OpenHarmony

Introduction to OpenHarmony

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OpenHarmony Concurrency & Coordination TSG Initial Member

Connected, Intelligent World: Calls for New Operating Systems

OpenHarmony

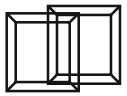
Replacement for manually punched cards

Batch processing

1956

First operating system
GM-NAA I/O

Multi-tasking
Improved performance



Host

1960s

- OS/360 (1964)
- UNIX (1969)

Keyboard and mouse based UI
Emergence of the software industry

PC internet

1980s

- **Windows (1985)**
- **Linux (1991)**

Touch-based UI
Portal of ecosystem

Mobile internet

2000s

- **iOS (2007)**
- **Android (2008)**

Empowering versatile industries with intelligence

Connected, intelligent world

2020s

- ?

What is a Connected, Intelligent World?

OpenHarmony

Healthcare
Making Health Computable, Bettering Quality of Life

Food
Data-driven Food Production for More Bountiful, Inclusive, and "Green" Diets

Cities
New Digital Infrastructure Makes Cities More Human and Livable

Energy
Intelligent, Green Energy for a Better Planet

Living Spaces
Personalized Spaces with Novel Interactive Experiences

Transportation
Smart, Low-carbon Transport Opens up the Mobile Third Space

Enterprises
New Productivity, New Production Models, New Level of Resilience

Digital trustworthiness
Digital Trust

# of connections worldwide	General-purpose computing power (FP32)	AI computing power (FP16)	Cloud services as % of total enterprise application expenditure	Share of renewable energy in global electricity generation
200 bn	3.3 ZFLOPS, 10x ⬆	105 ZFLOPS, 500x ⬆	87%	50%

Three Major Changes in a Connected, Intelligent World

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Mobile internet: Media-rich

Connected, intelligent world:
Diversified and Immersive + Scenario-oriented + Ecosystem-oriented

Computing
(Extension of human cognition)

PC
Mobile phone
Tablet

Augmented interaction
(Augmented human sense)

Large screen
TWS
Speaker
Watch
Intelligent cockpit
xR

(1)Diversified Immersive interaction

Entertainment
Office
Smart home
Sport and healthcare
Travel

(2)Scenario-oriented

(3)Ecosystem-oriented

Empowering a Connected, Intelligent World with OpenHarmony

OpenHarmony

Unified ecosystem for apps and services

HarmonyOS

Ultimate experience with software-hardware-chip-cloud integration to support Huawei's high-quality products.

HUAWEI

Third-party commercial releases & products

Empower a range of industries.

