



Impact of future Vehicle Architectures on Diagnostic Processes and Tools

Daimler AG – Diagnostic Development

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Mercedes-Benz
The best or nothing.



Agenda

1 History of Vehicle Diagnostics

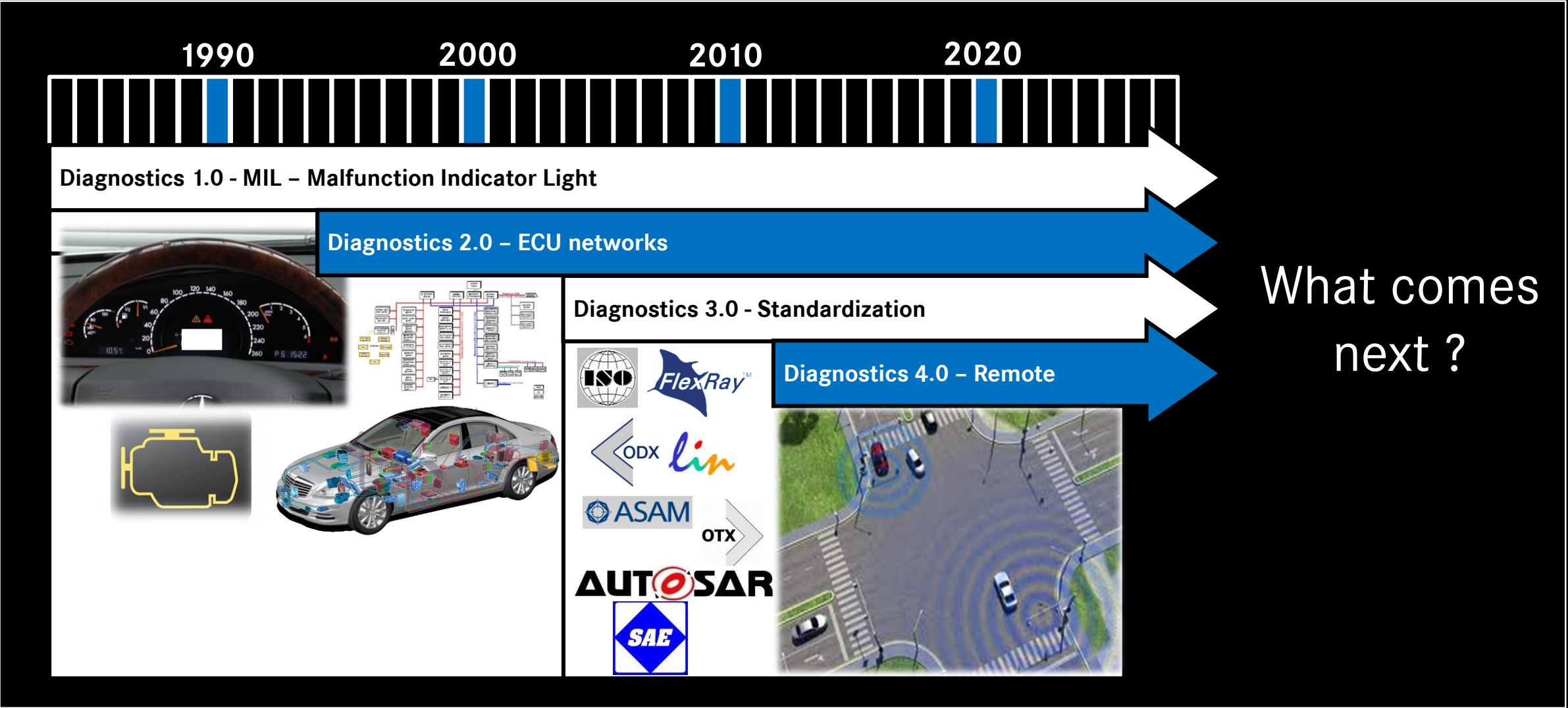
2 Motivation for future Diagnostics

3 Consequences

4 Impact on Diagnostics

5 Summary

1. History of Vehicle Diagnostics



2. Motivation for future Diagnostics



Market demands

- Agile software updates
- Innovations in software



New technologies

- High Performance ECUs
- Decoupling of hardware and software

Challenges for Diagnostics



Legal requirements

- Data Protection
- Security-related updates
- “Right to repair”



