



———— CIVIL ————
INFRASTRUCTURE
———— PLATFORM ————

How to make Smart Cities stay smart with Open Source Projects

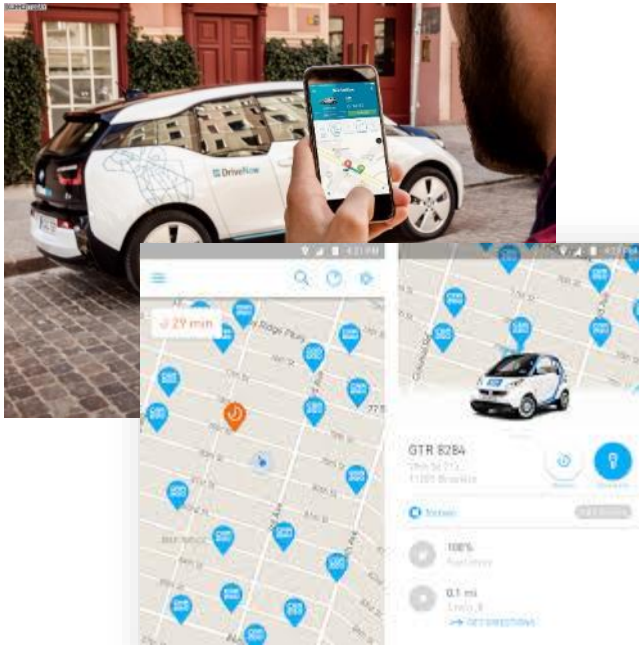
Yoshitake Kobayashi, Toshiba Corp., CIP TSC Chair
Open Source Summit Japan, Tokyo, July 17-19, 2019

IoT today – connecting systems



Connected Cars

Find and rent cars via smart phone.
Monitor fleets and provide service.



Industry

Collect data to improve processes
(cost, quality, speed). Minimize
downtimes by predictive



Smart City

Multimodal transportation, intelligent
traffic control, smart energy
management, emergency



Civil Infrastructure and its challenges



“Hidden” Industrial IoT Systems

Transport



Rail automation



Vehicle control



Automatic ticket gates

Energy



Power Generation



Turbine Control

Others



Building automation



Broadcasting



Healthcare

Industry



Industry automation



CNC control



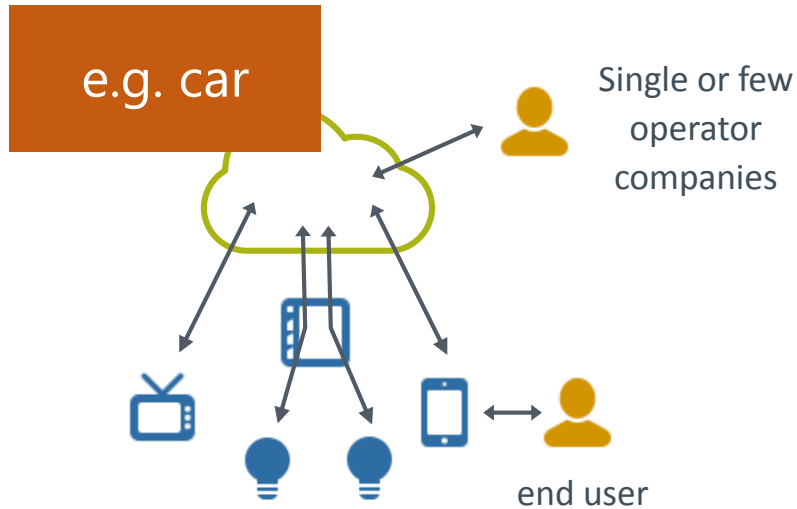
Industrial communication

Smart Cities combine consumer & industrial IoT



Consumer IoT

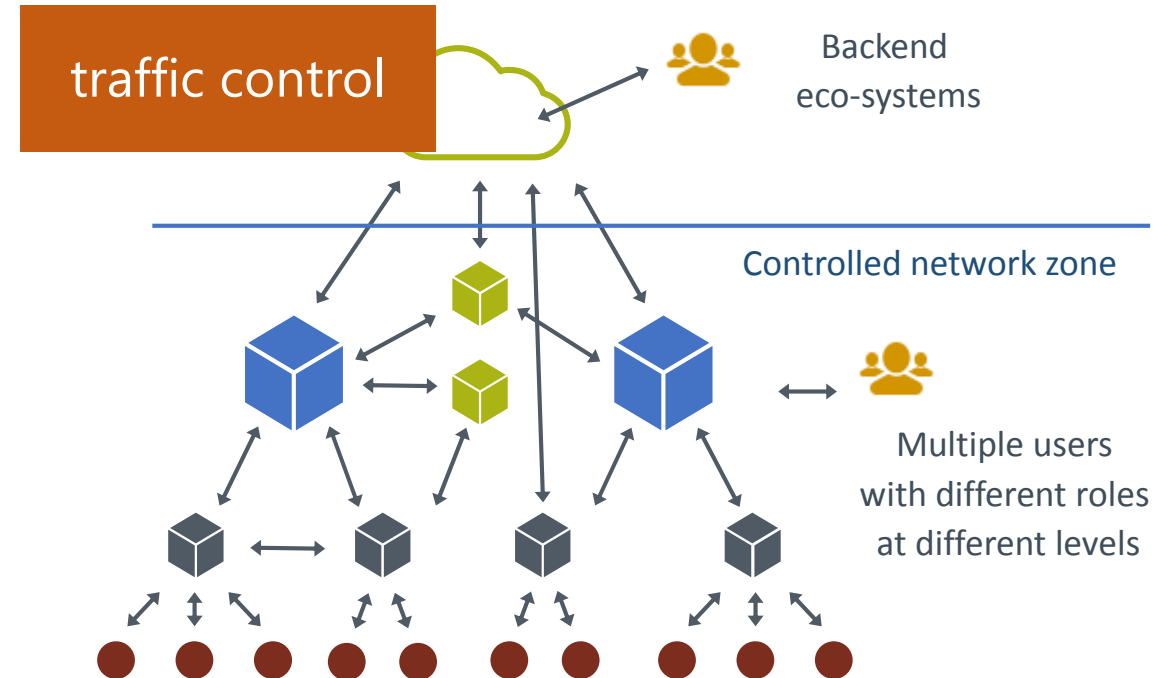
End user interfaces and comfort features



Permanent cloud connection required.
Quality and availability: Best effort
Low-cost / high volume

Industrial (grade) IoT

Digital backbone of connected systems



Complex systems: local intelligence + centralized intelligence
24/7 operation even with no connection to backend.
Guaranteed latency, throughput, and responsiveness.

Smart Cities need a smart infrastructure

IoT technology to be applied to industrial systems





A Power Plant System:

25-60 years products life-cycle

Very reluctant to perform product updates and upgrades of hardware and base software platform

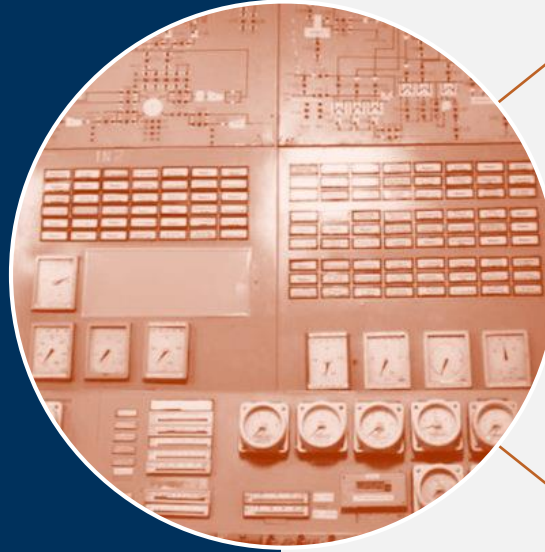
Security

...for millions of devices



The key challenges

- Apply IoT concepts to industrial systems.
- Ensure quality and longevity of products.
- Keep millions of connected systems secure.



