How Data Distribution Service Enhances VSS with a Secure, Full-Stack End-to-End Real-Time Communication for Software-defined vehicles

COVESA Spotlight

March 21st, 2023

COVESA

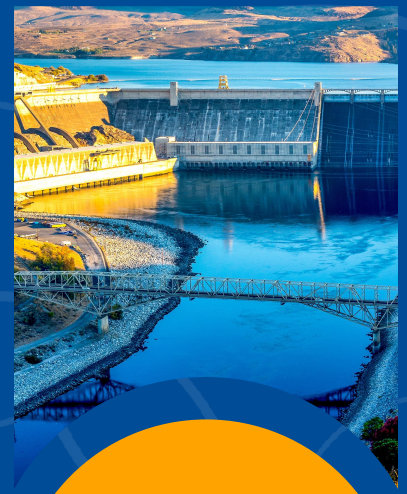
Accelerating the future of connected vehicles

1800+ DESIGNS

LEADER IN 20+ industry standards

rti

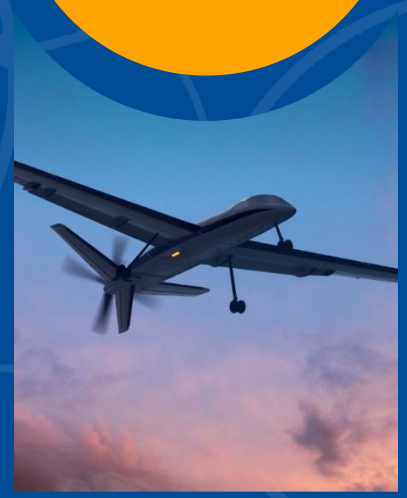
NUMBER ONE SOFTWARE FRAMEWORK FOR AUTONOMY



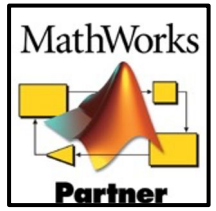
750+ RESEARCH PROGRAMS

250+ EMPLOYEES

Silicon Valley • Denver
Spain • Singapore



Enabling Interoperability through a Rich Automotive Ecosystem



The Software-defined Vehicle

Opportunities, Challenges and New Architectures

Opportunities in Software-defined Vehicle

Continuous innovation

- The vehicle development does not ends at SoP
- Several functionalities can be added once the vehicles are on the street including advanced functionalities such as ADAS

Severe **cost saving** given the new architectures

- Weight and Cost - EE architectures represents 3rd heaviest part of the vehicle
- Software providing most of the value

Business models opening to new opportunities

- New revenue streams

Competition

- Electric cars have drastically lowered the entry barrier
- MaaS is changing the relationship with the

Challenges in Traditional Vehicle Architecture

Scalability - Exponential system complexity

Standardization – Minimal Reusability between brands in architectural signals and datamodels

Cost, Liability and Warranty- The SBOMs are not yet standardized and broadly adopted as the case of Hardware

