
Specifications for service and work contracts

Version 1.0

Title **Unified Data Ecosystem (UDE) /
Big Data Stack (BDS)**

Data classification

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Summary

CARIAD SE is looking for a Cloud Engineering partner with emphasis on data-intensive applications to develop a high-performance computing environment to back the autonomous driving effort. CARIAD SE is currently building the **Unified Data Ecosystem (UDE)**, which exists to leverage data-driven development with an End-to-End (E2E) active Machine Learning (ML) ecosystem. This UDE bundles top talent, latest development methods and a top-notch technology stack to catch up and capture the top position in the field of autonomous driving.

The objective is to build a stack for data-intensive applications via the Microsoft Azure Cloud Platform to support major volumes of raw sensor data and the associated meta data. It is important to take operability, simplicity and evaluability in the base architecture design into account.

Technology:

We are looking for engineers with hands-on experience with the following technology stack. Not everything is required, but more is better.

Infrastructure:

- Azure Cloud
- Terraform
- Kubernetes
- Workflow Engines, e.g. Apache Airflow

Streaming:

- Apache Kafka
- MQTT
- Spark Structured Streaming

Programming:

- Python
- Java

DevOps:

- Azure DevOps, or another Git-based equivalent
- Azure Pipelines

Logging:

- Prometheus
- Grafana

High Performance Computing (HPC):

- Interconnect technology for high throughput
- Thorough understanding of Manycore compute hardware

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Engineering Directives

We are building a portable solution that can be deployed worldwide. Trying to avoid vendor lock-in, we use open-source components where possible.

Process

UDE team members are based around the world, centered around the headquarters in Berlin. Teams adhere to an agile approach to product development. The process is intentionally kept lightweight to collaborate efficiently across time zones and allow engineers to focus on shipping the product.

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1 Introduction

Electric mobility and digitalization are the pacesetters in the Volkswagen Group. Software already plays a key role in the car and will become even more important in the future. With the founding of CARIAD SE software is therefore another core competence. Our common goal: the development of a uniform software platform for all brands in the Volkswagen Group.

With the CARIAD SE, Volkswagen is the first group that enables an end-to-end customer experience across all brands. "Based on software, the next much more radical change is the transition towards much safer, smarter and finally autonomous cars. That means for us: Technology, speed and scale will matter more than today. The future of cars will be bright!" said CEO Herbert Diess.

Learning from a vast pool of data through always-connected, automated driving vehicles, the Group fleet can be continuously updated with new features and services tailored to customers' mobility needs. This so-called "Big Loop Process" for millions of vehicles will significantly expand the product lifecycle. By 2030, up to 40 million vehicles across brands will be operating on the Group's software platform – thanks to technology from CARIAD SE.

By the concentration of this huge amount of connected vehicle projects under the new roof, the demand for delivering big data and machine learning capabilities is dramatically growing. Therefore, CARIAD SE is currently building the Unified Data Ecosystem (UDE), which was initiated to leverage data-driven development with an End-to-End (E2E) Machine Learning (ML) ecosystem. This UDE bundles top talent, latest development methods and a top-notch technology stack to catch up and capture the top position in the field of autonomous driving.

One part of this UDE will be the Big Data Stack (BDS). To reach the goal of a BDS, CARIAD SE is looking for SUPPLIERS to support the development and implementation of the UDE, which will be built on IaaS (Infrastructure as a Service) as the core layer. However, since a massive increase in necessary computing power can be expected, at least a partial shift to an on-premises environment over time is valid. The establishment of data-driven development capabilities is, besides an efficient access to the whole unified data ecosystem, one of the targeted outcomes from this project.

Hence, the project will cover two main streams. The first stream focuses on the development of features for the Pioneer Fleet, which includes test and pre-production vehicles. Initial capabilities, which are developed and tested in the Pioneer Fleet will be transferred to the UDE and adapted for series production. The UDE represents the second stream leveraging the first one as a field for pre-development of specific complex capabilities (e.g. evaluation of a new technology stack in a high-scale scenario). In the end (final iteration), UDE's BDS should be able to support all VW Group production vehicles. It is important to mention that those two streams are highly interconnected. Key for success is a strong collaboration between the two streams.

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2 Principles

2.1 General Information

As the contractor, the SUPPLIER will ensure that the service described in the specifications is provided in accordance with the CARIAD SE - a Volkswagen Group Company - specifications. CARIAD SE reserves the right to conduct a cost plausibility check before and after nomination and renegotiate accordingly. The prices and deadlines proposed must not be exceeded.

The content of these specifications is subject to confidentiality and may only be passed on to third parties with written approval from CARIAD SE.

In the following chapters, the objectives, the architecture vision, and functional capabilities including the required modules, responsibilities and necessary system knowledge are described.

2.2 Document overview

This document outlines the relevant interfaces, processes, and the requested service as the basis for awarding the contract. These *specifications* describe technical specifications.

The following specifications are relevant for two streams and two phases in total: Phase 1 and Phase 2. Further details about the two phases can be found in section 3.3, specifically in 3.3.1 and 3.3.2.

The tenderer must take these specifications fully into account when structuring their offer. In their offer, they must consider all the services needed to fulfill the requirements set out in the specifications. The offer must refer to these specifications and the applicable documents and judge the provision of the services required therein to be plausible. Deviations from the specifications must be explicitly identified as such in the offer with reference to the appropriate section.

The services will be performed by the SUPPLIER independently, in accordance with the CUSTOMER's technical and organizational requirements, and under the supervision and sole authority of responsible employees appointed by the SUPPLIER.

2.3 Structured offer

Based on the request, the SUPPLIER will create a corresponding structured offer free of charge. This offer must include all details for the plausibility check and the derivation of the offer value. Should CARIAD SE require further details on the offer, the SUPPLIER undertakes to make these available without delay and free of charge.

2.4 Information about UDE

2.4.1 Strategic Outline

Vision:

"To be a global world class data services provider helping our consumers succeed."

Mission statement:

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“To empower our customers achieving value with our unified data ecosystem through outstanding data quality and performance.”

The main objectives are to empower our customers...

...to efficiently access the maximum amount of data ordered and delivered

...to access a unified data ecosystem in a cost-efficient and compliant way

...to use an easy data toolchain to foster data-driven development

The UDE is going to be the nucleus of our work and forms the basis for almost all our solutions and must be included in every decision. To achieve the formulated vision above, the following thirteen key principles were defined and shall constantly be kept in mind and guide every decision. Further, the thirteen key principles are designed to help navigating through the fast-paced data environment. Decisions made for the UDE should fulfill the thirteen key principles which are defined in the following:

1. **Elastic:** Suitable for Big Data Volume (Ingest, Storage & Compute)
2. **Private:** Assure legal reliability worldwide
3. **High Data Quality:** Enable Accurate, Complete, Relevant, Timely and Consistent data
4. **Secure:** Authorized users have access while providing security against external attacks
5. **Governed Uniqueness:** Balance between unique data and data replication
6. **Governed Location:** Balance between centralized and decentralized data
7. **Customer-Centric:** Easy to use and transparent for the customers (Self-service, Workbench Discoverability and Accessibility)
8. **Collaborative:** Data professionals from different organizational units can work together
9. **Portable:** Cloud provider flexibility (e.g., we could change cloud provider in x months)
10. **Smart:** Reasonable automation
11. **Holistic:** E2E Data Platform and seamless user experience along entire product lifecycle – One standardized system for both development and customer fleet data
12. **Operationalizability:** Site Reliability Engineering / DevOps-centric operating model. Overall monitoring and diagnostics
13. **Multitenancy:** Readiness for Brand Multitenancy & Multi-Region deployment. Instances of the system can be shared among multiple VW Brands. The system can be deployed and operated locally in multiple instances as well as different regions

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2.4.2 Architectural Principles

Next to the project structure, the CI/CD processes and the DevOps organization, the architectural principles of the UDE are defined. These principles are meant to serve as examples for how the UDE should architecturally fulfill the thirteen key principles defined in the previous chapter.