Industrial grade

- Reliability
- Functional Safety
- Real-time capabilities

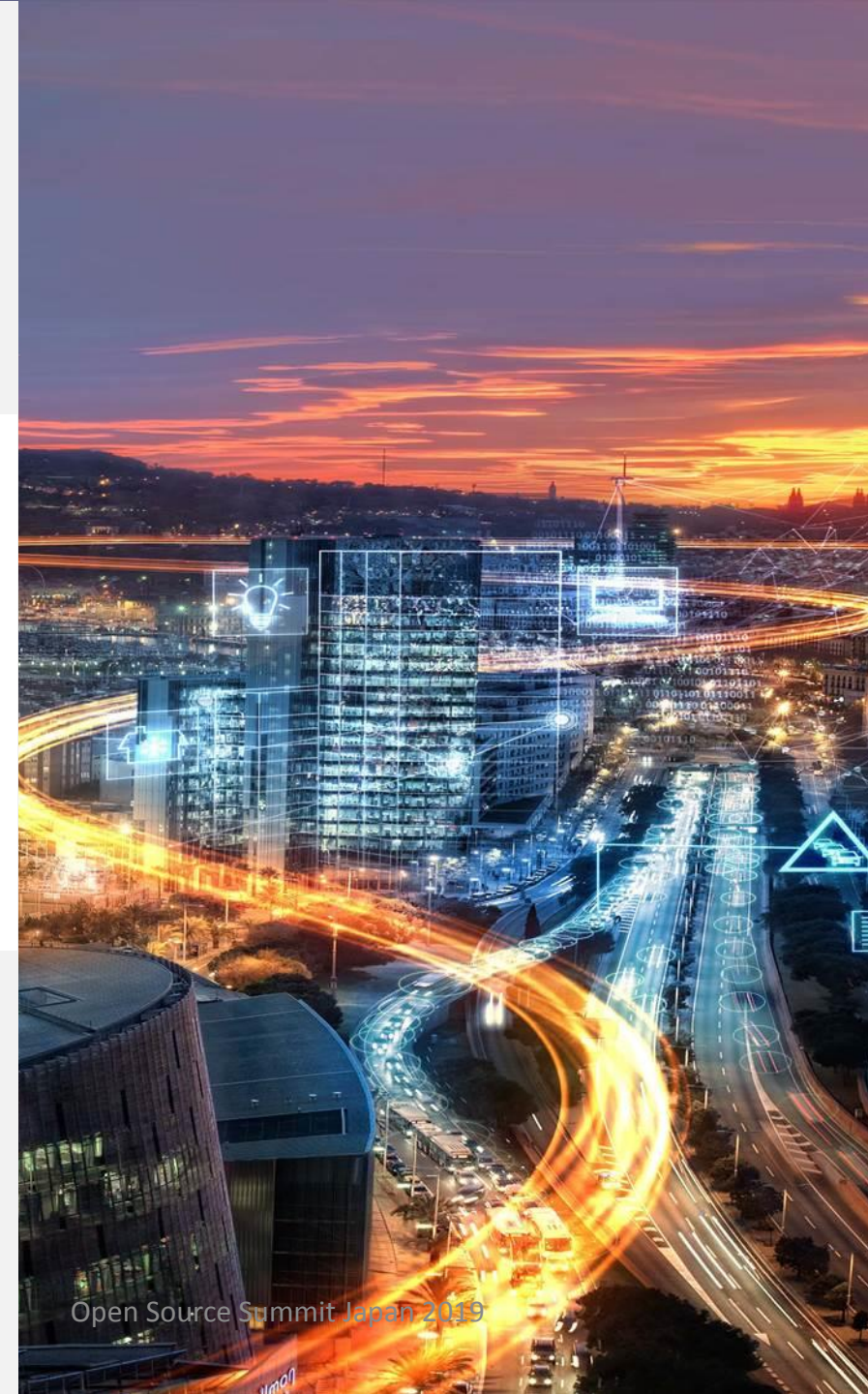
Sustainability

- Product life-cycles of decades
- Backwards compatibility
- Standards

Security

- Security & vulnerability management
- Firmware updates
- Minimize risk of regressions

Solving the Key Challenges



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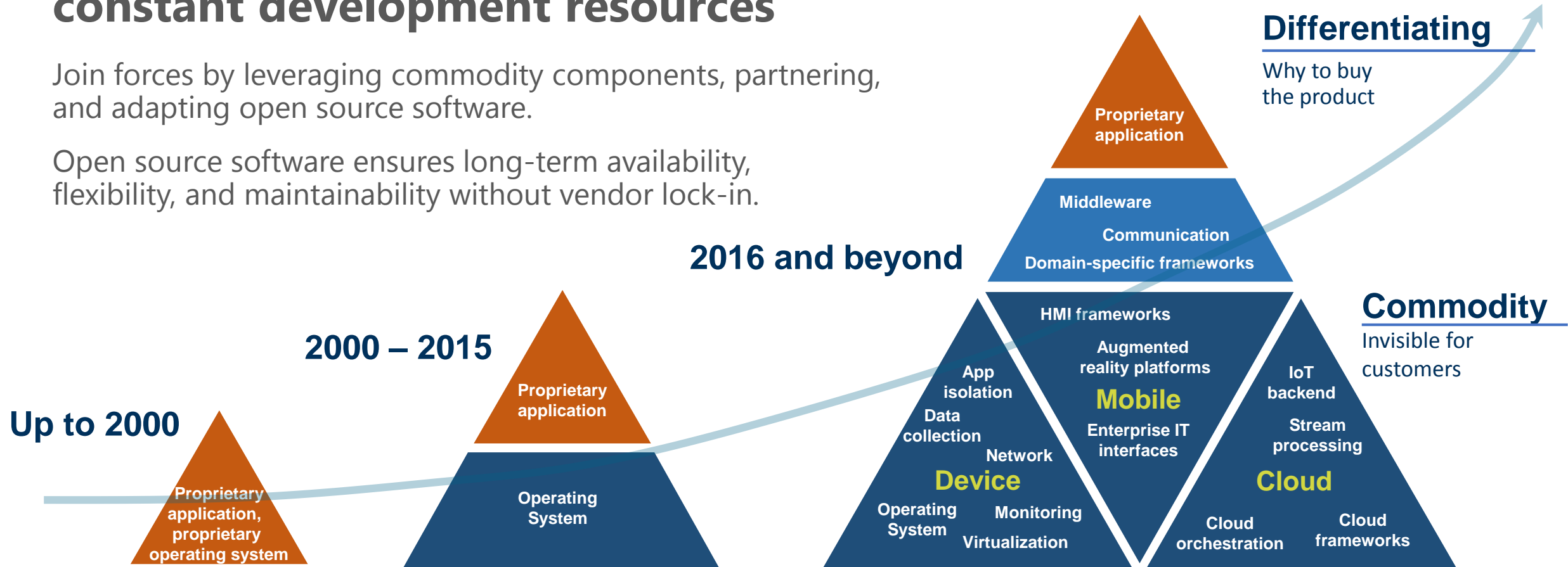
Speed and efficiency: focus on differentiating parts



Handling increasing complexity with constant development resources

Join forces by leveraging commodity components, partnering, and adapting open source software.

Open source software ensures long-term availability, flexibility, and maintainability without vendor lock-in.



Facts and Issues: Smart City uses Commodity Software

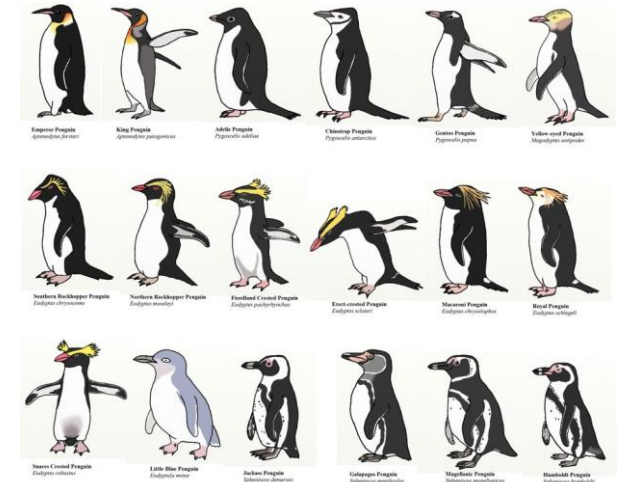
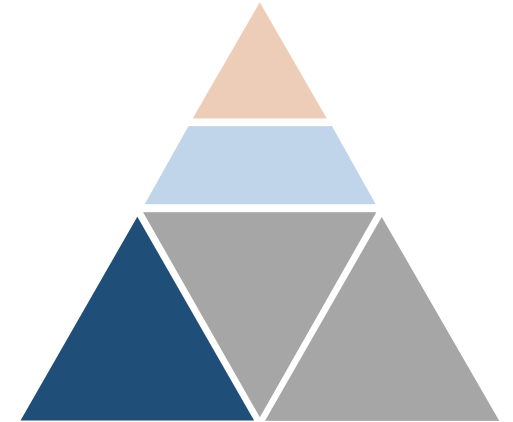


Facts

- Millions or trillions smart devices
- Similar software components (e.g. Linux)
- Industrial IoT requirements
 - Security
 - Sustainability
 - Industrial-grade

Issues

- A lot of products have to meet IIoT requirements
- Same development and maintenance efforts spent by many companies or even business units
- **No common solution** for base building blocks



picture taken from Pinterest
<https://www.pinterest.de/pin/554646510344033382/>

CIP is the Solution

Establishing an
Open Source Base Layer
of industrial-grade software
to enable the use and
implementation of software
building blocks for
Civil Infrastructure Systems

