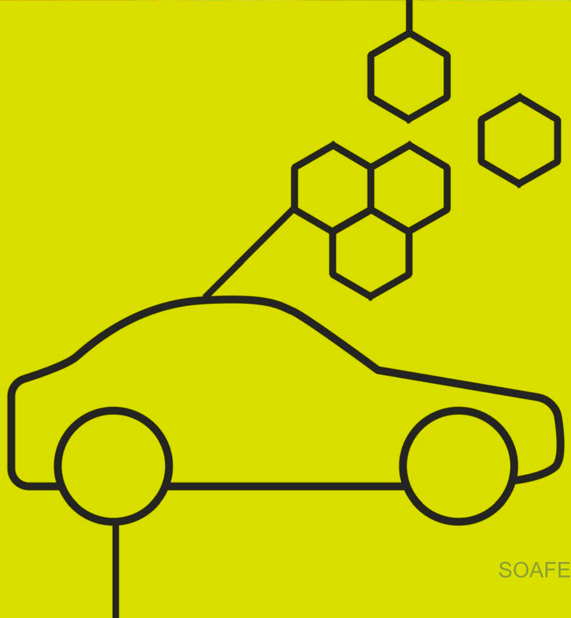
LG PICCOLO on EWAOL

and Future Collaboration Opportunities within SOAFEE



Chul-Hee Lee

LG Electronics

2025-05-15

LG PICCOLO

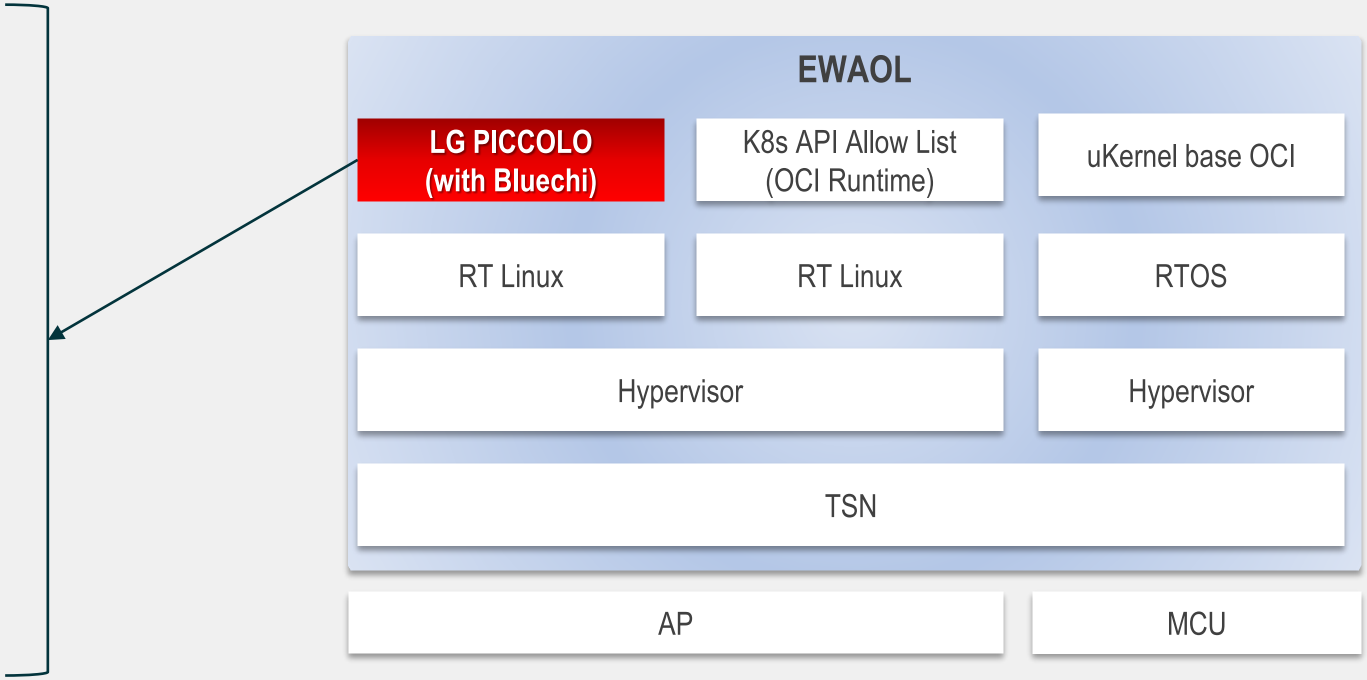
State Management

Resource Management

System Monitoring

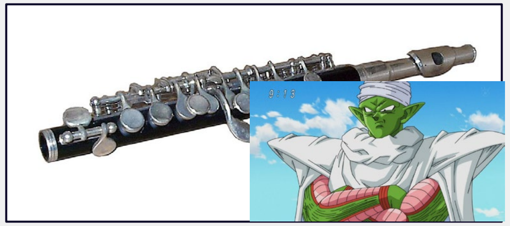
Deploy Management

Lifecycle Management



LG PICCOLO

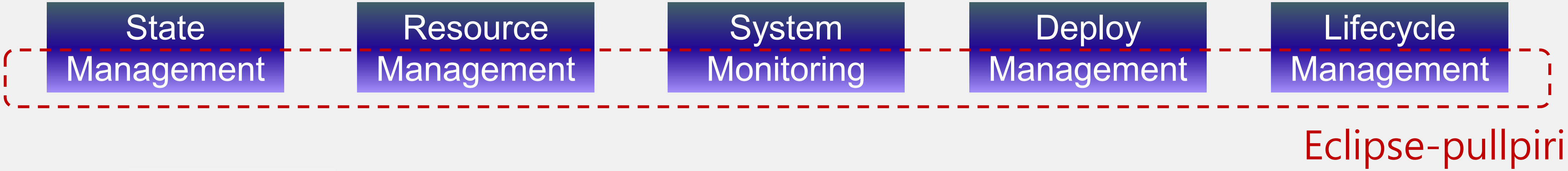
Eclipse-pullpiri



PICCOLO

pullpiri(□ □ □)

