

ACCELERATION ROBOTICS

Faster robots. Faster ROS. **Hardware acceleration**



What?

Acceleration Robotics is a firm **focused on designing customized brains for robots** to hasten their response time. Delivering **semiconductor building blocks for robots**, the company creates custom compute architectures for high performance robots through hardware acceleration solutions while remaining accelerator-agnostic (FPGAs or GPUs) and robot-agnostic.

Bonus 1:

We are amongst the top experts globally on ROS and ROS 2. Our consulting services focus on helping our clients streamline various robotic processes using ROS and Gazebo, so that you don't spend time reinventing the wheel and re-developing what already works.

Bonus 2:

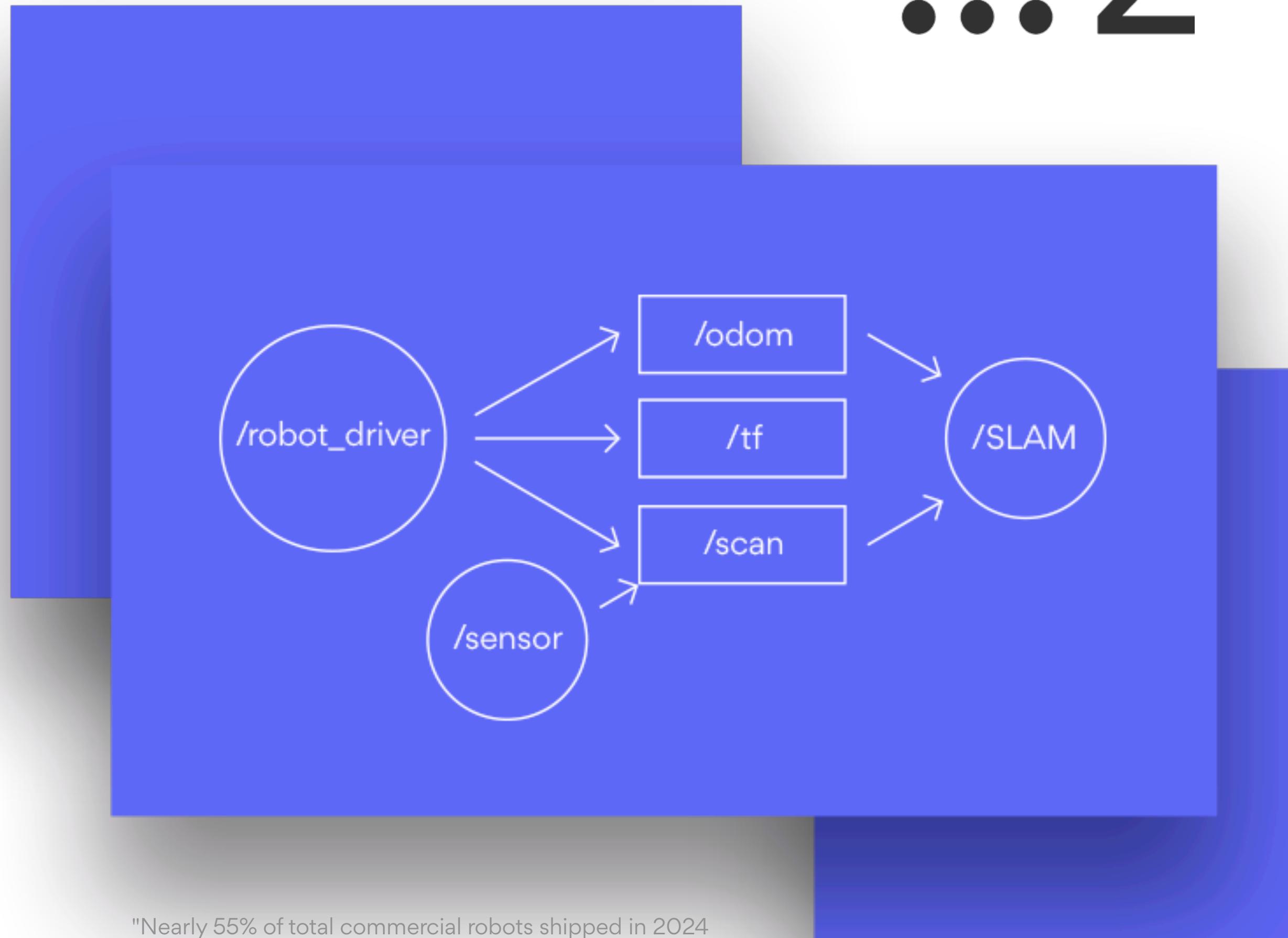
We are the leaders the ROS 2 Hardware Acceleration Working Group (HAWG) and drive the creation, maintenance and testing of hardware acceleration for ROS 2 and Gazebo.

Why us?

We are amongst the top experts globally on ROS and ROS 2. Our consulting services focus on helping our clients streamline various robotic processes.

We excel at the usual **robotics pipeline** (*sensing, perception, mapping, localization, motion control, low-level control and actuation*) and also at **Artificial Intelligence, hardware acceleration** (across compute substrates), **systems architecture, interoperability, embedded systems, real-time, hardware modularity** and **distributed synchronization**.

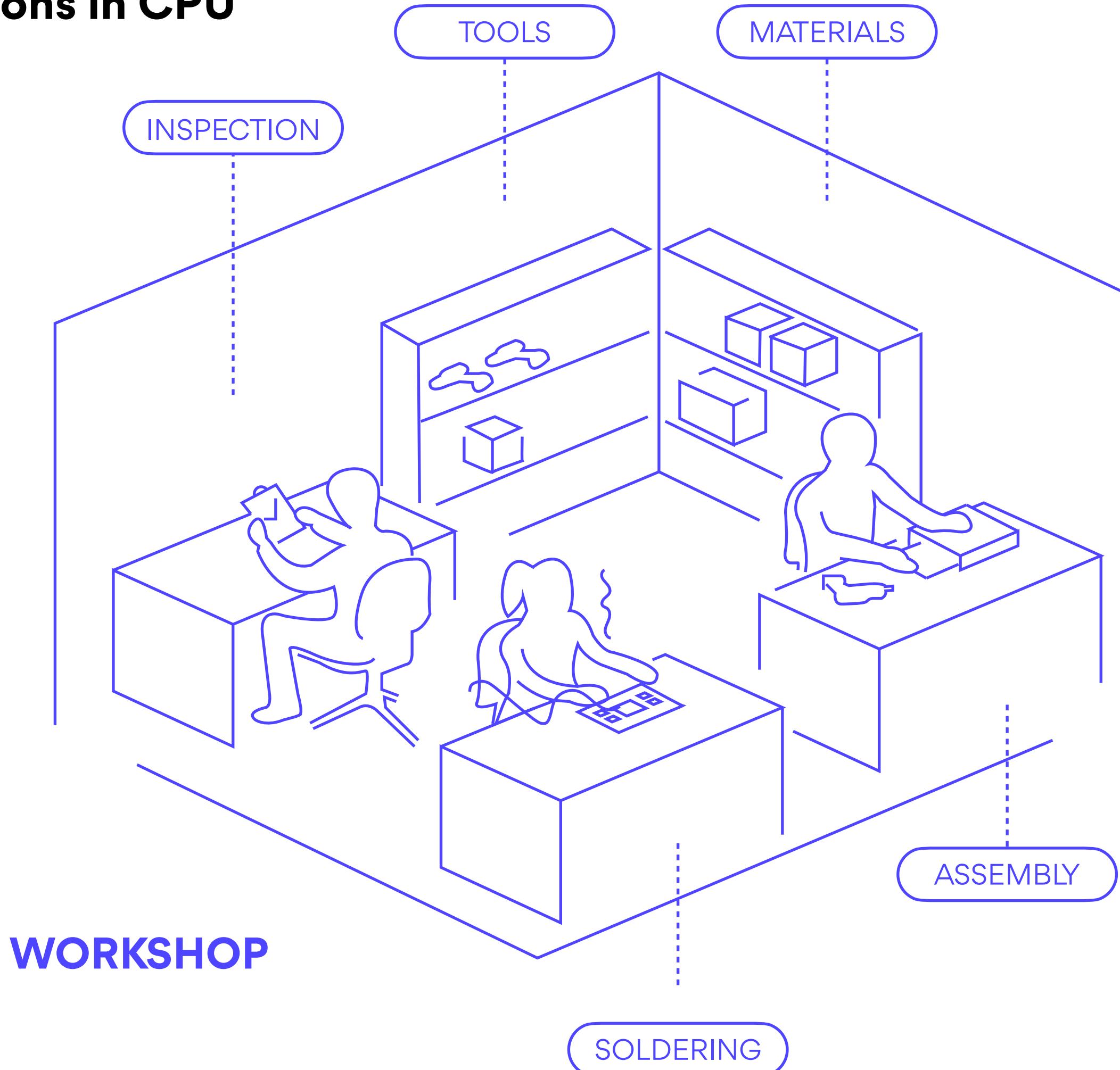
Read more about our past work [here](#).



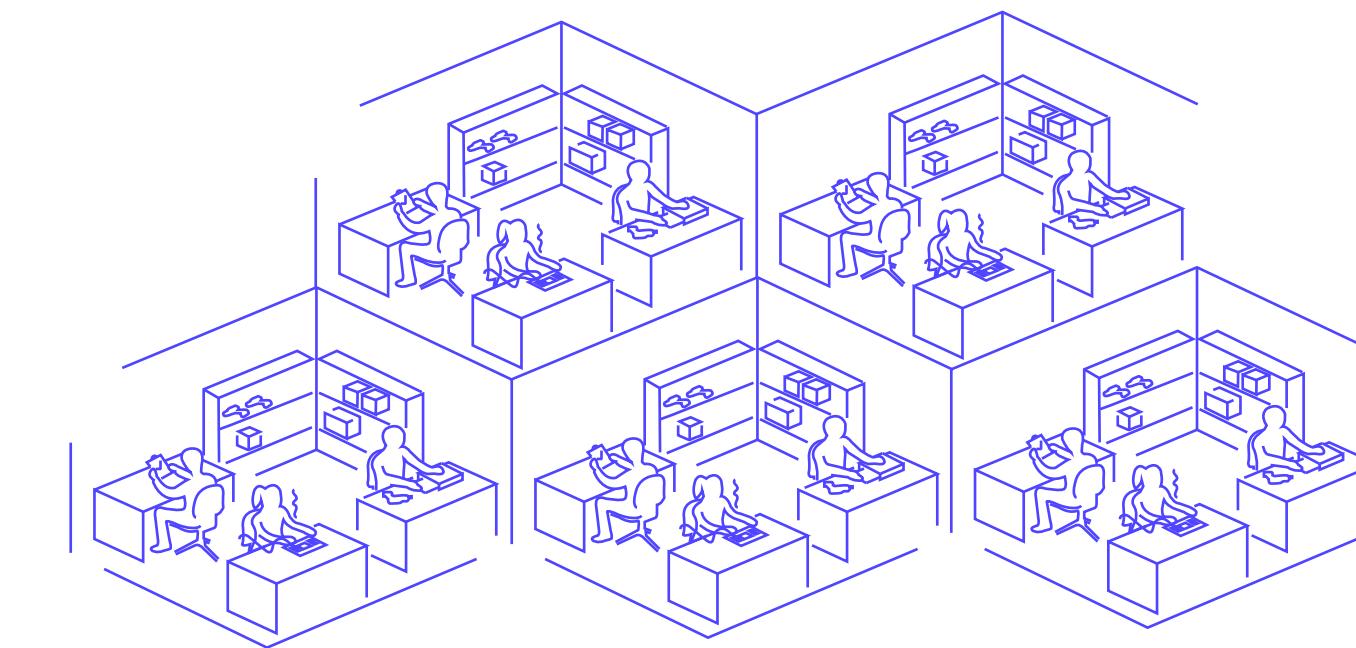
"Nearly 55% of total commercial robots shipped in 2024 will have at least one ROS package installed, creating a large installed base of ROS-enabled robots." [Source](#).

