



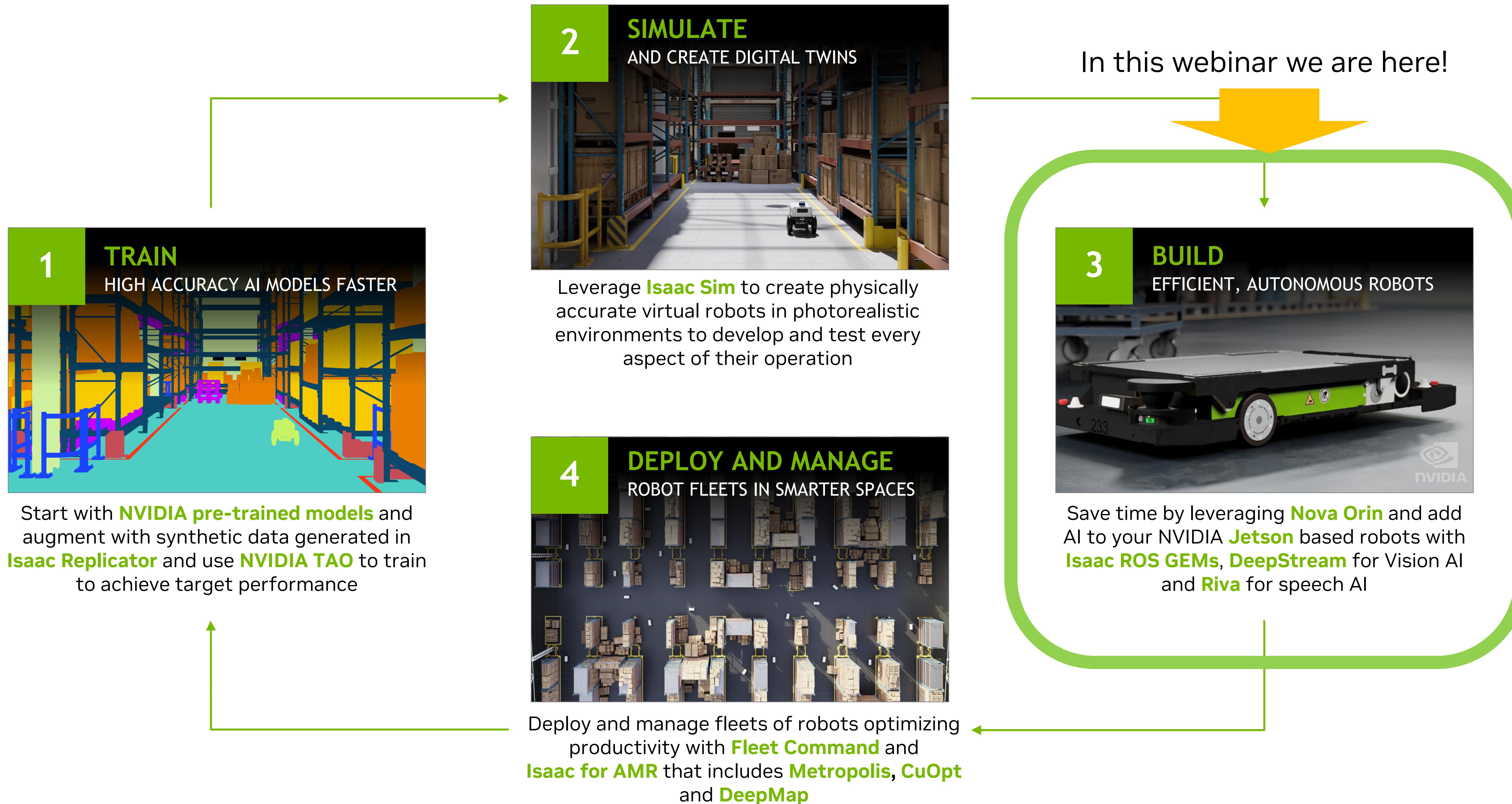
# Design a Complex Architecture on NVIDIA Isaac ROS

Raffaello Bonghi, Technical marketing engineer | GTC 23



# End to End Robotics with NVIDIA Isaac

Smarter Robots Developed Faster Leveraging NVIDIA AI and Omniverse

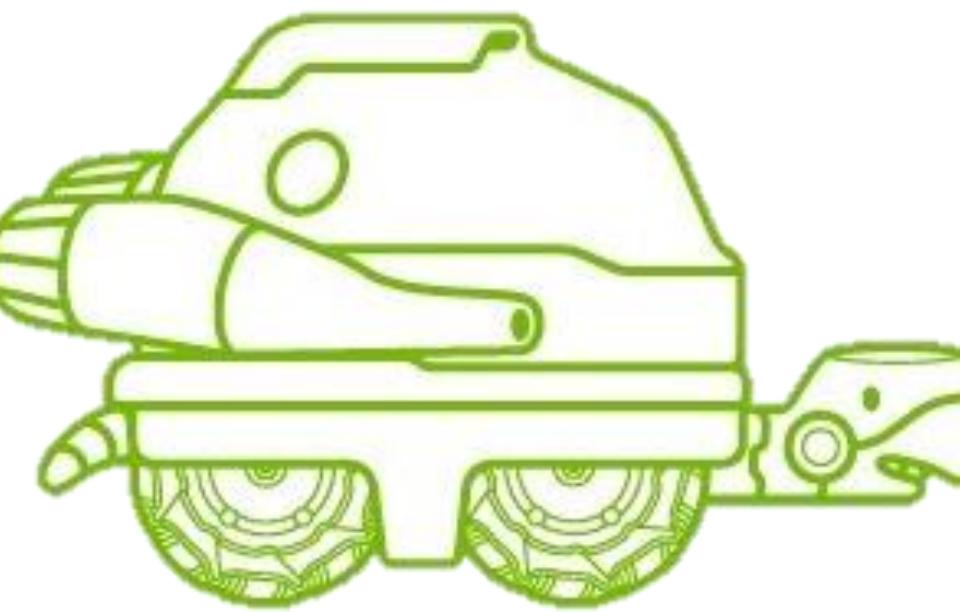


# How to design a complex robot

The architecture



AI/Control



NVIDIA Isaac

<https://developer.nvidia.com/isaac>

Software

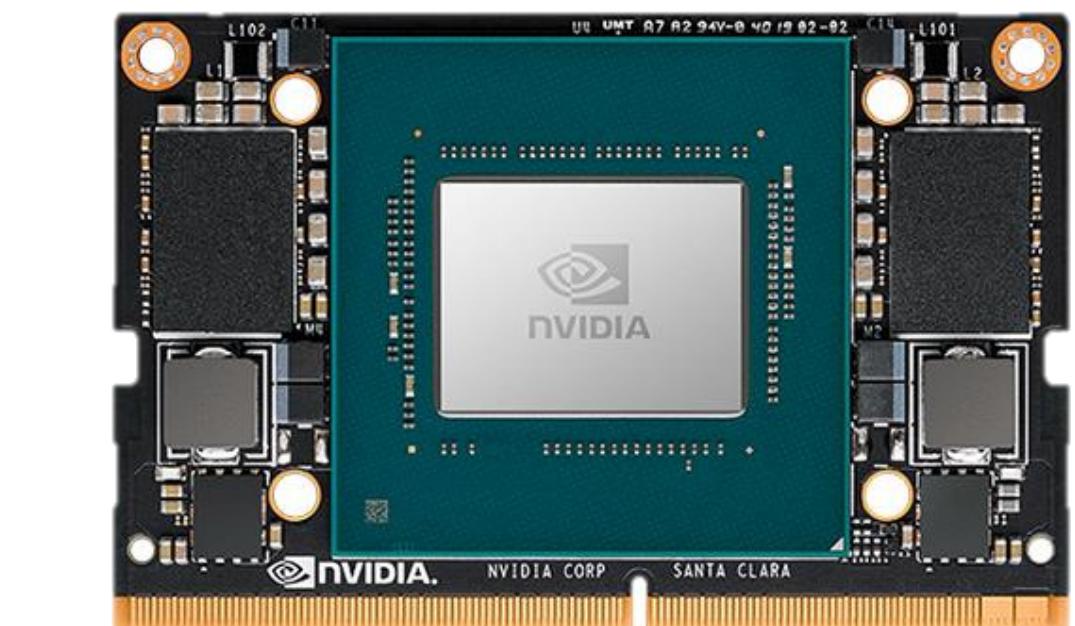
NVIDIA Jetpack

<https://developer.nvidia.com/embedded/jetpack>

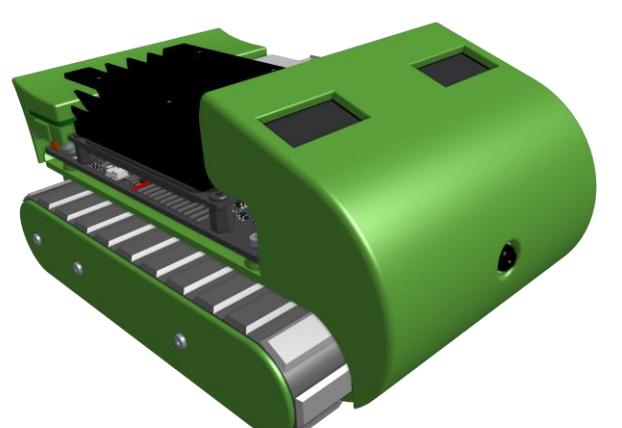
Electronics



NVIDIA Jetson Orin

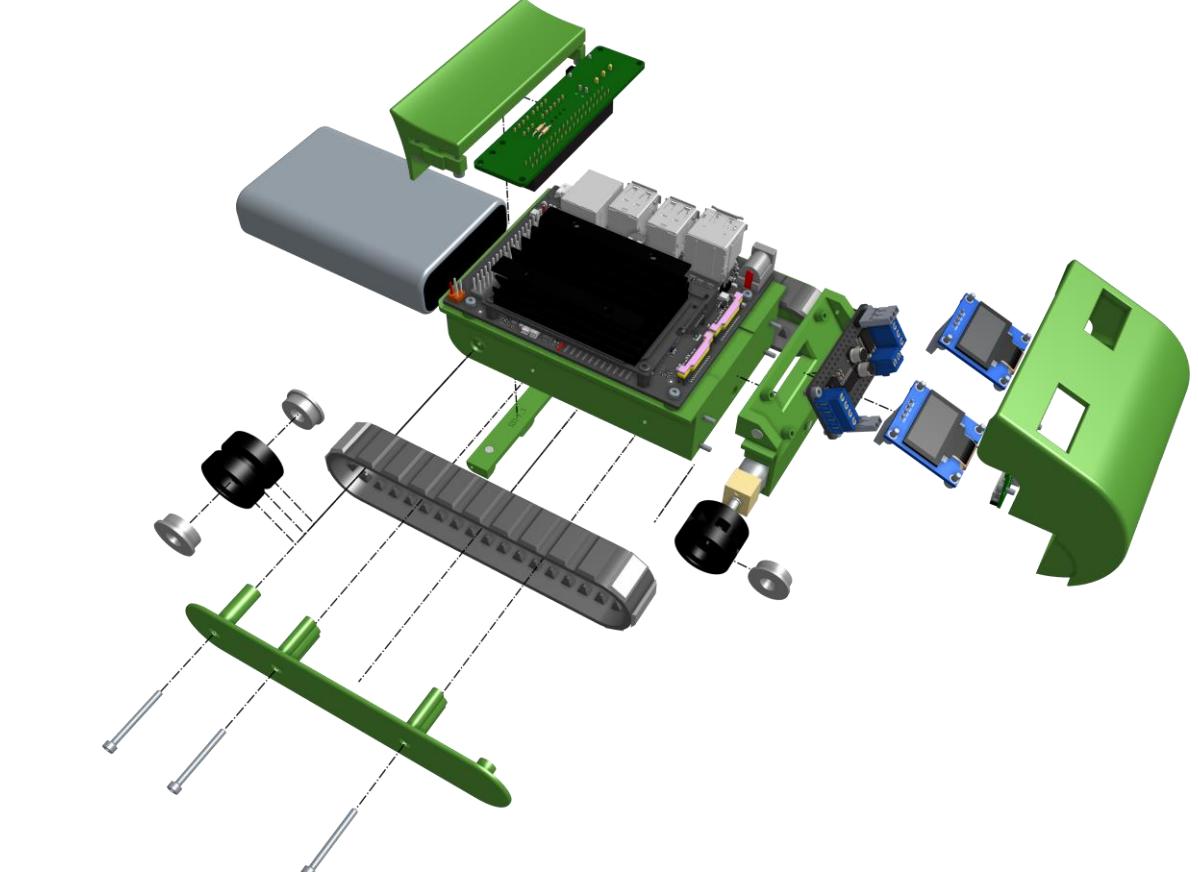


<https://www.nvidia.com/en-us/autonomous-machines/embedded-systems/jetson-orin/>



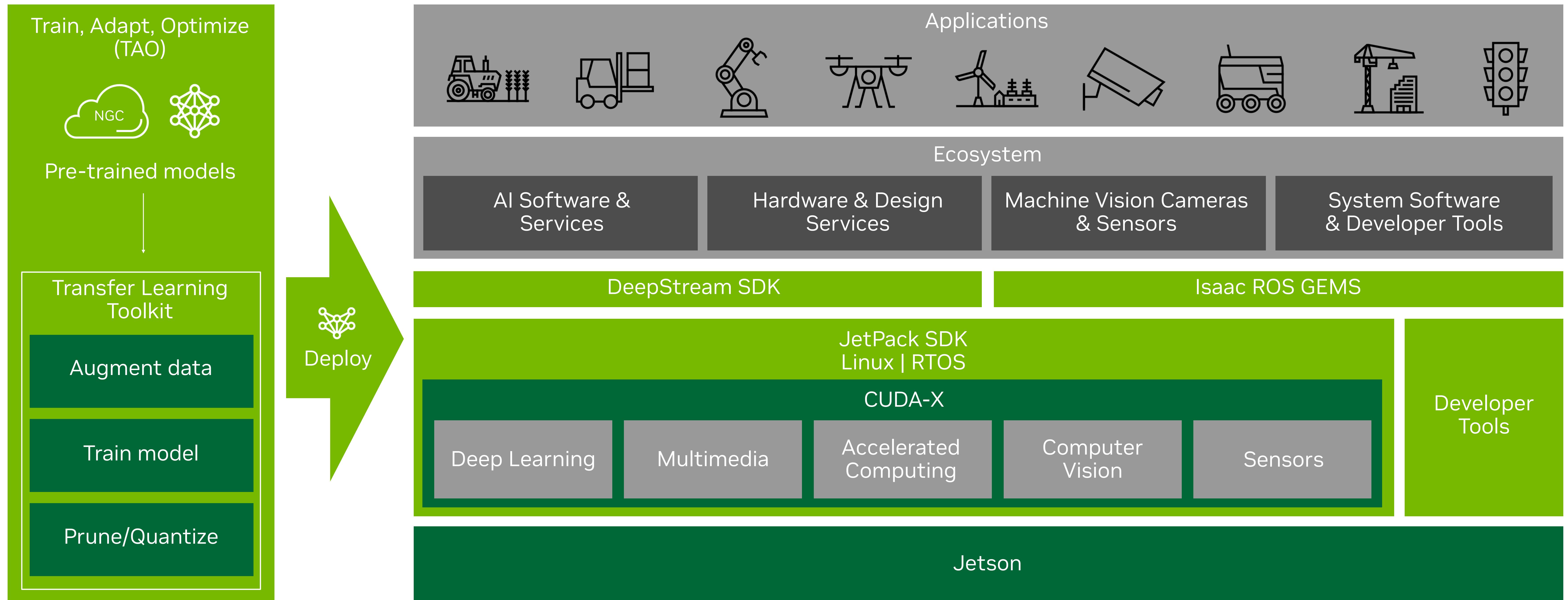
<https://nanosaur.ai>

Hardware

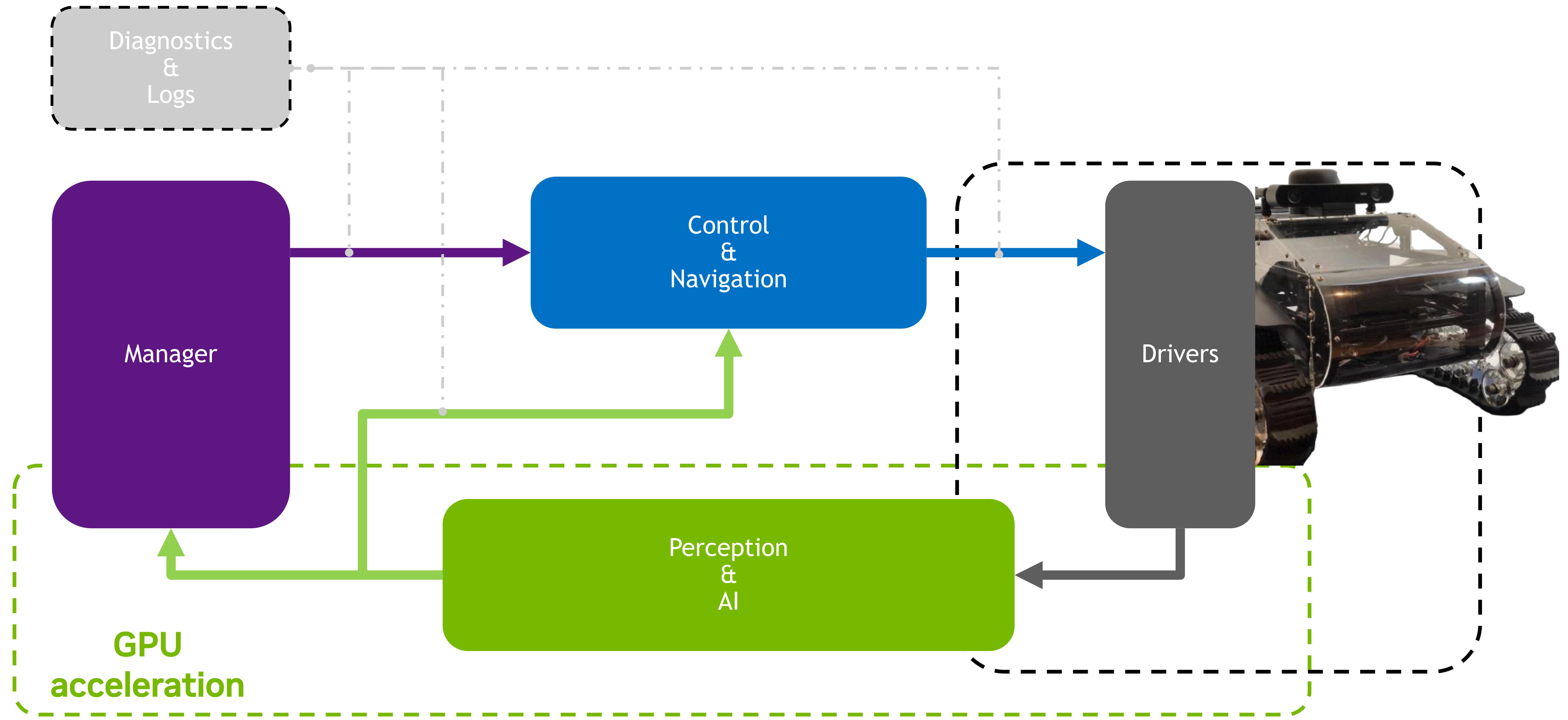


# Jetson Software

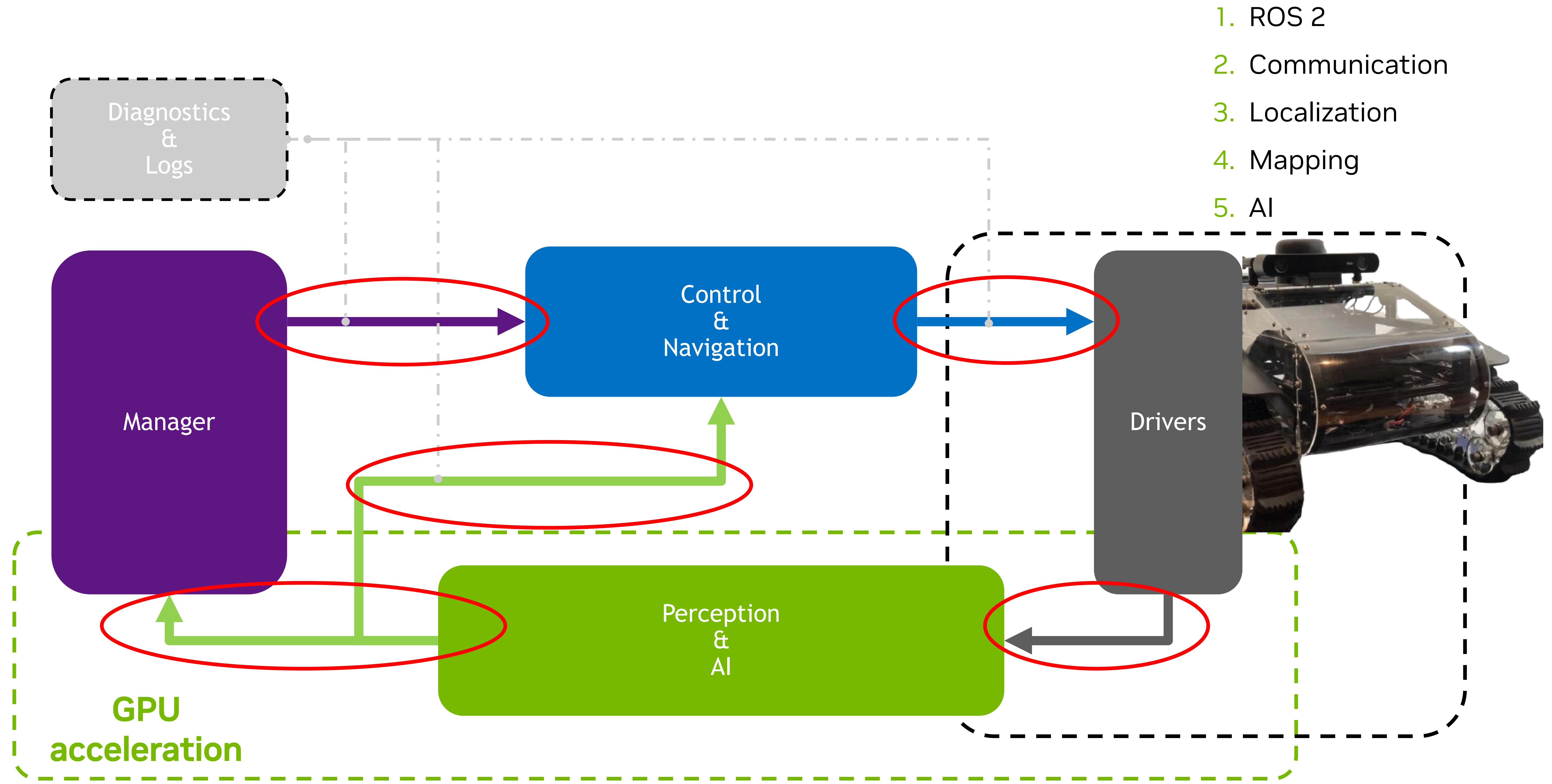
## For AI Edge Devices



# How you made a robot software architecture



# How you made a robot software architecture





# ROS 2

Robot Operative System



# What is ROS

## Robot Operative System



- ROS began life in 2007 as the development environment for the Willow Garage PR2 robot.
- The aim was to create a Robotics framework to concentrate on robotics tasks not “reinventing the wheel” for each new project

- ROS has gained visibility over time, especially in the academic field.
  - 13 official releases, the first in 2010, the latest in 2020.
  - The latest ROS versions started to diffuse also in the industry environments.
- **ROS Noetic Ninjemis** is the last release of ROS, reaching its **EOL** the next May 2025 with Ubuntu Focal.