Main architectural principles:

- Provision of a single platform with a data platform seamlessly connected with the vehicles (BDS)
- The platform should be scalable in multiple dimensions, beyond commodity services/products which are provided by cloud computing providers
- The UDE should utilize IaaS from Hyperscalers; however, it should be designed to allow for partial conversion to an on-premise solution, as the computing power required can increase exponentially
- Single connectivity layer (vehicle-backend interface): standardized, non-proprietary, secure, scalable (up and down link)
- Same developer interface for customer fleet and development fleet
- Single architecture for customer fleet and development fleet data
- Data locality: The pipeline e.g., MLOps is strongly coupled to persistent layer (esp. technology)
- To consume large amount of data processing algorithms must be close to data (cost, feasibility)
- Video and Image data is orders of magnitude larger as signal data
- Distributed Parallel System with geopolitical adaptations dealing also with local legal requirements: China, Europe, USA, etc.

2.4.3 System Landscape

The following *Figure 1* shows the main building blocks of the envisaged UDE. This UDE consists of technical capabilities that are placed among the key enabler system: The Big Loop. The Big Loop refers to a system architecture for data-driven development and data-driven services.

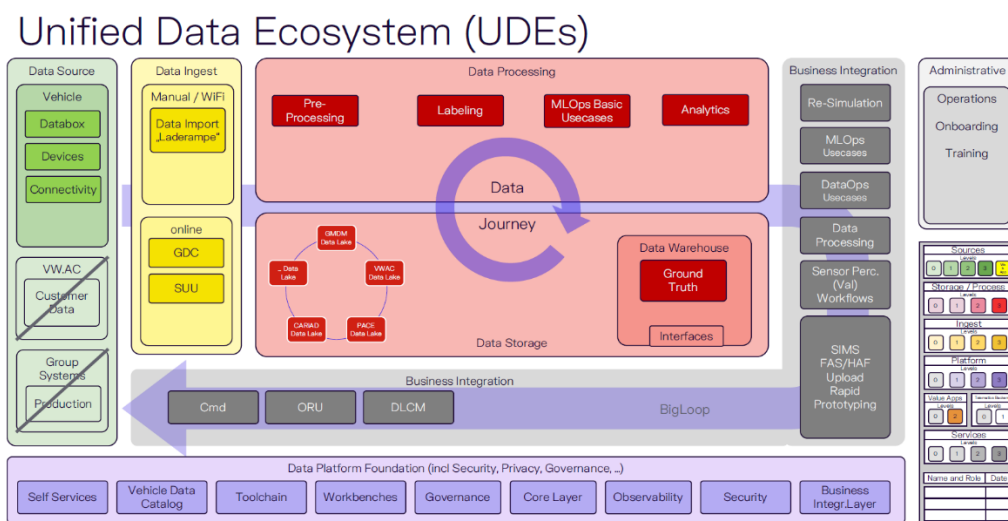


Figure 1 : High-level functional capabilities Building Blocks Overview - Level 1

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It is important to emphasize that UDE is a unique product that cannot be built as a simple combination of already available off-the-shelf solutions and services (yet out-of-the-box solutions should be used when technically feasible). Therefore, we are looking for partners who can jointly address specific technical challenges, some of which are listed below:

- Build high concurrency device backend including client authentication at scale
- Build efficient infrastructure for distributed deep learning, including set up of compute and storage, networking for optimal GPU usage (incl. selection of a right job scheduler)
- Set up the infrastructure ready for multi cloud / multi region
- Design a datalake/ storage layer that is suitable for global data collection, in multiple clouds, using open infrastructure, as well as enabling authorize access while taking care of privacy and local regulations
- Scaling MQTT to 10m devices (incl. load balancers, multi region / multi cloud setup)
- Make services highly available (take each incident as opportunity to find root cause and ensure it does not happen again)
- Set up infrastructure for experiment tracking, model registry, job scheduler, etc. (not just "deploy MLFlow" but really advice the Data science team on their Way of Working)

2.4.4 Logical Clusters

Here follows a target scope and capability description of these Unified Data Ecosystem building blocks. As seen in *Figure 1*, the UDE spans around the following logical clusters:

- Data Source
- Data Ingest
- Data Processing
- Data Storage
- Platform Foundation
- Business Integration and Solutions
- Command Channel (Cmd) / OTA / DLCM

Each of the following logical clusters are described in more detail throughout the next sections.

2.4.4.1 Data Ingest

Data ingestion interface for OTA (Over-The-Air) data collection from vehicle on-board data sources supporting various kinds of vehicle data. In addition, structured data from other sources (e.g., map data from 3rd-parties) will be used (e.g.: bus data, diagnosis data, images, video, application data).

ONE single highly scalable and fully managed data ingestion layer for both manual and online ingestion including the following core capabilities:

- Supports data source specific asynchronous ingest channels via MQTT
- Supports data source specific reliable ACK-based synchronous channel via HTTPS
- Provide on-demand interfaces/connectors for data ingestion from connected cars as primary data source
- Provide on-demand interfaces/connectors for data ingestion from Offboard data sources

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- Provide on-demand interfaces/connectors for data ingestion from Loading Stations ("Laderampe") for Offline Data Loggers.

2.4.4.2 Data Processing

Provide capabilities stack for the customizable automation of the ingestion, validation, normalization, pre-processing (digestion) and distribution of collected data. (e.g., Message Broker, Stream, or Batch processing Engine.) Including the following capabilities:

- Provide Fast Path for near-real time processing
- Provide Slow path for Batch processing
- Provide context- or use case-driven data pipeline configurability from Data Ingest till Business Integration and Solutions layer
- Provide Automated Data Pipeline Management
- Artificial Intelligence (AI) / ML / MLOps:
 - Support to implement distributed model training with *Horovod* environment
 - Support to implement MLOps Pipeline for Deep Learning model training
 - Support model training optimization on cost and performance metering
 - Support transforming ML models to a framework agnostic interchange format
 - Job scheduling
 - Availability to support interactive environment
- Provide labeling platform for 2D and 3D labeling (developed by CARIAD SE and to be integrated into the UDE)
- Data Processing is seamless integrated with the Data ingest layer

2.4.4.3 Data Storage

Provide capabilities stack for the customizable storage. This cluster should cover following capabilities:

- Provide hot storage
- Provide warm storage
- Provide a cold storage including:
 - Provide Metadata model for incoming vehicle data
 - Provide configurable Metadata Enrichment capability
 - Configurable Automated Vehicle Metadata
 - Role-based data authorization
- Provide Data Catalog for Data Discovery including:
 - Single point to discover and access data
 - User-Centric experience with ability to browse
 - Lower the barriers for data access to empower developers/users
 - Expose data context and metadata to users
 - Define, organize, and maintain metadata
- Provide configurable access management
- Able to store Processed Data (Warehouse)
- Able to store Raw data (Data Lake)

2.4.4.4 Platform Foundation

The platform foundation provides managed capabilities stack to support acquisition, administration, configuration, provisioning, and usage of infrastructure. Furthermore, it provides shared services

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supporting required cross-cutting concerns of the Platform (e.g. security, Logging & Monitoring/Observability, Key/Secret management, Workbenches). The Platform Foundation Layer should cover managed capabilities stack to ensure secure and compliant access to the data (e.g.: Data protection & privacy services, GDPR, Roles & Right Management). Furthermore, deliver managed capabilities stack for managing Platform assets catalogs, data governance and Brand Integration (E.g.: Catalog of Data, Schemas, Workbenches, Anonymization and Data Governance related workflows.)