Acceleration Robotics: Understanding computations in CPU

CPU



- Refined workshops that can build pretty much anything, each workshop is a core
- Work sequentially, task after task until finalizing
- Multiple workers or, “threads”, on each CPU (though it eventually fills the space)

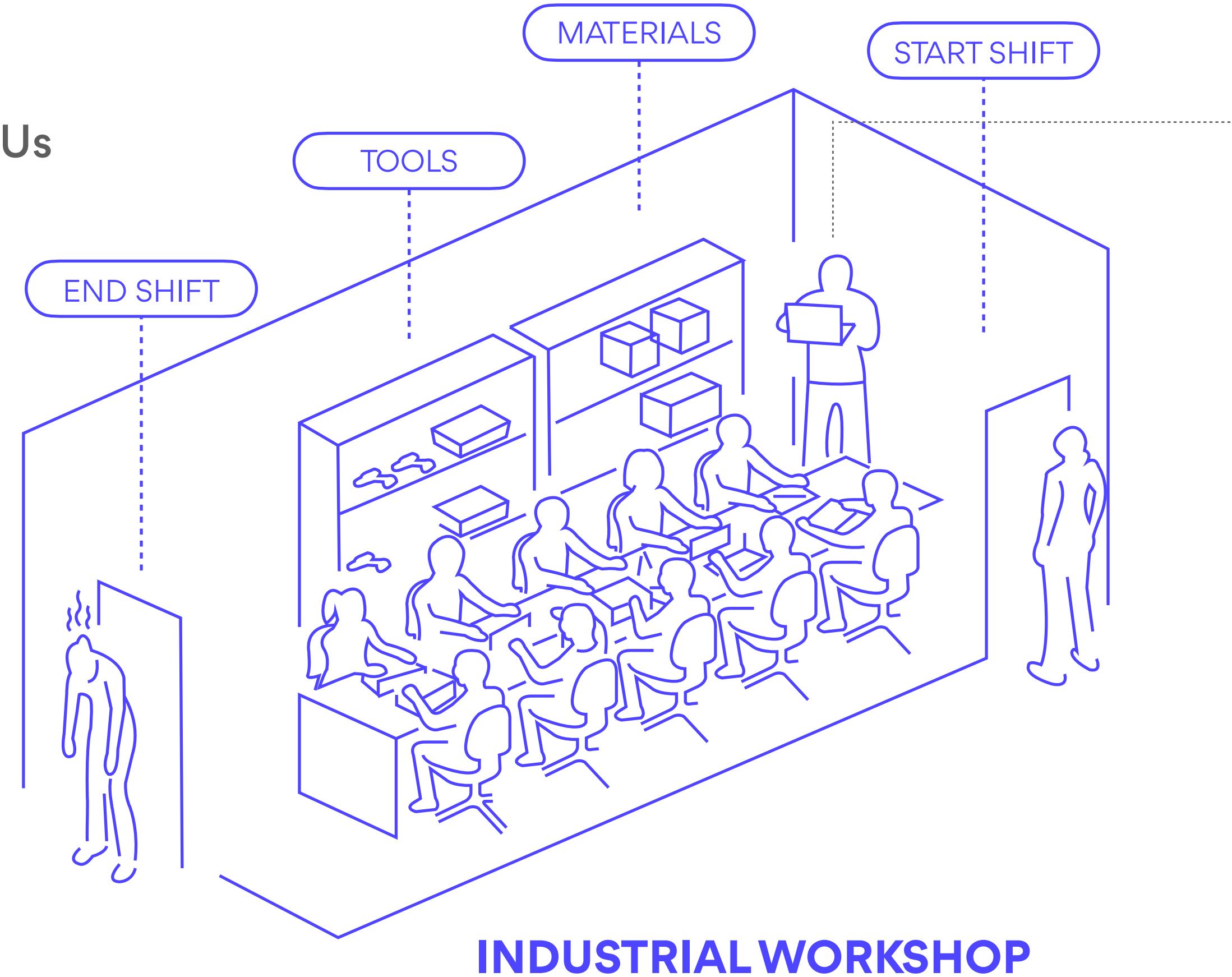


- Modern CPUs have various cores

Acceleration Robotics: Understanding computations in GPU

GPU

GPU = 10 CPUs

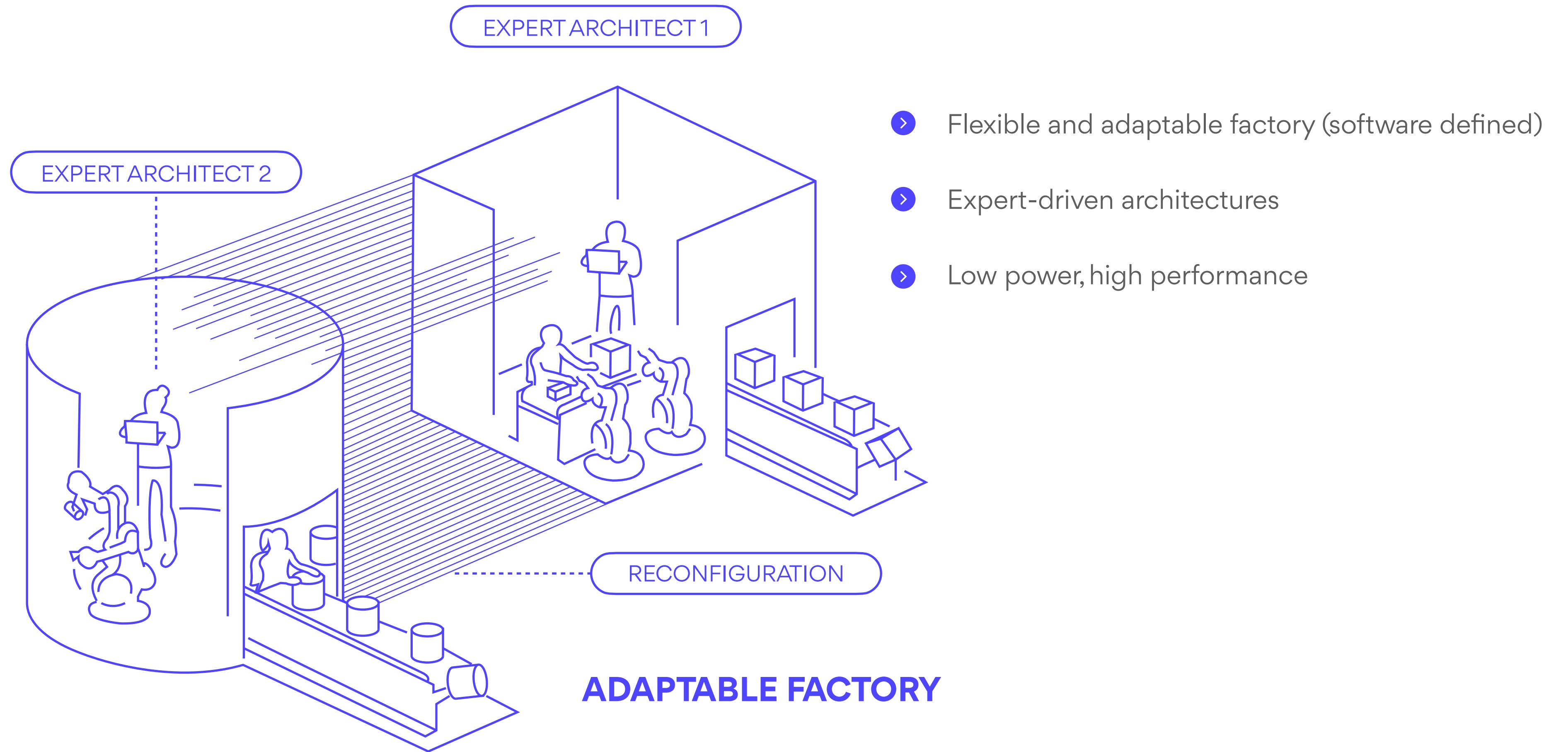


- Many workers doing repetitive work
- Expert, designs masterplan (hard to find, few)
- Not power efficient
- GPUs have many industrial workshops