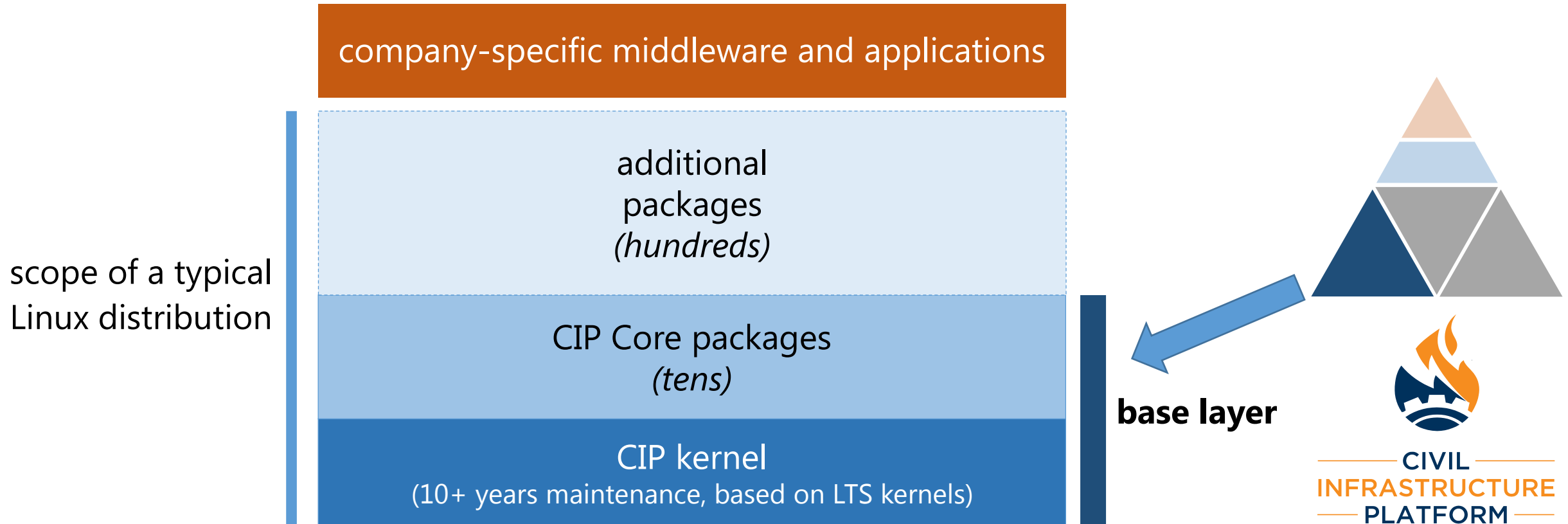


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What is “Open Source Base Layer (OSBL)”?



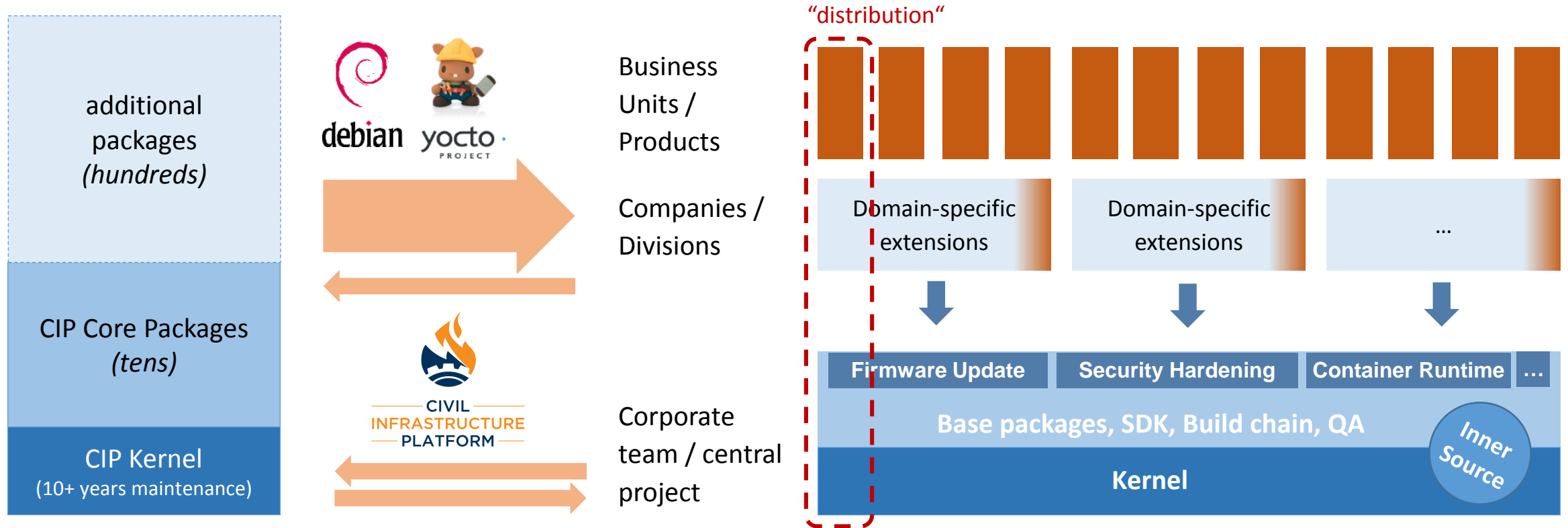
Layered Linux distribution for industrial products, utilizing and influencing the relevant Open Source projects:



Mapping CIP into the company

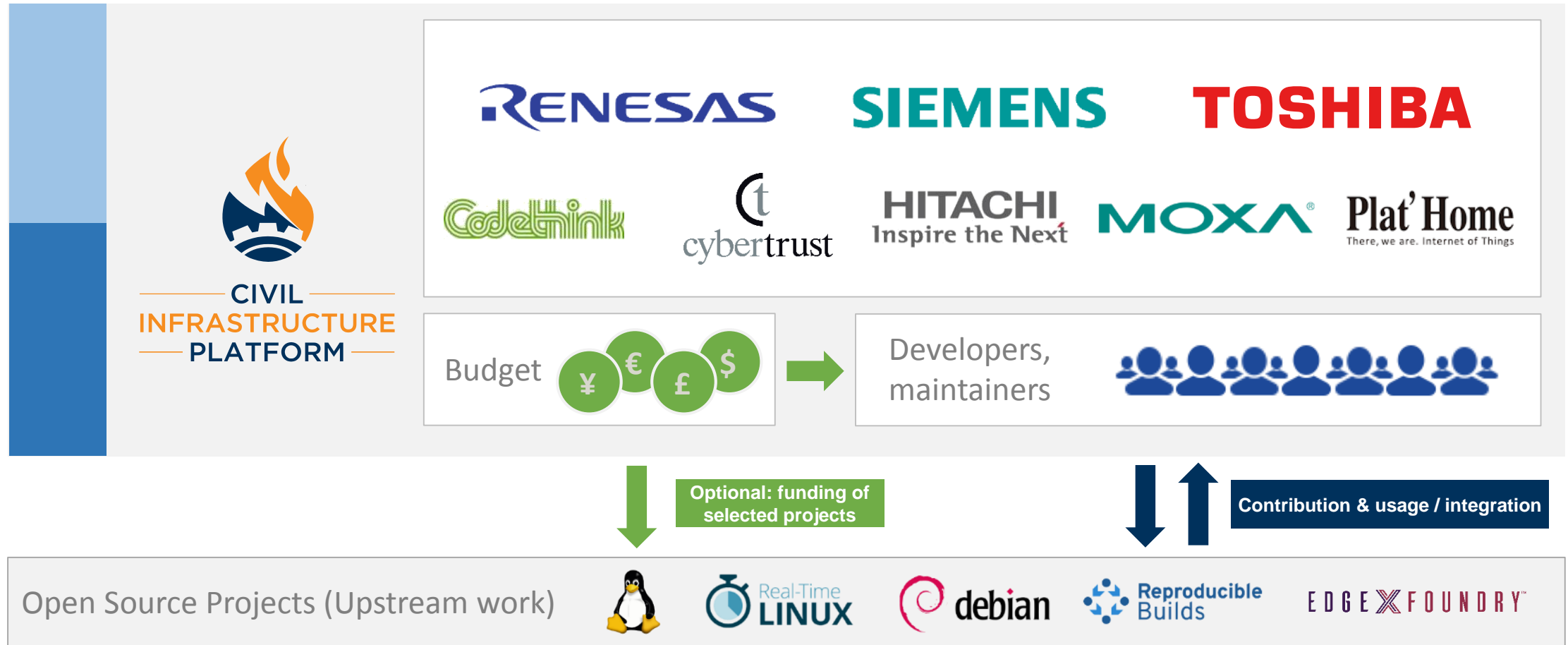


Layered Linux distribution for industrial products, utilizing and influencing the relevant Open Source projects:



Up to 70% effort reduction achievable for OSS license clearing and vulnerability monitoring, kernel and package maintenance, application adaptation and testing for an individual product.