New business models

- Subsequent purchase of vehicle functionality

Diagnostics in future vehicle will extremely change – IT mechanisms and classic diagnostic mechanisms will come closer

3. Consequences

Diagnostics in today's ECUs

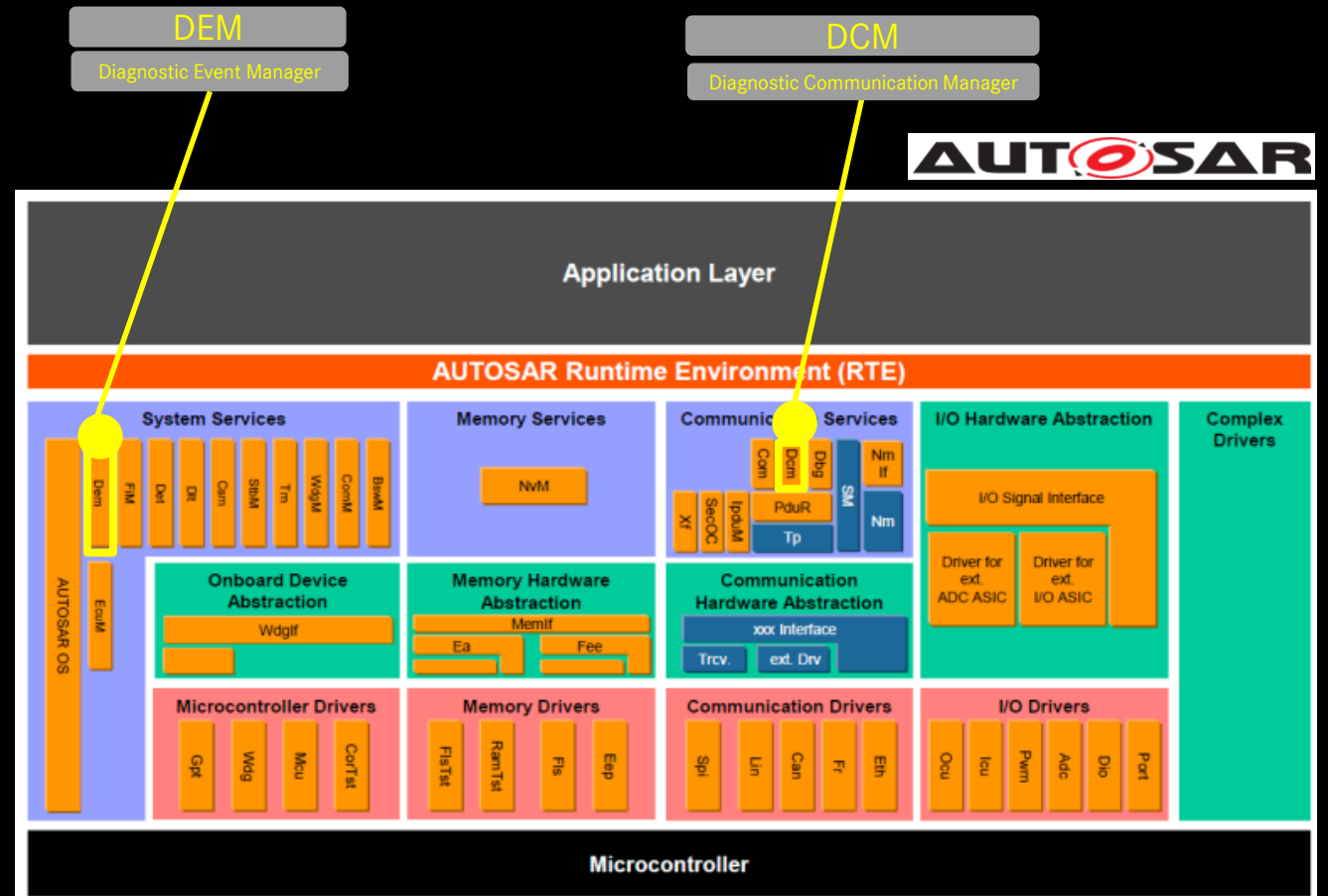
Today

μ-Controller



AUTOSAR architecture „Classic Platform“
– classic „OSEK-based“ embedded system

- Current version: AR4.4
- Static configuration at compile time
- Static memory management
- Diagnostics via DCM and DEM