Acceleration Robotics: Understanding computations in FPGA

FPGA

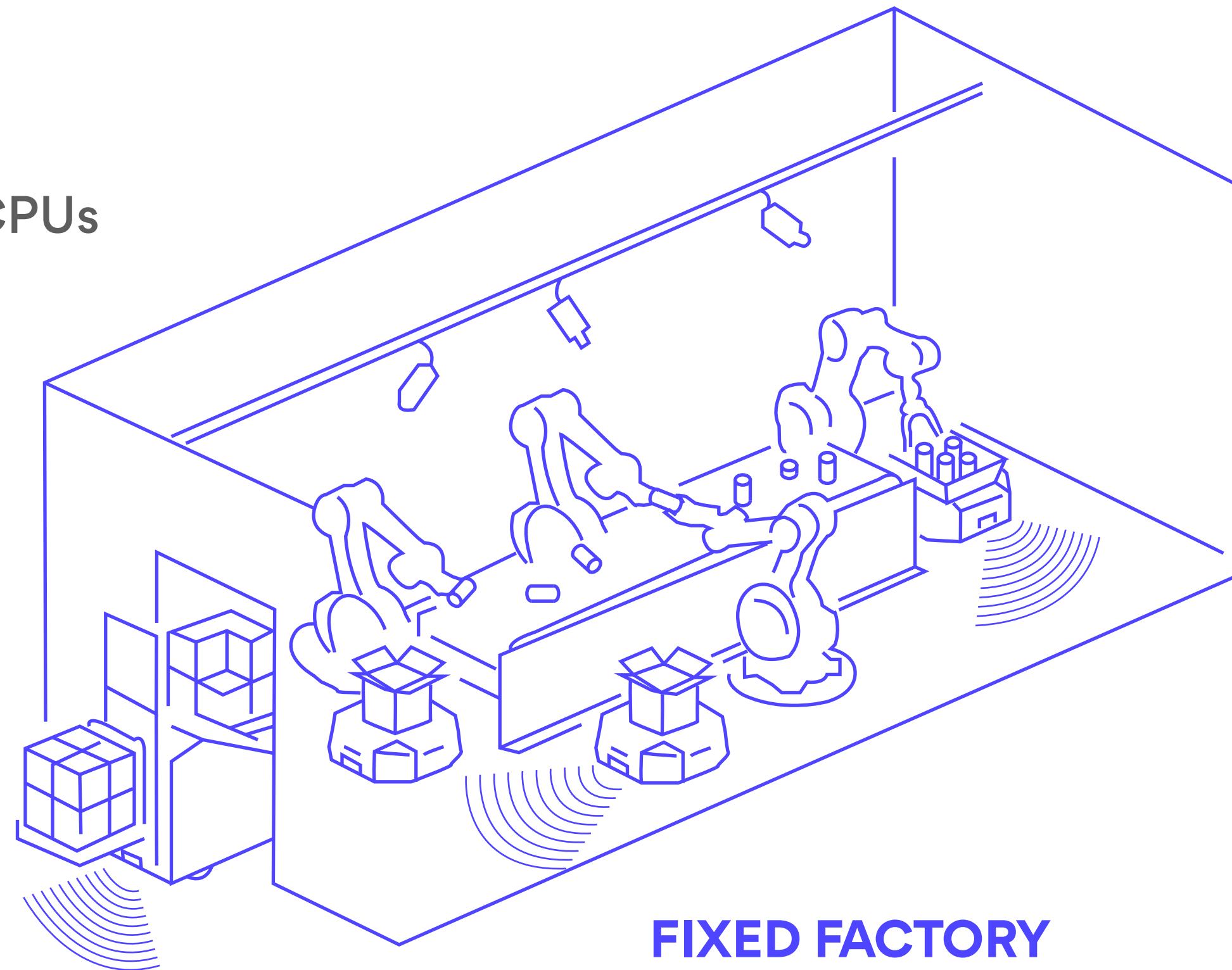
FPGA = 100 CPUs



Acceleration Robotics: Understanding computations in ASIC

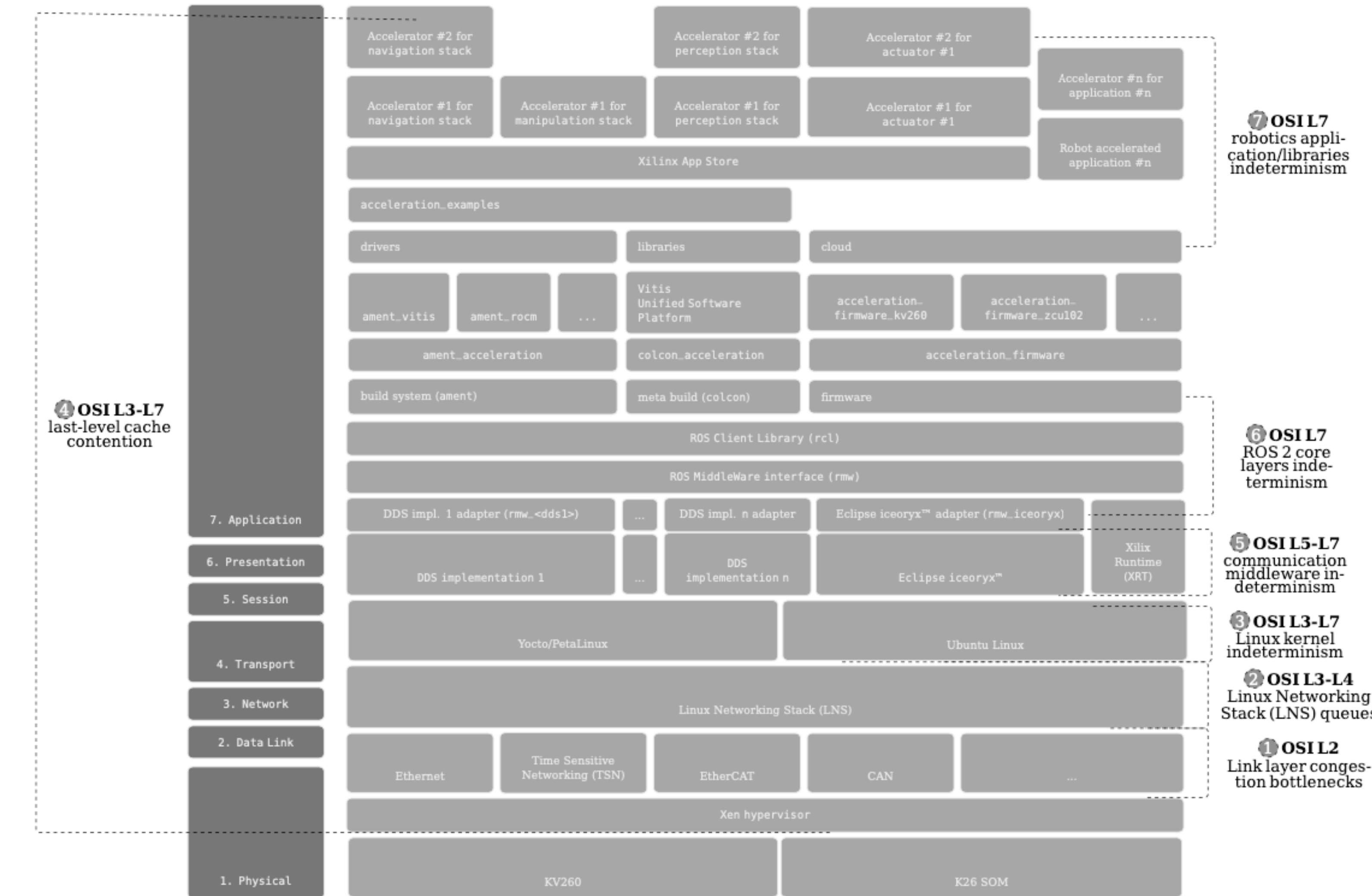
ASIC

ASIC = 1000 CPUs

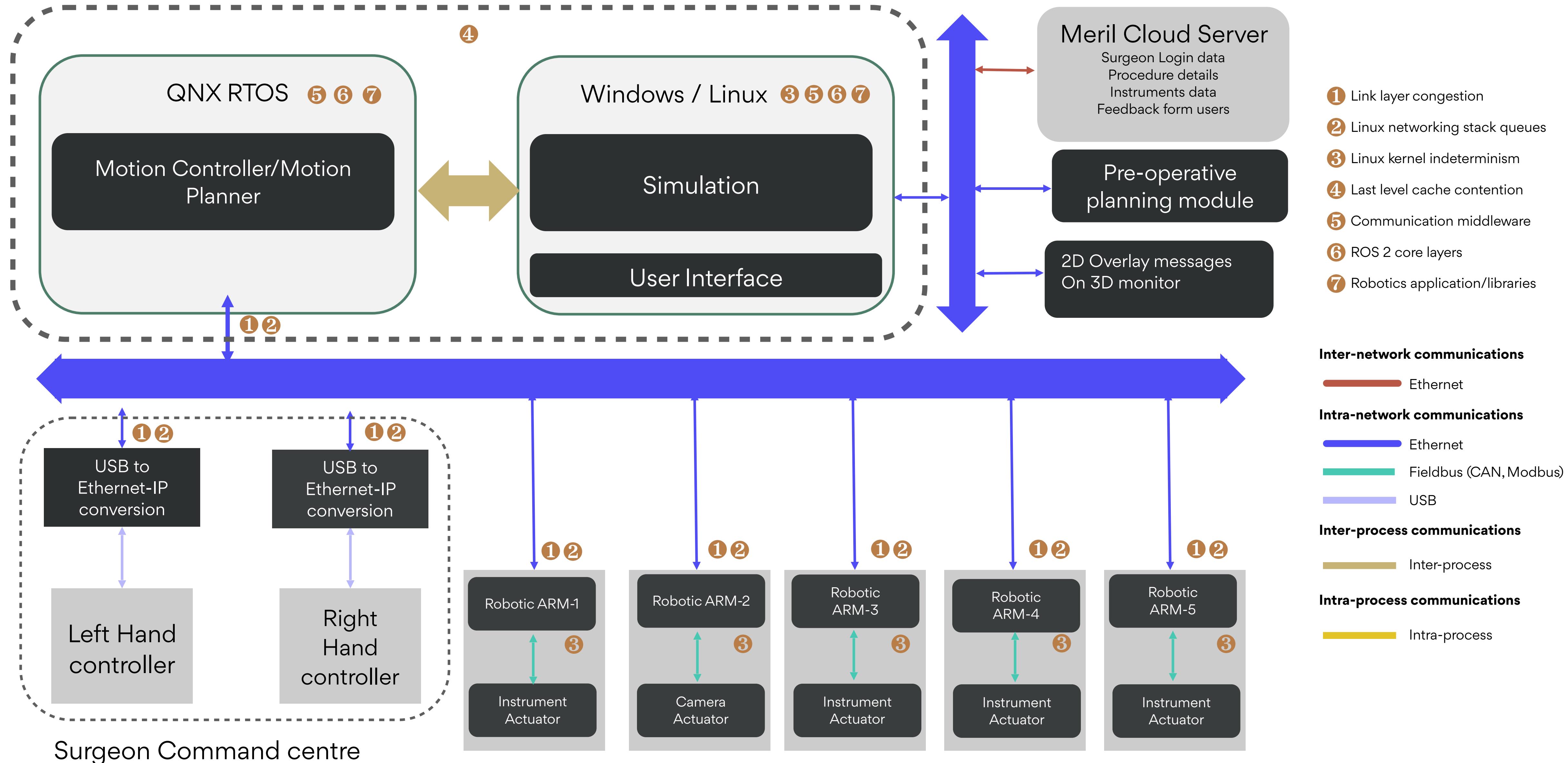


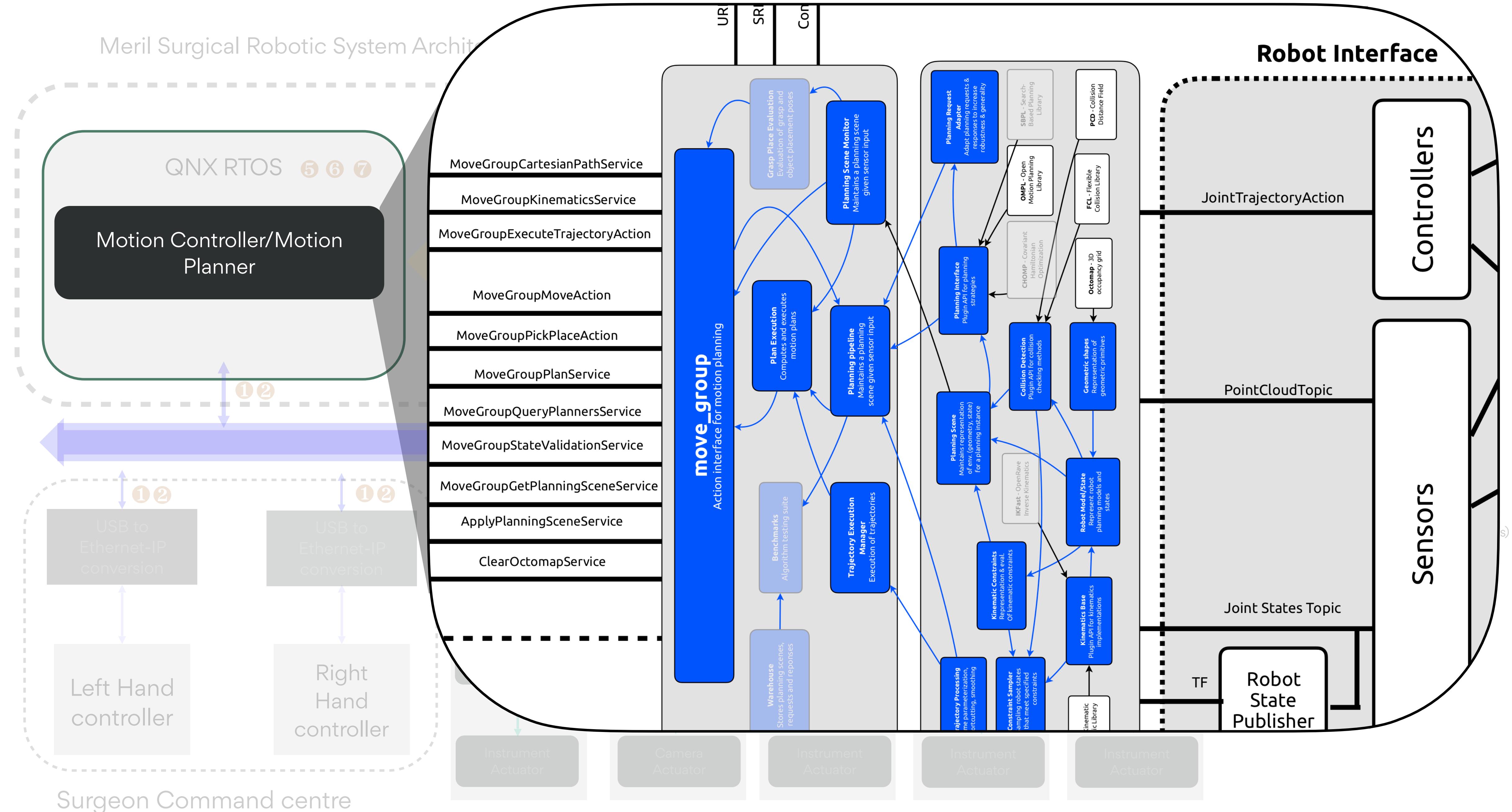
- Fixed, fully automated factory
- Specialized in one process
- Very expensive to design and build
- Best throughput at lowest power consumption

Real-time in robotics: Mitigating sources of indeterminism in the robotics stack



Meril Surgical Robotic System Architecture with UR Robot







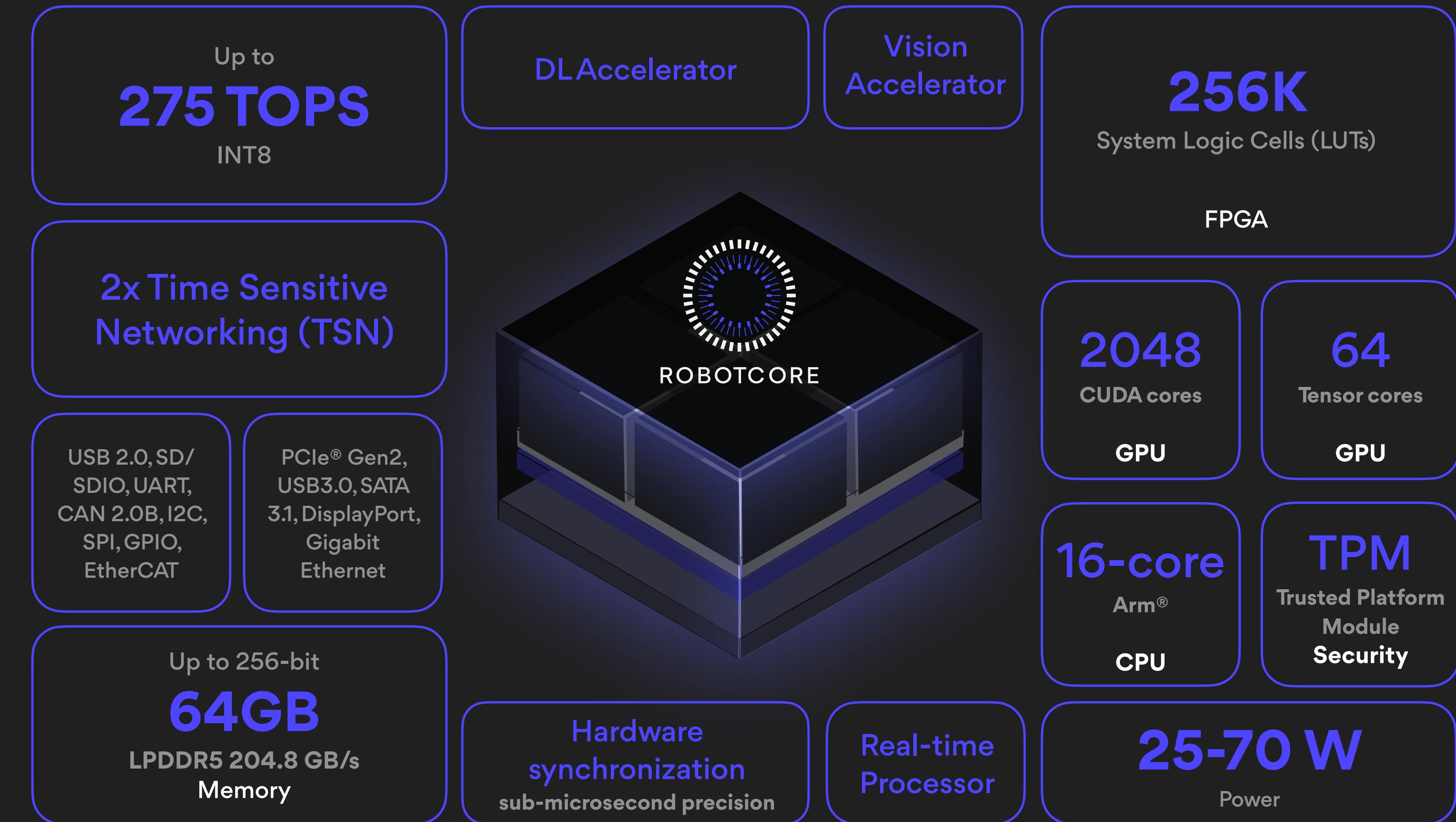
A Robotic Processing Unit

