Industrial IoT Systems are growing

Transport

Rail automation

Vehicle control

Automatic ticket gates

Energy

Power Generation

Turbine Control

Turbine Control

Others

Building automation

Broadcasting

Healthcare

Industry
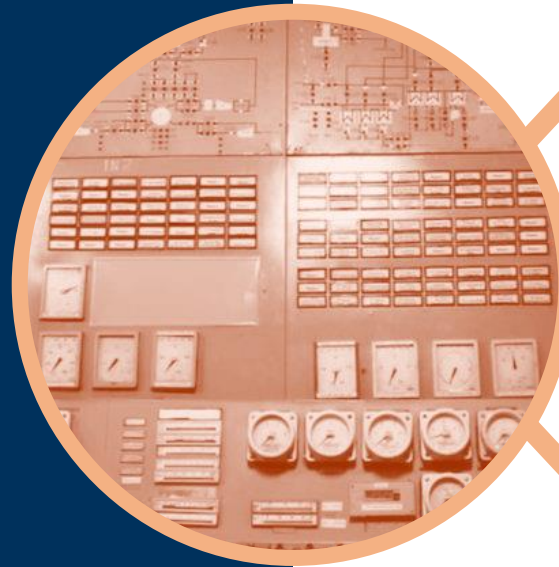
Industry automation

CNC control

Industrial communication

CIVIL INFRASTRUCTURE PLATFORM

The key challenges

- **Apply IoT concepts to industrial systems.**

- **Ensure quality and longevity of products.**

- **Keep millions of connected systems secure.**

Industrial gradeness
- Reliability
- Functional Safety
- Real-time capabilities

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

Security
- Security & vunerability managment
- Firmware updates
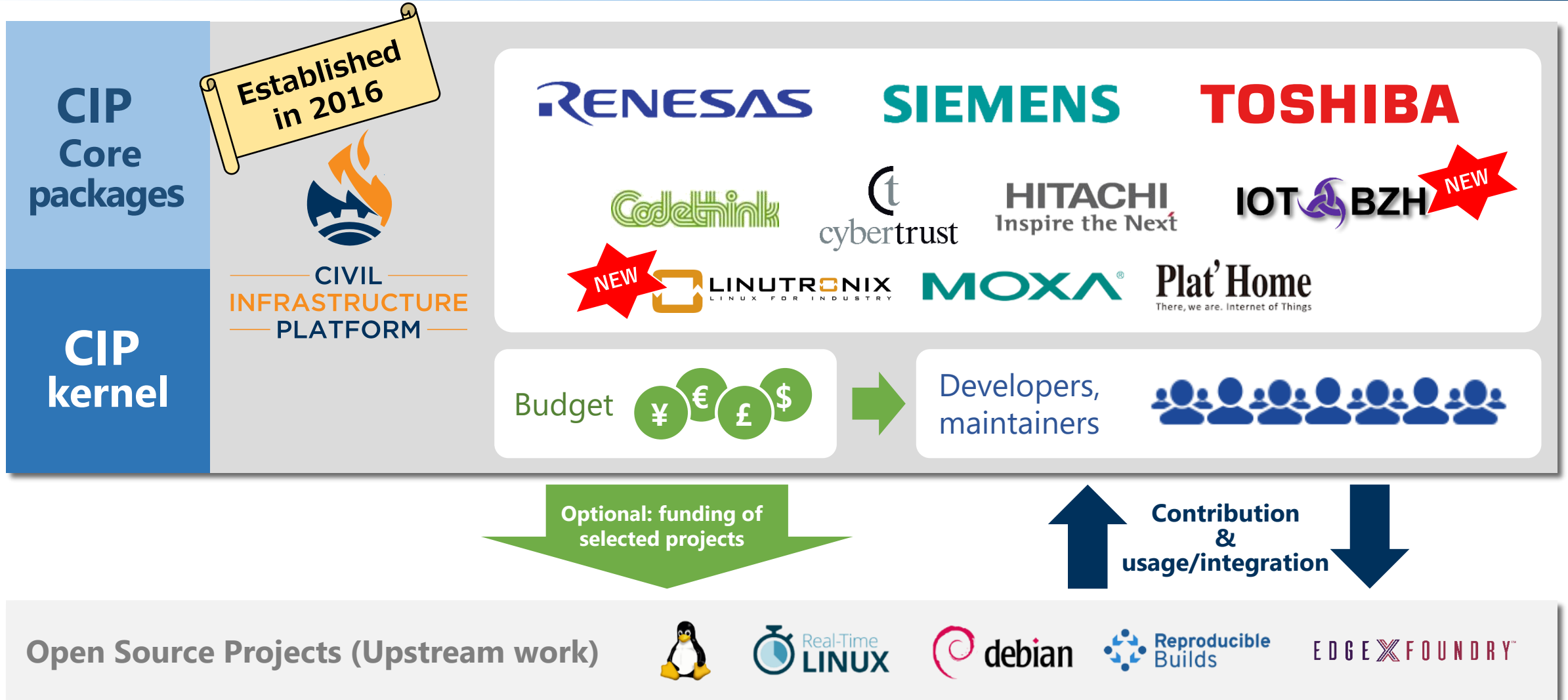- Minimize risk of regressions

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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

CIVIL INFRASTRUCTURE PLATFORM

The backbone of CIP are the member companies

CIP Core packages

CIP kernel

Established in 2016

CIVIL INFRASTRUCTURE PLATFORM

RENESAS   SIEMENS   TOSHIBA

Codethink   cybertrust   HITACHI Inspire the Next   IOT BZH **NEW**

NEW LINUTRONIX LINUX FOR INDUSTRY   MOXA   Plat'Home There, we are. Internet of Things

Budget ¥ € £ $ →   Developers, maintainers

Optional: funding of selected projects

Contribution & usage/integration

Open Source Projects (Upstream work)   Real-Time LINUX   debian   Reproducible Builds   EDGE X FOUNDRY

