ACRN/KATA:
Secure Container Solution for Software-defined Cockpit

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What is ACRN™ - The Big Little Hypervisor for IOT

A flexible, open-source, lightweight hypervisor for IOT workload consolidation

https://projectacrn.org

A Linux Foundation Project Launched in March 2018

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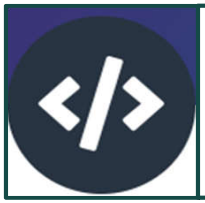
Agenda

- ACRN Introduction
- Challenge from Vehicle Development
- Vision: Solution and Use Cases
- ACRN/Kata on Vehicle

Value Proposition



Small Footprint

- Optimized for IOT class solutions
- Significantly smaller footprint than datacenter targeted hypervisors

Heterogeneous Workloads Consolidation

- Real time & Non-Real time
- Functionally Safe & non-safe

Open-source with Flexible Licensing

- BSD license enables proprietary Guest OS
- True Open source with a vibrant Community

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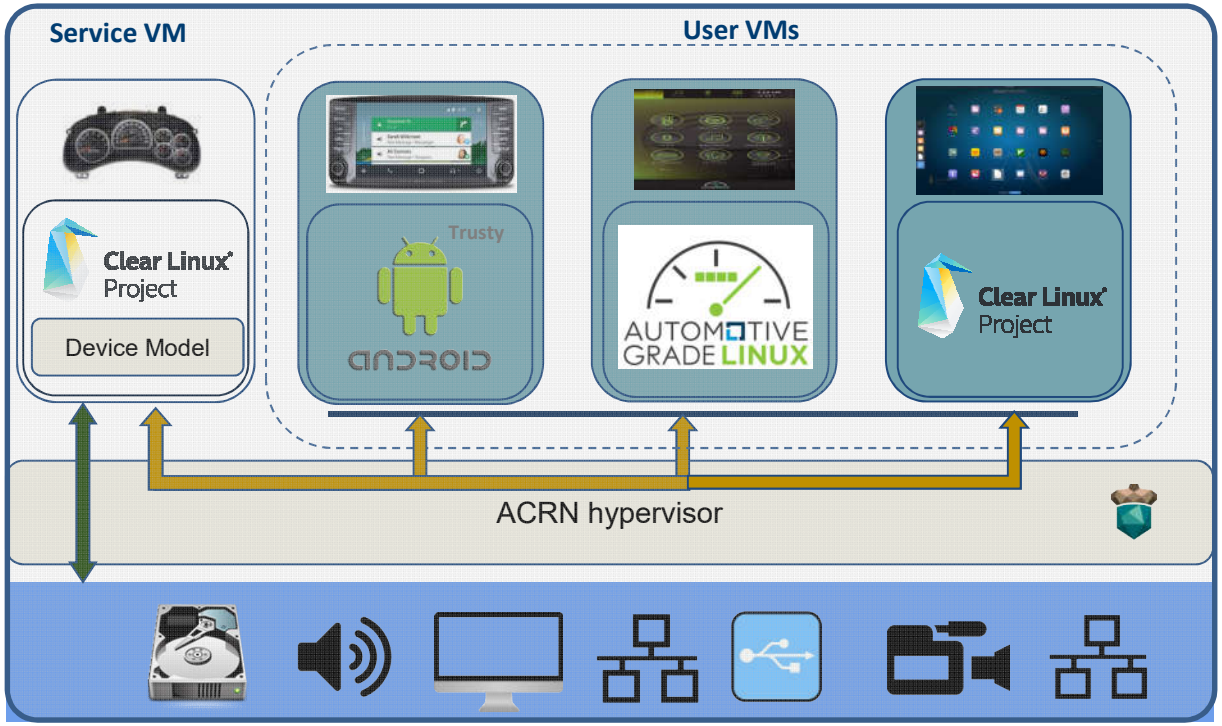
ACRN 1.0



