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Space Data Centres vs Edge Computing - 2026 Landscape Survey of Claims, Players, and Economics

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Abstract

Orbital data centres have become one of the most discussed concepts in NewSpace. Advocates cite abundant solar power, cooling advantages, secure storage, and global connectivity. Flight demonstrations show technical progress, while the economics of large orbital data centres remain unproven. This paper presents a landscape survey and assessment of space data centres, asking whether they represent a promising new industry, rebranded in-orbit edge computing, or hype amplified by the current AI boom.

The first part defines terms and reviews the literature. A few GPUs dedicated to a satellite's own payload are classified here as edge computing. We also address major terrestrial drivers, including permitting timelines, grid access, water usage and AI investment expectations. For example, waterless cooling is feasible on Earth too, but is often traded off against cost.

The second part provides a statistical overview of 70 companies and programmes using public information available by 30 September 2026. We categorise activities by use case, orbit, architecture, founding year, funding, geography and development status. Of the 70 entries, 52 are at concept, early-stage or development stages, and six are classified as demonstrated. The third part presents a landscape table and brief descriptions of major players, including Starcloud, Sophia Space and SpaceX.

The final section discusses recurring claims and compares 14 published technical, economic and environmental assessments. It examines their scope, assumptions and evidence, and highlights uncertainties affecting commercial viability, including launch prices, useful computing output, communications, utilisation and hardware replacement.

Data centres have a very large existing terrestrial market and could eventually become one of the largest space industries. The technical challenges may ultimately be solvable, but at what cost? We argue that near-term opportunities are more likely to emerge through incremental edge computing adoption, although each application still needs an economic case. The profitability of large orbital data centres remains unproven, with one key uncertainty being SpaceX Starship launch prices available to external customers.

Keywords: space data center, orbital data center, SBDC, space edge computing, space cloud computing

1. INTRODUCTION

Orbital data centres (ODC) have become a prominent application proposed for large space infrastructure. Advocates cite solar power availability, cooling, security and connectivity as reasons to move computing capacity into orbit. Recent space-based data center (SBDC) announcements range from individual co-processors and hosted payloads to constellations or large monolithic systems intended to serve terrestrial artificial intelligence (AI) workloads. Their functions and capabilities differ substantially. A clear definition for space data centers (SDC) is thus necessary before comparing their progress, capacity or economic prospects.

The economics of large orbital data centres remain unproven. Flight experiments demonstrate

technical capabilities, and funding supports further development. A commercial service must also operate reliably and earn enough from paying customers to cover development, launch, operations and hardware replacement. If orbital computing becomes competitive, even a small share of the terrestrial market could support a large space industry, creating demand for spacecraft manufacturing, launch and servicing.

Section 2 defines terms and reviews the literature and terrestrial drivers. Section 3 presents the statistical overview. Section 4 includes a landscape table of all surveyed entries. Section 5 describes the major players. Section 6 discusses claims, published assessments and commercial prospects. Section 7 presents the conclusions.

2. LITERATURE REVIEW

2.1 Data centres and edge computing

Edge computing describes processing close to data sources or users to reduce communication demand, latency or dependence on remote infrastructure.¹

A data centre houses computing, storage and networking equipment with supporting power and cooling systems.² The terms describe different attributes and can overlap. A data centre may provide edge computing services by placing computing resources close to users.² Onboard payload processing may be dedicated to acquiring, storing and reducing data from a spacecraft's own instruments.³

In this paper, dedicated processing for payload autonomy or data reduction is classified as onboard edge computing. This survey does not classify a processor dedicated to its host payload as a data centre solely because it performs computation in orbit.

Shared (cloud) orbital computing provides processing to more than one user. Orbital storage provides buffering, backup or archival. Computing for terrestrial users includes AI training, inference and other workloads. Table 1 summarises these terms.

For this paper, a *space data centre* is defined as a facility in space that provides computing or storage as a regular operational service, supported by power, thermal control and communications systems. Occasional experiments, processors or a few GPUs dedicated solely to their host payload do not meet this definition.

Classification depends on the workload, customer, resource management and supporting infrastructure. The term *orbital cloud* additionally implies service characteristics such as remote provisioning, resource allocation and measured usage, in line with the approach of the NIST cloud definition.⁴

2.2 Terminology and acronyms

The literature uses several overlapping terms for computing and storage facilities in space (Table 2). *Space-based data centre* (SBDC) appears in the research literature, while *space data centre* (SDC) is also used.^{5,6} *Orbital data centre* (ODC) identifies an orbital location and is used by e.g., Axiom Space.⁷

A *lunar surface data centre* (LSDC) is on the Moon's surface. A *lunar orbital data centre* (LODC) operates in orbit around the Moon. Both types fall within the SBDC category, and a LODC is also an ODC. This paper uses *lunar data centre* (LDC) as a broad term covering both types. This paper uses SBDC as the broad term, with SBDC and ODC used interchangeably when referring to systems in orbit.

Edge computing describes the placement of processing relative to data sources and users; it can be a function of an SBDC or ODC. The acronym alone therefore does not distinguish edge processing from a facility serving terrestrial computing demand.

This paper also distinguishes between architectures.

A *data-centre constellation* consists of multiple spacecraft that together provide computing or storage services. The spacecraft remain separate and exchange data through communication links. It does not imply small satellites. Individual spacecraft may have power levels of around 200 kW.

