

NASA Space ROS Sim Summer Sprint Challenge

Help make the Space Robot Operating System (ROS) more robust and assist NASA's plan for future missions by adding to the repository.

Solvers need to fill out the [Challenge Registration Form](#) before submitting the solution. Please refer to the [Guidelines](#) tab for more information.

Overview

[Space ROS](#) is an open-source software framework, derived from [ROS 2](#), which was created to be compatible with the demands of safety-critical space robotics applications. NASA is looking to expand the Space ROS repository with new higher fidelity demonstration environments and additional capabilities.

If you can provide a useful addition to Space ROS, you could be eligible for a share of the \$30,000 US prize purse.

Background

The Space ROS project started with a joint agreement between the private space industry and NASA (see: <https://space-ros.github.io/docs/rolling/Introduction.html>). Space ROS is intended to be an open, community-driven effort. Through this Challenge, NASA hopes to grow the community of contributors and increase the functionality and usability of Space ROS.

Using the ROS 2 Humble distribution as a foundation, Space ROS is designed to be platform independent, portable, and project independent. Space ROS is becoming a robust framework for space robotics applications where ROS 2 applications can be reused with little to no modification, enabling the space community to take advantage of the innovation of the ROS community.

Building out Space ROS capabilities can shorten the time for development of novel space robotics capabilities, enable reuse of capabilities between missions, and lower the life-cycle cost of new space robotics missions. While Space ROS can be used by anyone working within the space community, NASA is particularly interested in additions to Space ROS that might impact future missions. For example, improvements to Space ROS will help speed testing and development of the new robotic technologies needed for NASA's future Lunar missions as part of its Artemis program.

Space ROS currently has two existing demos, a Curiosity Mars Rover demo and an ISS Robot Arm (SSRMS) demo. However, the [Gazebo](#) simulator environments in which they are placed are very basic and the capabilities these demos show are minimal. Expanding these demos to include higher fidelity environments and adding new capabilities would better show the concepts and benefits of using the Space ROS.

Some examples of how the Space ROS could be improved include:

- Making existing demo or environments more accurate
Examples: incorporating public source data
- Making demos look more realistic
Examples: adding better lighting or model fidelity
- Helping robots perform tasks better
Examples: conducting scientific experiments or resource allocation
- Adding new, relevant demos or environments
- Adding new features, capabilities, integrations, or interfaces

Solution Requirements

- Solvers may submit more than one solution however the solutions must be substantively different.
- Only complete submissions will be eligible for judging and prizes. Submissions must include complete: Registration Form, Submission Form, Visuals (screenshots or video), and code submission to the Space ROS Repository.
- All solutions must conform to the Space ROS contribution rules.
- All solutions must conform to the ROS style guide/community standards.
- Each solution should include an explanation or demonstration of how the solution might apply to future NASA missions.

Space ROS Contribution Rules

<https://github.com/space-ros/space-ros/blob/main/CONTRIBUTING.md>

The following subsections address how to contribute to the Space ROS project.

All Solvers should follow these rules when submitting contributions to the Space ROS. These rules have been designed to simplify the process of establishing compliance with requirements of space software.

Commits

All commits must reference the issue they address. A consequence of this is that no commits can be made unless there is a corresponding issue for them.

Note: for this competition, reference “NASA Space ROS Sim Summer Sprint Challenge” as the issue.

Pull Requests

All changes are incorporated via pull requests (even changes by the core team).

All PR merges introduce a separate merge commit (i.e., `git merge --no-ff`), that closes the issue that the PR addresses, as well as any other issues that are fixed as a side effect, or that can no longer be reproduced after the change. The commit uses the syntax `Closes #<Ref>`, `Fix #<Ref>` or a command supported by github to automatically close the issue.

There'll be a preference for PRs to address only one issue at a time, but we'll be flexible especially for cases in which a fix addresses multiple related issues at the same time (see point above).

All PRs must be approved by a maintainer. When the author of the PR is one of the maintainers, a different maintainer must approve the PR.

All PRs must pass the tests for the repository they are being committed to.

The commit history must be clean. Contributors and maintainers are recommended to rebase and squash as needed prior to accepting a PR and merging the changes, so that the commits present how to introduce the change onto the HEAD in an understandable way (rather than describing all the intermediate steps taken until the final solution was discovered).

ROS 2 Contributing Guidelines

To contribute to the Space ROS and ROS 2 projects please refer to the ROS 2 contributing guidelines (see: <https://docs.ros.org/en/rolling/The-ROS2-Project/Contributing.html>)

Developer Guide

<https://docs.ros.org/en/rolling/The-ROS2-Project/Contributing/Developer-Guide.html>

Resources

Space ROS Website

<https://space.ros.org/>

ROS Website

<https://www.ros.org/>

Space ROS documentation. Includes information about Space ROS including tutorials, how-to guides, and demos.