Security - Managing the path to Safety and Cybersecurity

ADAS - Building L2+ Sustainable Development

Updates - Continuous development and systems updates

Software-defined Vehicle Architectures

Flexible Deployment

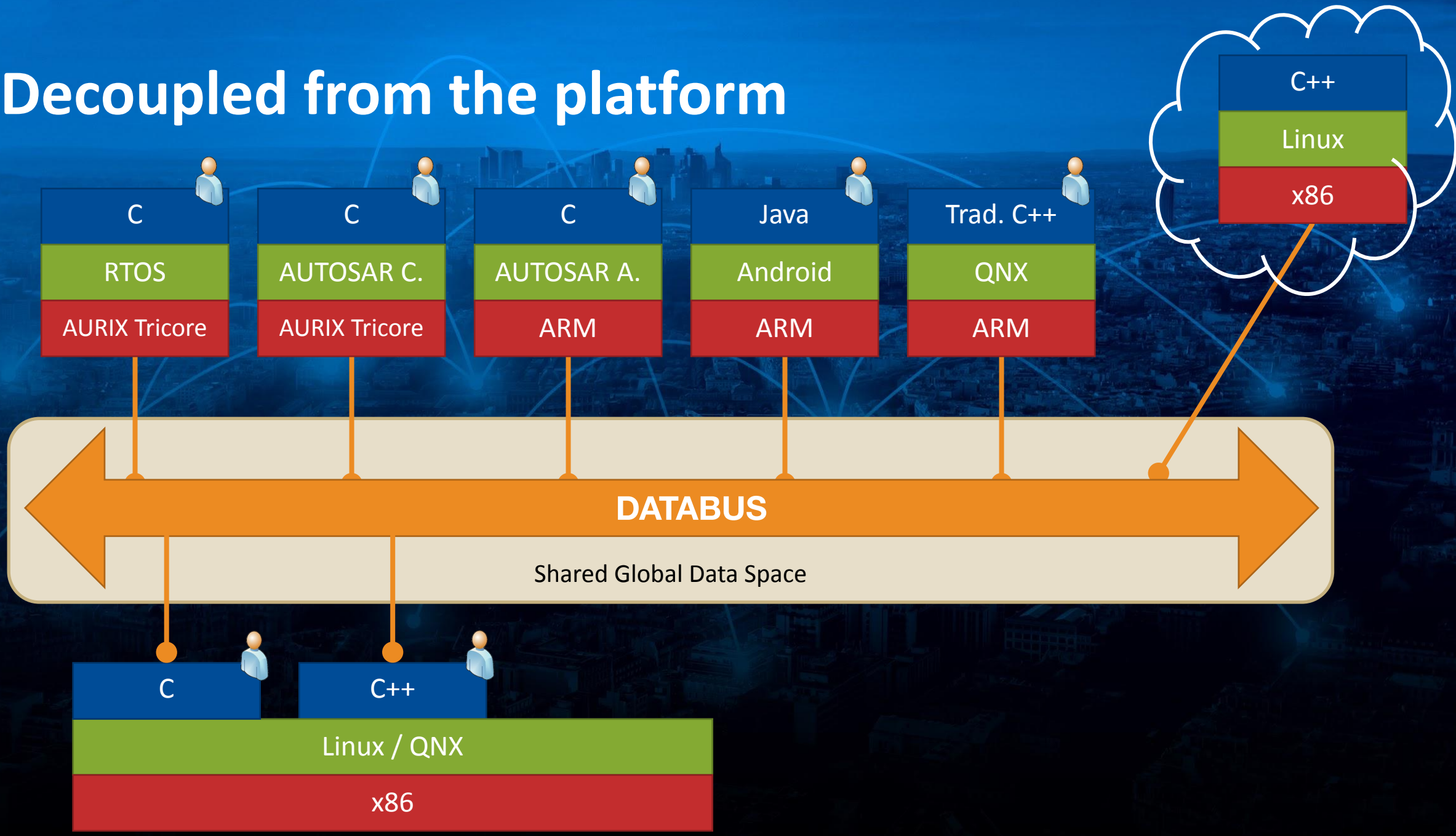
Standardized Communication

Decoupled from Platform

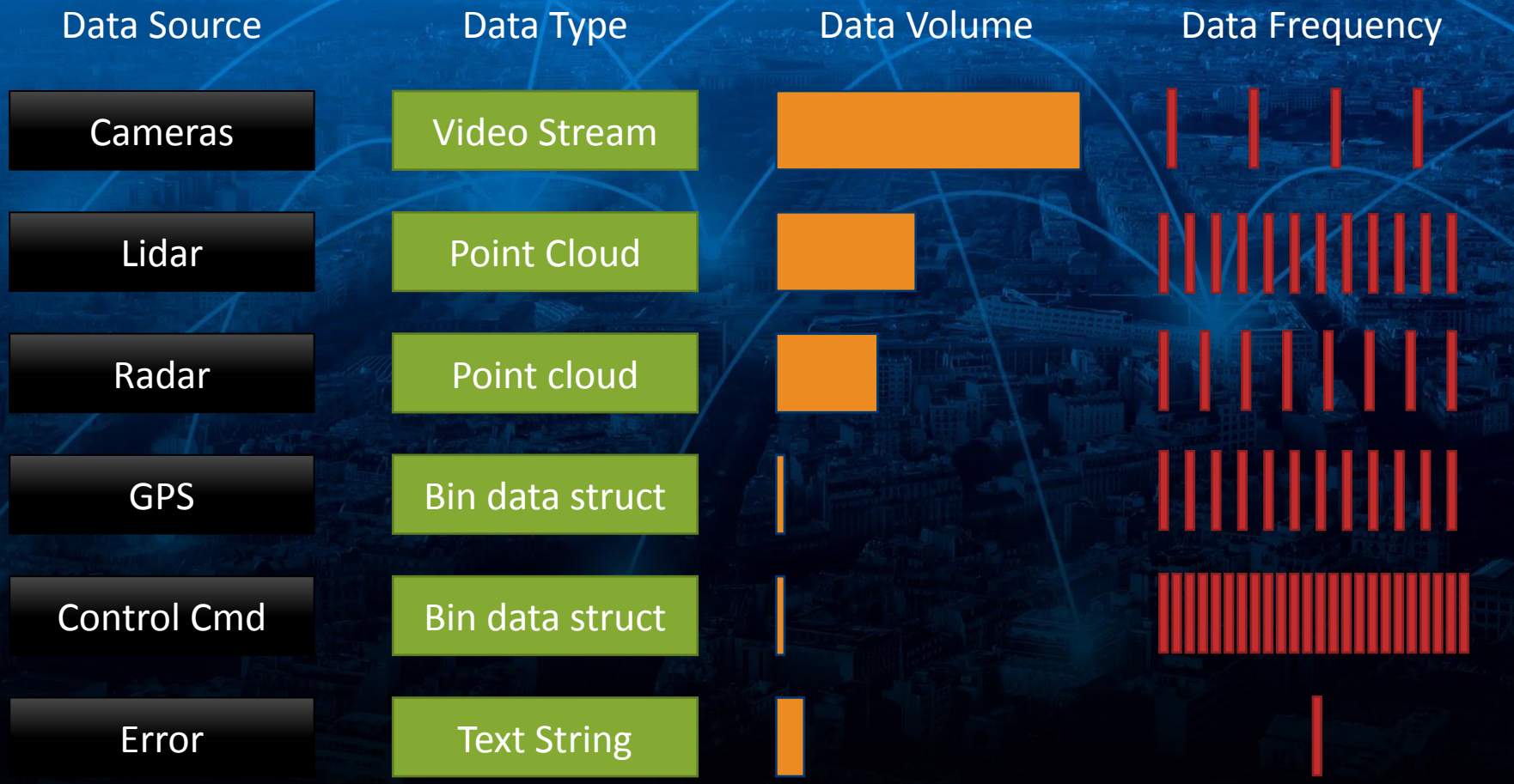
Future Proof

Safety and Cybersecurity

Decoupled from the platform



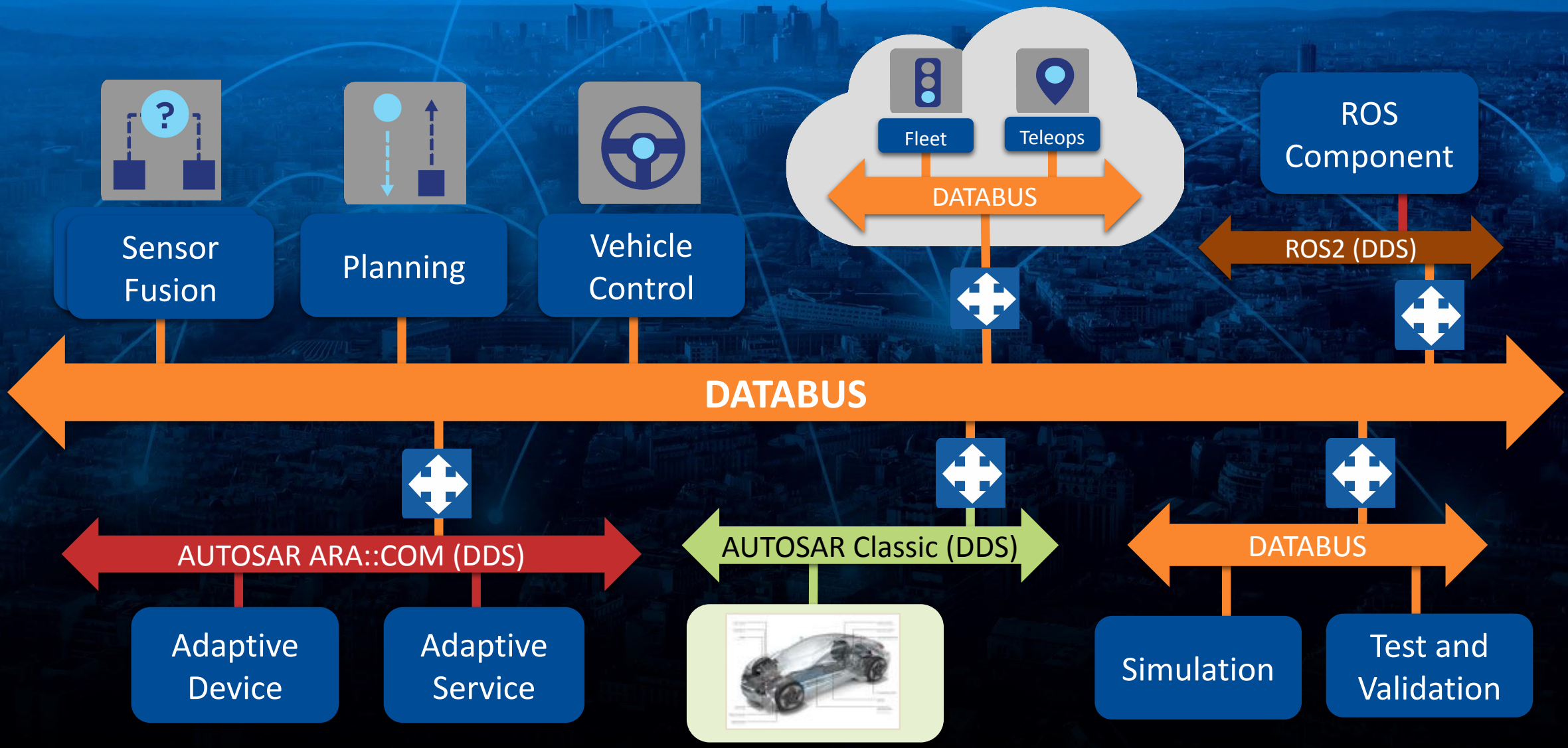
Standardized



- Many different dataflows
  - Volume
  - Frequency
  - Latency
  - Reliability
  - Destination
- Multiple hardware and software solutions