Grass Whistle



State Management

Resource Management

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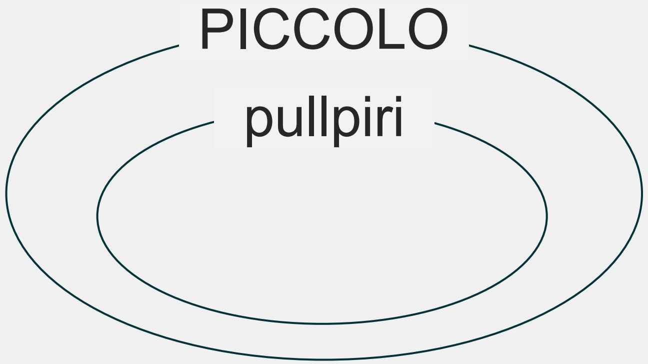
Eclipse-pullpiri

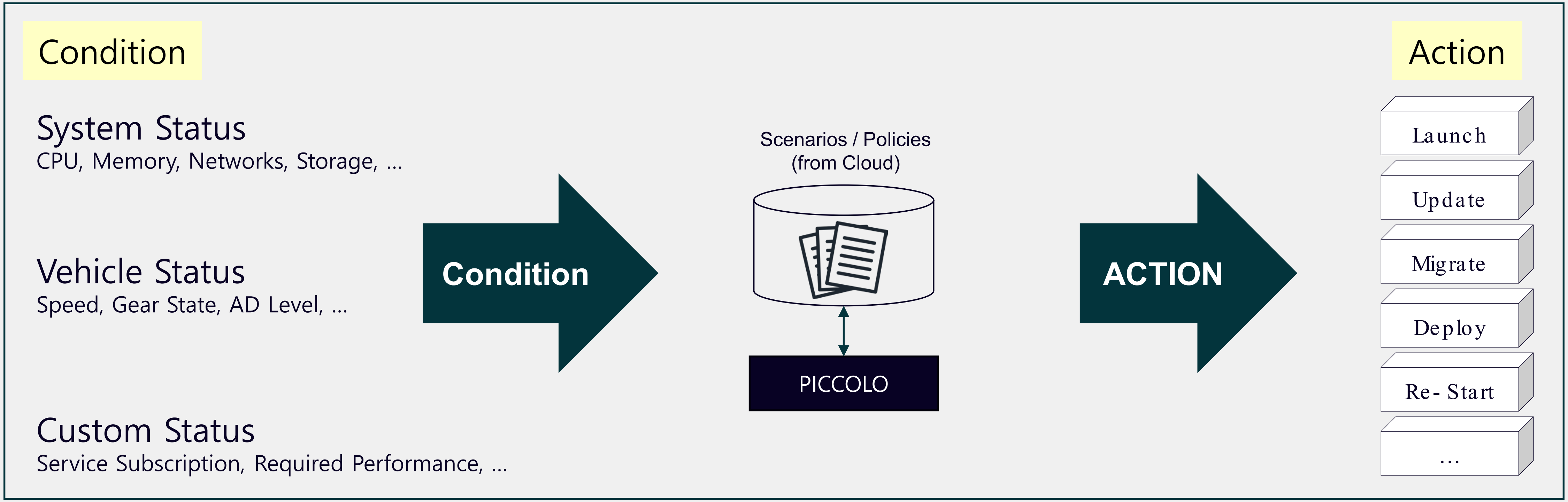


- ➢ One of the key differences is that pullpiri does not include features such as Container Network Interface, Storage management capabilities, or Workload CPU Time Scheduler.

LG PICCOLO

State Management

Manage the necessary actions based on the condition of the system, vehicle, custom status



Condition

System Status
CPU, Memory, Networks, Storage, …

Vehicle Status
Speed, Gear State, AD Level, …

Custom Status
Service Subscription, Required Performance, …

Action

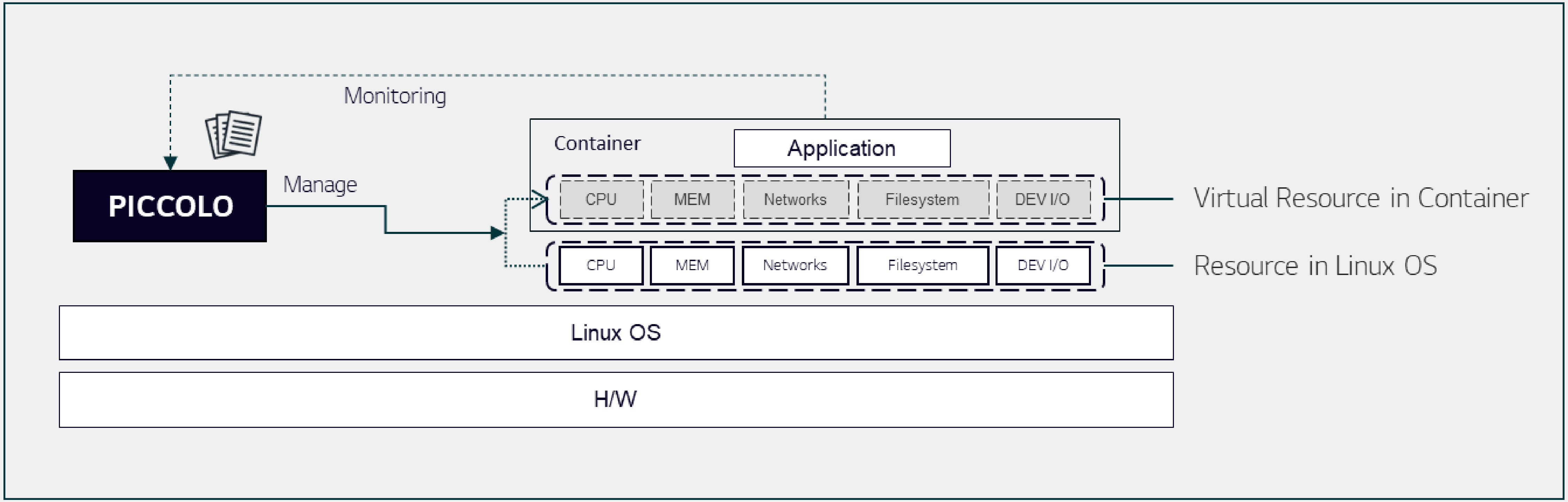
- Launch
- Update
- Migrate
- Deploy
- Re-Start
- …