<https://space-ros.github.io/docs/rolling/index.html>

Space ROS contribution guidelines. All submissions must follow the contribution rules.

<https://github.com/space-ros/space-ros/blob/main/CONTRIBUTING.md>

ROS 2 Project Documentation. This includes style guide, community standards, and technical information about ROS 2.

<https://docs.ros.org/en/rolling/The-ROS2-Project/Contributing/Code-Style-Language-Versions.html>

Space ROS Demos

https://github.com/space-ros/docker/tree/main/space_robots

NASA Moon to Mars Architecture Definition Document

<https://www.nasa.gov/wp-content/uploads/2024/01/rev-a-acr23-esdmd-001-m2madd.pdf>

NASA Artemis Missions

<https://www.nasa.gov/humans-in-space/artemis/>

Eligibility Requirements

- Must be at least 18 years old.
- May compete as an Individual, Team, or Entity; however, the prize will be awarded in whole to the submitter (Team Lead).
- The Team Lead must be eligible to receive payment under the laws of the United States; U.S. federal sanctions prohibit participation from certain countries. (see: <https://ofac.treasury.gov/sanctions-programs-and-country-information>).
- Solutions must originate from either the U.S. or a designated country (see definition of designated country at https://www.acquisition.gov/far/part-25#FAR_25_003).

See the full rules, including Eligibility Requirements under the Guidelines Tab.

Challenge Schedule

Challenge Launch	July 18, 2024
Webinar	The week of August 5, 2024
Challenge Close	September 11, 2024 5:00 PM ET
Judging Complete	September 30, 2024
Winners Announced	October 7, 2024

Prizes

1st Place	\$10,000
2nd Place	\$7,500
3rd Place	\$5,000
4th Place	\$3,000

5th Place	\$2,500
Honorable Mention	\$500 (up to 4 prizes)

All prize money will be awarded to candidate proposals deemed viable. Honorable mention prizes will go to submissions that the Judging panel deemed to have interest or value outside of the judging rubric.

Contact

Please submit your questions in the challenge Clarification Board or via email at:

nasa-rst@freelancer.com

How to Enter

Solvers can be:

- Individuals
- A group of individuals (a Team)
- Affiliated with a company, an organization, or a university (an Entity).

Teams and Entities must designate a Team Lead to be the primary contact. Submission must be done by the Team Lead. See Team Lead description below.

To submit your Solution:

1. Register on Freelancer.com

In order to submit your solution, the Team Lead will need a Freelancer account. [Sign up](#) for a Freelancer account at Freelancer.com.

2. Register for the Challenge

Once you have a Freelancer account, you must register for the Challenge by completing the [Challenge Registration Form](#). The Challenge Registration Form provides us with your contact information. This information will be used to determine whether you are eligible to compete in the Challenge (Eligibility Requirements).

Only registered solvers will receive timely information via email about the Challenge, including notices of webinars, weekly digests of questions, and all other Challenge updates.

3. Submit your Solution

- a. **Submission Form** must be submitted as an entry to the Challenge on the [Challenge Page](#) prior to the deadline, September 11, 2024 at 5 PM ET.
The Submission Form template (a fillable .pdf) is attached in the Files section on the Challenge Page.
- b. **Visuals** must be uploaded to the [Challenge Page](#) **as part of the same entry** as the Submission Form. Screen shots must be uploaded in .pdf format. Videos must be in .mp4 format. All media files must be uploaded to the same entry on the Challenge Page.
- c. **Code Submissions** must be uploaded to the [Space ROS GitHub](#) before the deadline. Changes may be made up until the deadline but any code added after the deadline will not be considered for judging. Submissions must be packaged as an open-source Docker file or a docker-compose.yml configuration. All documentation and required supporting information must be provided in the upload as well.

Please note that the Space ROS team is currently implementing updates to the project. Therefore, we request that all pull requests be submitted after August 1, 2024.

*For more information, see the **Submission Guideline Document** (attached in the Files section on the Challenge Page).*

Submission Requirements

Solvers must submit all required information prior to the deadline of September 11, 2024 at 5 PM ET. Submissions may be updated up until the deadline. Submission Form and Visuals must be uploaded to the [Challenge Page](#) in the same entry. Repo Submissions must be added to the Space ROS GitHub.