Open Source Community & Third-party

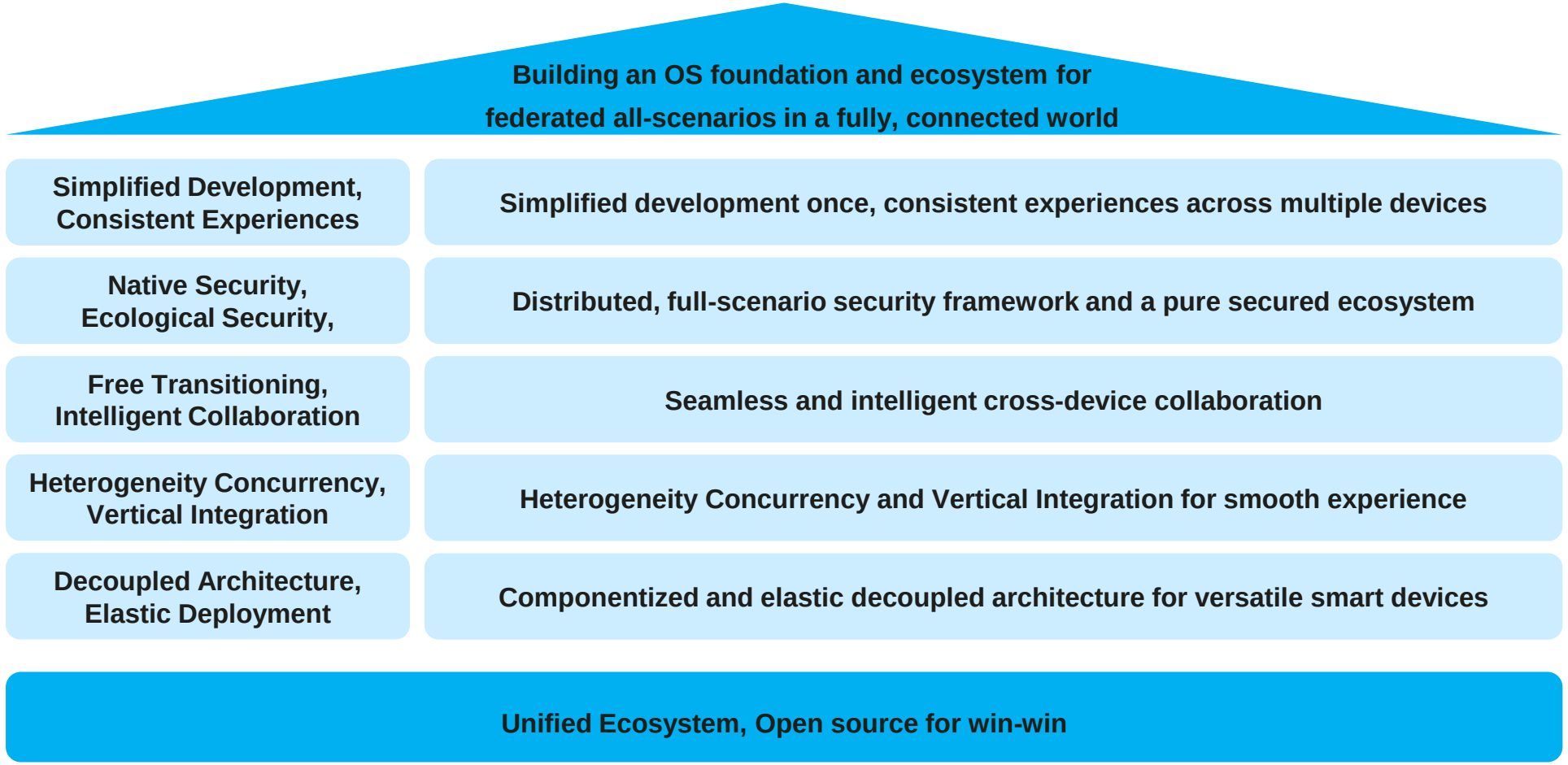
OpenHarmony

OpenHarmony

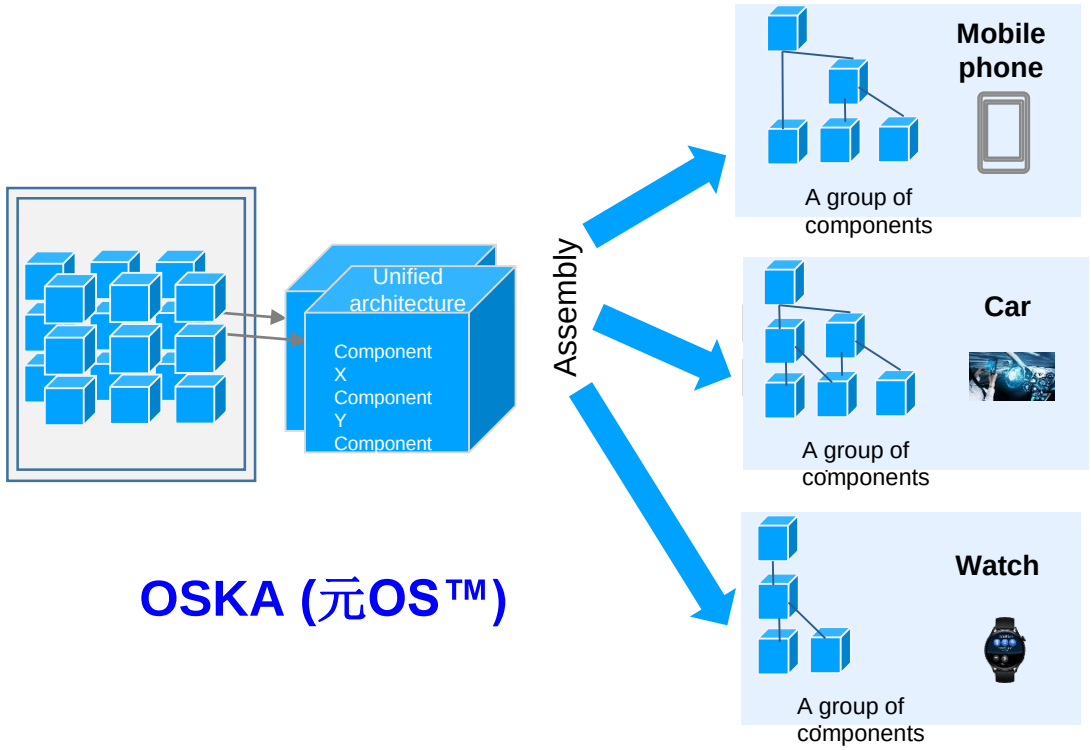
Advanced OS base for a connected, intelligent world