Specialized in providing **higher performance, lower power consumption, lower response times** and **increased determinism** in robotic computations and robotic computational graphs. It does so by leveraging hardware acceleration and running custom compute architectures for robots, or robot cores.

ROBOTCORE®

Robotic Processing Unit:

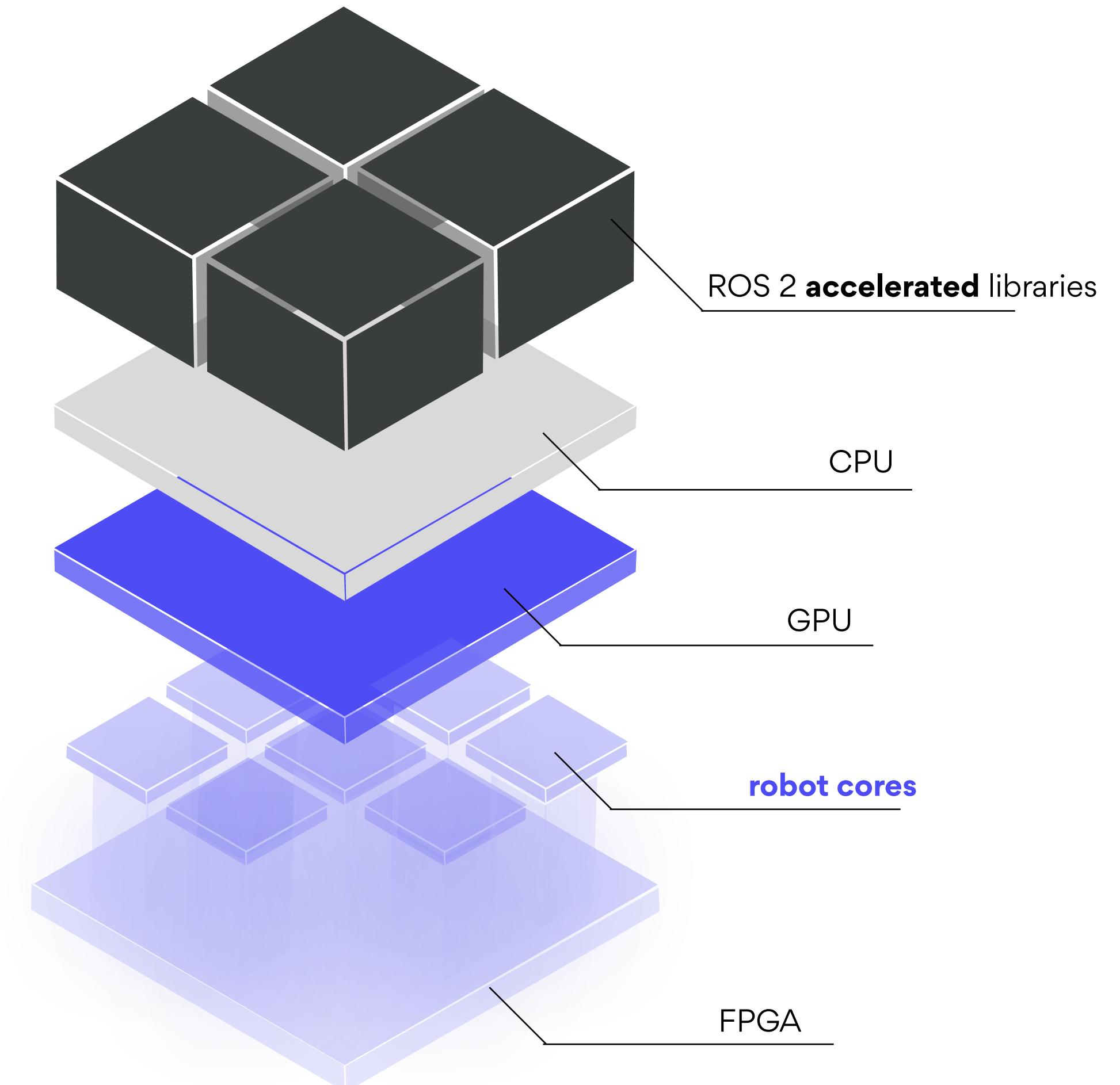
Robotic Processing Units will empower robots with the ability to react faster, consume less power, and deliver additional real-time capabilities with their custom compute architectures that fit the usual robotics pipelines. This includes tasks across sensing, perception, mapping, localization, motion control, low-level control and actuation.