A *monolithic data centre* is a single physically connected facility. It may consist of modules launched separately and assembled in space, with further modules added or replaced. The term includes large facilities in the roughly 10 MW–1 GW range that would require in-space assembly and servicing.

Edge computers and co-processors are onboard processing units used for tasks such as image processing, compression and AI inference. A co-processor handles selected workloads alongside the main onboard computer. They are not classified as data

Table 1: Classification of computing used in this survey.

Term / Category	Main function	Typical customer or work	Evidence needed
Onboard processing	Processes data from the payload, supports autonomy.	Image filtering, event detection or navigation.	Useful task completed under flight conditions.
Shared orbital edge computing	Receives and processes data from several space assets.	Earth-observation operators, stations, exploration missions.	Network access, scheduling, useful output and availability.
Orbital storage	Holds customer data for buffering, backup or archival.	Satellite operators or terrestrial data owners.	Integrity, replication, retrieval time and recurring delivery.
Orbital computing for Earth	Processes workloads whose main users and inputs are terrestrial.	AI training, inference, batch simulation or cloud services.	Competitiveness after data transfer, power, launch and replacement costs.
Surface or cislunar computing	Provides computing or storage on the Moon or beyond Earth orbit.	Local exploration or specialised backup customers.	Mission-specific energy, thermal, access and latency budgets.

Table 2: Space data centre acronyms.

Acronym	Expansion	Definition and usage
SBDC	Space-Based Data Centre	Broad term for a computing and storage facility physically located in space. A study considers a facility integrated with satellite networks. ⁵
SDC	Space Data Centre	Shorter term with overlapping usage. ESA’s study covers satellite-based facilities and a lunar lander providing processing and storage. ⁶
ODC	Orbital Data Centre	A data centre located in orbit. Axiom uses the term for networked computing and storage nodes serving space and terrestrial users. ⁷
DCiS	Data Center in Space	The name used for a specific architecture described by Ginosar et al., combining computing, storage, networking and cloud functions. ⁸
SHDC	Space Habitat Data Centre	A data centre associated with a space habitat. Used by Periola et al. for an architecture examining computing and asteroid-sourced water. ⁹
LDC	Lunar Data Centre	Defined in this paper as a broad term covering data centres on the lunar surface or in lunar orbit. Both types fall within the SBDC category.
LSDC	Lunar Surface Data Centre	Acronym defined in this paper for a data centre installed on the Moon’s surface. Lonestar’s plans include facilities on the Moon. ¹⁰
LODC	Lunar Orbital Data Centre	Acronym defined in this paper for a data centre in orbit around the Moon, also classified as an ODC. Starcloud’s planned demonstration with Firefly supports such a future facility. ¹¹

centres in this survey.

2.3 Literature and previous demonstrations

Previous work includes data-centre studies and flight demonstrations, many of which focus on edge computing. Edge computing in space includes many missions and hardware suppliers, so only selected examples are discussed here. These include ESA’s Φsat-2 CubeSat for onboard image processing^{12,13} and HPE’s Spaceborne Computer programme on the International Space Station (ISS).¹⁴ Planet demonstrated onboard object detection using an NVIDIA Jetson Orin module on Pelican-4 in March 2026.¹⁵ Satellogic has also described satellites that use on-board GPUs to process images and run AI models.¹⁶

Kepler reported deploying 40 NVIDIA Jetson Orin modules across ten satellites connected by optical links. Its system supports shared computing for customer workloads.¹⁷ The wider field also includes processors and AI modules supplied for spacecraft, such as NVIDIA’s Jetson Orin and IGX Thor.¹⁸

The European ASCEND study, led by Thales Alenia Space and funded through Horizon Europe, examined the technical, economic and environmental feasibility of orbital data centres (large and monolithic). Its proposed facilities would use modules assembled by robots in orbit, with a target of reaching 1 GW before 2050. Results published in June 2024 identified launch emissions as a major condition for environmental benefits. The study estimated that a tenfold reduction in launcher life-cycle emissions would be needed to achieve substantial CO₂ savings. It also reported a positive economic assessment.¹⁹

Starcloud, formerly Lumen Orbit, published a

white paper in 2024 proposing large solar-powered data centres in orbit.²⁰

Google’s Project Suncatcher studies satellites connected by laser links to share AI workloads. Its paper examines communication links, formation flying, radiation effects and launch costs.²¹ As of 30 September 2026, its first prototype, developed with Planet, was awaiting launch on SpaceX’s Transporter-18 mission. This mission intends to test Google’s Tensor Processing Units and their cooling system in orbit. A separate two-satellite mission is planned for 2027 to test optical links between spacecraft.²²

2.4 Terrestrial drivers and market context

Interest in orbital data centres is partly driven by growing computing demand and constraints on terrestrial expansion. The literature identifies power availability, grid connections, permitting, cooling and water use as factors affecting data-centre deployment. Expectations for AI demand also influence investment in new infrastructure. These factors motivate proposed orbital solutions, whose potential advantages are discussed in Section 6.

2.4.1 Power availability, grid access and permitting

The International Energy Agency estimated global data centre electricity consumption at 485 TWh in 2025 and projected approximately 950 TWh in 2030, representing around 3% of global electricity demand.²³ It also identified grid constraints as a potential source of delay for around 20% of planned projects.²⁴ These estimates indicate substantial demand for new electrical infrastructure, although they do not quantify

the market available to orbital computing.