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Collaborative development with other OSS projects

Upstream Projects

Contribute, Collaborate and use by CIP

LTS

Real-Time LINUX

~ isar

LAVA

Reproducible Builds

SWUpdate

meta-debian

KernelCI

yocto PROJECT

① **Upstream first**

② Use the upstream code

CIVIL INFRASTRUCTURE PLATFORM

③ Integrate

CIP Open Source Base Layer (OSBL)

CIVIL INFRASTRUCTURE PLATFORM
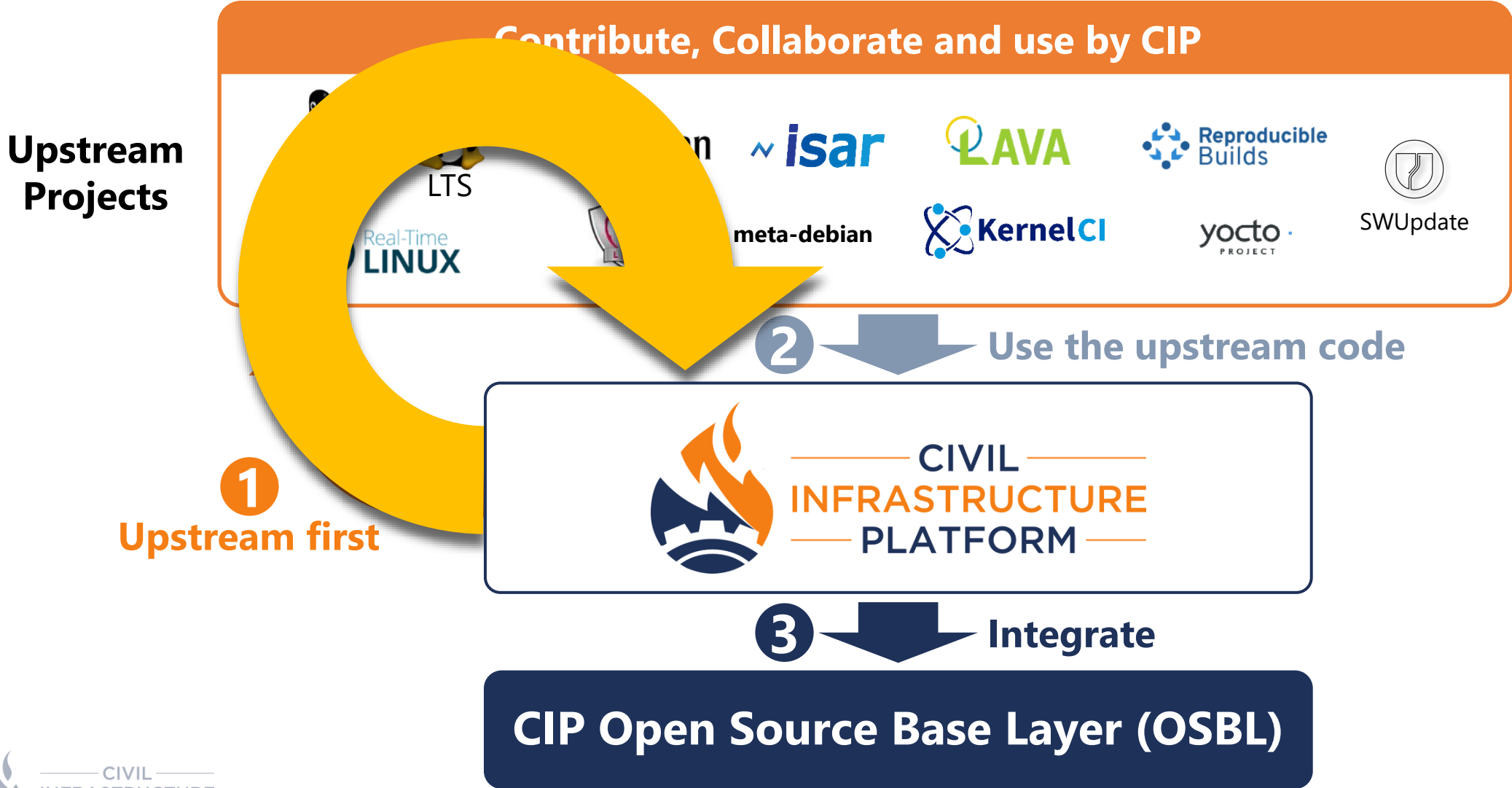
CIP's Main Pillar: Extended Maintenance

Applications

Additional packages *(hundreds)*

CIP Core packages *(tens)*

CIP Kernel

out-of-tree drivers

From Debian (3 years)

From Debian LTS (+2 years)

From Debian ELTS (+x years)

TBD

CIP support (10 years + more)