This building block should include following capabilities:

- **Core Layer**
 - **Hyperscaler as IaaS provider** (e.g., Azure)
 - **Identity and Access management** (e.g Active Directory, Azure RBAC)
 - **Infrastructure as Code** (IaC): (Terraform)
 - **Provide High Availability / Disaster Recovery mechanisms**
 - Best-in-class, cloud-agnostic first application tech stack (E.g.: Kafka instead of EventHub, HiveMQ as MQTT Broker)
 - Persistence Layer via sustainable technologies and sufficient data model
 - Support data assumption process to organize the data storage for model training
 - Support data segmentation process for necessary data annotations for further ML workflows
- **Foundation for Observability**
 - **One logging & monitoring system providing logging & tracing capabilities via state-of-the-Art formats and standard protocols** (e.g. OpenTelemetry, Prometheus, Grafana)
 - Integrate where required to further observability systems to support end2end-monitoring
 - Provide a diagnostic layer to analyze and assess data quality
- **Foundation for Security**
 - Continuous automated system PEN-Tests / vulnerability scans
 - Implement SecDevOps best-practices
 - Open-Source SW management
 - Data management services for regulation compliance e.g. GDPR in EU (auto. Deletion/retention time/information disclosure)
- **Foundation for Business integration and Solutions Layer**
 - Automated Workbench Provisioning
 - Target Workbench configurability over Pipeline Configuration
 - MLOps Workbench:
 - Support development of MLOps infrastructure and register models and its corresponding data software assets
 - No SaaS approaches
 - Suitable for data parallel trainings
 - Proper HPCs cluster setup including Infini Band configuration
 - Integration to Observability layer
- **Data Governance** – other important part of the Platform Foundation Layer. The Data Governance concept should be designed to enable the most efficient operation of the UDE. All external SUPPLIERS are requested to include a high-level concept regarding data governance for the UDE in their respective offers. Special emphasis is placed on the required roles and processes - and their description - in the context of a data platform.

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2.4.4.5 Business Integration and Solutions

- Provide a capability stack for simple/complex post-processing/analytics of a prepared snapshot of data after their successful integration into the platform. Those data may have been pre-processed upfront after ingestion (e.g., Machine Learning tool chain / MLOps).
- Provide capabilities stack for seamless integrated data delivery to internal or third-parties services/systems (E.g.: OTA-SW Campaign Management, VW Group *Marketplace*, Online Services like *Local Hazard Warning*, *HD Map*) including:
 - Support model deployment on the target or simulator hardware
 - Integrate with OTA-SW Update System for CARIAD SE SW-Campaign management

2.4.4.6 Command Channel (Cmd) / OTA / Digital Lifecycle Management (DLCM)

Channel to cloud interface on the device platform out of the data platform (E.g. Configs, PullJobs) This building block should provide following capabilities:

- Provide of async commands device-specific interface to vehicles via MQTT
- Provide queue management
- Provide of asynchronous device-specific response back channel e.g. for ACK

OTA / DLCM elements are developed by CARIAD SE and not part of the tender, however they will be part of the UDE and should be seamlessly integrated into the ecosystem.

2.4.4.7 Further components

The following capabilities should be assumed as existing systems to be provided by CARIAD SE or further CARIAD SE project partners and to which the above-mentioned capabilities in this scope should integrate with.

Data Source

The vehicle will be the main source of data, however different types of upload scenarios / classes of message sizes should be considered.

Orchestrate Data Collection (part of the Data Storage Logical Cluster)

Provide capabilities stack for full-managed data collection, processing in pipelines and distribution to storages and consumers from fleet & non-fleet sources as well as delivery.

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3 Specific order contents

3.1 Description of the project environment

This project is targeting related activities for an agile development value stream within the series development process (e.g. concept determination, Proof-Of-Concepts, Continuous development, and integration of features, etc.). This introductory describes in which environment the project takes place. We hope that potential SUPPLIERS will then also be able to accurately classify the project according to its specific technical terms without consulting the relevant division or Procurement department.

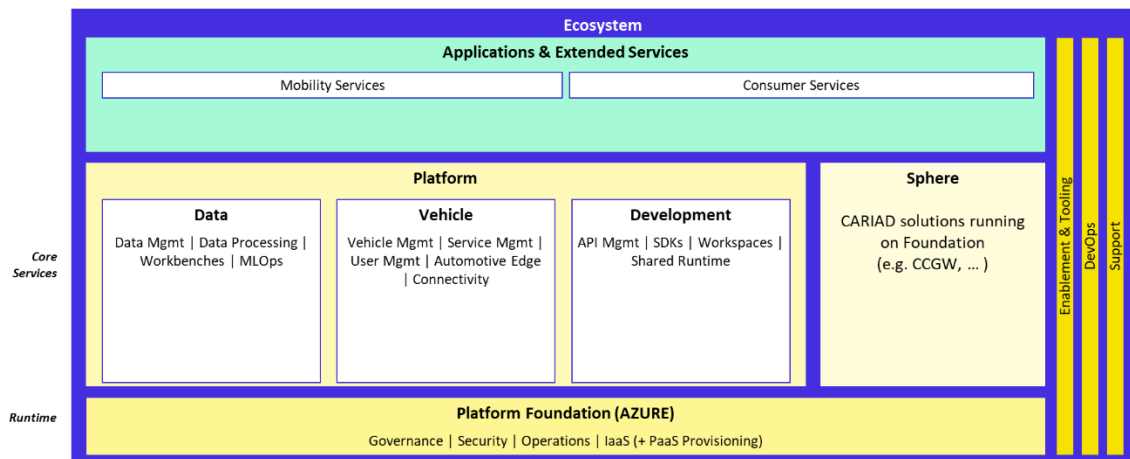


Figure 2: Product Vision and Functional Building Blocks

As part of Volkswagens novel approach on digital & connected vehicles, the solution vision of the Volkswagen Automotive Cloud (VW.AC) was established. Its purpose is to serve as the foundational platform for all future connected vehicle services throughout all brands under the roof of the Volkswagen Group (see *Figure 2: Product Vision and Functional Building Blocks*).

Technically the VW.AC is currently based on Microsoft Azure and organized in two main parts – one part concerned mostly with device functionality and one part handling the data scope. Although many Azure services are used for implementing the functionality, they are oftentimes supplemented with additional state of the art open-source software from the big data realm. The VW.AC platform and use cases based on it are developed in an agile approach, organized through an agile Framework (e.g. Scaled Agile Framework (SAFe®)).

With the founding of CARIAD SE and the concentration of a huge amount of connected vehicle projects under this new roof, the demand for delivering big data and machine learning capabilities is growing. This is the main scope of the data domain.

Now we are looking for several SUPPLIERS to support CARIAD SE in implementing the full BDS (see Figure 2 above “Data”) within the Unified Data Ecosystem. Currently it is planned to build the UDE using an independent IaaS foundation (Azure) which in the future could be integrated into the overall “VW.AC” platform. The purpose of this project is to real-time collect sensor data (camera, lidar, radar, etc.) and bus data from testing, pre-production, and series-production vehicles (comparable to IoT devices) of the VW Group with the ability to store and process this data (AI workloads). All of the

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project participants (Data Engineers, etc.) should be able to collaborate across all workloads within this data stack.

