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LEOcloud

HOW CLOUD INFRASTRUCTURE WILL EXTEND INTO SPACE TO ENABLE THE EMERGING SPACE ECONOMY

C21-VIRTUAL
THURSDAY, FEB. 12

SATELLITE AND THE CLOUD:
INNOVATIVE CLOUD STRATEGIES INFUSING NEXT-GEN TECH

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DENNIS GATENS
PRESIDENT, LEOcloud

BLUF

- *LEOcloud is now part of Voyager Technologies*

- 1st Generation Space Edge IaaS Micro Datacenter is operational on the ISS
  - Collaborating with partners to demonstrate utilization of a space cloud region
- Market-driven technology strategy focused on scalable orbiting datacenters for LEO, lunar region and beyond
- Voyager has a broad portfolio of technology with decades of mission critical space system design experience
- Voyager announces strategic lunar initiative

- Clear market validation for orbiting compute
  - Datacenter tenant model is emerging in space
- Evolving ODC Market Segmentation
  - Micro and Datacenters
    - 100 – 100K watts
  - Gigawatt Datacenters
    - Megawatts to Gigawatts
- Micro and Datacenter class
  - Address the requirements of latency, security, data transport for actionable insight
    - Resiliency is key point of differentiation
    - Military, government, commercial
- Gigawatt Datacenter class
  - Anticipated sustainability, operational cost, regulatory and sovereignty advantages to deliver cloud services
    - Mass market consumer, military, government, commercial
  - Technology Gaps: Power, Thermal management, Optical communications infrastructure

Why extend cloud services into space?

- Space is a data-driven, consumption-based economy, requiring critical infrastructure
  - In support of economy, national security, safety
- The space economy and a permanent presence will require communications and cloud services
- The edge computing value proposition of moving resources as close as possible to the sources and users of data is greatly amplified in space


@%@% ...
NETFLIX

Houston … we have a problem …

Houston … we have a #%@# problem! … Houston?

Experiencing a spinning wheel when downloading a video is annoying … it has potentially severe mission and national security consequences in space …

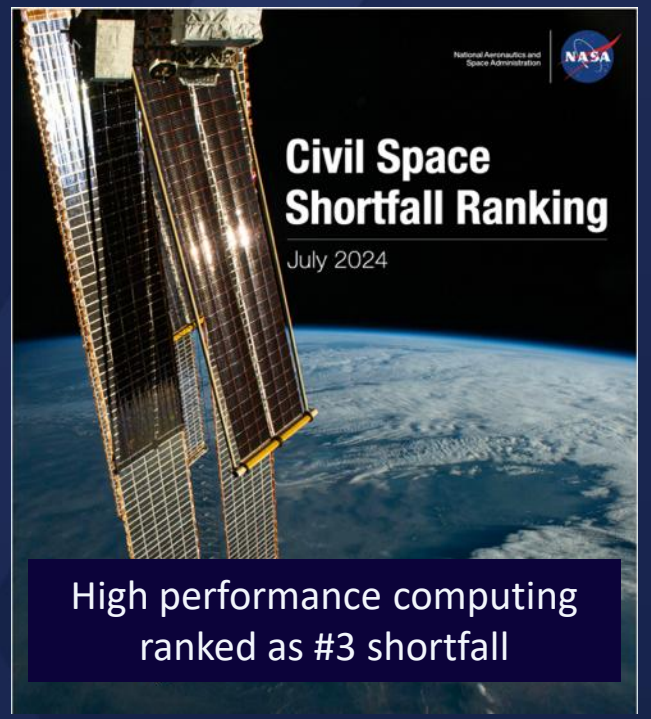
… moving cloud resources as close as possible to the sources and users of data is the solution … the further from Earth the greater the importance …

The Problem
Commercial Space Is A Data-Driven Economy

- End users in space and on Earth require AI-driven results from space-sourced data
- Missions and business cases are dependent on latency, security and data transport capacity and cost
- Significant volume of space-sourced data is not analyzed due to its limited relevant shelf life
- Cloud service providers are seeking partners for managed space-hardened hardware infrastructure to extend their services into space

"We need data centers in Space, now"

Steve 'Bucky' Butow, Director of Space Portfolio, Defense Innovation Unit
Space Mobility Conference, 2023



The LEOcloud Solution

An Inside The Terrestrial Loop (ITTL)™ Paradigm Shift Is Required

- Multi-cloud Infrastructure as a Service (IaaS) for commercial, government and military end users
- Scalable, managed service that enables:
  - Spacecraft operators to offer cloud-based edge computing capabilities
  - Cloud service providers to extend their cloud services into space
- Provide a connected enterprise cloud infrastructure between Earth and space