OpenHarmony: Vision, Design Philosophy and Architecture Characteristics

OpenHarmony



One OS Kit for All: Serving a Broad Spectrum of Devices



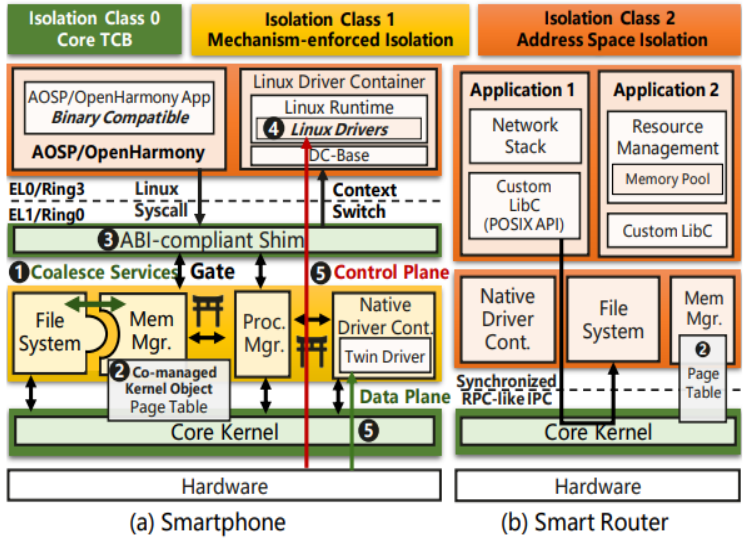
OSKA (元OS™)

1. **Unified architecture across different devices**
   - Fast time to market
   - Low R&D costs
2. **All-scenario collaboration and intelligence**
   - Cross-device cooperation
   - Transparent task offloading
3. **Open and unified ecosystem**
   - Write once, run everywhere

HongMeng Kernel: A Commercialized General-purpose Microkernel

OpenHarmony

Flexiblity



- Minimal microkernel with isolated, least-privileged OS services
- Flexible composition to accommodate diverse scenarios
- Linux API/ABI compatible

Recognized Security & Safety

- CC EAL 6+
- ASIL-D
- IEC 61508

Higher Performance

20% ↑

20%+ higher performance than Linux in commercialized products

Chen, Haibo, et al. "Microkernel Goes General: Performance and Compatibility in the {HongMeng} Production Microkernel." 18th USENIX Symposium on Operating Systems Design and Implementation (OSDI 24). 2024.