As already mentioned, the cooperation model for the development of the data stack on the part of the CUSTOMER is based on an agile Framework (e.g. SAFe®). This enables agile work on the different company levels. Therefore, the UDE is developed across multiple Agile Release Trains (ARTs).

The interface between the development team and the CUSTOMER is the Product Manager of the corresponding ART, who is provided by the client. He will be supported by the SUPPLIER project management team, which will facilitate the work of the development teams. The team sizes for the development teams are categorized into S, M and L sizes. The size of the project management team will scale relative to the amount of developer teams. Examples about specific team sizes can be found in the Phase volume sections for each phase (3.3.1.2 and 3.3.2.2).

The heartbeat of the project is organized through so-called Product Increments (PI). The goals of a PI are defined at the beginning of the cycle in what is known as PI Planning (PIP). During this PIP, dependencies between the individual development teams are identified.

Below this, the agile teams work in a coordinated sprint mode (e.g. sprint duration: 2 weeks). The last sprint of a PI is used for integration and stabilization. The joint results are presented in regular sprint demos and solution demos.

The CUSTOMER determines participation as necessary and does not always have to affect the entire team.

3.2 Objectives and service description

This part describes the project structure, objectives including milestones and the basis for the offer calculation.

3.2.1 Project Structure

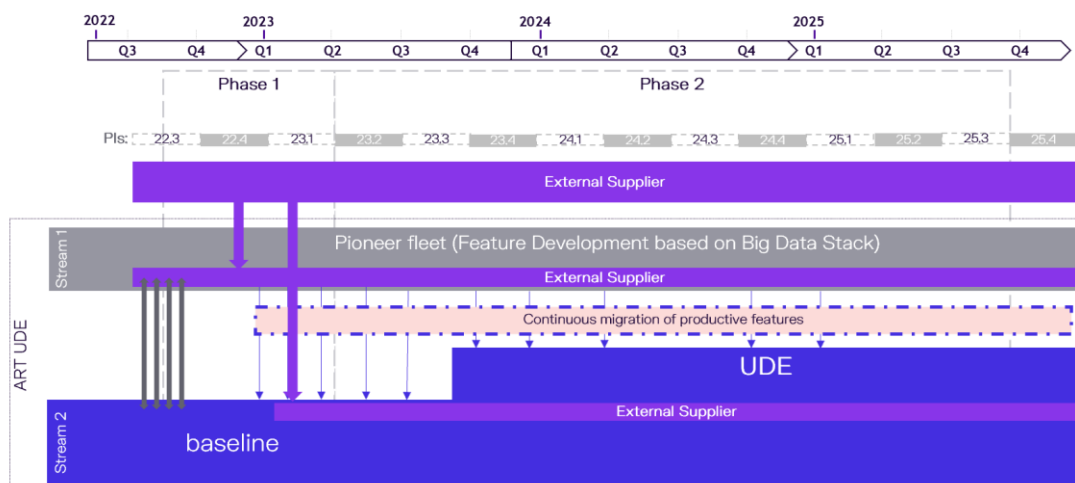


Figure 3: Project structure and timeline

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As shown in Figure 4, the current project has two main streams (horizontal, Pioneer Fleet and UDE) and is divided into two major phases (vertical, Phase 1 and Phase 2). The first phase focuses on the development of features for the so-called Pioneer Fleet. The purpose of this fleet is to collect sensor data (camera, lidar, radar, etc.) from up to 1.000 test and pre-production vehicles. By the end of the first phase, initial capabilities should be established to collect, transport, process and analyze data from test and pre-production vehicles. CARIAD SE has already begun developing these capabilities, and the approximate duration of this phase will be about 1 to 2 PIs.

The second phase will cover two streams, but they will be highly interrelated. The initial capabilities developed and tested in the Pioneer Fleet will be transferred to the UDE and adapted for series production. The team developing specific features in the Pioneer Fleet will also be responsible for migrating those features to the UDE. In the end (final iteration), the UDE's BDS should be able to support all VW Group production vehicles. In parallel to the development and migration of the new functions, there will be further teams responsible for building up the core capabilities of the UDE. Key to a successful UDE integration is a strong collaboration between the two streams Pioneer Fleet and UDE.

Software development for these two streams is to be optimized through Continuous Integration / Continuous Deployment (CI/CD) to such an extent that every change can be taken over into production immediately after quality optimization. The basis for this form of sustainable process optimization should be the merging of development and operation in a DevOps organization.

The contract will be for 3 years, with a possibility of extension. It is expected that multiple SUPPLIERS will obtain a frame contract and that the individual work assignments will take place on a 12–14-week SAFe® PI Planning interval.

The work location will be mostly remote (offsite e.g. home office), however, it is expected that the offsite resources will be available in the locations of CARIAD SE on demand for workshops or escalations.

The CUSTOMER will accept a mix of offsite, near shore (European countries) and offshore (Outside Europe) resources, with the near and offshore resources expected to focus on the support & maintenance activities. However, it is advisable to have offsite resources with reasonable time zone differences.

Important note: Optionally, the CUSTOMER has the possibility to take over the teams involved in the development of UDE and Pioneer Fleet after a certain period (e.g. after 3 years).

3.2.2 Agile approach and development process

A prerequisite for the implementation of agile projects and thus an essential success factor is the common understanding of the procedure in the project. These points are among others written in the agile manifesto:

- Individuals and interactions have precedence before processes and tools
- Functional Products have precedence before extensive documentation
- Cooperation with the CUSTOMER has priority over contract negotiations

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- The entering of changes has priority before strict plan persecution

The entire duration is divided into PIs, which are further divided into individual sprints. For each PI, the features to be processed by SUPPLIERS are displayed as items in the product backlog between CUSTOMER & SUPPLIER.

Not all items in the Product Backlog are necessarily implemented by the SUPPLIER. The SUPPLIER will therefore not assume any responsibility for the complete implementation of CUSTOMER requirements and the overall project.

The prioritization of the individual deliverables is carried out by the Product Manager of CARIAD SE & the Product Owner. The SUPPLIER is responsible for delivering the deliverables defined per PI in the Backlog.

3.2.3 Information on the tender process

We reserve the right to organize a performance day where different SUPPLIERS in small groups must solve a task in one day. The processing of the task will take place within the framework of a Hackathon.

For the development of the UDE, it is important to see how much hands-on experience the SUPPLIER brings to the table. In addition, the SUPPLIER can get to know the environment of the UDE better.

- SUPPLIER will be asked to propose expertise to deliver the phases 1 & 2. Potential SUPPLIERS will be given the change to ask detailed questions on the phases to better estimate the required skillsets
- Against the background of the requirements and information compiled in this specification, all external SUPPLIERS are requested to include a high-level concept of the data platform with their respective offer. Special attention should be paid to the areas of architecture, organization, processes, and their orchestration
- Potentially, all selected short-listed SUPPLIERS will be invited to a pitch day (hackathon) where they will be asked to perform a two specific tasks in the data management & autonomous driving data platform domain. The SUPPLIERS will be asked to decide on the team size based on the complexity of the task

3.3 Overview of the project phases, forecast volume and team setup

3.3.1 Phase 1

In accordance with Figure 4 and the description of the project structure, Phase 1 of the project is defined in detail. The main goal of Phase 1 is the support of the implementation of an initial BDS for testing and pre-production vehicles (Stream 1 - Pioneer Fleet).

