Security overview within the connected and autonomous car environment

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SEAT

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01

What’s inside a vehicle?

What's inside a vehicle

What does it mean for cars?

Yesterday

There was a car….

What’s inside a vehicle

What does it mean for cars?

Yesterday → **Today**

There was a car....

We connect the car ....

Bluetooth
GPS
GSM
Smartphone

What's inside a vehicle

What does it mean for cars?

Yesterday → Today → Tomorrow

There was a car....

We connect the car ....

We will have a connected environment...

Bluetooth
GPS
GSM
Smartphone

Map services
Emergency call
Digital Key
Third parties Back-ends
Big Data
Online Diagnosis
Geolocalization
Fleet management
Online update
Vehicle finder
WiFi, Smartwatch, ...

What's inside a vehicle?

Cars in numbers

+40 electronic Control Units

~100million lines of code in premium vehicles

5 different network buses

~10 External interfaces

5 years of development process

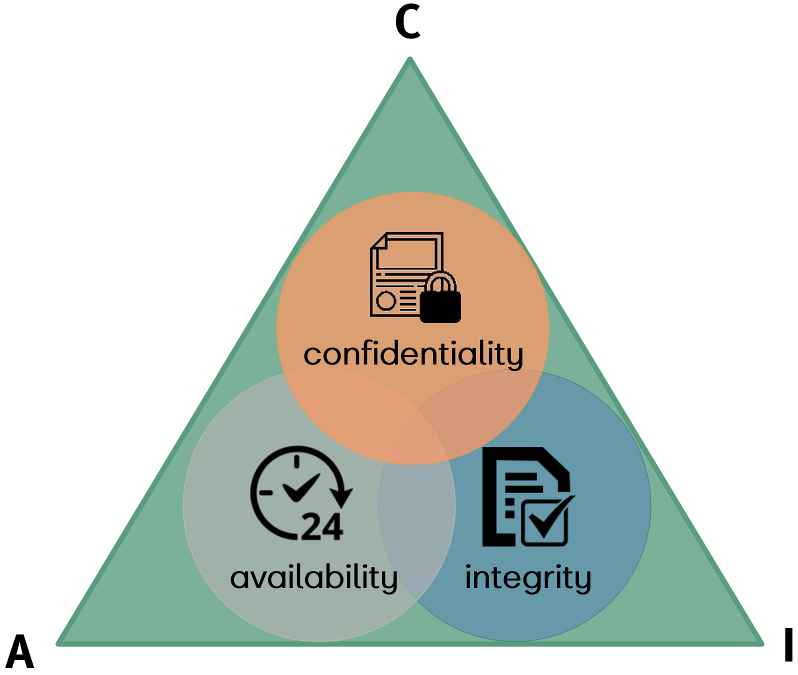
~ 1k Functions

02

State of the art of modern vehicles

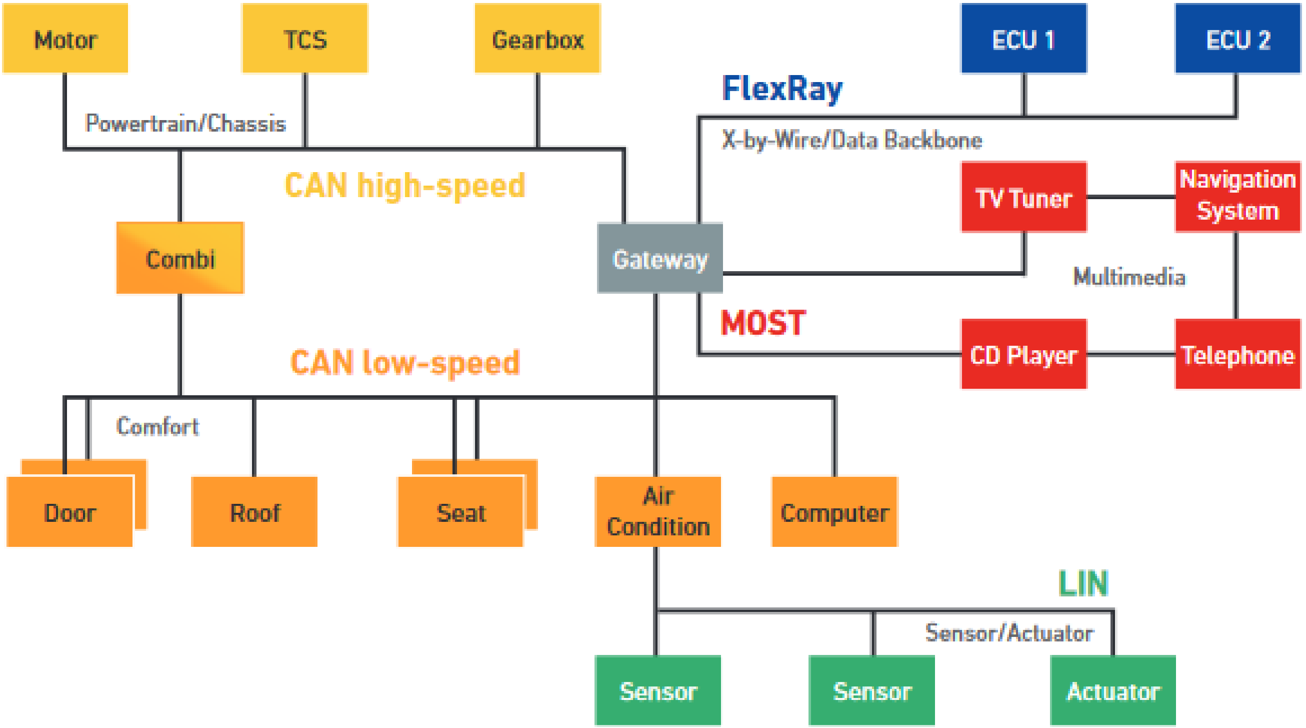
State of the art of modern vehicles

Important Security goals

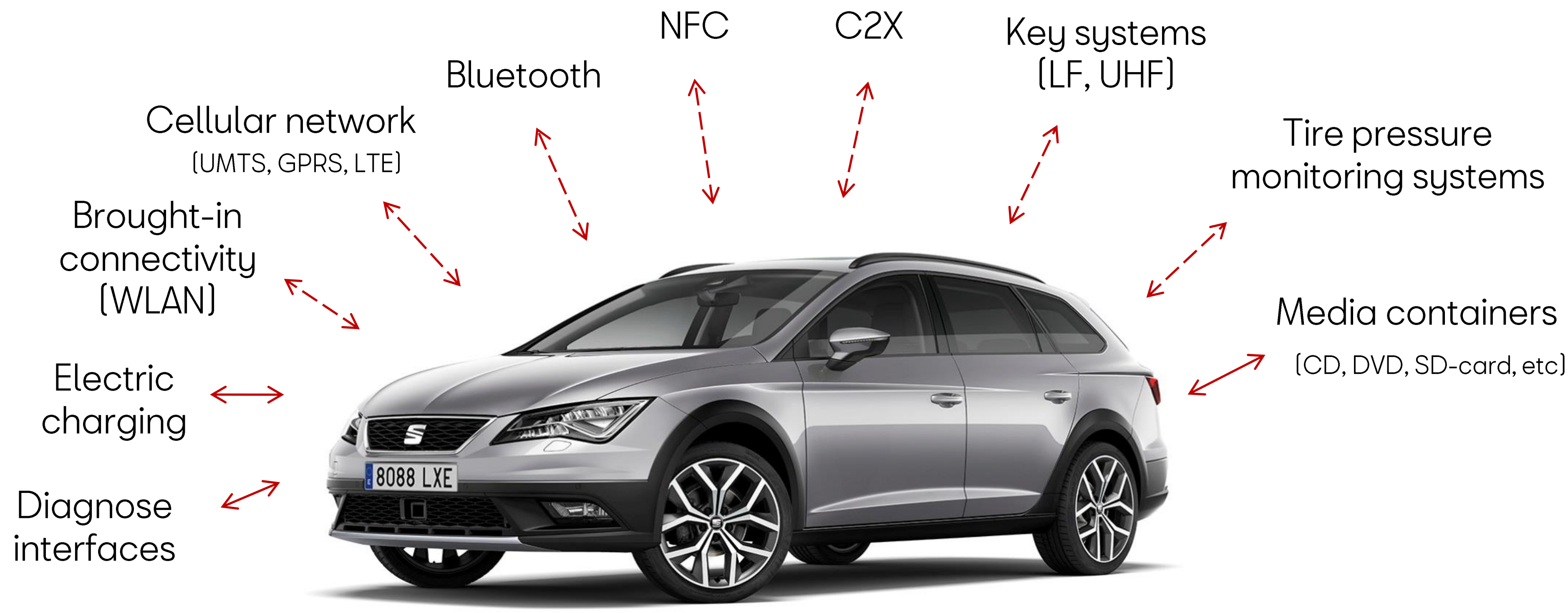


State of the art of modern vehicles

Electronics architecture topology



State of the art of modern vehicles
Communication interfaces to the exterior world


NFC
C2X
Key systems (LF, UHF)
Bluetooth
Cellular network (UMTS, GPRS, LTE)
Tire pressure monitoring systems
Brought-in connectivity (WLAN)
Media containers (CD, DVD, SD-card, etc)
Electric charging
Diagnose interfaces
8088 LXE

State of the art of modern vehicles
Internal communication networks

In general, internal networks are vulnerable to:

1. CAN
   - Does not provide mechanisms to guarantee confidentiality, integrity, authenticity

2. LIN
   - Lacks of data authenticity and integrity mechanisms.
   - Availability might get compromised by attacking syncronization mechanisms.