LEOcloud's Mission

Be the 1st market mover and sustained market leader in LEO, lunar and beyond

LEOcloud

the Multi-Cloud IaaS provider that delivers space-based cloud services as close as possible to the sources and users of data

- **Commercial Space Stations**
- **Orbiting Data Centers**
- **Satellites, Manufacturing and Research Platforms**
- **Lunar Region Facilities**

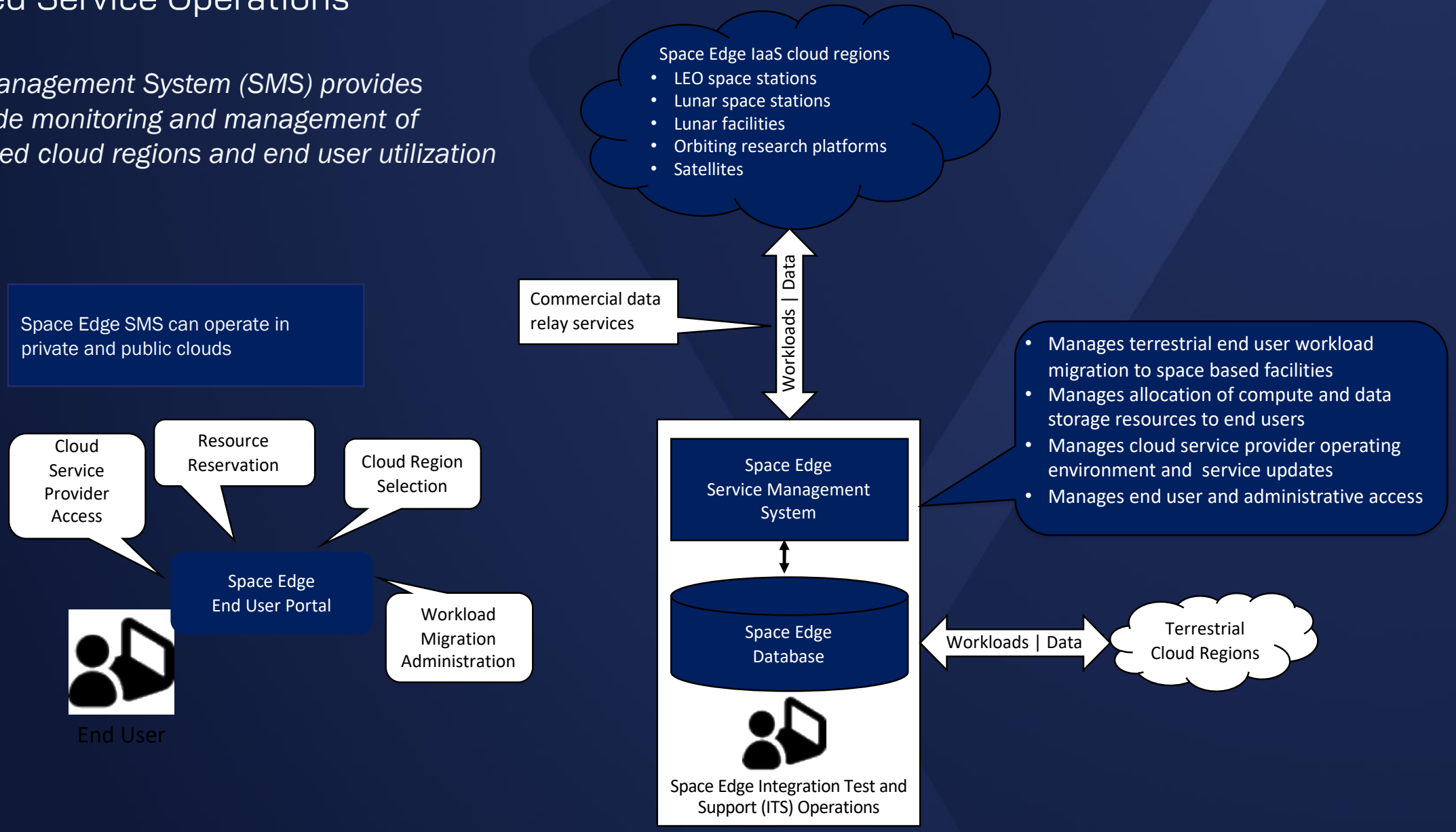
Space Edge Orbiting Data Centers

Space Edge is the “Data” in Orbiting Data Centers

- ODCs will be part of critical infrastructure in LEO, lunar region and beyond
- Hosted on:
  - Satellite constellations
  - Nextgen space stations
  - Research and ISAM platforms
  - Purpose built, dedicated orbiting data centers
- Human-rated and external environments
- Networked for redundancy, geo-diversity, scalability and resiliency
- Support technology refresh
- ODC facility providers business model will evolve as they have on Earth, where they provide the real estate and utilities (communications, power, thermal management) for hosted services such as Space Edge
  - Tenant Model