3.3.1.1 Scope

The CUSTOMER defines the process step at which the SUPPLIER is commissioned for which task area (interface definition).

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Concrete tasks will be derived in accordance with the current state of finished developments from the following building blocks. However, some changes to the following description are possible at starting point of the contract.

Data Ingest:

- Collection of data from Vehicles (Images, Video, Metadata)
- Multi region deployment
 - in EU and US regions
 - in China
 - In other regions (to be defined later)
- Verification of large data upload via MQTT (or HTTPS instead)
- MQTT Broker selection
- Scalable Device Authentication scheme
- Performance tests (Concurrency, Throughput (data volume))
- Device management

Command/Config channel:

- Health monitoring
- Debugging channels

Store & Process:

- Data Lake
 - Metadata "search" (E.g. find all images near traffic lights)
 - Role based data authorization
 - Enrichment of data with vehicle metadata
 - Data catalog (e.g. Collibra)
- MLOps Workbench
 - Collection of metrics from GPU infrastructure
 - Spawning of Infiniband GPU clusters
 - Provide interactive development environment
 - Provide mechanism to run batch jobs
 - Multi region deployment (Deployment in EU and US regions, since images cannot leave region, the training/labeling jobs need to run in each region)
 - Model registry
 - Model tracking
 - Workflow orchestrator (E.g. Airflow or similar)

Platform Foundation:

- Network design (firewalls etc.)
- Penetration testing
- Domain Name System (DNS) and Certificate Management (e.g. SSL)
- Certifications (e.g. ISO)
- Documentation
- Centralized logging solution (e.g. Elasticsearch)
- Day to day operation of the platform:
 - SLO/SLA etc.
 - Support channels

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3.3.1.2 Phase volume

The planned period for Phase 1 is 2 PIs (PI = 12 weeks) starting from the contract beginning. In the first PI we are currently planning to contract one S team. According to the relative scaling of the project management team set out in 3.1, this one S team is joined by the equivalent of 2,0 FTE from the project management team (e.g. role equivalent of 1 FTE Project Manager (Senior) and 1 FTE Project Management Office (PMO)). In the following PI, one S and one M team should be part of the project and additional support from the project management team (see also cost break down structure). However, the team size and number of teams per PI could be changed, depending on the estimated scope of work for a PI.

For more details about the different team sizes and skill set (including the “Leistungsstufen”) please see 3.3.3.

Important note: For the first PI, the bidder should submit the concrete profiles of the staff to be assigned to the required roles (in this case team size S). The exchange of the proposed personnel is only possible in exceptional cases and only if the level of qualification is equal.

3.3.2 Phase 2

In accordance with Figure 4 and the description of the project structure, Phase 2 of the project is defined in detail. The main goal of Phase 2 is to continue the support of Pioneer Fleet developments and the migration of the functionalities to series production vehicle platform (UDE). Furthermore, the support of the UDE developments start in this phase of the project.

3.3.2.1 Scope

The CUSTOMER defines the process step at which the SUPPLIER is commissioned for which task area (interface definition).

Concrete tasks will be derived in accordance with the current state of finished developments for Pioneer Fleet and UDE. For the high-level descriptions of the required modules for the phase 2 please see chapter ‘2.3.3 System Landscape Vision’.

3.3.2.2 Phase volume

The planned period for Phase 2 is 10 PIs (PI = 12 weeks) starting after Phase 1 is finished.

In the first PI one additional M Team will be contracted, which sums up to one S and two M teams. In the second PI of Phase 2 one additional M team will be required. Starting from Q3 2024, the support will reach five teams in total. In Q4 2024, one of the M teams is planned to be ramped up to a L team. For the next PIs and until the end of the project CARIAD SE is planning to contract 1 S, 3 M teams and 1 L Team in total (see also cost break down structure). According to the relative scaling of the project management team set out in 3.1, this total of five development teams is joined by the whole project management team (see Project Management Table in the following Chapter “Team Setup”). However, the team size and the number of teams per PI could be changed, depending on the estimated scope of work for each PI.

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For more details about the different team sizes and skill set (including the “Leistungsstufen”) please see 3.3.3.

3.3.3 Team setup

The following part describes the S, M and L team setups (including the roles, “Leistungsstufen” and volume in Full Time Equivalents (FTE)) in more detail.

Because of the overall complexity of the project and hence the respective tasks, a certain level of senior experience is required for all roles. Further, some of the roles are staffed by internal CARIAD SE employees and further roles by external SUPPLIERS. However, if CARIAD SE had available capacity, some roles covered by external SUPPLIERS could be covered by CARIAD SE. Nevertheless, during one PI, the team setup will remain constant.

It is expected that the SUPPLIER should provide a mix of onshore, near shore and offshore resources. Onshore resources are defined as resources which are in Germany or comparable high-cost countries with less than 1 hour of time difference (France, UK, Benelux, Scandinavia). While the language of CARIAD SE is English, German speaking knowledge workers are preferred, ceteris paribus, due to the presence of legacy documentation in the German language. The SUPPLIERS will be asked to specify how many onshore resources are either business fluent or have passive knowledge in the German language.

Near shore resources are from middle to low costs countries with less than 3 hours of time difference such as Southern Europe, Central & Eastern Europe, the Baltic countries, and Ukraine. However, it is advisable to have offsite resources with reasonable time zone differences. Offshore resources are from lower daily rates countries outside of Europe.

From all external SUPPLIERS, it is required to indicate the location and the percentage of shoring for the proposed teams.

To compare costs between the offers and to be financially compliant, the SUPPLIER needs to provide costs for all needed roles (additional spreadsheet is provided for this purpose). It is required for the SUPPLIER to provide detailed information on how the price rates have been calculated and it is necessary to define the roles which are mentioned below. The SUPPLIER is free to define its own associations. The SUPPLIER should provide the following information:

1. Role definition (e.g. which tasks does the role perform, skill set)
2. Experience level in years per role (based on “Leistungsstufen”)
3. Indicate the role and “Leistungsstufen” on each of the proposed employees CV (Curriculum Vitae)

The solution and program management roles will be provided by CARIAD SE internally (e.g. Business Owner, Solution Manager, Solution & System Architect, Release Train Engineer). Additional roles to support these functions might be a useful extension to the following team setup examples.

Furthermore, the SUPPLIER has to provide one contact person per team that is available during the CET (Central European Time zone) office hours.

