LINUX FOUNDATION
COLLABORATIVE PROJECTS

CIVIL INFRASTRUCTURE PLATFORM

Upstream First is Our Principle
– Toward Super Long-Term Support –

Chris Paterson @ Renesas
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October 26th , 2020

About US

- **Masashi Kudo <masashi.kudo@miraclelinux.com>**
  - Working for Cybertrust Japan Co., Ltd.
  - Acted as OpenDaylight (LF Networking) Ambassador
  - CIP Kernel Team Chair

- **Chris Paterson <chris.paterson2@renesas.com>**
  - Working for Renesas Electronics Europe GmbH
  - CIP Testing Working Group Chair

CIVIL INFRASTRUCTURE PLATFORM

Table of Contents

CIVIL INFRASTRUCTURE PLATFORM

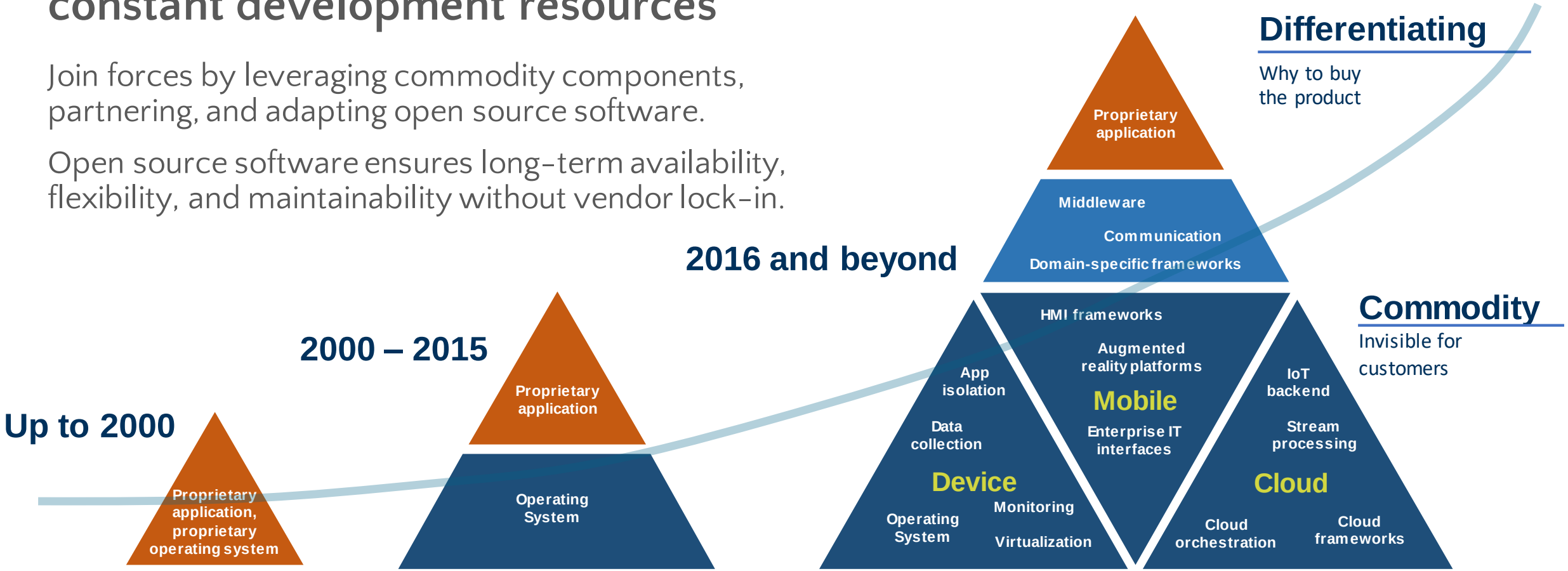
What is CIP?

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.



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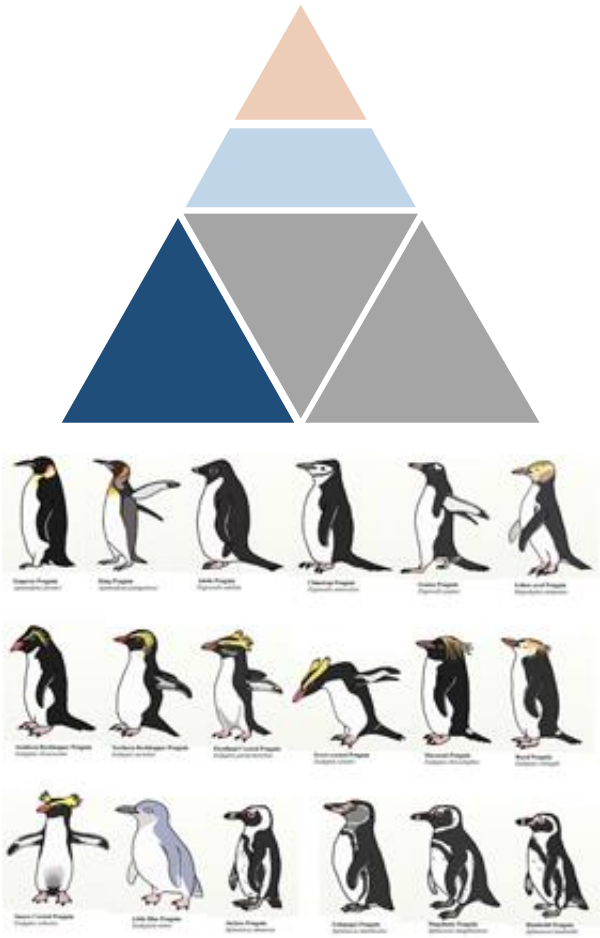
Facts and Issues: Silo Development

Facts

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

Issues

- A lot of products have to meet industrial 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/

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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

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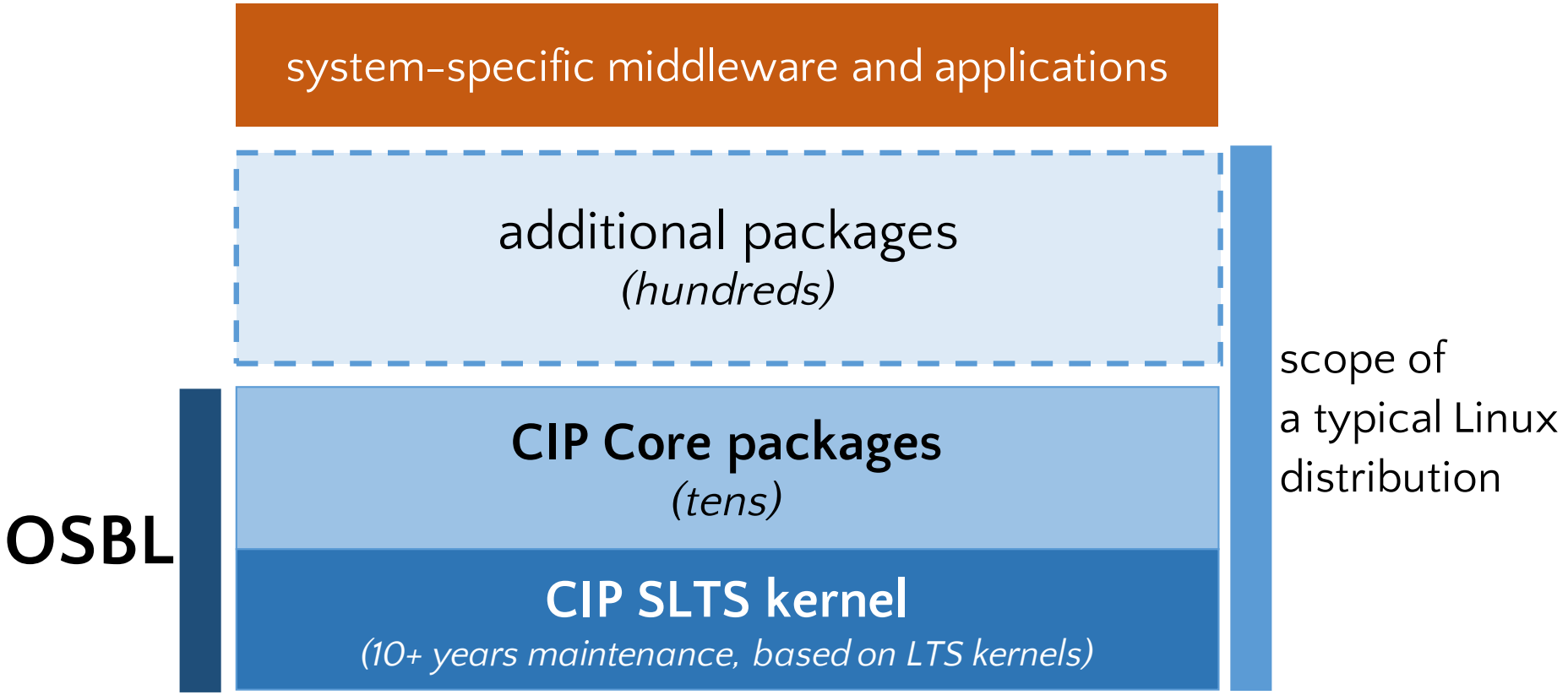
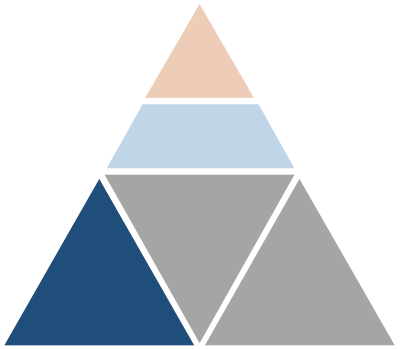
What is “Open Source Base Layer (OSBL)”?





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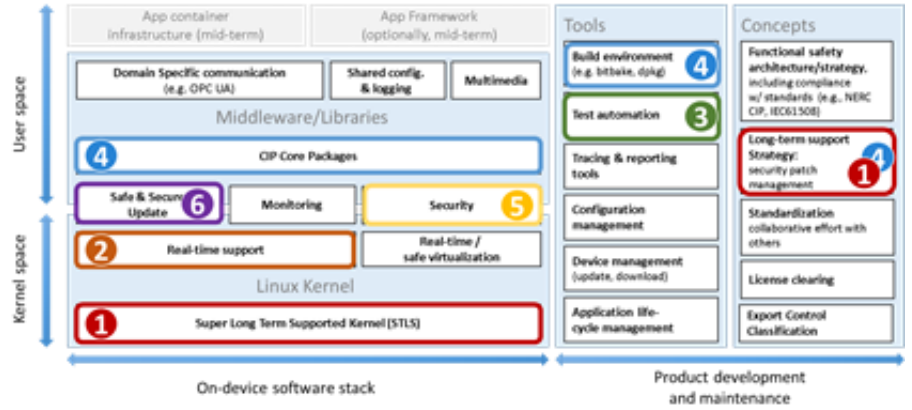
CIP Civil Infrastructure Platform Project (https://www.cip-project.org/) **SLTS** Super Long Term Support

CIP governance structure and projects



Governing Board (GB)

Technical Steering Committee (TSC)

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

(*): Workgroup

CIP Projects and its scopes

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The backbone of CIP are the member companies

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RENESAS SIEMENS TOSHIBA

CodeThink cybertrust HITACHI Inspire the Next MOXA Plat'Home There, we are. Internet of Things