➢ Reduce software complexity, lower management costs, and enable rapid development and validation

LG PICCOLO

Resource Management

Manage access to the Computing, Network, Storage, and Devices related to the workload

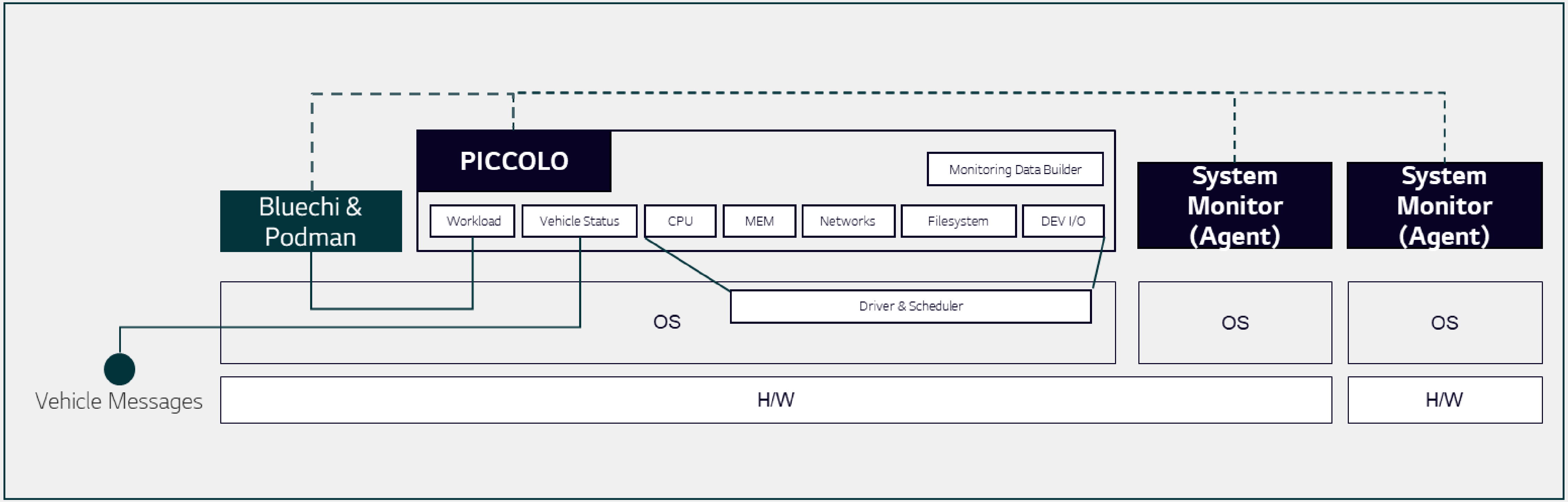


- ➢ Enables stable system operation, reducing the system integration costs

LG PICCOLO

System Monitoring

Monitors vehicle status, workload status, and resources

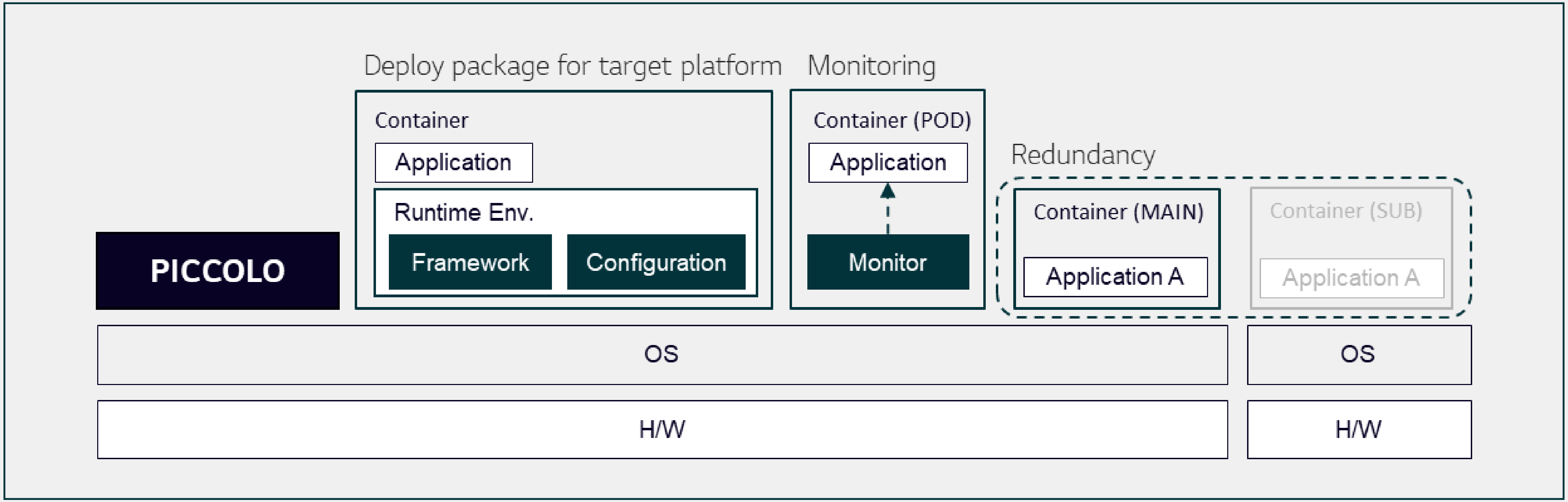


- ➢ Enables stable system operation, Easy management for Vehicle Monitoring

LG PICCOLO

Deploy Management

Manage the deployment timing, location, runtime environment, and struct of the workload

