SIMPLIFYING MISSION OPERATIONS AT CNES THROUGH A COLLABORATIVE SOLUTION: THE PULP APPROACH

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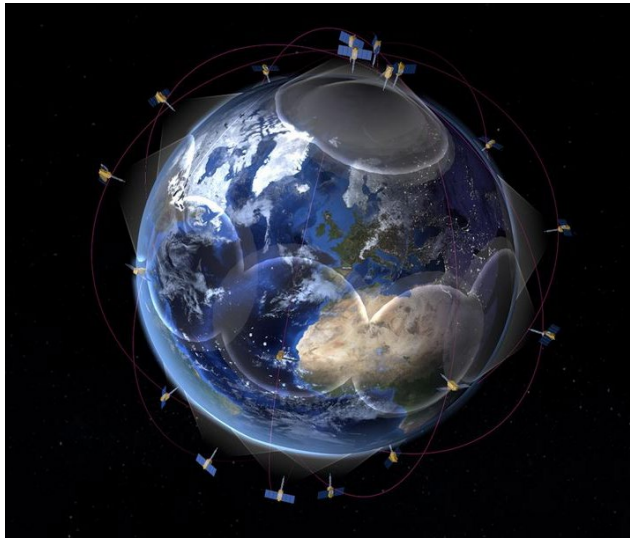
What do these missions have in common?

SWOT: NASA/CNES
LEO satellite altimeter

MMX Rover: CNES/DLR rover for
JAXA's MMX mission



KINEIS: 25 satellites constellation
Argos system and IoT applications

They are all using PULP!

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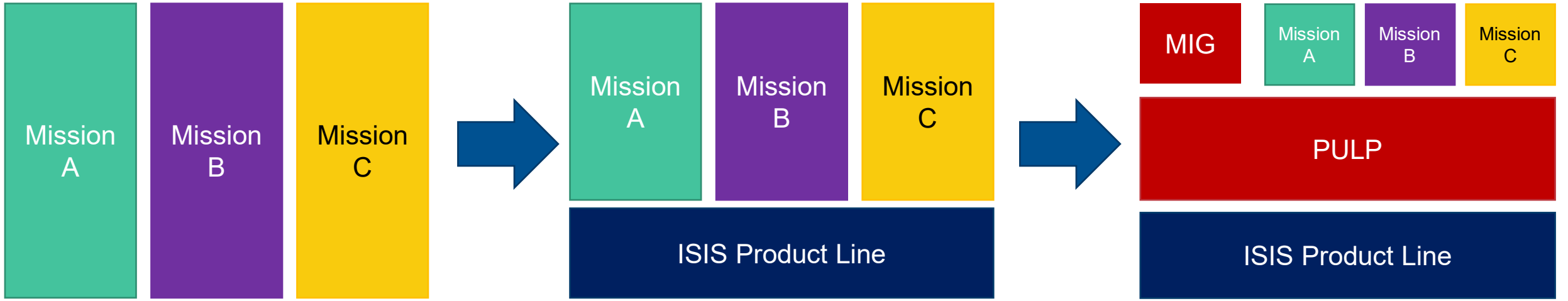
Outline

1. A short history of PULP
2. PULP coverage and contents
3. PULP's multi-mission collaborative process
4. Usage statistics after 3 years
5. What's next?
6. Achievements

A short history of PULP

- **ISIS Standard for mission operations → ISIS Product Line development (2010)**
- **ISIS PL provides core components for all kinds of missions**
- **PULP (PULP is the Unified Layer Package): common operability layer to all missions (2020)**
- **MIG (*'Mission Générique'* / Generic Mission): dummy mission to test PULP developments and provide an example of implementation**



Without ISIS Product Line

With ISIS Product Line
Mission development: 1~2 years

ISIS PL + PULP + Mission layers
Mission development: 1~2 months

PULP coverage

Two main purposes:

- **Allow mission teams to focus on their specificities rather than how to build and operate a mission control center**
- **Define common practices and environment to facilitate working on multiple missions**

What is in PULP? A non-exhaustive list:

Code

- Common configuration for ISIS PL components
- Python libraries for control procedures
- Ansible playbooks and roles
- Infrastructure sizing and security baseline
- Databases