TBD

Depend on SOC vendors

Work with Debian community

5 years

10 years

Support Term
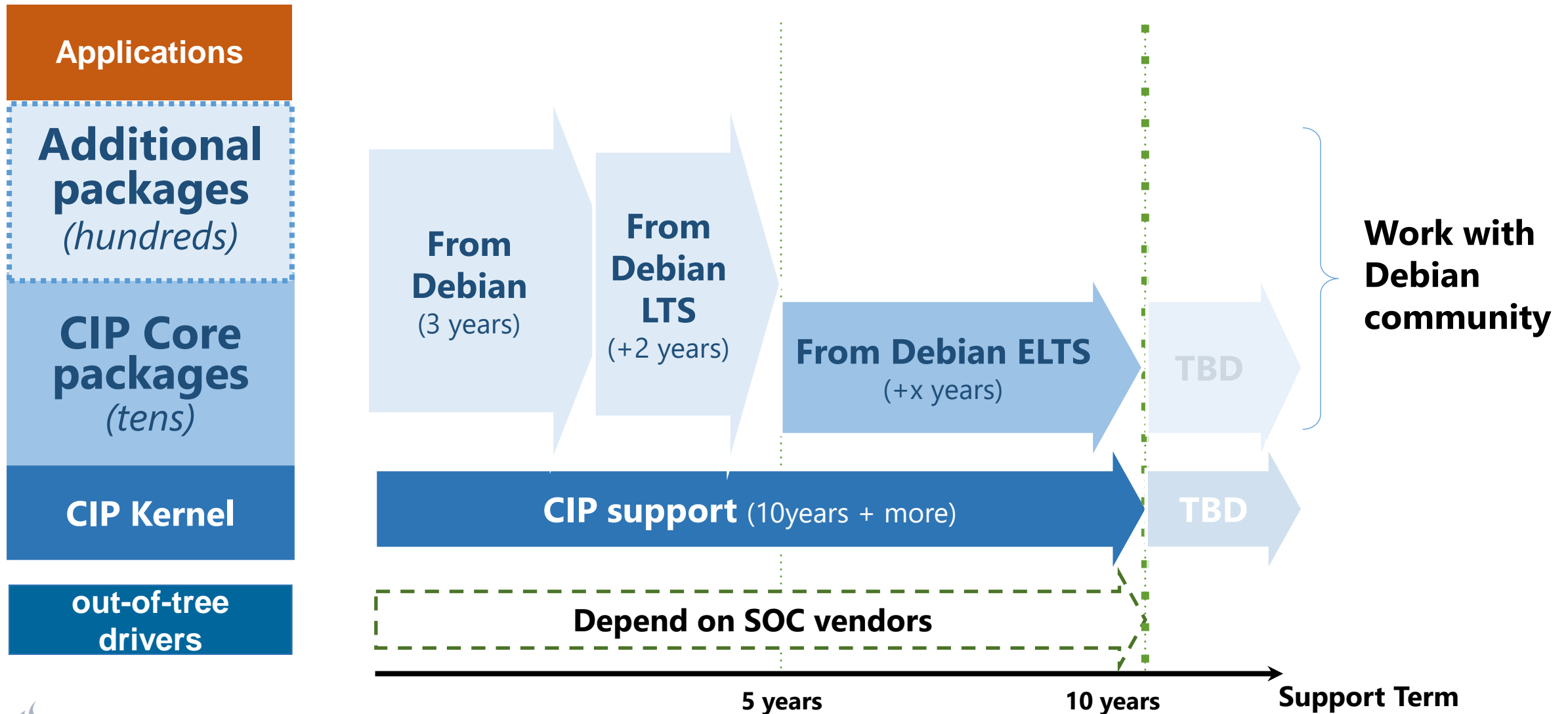
CIP governance structure and projects

Governing Board (GB)

Technical Steering Committee (TSC)

	App container infrastructure (mid-term)	App Framework (optionally, mid-term)	Tools	Concepts
User space	Domain Specific communication (e.g. OPC UA) / Shared config. & logging / Multimedia		**3** Build environment (e.g. bitbake, dpkg)	Functional safety architecture/strategy, including compliance w/standards (e.g. NERC CIP, IEC61508)
	Middleware/Libraries		**4** Test automation	
	3 CIP Core Packages		Tracing & reporting tools	**1** Long-term support Strategy: **3** security patch management
Kernel space	**6** Safe & Secure Update / Monitoring / **5** Security		Configuration management	Standardization collaborative effort with others
	2 Real-time support / Real-time / safe virtualization		Device management (update, download)	License clearing
	Linux Kernel		Application life-cycle management	Export Control Classification
	1 Super Long Term Supported Kernel (STLS)			

On-device software stack ◄───────► Product development and maintenance

1 SLTS kernel	**2** Real-time	**3** CIP Core	**4** Testing	**5** Security WG(*)	**6** Software Update WG	(*): Workgroup
✓	✓	✓	✓	✓	✓	**Industrial grade**
✓		✓	✓		✓	**Sustainability**
✓		✓	✓	✓	✓	**Security**