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3.3.3.1 Team size S

The total expected team size for a S team is 6 FTE. The external role, their “Leistungsstufen” requirements and the allocated FTE for the S team can be found in the following table:

Role name	“Leistungsstufen”	FTE
Product Owner	C2 Development lead	1,0
Scrum Master	C3 Development (complex)	0,5
Software Architect	B3 Consulting (complex)	0,5
Data Engineer (Senior)	C2 Development lead	1,0
DevOps Engineer	C3 Development (complex)	1,0
Security Engineer	C4 Development (standard)	0,5
Automated Test Engineer	C4 Development (standard)	0,5
Data Engineer (Professional)	C4 Development (standard)	1,0

3.3.3.2 Team size M

The total expected team size for a M team is 8,5 FTE. The external role, their “Leistungsstufen” requirements and the allocated FTE for the M team can be found in the following table:

Role name	“Leistungsstufen”	FTE
Product Owner	C2 Development lead	1,0
Scrum Master	C3 Development (complex)	0,5
Software Architect	B3 Consulting (complex)	0,5
Data Engineer (Senior)	C2 Development lead	2,0
DevOps Engineer	C3 Development (complex)	1,0
Security Engineer	C4 Development (standard)	1,0
Automated Test Engineer	C4 Development (standard)	0,5
Data Engineer (Professional)	C4 Development (standard)	2,0

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3.3.3.3 Team size L

The total expected team size for a L team is 10,5 FTE. The external role, their “Leistungsstufen” requirements and the allocated FTE for the L team can be found in the following table:

Role name	“Leistungsstufen”	FTE
Product Owner	C2 Development lead	1,0
Scrum Master	C2 Development lead	0,5
Software Architect	B3 Consulting (complex)	1,0
Data Engineer (Senior)	C3 Development (complex)	2,0
DevOps Engineer	C3 Development (complex)	2,0
Security Engineer	C4 Development (standard)	1,0
Automated Test Engineer	C4 Development (standard)	1,0
Data Engineer (Professional)	C4 Development (standard)	2,0

3.3.3.4 Project Management team

The total expected team size for the PM team is 5 FTE. The external role, their “Leistungsstufen” requirements and the allocated FTE for the PM team can be found in the following table:

Role name	“Leistungsstufen”	FTE
Project Manager (Senior)	A2 Project Management	2,0
PMO (Senior)	A3 Consulting (complex)	2,0
PMO (Professional)	A4 Consulting (standard)	1,0

3.3.4 “Leistungsstufen” Descriptions

A2 Project Management

- Ensuring project management and quality assurance in the project
- Management or control of a project team
- Project management with assumption of analysis, risk management and controlling of a project
- Planning, implementation, and completion of the project

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- Coordination and presentation of the final project results
- Independent order processing according to IT-PEP

A3 Consulting (complex)

- Independent detailed analysis of complex technical requirements
- Conducting workshops (incl. preparation and follow-up)
- Execution of complex process analyses of existing processes in cross-sectional topics
- Optimization and further development of complex processes in cross-sectional topics
- Simulation and definition of complex target processes (as well as KPIs) in cross-sectional topics
- Preparation of complex feasibility and profitability analyses
- Elaboration of complex solution approaches, creation of complex organizational concepts
- Independent order processing according to IT-PEP

A4 Consulting (standard)

- Independent detailed analysis of technical requirements
- Conducting workshops (incl. preparation and follow-up)
- Execution of process analyses of existing processes in cross-sectional topics
- Optimization and further development of processes in cross-cutting topics
- Simulation and definition of target processes (as well as KPIs)
- Preparation of feasibility and profitability analyses
- Elaboration of solution approaches, creation of organizational concepts
- Independent order processing according to IT-PEP

B3 Consulting (complex)

- Independent preliminary clarification, order clarification and conceptual design of complex connected application systems
- Independent detailed analysis of complex technical requirements
- Elaboration of complex solution approaches and creation of complex organizational concepts,
- requirement specifications (requirement definition), development specification (rough)

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- Independent order processing according to IT-PEP

C2 Development lead

- Management and leadership of a development team / Scrum team
- Ensuring functionality
- Optimizing the productivity of the team
- Monitoring compliance with project specifications and milestones
- Removal of impediments and protection of the team from disruptions as well as representation of team interests
- Independently complete assignments in accordance with IT-PEP

C3 Development (complex)

- Independent preliminary clarification, order clarification and conceptual design of complex connected application systems
- Independent detailed analysis of complex technical requirements
- Elaboration of complex solution approaches and creation of complex organizational concepts,
- Requirement specifications (requirement definition), development specification (rough)
- Independent order processing according to IT-PEP

C4 Development (standard)

- Independent design, realization, implementation, and stabilization of application systems according to IT-PEP
- Independent processing of delimited development tasks in IT projects
- Programming with programming languages
- Independent order processing according to IT-PEP

3.4 Service period

The proposed service period for the contract is 36 months, from **17.10.2022 to 16.10.2025**.

3.5 System knowledge

The SUPPLIER will independently provide the scope of services described in the specifications with qualified specialists who possess the following system knowledge:

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Experience in Agile software development

As stated above, the setup of the project environment is based on an agile Framework (e.g. SAFe®). Experience in working in this manner is mandatory. This applies to agile rituals as well as the necessary tooling based on Collaboration and Development Toolchain (e.g. Azure DevOps or Atlassian stack).

As the current setup is following the DevOps paradigm, experience in this area will also be necessary.

Development Skills

- Experience in building cloud platforms for big data processing
- Experience with services in Azure ecosystem
- Deep understanding of scalable architectural styles and characteristics of a big data platform
- Good understanding of scalable architectural styles and characteristics of a big data platform
- Experience with streaming/messaging technologies (e.g. Apache Kafka)
- Experience with streaming/batch analytics technologies (e.g. Apache Spark)
- Experience with NoSQL databases
- Experience with state-of-the-art container technologies such as Docker, Kubernetes
- Security by Design. Knowledge of the NIST-800 catalog as the current reference standard is surely a plus
- Familiar with Continuous Integration / Continuous Delivery. Experience with Azure Dev-Ops Collab/Dev toolchain would certainly be a plus
- Understanding the VW.AC Data Platform system landscape and infrastructure would certainly be another plus
- Experience with Infrastructure as Code (IaC) with tools like ARM

System Integration Skills

Due to the heterogeneous nature of OEM's digital landscape a high degree of complex system integrations will be necessary. Experience – preferably within the Volkswagen Groups – will be required to ensure the interworking of to be developed modules with existing VW Group systems.

System Security Skills

The data platform is targeting to handle a huge amount of vehicle data from various brands, potentially including personal information. The need for highest standards in terms of data & system security is paramount. Required skillsets span from hardening on architecture level through the full development

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cycle to the comprehensive documentation of processes and measures, culminating in a full NIST-800 compliance of developed artefacts.

3.6 Schedule and project documents

The relevant project documents such as schedules and milestones will be provided separately by the client.

3.7 Framework conditions

Framework conditions to be complied with, standards, technical guidelines, operating equipment regulations etc.

- **Relevant regulations**
 - EU GDPR (Data Act)
 - EU antitrust
 - Germany TTDSG
 - China CyberSecurity Laws and Regulations
 - UNECE EU
 - US data protection legislation (Federal and State levels. E.g. California Consumer Privacy Act (CCPA))
- **Relevant standards**
 - ASPICE
 - Extended Vehicle (ISO20077/78)
 - NIST 800
- **Relevant Guidelines**
 - OSS conformity
 - SecDevOps by Design
- **Relevant Key Regions with need of local availability of the solution as minimal requirement**
 - EU
 - North America
 - China
- **Required tests/test procedures**
 - Unit tests
 - Component & systems tests
 - Integration tests
 - Penetration tests
 - Vulnerabilities scans

3.8 Provision of services

The place of performance is: Plant premises and outside the plant premises

Any access authorization required for the provision of services on the plant premises (if necessary) of CARIAD SE will be provided by the client.

All CARIAD SE system access authorizations required for the provision of services will be made available by the CUSTOMER to the necessary extent prior to the project start. The SUPPLIER will always perform the services using their own work equipment and materials. The use of CARIAD SE work equipment and areas is generally subject to payment, unless otherwise agreed.

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In their correspondence with CARIAD SE, with employees of CARIAD SE and as soon as they contact third parties on behalf of CARIAD SE, employees of the SUPPLIER will always indicate that they are working based on a contractual relationship between the SUPPLIER and CARIAD SE.

