

# Asimovo

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[asimovo.com](https://asimovo.com)

## From Code to Robots

Asimovo's RoboDevOps -  
A Software First Approach for Robotics

### Contents

2. Introduction
3. Asimovo Difference: A Software First Approach for Robotics
4. Right Tools, in the Right Place at the Right Time
5. Agile Robotics Engineering in the Cloud
6. The Power of Simulation Unleashed with Asimovo
7. Connecting Robotics to the Effective Computing Power
8. The Future Workflow of Robotics Engineers
9. Example: The Warehouse Rover with an Arm
11. Conclusion

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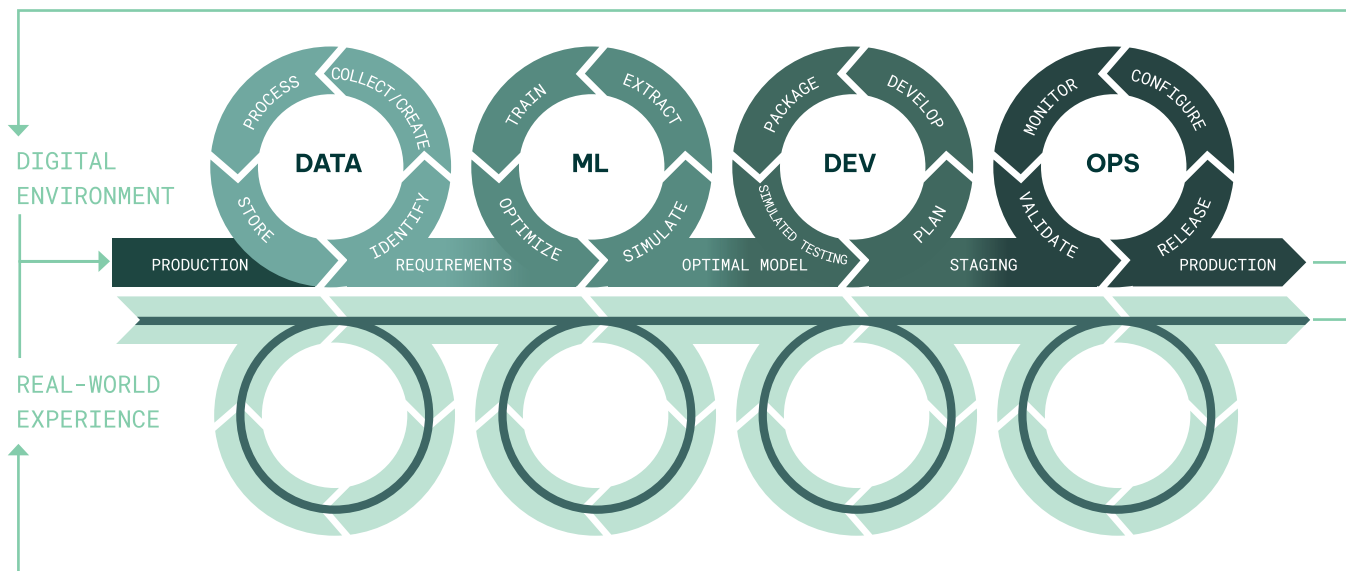


# Introduction

In the realm of robotics engineering, a silent revolution is underway. It's a shift of paradigm, one that moves the needle from the tangible clutches of hardware to the fluid, expansive domain of software. Evidence shows that multidisciplinary teams build the best products. The last 20 years have seen a dramatic revolution in how products are developed when software engineering approaches are adopted. This whitepaper offers a deep dive from a software engineer's vantage point, examining the nuanced transition robotics engineering is experiencing. We explore the emerging trends and future workflows poised to redefine the industry.