Terrestrial deployment depends on access to power at a suitable location and date. Grid connections, transmission capacity, equipment delivery and permitting can delay projects. The proposed orbital advantage is therefore partly a question of deployment time. Its magnitude depends on the terrestrial alternative, including other locations, power arrangements and workloads with flexible schedules. The comparison also depends on the development, licensing, launch and commissioning time of the SBDC.

2.4.2 Cooling requirements and water consumption

Direct cooling-water consumption, water associated with electricity generation and water used in manufacturing are separate environmental quantities. The Berkeley Lab data centre report provides estimates of electricity demand and associated resource use.²⁵ Water consumption also depends on the cooling method and local climate.

Cooling without water evaporation is technically possible on Earth too. Evaporative cooling can reduce electricity demand, making it economically attractive where water is inexpensive. Under these conditions, the electricity savings may outweigh the cost of the water consumed, weakening the financial incentive to reduce water use. Microsoft has described a closed-loop design that avoids water evaporation, while acknowledging a small increase in electricity demand compared with its evaporative designs.²⁶ The choice thus depends on local costs, climate and water availability. Avoiding cooling-water consumption is a potential benefit of orbital operation, but it could also be achieved on Earth.

2.4.3 AI demand and investment uncertainty

The current AI investment boom may contain a financial bubble. Company valuations and infrastructure spending depend on expectations of future revenue that may not be achieved. The Bank for International Settlements identifies a risk of excessive investment driven by competition for market share and warns that disappointing returns could lead to a sharp reduction in financing.²⁷ AI can have lasting economic value while attracting more investment than its commercial returns can support.

Subsidised prices also complicate the interpretation of demand. Subsidies reduce the price paid by users and can encourage workloads that would be less attractive at normal prices. If investor funding covers operating losses, providers may also sustain prices that do not recover their full costs. Usage under these conditions does not establish how

much customers would purchase without subsidies. If prices rise before costs fall enough, some use cases may become uneconomic and growth may slow.

These risks also affect the business case for space data centres. A correction could reduce demand and access to finance. If terrestrial capacity exceeds demand, lower prices could also make orbital services less competitive. The economic discussion in Section 6 thus considers slower demand growth, lower utilisation and weaker pricing, alongside continued expansion. The large existing computing market provides an opportunity, but its current growth should not be assumed to continue throughout the development of orbital infrastructure.

2.4.4 Terrestrial alternatives

Orbital data centres would compete with terrestrial facilities that are also improving. Developers can consider other locations, new power supplies and more flexible operation. Google has reported agreements with utilities to reduce or shift machine-learning workloads during periods of grid stress.²⁸ Workloads that can tolerate an orbital location may also tolerate a different terrestrial location or a flexible operating schedule.

2.4.5 Computing efficiency and demand

More efficient processors, software and models can reduce the resources needed. At the same time, lower costs can encourage greater use, while more complex applications require more computation.

For orbital proposals, both effects matter. Greater efficiency could reduce the power and cooling required for a given service. However, improvements on Earth could also lower competing prices before an orbital system begins operation.

2.4.6 Customers and market access

Space data centres could serve a large existing market for computing and storage. Serving terrestrial customers would allow the industry to grow beyond demand from other space activities. However, the total computing market is much larger than the share that could reasonably move to orbit.

Early customers may value a specific function, such as processing satellite data before transmission or keeping an additional backup. Such services may support a higher price for a limited market. Their success would provide evidence for those applications, but would not establish demand for large orbital facilities serving general computing workloads.

3. STATISTICAL OVERVIEW

The survey covers 70 companies and programmes that plan or provide computing or data storage services in space and mention data centres in their public descriptions. This includes projects presented as data centres whose main function is edge computing. Suppliers that only provide onboard computing hardware are generally excluded. Ordinary spacecraft control computers, ground-only facilities and communication systems without a computing or storage service are also excluded. Dormant and cancelled projects are retained with their status shown.

The review uses publications, company announcements, websites and regulatory documents available by 30 September 2026. NewSpace Index provides a comparison with satellite constellation activities, dated 31 July 2026.²⁹

The following data is recorded where available:

- **Applications:** Processing satellite data, computing for users on Earth or in space, and data storage. A project may have several.
- **Orbit or location:** Orbit type, altitude, inclination or another operating location, such as the lunar surface.
- **System design:** Dedicated satellite, hosted payload, station module, satellite constellation or large assembled platform.
- **Founding year:** Year the company was founded or the programme started.
- **Funding:** Announced amounts, financing dates and total funding where known.
- **Country:** Headquarters and other locations.
- **Development status:** Concept, early development, hardware development, flight demo, operation, dormant, cancelled or acquired.

Company name changes are tracked to avoid duplicate entries. Funding rounds are distinguished from cumulative totals and financing agreements. Missing information is marked as unknown. The category, status and location charts use one primary classification per entry. Additional activities and locations are described in Section 5.

Development status refers to the position at the survey date. Announcements and regulatory filings establish plans, while launch records establish deployment. Demonstrated status refers to relevant hardware or software operated in space. A project can continue developing a larger system after a successful demonstration. Service operation requires evidence of repeated delivery to users.

