



MAY 13 – 14, 2026

TOKYO, JAPAN

How SDV Reference PF Accelerates the Future of Mobility Through Open-Source Collaboration

Yuichi Kusakabe

Chief Architect

Honda Motor R&D Co., Ltd.

About myself(Yuichi Kusakabe)

- 2005/4 Automotive Tier1 in Japan
 - Renesas H8S AVN power control(Non-OS)
 - Panasonic UniPhier USB-Audio(Fastest in the industry with HDD transfer function)
- 2009/12 Working together with in Japan OEM
 - Engaged in the R&D of SoC for next-generation IVI and multimedia OS
- 2011/1 Paradigm shift to use OSS
 - Renesas RMA1 Linux-PF Project Leader, **AGL Board Member**
 - Renesas R-Car M2/H3/M3 Fast Boot, Java, HTML5 browser
- 2020/6 Join Honda Motor in IVI software development team
 - Qualcomm SA8155P AAOS based IVI Lead Architect
- 2024/4 Launched Honda **OSPO(Open Source Program Office)**
 - SDV(Software Defined Vehicle) SW Chief Architect and **OSPO Tech Lead**
 - **Xen Board Member, ELISA and Zephyr Member**





Agenda

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- **Background to software changes in the automotive industry**
- **Why open source is important**
- **SDV Reference PF AGL –SoDeV-**
- **Conclusion**



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Background to software changes in the
automotive industry

A dark, stylized illustration of a car's side profile, rendered in a dark blue or black color, serving as a background for the text. The car is shown from a side-on perspective, facing right.

- Shift 1: Hardware → Software-Defined Vehicle
 - Vehicle value shifts from hardware to software
- Shift 2: Close → Open Standards & Consortia
 - Siloed, proprietary systems limit scalability
- Shift 3: Linear Supply Chain → Ecosystem
 - The traditional OEM and Tier 1 hierarchy is changing

Shift 1: Hardware → Software-Defined Vehicle



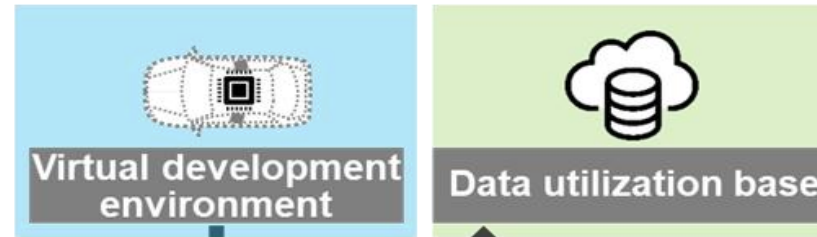
- Vehicle value shifts from hardware to software
 - Functions are defined and updated by software
 - Over-the-air (OTA) updates enable continuous evolution
 - The vehicle becomes a software-driven platform

Shift 1: Hardware → Software-Defined Vehicle

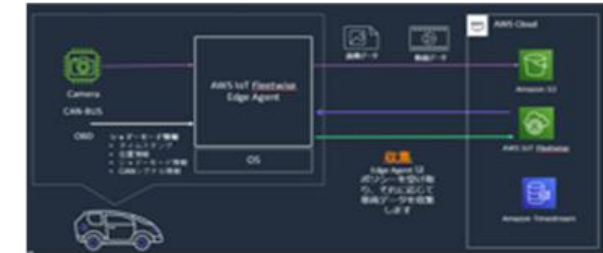
Virtual, digital twin development



Out-Car



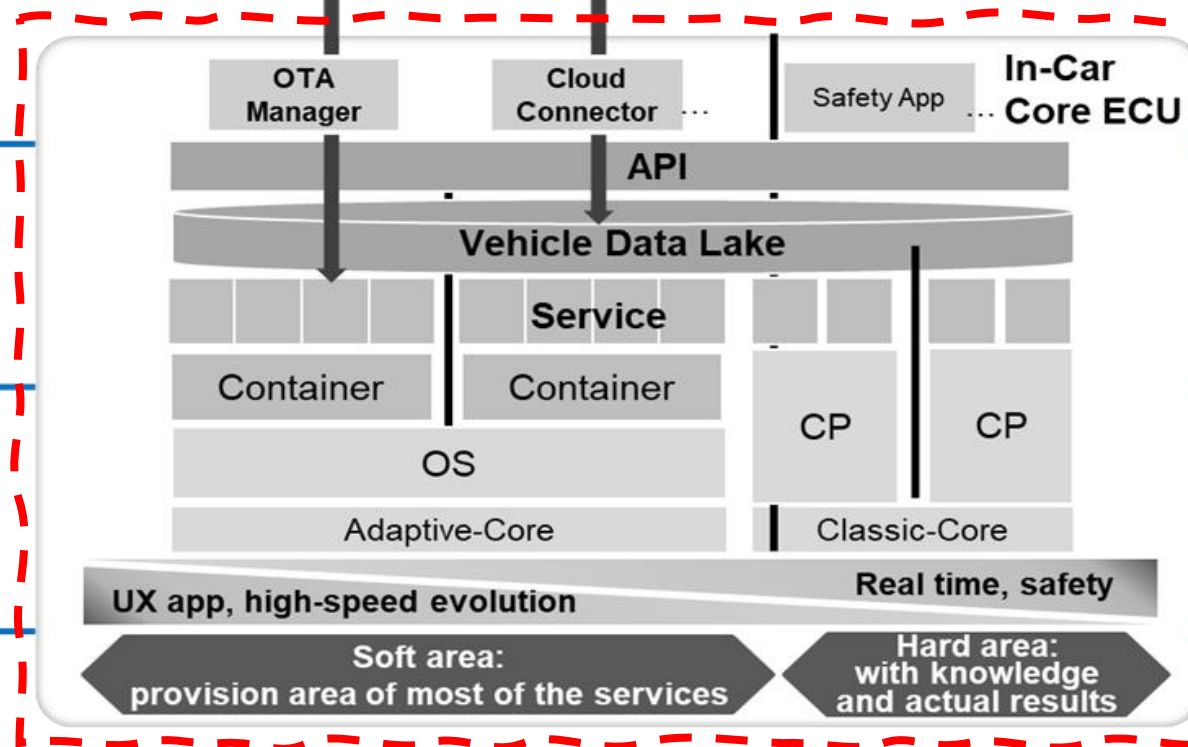
Data driven development



Utilize standard architecture/
technology/tool

Hardware-less development/
verification environment

End To End environment
including other ECUs



Enhance development
efficiency by automation

Data driven development/
analysis environment

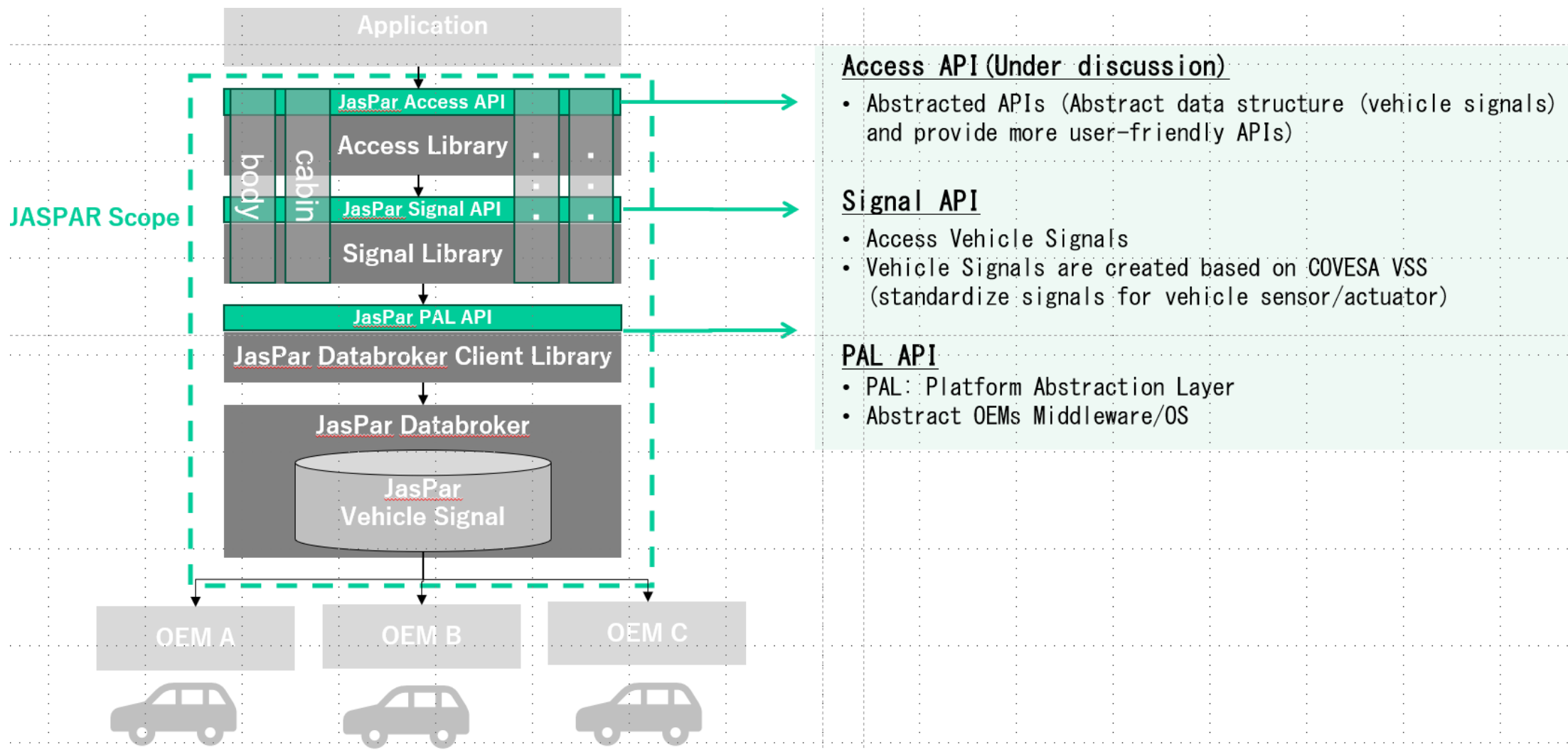
Cross-generation SW
development
(shift to one-branch)

Shift 2: Close → Open Standards & Consortia



- Siloed, proprietary systems limit scalability
 - Common data models and APIs enable interoperability
 - Industry consortiums (e.g., JasPar) drive standardization
 - OEMs focus on differentiating software and services

Shift 2: Close → Open Standards & Consortia

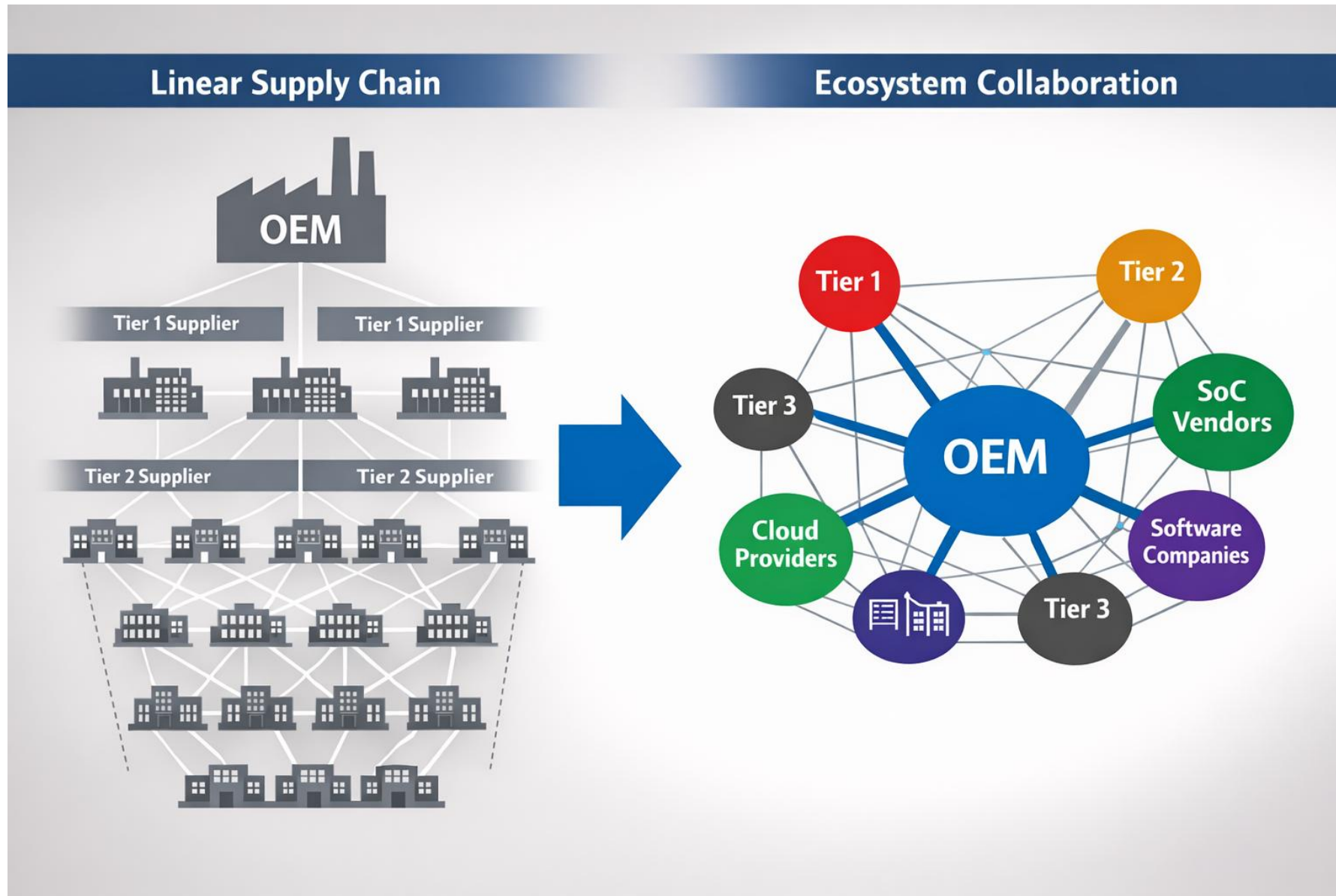


Shift 3: Linear Supply Chain → Ecosystem



- The traditional OEM and Tier 1 hierarchy is changing
 - Semiconductor, cloud, and software players gain importance
 - Value is created through cross-industry collaboration
 - OEMs increasingly act as ecosystem orchestrators

