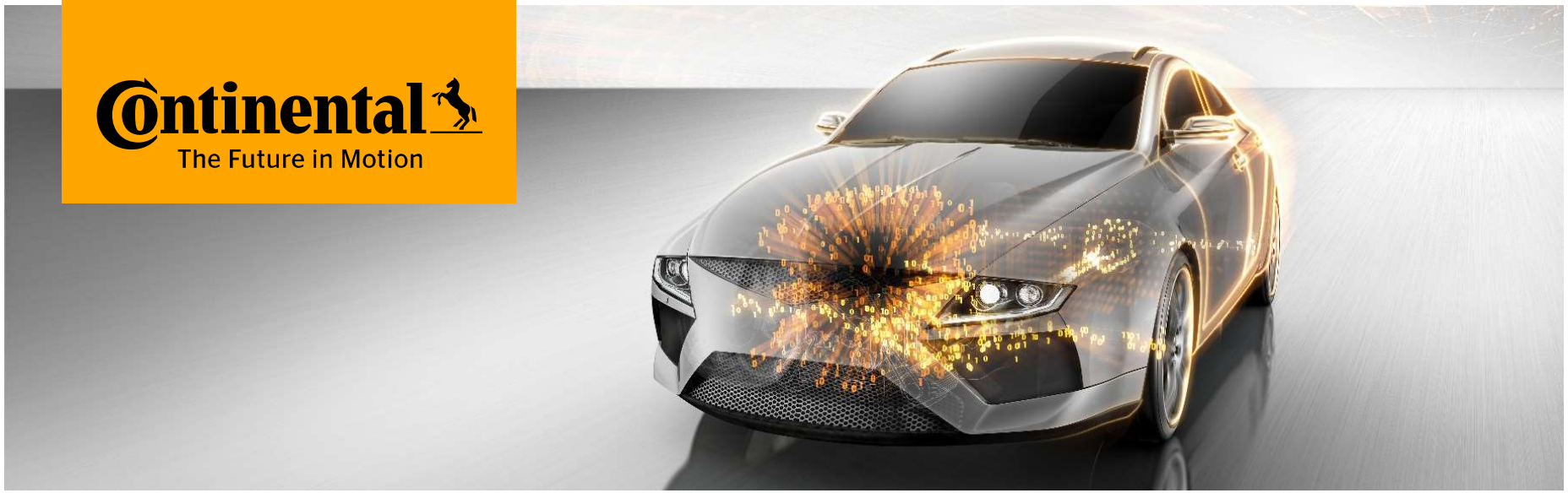
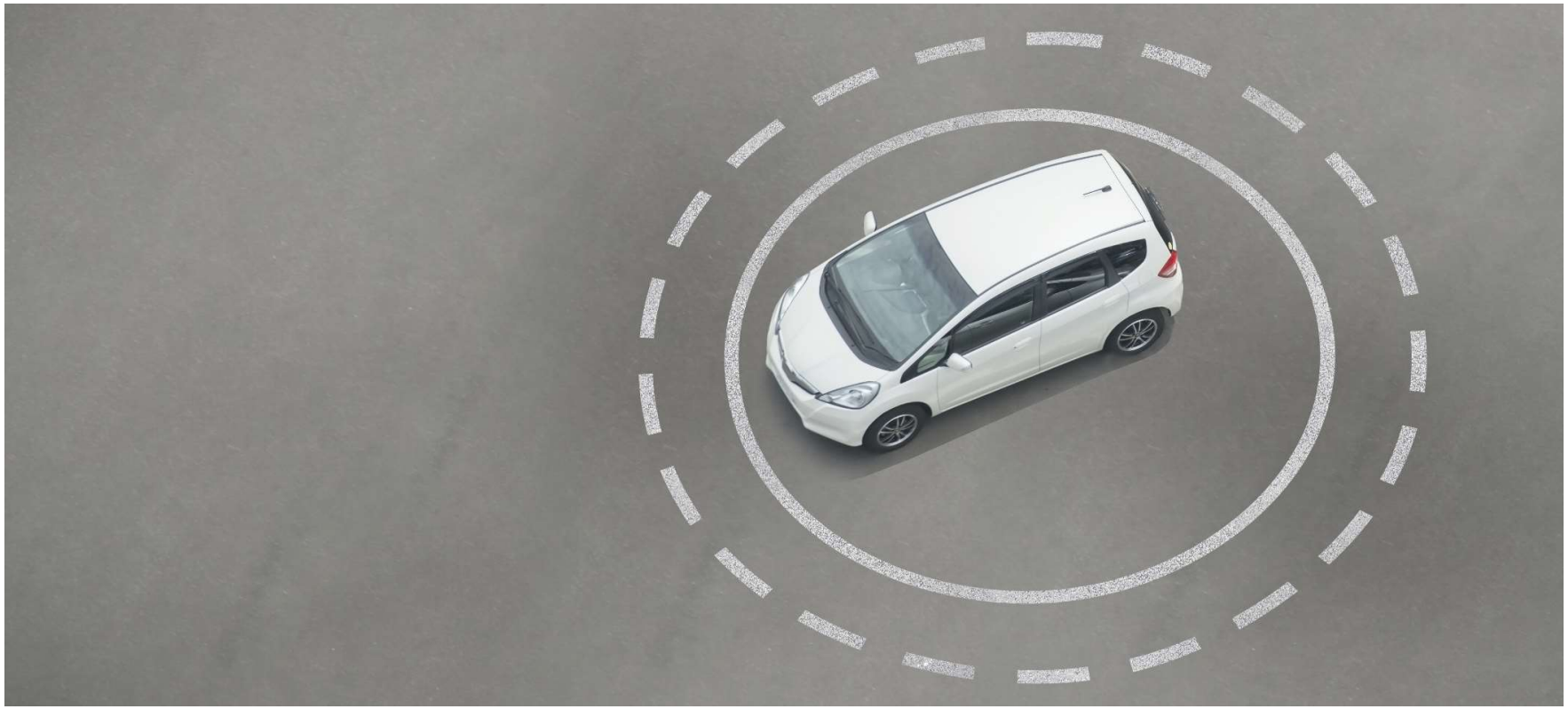


Cybersecurity in the Automotive Domain

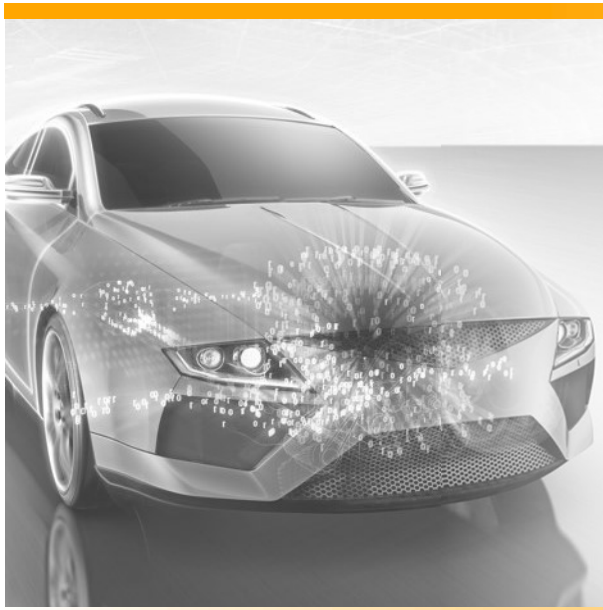
MOB1 Guest Lecture

Dr. Markus Tschersich | November 19th, 2019 | Goethe University Frankfurt

https://www.continental-corporation.com/



Cybersecurity in the Automotive Domain
Agenda



1. **Introduction to Continental**
2. Automotive Security
3. New Challenges of Automotive Megatrends
4. Interplay of Safety and Security
5. Developing a Cybersecurity Engineering Standard
6. Entry Possibilities at Continental

Our Vision:

Your Mobility.
Your Freedom.
Our Signature.

› Highly developed, intelligent technologies for mobility, transport and processing make up our world.

› We want to provide the best solutions for each of our customers in each of our markets.

› This is how we satisfy the demands of our stakeholders and become recognized as a highly reliable and respected partner creating the highest possible value.

Our Mission:

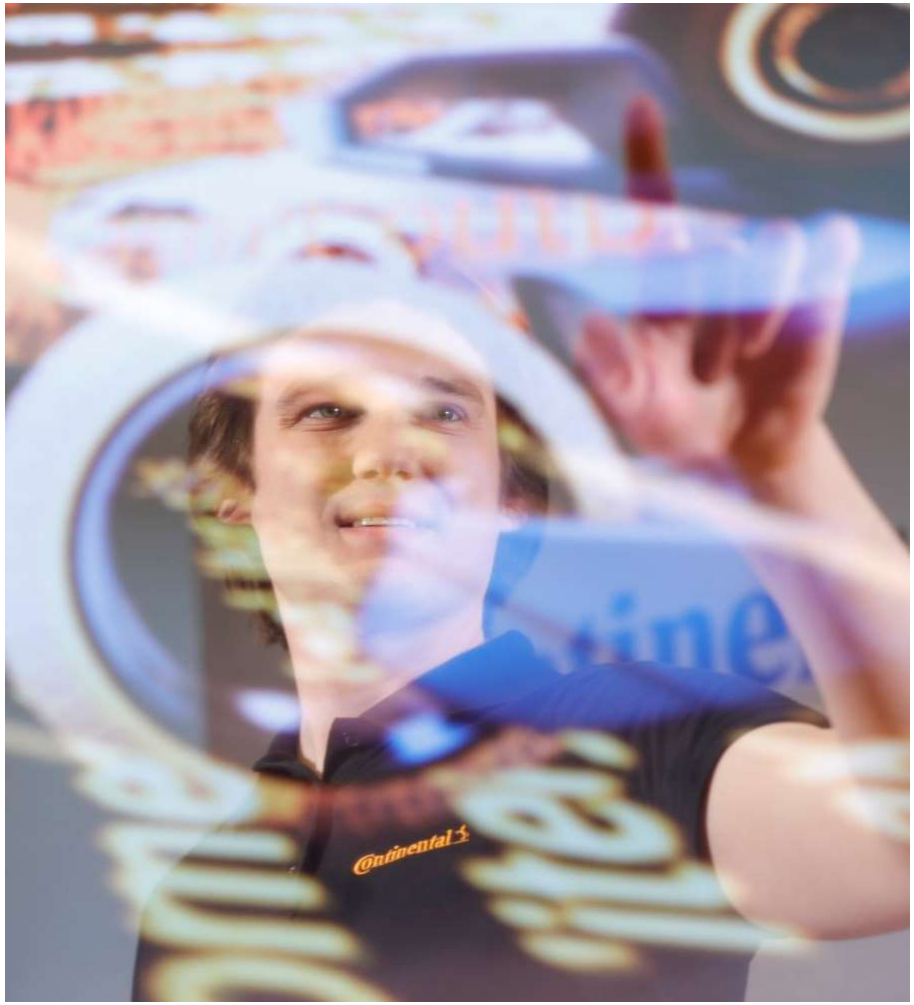
The Future Starts Earlier with Continental.

› **Safety –**
our aim: Zero accidents
To protect life and conserve resources

› **Information –**
our aim: Saving time, increasing comfort
Intelligent mobility through constantly connected driving

› **Environment –**
our aim: Clean air
Resource-efficient and emission-free driving

› **Affordable mobility –**
our aim: Individual mobility for everyone
Enabling more freedom and opportunities



Continental Corporation

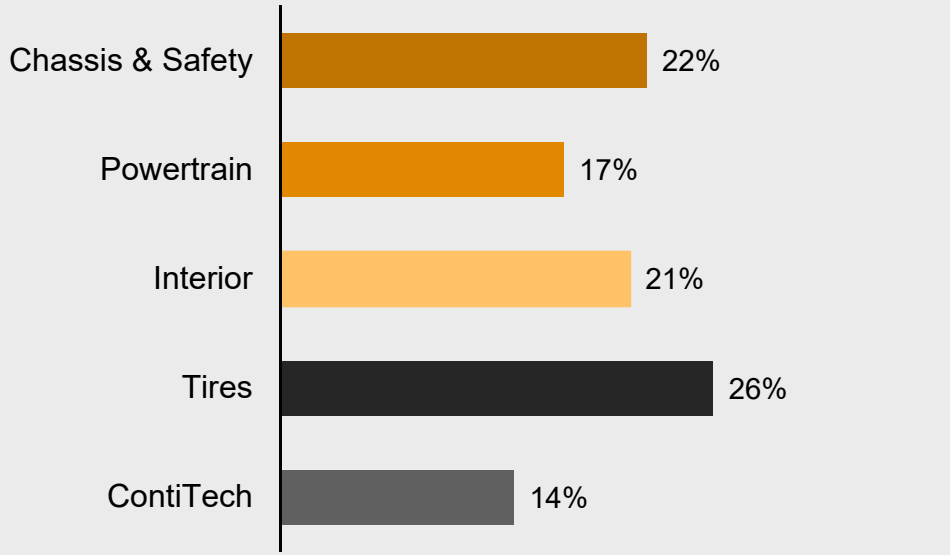
Overview of 2018

€44.4 billion
Sales

243.226
Employees

544 sites*
in 60 countries
* Since 1871 with headquarters in Hanover, Germany

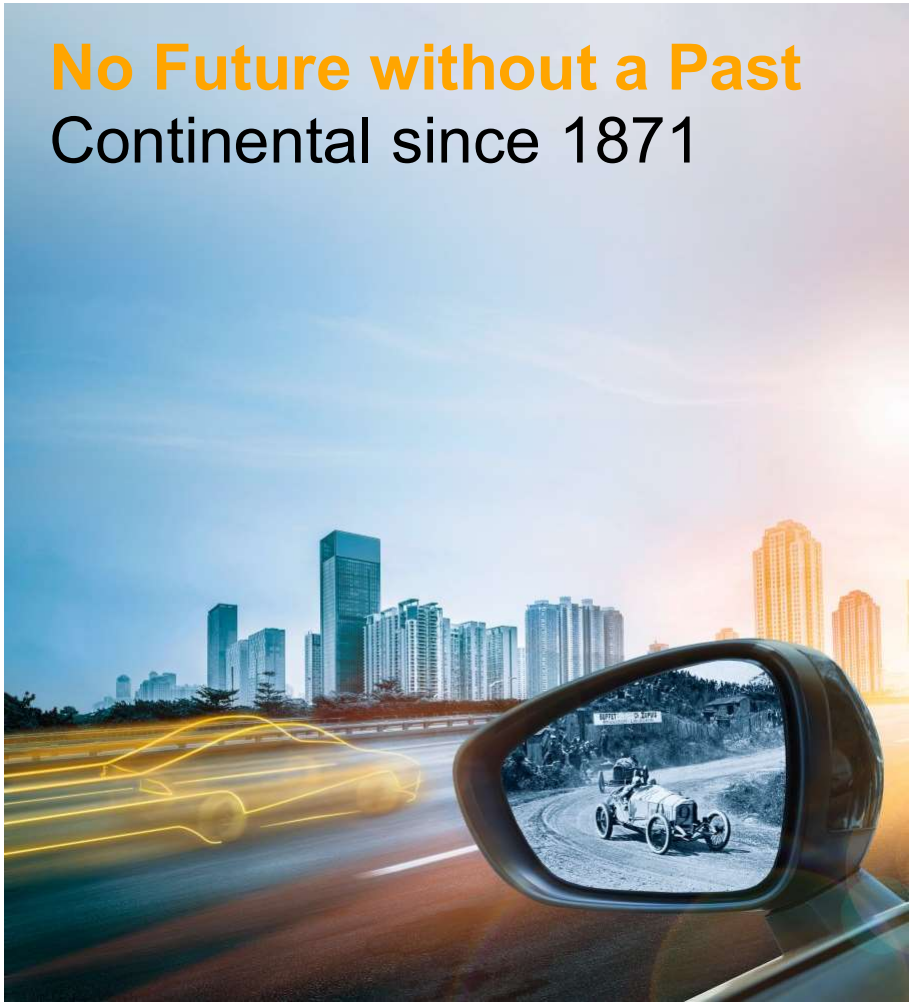
Sales by division in %

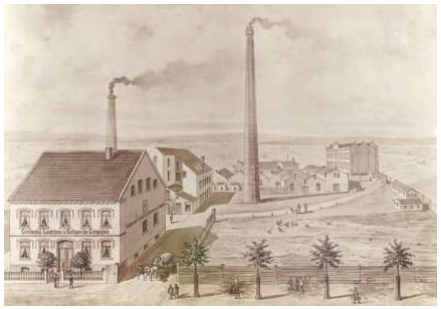


Status: Dec. 31, 2018

No Future without a Past

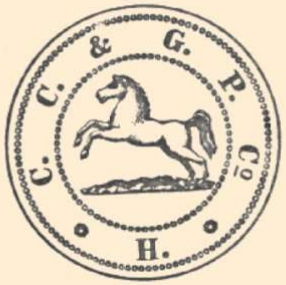
Continental since 1871





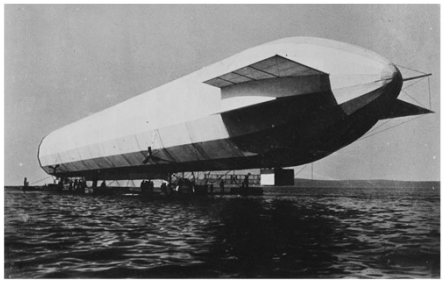
Continental-Caoutchouc- und Gutta-Percha Compagnie is founded in Hanover on October 8 as a joint stock company. Soft rubber goods such as hoof buffers for horses, rubberized fabrics, as well as pneumatic tires for bicycles and cars are manufactured.