Space Edge IaaS System Overview
Managed Service Operations

Service Management System (SMS) provides system-wide monitoring and management of space-based cloud regions and end user utilization



Space Edge IaaS Overview
Multi-Cloud Managed Space Edge IaaS

XIPHOS

- Space-hardened server technology
- Tier 3 Support

Microsoft aws Google

Cloud Service Providers

IBM Cloud ORACLE

LEOcloud
Space Edge IaaS

- Space Edge Micro Datacenter
- End-End Integrated Service Management
- Cloud Service Provider Reseller and Life Cycle Management
- Customer Specific Requirements
- End User Onboarding Support
- Hardware and Software Life Cycle Management
- Hardware and Software Roadmap
- Remote System Monitoring
- Maintenance, Training and Sparing
- Tier 1/2 Support, and Tier 3 Flow Through
- Manage 3rd party hardware

Space Edge IaaS cloud regions in space

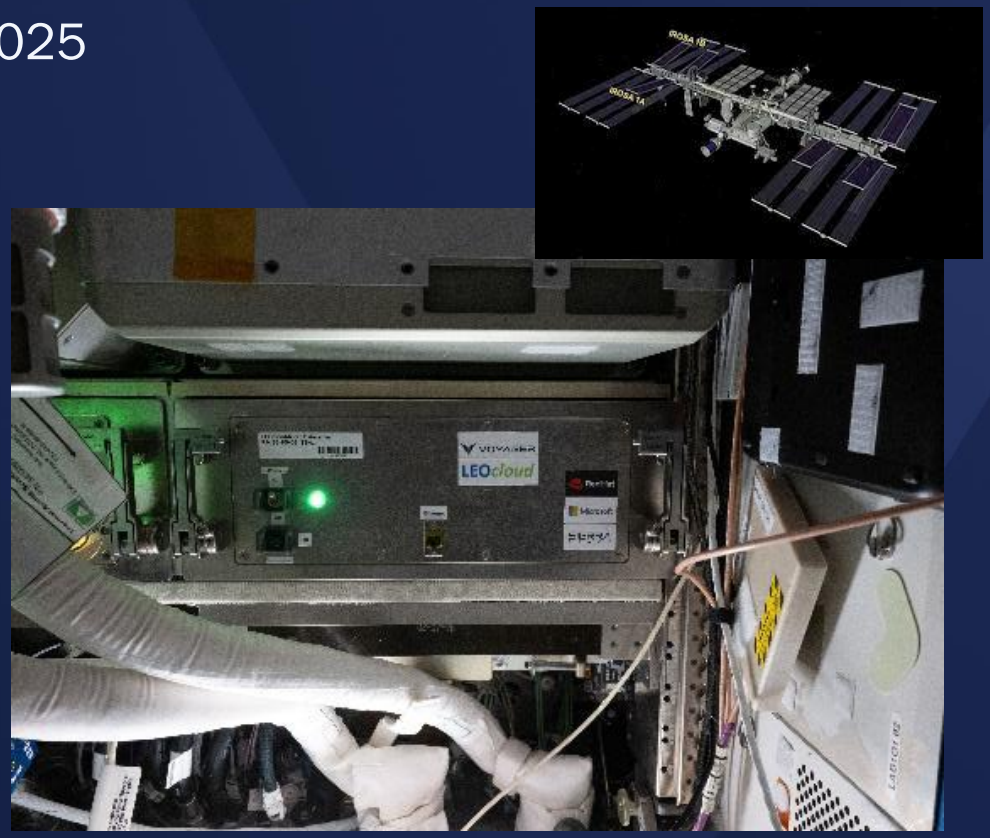
ISSNL Project

The 1st Cloud Region in Space

- 1st Generation Space Edge IaaS
- Commissioned in September 2025

Highlights

- Enables end users, application partners and cloud service providers access to and utilization of a space-based cloud region
- Hosted in an EXPRESS Rack ISIS Drawer
- Project duration is maximum 18 months
- Proposed to CASIS and NASA to transition to a commercial service after project is complete

