SOAFEE

Enabling Cloud-Vehicle Workload Orchestration

SOAFEE Collaboration

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2025. 11. 13

Agenda

1. Updates of PICCOLO
2. PICCOLO Journey (2021 ~ 2024)
3. ‘25 Updates
   - Cloud-Vehicle Workload Orchestration
   - Priority-Based Resource Orchestration
   - Demonstration Video Clip
4. Our Next Target Goal with SOAFEE

Updates of PICCOLO

Mixed Critical Orchestrator with SOAFEE

1 Eclipse-pullpiri (Container Orchestrator) Opensource

- A lightweight **Rust-based** orchestrator for in-vehicle workloads, managing deployment, lifecycle, and resources with minimal overhead

2 TIMPANI (Time Deterministic Schedul Opensource

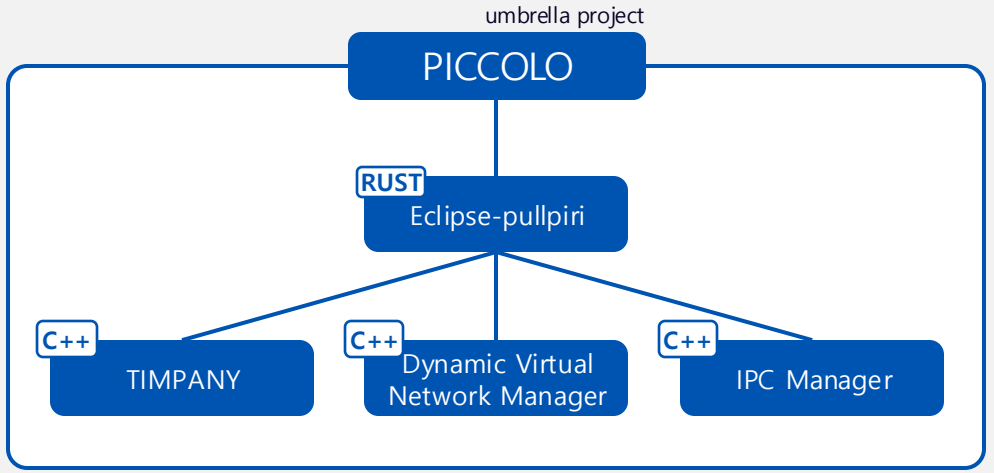
- A container-level scheduler that guarantees **deterministic execution**
- Ensuring **time-critical performance for consecutive safety** workloads

3 Dynamic Virtual Network Manager

- An eBPF-based **N/W manager supporting automotive protocols**
- TSN, Firewall, enabling **dynamic routing** and high-speed, reliable communication
- core capability that enables **Cloud Connected** functionality

4 IPC Manager

- Inter-process shared memory, supporting **communication with safety and security**
- Safety design to shared memory communication **between critical services(ADAS) and others**
- Addressing memory conflicts, data integrity, and access control issues



PICCOLO Journey: From Vision to Reality

Container Orchestration Based K8S

First Integration

- PICCOLO
- Bluechi
- AutoSD

Eclipse-Pullpiri

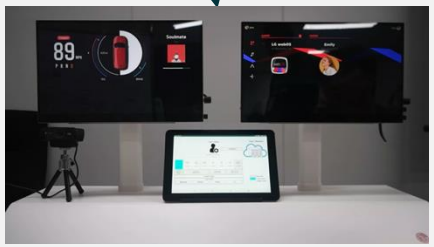
Cloud Env.

- PICCOLO
- Bluechi
- AutoSD
- AWS

Cloud Env.

- PICCOLO
- Bluechi
- EWAOL
- Corellium

2022 2023 2024 2025 2026



Container Technologies for Vehicle

Orchestration USE-CASE for Vehicle

- PICCOLO
- Bluechi
- EWAOL

SOAFEE Ref.