  - IPC
  - Shared Memory
  - UDP
  - Middleware

What if you could use a common standard for all your data models?

Future Proof



Why COVESA VSS?

Benefits of COVESA VSS

Benefits of COVESA VSS

Flexible Deployment
From in-vehicle, edge and to the cloud

Interoperability
Secure cooperation with AUTOSAR and other standards

Standardized Communication
Common approach for describing vehicle data

Cost Driven
Focus on business value creation

Decoupled from Platform
Protocol Agnostic

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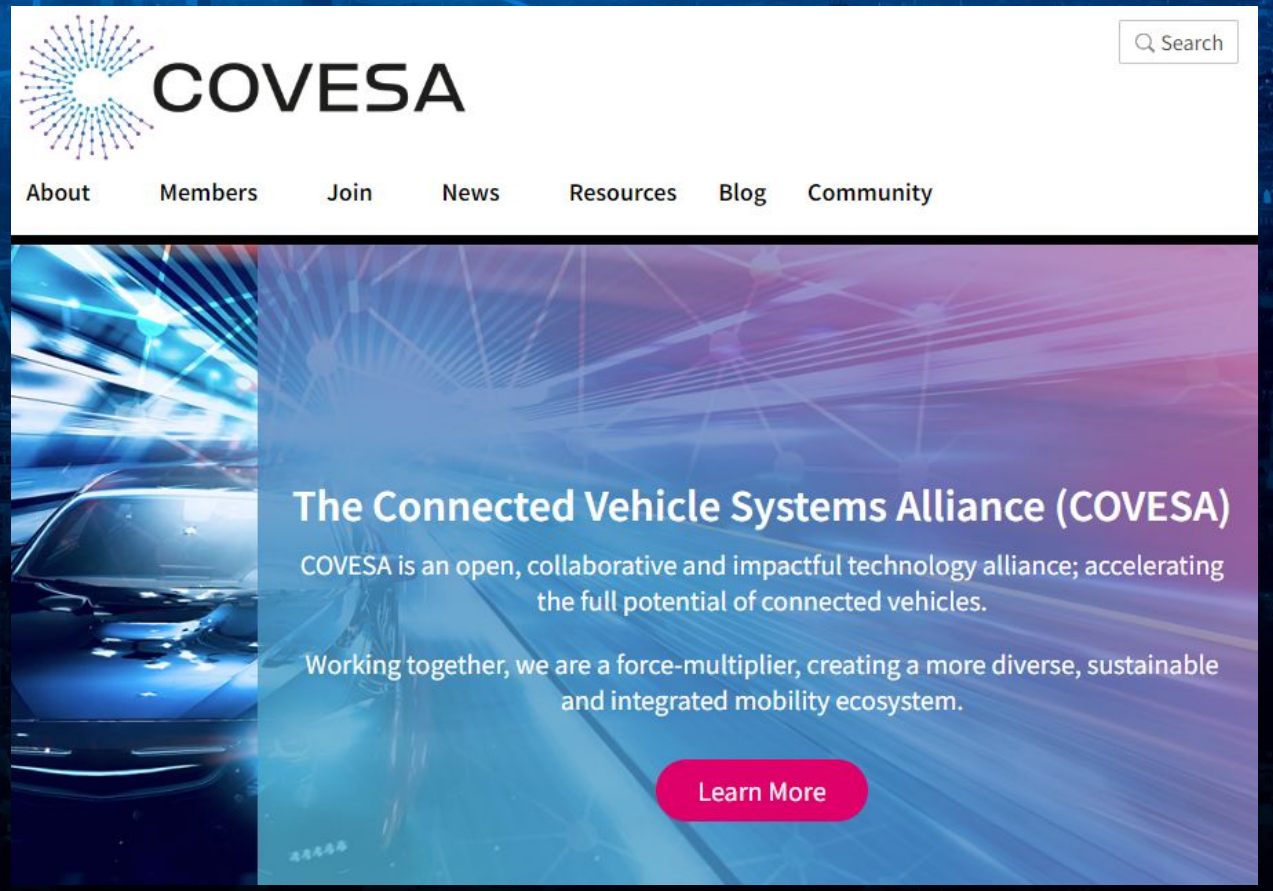
RTI Involvement in:

