How Nexus SDV Complements Selected Eclipse SDV Projects - Conceptual Approaches

Daniel Elhs

Business Director SDV

Valtech Mobility

Valtech Mobility & Nexus SDV

Eclipse SDV Architecture Patterns with Nexus

Valtech Mobility, Valtech & Eclipse SDV

Valtech Mobility

Core Topics

- Connected Vehicle,
  Volkswagen Automotive Cloud

- **45.000.000+ connected vehicles**

History

- **2018:** Founded as a Joint Venture
  between Valtech and Audi

- **2020: Transition** of Audi's JV shares to
  the newly established **CARIAD**

- **2025: Buyback** of shares by Valtech;
  now a **100% independent** subsidiary

Facts VM + V

Employees

- Valtech Mobility: 400+

- Valtech 6000+

Locations

- Valtech Mobility: Germany, India, China

- Valtech: global

Eclipse SDV
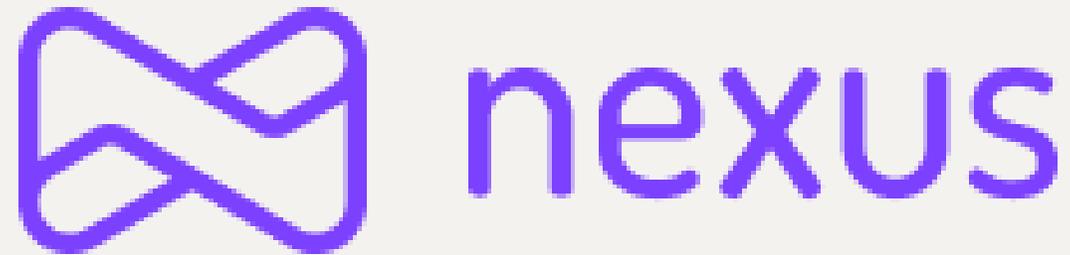
Contributions

- uProtocol

- ThreadX

Events

- Community Days

- Hackathons

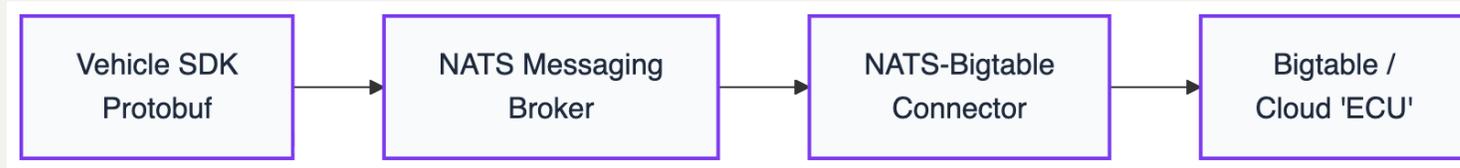# Open Source & AI-Native Connected Vehicle Platform on Google Cloud

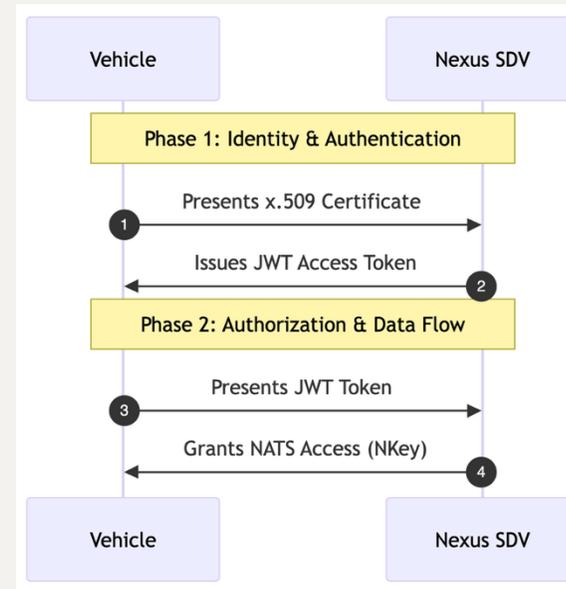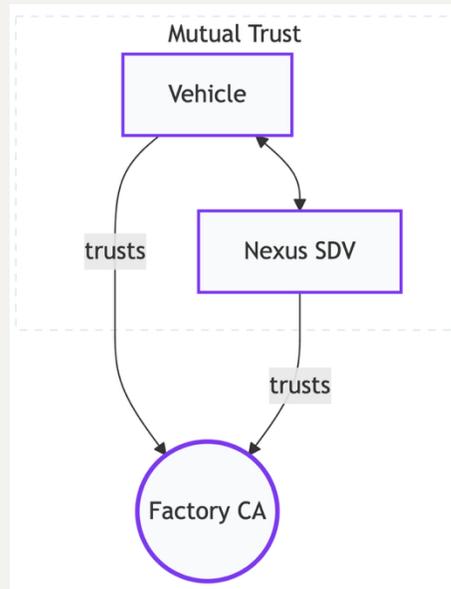# Reference implementation designed for Software Defined Vehicles

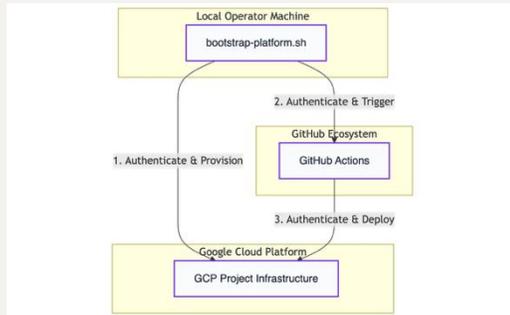https://github.com/GoogleCloudPlatform/nexus-sdv

https://docs.nexus-sdv.io/

Telemetry

https://docs.nexus-sdv.io/core-concepts/telemetry/

Security

https://docs.nexus-sdv.io/core-concepts/security/

Running Software

Name ↑	Status	Type	Pods
data-api	✅ OK	Deployment	1/1
keycloak	✅ OK	Deployment	1/1
nats	✅ OK	Stateful Set	1/1
nats-auth-callout	✅ OK	Deployment	1/1
nats-bigtable-connector	✅ OK	Deployment	1/1
nats-box	✅ OK	Deployment	1/1
registration-server	✅ OK	Deployment	1/1

