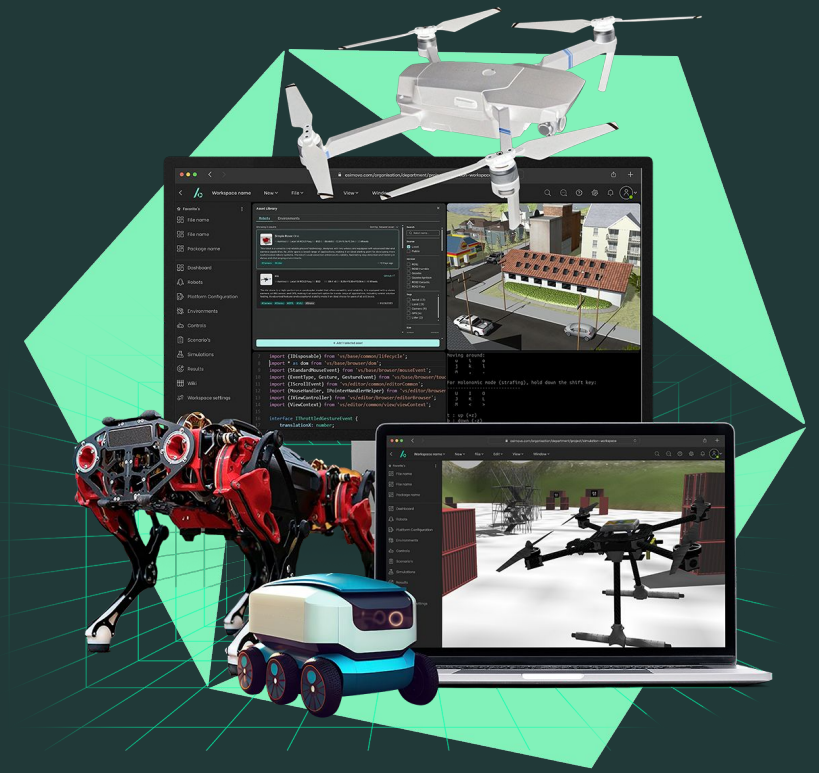
Asimovo

Smarter Robotics Research & Education

SURF

SURF Cloud Event
7th March 2024



Introducing SURF-Asimovo Collaboration

Who am I?:

- Christine from Asimovo

What we are covering today:

- Problems with Teaching Robotics Today
- Robotics in Cloud Environment
- Asimovo Platform Solution
- Examples of Projects
- Collaboration with SURF
- How you can get involved

Christine Fraser
CEO & Founder
Asimovo

MEng , MBA

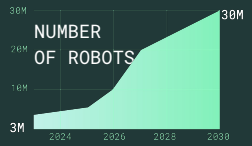
Associate Vice President
IEEE-RAS - Industry Activities Board
Leading - Entrepreneurship & Education

Idea Grew Out from Horizon Europe Research

Robotics research on complex problems was incompatible with tools available

Becoming More Autonomous

- Service robotics soon to overtake industrial robotics in numbers



- Robotics development becoming more multi-disciplinary. Hardware & software both needed
- There are not enough robotics engineers globally to deliver to market demand
- Best practices for robot autonomous behaviours not yet established

Fragmented Tools

Open source operating system and tools becoming stable and adopted
~**0.5 billion** ROS2 downloads
>**42 million** av. downloads monthly

ROS GAZEBO

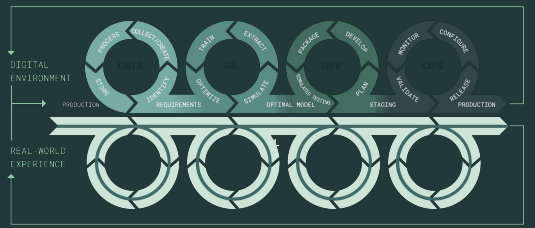
However:

- Tools require high skills
- High barrier to entry due to bespoke set ups
- Many only available as native versions
- Difficult to scale
- Difficult to collaborate with specialists

Lack of Infrastructure

Robotics researchers are struggling with cloud native tools and infrastructure that are incompatible with their development tools.

Many robotics activities are still work in silos, with no DevOps cycle



Teaching Robotics can be Slow and Frustrating

Robotics research & education is limited by the tools available, what we have heard from SURF members

Tooling Performance **67%**

Setting up the right tools and learning new tools takes up a lot of time right now. Many Robotics tools are only available natively. Web versions have limited capabilities.

Collaboration **62%**

Stop working in silos. It is proven that multidisciplinary teams develop the best solutions. Remote access to robots and people needed.