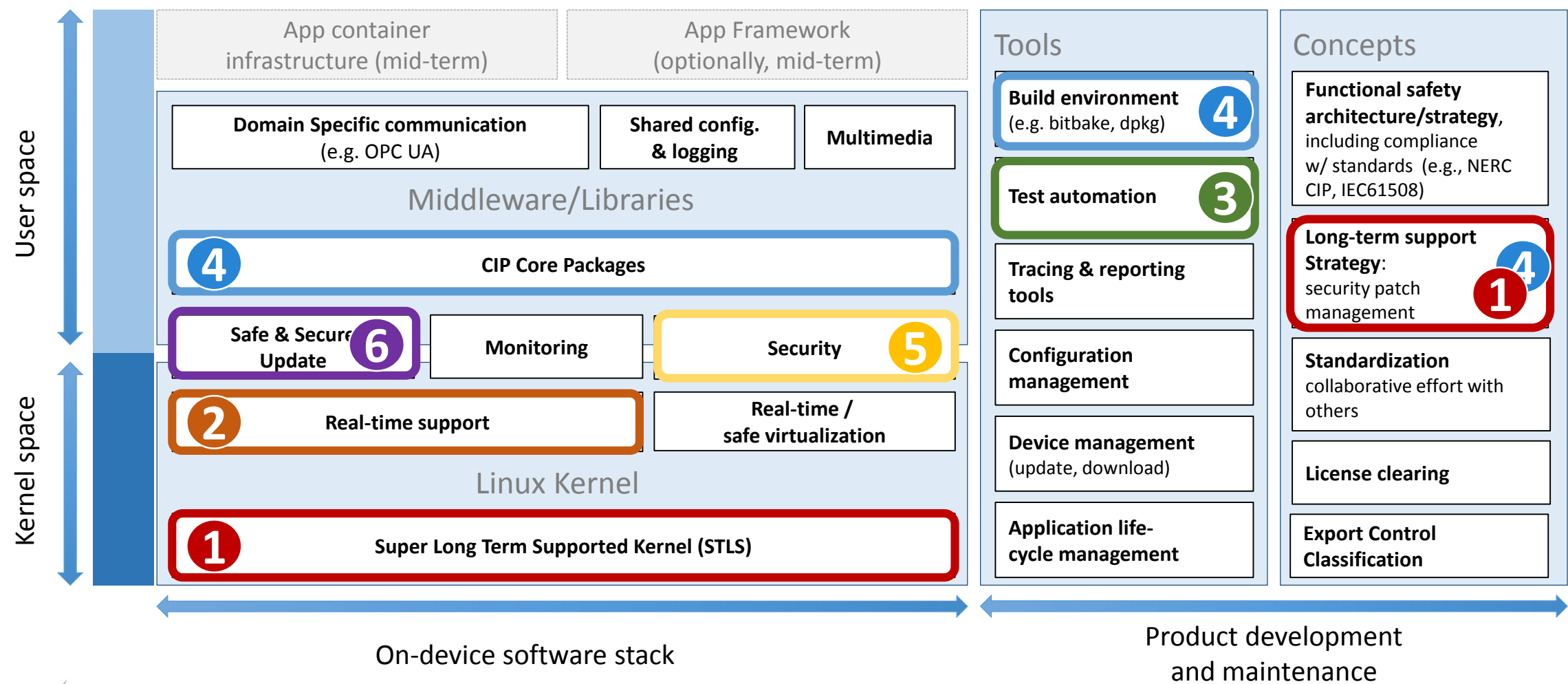
The backbone of CIP are the member companies



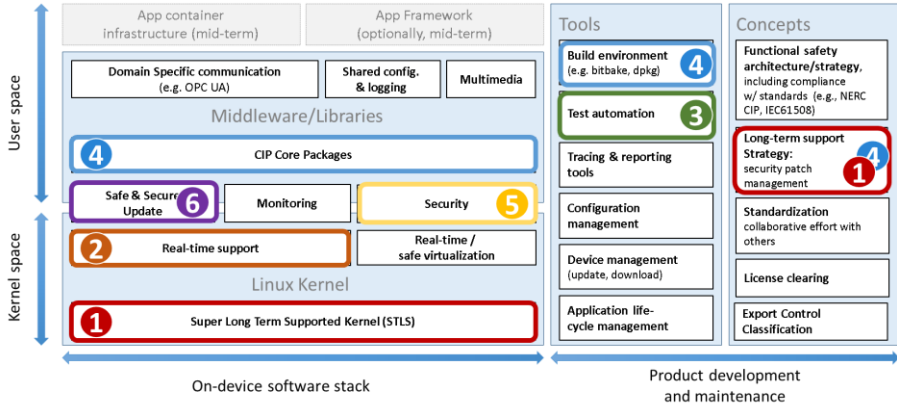
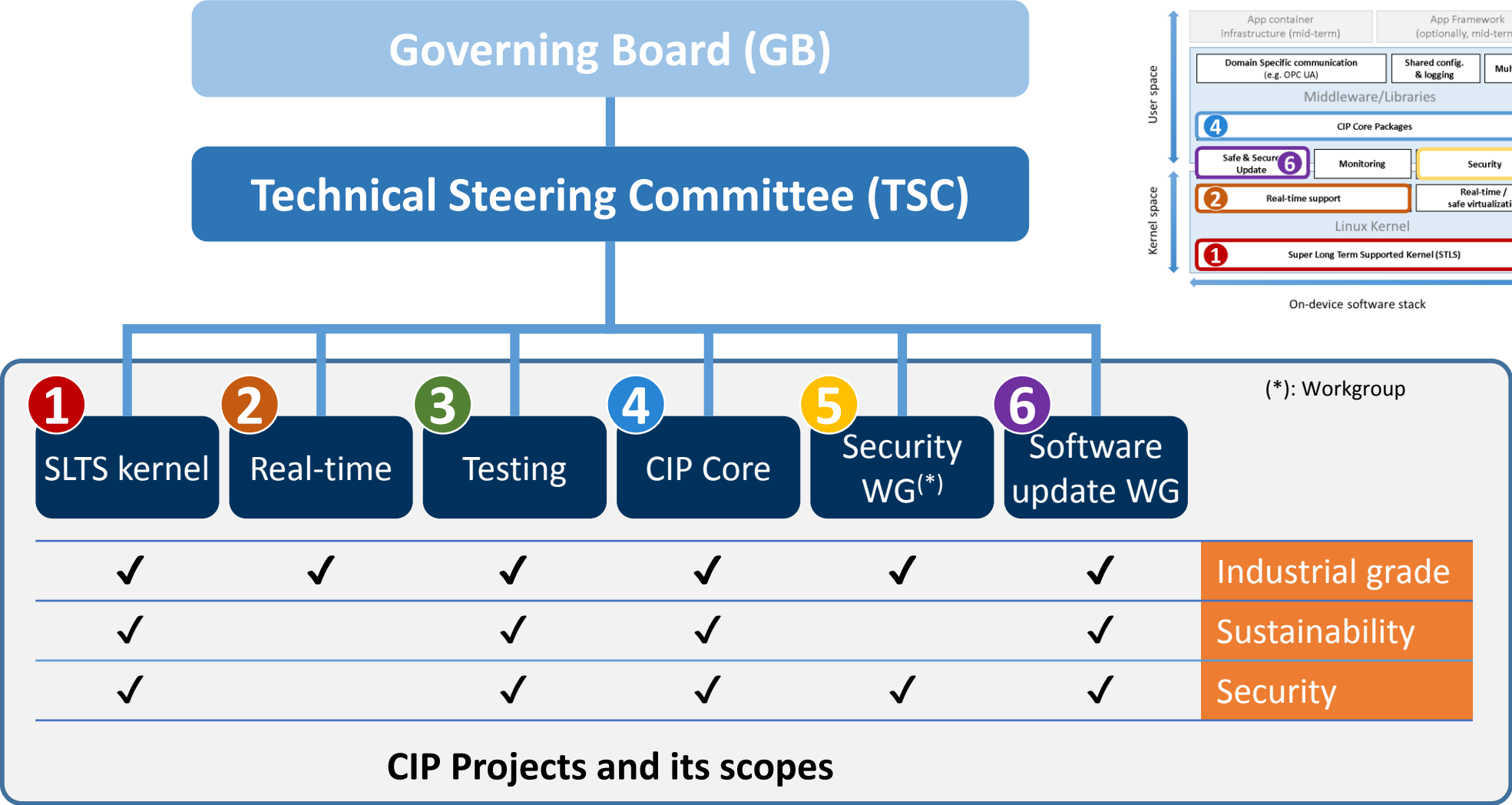
CIP lays the Foundation for Sustainable Smart Cities