_key	Speed	SoC	Brake_Pedal	RPM
"VEHICLE002#2026-02-18T15:15:23.495754000Z"	"43.54"	"82.65"	"0.00"	"2568.00"
"VEHICLE002#2026-02-18T15:15:21.485728000Z"	"40.79"	"82.70"	"0.00"	"2412.00"
"VEHICLE002#2026-02-18T15:15:19.471047000Z"	"36.06"	"82.75"	"0.00"	"2218.00"
"VEHICLE002#2026-02-18T15:15:17.430814000Z"	"32.86"	"82.80"	"73.00"	"2072.00"
"VEHICLE002#2026-02-18T15:15:15.423890000Z"	"42.86"	"82.85"	"0.00"	"2496.00"
"VEHICLE002#2026-02-18T15:15:13.415745000Z"	"39.55"	"82.90"	"60.00"	"2382.00"
"VEHICLE002#2026-02-18T15:15:11.406563000Z"	"49.55"	"82.95"	"0.00"	"2807.00"

IaC

```
▼ 📁 terraform
    📄 .tflint.hcl
    📄 README.md
    📄 bigtable.tf
    📄 dns.tf
    📄 external-dns.tf
    📄 gke.tf
    📄 iam.tf
    📄 main.tf
    📄 network.tf
    📄 pki.tf
    📄 registry.tf
    📄 secrets.tf
    📄 sql.tf
    📄 variables.tf
    📄 workload-federation.tf
```

Example Code

```
▼ 📁 sample-clients
    ▶ 📁 python
    ▶ 📁 vehicle-client
    📄 README.md
    📄 generate-factory-cert-gcp.sh
    📄 generate-factory-cert.sh
▼ 📁 sample-services
    ▶ 📁 data-api-sampler
    📄 README.md
```

https://docs.nexus-sdv.io/

1 Vehicle SDK

3 Nexus SDV Cloud Platform

Vehicle

android

SDV Vehicle Platforms (AAOS or others)

Nexus In-Vehicle SDK

- Telemetry Collector
- Security Agent
- Cloud Agent
- Services, Signals, etc.

Python Client (Security, NATS, VHAL)

2

High-Volume Telemetry Data

Google Cloud Platform

Project

VPC Network

GKE Cluster

GKE (NATS-Bigtable Connector)

Workloads (Keycloak, NATS, etc.)

Bigtable

Shared Views

Data Analytics & AI

4

Gemini

BigQuery

Vertex AI

Looker

Users

Security — Online Root CA — IAM — Workload Identity Pool

External (OEM) — Factory Root CA — Trust

PKI / Factory Process

GitHub
Terraform

GH Actions Workflow

Deployment

nexus | Valtech Mobility | Google Cloud

Eclipse SDV
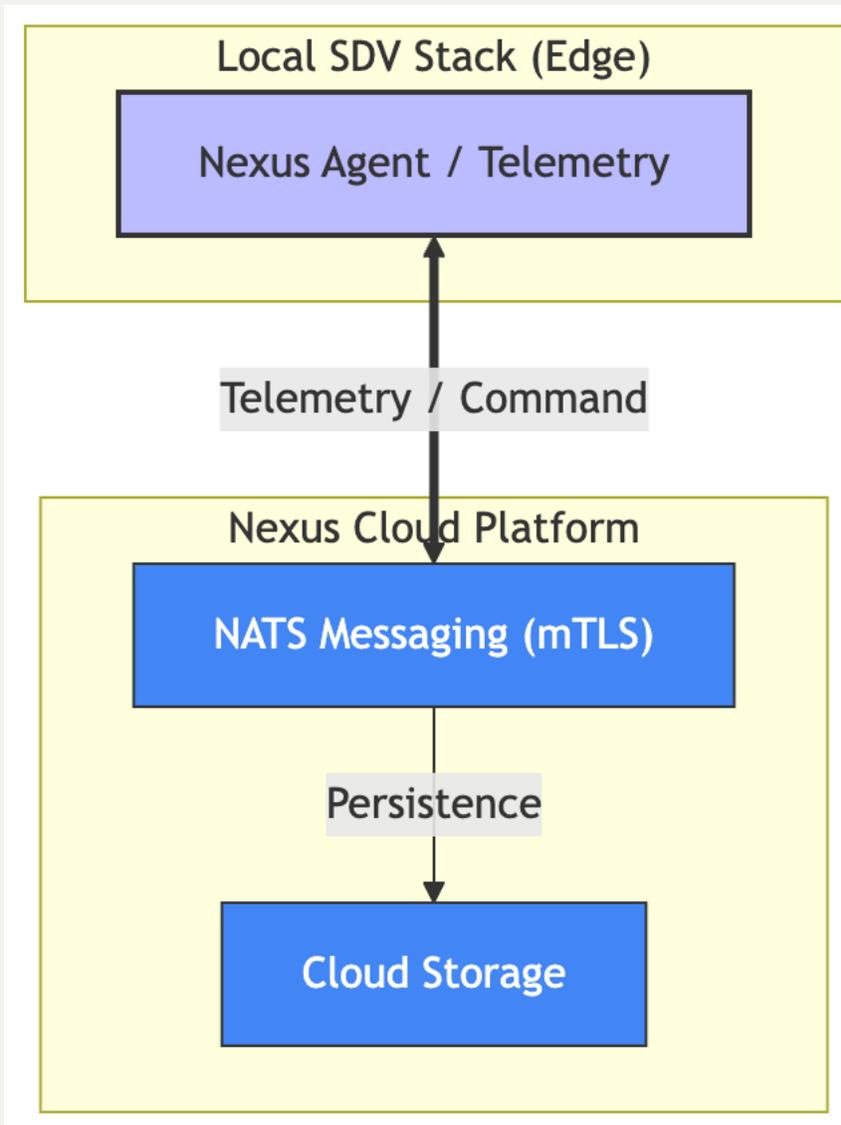# Architecture Patterns
with Nexus