Budget ¥ € £ $

Developers, maintainers

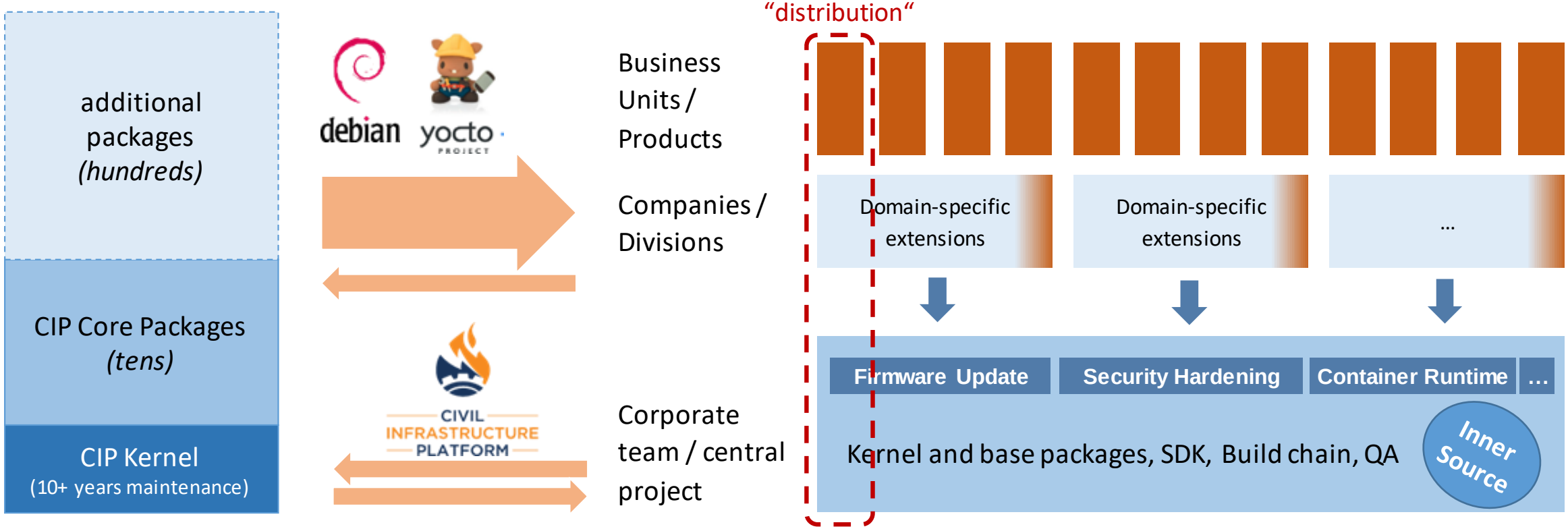
Optional: funding of selected projects

Contribution & usage / integration

Open Source Projects (Upstream work)

Real-Time LINUX debian KernelCI Reproducible Builds

Mapping CIP into the company



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.

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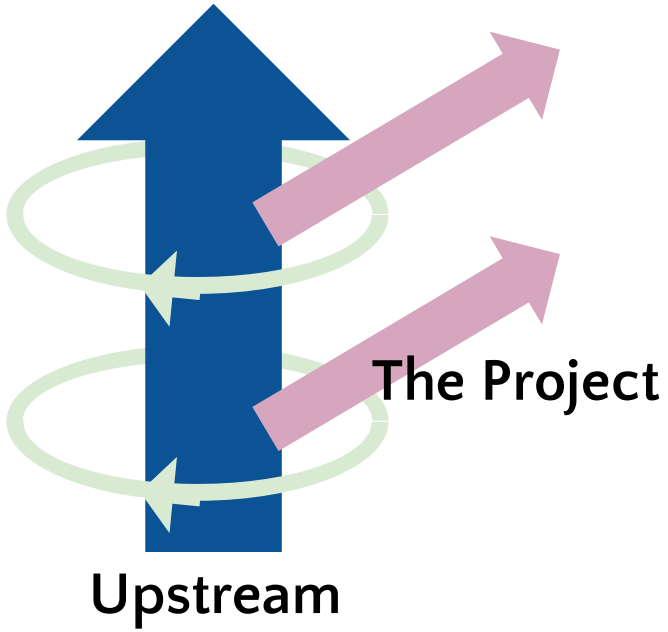
OSS Open Source Software **QA** quality assurance **SDK** software development kit

Upstream First

Development Models

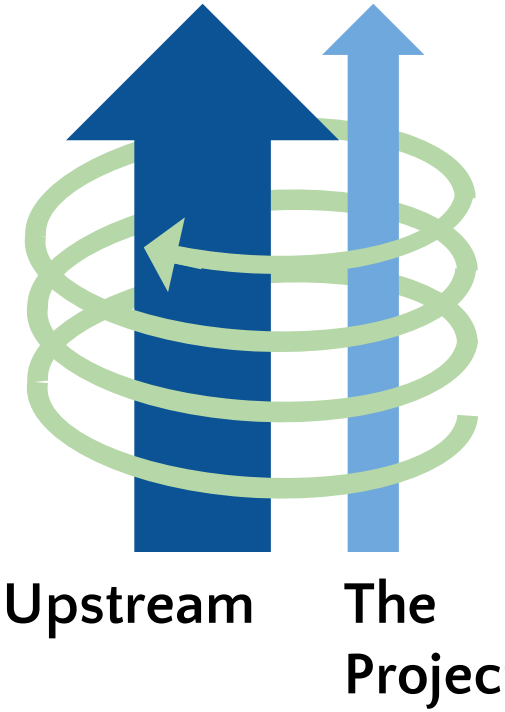
"Own Community" Model

Branches its base from upstream and evolves by its own.



"Upstream First" Model

Only allows patch commits if those patches are already in the upstream.



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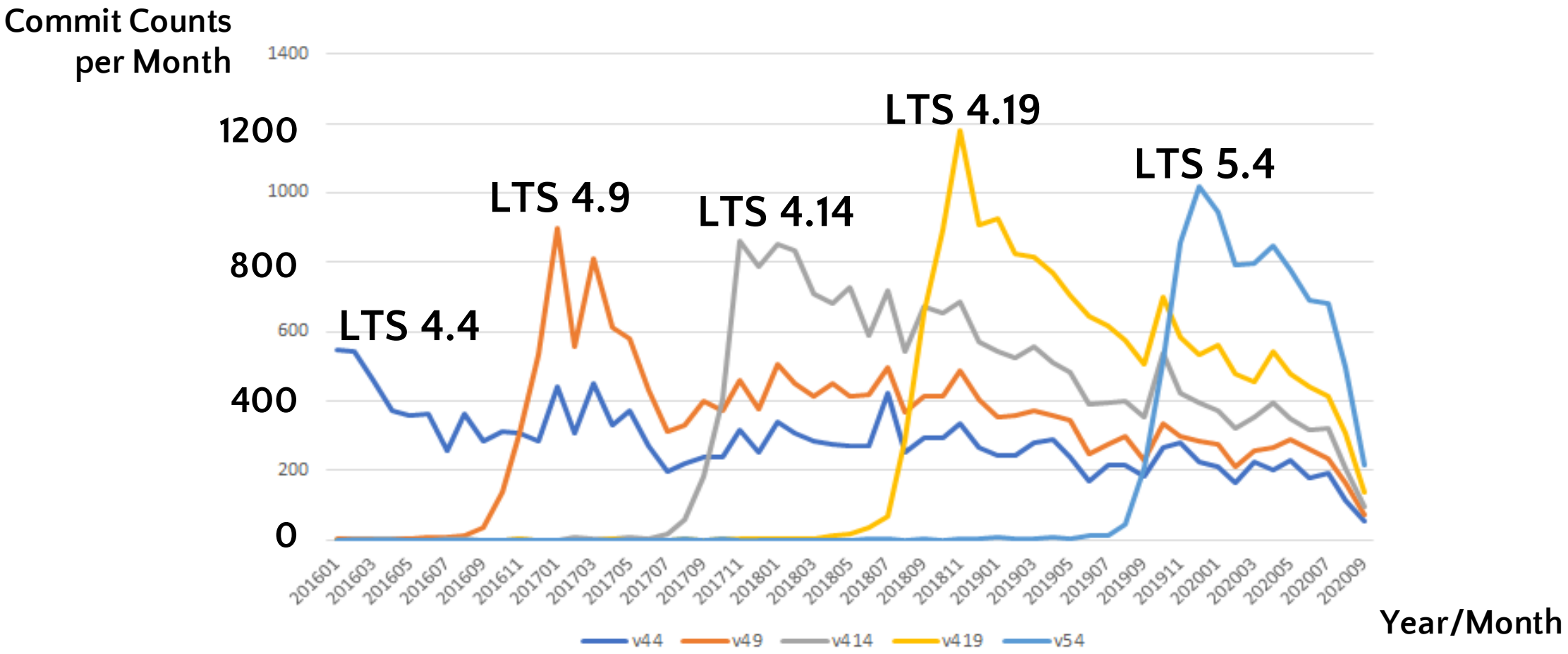
Commit Counts per LTS