Submission **must** include:

- **Registration Form**
 - Submission Name (optional)
 - Individual/Team/Entity
 - Team Lead contact information
 - Team member(s) information
 - Certification that Team Lead has read, understand, and agrees to follow official rules
 - How they learned about the challenge
- **Submission Form**

All submissions must be complete, in English and saved in .pdf format, and uploaded to the Challenge Webpage prior to the deadline. Submission forms must include:

 - Submission Title

- Team Lead Freelancer Name
- Team Lead GitHub Username
- Submission Description
 - What makes the submission unique?
 - How can it be used within Space ROS?
 - How might it apply to future NASA missions?
- Link to their Space ROS pull request
- **Visual Submission**

Visual submissions can be **either** a 5-minute video **or** multiple screenshots. The visuals must show the capabilities of the submission either through a video or a set of screenshots. The visuals will supplement the written descriptions provided in the Submission Form.

 - Videos must include either audio or on-screen captions in English and be uploaded in .mp4 format.
 - Screen shots must be uploaded in .pdf format and include a description for each image. You can submit up to 10 screenshots.
- **Code Submission**

Submissions must be uploaded to the [Space ROS GitHub](#), into existing repositories within it. There are already existing repositories for [Demos](#) and [Simulations](#). Changes to the existing demos can be made within existing folders, new demos or features that don't exist yet can be added as a new folder. It must:

 1. Meet all requirements for Space ROS pull request
 - a. Additionally, the pull request should be named "NASA Challenge_[@your freelancer username]_[Submission Title]"
 2. Be a Dockerfile or docker-compose.yml configuration that can be built upon Space ROS
 - a. Dockerfile example: FROM osrf/space-ros:latest
 3. Be published with a compatible open-source license
 - a. ROS 2 code is licensed under Apache 2.0 License, with ported ROS 1 code under the 3-clause (or "new") BSD License. Both licenses allow permissive use of the software, without implications on the user's intellectual property
 4. Include a README file

In addition to the [ROS 2 requirements](#) for a README file, the README **MUST** also contain:

 - a. Challenge Name: NASA Space ROS Sim Summer Sprint Challenge
 - b. Team Lead Freelancer User Name
 - c. Submission Title (must be the same as on the Submission Form)

ROS 2 README Requirements:

 - d. Description and purpose of package
 - e. Definition and description of the public API
 - f. Examples
 - g. How to build and install (should reference external tools/workflows)
 - h. How to build and run tests

- i. How to build documentation
 - j. How to develop (useful for describing things like python setup.py develop)
 - k. License and copyright statements
5. Source code

Judging

Prior to being submitted for judging, all submissions will be reviewed for completeness, eligibility, and applicability to the Challenge goals. Only submissions that meet the requirements will be submitted for judging.

Category	Description	Points
Improvements to Space ROS		
	Degree to which submission improves the accuracy to existing demos or environments and/or Degree to which submission improves the visual fidelity of Space ROS demos and/or Degree to which it improves the capabilities demonstrated within Space ROS and/or The quality and usefulness of new demos or environments and/or The extent of new features, capabilities, integrations, or interfaces And the overall quality of all of the above.	40
Ability to be merged into Space ROS		
	Satisfies all requirements to be merged into the repository including: <ul style="list-style-type: none"> ● Completeness ● Complete, high-quality documentation ● Code follows guidelines and can be executed ● Reproducibility ● Applicability to the goals of Space ROS 	20
Description		20
	The quality and accuracy of the written / visual description of the solution.	
Uniqueness		10
	Provides a unique, novel, or otherwise interesting addition to the Space ROS repository.	
Applicability to future NASA missions		10
	The relevancy of the improvements, additions, or integrations to future NASA missions. Improvements to Space ROS that can be used to demonstrate elements of future NASA Missions within Space ROS.	

Official Rules

NASA and Challenge Partners reserve the right to cancel, suspend, and/or modify the challenge, or any part of it, for any reason.

Eligibility Requirements

For all Solvers, general eligibility requirements include:

