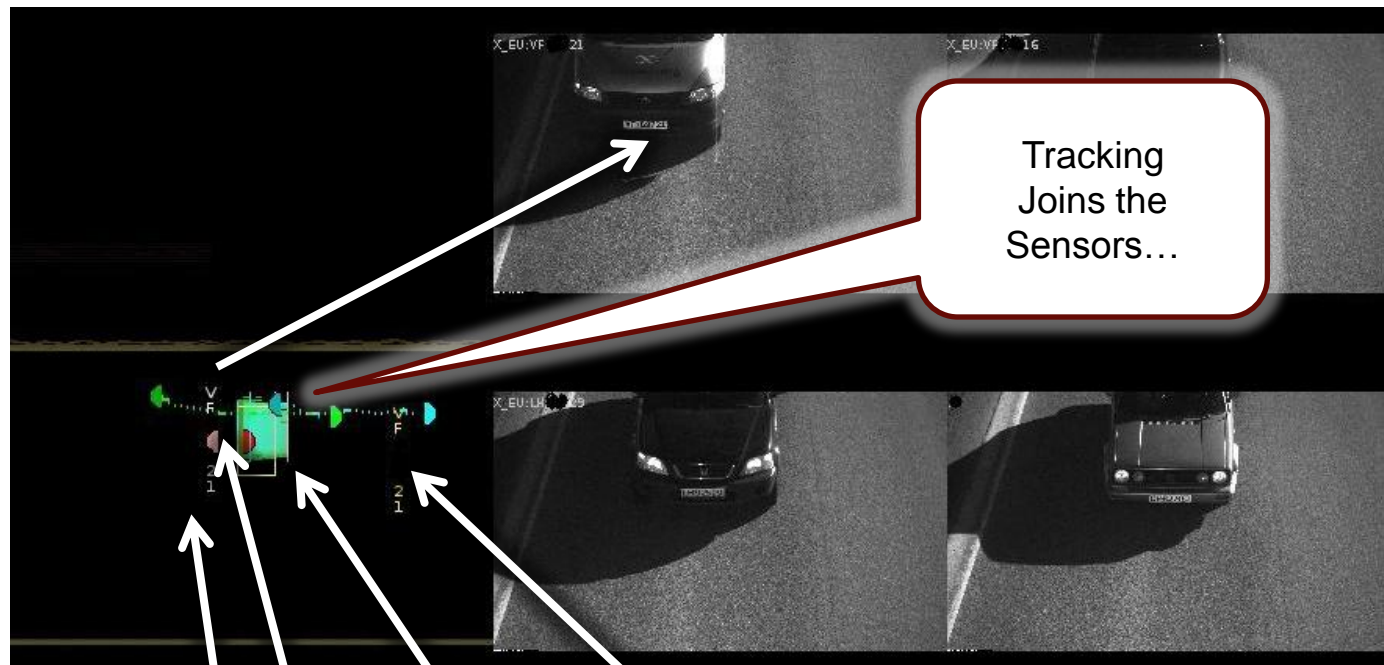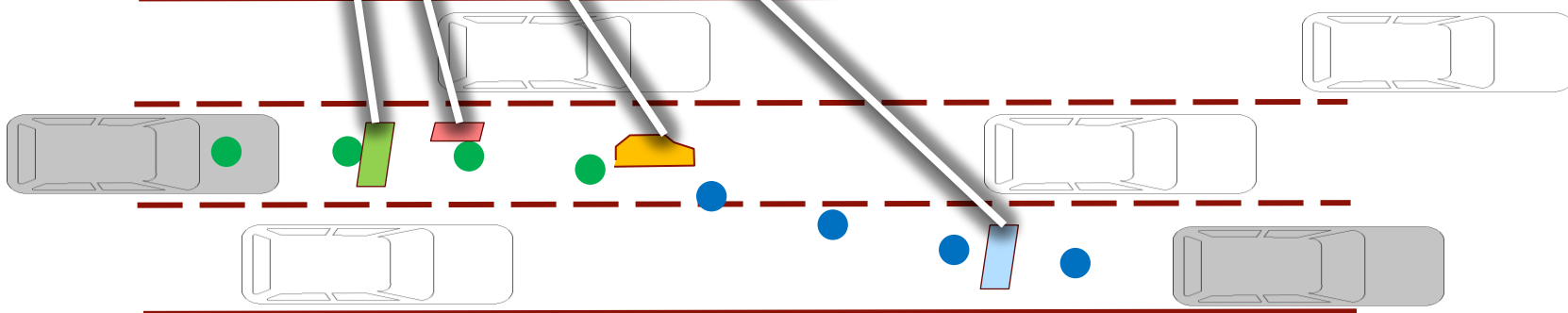
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Passage Tracking