Ready for Production

- **Released in May 2019**

Key Features

- **Safety and Security Isolation (Cluster + IVI)**
- **Extensive Sharing Capabilities**
- Graphics, media, USB, audio, camera etc.
- Advanced DMA/graphics buffer sharing
- **Multiple OS Support**
- Clear Linux, Yocto, Ubuntu
- Android, AGL, AliOS
- **MISRA-C Compliance**

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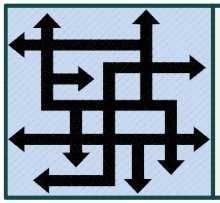
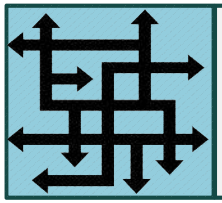
Challenge – Complex Software



Explosion in Software Lines of Code

- Today vehicle 100M lines of code
- Near future vehicle 200M – 300M lines of code
- Up to 1 billion lines of code for level 5 auto driving



Varieties of Software Category

- Instrument cluster, In-vehicle Infotainment, ADAS, V2V…
- Various execution environment – SOCs, OSs..

The Trends:

Consolidation based on Virtualization and Containerization

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Challenge – Safety and Security

Safety

- Functional Safety
- Mixed-Criticality
- Fault Detection and Tolerance

Security

- Untrusted applications
- Secret protection

The Trends:

Multi-nodes, safety separation, secure/isolated execution environment

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Challenge – Software Update & Deployment

Frequently Update

- Improved Performance Every Day
- Minimizes Security Risks

Dynamic Deployment

- Cabin Connectivity
- Remote Updating Service

The Trends:

Containerization, Orchestration, Cloud/Edge Connectivity

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Solution

Secure Container

+

Orchestration

+

Multiple Compute Nodes

+

Virtualization

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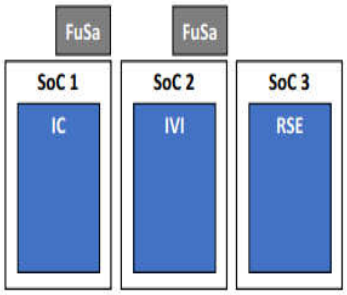
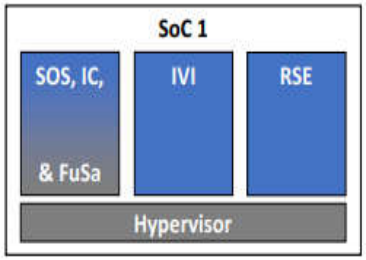
Our Vision

Traditional Embedded



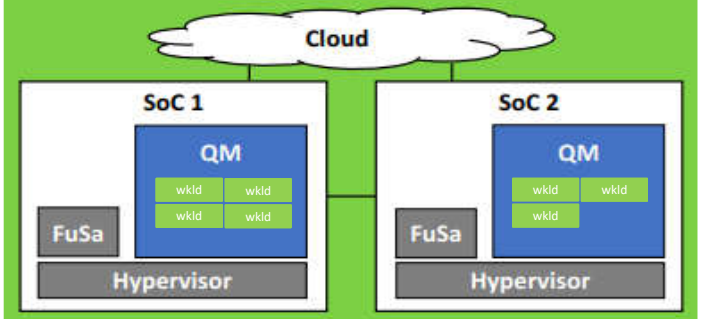
- Isolated System
- Multiple Native OS & SOC

Virtualized SDC



- Isolated System
- Mixed OSs on single SOC
- Consolidation through virtualization

Virtualization & Orchestration



- **Cloud Connectivity & Compute**
- **Multi Nodes**
- **Orchestration for App/Services Deployment**
- **Container Models for Workload Isolation**

FuSa (ASIL-B) Quality Managed (QM)