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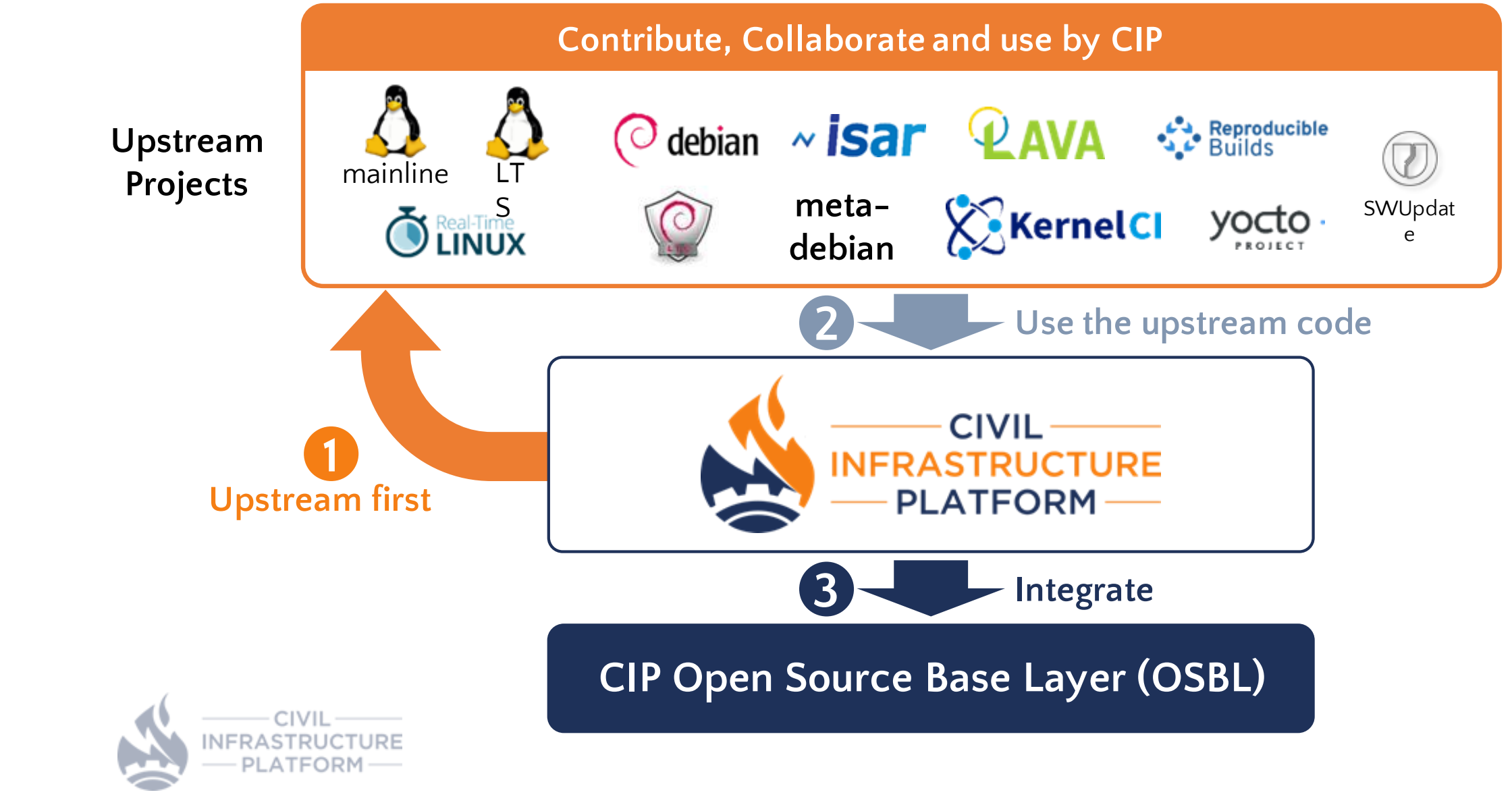
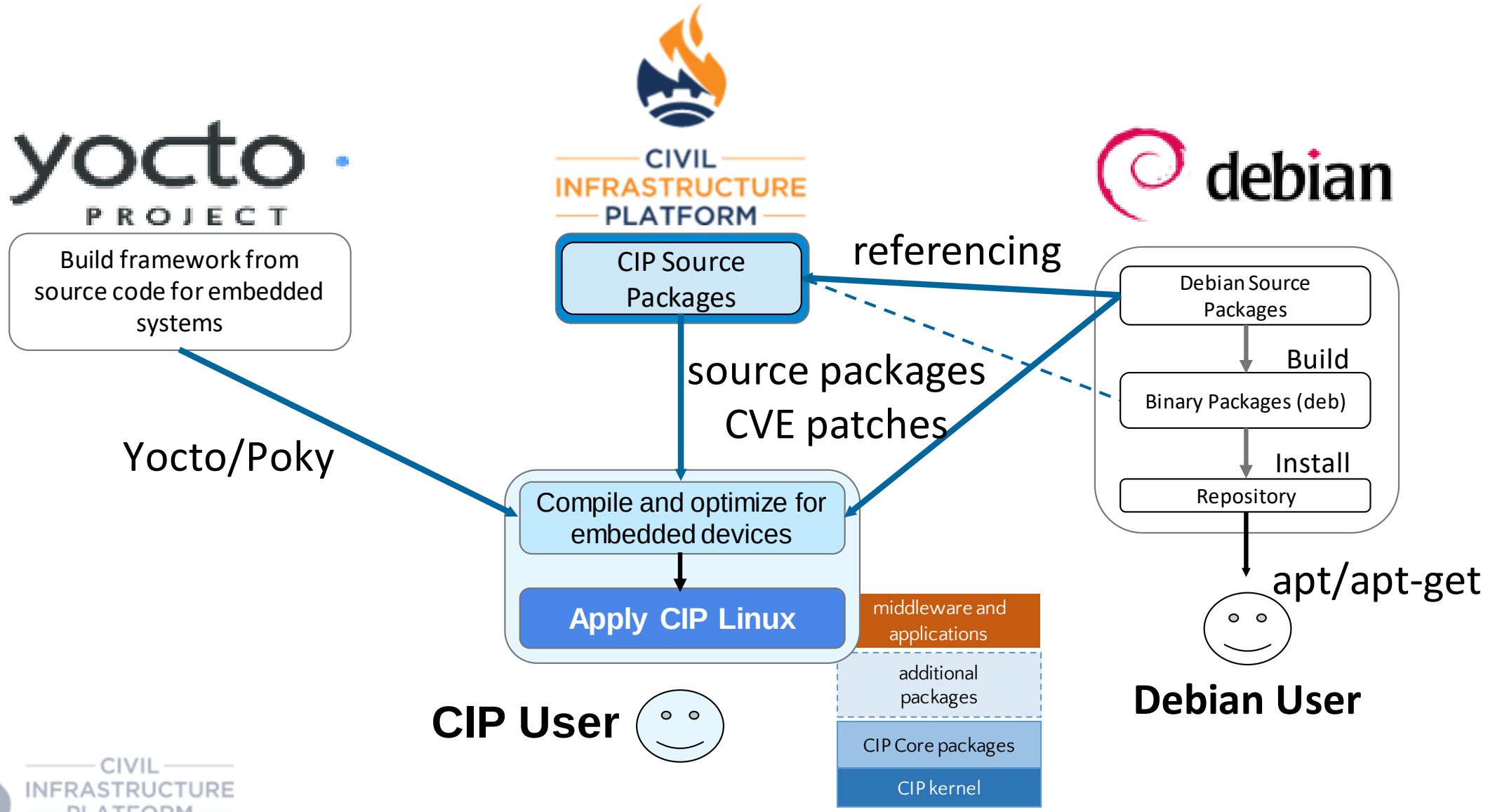
Note: If a patch has an original patch, the date of the patch is that of the original one.

Collaborative development with other OSS projects



How CIP Artifacts can be used



CIP Kernel Team Activities

CIP Kernel Team

Primary Goal

- Provide CIP SLTS kernels with ten+ years maintenance period **by fixing versions** to fulfill the required level of reliability, sustainability, and security

Team Members

- Masashi Kudo – **Chairperson**
- Nobuhiro Iwamatsu – **Kernel Maintainer**
- Pavel Machek – **Kernel Maintainer**
- Ben Hutchings – **Kernel Mentor**
- Chen-Yu Tsai – **Kernel Developer**

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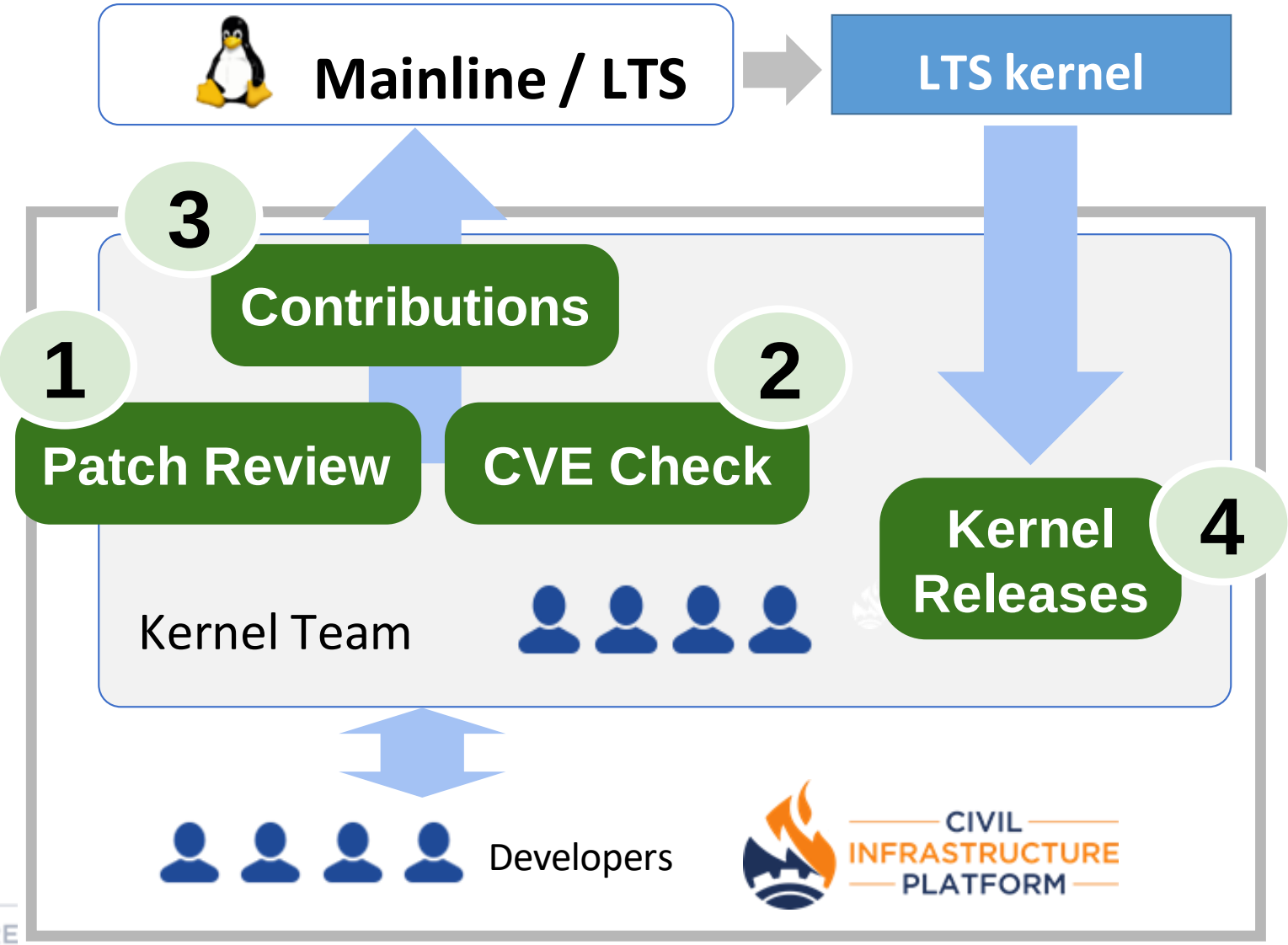
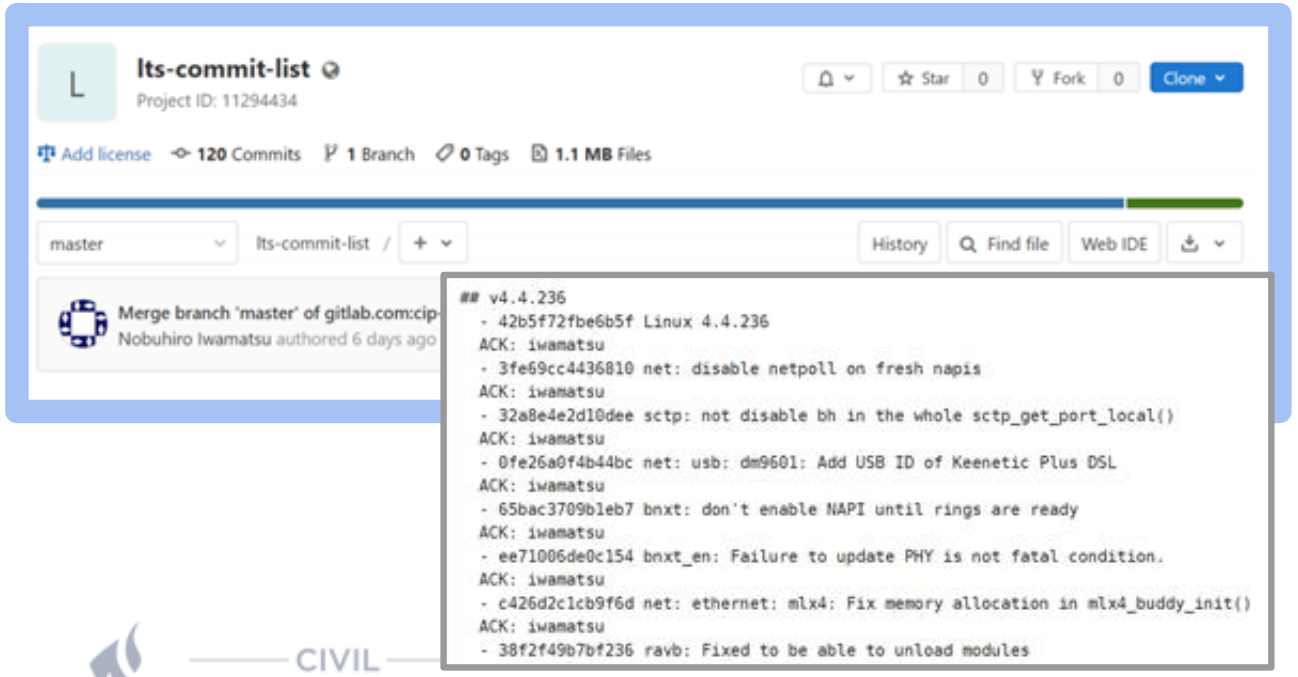
CIP SLTS kernel development