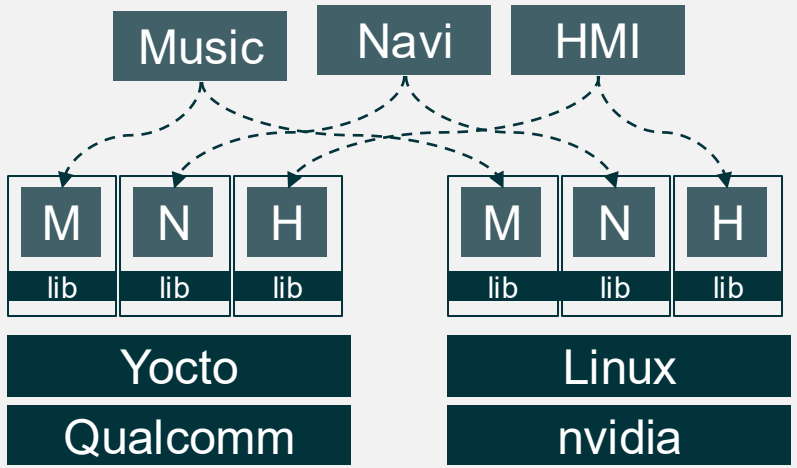
Cloud / Vehicle Orchestration

In 2021 : Container Technologies with Vehicle

1. Reusing Applications Across Multi-Vendor Platforms via CI/CD

Qualcomm

nvidia



- Reducing Development Time
- Reusability
- Reducing Maintenance Costs

2022 CES : Container Technologies with Vehicle

2. IVI Use Case Demonstration

- FoD Functionality
- Observability
- App Marketplace Business

In 2022 : Container Orchestration based K8S

1. Scale-Out Demo of Face Detection Algorithm

2. Cloud Clustering and Offloading

Good

- Efficient Resource Utilization
- Scalable Cloud Computing
- Management for Mixed Critical Services

Bad

- Transitioning from situation awareness to executing actions like Scale-Out or Offloading had been slow.
- **Need to change the Orchestrator**

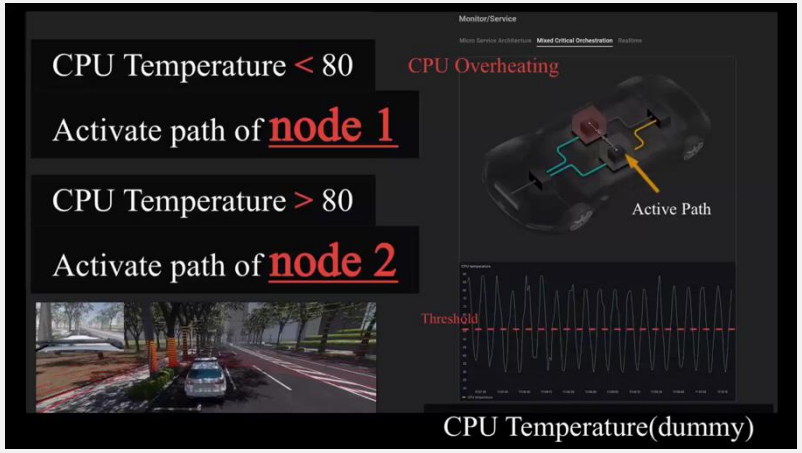
2024 CES : Orchestration USE-CASE for Vehicle

1. Context-Aware Lifecycle Management for Driving Scenarios

Scenario

- When Parking
- Enable updating the algorithm

2. Pre-Fail-Operation, Prior to the real issue arising



- Proactive Issue Handling Through Declarative Development
- Redundancy Through Multi-Instance Management
- MSA Structuring and Orchestration Applied to Autoware

2025 CES : Vehicle Service Orchestrator without K8S (Eclipse-Pullpiri)

1. Smart BMS Workload Orchestration (HPC – Zonal ECU Orchestration)

Scenario

- When Needed, Performance In HPC
- When Parked, Efficiency In Zonal ECU

2. Declarative Service Relationship Definition

Declarative Definition of Service Dependencies,
Condition-Action Driven Service Relationship