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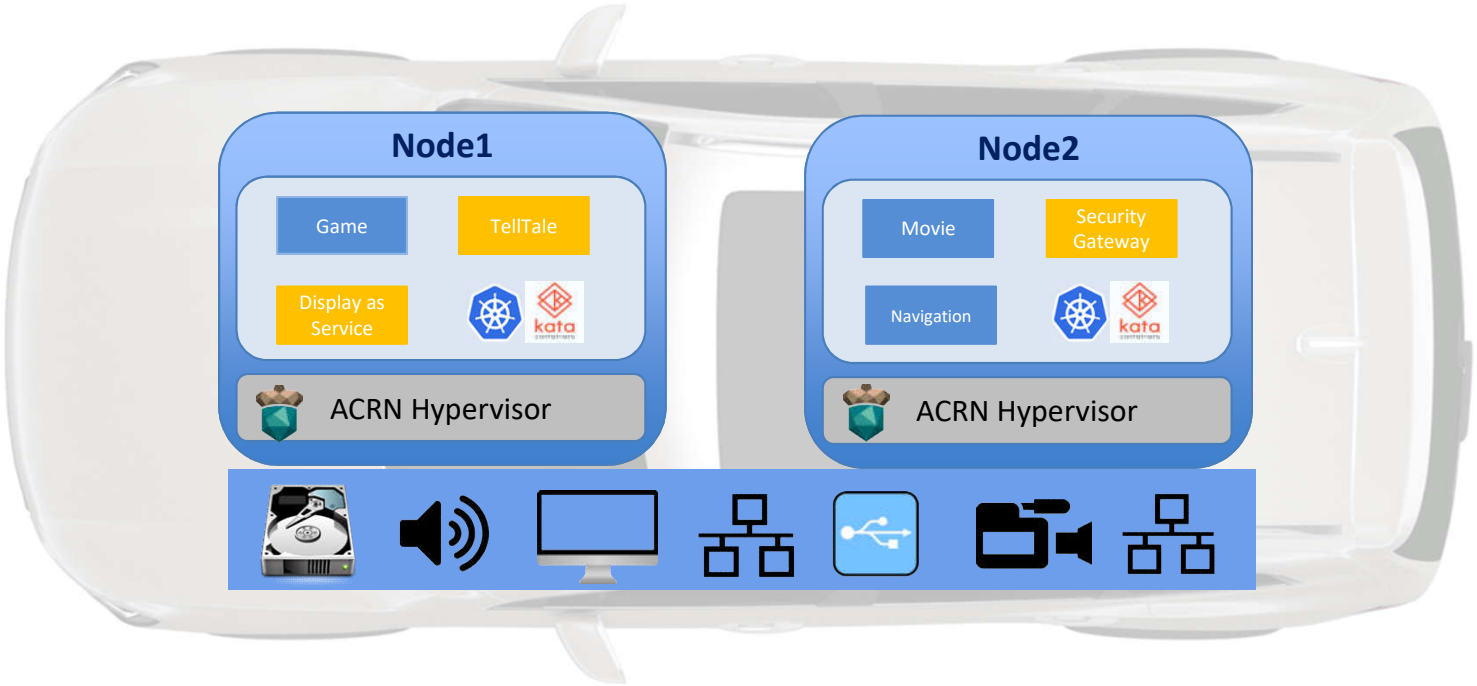
Use Case – Fault Tolerance



