



**I E T F**<sup>®</sup>  
125 Shenzhen

# Bridging the Future Digital Divide with Space Cloud Network Infrastructure

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Mar 17, 2026



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**Information Infrastructure in Space**

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**Architecture and Performance Evaluation**

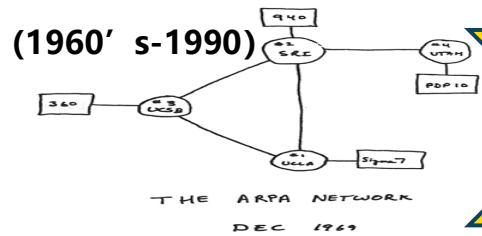
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# **Information Infrastructure in Space**

# 1-1 Internet as an Information Infrastructure



## Application



## Computation

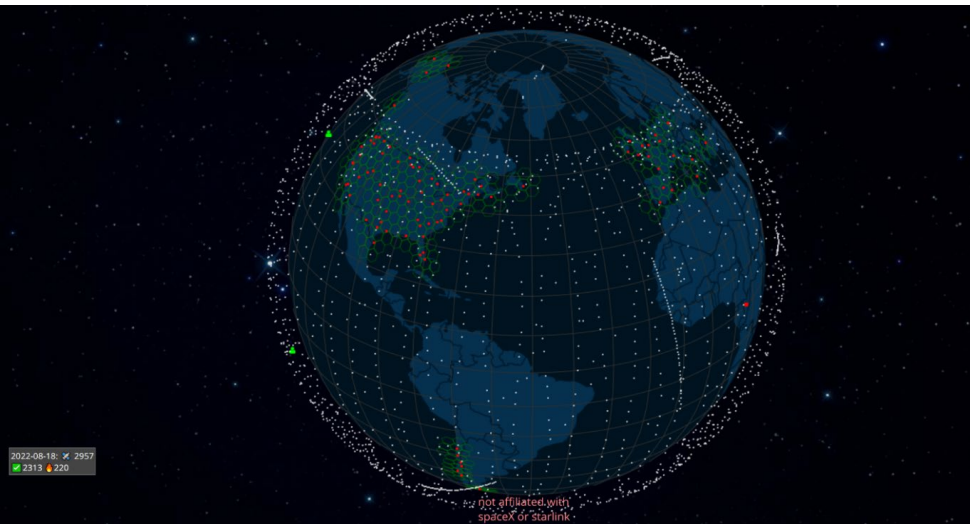
**Shared Computation**  
ARPANET was designed as a **communication and compute resource sharing** tool.



## Networking



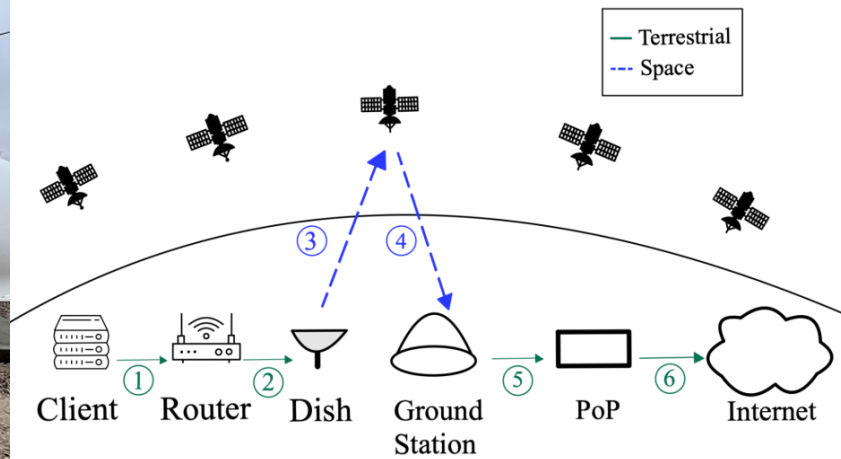
# 1-2 Space Internet with Terrestrial Cloud



Starlink Space Segment



Starlink Ground Station Antennas



Starlink Bentpipe Network Architecture



Phoenix, AZ  
Flexential Data Center

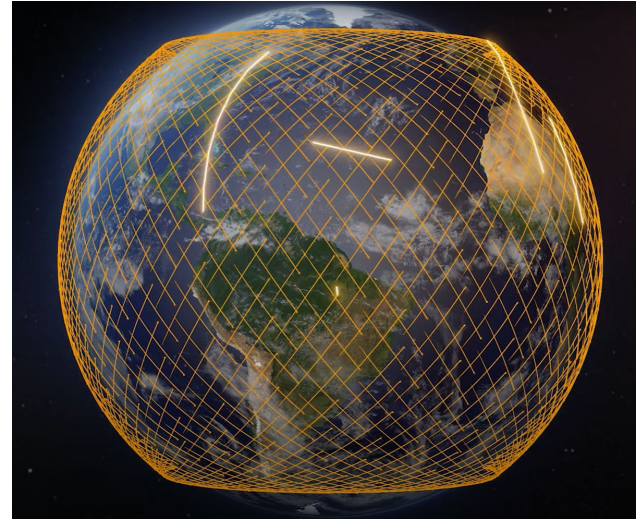
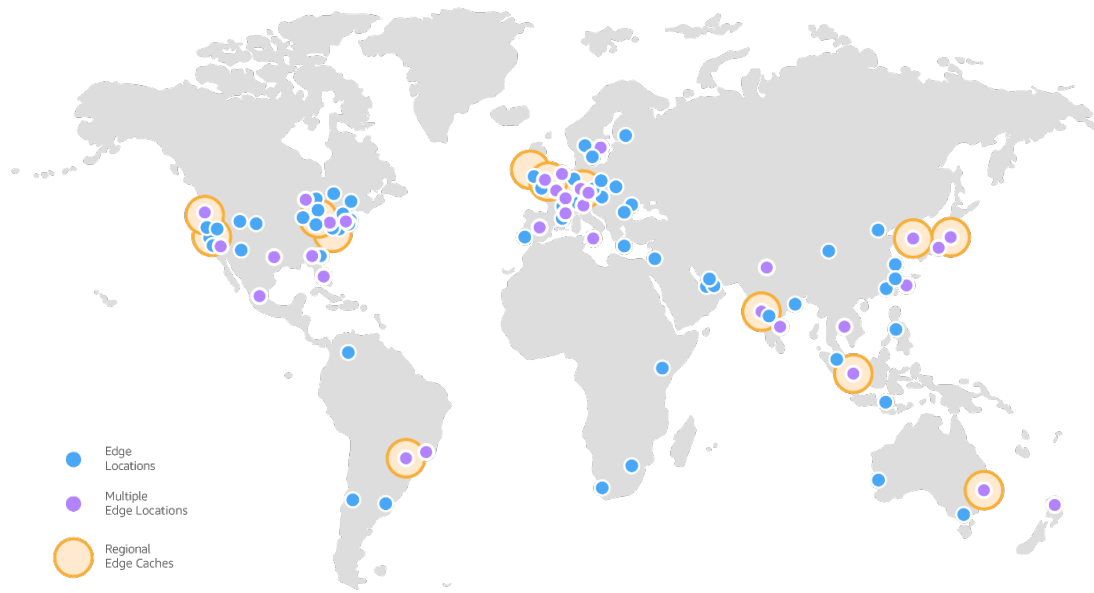