Access to Resources **52%**

Access to the right processing power for the task at hand. Manage and allocate the resources you have.

Robot Performance **52%**

Need a way to keep the digital: reality gap small, so there can be an increase in the use of digital twins and simulation.

Lack of standardisation **41%**

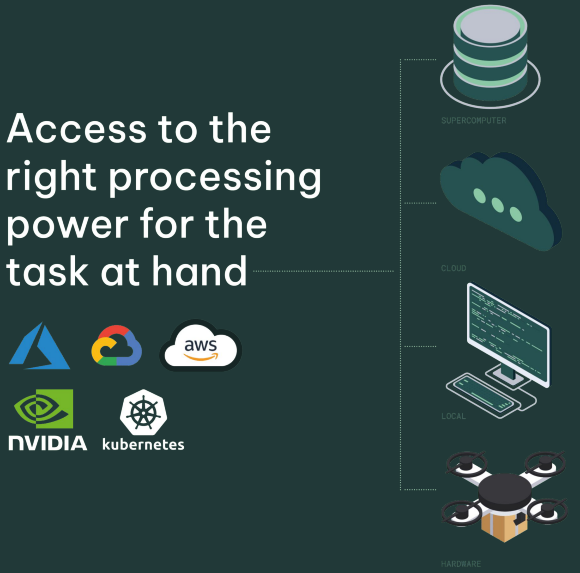
Lack of best practices, tools and documentation.

Embrace the Benefits of Cloud Computing

Remote Collaboration

Access to Resource Allocation

Access to the right processing power for the task at hand



Cloud Computing has Limitations

Web based tooling are an inherent limitation especially in Robotics

For example:

- The web based Gazebo viewer is limited and view only
- RViz is not web based

Mitigation Strategy

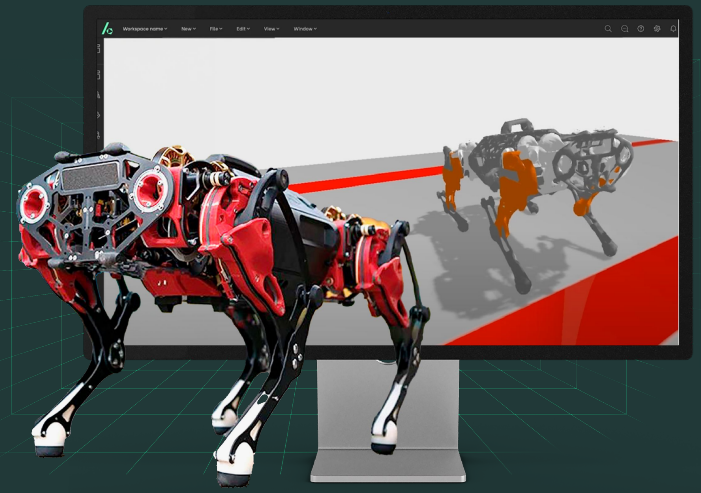
- Provide a locally running native Gazebo interface while keeping cloud benefits
- Either provide a locally running RViz or provide web based alternative
  eg Foxglove

Cloud Computing has Limitations

How to connect your robot to your cloud tooling

Many people still struggling to connect their robots to the benefits of cloud computing

- Create a digital twin of your robot in a digital representation of the operating environment
- The naive approach is to put cloud tooling in the planning cycle of your robot - latency!
- There are benefits for higher abstract planning - eg predictive behaviour, scenario planning, Robot-2-Robot behaviour