Faced with a landscape where iteration speeds are critical, and collaboration is not just nice-to-have but essential, robotics engineering finds itself at a crossroads. Traditional methodologies—steeped in the rigidity of hardware dependencies and siloed development—are yielding to more agile, software-centric approaches. This paper outlines how Asimovo, a RoboDevOps platform, is architecting this transformation, offering robotics and software engineers a suite of tools that streamline the creation, simulation, and deployment of robotic systems. Here, we chart the course for a future where robotics and software engineers can innovate freely, unencumbered by the high entry barriers and collaboration challenges of the past.

## Asimovo RoboDevOps



DevOps for robot development on the software side, particularly in the context of AI/ML, plays a crucial role in ensuring efficient and responsible development practices. Simulation environments, with the added element of human-AI collaboration, are integral to this process as they allow developers to test and refine AI/ML models while considering the interaction and collaboration between humans and AI systems.



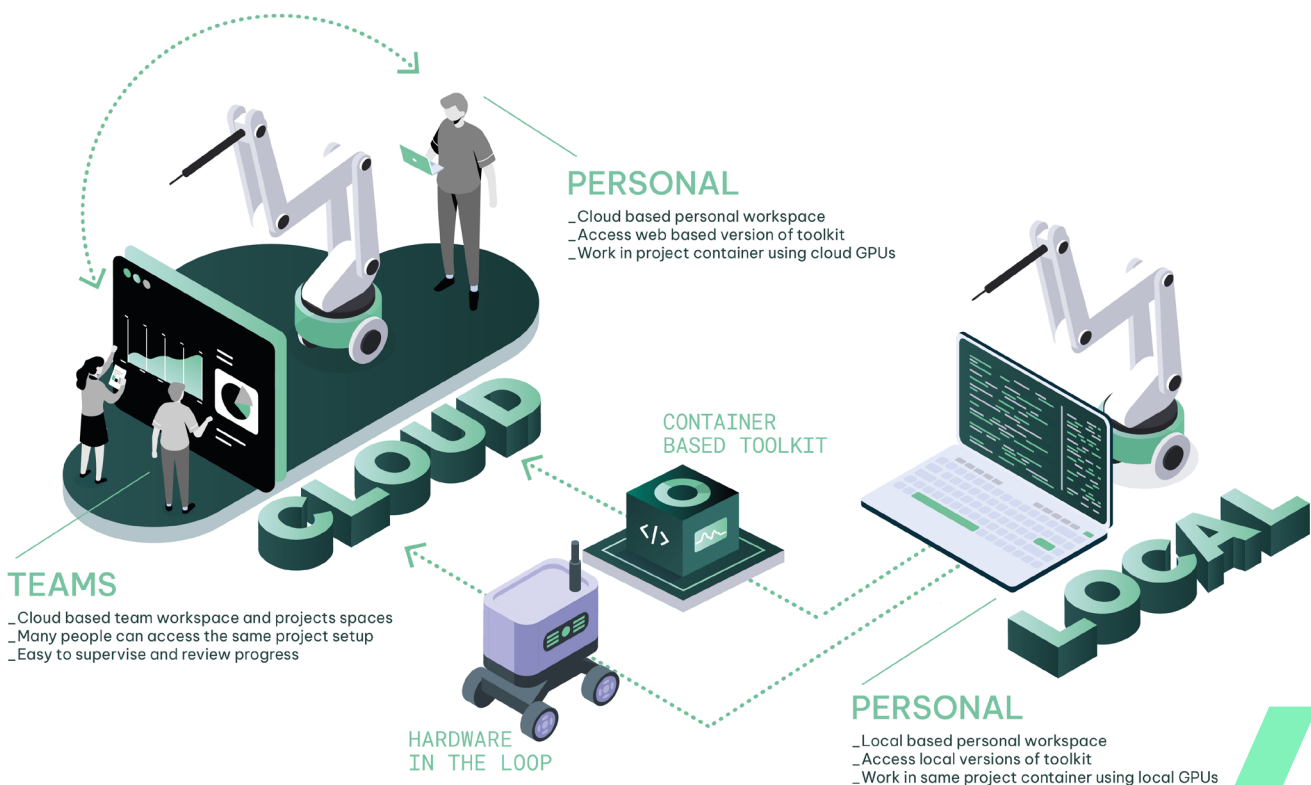
# Asimovo difference

## A Software First Approach for Robotics

Through speaking with multiple robotics engineers and companies Asimovo identified a need to combine different areas of development, with different infrastructure and resources. A need to speed up the development process and increase the quality of performance of both the team and the robots.