Mutual Contribution Patterns

Support of Eclipse SDV and other open-source standards **within Nexus SDV**

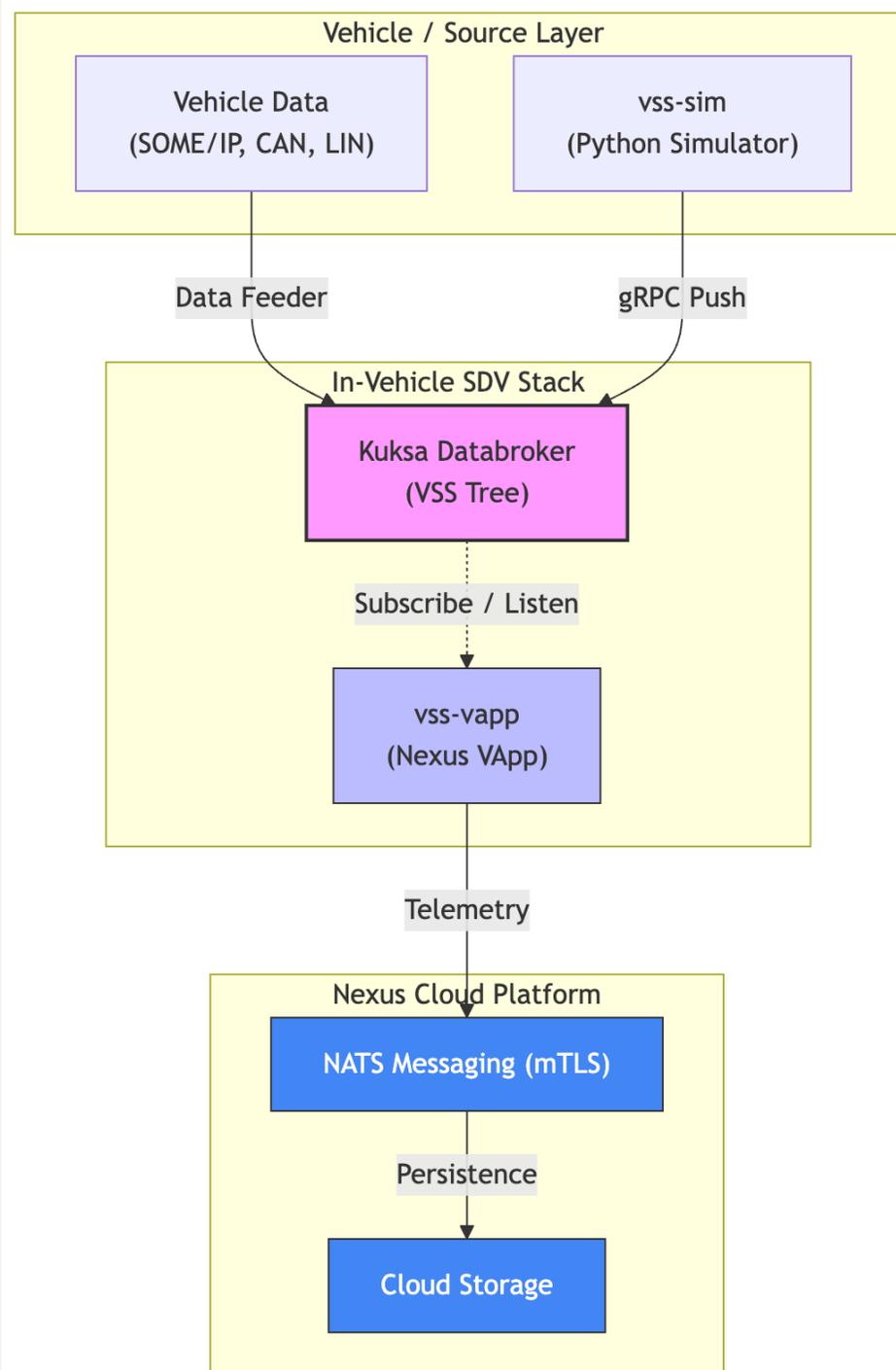Nexus SDV team contributes to **Eclipse SDV Projects**

