



NISAR:

Lessons Learned in Responding to Increasingly Complex Earth Science Missions

Ground System Architecture Workshop
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February 2024



Jet Propulsion Laboratory
California Institute of Technology



JPL IT PROVIDES CRITICAL SERVICES IN SUPPORT OF FLIGHT PROJECTS

- IT services support technology needs from enterprise institutional to mission-critical and specific to individual flight projects.
- Over the years, IT and infrastructure required by flight projects have become increasingly complex.
- The needs for Earth missions have grown in terms of data volumes, and external partnerships.
- Federal cybersecurity mandates are steadily increasing and growing in scope.
- Early planning and coordination between JPL IT and flight projects is crucial to mission success.

NISAR Mission Overview

Artist rendering of NISAR spacecraft
Credits: NASA/JPL-Caltech

NISAR (NASA-ISRO SAR) is a joint mission between NASA and the Indian Space Research Organisation (ISRO).

The NISAR Mission will measure Earth's changing ecosystems, dynamic surfaces, and ice masses, providing information about biomass, natural hazards, sea level rise, and groundwater, and will support a host of other applications.

NISAR will observe Earth's land and ice-covered surfaces globally with 12-day regularity on ascending and descending passes, sampling Earth on average every six days for a baseline three-year mission.

IT Support for NISAR

Members of the integration and test team from JPL and ISRO pose with the S-SAR instrument.

Credits: NASA/JPL-Caltech



IT support NISAR began in early 2017, when it was recognized that this mission would require new and complex technology and infrastructure solutions.

The mission will create over **30 terabytes of science data per day**.

- This huge data volume could not be processed on premise by servers in JPL data centers.
- This need for handling very large data volumes by NISAR (and by a similar mission, SWOT) drove JPL to establish agreements with Amazon Web Services (AWS).
- NISAR testbeds at JPL helped drive updates to the on-premise network infrastructure.

The mission has also needed significant **impromptu assistance**:

- Regular unplanned labor and support to enable mission success
- Changing requirements within the mission
- On-site/on-call for critical events such as launches, orbit insertions, and landings

These key support areas are funded by a “mish-mash” of direct accounts, charge back, fees, and burden.

NISAR System Integration Test (SIT) Activities at JPL

- In July 2020, Kent Kellogg (NISAR Project Manager at the time) contacted JPL's IT leadership regarding a quick-turn request.
- The request cited the need for ISRO remote access connectivity to support upcoming NISAR System Integration and Test (SIT) activities:
 - S-band Synthetic Aperture Radar (S-SAR) and Baseband Data Handler (BDH) testing
 - Need-by date for remote access connectivity stated as “end of November 2020”
 - Test activities anticipated to last for 12 months
- SIT activities were originally planned to be conducted in-person; however, travel restrictions and quarantine requirements hindered this plan.
- NISAR and JPL's IT organization partnered to investigate the architecture, design, and implementation of an ISRO remote-access capability to support SIT activities.



NISAR flight antenna system in thermal vacuum chamber
Credits: NASA/JPL-Caltech

Prepare for SIT and Launch in India

SIT is now in the final phase of assembly and test prior to launch. The primary activities are at the ISRO Satellite Integration and Testing Establishment (SITE) facility in Bangalore, Karnataka, India.

IT support for NISAR now includes JPL Network Engineering and System Administration personnel on site in India at SITE.



NISAR science instrument payload is unloaded in Bengaluru, India, March 6.
Credits: ISRO

CYBERSECURITY



- Guided solution design to meet NISAR requirements while protecting the mission and JPL

IDENTITY

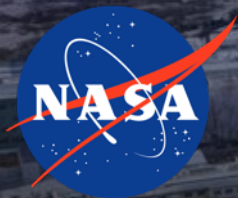


- Deployed DIAMOND (Distributed Identity and Access Management: Operations-supported, Network-integrated, mission-Dedicated) servers to provide essential IT services
- Randomized unchanged passwords prior to export to protect JPL

NETWORK



- Installed new connectivity solution from ISRO back to JPL
- Created wired networks to enable tablet-driven SIT activities in areas where WiFi and Internet are not permitted



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