# The story of ROS 1

## Advantage and limitations



- **Advantages**

- Open Source
- Multi-process architecture
- Custom communication messages creation
- Not rigid architecture
- Many useful ready tools
- Many useful ready drivers for the most used sensors
- Many ready packages for localization, obstacle detection, mapping, path planning, ...
- Short design to product time

- **Limitations**

- Proprietary communication protocol
- One master, many slaves. If the master falls, the system crashes
- No security in communication (avoidable)
- Not ready for real-time
- Single supported OS

**ROS was good, but not reliable.**

Large scale embedded systems **not** really supported.

Only Ubuntu officially supported.

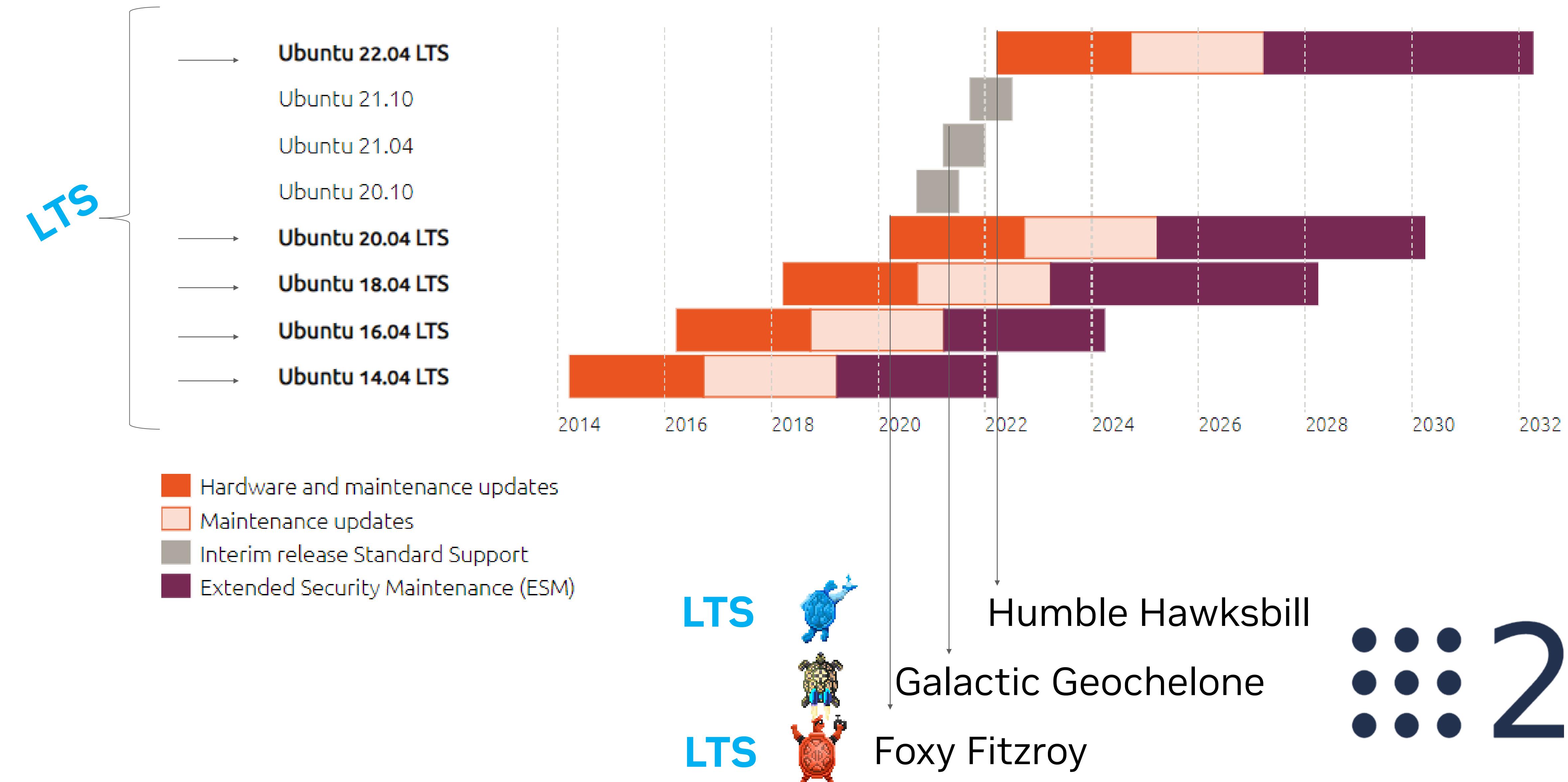
Many companies were building workarounds on top or inside of ROS to create reliable applications.

# ROS 2 Distributions & Advantages

The latest distribution is ROS2 Humble

Why 23° May?

## Ubuntu roadmap



**LTS** = Long Term Support

It's the **World Turtle Day** sponsored yearly since 2000 by American Tortoise Rescue, is to bring attention to, and increase knowledge of and respect for, turtles and tortoises, and encourage human action to help them survive and thrive.



# ROS 2 Humble LTS & recap



## ROS 2 Humble Hawksbill - LTS

**Release date:** 23 May 2022  
**End of Life:** May 2027



**LTS** = Long Term Support

# NVIDIA Isaac ROS



# NVIDIA Isaac ROS

NVIDIA AI Perception for the ROS community

AI modules that can plug into the ROS framework and get accelerated performance immediately



Optimize  
ROS Framework

Accelerate  
Hardware  
Performance

2

850,000+  
Developers

Scale with  
AI Algorithms

750,000+  
Downloads



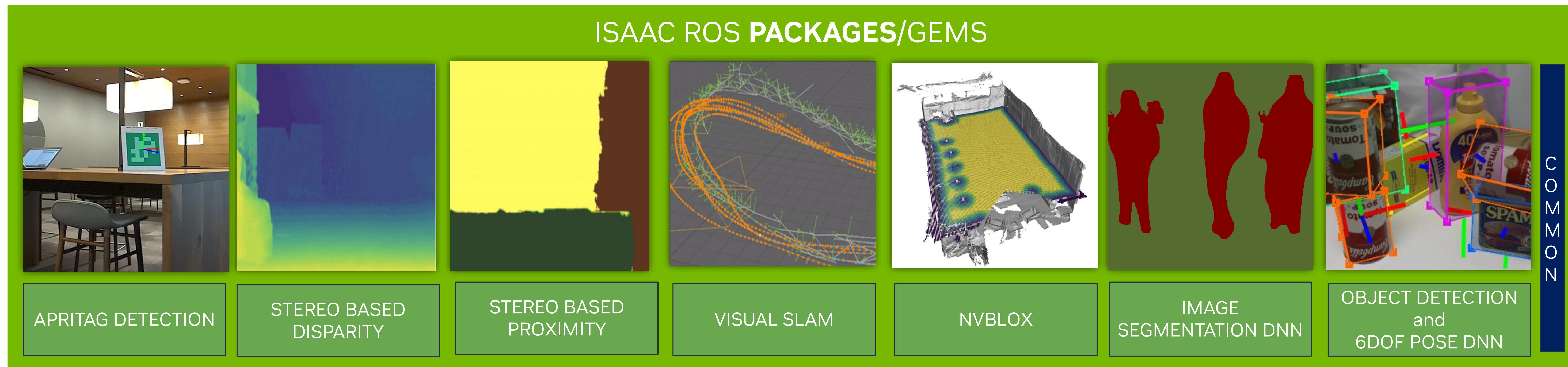
# NVIDIA Isaac ROS GEMs

Hardware Accelerated Packages for ROS 2

ROS native packages for bringing AI, CV and camera sensors to manipulation and navigation.

Support for large collection of pre-trained models from NGC

Seamless integration with open source/custom ROS tools and packages.



Hardware accelerated libraries and engines enable highest performance and efficient resource utilization.

Optimized to run on all NVIDIA compute platform.

Triton Server

NvEngine

ROS Middleware

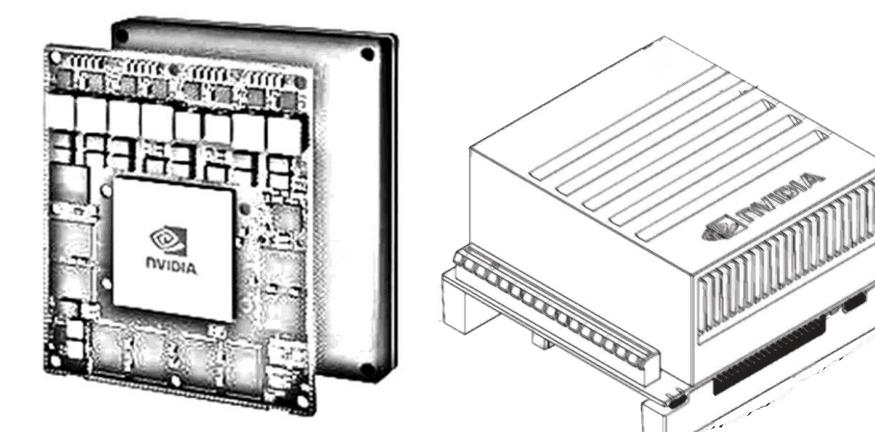
TensorRT

HARDWARE ACCELERATED LIBRARIES

VPI

CUDA

ARGUS



JETSON COMPUTER



GPU WORKSTATION



GPU SERVER

<https://github.com/NVIDIA-ISAAC-ROS>

# NVIDIA Isaac ROS

## Roadmap

2021 – Aug.

### Isaac ROS EA1

- Image Pipeline
- Apriltag
- Stereo Depth

2022 – Mar.

### Isaac ROS EA3

- Visual SLAM
- NVBLOX
- Object Detection

2022 – Oct.

### Isaac ROS DP2

- Visual Nav2 Pipeline
- Multi-modal odometry
- Mono SVIO
- P-STOP
- H.264 HW enc & dec
- Mission Dispatch & Client

2021 – Oct.

### Isaac ROS EA2

- Visual Odometry
- Argus Camera
- Image Segmentation
- Pose Estimation

2022 – Jun

### Isaac ROS DP1

- Jetson Orin Support
- NITROS (up to 7x perf)
- ESS DNN Stereo Disparity
- Bi3D Proximity Segmentation

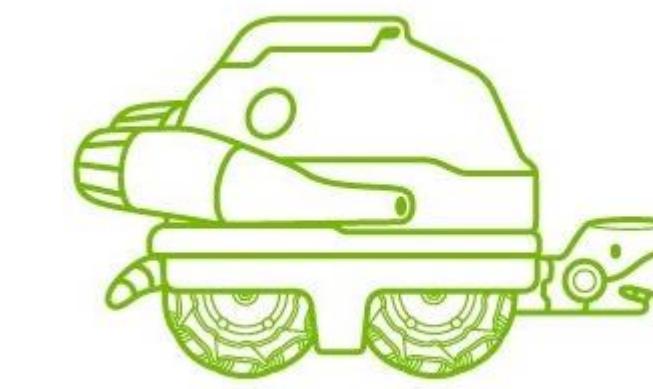
2023 – Mar.

### Isaac ROS DP3

- New features
- Bug fixes

# NVIDIA Isaac ROS GEMs (1/2)

NITROS Accelerated

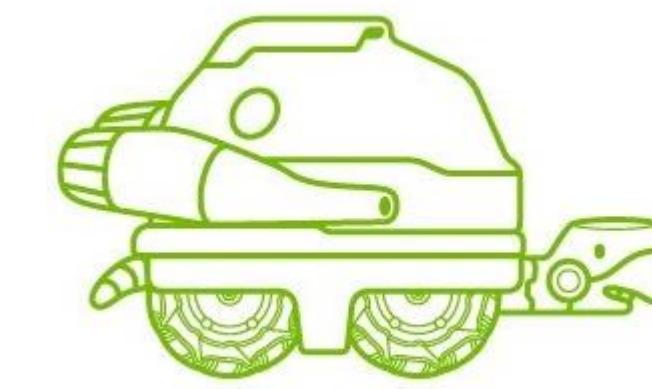


Package	Description	Image Resolution	Isaac ROS EA3 Foxy Jetson Xavier	Isaac ROS DP Humble Jetson Xavier	Isaac ROS DP Humble Jetson Orin
<a href="#"><u>AprilTag</u></a> 	CUDA-accelerated Apriltag detection and pose estimation	1280x720	101fps	150fps (1.5x)	260fps (1.7x)
<a href="#"><u>Pose Estimation</u></a> 	Deep learned, hardware-accelerated 3D object pose estimation	640x480	12.5fps <a href="#"><u>DOPE</u></a>	12.5fps (1x) <a href="#"><u>DOPE</u></a>	43fps (3.4x) <a href="#"><u>DOPE</u></a>
<a href="#"><u>Image Segmentation</u></a> 	Hardware-accelerated, deep learned semantic image segmentation	960x544	30fps <a href="#"><u>PeopleSemSegnet</u></a>	208fps (6.9x) <a href="#"><u>PeopleSemSegnet</u></a>	325fps (1.5x) <a href="#"><u>PeopleSemSegnet</u></a>



# NVIDIA Isaac ROS GEMs (2/2)

NITROS Accelerated

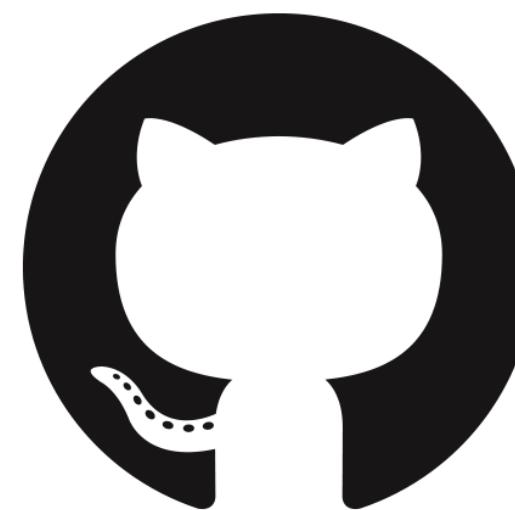


Package	Description	Image Resolution	Isaac ROS EA3 Foxy Jetson Xavier	Isaac ROS DP Humble Jetson Xavier	Isaac ROS DP Humble Jetson Orin
	<u>Proximity Segmentation</u>  DNN-based proximity segmentation and obstacle field ranging using Bi3D	960x576	N/A	33fps <u>Bi3D</u> on DLA	62fps (1.9x) <u>Bi3D</u> on DLA
	<u>DNN Stereo Disparity</u>  Deep learned stereo disparity estimation	1920x1080	N/A	24fps <u>ESS</u>	51fps (2.2x) <u>ESS</u>
	<u>SGM Stereo Disparity</u>  Semi-global matching stereo disparity estimation	960x540	60fps	80fps (1.3x)	166fps (2x)



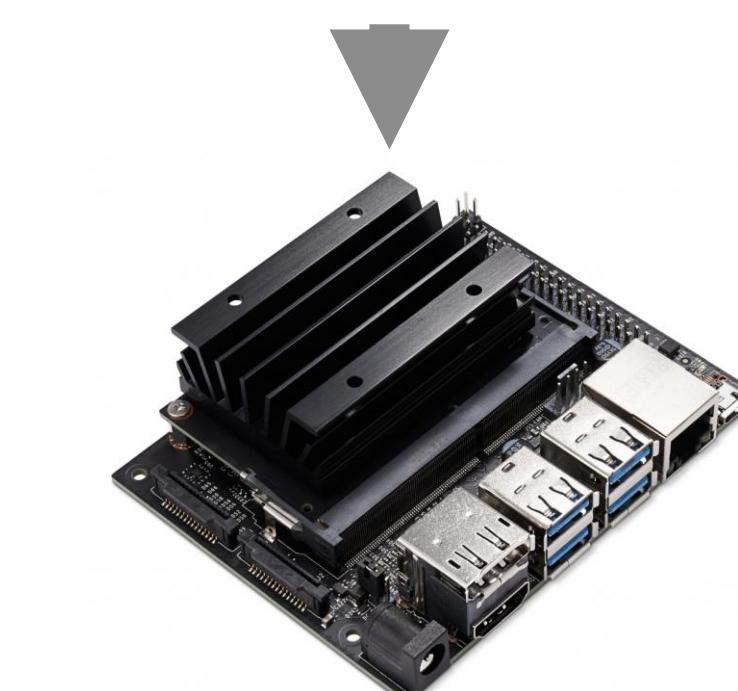
# Isaac ROS versions

Some hints when you work with Isaac ROS



<https://github.com/NVIDIA-ISAAC-ROS/.github/blob/main/profile/release-notes.md>

Version	Release date	NVIDIA Jetpack	ROS
EA1	Aug 11, 2021	4.5	Foxy
EA2	Oct 20, 2021	4.6	Foxy
0.9.1 EA2.1	Nov 22, 2021	4.6	Foxy
0.93 EA3	Mar 23, 2022	4.6.1	Foxy
0.10.0 DP	June 30, 2022	5.0.1 DP	Humble
0.10.1 DP	July 12, 2022	5.0.1 DP	Humble
0.11.0 DP	Sep 1, 2022	5.0.2	Humble
0.20.0 DP	Oct 19, 2022	5.0.2	Humble



Jetson Nano



Xavier Series



Orin Series

# NVIDIA Isaac ROS Resources

<https://github.com/NVIDIA-ISAAC-ROS>

The screenshot shows the GitHub organization page for "NVIDIA Isaac ROS". The page features a profile picture of a robot tank, a brief description of the organization, and navigation links for Overview, Repositories (18), Projects, Packages, and People. A prominent red circle highlights the "Follow" button in the top right corner.

The screenshot displays the main content of the Isaac ROS README. It includes a "README.md" file link, the title "NVIDIA Isaac ROS", a welcome message, and a bulleted list of instructions for getting started with the ROS2 packages.

README.md

## NVIDIA Isaac ROS

Welcome to Isaac ROS, a collection of ROS2 packages for making autonomous robots.

- To get started, visit the [summary of packages](#) and [examples](#) of how to use them.
- Compare the [performance](#) of the packages on various platforms.
- Setup [hardware](#) to develop and run Isaac ROS packages.
- Read the collection of [blog posts](#) for more information.
- Scan through the [FAQs](#) for answers to common questions.
- Reference the [release notes](#) for details on all updates made to Isaac ROS.

## Pinned

A pinned repository card for "isaac\_ros\_compression" (Public). It includes the repository name, a brief description of hardware-accelerated data compression, and a link to its GitHub page.

A pinned repository card for "isaac\_ros\_mission\_client" (Public). It includes the repository name, a brief description of a VDA5050-compatible mission controller, and a link to its GitHub page.

## People

This organization has no public members.  
You must be a member to see who's a part  
of this organization.

## Top languages

Python C++

## Most used topics

ros2-humble jetson gpu nvidia  
ros2

Report abuse

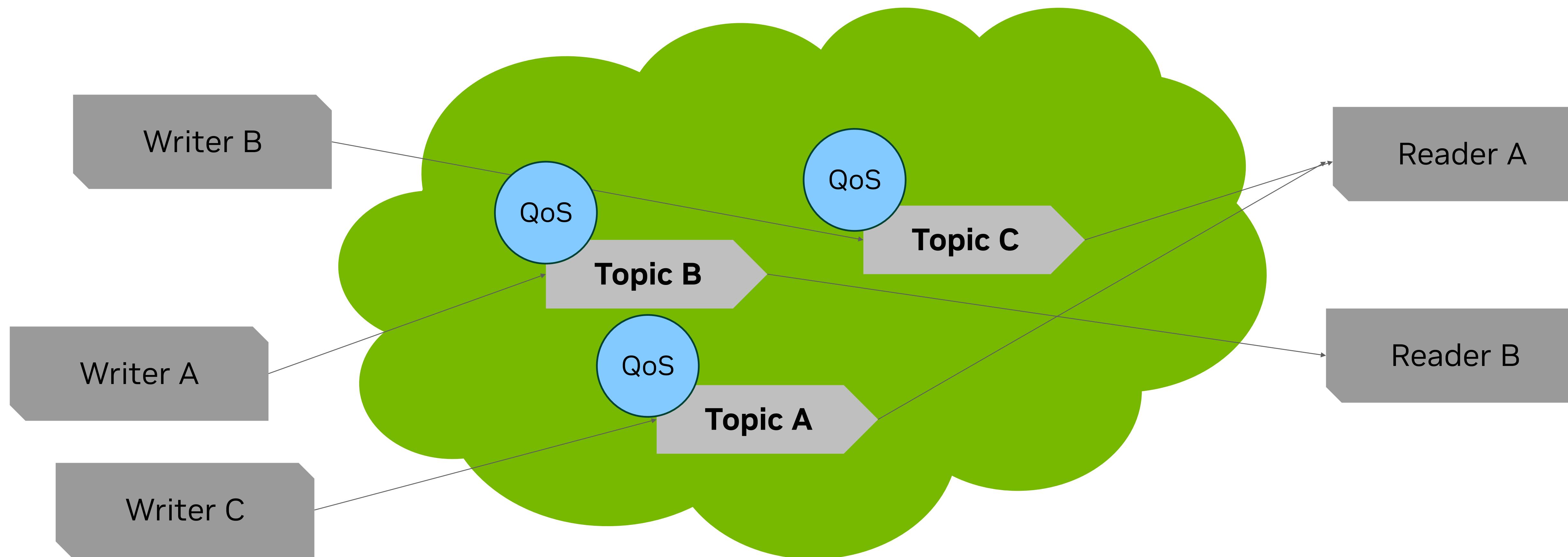


# Communication



# DDS & ROS 2

## Data Distribution Service for real time systems

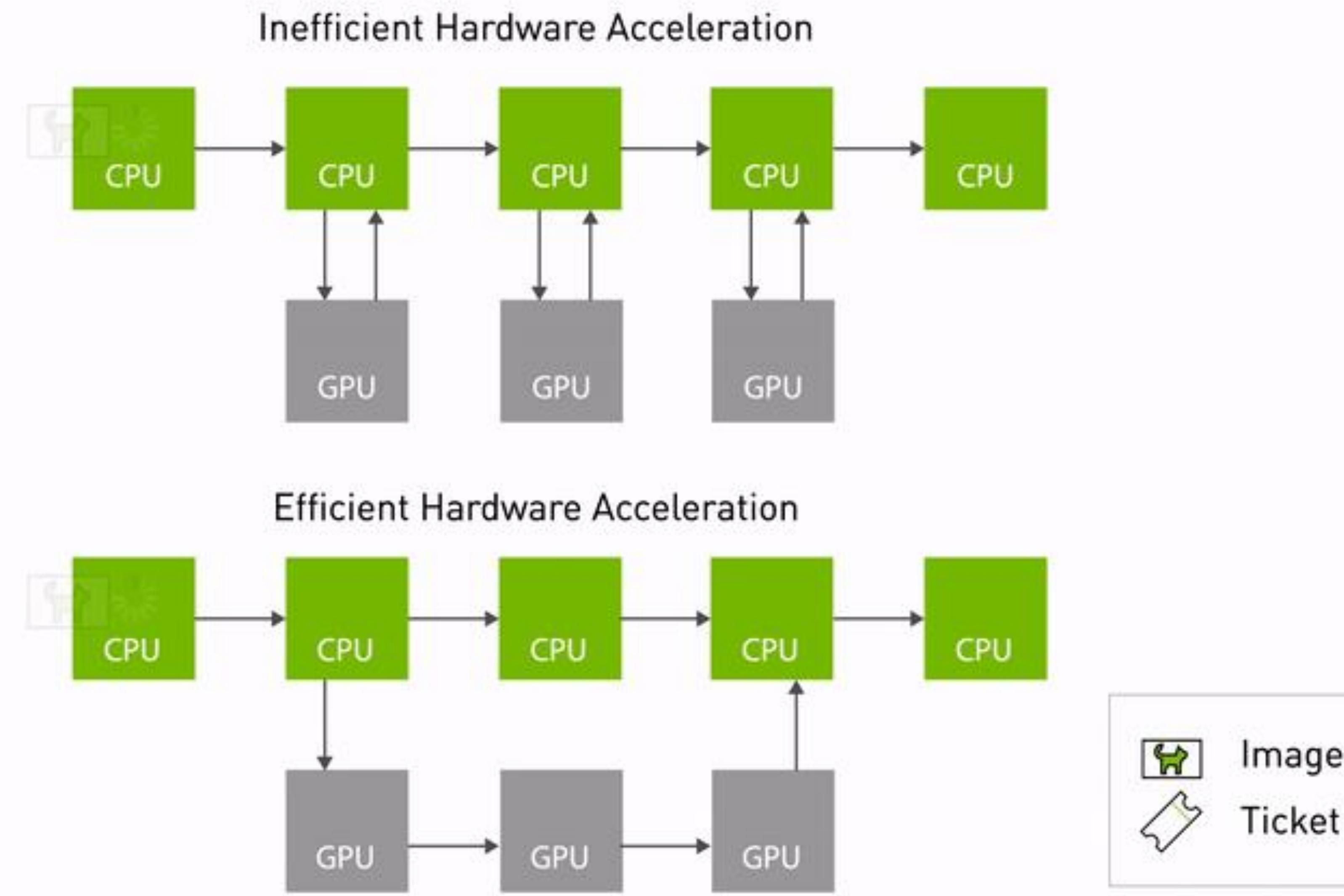


- It is a standard from **Object Management Group (OMG)** defined using the Publisher/Subscriber paradigm.
- For each topic is also shared a flexible **Quality of Service (QoS)** specifications

Product name	License	RMW implementation	Status
eProsima Fast DDS	Apache 2	rmw_fastrtps_cpp	Full support. Default RMW. Packaged with binary releases.
Eclipse Cyclone DDS	Eclipse Public License v2.0	rmw_cyclonedds_cpp	Full support. Packaged with binary releases.
RTI Connext	commercial, research	rmw_connex_cpp	Full support. Support included in binaries, but Connext installed separately.