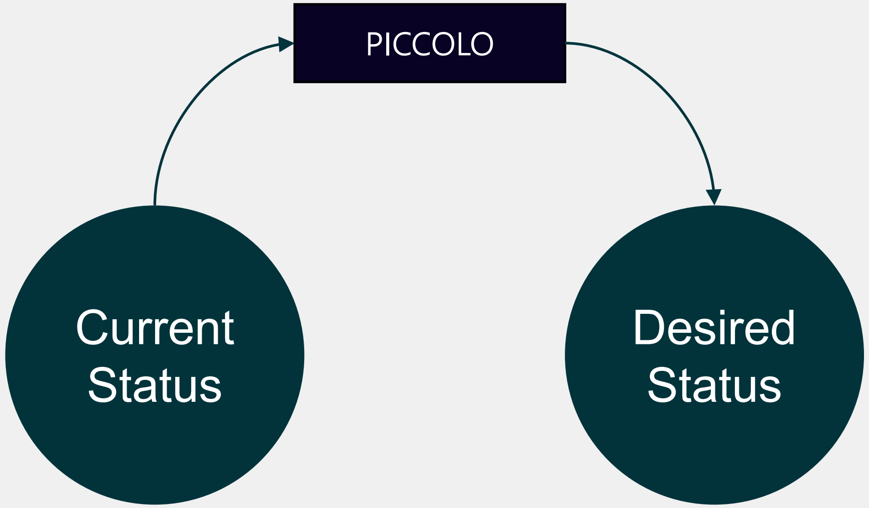


- ➢ Enables to reduce cost for integration and operation workloads

LG PICCOLO

Lifecycle Management

Managing Workload Lifecycle and Deterministic Factors

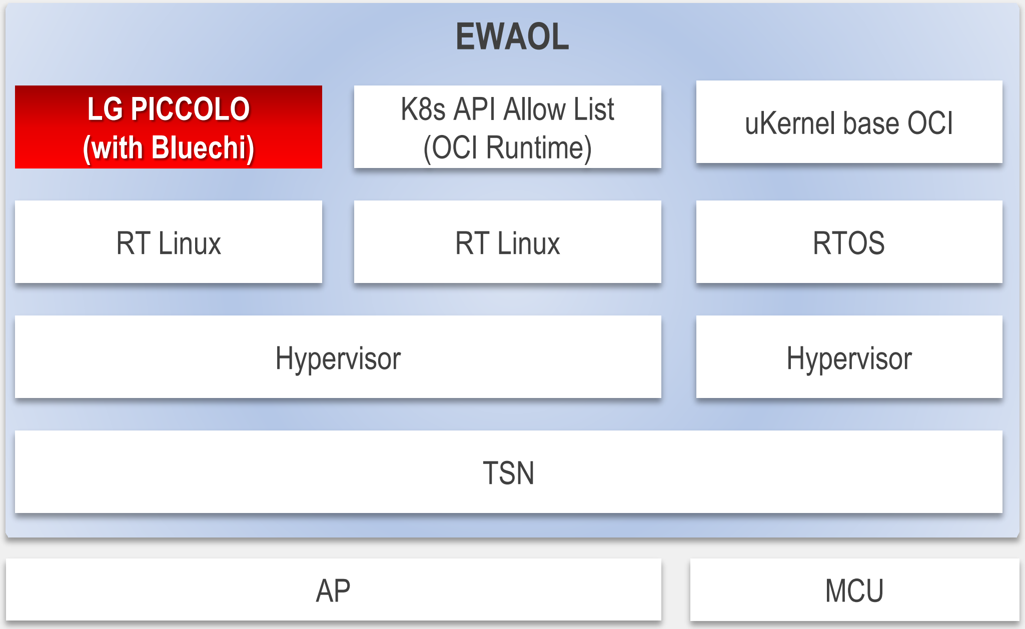


- Liveness of Workload
- Status of Network for workload
- Status of Custom Resources
- Time Triggered Scheduling

Focus on Monitoring

➢ Enables easy and stable software management and operations

LG PICCOLO on EWAOL



EWAOL

LG PICCOLO (with Bluechi)

K8s API Allow List (OCI Runtime)

uKernel base OCI

RT Linux

RT Linux

RTOS

Hypervisor

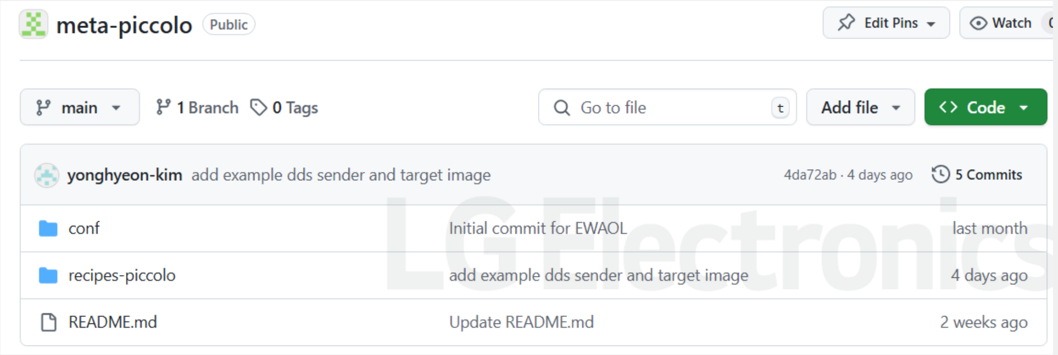
Hypervisor

TSN

AP

MCU

https://github.com/MCO-PICCOLO/meta-piccolo



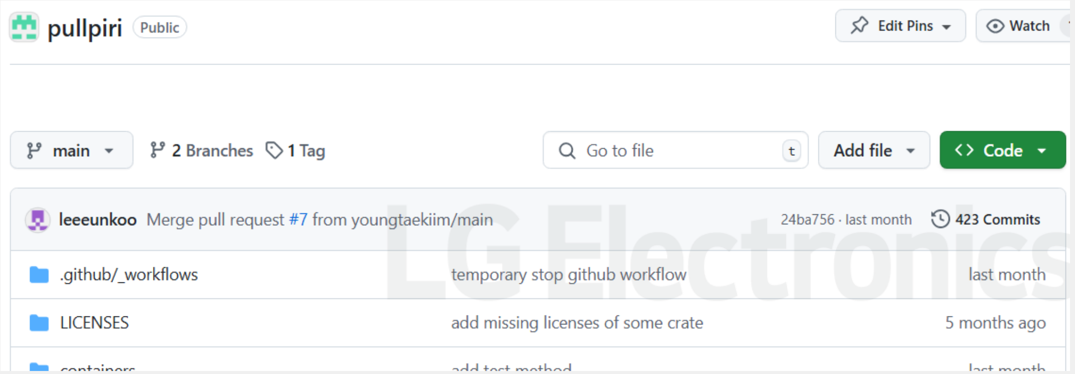
yonghyeon-kim add example dds sender and target image 4da72ab · 4 days ago 5 Commits