Shift 3: Linear Supply Chain → Ecosystem





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Why open source is important



Lots of OSS communities involved in SDV



AUTOMOTIVE
GRADE **LINUX**

Automotive Grade
Linux (AGL)



ELISA
Enabling **Linux** in
Safety Applications



<https://www.linuxfoundation.org/projects>

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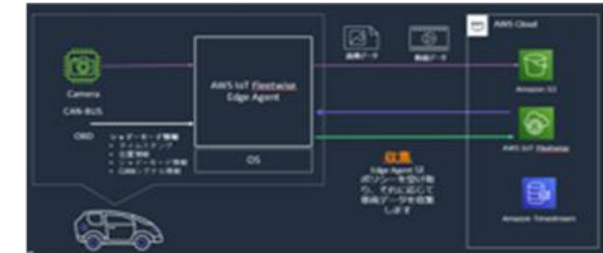
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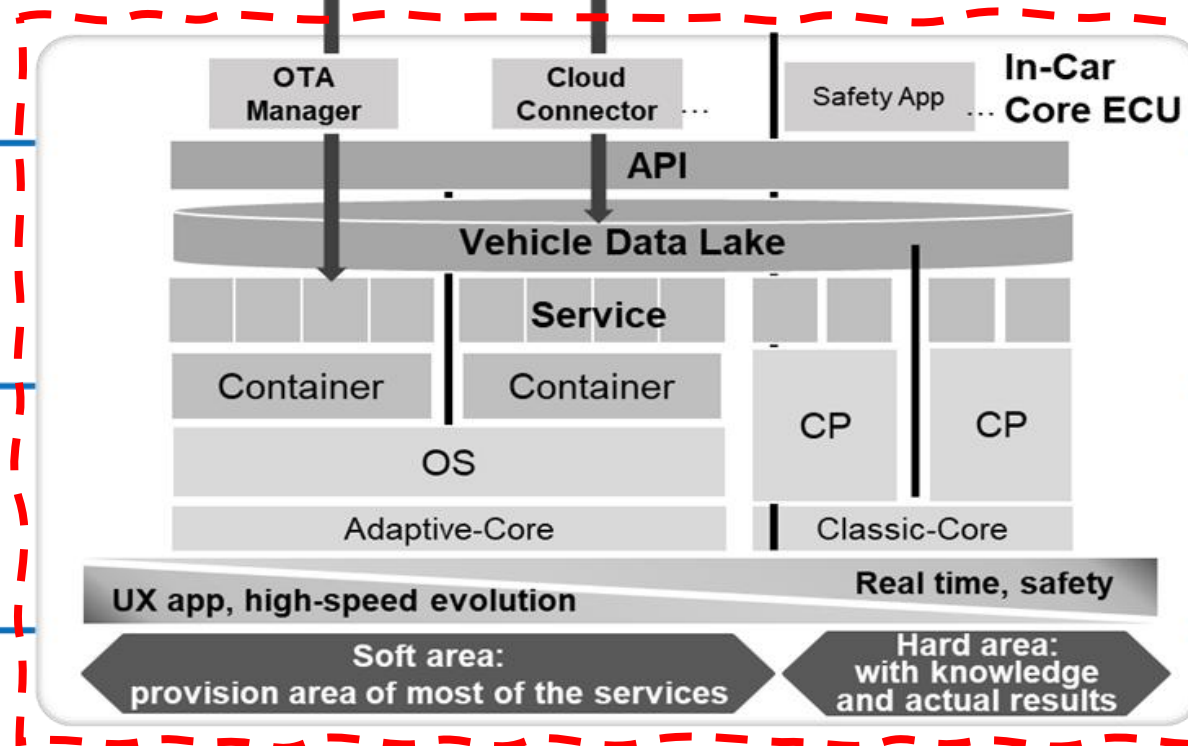
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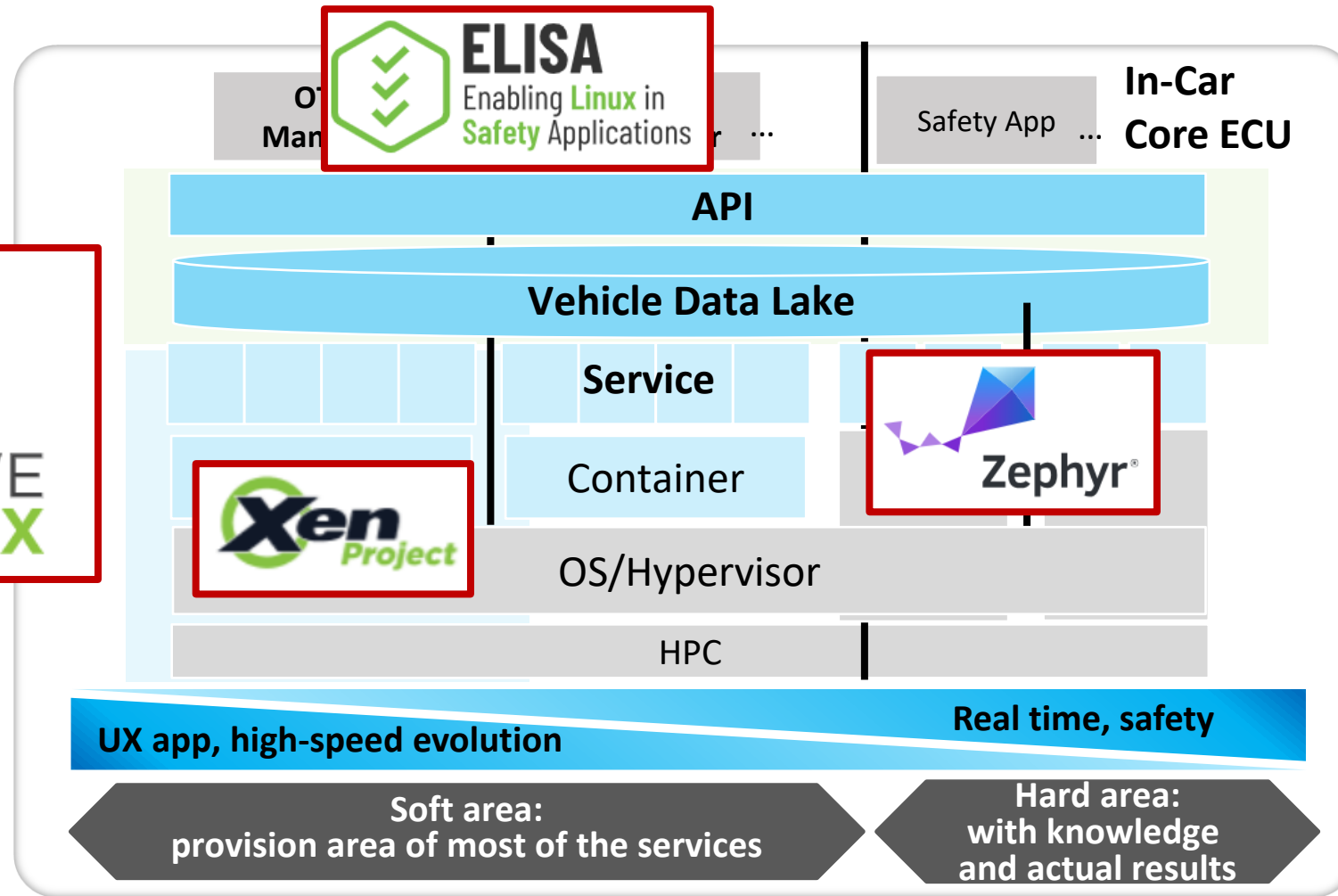



**Enhance development
efficiency by automation**


**Data driven development/
analysis environment**


**Cross-generation SW
development
(shift to one-branch)**

Shift 1: Hardware → Software-Defined Vehicle




What is Automotive Grade Linux?

Automotive Grade Linux is a collaborative, open source project that brings together automakers, suppliers, and technology companies for the purpose of building Linux-based, open source software platforms for automotive applications that can serve as de facto industry standards.

AGL address all software in the vehicle: infotainment, instrument cluster, heads-up-display (HUD), telematics, connected car, advanced driver assistance systems (ADAS), functional safety, and autonomous driving.

Adopting a shared platform across the industry reduces fragmentation and allows automakers and suppliers to reuse the same code base, which leads to rapid innovation and faster time-to-market for new products.

AGL is a Linux Foundation project and its goals are as follows:

- 
- A large green arrow pointing to the right, highlighting the list of goals.
- Build a single platform for the entire industry
 - Develop 70 to 80% of the starting point for a production project
 - Reduce fragmentation by combining the best of open source
 - Develop an ecosystem of developers, suppliers, and expertise that all use a single platform

You can find additional overview information on the "[About Automotive Grade Linux](#)" page. You can find information on the AGL Unified Code Base on the "[Unified Code Base](#)" page.

- VirtIO available in UCB for hypervisor use cases
- Non-hypervisor (loopback) use cases complete for Quillback
- Unified HMI – Virtual display used by different ECUs based on VirtIO (Panasonic)
- ***SDV reference PF under development***

Charter

The AGL Software Defined Vehicle (SDV) Expert Group (SDV-EG) (formerly known as Virtualization and Containers Expert Group (EG-VIRT)) is responsible to design and implement virtualization solutions for AGL. Containers, Hypervisors (both based on Virtualization Extensions and TrustZone) and any other virtualization solution for x86/ARM are considered to be of interest for this Expert Group. The AGL Unified Code Base (UCB) supports the KVM hypervisor on the Renesas RCar M3 platform.

The SDV-VIRT expert group has been focused on defining the Virtualization platform architecture of AGL since 2018. One result of the work is this [white paper](#)

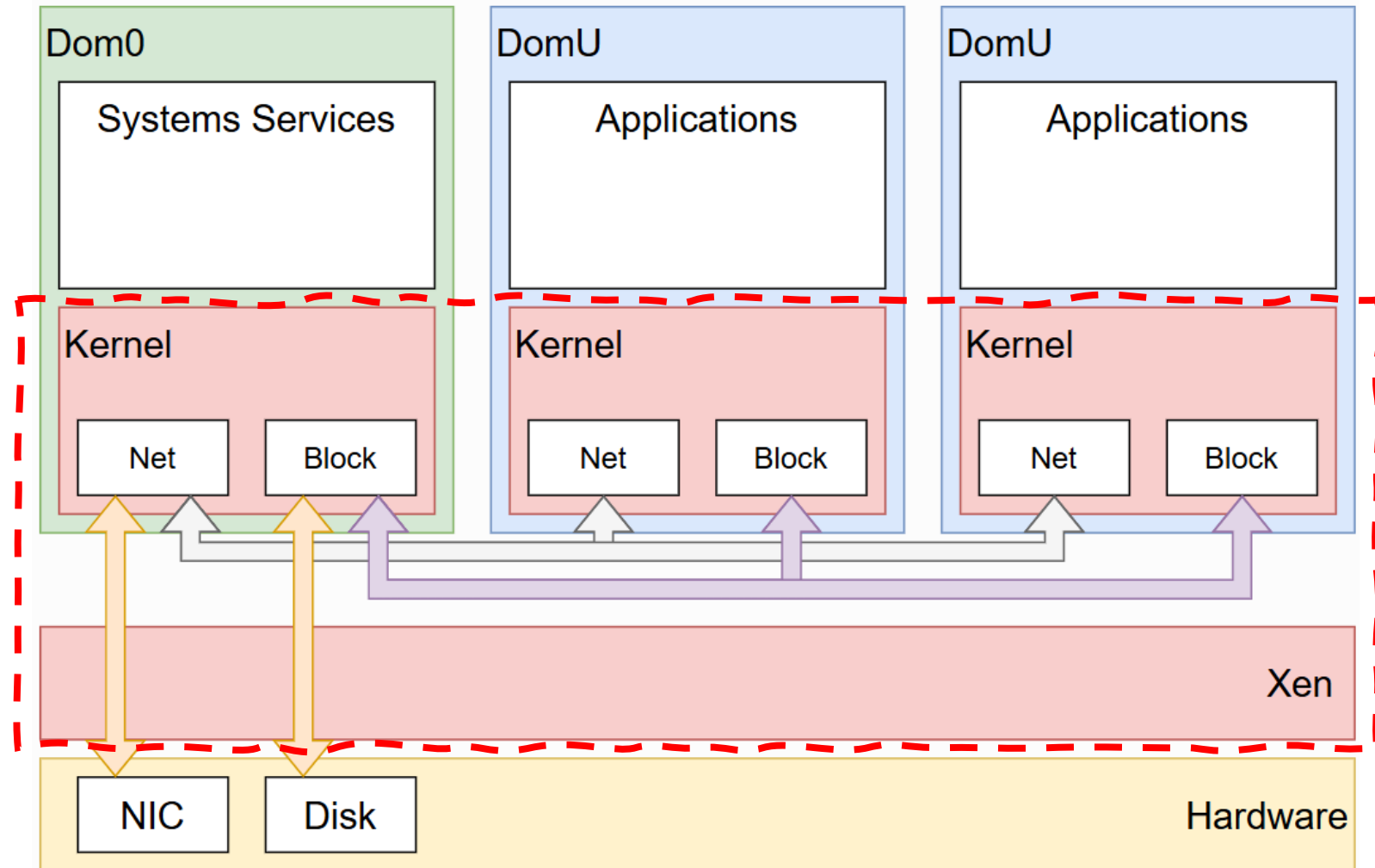
Type1 Hypervisor: Xen



Xen is an open source, bare metal hypervisor. It runs as the most privileged piece of software, and shares the resources of the hardware between virtual machines.