3.1 Categories and development status

Figure 1 divides the 70 entries into 40 constellation activities, 14 monolithic systems, 10 hardware activities, 4 edge-computing services and 2 unspecified activities. Constellations account for 57% of the total, followed by monolithic systems at 20%. Together, these two categories contain 54 entries.

Constellation projects distribute computing or storage across multiple spacecraft. Examples include Starcloud, Cowboy Space, ADA Space and Kepler Communications. Monolithic projects centre on a single facility or connected platform, including modular structures assembled in space. Examples include ALATYR's CITADEL, Sophia Space's connected TILE modules and the ASCEND concept led by Thales Alenia Space.^{19,30,31} The hardware category covers eligible activities centred on computing platforms. The edge-computing category identifies services that process data close to spacecraft and their sensors. Axiom Space, D-Orbit, Planetek Italia and LEOcloud fall in this group.^{7,32-34}

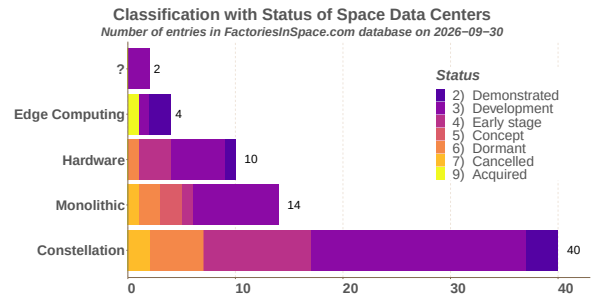


Figure 1: Primary survey categories with status of space data centre activities.

Development is the largest status group, with 36 entries, or 51.4%. A further 14 are at an early stage and 2 at concept stage. These 3 groups account for 52 entries, or 74.3%. Six entries, or 8.6%, have demonstrated as their status. 8 are dormant, 3 cancelled and 1 acquired. Dormant and cancelled activities together account for 15.7% of the total.

The 6 demonstrated entries comprise 3 constellation activities, 2 edge-computing services and 1 hardware activity. No monolithic system has demonstrated as its primary status. The constellation examples are ADA Space, Kepler and Starcloud. ADA Space's first twelve Three-Body Computing satellites launched in May 2025. Kepler reported commissioning 40 NVIDIA Jetson Orin modules across 10 satellites in March 2026. Starcloud reported AI experiments using the H100 GPU on Starcloud-1.^{17,35,36} These demonstrations cover certain computing functions and components of larger proposed systems.

Dormant activities include LyteLoop, Dunvegan

Space Systems and Stara Space. Stara's two NOOR demonstration spacecraft launched in 2019, showing that flight experience can precede a later dormant status.³⁷ AS23.Space, Indicium and Macro Aerospace are classified as cancelled. AS23.Space's founder announced its closure in 2026.³⁸ The acquired entry is LEOcloud, purchased by Voyager Technologies in April 2025.³⁹

3.2 Orbits and locations

LEO is the primary location for 55 of the 70 activities, or 78.6%, as shown in Figure 2. Five activities are assigned to the lunar surface, two to lunar orbit and one to Mars orbit. Seven, or 10%, have no specified location.

Of the 40 constellation activities, 34 concern LEO, two lunar orbit and four an unspecified location. The 14 monolithic activities comprise seven in low Earth orbit, four on the lunar surface and three with unspecified locations. Eight of the ten hardware activities concern LEO, with one each on the lunar surface and in Mars orbit. All four edge-computing services are assigned to LEO.

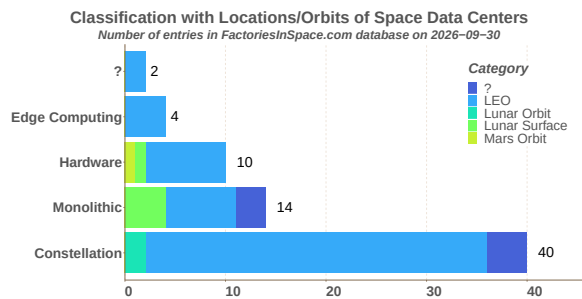


Figure 2: Orbits and locations of space data centres.

The lunar-surface group includes Lonestar Data Holdings, Ethos Space, NAVXCOM, Indicium and United Space Structures. Their proposals range from backup storage to computing infrastructure for lunar industry and surface operations.^{10,40-42} The lunar-orbit constellation proposals are 3K SpaceTech and Planetoid Mines.^{43,44} Relativity Space is the Mars-orbit example through its proposed Relay Data Center, to support scientific missions from 2028.⁴⁵

Several companies pursue more than one location. Lonestar combines lunar storage plans with its StarVault orbital network.⁴⁶ Starcloud's main programme concerns LEO, while its September 2026 agreement with Firefly targets a computing payload in lunar orbit no earlier than 2028.¹¹ The location counts therefore identify the primary destination of each activity. They do not represent the number of systems already operating at those destinations.

3.3 Founding years and development status

Figure 3 shows 69 organisations founded between 1994 and 2026. NTT's predecessor date of 1952 falls outside the plotted period. Founding year records the age of the organisation and can be much earlier than the start of its space data centre activities.