High Severity Workload Low Severity Workload

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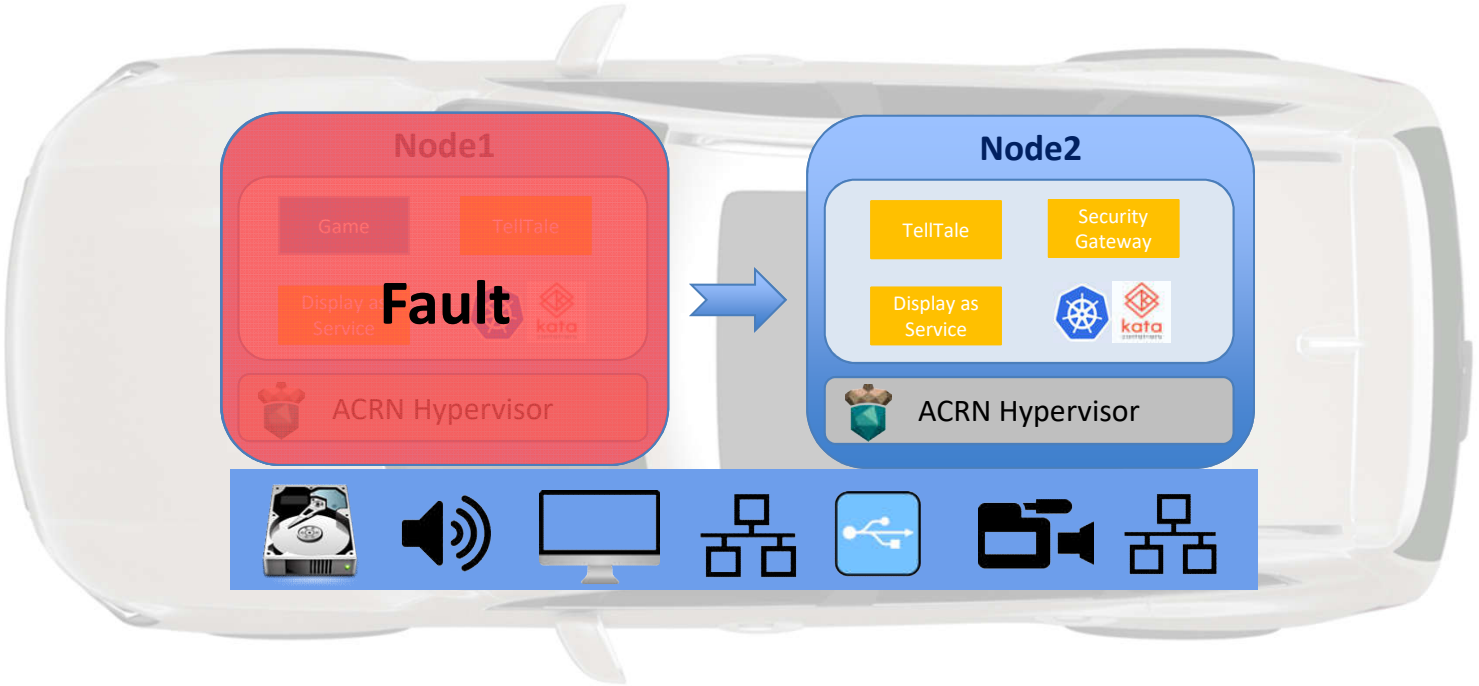
Use Case – Fault Tolerance