In Xen terminology, there are domains, commonly abbreviated to dom, which are identified by their numeric domid.

When Xen boots, dom0 is automatically started as well. Dom0 is a virtual machine which, by default, is granted full permissions



Type1 Hypervisor: Xen



Functional safety

With sponsorships from the likes of AMD, we're on a mission to align Xen with top safety standards, including ISO 26262 ASIL D and IEC 61508 SIL 3.

Initiatives like the MISRA C course for community members and striving for MISRA C compliance in the Xen upstream codebase underscore our dedication to ensuring Xen's role in safety-critical environments.

Xen is not just a technology; it's a vision coming to life, shaping the future of embedded systems, and redefining what's possible.

Xen Project's Progress Toward Safety Certification

Stefano Stabellini
Fellow at AMD
Xen Hypervisor & Linux Kernel Maintainer

Roberto Bagnara – BUGSENG
Ayan Kumar Halder – AMD
Senthil Rajagopal – AMD

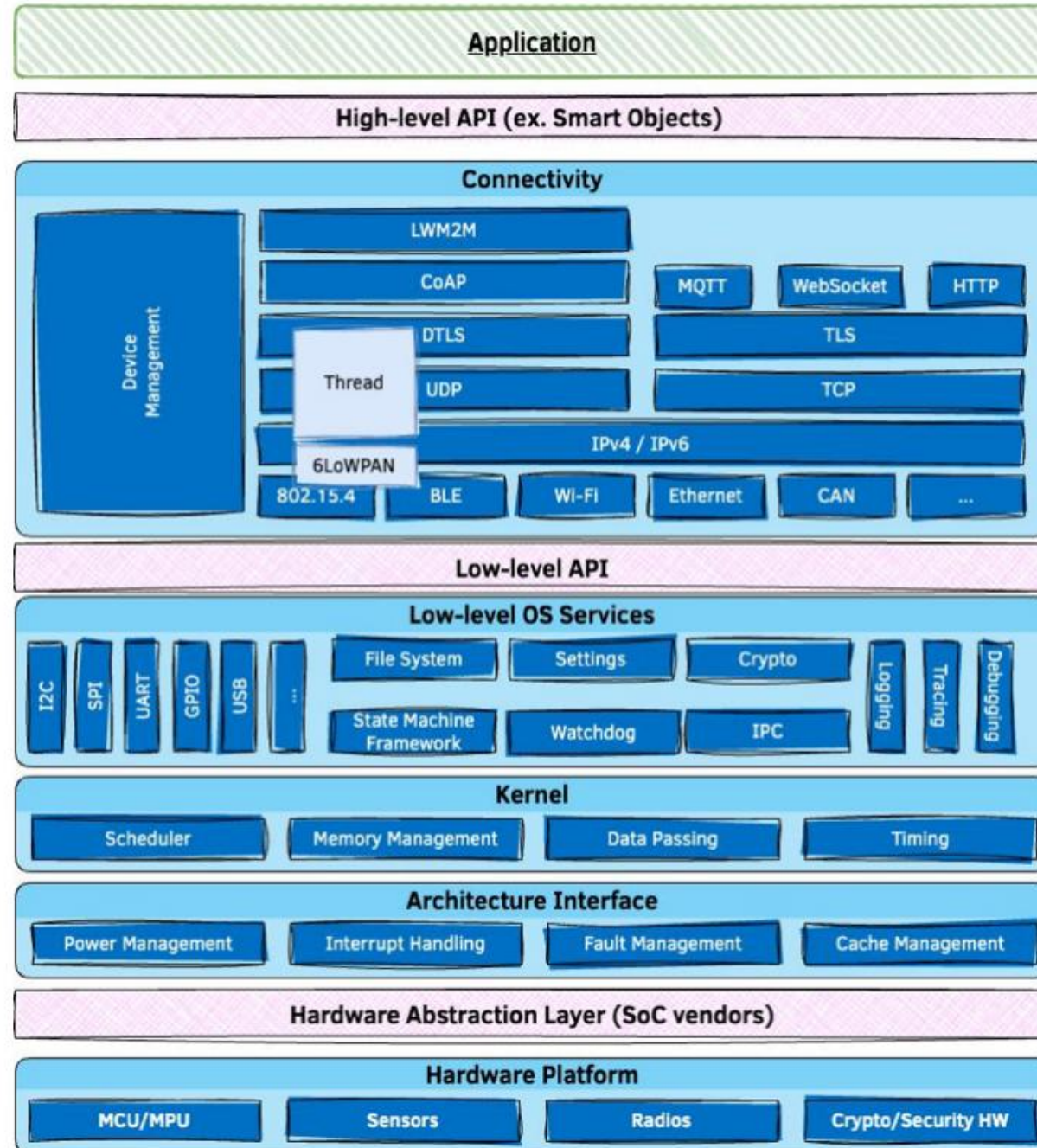


together we advance.

Architecture



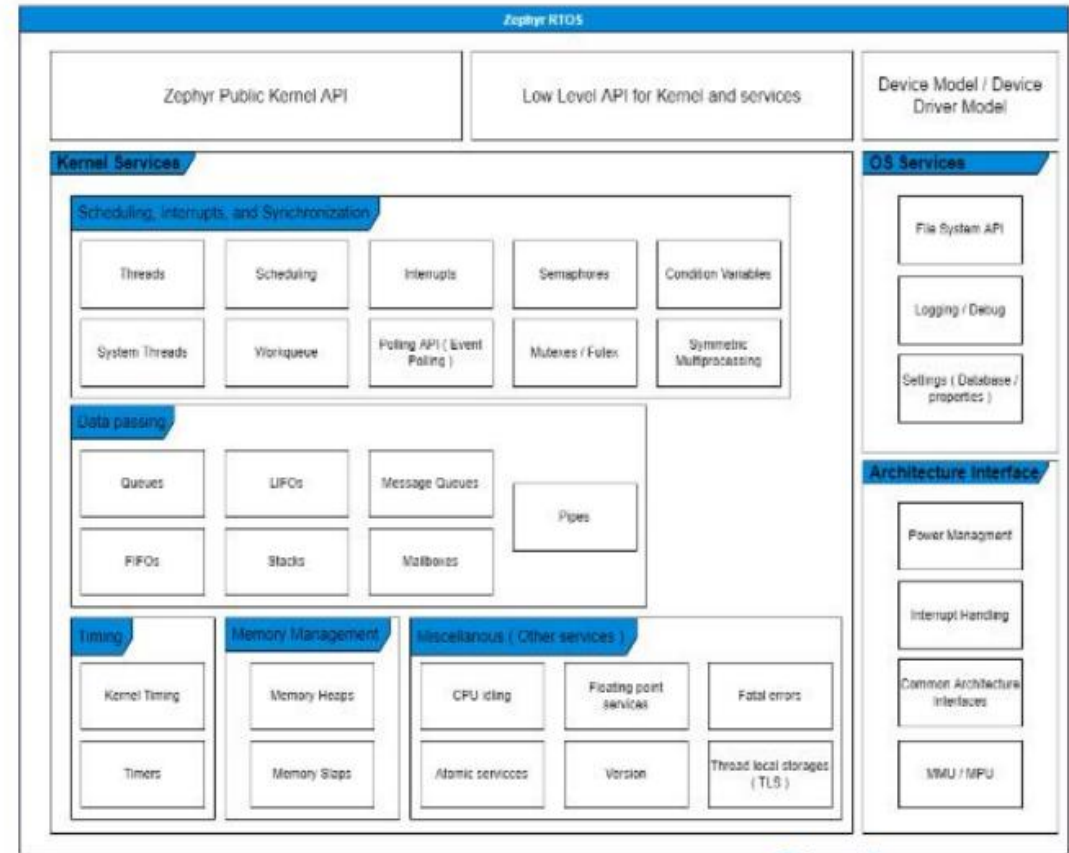
- **Lightweight kernel** & supporting drivers and services
- Portable, secure, power-efficient
- Highly connected
 - Bluetooth 5.0 & BLE
 - Wi-Fi, Ethernet, CANbus, ...
 - IoT protocols: CoAP, LwM2M, MQTT, OpenThread, ...
 - USB & USB-C



Zephyr Initial Certification Focus



- Start with a limited scope of kernel and interfaces
- Initial target is IEC 61508 SIL 3 / SC 3 (IEC 61508-3, 7.4.2.12, Route 3s)
- Option for 26262 certification has been included in contract with certification authority should there be sufficient member interest



Starting scope

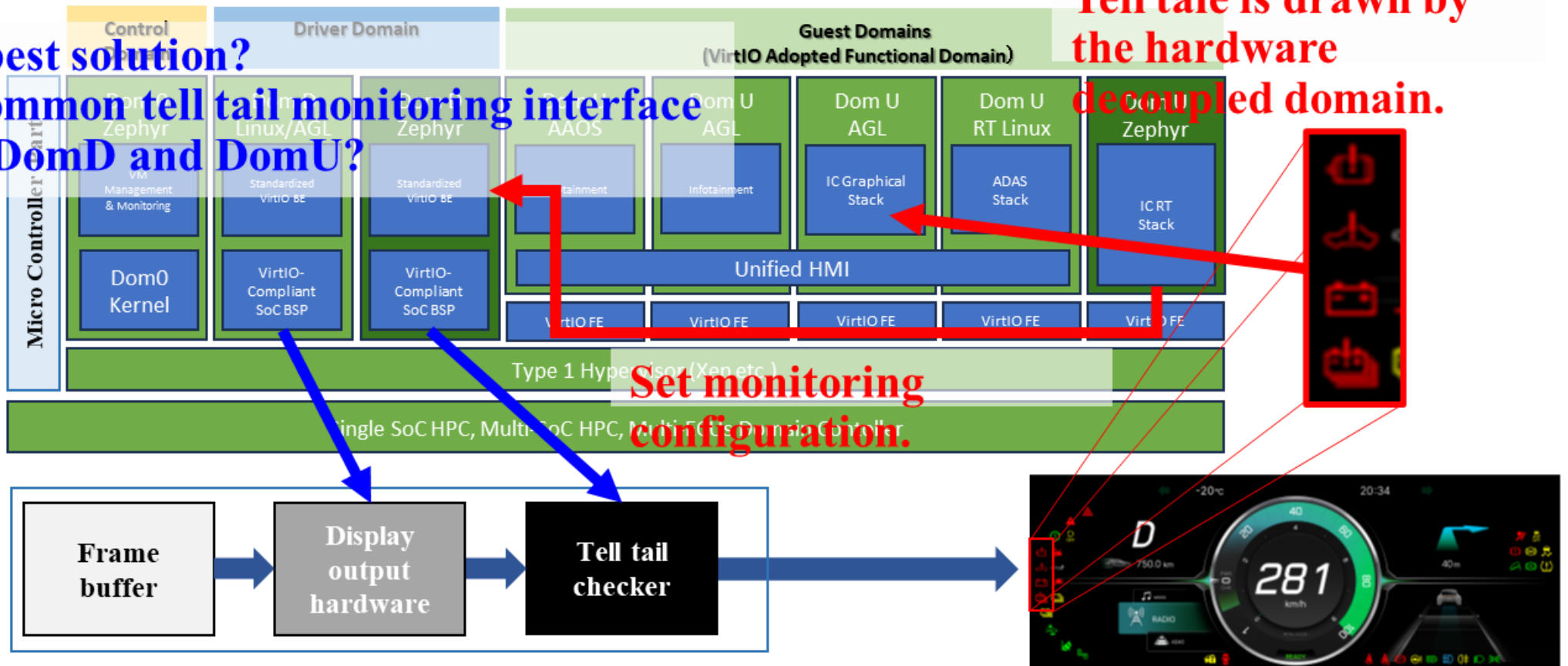
Scope can be **extended** to include **additional components** with associated **requirements** and **traceability** as determined by the safety committee

The Enabling Linux In Safety Applications (ELISA)

- How to achieve safety?
 - Example use case: Tell tale for instrument cluster.