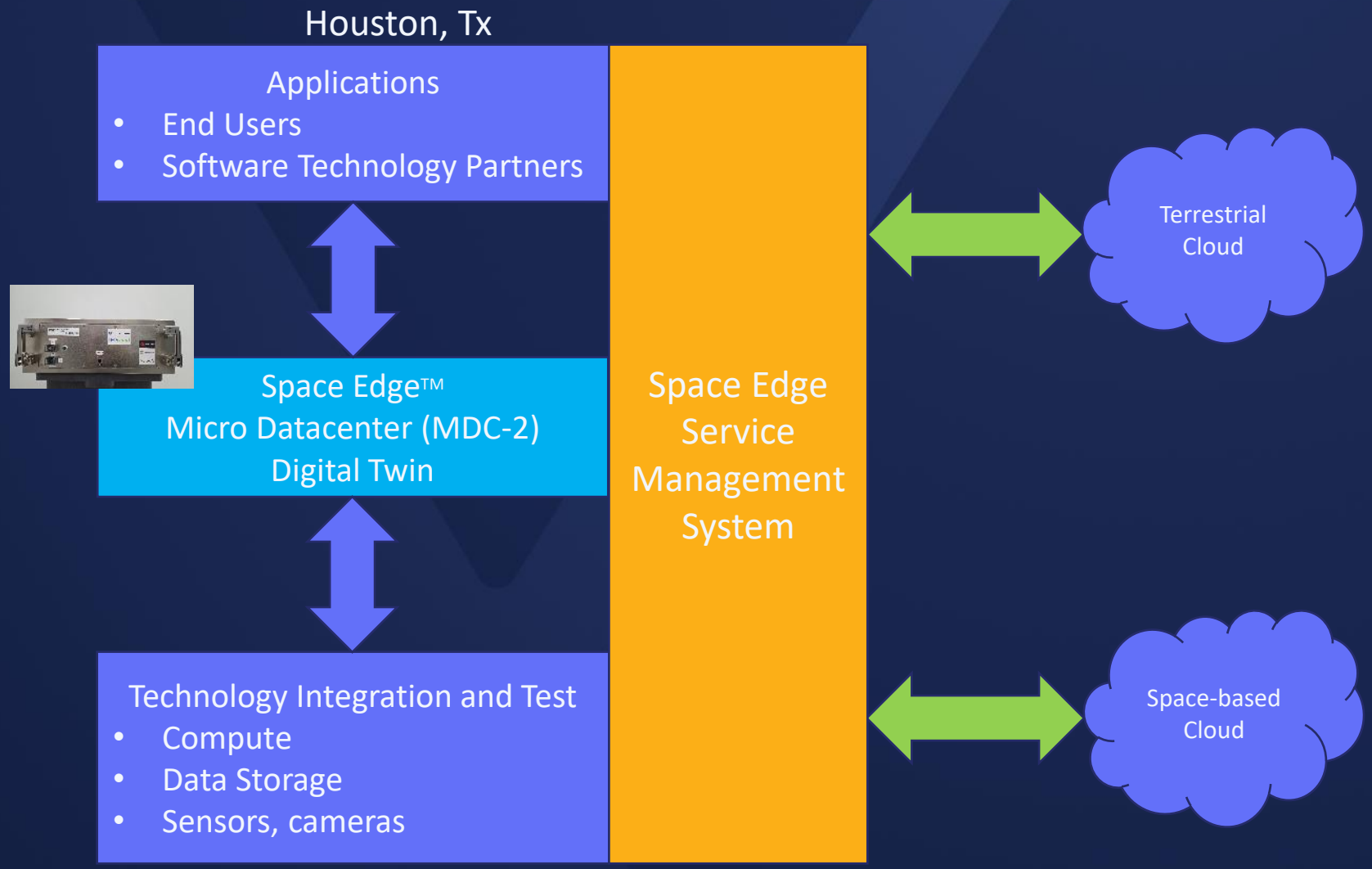


Project Objectives

- Demonstrate highly reliable, scalable and resilient technology that can support the broad range of use cases for space-based missions, R&D and operations
- A multi-cloud, virtualized cloud environment in space
- Application migration from terrestrial cloud to a cloud region in space
- Process data sourced from existing and future ISS instruments

Space Edge IaaS System Overview
Integration, Test and Support Operations (ITS)

- Continuous health and status monitoring of Space Edge cloud regions
- Cloud region resource management and application migration
- Integration and test of software updates and releases
- Customer demonstration
- Performance benchmarking
- Interoperability testing
- 3rd party technology integration and test
- Experienced space ops team