S4C: Safe and Scalable System Software Concurrency

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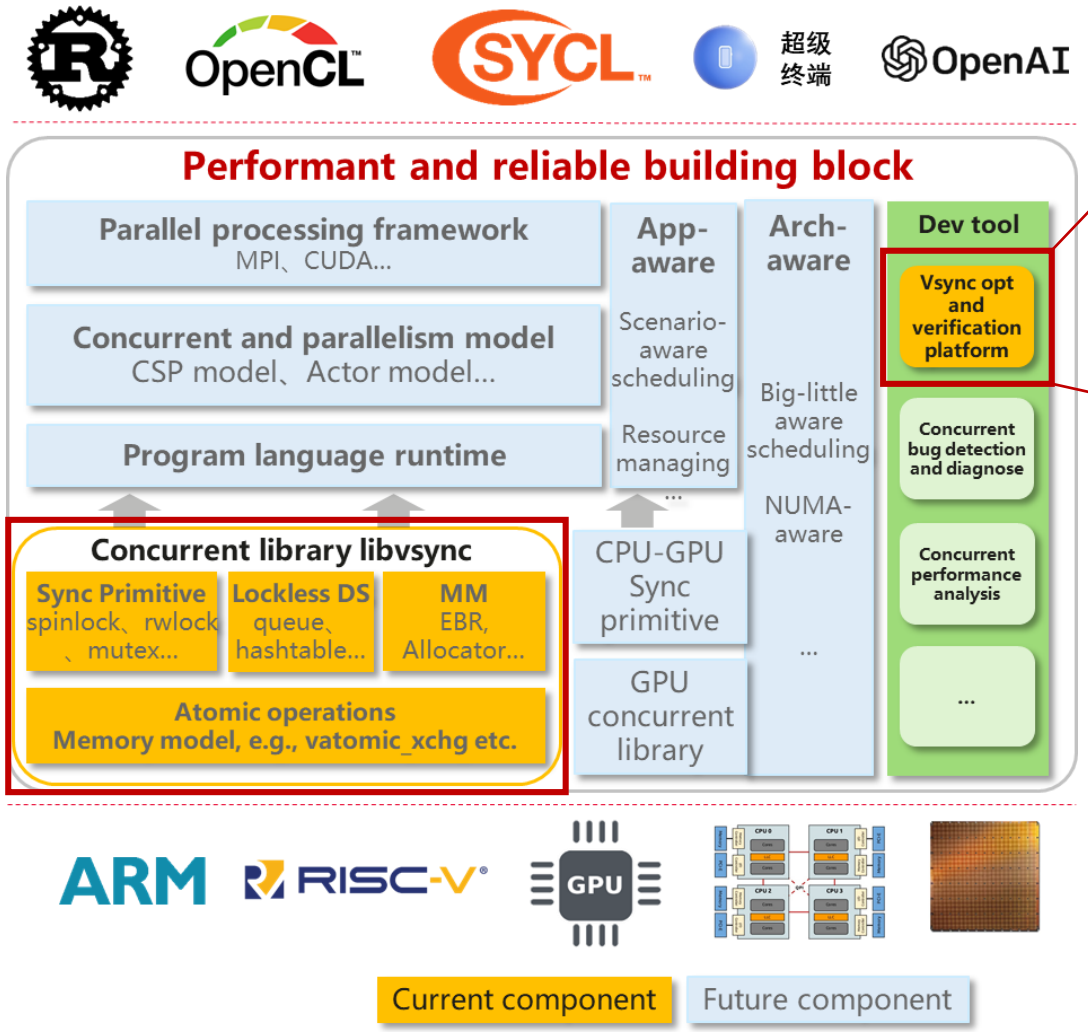
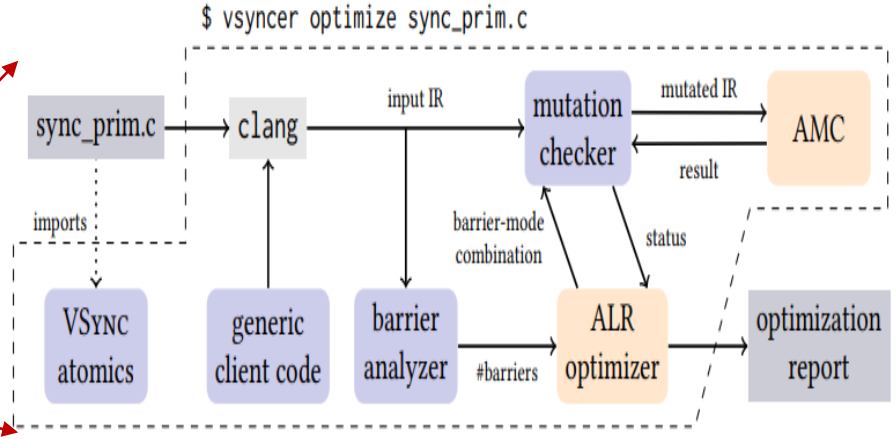