Minneapolis-Chaska,  
Flexential Data Center



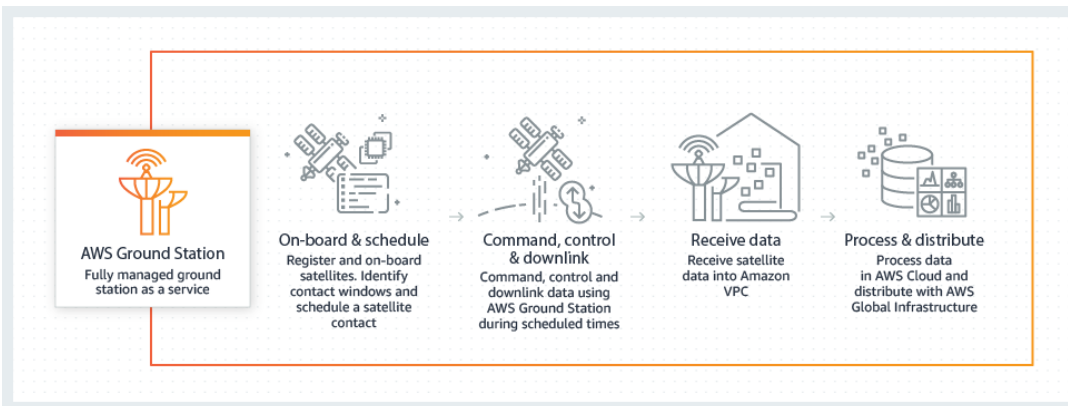
Okun Ajah, Lekki, Lagos State, Nigeria  
Equinix Data Center

# 1-2 Space Internet with Terrestrial Cloud



**Amazon Leo** (Project Kuiper) plans **3232 LEO satellites** (more than 200 in orbit) to be integrated with **over 300 ground stations supported with the AWS infrastructure.**

## Amazon AWS (World #1 Public Cloud)



AWS starts to provide **AWS Ground Station** in 2018

## How it works

### Gateways

- Bring traffic back to Earth
- Over 300+ gateways planned
- Scales using the AWS ground infrastructure
- Forwards traffic to the closest Point of Presence (POP)



Ground Gateway

# 1-2 Space Internet with Terrestrial Cloud

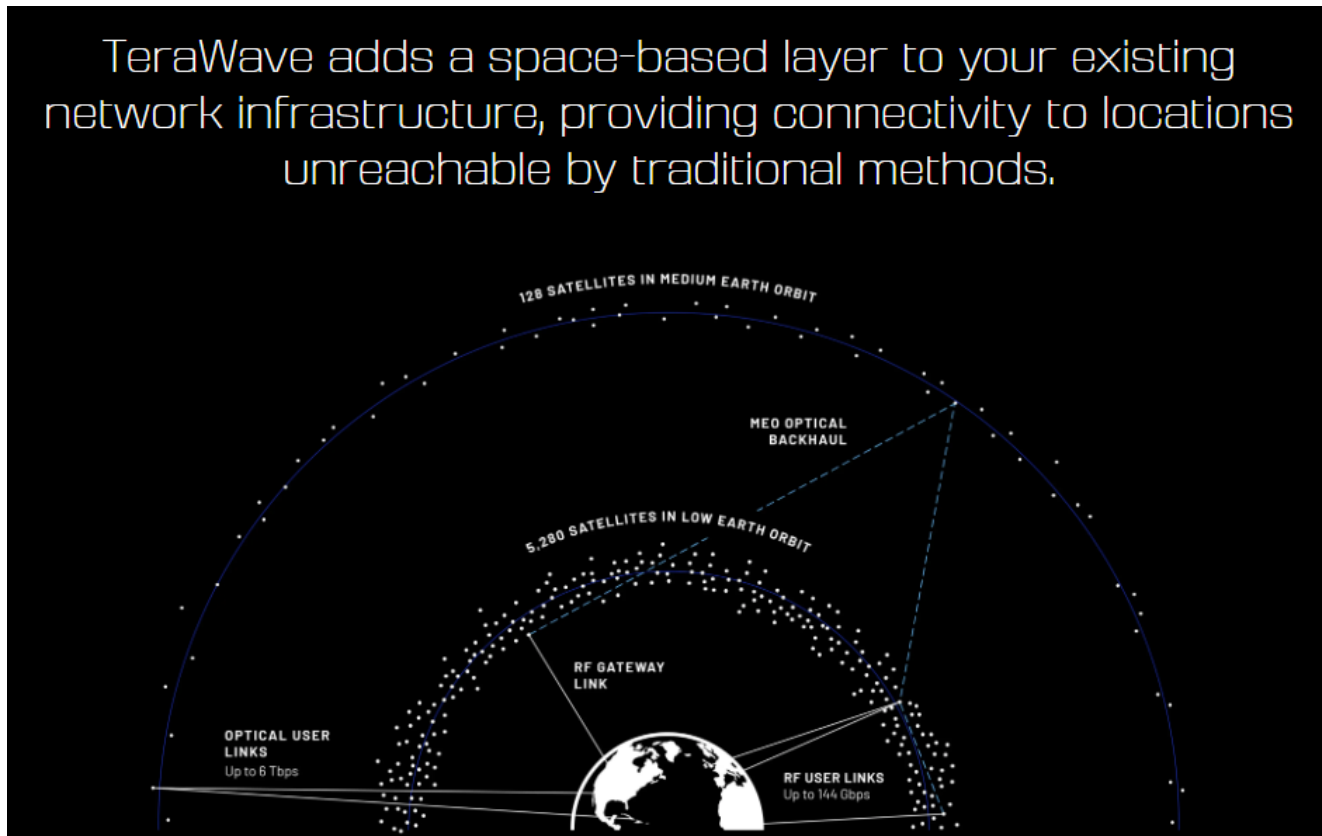
**With its terrestrial infrastructure advantages,  
Amazon focuses on enhancing space-based network capabilities.**

Blue Origin proposed project **TeraWave** in Jan. 2026 to place 5408 satellites in orbit as a backbone in space:

(1) 5280 satellites in LEO to provide Q/V band RF user link **up to 144Gbps**;

(2) 128 satellites in MEO to provide optical user link **up to 6Tbps**.

TeraWave adds a space-based layer to your existing network infrastructure, providing connectivity to locations unreachable by traditional methods.



Data speeds up to 6 Tbps, offering reliable connectivity for critical operations



#### Unmatched Speeds up to 6 Tbps

Move massive amounts of data between locations and cloud services, adding capacity where fiber is limited or unavailable.



#### Symmetrical Upload & Download

Upload large files as fast as you download, eliminating bottlenecks.



#### Network Redundancy

Keep critical services running during fiber outages, natural disasters, cyber incidents, or maintenance events.



#### Deploy & Scale Anywhere

Scale capacity when needed and relocate service globally without performance loss.

TeraWave is Optimized for Enterprise, Data Center, & Government Customers

	TeraWave	Current LEO Constellations
DOWNLOAD SPEED	RF - Up to 144 Gbps Optical - Up to 6 Tbps	RF - Up to 1 Gbps
UPLOAD SPEED	RF - Up to 144 Gbps Optical - Up to 6 Tbps	RF - Up to 400 Mbps
BANDWIDTH TYPE	Symmetrical	Asymmetrical
COVERAGE	Global	Global
MAX CUSTOMERS SERVED	~100K	Many Millions

# 1-3 Cloud Network in Space

SpaceX leverages its launch capability advantages to move toward space-based cloud networks.

Jan 30, 2026, SpaceX proposed to launch 1000,000 satellites to build **orbital data centers**.