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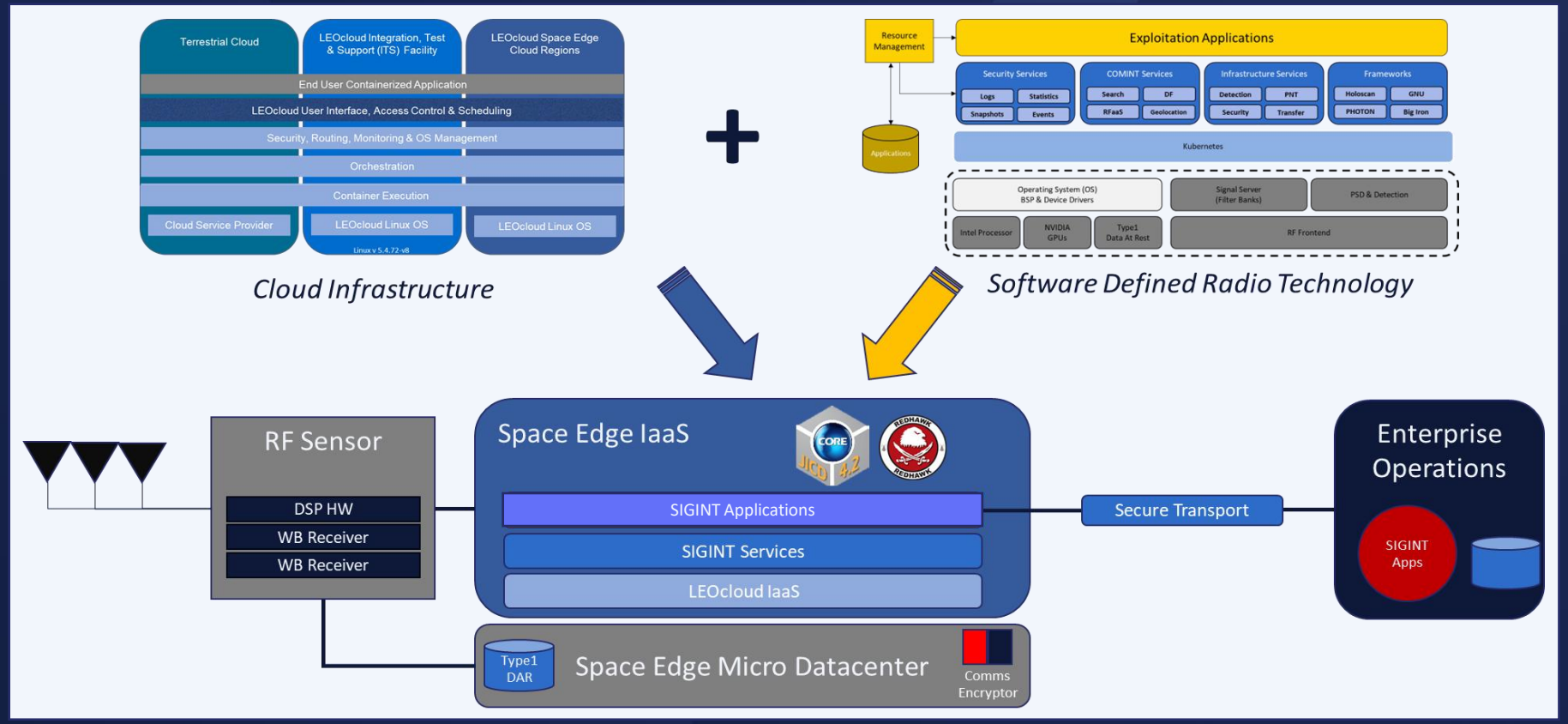
Use Cases

- Autonomous operations
  - Space situational awareness
  - Post Quantum Cryptography (PQC) gateway
  - Cybersecurity
  - Network orchestration
  - SIGINT ISR
  - RPO orchestration
  - Disaster recovery
  - Satellite and NTN network inter-CSP exchange
  - Operations and Support
  - ISAM
  - AI Subject Matter Experts (AISME™)

- Microgravity R&D
- Blockchain applications
  - Crypto currency
  - Data sovereignty
  - Chain of custody
  - Value exchange