- **Vehicle Signal Specification (VSS)**
  Convert VSS into structured IDL for common DDS use
- **AUTOSAR Interoperability**
  Bridging VSS to AUTOSAR
- **Digital.auto**
  Accelerating Vehicle Prototyping

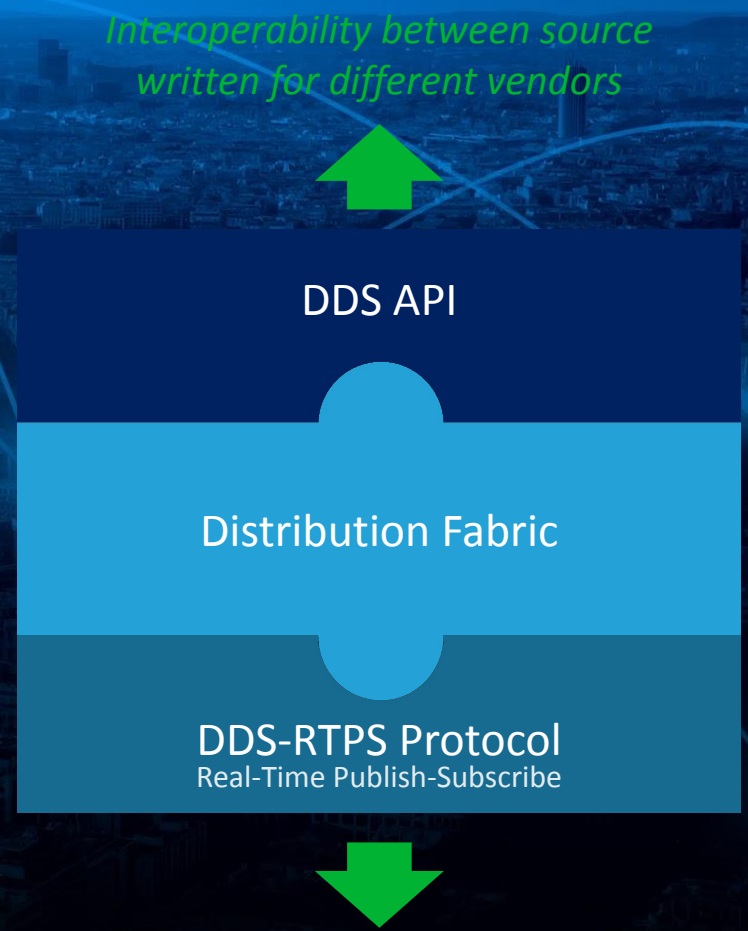


Why Connext Drive?
Why DDS?

Benefits of COVESA VSS

The DDS Standard

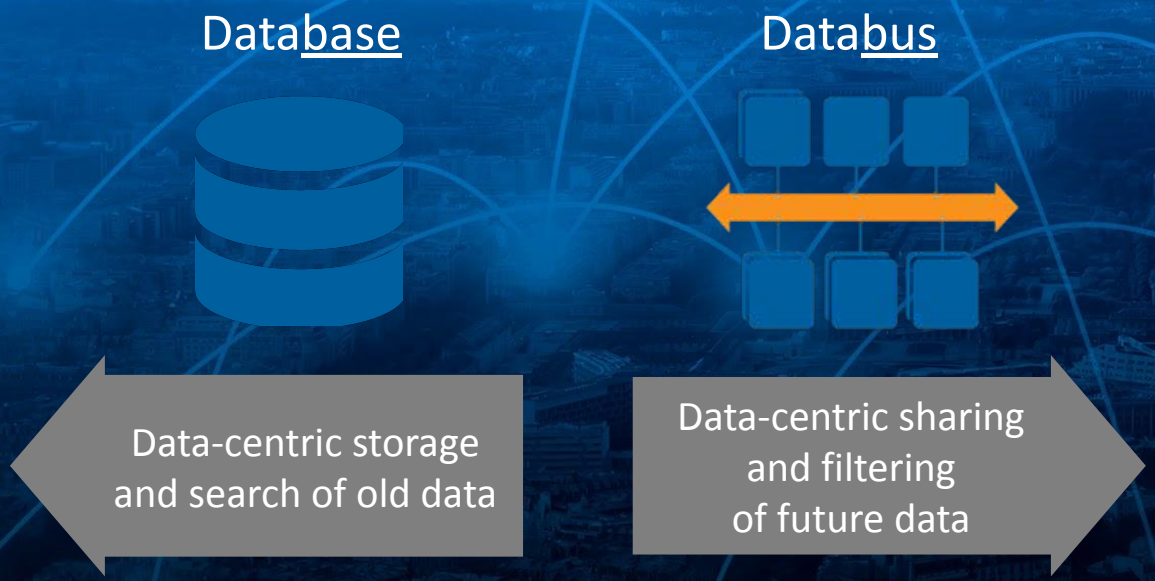
- DDS is the Proven Data Connectivity Standard for the IoT
- OMG: world's largest systems software standards org
  - UML, DDS, Industrial Internet Consortium
- DDS: open and cross-vendor
  - Open Standard and Open Source
  - 12+ implementations