ROBOTCORE®

Robotic Processing Unit:

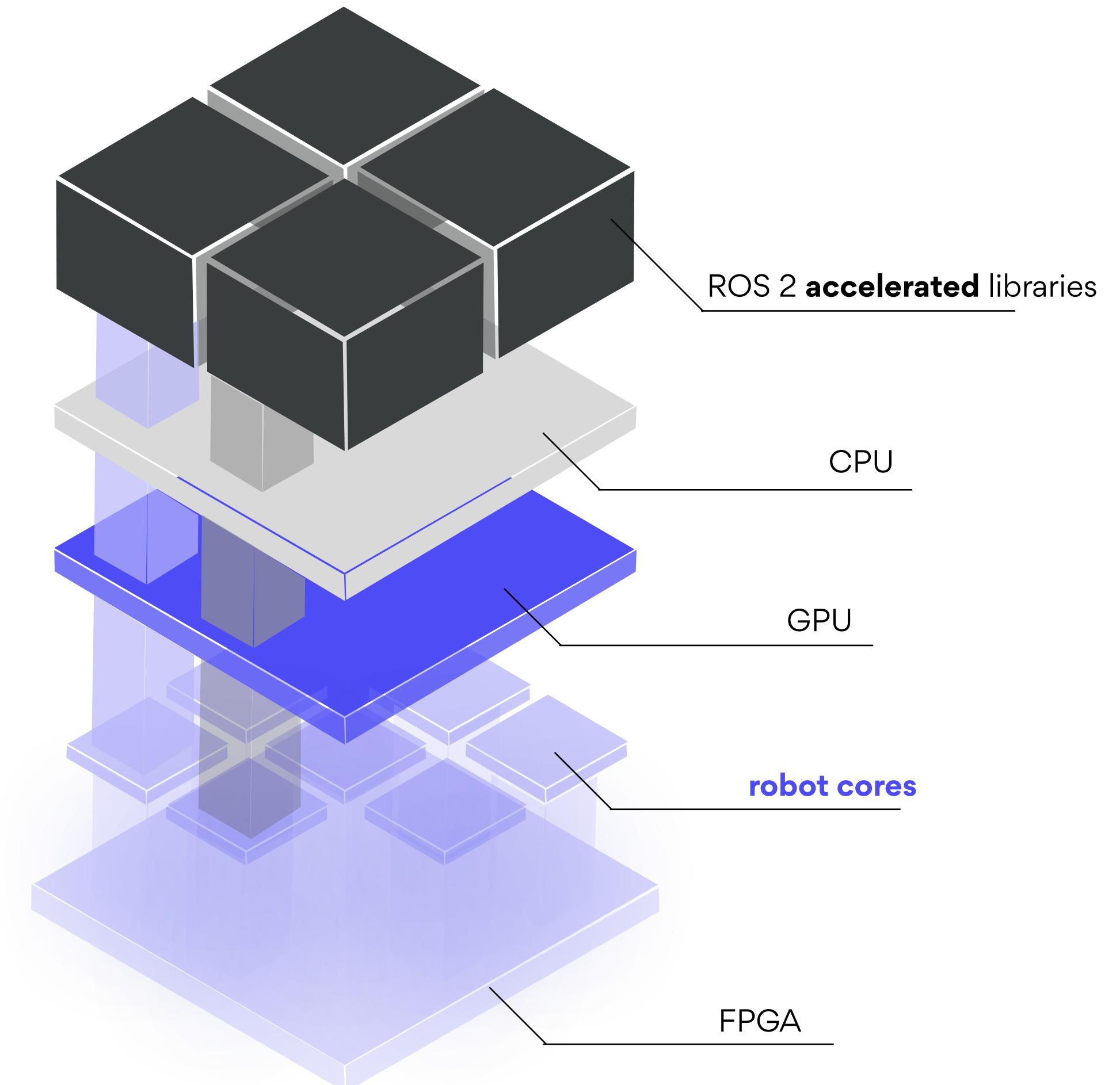
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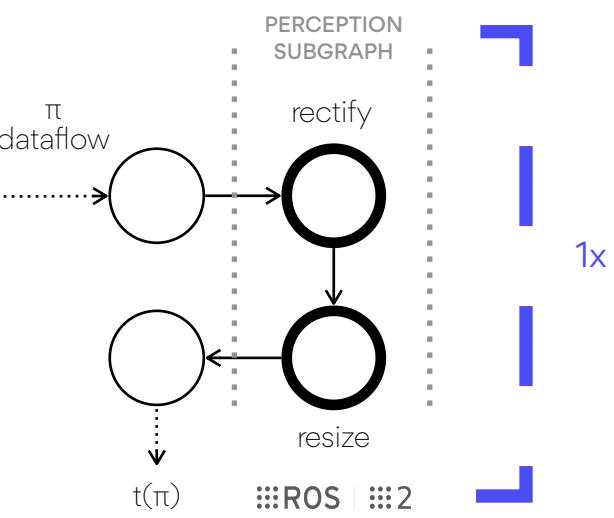
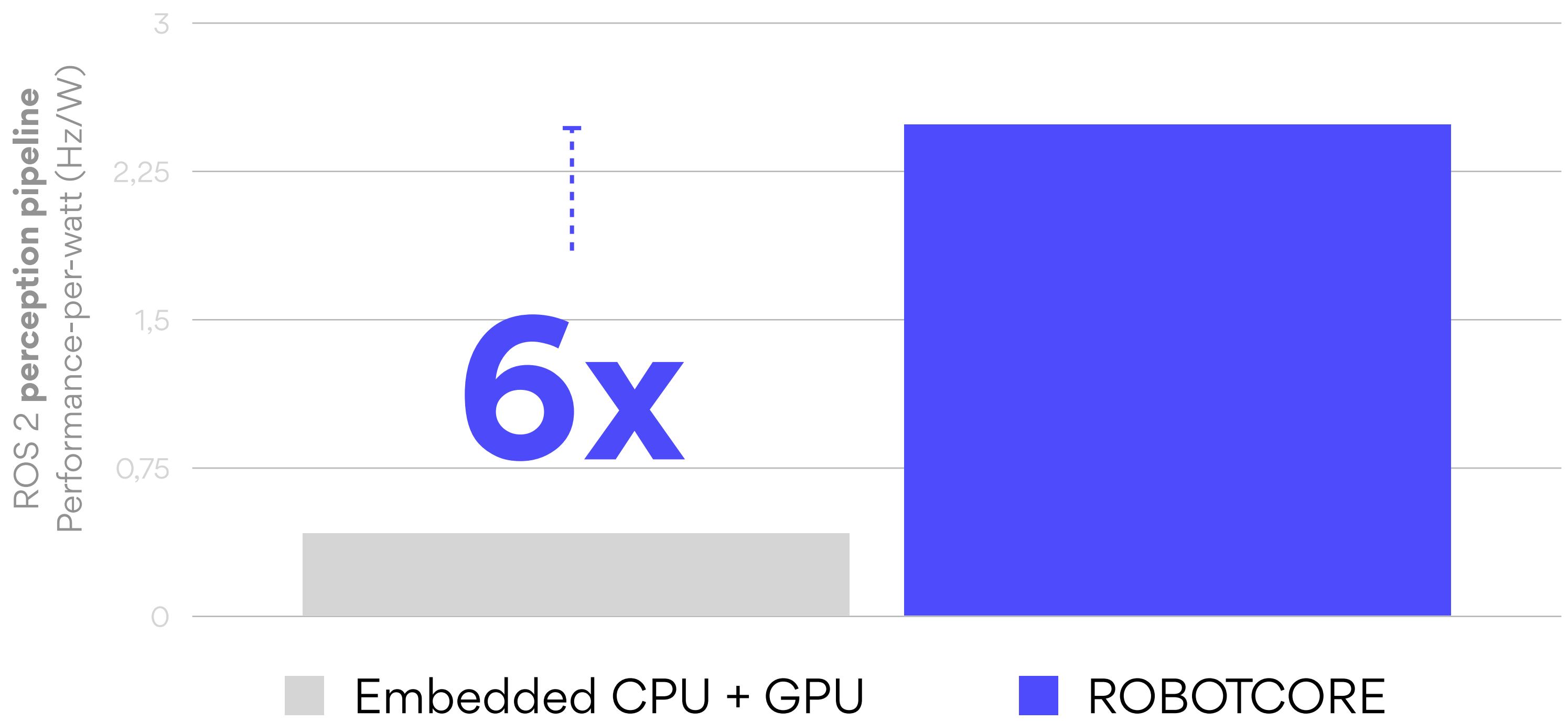
ROBOTCORE®

Accelerated robotic pipelines:

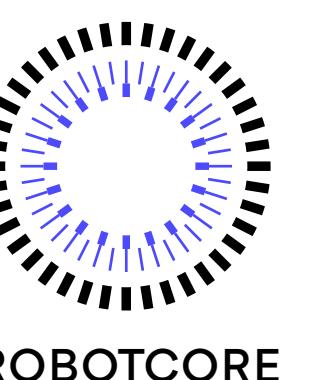
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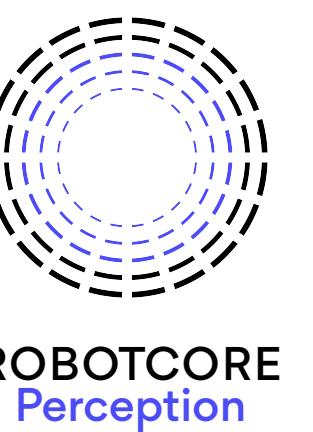
ROBOTCORE Perception: 2 nodes perception pipeline