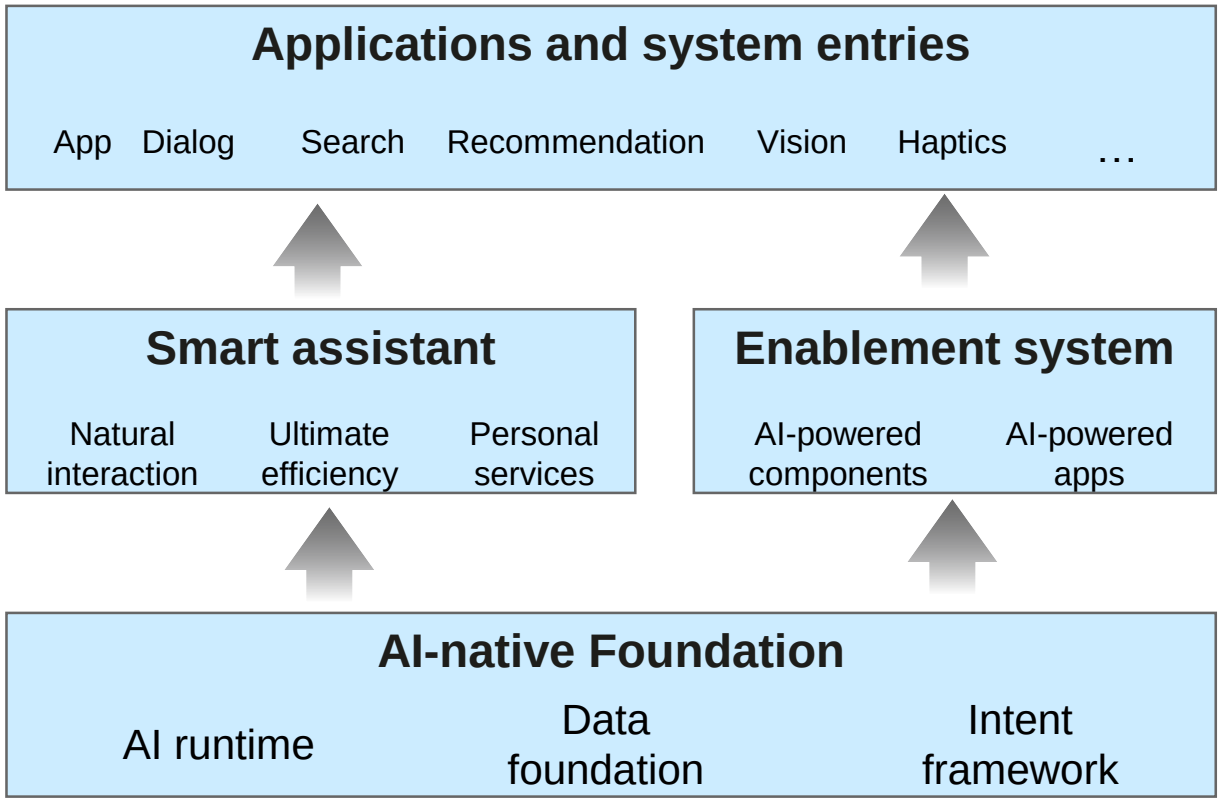
- libvsync open sourced in OpenHarmony

  [s4c: Safe and Scalable System Software Concurrency]

- Publications in top conferences:

  VSync (ASPLOS'21 Best Paper), CLoF (SOSP'21), BBQ (ATC'22), BWoS (OSDI'23), AtoMig (ASPLOS'23), Btrace (ASPLOS'25), etc.