High Severity Workload Low Severity Workload

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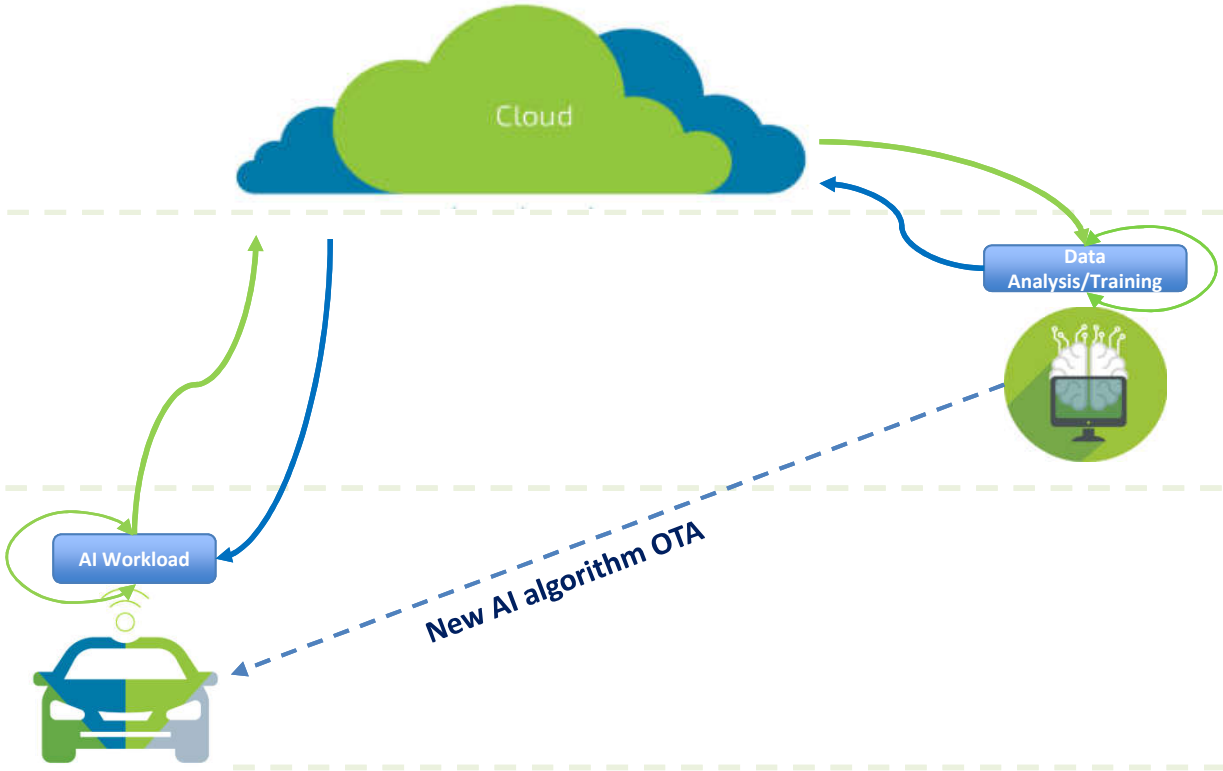
Use Case – Dynamic Workload Deployment



KVM openstack.

KVM openstack.

kata containers

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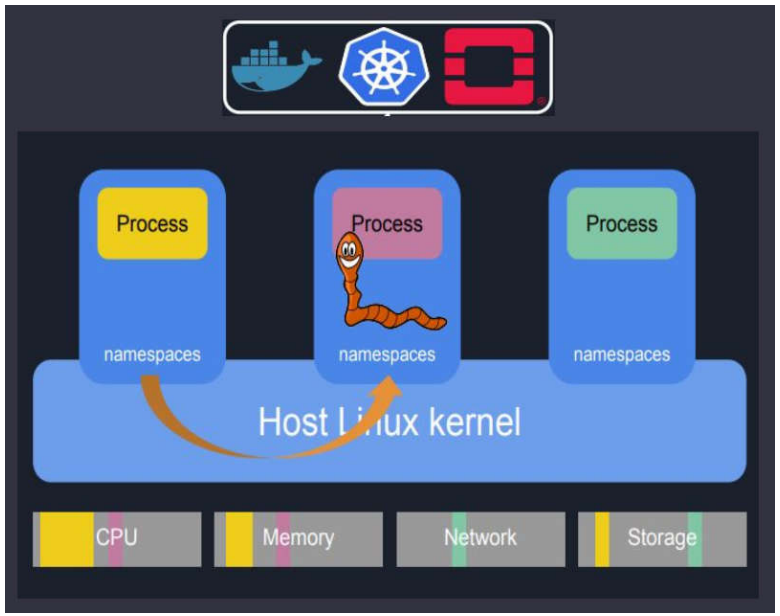
We Need Secure Container - ACRN+KATA