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4 General order contents

4.1 Scope, conclusion of the contract

“Contractual regulations” are all the provisions between CARIAD SE and the SUPPLIER, which are either contained in the service contract itself or in documents directly or indirectly referenced in the contract.

The service contract will be concluded as part of the CARIAD SE procurement process, including the General Terms of Purchase of Volkswagen AG, whereby any reference to Volkswagen AG is to be understood as a reference to CARIAD SE.

The type and scope of service as part of the contractual regulations will be governed by these specifications unless a matter is negotiated individually and expressly regulated otherwise in writing.

The rights and obligations of the SUPPLIER arising from general legal provisions will remain unaffected as far as no different regulations are agreed.

4.2 Responsibility, duties of information and cooperation

The SUPPLIER will perform their services independently, autonomously, in a targeted manner and exclusively with their own qualified personnel. The SUPPLIER will carry out their work using state of the art science and technology and in accordance with the principles of proper professional exercise including documentation. Any technical, specialist or other specifications issued by CARIAD SE do not release the SUPPLIER from their obligation and responsibility to provide a complete and error-free service. The SUPPLIER is permitted to involve sub-SUPPLIERS in the provision of services in consultation with CARIAD SE but needs to provide up-front approval.

Only valid for the selected options:

The SUPPLIER undertakes to train their employees to perform the tasks on high-voltage vehicles agreed in the contract, using the latest technology and the applicable regulations and standards. Furthermore, evidence of the above-mentioned qualifications must be provided to the relevant entity on request.

☐ Performing the service includes work on high-voltage vehicles

☒ Performing the service does not include work on high-voltage vehicles

The SUPPLIER will perform their service in constant consultation with CARIAD SE and will appoint a coordinator, who will plan and monitor the use of personnel and fulfillment of the service. This coordinator is the responsible point of contact for CARIAD SE in relation to all matters concerning the project. CARIAD SE can submit declarations with effects on the SUPPLIER to this point of contact.

The employees employed by the SUPPLIER will be subject solely to the SUPPLIER’s right to issue instructions. The SUPPLIER will ensure that the right to issue instructions is exercised only by themselves.

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Discussions concerning the content and performance of the services will take place at regular intervals between the coordinators of the contractual partners. Any questions concerning performance of the contract and provision of services must be clarified exclusively by the respective coordinators or the contractual partners.

CARIAD SE will coordinate detailed specifications and changes regarding the service to be provided exclusively with the SUPPLIER's coordinator.

The SUPPLIER undertakes to comply with the valid confidentiality obligations and access authorizations of CARIAD SE, to comply with the obligation to carry identification when accessing the plant premises.

At any time following prior request, the SUPPLIER will inform the CUSTOMER as to the status of the service provision, allow access to the (partial) results and work documents to be delivered as well as to drafts and will submit any requested status reports.

The SUPPLIER should come up with a proposal for an effective and transparent (bi-)weekly status report.

4.3 Service deadlines

The agreed service deadlines and schedules are binding. In these schedules, there are end dates and, where applicable, interim dates; they can only be changed in writing and by mutual agreement.

4.4 Change in service

The written agreement must include statements on the following points: description of the scope of services, remuneration (with written invoices of additional costs and reductions), schedules and service deadlines and other contractual regulations, if applicable.

4.5 Proof of service/acceptance

The SUPPLIER will notify the CUSTOMER in writing of completion of partial or entire services according to milestones defined in these specifications and provide an invoice, at acceptance or with appropriate proof of services.

CARIAD SE will check the services after the declaration of completion by the SUPPLIER. At the request of CARIAD SE, the SUPPLIER will provide the services for acceptance without special remuneration and submit the proof of services and documents required for this. Defects which occur during acceptance will be documented.

If merely slight and insignificant defects that only marginally inhibit proper usage are present, CARIAD SE will declare acceptance. The SUPPLIER must rectify defects that prevent acceptance immediately and provide their services for acceptance again. The above rules will apply accordingly to repeat acceptance processes. Acceptance of partial services does not prevent CARIAD SE from making claims later for defects in partial services already accepted if they only become apparent due to interaction between system components.

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4.6 Remuneration

The service to be provided is contained in Program Increments (PIs) (see SAFe®), each lasting approximately 3 months / 12 weeks. For each PI, it is assumed that the full scope of the services described in the detailed requirements can be called off by the SUPPLIER. The weighting is based on the requirements of the project and is requested by the CUSTOMER in the planning of the respective sprints or determined together with the SUPPLIER.

As described in the phase volume chapters, there are different requirements for the number of teams in each phase of the project. The requirements for the phases can change over time.

The SUPPLIER shall allocate the provided workforce to the various roles in the enclosed calculation sheet and price them accordingly.

To provide the required service, participation in regular meetings is also necessary (in alignment with other CARIAD SE projects teams and the product management).

This includes the following activities:

- Participation in relevant alignment meetings
- Regular status reporting on the development status
- Reporting the product quality to the project management and other stakeholders
- Participation in relevant ticket control boards

The calling of the appropriate team sizes requires the joint planning during the regular PI planning / sprint planning as well as the confirmation of the client. To schedule the tasks, a ticketing tool (e.g. Microsoft Azure DevOps, Atlassian stack) is used for documentation and control.

The development increments are executed in sprints in the planned period and deployed in the test environment. The acceptance takes place according to the acceptance criteria documented in the tool based on the results of the individual development increments.

The order value includes all additional costs. All expenses and costs not explicitly covered by CARIAD SE must also be borne by the SUPPLIER and covered in the agreed price. Travel times, travel costs and additional costs are only paid if this has been explicitly agreed.

In the event of service reductions by CARIAD SE/relevant departments, there is no entitlement to the entire nominated order value (e.g. because of project terminations).

4.7 Ramp On / Ramp Off

4.7.1 Transition phase

The SUPPLIER undertakes to take over the IT services to be provided by him and the operational responsibility of Cariad CARIAD SE or the previous service provider in due time and in full.

The gradual takeover at CARIAD SE shall be conducted in the form of a transition, in which the previous service provider is replaced, and the prerequisites are created to operate the IT services in accordance

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with the provisions of the framework agreement and its appendices and annexes under its own responsibility for CARIAD SE.

The transition will end with the transfer of operations at the mutually agreed time.

One of the main objectives of the Transition is the smooth transition of the operation from CARIAD SE or previous service provider without restriction, endangerment, or negative impact on the operation.

The SUPPLIER is holistically responsible for the detailed content planning and successful execution of the transition within the specified period of max. 3 months, this includes planning as well as monitoring, coordination, reporting and project management of the activities for the SUPPLIER and CARIAD SE.

4.7.2 Completion support

The provisions of this subchapter apply at the end of the assignment.

In principle, termination support shall be provided by the SUPPLIER. The SUPPLIER shall ensure that there is no deterioration in quality during the period of termination support.

The SUPPLIER shall be obliged to provide transitional support within the framework of the termination of the contractual relationship. This shall be ordered separately by the CUSTOMER and shall be estimated at 12 weeks (of which 8 weeks shall be on-site and 4 weeks as required).

After termination of the contract, any work equipment provided must be returned to the CUSTOMER without being requested to do so.

Upon termination of the contract, all program codes and documentation created within the scope of the order are to be handed over to the client.

4.8 General legal relationships

The contractual regulations apply regarding the agreed rights and obligations concerning topics such as service problems, third party rights, liability, and warranty, as well as confidentiality and data protection.