- By participating in a Freelancer.com contest, each Solver (whether an individual, group of individuals, or entity) must agree to and abide by the following: Freelancer Eligibility Policies, [Freelancer User Agreement](#), and the [Freelancer Copyright Infringement Policy](#).
- Each Solver must complete and comply with the Freelancer ["Know Your Customer"](#) (KYC) process.
- Prior to receiving awards, Solvers must complete the [Freelancer.com handover process](#).
- All team members must be at least 18 years old and must be eligible to receive payment under the laws of the United States.
- The team lead must be eligible to receive payment under the laws of the United States; U.S. federal sanctions prohibit participation from certain countries. (see: <https://ofac.treasury.gov/sanctions-programs-and-country-information>)
- Solvers may not be an employee of NASA or a competition partner employee.
- Solvers may not be a Federal employee acting within the scope of their employment.
- Government contractors working on the same or similar projects are ineligible to participate in the Challenge.
- Any individuals (including an individual's parent, spouse, or child) or private entities involved with any aspect of the design, production, execution, distribution, or evaluation of the Challenge are not eligible to enter as an individual or member of a team.
- Federal employees acting in their personal capacities should consult with their respective agency ethics officials to determine whether their participation in this Challenge is permissible. If you work for a Government contractor and this solution was made either under a Government Contract, Grant, or Cooperative Agreement, or while performing work for the employer, you should seek legal advice from your employer's ethics agency on your conditions of employment which may affect your ability to submit a solution to this Challenge and/or to accept award.
- Funds from U.S. or foreign government organizations should not be used to directly fund the development of a solution to this Challenge. Solutions that were previously developed with Government/Federal funds, or where Government/Federal funds, including but not limited to, employee time, materials, and reviews, were utilized to prepare the submission or solutions are prohibited.
- Solvers currently receiving Federal funding through a grant or cooperative agreement unrelated to the scope of this challenge are eligible to compete but may not utilize that Federal funding for competing in this challenge.

- Solvers may not be working with the Federal government as a CRADA collaborator if the statement of work of the CRADA includes the subject matter of the challenge or if the CRADA provides the Solver with a competitive advantage.
- A Solver that enters the Challenge without the ability to claim a cash prize based on the eligibility requirements above may not compete in the Challenge.

Submission Requirements

Solutions must originate from either the U.S. or a designated country (see definition of designated country at https://www.acquisition.gov/far/part-25#FAR_25_003), OR have been substantially transformed in the US or designated country prior to submission deadline pursuant to FAR 25.403(c).

The solution shall not include proprietary components or anything that requires licensing.

Team Lead

All communication from the Challenge Team will be directed to the Team Lead. Only the Team Lead will be authorized to interact with the Challenge Team, as facilitated by Freelancer, and be responsible for meeting all entry, evaluation, and administrative requirements of the challenge.

Payment

Payment of prize will be conducted via Freelancer.com platform. For any prize award, the winner will receive the full amount awarded; any Freelancer seller fee will be refunded to the winner.

If participating as a team, all payments will be made to the Team Lead who is solely responsible for the distribution of funds among team members.

Warrantees

Each Solver represents and warrants that the Solver is the sole author and copyright owner of the submission; and/or that the submission is an original work of the Solver; and/or that the Solver has acquired sufficient rights to use and to authorize others, including the Federal government, to use the submission, as specified throughout the Official Rules, that the submission does not infringe upon any copyright or upon any other third party rights of which the Solver is aware; and that the submission is free of malware.

The Solver represents and warrants that all information submitted is true and complete to the best of the Solver's knowledge, that the Solver has the right and authority to submit the entry on the Solver's own behalf or on behalf of the persons and entities that the Solver specifies within the entry, and that the entry (both the information and materials submitted in the entry and the underlying technology/method/idea/treatment protocol/solution described in the entry):

- is the Solver's own original work, or is submitted by permission with full and proper credit given within the entry;
- does not knowingly violate or infringe upon the patent rights, industrial design rights, copyrights, trademarks, rights in technical data, rights of privacy, publicity or other intellectual property or other rights of any person or entity;
- does not trigger any reporting or royalty or other obligation to any third party.

No Confidential Information

Each Solver agrees and warrants that no part of its submission includes any trade secret information, ideas or products, including but not limited to information, ideas or products within the scope of the Trade Secrets Act, 18 U.S.C. § 1905. All submissions to this prize challenge are deemed non-proprietary. Since the Federal Government will not accept or hold any submitted materials "in confidence" it is agreed that, with respect to the Solver's entry, no confidential or fiduciary relationship or obligation of secrecy is established between the Federal government and the Solver, the Solver's team, or the company or institution the Solver represents when submitting an entry, or any other person or entity associated with any part of the Solver's entry

Intellectual Property

Each Winning Team (whether an individual or group of individuals) selected to win a prize under this Challenge must apply a permissive open source license, such as Apache 2.0, MIT, or BSD3, to their solution(s) and retain the software and accompanying documentation in a publicly available repository until December 31, 2025.

Ownership of all intellectual property rights, if any, in the idea or concept demonstrated by the proposed solution will remain with the solver.

General Conditions

NASA and Challenge Partners reserve the right to cancel, suspend, and/or modify the challenge, or any part of it for any reason.

You agree to the terms set forth herein and to all decisions of NASA and Challenge Partners, which are final and binding in all respects.

Scores from the judging panel will not be shared with the Solvers.