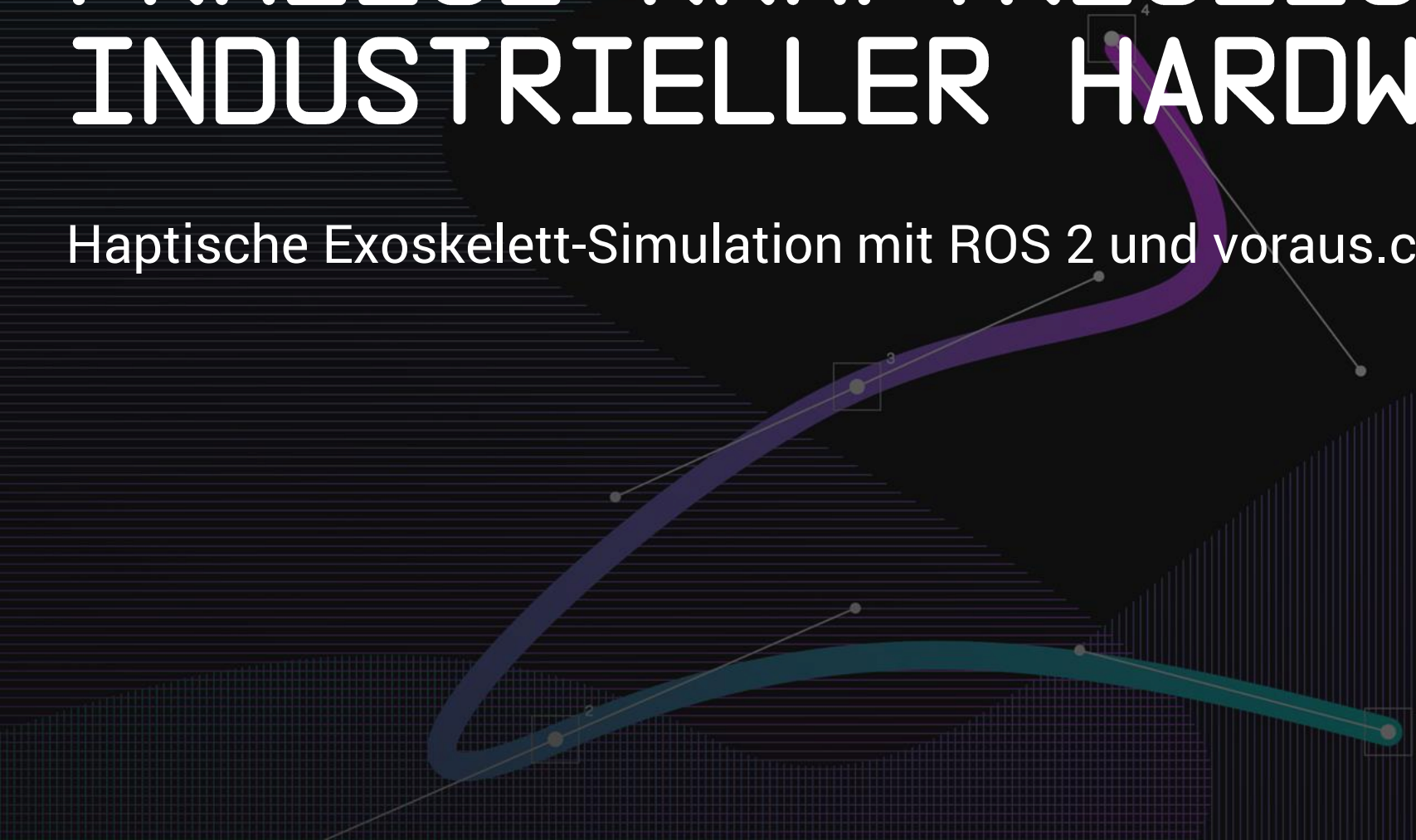
vorausrobotik

PRÄZISE KRAFTREGELUNG AUF INDUSTRIELLER HARDWARE

Haptische Exoskelett-Simulation mit ROS 2 und voraus.core



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AUTOMATION CAUSES SIGNIFICANT PAIN

Automation solutions are complex and expensive.

AUTOMATION SUFFERS FROM PROPRIETARY BLACK BOXES.

- **complexity** from different robots and components.
- **outdated** software and interfaces.

- **long development**.
- **inflexible solutions**.
- **limited possibilities**.