1871



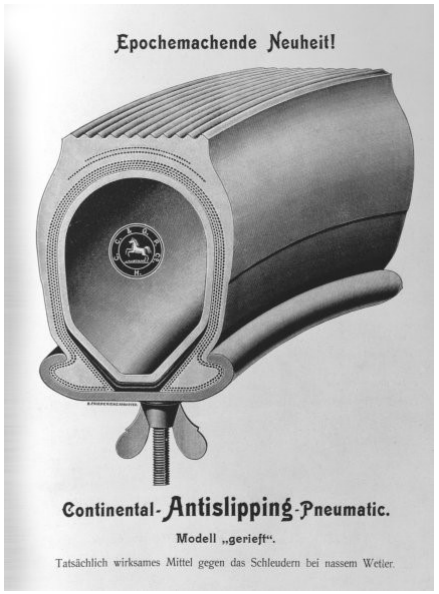
The rampant horse is adopted as the trademark.

1882



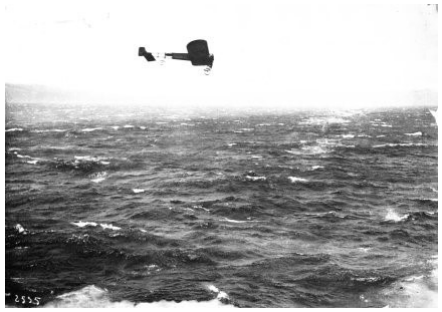
The first German airship LZ 1 rises above Lake Constance for its inaugural flight. The gas cells are sealed with Continental balloon material.

1900



Continental is the first company in the world to develop automobile tires with a patterned tread.

1904



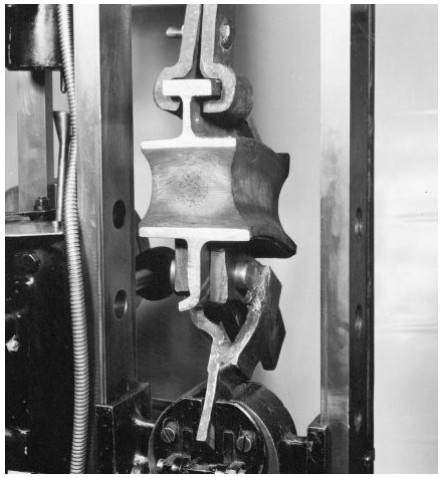
Louis Blériot, the pioneer aviator, writes history with the first flight across the English Channel. Continental Aeroplan material covers the fuselage and wings of his plane.

The same year, specimens of synthetic rubber developed at the Bayer laboratories are successfully vulcanized at Continental and processed to make the first test tires.

1909

The first edition of the customer magazine “Echo Continental” is published featuring contributions from young authors such as Erich Maria Remarque and drawings by well-known commercial artists.

1913



Continental markets a rubber-metal bonding under the registered trade name of Continental Schwingmetall.It is used to isolate vibrations and noise when supporting motors.

1932

Continental adds M+S tires for winter driving to its range of conventional tires.

1952

In close collaboration with Daimler-Benz and Porsche, Continental repeats its pre-war successes on the track.

Racing in cars fitted with Continental tires, drivers like Karl Kling, Stirling Moss and Juan Manuel Fangio win the 1952 Carrera Panamericana and the French, British, Dutch and Italian Grand Prix.

1951–55

Opening of the Contidrom tire testing facility on the edge of the Lüneburg Heath.

1967

1995

The Automotive Systems division is established to intensify the systems business with the automotive industry.

2007

Continental acquires Siemens VDO Automotive AG and advances to among the top five suppliers in the automotive industry worldwide, at the same time boosting its market position in Europe, North America and Asia.

2012

Start of extensive automated-driving tests in the U.S. state of Nevada.

A highly automated Continental test vehicle has covered 15,000 miles on public roads without any accidents.

2017

For the first time, the company employs more than

235,000

employees all over the world.
Annual sales amount to €44 billion.

Continental has built a test vehicle to enable driverless mobility, especially in cities. Called a **CUbE** (**C**ontinental **U**rban Mo**b**ility **E**xperience), this vehicle is being trialled at the Frankfurt site.

Opening of the research and experimental laboratory “Taraxagum Lab Anklam” in Anklam, Mecklenburg-Vorpommern, Germany. It provides a base for research into the cultivation and processing of Russian dandelion as an alternative source of raw material to the rubber tree.

Through its architecture, the new Continental headquarters – which are to be inaugurated to mark the company's 150-year anniversary – symbolize and promote the culture of innovation and interconnectivity at Continental. The new campus meets the demand for agile, flexible and interconnected collaboration throughout the entire organization, as is already common practice at Continental worldwide.

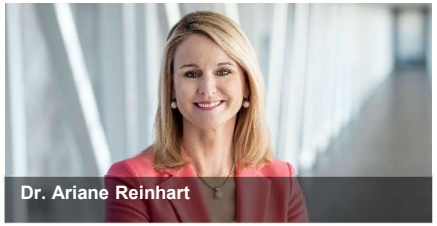
Continental Corporation
The Executive Board

Dr. Elmar Degenhart
Chairman of the Executive Board

Corporate Functions:
Corporate Communications, Corporate Quality and Environment, Continental Business System

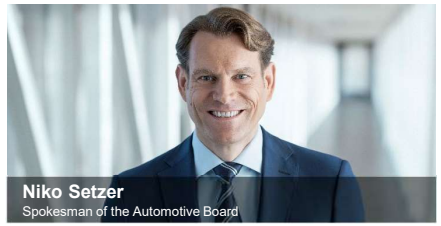
Wolfgang Schäfer

Corporate Functions:
Finance, Controlling, Compliance, Law, IT



Dr. Ariane Reinhart

Corporate Functions:
Human Relations and Sustainability, Director of Labor Relations



Niko Setzer
Spokesman of the Automotive Board

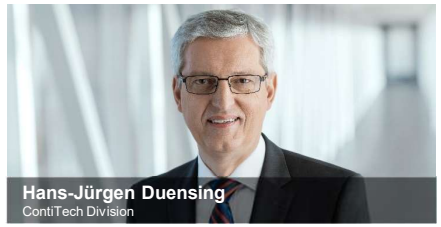
Central Functions Automotive

Frank Jourdan
Chassis & Safety Division

Helmut Matschi
Interior Division

Christian Kötz
Tire Division

Corporate Function:
Purchasing



Hans-Jürgen Duensing
ContiTech Division

Continental Corporation
Five Strong Divisions

Chassis & Safety	Powertrain	Interior	Tires	ContiTech
Advanced Driver Assistance Systems (ADAS)	Engine & Drivetrain Systems	Body & Security	PLT Original equipment	Air Spring Systems
Hydraulic Brake Systems	Hybrid Electric Vehicle	Commercial Vehicles & Aftermarket	PLT, Repl. Business, EMEA	Benecke-Hornschuch Surface Group
Passive Safety & Sensorics	Powertrain Components	Infotainment & Connectivity	PLT, Repl. Business, The Americas	Conveyor Belt Group
Vehicle Dynamics		Instrumentation & Driver HMI	PLT, Repl. Business, APAC	Industrial Fluid Solutions
			Commercial Vehicle Tires	Mobile Fluid Systems
			Two Wheel Tires	Power Transmission Group
				Vibration Control

Continental Corporation
Present Worldwide

*Headquarters in Hanover

Status: Dec. 31, 2018

Continental Corporation

Distribution of Sales: Vehicle Manufacturers and Other Industries

Status: Dec. 31, 2018

Automated Driving

- Today's **advanced driver assistance** systems provide the basis for the automated driving of the future.
- Continental is using its full **innovative power** to drive forward this trend and developing intelligent technologies that take over more and more driving functions – as long as the driver wants them to.
- **The advantage**: more safety, more convenience, more efficiency.

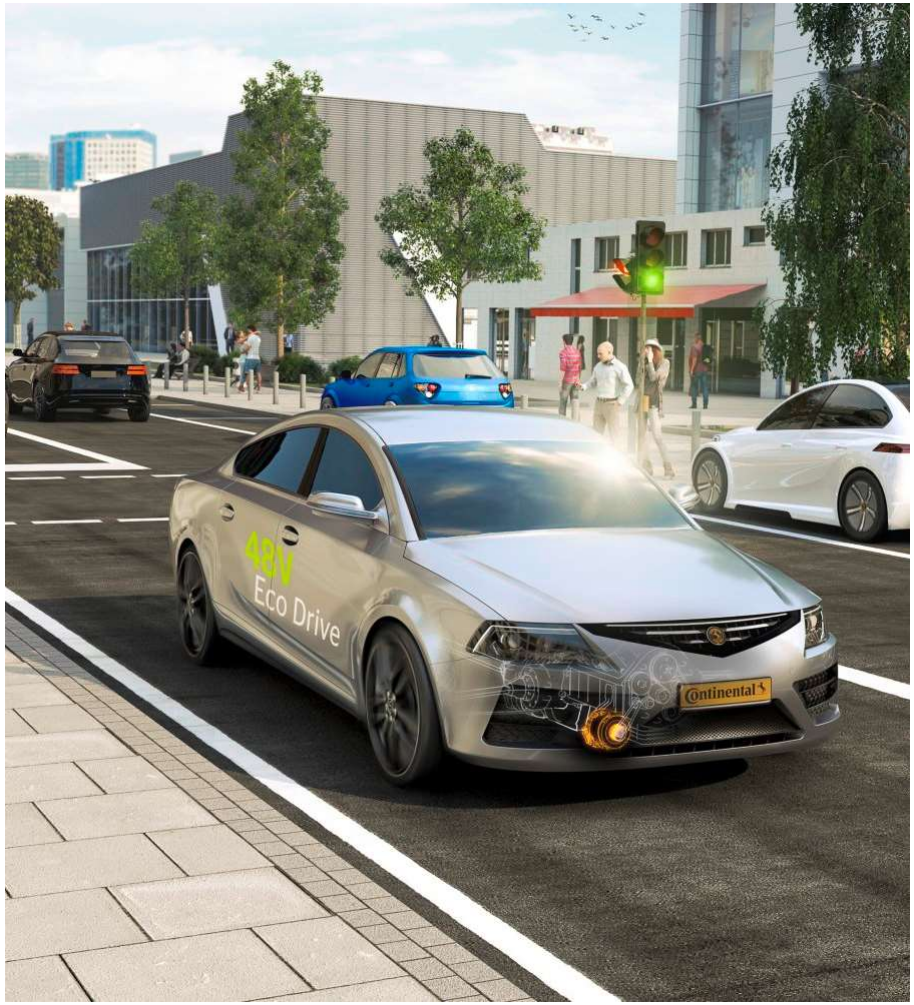
CUbE (**C**ontinental **U**rban mo**b**ility **E**xperience)

Connectivity

- Continental connects vehicles and people with the digital world.
- We develop and enable **holistic connectivity solutions**. We provide connectivity within the vehicle itself as well as with other vehicles and the outside environment.
- New possibilities are also emerging from the development of **intelligent transport systems**. In the future, **cloud-based software solutions** will offer more convenience not only for the driver and passengers, but also for the transport industry.

Electric Mobility

- With the **“Clean Power”** vision, Continental demonstrates the opportunities offered by clean mobility.
- Continental offers vehicle manufacturers the components and systems to gradually bring tailor-made electrification to the roads. From **start/stop technologies** and **48 V** and **hybrid component**, right up to systems for all-electric vehicles.
- Our **innovative solutions** not only make driving more environmentally compatible and affordable, they also make it more practical and fun.

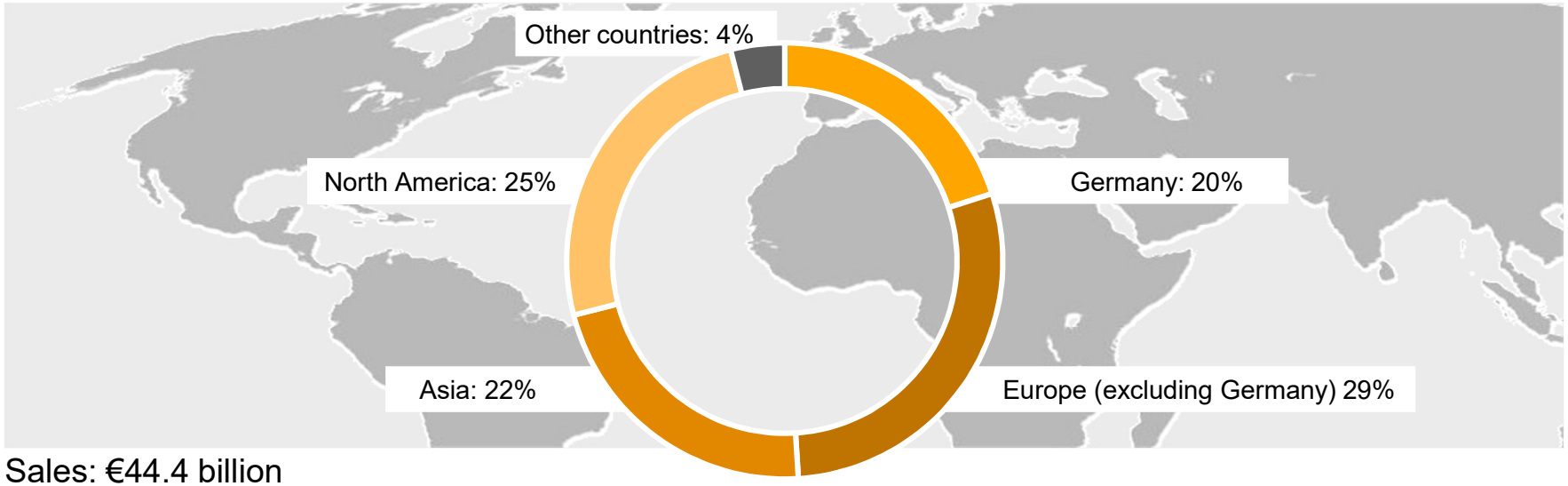


Continental Corporation
Key Figures for 2018

	2018	2017
Sales	**€44.4 billion**	€44.0 billion
EBIT*	**€4,027.7 million**	€4,561.5 million
Adjusted EBIT**	**€4,118.1 million**	€4,746.9 million
Employees	**243,226**	235,473

* Earnings before interest and taxes.
** Before amortization of intangible assets from PPA, changes in the scope of consolidation, purchase price allocation and special effects.

