Ground System Architectures Workshop
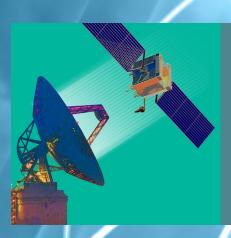*Stronger Together: Improving Interoperability for Users and Operations*

February 22–March 2, 2023 | The Aerospace Corporation | El Segundo | California

Cloud Computing and Big Data Technologies for Ground Systems

Ramesh Rangachar, The Aerospace Corporation

Session Goals

- Discuss the current trends, best practices, and lessons learned in using Cloud Computing and Big Data technologies for ground systems
- Key Focus Areas:
  - *State of the art in Cloud Computing and Big Data*
  - *Cloud and Big Data reference models*
  - *Cloud-based ground systems*
  - *Cloud and Big Data technologies*
  - *Cloud security, standards, and compliance*
  - *Acquisition strategies for cloud-based systems*
  - *Cloud computing economics*
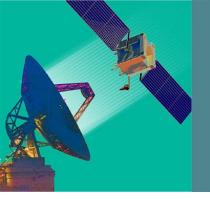 - *Cloud performance management*

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Presenters/Panelists

Time	Presentation	Author
12:30 PM to 2:00 PM	Introduction	**Ramesh Rangachar** The Aerospace Corporation
	The NOAA/NESDIS Common Cloud Framework: A Scalable, Agile and Enterprise Cloud Solution	**Kathryn Shontz** Director (Acting), OSGS NOAA Satellite and Information Service
	ESA Mission Operations shared Storage Cluster Solution	**Klara Widegård** European Space Agency (ESA)
	Earthdata in the cloud: PO.DAAC journey to the Cloud in support of SWOT	**Suresh Vannan** PO.DAAC Manager NASA Jet Propulsion Laboratory
2:00 PM to 3:00 PM	**Panel Discussion:** **Topic:** Cloud Migration: A Key Enabler for Next-Gen Ground Services **Panelists:** Kathryn Shontz, Klara Widegard, and Suresh Vannan **Moderator:** Richard Deslonde **Chat Monitors**: Sheryl Olguin and Stephen Marley	

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- 40 participants in person and 36 participants online/virtual.
- Kathryn Shontz (NOAA/NESDIS)
  - *Implementing the NESDIS Cloud Computing Framework (NCCF).*
  - *NCCF is a flexible, scalable, highly available and secure suite of cloud services to provide environmental data and science operations functionality to serve NOAA goals.*
  - *Discussed NCCF architecture, high level common ground services, and implementation roadmap.*
- Klara Widegard (ESA/ESOC)
  - *ESA is building one shared solution for all missions for operational data storage.*
  - *In line with the European Common Core requirements; missions will use shared infrastructure, shared solutions*
  - *Discussed technical solution, concerns, and mitigations.*
- Suresh Vannan (NASA JPL PO.DAAC Team)
  - *The mission of the PO.DAAC is to preserve NASA's ocean and climate data and make these universally accessible and meaningful.*
  - *2022 data archive volume is 76.4 PB; increasing to ~600 PB by 2029. Distributed 3 Billion files in 2022.*
  - *PO.DAAC is in the process of migrating its data archive to the Earthdata Cloud hosted on AWS.*
  - *Discussed the challenges (mainly, cost, security and migration).*

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- Agencies/organizations continue to migrate from mission-specific ground systems to common (or Enterprise) ground services.

- The amount of data managed by the ground systems as well as the rate of data growth is increasing.

- Common themes are:

  – *Transitioning to modern software development (agile, microservices, devsecops, etc.)*

  – *Negotiating with cloud providers for volume pricing, and*

  – *A focus on refactoring systems to common services.*

- Both public clouds and private clouds are being considered.

- Key concerns include cost, security, and migration effort. Risks are recognized, efforts are in place to mitigate the risks.

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