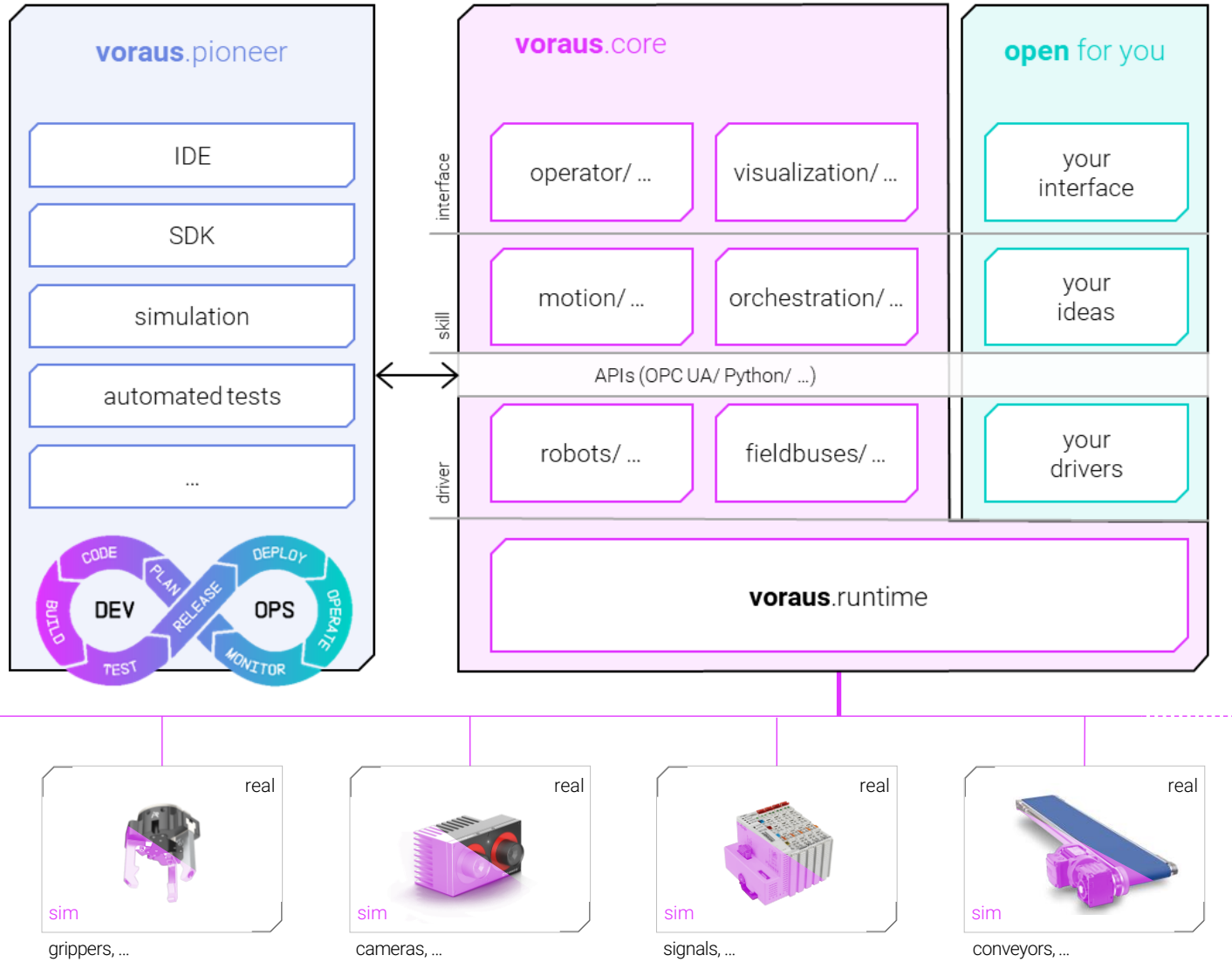
WE ENABLE EVERYONE

We unlock the power of modern software development.

- **Execution** of robots and components.
- **Agnostic** and containerized.
- **Orchestration** of the entire automation.