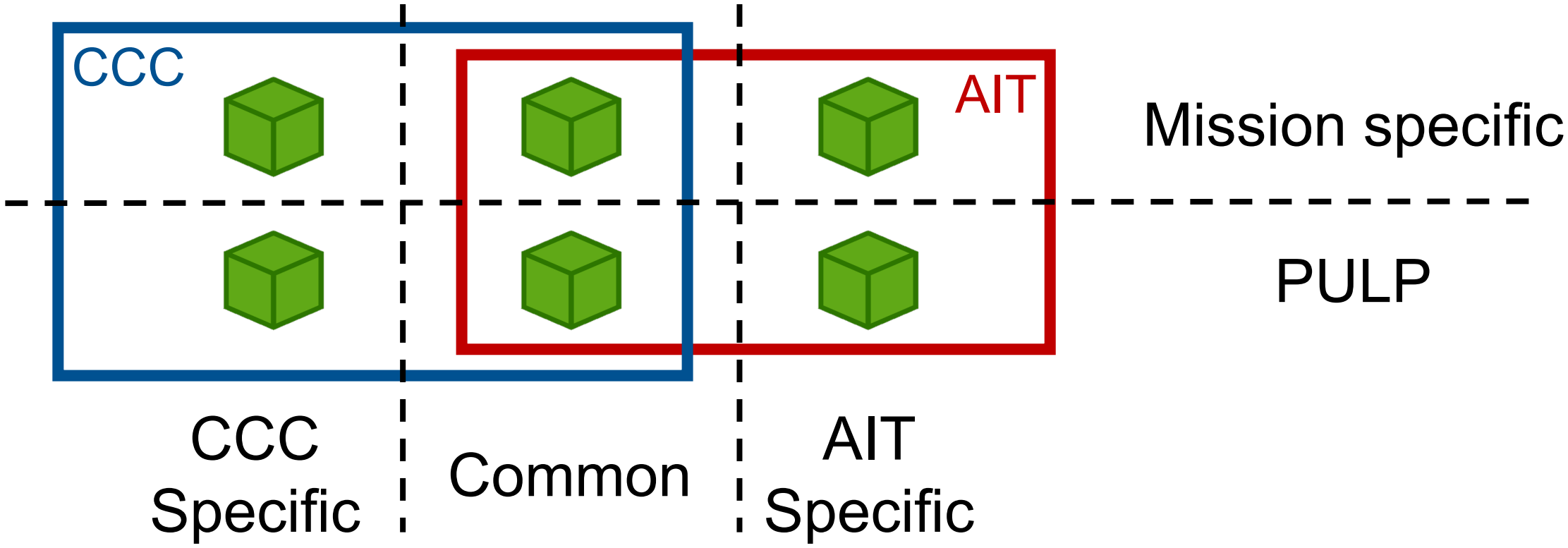
…but not only!

- Activities: elementary bricks of concepts of operations used sequentially along the mission's lifecycle
- Naming conventions
- Wiki documentation for practices and quality process
- Decision-making process