Scope of activities



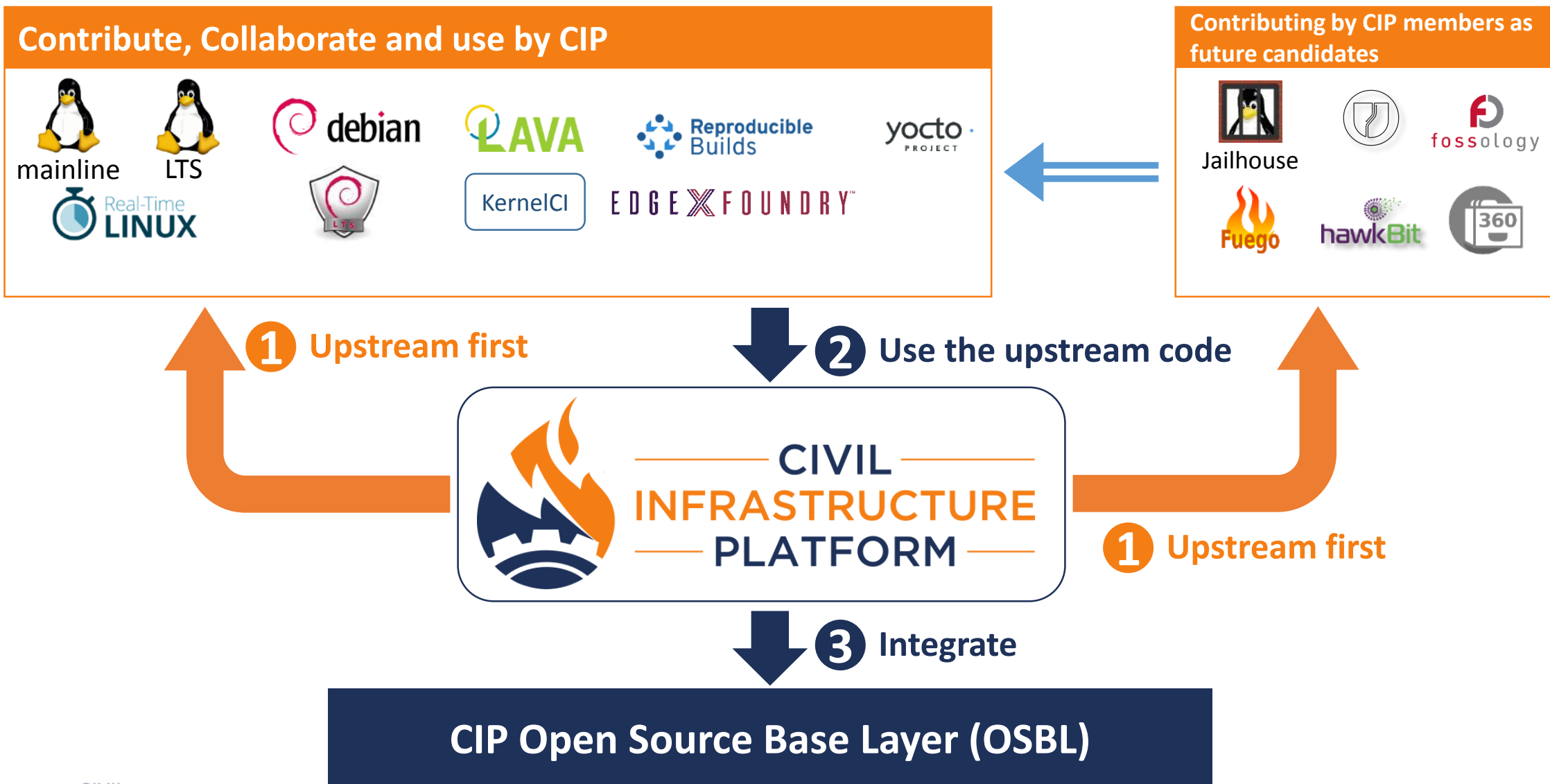
CIP governance structure and projects



Collaborative development with other OSS projects



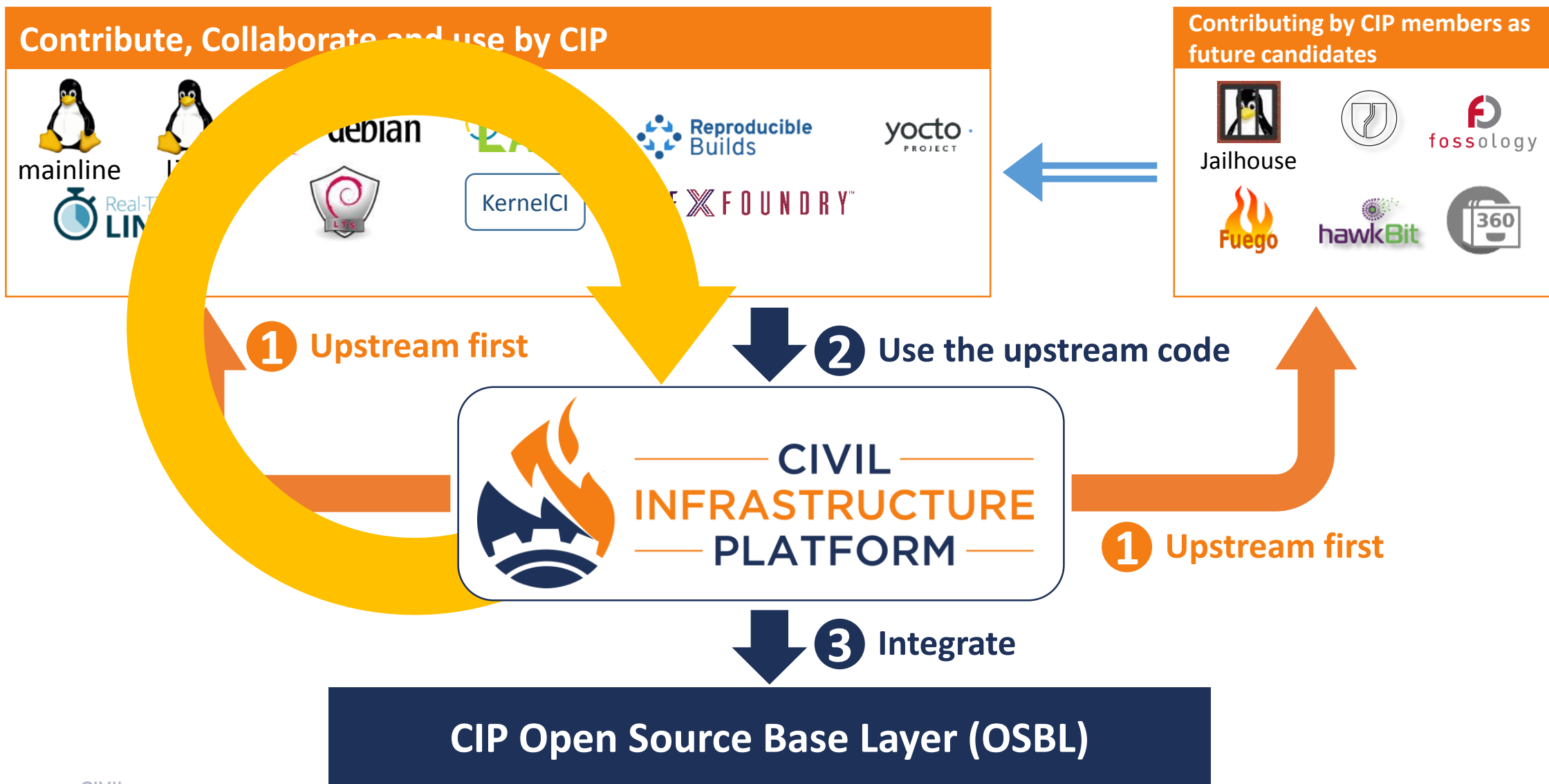
Upstream Projects



Collaborative development with other OSS projects

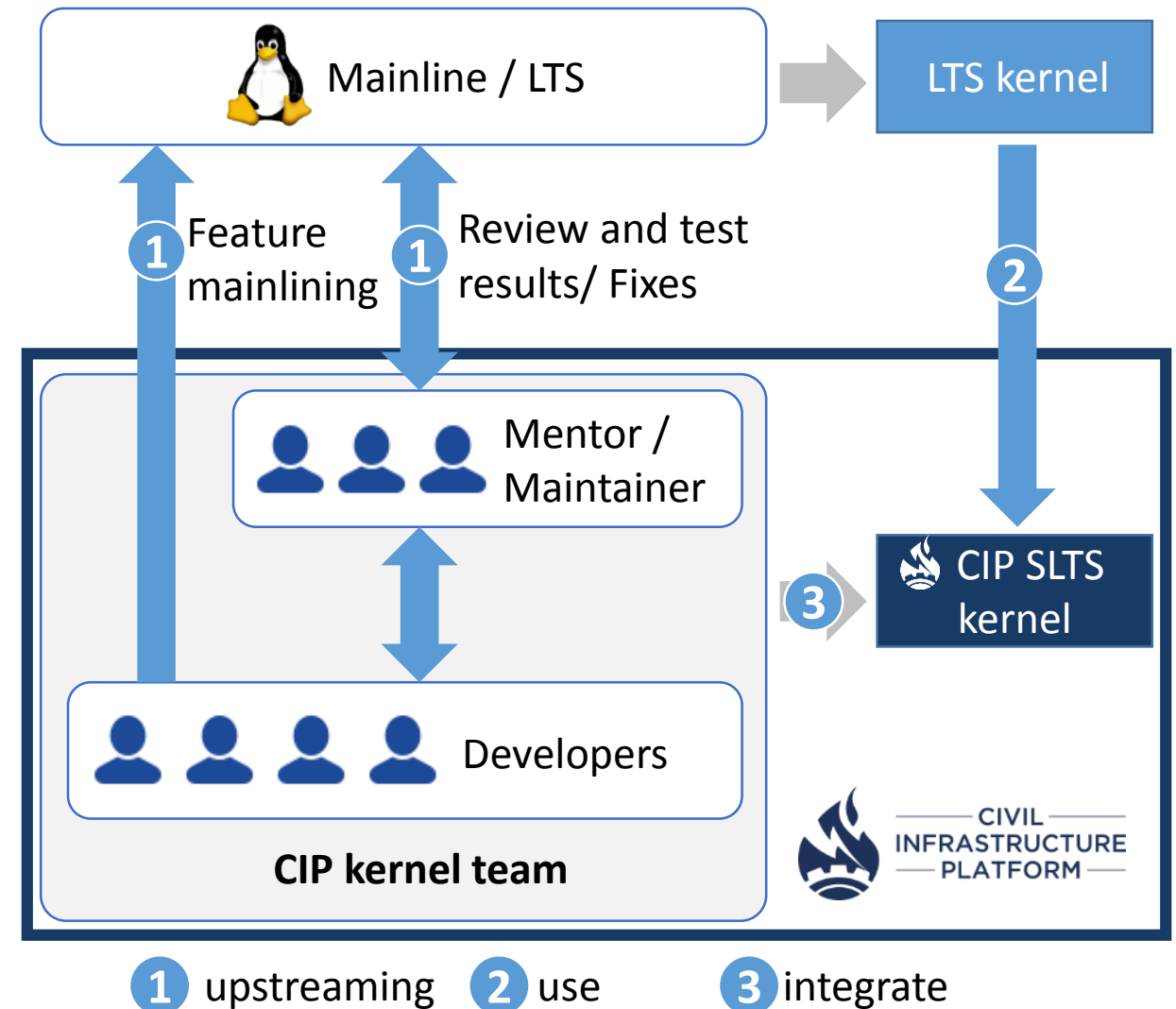


Upstream Projects



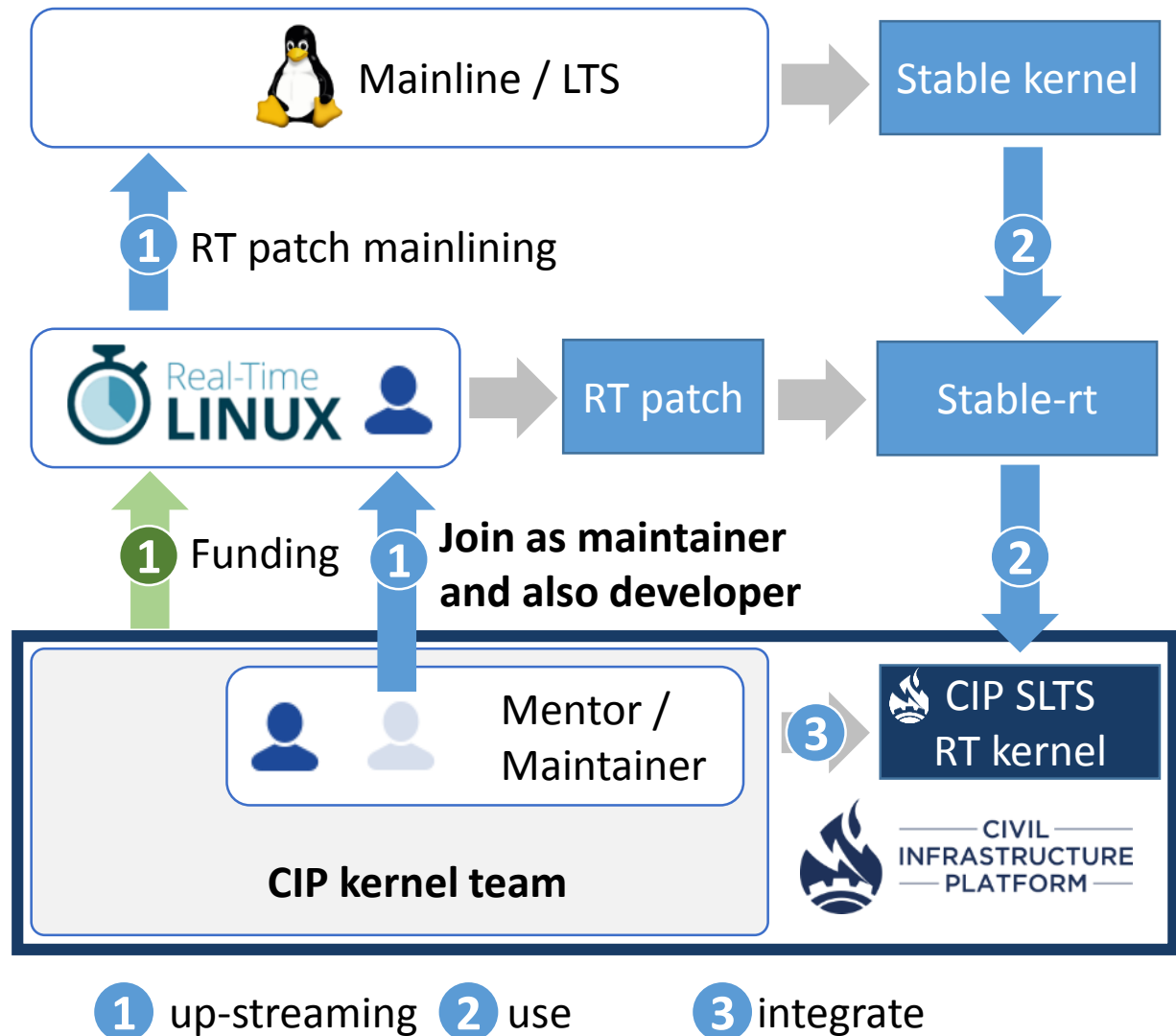
① CIP SLTS kernel development (Upstream first development)

- Goal
 - Providing CIP kernels with more than 10 years maintenance period
 - Super Long Time Stable kernel
- Status
 - CIP SLTS kernels has been released
 - Linux 4.19.58-cip6 (July 12th)
 - Linux 4.4.185-cip35 (July 12th)
 - <https://git.kernel.org/pub/scm/linux/kernel/git/cip>
 - CIP kernel team participate into LTS review process



② Real-time Linux development (PREEMPT_RT)

- Goal
 - CIP joins RT Linux project as Gold member to Work with them to upstream Real-time enhancement
 - Provide CIP SLTS kernel with real-time enhancement by using RT patch
- Status
 - CIP SLTS RT kernels has been released
 - Linux 4.4.166-cip29-rt21
 - Linux 4.19.13-cip1-rt
 - <https://git.kernel.org/pub/scm/linux/kernel/git/cip>
 - Test results are available on CI-RT
 - <https://ci-rt.linutronix.de/RT-Test/>