CIP Projects and its scopes

CIVIL INFRASTRUCTURE PLATFORM

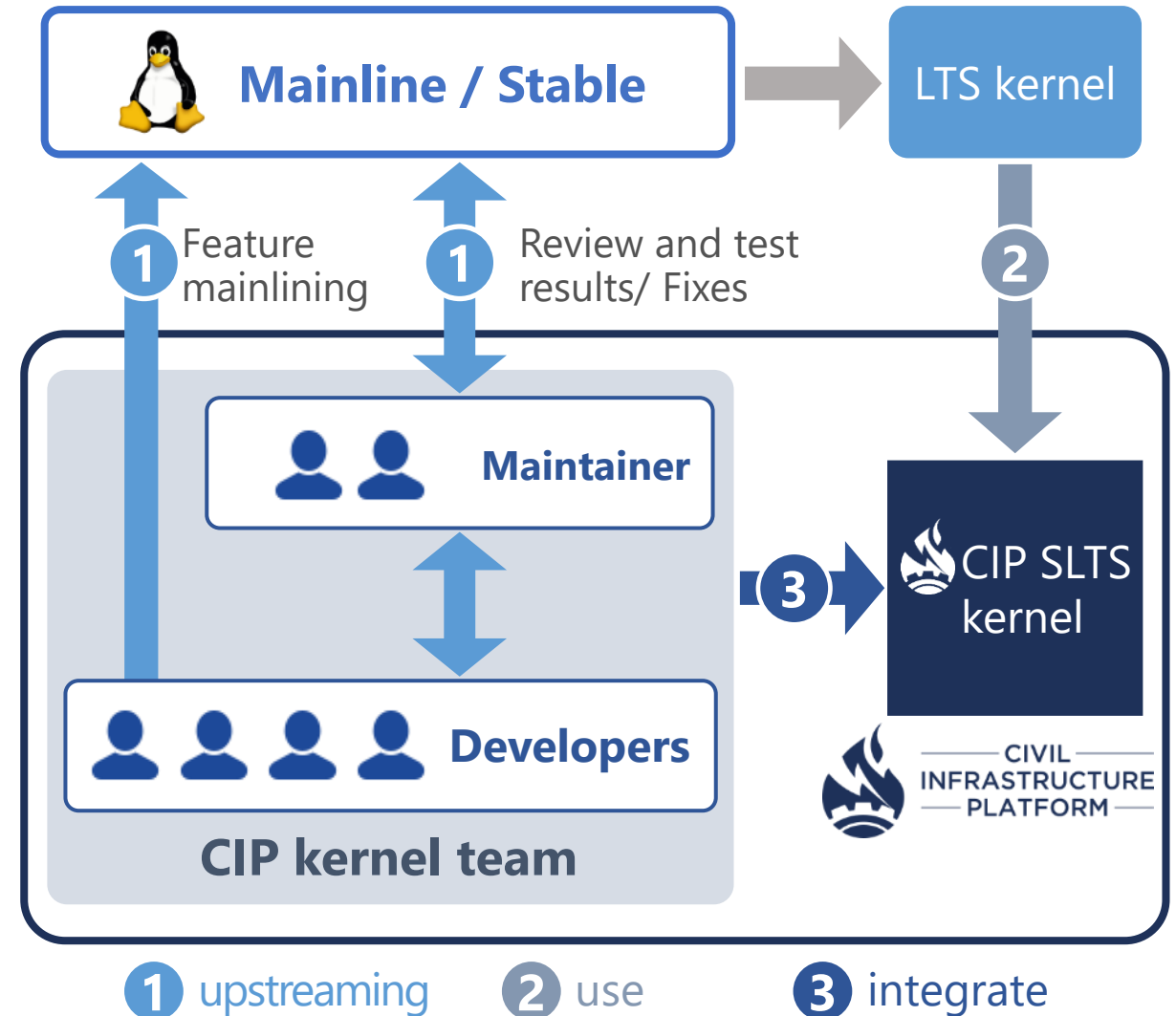# CIP SLTS [rt-]kernel development

Goal

- Providing CIP kernels with more than 10 years maintenance period (super long term stable)
- Include real-time support (preempt-rt)
- **CIP is Real-Time Linux project member**

Status

- CIP SLTS kernels has been released
  - v4.19.190-cip49 (May 14, 2021)
  - v4.19.182-cip45-rt19 (March 24, 2021)
  - v4.4.268-cip57 (May 14, 2021)
  - v4.4.262-cip55-rt34 (March 23, 2021
- Created CVE tracker
- Participate in LTS review process

Resources

- https://git.kernel.org/pub/scm/linux/kernel/git/cip
- https://gitlab.com/cip-project/cip-kernel/cip-kernel-sec

CIP SLTS Kernel Release Policy

Current Releases		Life-Cycle		Release Frequency	
		First Release	**Projected EOL**	**Regular Release**	**Release on Demand**
SLTS 4.4	SLTS 4.4	2017-01-17	2027-01	once a month	Depends on criticality of bug / security fixes
	SLTS 4.4-rt	2017-11-16	2027-01	once every two months	
SLTS 4.19	SLTS 4.19	2019-01-11	2029-01	twice a month	
	SLTS 4.19-rt	2019-01-11	2029-01	once every two months	

Note: Difficult to estimate actual release date because of number of patches depends on each stable release