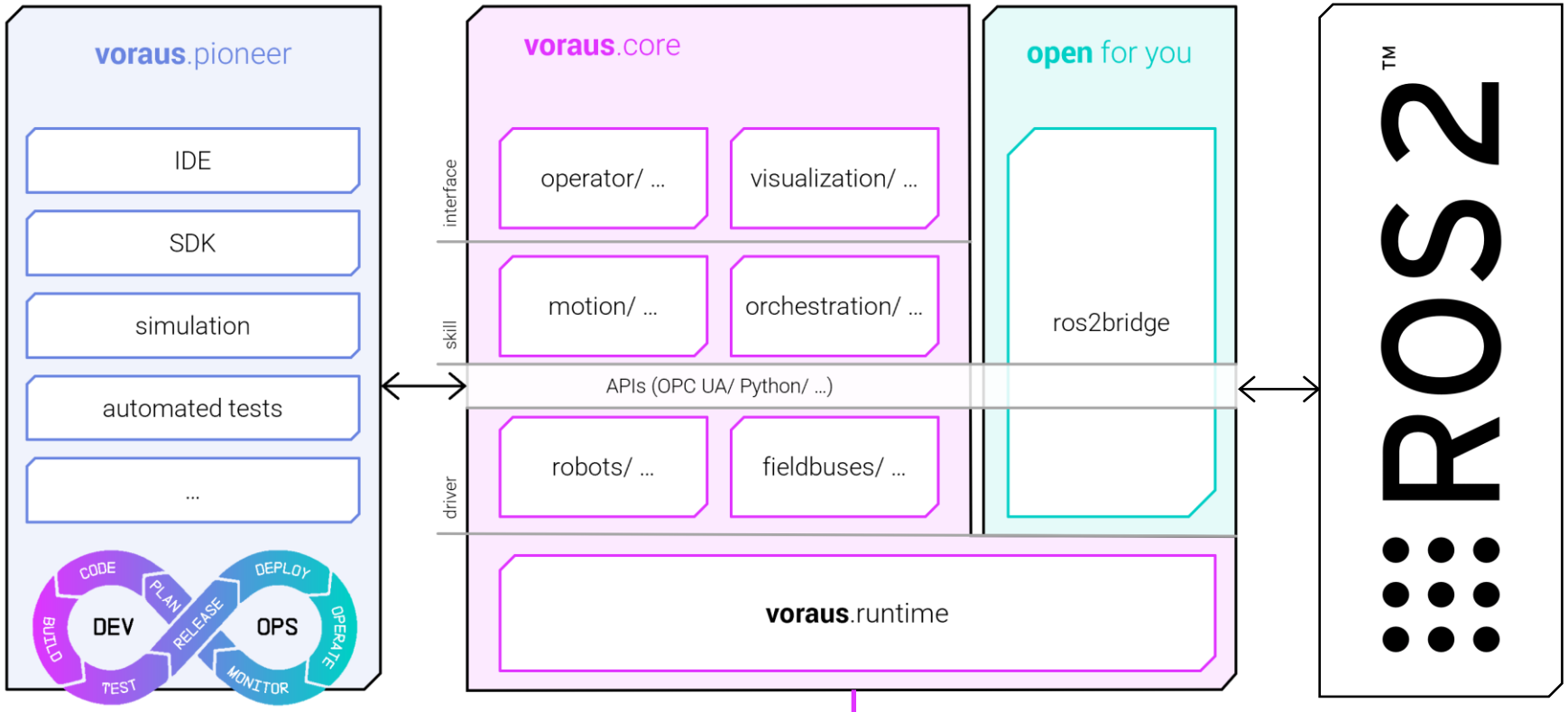
- **Open** and no vendor-lock.
- **APIs** enable you and **unlock ∞ resources and possibilities**.

- **Decoupling** of HW and SW development.
- **Change running systems**: develop, simulate, test, deploy.

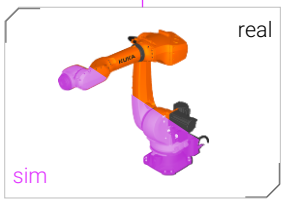


VORAUS.APP //ROS2BRIDGE

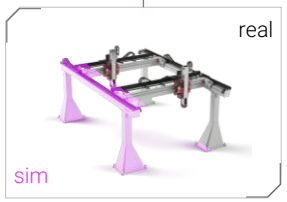
Direct access to voraus.core data, API and driver layer via ROS 2



motors

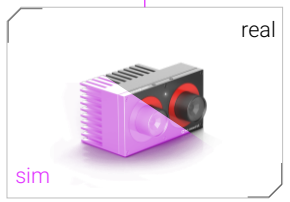


robot brands

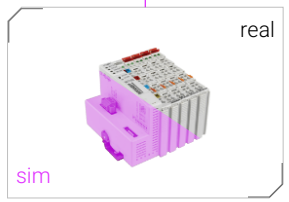


modular kinematics

grippers, ...



cameras, ...



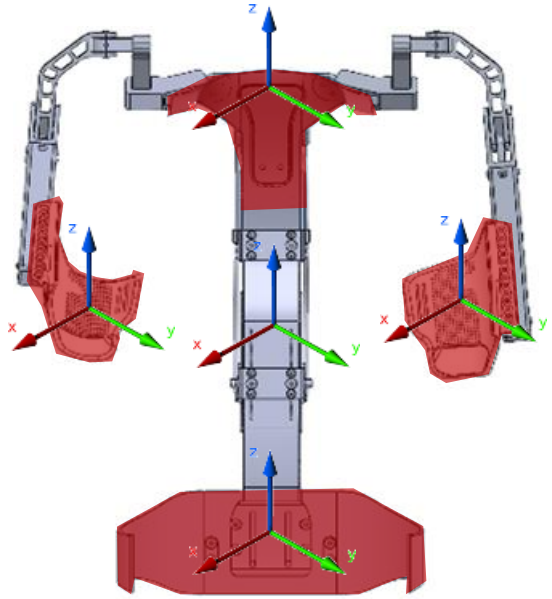
signals, ...

conveyors, ...

RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

Shoulder exoskeleton S700 (https://www.exoiq.com/)



Exo-Skeleton “Lucy”

gefördert durch dtec.bw Zentrum für Digitalisierungs- und Technologieforschung der Bundeswehr

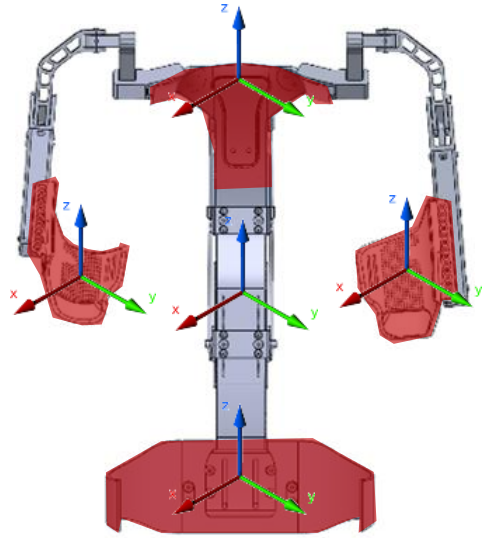
Funded by the European Union NextGenerationEU

RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

- Emulation of reaction forces via sensitive force control
- Online calculation of the exoskeleton state space model

robot-based haptics simulation



Exo-Skeleton “Lucy”

Immersive experience combined with VR-environments

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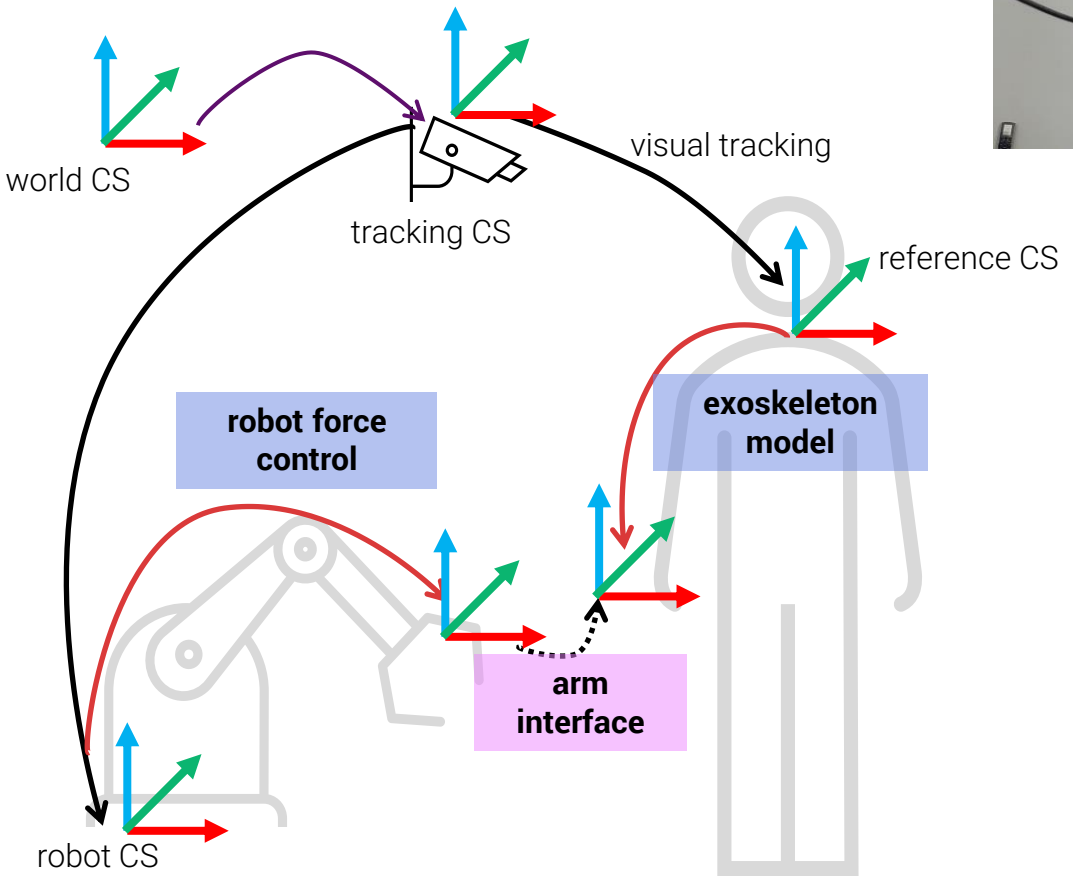
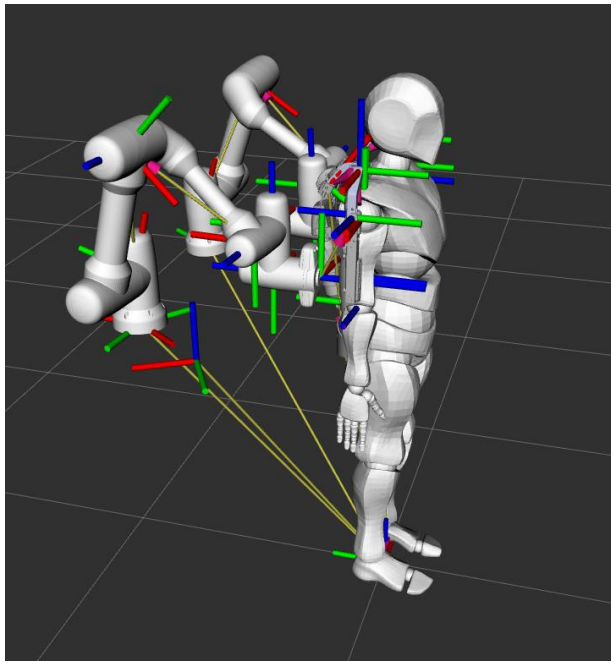
RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