Nexus simplified
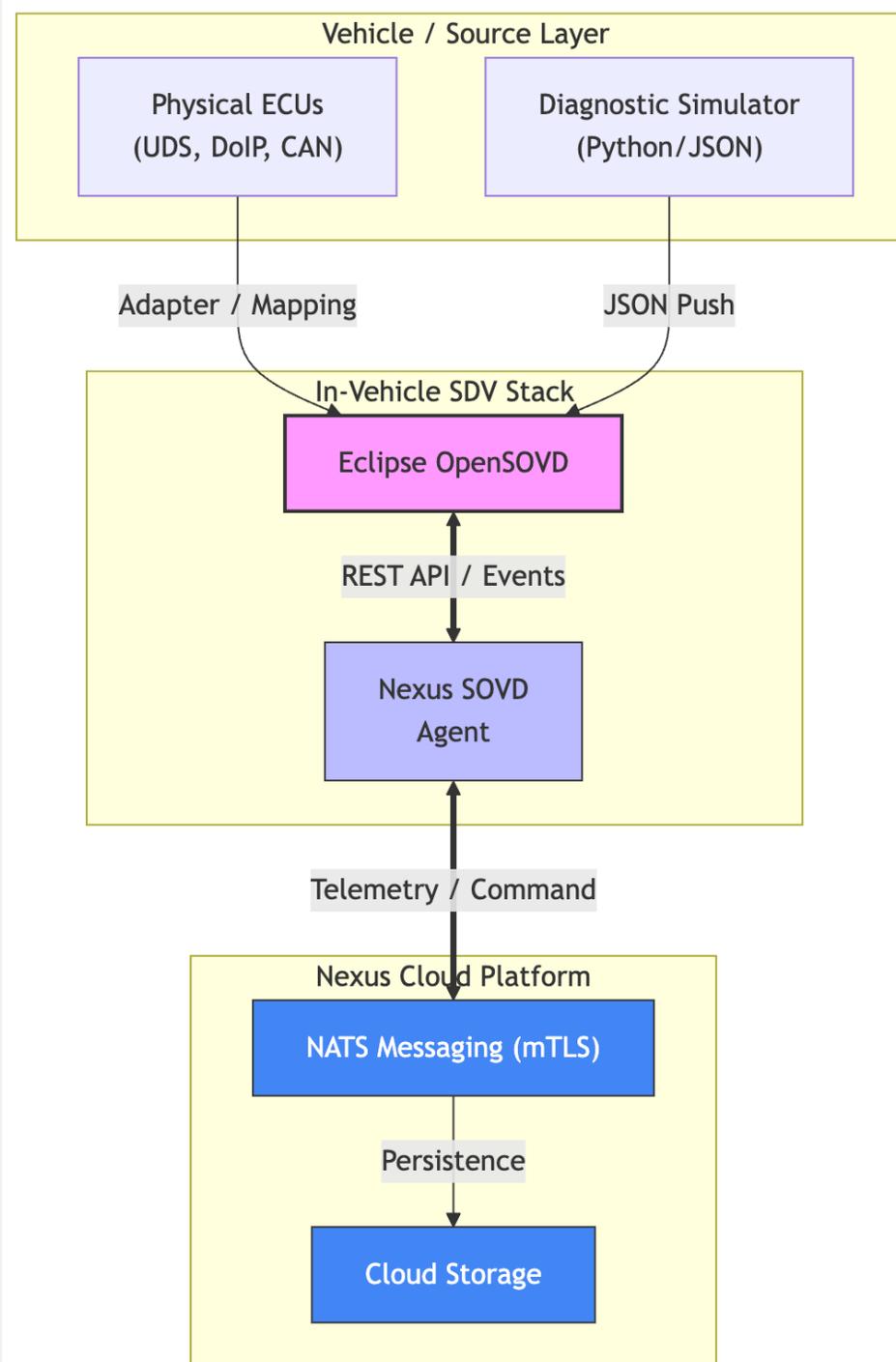
leveraged for coming diagrams!