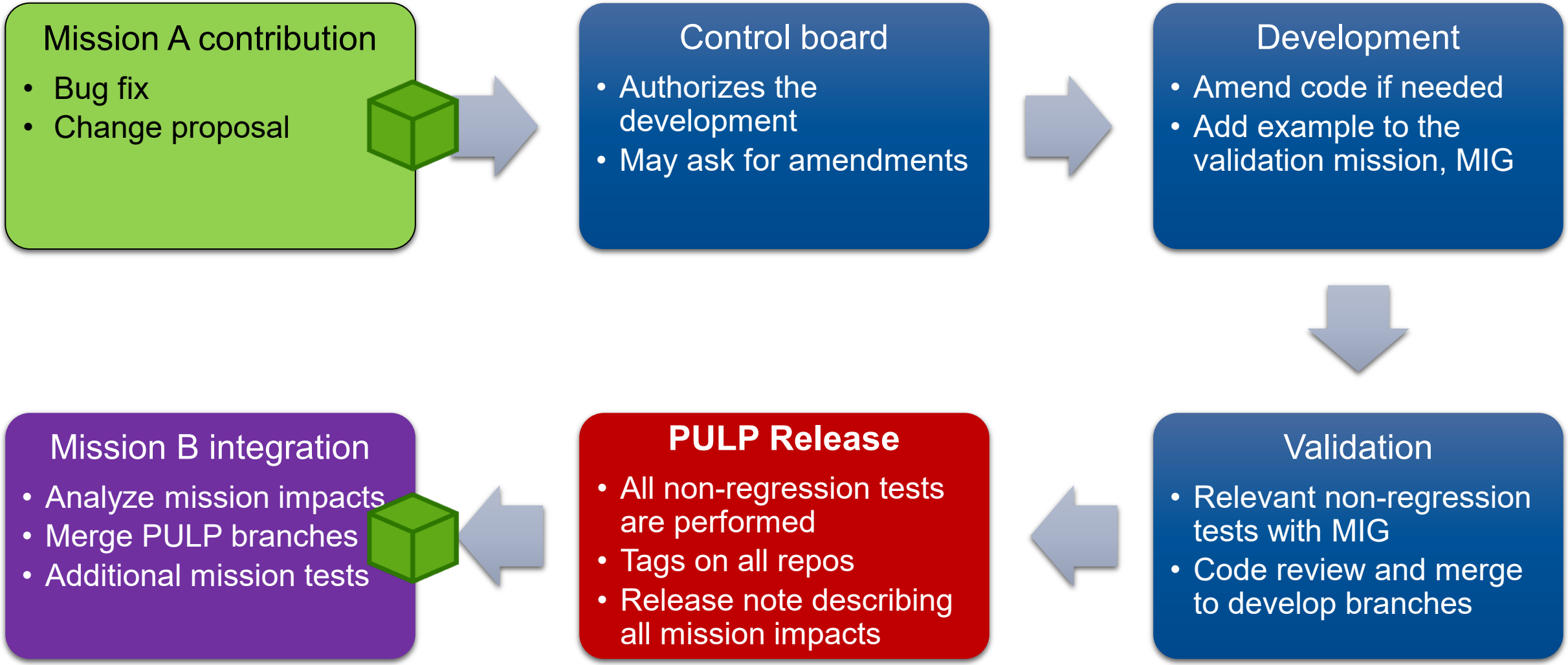
Multi-target aspects

A target is a set of components and activities used for different ISIS PL applications such as AIT (Assembly, Integration and Tests) or CCC (Command and Control Center)

Some elements of PULP are common across targets, and some are target-specific (e.g.: no scheduling in AIT)