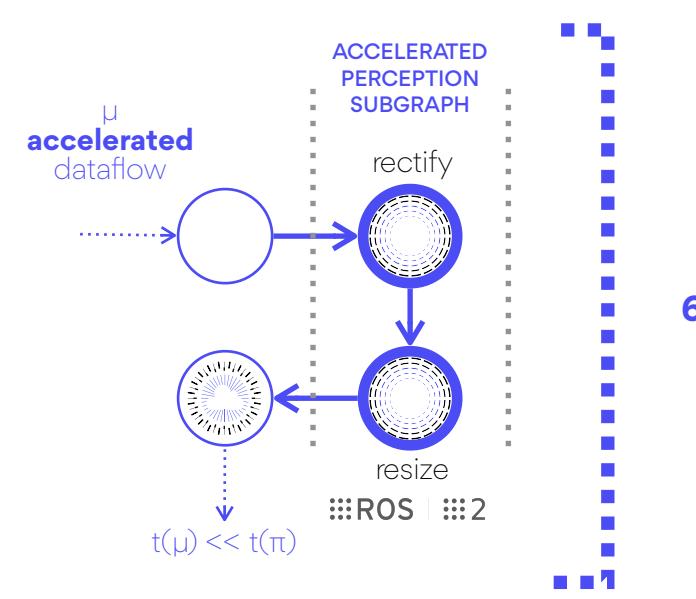
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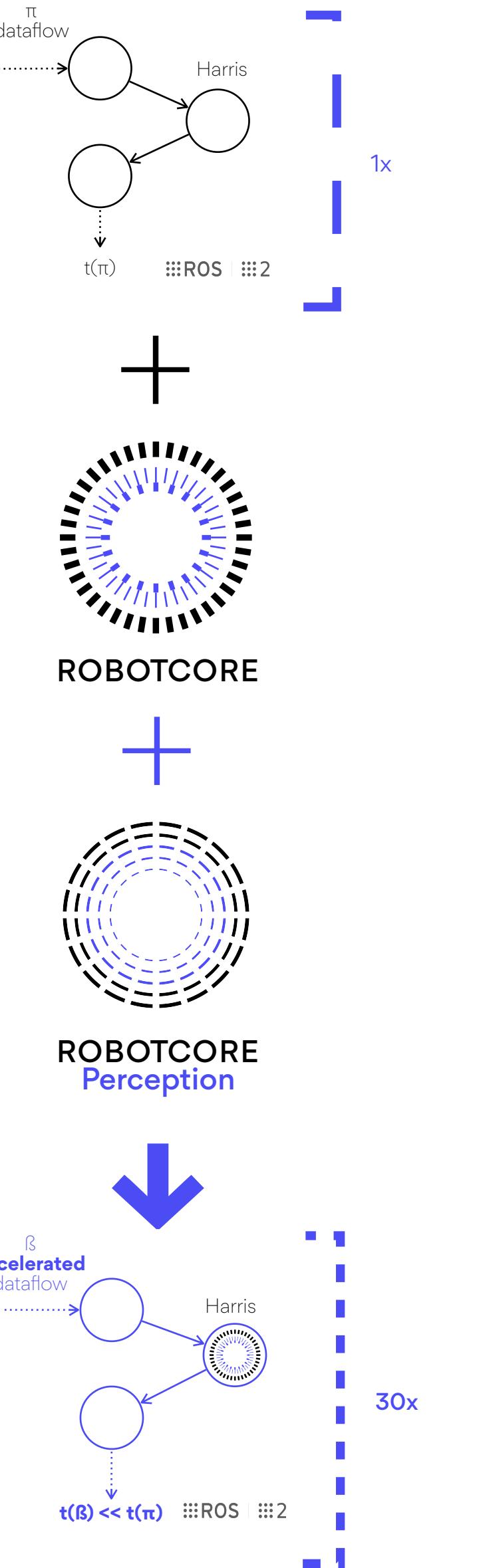
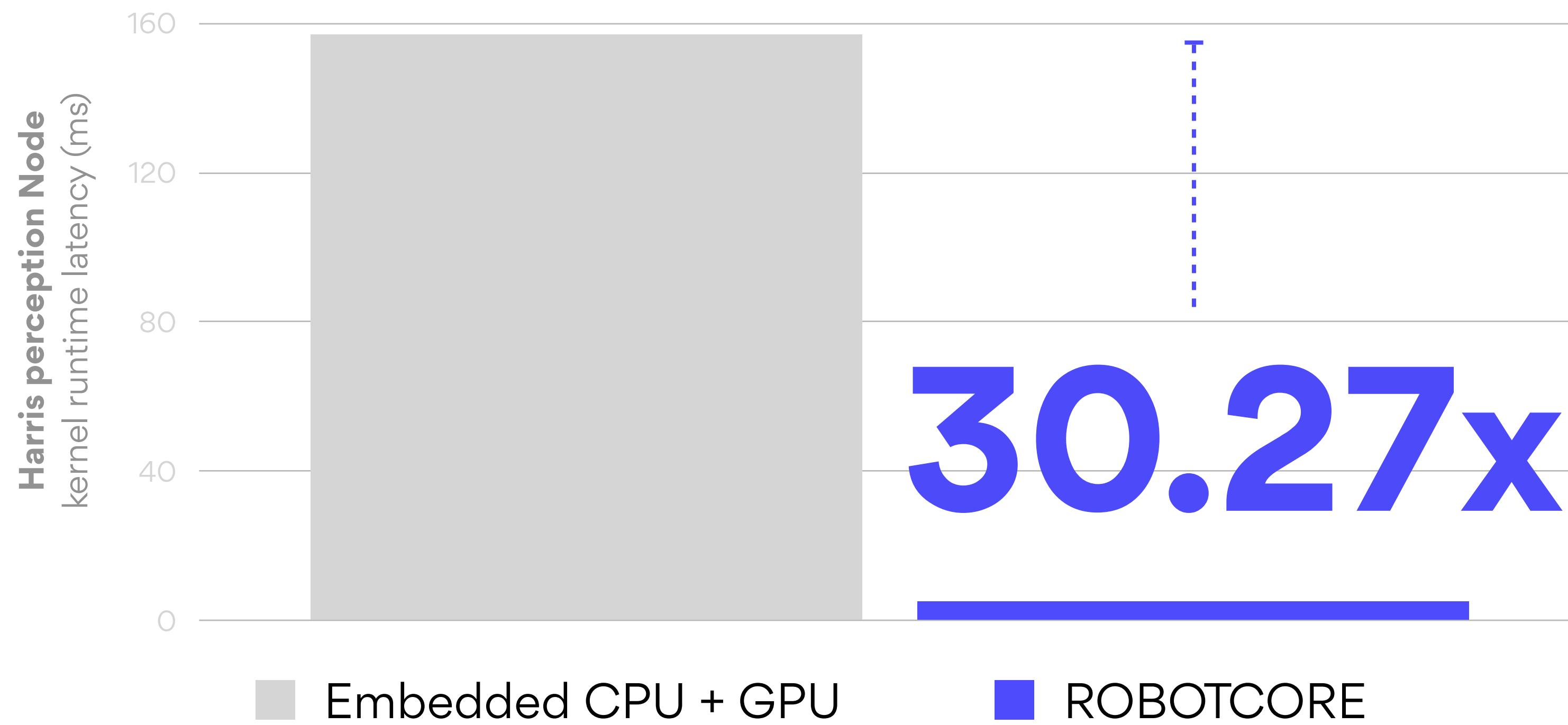
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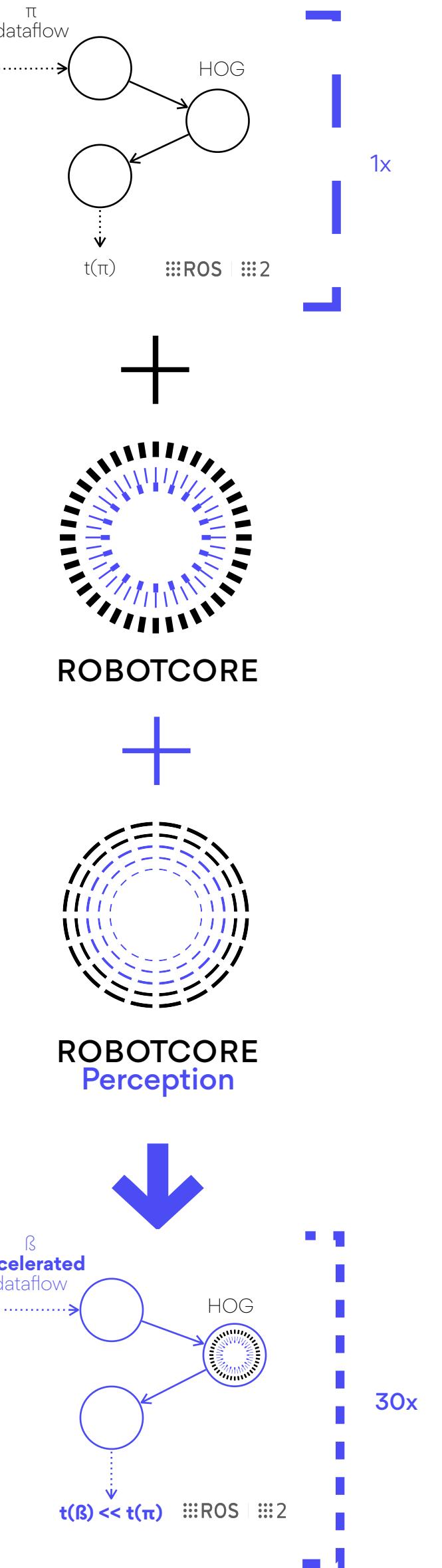
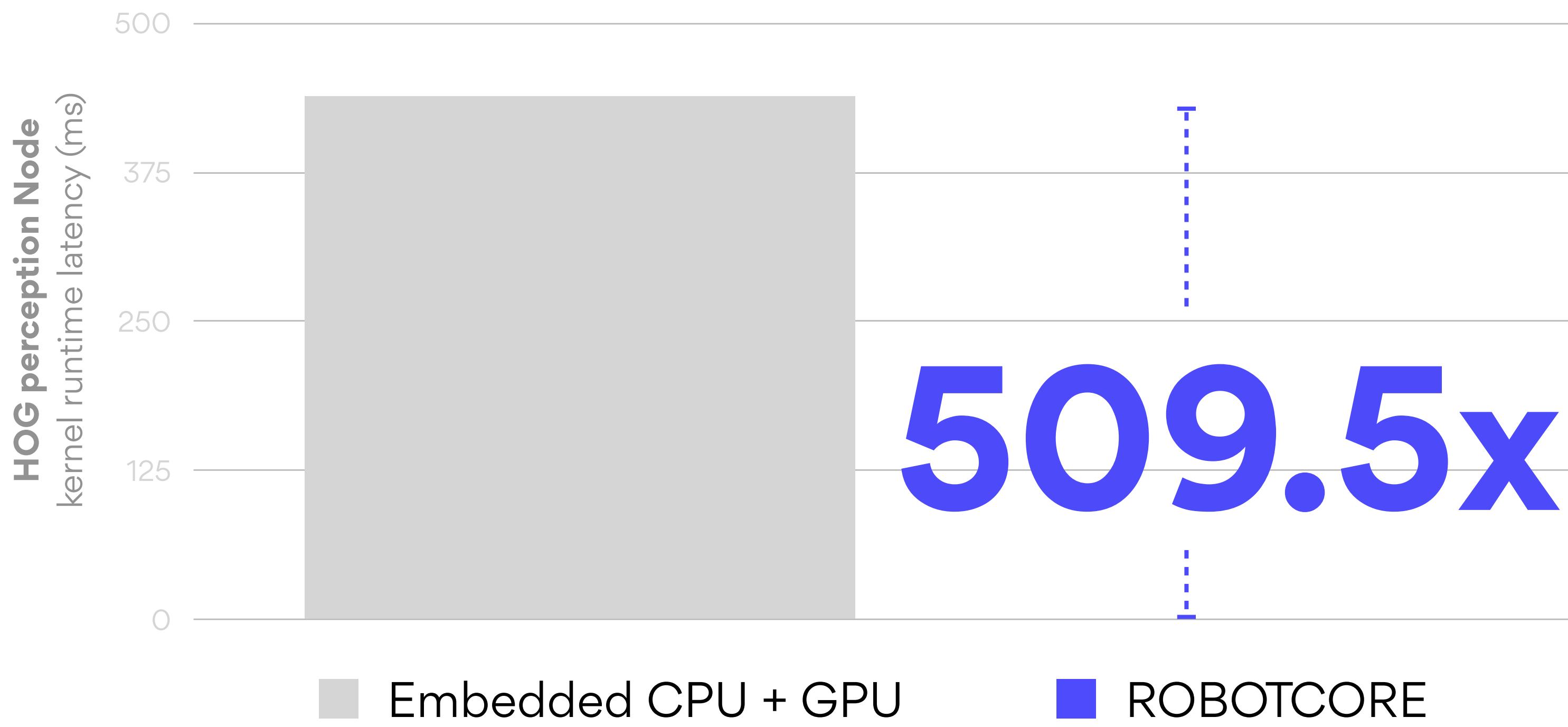
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ROBOTCORE Perception: Harris perception Node