The largest founding-year group is 2024, with 11 organisations. This is followed by 8 founded in 2026 and 7 in 2023. The years 2015, 2018 and 2025 each contain 5. Altogether, 31 of the 70 organisations, or 44.3%, were founded from 2023 through September 2026. Twenty-four, or 34.3%, were founded from 2024 onwards. The 8 establishments in 2026 cover only the first nine months of the year.

7 of the 11 organisations founded in 2024 are classified as development, 3 as early stage and 1 as demonstrated. The 2025 group comprises 3 in development and 2 at an early stage. 5 of the 8 organisations founded in 2026 are in development and 3 at an early stage. All 13 organisations founded in 2025–2026 thus remain in these 2 groups.

The 2026 entrants are Deep Space Matrix, Inorbii, Orbital, Shanghai Xingshu Tiansuan, Stellar, Xingji Tiansuan, Xuanwu Aerospace and Yusuan Xinghe. Five are Chinese companies. Their activities include dedicated computing satellites, shared orbital processing and combined launch and computing infrastructure.⁴⁷⁻⁵¹ The other three entrants are Orbital in the United States, Inorbii in India and Stellar in the United Arab Emirates.⁵²⁻⁵⁴

Figure 4 shows that eight of the eleven organisations founded in 2024 pursue constellations, two monolithic systems and one hardware activity. The 2023 group is more varied, with two constellation, two monolithic, two hardware and one unspecified activity. Three of the five organisations founded in 2025 pursue constellations, alongside one hardware and one monolithic activity. All eight organisations founded in 2026 are classified as constellation developers. Constellations consequently account for nineteen of the twenty-four organisations founded from 2024 onwards, or 79.2% of that group.

Older organisations have entered the field through new programmes and partnerships. Google, founded in 1998, announced Project Suncatcher in November 2025.²¹ Thales Alenia Space was formed in 2007 and was selected to lead ASCEND in 2022.⁵⁵ Axiom Space, founded in 2016, announced its orbital data-centre partnership with Kepler and Skyloom in 2023.⁵⁶ A change of business direction can also happen. Aetherflux was founded in 2024 for space solar power, added orbital data centres in December 2025 and became Cowboy Space in 2026.^{57,58}

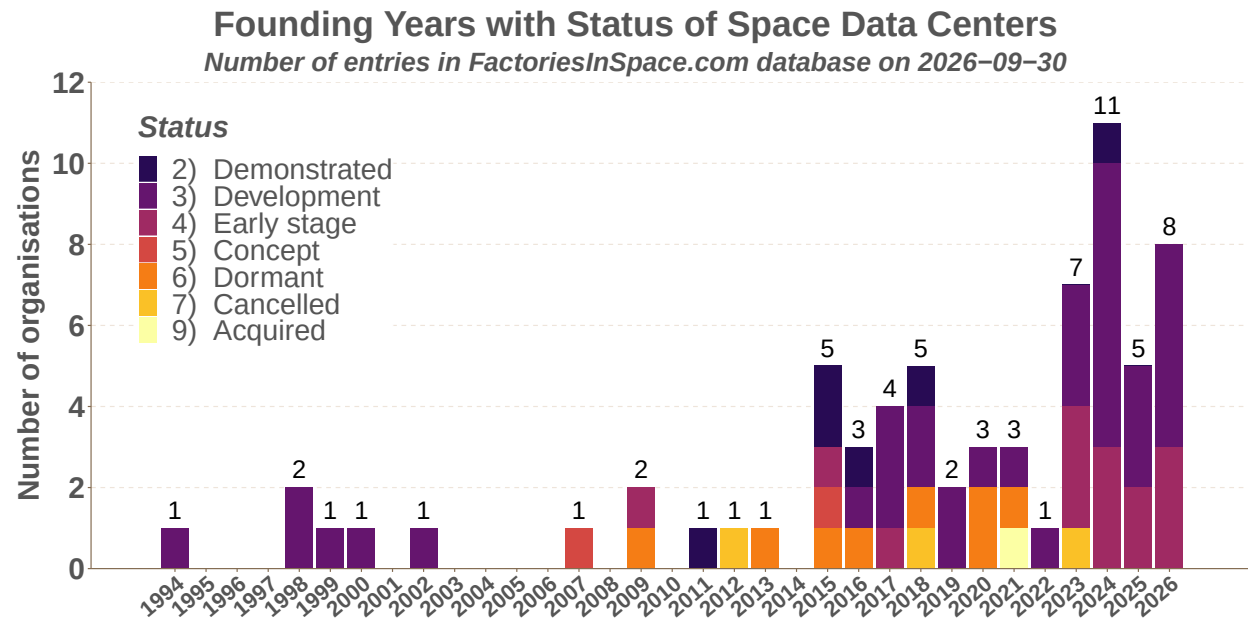


Figure 3: Founding years and status of space data centre activities.