Tracks
For Combination
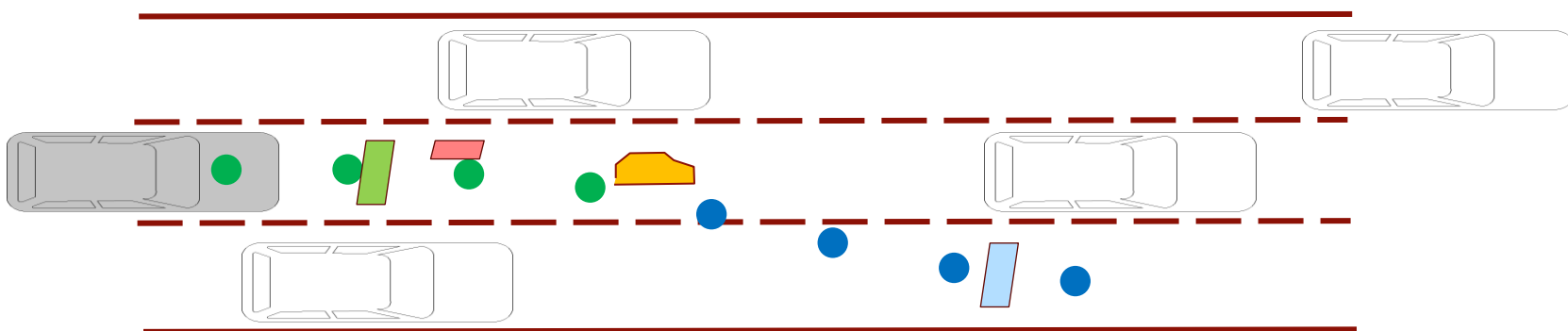
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Sensor Combination