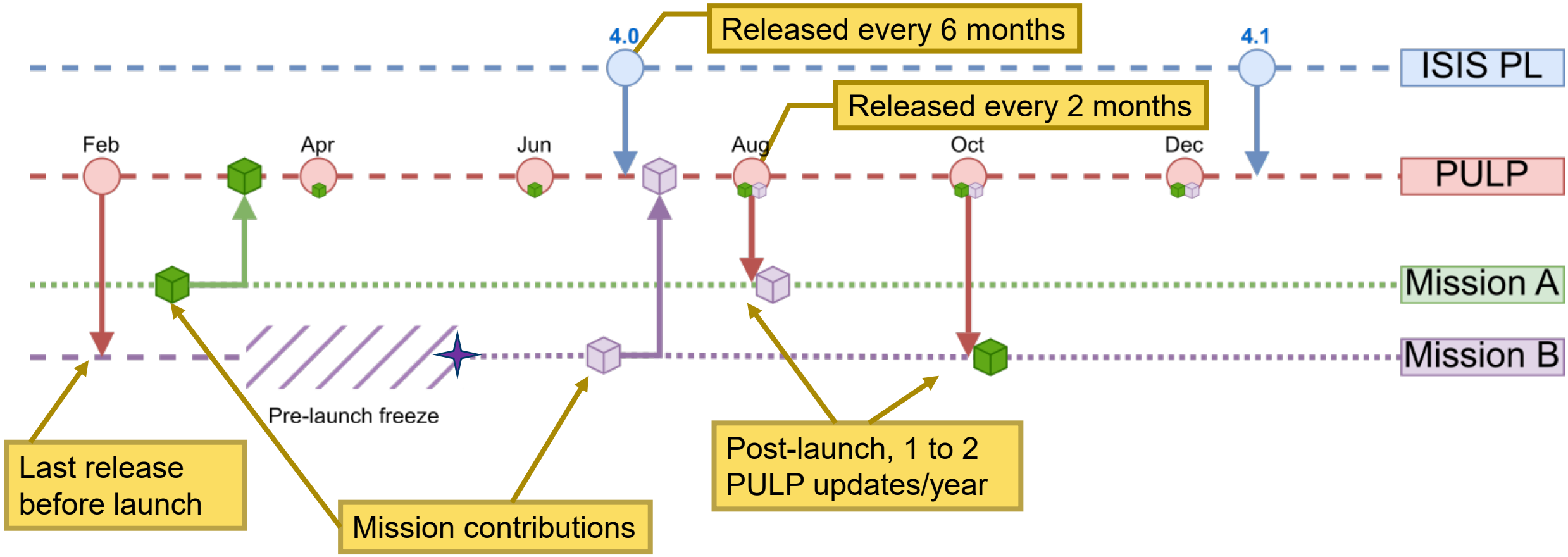


PULP development process for mission contributions



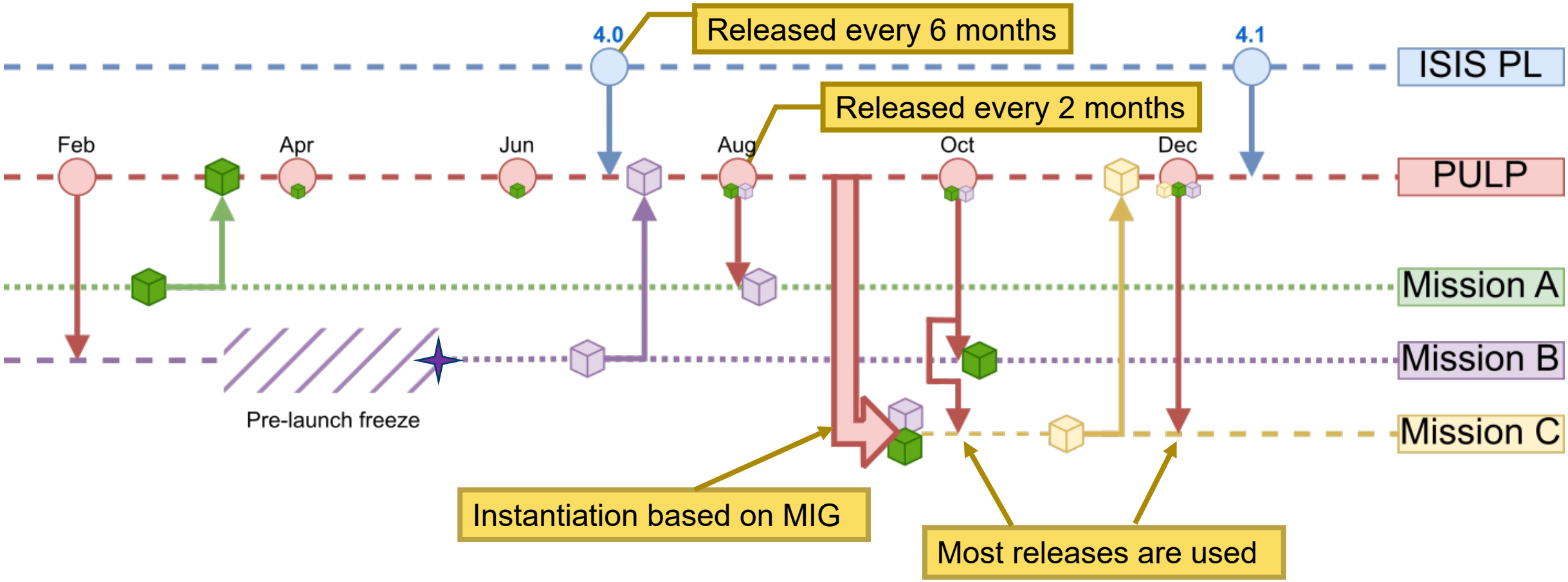
PULP development process over 1 year

Interactions between two missions, PULP and ISIS PL



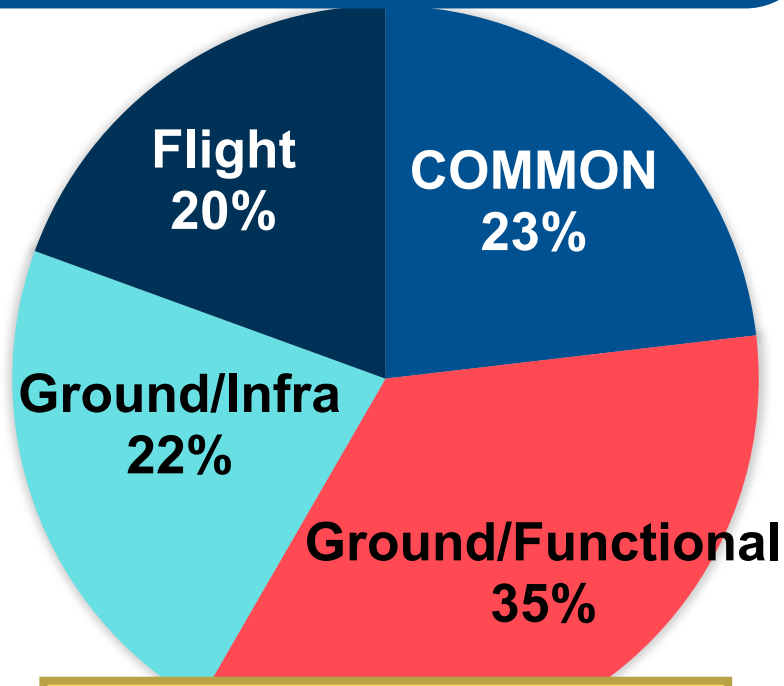
PULP development process over 1 year

New mission instantiation from MIG

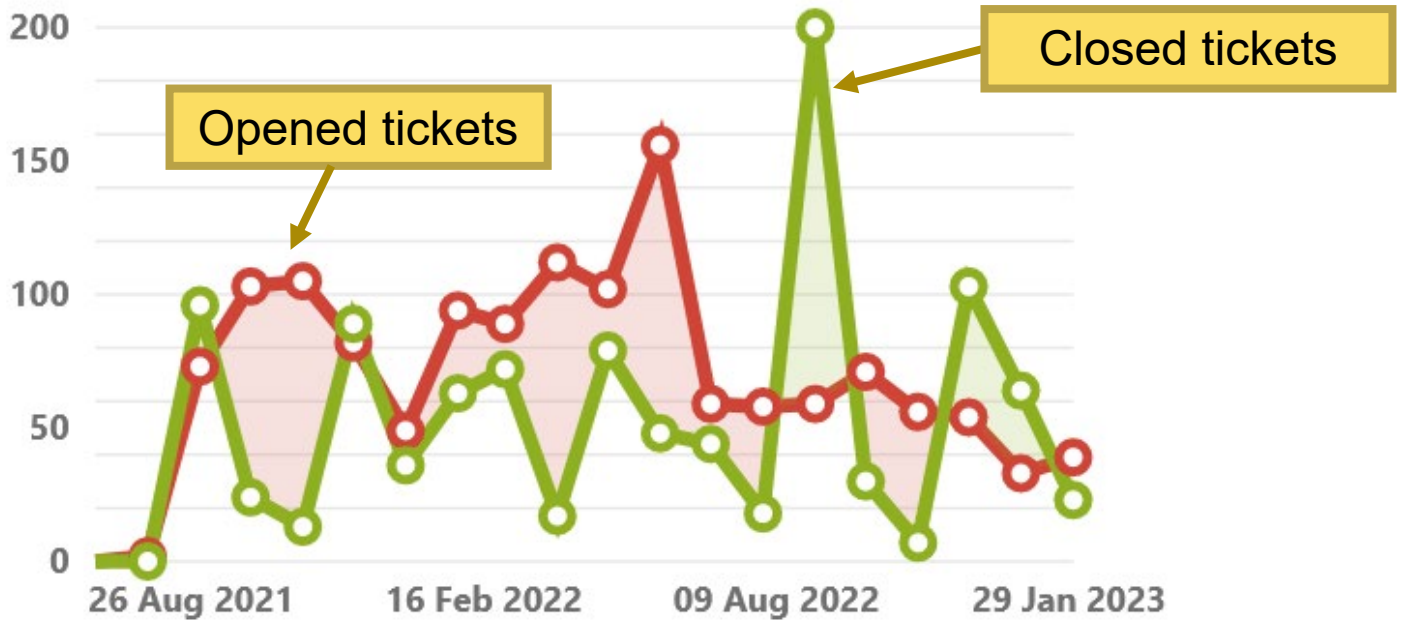


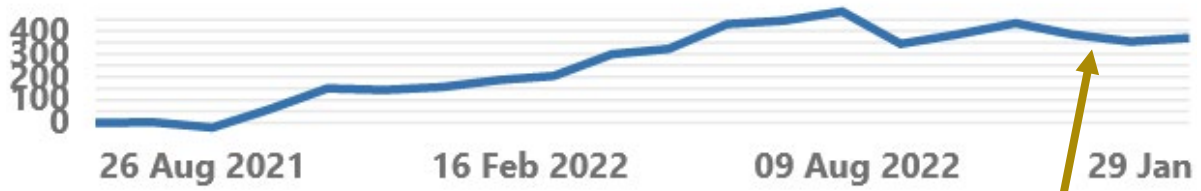
Statistics after 3 years