Stable Patch Review

- Reviews for -rc
  - Review results are posted to ML
- Reviews for stable releases




```
> --- a/drivers/infiniband/core/restrack.c
> +++ b/drivers/infiniband/core/restrack.c
> @@ -209,7 +209,7 @@ void rdma_restrack_del(struct rdma_restr
>      struct ib_device *dev;
>
>      if (!res->valid)
> -            return;
> +            goto out;
>
>      dev = res_to_dev(res);
>      if (!dev)
#               return;

This test does return, does it need to go through 'goto out', too? (I
see it should not happen, but...)

> @@ -222,8 +222,10 @@ void rdma_restrack_del(struct rdma_restr
>      down_write(&dev->res.rwsem);
>      hash_del(&res->node);
>      res->valid = false;
> +    up_write(&dev->res.rwsem);
> +
> +out:
>      if (res->task)
>              put_task_struct(res->task);
> -    up_write(&dev->res.rwsem);
> }

Mainline says res->task = NULL is needed there, see fe9bc1644918aa1d.

Best regards,
                                                    Pavel
```

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2 CVE Check

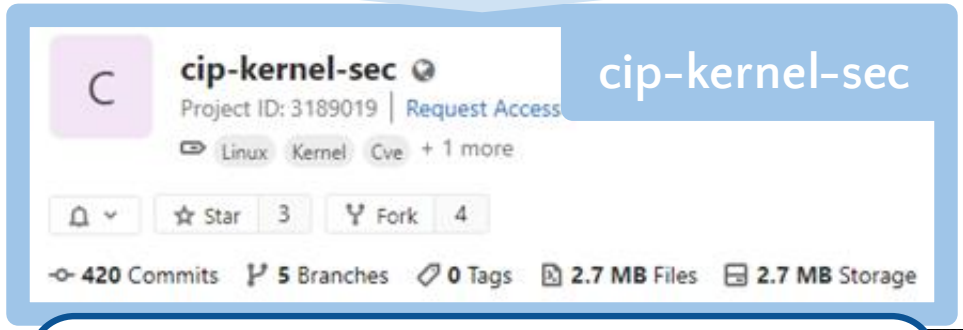
Mainline/ LTS

debian

ubuntu

Gather kernel CVE Information

cip-kernel-sec



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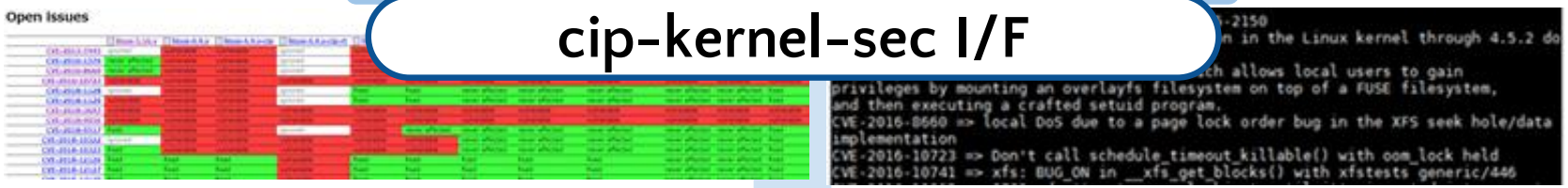
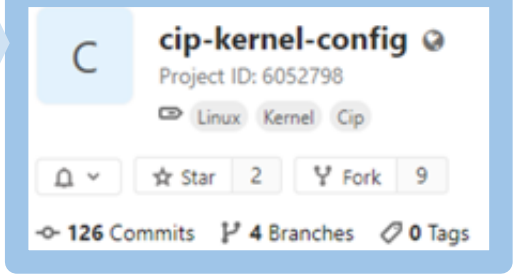
cip-kernel-sec I/F



Analyse CVEs to determine necessities for contributions

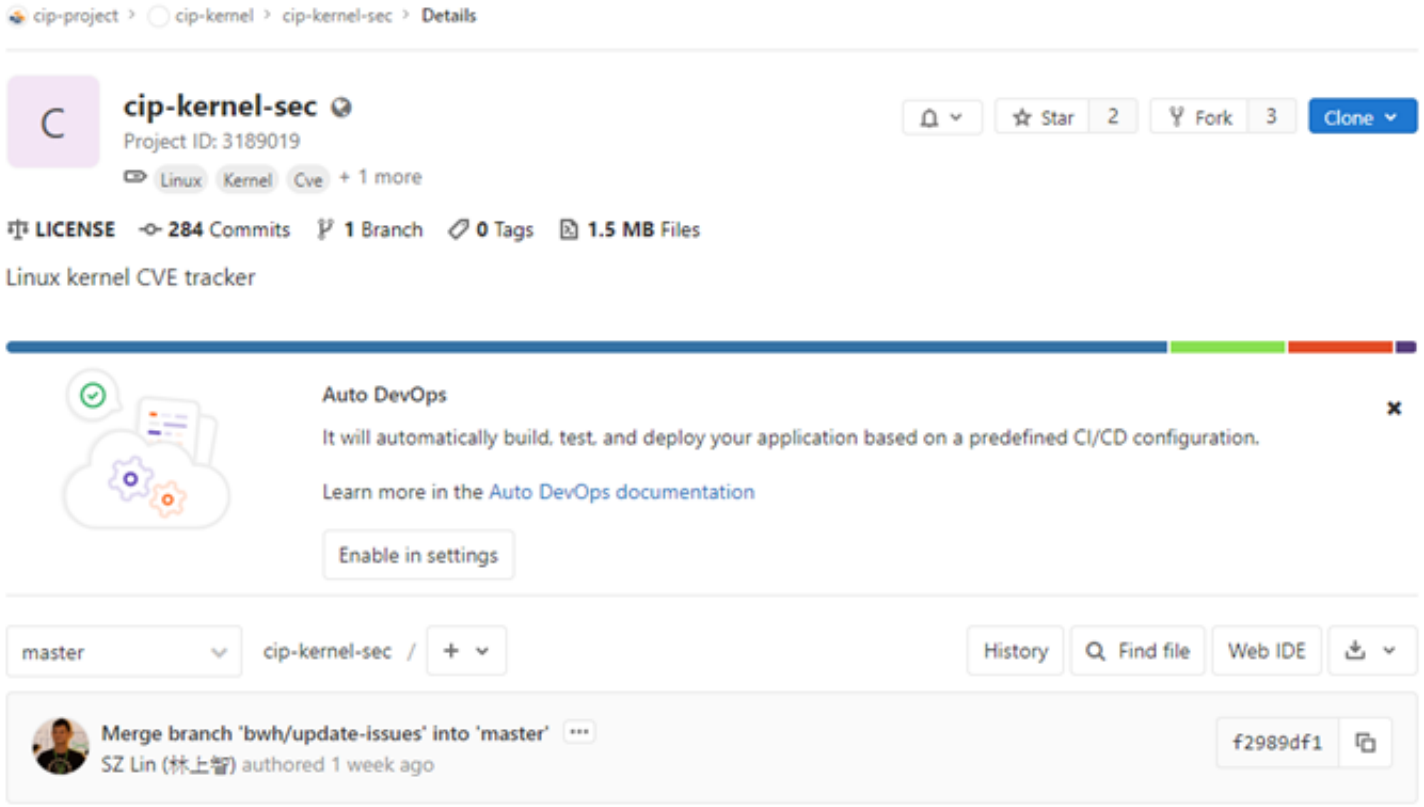
Refer

cip-kernel-config



2 cip-kernel-sec

- Tracks the status of security issues, identified by CVE ID, in mainline, stable, and other configured branches.