AUTOSAR Classic Platform – Source: AUTOSAR consortium

Limitation: Changes in application require built of complete ECU software

3. Consequences

New Diagnostic concepts in future ECUs

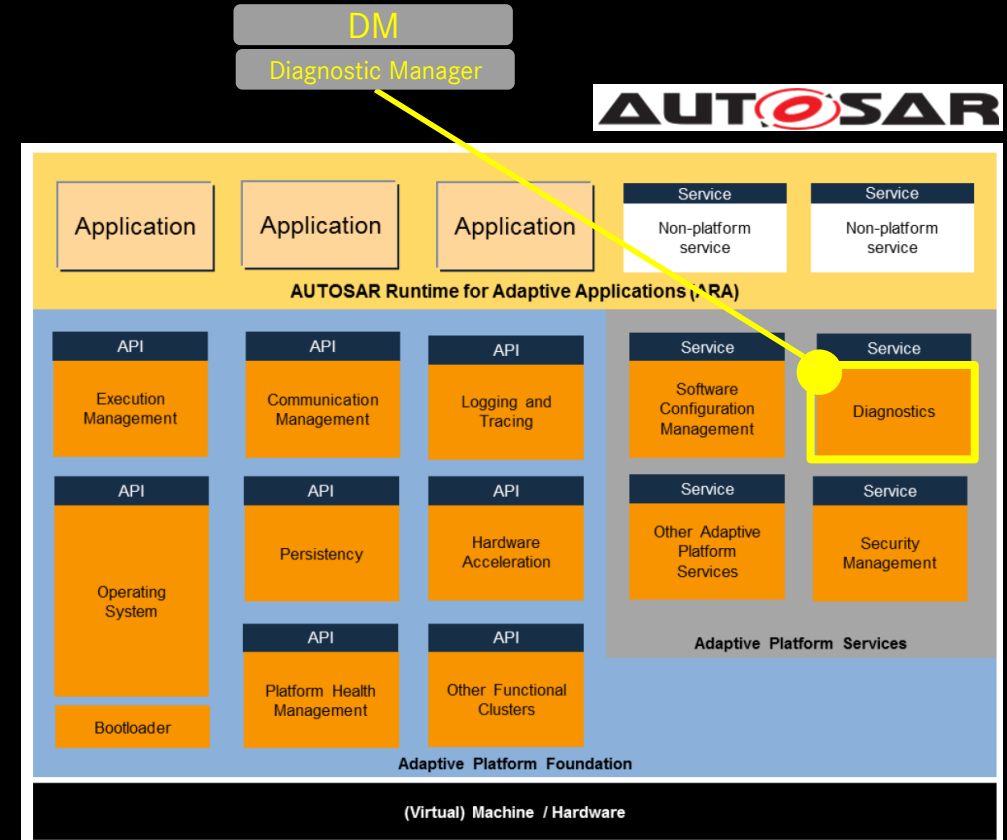
Tomorrow

μ-Processor



AUTOSAR architecture „Adaptive Platform“ – „LINUX-based“ embedded system

- Current version: 10-18
- Dynamic configuration mechanisms (“Manifest”)
- Dynamic memory management
- Diagnostics via Diagnostic Manager



AUTOSAR Adaptive Platform – Source: AUTOSAR consortium

New diagnostic mechanisms must be developed for high performance ECUs

3. Consequences

Importance of software requires faster rollout processes

Challenges:

- New development process
 - Specification
 - Implementation
 - Testing
 - Distribution
- Documentation and release process
 - SW / HW dependencies
 - Release documentation

Software is driver for innovation

Agile software development and deployment

09.08.2016 | KEYNOTE IN LUDWIGSBURG 2016

Radikal neue E/E-Architektur für die nächste Autn-
Generation

Software statt Spoiler

Autos aus dem Silicon Valley könnten zur Massenware werden. Was haben die deutschen Hersteller dann noch, was Google und Apple nicht haben?