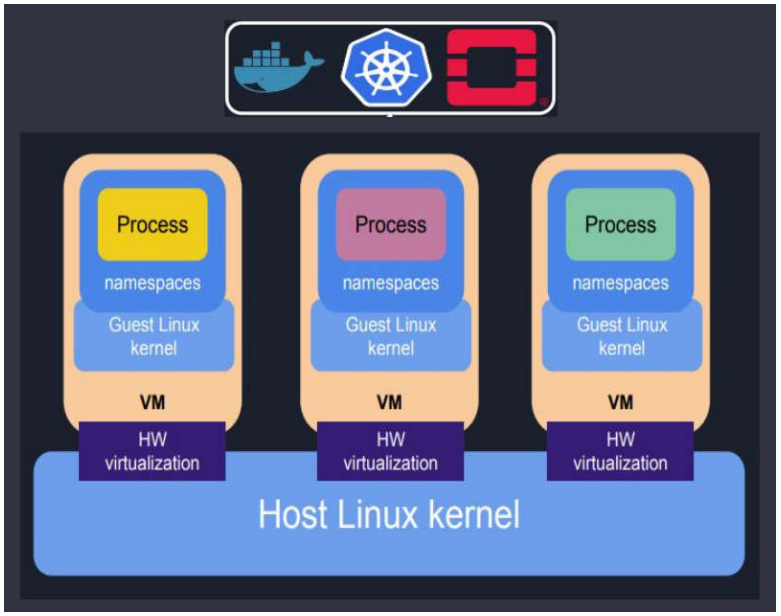
ACRN + Kata

- ACRN is design for vehicle SDC solution
- Increasing orchestration requirements for vehicle
- Future vehicle need Secure Container
- Kata is designed for Secure Container

What's KATA



Traditional Containers



Kata Containers

- An open source project hosted by the OpenStack Foundation
- Each container/pod isolated by a quick-to-boot and lightweight VM
- Support industry standards including OCI container format, Kubernetes CRI interface

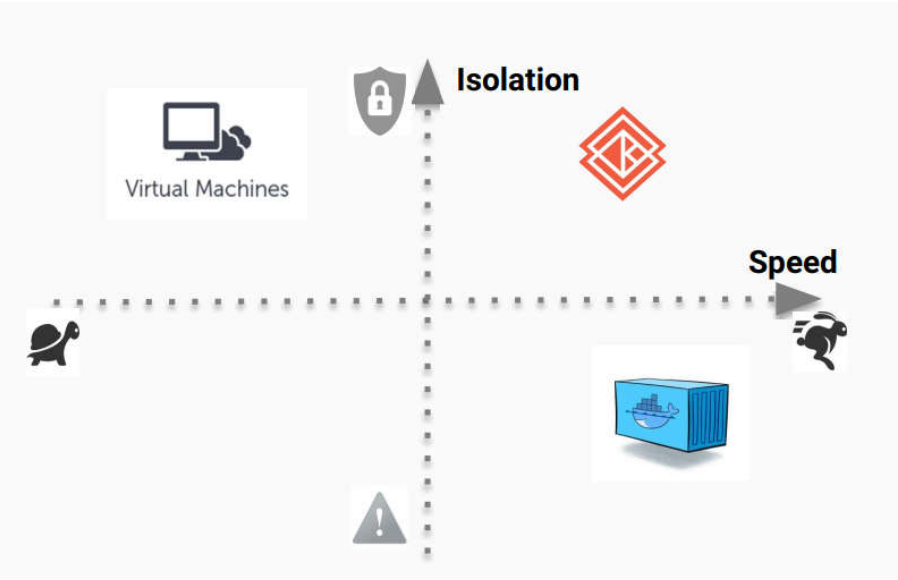
Advantage of KATA

Security/Isolation

- Dedicated kernel, isolation of network, I/O and memory, and utilize hardware-enforced isolation with VT extensions.

Performance/Speed

- Delivers consistent performance as standard Linux containers; increased isolation with the performance tax of standard virtual machines.