Asimovo have done this through connecting 4 key elements needed to create high performing robots with a high performing multi-disciplinary team.

- i. Teams - the people who can access, develop and share
- ii. Tool-kit - the development tools and versions specific to a particular project
- iii. The work packages - The things being developed (the robot behavior, control systems, test environments ,etc)
- iv. The Computing Power - Access to GPUS both local and in the cloud, as well as being able to add more when needed.



# Right Tools, in the Right Place at the Right Time

Asimovo enables a software-first approach to robotics engineering. It believes in integrating the best tools available.

As a first step, Asimovo has chosen to embrace the open-source robotics toolkit. Building on the foundation of the Robot Operating System (ROS1 & 2), a beloved toolkit amongst roboticists for its modularity and versatility. Asimovo extends ROS's capabilities into the cloud, presenting a cohesive, integrated platform that addresses the pain points of contemporary robotics development. Other proprietary software can of course also be used however the default settings and assets are all ROS-compatible.

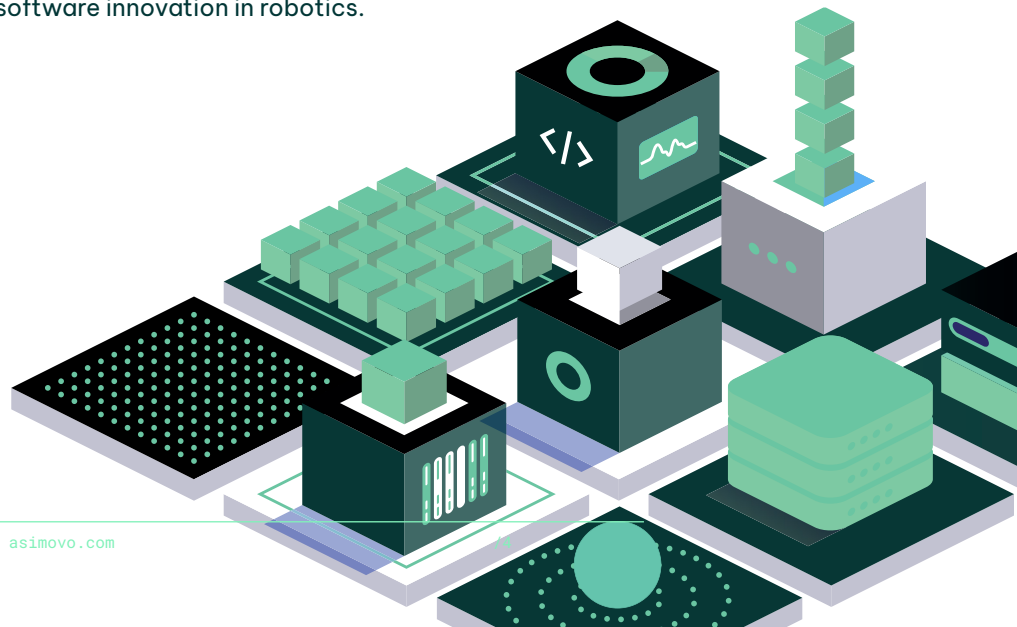
The robotics engineer's craft, historically tied to the slow feedback loop of hardware prototyping, is liberated by Asimovo's "simulation and software-first approach". The platform enables engineers to model, test, and refine robotic behaviors in a virtual environment that mirrors the complexity of the real world. This approach not only slashes development costs associated with physical prototypes but also dramatically accelerates iteration cycles.