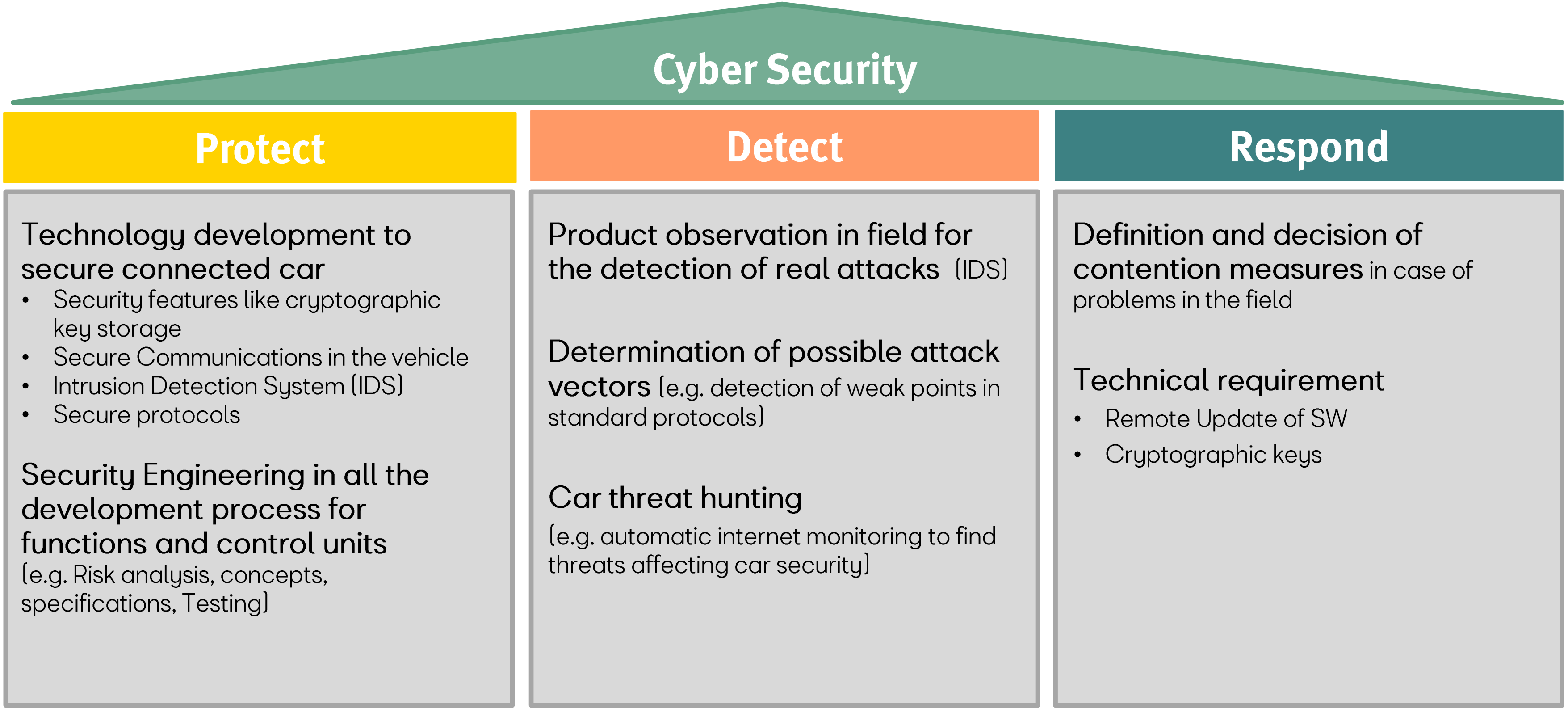
3. FlexRay
   - Availability of communications could be affected by addressing sync mechanisms.
   - No integrity or authenticiation countermeasures implemented.
4. MOST
   - Addressing synchronization mechanisms could cause DoS.
   - Again, authenticity and integrity is not guarenteed.
5. Ethernet
   - All that we know from Ethernet/IP world!!