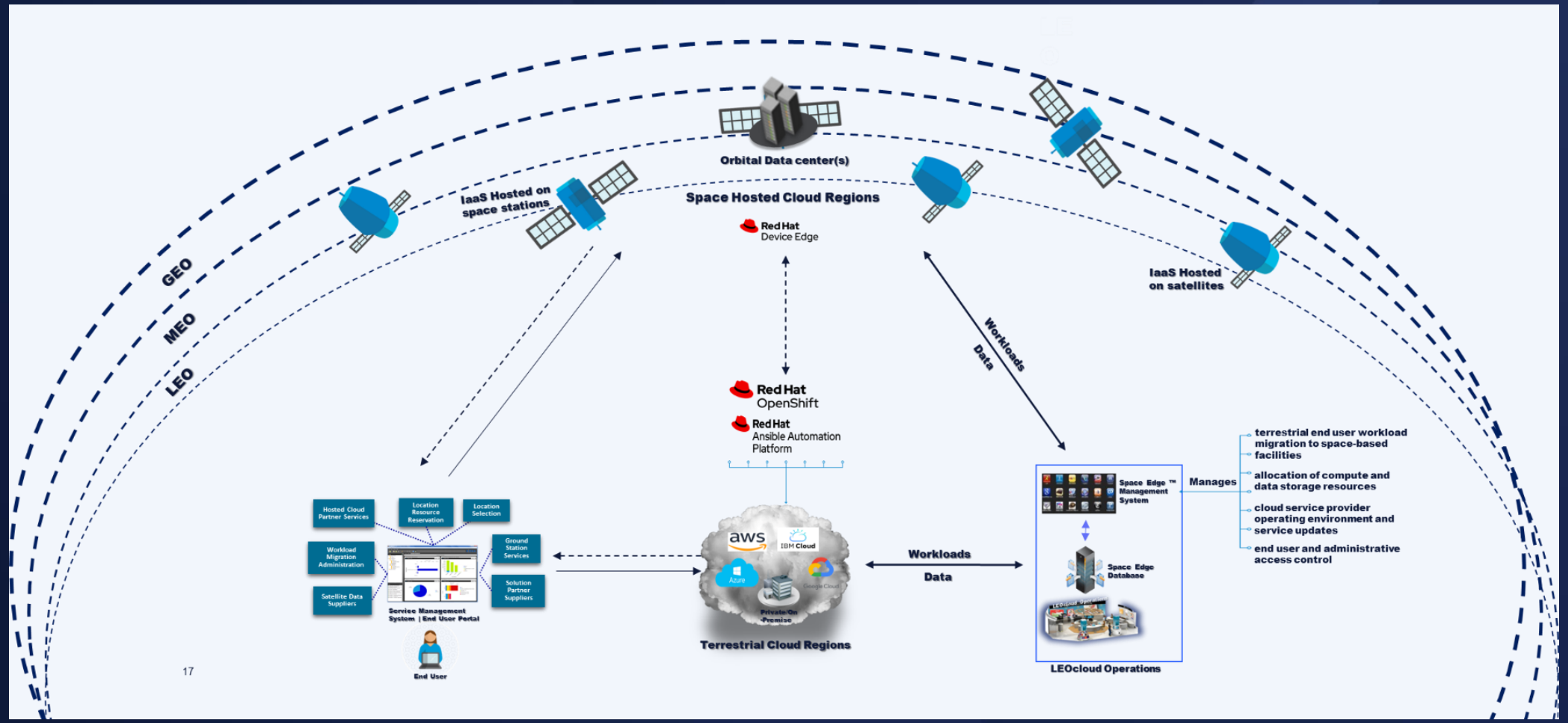
Value Chain of Data Exploitation
Integrated Space Edge IaaS and SIGINT Capabilities

- Enables battlefield situational awareness, SIGINT sensing and spectrum AI/ML
- Open architecture framework
- Rapid cloud-based development and deployment
  - Secure, agile DevSecOps extended to cloud regions in space
  - 3rd party exploitation application support
- AI-driven analysis and insight as close as possible to the sources of data in LEO and lunar regions



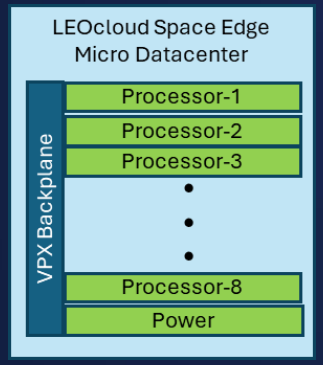
Connected Cloud Strategy

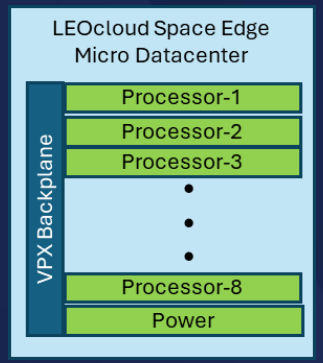
Strategic partnership with Red Hat to extend secure, agile DevSecOps pipeline to cloud regions in space