# NVIDIA Isaac ROS for Transport (NITROS)

## Hardware Acceleration for Graphs of Nodes

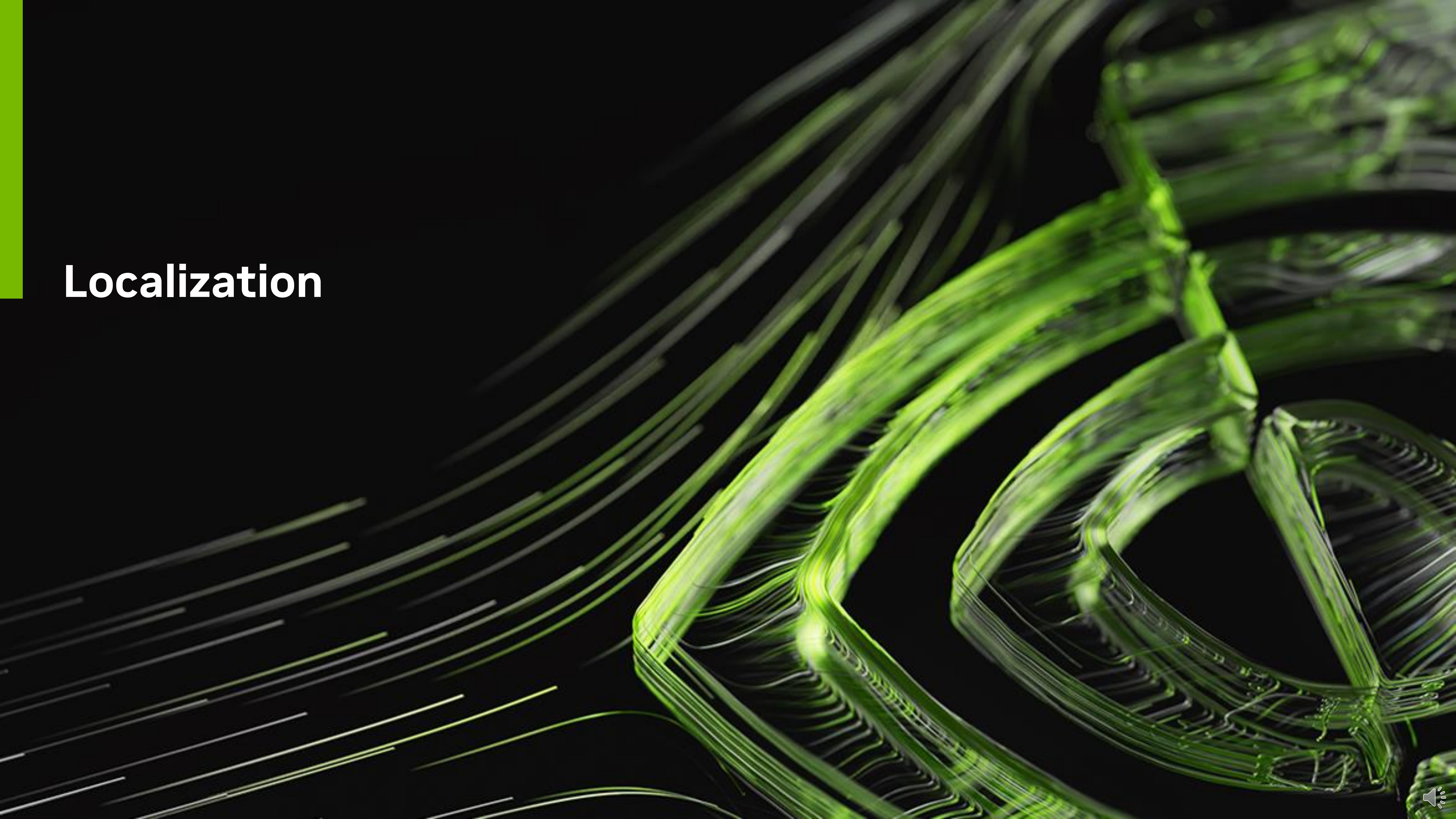


**2.8X**  
faster pixel  
processing\* on AGX  
Xavier

**7X**  
faster pixel processing'  
on AGX Orin

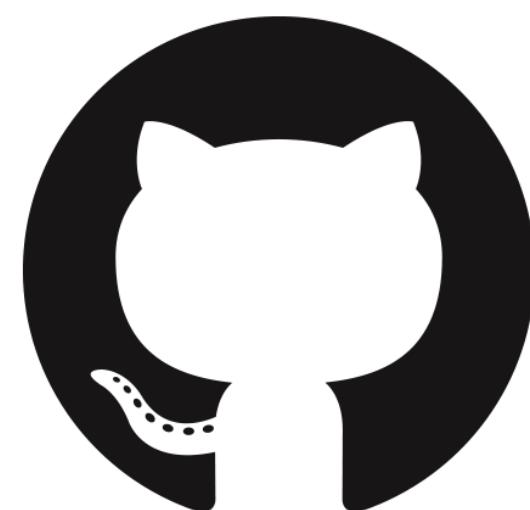
\* ROS2 node graph operating in sequence on 1080p CUDA buffers in Foxy vs the same node graph in Humble with Type Adaptation; results measured in Hz on Jetpack 5.0 developer preview, Ubuntu 20.04 with Jetson AGX Orin and Xavier. Graph of nodes is designed to test framework performance by minimizing compute workload, bringing focus to overhead in the ROS Client Library

# Localization



# NVIDIA Isaac ROS vSLAM

How the repository and package are made



[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)

NVIDIA-ISAAC-ROS / [isaac\\_ros\\_visual\\_slam](#) Public Watch 11 Fork 35 Starred 218

Code Issues 3 Pull requests 1 Actions Projects Security Insights

main 11 branches 6 tags Go to file Add file Code

	jaiveersinghNV Merge pull request #55 fr... ...	186ffc8 10 days ago	24 commits
	docs Isaac ROS 0.20.0 (DP2)	15 days ago	
	isaac_ros_visual_slam Isaac ROS 0.20.0 (DP2)	15 days ago	
	isaac_ros_visual_sla... Isaac ROS 0.20.0 (DP2)	15 days ago	
	resources Isaac ROS 0.20.0 (DP2)	15 days ago	
	.gitattributes Isaac ROS 0.10.0 (DP)	4 months ago	
	.gitignore Isaac ROS 0.10.0 (DP)	4 months ago	
	CONTRIBUTING.md Isaac ROS 0.20.0 (DP2)	15 days ago	

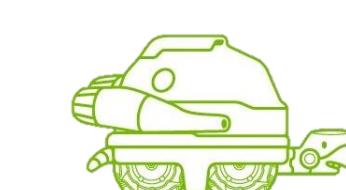
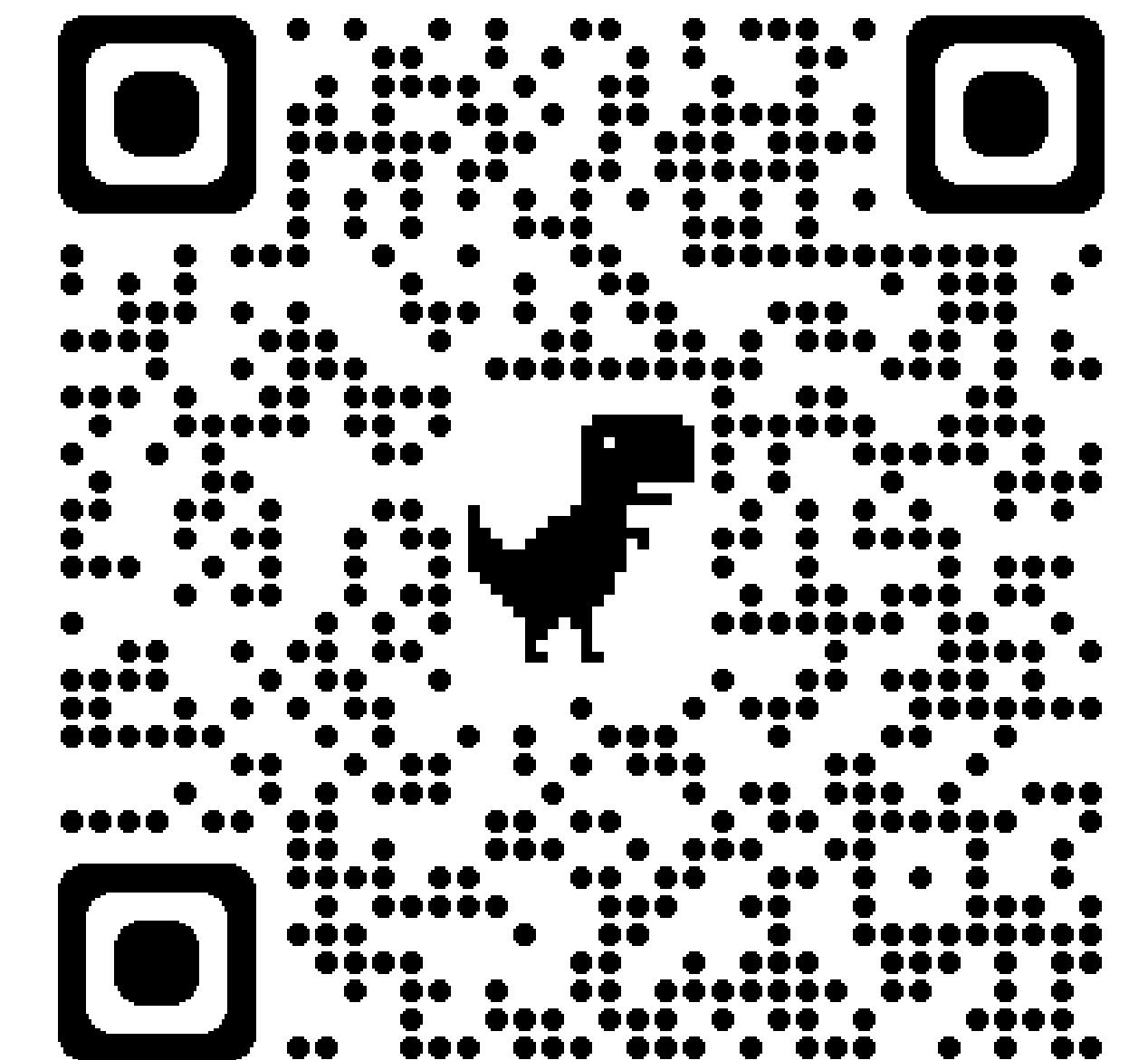
About

Visual odometry package based on hardware-accelerated NVIDIA Elbrus library with world class quality and performance.

[developer.nvidia.com/isaac-ros-gems](#)

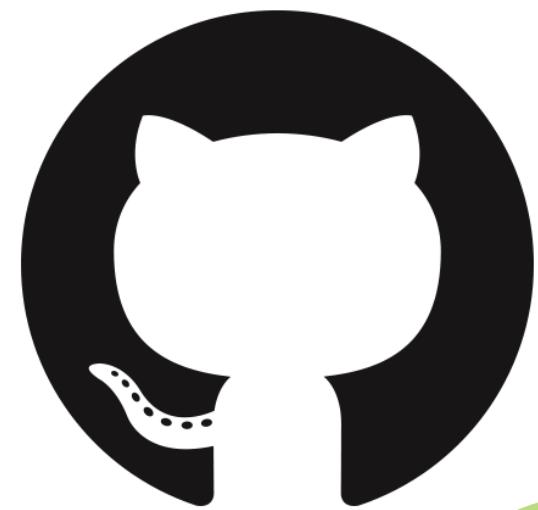
localization robotics ros perception  
slam ros2 visual-odometry  
ros2-humble

Readme Apache-2.0 license 218 stars

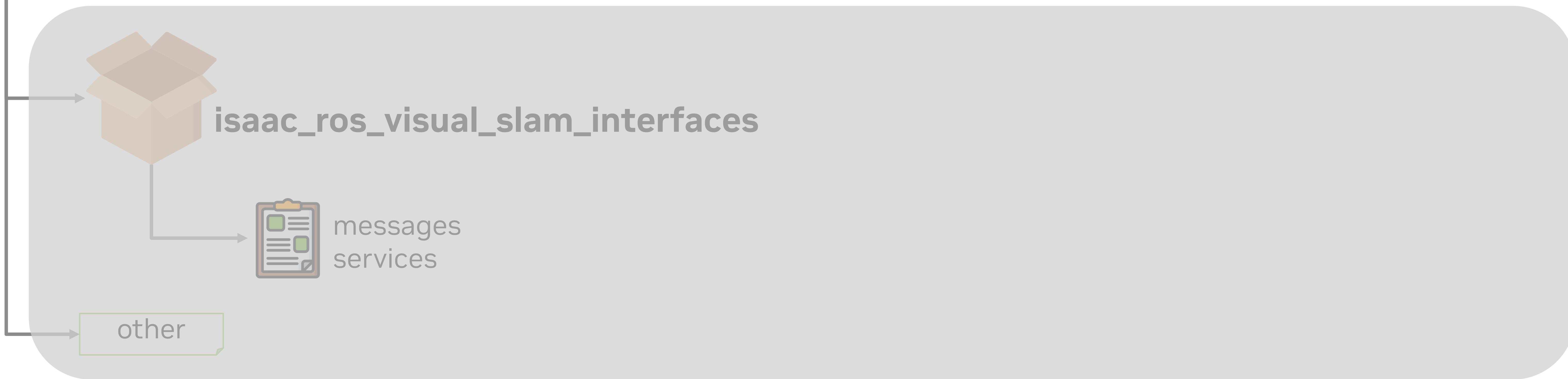
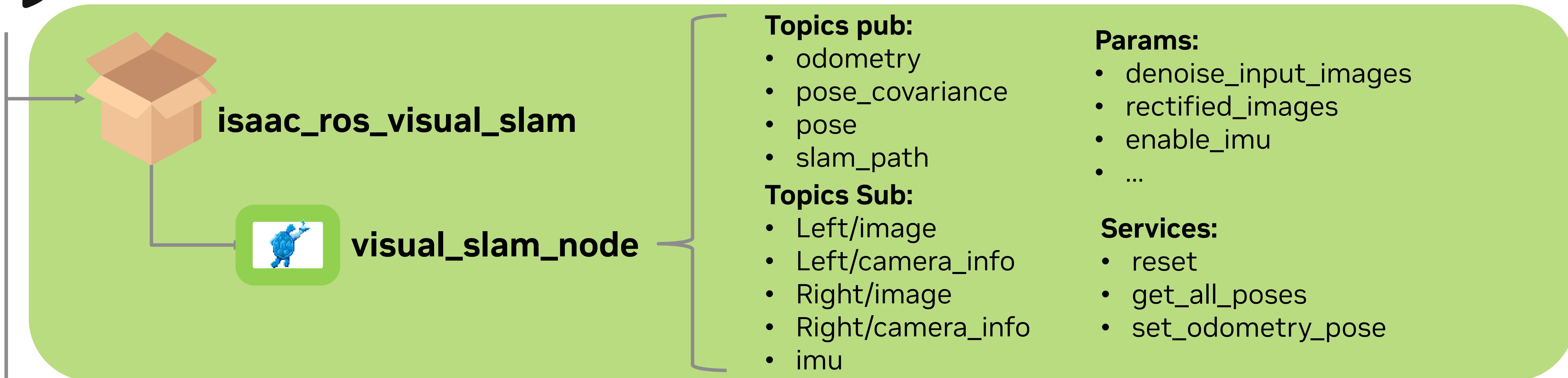


# NVIDIA Isaac ROS vSLAM

How the repository and package are made

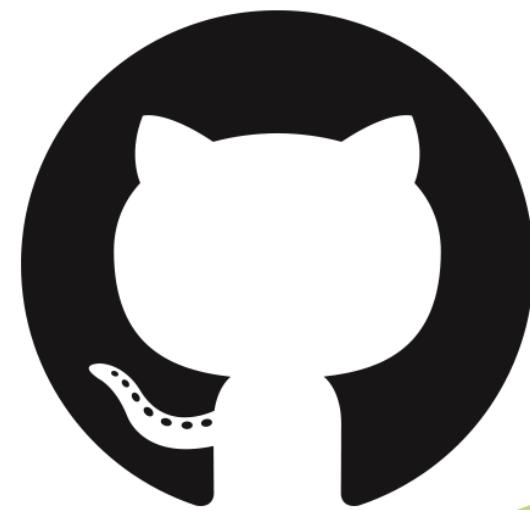


[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)

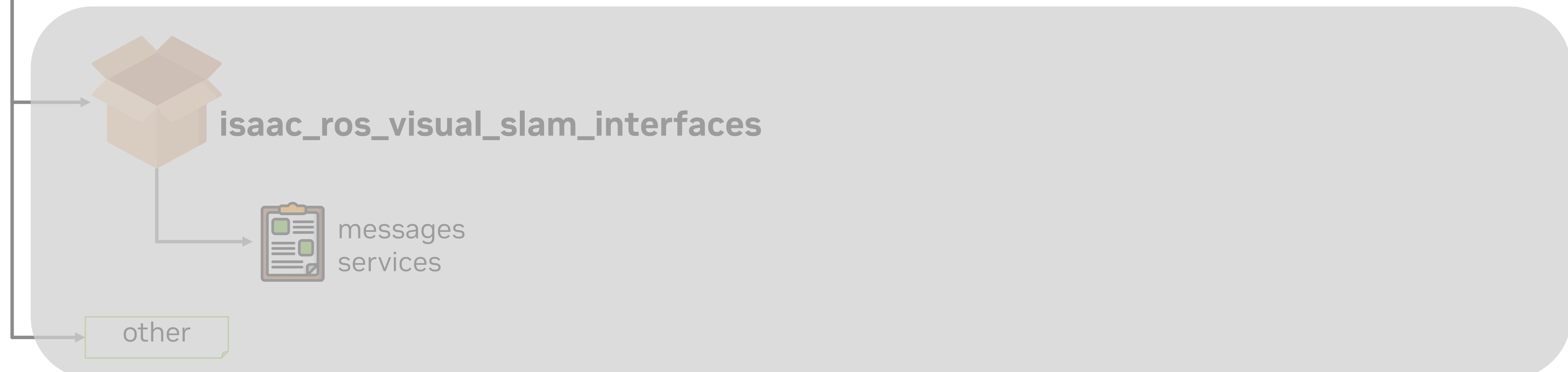
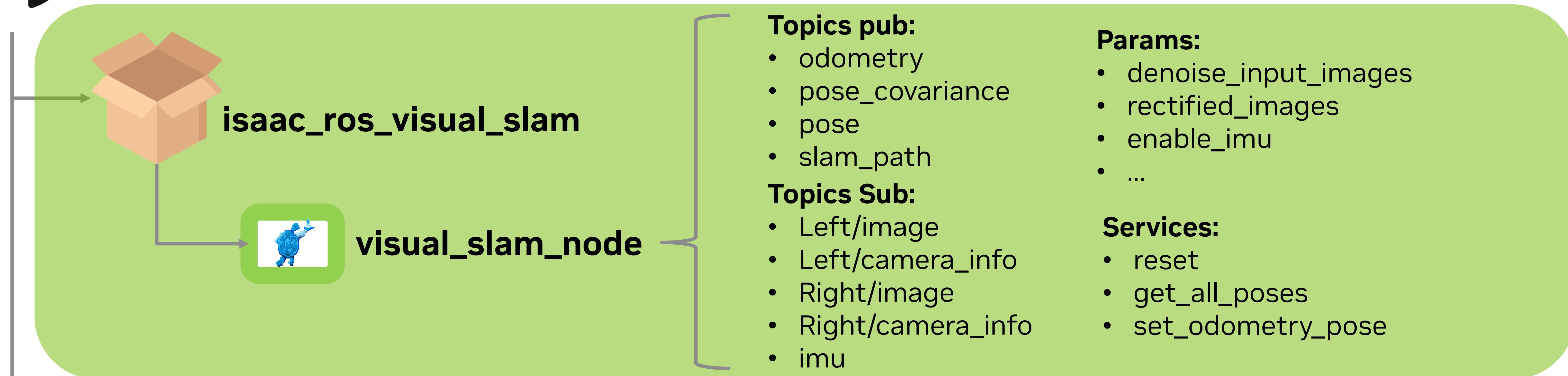


# NVIDIA Isaac ROS vSLAM

How the repository and package are made

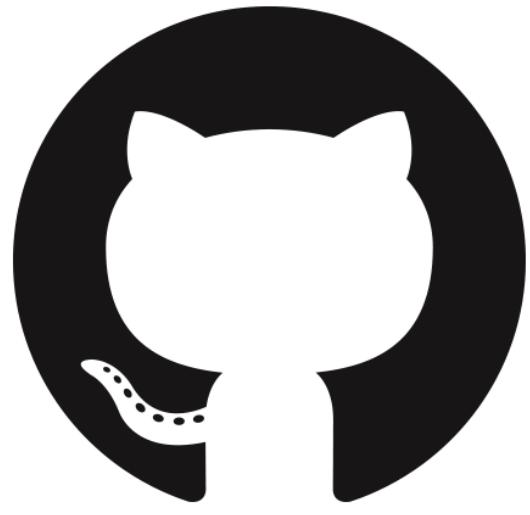


[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)