Asimovo provides a cloud platform environment to collaboratively develop robots. It features an integrated suite for robotics engineers, which includes tools for monitoring the simulation in the cloud and visualization capabilities, Asimovo reduces the barriers for new users to get started with their first simulation. Overtime additional simulation and observability tools will become available via the Asimovo platform, in the first release Gazebo and Foxglove are the default tools.

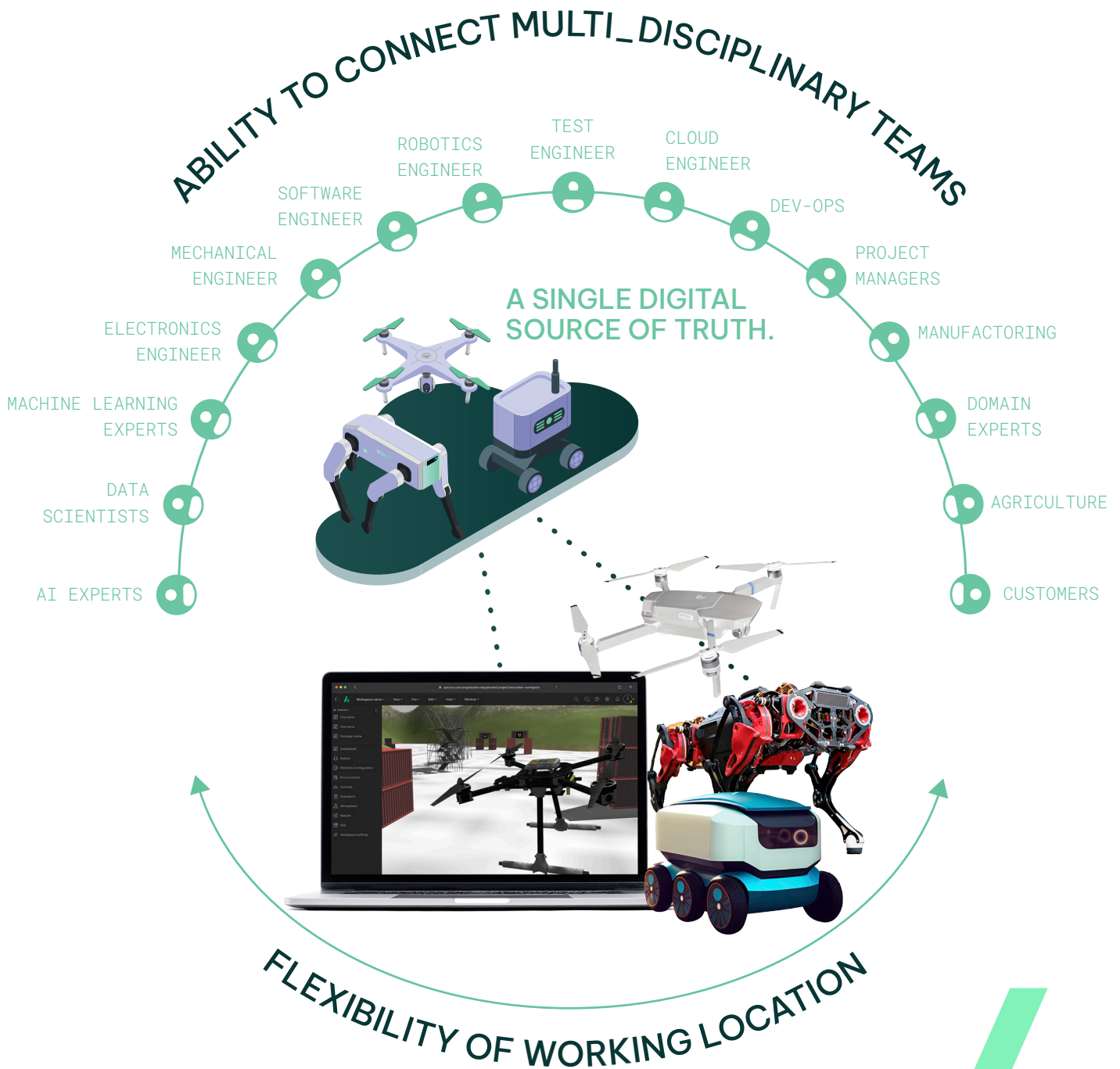
With its extendable catalog of hardware sensors and platform presets, it not only minimizes time to get started for people new to robotics, it also allows robotics platform and sensor manufacturers to make their products available for engineers to begin experimenting with instantly in the cloud.