Amazon Web Services' CEO says we're "pretty far" from having a million space data centers, calls them "just not economical"



## PUBLIC NOTICE

Federal Communications Commission  
45 L Street NE  
Washington, DC 20554

News Media Information 202-418-0500  
Internet: [www.fcc.gov](http://www.fcc.gov)

DA 26-113

Released: February 4, 2026

### SPACE BUREAU ACCEPTS FOR FILING SPACEX'S APPLICATION FOR ORBITAL DATA CENTERS

ICFS File No. SAT-LOA-20260108-00016

Comments/Petitions Due: March 6, 2026  
Response to Comments/Oppositions to Petition Due: March 16, 2026  
Replies to Responses/Oppositions Due: March 23, 2026

By this Public Notice, the Space Bureau (Bureau) accepts for filing and seeks comment on an application by Space Exploration Holdings, LLC (SpaceX) for a new non-geostationary orbit (NGSO) system of up to one million satellites.<sup>1</sup> This satellite system will represent the "first step towards becoming a Kardashev II-level civilization – one that can harness the Sun's full power," according to SpaceX.<sup>2</sup>

On January 30, 2026, SpaceX filed an application seeking authority to launch and operate a new NGSO satellite system of up to one million satellites to operate as the "SpaceX Orbital Data Center system" (System). The System will operate at altitudes ranging from 500 km to 2,000 km and in 30 degree and sun-synchronous orbit inclinations within orbital shells spanning up to 50 km each.<sup>3</sup> The proposed satellites will use high-bandwidth optical inter-satellite links and conduct telemetry, tracking, and command (TT&C) operations.<sup>4</sup> The Bureau seeks comment on the application and the associated requests for waiver.

SpaceX's proposed System will primarily rely on optical intersatellite-links, which may connect with other satellites in the proposed System and with satellites in SpaceX's first- and second-generation Starlink systems.<sup>5</sup> SpaceX requests authority to use the 18.3-19.3 GHz (space-to-Earth) and 28.6-29.1

**Mario Nawfal** @MarioNawfal · 15小时

**ELON: WHO NEEDS EARTH? WE'RE BUILDING DATA CENTERS IN SPACE**

Elon revealed that Starlink V3 satellites could be used to build full-on data centers in space.

He says they'll have ultra-fast laser links and up to 1 terabit per second speeds, which is wild considering most

[显示更多](#)

0:10

**Elon Musk** @elonmusk · 10月31日

回复 @SciGuySpace

Simply scaling up Starlink V3 satellites, which have high speed laser links would work.

SpaceX will be doing this.

614 1350 9747 1144

146 543 2,839 26万

**AI4 by itself will achieve self-driving safety levels very far above human.**

**AI5 will make the cars almost perfect and greatly enhance Optimus.**

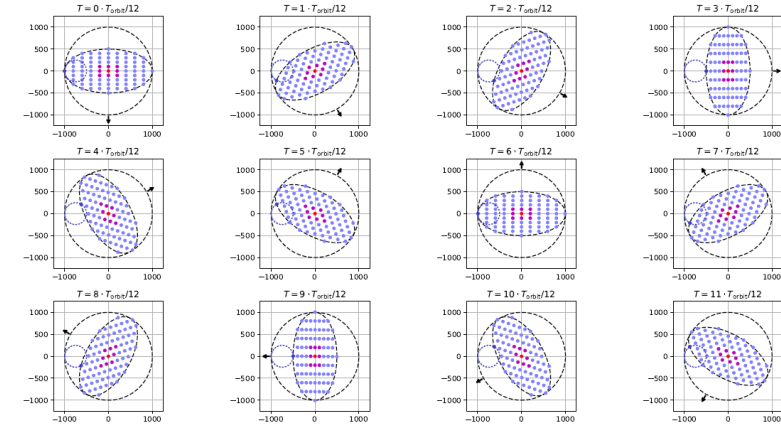
**AI6 will be for Optimus and data centers.**

**AI7/Dojo3 will be space-based AI compute.**

# 1-4 Orbital Data Centers

## Google Project SunCatcher

A "satellite cluster" architecture is adopted, with Google's Tensor Processing Unit (TPU) accelerator chips hosted on board the satellites. A dense fleet of satellites supporting model training is deployed in a Sun-synchronous orbit (dawn-dusk orbit) at an altitude of 650 km. In terms of radiation tolerance, **Google's Trillium TPU v6e chips have passed simulated testing** with a 67 MeV proton beam.



<https://goo.gl/project-suncatcher-paper>

# Towards a future space-based, highly scalable AI infrastructure system design

Blaise Agüera y Arcas<sup>\*,1</sup>, Travis Beals<sup>\*,1</sup>, Maria Biggs<sup>\*,1</sup>, Jessica V. Bloom<sup>\*,1</sup>, Thomas Fischbacher<sup>\*,1</sup>, Konstantin Gromov<sup>\*,1</sup>, Urs Köster<sup>\*,1</sup>, Rishiraj Pravahan<sup>\*,1</sup> and James Manyika<sup>1</sup>