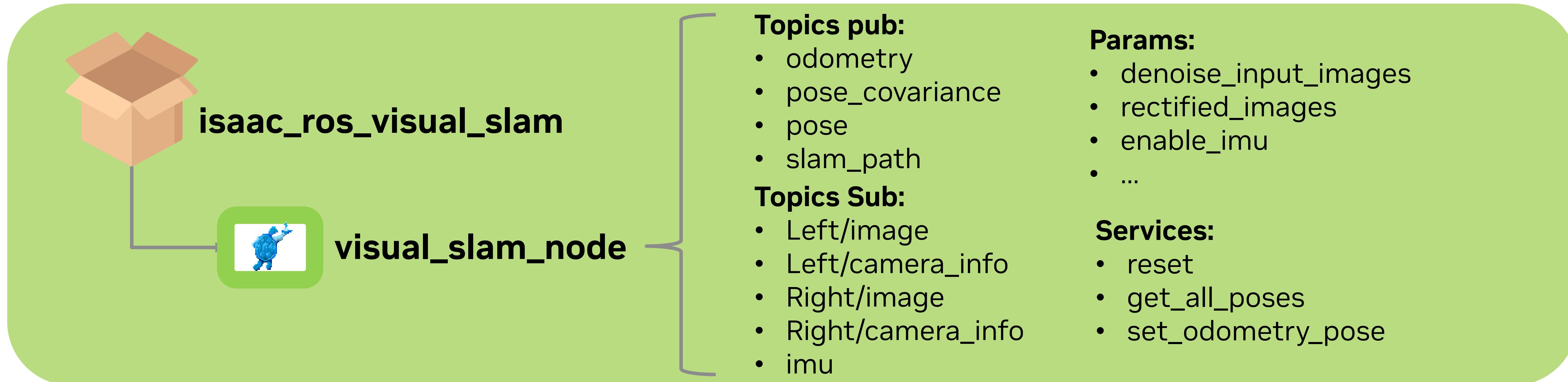


# NVIDIA Isaac ROS vSLAM

How the repository and package are made



[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)



# NVIDIA Isaac ROS vSLAM

How the repository and package are made



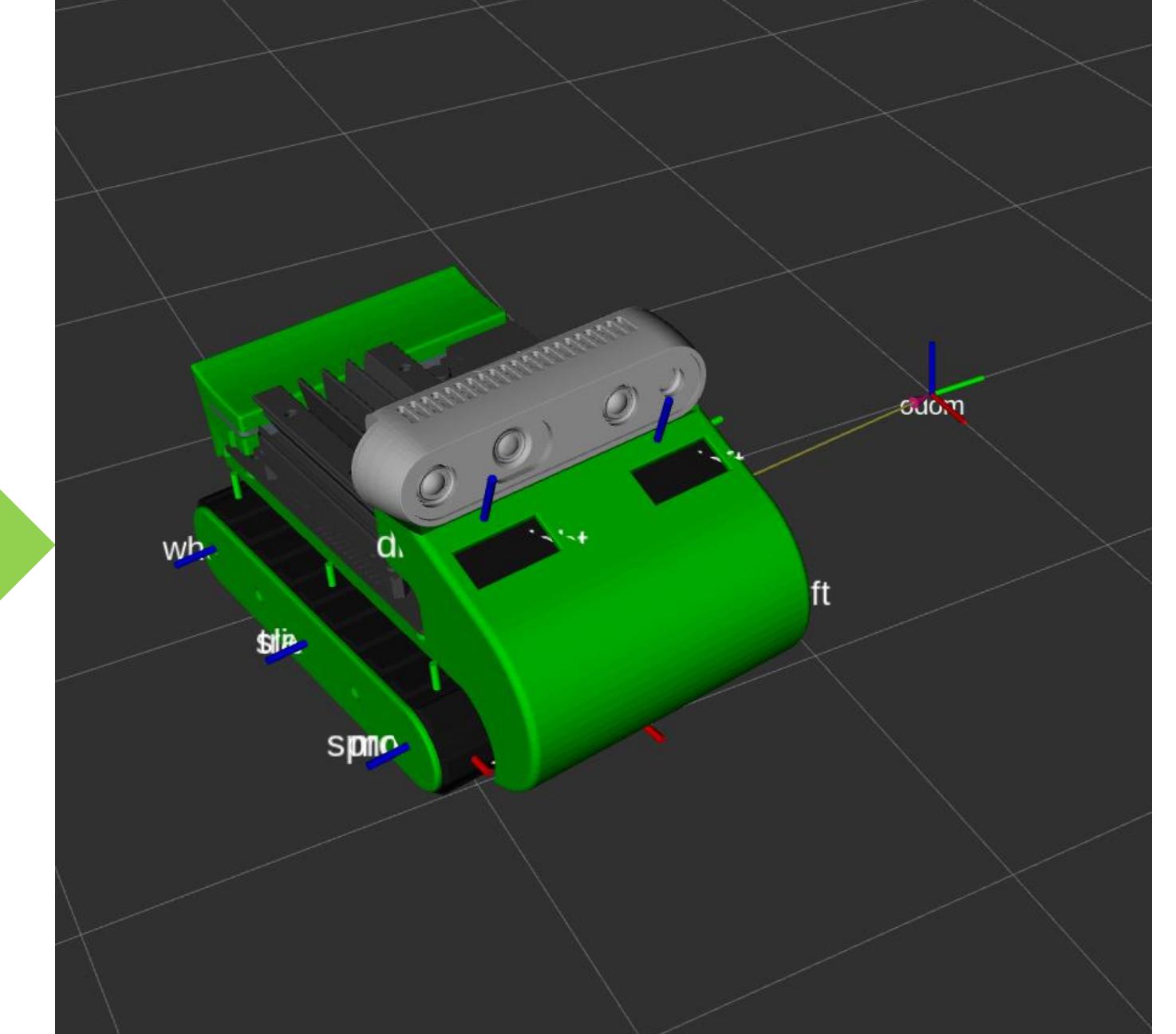
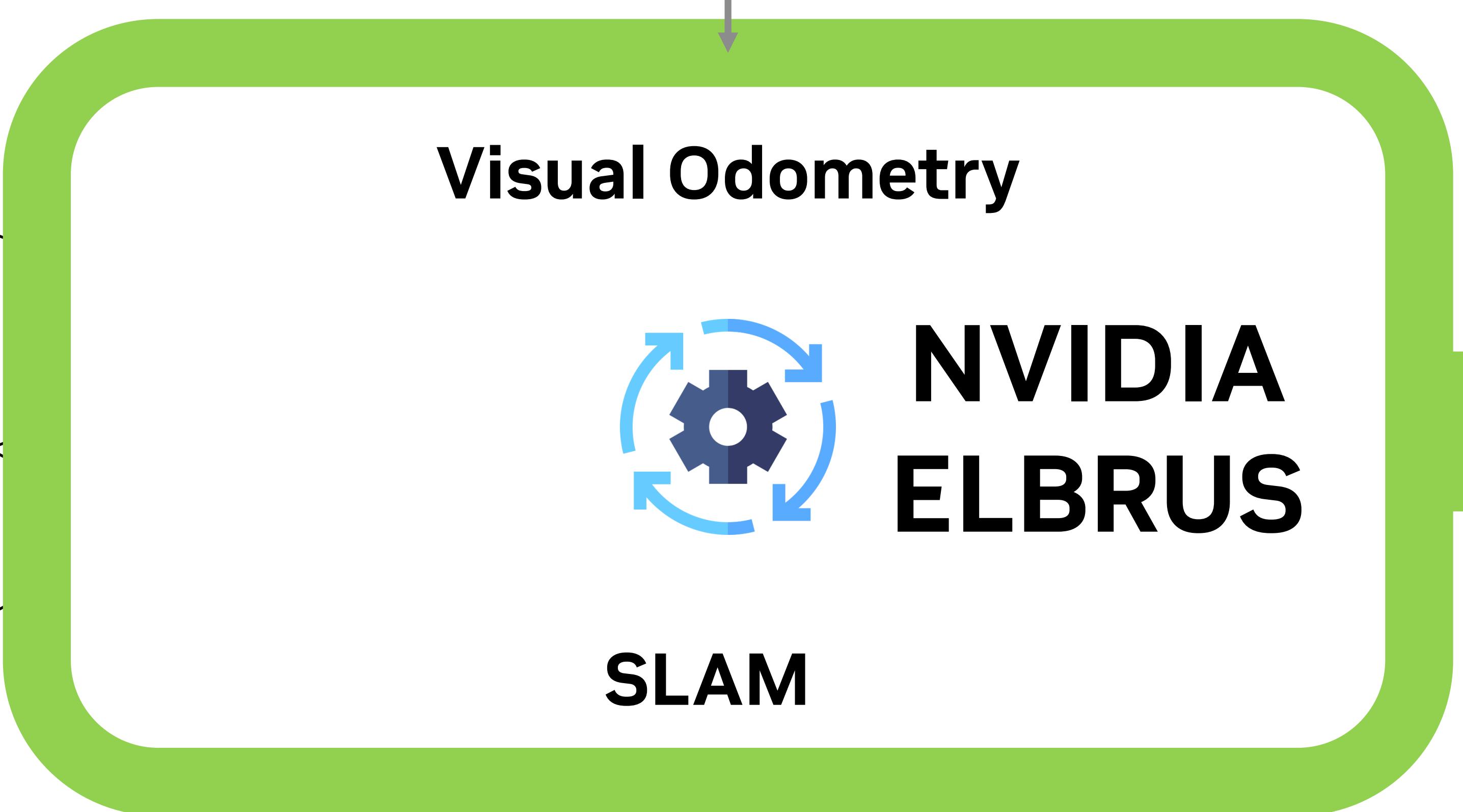
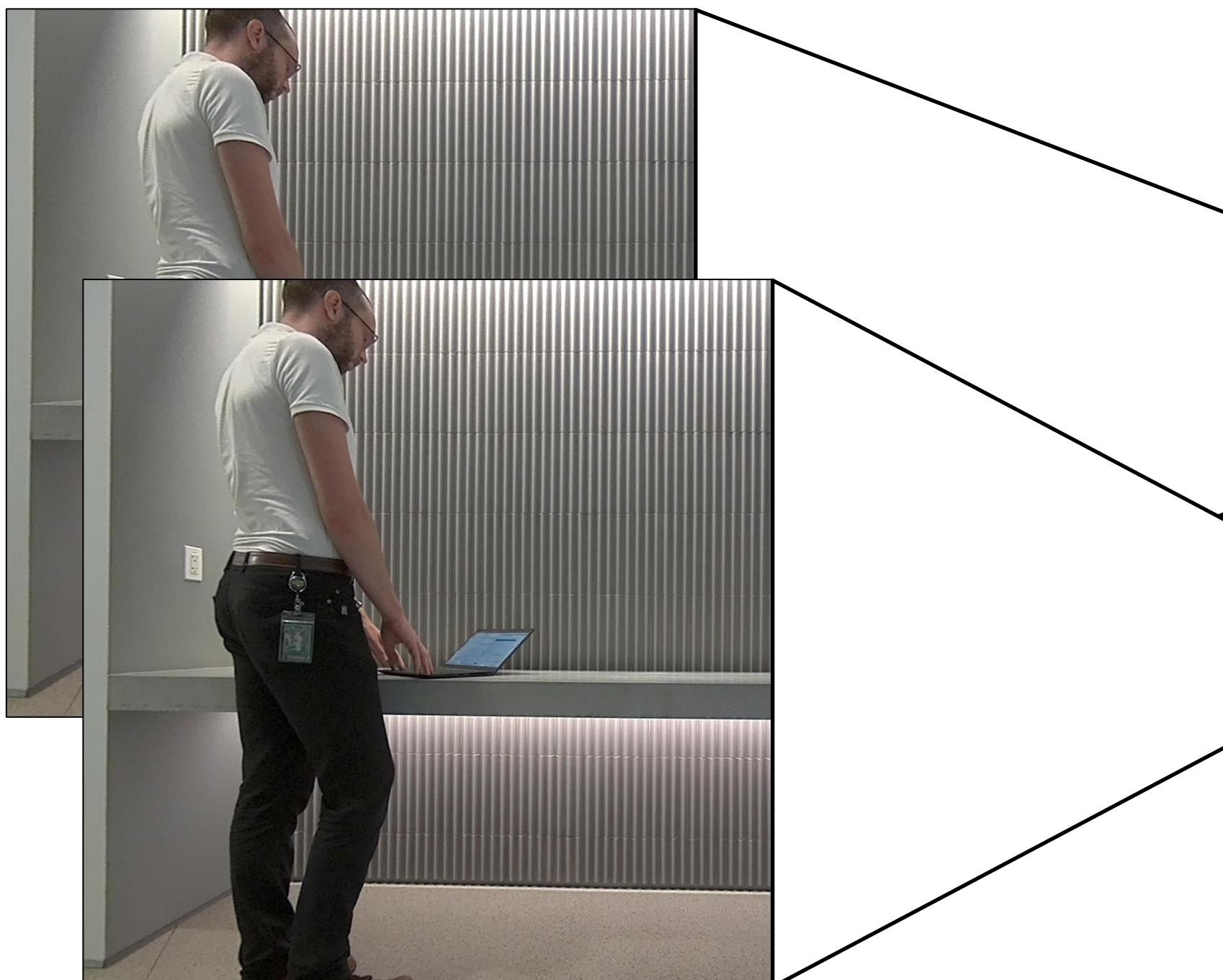
[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)



**isaac\_ros\_visual\_slam**



**visual\_slam\_node**



# NVIDIA Isaac ROS vSLAM

How the repository and package are made



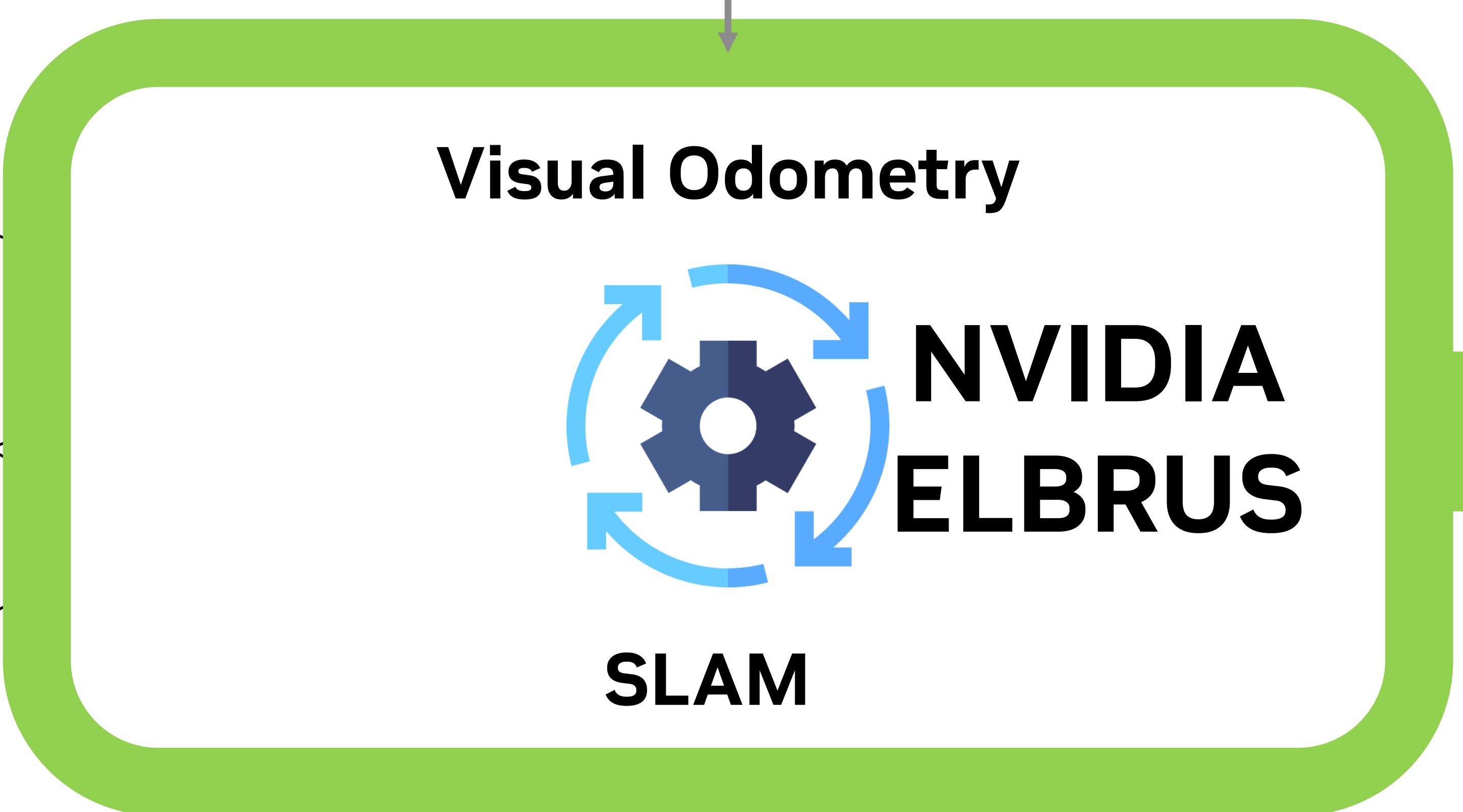
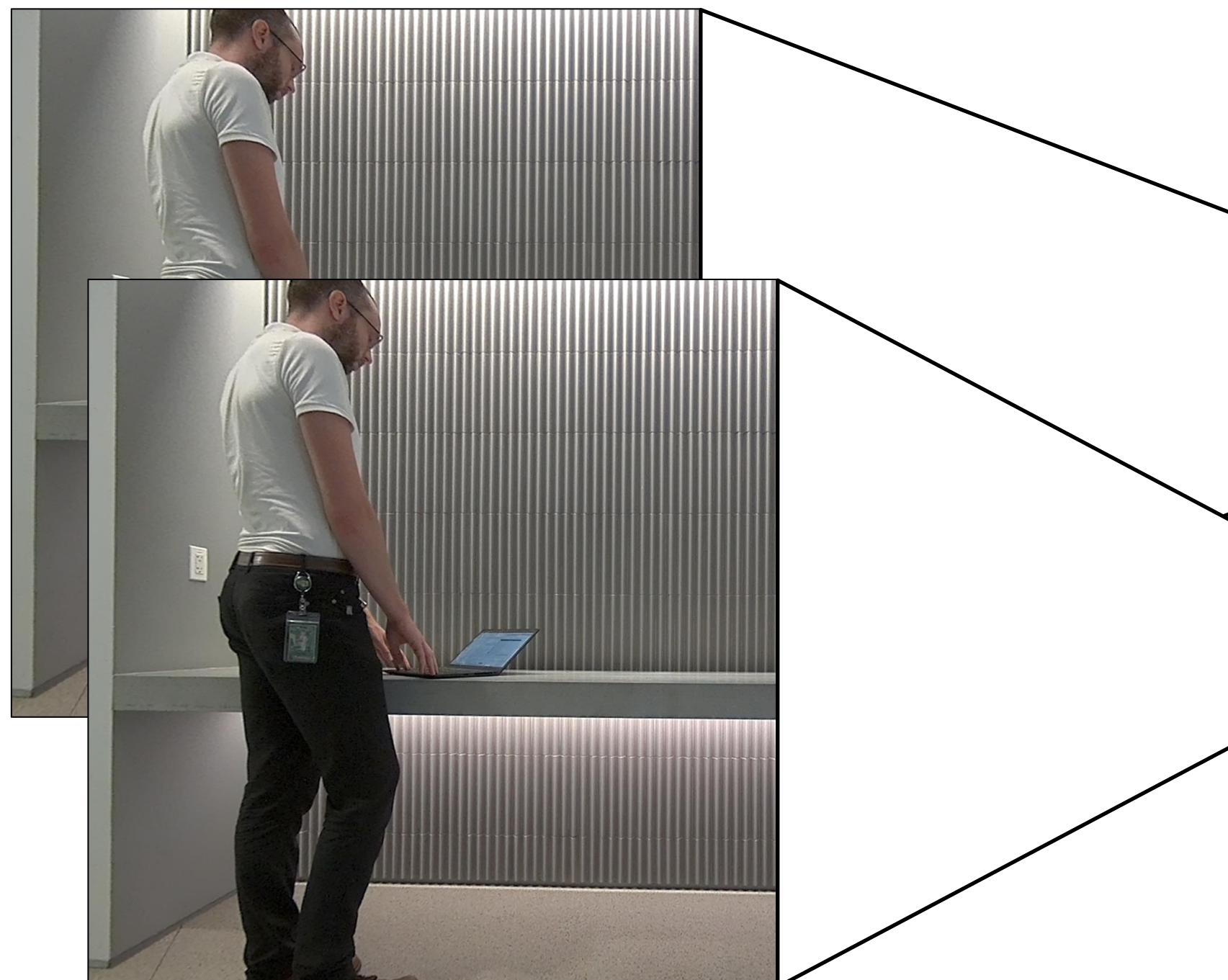
[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_visual\\_slam](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam)



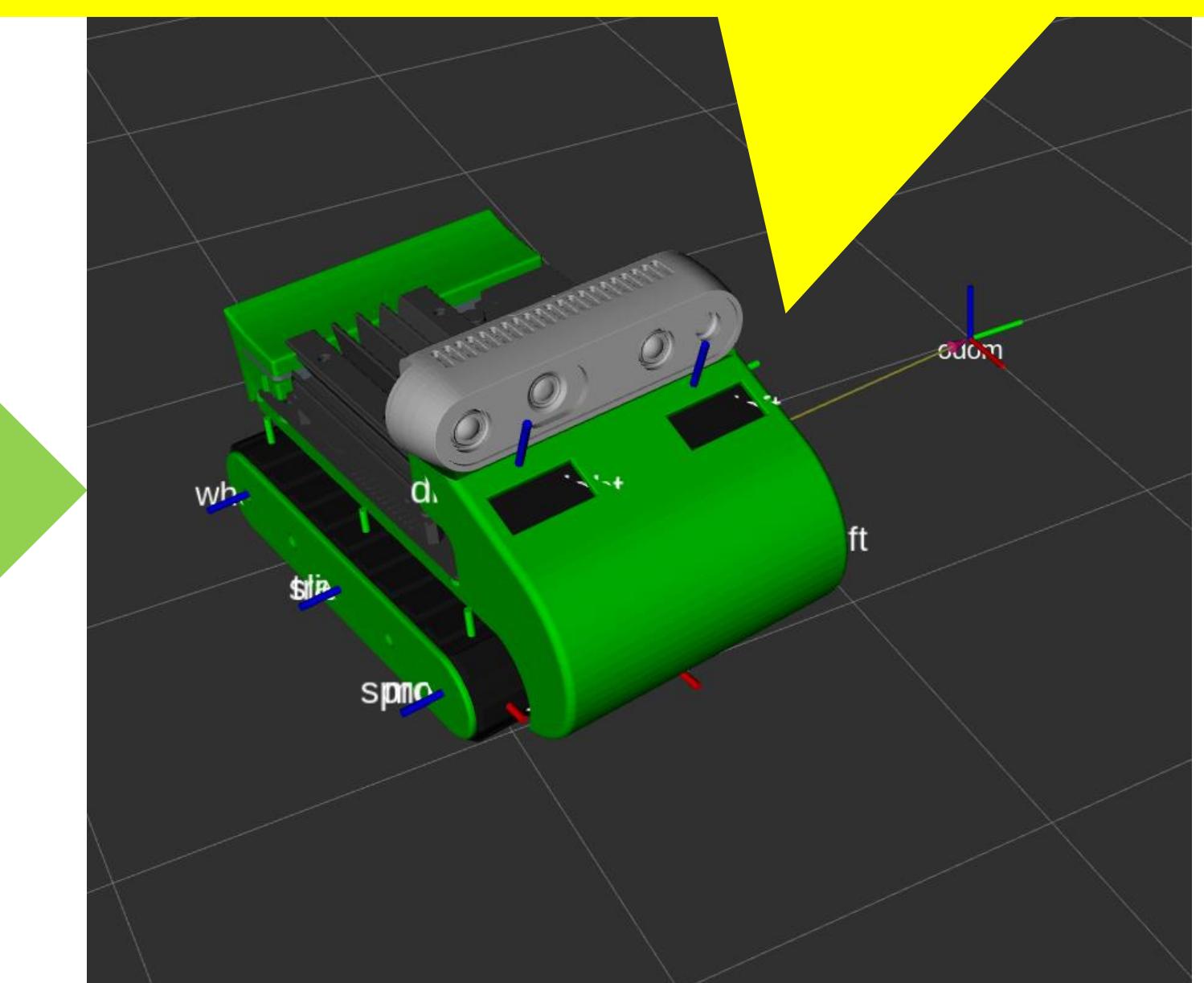
isaac\_ros\_visual\_slam



visual\_slam\_node



Cool!  
I know where I am



# Benchmark

## Elbrus and Isaac ROS

	Method	Setting	Code	<u>Translation</u>	Rotation	Runtime	Environment	
54	<a href="#">IsaacElbrusGPUSLAM</a>			0.94 %	0.0019 [deg/m]	0.007 s	Jetson AGX	<input type="checkbox"/>