conf Initial commit for EWAOL last month

recipes-piccolo add example dds sender and target image 4 days ago

README.md Update README.md 2 weeks ago

https://github.com/eclipse-pullpiri/pullpiri



leeeunkoo Merge pull request #7 from youngtaekiim/main 24ba756 · last month 423 Commits

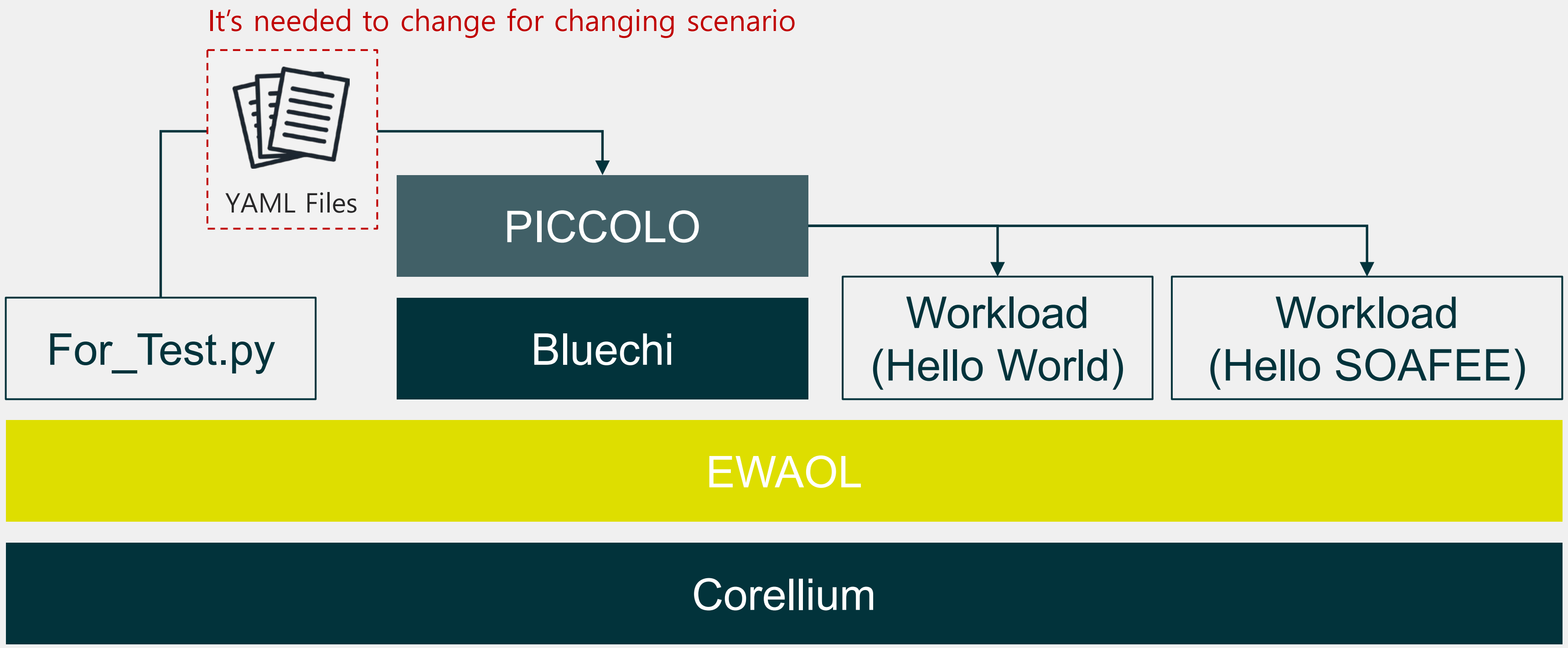
.github/_workflows temporary stop github workflow last month