Cloud Does Not Equal Open

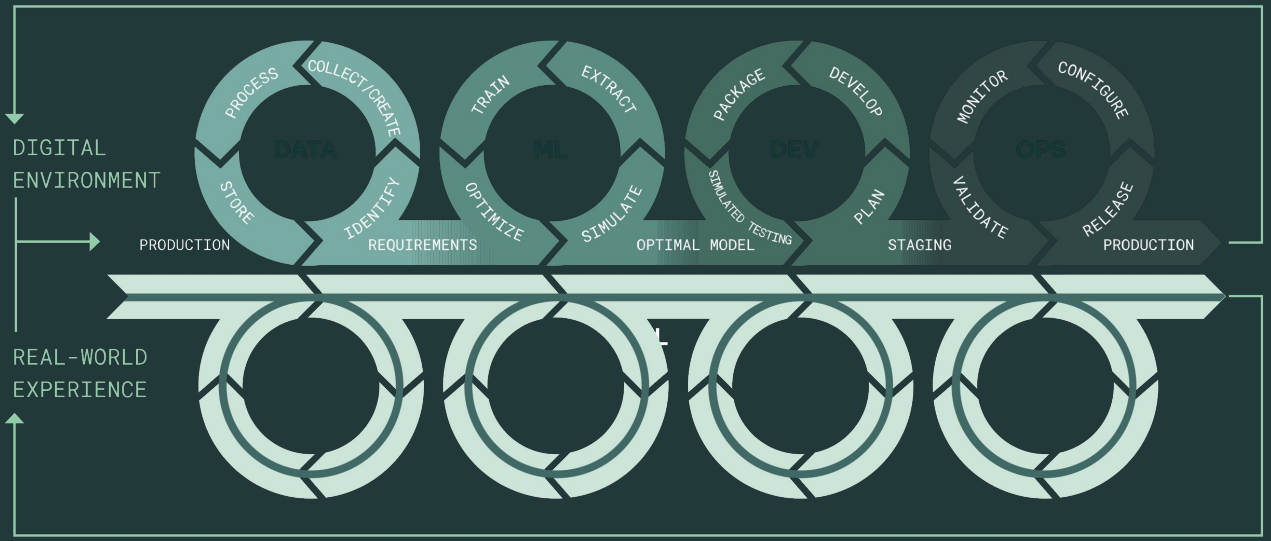
Your projects can be as open or as private as you want them to be

Modern Cloud Environments Offer a Full Range of Data Access Capabilities

- You are able to control your own IP
- You are able to control access and edit rights
- You are able to allocate resources
- You are able to collaborate internally and/or externally
- You can work as openly or as closed as you want
- You can support an open access area or open source community

A Software First Approach

Digital Twin - Of Robot Mind, Body and Operating Environment



Change Accelerators

- Propietary to Open Source Software
- Silos to DevOps Philosophy
- On-Premise to Cloud Computing
- In-house to Outsourcing
- Waterfall to Agile Methodology
- Isolated Models to Connected APIs

Key Learnings from Cloud Robotics

Ideation

Empower creativity and innovation through access to tools and resources, do not constrain it

Simulation

Use Simulation together with cloud computing to power an iterative development process

Collaboration

A platform for the robotics research & education community. Where many can develop using integrated tools and systems

Operation

Empower building best practices as robot behaviours become more complex and autonomous.

Collaborating with SURF to bring the benefit of Cloud Robotics to their members

Smarter Robotics Research & Education

SURF-Asimovo already connects 4 key aspects needed for smarter robotics:

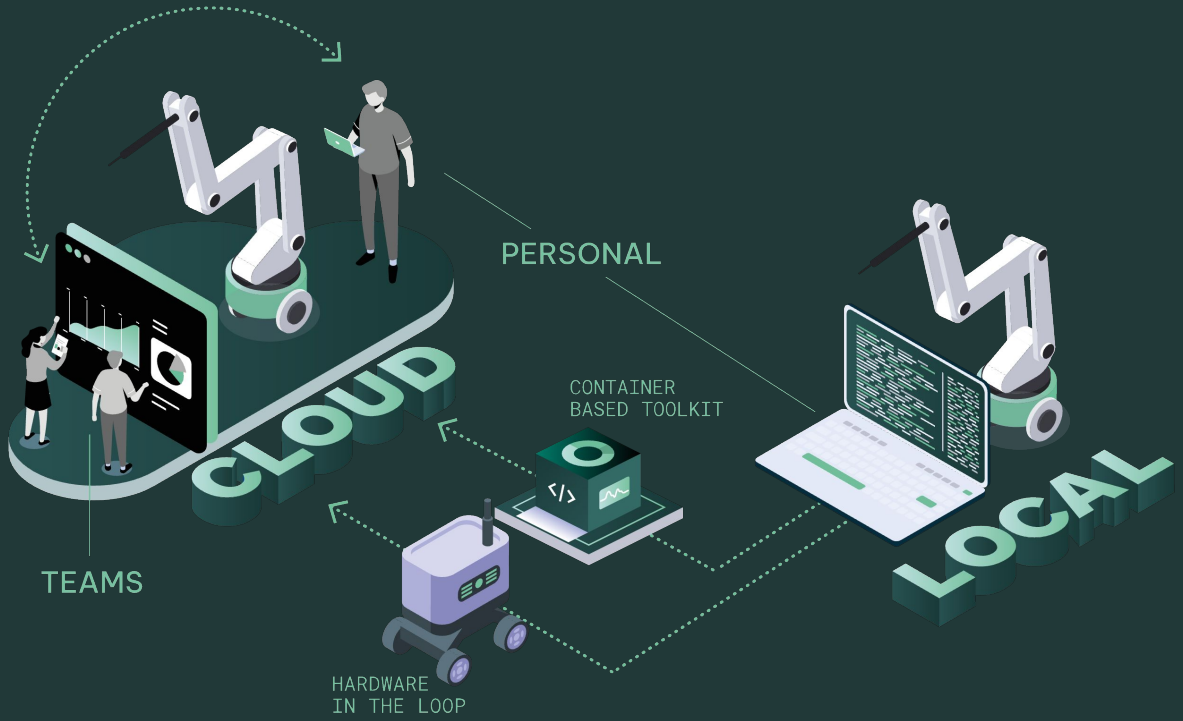
PEOPLE
Teams and their hardware can be located anywhere