A. Korovko, D. Robustov, D. Slepichev, E. Vendrovsky and S. Volodarskiy: [Realtime Stereo Visual Odometry](#).

59	<a href="#">IsaacElbrusSLAM</a>			0.99 %	0.0020 [deg/m]	0.008 s	3 cores @ 3.3 Ghz (C/C++)	<input type="checkbox"/>
----	---------------------------------	--	--	--------	----------------	---------	---------------------------	--------------------------

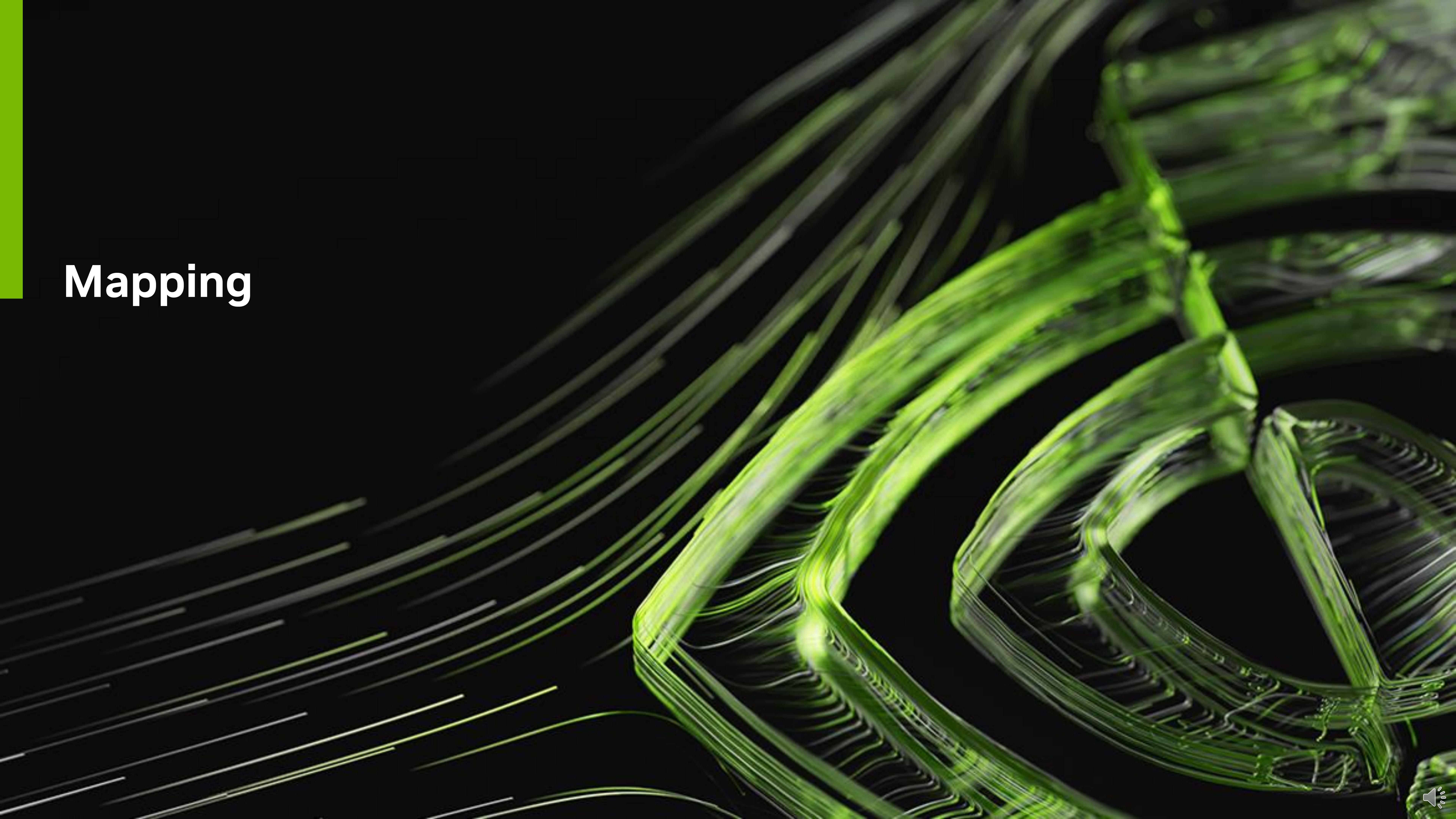
A. Korovko, D. Robustov, D. Slepichev, E. Vendrovsky and S. Volodarskiy: [Realtime Stereo Visual Odometry](#).

[https://www.cvlibs.net/datasets/kitti/eval\\_odometry.php](https://www.cvlibs.net/datasets/kitti/eval_odometry.php)

Package	Resolution	AGX Orin	Orin Nano 8GB	x86_64 w RTX 3060 Ti
Isaac ROS visual slam	720p	250 fps 3.1 ms	105 fps 10 ms	265 fps 5.2 ms

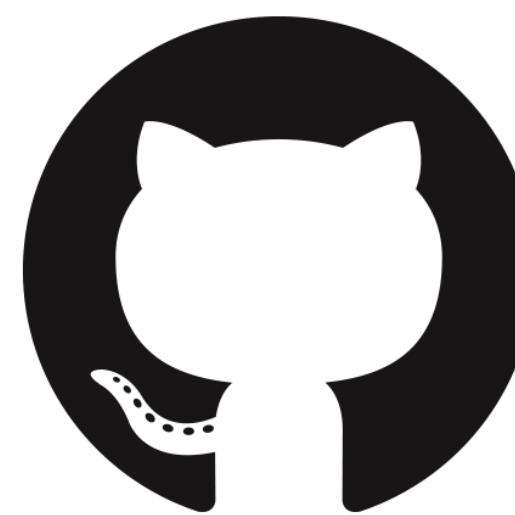
<https://github.com/NVIDIA-ISAAC-ROS/.github/blob/main/profile/performance-summary.md>

# Mapping



# NVIDIA Isaac ROS NVBlox

Where find NVBlox



[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_nvblox](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_nvblox)

NVIDIA-ISAAC-ROS / isaac\_ros\_nvblox Public

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main 11 branches 5 tags Go to file Add file Code

hemalshahNV Merge pull request #49 from NVIDIA-ISAAC-ROS/release-dp2-hotf... 61897a4 on Dec 26, 2022 23 commits

ci	Isaac ROS 0.11.0 (DP1.1)	6 months ago
docs	Hotfix to the nvblox realsense vslam example.	2 months ago
isaac_ros_nvblox	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox @ 9bdbd80	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox_examples	Hotfix to the nvblox realsense vslam example.	2 months ago
nvblox_isaac_sim	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox_msgs	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox_nav2	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox_performance_measurement	Isaac ROS 0.20.0 (DP2)	4 months ago
nvblox_ros	Hotfix to the nvblox realsense vslam example.	2 months ago
nvblox_rviz_plugin	Isaac ROS 0.20.0 (DP2)	4 months ago
resources	Isaac ROS 0.20.0 (DP2)	4 months ago
.clang-format	Isaac ROS 0.9.3 (EA3)	last year
.gitattributes	Isaac ROS 0.11.0 (DP1.1)	6 months ago

About

Hardware-accelerated 3D scene reconstruction and Nav2 local costmap provider using nvblox

developer.nvidia.com/isaac-ros-gems

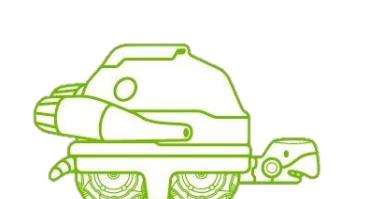
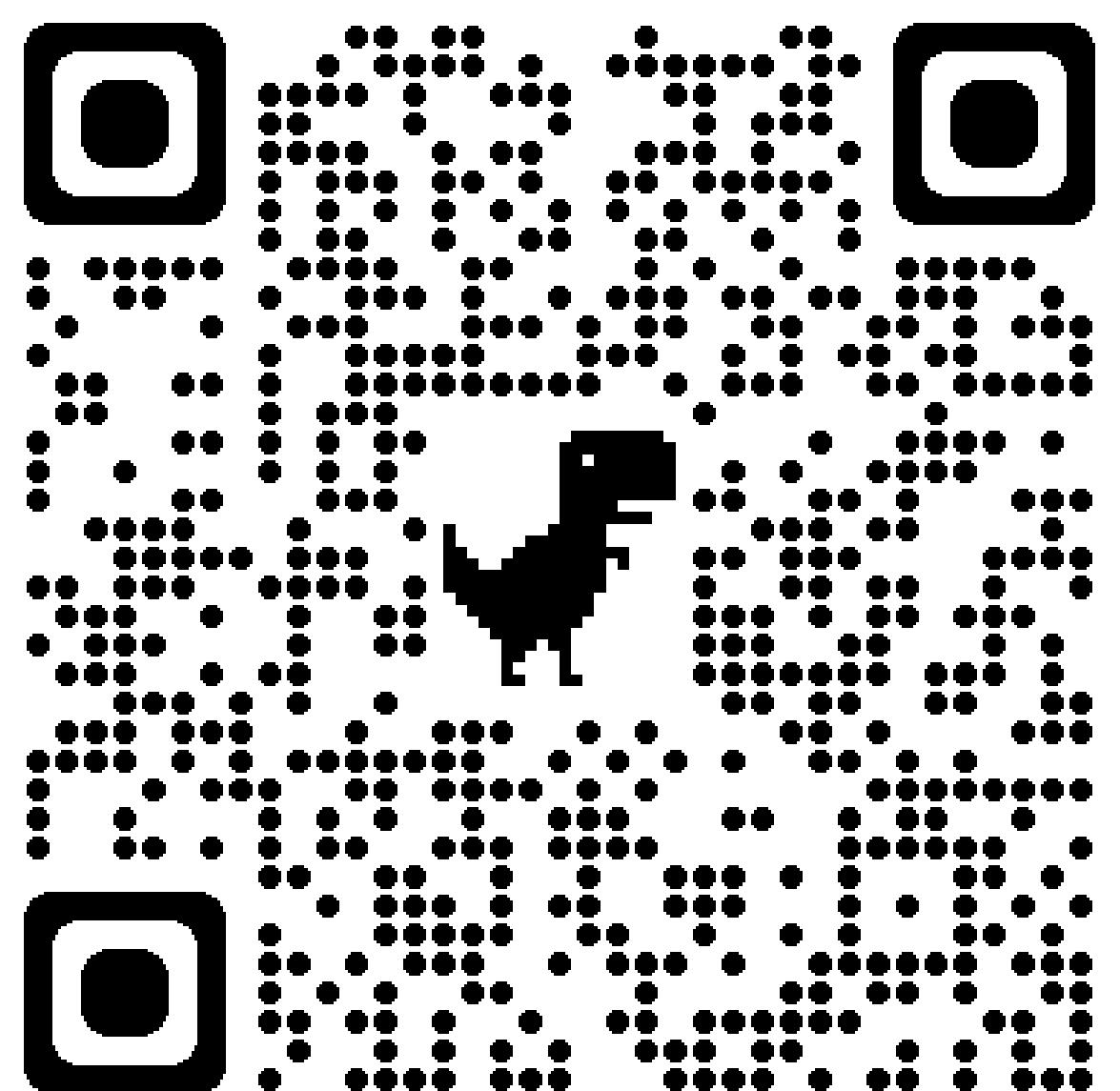
Robotics GPU ROS NVIDIA  
3D-reconstruction Jetson ROS2-Humble

Readme Apache-2.0 license  
176 stars 10 watching 29 forks

Releases 4

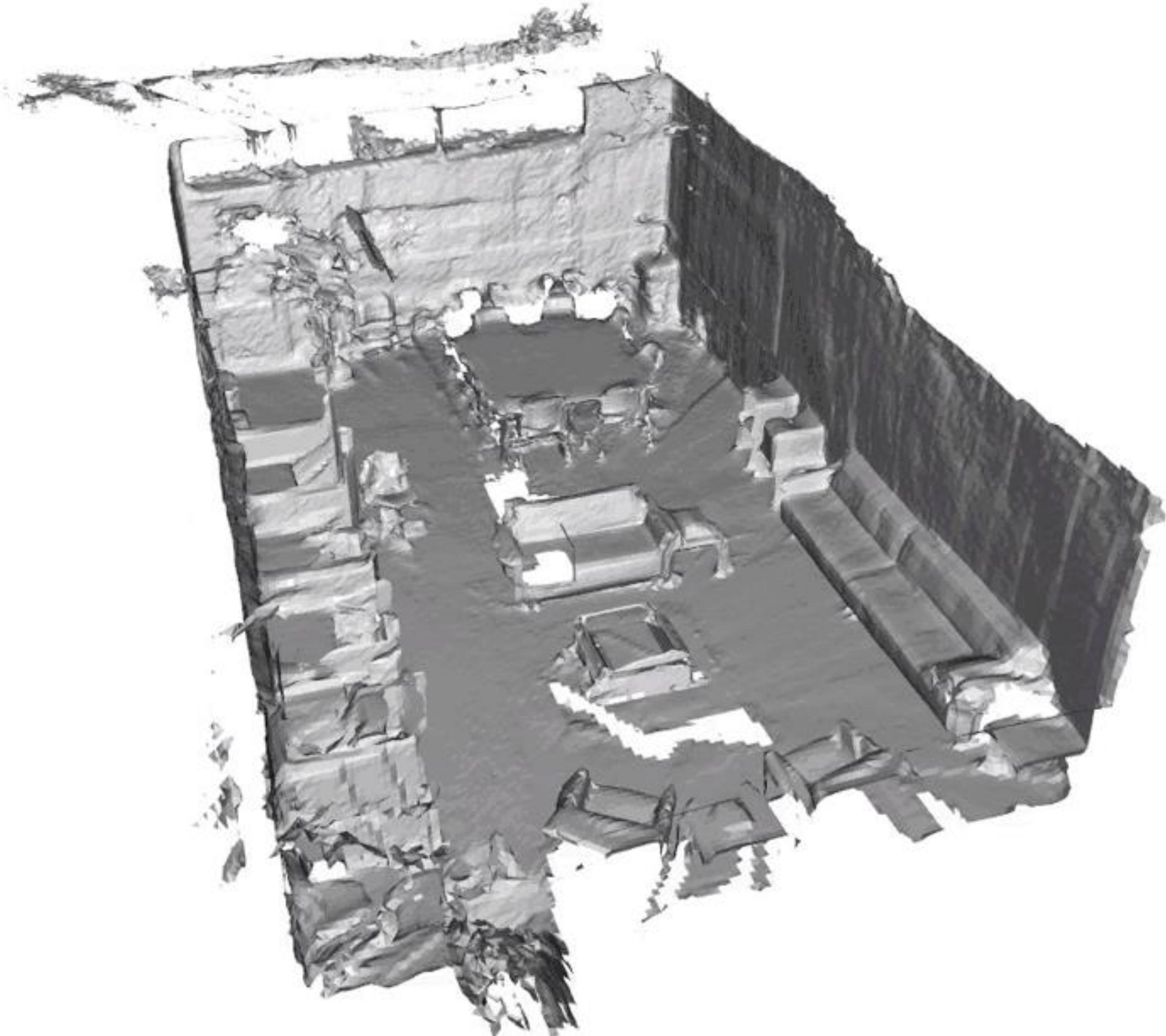
DP 2 Release Latest on Oct 19, 2022 + 3 releases

Contributors 4



# Isaac ROS NVBLOX

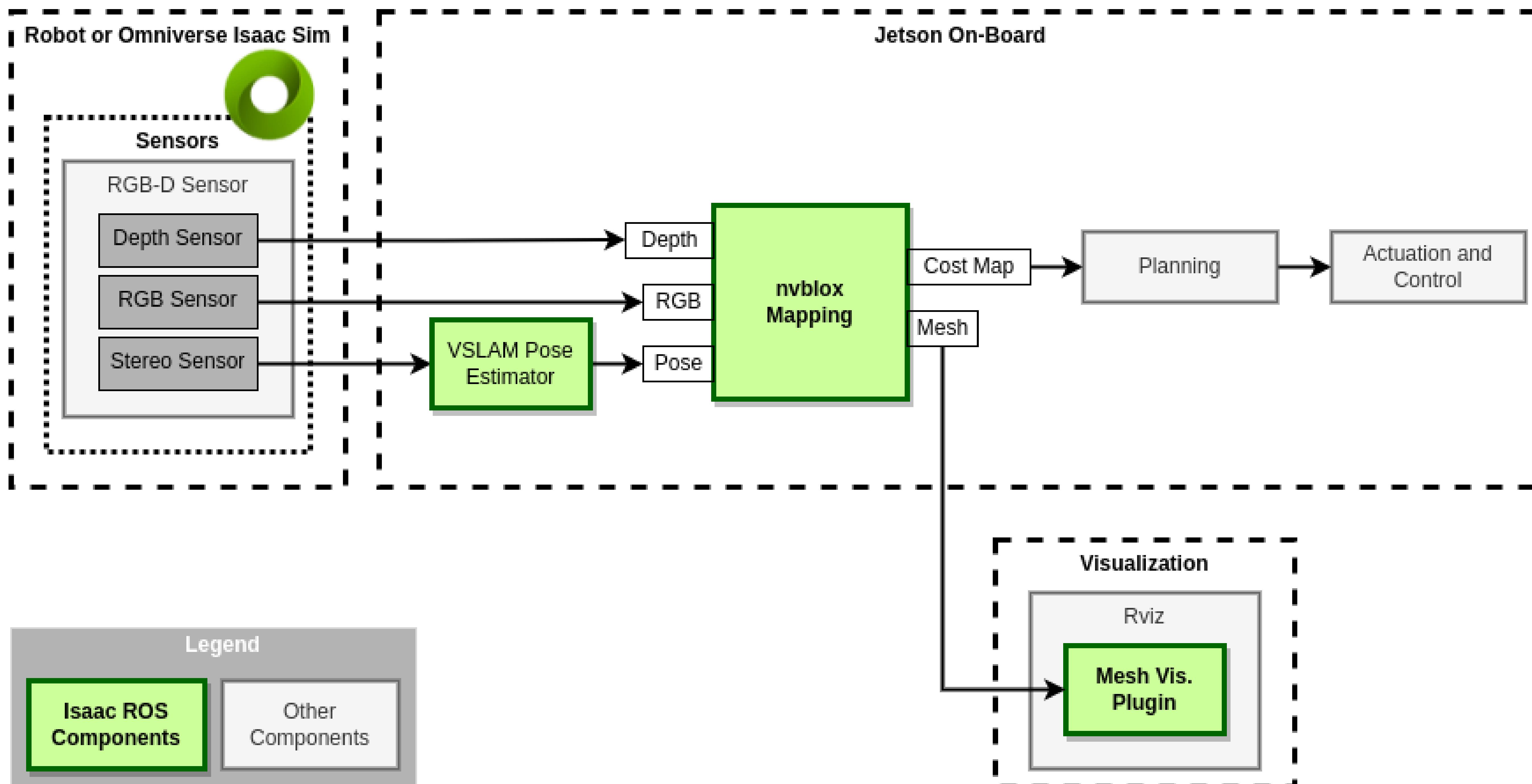
## 3D reconstruction and mapping



Given a sequence of known poses and depth measurements, reconstruct 3D volumetric map of the environment which is useful for robotic navigation.

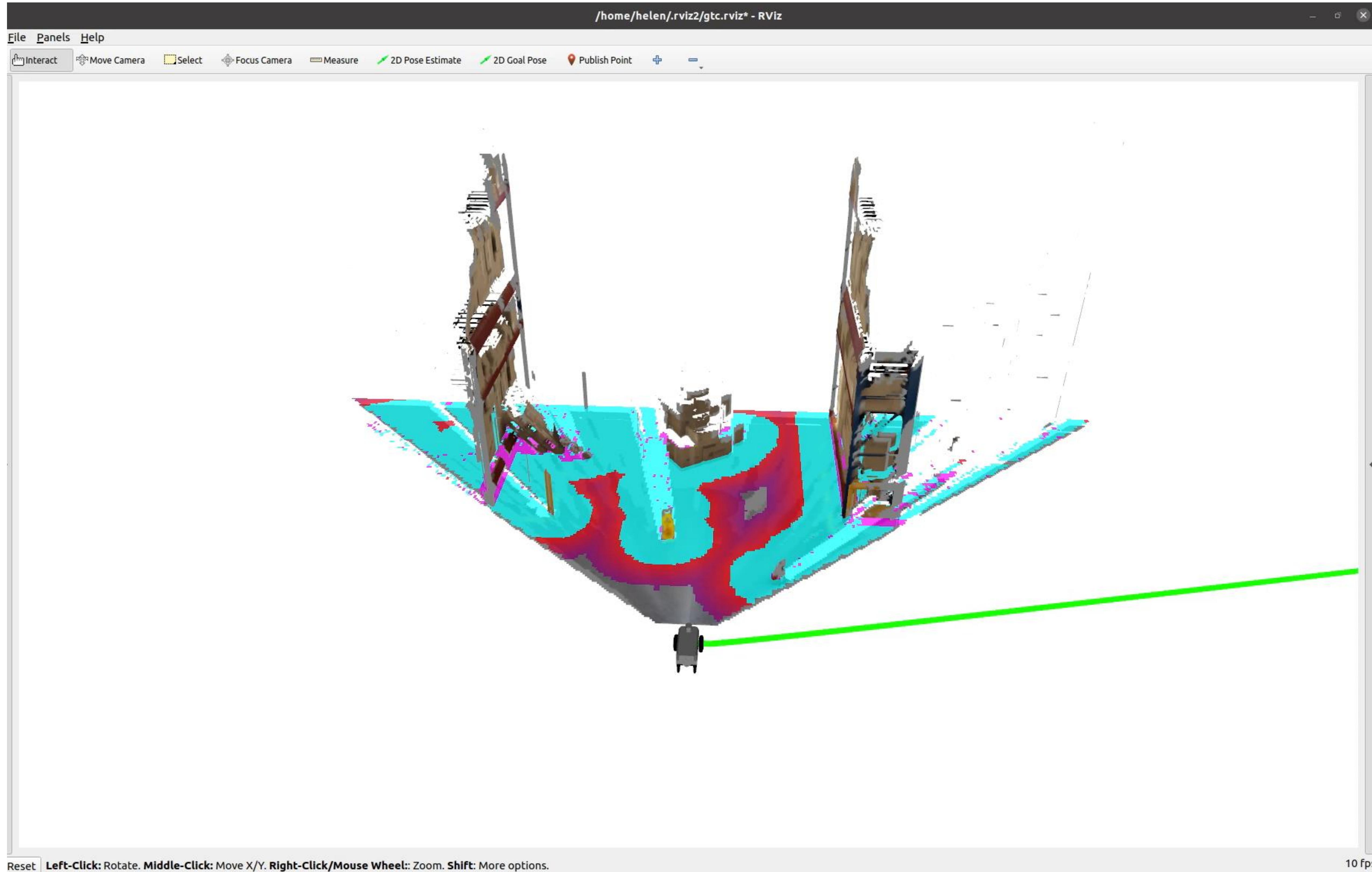
- Real-time collision avoidance
  - Obstacle avoidance detection and avoiding
- Limited compute
  - Optimized specifically for NVIDIA Jetson
  - Allow 3D mapping on a small compute footprint
- Real-time reconstruction
  - Reconstruction output at interactive rates.