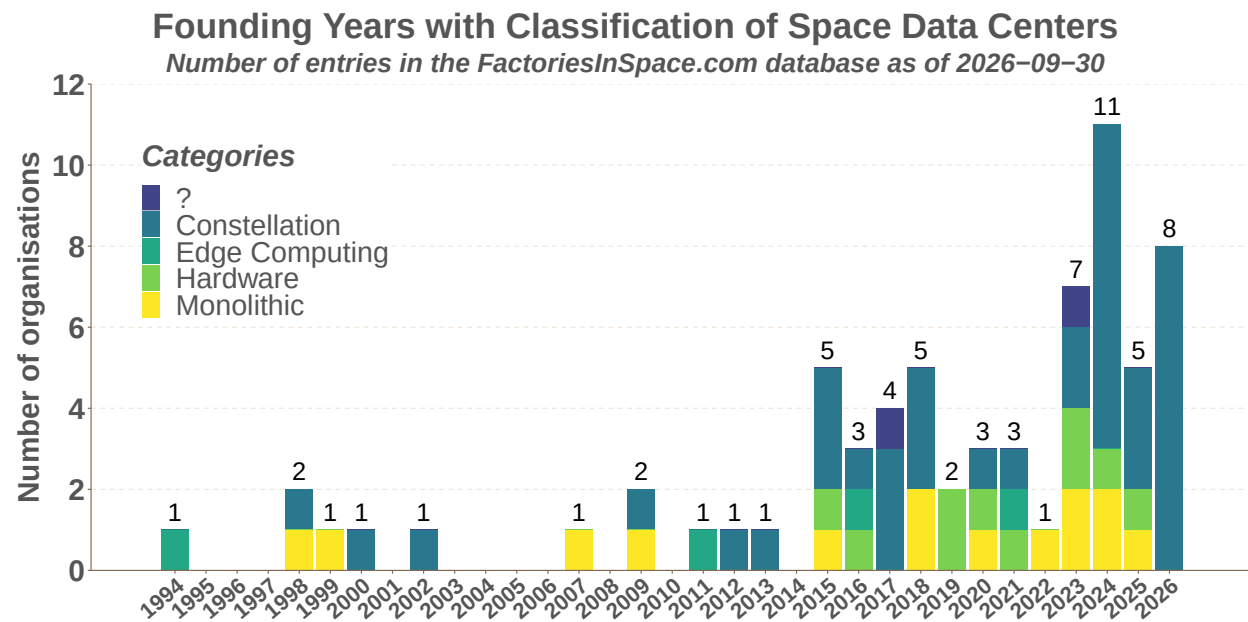


Figure 4: Founding years and categories of space data centre activities.

3.4 Funding levels

Figure 5 groups all 70 entries by funding level and activity category. Funding is unknown for 24 entries. Another 21 are labelled “Yes, TBD”, indicating that funding is reported without a specified amount. Together, these account for 45 entries, or 64.3%. Numerical amounts are available for 25 entries, or 35.7%. An unknown amount does not indi-

cate that a company has received no funding.

Three entries fall in the \$0.1–1 million band, four in \$1–5 million, six in \$5–10 million and six in \$10–50 million. Four fall in \$100–300 million, two between \$300 million and \$1 billion, and two at \$1 billion or more. Thus, thirteen of the 25 entries with numerical amounts fall in the bands covering \$0.1–10 million, while eight have at least \$100 million.

Constellation activities account for ten of the fourteen entries in bands of \$10 million or above.

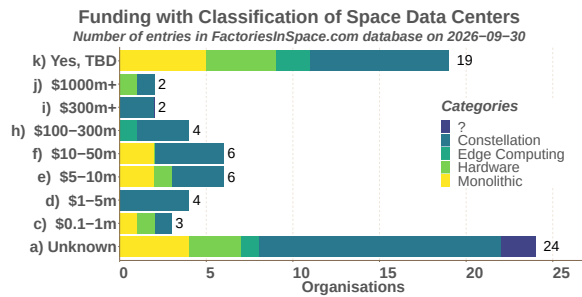


Figure 5: Funding levels by category of space data-centre activities.

Starcloud reported total funding of \$450 million after a \$250 million Series A extension in August 2026. Cowboy Space announced a \$275 million Series B in May 2026.^{36,58} At smaller funding levels, Orbital announced a \$5 million pre-seed round in June 2026. Sophia Space announced a \$7 million SAFE round in June, taking its reported total to \$22 million.^{31,52} Sophia's separate \$300 million asset-financing framework with SLI was announced in September under a non-binding letter of support.⁵⁹

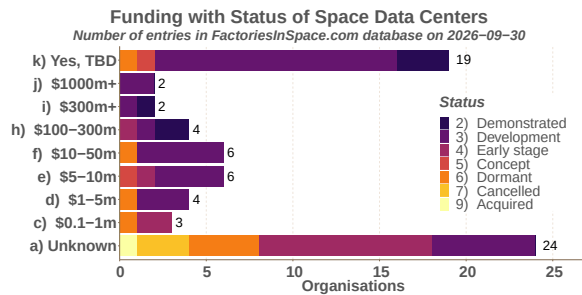


Figure 6: Funding levels by status of space data-centre activities.

Figure 6 shows that both entries in the highest funding band remain classified as development. Of the 6 demonstrated entries, two fall in \$100-300 million, one in the \$300 million-plus band and three have funding without a published amount. Funding also appears among dormant activities. LyteLoop announced a \$40 million financing round in 2021, while its optical-storage project is now dormant.⁶⁰

Company funding can support several business lines. This is particularly relevant to launch providers, satellite manufacturers and large technology companies. The funding of SpaceX, Relativity Space, D-Orbit and Pixxel also supports activities beyond space data centres. These amounts therefore cannot be summed as investment committed exclusively to orbital computing or storage.