- Emulation of reaction forces via sensitive force control
- Online calculation of the exoskeleton state space model
- Using internal robot sensors and external force-torque-sensors



Exemplary simulation architecture



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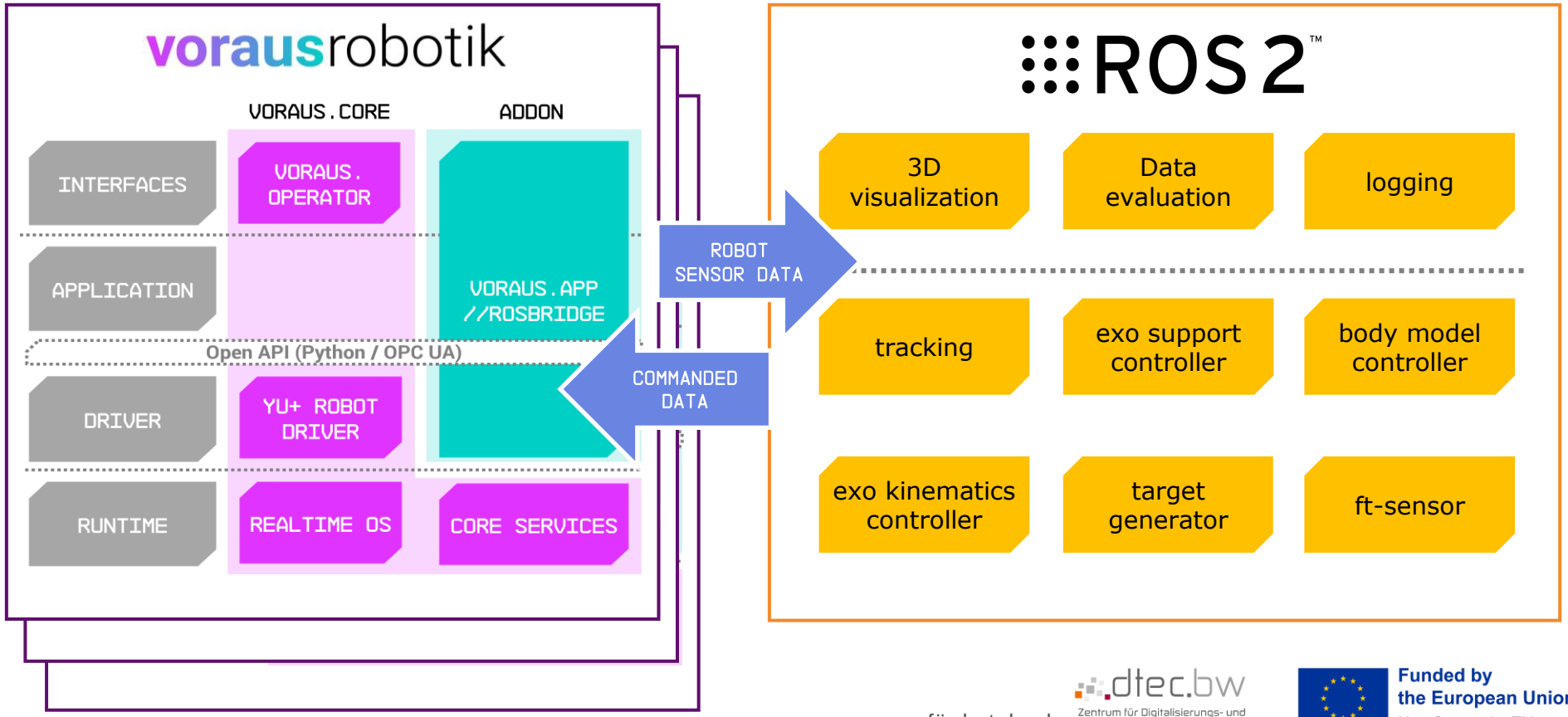
RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