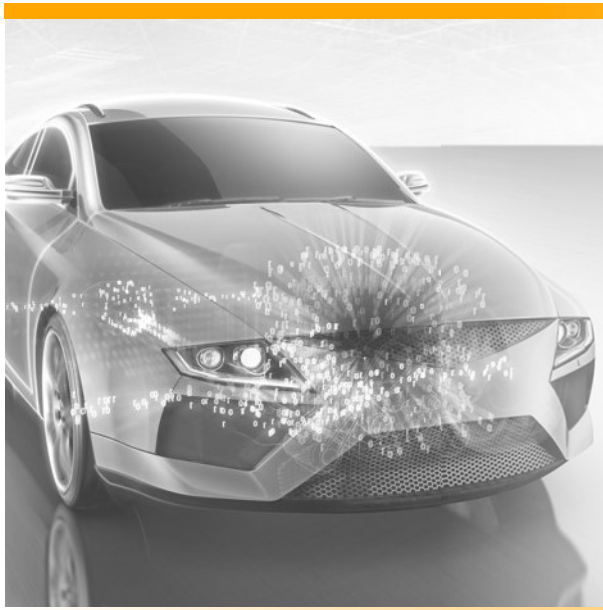
Continental Corporation
Sales by Market in 2018



Sales: €44.4 billion

Status: Dec. 31, 2018

Cybersecurity in the Automotive Domain
Agenda



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Introduction to Automotive Security
Increasing Complexity

Increasing number of ECUs

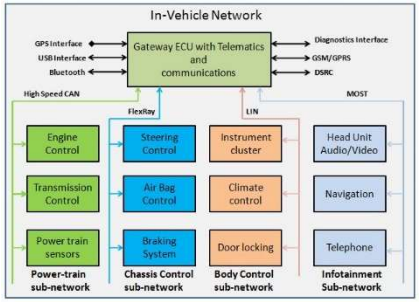
- 1997: 5 ECUs in Audi A6
- 2007: about 50 ECUs in Audi A4
- today: about 80 to 100 ECUs

Change in ECU usage

- Traditionally one task per ECU
- New trend of
  - distributing functions across ECUs
  - Integration multiple functions on one ECU

Variety of Applications

- Lane Assistance
- Collision avoidance
- Accident Reporting (eCall)
- Autonomous and Cooperative Driving



ECU: Electronic Control Unit

Introduction to Automotive Security
Understanding Security

NO

security

security „gate“

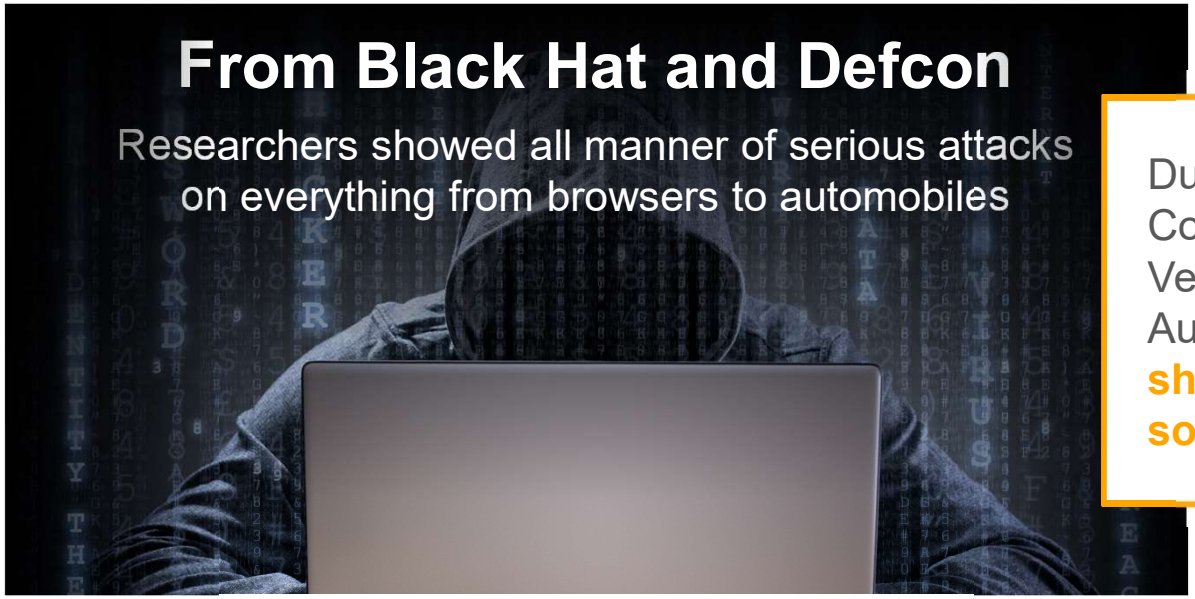
OKAY

Security

BYPASSED

Unfortunately, implementation attacks are hard to predict.

Introduction to Automotive Security
Consequences from a lack of security



During the Hacking Conferences - “Black Hat Las Vegas & Defcon Las Vegas” Aug 2015 - a **video was shown** and **distributed via social media**.

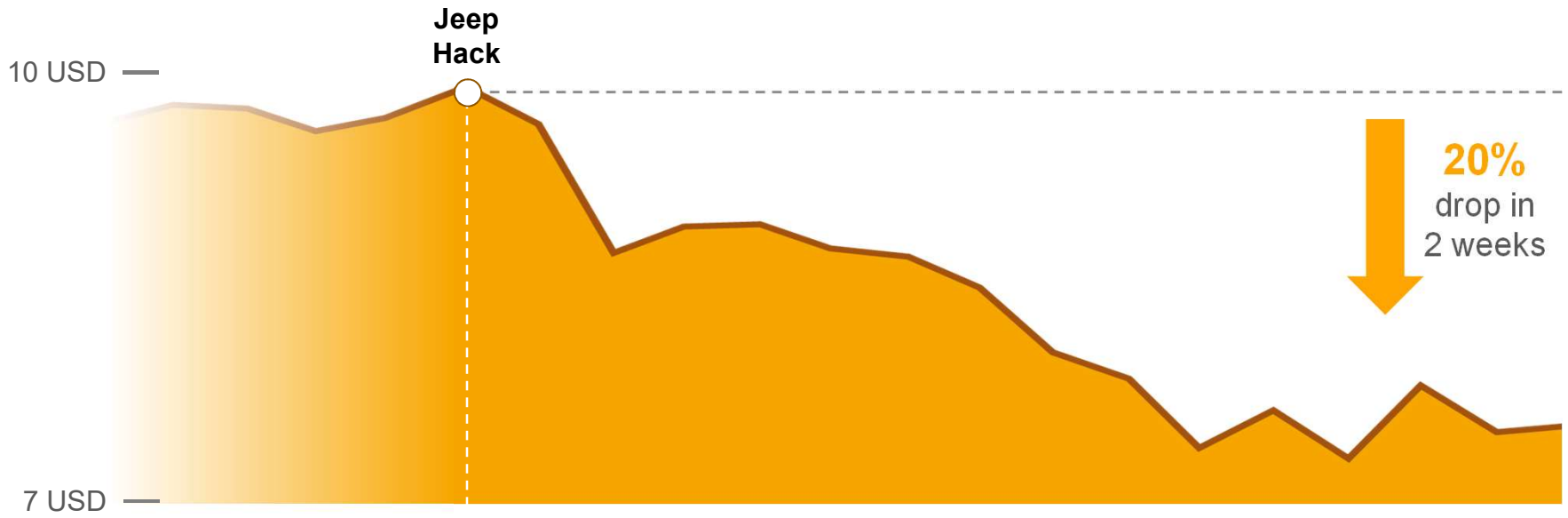

THE
CYBER
THREAT

Introduction to Automotive Security
Consequences

„After this jeep hack, **Chrysler recalled 1.4 Mio. vehicles for a security bug fix**.”

Introduction to Automotive Security

Stock Value Fiat Chrysler August 2015

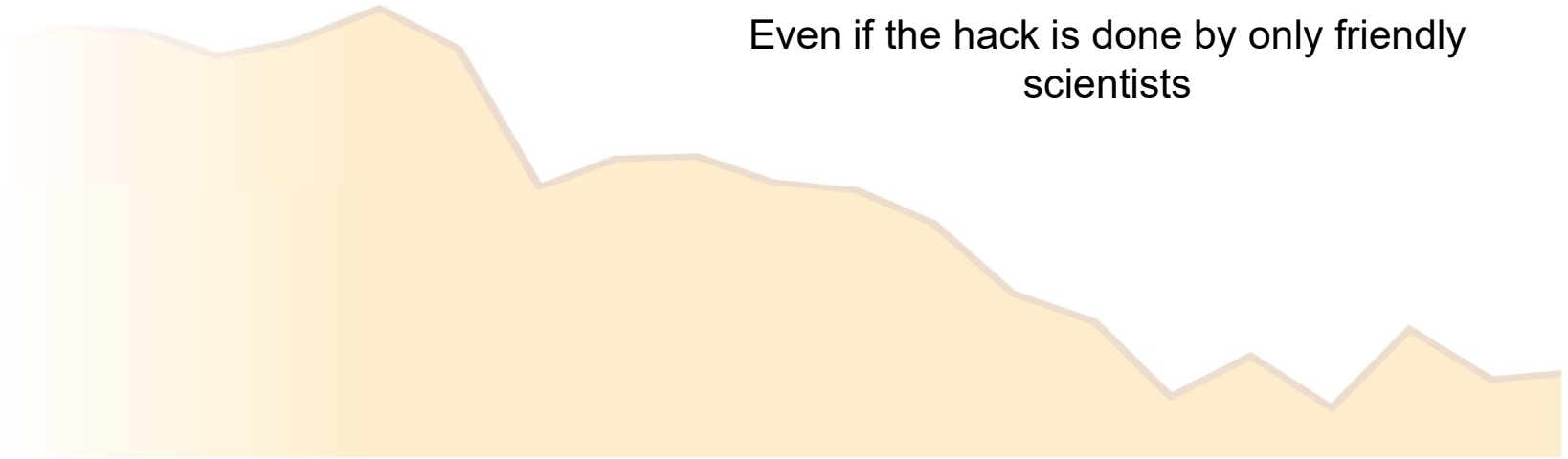


Introduction to Automotive Security

Stock Value Fiat Chrysler August 2015

Lack of Security has a deep impact on a companie's value

Even if the hack is done by only friendly scientists



Introduction to Automotive Security

… and more attacks with increasing press perception

2004: DRIVING; Altering Your Engine With New Chip (NY Times)
2003: Gentlemen, Start Hacking Your Engines (NY Times)
2002: How To Hack Your Car (Forbes)

< 2005

2010: Security and Privacy Vulnerabilities of In-Car Wireless Networks: A Tire Pressure Monitoring System Case Study (Rutgers, USC)
2010: Experimental Security Analysis of a Modern Automobile (Center for Automotive Embedded Systems Security)
2007: Hackers can take over car navigation system (The Telegraph)
2005: RFID Chips in Car Keys and Gas Pump Pay Tags Carry Security Risks (John Hopkins University)
2005: Linux Bluetooth hackers hijack car audio (The Register)
2005: Hacking the Hybrid Vehicle (Wired)

2005-2010

2016: Nissan Leaf electric cars hack vulnerability disclosed (BBC)
2014: A Survey of Remote Automotive Attack Surfaces (IOActive)
2014: Most Hackable Cars (CNN Money)
2014: How to Hack a Car (Vice)
2014: The Robot Car of Tomorrow May Just Be Programmed to Hit You (Wired)
2013: Digital Carjackers Show Off New Attacks (Forbes)
2013: Jury Finds Toyota Liable in Fatal Wreck in Oklahoma (New York Times)
2013: Adventures in Automotive Networks and Control Units (IOActive)
2013: Car Hacking: Your Computer-Controlled Vehicle Could Be Manipulated Remotely (CBS)
2013: How to Hack Your Mini Cooper: Reverse Engineering CAN Messages on Passenger Automobiles (Defcon 21)
2011: Can Your Car be Hacked? (Car and Driver)
2011: Comprehensive Experimental Analyses of Automotive Attack Surfaces (Center for Automotive Embedded Systems Security)

> 2010

Introduction to Automotive Security

Odometer Example: Good old times

Expertise	› Automotive mechanist
Tools	› Specific tools or garage
Time	› Hours
Evidence	› Mechanical Traces

Video: https://www.youtube.com/watch?v=vUh-8GEhzJM

Introduction to Automotive Security

Odometer Example: Nowadays

Expertise	› Search on google › Make a call
Tools	› Tester for ODB interface
Time	› Minutes
Evidence	› No digital traces

Video: https://www.youtube.com/watch?v=orMsibfLcFY

Introduction to Automotive Security
Attackers and their Damage Categories

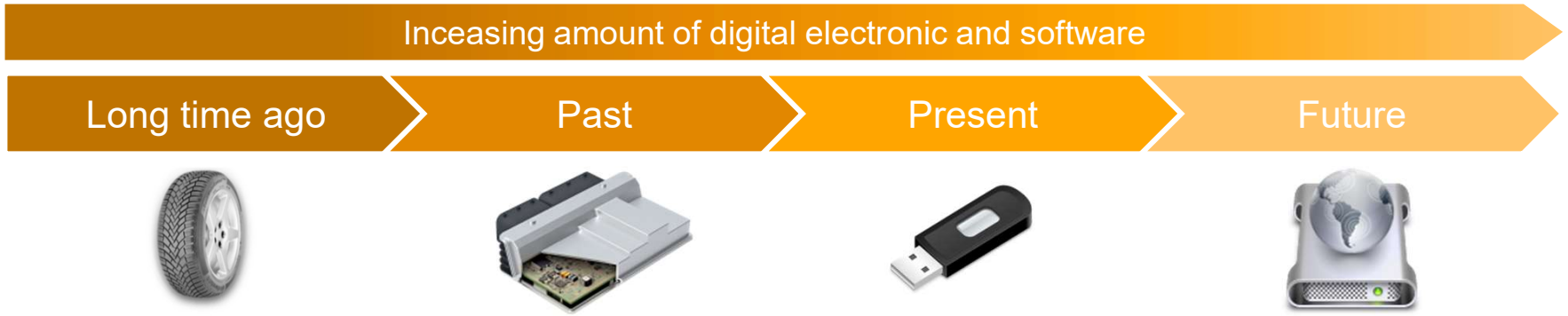
Thieves	› Stealing assets › Stealing vehicles
Owner/Driver	› Manipulating vehicle data › Manipulating vehicle Settings › Spoofing licences
OEM/Tier-1	› Stealing business secrets › Conducting product piracy
Software manufacturer	› Elevating privilidges
Hacker, Virus, Malware	› Stealing of personal data › Manipulating the functional safety

Damage Categories

- Property
- Image
- Business Model
- Legislation
- Know-How
- Reliability
- Functional Safety
- Privacy

Introduction to Automotive Security

Trends on Automotive Products – IT Technology



- Simple mechanical vehicles change to intelligent, connected, and software-based IT-Systems
- Flexibility, compatibility, costs, and weight are driving the change

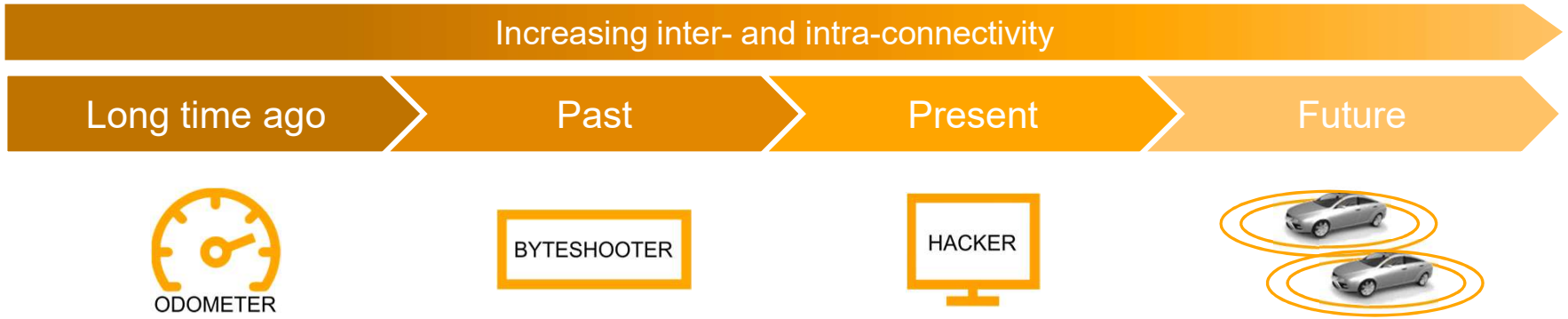
Introduction to Automotive Security

Trends on Automotive Products – Interconnectivity

- Evolutionary step from closed system to a complex interconnected and interactive communication party
- The need for an efficient and safe traffic regulation is one driver next to infotainment and internet connectivity.