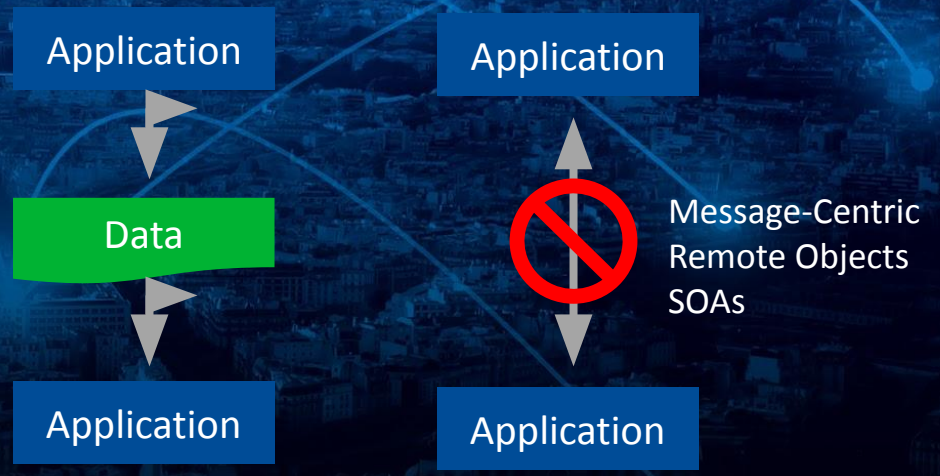


Why DDS ?

Data-centric	Resiliency	Performance	Faster development	Standards based
Naturally modular	High reliability	Minimum latency	SOA-like architecture	No vendor lock-in
Naturally scalable	Maximum up-time	Maximum throughput	Code re-use	Future proof