- Exoskeleton behavior modeling and control implemented in ROS 2
- Hardware control with voraus.core via voraus.app //ros2bridge



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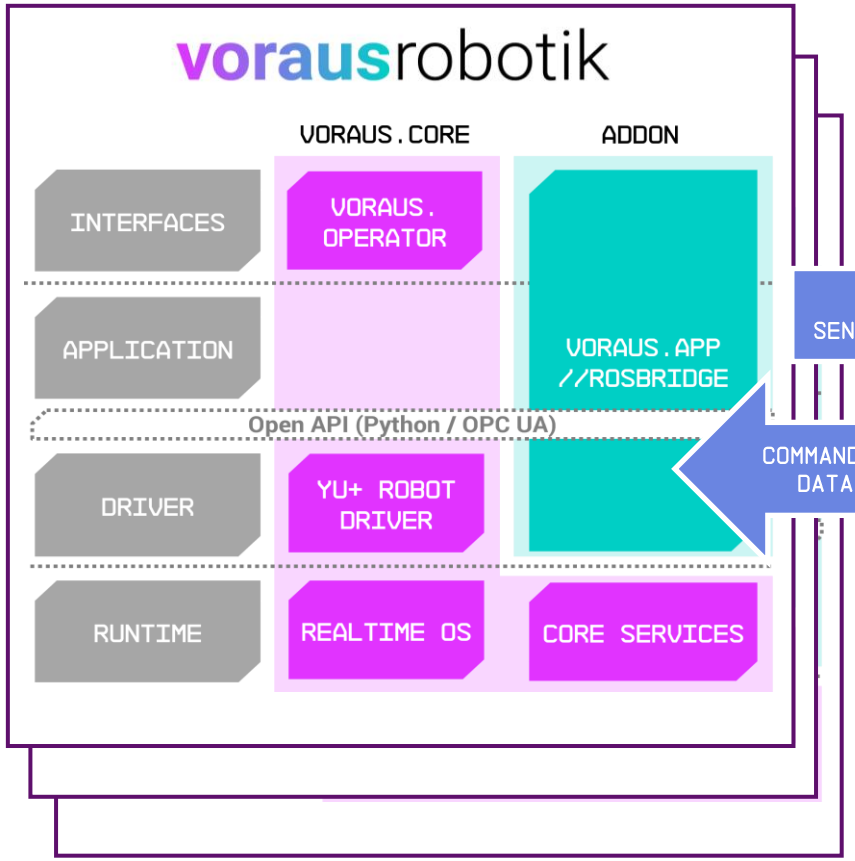
RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

- Transformed robot task-space into exoskeleton degrees of freedom
- Control the motion of the robot-mounted body interfaces in virtual exoskeleton coordinates