LICENSES add missing licenses of some crate 5 months ago

containers add test method last month

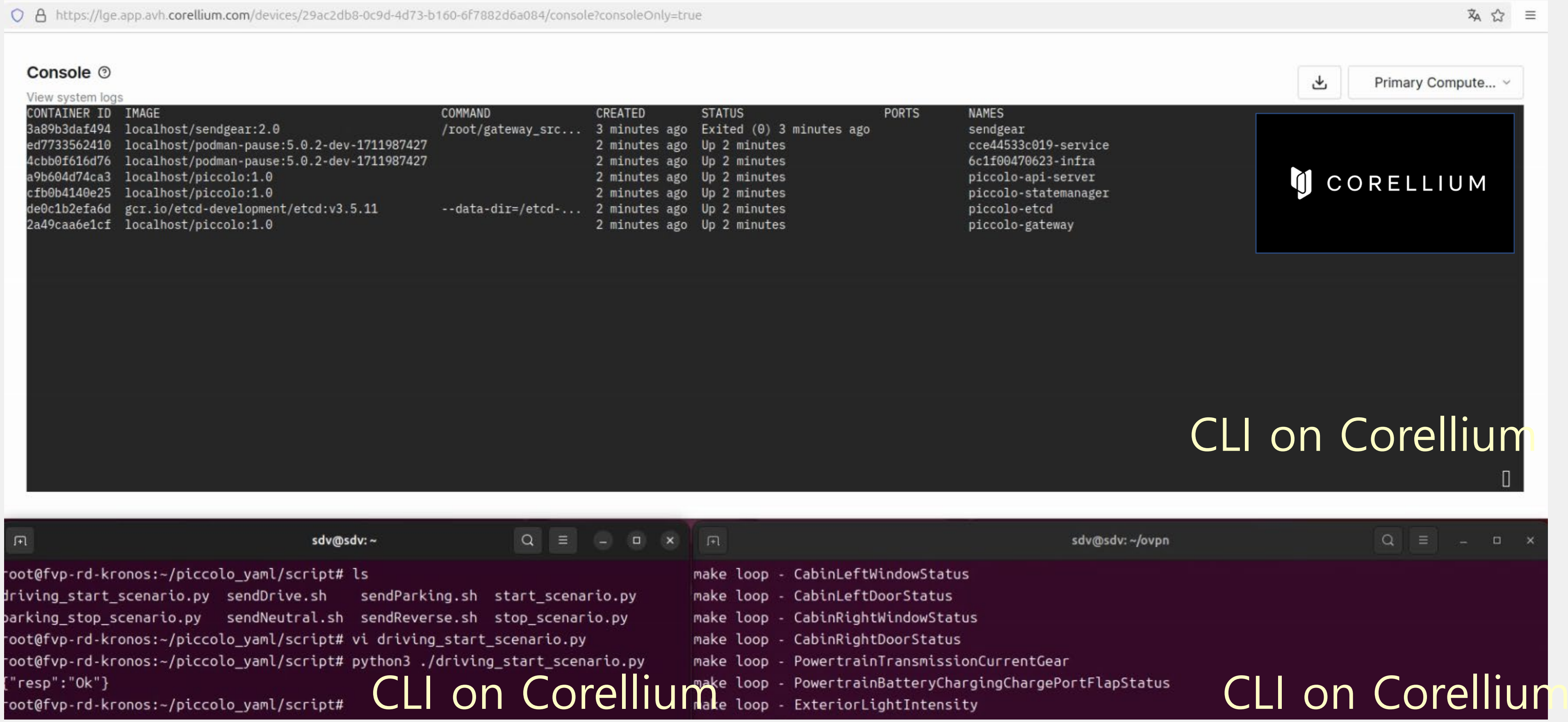
LG PICCOLO on EWAOL

How To Use PICCOLO



LG PICCOLO on EWAOL

How To Use PICCOLO


https://lge.app.avh.corellium.com/devices/29ac2db8-0c9d-4d73-b160-6f7882d6a084/console?consoleOnly=true
Console
View system logs
Primary Compute...
CORELLIUM
sdv@sdv: ~
sdv@sdv: ~/ovpn

```
CONTAINER ID  IMAGE                                   COMMAND              CREATED         STATUS                     PORTS       NAMES
3a89b3daf494  localhost/sendgear:2.0                  /root/gateway_src... 3 minutes ago   Exited (0) 3 minutes ago               sendgear
ed7733562410  localhost/podman-pause:5.0.2-dev-1711987427                  2 minutes ago   Up 2 minutes                           cce44533c019-service
4cbb0f616d76  localhost/podman-pause:5.0.2-dev-1711987427                  2 minutes ago   Up 2 minutes                           6c1f00470623-infra
a9b604d74ca3  localhost/piccolo:1.0                                        2 minutes ago   Up 2 minutes                           piccolo-api-server
cfb0b4140e25  localhost/piccolo:1.0                                        2 minutes ago   Up 2 minutes                           piccolo-statemanager
de0c1b2efa6d  gcr.io/etcd-development/etcd:v3.5.11    --data-dir=/etcd-... 2 minutes ago   Up 2 minutes                           piccolo-etcd
2a49caa6e1cf  localhost/piccolo:1.0                                        2 minutes ago   Up 2 minutes                           piccolo-gateway
```

CLI on Corellium

```
oot@fvp-rd-kronos:~/piccolo_yaml/script# ls
riving_start_scenario.py  sendDrive.sh    sendParking.sh  start_scenario.py
arking_stop_scenario.py   sendNeutral.sh  sendReverse.sh  stop_scenario.py
oot@fvp-rd-kronos:~/piccolo_yaml/script# vi driving_start_scenario.py
oot@fvp-rd-kronos:~/piccolo_yaml/script# python3 ./driving_start_scenario.py
"resp":"Ok"}
oot@fvp-rd-kronos:~/piccolo_yaml/script#
```