**What is best solution?
Create common tell tail monitoring interface
between DomD and DomU?
Others?**

**Tell tale is drawn by
the hardware
decoupled domain.**



Why open source is important



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Open Standards & Consortiums(VirtIO)



-What is VirtIO (a standardized device virtualization technology)

VirtIO is an open standard for device I/O in virtual environments. It allows the same drivers and device models to work across different operating systems, hypervisors, and hardware. The specification is developed and maintained as an international standard by OASIS.

-OASIS activities: defining and maintaining the VirtIO specification

OASIS operates the Virtual I/O Device (VIRTIO) Technical Committee. This committee publishes and updates the VirtIO specifications (such as VirtIO v1.1 and v1.2) as official Committee Specifications. This ensures an open, neutral standard without vendor lock-in.



Virtual I/O Device (VIRTIO) Version 1.2

Committee Specification 01

01 July 2022

This stage:

<https://docs.oasis-open.org/virtio/virtio/v1.2/cs01/tex/> (Authoritative)

<https://docs.oasis-open.org/virtio/virtio/v1.2/cs01/virtio-v1.2-cs01.pdf>

<https://docs.oasis-open.org/virtio/virtio/v1.2/cs01/virtio-v1.2-cs01.html>

Previous stage:

<https://docs.oasis-open.org/virtio/virtio/v1.2/csd01/tex/> (Authoritative)

<https://docs.oasis-open.org/virtio/virtio/v1.2/csd01/virtio-v1.2-csd01.pdf>

<https://docs.oasis-open.org/virtio/virtio/v1.2/csd01/virtio-v1.2-csd01.html>

Latest stage:

<https://docs.oasis-open.org/virtio/virtio/v1.2/virtio-v1.2.pdf>

<https://docs.oasis-open.org/virtio/virtio/v1.2/virtio-v1.2.html>

Technical Committee:

OASIS Virtual I/O Device (VIRTIO) TC

Chairs:

Michael S. Tsirkin (mst@redhat.com), Red Hat

Cornelia Huck (cohuck@redhat.com), Red Hat

Editors:

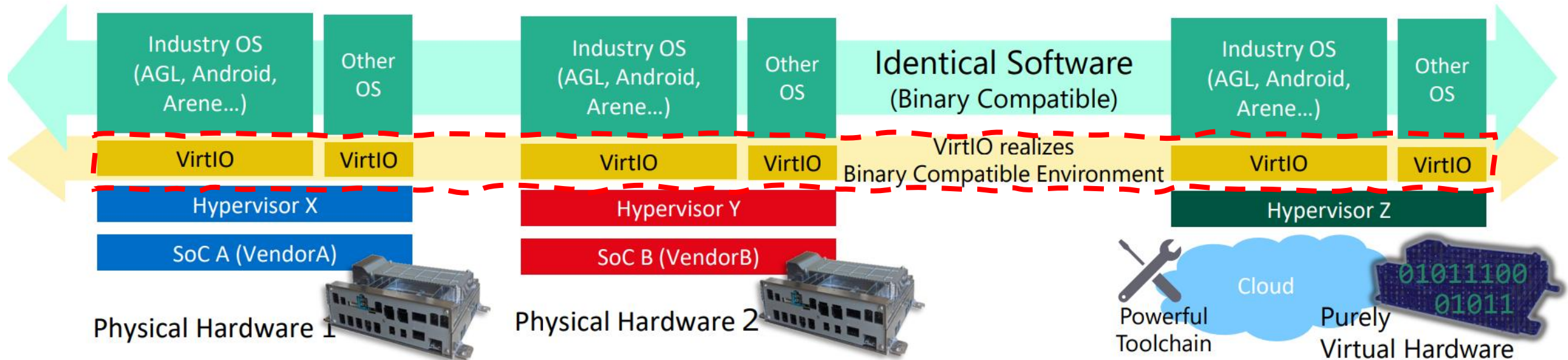
Michael S. Tsirkin (mst@redhat.com), Red Hat

Cornelia Huck (cohuck@redhat.com), Red Hat

VirtIO support for Xen



ARM: Add “tech preview” implementation for VirtIO. Xen now includes full support for VirtIO on embedded systems, on ARM, for the virtio-mmio transport, allowing a wide range of VirtIO devices to be supported. This includes front-end support in Linux, toolstack (libxl/xl) and dom0less support, and a userspace backend. Currently, the following stand-alone backends are available and have been tested: virtio-disk, virtio-net, i2c, and gpio.



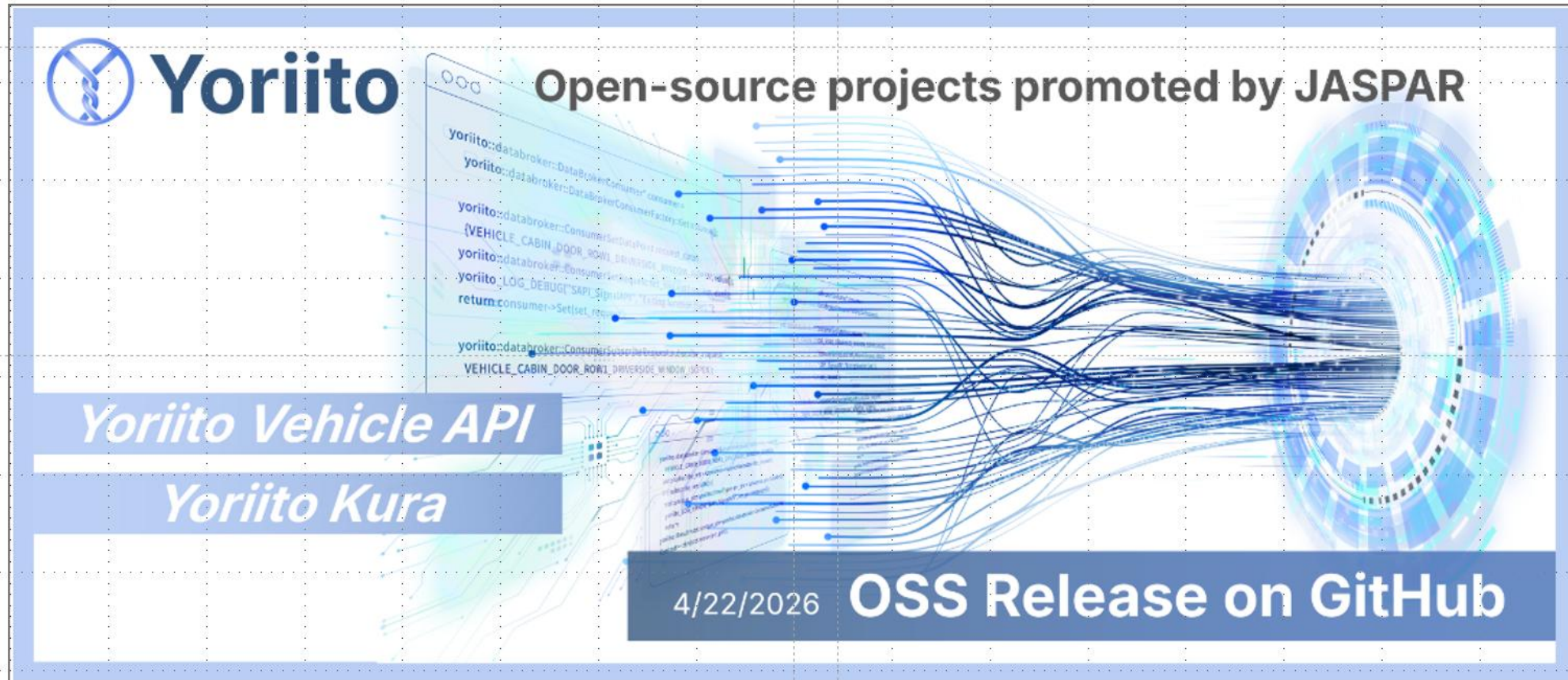
Panasonic Automotive Systems secures industry-wide endorsement for its initiative to standardize VirtIO device virtualization technology

~Development of VirtIO-compliant in-vehicle software platform completed~

Yokohama, Japan, February 24, 2026 – Panasonic Automotive Systems Co., Ltd. (Headquarters: Yokohama, Kanagawa, Japan; President: Masashi Nagayasu) has been actively promoting the global adoption and industry-wide standardization of VirtIO—an open-source device virtualization technology advanced by industry groups such as AGL*¹, Android™, OASIS*², and SOAFEE*³—for automotive applications. Today, our efforts have gained industry-wide endorsement from Honda Motor Co., Ltd., Mazda Motor Corporation, Mitsubishi Motors Corporation, Nissan Motor Co., Ltd., Toyota Motor Corporation, as well as related companies in the IT and other sectors. In addition, we have completed the development of a VirtIO-compliant in-vehicle software platform for CDC (Cockpit Domain Controller). Moving forward, we will continue to develop and promote VirtIO-compliant automotive software to contribute to innovation in vehicle development.

Open Standards & Consortiums(JASPAR)

1st OSS Release !!



The image shows a promotional graphic for Yoriito. On the left is the Yoriito logo, a blue circle with a white caduceus-like symbol. To its right is the text "Yoriito" in a large, bold, blue font. Below this, there are three blue rectangular boxes containing the text "Yoriito Vehicle API", "Yoriito Kura", and "4/22/2026 OSS Release on GitHub". The background features a stylized blue and white graphic of a car's interior with various components labeled with code snippets such as "yoriito::databroker::DataBrokerConsumer", "yoriito::databroker::DataBrokerConsumerFactory", "yoriito::databroker::ConsumerSettings", "yoriito::databroker::ConsumerSettings", "yoriito::LOG_DEBUG", and "return consumer->Setset". The overall design is modern and technical, with a blue and white color scheme.

More open. More free. Automotive software—built by everyone

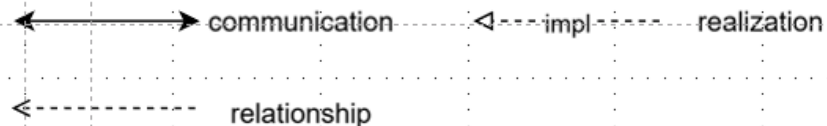
Architecture and scope

Legends:

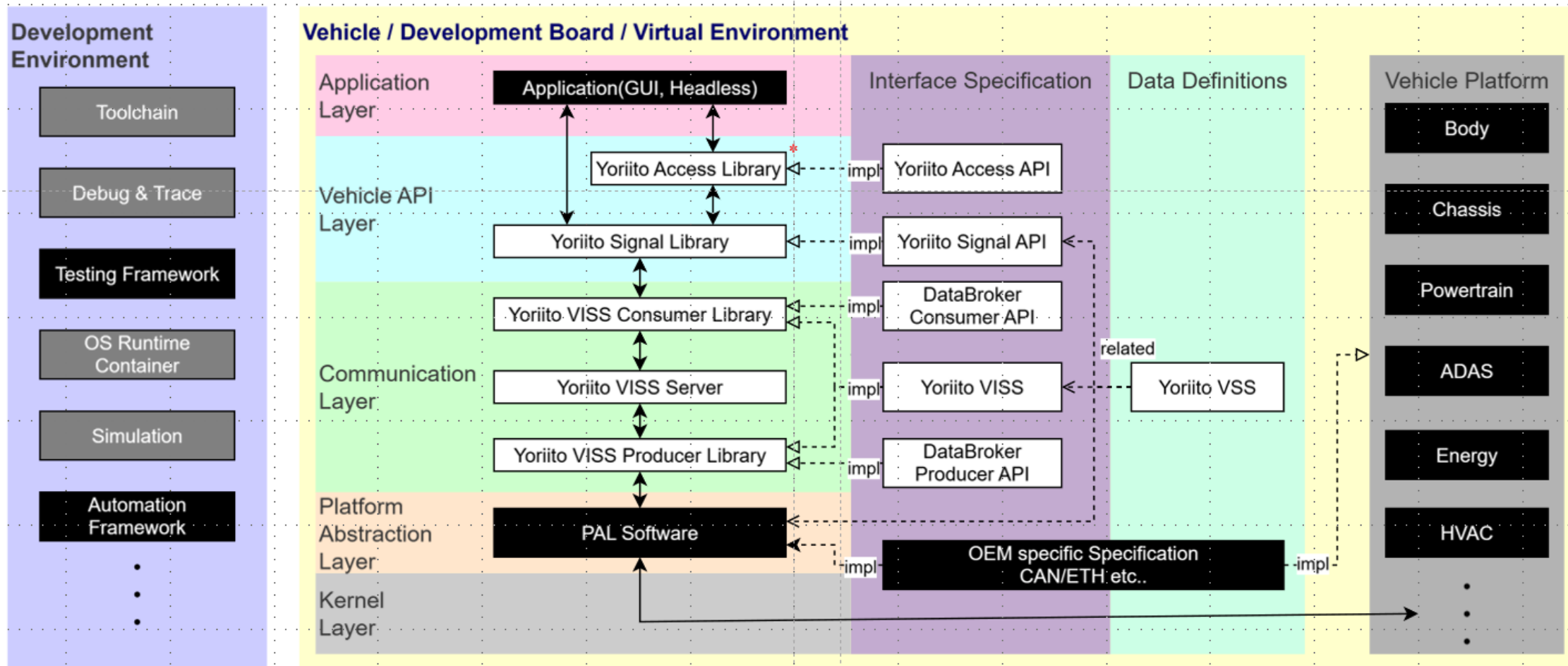
Not Supported Component
(Only Sample provided)

Partially Supported Component

Supported Component



* Under development




Welcome to the Yoriito Project

This GitHub organization hosts artifacts from the activities of the [JASPAR API standardization WG](#).