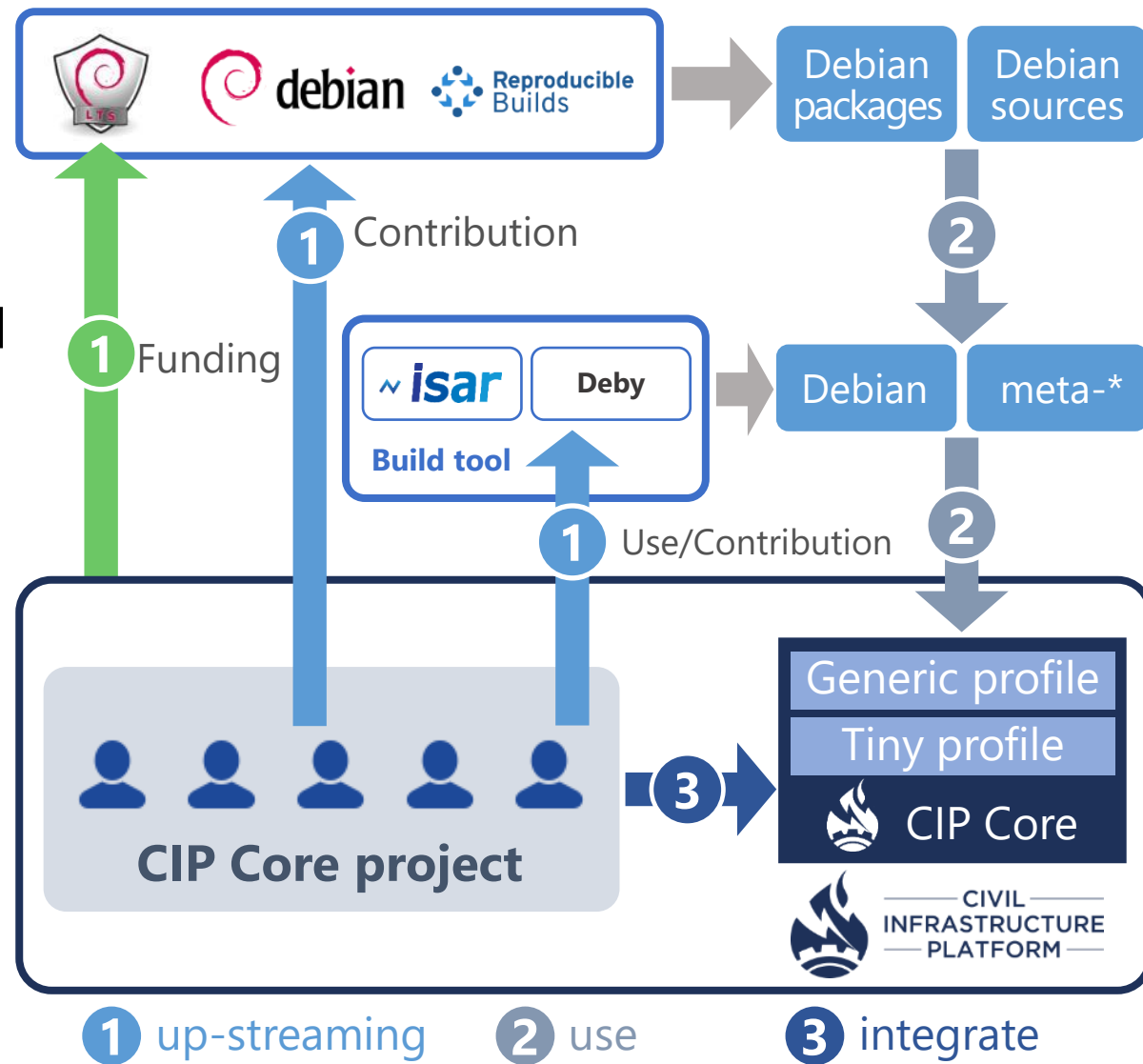# Contributions to LTS

as of February 25, 2021
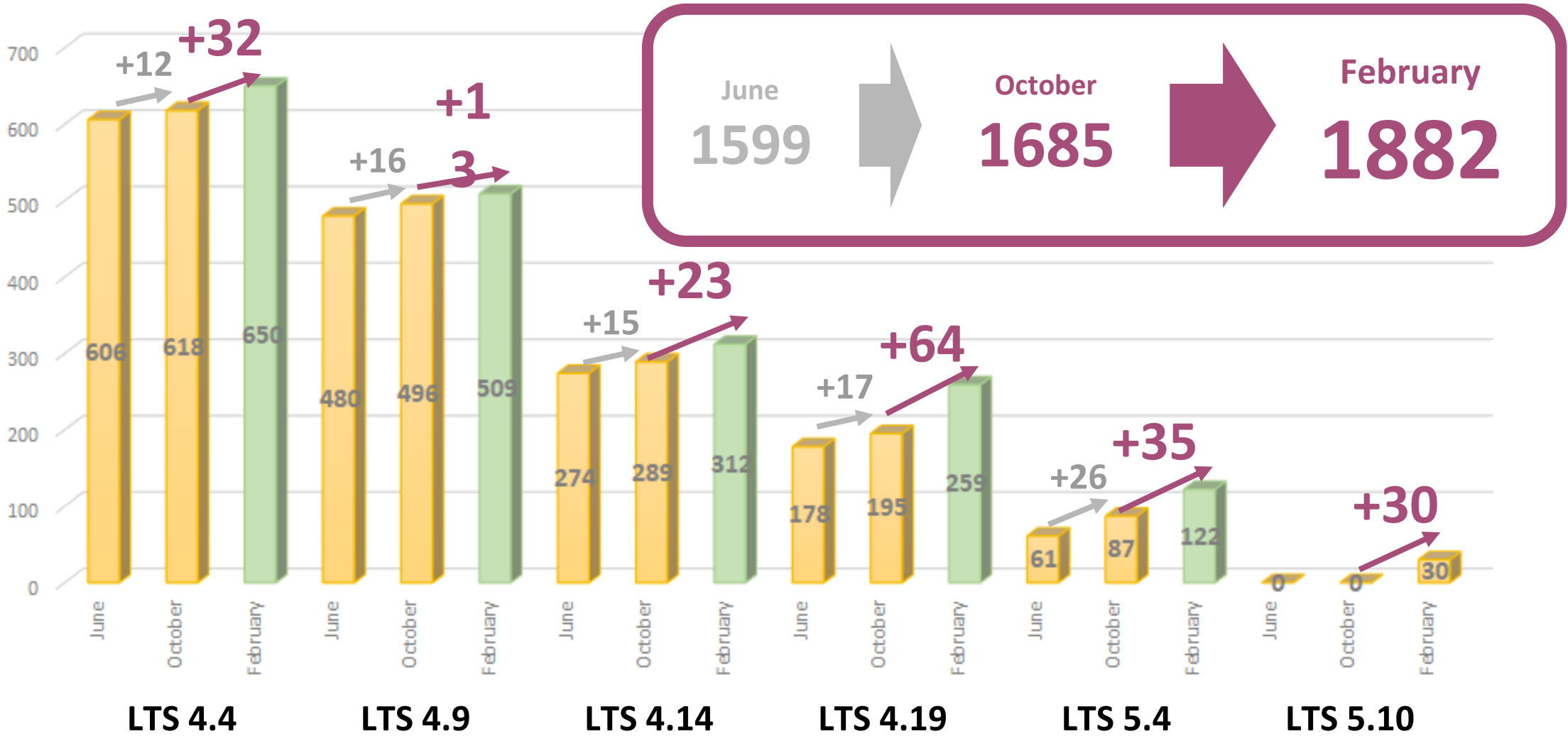
Goal

- **Provide a reference implementation** with CIP core packages for testing
- Based on **high-quality Debian** sources
- Following implementations are provided
  - **Tiny profile** ➢ E.g. Small IoT devices
  - **Generic profile** ➢ E.g. IoT gateways

Status

- CIP Core profiles are available
  - https://gitlab.com/cip-project/cip-core
- **Started to support Debian Extended LTS from 1st of July 2020**