<sup>\*</sup>Equal contributions, <sup>1</sup>Google

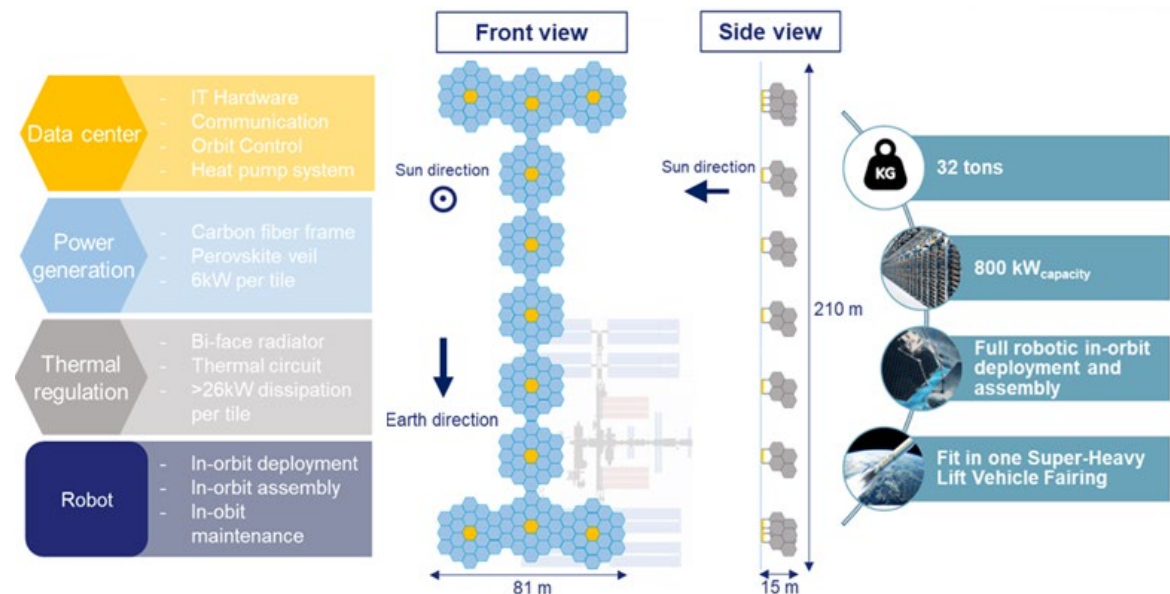
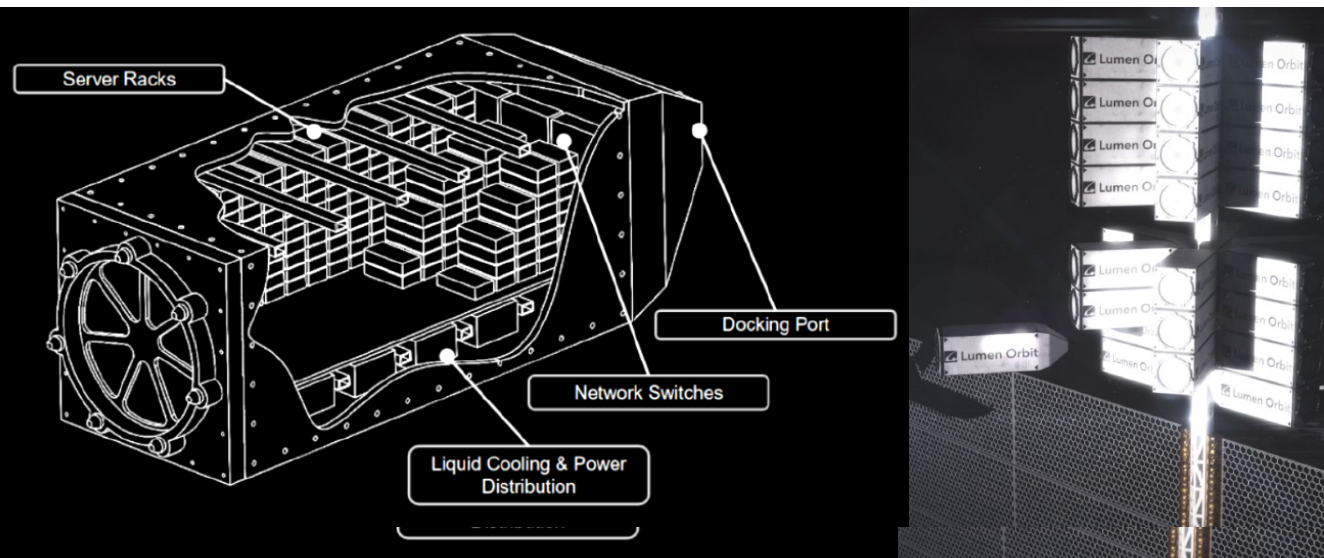
# 1-4 Orbital Data Centers

## Starcloud: Orbital Data Center

The space data center adopts a **container-based structure**, with a single container weighing up to 100 tons, designed to maximize the payload capacity of heavy-lift rockets like Starship per launch.

A single container can accommodate approximately 300 Nvidia GB200 NVL72 racks, delivering 40 MW of computing power.

These containers are assembled in orbit, ultimately building a 5 GW space data center.



## EU ASCEND (Advanced Space Cloud for European Net zero emission and Data sovereignty) Project

Plans to build GW-scale large in-orbit data centers after 2035 to ensure data sovereignty.

02  
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# Applications and Use Cases

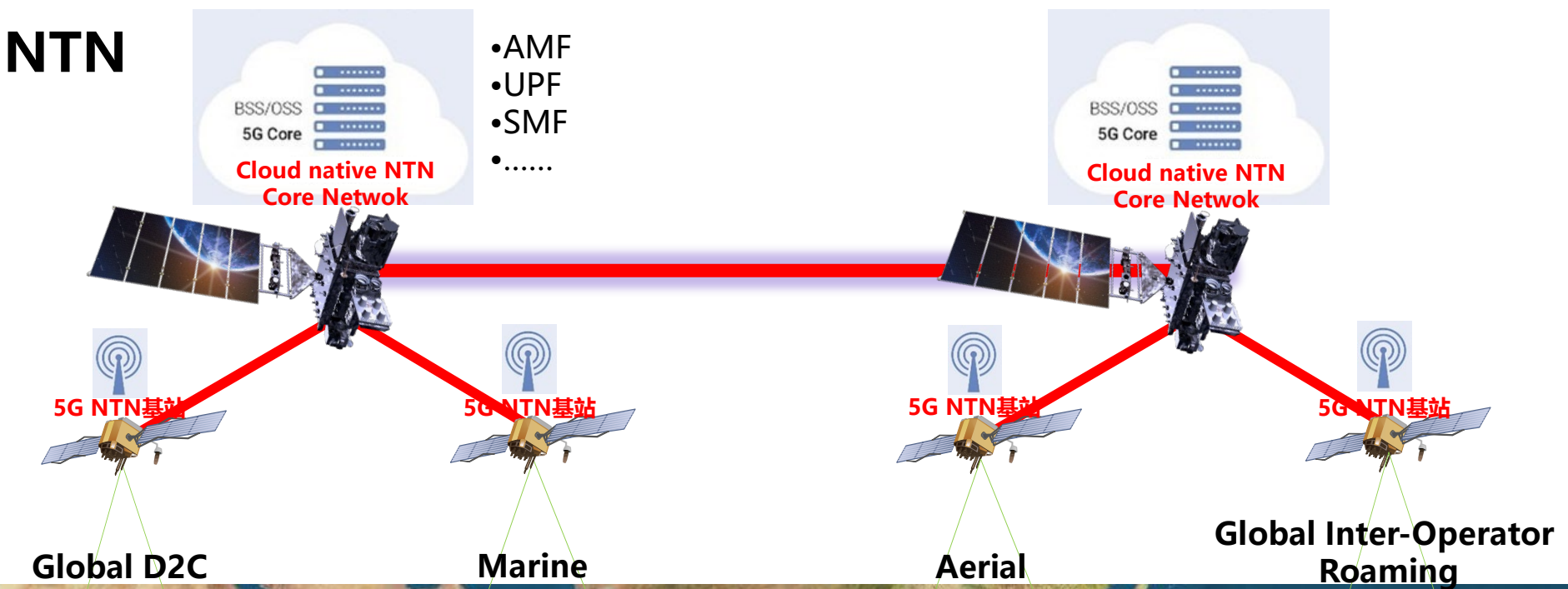
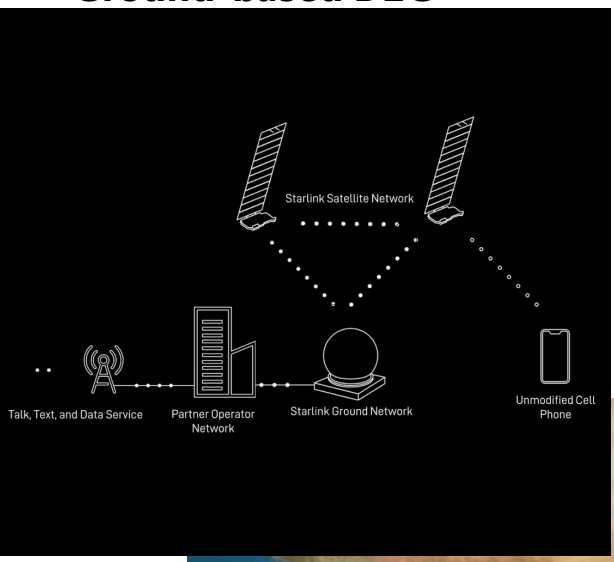
# 2-1 Applications of Orbital Data Center