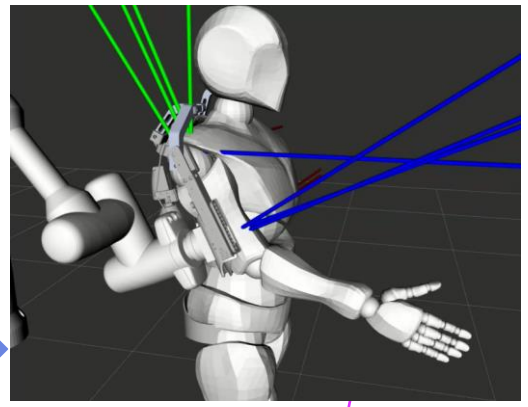


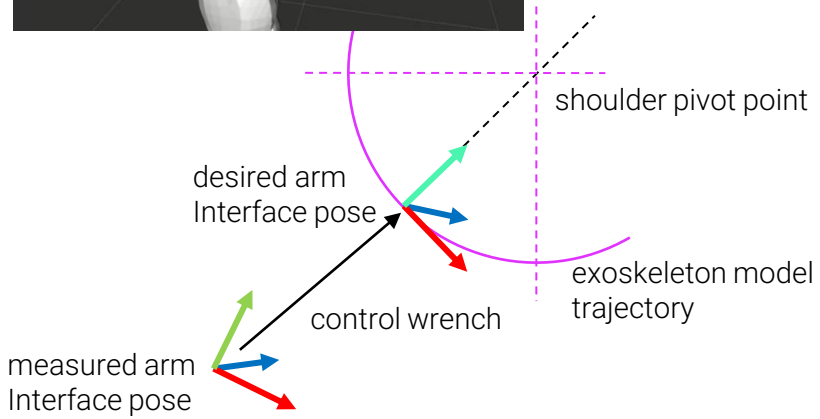
ROBOT SENSOR DATA

COMMANDED DATA

ROS 2™

Controlling the robot endeffektor in exoskeleton coordinates





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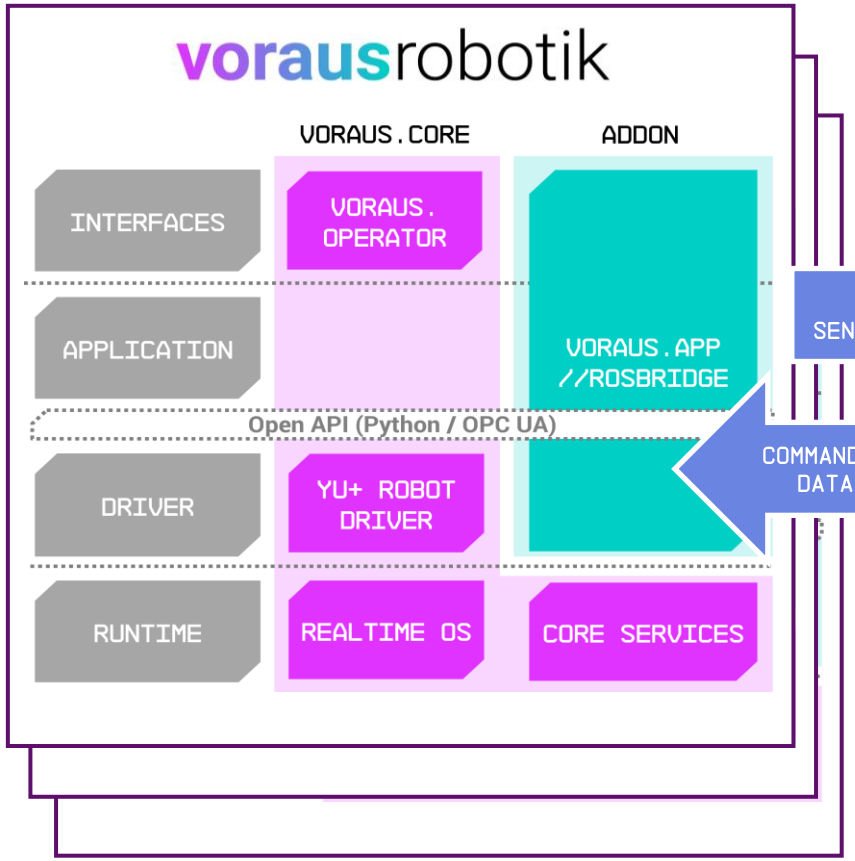
RESEARCH PROJECT: EVO-MTI

Robot-based haptics simulation of active support systems

Extended force control with additional force-torque sensors

- Integration of a 6-dof force-torque sensor in a force control loop
- Improved tracking behavior of Cartesian force control
- Support and reaction forces controlled in exoskeleton coordinates