Introduction to Automotive Security

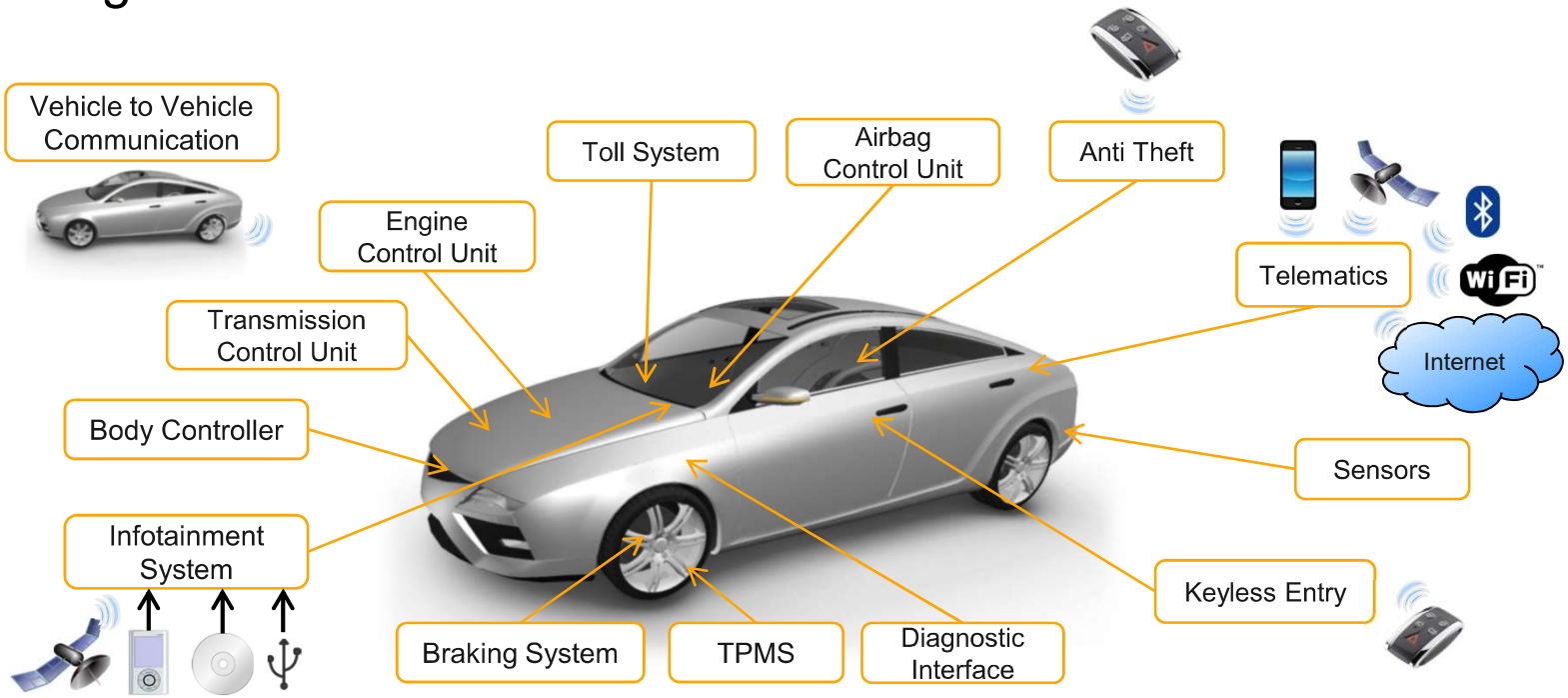
Trends on Automotive Products – Scaleability of Attacks



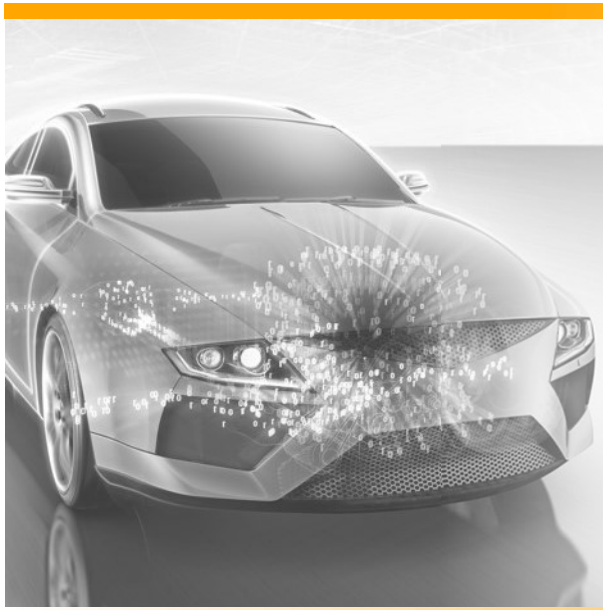
- Attacks are scaling from single manipulations of ECUs to organized network wide attacks
- Driver for this development on various stakeholder (owner, companies, 3rd parties): fun, fame, sabotage

Automotive Security Threats

Increasing attack surface



Cybersecurity in the Automotive Domain
Agenda



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New Challenges of Automotive Megatrends
Increasing Threats and Attack Potential at the Horizon

Electric Mobility

Autonomous Driving

Information

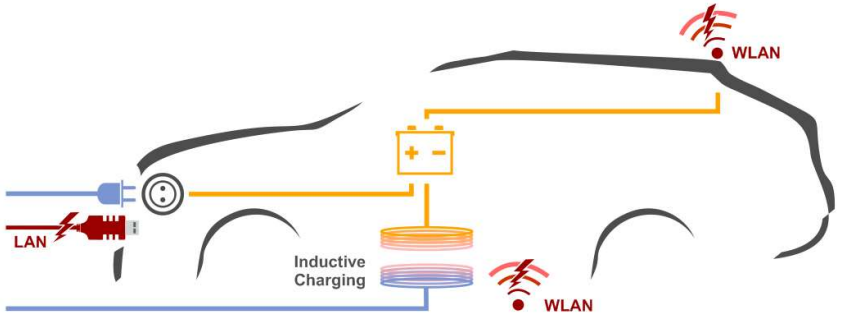
Megatrend: Electric Mobility
Infrastructure Necessary to be Protected

Charging Infrastructure

- Connects Automotive to the critical infrastructure “Electric Power”
- Electromobility is highly depending on the availability of charging infrastructure
- Implications with NIS Directive Regulation on the horizon

Payment

- Needs to be secured to avoid financial harm for supplier and/or customer



Megatrend: Electric Mobility
Attacks Based on Loss of Data Integrity

Attack on EV performance

- Different data sources used to extend range (weather, altitude difference, traffic volume)
- Manipulation can lead to unexpected performance of electronic vehicle

Attack on components

- Overheated battery triggered by manipulation of temperature sensor
- Will cause financial harm

Megatrend: Autonomous Driving

SAE J3016 - Driving Automation Definitions

	SAE Level	Name	Steering, Acceleration, Deceleration	Monitoring of Driving Environment	Fallback Performance	System Capability (Driving Modes)
 Human driver monitors the driving environment	0	**No Automation**	Human	Human	Human	n/a
	1	**Driver Assistance**	Human and System	Human	Human	Some driving modes
	2	**Partial Automation**	**System**	Human	Human	Some driving modes
 Automated driving system monitors the driving environment	3	**Conditional Automation**	System	**System**	Human	Some driving modes
	4	**High Automation**	System	System	**System**	Some driving modes
	5	**Full Automation**	System	System	System	**All driving modes**

Megatrend: Autonomous Driving
Automated Driving System takes over more responsibility

- Impact of errors/attacks increases due to higher range of functions
- Simple shut-down in case of attacks is not working
- Need for redundancy and fallback systems
- Higher impact on privacy due to increased need of data collection and processing

Megatrend: Information
New Opportunities and Risks of Big Data

Collection, processing and connectivity

- Improve driver assistant systems (Safety)
- More attractive/interactive infotainment systems
- Reduction of fuel/energy consumption
- Mobility Services, Smart Cities, Smart Home

Arising Risks of Big Data

- Increasing number of attack vectors
- Compliance with different legal privacy frameworks
- Higher attraction to data theft

Megatrend: Information
Over the Air is Enabler and Additional Risk

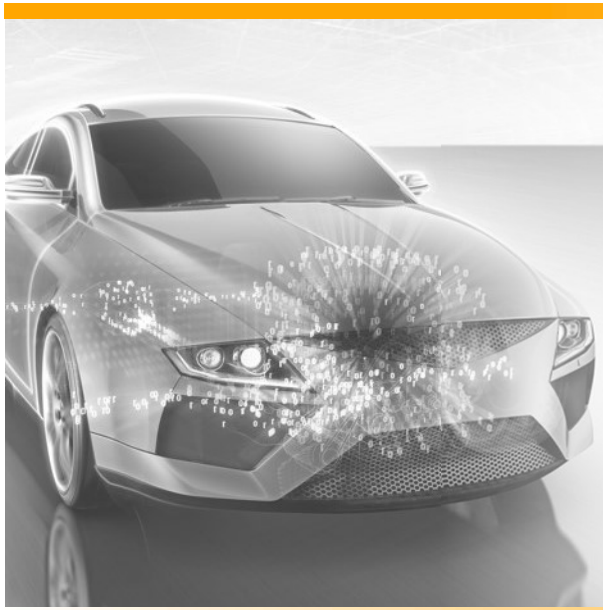
Opportunities

- Smart and fast way for bug fixing and security patches
- Enables automotive app ecosystem
- Provides live information

Attack Vectors

- Connection interface can be attacked
- Risk of infected automotive apps

Cybersecurity in the Automotive Domain
Agenda



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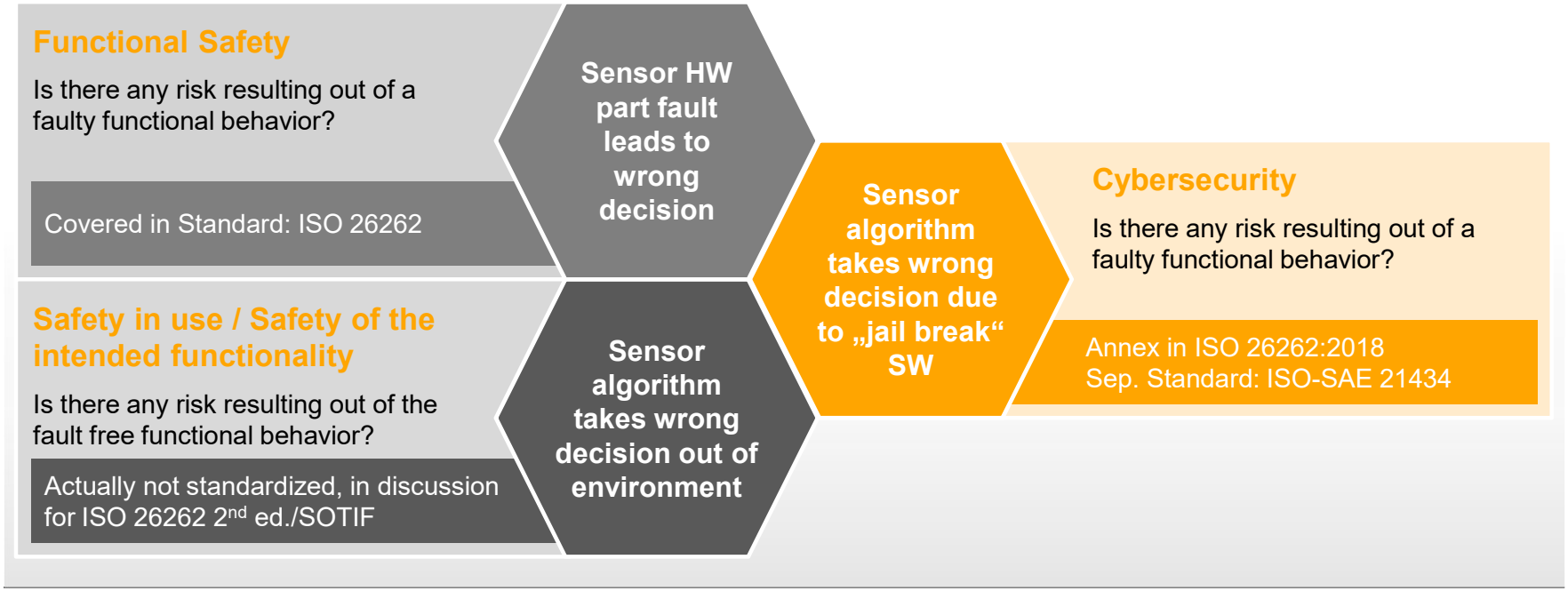
Ensuring Device Reliability

Interplay of Functional Safety and Security Required

- Safety a discipline with a long history in automotive
- Functional Safety and Security need to engage with each other to ensure high quality products
- Both disciplines need to be considered by the organization.

Differentiate Safety and Security
Function: Intended functional behavior



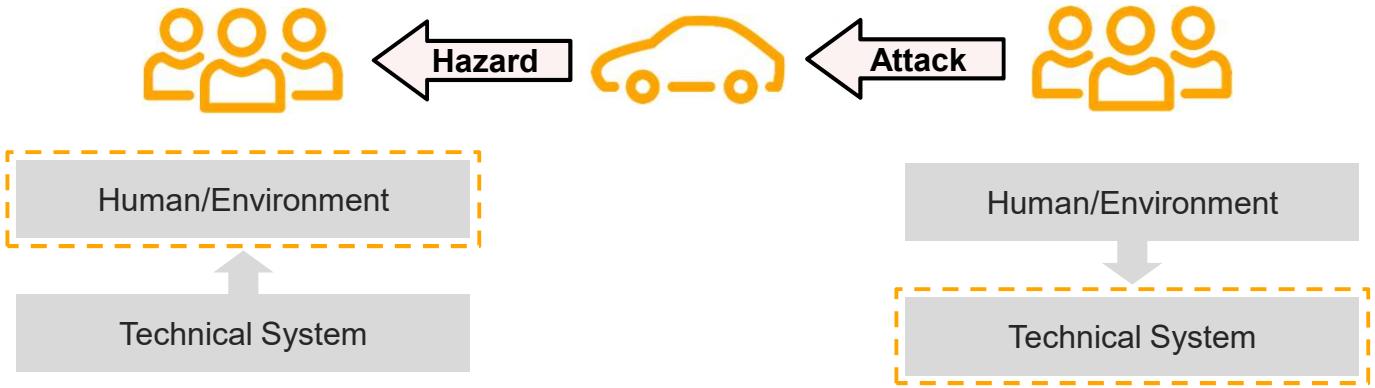
Differentiate Safety and Security
Security vs. Functional Safety

Functional Safety

› Protect human against threats proceeded from (known) technical systems.

Security (IT/Cyber)

› Protect a technical system against attacks (basically unknown) as well as disturbances from the environment or caused by human.



Differentiate Safety and Security
Similarities between Safety and Security

Risk oriented approach
- What can go wrong? How likely is it? What will the consequences be? (note: differences in probability estimations)

Development process
- Safe and secure software is achieved by using a systematic development approach rather than reactive patching

Testing
- Comprehensive testing is essential for confidence in the final product

Redundancy
- Double instances of safety/security mechanisms does not necessarily lead to double safety/security

Ultimate objective
- Achieving a **sufficiently safe/secure product**

Culture and values
- Knowledgeable, motivated and committed management and employees is a success factor for achieving safe and secure products

Differentiate Safety and Security

Differences between Safety and Security

Classification of consequences

- In safety typically divided into several levels (e.g. SIL/ASIL/DAL)
- In security quite binary, system is either compromised or not

Threat analysis, risk assessment

- In safety we have pretty well known, static fault models and fault assumptions
- In security threats changes regarding motivation, knowledge and attack vectors

Non-experts understanding

- In safety the consequences are easily understandable
- In security the threat models are often met with scepticism and might be judged as paranoid

Knowledge of experience

- In the safety domain there is a culture of discussion and sharing of experience
- In security, business actors tend to keep their experiences to themselves, thus efficiently slowing down the collective expertise

Challenges of Security in Automotive
Variety of Challenges

Vulnerability in BMWs online-system ConnectedDrive

Compromised
Entertainment
Acceptable?

http://www.heise.de/autos/artikel/Sicherheitsluecke-in-BMWs-Online-System-ConnectedDrive-2533697.html

30.01.2015

Hackers remotely disrupt a Jeep on the highway

Compromised
Breaking System
Acceptable?

https://www.wired.com/video/2015/07/hackers-wireless-jeep-attack-stranded-me-on-a-highway/

21.07.2015

Tesla App hacked: car stolen

Compromised
Smart Phone
Acceptable?

https://promon.co/blog/tesla-cars-can-be-stolen-by-hacking-the-app/

23.11.2016

ADAC-Investigation: OEMs collect Big Data

Compromised
Compliance
Acceptable?

http://www.heise.de/newsticker/meldung/ADAC-Untersuchung-Autohersteller-sammeln-Daten-in-grossem-Stil-3227102.html

04.06.2016

Challenges of Security in Automotive
Uncomfortable consequences in common

Tens of millions of airbags are defective. Even a minor fender-bender can cause these airbags to rupture, spraying metal shrapnel into drivers and passengers.

