Re-engineering Space for the Cloud

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CSPS Paper "Re-engineering Space for the Cloud"

One Year of Research, Several Insightful Interviews

Interviewee	Affiliation
Naeem Atlaf	IBM Distinguished Engineer, CTO Space Technology
Victor Brown	VP/CTO IBM US Public Sector and Federal Markets
Joe Foster	Cloud Computing Program Manager, NASA GSFC
Shayn Hawthorne	Space Technology Lead, Amazon Web Services
Steve Kitay	Senior Director, Azure Space at Microsoft
Mike Mineiro	V.P. Legal, Regulatory, and Government Affairs at HawkEye 360, Inc.
Sarah Mineiro	Senior Director for Space Strategy, Anduril Industries
Katherine Monson	COO Hedron Space (was CEO KSAT US at the time of interview)
Ray O'Brien	Service Manager, Enterprise Managed Cloud Computing NASA
Irene Parker	Deputy Assistant Administrator Systems, NOAA/NESDIS
Karen Petraska	Program Executive for Computing Services, OCIO NASA
Hank Tseu	Senior Software Architect, Oneweb LTD

Topics of the Research

Bridging the Perspectives of Government and Industry

- ***Cloud benefits.*** An understanding of all the benefits is critical including agility and resiliency. Examine the opportunities, risks, and competitive advantages implied by space and ground systems in the Cloud.

- ***Cybersecurity***. Examine security implications for space and ground systems in the public cloud, including security intrusions, breaches, denial of service, multi-layer security protocols in multi-tenant environments, rapid detection of anomalies, and zero trust architecture.

- ***Policy Drivers and Roadblocks***. Examine international/US policy/regulations that enable or are a barrier to cloud implementations and recommendations for US policy/regulatory changes.

- ***Cloud based space and ground systems new applications.*** Including analysis at scale, rapid validation/verification of space-based Earth observations by integrating IoT, expansion of the range of space-based communication, self-healing adaptive systems, platforms and services for broader data exploitation by the US public and commercial interests.

- ***Expansion of Cloud technology beyond current boundaries.*** (possibilities/likelihood) examine how the US Space industry will stay ahead of global competitors and review satellite as a service, interfaces with (IoT) sensors as a service, orbital edge computing and storage, off-world edge computing and storage, interfaces with bio-sensors and wearables.

Exploring the enablers and barriers affecting the adoption of cloud technologies by commercial, defense and civil space sector.

Key Takeaways

Commoditization – Agility - Innovation

- Space is becoming a commodity
  - *The space sector is rapidly shifting from a few closely held centralized assets and data platforms to an ecosystem with multiple sources delivering actionable information.*
- Acquisition Agility
  - *Technology innovation in the commercial sector is fast paced, and service based. Rapid decisions are required for government to use and benefit from this.*
  - *Government encourages investment by vendors by providing demand signals. Government and vendors benefit from the cloud services consumption model.*
  - *Many federal execs may have only worked in GOGO models and may not know how to be successful with COCO models.*
    - Collaboration between domain and cloud SMEs across government, industry, contractors and FFRDC's yields opportunities for innovative solutions vs heavily prescriptive requirements.
- Take advantage of industry's willingness to assume capital risk
  - *Industry will invest in the space sector, sell as a service, and can benefit government*
- Take more risks to assume greater benefits and returns
  - *Focus on resilience rather than attempting to eliminate failure*
- Update regulatory framework for foreign data and future proof (Best Available Technology) to avoid regulation obsolescence

Challenges faced by the Space Sector require collaboration and innovative solutions birthed from ideation to implementation by government and industry