Introduction to the Yoriito Project

For more information, please see the Yoriito [homepage](#).

Organization Repositories

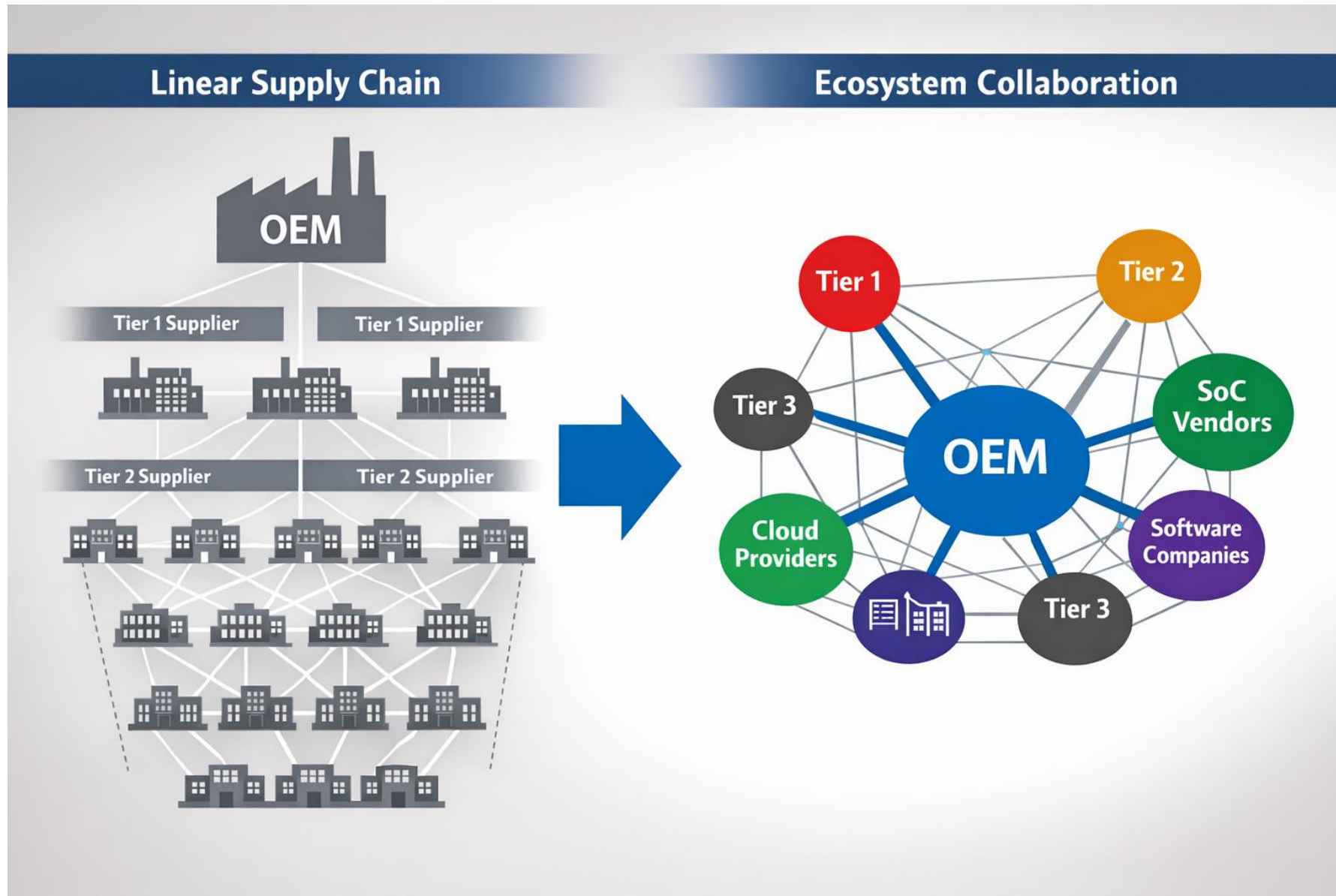
Repository	Description	Status
yoriito	Main repository for the Yoriito project	 active

Why open source is important



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Shift 3: Linear Supply Chain → Ecosystem



blob: 13b083f073883156df7cdb23190827b56d491e7d [file] [log] [blame] [edit]