<b>Application</b>	<b>Mode Training</b>	<b>Space Data, Space Computing</b>	<b>Ground Data, Space Computing</b>
<b>Demand</b>	<b>Low cost energy</b>	<b>Low latency, low bandwidth</b>	<b>Global low-latency access especially for undeveloped area</b>
<b>Forms</b>	<b>Single AI Data Center</b>	<b>Global Space-Based Computing (Storage) Network</b>	<b>Global Space-Based Computing (Storage) Network</b>
<b>Deployment</b>	<b>Assembled Single node or Satellite Cluster</b>	<b>Distributed</b>	<b>Distributed</b>
<b>Orbit</b>	<b>Dawn-dusk orbit</b>	<b>Dawn-dusk orbit</b>	<b>Dawn-dusk orbit or Inclined orbit</b>
<b>Challenges</b>	<b>Cost, Thermal management, Maintenance</b>	<b>Cost, Thermal management, Maintenance</b>	<b>Cost, Mobility, Thermal management, Maintenance</b>
<b>Examples</b>	<b>StarCloud, SunCatcher</b>	<b>ASCEND (Cloud Computation) , Starlink (Edge Computation)</b>	

# 2-2 Use Cases of Space Cloud Network

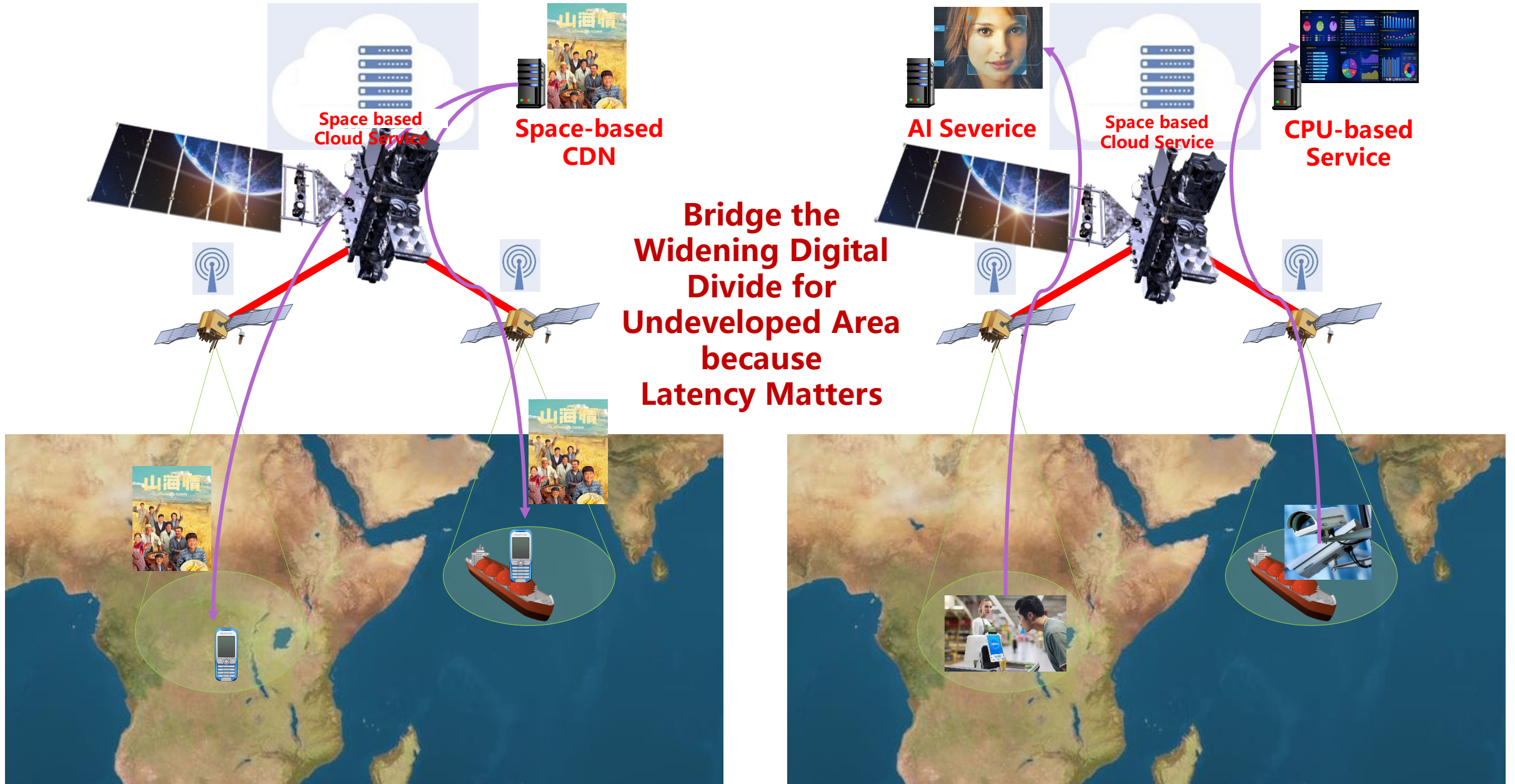
## Space Cloud Native NTN

### Current Starlink's Ground-based D2C

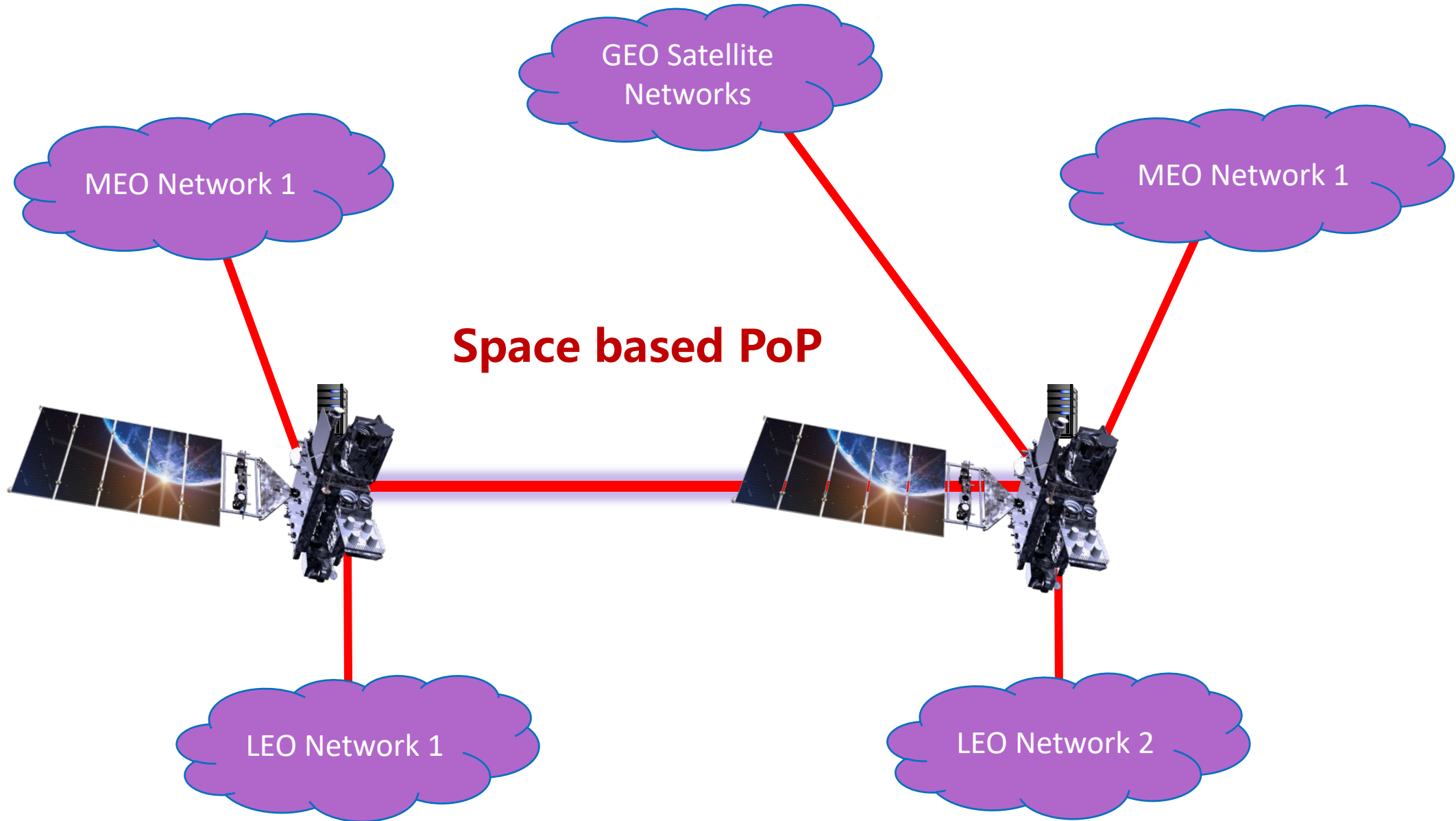


In 2023, the global number of cruise passengers reached 31 million.  
In 2024, global air traffic is projected to reach 4.96 billion passengers.

# 2-2 Use Cases of Space Cloud Network



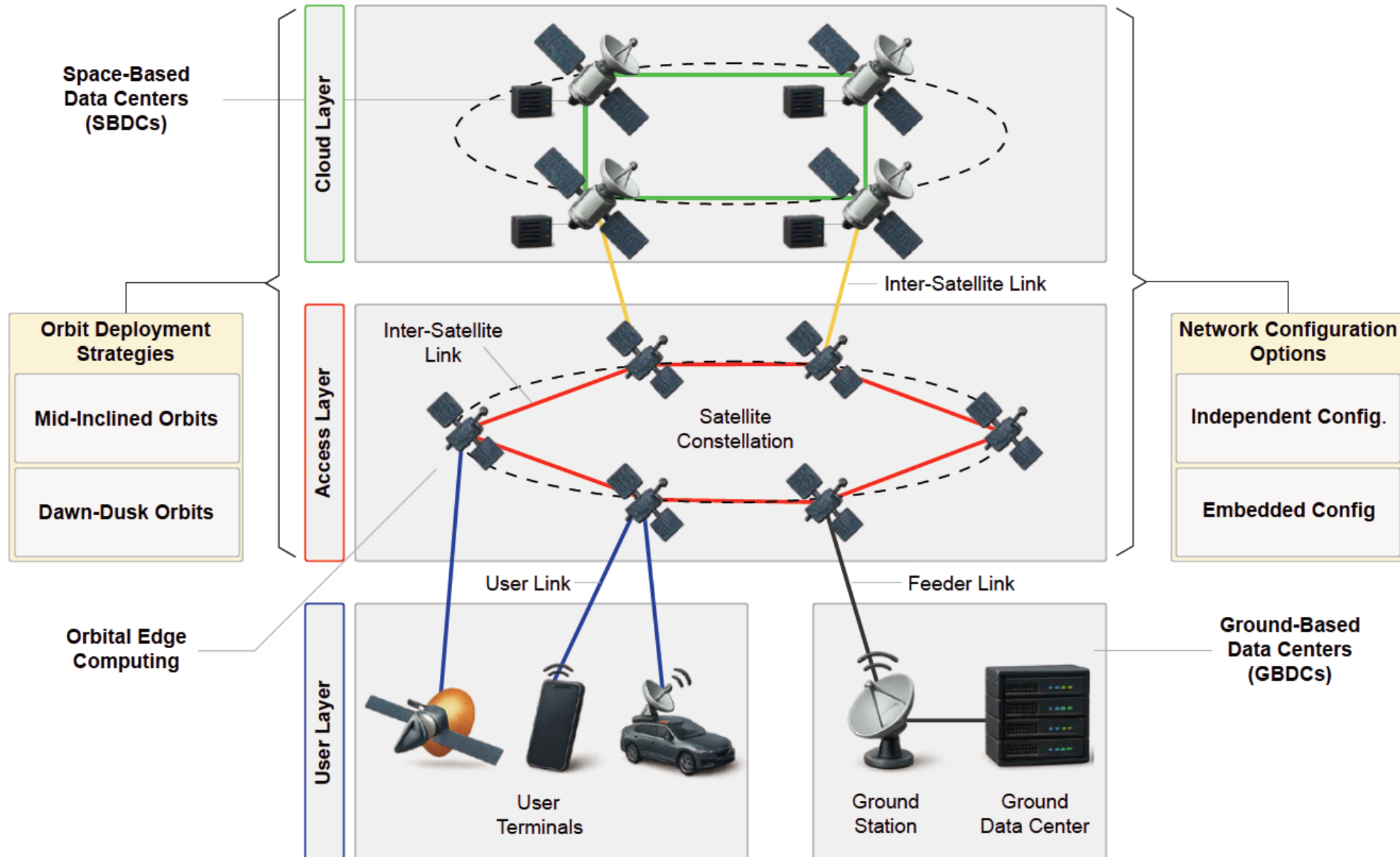
# 2-2 Use Cases of Space Cloud Network



**03**  
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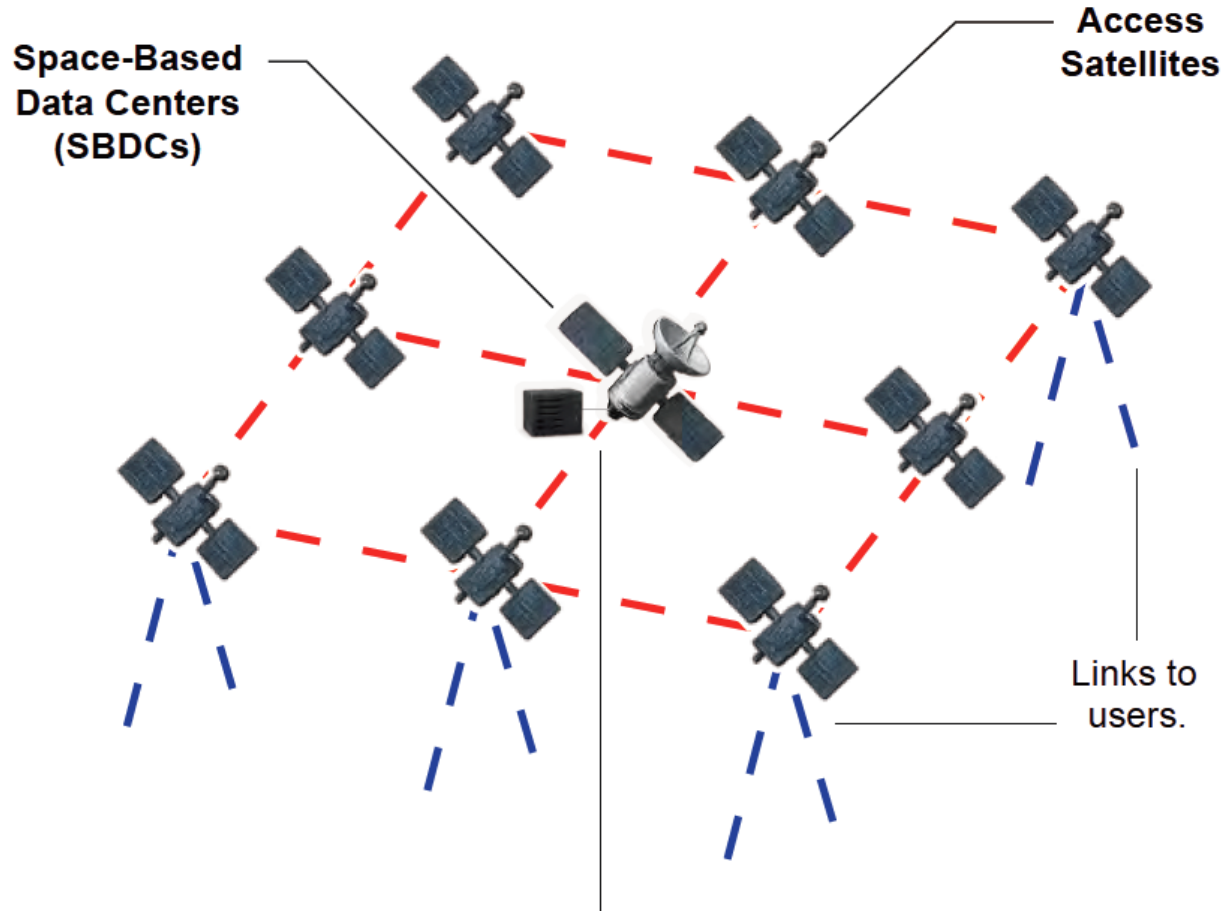
# **Architecture and Performance Evaluation**