3.5 First launches

Figure 7 shows first-mission years and scheduling categories for 70 entries. Twenty-eight entries, or 40%, have no year specified. Seven are listed as dormant and three as cancelled. The remaining 32 entries, or 45.7%, have an assigned year. Fourteen are dated before 2026, 10 in 2026 and 8 after 2026.

The early years each contain one entry: 2017, 2019, 2021 and 2022. These correspond to HPE's first Spaceborne Computer mission, Stara Space's NOOR spacecraft, D-Orbit's Wild Ride computing demonstration and Axiom's AWS Snowcone demonstration aboard the ISS.^{7,37,61,62}

The 2024 examples are Aethero's Deimos demonstrator, Lonestar's Independence payload on IM-1 and TakeMe2Space's computing technology demo.^{10,63,64} The 2025 group includes ADA Space's first 12 computing satellites, Starcloud-1, Planetek's first AIeXpress mission and the launch of LEOcloud's Space Edge platform under Voyager.^{34-36,65}

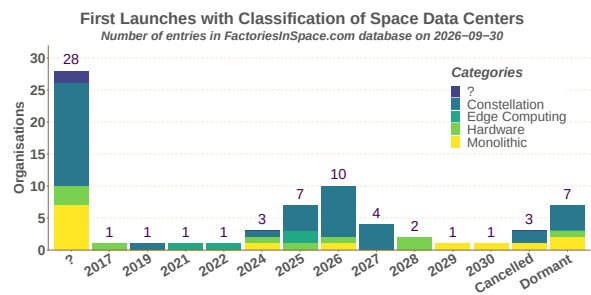


Figure 7: First launches by category of space data-centre activities.

The ten entries assigned to 2026 comprise eight constellation activities, one hardware activity and one monolithic system. Four constellation entries are assigned to 2027. Two hardware entries have 2028 targets, while one monolithic entry is assigned to each of 2029 and 2030. These dates combine completed missions and future targets. For example, Kepler's first computing-equipped satellite group launched in January 2026, while Google's initial Suncatcher prototype was still awaiting launch at the end of September.^{17,22} The ten entries dated 2026 consequently cannot be treated as ten completed missions.

A first mission can be a small hosted payload or technology demonstration. The counts refer to organisations and programmes, and several can share the same spacecraft or launch. Axiom's two nodes flew on Kepler satellites, while LEOcloud and Voyager are both associated with Space Edge.^{7,34} First launch, completion of a proposed system and delivery of a commercial service are separate milestones.

3.6 Geographical distribution

Figure 8 shows activities associated with seventeen countries. The United States has 34 entries, or 48.6% of the 70 activities. China follows with twelve, or 17.1%. Together, these two countries account for 46 entries, or 65.7%. Italy and India each have four. Canada, France, Germany, the United Kingdom and the United Arab Emirates each have two. Austria, Israel, Japan, Poland, Singapore, South Africa, South Korea and Thailand each have one.

The United States combines large aerospace and technology companies with dedicated startups. Examples include SpaceX, Blue Origin, Google, HPE, Starcloud, Cowboy Space, Sophia Space and Orbital. Their activities span orbital computing constellations, space station-based services and proposed facilities for terrestrial workloads.^{21, 61, 66, 67}

China's 12 entries include CASC, ADA Space and STAR.VISION alongside recently formed entities. 9 of the 12 were founded from 2024 onwards, including 5 in 2026. ADA Space has already launched the initial 12-satellite group of the Three-Body Computing constellation, while companies such as Deep Space Matrix and Zhongke Tiansuan are developing further orbital computing systems.^{35, 47, 68}

India's four entries are Agnikul Cosmos with Neev-Cloud, Inorbii, Orbit Grid and TakeMe2Space. Their approaches include computing integrated with launch infrastructure, hosted inference payloads and dedicated orbital computing satellites.^{53, 64, 69, 70}

European examples include D-Orbit and Planetek in Italy, ALATYR in France, Exlumina and ODC in Germany, and LeoTrek in Austria.^{30, 32, 33, 71–73}

Canada's two entries are Kepler Communications and 3K SpaceTech. Kepler combines optical data relays with computing services and commissioned 40 NVIDIA Jetson Orin modules across 10 satellites in March 2026.¹⁷ The lunar-orbit power, computing and storage idea from 3K SpaceTech is dormant.⁴³

Japan's activity centres on NTT and SKY Perfect JSAT's Space Compass joint venture, established in 2022 to develop space communications and computing infrastructure.⁷⁴ Singapore's Orbit AI combines communications and computing satellites in its Orbital Cloud programme.⁷⁵ South Korea's SpaceD proposes software-defined data-centre satellites.⁷⁶ Thailand's mu Space combines satellite communications with server and storage systems.⁷⁷

The United Arab Emirates has two entries, Madari Space and Stellar. Madari targets protected storage and backup services, while Stellar focuses on orbital edge computing and a sovereign space cloud.^{54, 78} Israel's SpaceComputer develops confidential processing and cryptographic verification services.⁷⁹ Other historical activities include 3K SpaceTech, the dormant IZN StarBlade project in South Africa and the cancelled Indiciun lunar data centre in Poland.^{80, 81}

Thales Alenia Space contributes to the counts for Italy, France and the United Kingdom. Thus, they are not mutually exclusive.