https://www.airbagrecall.com/
https://www.safercar.gov/rs/takata/takatalist.html

Recall Campaign

FCA: 1.4M Vehicles
24.07.2015

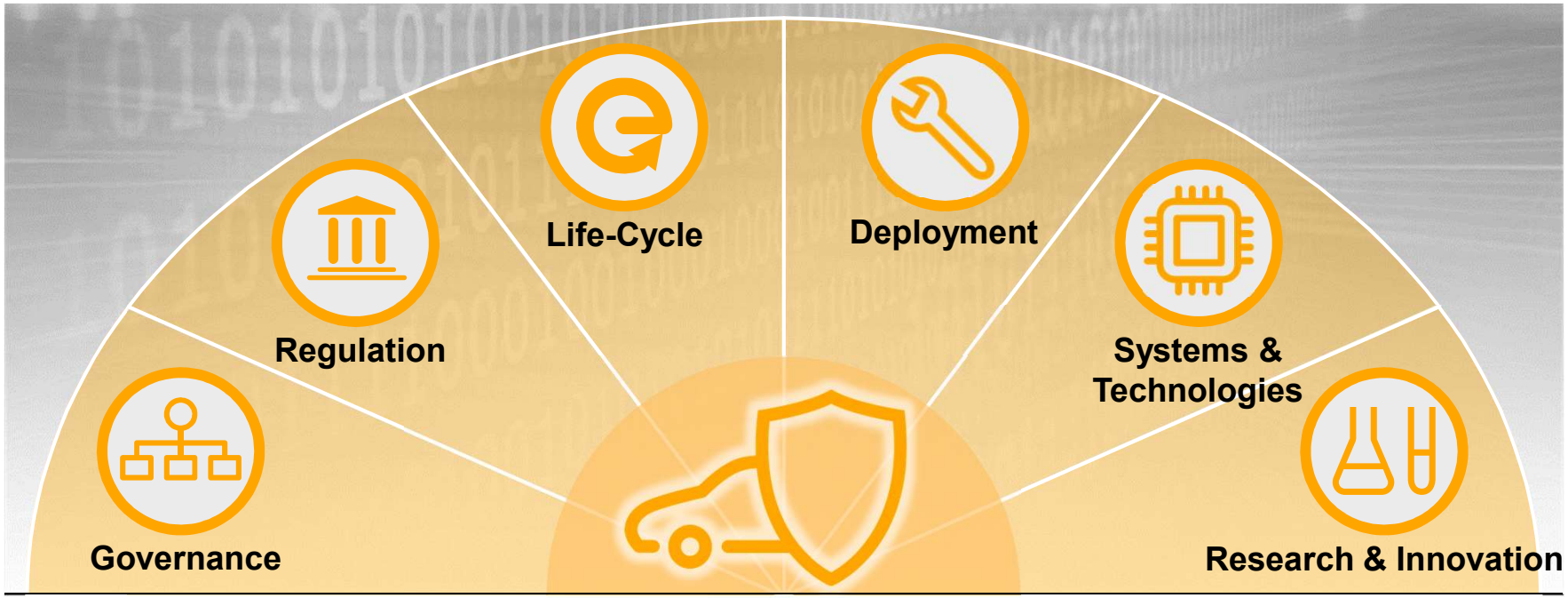
Affected are certain vehicles equipped with 8.4-inch touchscreens a

- 2013-2015 MY Dodge Viper specialty vehicles
- 2013-2015 Ram 1500, 2500 and 3500 pickups
- 2013-2015 Ram 3500, 4500, 5500 Chassis Cabs
- 2014-2015 Jeep Grand Cherokee and Cherokee SUVs
- 2014-2015 Dodge Durango SUVs
- 2015 MY Chrysler 200, Chrysler 300 and Dodge Charger sedans
- 2015 Dodge Challenger sports coupes

Customers affected by the recall will receive a USB device that they software, which provides **additional security features** independer Alternately, customers may visit http://www.driveuconnect.com/sol Vehicle Identification Numbers (VINs) and determine if their vehicle

Address Challenges of Security in Automotive

Parts of the Holistic Approach



Part: Governance
Preparation of the Organisation Necessary

Management

- **Security Strategy**
  Consideration by Management for the overall strategy
- **Processes**
  Revise processes with security respective activities and work products
- **Standardisation**
  Harmonization of internal and external activities
- **Compliance and Audits**
  Ensure correct implementation of security measures over time

Culture

- **Awareness of Management and Engineers**
  Inform about security threats and their impact
- **Trainings, Competence Management**
  Ensure technical skills to address security threats appropriately
- **Security Engineering**
  Consider security in the design
- **Lessons Learned**
  Consider known threats and effective countermeasures

Sustainability

- **Surveillance and Cyber-Defence**
  Awareness about new threats appearing in the field
- **Incident Management**
  Effective and lean processes to mitigate security incident short-term
- **Knowledge Management**
  Documentation of effective solutions

Approach: Regulation
Not Exhaustive List of Regulations | 1

International

- UNECE WP.29 TF Cybersecurity and OTA issues

Europe

- Joint Communication on „Resilience, Deterrence and Defence: Building strong cybersecurity for the EU” (JOIN (2017) 450
- Product-specific Certification, e.g. Tachograph, Event Data Recorder (AD), C-ITS
- General Data Protection Regulation
- NIS Directive (might be relevant in future)

Approach: Regulation
Not Exhaustive List of Regulations | 2

China

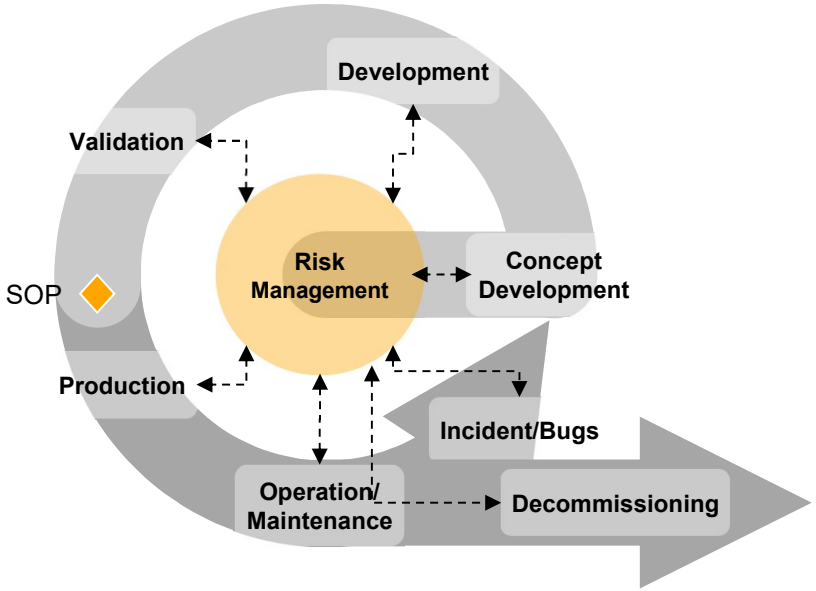
- Cybersecurty Law (中华人民共和国网络安全法)
- Cryptographic Law Draft (中华人民共和国密码法)

USA

- Self-Driving Car Act

Part: Life-Cycle
Consider Cybersecurity from Cradle to Grave

- Low impact by Cybersecurity
- Shall be stable within organisations
- Product independent within organization
- Slight tailoring for specific products
- Clear interfaces due to harmonization in distributed development

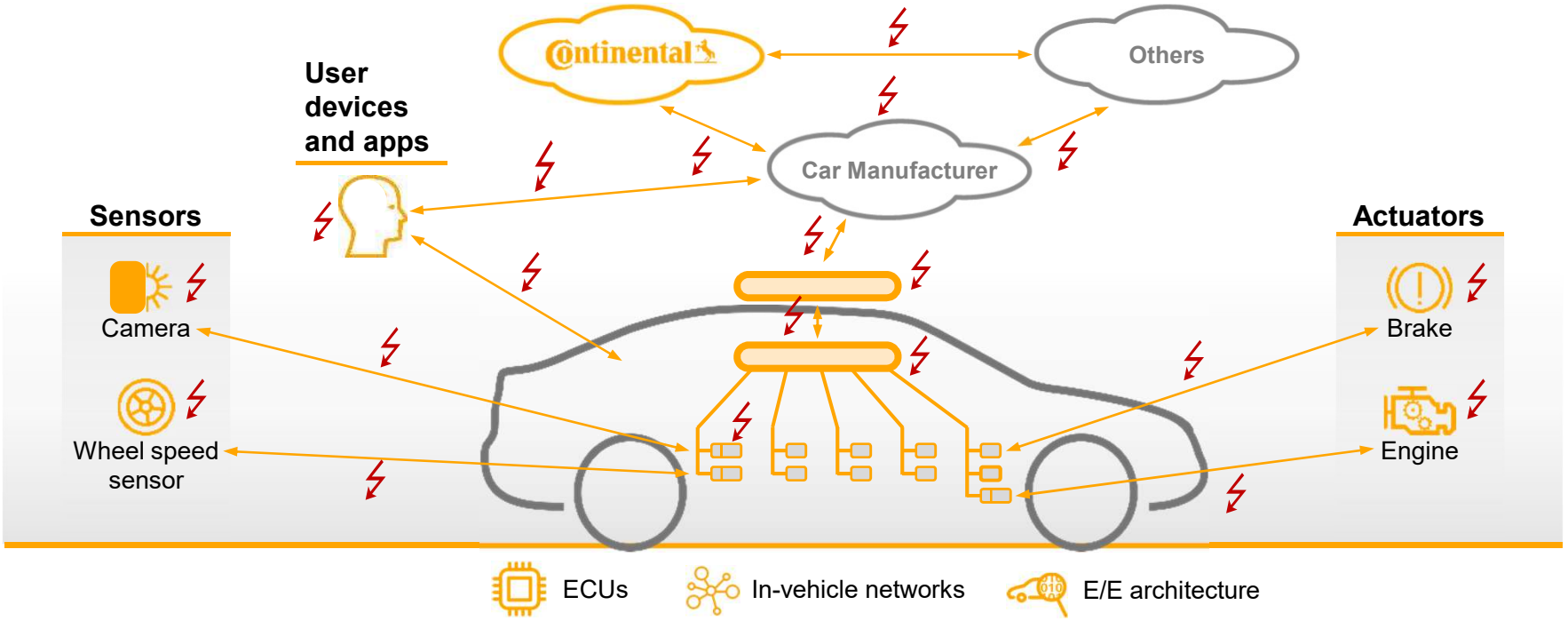


Part: Deployment
Establish Cybersecurity on the Operational Level

- Medium impact by Cybersecurity
- Defined methodologies for transparent and comprehensible decisions, e.g.
  - Risk Management
  - Security Testing
- Supply Chain Management
  - Clear assignment of responsibilities
  - Engineering Interface Agreement
- Dedicated Security Services
  - Online Trust Center
- Configuration & Vulnerability Management

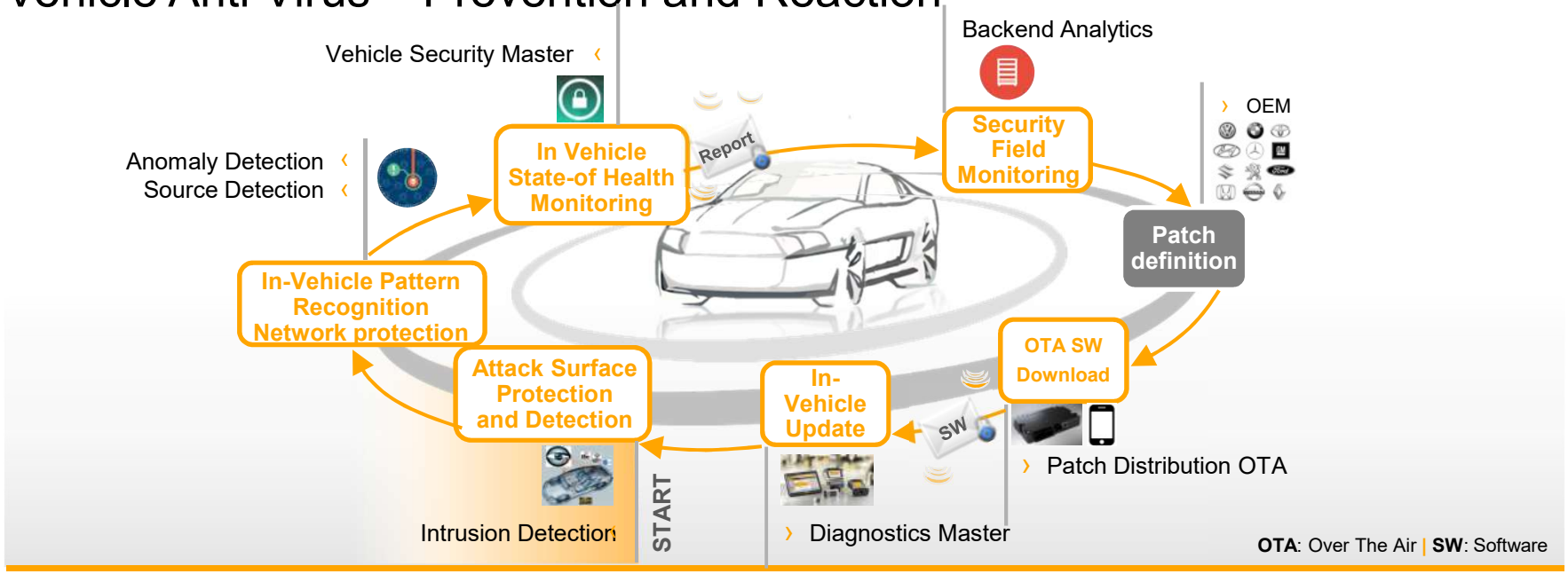
Part: Systems & Technologies

Secure Data, Secure Network, Secure Components



Part: Research & Innovations

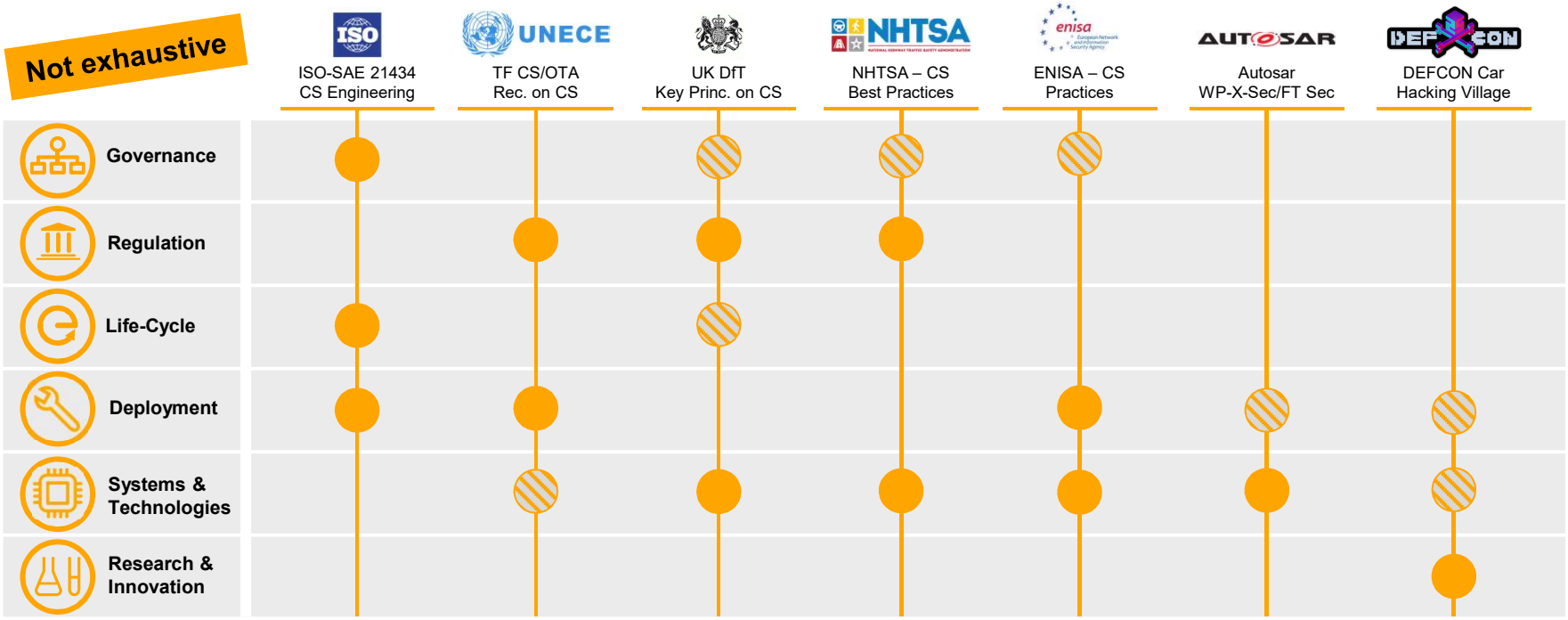
Vehicle Anti Virus – Prevention and Reaction



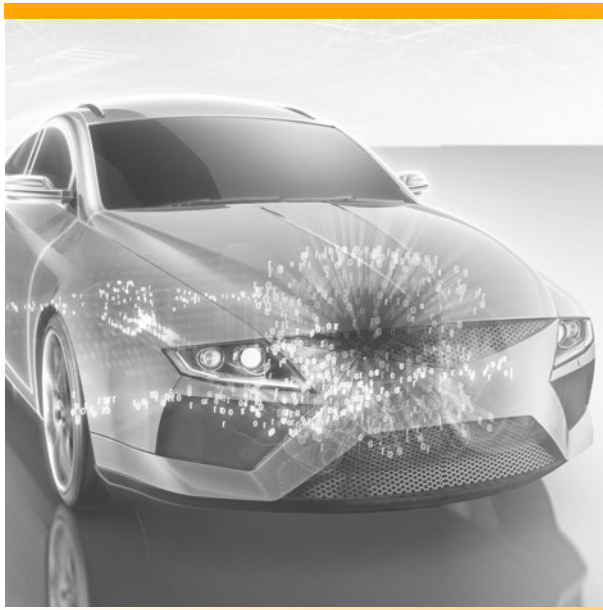
Cyber Security needs to be continuously observed and if needed be patched