Engineers can easily add components into their simulations, customize them, and share their innovations with a global community. The simplicity of setup—mere clicks away from ideation to simulation—lowers the barrier to entry, inviting a new wave of engineers and technical disciplines to explore the field of robotics.

For engineers and management, Asimovo's platform means quicker project turnaround times, resource optimization, and a broader talent pool to tap into. It promises a future where the focus shifts from hardware limitations to the boundless potential of software innovation in robotics.



# Agile Robotics Engineering in the Cloud



The shift to agile methodologies in software development has profoundly impacted how products are designed, tested, and deployed. Asimovo's cloud-based platform embodies this agile spirit in the realm of robotics. It provides an environment where engineers can swiftly iterate on robot designs, employing a rich library of presets that replicate real-world hardware. This ecosystem allows for rapid prototyping, with the ability to test robots on virtual terrains and scenarios, reflecting a diverse range of real-world conditions.

To further strengthen this continuous deployment approach, Asimovo will enable end-to-end observability and testing of robots. By enabling rapid deployment of your robots to multiple parallel simulations and providing tools to collect all data produced by the robots and the environment itself, Asimovo empowers the next generation of agility in robotics development that focuses more on the behavior of the robot than only the interaction between individual electronic components.

Furthermore, engineers can share their simulations and iterations instantaneously, bridging the gap between different expertise within the team. Management can oversee project progress in real-time, enabling a more responsive and adaptive project governance. With cloud-based tools, teams can work synchronously, irrespective of geographical boundaries, ensuring that the development process is not just faster, but smarter and more cohesive.

Asimovo has the ability to be not just an Integrated Development Environment (IDE) but a Cloud-Based Integrated Development Environment (CIDE). Enabling many people to develop within the same development environment without having to be physically in the same location as each other or the robot. The google-doc type live edits while coding excited many developers we speak with.

This innovative approach not only shatters previous barriers to entry for budding engineers but also equips leading engineers with tools to expedite the development cycle, ushering in a new era of efficiency and collaboration in robotics engineering.

# The Power of Simulation Unleashed **with Asimovo**

In the domain of robotics engineering, simulation is not just a tool; it's a strategic asset. Asimovo's cloud-based platform exemplifies this, offering a suite of simulation types that cater to the diverse needs of development strategies. From basic physics models to photorealistic simulators and advanced physics environments, the platform will support a progressive approach to simulation. Engineers can initiate their projects with simple simulation environments that they are used to, for example using Gazebo to model and test specific behaviors or tasks, ensuring foundational robustness. As the complexity of the robotic systems increases, Asimovo provides the capability to scale up to more sophisticated testing environments that match this advancement.

This scalable simulation framework within Asimovo is vital for applying different machine learning strategies. For instance, reinforcement learning models, which learn optimal actions through trial and error, benefit from simulations that can rapidly iterate and evolve. On the other hand, imitation learning, where models learn to mimic desired behaviors, requires high-fidelity simulations that accurately reflect real-world dynamics. Asimovo's simulation spectrum is adept at meeting these varied requirements, providing a nuanced environment that evolves in parallel with the learning models and the robots themselves.

Acknowledging the importance of simulation diversity, Asimovo is committed to expanding its simulation offerings. Future updates aim to include even more refined simulation tools for photorealistic rendering and complex physics, offering developers the resources to test their robots with an unprecedented level of realism. This commitment ensures that as robots grow in sophistication, the tools available for their development and testing advance accordingly, underscoring simulation's role as a cornerstone of modern robotics development.