Tracking Joins the Sensors…

Track based Combination

Speed & Direction

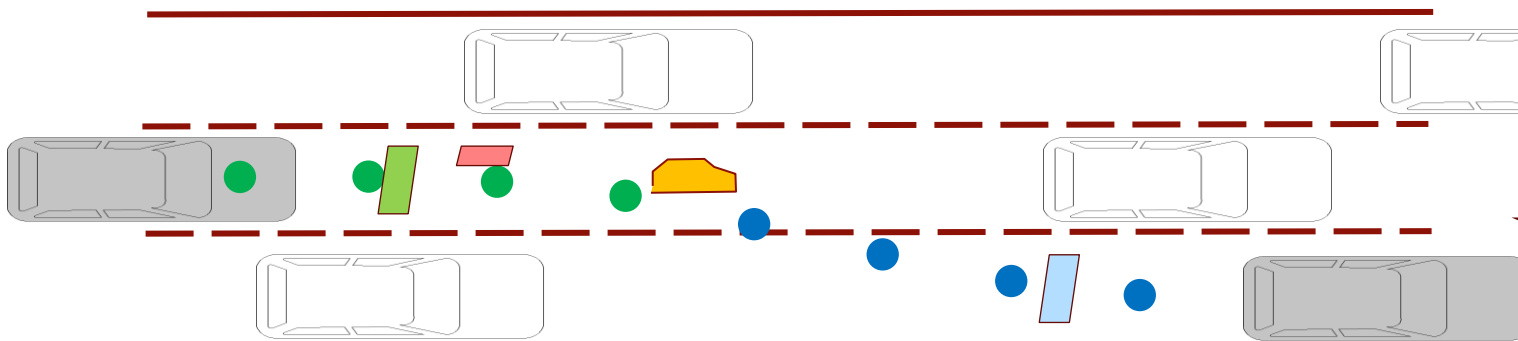Front ALPR

OBU ETC
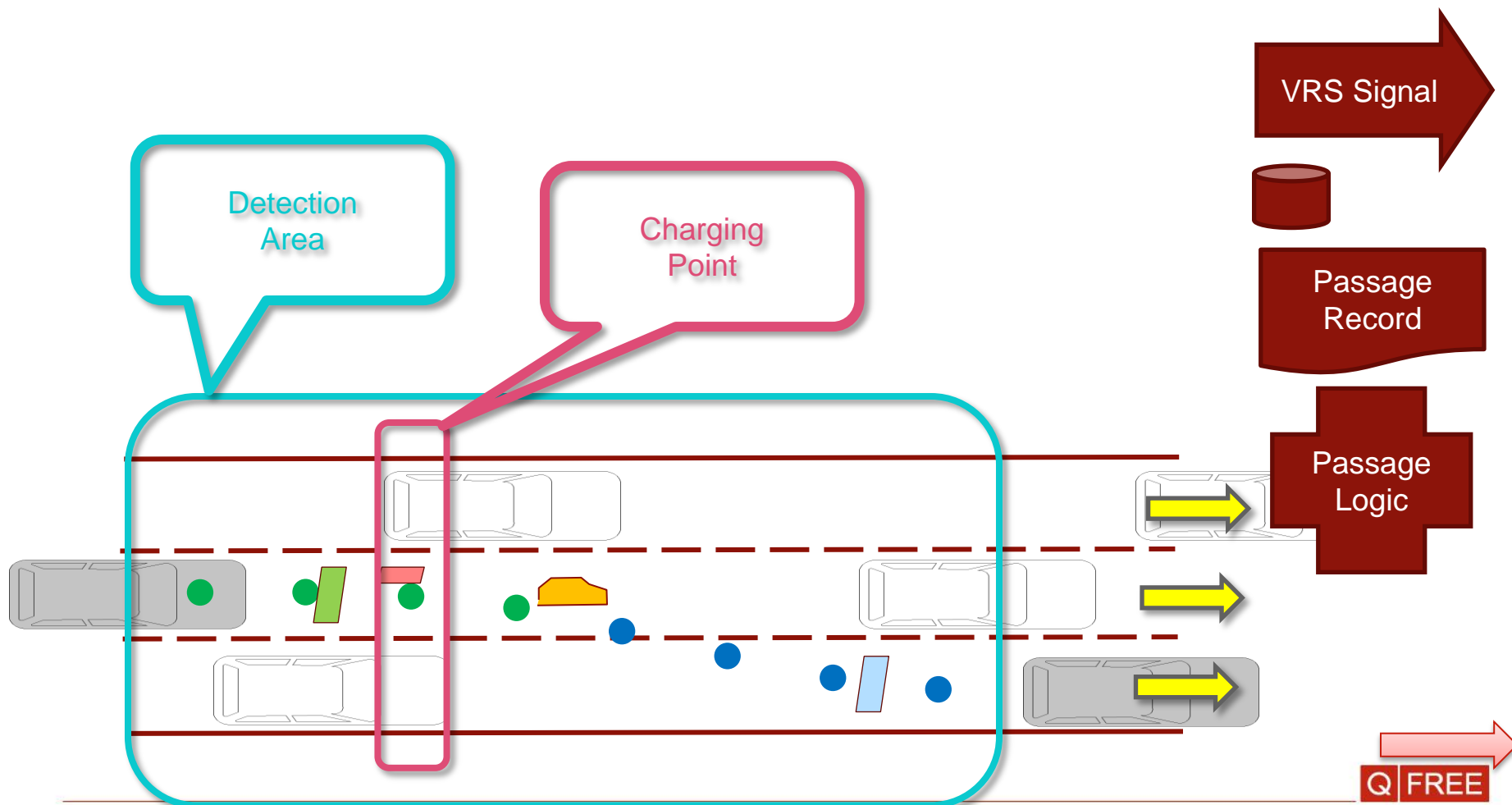
Classification

Rear ALPR

VRS Signal

Passage Record

Passage Logic

Transmit

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Detection and Charging Scenarios – 3 LANE

Summary

- Q-Free is unique in having in-house expert knowledge on all core technologies for road user charging which enable us to offer new innovate solutions to the market

- The Single Gantry is the result of utilizing synergies between different technologies, and brings a unique solution to the road user charging arena

- By adopting product family approaches and software configuration capabilities, our product platforms are future proof and will enable us to enter into new markets and develop even better solutions for RUC