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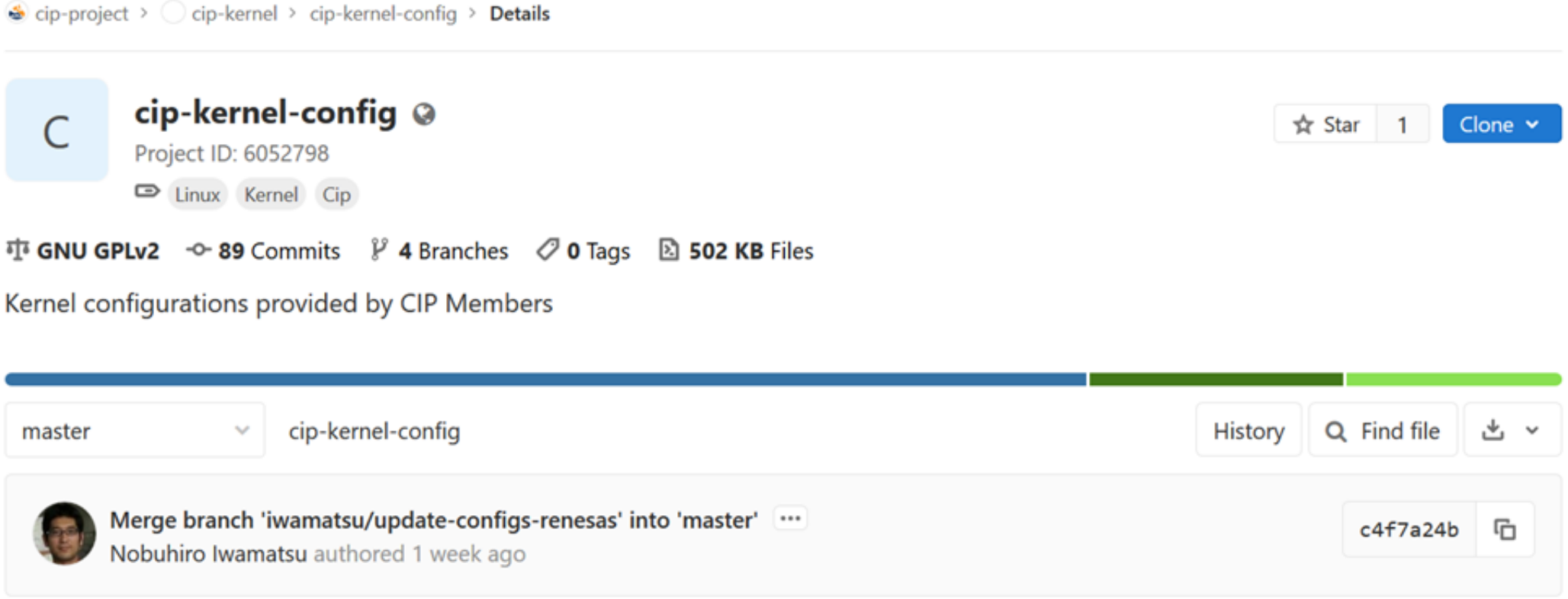
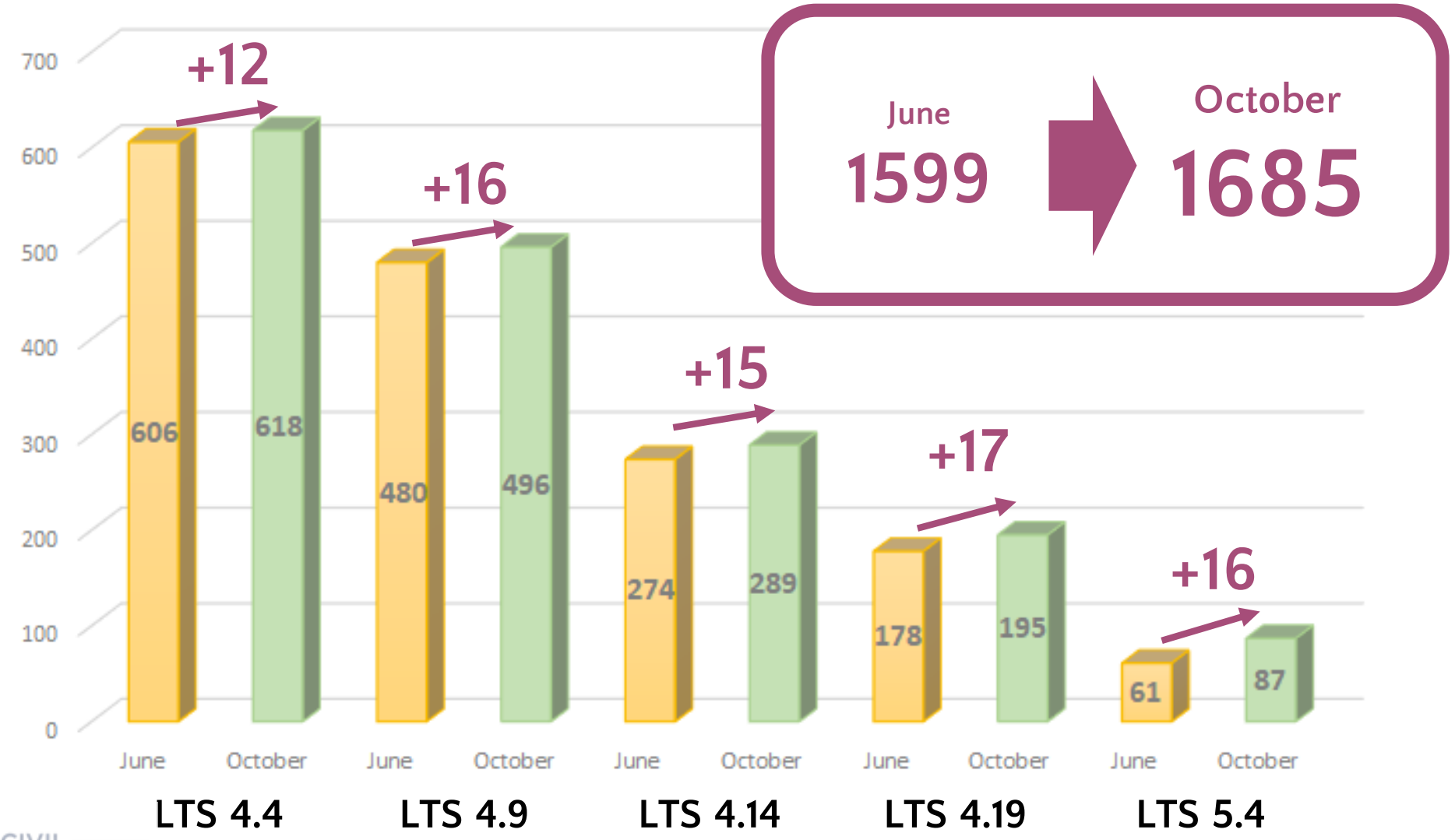
2 cip-kernel-config

- Necessity of contributions (backporting) is determined to be fixed base on kernel configurations provided by CIP members



3 Contributions to LTS



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3 Contributions to LTS – Details

as of October 6, 2020

	v4.4.238	v4.9.238	v4.14.200	v4.19.149	v5.4.69	TOTAL
Suggested-by:	1	1	1	2	1	6
Reported-by:	44	35	29	16	6	130
Signed-off-by:	440	334	149	88	41	1052
Debugged-by:	1	1				2
Author:	80	83	55	39	23	280
Acked-by:	26	29	33	44	13	145
Reviewed-by:	2	4	10	7	6	29
Tested-by:	4	4	6	3		17
Cc:	104	97	72	51	28	352
TOTAL	**618**	**496**	**289**	**195**	**87**	**1685**

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Note: There could be multiple contributions by a same personnel in one commit. such duplicates are eliminated in total numbers. Therefore, the summation of each item may not equal to "Total".

4 CIP Kernel Release Process

1. Review stable patches - status tracked in Gitlab [1]
   - Mark the review and the name of the worker under the commit.
   - **Start to review stable kernel patches in rc stage**
2. Review patch from CIP members via cip-dev [2]
   - Update the status of the commit in patchwork
3. Start testing
4. Tag release candidate
5. Ack by other maintainers
6. Release and send the news to cip-dev

```
# Stable Kernel Patches Review Status
Please list your name and review result below the patch item

  * UR:  Under Review
  * ACK: Acknowledge (if the patch is accepted)
  * TBB: To be backported (if other patches should be also backported)
  * NAK: Negative acknowledge (if the patch is rejected, please list the reason)
  * IGN: Patch was not reviewed as it is out of scope for CIP project


## v4.4.184
  - 72d1ee93e931 Linux 4.4.184
  - 46c7b5d6f2a5 tcp: refine memory limit test in tcp_fragment()
```

[1] https://gitlab.com/cip-project/cip-kernel/lts-commit-list

[2] https://patchwork.kernel.org/project/cip-dev/list/

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4 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

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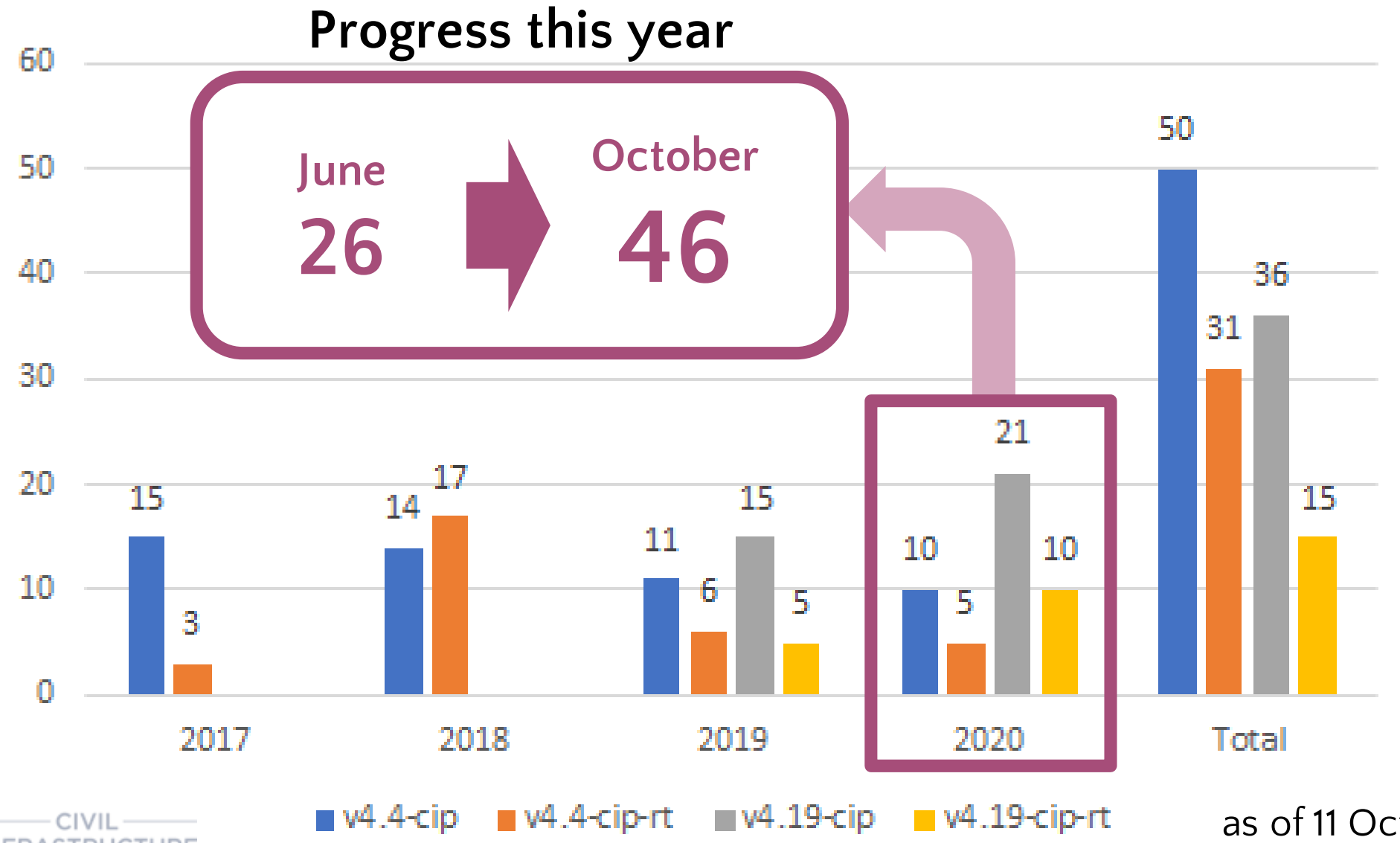
4 CIP SLTS Kernel Release Statistics