# Connecting Robotics to the Effective Computing Power

The Cloud is great for collaborating and storing a single digital source of truth. Running powerful simulations and large language models often needs cloud based infrastructure to work effectively. However local machines and local infrastructure can also be used effectively to run simulations and development environments.

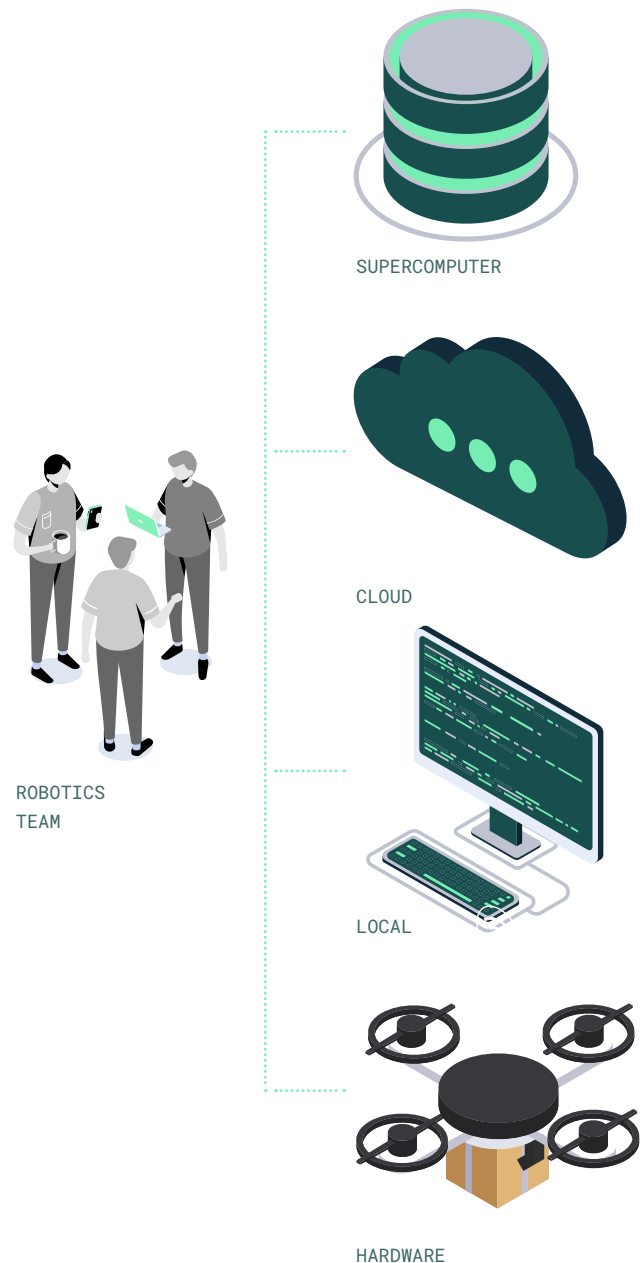
Asimovo is driven to ensure that robotics team and individuals are empowered to use the most relevant infrastructure for the task at hand. Sometimes that may mean running simulations and working in a container on a local machine. At other times it means using the cloud based computing power.

When opening a development environment in Asimovo we will empower the developer to choose the appropriate computing resources for the task. Allowing them to not only select between working locally or in the cloud, but actually choosing the most appropriate cloud infrastructure for the task. Essentially being able to dial up and down a continuum of computing power as needed.

With integrated services with some providers users of the Asimovo platform will even have the ability to package or bundle tests and simulations to be run on a Supercomputer.

Access to effective computing power is liberating but comes with some new resource management issues. Cloud computing costs will be accrued as cloud computing is used. There is a cost v's time balance that needs to be understood.