- The Beginning of a True Vehicle-Orchestrator
- Declarative Workload Orchestration
- UX Expansion via MSA-Based Service Orchestration

In 2025 : Cloud-Vehicle Orchestration

Open Source

LG PICCOLO

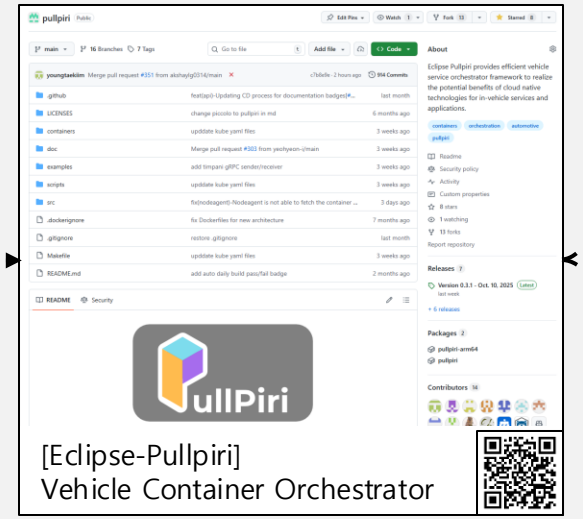
Eclipse-Pullpiri

CPU Scheduler (TIMPANI)

...

Network Manager

Layer for Eco Partners



[Eclipse-Pullpiri]
Vehicle Container Orchestrator

aws Cloud

Workloads

Eclipse-Pullpiri

Red Hat AutoSD9

AWS EC2 & Graviton

[Pullpiri on AWS]
Pullpiri / AutoSD AMI Based
*Currently available for free

Edge Device (Vehicle)

Workloads

Eclipse-Pullpiri

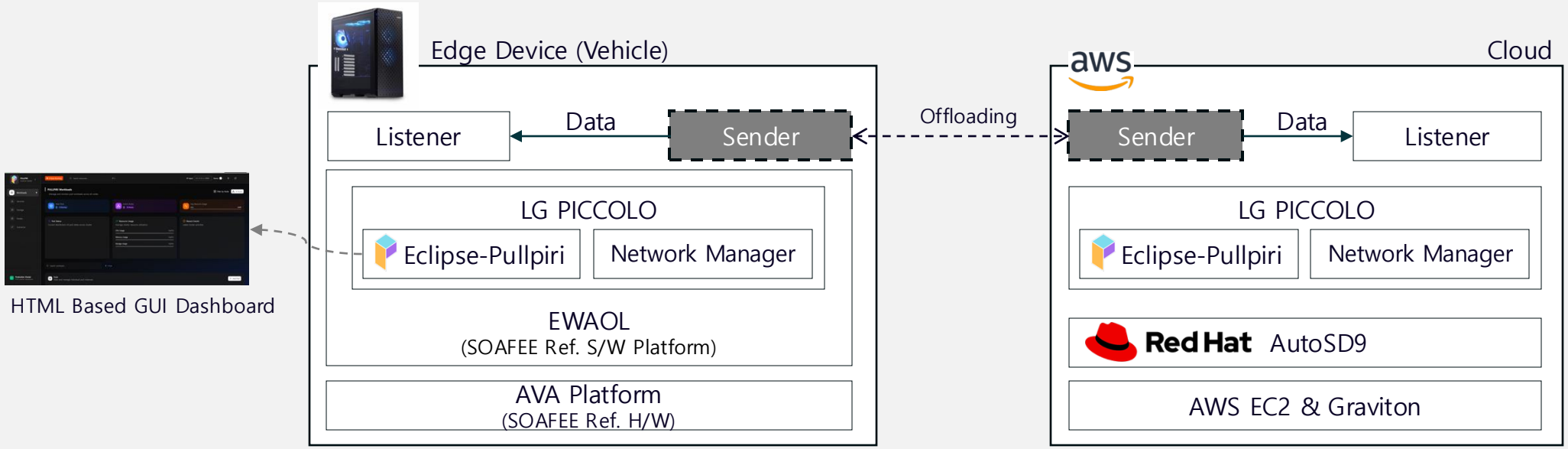
EWAOL
(SOAFEE Ref. S/W Platform)

AVA Platform
(SOAFEE Ref. H/W)

In 2025 : Cloud-Vehicle Orchestration

No Protocol Conversion, No Changes to Application Source Code

Maintains communication with existing in-vehicle services even after migrating to the cloud.