TOOLS
Development toolkits and Environments

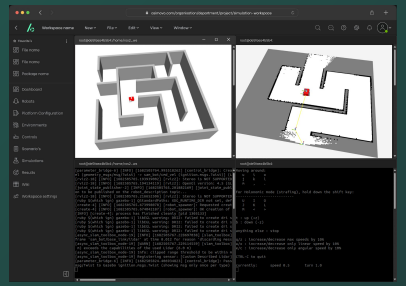
WORK
Course work packages and results

RESOURCES
Flexible Computing Power -local & cloud

Accessed via either cloud based or local IDEs



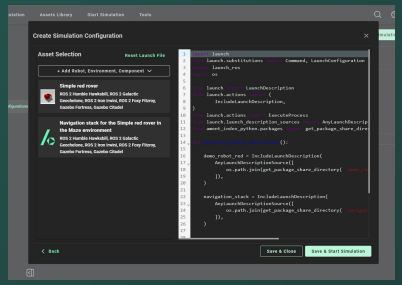
Pick the toolkit for your course or project



Create a tool-kit for your course or research project, so everyone is working off the same versions and setup

- ROS versions
- Gazebo versions
- Sensor data visualisation
- Code editors
- Navigation stacks

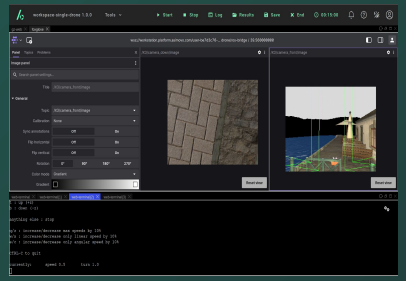
Populate your project repository



Create project level repositories of assets your team can develop with

- Robot body
- Components & Sensors
- Python Libraries/Containers
- Scenarios & missions
- Simulation configurations

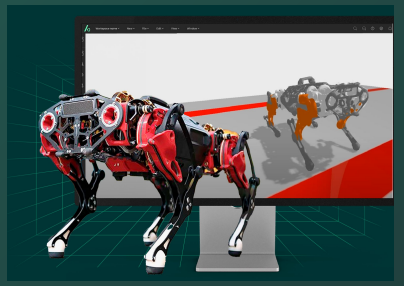
Share and collaborate easily



Cloud based teams and projects. Allocate resources and permissions

- SURF member accounts
- Supervisor functionality
- Student permissions
- Cloud based and local workstations
- Allocate appropriate cloud computing resources

Transfer between digital and real world easily

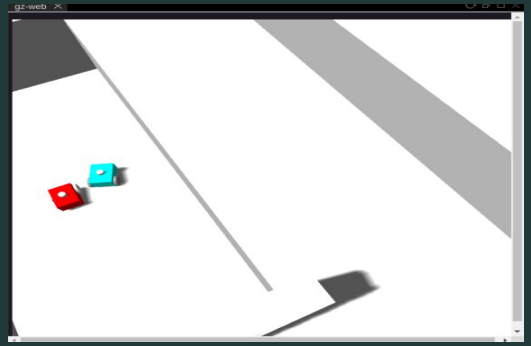


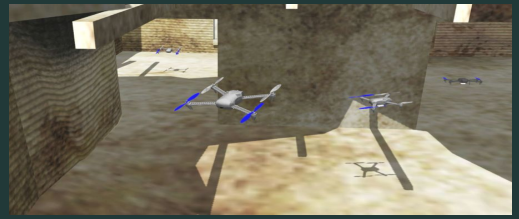
Bring hardware into the loop at anytime. Work on local machines as well as cloud infrastructure