Challenges of Security in Automotive

Different Activities needs to be Considered



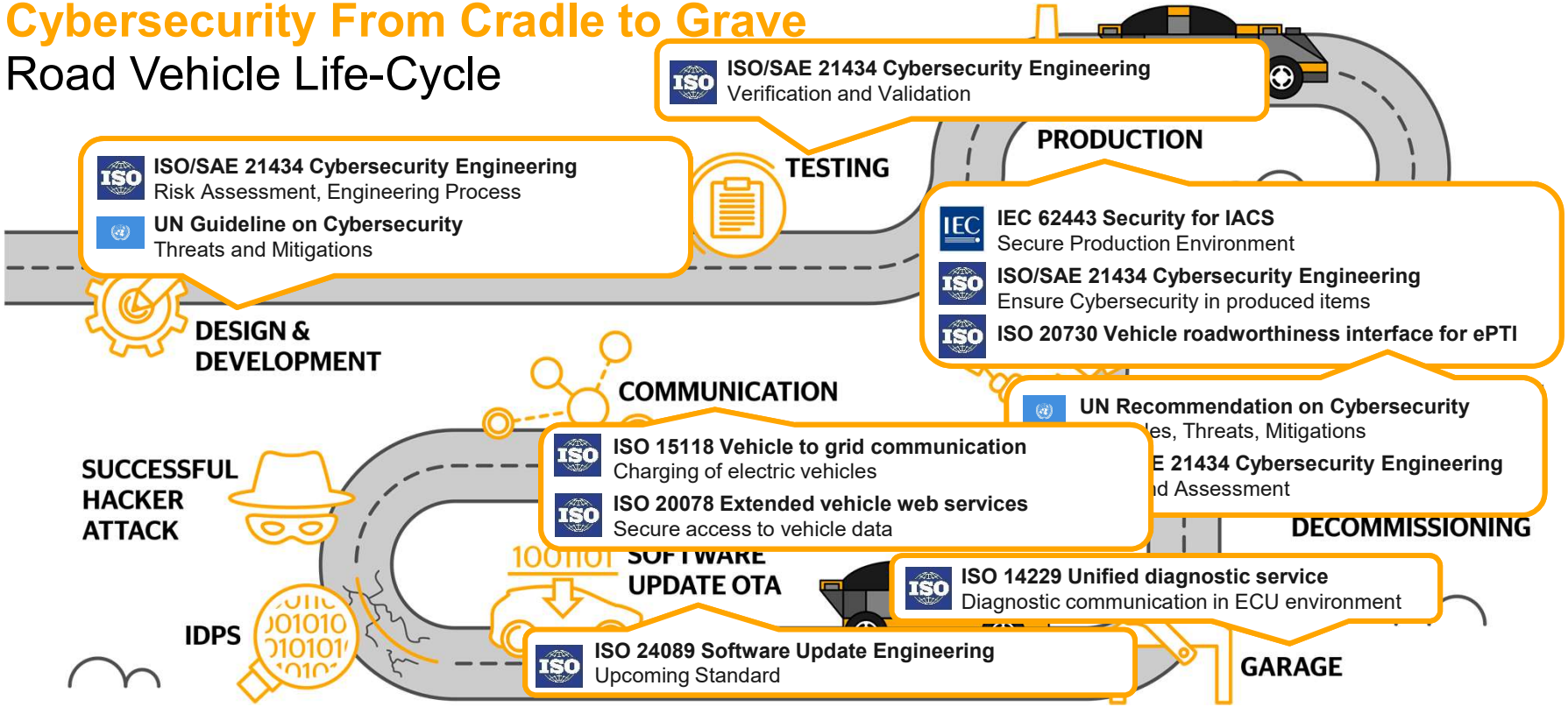
Cybersecurity in the Automotive Domain
Agenda



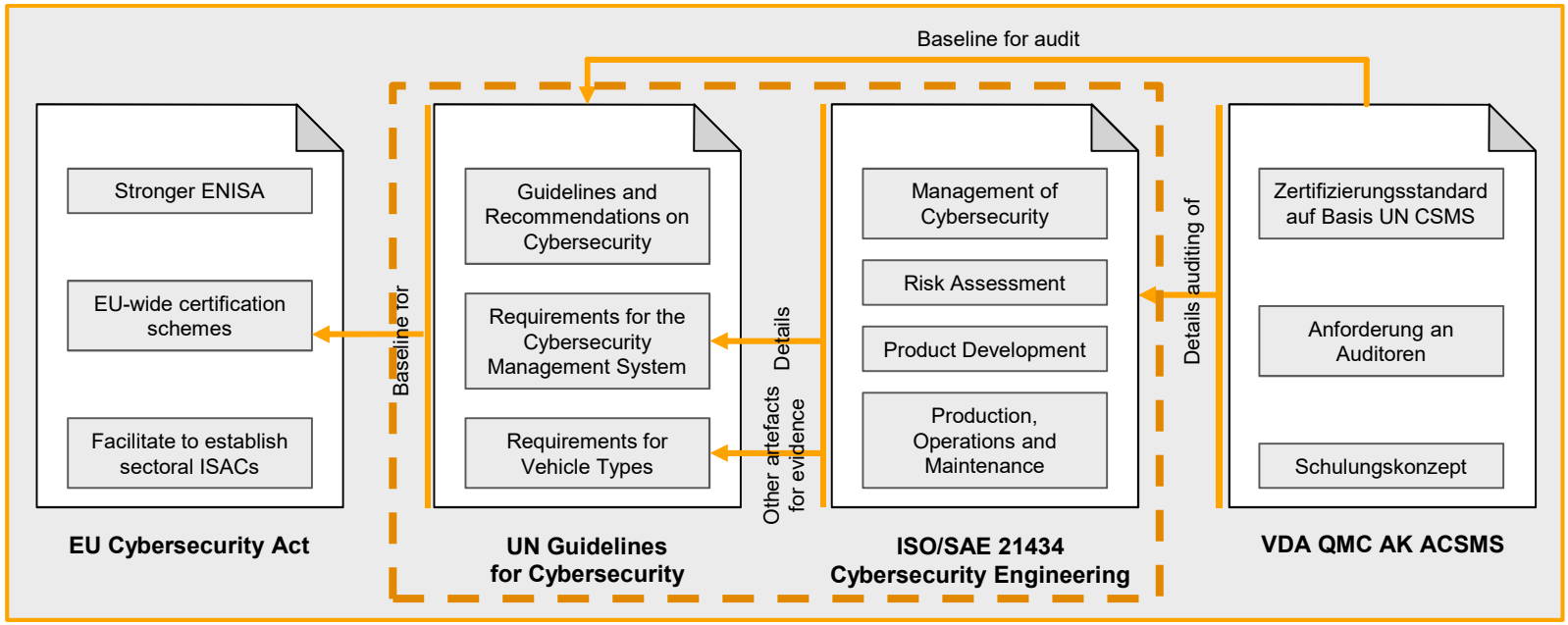
1. Introduction to Continental
2. Automotive Security
3. New Challenges of Automotive Megatrends
4. Interplay of Safety and Security
5. **Relation between Standardization and Regulation**
6. Entry Possibilities at Continental

Cybersecurity From Cradle to Grave

Road Vehicle Life-Cycle



Cybersecurity in Automotive
Relation of Current Activities



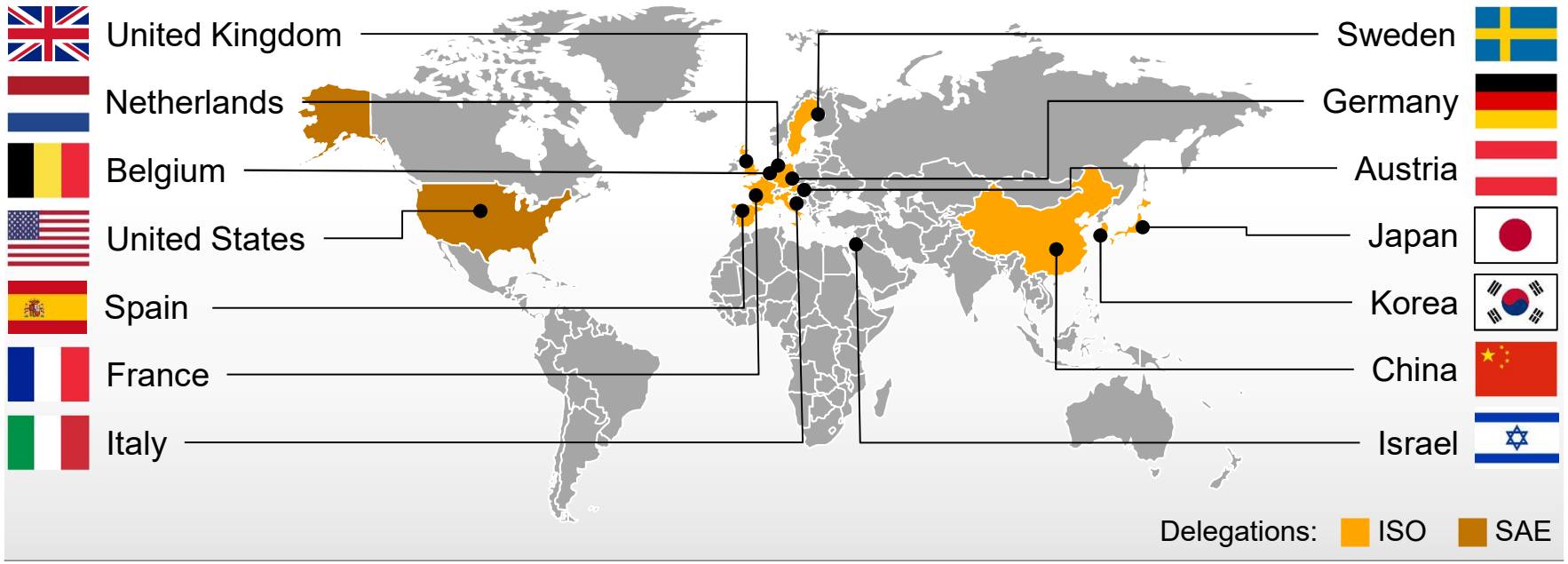
ISO/SAE 21434 Road vehicles – Cybersecurity Engineering
Goals of the Standardization Project

The future standard shall…

1. Give uniform definition of notions relevant to automotive security
2. Specify minimum requirements on security engineering process and activities and define – wherever possible – criteria for assessment
3. Describe the state of the art of security engineering in automotive E/E development
4. Enable better solutions due to harmonized value-chain
5. Facilitate bi-directional communication along the supply-chain

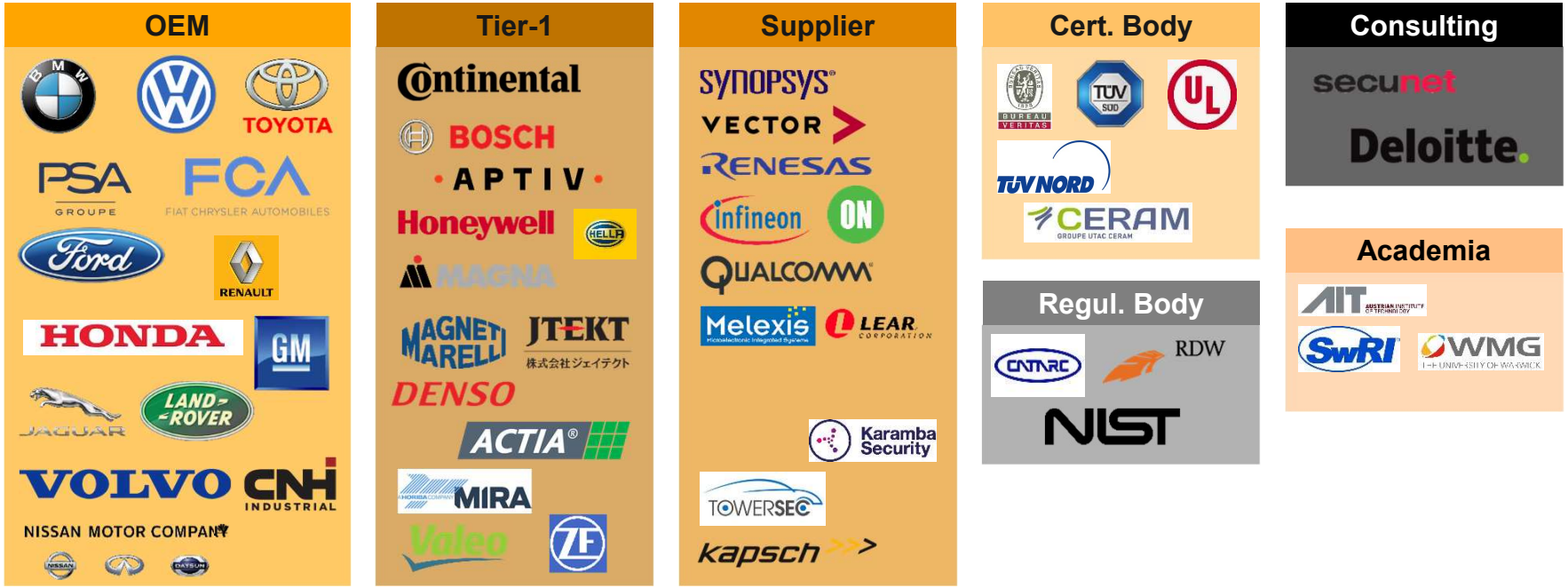
ISO/SAE 21434 Road vehicles – Cybersecurity Engineering