CLI on Corellium

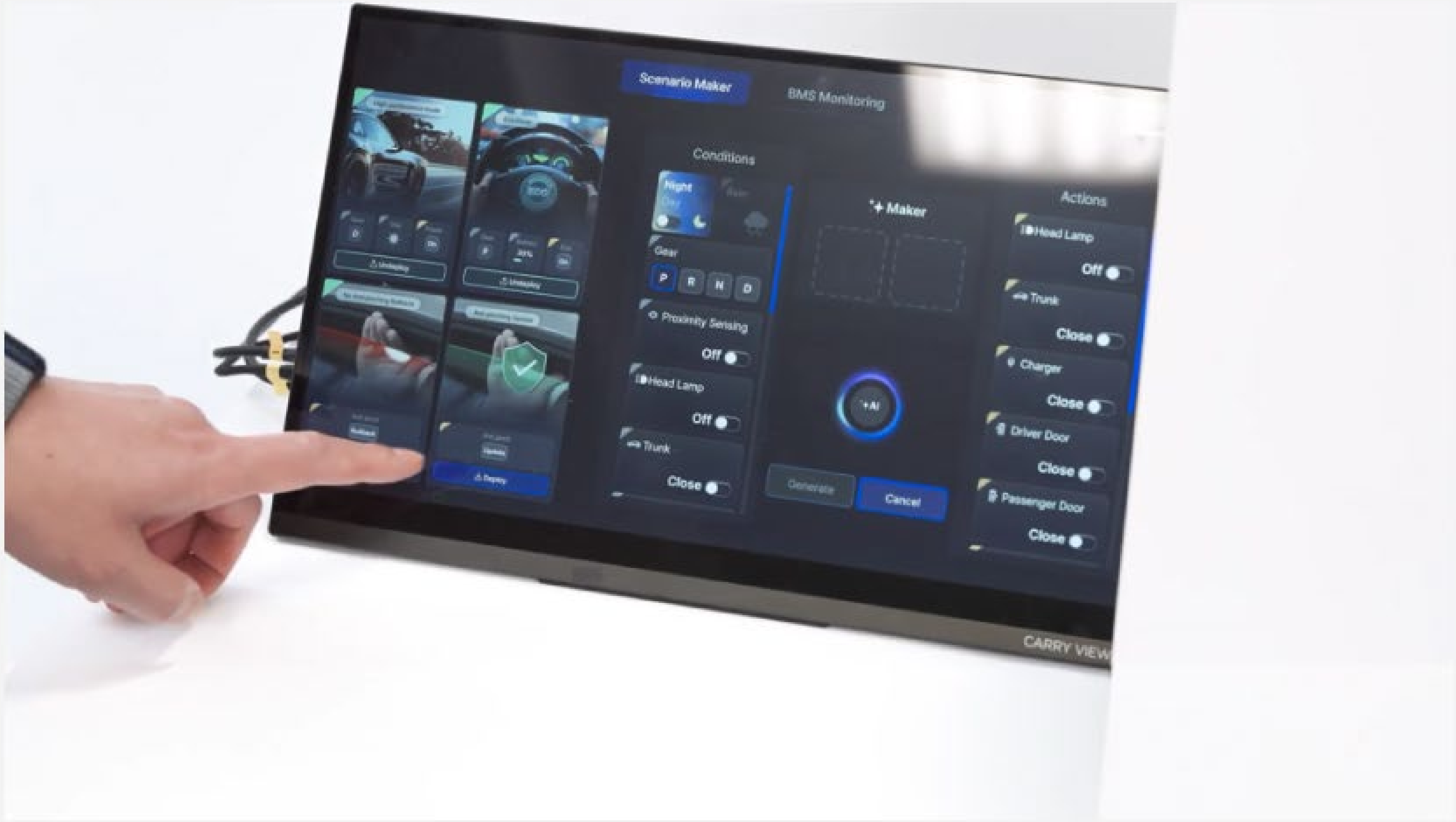
```
make loop - CabinLeftWindowStatus
make loop - CabinLeftDoorStatus
make loop - CabinRightWindowStatus
make loop - CabinRightDoorStatus
make loop - PowertrainTransmissionCurrentGear
make loop - PowertrainBatteryChargingChargePortFlapStatus
make loop - ExteriorLightIntensity
```

CLI on Corellium

- ➢ initially prepared a command line demo video, but it turned out to be boring. So, I'll skip it and include it as a guide on GitHub instead.

LG PICCOLO USE-CASE

Upgradable Vehicle Function



Proximity Sensing Off

Head Lamp Off

Trunk Close

Head Lamp Off

Trunk Close

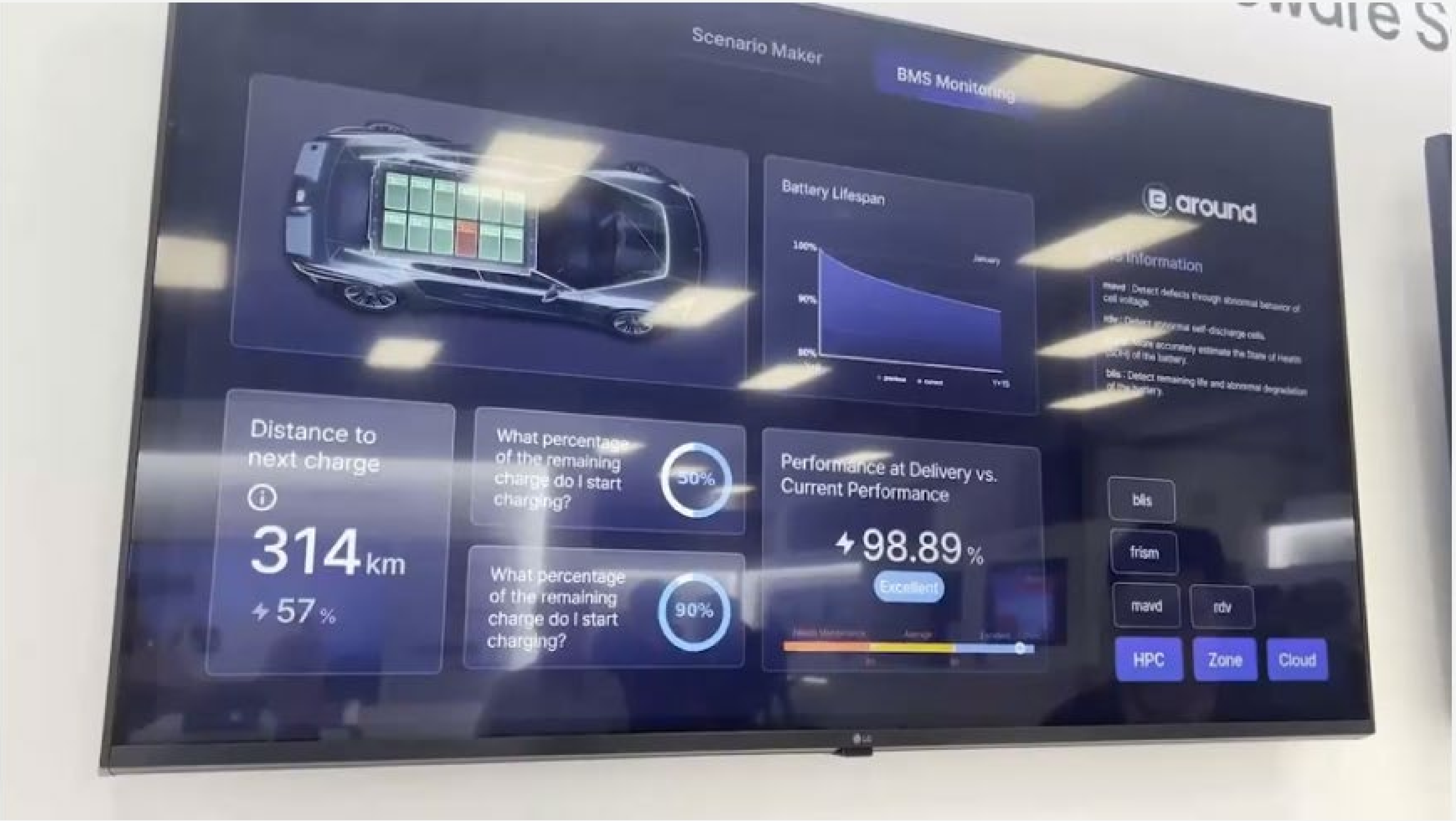
Charger Close

Driver Door Close

Passenger Door Close

LG PICCOLO USE-CASE

Text-Based Condition-Specific Workload Lifecycle Management (BMS)