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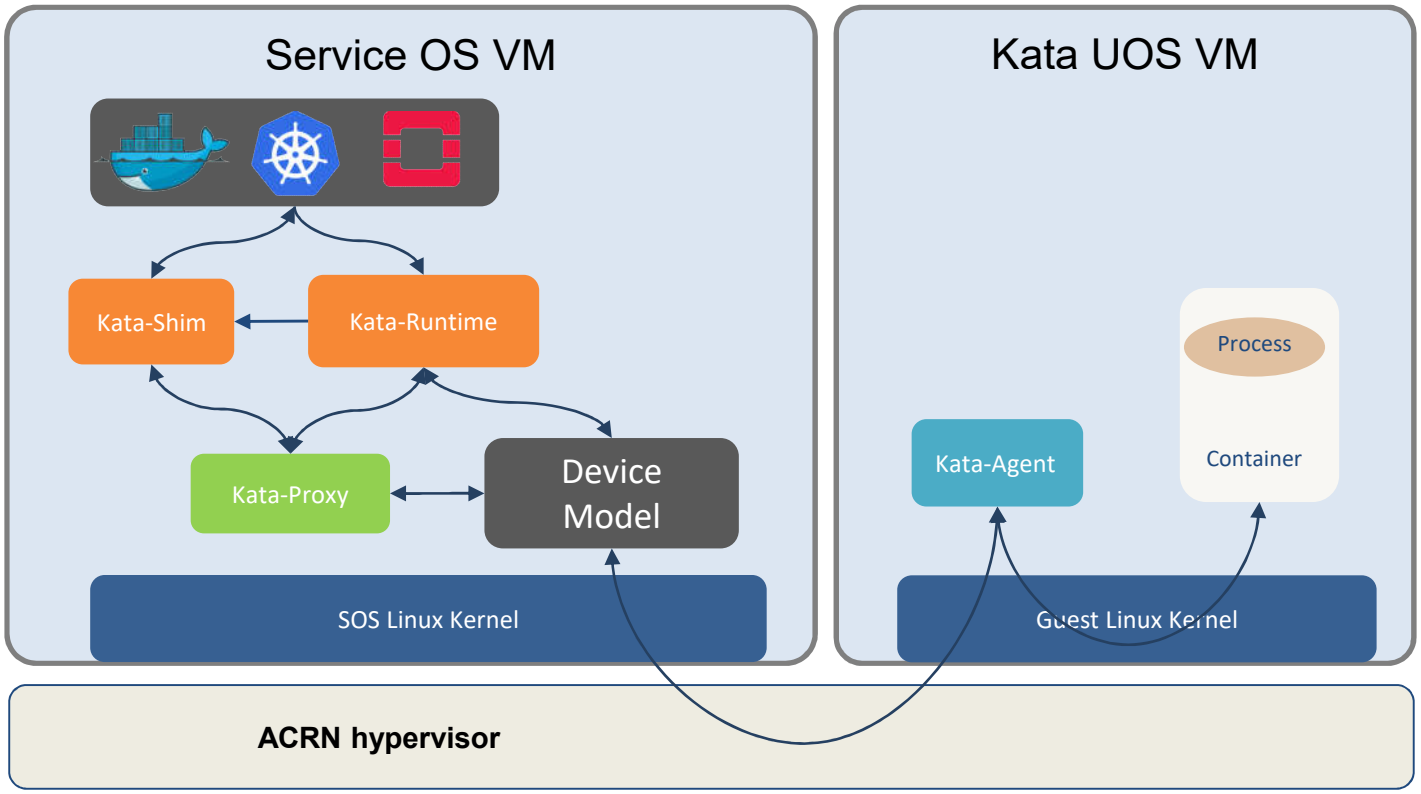
Support Kata on ACRN



- **Kata to support ACRN**
- **ACRN-DM to support Kata**
- **ACRN add-on to Kata: CPU Sharing**