Debian packages   Debian sources

1 Contribution

~isar   Deby

Debian   meta-*

Build tool

1 Funding

1 Use/Contribution

Generic profile
Tiny profile
CIP Core

CIP Core project

CIVIL INFRASTRUCTURE PLATFORM
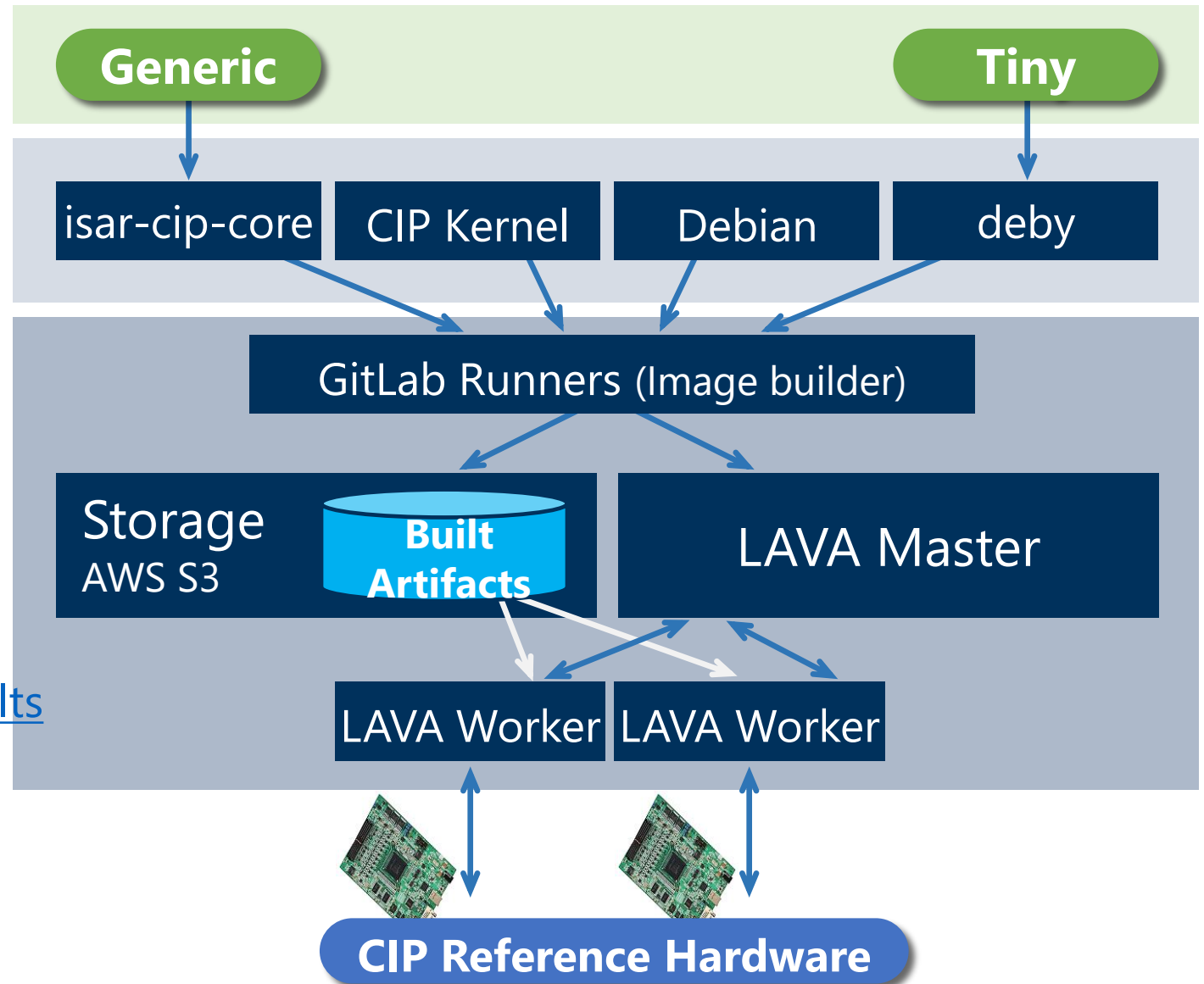
1 up-streaming   **2** use   **3** integrate

Goal

- Providing an environment to test CIP kernel and CIP Core

Status

- Distributed testing environment on AWS with LAVA + GitLab-CI,
- All test results available online
  - https://lava.ciplatform.org/results
- Testing also via KernelCI
- KernelCI project member

Generic   **Tiny**

isar-cip-core | CIP Kernel | Debian | deby

GitLab Runners (Image builder)