as of 11 Oct. 2020

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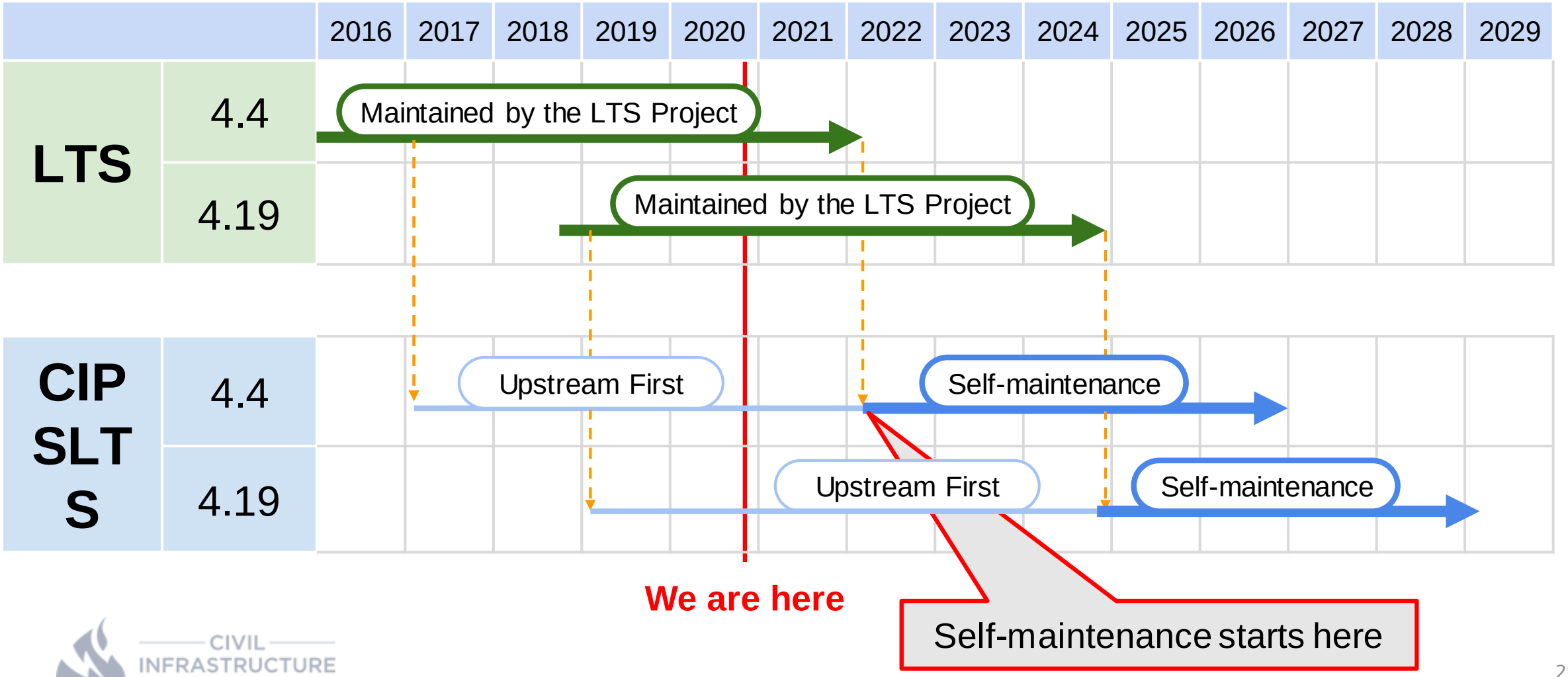
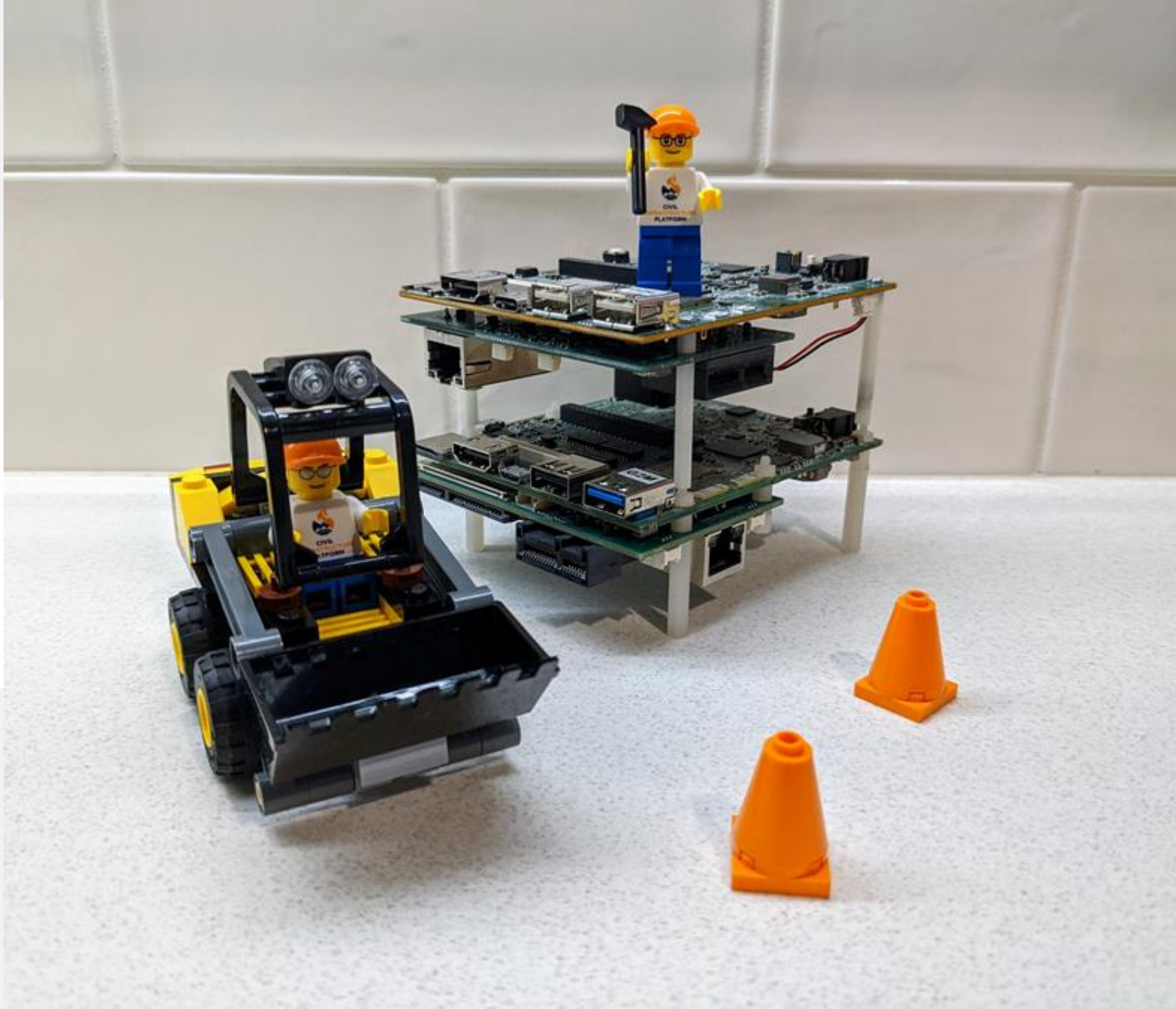
CIP SLTS Kernel Maintenance



CIP Automated Testing



Testing Goals

- **Centralised control / distributed testing**
  - CIP developers who are distributed over the world should be able to test CIP software on the CIP reference platforms, even if they don't have a platform locally
- **Automated testing with Continuous Integration (CI)**
  - Sustain periodical and long-term kernel releases cost-effectively
- **Open Source collaboration**
  - Improve the whole ecosystem and avoid reinventing the wheel

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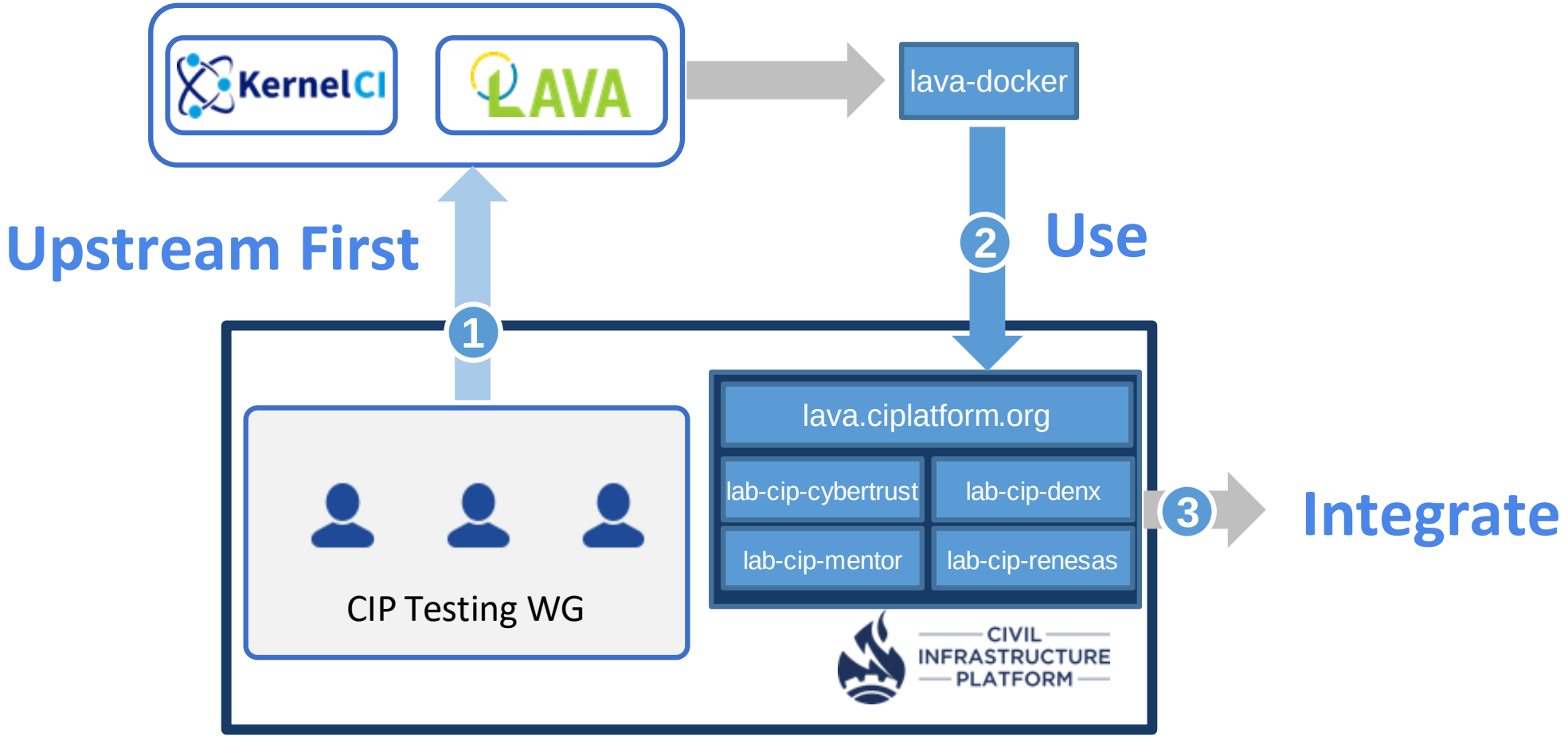
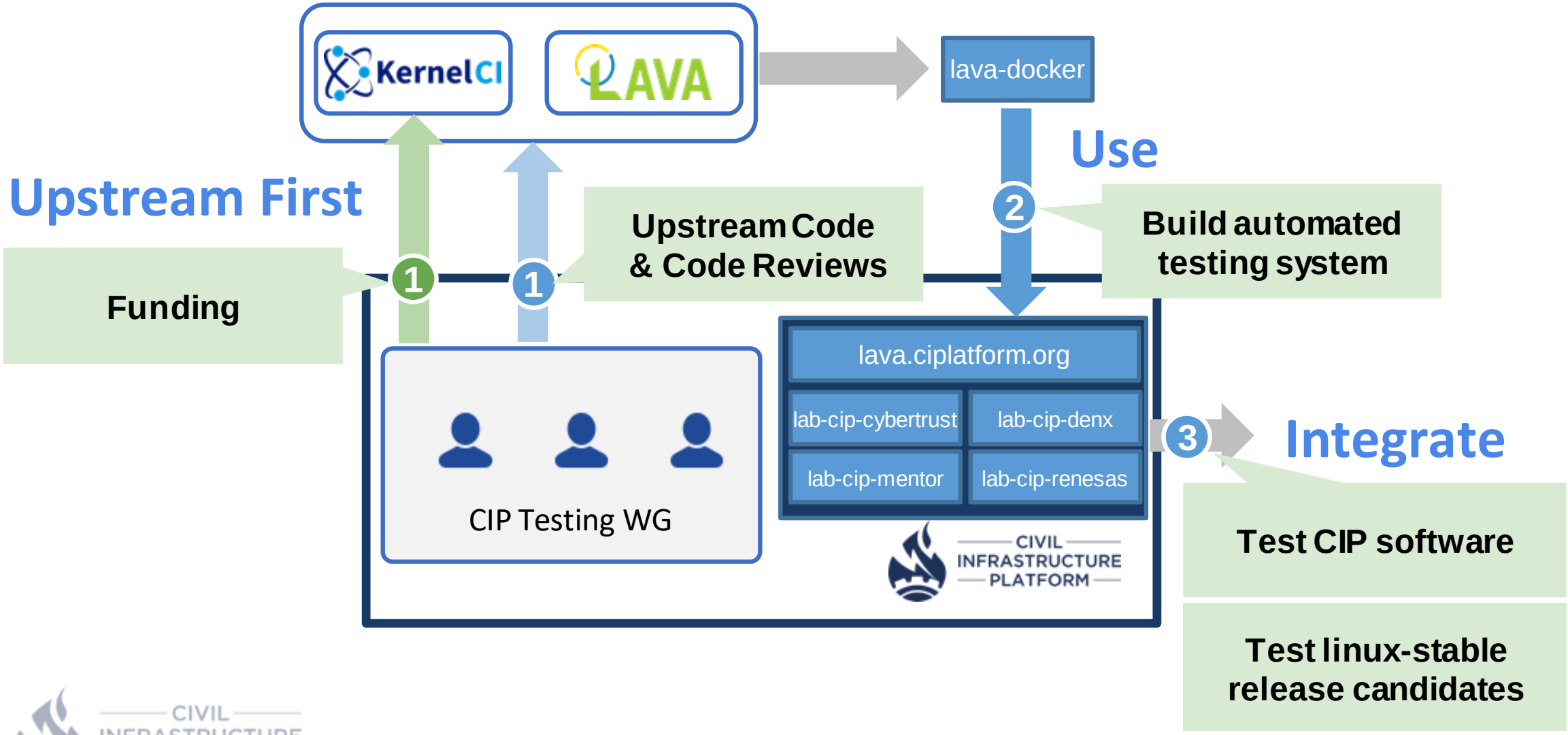
Open Source Approach