# 3-1 Space Cloud Network Architecture



# 3-1 Space Cloud Network Architecture

## Embedded Configuration

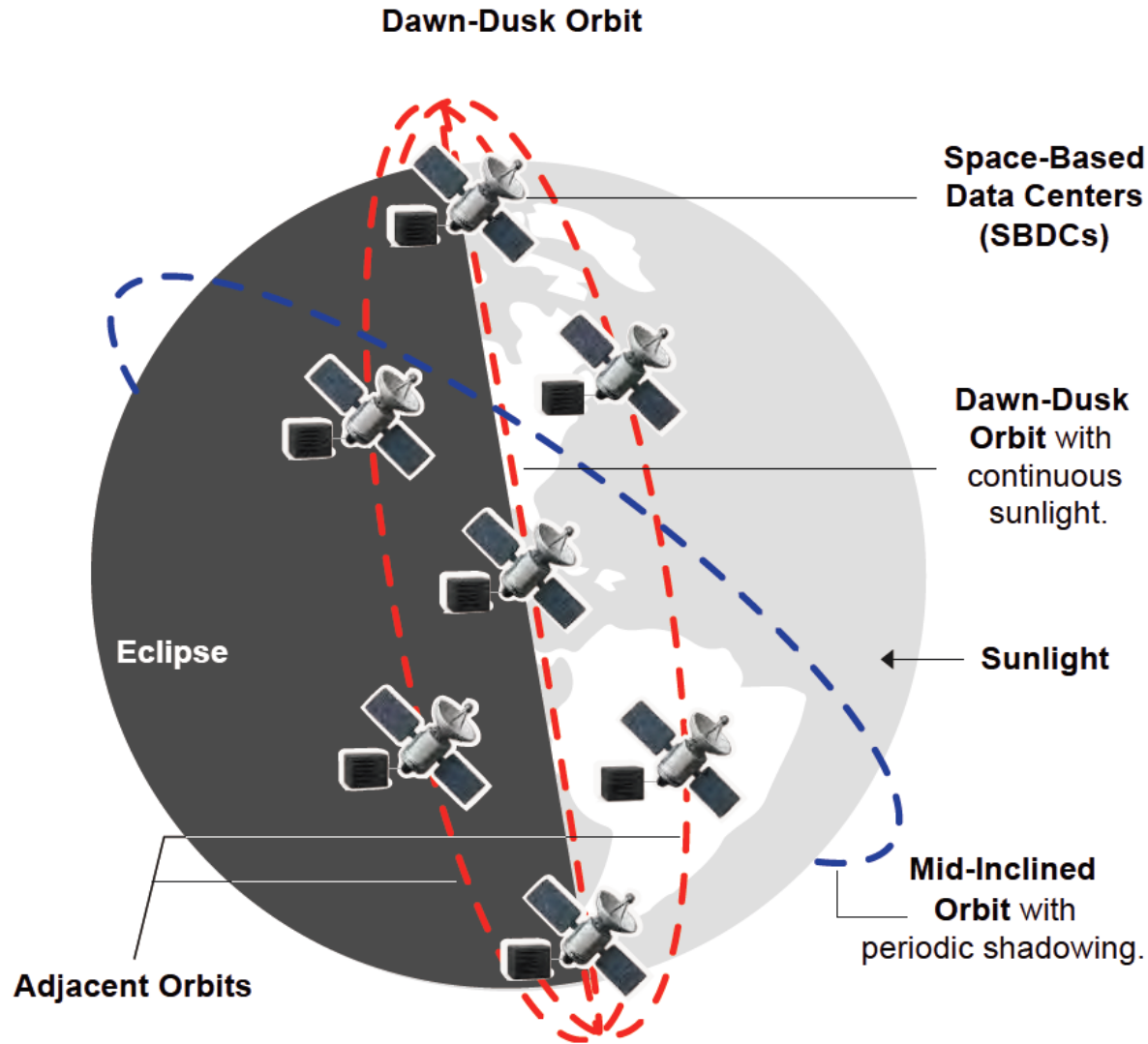


SBDCs are integrated within the access constellation.

## Organization:

- **Independent Configuration:** SBDCs and the access layer operate as separate constellations, connected through inter-layer communication links
- **Embedded Configuration:** SBDCs are directly integrated into the access layer by replacing access satellites