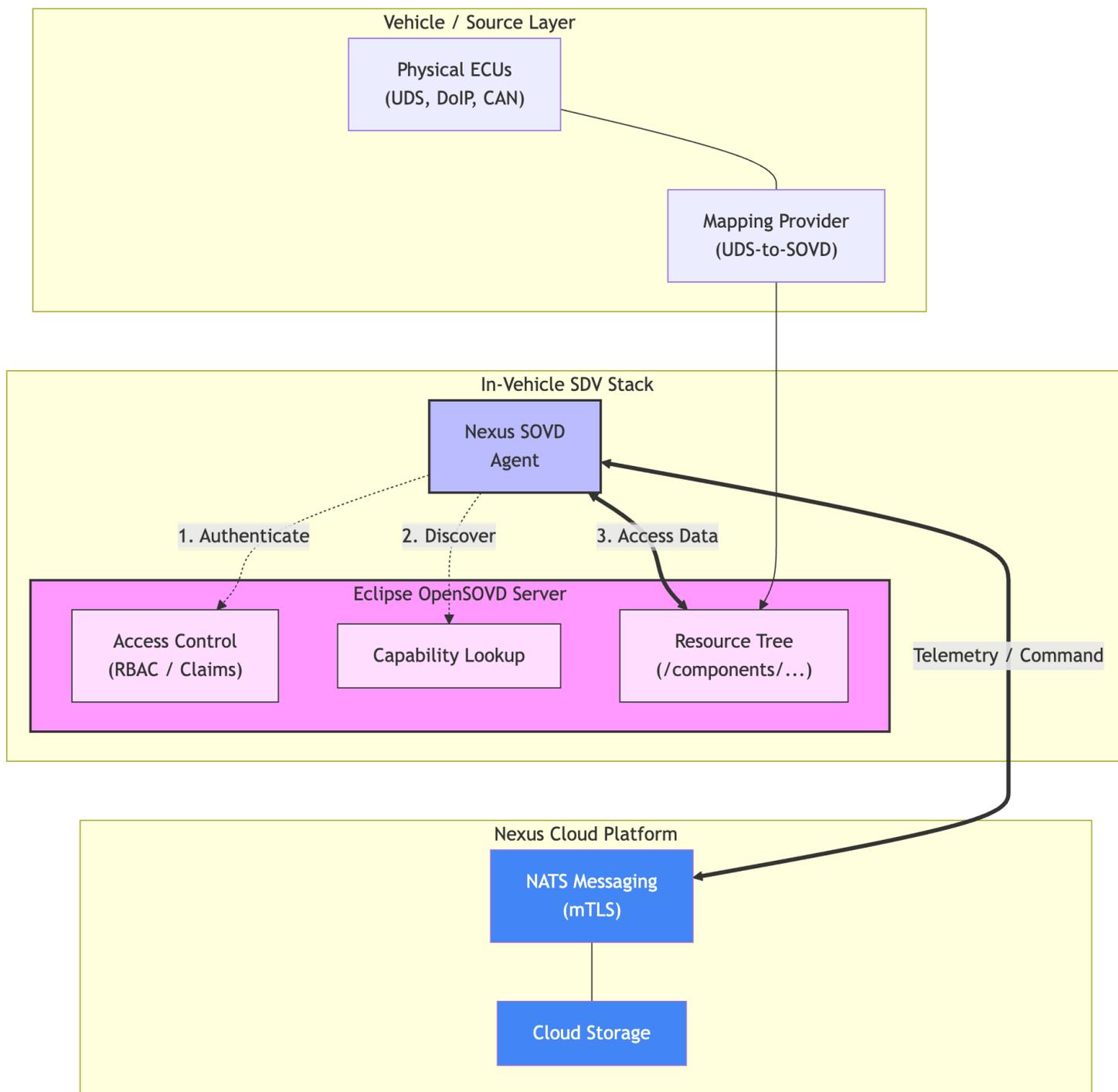Kuksa
COVESA.VSS
digital.auto
AutoWRX

OpenSOVD
Simple View

Vehicle / Source Layer

Physical ECUs
(UDS, DoIP, CAN)

Diagnostic Simulator
(Python/JSON)

Adapter / Mapping

JSON Push

In-Vehicle SDV Stack

Eclipse OpenSOVD

REST API / Events

Nexus SOVD
Agent

Telemetry / Command

Nexus Cloud Platform

NATS Messaging (mTLS)

Persistence

Cloud Storage

OpenSOVD
Detail View

Vehicle / Source Layer