AI-native capabilities brings in-depth intelligent innovation



- **Third-party apps can call OpenHarmony AI-native capabilities through AI-powered components and minor code modifications.**
- **More and more native intelligent components are opened, bringing in-depth innovation and transformation to third-party apps.**

Secure by Design: Security Architecture with Multi-level Compartmentalization

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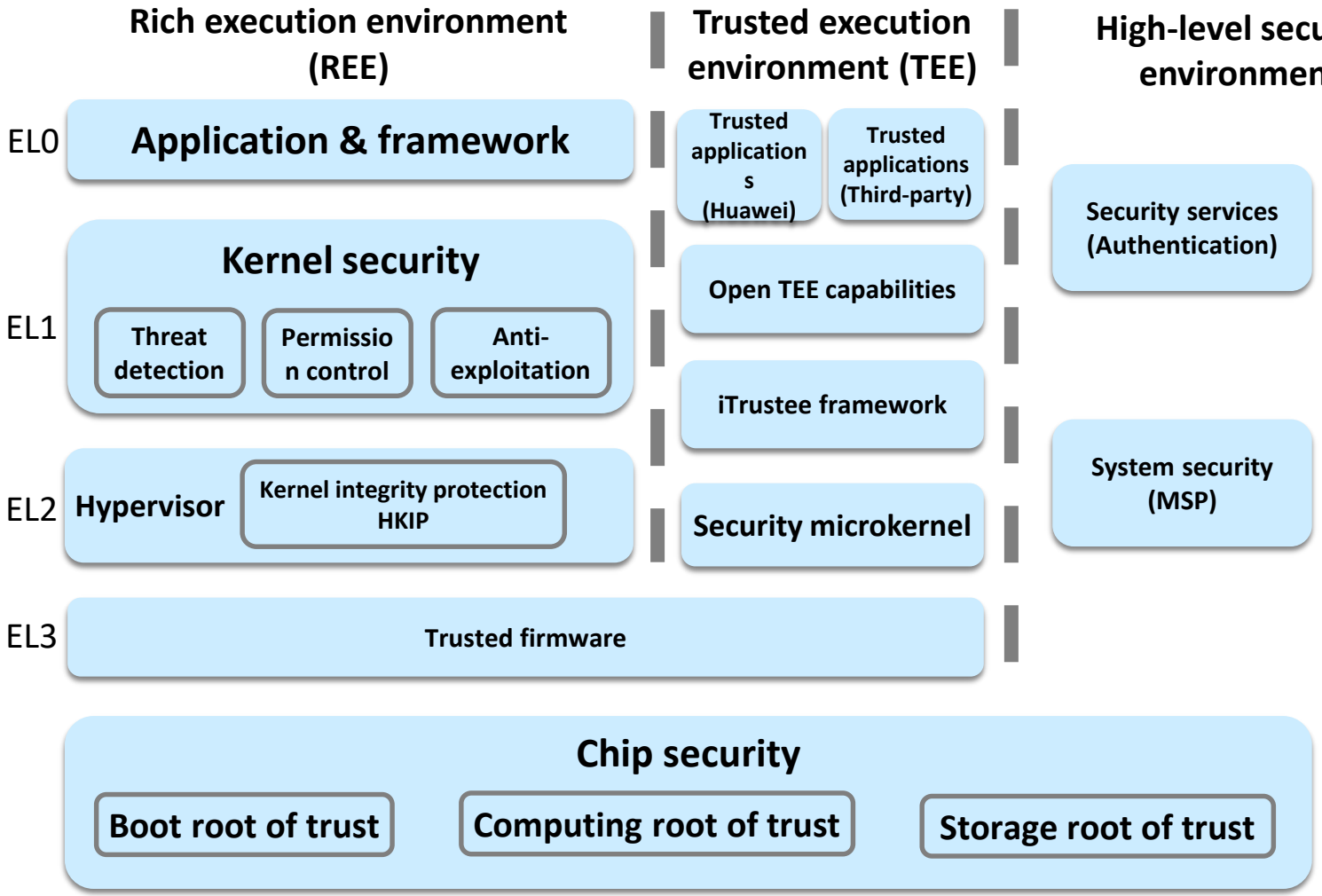