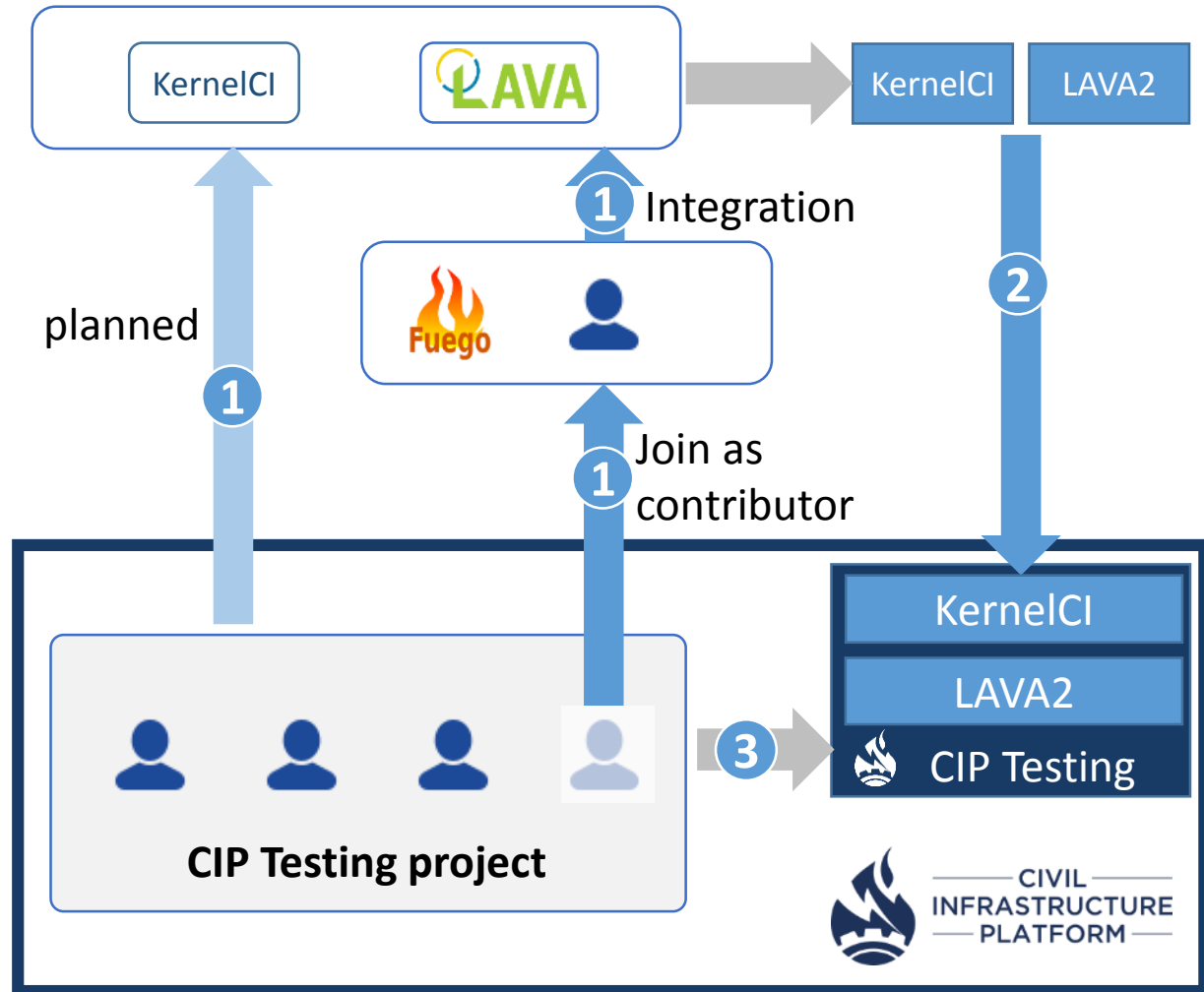


3 CIP Testing

- Goal
 - Providing a test environment to test the CIP kernel and more
 - CI testing for CIP kernel and CIP Core

- Current status

- First release was B@D
 - <https://gitlab.com/cip-project/board-at-desk-single-dev>
- Move to distributed testing environment on AWS with LAVA
- Integrating with GitLab-CI

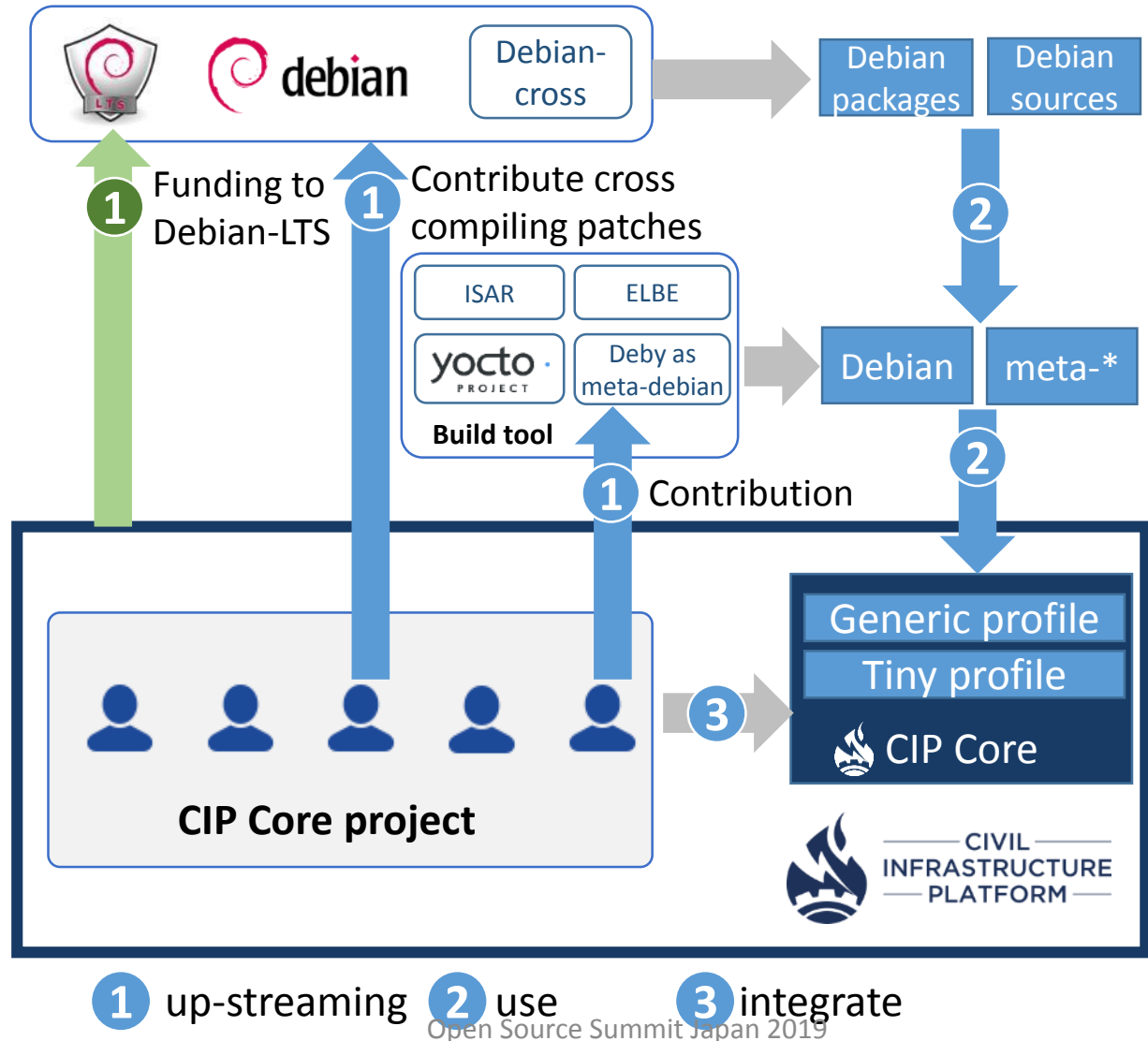


1 up-streaming 2 use 3 integrate

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4 CIP Core

- Goal
 - Provide a reference implementation with CIP core packages for testing
 - Following implementations are provided
 - Tiny profile
 - E.g. Small IoT devices
 - Generic profile
 - E.g. IoT gateways
- Status
 - CIP Core Tiny profile has been released
 - <https://gitlab.com/cip-project/cip-core>
 - PoC implementation is available for Debian profile
 - <https://gitlab.com/cip-playground/isar-cip-core>