Storage AWS S3 — **Built Artifacts** | LAVA Master

LAVA Worker | LAVA Worker

CIP Reference Hardware

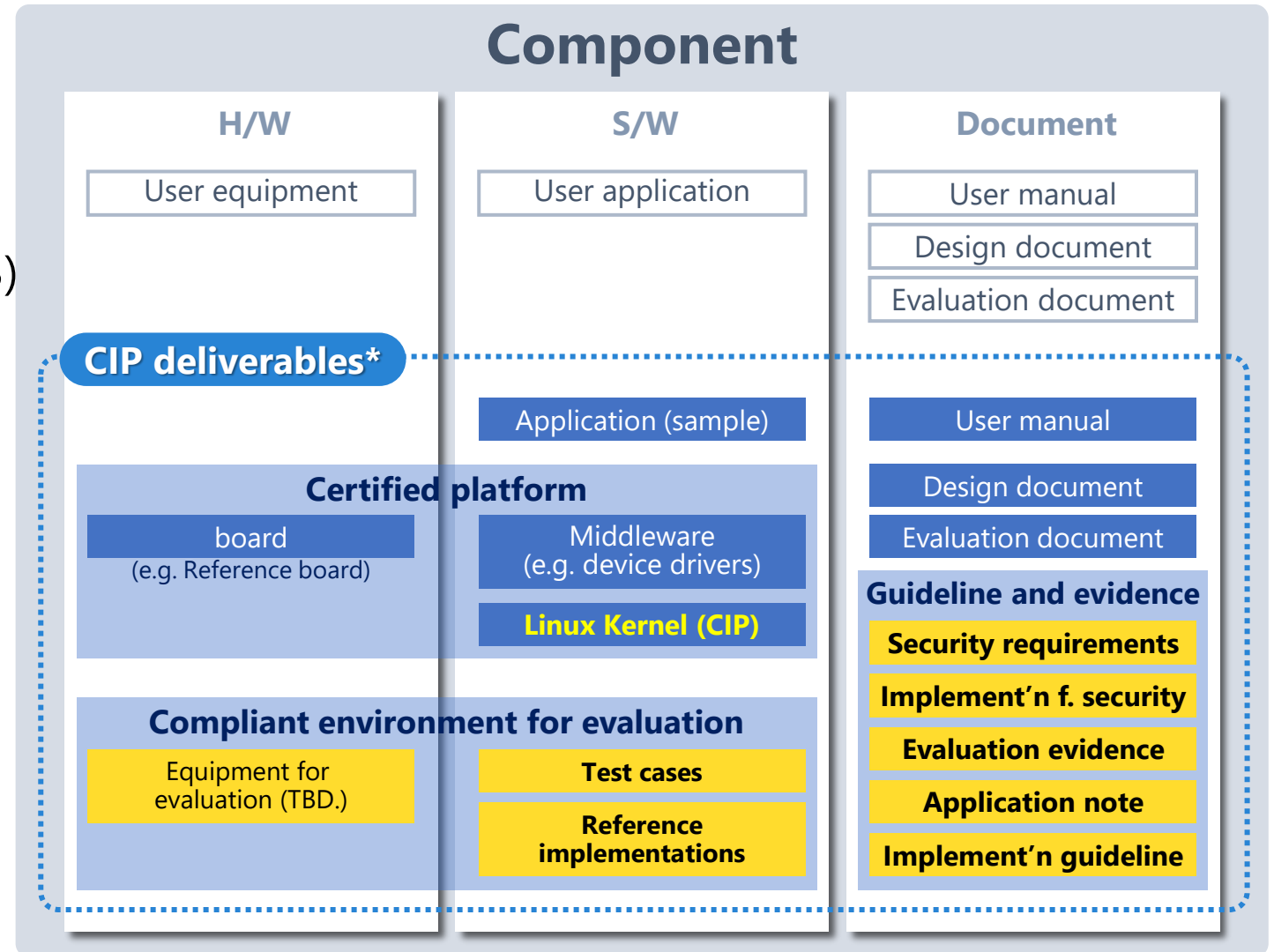## Goal

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

Status

- Onboarded exida as security assessor

- Mapping 62443 requirements on CIP kernel, Debian packages and CIP/community workflows

- Developing strategy to fill identified gaps

- Reference image via isar-cip-core

Component

H/W	S/W	Document
User equipment	User application	User manual
		Design document
		Evaluation document

CIP deliverables*

	Application (sample)	User manual
Certified platform		Design document
board (e.g. Reference board)	Middleware (e.g. device drivers)	Evaluation document
	Linux Kernel (CIP)	**Guideline and evidence**
		Security requirements
		Implement'n f. security
Compliant environment for evaluation		**Evaluation evidence**
Equipment for evaluation (TBD.)	**Test cases**	**Application note**
	Reference implementations	**Implement'n guideline**