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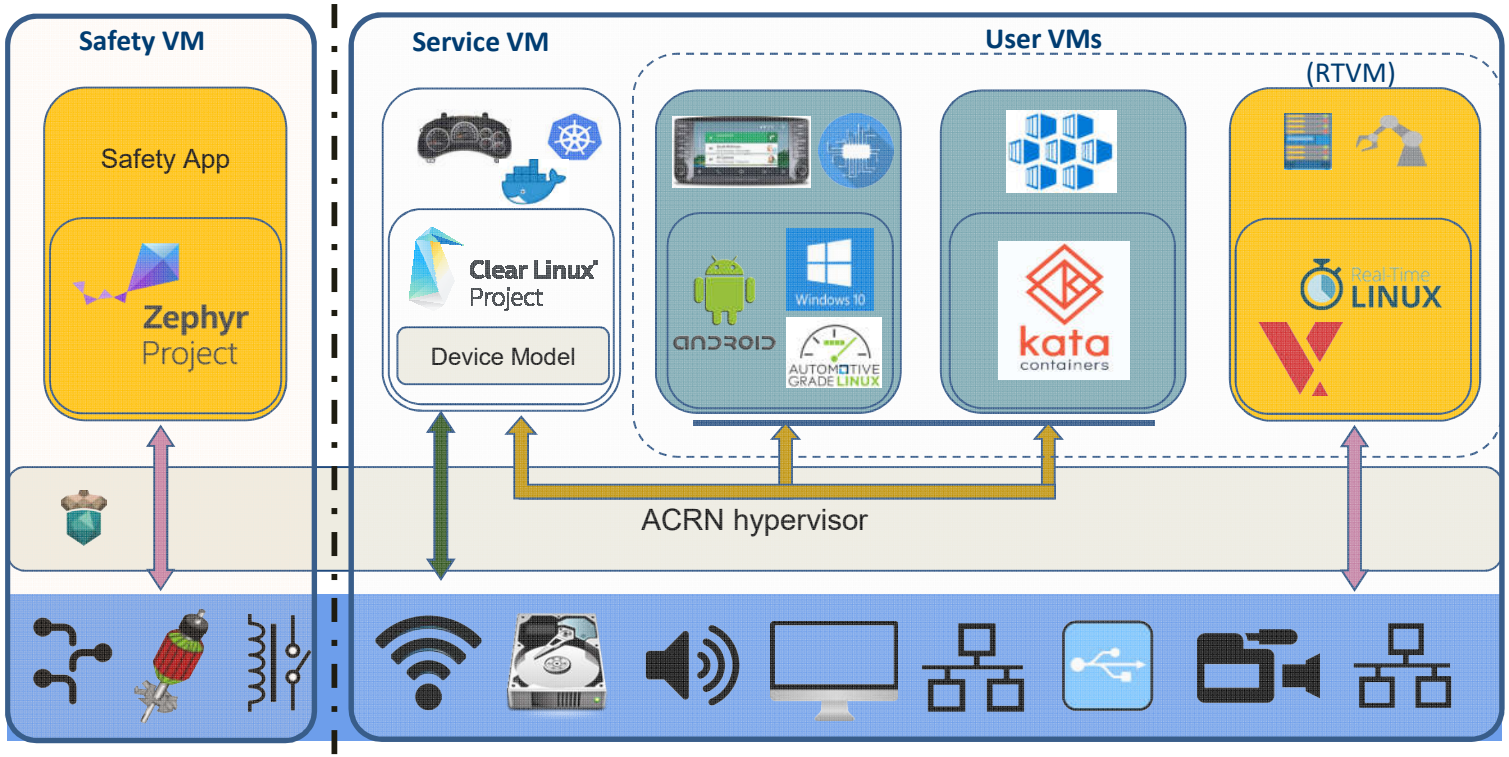
Looking Forward – Solution in ACRN 2.0



Hybrid-Mode

- Partition + Shared

VM Type

- Safety VM
- Real-time VM

Kata Container

More OS Support:

- Zephyr, VxWorks, RT-Linux, Windows

FUSA Certification

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Call for Participation

https://projectacrn.org

https://projectacrn.github.io/index.html

Joining ACRN Community Today!!!

Questions?


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LINUX SUMMIT