Physical ECUs
(UDS, DoIP, CAN)

Mapping Provider
(UDS-to-SOVD)

In-Vehicle SDV Stack

Nexus SOVD
Agent

1. Authenticate

2. Discover

3. Access Data

Eclipse OpenSOVD Server

Access Control
(RBAC / Claims)

Capability Lookup

Resource Tree
(/components/...)

Telemetry / Command

Nexus Cloud Platform

NATS Messaging
(mTLS)

Cloud Storage
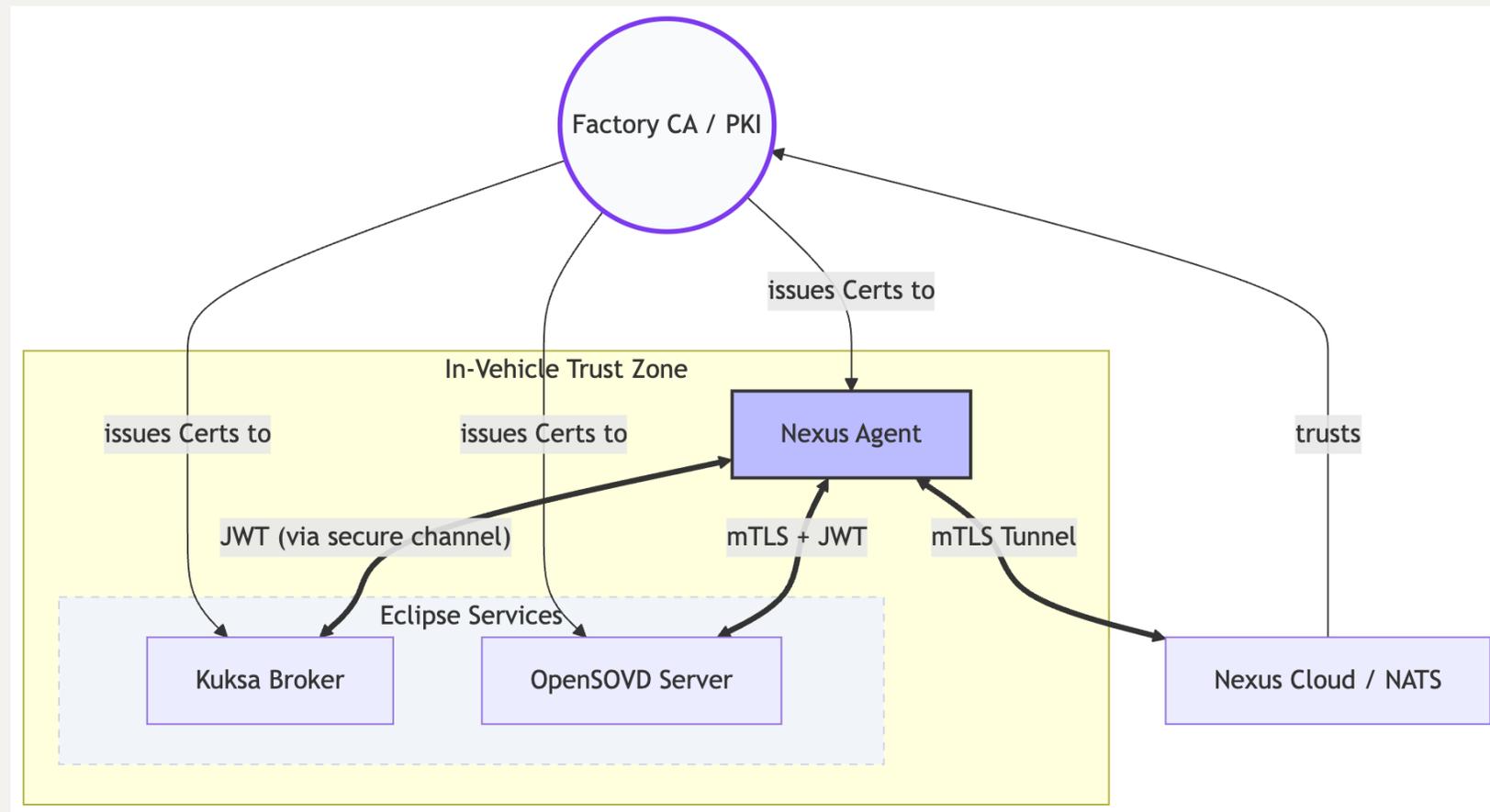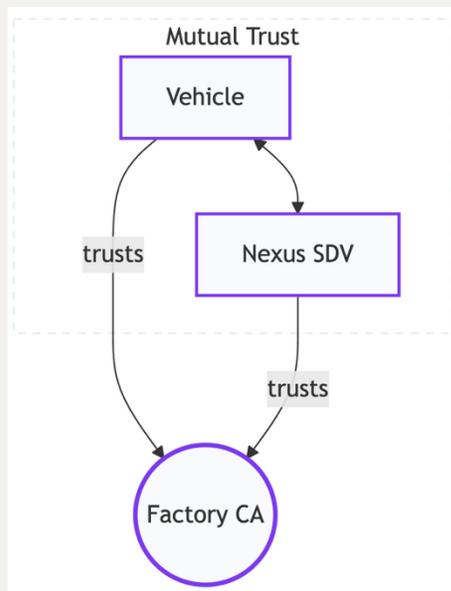
OpenSOVD & Kuksa Secure