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <manifest>
3
4   <remote name="aosp"
5         fetch=".."
6         review="https://android-review.googlesource.com/" />
7   <default revision="android14-qpr3-release"
8         remote="aosp"
9         sync-j="4" />
10
11  <superproject name="platform/superproject" remote="aosp" revision="android14-qpr3-release"/>
12  <contactinfo bugurl="go/repo-bug" />
13  <project path="build/make" name="platform/build" groups="pdk,sysui-studio" >
14    <linkfile src="CleanSpec.mk" dest="build/CleanSpec.mk" />
15    <linkfile src="buildspec.mk.default" dest="build/buildspec.mk.default" />
16    <linkfile src="core" dest="build/core" />
17    <linkfile src="envsetup.sh" dest="build/envsetup.sh" />
18    <linkfile src="target" dest="build/target" />
19    <linkfile src="tools" dest="build/tools" />
20  </project>
21  <project path="build/orchestrator" name="platform/build/orchestrator" groups="pdk" />
22  <project path="build/bazel" name="platform/build/bazel" groups="pdk" >
23    <linkfile src="bazel.WORKSPACE" dest="WORKSPACE" />
24    <linkfile src="bazel.BUILD" dest="BUILD" />
25  </project>
26  <project path="build/bazel_common_rules" name="platform/build/bazel_common_rules" groups="pdl" />
27  <project path="build/blueprint" name="platform/build/blueprint" groups="pdk,tradefed" />
```

OSS Repository
58.9% (799/1,357)

[platform/external/aac](#)

[platform/external/abi-compliance-checker](#)

[platform/external/abi-dumper](#)

[platform/external/abseil-cpp](#)

Bug: 121037047

[platform/external/accessibility-test-framework](#)

Bug: 328779485

[platform/external/accompanist](#)

Bug: 324277532

[platform/external/actionbarsherlock](#)

[platform/external/adeb](#)

Bug: 111852163

[platform/external/adhd](#)

Bug: 111264136

[platform/external/adt-infra](#)

[platform/external/aeht](#)

Bug: 306906844

[platform/external/aes](#)

[platform/external/AFLplusplus](#)

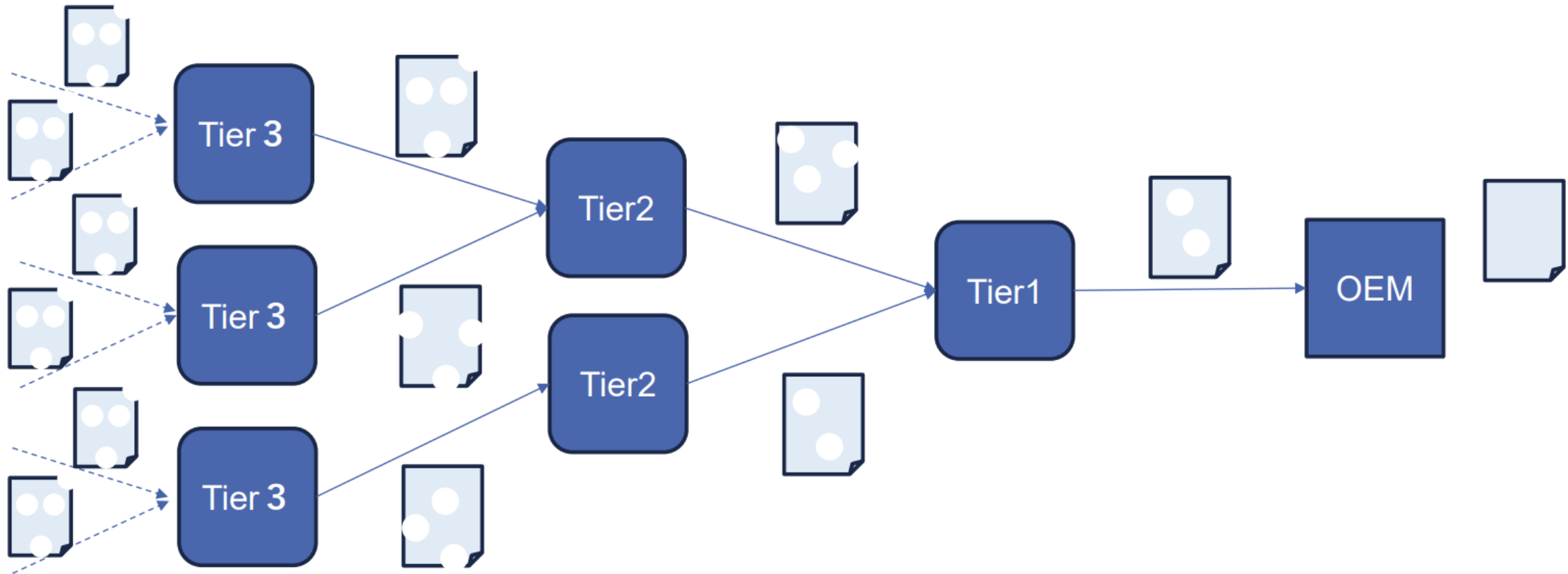
[platform/external/alach](#)

[platform/external/alsa-lib](#)

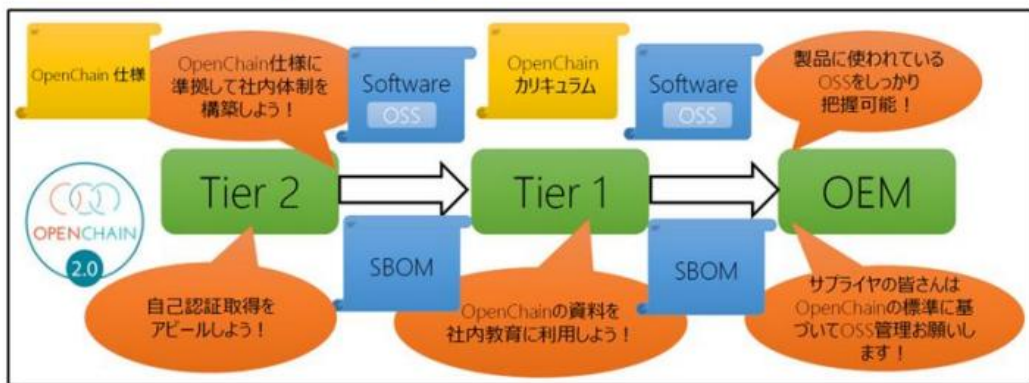
<https://android.googlesource.com/platform/manifest/+refs/heads/android14-qpr3-release/default.xml>

<https://lfms25.sched.com/event/1urXW/understanding-and-managing-sboms-in-modern-automotive-vehicles-a-journey-yuichi-kusakabe-takashi-ninjouji-honda-motor-co-ltd>

Addressing resource constraints and workflow integration



■ We adopted OpenChain's SPDX Lite (Excel) to smoothly share OSS information between companies.



3.1	3.2	3.3	3.4	3.7	3.8	3.11	3.13	3.15
PackageName	Package SPDX Identifier	Package Version	PackageFileName	PackageDownloadLocation	Files Analyzed	PackageHomePage	Concluded License	Declared License
項	パッケージ名	パッケージSPDX識別子	パッケージバージョン	パッケージダウンロード位置(入手先)	解析したファイル(手作業の場合false)	ホームページ(OSS開発コミュニティサイト)	結論されたライセンス	宣言されたライセンス
LibXML2		2.99	libxml2-2.9.9.tar.gz	http://xmlsoft.org/libxml2/	FALSE	http://xmlsoft.org/	MIT	MIT
PCRE		8.4343	pcre-8.43.tar.gz	http://ftp.pcre.org/pub/pcr/	FALSE	https://www.pcre.org/	BSD-3-Clause	BSD-3-Clause
SQLite		3300100.1	sqlite-autoconf-3300100.tar.gz	https://www.sqlite.org/download.html	FALSE	https://www.sqlite.org/index.html	その他(ライセンス名を記載)	その他(ライセンス名を記載)
Zlib (1.2.3)		1.2.11	zlib-1.2.11.tar.gz	https://www.zlib.net/	FALSE	https://www.zlib.net/	Zlib	Zlib
cURL (7.41.0)		7.66.0	curl-7.66.0.tar.bz2	https://github.com/curl/curl/releases	FALSE	https://curl.haxx.se/	MIT	MIT

G.2 Format of SPDX Lite

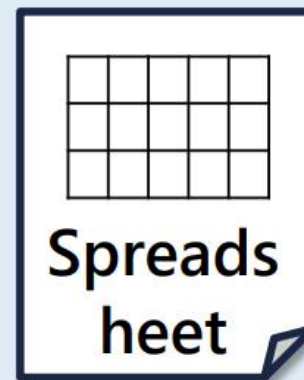
The SPDX Lite profile is a subset of the SPDX specification. SPDX Lite consists of mandatory fields of the Document Creation and Package Information sections and other basic information. Cardinality of each item is not changed.

The mandatory part of the SPDX document creation information section (which consists of SPDX Version, Data License, SPDX Identifier, Document Name, SPDX Document Namespace, Creator and Created) is used for keeping compatibility with SPDX tools.

The main part of the Package Information (those are Package Name, Package Version, Package File Name, Package Supplier, Package Download Location, Package Home Page, Concluded License, Declared License, Comments on License and Copyright Text) is used for exchanging license information.

https://www.meti.go.jp/shingikai/mono_info_service/sangyo_cyber/wg_seido/wg_bunyaodan/software/pdf/003_04_00.pdf
<https://github.com/OpenChain-Project/Japan-WG-General/tree/master/License-Info-Exchange>
<https://spdx.github.io/spdx-spec/v2.3/SPDX-Lite/>

Format
Annex of
ISO/IEC 5942 (SPDX
2.2.1), SPDX 2.3



Elements
Annex of
ISO/IEC 5942 (SPDX
2.2.1), SPDX 2.3

- Component**
- Package Name
 - Package Version
 - Concluded License
 - Copyright Text
 - Other elements

<https://lfms25.sched.com/event/1urXW/understanding-and-managing-sboms-in-modern-automotive-vehicles-a-journey-yuichi-kusakabe-takashi-ninjouji-honda-motor-co-ltd>

Self-certification to “OpenChain” Process Management Standards

- Clearly documented policy & training encourage positive attitude
- OSPO, structured organizational process, and toolchain
- Well communication , with confident, and continuously Improve

Methods

Materials reviewed and advised by a self-certified Japanese company



- <https://openchainproject.org/news/2023/12/06/honda-announces-iso5230-program>
- <https://openchainproject.org/news/2024/10/16/honda-announces-iso18974-program>


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Automotive Grade Linux Launches Open Source SoDeV Reference Platform to Accelerate Software Defined Vehicles