4.8.1 Warranty and liability

The SUPPLIER undertakes to perform the services in a professional and careful manner. If these obligations are violated, the warranty and liability regulations of the contractual regulations will also apply.

4.8.2 Rights of third parties

The SUPPLIER will ensure that the provision of their services does not illegally encroach on the rights of third parties. In the event of violations, the contractual regulations apply.

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4.8.3 Confidentiality and data protection

The services to be provided on behalf of CARIAD SE are subject to confidentiality. The contractual regulations apply.

4.9 Termination

CARIAD SE can terminate the contract at any time with a notice period of two weeks to the end of a month. The SUPPLIER may only terminate the contract with a notice period of two weeks to the end of a month in the event of an essential contract violation on the part of CARIAD SE which is not rectified after written warning of termination and the lapse of an appropriate deadline. A termination must be provided in written form.

If CARIAD SE terminates the contract for a reason for which the SUPPLIER is not responsible, the SUPPLIER will be entitled to the agreed remuneration for all contractual services provided until termination of the contract has taken effect in addition to compensation for costs proven to have arisen from the provision of personnel and materials for a period of up to one month after termination of the contract has taken effect.

If the contract is terminated for a reason for which the SUPPLIER is responsible, the SUPPLIER is only entitled to remuneration for those parts of the service which CARIAD SE can reasonably and economically use; and at the maximum, the contractually agreed remuneration for all services recognized according to the contract by the time the termination becomes effective. Any further claims by the SUPPLIER are excluded in this case. CARIAD SE is entitled to partial terminations.

5 General Information

5.1 Definitions, Terms, Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
ART	Agile Release Train
BDS	Big Data Stack
CCPA	California Consumer Privacy Act
CV	Curriculum Vitae
DLCM	Digital Lifecycle Management
DNS	Domain Name System
E2E	End-to-End
E ³	End-to-End-Electronics

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EU	European Union
FTE	Full Time Equivalent
GDPR	General Data Protection Regulation
GPU	Graphics Processing Unit
HPC	High Performance Computing
IaaS	Infrastructure as a Service
IoT	Internet of Things
ISO	International Organization for Standardization
IVC	In-Vehicle Client
JCA	Joint Control Agreement
MEB	Modular Electric Building blocks
ML	Machine Learning
MLOps	Machine Learning Operations
OTA	Over-the-air
PI	Program Increment
Pioneer Fleet	The Volkswagen Group pre-production test car fleet
PIP	Program Increment Planning
SAFe®	Scaled Agile Framework
SE	Societas Europaea
SLA	Service Level Agreement
SLO	Service Level Objective
SSP	Scalable Systems Platform
SW	Software
TC	Terms and Conditions
TISAX	Trusted Information Security Assessment Exchange

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UDE	Unified Data Ecosystem
VDA	German Association of the Automotive Industry
vNow	Data platform for series production vehicles
VW	Volkswagen
VW.AC	Volkswagen Automotive Cloud

5.2 Other documents

The CUSTOMER will provide the SUPPLIER with the necessary departmental coordination documents/methods and process descriptions required for fulfillment of the contract in their valid form or will ensure that these can be viewed at the client's premises.

For test bench scopes, the SUPPLIER must prove certification to the CUSTOMER in accordance with ISO 17025.

5.3 Software

If the services requested in the specifications include complete or partial scopes for the development of vehicle-specific software, i.e. software that has an impact on the vehicle and its functions, the applicable documents in this chapter are binding.

- ☒ The requested services contain complete or partial for the development of vehicle-related software.
- ☐ The requested services do not contain complete or partial for the development of vehicle-related software.

5.4 Special features

If special features in accordance with VDA (German Association of the Automotive Industry) volume "Produktentstehung – Prozess Besondere Merkmale (BM) (Product Emergence - Process Special Features (BM))" are components of the assigned scope or the scope is marked as relevant for special features by the client, the SUPPLIER undertakes to apply, ensure and comply with the guidelines of Group Basic Software Requirements (KGAS), LAH.893.909.C Special Features and Formel Q Capability Software (latest version available in Group Supply) in the fulfillment of the contract.

- ☐ The assignment is relevant for special characteristics.
- ☒ The assignment is not relevant for special characteristics.

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5.5 Intellectual Property (IP)

The SUPPLIER grants the CUSTOMER exclusive, transferable, irrevocable and sub-licensable rights to use the deliverables unlimited in time, territory and content in any type of use, including the right to edit, translate, duplicate, distribute broadcast and make available to the public.

Further IP rights conditions apply to the specification, which can be found in the ‘General Terms and Conditions of Purchase for services in the field of information technology (IT) and/or electronic information and communication (TC)’, which are part of the tender documents.

5.6 Processing of personal data

If the SUPPLIER processes personal data for, together with or originating from CARIAD SE, a separate agreement under data protection law must be concluded in accordance with the European General Data Protection Regulation (GDPR). This determines whether processing, joint control or separate control exists.

The relationship between CARIAD SE and the SUPPLIER was audited by the CUSTOMER and corresponds to a:

- ☒ **COMISSIONED DATA PROCESSING** (CARIAD SE as the purchaser)
- ☐ **JOINT RESPONSIBILITY**
- ☐ **SEPARATE RESPONSIBILITY**
- ☐ **IS NOT REQUIRED**

In the event of processing, it is essential to conclude what is known as a processing agreement (AVV) in accordance with Article 28 of the GDPR, in which the subject-matter and duration of processing, nature and purpose of processing, the type of personal data and categories of data subjects and the obligations and rights of the controller must be determined. The contract template for this will be made available by the client.

If the SUPPLIER processes personal data, which have a higher protection requirement, the SUPPLIER must upon request from the CUSTOMER have an evaluation of their technical and organizational measures in accordance with TISAX performed at their own cost. It must be ensured that the “Scope” of the certification corresponds to the specific service and the certification covers the test target “Data” (in processing special categories of personal data, test target “Special Data”).

If the CUSTOMER and SUPPLIER’s joint control over the processing of personal data requires an agreement for joint control (in particular, Joint Control Agreement, “JCA”) in accordance with Article 26 of the GDPR, in which the respective duties of controllers in relation to the rights of the data subjects, are regulated and documented in a transparent manner. The contract template for this will be made available by the client.

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5.6.1 Assessment of the information security of partner companies

Note: Please only mark the fields with a cross if necessary.

Classification of the envisaged approval(s):

- ☒ **PROTOTYPES** (vehicles/design-relevant parts subject to confidentiality according to classification by Development/Design)
- ☐ **COMPONENTS AND ASSEMBLIES** that are subject to confidentiality, installed in series vehicles or not relevant for design.
- ☐ **IMMOBILIZER COMPONENTS** (e.g. development and production facilities for keys, locking sets, engine/motor control module, immobilizer master, electric steering locking mechanisms etc.)
- ☐ **Miscellaneous** (see appendix)

5.6.2 Applicable documents

Applicable documents as well as the documents referenced therein apply in the version valid on the issue date of the specifications. The SUPPLIER will ensure that they work with the valid applicable documents for these specifications.

In particular, the following documents and standards, which are regarded as the basis for contract conclusion, must be considered:

- Volkswagen AG General Terms and Conditions of Purchase for services in the field of information technology (IT) and/or electronic information and communication (TC) (Status: October 2021)
- Cost Breakdown for the execution of the pricing

Source of supply: Applicable documents that are not enclosed with the specifications can be accessed via the Volkswagen Group's B2B SUPPLIERS platform at the Internet address www.vwgroupsupply.com or made available on request.