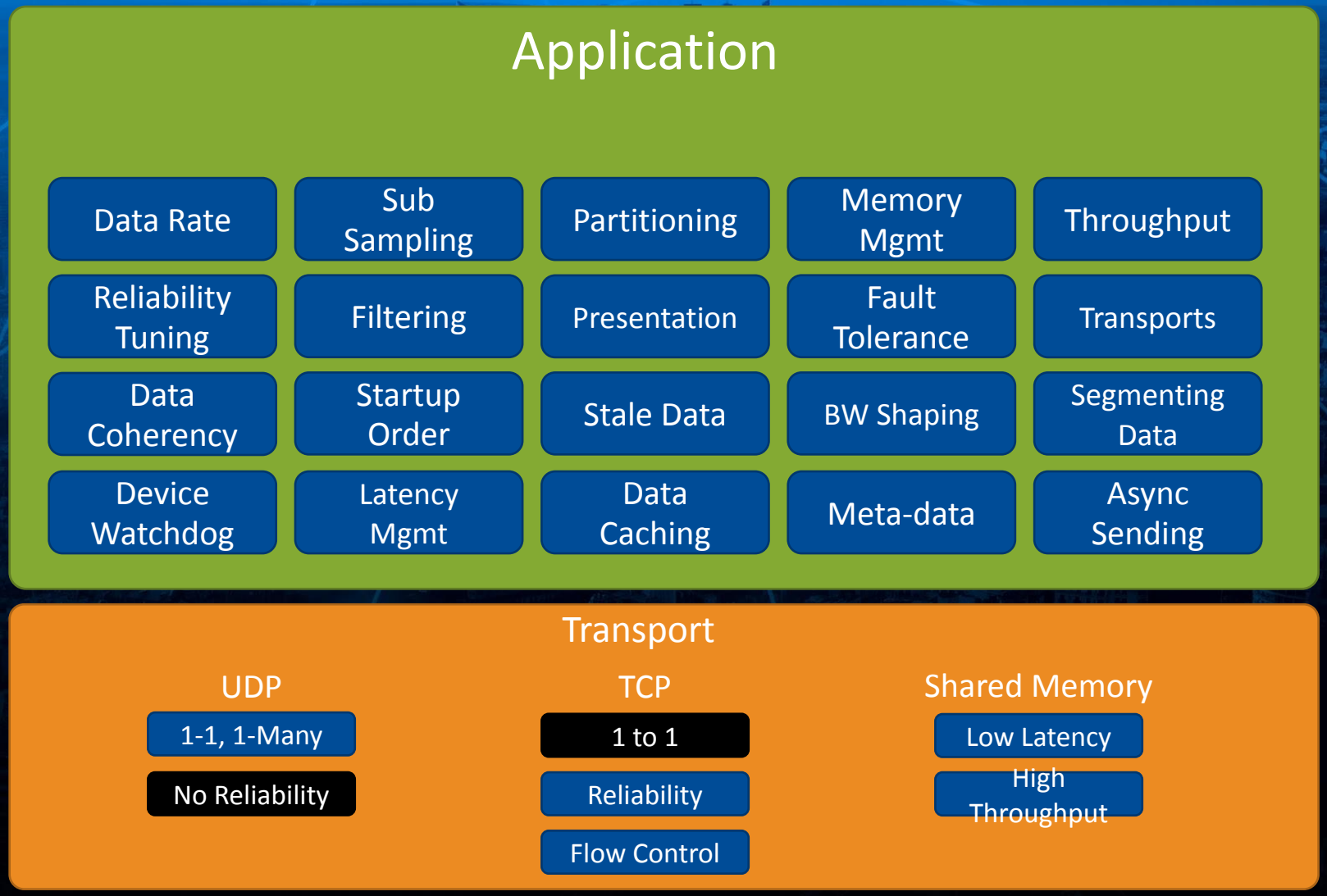
Data-Centric Architectures



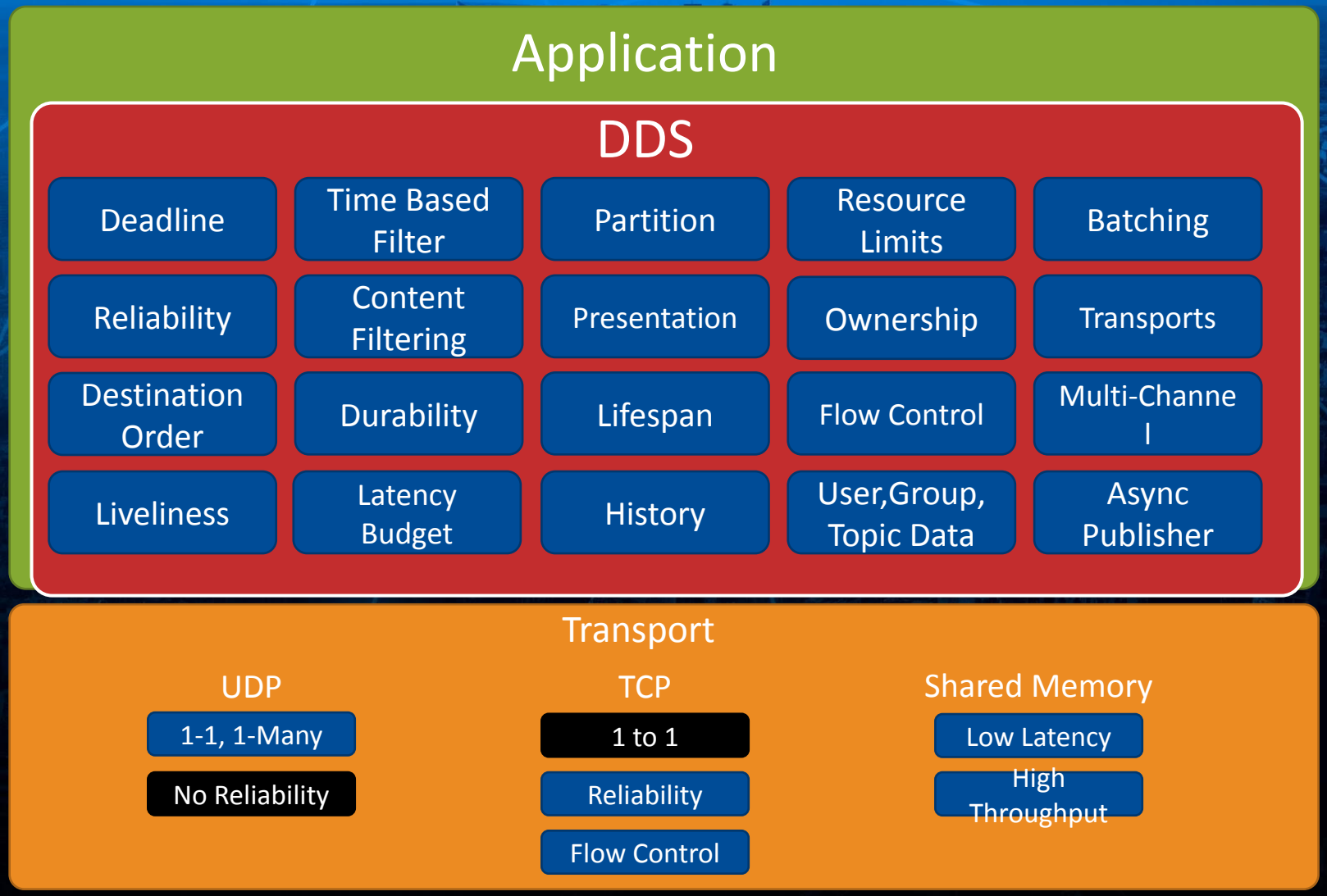


- Data Centricity Definition:
  - The interface is the data
  - The infrastructure understands that data
  - The system manages the data and imposes rules on how applications exchange data