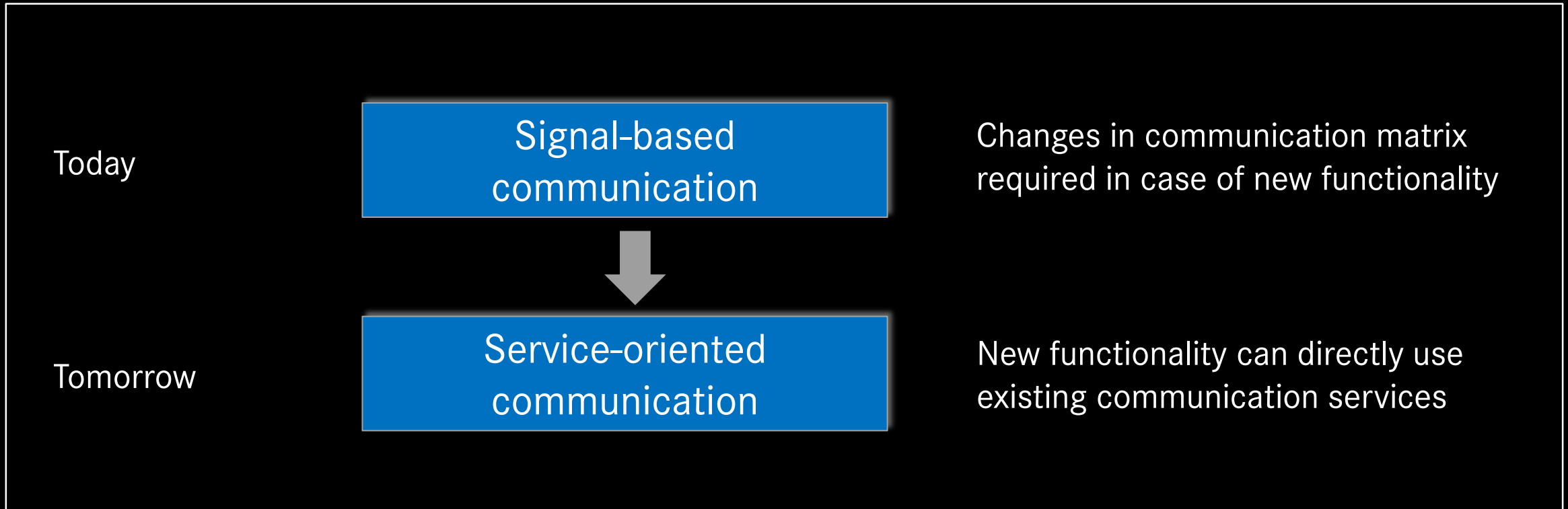
INNOVATION

Nvidia stellt Supercomputer für selbstfahrende Autos vor

Fast release and update processes require organizational changes

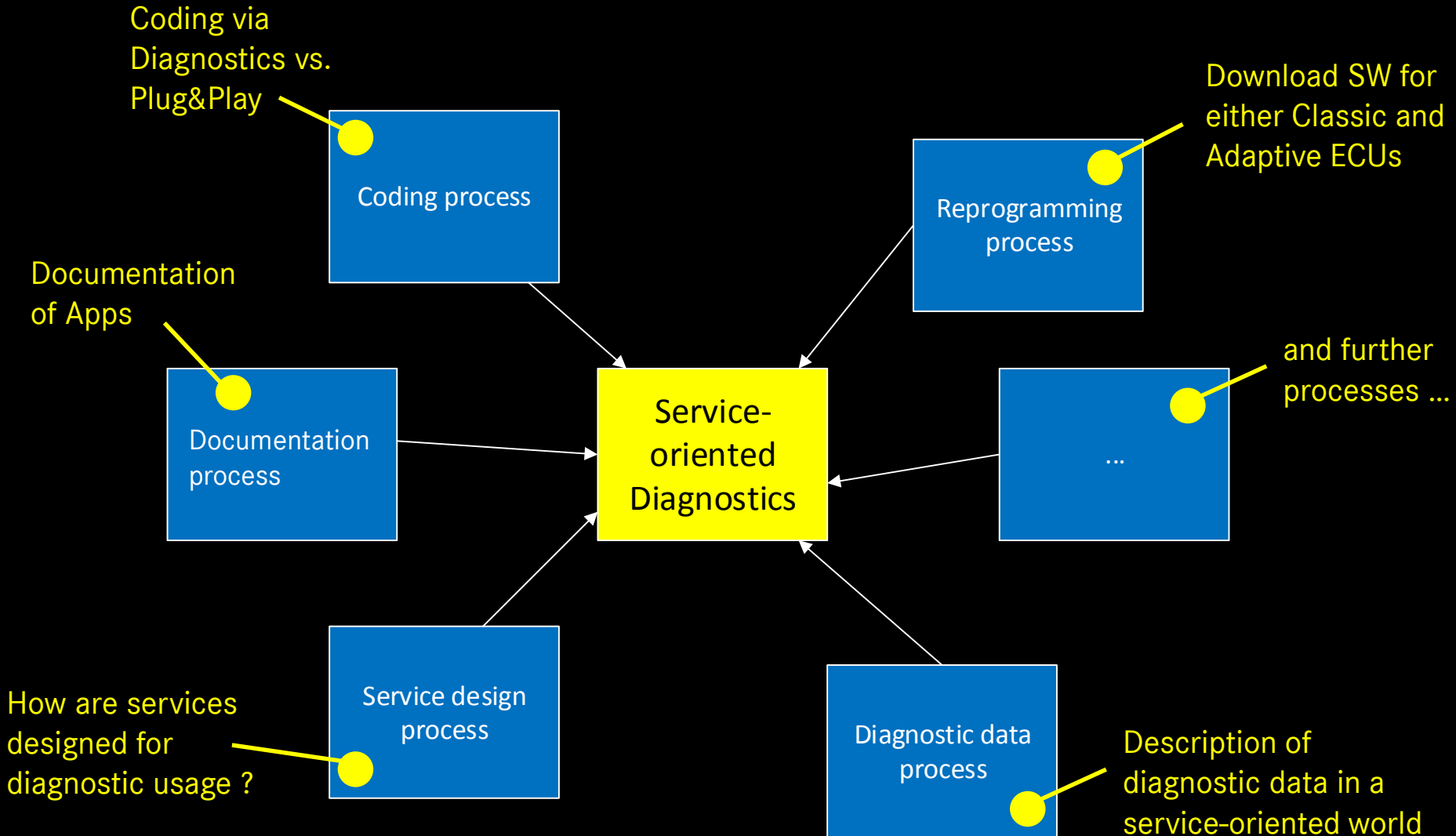
3. Consequences

Implement new functionality without changes in communication matrix



Increased decoupling of hardware and software – service-orientation

4. Impact on Diagnostics - Diagnostic processes



4. Impact on Diagnostics

Technology and standardization in diagnostics

	ECU Hardware	Diagnostic Protocol	ISO	Diagnostic Tester	AUTOSAR	Use Case
Today	μ-Controller	UDS	ISO 14229-1 (UDS)	ISO22900 (ODX/MVCI)	AUTOSAR Classic	Peer-2-Peer-Diagnostics
Tomorrow	μ-Controller	UDS	ISO 14229-1 (UDS)	ISO22900 (ODX/MVCI)	AUTOSAR Classic	Unified diagnostic access for all diagnostic client without VCI (Vehicle Communication Interface)
	μ-Processor	UDS IT protocol*	ISO 14229-1 (UDS) New spec for IT protocol*	ISO22900 (ODX/MVCI) New spec for IT protocol in diagnostic tester*	AUTOSAR Adaptive*	