National Delegations



ISO/SAE 21434 Road vehicles – Cybersecurity Engineering

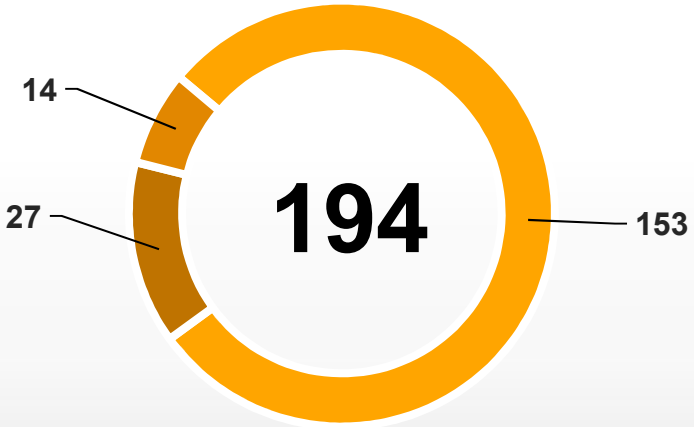
Involved Organizations

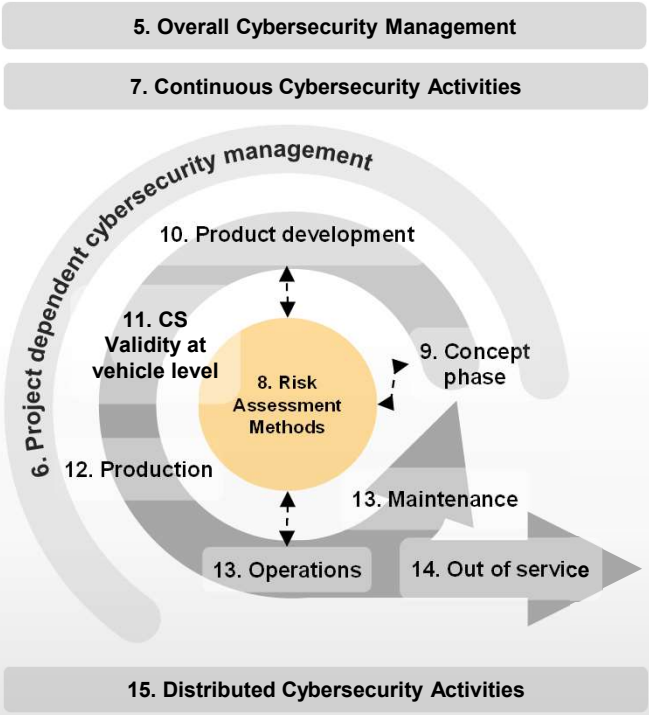


ISO/SAE 21434 Road vehicles – Cybersecurity Engineering

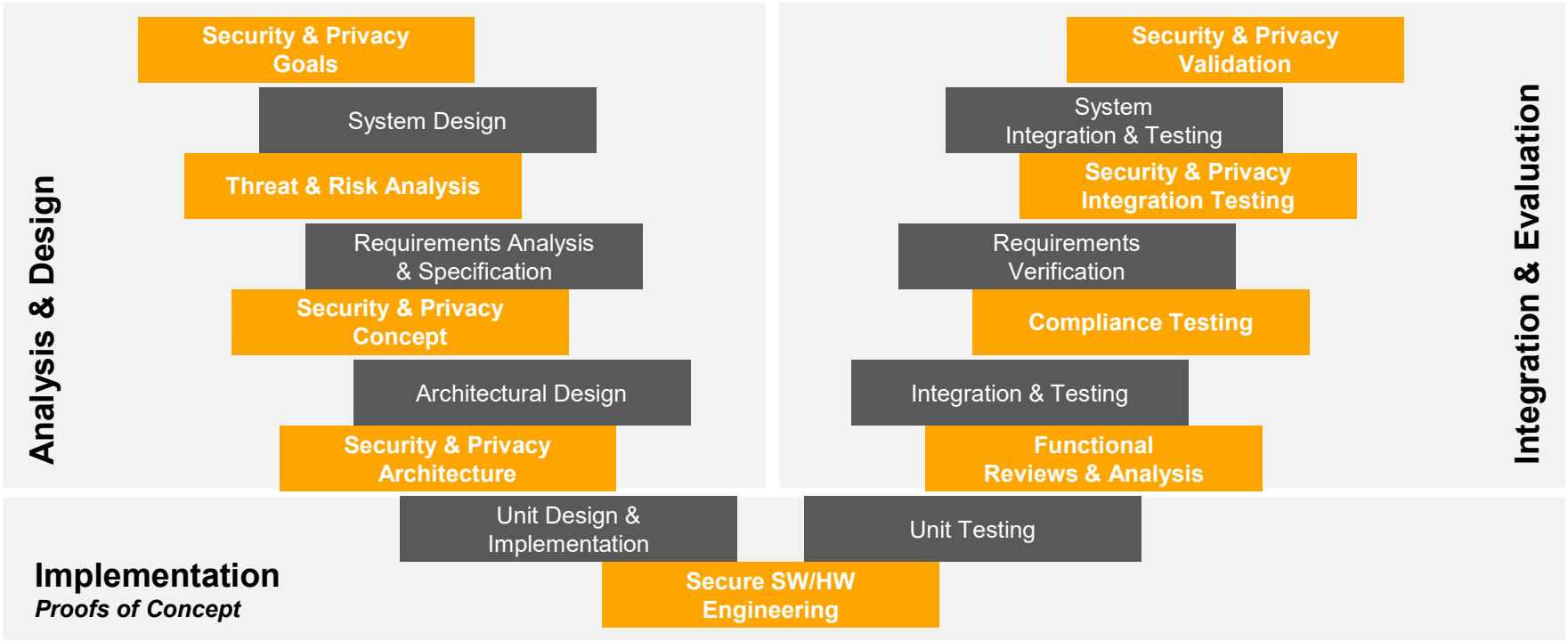
Outlook to the Content

Clause Types

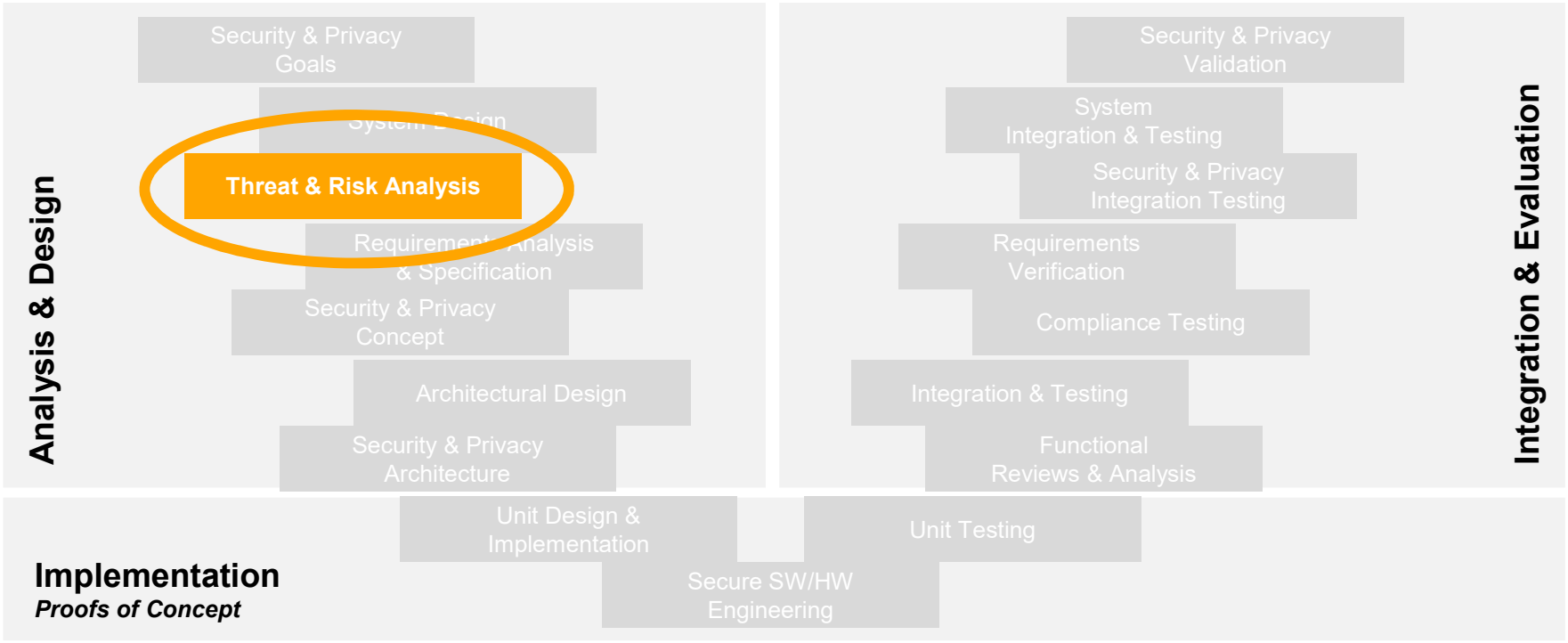




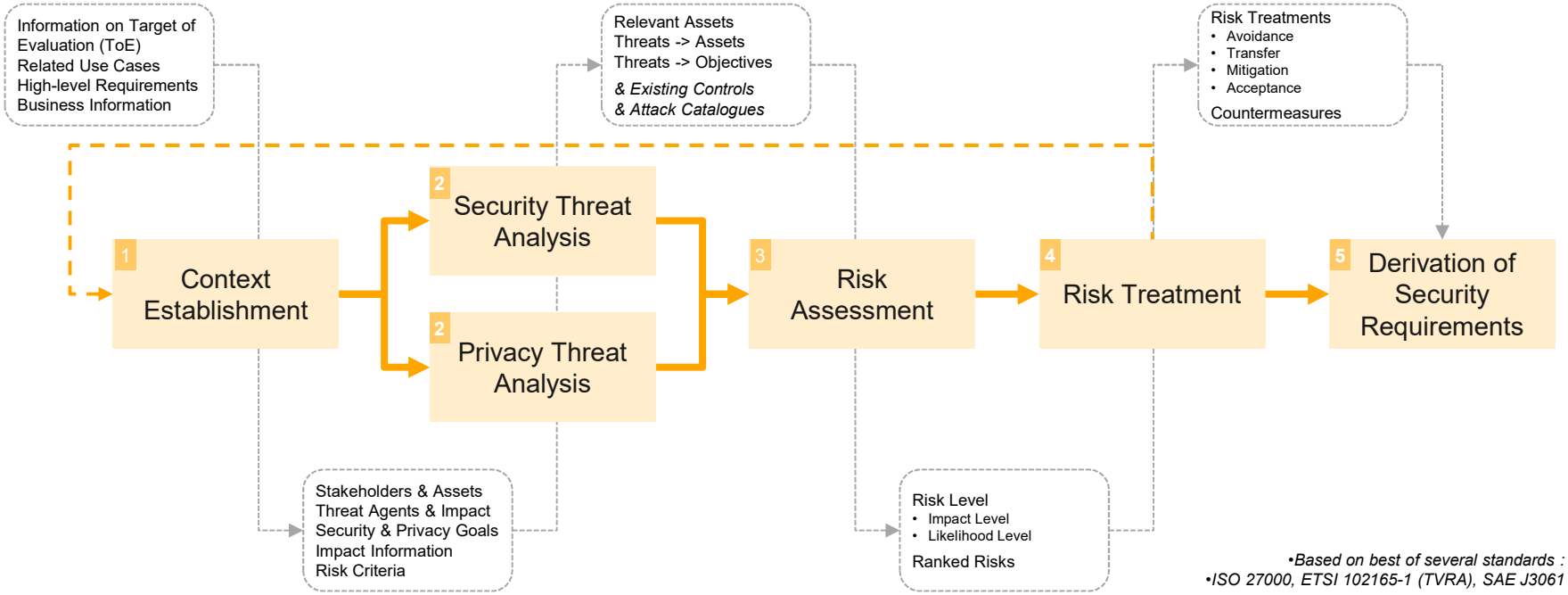
V-Model: Security & Privacy



V-Model: Security & Privacy



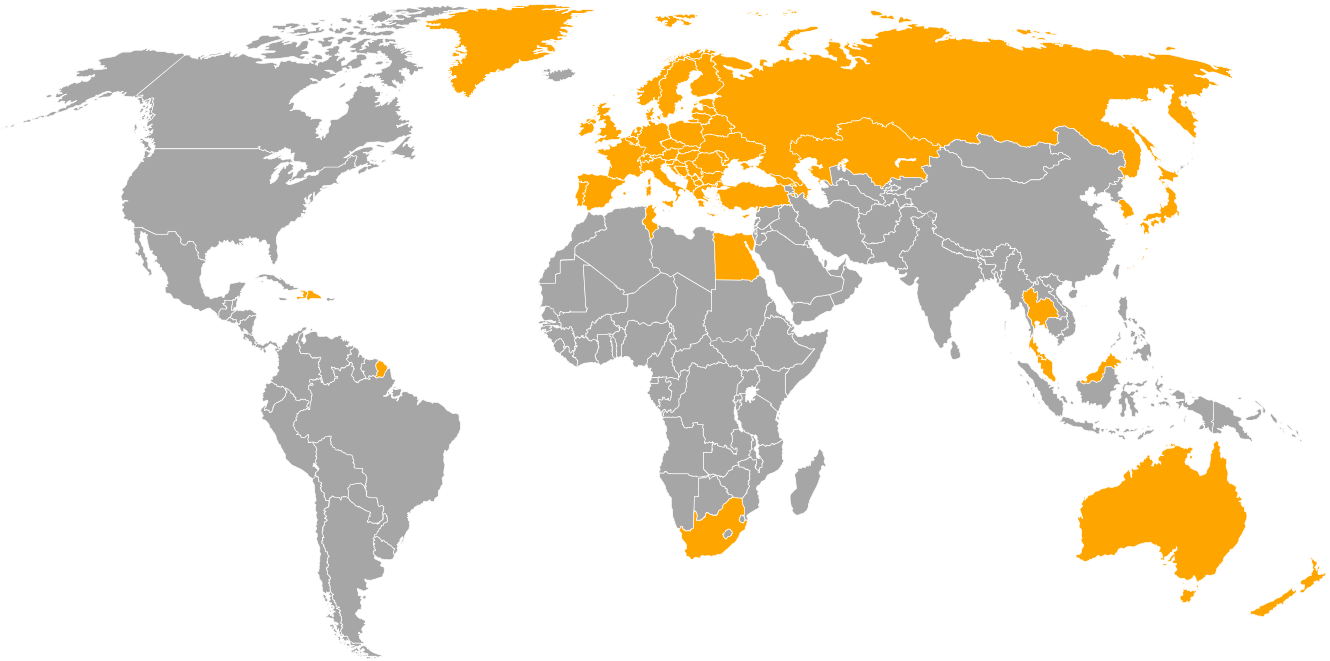
Threat Analysis and Risk Assessment (TARA*)



•Based on best of several standards :
•ISO 27000, ETSI 102165-1 (TVRA), SAE J3061

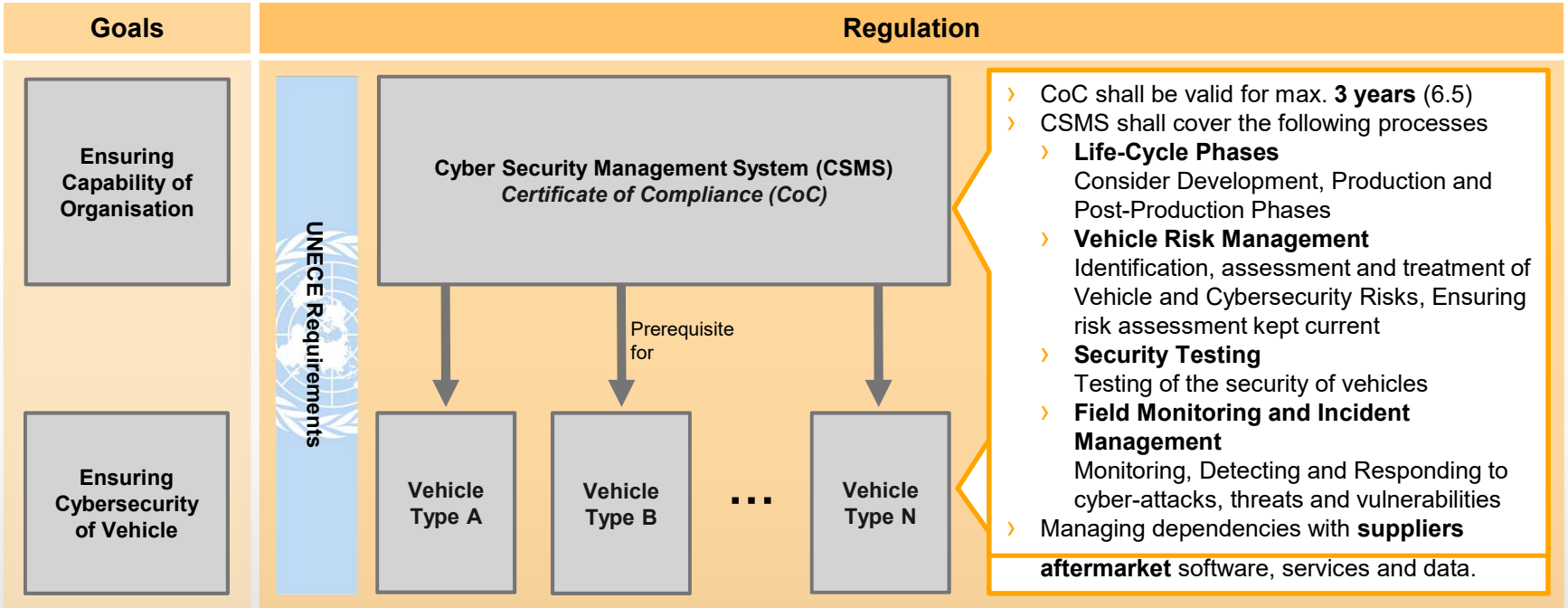
World Forum for Harmonization of Vehicle Regulations