* this image represents the planning and is for illustrative purpose only

CIVIL INFRASTRUCTURE PLATFORM
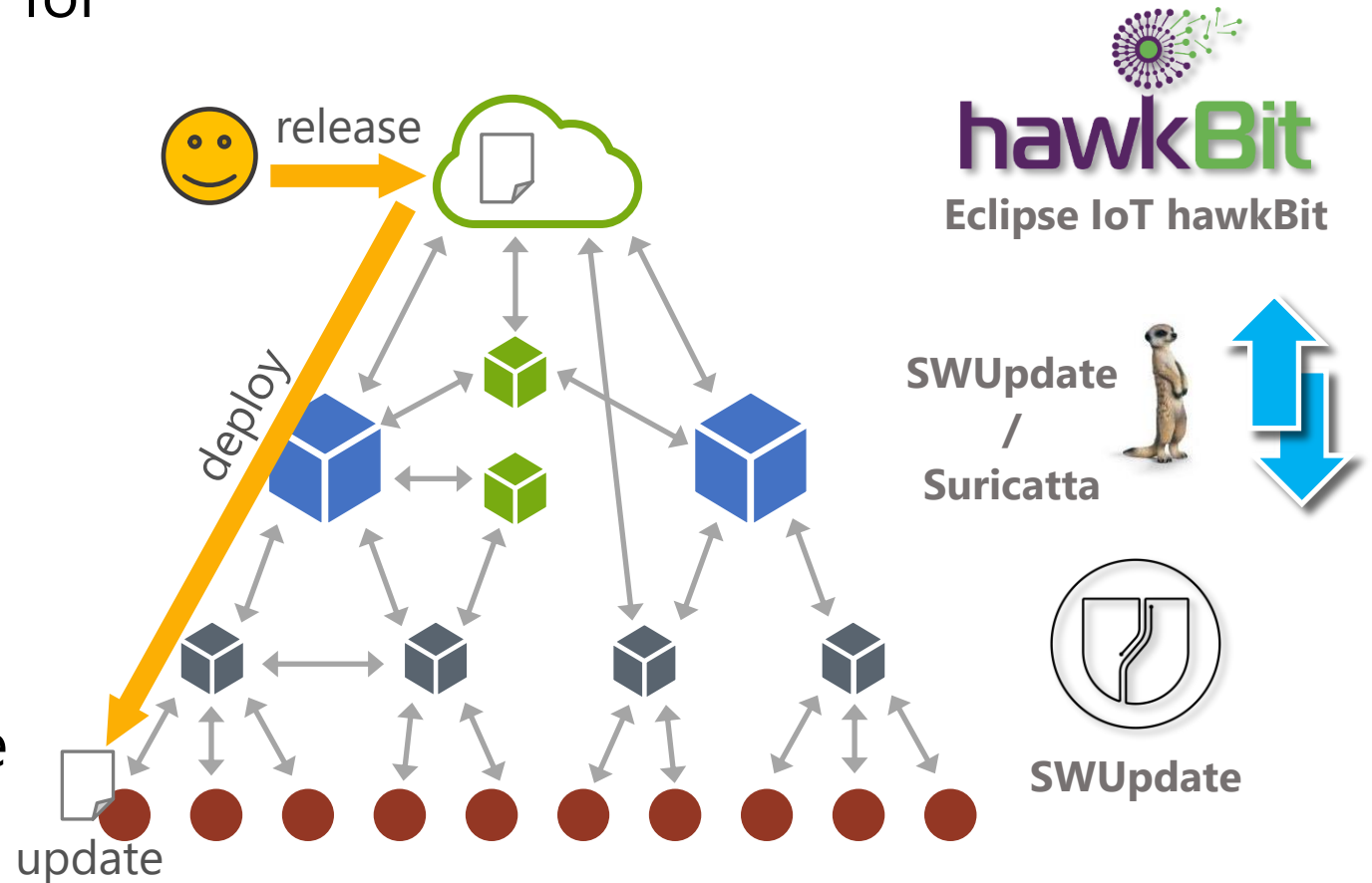
Goal

- Incorporate a common solution for software updates into CIP core
  – Device management
  – Deployment
  – Safe update

Current status

- Full-stack demonstrator from SWupdate up to hawkbit
- Secure boot + A/B update pre-integration via isar-cip-core
- In production use

release

deploy

update

hawkBit
Eclipse IoT hawkBit

SWUpdate / Suricatta

SWUpdate

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Looking ahead

- **CIP is here to stay**
  - 5 years around, broadly recognized as stable project
  - Our tasks will not be "done" tomorrow, by nature
- **Sustainability requires further growth**
  - 1st SLTS kernel self-maintenance starts next year
  - Extended Debian LTS tasks will grow when buster leaves LTS
  - CIP would like to preserve its breadth and support more activities
- **Contributions are essential**
  - Provide feedback on use of and requirements on CIP components
  - Join technical work in CIP workgroups
  - Promote CIP as value towards customers and as requirement to suppliers

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INFRASTRUCTURE
PLATFORM

CIP SLTS Kernel Maintenance Outlook
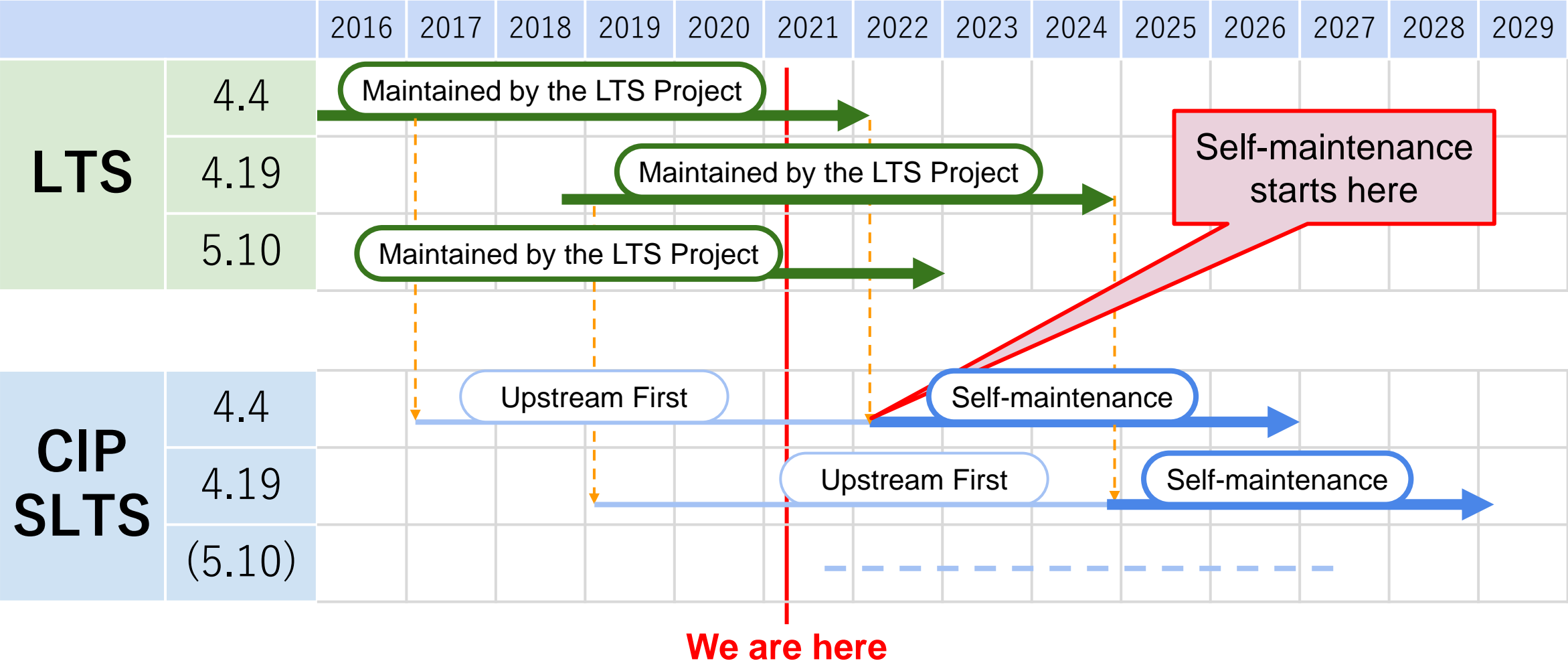
Questions?

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
- CIP web site: https://www.cip-project.org
- 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