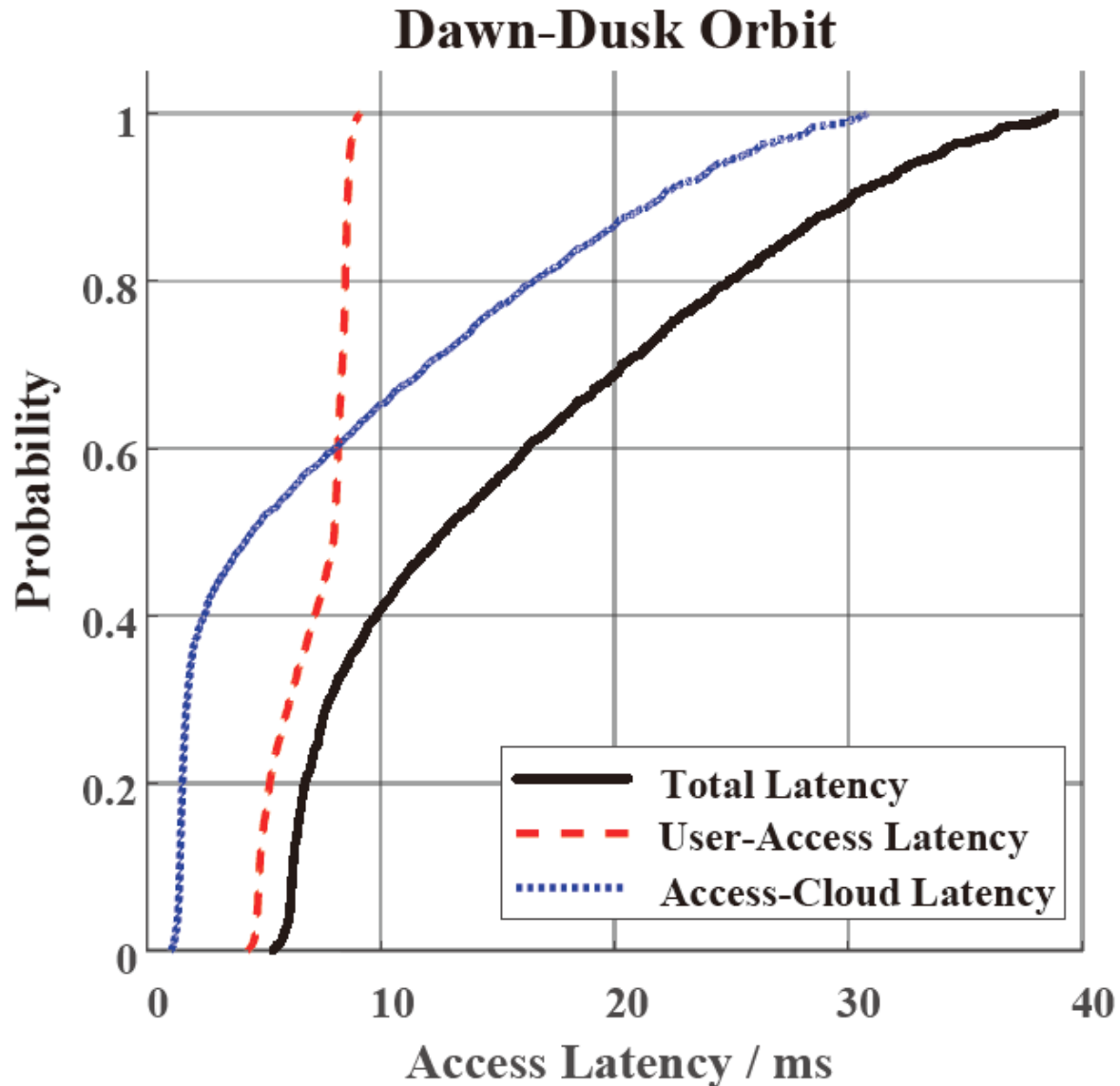
# 3-1 Space Cloud Network Architecture



## Orbit Choice:

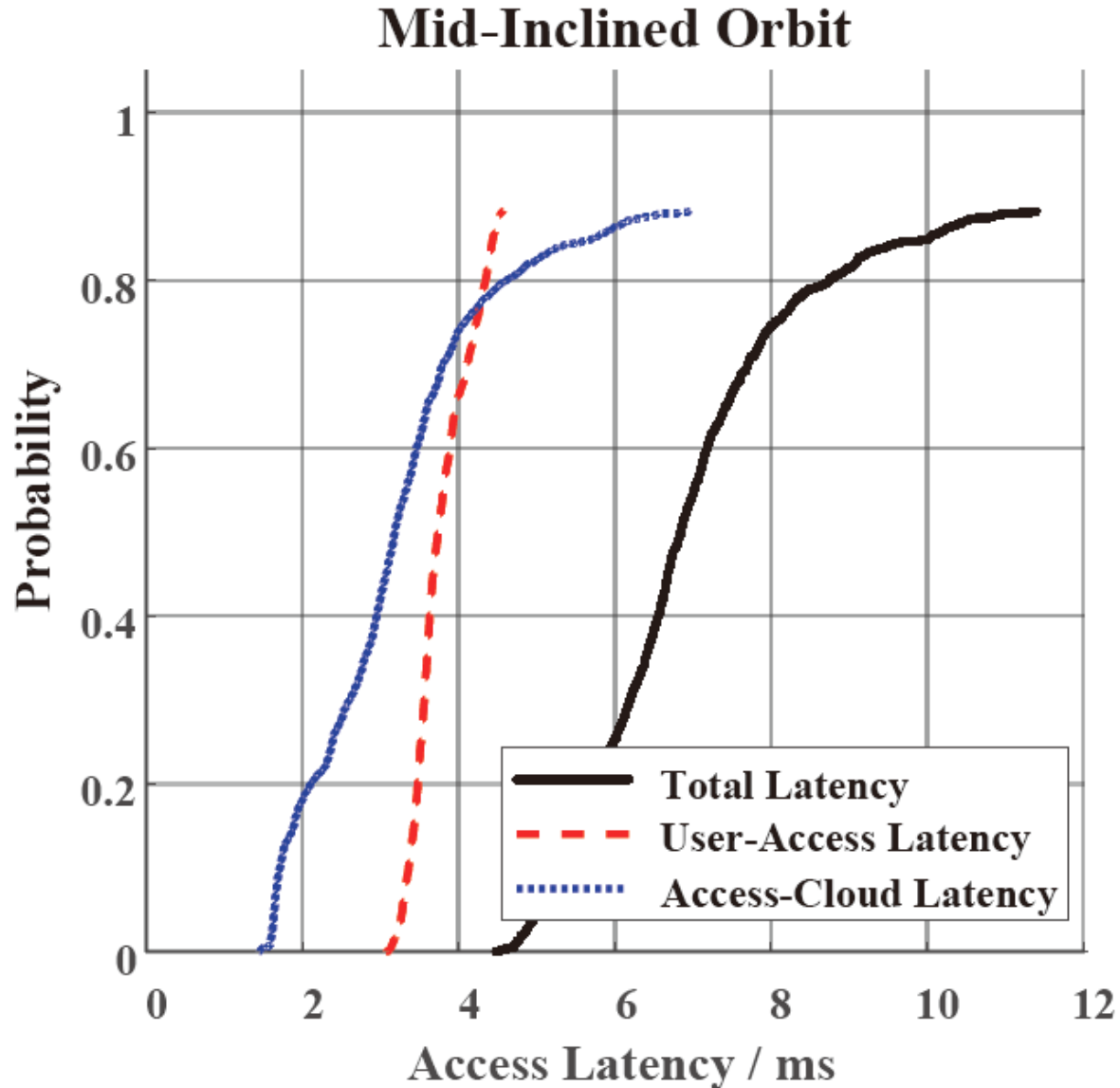
- **Mid-Inclined Orbit:** The angle between the orbital plane and the Sun varies periodically. SBDCs in these orbits experience shadows due to Earth's occlusion
- **Dawn-Dusk Orbit:** A special type of sun-synchronous orbit, maintains an orbital plane closely aligned with the Earth's terminator, allowing SBDCs to remain continuously illuminated by sunlight

## 3-2 Performance Evaluation



- The cloud layer consists of a **three-plane** independent constellation with **15 SBDCs per plane**, while the access layer corresponds to the first layer of the OneWeb
- Users experience access latency within **40ms**, with latency increasing as the user's spatial distance from the cloud layer increases

## 3-2 Performance Evaluation



- **48 SBDCs** are embedded within the first layer of the Starlink constellation.
- 90% of users experience access latency under **12ms**, much lower than Starlink's **20ms** target when relying on GBDCs

04  
PART

# Conclusions

# Conclusions

- Space Cloud Network is a promising architecture to provide global low latency network and computation services.
- Although there have been WGs working on terrestrial Computation Power Network, space cloud network is facing very different challenges.
- It might be a good chance to start relevant research in our SPACE group.