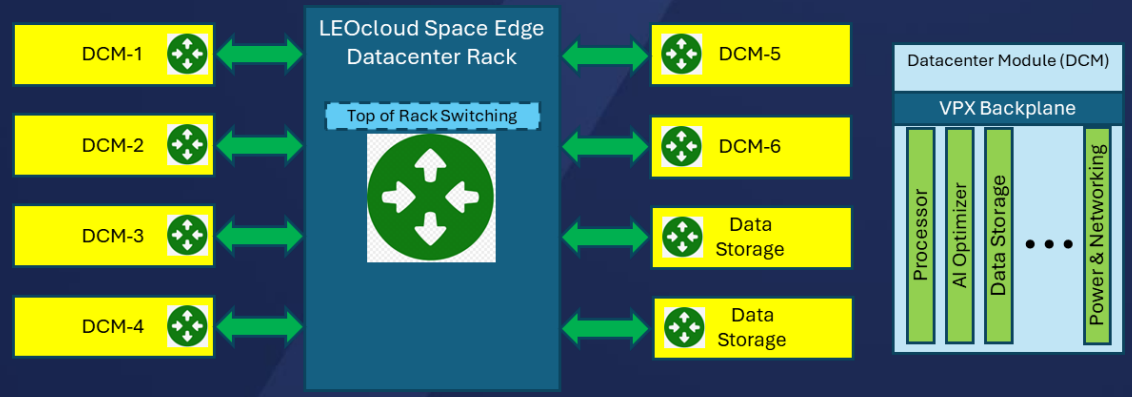


LEOcloud Space Edge IaaS Roadmap

Micro Datacenter to Scalable Datacenter







2025 — MDC Gen 1

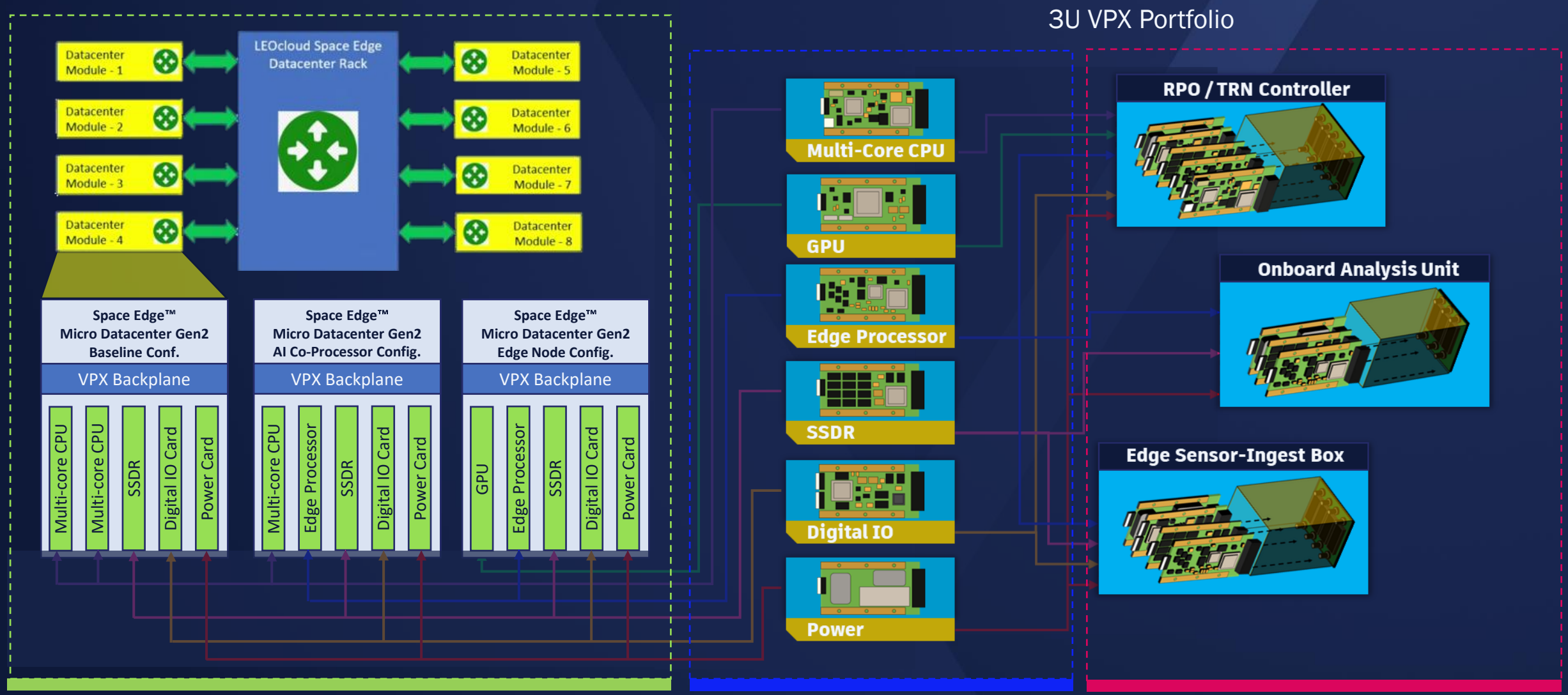
2027 — MDC Gen 2

2027-28 — MDC Gen 3

DC Gen 1

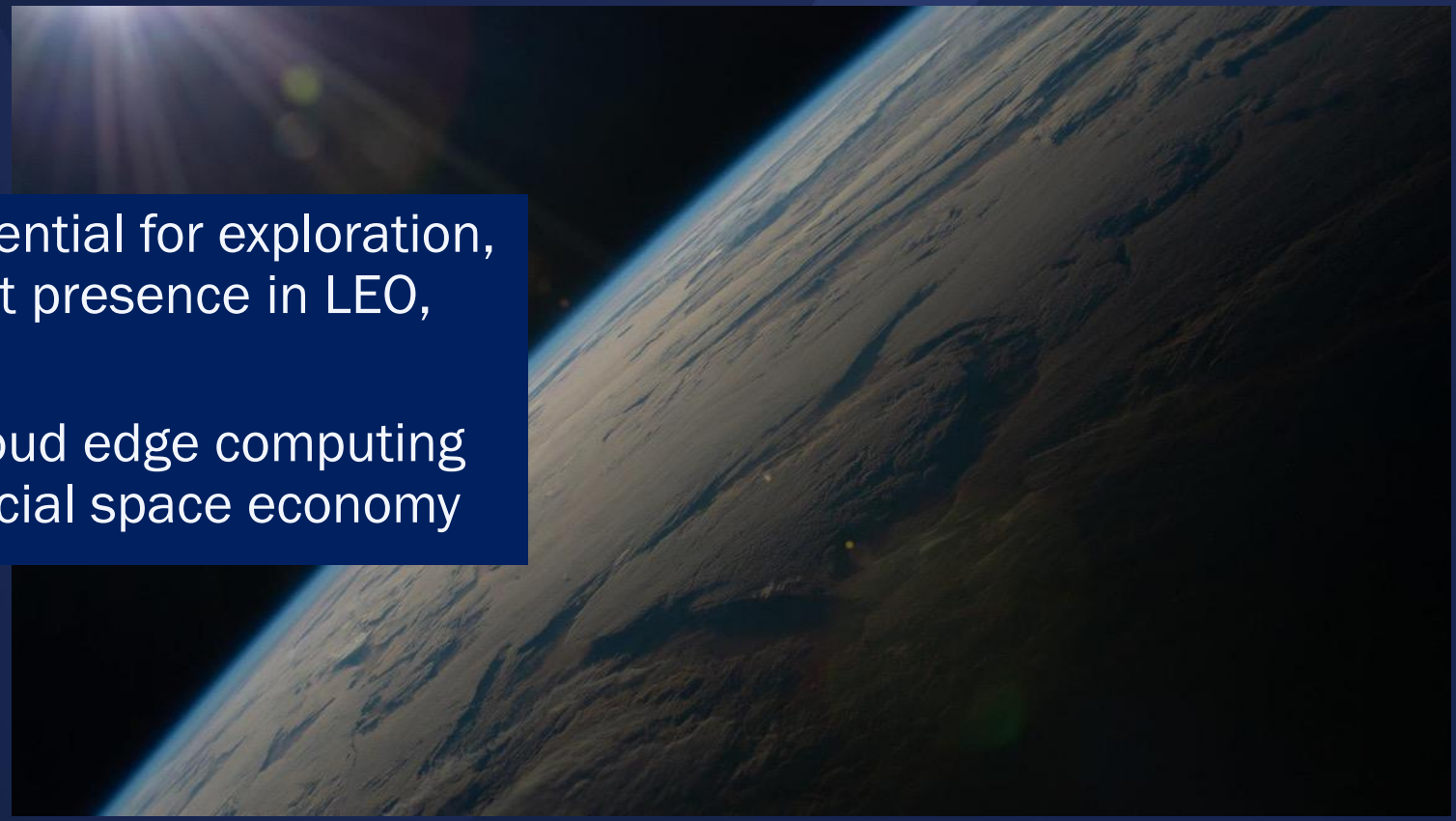
MDC: Micro Datacenter
DC: Datacenter
DCM: Datacenter Module

Space Edge Datacenter
Scalable, Resilient, Redundant, Modular



Leaders in Space Edge Compute and Cloud Services

- Cloud edge computing will be essential for exploration, R&D, operations and a permanent presence in LEO, lunar and beyond
- LEOcloud will deliver managed cloud edge computing services for the AI-driven commercial space economy

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