Hierarchical security of connected devices, device-device complementation, and device-cloud synergy

Cangjie：A Programming Language Oriented to Full-scenario Intelligence

OpenHarmony

High Performance

Full-concurrency GC in terminal scenarios, smoother application threads and faster response. Lightweight threads provide better concurrency performance and less overhead.

Strong Security

Security DNA is integrated into language design, helping developers focus on business logic without spending too much energy on defensive programming.

Intelligence

Embedded AgentDSL programming framework, organic integration of natural language and programming language

All Scenarios

Lightweight and scalable runtime, modular and layered design, supporting domain-oriented declarative development.

OpenHarmony: Fastest-Growing Open-Source OS Community for Devices

OpenHarmony

70+

Organization

Contributor

8200+

Contributors

120+ million

Code lines

1030+

Software and hardware products

Huawei builds HarmonyOS NEXT based on OpenHarmony

OpenHarmony

Secure at its core

Pure apps

100%
from trusted sources

100%
code signing

Privacy protection

7 types
of privacy data now restricted
Secure access to images, contacts, files, etc.

74%
fewer permission pop-ups
(vs. iOS 18)

Privacy and security at your beck and call

Smoother than ever

30%
smoother

56 min
longer battery life

Ark Engine for unprecedented smoothness

Native intelligence

More knowledgeable

Trillion-level
tokens

Inference & planning

90%
Success rate

HarmonyOS Intelligence
Intelligent Celia for all your queries

Memory & perception

23 categories
of top scenarios

Service distribution

300+
key services

Celia for intelligence across the board

Born to be exquisite

Innovative new interactions

Harmonious look and feel

Personalized fun

Native connectivity

Seamlessly connected at all times

3x
faster connections

4x
more connections

20%