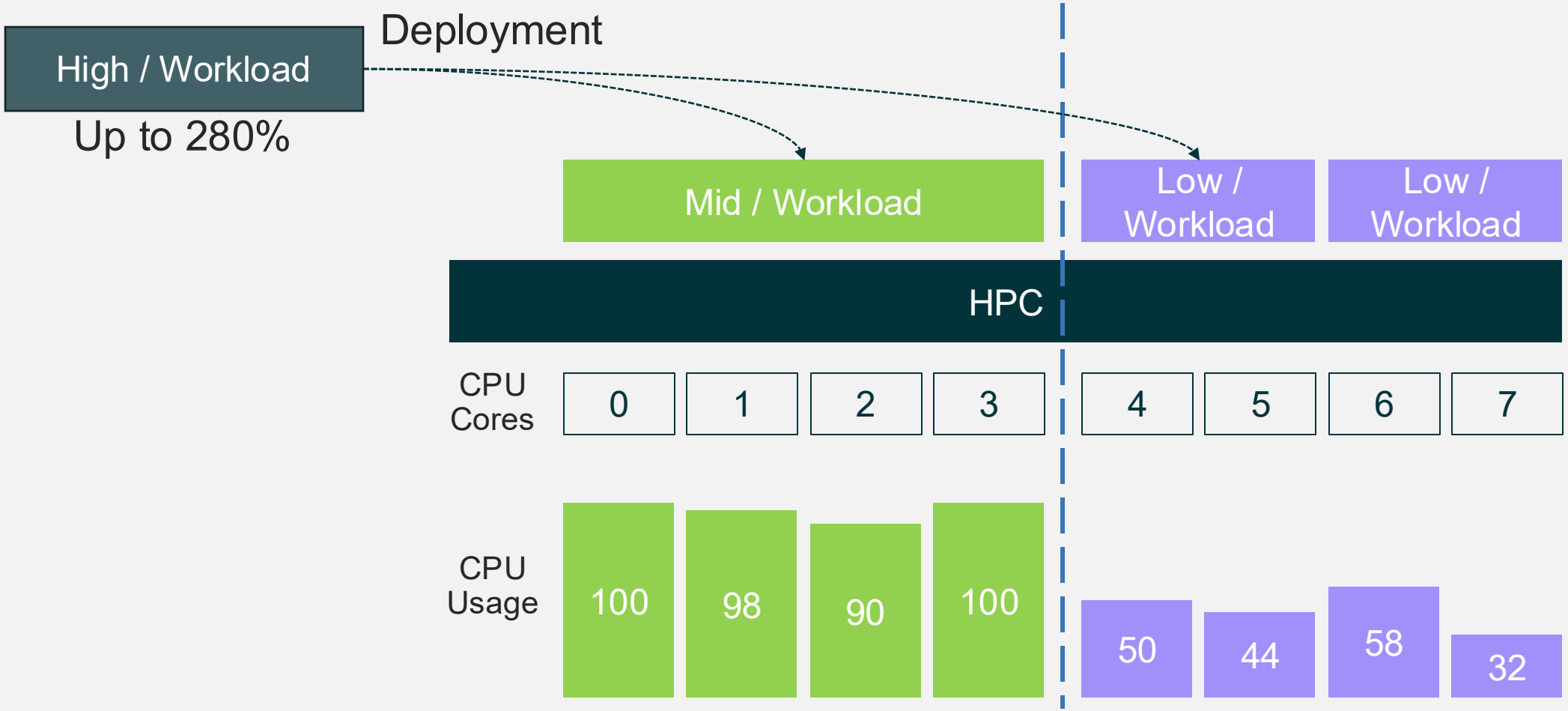


Enabled location-agnostic deployment for in-vehicle services.