Common Distributed Application Challenges

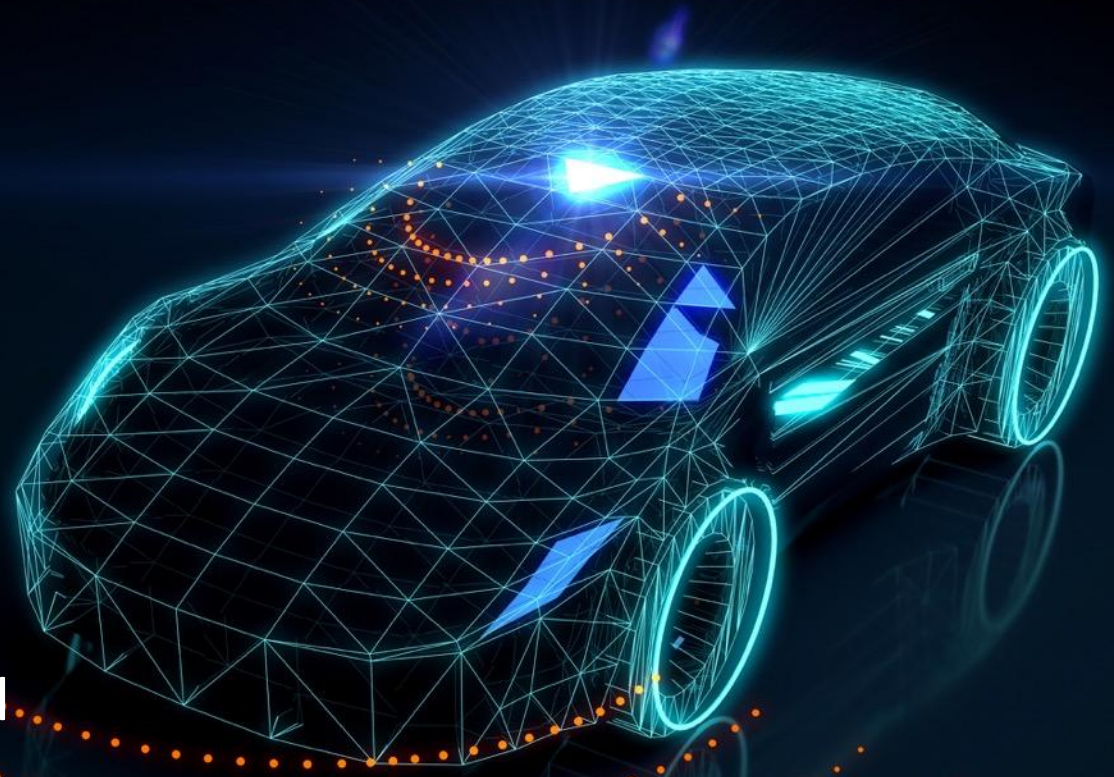


Quality of Service: DDS



Connext Drive®

- Automotive-grade software framework to develop communication networks for the Software-defined vehicle (SdV)
- Based on DDS (Data Distribution Service) Standard
- Complete ECU to Cloud Framework
- Future Proof, data-centric architecture will support industry evolution towards fully autonomous driving
- Supports communication libraries certified for systems up to ISO 26262 ASIL D



Connext Drive® Overview

Simulation Applications | Telematics & Cloud Applications | Zonal & ADAS Applications | Digital Cockpit Applications | OEM Custom Applications | ROS2 Application | Adaptive Application | Classic Application

Automotive Applications

ISO-26262

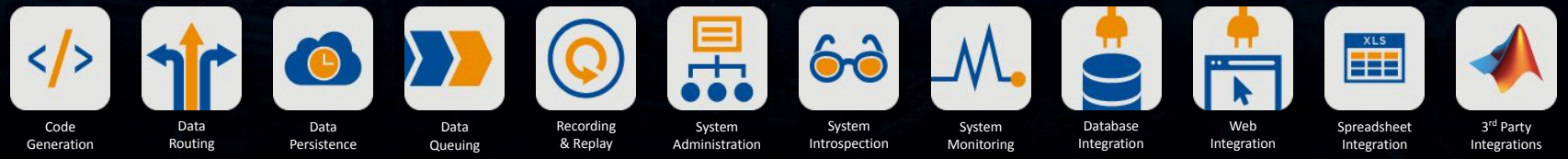
Connext Drive **DDS** APIs

ROS2 | AUTOSAR Adaptive | AUTOSAR Classic

Ecosystem Interfaces with Connext Drive

Connext Drive Products

CONNEXT DATABUS



Connext Drive Tools & Services

COVESA VSS & DDS + Live Demo

VSS leveraging from Data Centricity

Data-Centricity

The data itself is the interface

```
module Vehicle {
  module Cabin {
    struct HVAC {
      boolean IsRecirculationActive;
      boolean IsFrontDefrosterActive;
      boolean IsRearDefrosterActive;
      boolean IsAirConditioningActive;
      float AmbientAirTemperature;
      uint8 PowerOptimizeLevel;
    };
  };
};
```

Data-Centric Connectivity
+ Common Set of Data Types
= Interoperability
+ Multiple Suppliers
+ Expanding Ecosystem of Tools and Capabilities

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Accelerating the future of connected vehicles