Open Source Approach – In Practice



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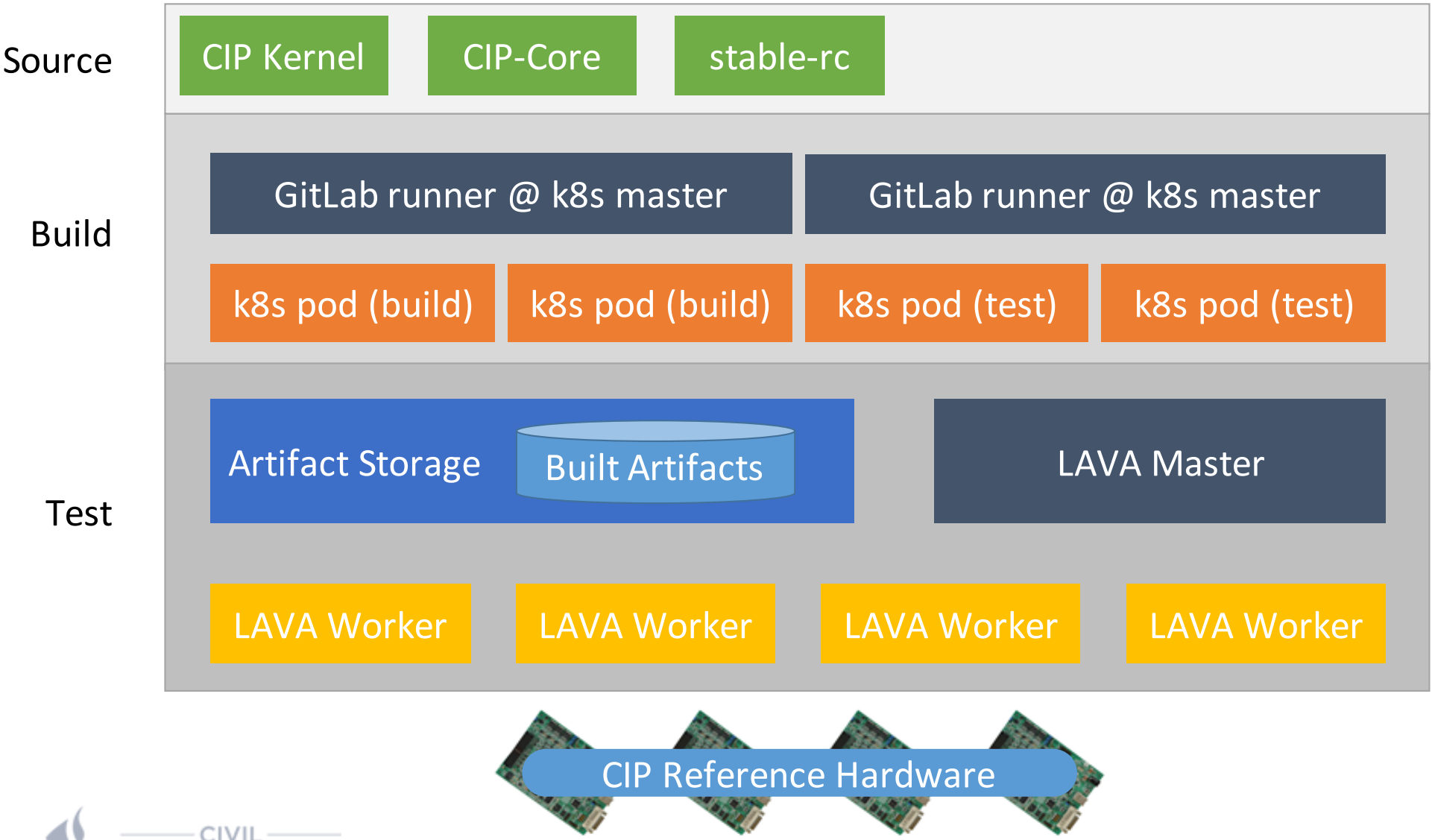
Testing Architecture Overview



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CIP Reference Boards

CIP Reference Boards		Supported Kernels			
Platform	**Architecture**	**SLTS v4.4**	**SLTS v4.4-rt**	**SLTS v4.19**	**SLTS v4.19-rt**
AM335x Beaglebone Black	Armv7	Y	Y[1]	Y	Y[1]
Cyclone V DE0-Nano-SoC Development Kit	Armv7	N	N	Y	Y[1]
QEMU	x86_64	Y	Y[1]	Y	Y[1]
RZ/G1M iWave Qseven Development Kit	Armv7	Y	Y[1,2]	Y	Y[1,2]
RZ/G2M HopeRun HiHope	Armv8	N	N	Y	Y[1,2]
SIMATIC IPC227E	x86_64	N	N	Y	Y[1]
OpenBlocks IoT VX2	x86_64	N	N	Y	Y[1]

CIP Reference Board Candidates		Supported Kernels			
Platform	**Architecture**	**SLTS v4.4**	**SLTS v4.4-rt**	**SLTS v4.19**	**SLTS v4.19-rt**
Zynq UltraScale+ MPSoC ZCU102 Evaluation Kit	Armv8	N	N	Y	Y[1]

[1] Tested with standard Kernel configuration (non-RT)
[2] Tested with Real-Time enabled Kernel configuration

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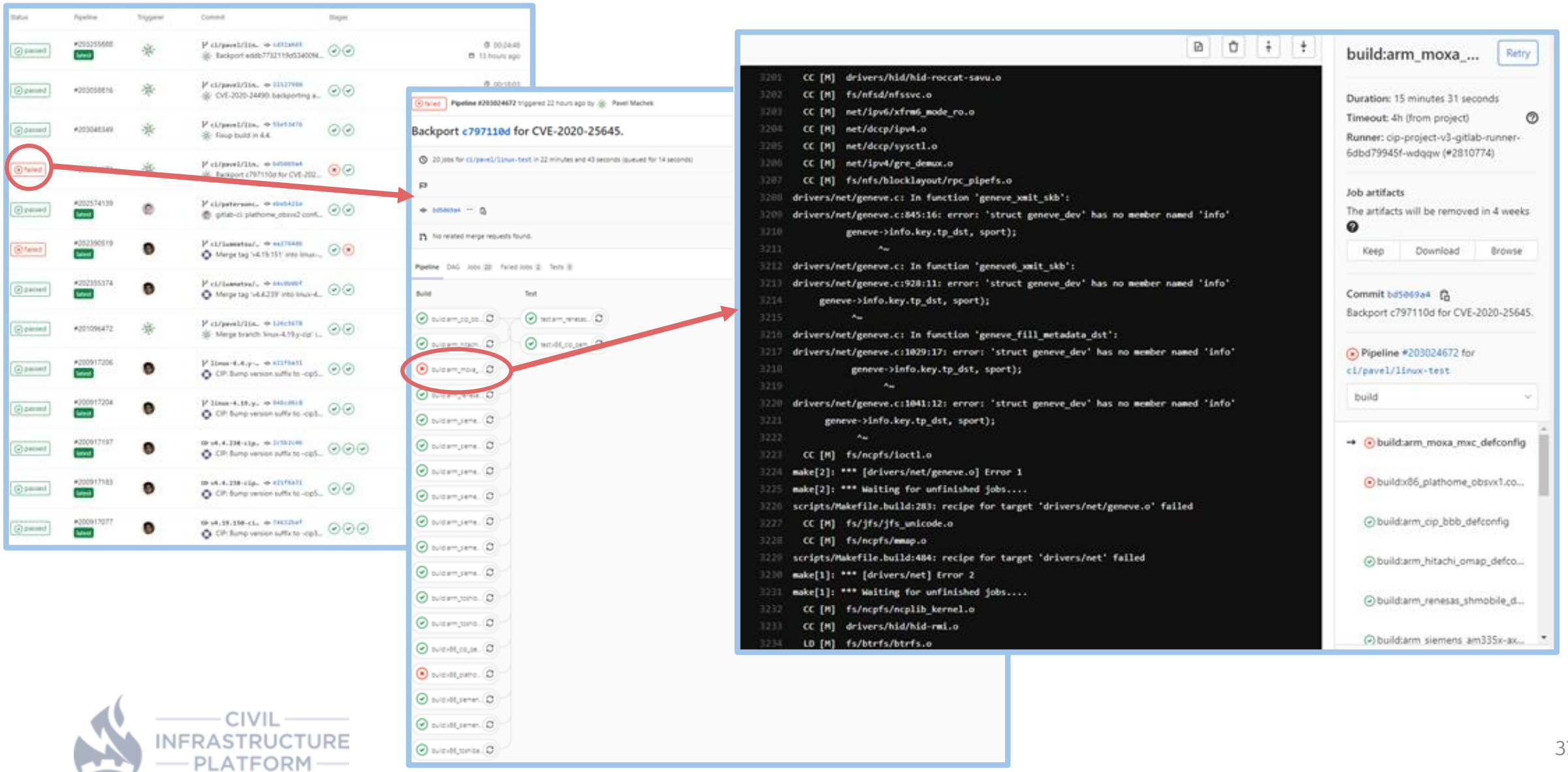
Tests

- Currently CIP is running the following tests:
  - Boot test
    - uname -a
  - Spectre/Meltdown checker
    - A shell script to tell if your system is vulnerable against the several "speculative execution" CVEs that were made public in 2018.
    - https://github.com/Linaro/test-definitions/tree/master/automated/linux/spectre-meltdown-checker-test
  - LTP
    - ltp-cve-tests, ltp-dio-tests, ltp-fs-tests, ltp-ipc-tests, ltp-math-tests, ltp-open-posix-tests, ltp-sched-tests, ltp-syscalls-tests and ltp-timers-tests
    - https://github.com/Linaro/test-definitions/tree/master/automated/linux/ltp
    - https://github.com/Linaro/test-definitions/tree/master/automated/linux/ltp-open-posix
  - Cyclictest+Hackbench
    - This test measures event latency in the Linux Kernel, with hackbench running in the background to stress the system.
    - https://gitlab.com/cip-project/cip-testing/linux-cip-ci/-/blob/master/lava_templates/test_cyclictest+hackbench.yaml