"No need to separately develop, integrate, and manage cloud services anymore."

In 2025 : Priority-Based Resource Orchestration

When integrating, when priorities change, or when aiming for efficient operations.



In 2025 : PICCOLO Demonstration

Usage of Cores

Green : Safety

Purple : Non-Safety

Location of Apps

System / Cloud

Cloud will activate

In 2025 : PICCOLO Demonstration (Resource / Cloud Orchestration)

- Computing Resource Management for Critical Functions
- Scalable Cloud Computing When Needed
- Vehicle-Cloud Clustering Environment for location-agnostic

Our Next Target Goal – Making Playground

CORELLIUM Cloud

- Workloads
- Eclipse-Pullpiri
- EWAOL (SOAFEE Ref. S/W Platform)
- AWS EC2 & Graviton

aws Cloud

- Workloads
- Eclipse-Pullpiri
- Red Hat AutoSD9
- AWS EC2 & Graviton

This is on AWS Marketplace

Already Have Done

Edge Device (Vehicle)

- Workloads
- Eclipse-Pullpiri
- EWAOL (SOAFEE Ref. S/W Platform)
- AVA Platform (SOAFEE Ref. H/W)

Edge Device (Vehicle)

- Workloads
- Eclipse-Pullpiri
- LG SDV Platform
- LG HPC

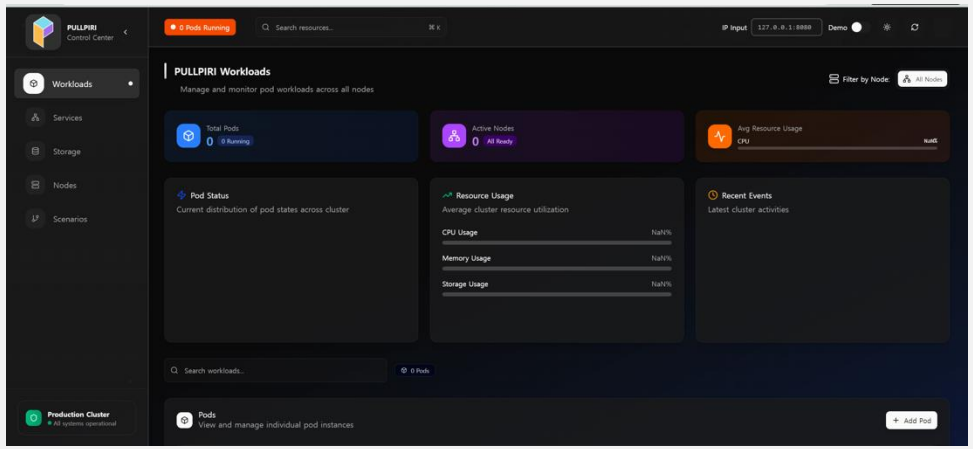
Want to do

Playground For Developers

This is absolutely necessary!

What functions do we need to provide?

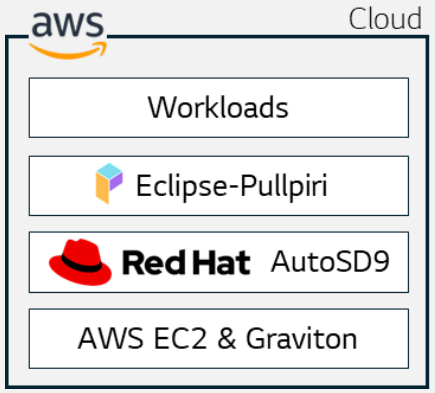
1. Workload Monitoring and Runtime Configuration



Developing

2. Test & Validation Env.

Developing



3. Declarative Scenario & Deployment Tooling

Will Develop

4. And Partners like you

SOAFEE

Thank You