This can be managed by allocating different Asimovo simulation credits to different projects, and in some cases teammates. Asimovo will then play a part in helping people understand the practicalities of responsible resource use and



# The Future Workflow of Robotics Engineers

Envisioning the workflow of tomorrow's robotics engineers, Asimovo plays a pivotal role. The platform transforms the landscape, enabling engineers to conduct the entirety of their work within its virtual confines. From the initial spark of an idea to the deployment of complex robotic systems, Asimovo's streamlined process ensures that robotics engineers can focus on innovation without the encumbrance of traditional hardware constraints. Robotics will become an industry that includes many different engineers, developers and scientist. Asimovo will enable all of these professionals to collaborate in new ways, which in turn will accelerate the whole industry and adoption of robotics.

Engineers begin by selecting components and environments from Asimovo's extensive library, assembling them with intuitive, user-friendly tools. They can simulate and iterate designs, leveraging cloud computing's vast resources to run numerous scenarios in parallel, drastically reducing development time. When a design is ready, transitioning from simulation to real-world application is seamless. Engineers can deploy their code to physical robots with confidence, backed by comprehensive simulation data, ensuring robust performance in live environments.

Asimovo not only redefines the individual engineer's workflow but also reshapes team dynamics. It enables a truly collaborative approach, where cross-functional teams can work in concert, informed by real-time data and shared insights. The result is a cohesive, well-orchestrated process that aligns with the management's vision of swift, agile, and risk-mitigated development, setting a new standard for robotic engineering excellence.





# Example: The Warehouse Rover with an Arm

With the agile workflow of the robotics engineer in the future, the boundary between software and hardware gets blurred.

Asimovo not only provides tools for simulating robots in the cloud and collecting data generated by the robot and its environment, it also enables collecting the same data on actual physical machines.

Imagine a warehouse rover tasked with the delicate job of picking and placing packages. To build such a machine, engineers need to model both the rover and its operational environment to simulate the warehouse complete with aisles, obstacles, and varying lighting conditions, all of which influence the rover's function.

Traditionally ROS helps do the heavy lifting of simulating these in software and Gazebo provides the graphics and physics layer of the simulation. Asimovo takes this even further by allowing the complete simulation to run in the cloud and providing a suite of tools empowering the engineers to focus on the behavior of the robot instead of the underlying electronics.

With Asimovo, engineers can swiftly iterate on the rover's behavior, refining its navigation algorithms for obstacle avoidance and optimizing its arm for precise package handling. The platform allows for drag & drop deployment for simulating sensors and implementing algorithms, from LIDAR for navigation to cameras for package detection, ensuring that the rover's interactions with its environment are as authentic as possible.

When developing this rover and the arm, there will be a lot of software logic to handle the inverse kinematics of the arm and the fingers for smooth operation. This requires not only high quality knowledge of the underlying electronics and data collection of all the objects in the robot itself (e.g pressure sensors, voltage across actuators, etc) but also a simulation or a physical environment with cameras that shows exactly how the arm is positioned in the real world (data that is captured by

the environment and not the robot).

The simulation's accuracy is critical for tasks such as identifying the exact location of a package, a process that relies heavily on the simulated sensors. In Asimovo's virtual environment, every aspect of the rover's operation can be monitored, tweaked, and validated. This includes how it uses visual cues from the environment to determine the position and orientation of packages, a crucial factor in successful pick-and-place operations.

Once the simulated behavior is perfected, Asimovo facilitates a smooth transition to real-world application. Engineers can deploy the validated simulation algorithms to the physical rover, confident in the knowledge that the virtual trials have thoroughly prepared the system for the rigors of actual warehouse operations.