less power consumed

All-new DSoftBus

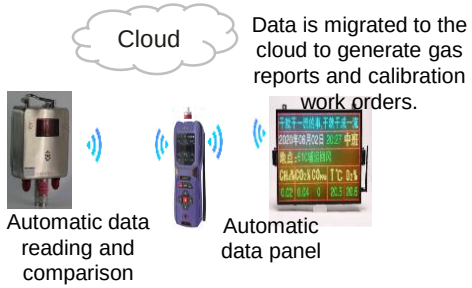
OpenAtom OpenHarmony

1030+ Software and Hardware Products Across Key Sectors

OpenHarmony

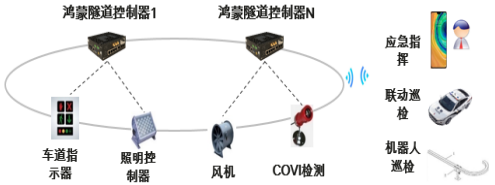
Energy

Mining and electric power terminals



Transportation

Smart tunnels



Industry

Drones and industrial terminals

Finance

Financial terminals

Healthcare

Smart medicine cabinets

Education

Harmony classroom

Government

e-Government terminals

More…

OpenAtom OpenHarmony

World Class Cross-Foundation Open Source Collaboration

OpenHarmony

开放原子开源基金会 OPENATOM FOUNDATION

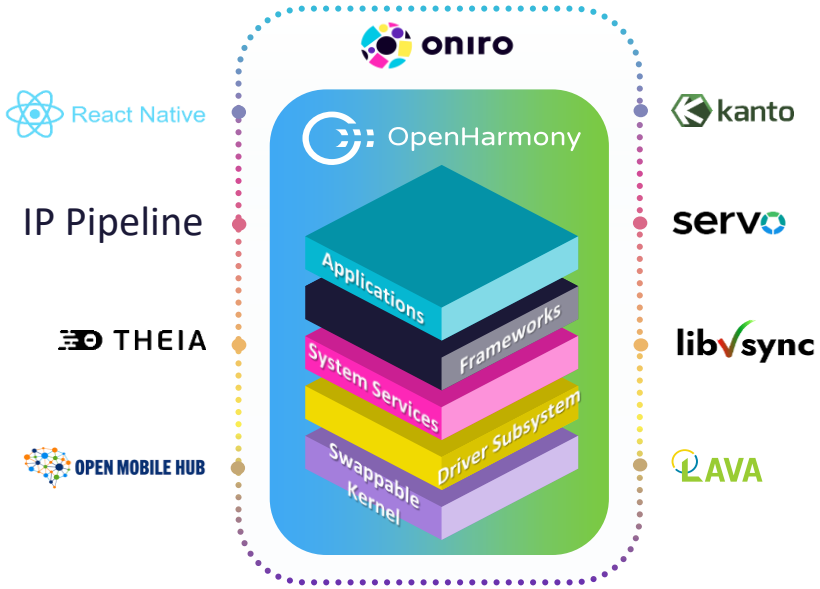
Specification
Developed following OpenAtom Specification Process

Distribution
OpenHarmony compatible

oniro ECLIPSE FOUNDATION

Specification
Superset of OpenHarmony Specifications
Developed following Eclipse Specification Process

Distribution
Oniro & OpenHarmony compatible

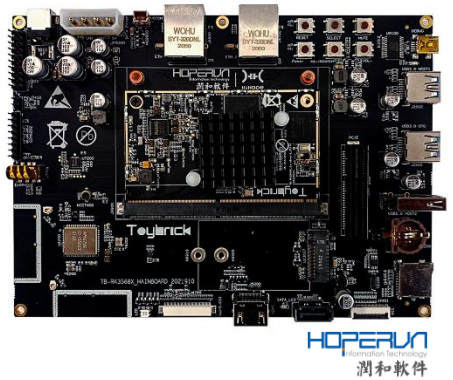


- **Open specifications to serve devices in multiple domains & regions to be truly compatible**
- **Oniro Specifications are based on OpenHarmony Specifications to ensure compatibility and interoperability across all regions and across hardware of different types, from graphic rich mobile devices to IoT devices.**

Eclipse Foundation Oniro Addition & Innovation Highlights

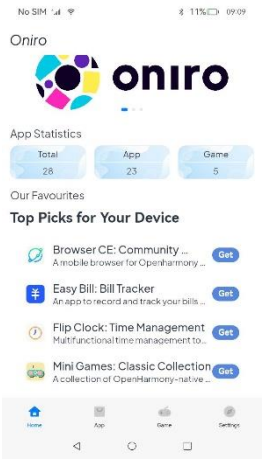
oniro OpenHarmony

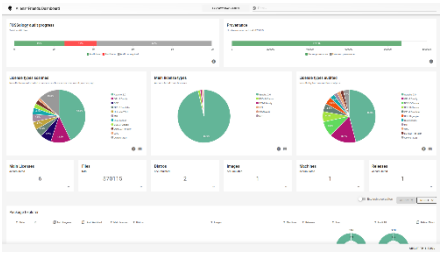
- The European open source phone for innovators
- Empowering IoT with Eclipse Kanto integration
- Continuous IP compliance workflow with custom-built toolchain
- App store with open source mobile apps
- Cross-platform development using React Native framework
- Web rendering engine in Rust with WebGL & WebGPU support
- Open, flexible IDE for developers based on Eclipse Theia



React Native servo kanto

THEIA





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Privacy-first, fully open source

Thank You!