Scenario Maker
BMS Monitoring
Battery Lifespan
100%
90%
80%
January
around
Information
Distance to next charge
314km
57%
What percentage of the remaining charge do I start charging?
50%
What percentage of the remaining charge do I start charging?
90%
Performance at Delivery vs. Current Performance
98.89%
Excellent
bils
frism
mavd
rdv
HPC
Zone
Cloud

mavd : Detect defects through abnormal behavior of cell voltage.

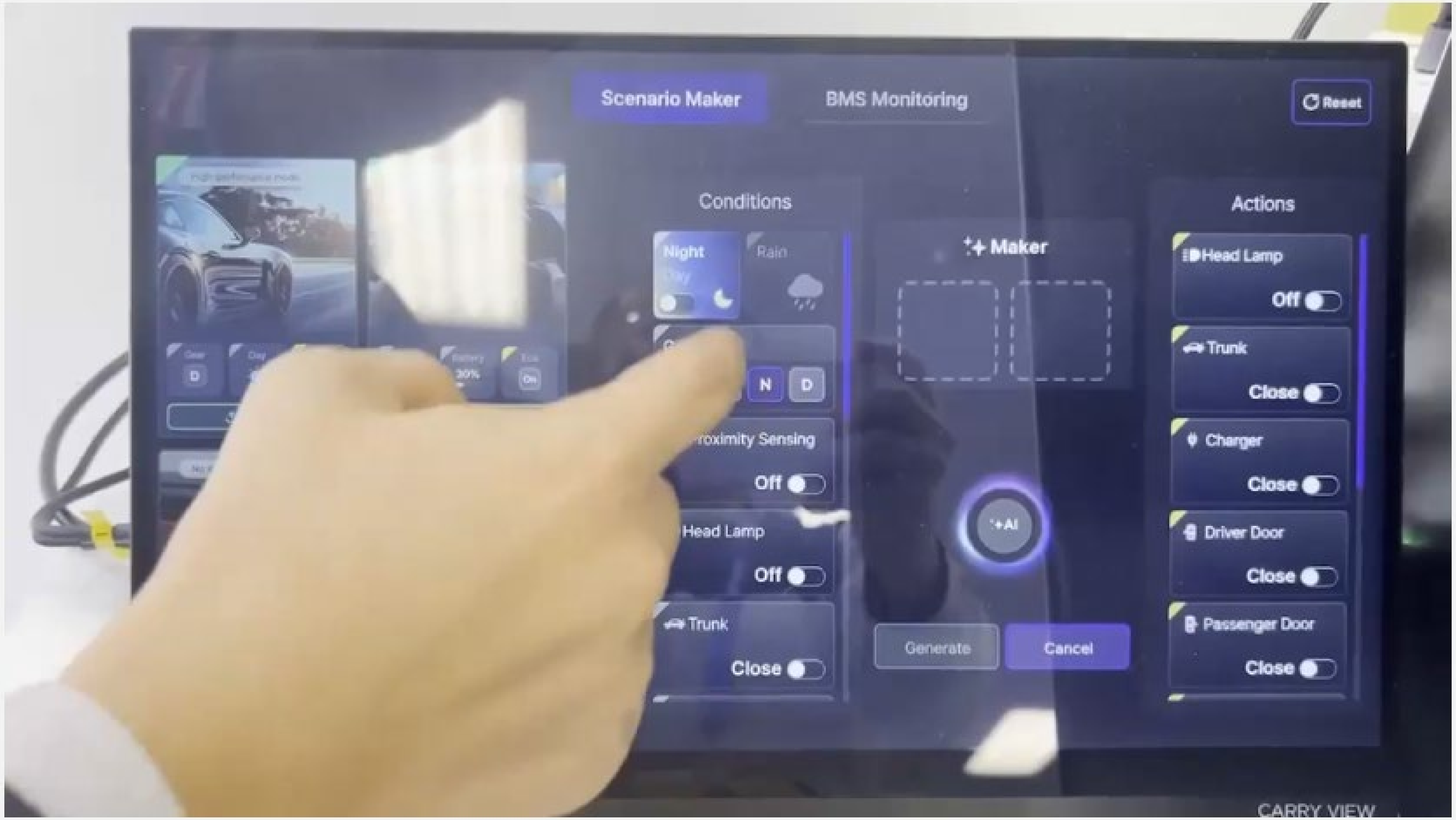
rdv : Detect abnormal self-discharge cells.

[illegible] accurately estimate the State of Health (SOH) of the battery.

bils : Detect remaining life and abnormal degradation of the battery.

LG PICCOLO USE-CASE

Enabling Infinite Expansion of User Experience



Next Step of PICCOLO

Apply New Architecture for PICCOLO on pullpiri/refactoring branch

1. Improve Performance of Controlling workload
2. Implementation of Encrypted String-Based Manifest to Mitigate Security Risks
3. Expansion of Monitoring Targets and Vehicle Status Reception Range on Demand

Standardizing Manifests for Workload Structure, Network, and Storage

1. Workload Structure : Redundancy, Monitoring, Multi Instances, …
2. Network : Protocol, Topic, Data Structure, …
3. Storage : Path, Permissions, Types, …

- ➢ We are looking for individuals to discuss, validate, and contribute to the standardization process.

Thank You