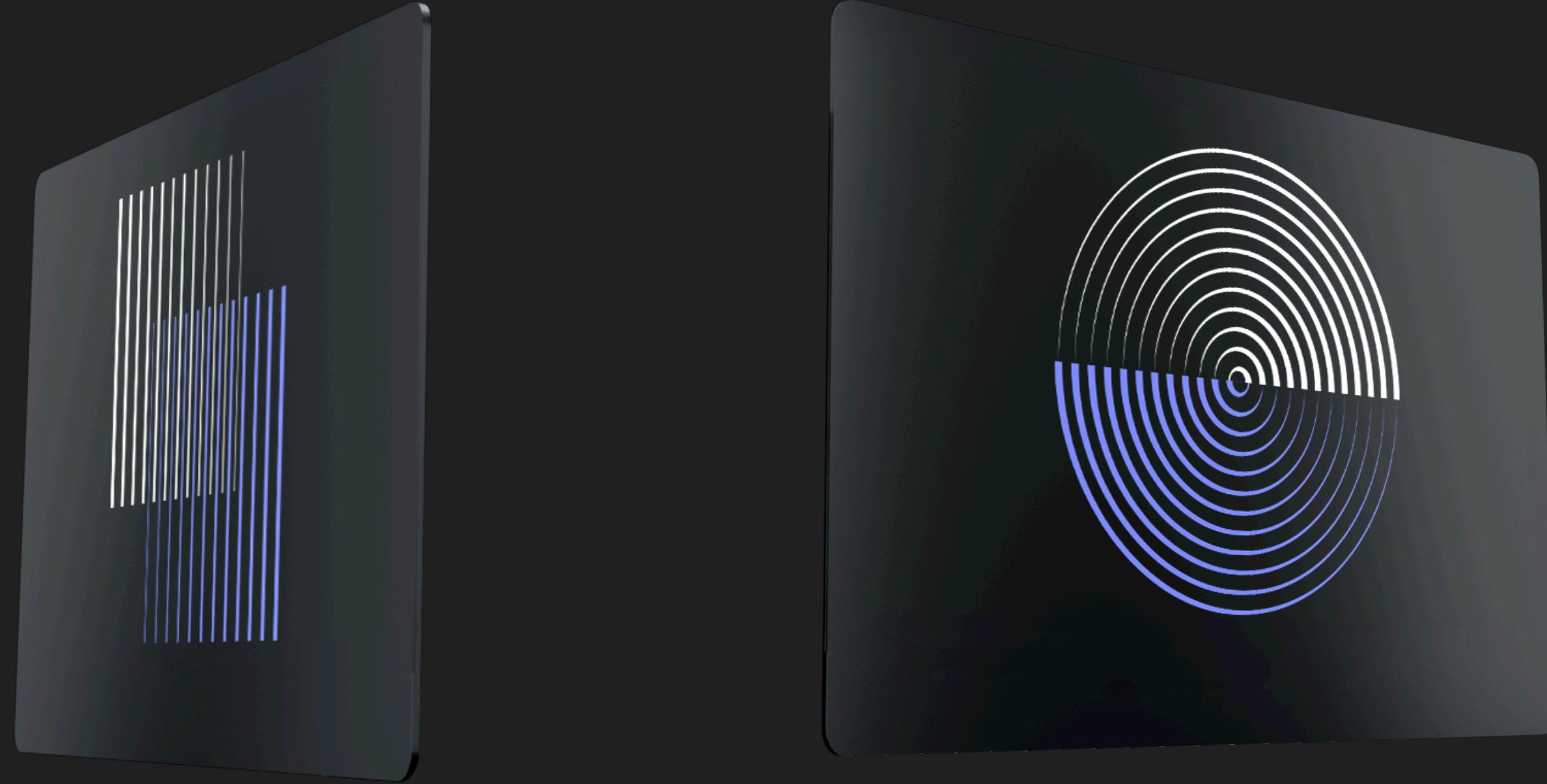


ROBOTCORE Perception: HOG perception Node



Services

Hardware acceleration will revolutionize robotics, enabling new applications by speeding up robot response times while remaining power-efficient. Our services help rapidly augment your engineering capabilities with a robotics deep domain expertise.



**ROBOTICS
CONSULTING**

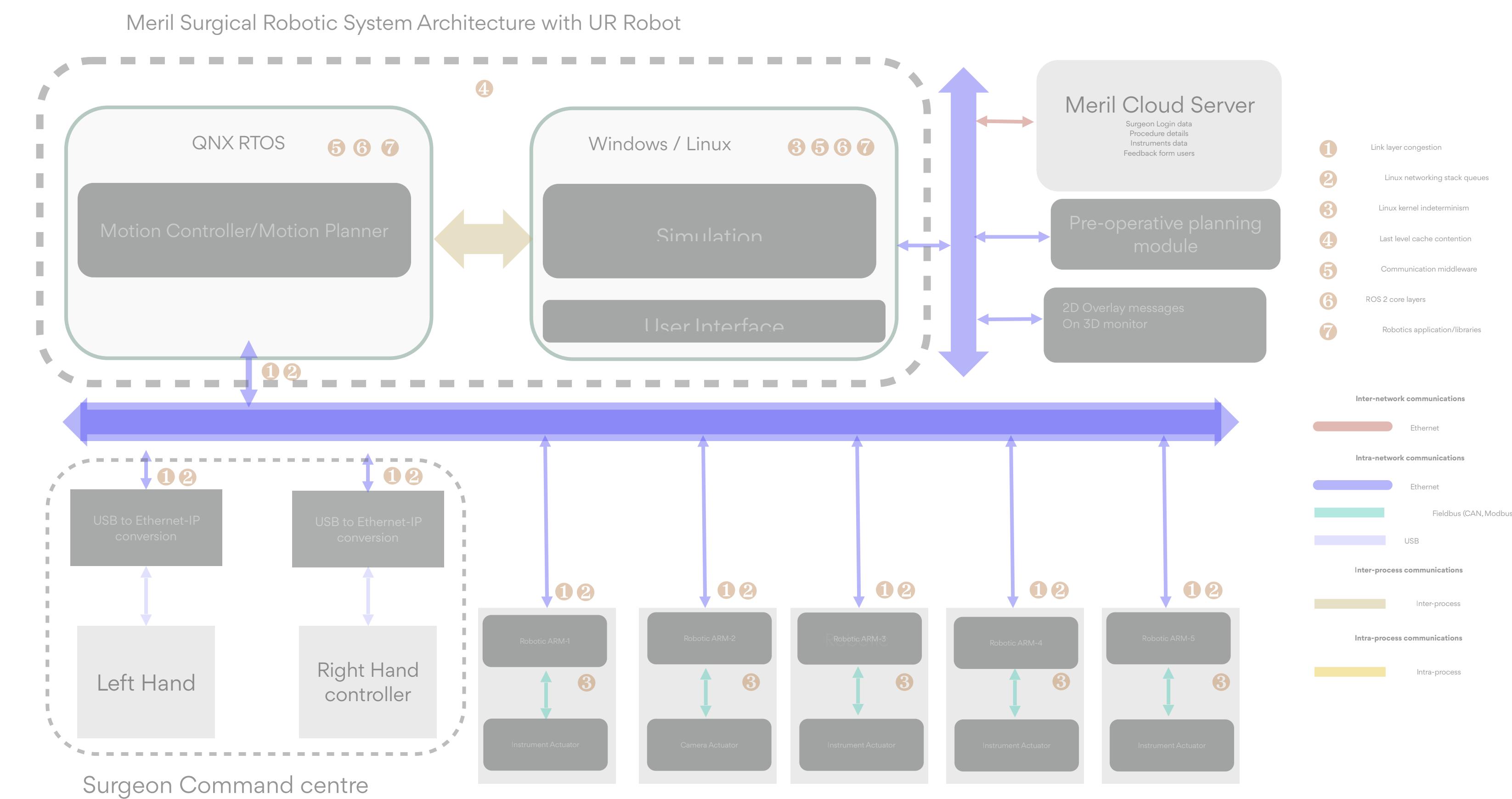
**ROBOT FPGA AND GPU
IP DESIGN SERVICES**

PHASE I:

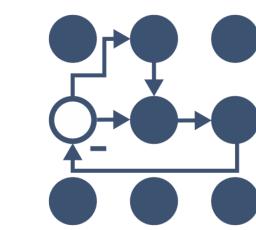
Systems architecture review

We'll perform a detailed architecture review of the complete software and hardware architecture with special emphasis on real-time and indeterminism. We'll assume ROS 2 will be the robotics framework to be used and propose/interface proven libraries in alignment with the team to select and model appropriate ROS 2 components for each capability.

The review is intended to ensure that the architectural solution is ready for the next design phases.