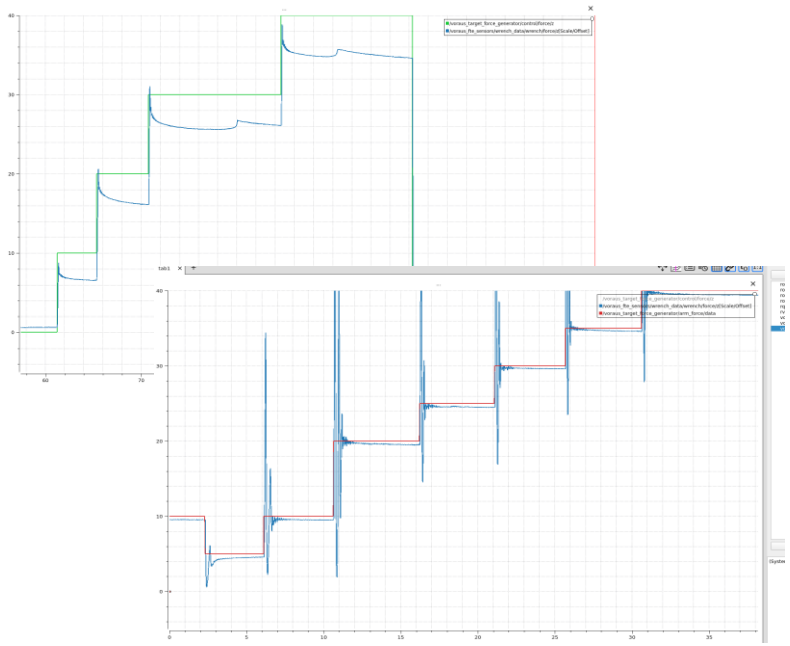


ROBOT SENSOR DATA

COMMANDED DATA

ROS 2™

- Closed-loop force control via voraus.app //ros2bridge
- External force-torque-sensor to compensate disturbance



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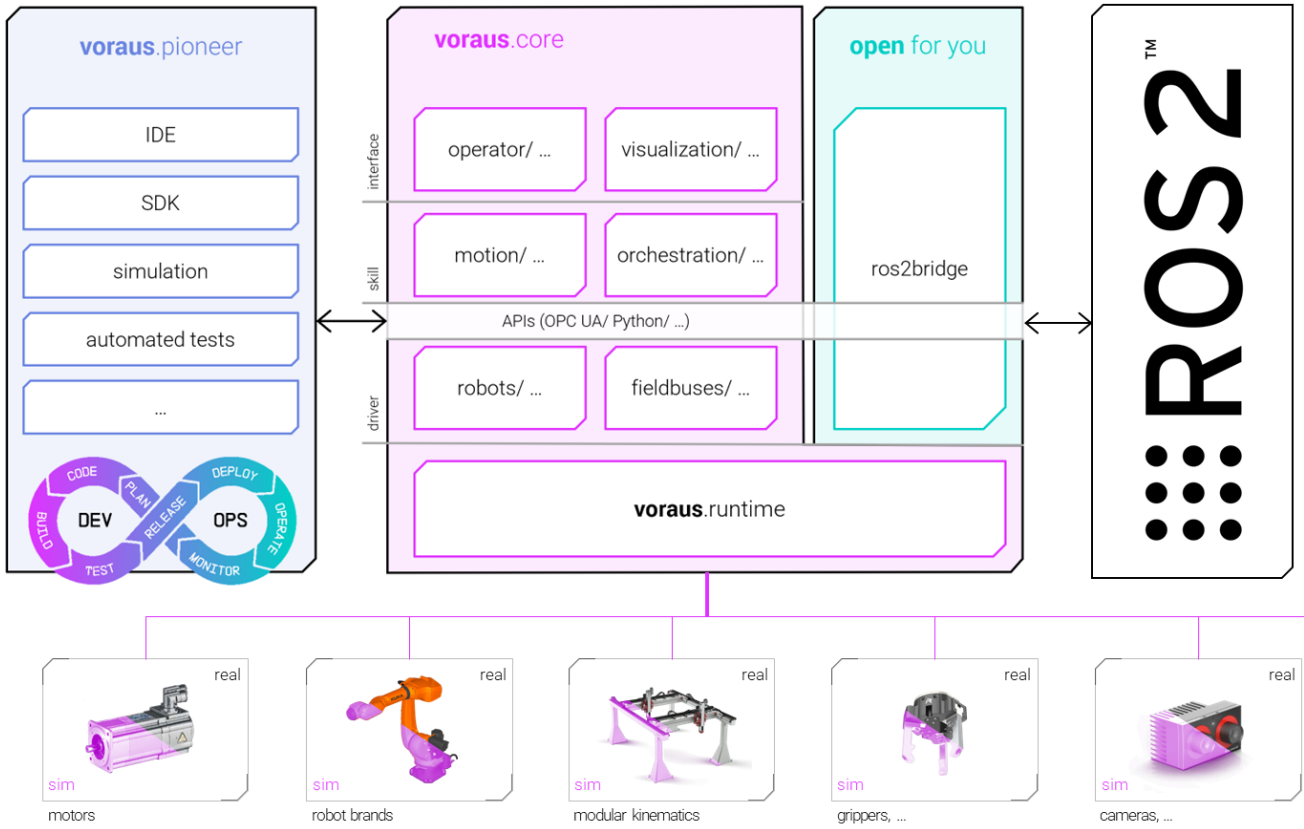
Funded by the European Union NextGenerationEU

VORAUS.APP //ROS2BRIDGE

Direct access to voraus.core data, API and driver layer via ROS 2

The voraus.core is free for non-commercial research and education projects & young start-ups!
vorausrobotik.com/demo



https://github.com/vorausrobotik/voraus-ros-bridge