By AGL | December 5, 2025 | Announcements

New AGL SoDeV reference platform supports ECU consolidation, virtualization, hardware abstraction and cloud integration for next-generation vehicles.

Highlights:

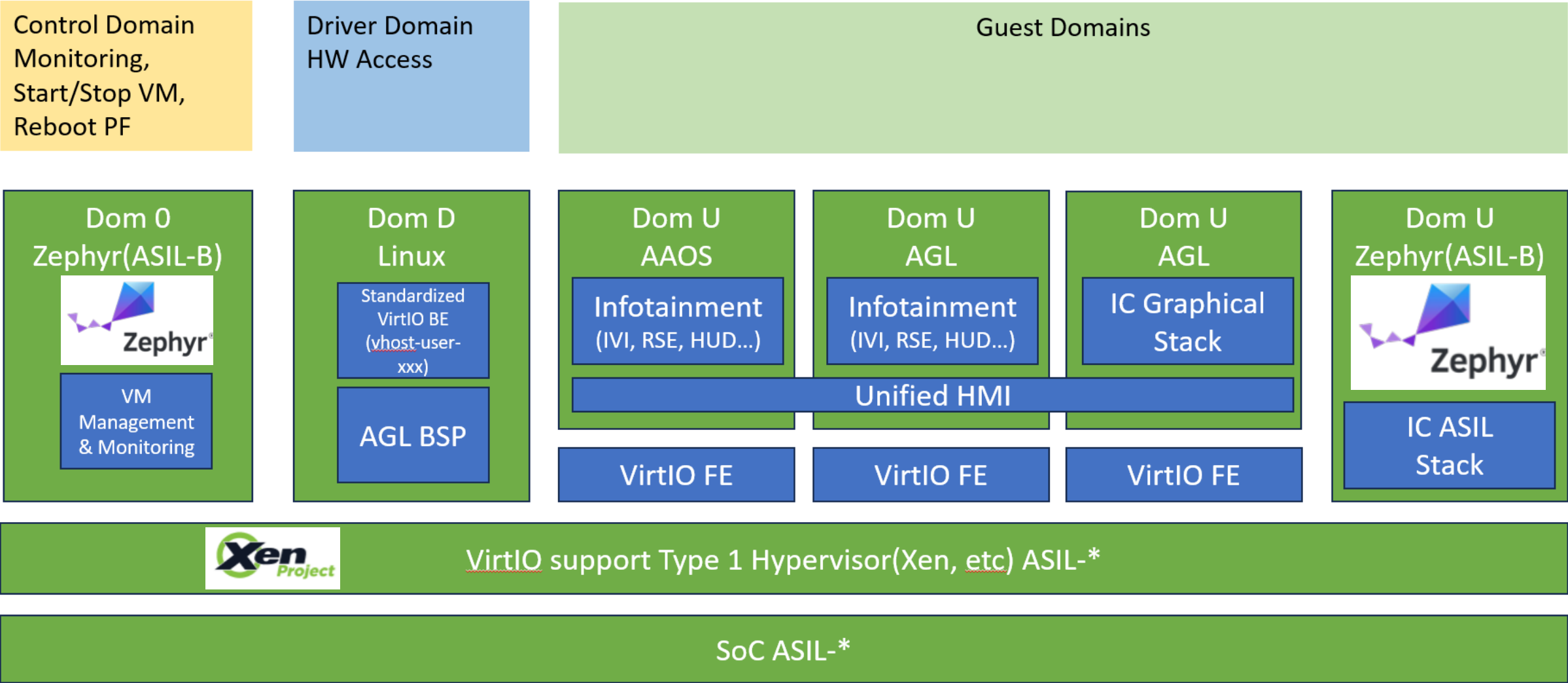
- **AGL SoDeV** is an open source reference platform for software defined vehicles enabling software-first development, independent of hardware constraints.
- The initiative is led by **Panasonic Automotive Systems, Honda, and the AGL SDV Expert Group**, with contributions from Toyota, Mazda, AISIN and Renesas.
- SoDeV integrates the **AGL Unified Code Base** with key open source projects including **Linux Containers, VirtIO, Xen, Yocto Project, Zephyr and ELISA**.
- Availability is planned for **early 2026** for virtual environments, cloud processors and automotive SoCs.

SAN FRANCISCO, December 5, 2025 – **Automotive Grade Linux** (AGL), a collaborative cross-industry effort developing an open source platform for connected car technologies, today announced SoDeV, a new open source SDV reference implementation that enables software-first development, decoupled from hardware constraints.

Led by Panasonic Automotive Systems, Honda and the AGL Software Defined Vehicle (SDV) Expert Group, SoDeV combines the AGL Unified Code Base (UCB) with multiple open source projects hosted by the Linux Foundation to support consolidation of ECUs, hardware abstraction using virtualization, and cloud integration for next-generation vehicles. Additional contributors to SoDeV include Toyota, Mazda, AISIN and Renesas.

<https://www.automotivelinux.org/announcements/sodev/>

SoDeV Architecture Overview(SoC ASIL-A/B)



VirtIO support Type 1 Hypervisor(Xen, etc) ASIL-*

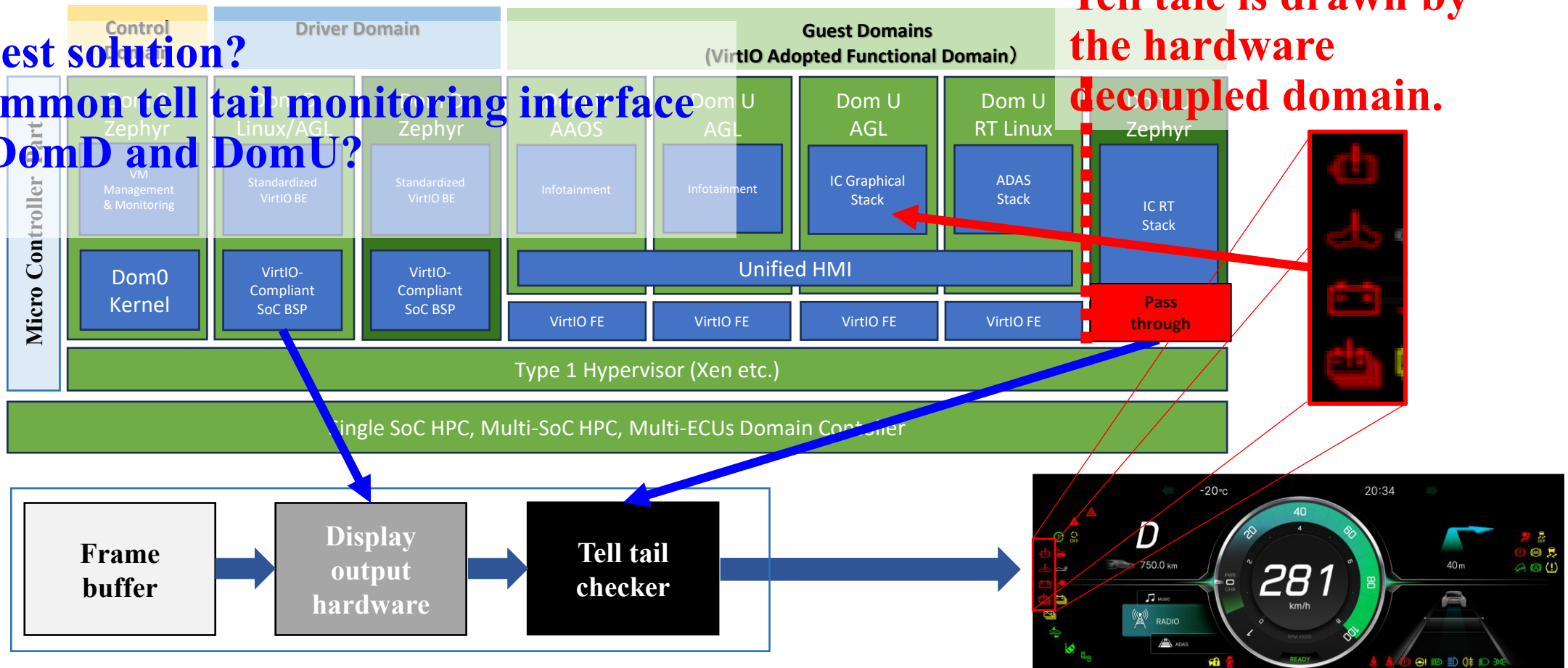
SoC ASIL-*

SoDeV safety use case(Zephyr pass-through)

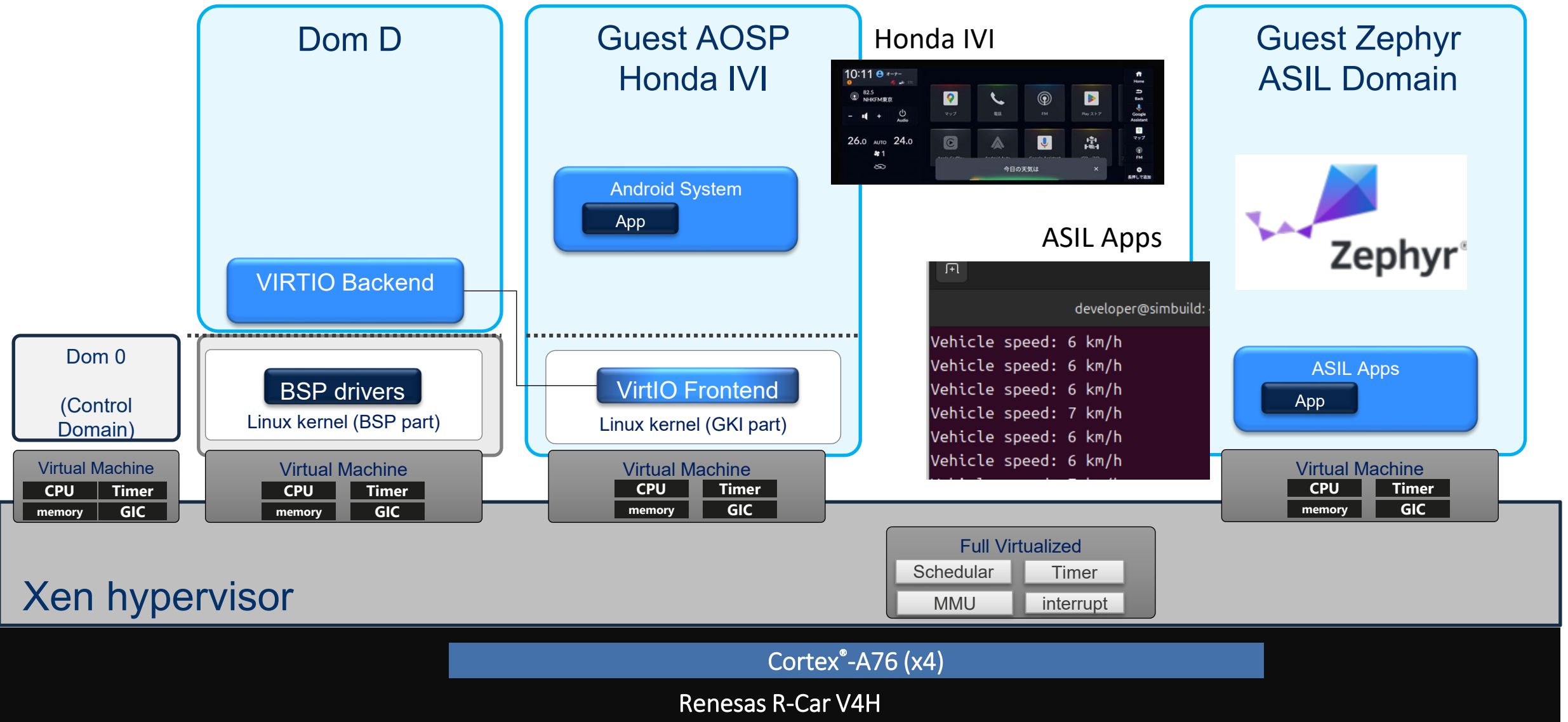
- How to achieve safety?
 - Example use case: Tell tale for instrument cluster.

**What is best solution?
Create common tell tail monitoring interface
between DomD and DomU?
Others?**

**Tell tale is drawn by
the hardware
decoupled domain.**



AGL SDV Reference PF(V4H) - SoDeV -





main

1 Branch 0 Tags

Go to file

Add file

Code

hiroishii Bump external/meta-rcar-demo

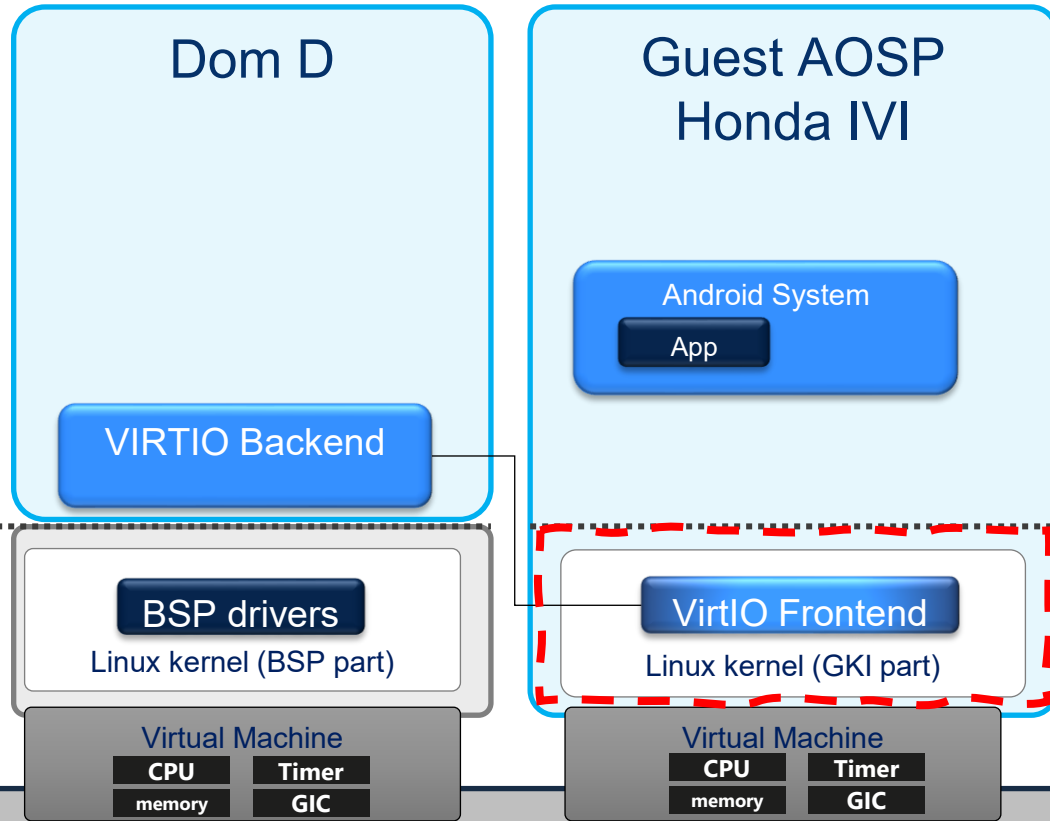
354923a · 15 hours ago 27 Commits

agl/patches	Change AGL repository to github fork	3 months ago
external	Bump external/meta-rcar-demo	15 hours ago
flatcar	Bump submodules	last week
.gitignore	Add DomAGL-IVI and DomAGL-IC guests	4 months ago
.gitmodules	add flatcar build process to build.sh	last month
LICENSE	Initial commit	5 months ago
README.md	Update README.md	5 months ago
build.sh	Disable Android and Flatcar guests by default	last week

README Apache-2.0 license

sodev-demo-workspace

AGL SDV Reference PF(New SoC X5H) - SoDeV -

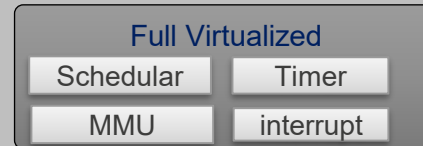


Honda IVI



Porting in a very short time

Xen hypervisor



Cortex®-A720AE (x32)

Renesas R-Car X5H

New SoC

Text Channels ▾

japanese-language

RPi5 SoDeV立ち上げスレッド

general

all-member-meetings

off-topic

weekly-dev-call

google-summer-of-code

industry-news

autoworld-japan

embedded-world

Voice Channels ▾

Lounge

Meeting Room

Expert Groups ▾

system-architecture-team

<https://github.com/xen-troops/meta-xt-prod-devel-rpi5/tree/main>
を使用して、下記の構成案を実現出来れば、SoDeVが実現出来るかもしれない
RPi5 (2x HDMI)

- └ Xen (Xen-Troops)
 - └ Dom0: Zephyr
 - └ DomD: Linux/Yocto (GPU/HDMI)
 - └ Weston (kiosk-shell, DRM backend)
 - └ HDMI-A-1: DomD UI (AGL IC)
 - └ HDMI-A-2: QEMU (SDL) = DomU GUI
 - └ QEMU device-model (SDL, virtio-vga-gl)
 - └ DomU: Linux/Yocto (VirtIO-GPU + AGL IVI)

GitHub

[GitHub - xen-troops/meta-xt-prod-devel-rpi5](#)

Contribute to xen-troops/meta-xt-prod-devel-rpi5 development by creating an account on GitHub.

xen-troops/**meta-xt-prod-devel-rpi5**



5 Contributors 2 Issues 19 Stars 15 Forks



Raspberry Pi5(RPi5) HW

Raspberry Pi **5** **16GB RAM**

For power users and professional applications.

Raspberry Pi 5 16GB is available now for \$305.



Broadcom BCM2712 2.4GHz quad-core 64-bit Arm Cortex-A76 CPU, with cryptography extensions, 512KB per-core L2 caches and a 2MB shared L3 cache

VideoCore VII GPU, supporting OpenGL ES 3.1, Vulkan 1.3

Dual 4Kp60 HDMI® display output with HDR support

4Kp60 HEVC decoder

LPDDR4X-4267 SDRAM (1GB, 2GB, 4GB, 8GB, and 16GB)

Dual-band 802.11ac Wi-Fi®

Bluetooth 5.0 / Bluetooth Low Energy (BLE)

microSD card slot, with support for high-speed SDR104 mode

2 × USB 3.0 ports, supporting simultaneous 5Gbps operation

2 × USB 2.0 ports

Gigabit Ethernet, with PoE+ support (requires separate PoE+ HAT)

2 × 4-lane MIPI camera/display transceivers

PCIe 2.0 x1 interface for fast peripherals (requires separate M.2 HAT or other adapter)

5V/5A DC power via USB-C, with Power Delivery support

Raspberry Pi standard 40-pin header

Real-time clock (RTC), powered from external battery

Power button

main

7 Branches 8 Tags

Go to file

T

Add file

Code



Svitlana Drozd and drozd-svtln readme: Update the changelog and bump up the release



a577f08 · 5 months ago



76 Commits

doc

Add support for Docker image

8 months ago

layers

rpi5-image-xt-domd, yaml: Add packages for graphics

6 months ago

.gitignore

reorganize project to match the new structure

last year

LICENSE

Initial commit

2 years ago

README.md

readme: Update the changelog and bump up the release

5 months ago

rpi5.yaml

yaml: Add the parameter to configure early printk for Xen

6 months ago

README

Apache-2.0 license



meta-xt-prod-devel-rpi5

meta-xt-prod-devel-rpi5