⋮ 2 > **MoveIt2**

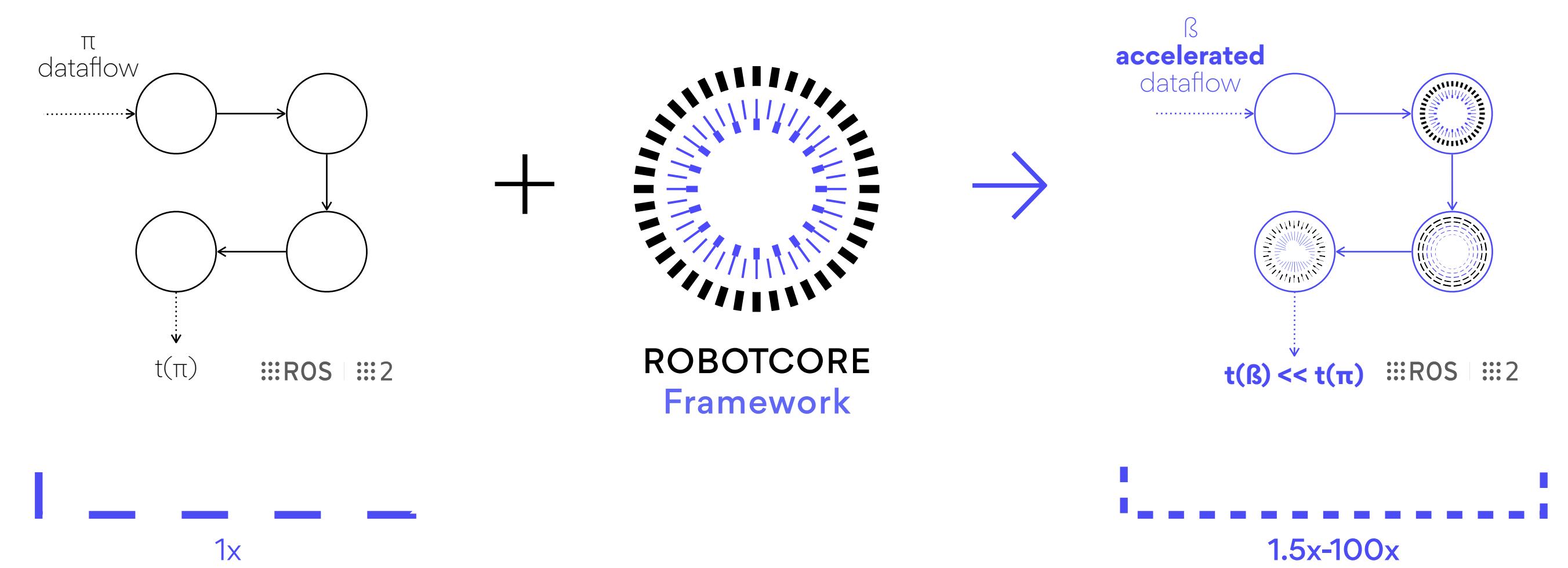


PHASE II:

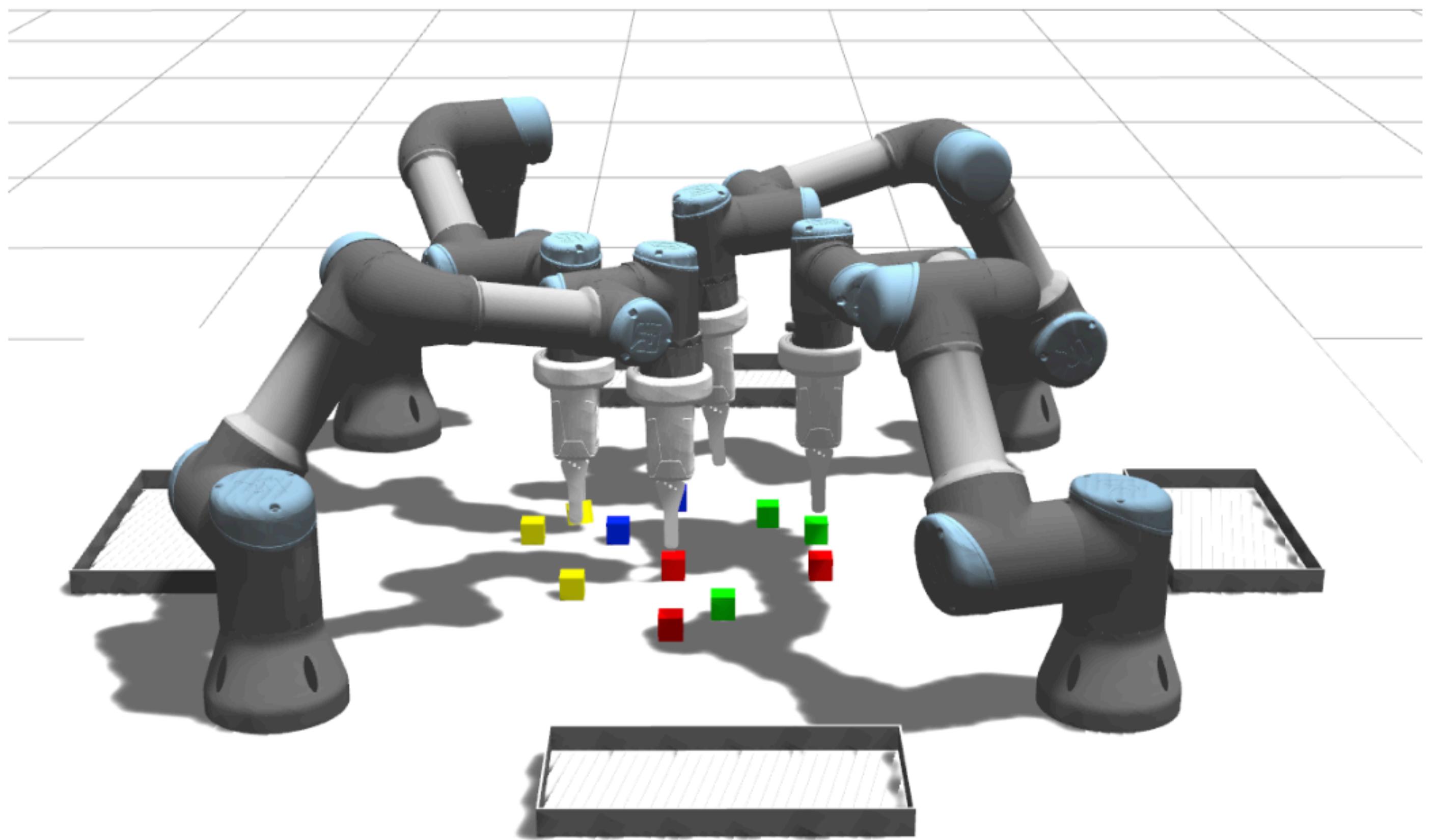
Develop custom accelerators

ROBOTCORE® Framework allows to easily leverage hardware acceleration in a ROS-centric manner and build custom compute architectures for robots, or "robot cores". With robot cores, roboticists can adapt one or simultaneously more of the properties of their computational graphs (e.g., its speed, determinism, power consumption) optimizing the amount of hardware resources and, as a consequence, the performance in an accelerated dataflow.

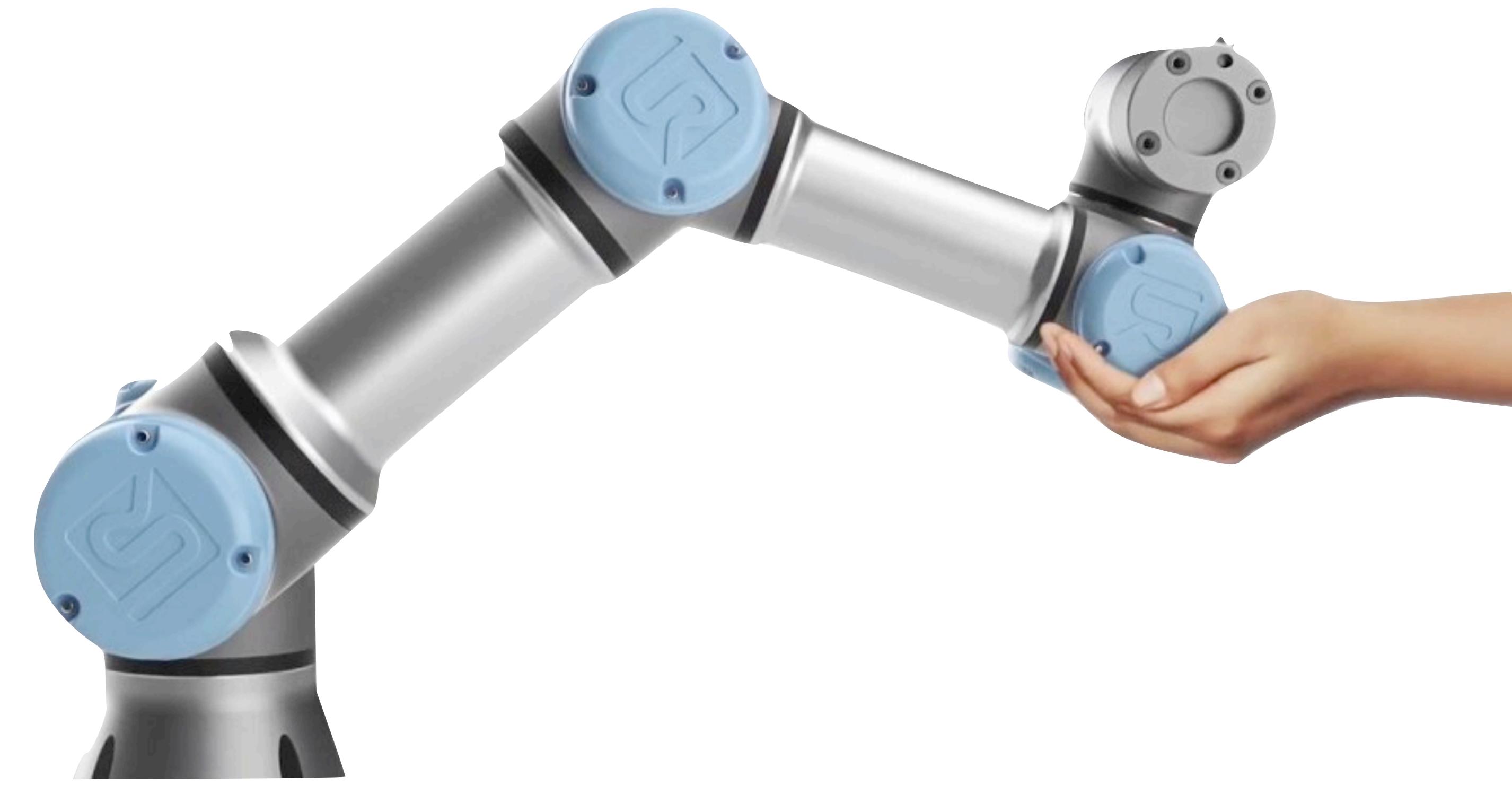
This includes custom communication bridges, perception tasks, motion planning, custom data pipelines within the (ROS 2) message passing infrastructure, etc.



PHASE III: Systems architecture review (optional)



PHASE IV: Prototype in hardware (optional)



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