5 Security working group

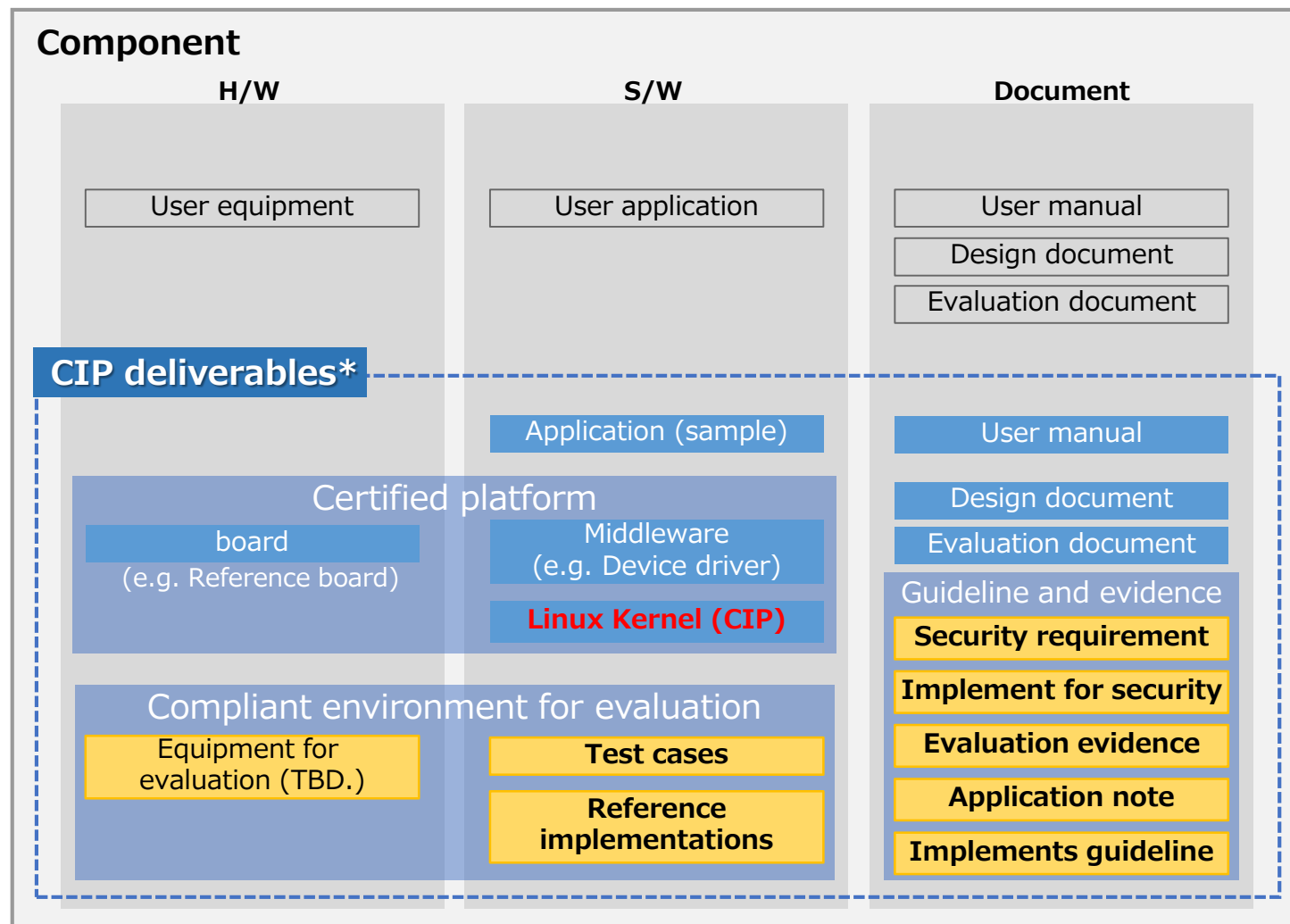


- **Goal**

- Provide guidelines and reference implementations to help developers to meet cybersecurity standard requirements (IEC 62443)

- **Status**

- Started for feasibility study
- A demonstration scheduled at OSS Japan in July



*: Noted that this image is under planning and for only illustrative purposes.

6 Software update working group

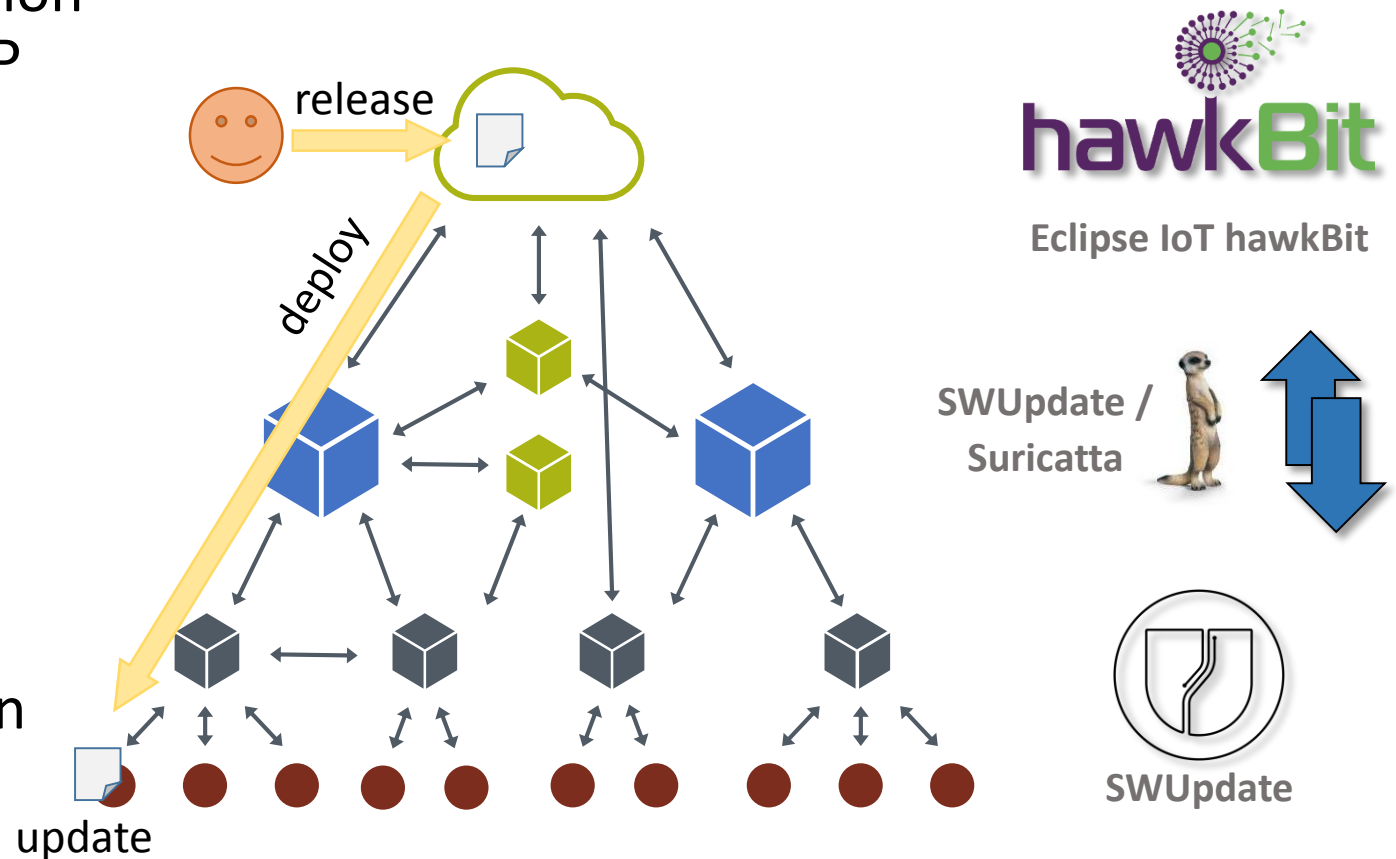
- **Goal**

- Incorporate a common solution for software updates into CIP core

- Device management
- Deployment
- Safe update

- **Status**

- Selected OSS update tools
- Demonstration will be shown at OSS Japan in July



Summary



- CIP today focuses on
 - **Kernel maintenance:** maintaining Linux kernels for very long time including real-time support
 - **Testing:** providing a test infrastructure and evolve tests
 - **CIP Core packages:** a set of industrial-grade components that require very long-term maintenance including the required build tool chains
 - **Security:** Improving to have security features and to follow Cyber Security Standard
 - **Software update:** Incorporate a common solution for software updates into CIP core
 - **Collaboration:** Linux, Debian/Debian-LTS, Real Time Linux, Reproducible Builds, EdgeX Foundry

Conclusion



- Our Civilization needs an Open Source Base Layer of industrial-grade software
 - CIP provides this, using Linux
- Sustainability is ensured by
 - The backing of big industrial and semiconductor companies
 - Close cooperation with and building with mature Open Source projects (Debian, PREEMPT_RT, KernelCI, ...)
 - Providing suitable tool chains
 - Ensuring in-depth tests
- **Contribution and collaboration with upstream projects are the key CIP activities**

Join us

CIP for sustainable Smart Cities with Open Source Software



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INFRASTRUCTURE
PLATFORM

RENESAS

SIEMENS

TOSHIBA

CodeThink

cybertrust

HITACHI
Inspire the Next

MOXA®

Plat'Home
There, we are. Internet of Things

Contact Information and Resources



To get the latest information, please contact:

- CIP Mailing list: cip-dev@lists.cip-project.org

Other resources

- Twitter: [@cip_project](https://twitter.com/cip_project)
- CIP Web site: <https://www.cip-project.org>
- CIP news: <https://www.cip-project.org/news/in-the-news>
- CIP Wiki: <https://wiki.linuxfoundation.org/civilinfrastructureplatform/>
- CIP source code
 - CIP GitLab: <https://gitlab.com/cip-project>
 - CIP kernel: [git://git.kernel.org/pub/scm/linux/kernel/git/cip/linux-cip.git](https://git.kernel.org/pub/scm/linux/kernel/git/cip/linux-cip.git)

Question?



Thanks you