AUTOSAR

ROS

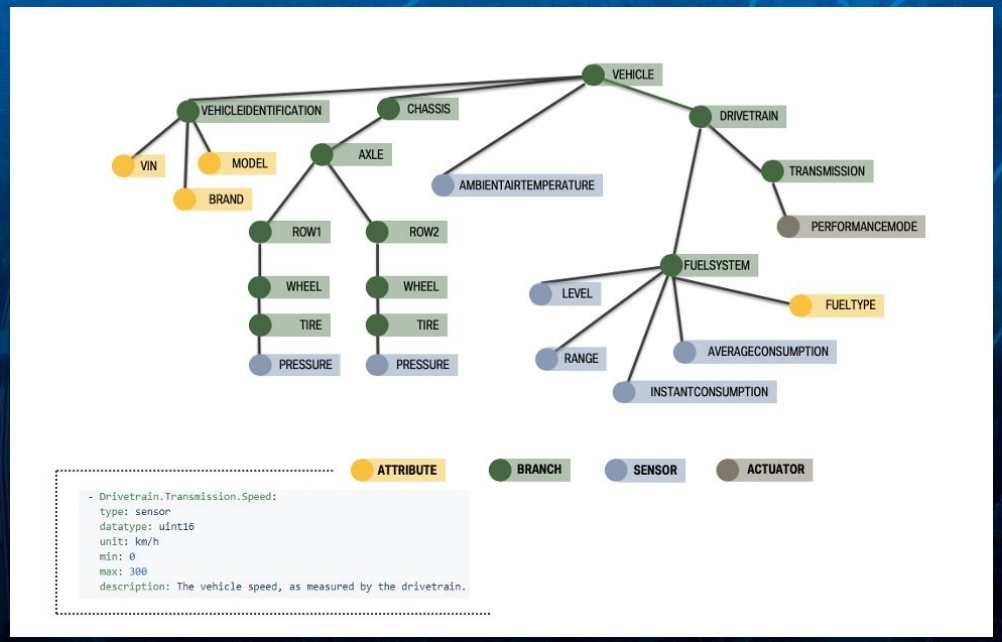
NGVA

FACE
Future Airborne Capability Environment

UMAA

All of these run on DDS

COVESA VSS on Connext DDS



COVESA VSS

VSS-TO OLS

```
module Vehicle {
  @nested
  struct Driver_v {
    float DistractionLevel;
    boolean IsEyesOnRoad;
    float AttentiveProbability;
    float FatigueLevel;
    uint16 HeartRate;
  };
  struct Driver : Vehicle::Base::KeyId {
    Driver_v value;
  };
};
module Vehicle {
  @nested
  struct Exterior_v {
    float AirTemperature;
    float Humidity;
    float LightIntensity;
  };
  struct Exterior : Vehicle::Base::KeyId {
    Exterior_v value;
  };
};
module Vehicle {
  @nested
  struct Service_v {
    boolean IsServiceDue;
    float DistanceToService;
    int32 TimeToService;
  };
  struct Service : Vehicle::Base::KeyId {
    Service_v value;
  };
};
module Vehicle {
  @nested
  struct Connectivity_v {
    boolean IsConnectivityAvailable;
  };
  struct Connectivity : Vehicle::Base::KeyId {
    Connectivity_v value;
  };
};
```

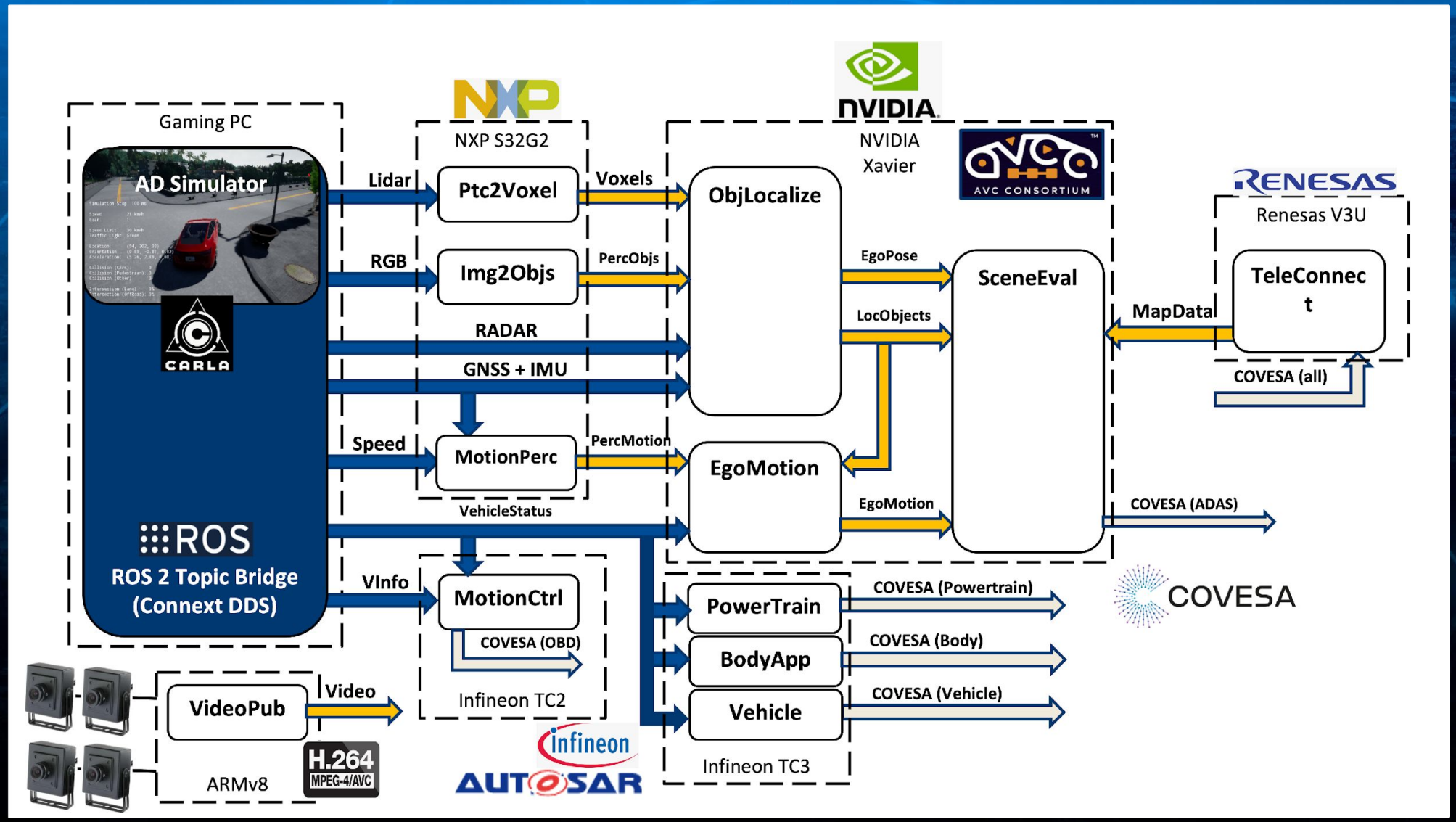
OMG IDL

- C
- C++ / C++11
- C# / .NET
- Java
- Ada
- Python
- JavaScript
- Go, Lua
- MATLAB
- LabVIEW
- SCADE
- RTMaps
- ++

AUTOSAR
QNX
INTEGRITY
VxWorks
SafeRTOS
AGL
Android
IOS
Linux
Windows
Bare metal
++

Code Generator

Connext Drive Live Demo



Open Discussion

Thank you!

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RTI

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Free trial of Connext DDS

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