>1600 contributions in total
~50 active contributors
~200 end users
(CNES + contractors)
6 missions, and more to come!



JIRA tickets by category

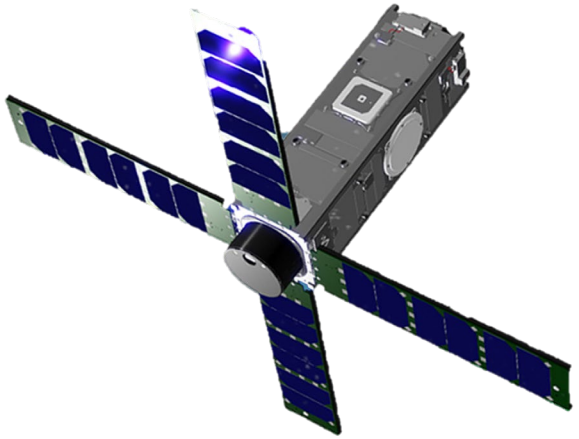


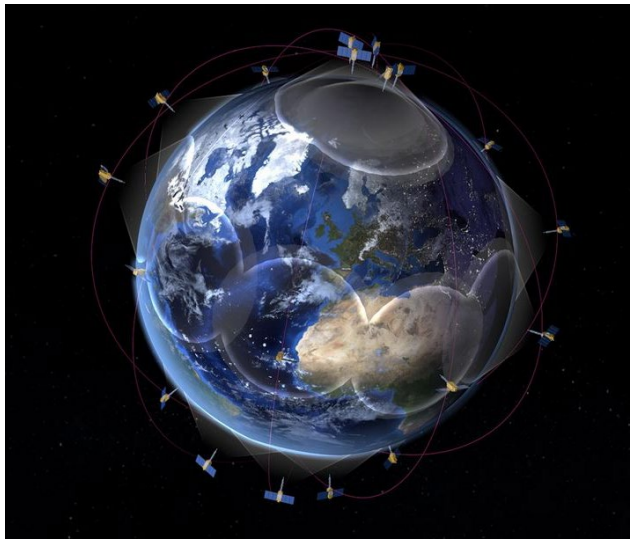


Total opened trend

What's next?

- Expand MIG test coverage (e.g. contingency scenarios)
- Improve quality of code for maintainability
- Ease new mission creation
- Reduce the number of Git repos (> 30 for PULP + MIG) and simplify Git usage
- Frequent Delivery of PULP
  - 2 launches to come this year: NεSS CubeSat and KINEIS constellation (1st batch)





Achievements

Cost reduction

- Mission development time reduced from 1~2 years to 1~2 months
- Operators can work seamlessly on multiple missions

Operability

- 4 satellites currently operated
- 1 rover in AIT test phase

Community

- Common, strong commitment from operators around PULP
- Initiatives and innovations from all missions