```
$ moulin rpi5.yaml --help-config
```

```
usage: moulin rpi5.yaml [--MACHINE {rpi5}] [--XEN_EARLY {yes,no}] [--DOMD_ROOT {usb,nvme}] [--ENABLE_SCMI {yes,no}] [--ENABLE_WIFI {yes,no}]
```

```
    [--ENABLE_CAN {mcp2515-can,seed-can-fd-hat-v2,no}] [--ENABLE_HDMI {yes,no}]
```

Config file description: Raspberry 5 with xen dom0less

options:

`--MACHINE {rpi5}` Raspberry Pi machines (default: rpi5)

`--XEN_EARLY {yes,no}` Enable early printk for Xen (default: yes)

`--DOMD_ROOT {usb,nvme}`

Domd root device (default: usb)

`--ENABLE_SCMI {yes,no}`

Enable ARM SCMI support (default: no)

`--ENABLE_WIFI {yes,no}`

Allow wifi in domd (default: no)

`--ENABLE_CAN {mcp2515-can,seed-can-fd-hat-v2,no}`

Allow CAN in DomD and choose it type. The naming of options align with the overlay naming used in RPI OS (default: no)

`--ENABLE_HDMI {yes,no}`

Allow HDMI in DomD (default: no)

Xen(ENABLE_HDMI) + Dom0(Zephyr) + DomD/U(Linux)



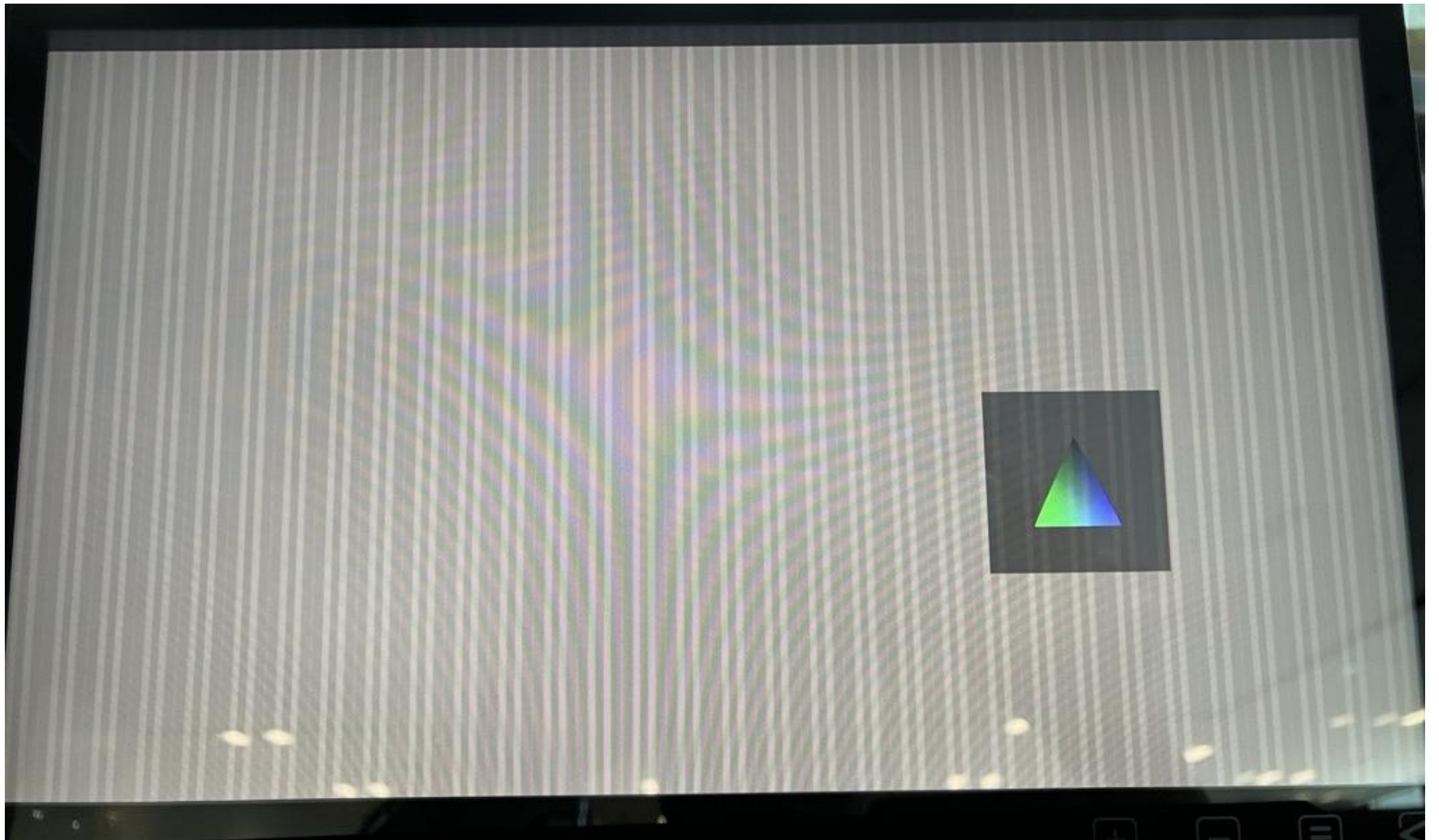
AGL SDV Reference PF(RPi5) - SoDeV -



xl subcommand	V4H Linux Dom0	RPi5 Linux DomD	RPi5 Zephyr Dom0 (xu)
<code>xl create <cfg></code>	✓	✗	☐ <code>xu create</code>
<code>xl create -p (paused)</code>	✓	✗	☐ <code>xu create -p</code>
<code>xl create -c (console attach)</code>	✓	✗ (no xenconsoled)	✗
<code>xl create -F (foreground)</code>	✓	✗	✗
<code>xl destroy <dom></code>	✓	✗	☐ <code>xu destroy</code>
<code>xl shutdown <dom></code>	✓	✗	✗
<code>xl reboot <dom></code>	✓	✗	✗
<code>xl pause <dom></code>	✓	✗	☐ <code>xu pause</code>
<code>xl unpause <dom></code>	✓	✗	☐ <code>xu unpause</code>

Coverage by category (combined: RPi5 DomD + Zephyr Dom0)

Category	Commands	Available on RPi5	Coverage
A. Domain lifecycle	14	6 (via xu)	43 %
B. Domain info	10	4	40 %
C. VCPU	3	0	0 %
D. Memory	4	0	0 %
E. Block	5	2 (including xenstore-write substitutes)	40 %
F. Network	6	2	33 %
G. USB / vTPM	4	0	0 %
H. PCI	4	0	0 %
I. xen-troops PV	3	3 (via xenstore-write)	100 %
J. CPU pool / scheduler	11	0	0 %
K. Debug / trace	4	0	0 %
L. Boot / Console	3	1 (xu console)	33 %
M. Driver domain	1	1 (xl devd ✓)	100 %
Total	72	19	26 %



Xen + Dom0(Zephyr) + DomD/U(without GPU)



Dom0 (Zephyr)

id=0, 128 MB, 1 vCPU

zephyr-dom0-xt

xen-tools / xu shell

domain control
+ DomU 起動 (xu create)

★ domain config:

- linux_pv_domu
- linux_pv_domu2

DomU.1 — linux_pv_domu (AGL IC)

id=2, 256 MB, 2 vCPU / Yocto Poky 5.0.10

agl-ic-demo (Cairo + SHM 自作)

weston (DomU 内、mesa CPU)

xen-front DRM (display front)

xen-blkfront (rootfs /dev/xvda)

bootargs: console=hvc0 (icdemo 無し)

app-id "DomU.1" → HDMI-A-2

1920×720, SPEED 0..120 km/h sweep
TACHO, FPS 表示

DomU.2 — linux_pv_domu2 (AGL ㊦)

id=3, 256 MB, 2 vCPU / Yocto Poky 5.0.10

agl-logo-rotate (simple-egl 派生)

weston (DomU 内、mesa CPU)

xen-front DRM (display front)

xen-blkfront (loop99 on DomD)

bootargs: icdemo=simple-egl

app-id "DomU.2" → HDMI-A-1

1920×1080 FHD, 4 秒周期回転
FPS 表示

DomD (Driver Domain)

id=1 (Dom0less-1), 512 MB, 1 vCPU / Yocto core-image-weston

weston (kiosk-shell.so, pixman renderer)

[output] HDMI-A-1 ← DomU.2, simple-egl | [output] HDMI-A-2 ← DomU.1

displ_be v0.2.1-52-gb218-dirty

C-ii patch (gntalloc 経路) / SHM via /dev/xen/gntalloc → wayland client

xendriverdomain (xenstored proxy + backend)

vc4-kms-v3d (DRM master / KMS)

setup-domu2.service (USB SSD → loop99)

Linux raspberrypi5-domd 6.12.25-v8-16k aarch64

passthrough: HDMI 0/1, V3D, USB, SD/SSD

★ 集中心: DomD 内 weston が KMS master、全 DomU frame の最終合流地

Xen 4.19-unstable — dom0less + Xen PV transport

xen-blkfront / xen-front (display) / displ_be SHM via gntalloc / event channel
xsm=flask flask=permissive | gnttab_max_frames=128 | dom0_mem=128M, dom0_max_vcpus=1

↓ HW passthrough (DomD 専有) ↓

Raspberry Pi 5 — BCM2712 + RP1

HDMI-A-1 (HDMI0)

→ AGL ㊦ 表示
(DomU.2 / 1920×1080)

HDMI-A-2 (HDMI1)

→ AGL IC 表示
(DomU.1 / 1920×720)

V3D / VPU GPU

DomD 専有
(KMS / vc4-kms-v3d)

USB 3.0 SSD

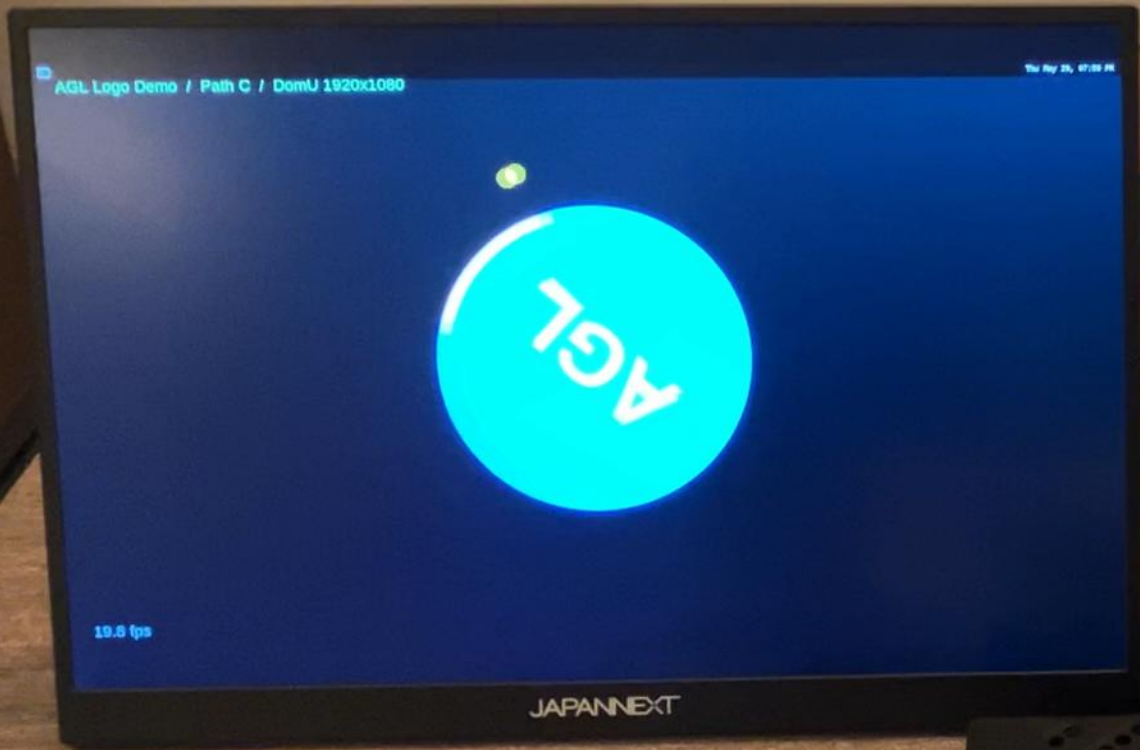
DomD: /dev/sda1
DomU: sda2 → loop99

SD カード

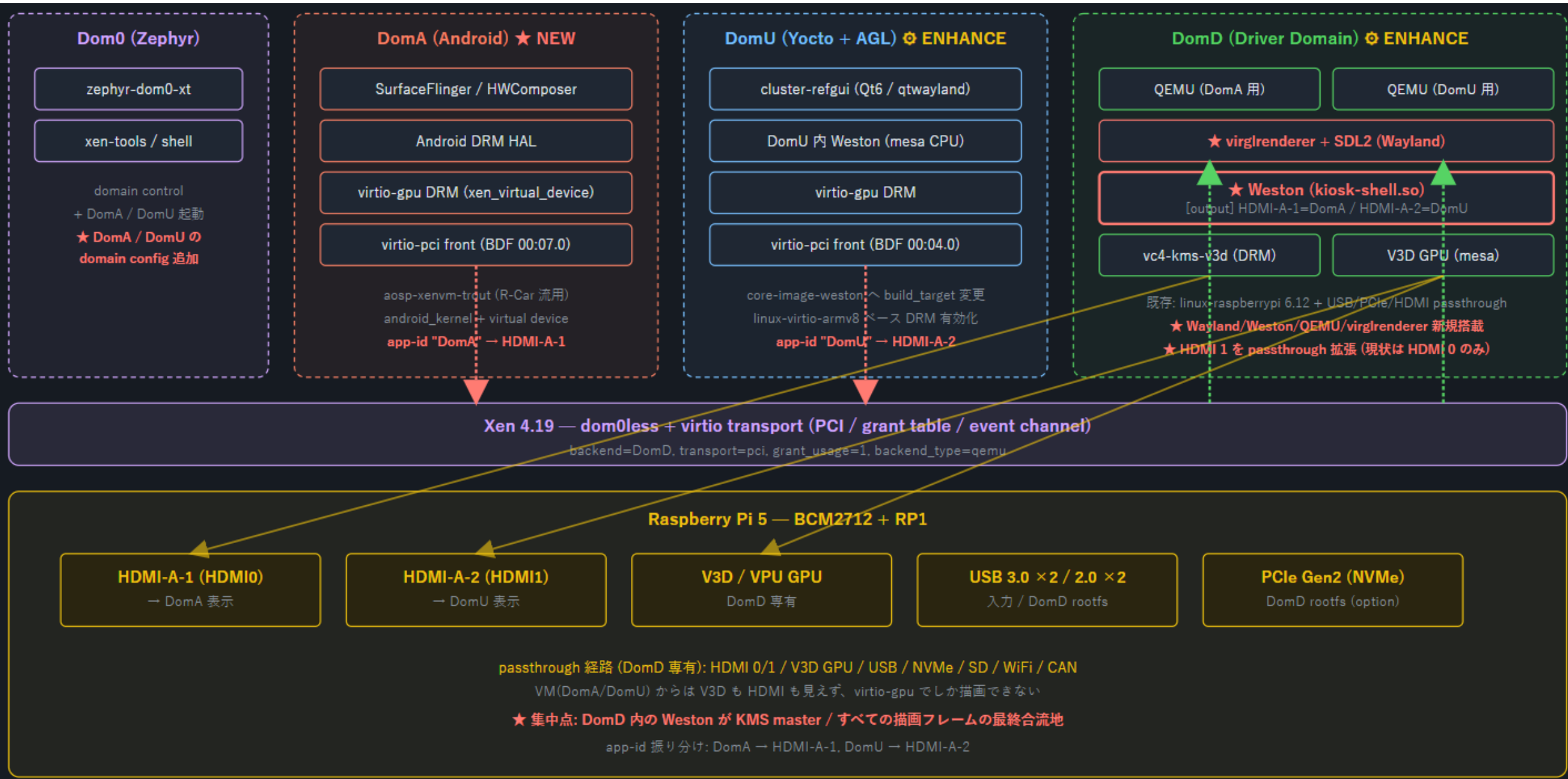
SD boot: Xen + Zephyr
+ DomD/DomU kernel

app-id 振り分け: DomU.1 → HDMI-A-2 (AGL IC, cluster 1920×720) / DomU.2 → HDMI-A-1 (AGL ㊦, FHD 1920×1080)

描画フロー: DomU 内 weston (mesa CPU) → xen-front DRM → displ_be (gntalloc SHM) → DomD weston (kiosk-shell, pixman) → vc4-kms-v3d → HDMI



Xen + Dom0(Zephyr) + DomA(Android) ★ NEW + DomU(Yocto + AGL) ✨ ENHANCE + DomD(Driver Domain) ✨ ENHANCE





MAY 13 – 14, 2026

TOKYO, JAPAN

Conclusion



- The automotive industry(SDV) is undergoing a paradigm shift
- It is impossible to achieve it alone
- However, the OSS community already has many solutions
- We need to move forward together with the OSS community

Open Source Software and Community one of the keys

Text Channels ▾

japanese-language

RPi5 SoDeV立ち上げスレッド

general

all-member-meetings

off-topic

weekly-dev-call

google-summer-of-code

industry-news

autoworld-japan

embedded-world

Voice Channels ▾

Lounge

Meeting Room

Expert Groups ▾

system-architecture-team

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xen-troops/**meta-xt-prod-devel-rpi5**



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Thank you very much

Let's build the future together and Open Way