# How works nvblox



# Isaac ROS NVBLOX

## 3D reconstruction and mapping



Isaac ROS Nvbox – map reconstruction



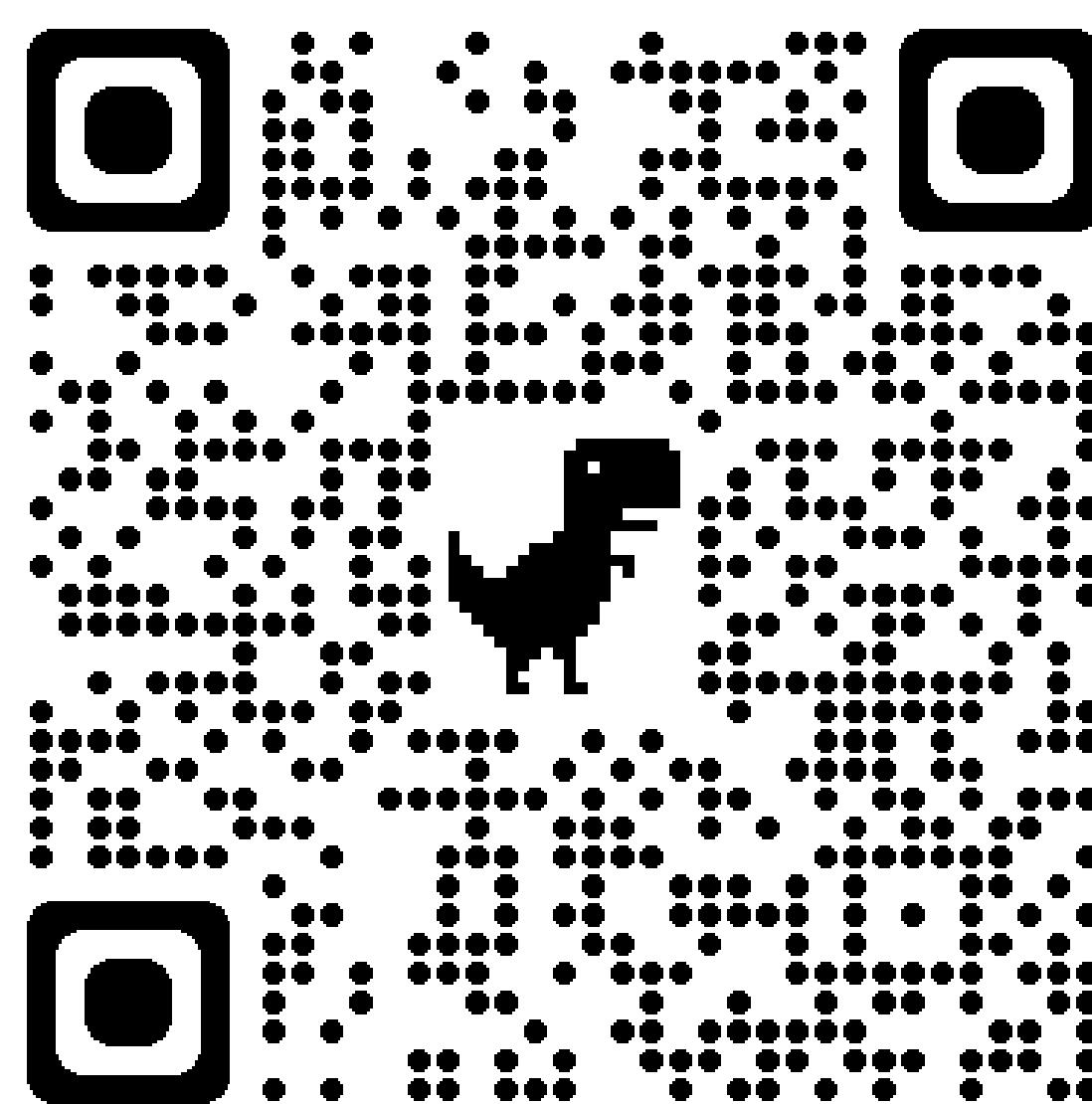
# Perception and AI



# Isaac ROS Proximity Segmentation

DNN-based proximity segmentation and obstacle field ranging using Bi3D

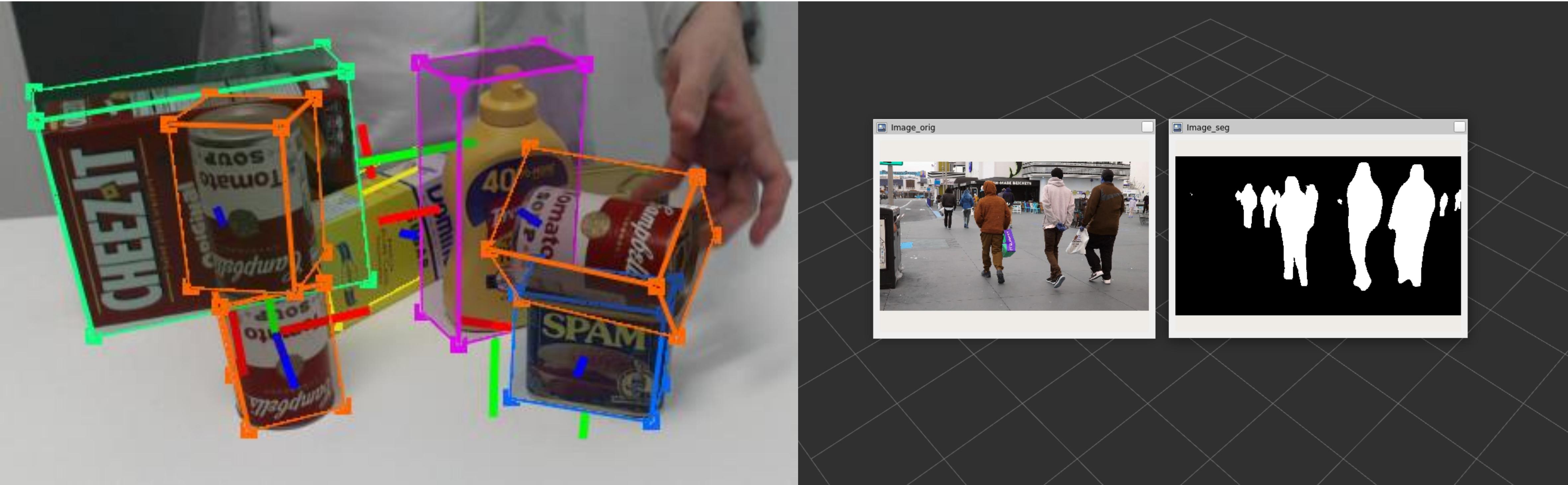
[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_proximity\\_segmentation](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_proximity_segmentation)



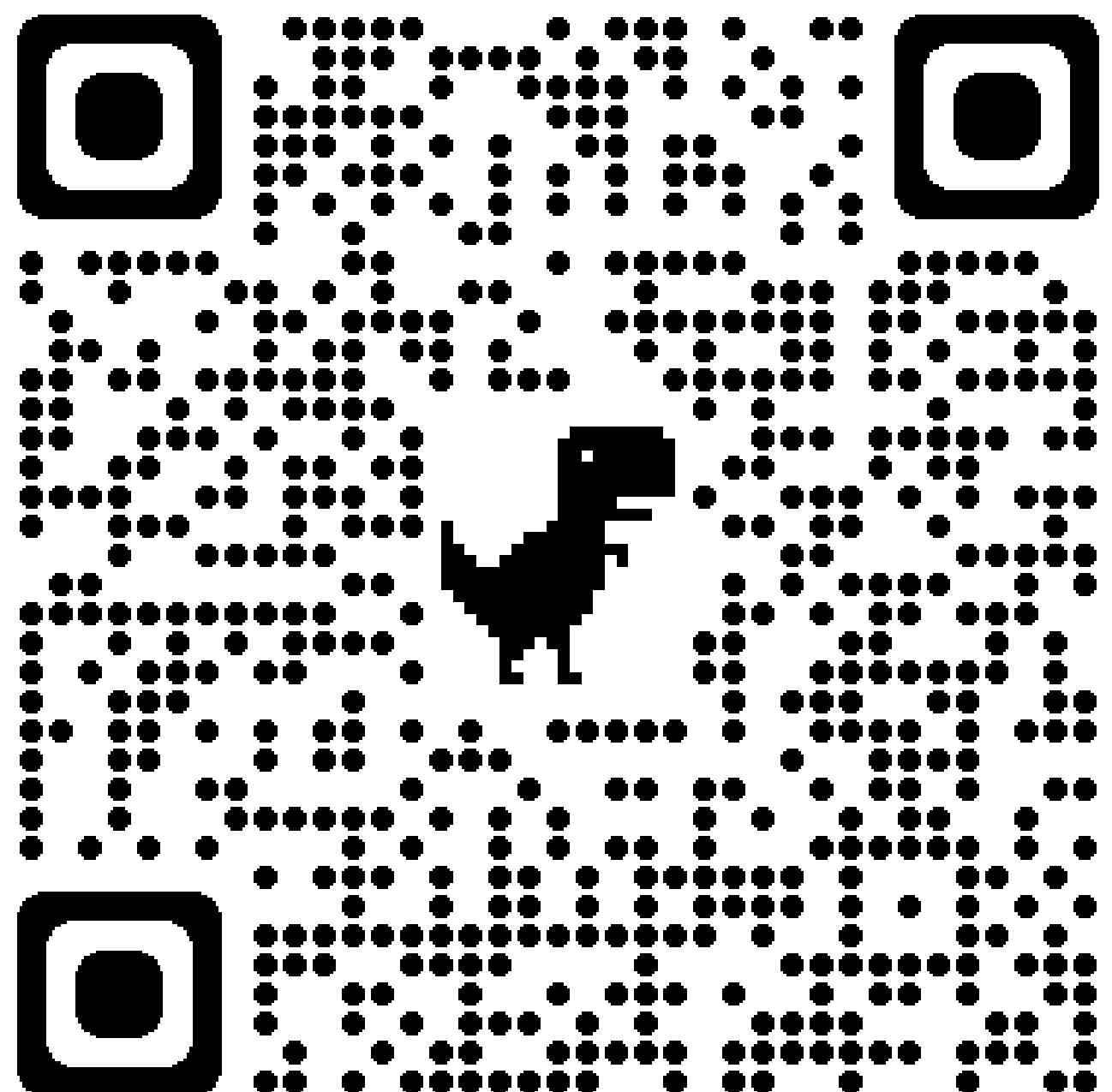
- This repository provides NVIDIA hardware-accelerated packages for proximity segmentation.
- The `isaac_ros_bi3d` package uses an optimized Bi3D model to perform stereo-depth estimation via binary classification for proximity segmentation.
- Proximity segmentation predicts freespace from the ground plane, eliminating the need for ground plane removal from the segmentation image.
- The `isaac_ros_bi3d_freespace` package uses proximity segmentation to produce an occupancy grid that indicates freespace in the robot's neighborhood.
- This camera-based solution offers better detection of low-profile obstacles compared to traditional 360 lidar occupancy scanning.
- Proximity segmentation provides a prediction of whether an obstacle is within a proximity field, instead of continuous depth, while simultaneously predicting freespace from the ground plane.
- Proximity segmentation is different from other stereo disparity functions in Isaac ROS, as it runs on NVIDIA DLA, which is separate and independent from the GPU.

# Isaac ROS DNN Inference

Hardware-accelerated DNN model inference ROS2 packages using NVIDIA Triton/TensorRT for both Jetson and x86\_64 with CUDA-capable GPU

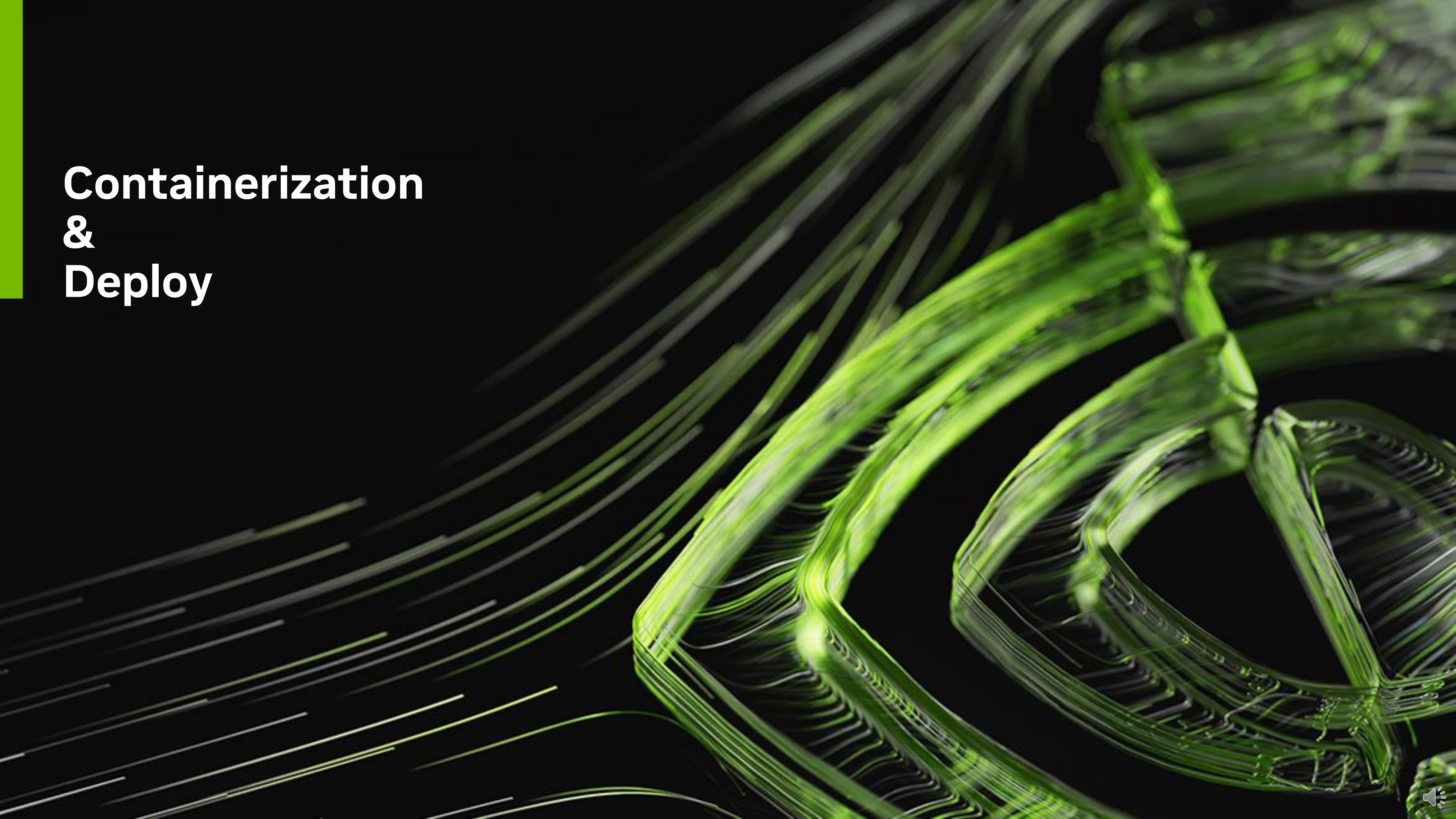


[https://github.com/NVIDIA-ISAAC-ROS/isaac\\_ros\\_dnn\\_inference](https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_dnn_inference)



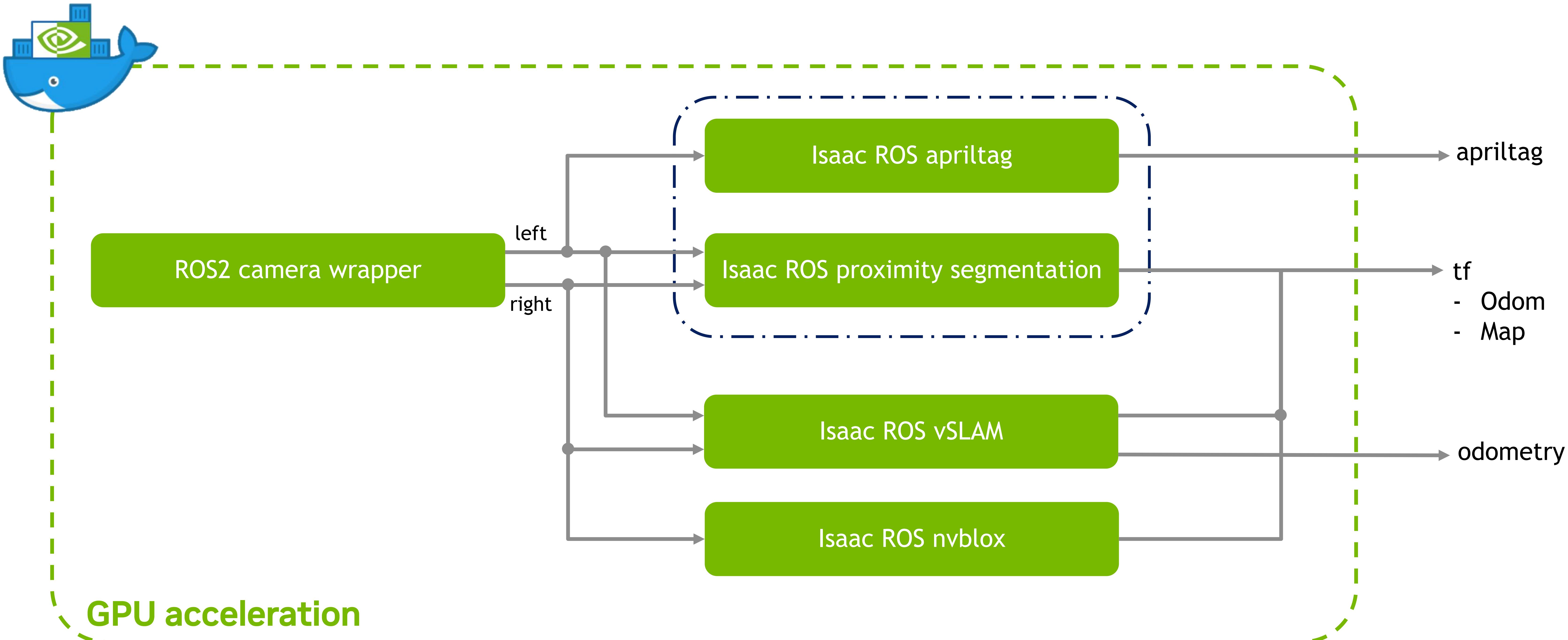
- This repository provides two NVIDIA GPU-accelerated ROS2 nodes that perform deep learning inference using custom models.
- One node uses the TensorRT SDK, while the other uses the Triton SDK. This repository also contains a node to preprocess images, and convert them into tensors for use by TensorRT and Triton.