# Example: The Warehouse Rover with an Arm cont.

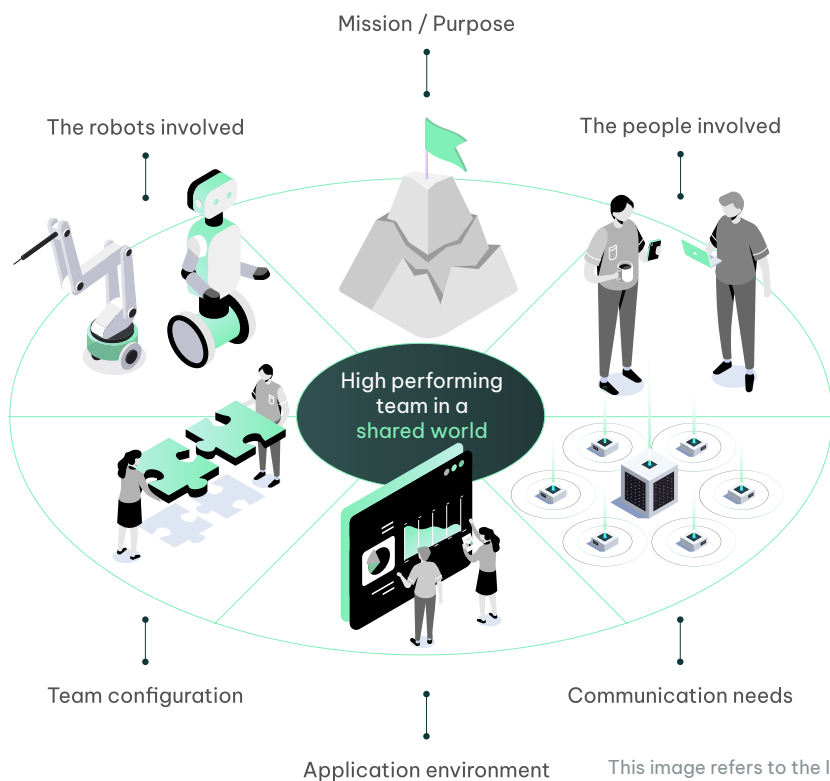
Asimovo empowers you with complete observability in your robot by allowing monitoring all components of your robot in the simulation i.e data monitoring of all actuators, sensors and output generated by your rover as well as complete monitoring of the environment i.e recording images/videos and success/failure factors from the environment your robot is running in. By providing this level of robot and environment data collection in the simulation and in the real-world, Asimovo gives your engineers the tools to focus on the only thing that generates value for your company i.e the behavior of the robot.

Asimovo essentially empowers you to create, build and test the digital twin of your robots behaviours.

However this is only the beginning. Asimovo will also enable this Rover-Arm to be able to be programmed with specific behaviours for specific customers. Customer of certain warehouse environments will be able to specify how they want robots in their facility to behave. Whether that is in Robot-2-Robot interaction, working as part of a Human-Robot-Team, or the way data should be collected and shared.

During the entire development process, access to high quality simulation environments via Asimovo and the capability to share the current state of the robot lets you monitor your progress in real-time and allow more disciplines in your company to work together e.g 3d artists for better simulations, test engineers for regression testing, or project managers to allocate resources.

The Problem-owners will be able to specify and use multiple robots from multiple robot suppliers. Enabling them to begin building out high performance teams that include both robots and people.



This image refers to the Influencing the future of human-robot teaming 2023 whitepaper.



# Conclusion

As we stand at the cusp of an unprecedented era in robotics, Asimovo paves the way for engineers to break new ground. This whitepaper has articulated a vision for a future where RoboDevOps is not just a concept, but a tangible reality. Asimovo's ecosystem empowers engineers to transcend traditional boundaries, offering a platform where the creation, collaboration, and deployment of robotic systems are not only simplified but also synergized with the cloud's vast capabilities.

As robots become more and more integrated into our day-to-day world, they will have the potential to revolutionise how we live, work and play. This potential impact shows the growing need for responsible robots (where behaviour in different scenarios is predictable and safe).

These responsible behaviours should be developed, matured and tested by many. Connecting the greatest minds to the world's biggest problems.

Asimovo allows simulation and testing to provide the compliance needed for large-scale implementation. We want to work with society leaders and problem owners to help articulate their challenges so the robotics industry can rise to the challenge to solve them.

Asimovo is committed to ensuring that the robotic engineers of today are equipped to be the pioneering innovators of tomorrow.

## Further reading...

if you found this white paper interesting why not read our other white papers

[Influencing the future of human-robot teaming](#)

[How intelligent robotics will change our lives](#)