UNECE WP.29 | 1958 Agreement Contracting Parties



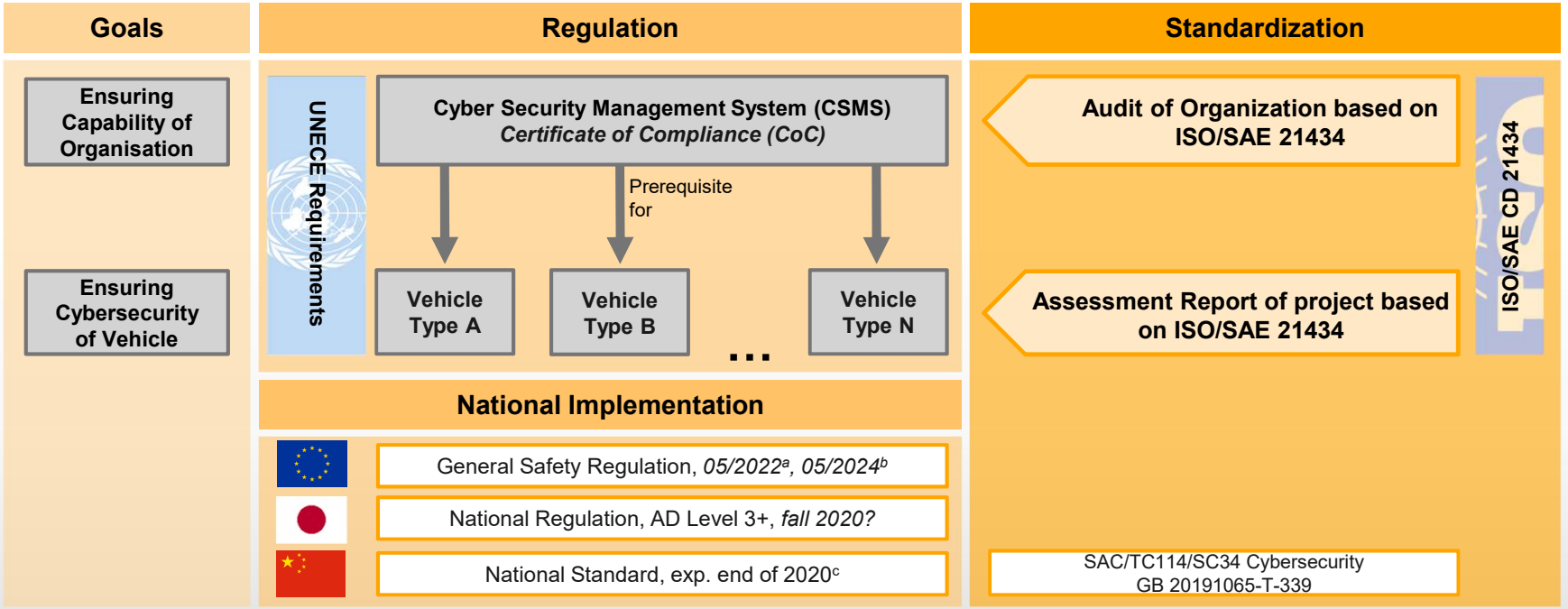
UNECE Regulation on Cybersecurity

Requirements on the Organization and the Vehicle Types



UNECE Requirements on Cybersecurity for Type Approval

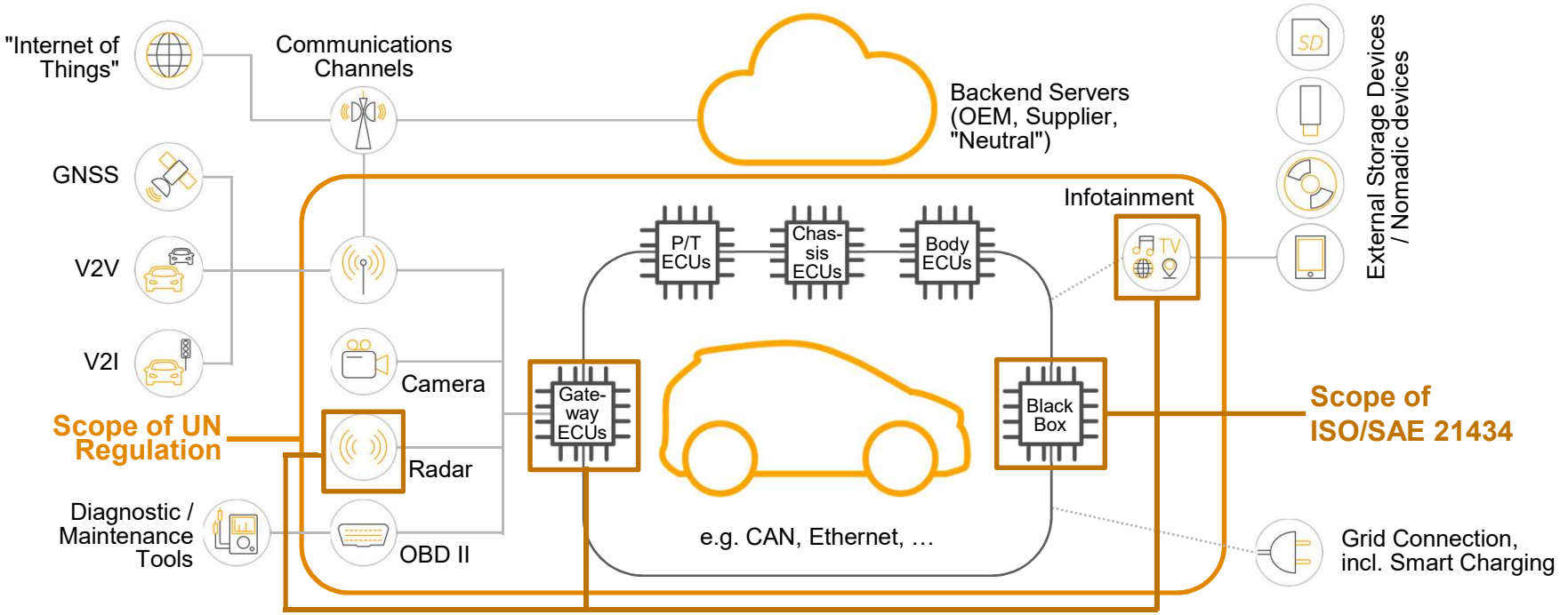
ISO/SAE 21434 can Prepare Supply-Chain for Compliance



| **a:** New European whole vehicle types | **b:** first registration of vehicles, entry to EU market | **c:** not 1958 agreement but adoption |

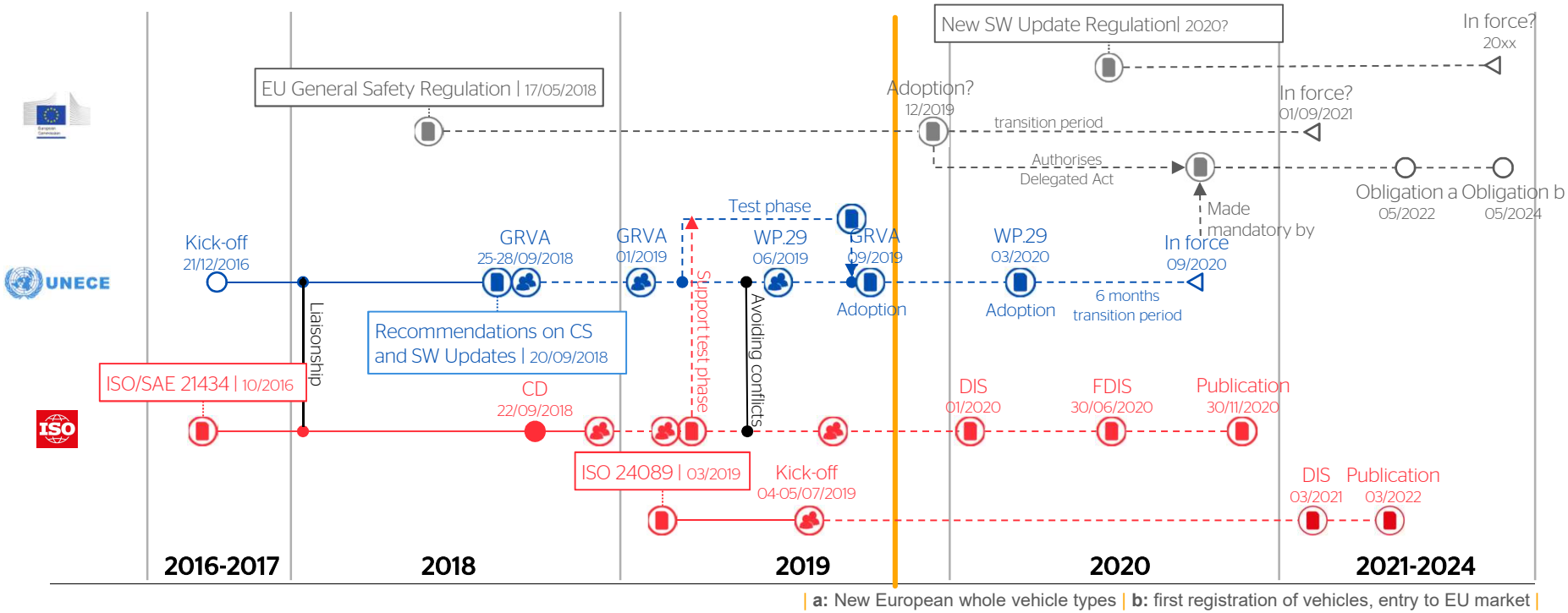
UNECE Requirements on Cybersecurity for Type Approval

Different Scopes of UN Regulation and ISO/SAE 21434



Roadmap for Implementation in Europe

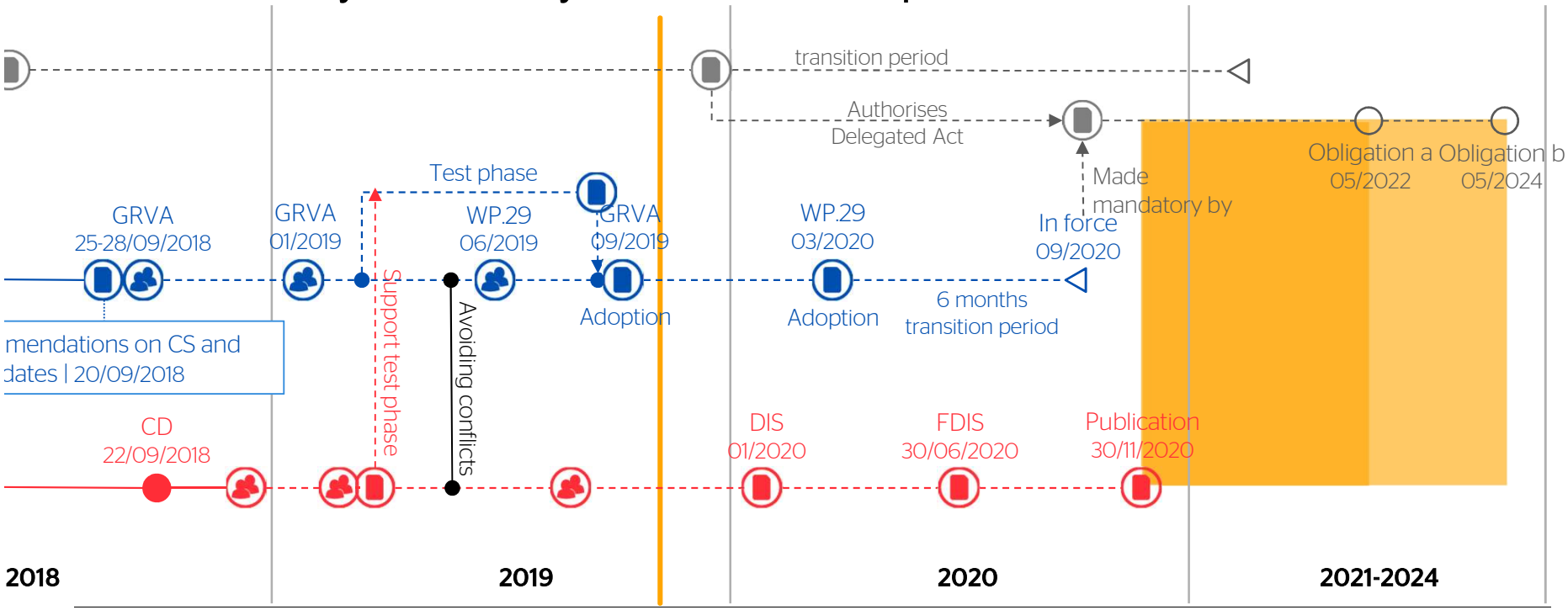
Timeline of Cybersecurity and Software Update Activities



| **a:** New European whole vehicle types | **b:** first registration of vehicles, entry to EU market |

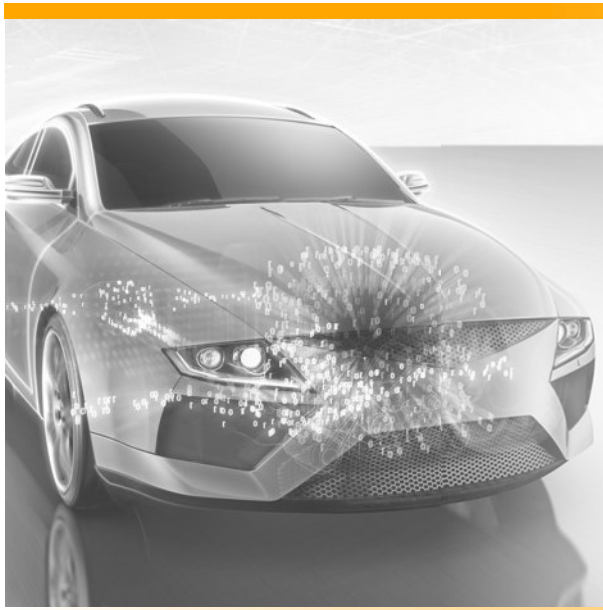
Roadmap for Implementation in Europe

Timeline of Cybersecurity and Software Update Activities



| **a:** New European whole vehicle types | **b:** first registration of vehicles, entry to EU market |

Cybersecurity in the Automotive Domain
Agenda



1. Introduction to Continental
2. Automotive Security
3. New Challenges of Automotive Megatrends
4. Interplay of Safety and Security
5. Developing a Cybersecurity Engineering Standard
6. **Entry Possibilities at Continental**

Entry Possibilities at Continental

This is Continental

- Truly international team around the globe
- Performance-oriented working atmosphere
- Early responsibility and exciting job challenges
- Achieving exceptional results through passion
- Open & informal culture: open doors & open minds
- Innovative Technology
- Significant contribution to sustainable mobility

Entry Possibilities at Continental
From Internship to Permanent Position

Possible entries at **Continental AG**

Students

Graduates

Professionals

Student @Continental	**Intern-ship**	**Working Students**	**Thesis**
Continental Trainee & Graduates Programs		**Direct Entry**	
Direct Entry			

Entry Possibilities at Continental
Internship and Thesis

Requirements:

- **Apply 2 to 3 months before** your preferred internship start date
- Duration: **3-6 months**
- Current certificate of matriculation
- Very good language skills in **English**
- Proficient experience in working with **MS Office** (esp. Word, Excel, Power Point)

Take your chance!

Apply online:

Have we sparked your interest?
Then spark ours!

www.careers-continental.com

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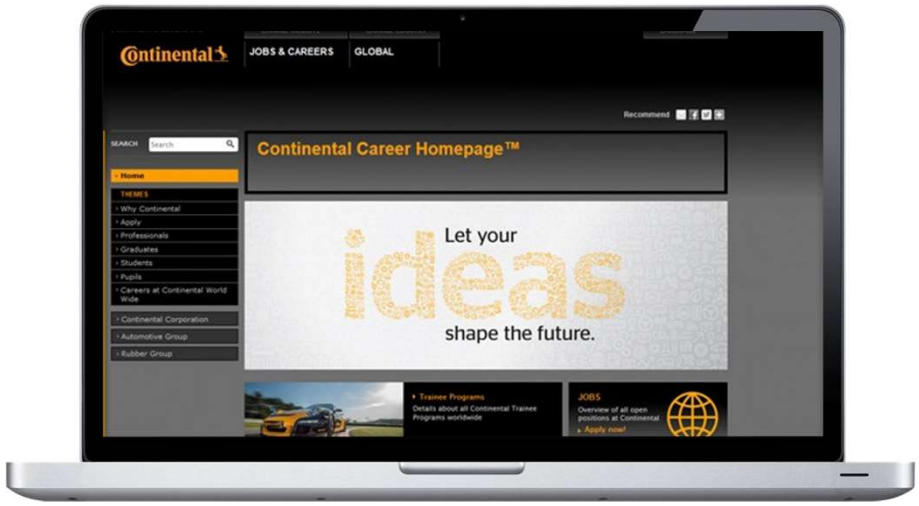
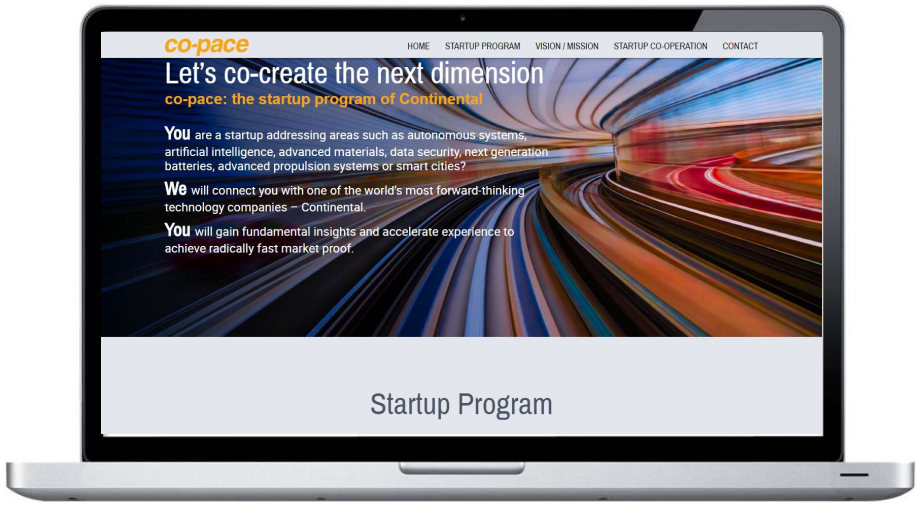
www.continental-people.com



Have we sparked your interest?
Then spark ours!

www.co-pace.com



Thanks for Listening
Any Questions?

Manager Security & Privacy Standardization & Regulatory Affairs

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eMail: **markus.tschersich@continental.com**