# Containerization & Deploy

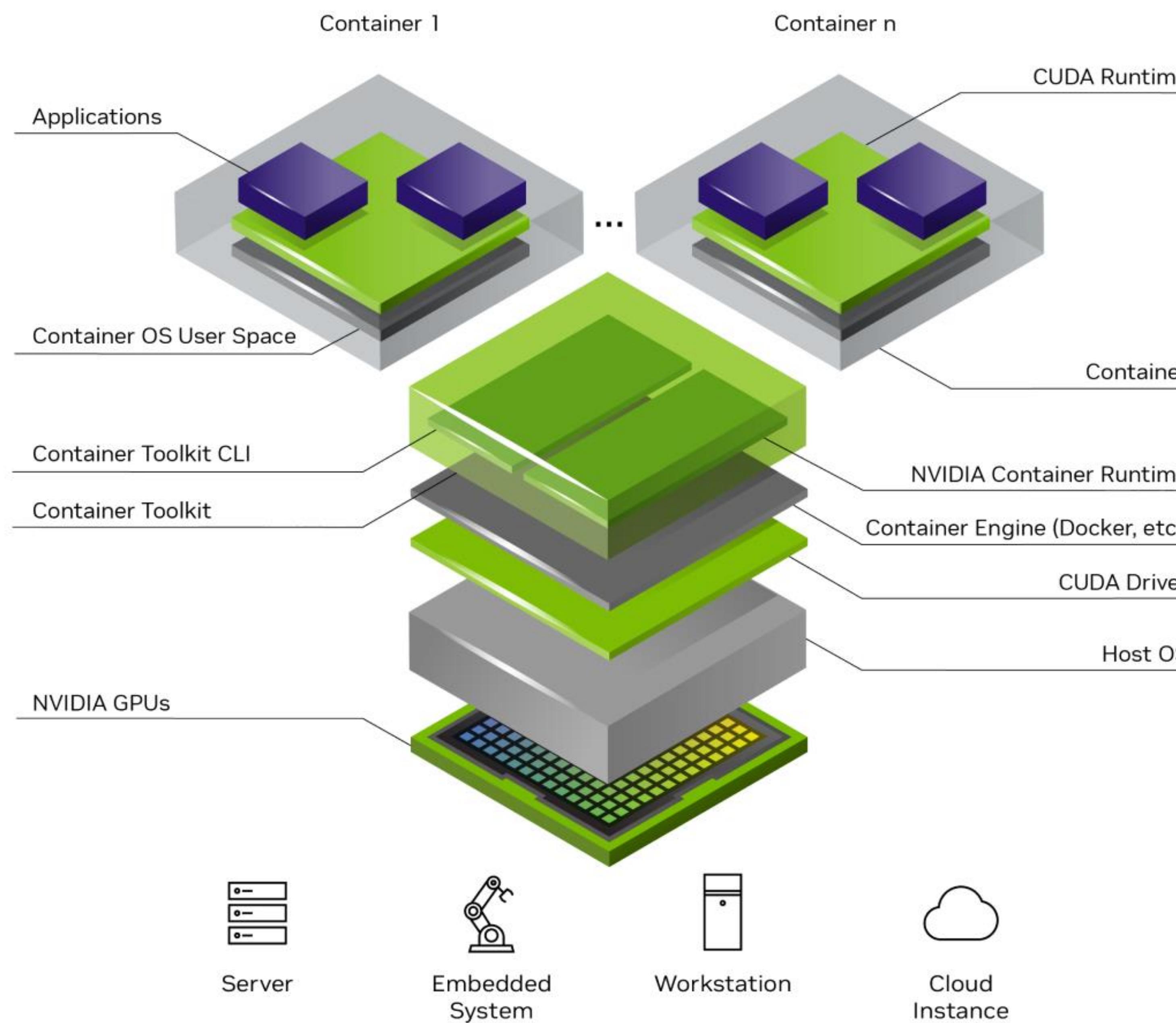


# ROS 2 workflow

example



# The NVIDIA Container Toolkit

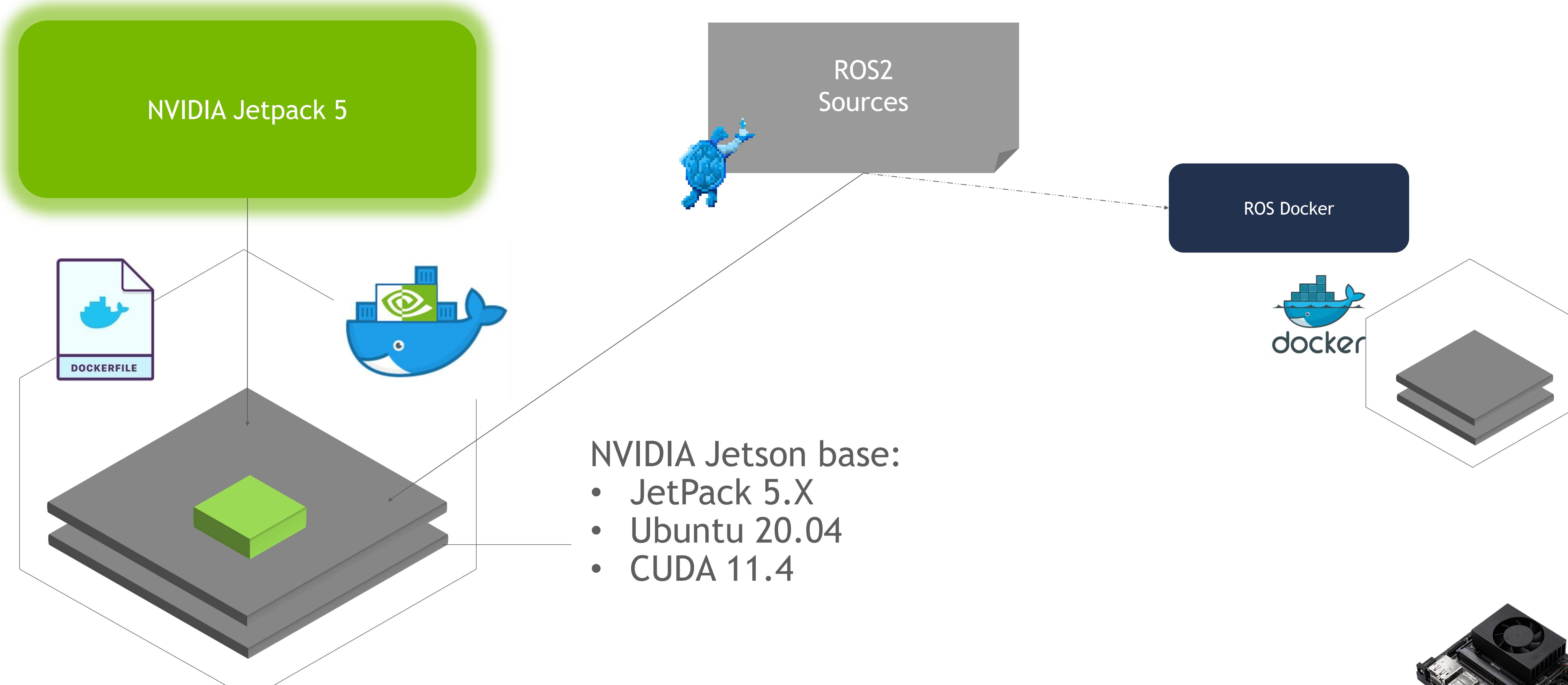


- The NVIDIA Container Toolkit **enables** the use of NVIDIA GPUs in a variety of container engines including Docker and Podman.
- The NVIDIA Container Toolkit takes care of **making the local GPUs and drivers available to containers**. This allows container images for GPU-accelerated applications to be handled in the same way as any other type of application making it easier to develop, test, and deploy GPU-accelerated applications in a **consistent and portable way**.

# ROS on NVIDIA Jetson

How ROS2 container is built on NVIDIA Jetson

GPU accelerated

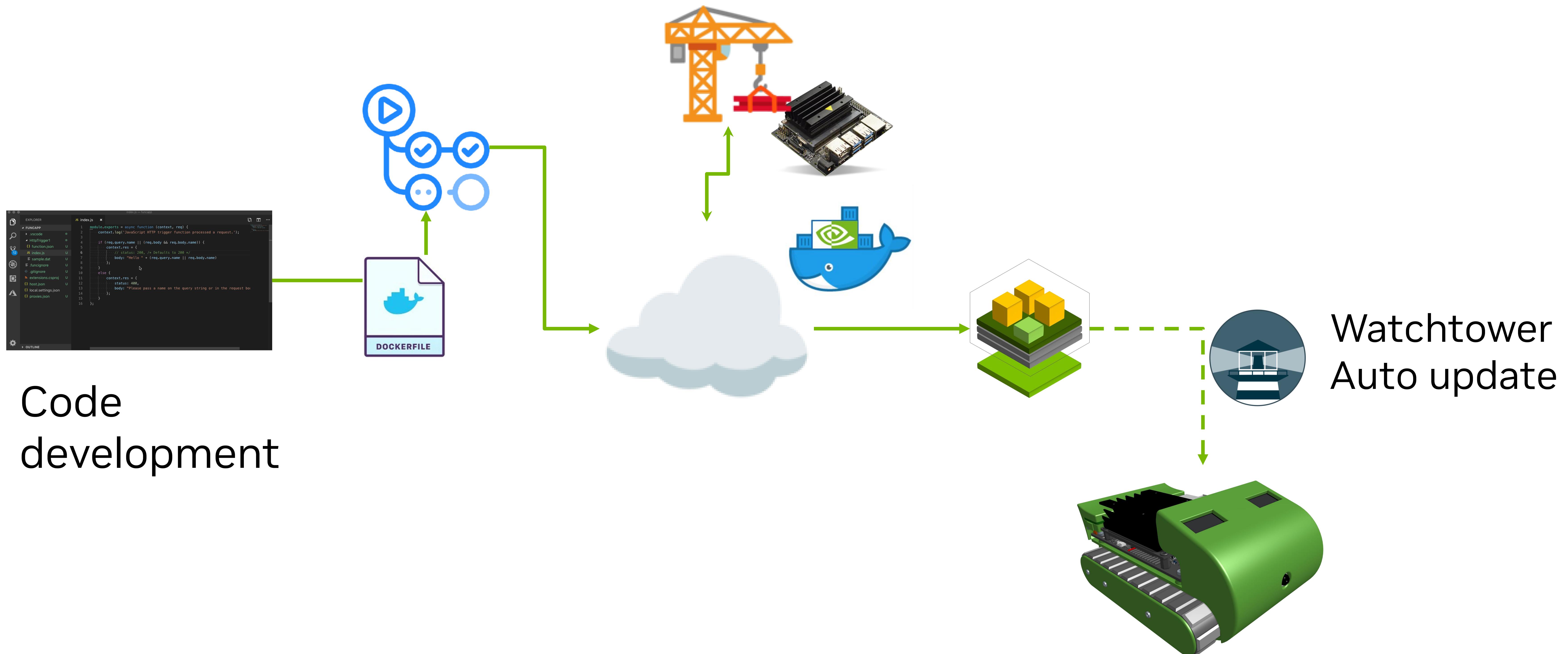


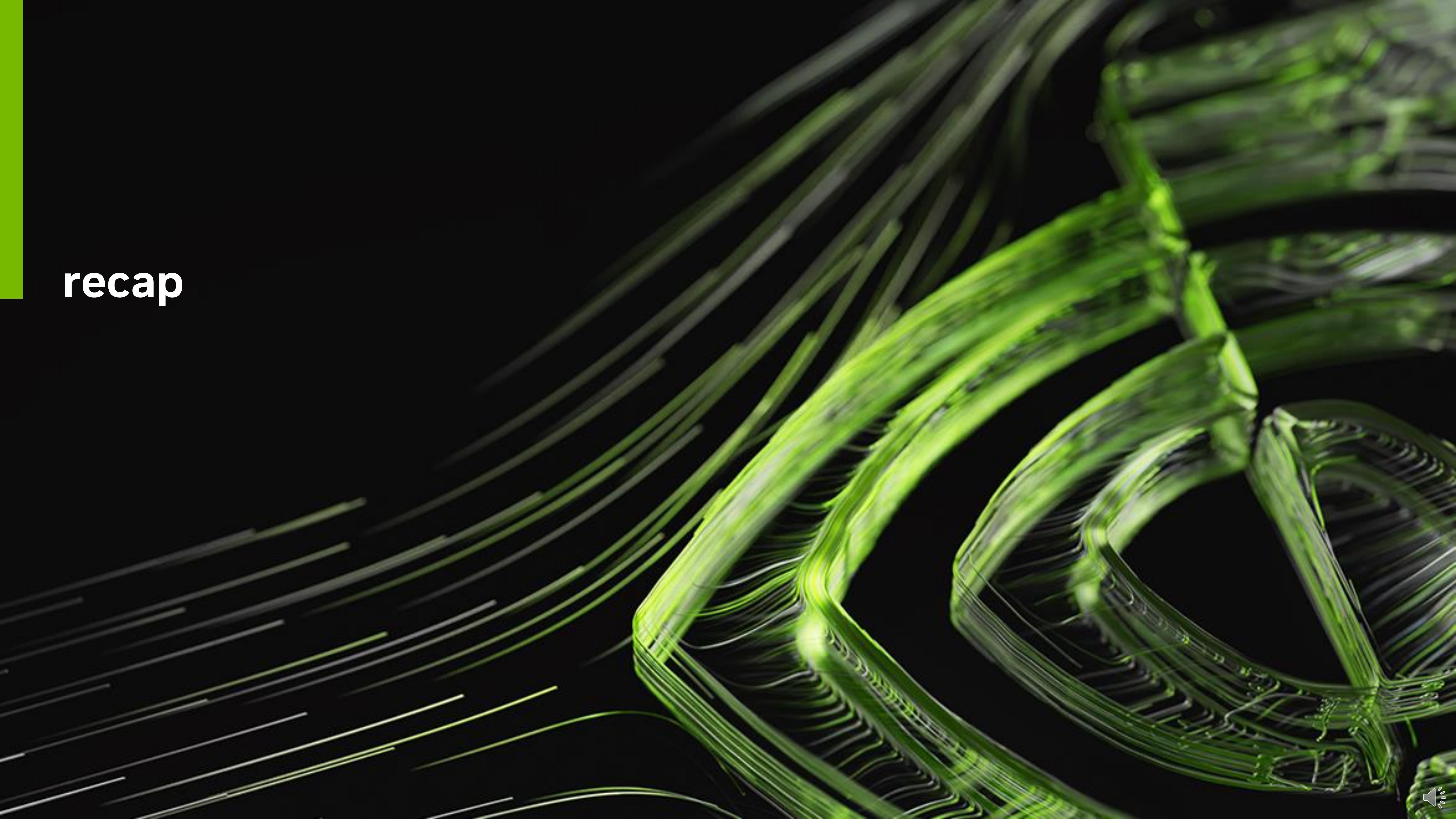
Both docker distributions runs on NVIDIA Jetson

# Example CI/CD

How a to build a CI with remote Docker build

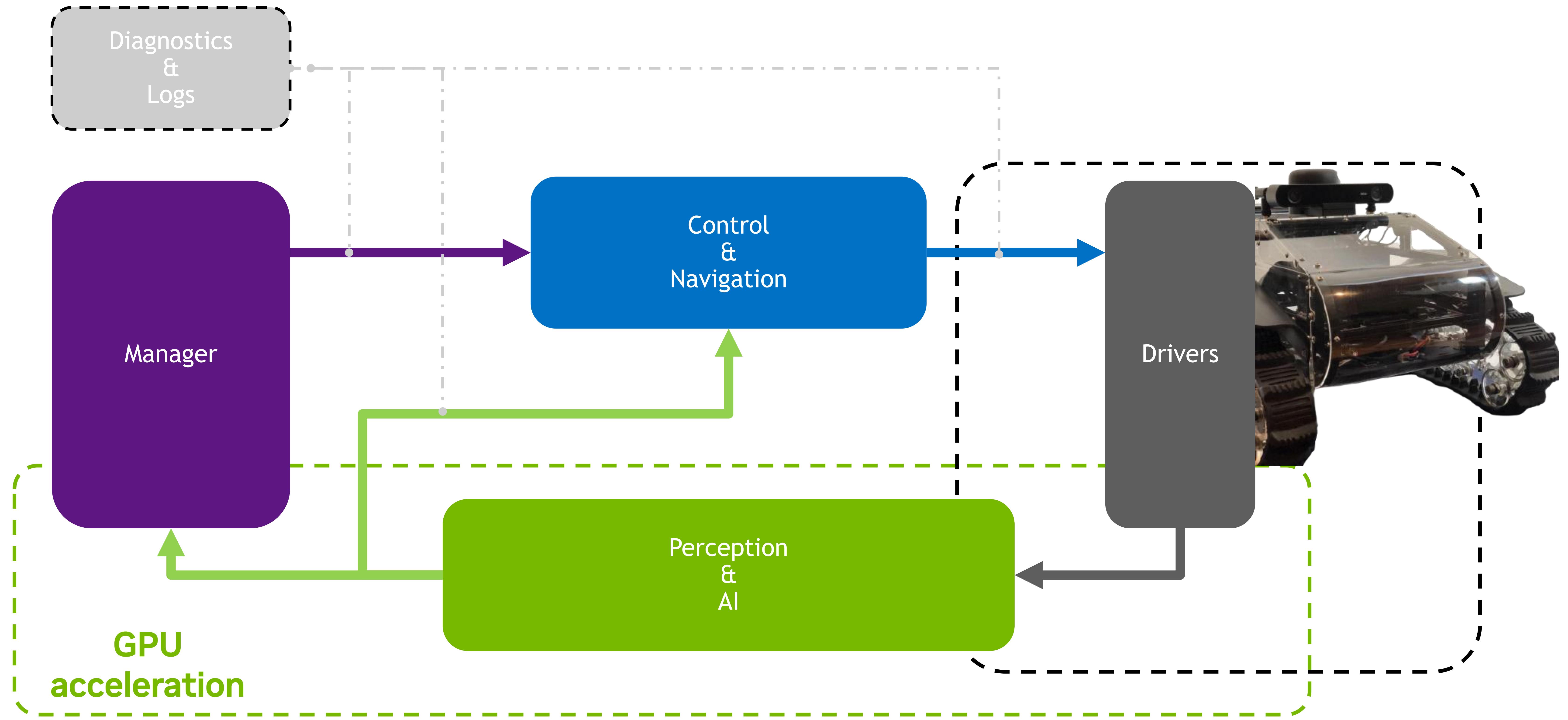
## CI - Remote building



The background features a dense, abstract pattern of glowing green lines against a black background. These lines are thick and thin, creating a sense of depth and motion. They form a complex, organic shape that resembles a network or a brain. A small, white speaker icon is located in the bottom right corner.

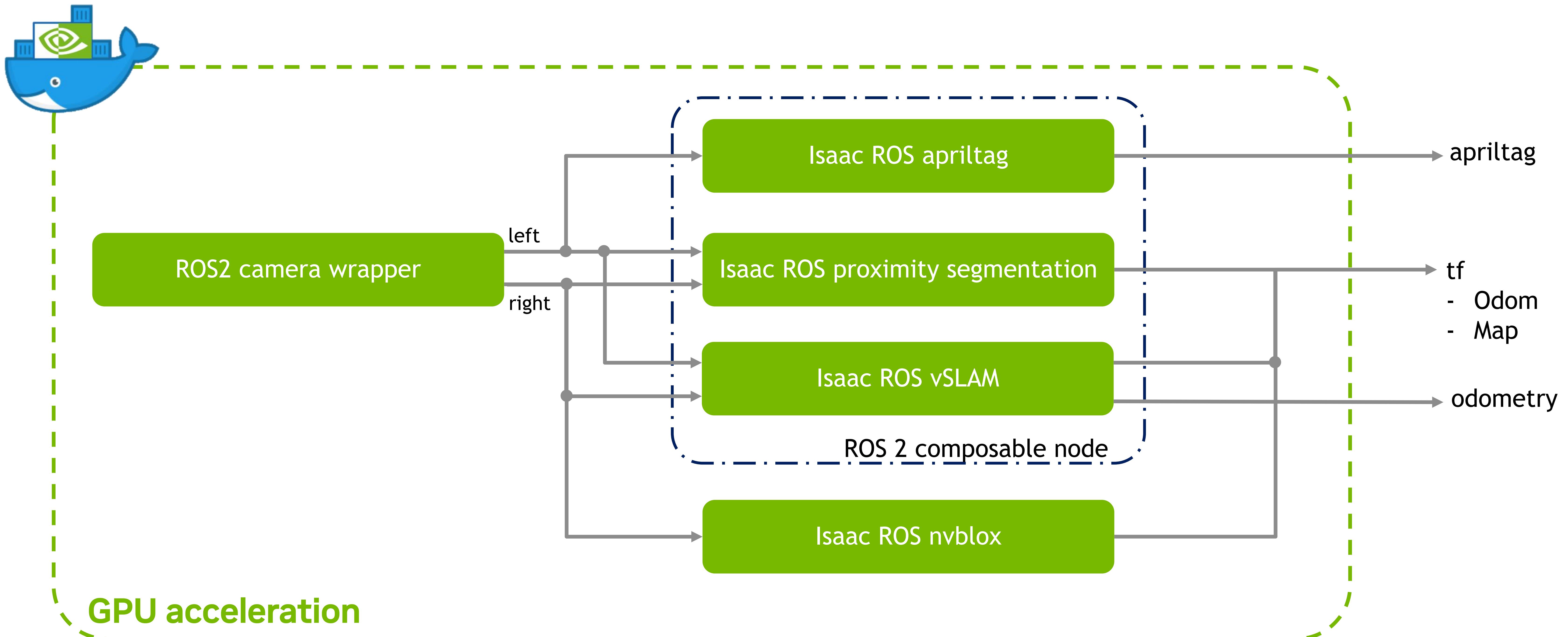
recap

# How you made a robot software architecture



# ROS 2 workflow

example



# ROS 2 launch example

## An example to run multiple Isaac ROS packages

```
nvblox_node = Node(  
    package='nvblox_ros',  
    executable='nvblox_node',  
)  
  
visual_slam_node = ComposableNode(  
    package='isaac_ros_visual_slam',  
    plugin='isaac_ros::visual_slam::VisualSlamNode',  
)  
  
apriltag_node = ComposableNode(  
    package='isaac_ros_apriltag',  
    plugin='isaac_ros::apriltag::AprilTagNode',  
)  
  
freespace_segmentation_node = ComposableNode(  
    package='isaac_ros_bi3d_freespace',  
    plugin='nvidia::isaac_ros::bi3d_freespace::FreespaceSegmentationNode',  
)  
  
isaac_ros_launch_container = ComposableNodeContainer(  
    package='rclcpp_components',  
    executable='component_container',  
    composable_node_descriptions=[visual_slam_node, apriltag_node, freespace_segmentation_node],  
)  
  
# Launch ROS2 packages  
ld = LaunchDescription()  
# vSLAM and NVBLOX  
ld.add_action(nvblox_node)  
# Isaac ROS container  
ld.add_action(isaac_ros_launch_container)
```

# Write my Isaac ROS workspace

The faster and cool way

## my\_isaac\_ros.rosinstall

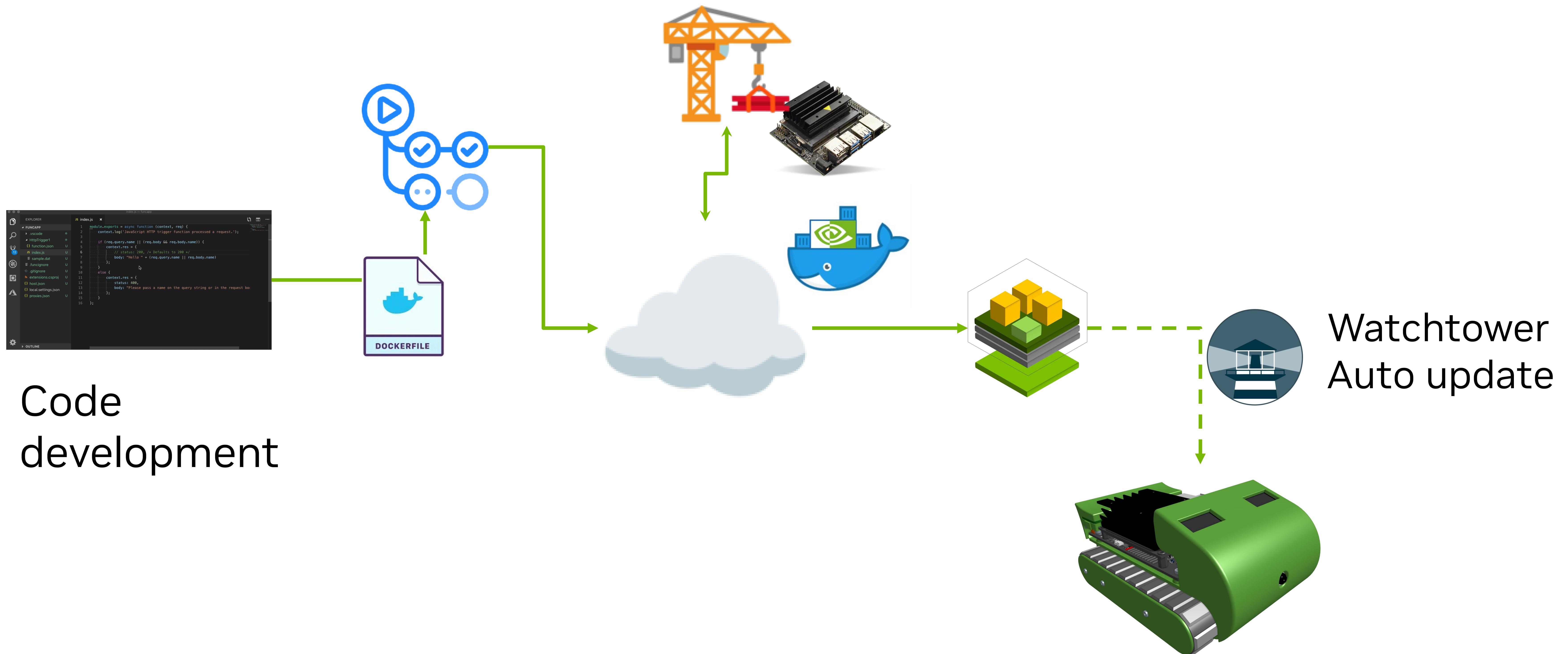
```
- git:  
  local-name: isaac_ros_common  
  uri: https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_common.git  
- git:  
  local-name: isaac_ros_nitros  
  uri: https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_nitros.git  
- git:  
  local-name: isaac_ros_image_pipeline  
  uri: https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_image_pipeline.git  
- git:  
  local-name: isaac_ros_apriltag  
  uri: https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_apriltag.git  
- git:  
  local-name: isaac_ros_visual_slam  
  uri: https://github.com/NVIDIA-ISAAC-ROS/isaac_ros_visual_slam.git
```

```
1  FROM rbonghi/isaac_ros_base:humble-base-devel  
2  
3  # Copy wstool isaac_ros.rosinstall  
4  COPY my_isaac_ros.rosinstall /my_isaac_ros.rosinstall  
5  # Import also all Isaac ROS packages  
6  RUN mkdir -p /ws_ros/src \  
7      && cd /ws_ros \  
8      && vcs import $/ws_ros/src < /my_isaac_ros.rosinstall \  
9      && rm /my_isaac_ros.rosinstall \  
10     # Install dependencies using rosdep  
11     # Load variable ROS2  
12     && . /opt/ros/$ROS_DISTRO/install/setup.sh \  
13     && apt-get update \  
14     && rosdep install -y \  
15         --ignore-src \  
16         --from-paths src \  
17         --rosdistro ${ROS_DISTRO} \  
18     && rm -Rf /var/lib/apt/lists/* \  
19     && apt-get clean \  
20     # Build Isaac ROS and clean resources  
21     && colcon build --merge-install --cmake-args -DCMAKE_BUILD_TYPE=Release \  
22     && rm -Rf src build log  
23  
24  CMD ["ros2", "launch", "my_cool_package", "isaac_ros.forever.launch.py"]
```

# Example CI/CD

How a to build a CI with remote Docker build

## CI - Remote building



# Links & webinars



# NVIDIA Isaac ROS Resources

<https://developer.nvidia.com/isaac-ros-gems>

## NVIDIA Isaac ROS GEMs

The NVIDIA® Isaac ROS GEMs are **hardware accelerated packages** that make it easier for **ROS developers** to build high-performance solutions on NVIDIA hardware.