Example GitLab Pipeline



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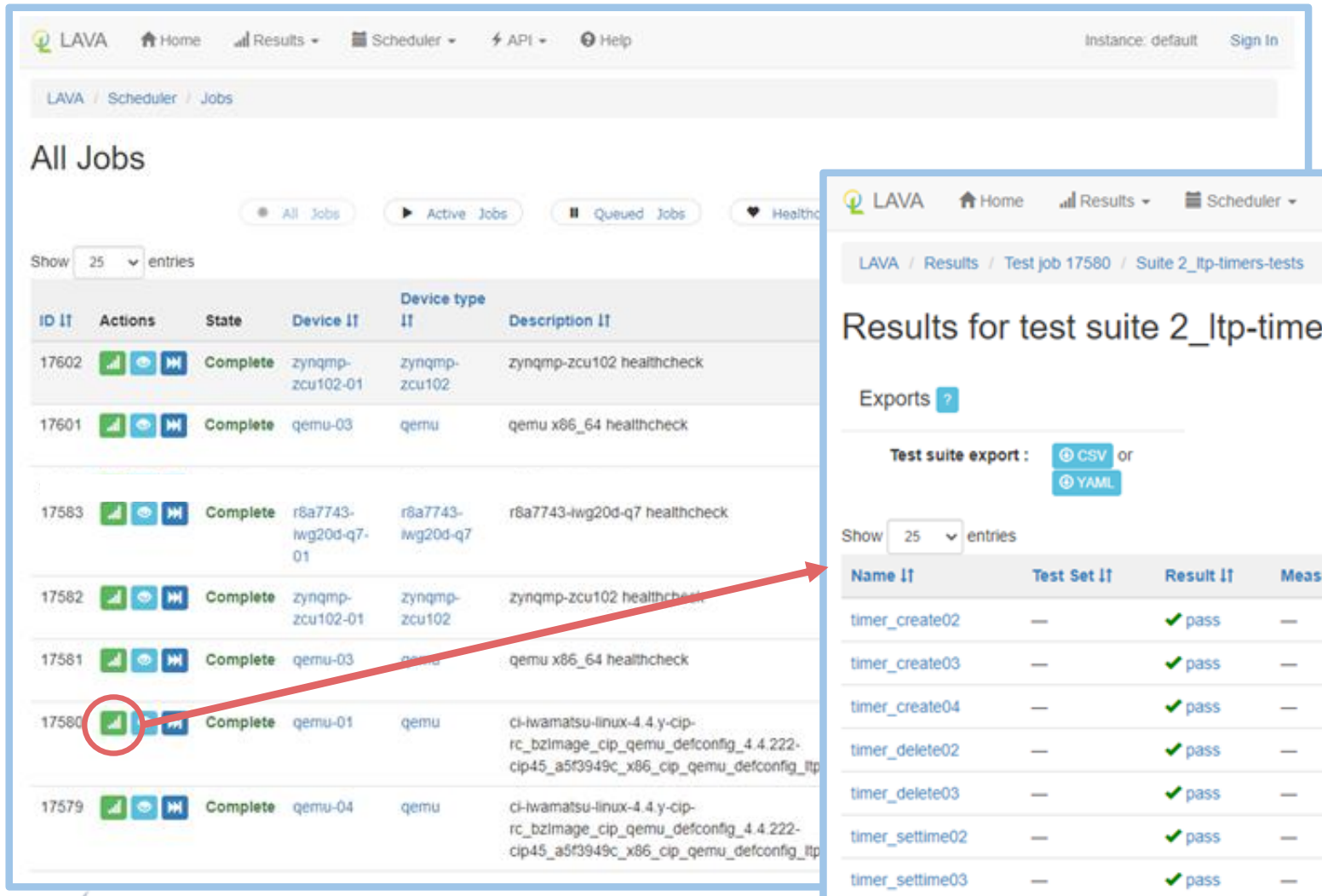
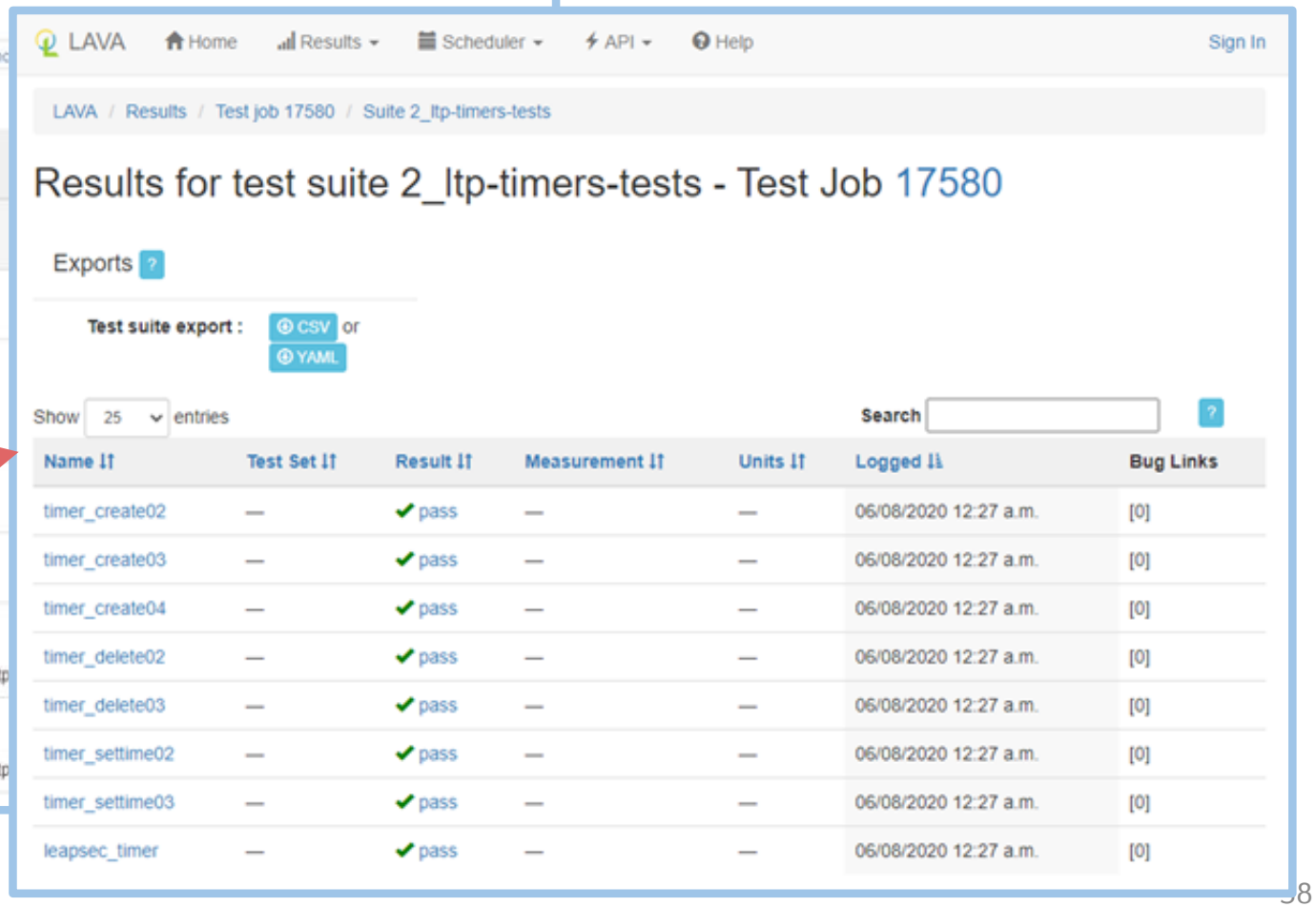
Test Results in LAVA





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Collaboration with KernelCI

- CIP joined the KernelCI project at its inception in 2019.
- As premier members we help to manage and steer the project.
- We also contribute via code and code reviews, and plan to keep improving the project in this way.
- In next few months we plan to start using the KernelCI front end to help us visualise our build and test results.

- If you want to learn more about KernelCI please attend Guillaume's BoF later today or Khouloud's talk on Wednesday evening.

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KernelCI

Summary


229.56
721.11
462.93
651.32
301.58
785.67
141.30
458.41
817.92
279.82
100m
219.98
458.41
123.05
818.71
983.28
536.85
885.49

Summary

- CIP Kernel and Test Teams follows “Upstream First” principle, and contributes to upstream.
- By taking advantage of kernel LTS, the team steadily releases CIP SLTS kernels, and aims to maintain them for 10 years or more.
- To reduce CIP SLTS kernel release cost, the team is closely working with CIP testing team to build automated testing systems.

Please join us to sustain Civil Infrastructure together !

Weekly Regular Online Meeting

- **CIP IRC weekly meeting – Every Thursday UTC (GMT) 09:00**

US-West	US-East	UK	DE	TW	JP
02:00	05:00	10:00	11:00	17:00	18:00

- **Channel:**
  * irc:chat.freenode.net:6667/cip

- The meeting is used to share status among CIP developers (Kernel Team, Test Team, SW Update WG, Security WG)

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CIP Kernel Workgroup Repositories

- **CIP Linux kernel & real-time kernel**
  - https://git.kernel.org/pub/scm/linux/kernel/git/cip/linux-cip.git
- **CIP Linux kernel CVE tracker**
  - https://gitlab.com/cip-project/cip-kernel/cip-kernel-sec
- **CIP Linux kernel failed patches tracker**
  - https://gitlab.com/cip-project/cip-kernel/classify-failed-patches

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CIP Testing Workgroup Links

- CIP Testing WG **wiki page**
  - https://wiki.linuxfoundation.org/civilinfrastructureplatform/ciptesting/ciptestingwg
- **CIP LAVA master**
  - https://lava.ciplatform.org/
- CIP's fork of **lava-docker**
  - https://gitlab.com/cip-project/cip-testing/lava-docker
- **GitLab Cloud CI** - manages our k8s build pods
  - https://gitlab.com/cip-project/cip-testing/gitlab-cloud-ci
- **CIP CI** - scripts used to build and test the Kernel
  - https://gitlab.com/cip-project/cip-testing/linux-cip-ci

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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 News: https://www.cip-project.org/news/in-the-news
- CIP Wiki: https://wiki.linuxfoundation.org/civilinfrastructureplatform/
- CIP Source Code
  - CIP repositories hosted at kernel.org: https://git.kernel.org/pub/scm/linux/kernel/git/cip/
  - CIP GitLab: https://gitlab.com/cip-project

CIVIL INFRASTRUCTURE PLATFORM

Thank You

Upcoming CIP Sessions

- **CIP Mini summit**
  - **Friday, October 30 • 11:00 - 12:30**
- **Other CIP members talks**
  - **The International Effort to Establish Open Source Base Layer of Cyber Security for IACS**
    - Kento Yoshida, Renesas Electronics Corporation
    - **Wednesday, October 28 • 16:15 - 17:05**
  - **Threat Modelling - Key Methodologies and Applications from OSS CIP Perspective**
    - Dinesh Kumar, Toshiba Software India & SZ Lin, Moxa Inc
    - **Tuesday, October 27 • 14:15 - 15:05**

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