* Decision on further standardization activities needs to be taken

4. Impact on Diagnostics

Reasons for diagnostics via IT protocol

- Unified diagnostic access for all diagnostic client without VCI (Vehicle Communication Interface)
- State-of-the-Art technology
- Reduction of complexity in diagnostic client(s)
- Calculation of data is done in vehicle and no conversion is done in diagnostic client
- Usage of existing security mechanisms

4. Impact on Diagnostics

Possible future diagnostic access via IT protocol

RESTful API
GET PUT POST DELETE

REST: **RE**presentational **S**tate **T**ransfer

REST provides:

- Abstraction mechanisms to support architectural constraints
- Support for internet-based protocols (HTTP)
- PUT, GET, DELETE methods
- Allows the usage of existing security mechanisms (OAuth)

Vehicle 1

ECU View

ECU 1

GetStoredDTCs
GetTemperature

ECU 2

GetStoredDTCs
WriteCodingData

ECU 3

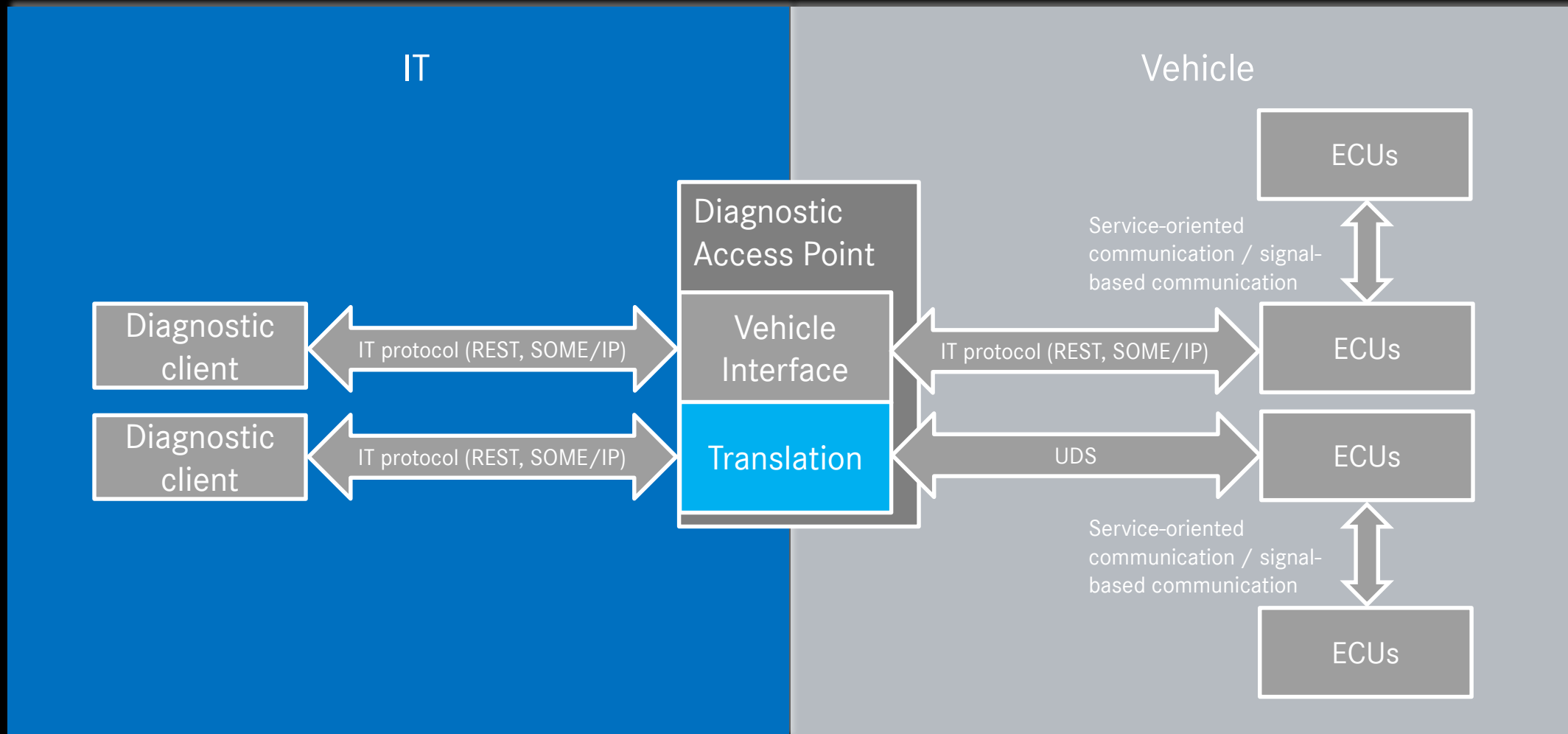
GetStoredDTCs
StartInitProcedure

Vehicle 2

...

4. Impact on Diagnostics

New diagnostic protocols resp. existing IT protocols for diagnostic usage

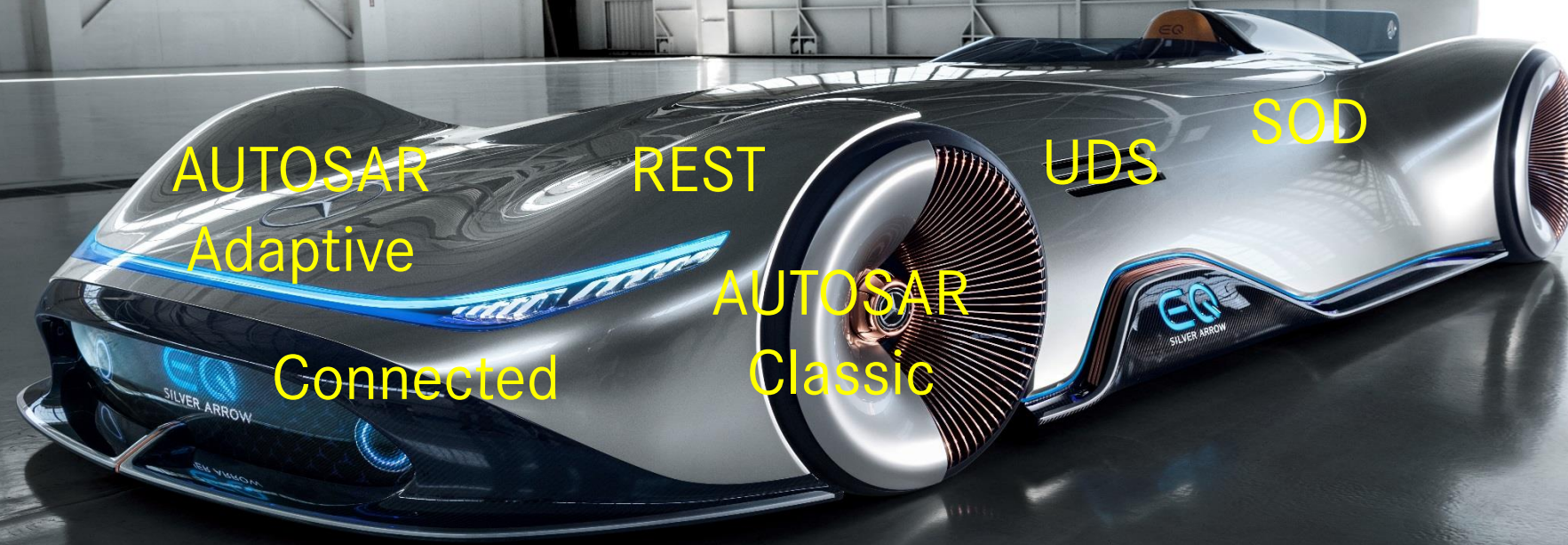


5. Summary

With future vehicle systems we have the chance to revolutionize vehicle diagnostics:

- Usage of State-of-the-art IT protocols
- Fast software updates
- Usage of service-oriented communication mechanisms for diagnostics
- Vehicle onboard apps for new diagnostic use-cases

Let's work on it and bring it into standardization.



Diagnostics, ready for the Future !

Thank you very much for your attention !