GET STARTED



Composite Image from 3 Isaac ROS GEMs -- DNN (PeopleSemSegnet)/AprilTags/Disparity(Depth)

# NVIDIA Isaac ROS Resources

<https://github.com/NVIDIA-ISAAC-ROS>

The screenshot shows the GitHub organization page for "NVIDIA Isaac ROS". The page features a profile picture of a robot tank, a title "NVIDIA Isaac ROS", a description "High-performance computing for robotics built on ROS2", and a "Follow" button circled in red. Below the header, there are navigation links for Overview, Repositories (18), Projects, Packages, and People. The "Overview" tab is selected.

README.md

## NVIDIA Isaac ROS

Welcome to Isaac ROS, a collection of ROS2 packages for making autonomous robots.

- To get started, visit the [summary of packages](#) and [examples](#) of how to use them.
- Compare the [performance](#) of the packages on various platforms.
- Setup [hardware](#) to develop and run Isaac ROS packages.
- Read the collection of [blog posts](#) for more information.
- Scan through the [FAQs](#) for answers to common questions.
- Reference the [release notes](#) for details on all updates made to Isaac ROS.

### People

This organization has no public members.  
You must be a member to see who's a part  
of this organization.

### Top languages

Python C++

### Most used topics

ros2-humble jetson gpu nvidia  
ros2

### Pinned

[isaac\\_ros\\_compression](#) Public

Hardware-accelerated data compression

[isaac\\_ros\\_mission\\_client](#) Public

VDA5050-compatible mission controller

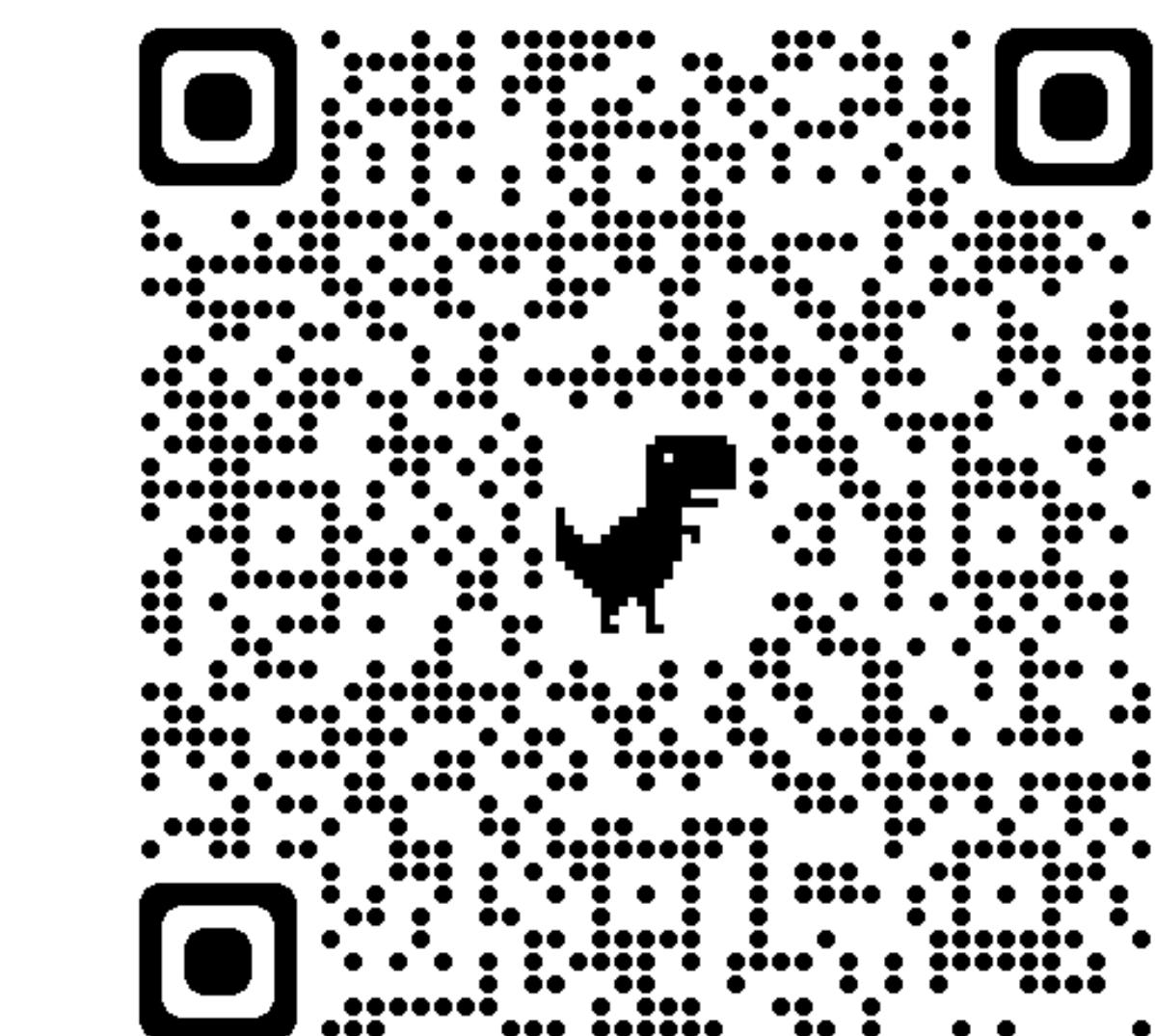
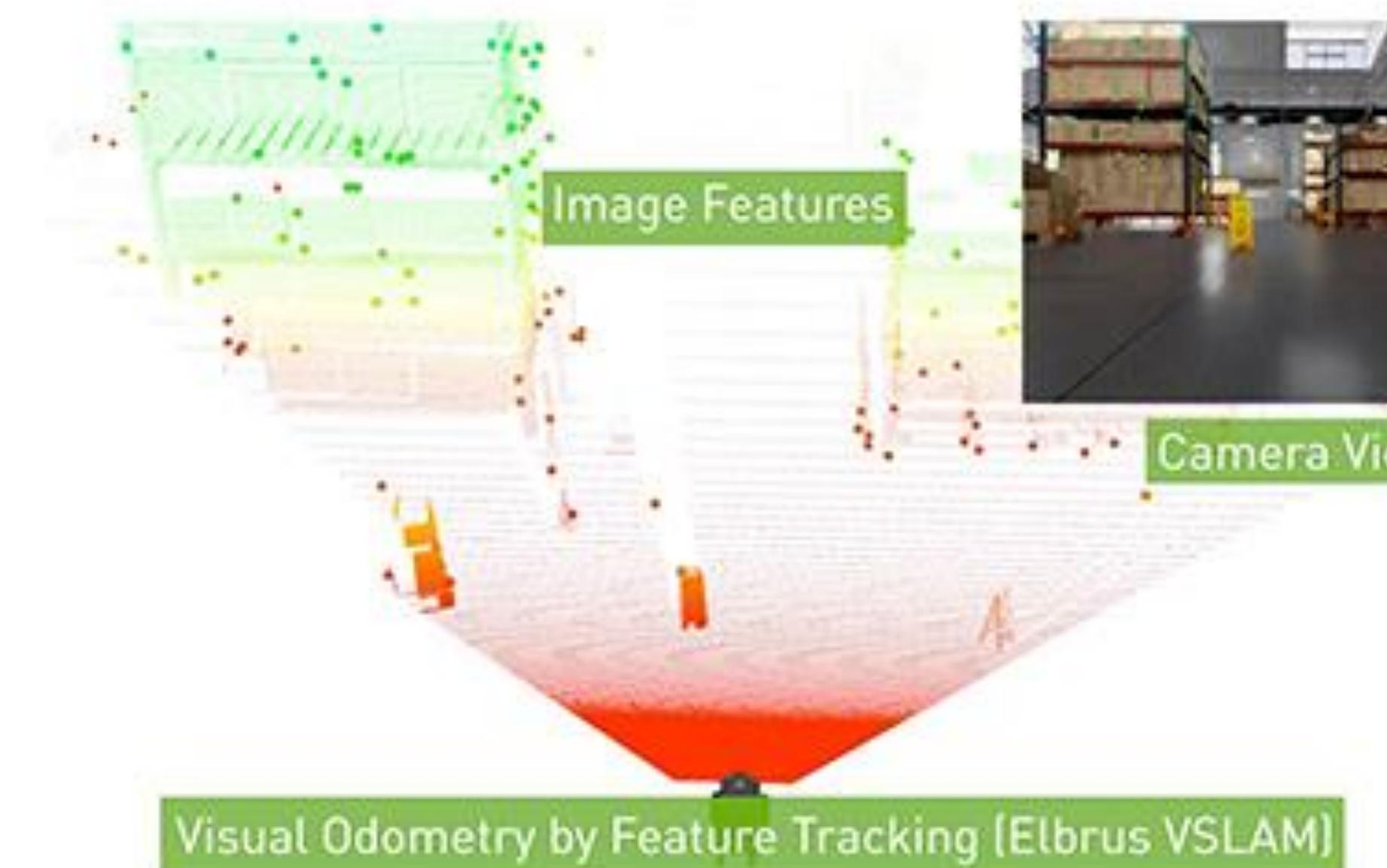
Report abuse





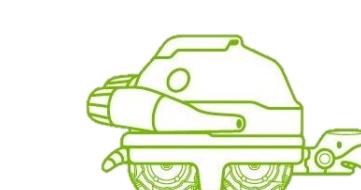
# Isaac ROS webinar

Pinpoint, 250 fps, ROS 2 Localization with vSLAM on Jetson



Isaac VSLAM ROS2 package performs stereo visual simultaneous localization and mapping (VSLAM) and estimates stereo visual inertial odometry using the Isaac Elbrus GPU-accelerated library.

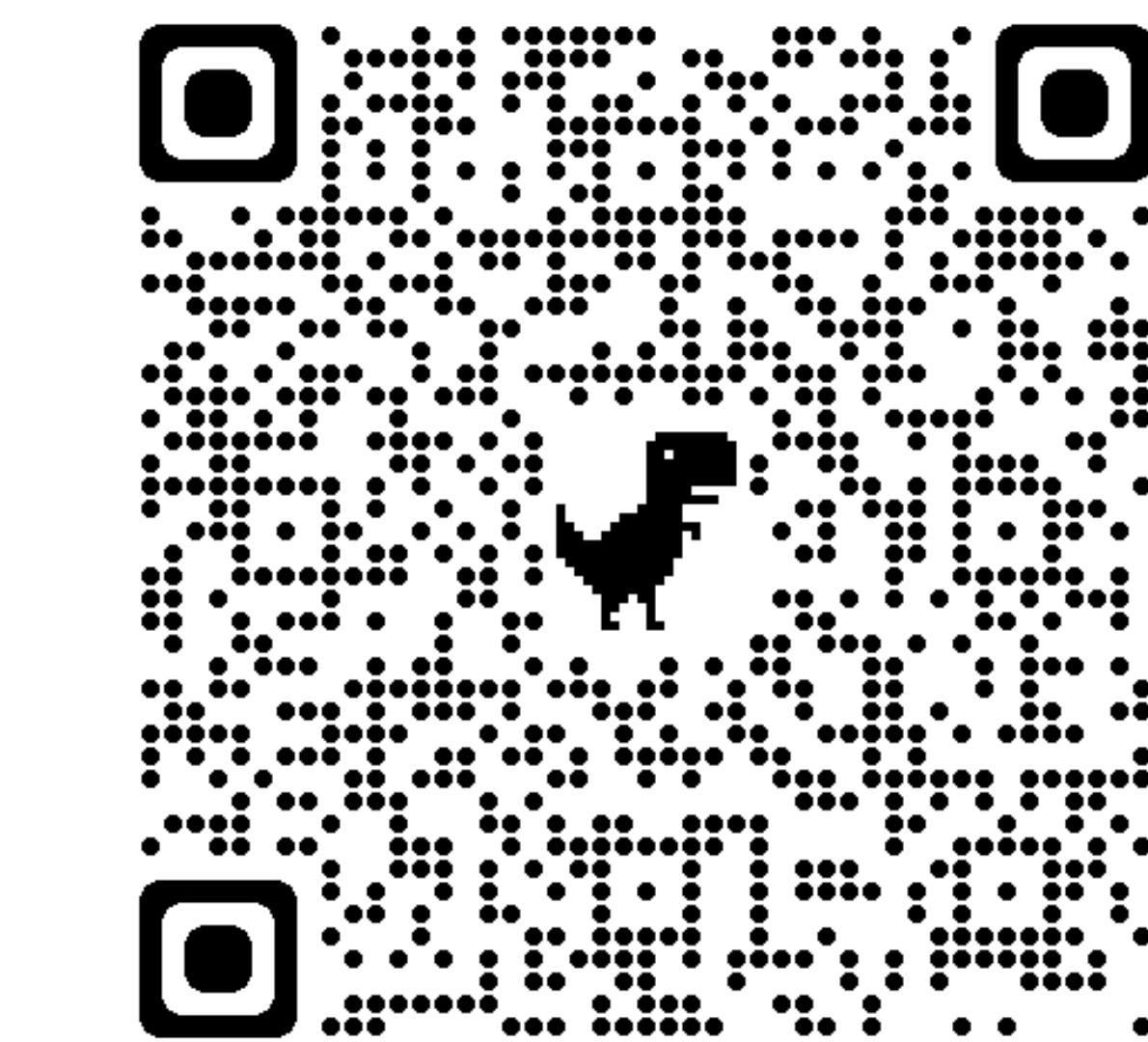
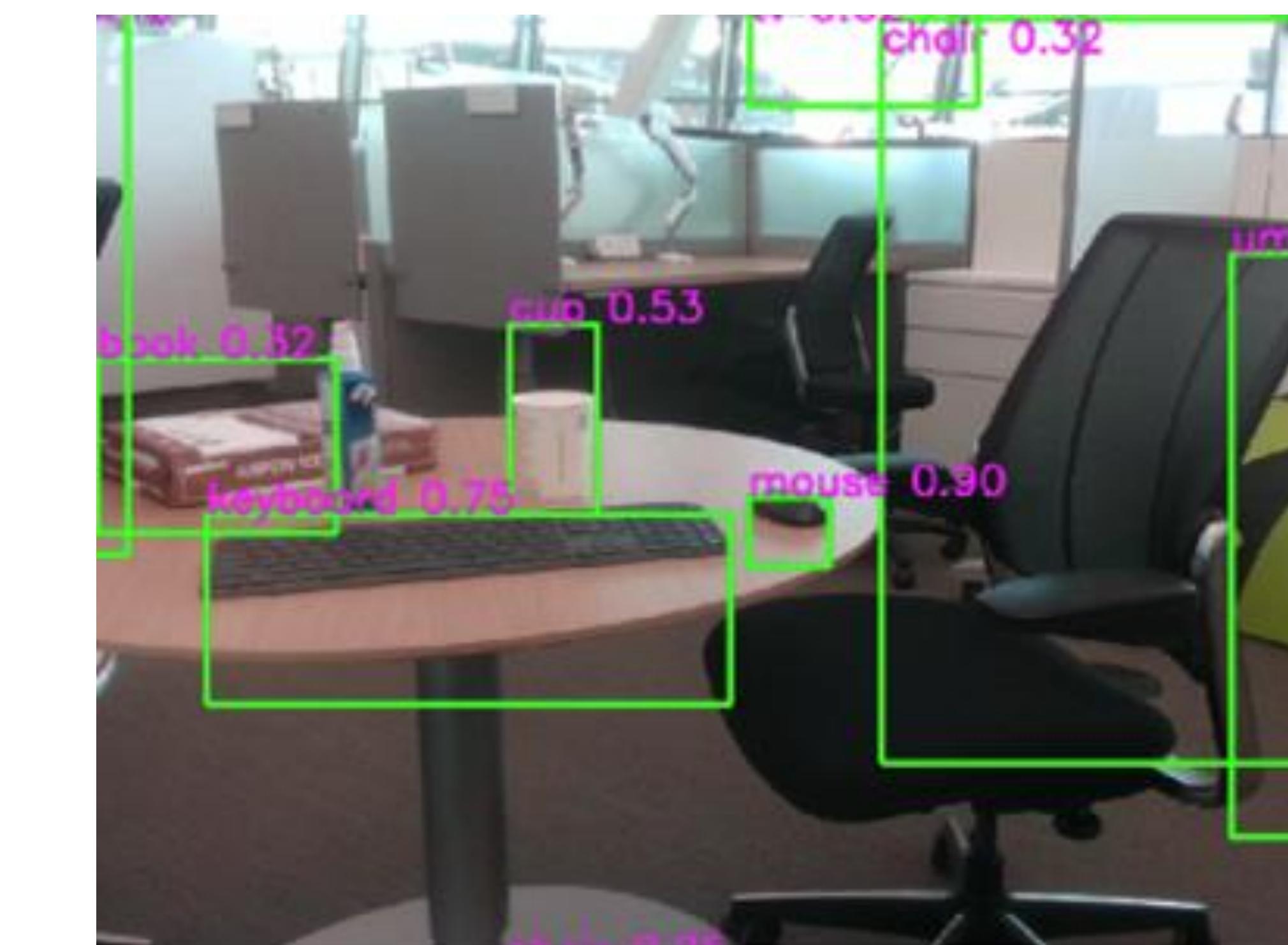
<https://gateway.on24.com/wcc/experience/elitenvidiabrigg/1407606/3998202/isaac-ros-webinar-series>





# Isaac ROS webinar

Accelerate YOLOv5 and Custom AI Models in ROS with NVIDIA Isaac



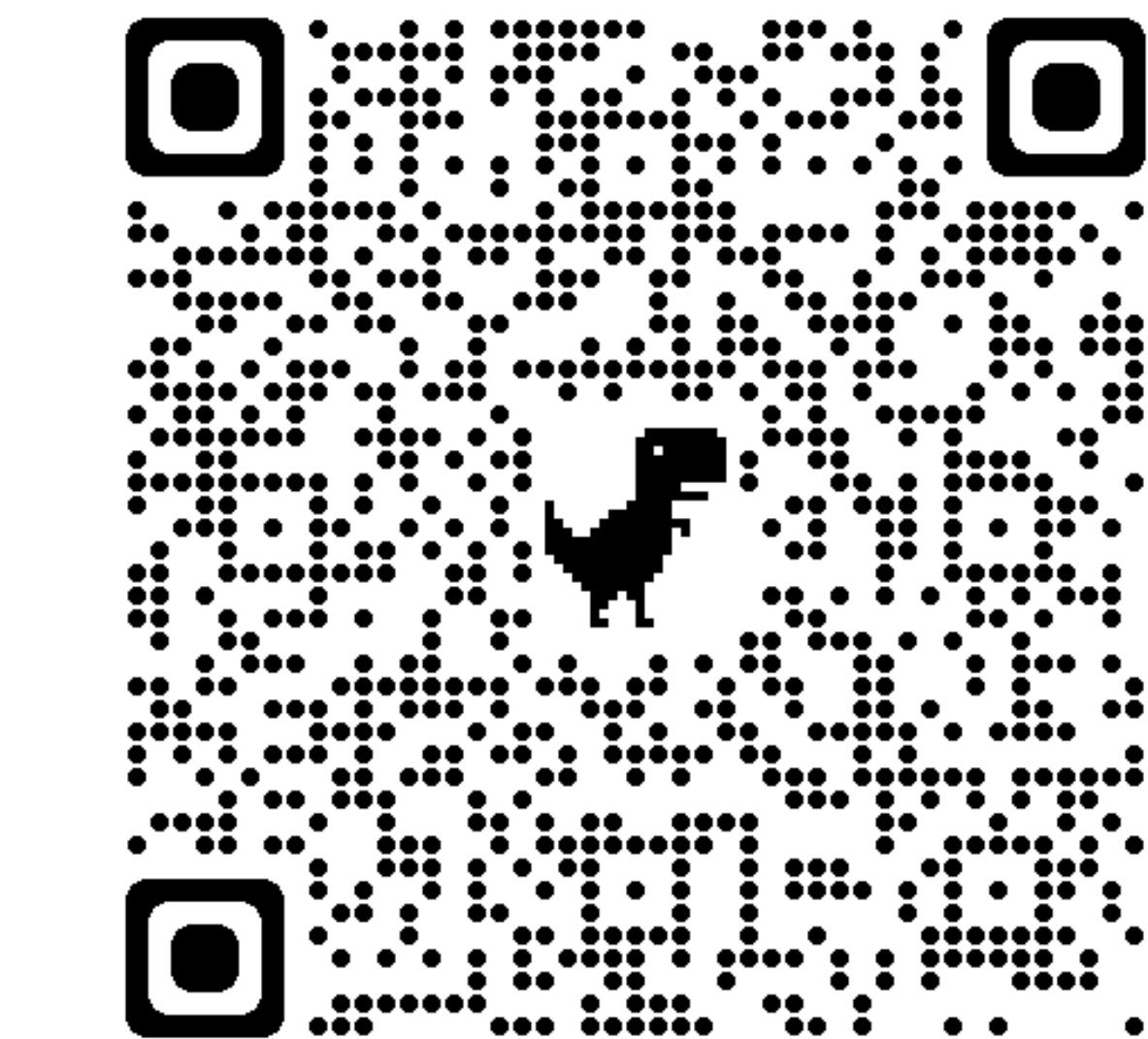
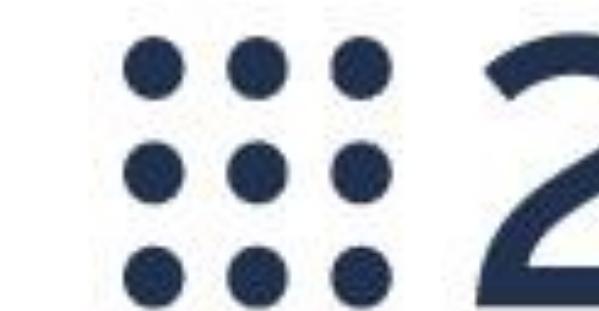
Learn about the NVIDIA Isaac ROS DNN Inference pipeline and how to use your own models with a YOLOv5 example.

<https://gateway.on24.com/wcc/experience/elitenvidiabrigg/1407606/3998202/isaac-ros-webinar-series>



# Isaac ROS webinar

Be an Isaac ROS DevOps Hero with  
Containerized Development



we investigate how to build your workstation and your NVIDIA Jetson Isaac ROS. Starting with an introduction to Docker and Continuous Integration (CI), we deep dive into Isaac ROS, how to set up a basic docker, and how to build the Isaac ROS packages directly for your distribution.

<https://gateway.on24.com/wcc/experience/elitenvidiabrigg/1407606/3998202/isaac-ros-webinar-series>