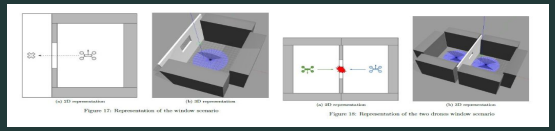
- Transfer from digital to real world
- Upload real sensor data
- Work seamlessly between cloud workstation and local workstations
- Access local versions of toolkit that might not be available in the cloud

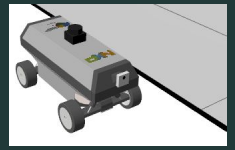
Connecting Many R&D Projects

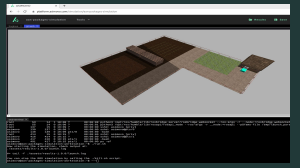
Create open source projects or publish you R&D projects in a new way

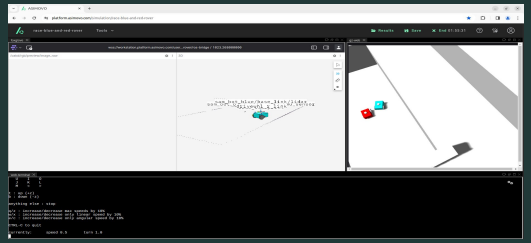


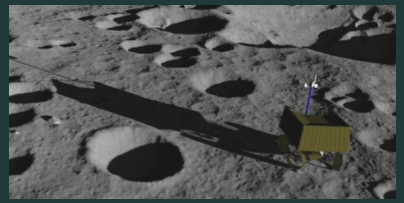


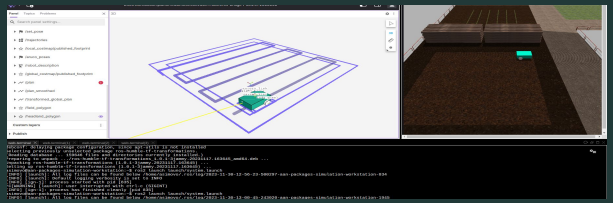












Connecting to Dutch Universities with SURF

Smarter Robotics **Research & Education**

“SURFAsimovo would really help us to set up new courses and students quickly. A platform like SURFAsimovo, is a way to easily share software with partners. That really helps us. ”

Kees van Tefelen, Researcher,
Saxion University of Applied Sciences

“When I first heard of SURFAsimovo, I was directly interested. I see one of the biggest challenges that we have is how to educate students in an efficient way in the limited time available. … I think the most important benefit of SURFAsimovo would be the increase in quality of education we could provide.”

Jan Benders, Program Manager Control Systems,
HAN University of Applied Sciences

EDUCATIONAL VALUE ADD WILL INCREASE OVER TIME

More Functionality over time

Redefining the Future of Work

Research into the future of work

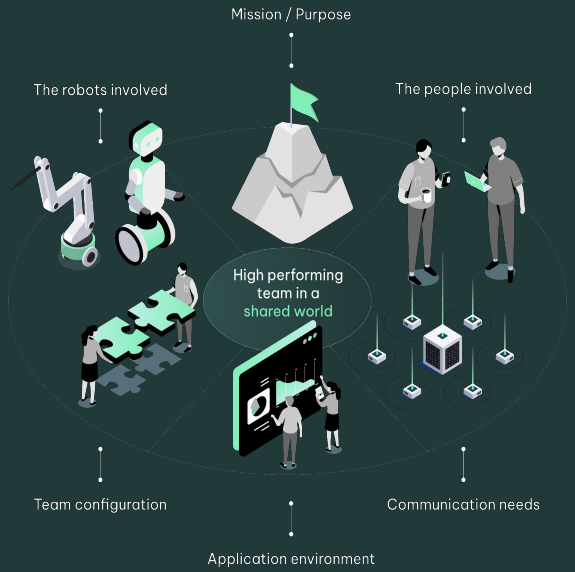
Robotics empowered research
Cross-Faculty Collaboration

Research tools closing gap to industry

Collaboration with AI and ML Disciplines

Publish R&D project and unlock new research opportunities

Platform for Smart robotics education



Keeping education close to cutting-edge robotics

Connecting to Dutch Universities with SURF

Asimovo being offered to all Dutch Universities

Smarter Robotics **Research & Education**

SHORT TERM - POC with a few SURF Members & Technical Feasibility Review

TARGET - Integrate Asimovo into SURF cloud computing capabilities for Connected Cloud services and Supercomputing.

Rollout to all SURF members by September 2024

The higher the demand the higher a priority to integrate. So if you are interested please reach out to SURF.

Find out more...

Smarter Robotics Research & Education

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