03

Structured approach to vehicle security

Structured approach to vehicle security

Action Areas



Cyber Security

Protect

Technology development to secure connected car

- Security features like cryptographic key storage
- Secure Communications in the vehicle
- Intrusion Detection System (IDS)
- Secure protocols

Security Engineering in all the development process for functions and control units (e.g. Risk analysis, concepts, specifications, Testing)

Detect

Product observation in field for the detection of real attacks (IDS)

Determination of possible attack vectors (e.g. detection of weak points in standard protocols)

Car threat hunting (e.g. automatic internet monitoring to find threats affecting car security)

Respond

Definition and decision of contention measures in case of problems in the field

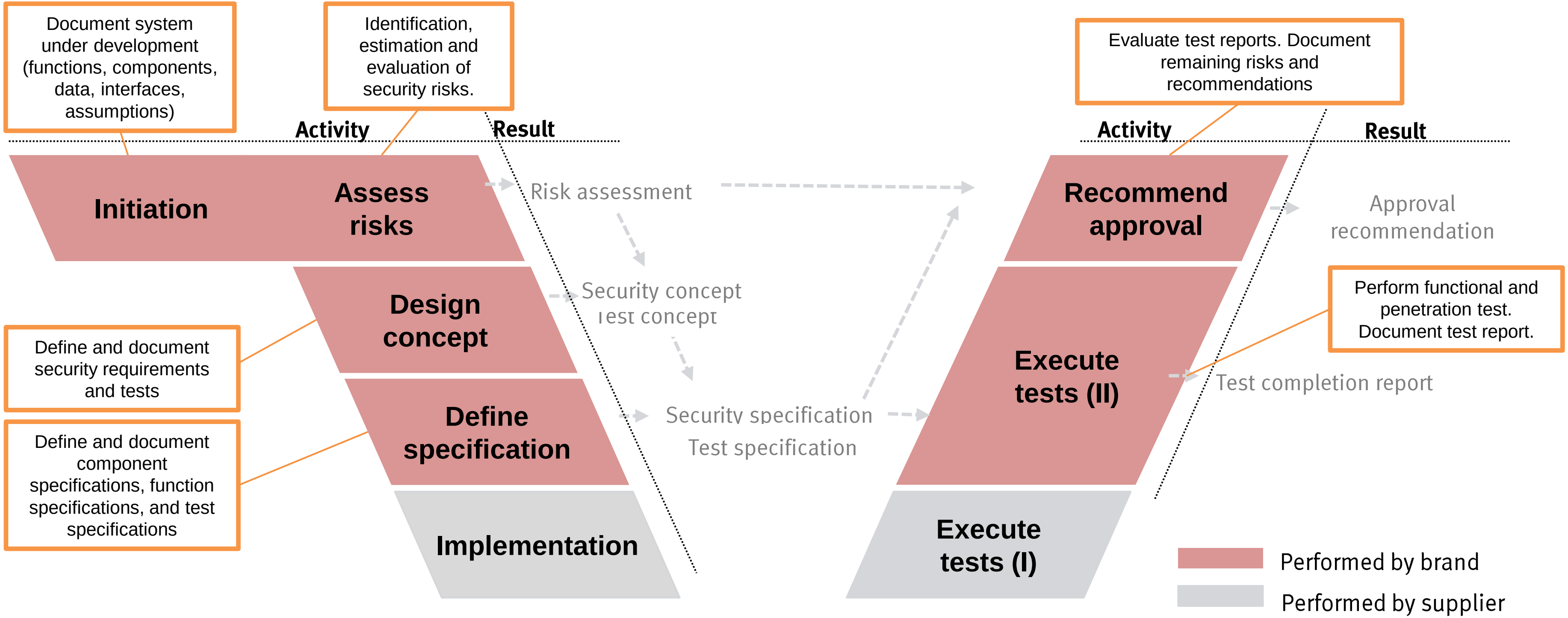
Technical requirement

- Remote Update of SW
- Cryptographic keys

04

Security development process and challenges

Security development process and challenges



Document system under development (functions, components, data, interfaces, assumptions)

Identification, estimation and evaluation of security risks.

Define and document security requirements and tests

Define and document component specifications, function specifications, and test specifications

Evaluate test reports. Document remaining risks and recommendations

Perform functional and penetration test. Document test report.

Activity

Result

Initiation

Assess risks

Design concept

Define specification

Implementation

Risk assessment

Security concept

Test concept

Security specification

Test specification

Activity

Result

Recommend approval

Approval recommendation

Execute tests (II)

Test completion report

Execute tests (I)

🟥 Performed by brand

⬜ Performed by supplier

Security development process and challenges

/Challenges

- Understand that security goes beyond “product Security”.
- Security of processes (have you thought about the entire supply chain?).
- Constraints in development decisions given the lifetime span of the vehicle.
- Constraints derivated from long and costly development processes.
- Disruptive models on business cases – how to make it fit within existing models.

/Conclusions

- “Over the air” update is mandatory for a secure autonomous car
- Security by design is an essential part of the autonomous and connected cars

Thank you!