Kuksa
(OpenSOVD)

Secure

```
{
  "alg": "RS256",
  "typ": "JWT",
  "kid": "nexus-keycloak-key-id-01"
}
```
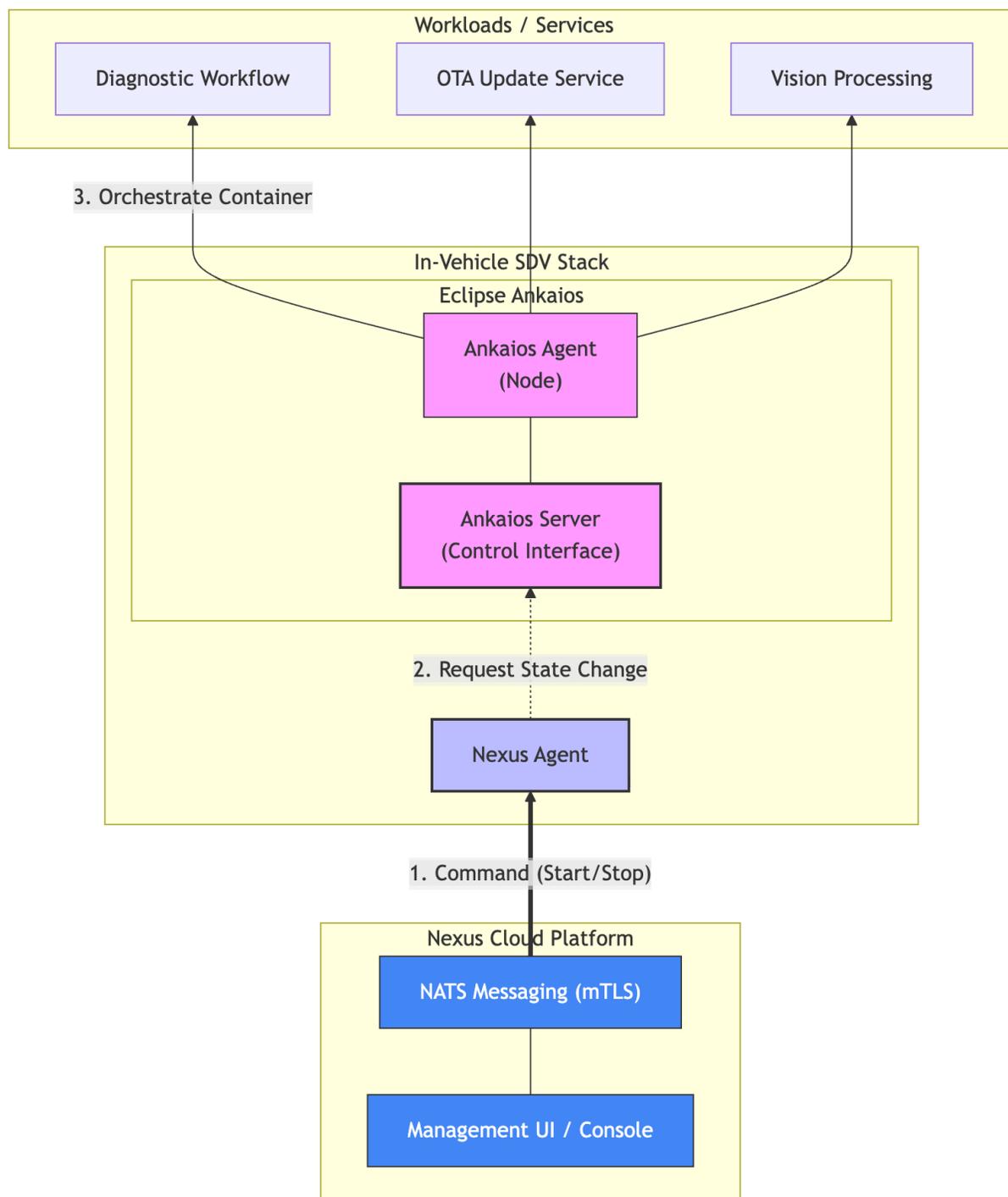
Kuksa (OpenSOVD) trusts the Key-ID:
- OIDC Discovery via kid
- Keykloak Cert signed by Factory CA
- Adopt scopes for OpenSOVD

```
{
  "iss": "https://keycloak.nexus-sdv.io/auth/realms/nexus",
  "sub": "nexus-agent-vehicle-42",
  "aud": "kuksa-databroker",
  "iat": 1718880000,
  "exp": 1718883600,
  "scope": "openid profile",
  "nexus_metadata": {
    "vehicle_id": "VIN123456789"
  },
  "kuksa": {
    "permissions": [
      {
        "path": "Vehicle.Speed",
        "action": "read"
      },
      {
        "path": "Vehicle.Cabin.ClimateControl.*",
        "action": "write"
      }
    ]
  }
}
```
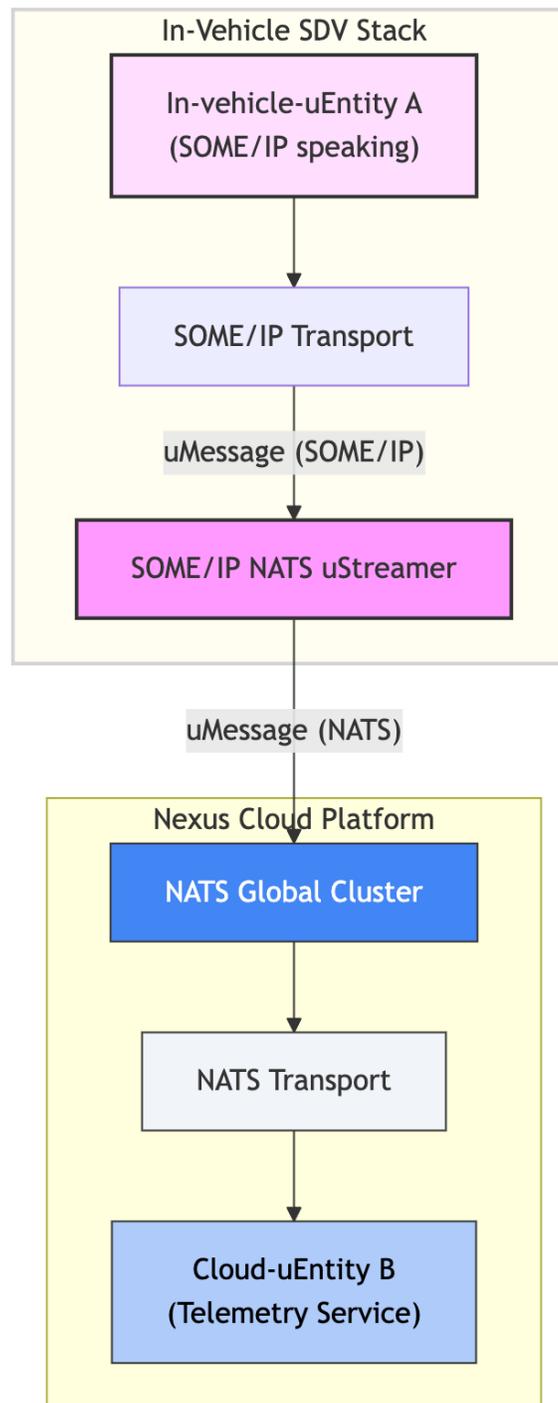
Ankaios

Workloads / Services

Diagnostic Workflow | OTA Update Service | Vision Processing

3. Orchestrate Container

In-Vehicle SDV Stack

Eclipse Ankaios

Ankaios Agent (Node)

Ankaios Server (Control Interface)

2. Request State Change

Nexus Agent

1. Command (Start/Stop)

Nexus Cloud Platform

NATS Messaging (mTLS)

Management UI / Console

uProtocol

Needed Contributions:
- NATS L1 Transport
- NATS uStreamer

In-Vehicle SDV Stack

In-vehicle-uEntity A
(SOME/IP speaking)

SOME/IP Transport

uMessage (SOME/IP)

SOME/IP NATS uStreamer

uMessage (NATS)

Nexus Cloud Platform

NATS Global Cluster

NATS Transport

Cloud-uEntity B
(Telemetry Service)

`//vin_xyz/hvac/1/status`

`Service: 0x1234,Method: 0x8001`

`uP.v1.vin_xyz.hvac.1.status`

`//vin_xyz/hvac/1/status`

S-CORE?

Telematic and Connectivity
Telematics & Connectivity
Applications / Functions
TCU Framework
HW assistance
Mix

...cy | Communication | Configuration | I/O | Time

Cloud
Cloud applications & computing is NOT
IN FOCUS of S-Core.
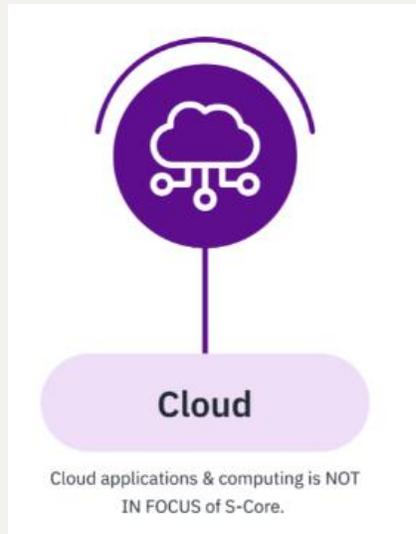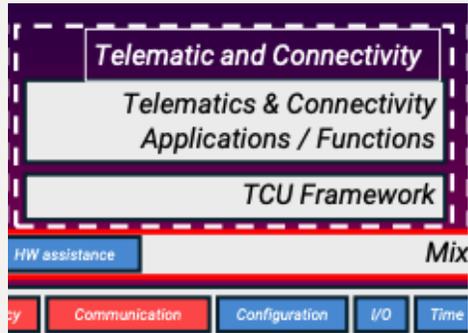
Closing the Cloud Gap
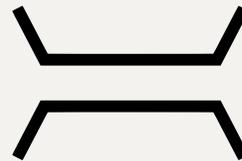
S-CORE-Nexus
TCU-Framework?

Nexus In-Vehicle SDK

Nexus In-Vehicle SDK

Telemetry Collector

Security Agent

Cloud Agent

Services, Signals, etc.

python
- apps
  - simple_sim
  - vhal
  - vss
- nexus_sdk
  - __init__.py
  - car.py
  - telemetry.py
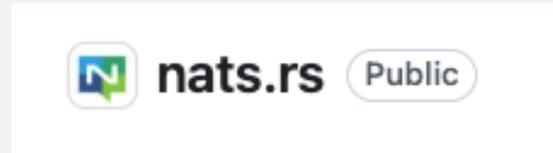
+

nats.rs Public

+

 TSF
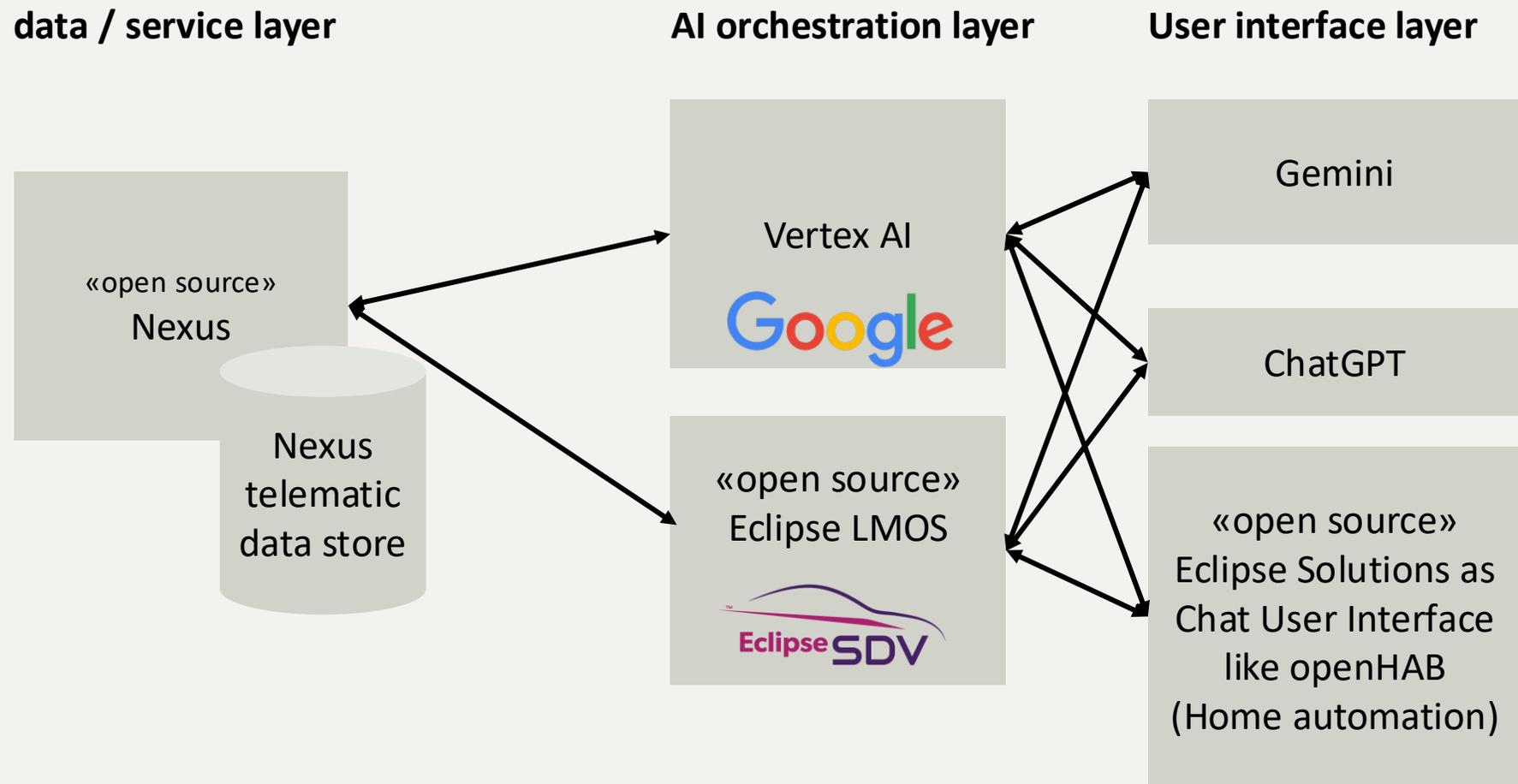
THANK YOU!

Stay in touch:

- Eclipse Slack

- daniel.elhs@valtech-movility.com

- https://www.linkedin.com/in/daniel-elhs-3b96451b/

OpenSOVD
Secure