Geographical Distribution of Space Data Centers

Number of entries in the *FactoriesInSpace.com* database as of 2026-09-30

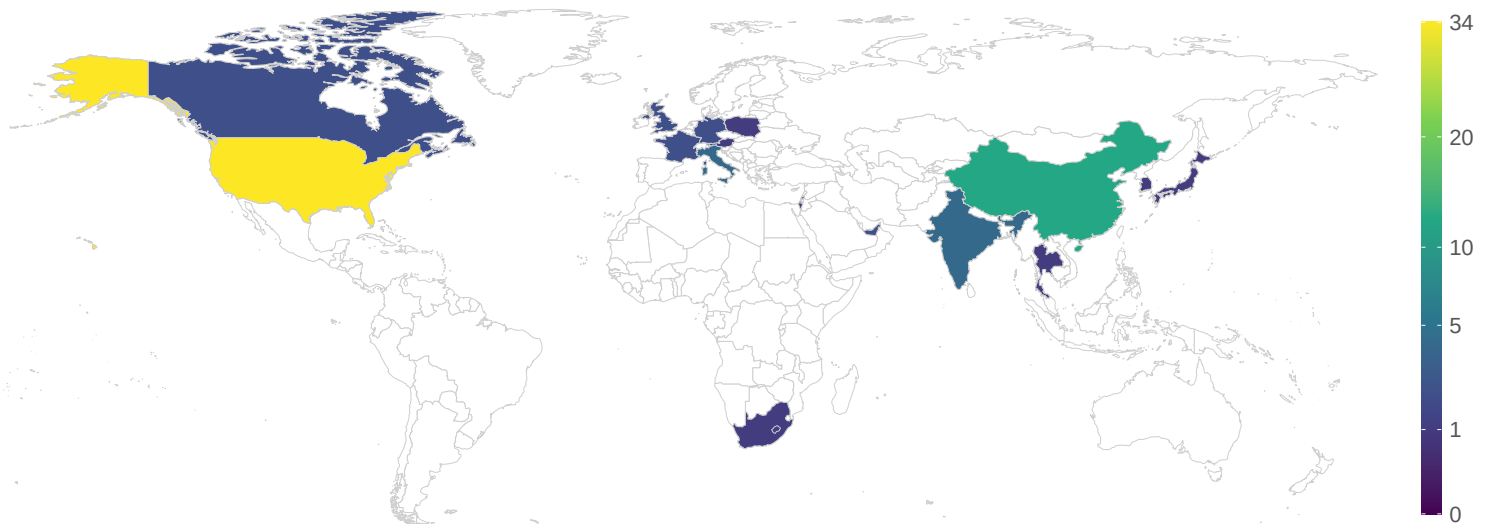


Figure 8: Geographical distribution of space data centre activities.

4. COMMERCIAL LANDSCAPE OF SPACE DATA CENTERS

Table 3 collects the 70 surveyed 70 companies and programmes in the space data center field. It is followed by short descriptions of the organisations.

Table 3: Space Data Center Commercial Activities

Organisation	Status	Founded	First launch	Funding	Category	Location, Orbit		Country
3K SpaceTech	Dormant	2021	Dormant	?	Constellation	Lunar Orbit		Canada
ADA Space	Demonstrated	2018	2025	Yes, ?	Constellation	LEO		China
Aethero	Development, Launched	2021	2024	\$8.4M	Hardware	LEO		USA
Agnikul Cosmos (Neevcloud)	Development	2017	2026	?	Constellation	LEO		India
ALATYR (ASTROLAB)	Development	2023	?	?	Monolithic	LEO		France
AS23.Space (Autonomous Science)	Cancelled	2023	Cancelled	?	Constellation	LEO		UK
Axiom Space	Demonstrated	2016	2022	Yes, ?	Monolithic, Edge Computing	LEO		USA
Blue Origin	Development	2000	?	Yes, ?	Constellation	LEO		USA
China Aerospace Science and Technology Corporation - CASC	Development	1999	2030	Yes, ?	Monolithic	?		China
Cloud Constellation	Early stage	2015	?	\$100M	Constellation	LEO		USA
ConnectX	Early stage	2017	?	?	Constellation	LEO		USA
Cowboy Space (Aetherflux)	Development	2024	2026	\$335M+	Constellation	LEO		USA
D-Orbit	Demonstrated	2011	2021	\$198M+	Edge Computing	LEO		Italy
Deep Space Matrix (Shenkong Juzhen)	Development	2026	?	\$15M+	Constellation	LEO		China
Dunvegan Space Systems	Dormant	2013	Dormant	?	Constellation	LEO		USA
Ethos Space	Development	2022	?	Yes, ?	Monolithic	Lunar Surface		USA
Exlumina	Early stage	2023	?	?	Constellation	LEO		Germany
Google (Project Suncatcher)	Development	1998	2026	Yes, ?	Constellation	LEO		USA
Hewlett Packard Enterprise	Demonstrated	2015	2017	Yes, ?	Hardware	LEO, ISS		USA
Indicium	Cancelled	2018	Cancelled	?	Monolithic	Lunar Surface		Poland
Inorbii	Early stage	2026	?	?	Constellation	LEO		India
Intercosmic Energy	Early stage	2024	?	?	Constellation	?		USA
IZN	Dormant, Early stage	2016	Dormant	?	Constellation	LEO		South Africa
Kepler Communications	Demonstrated	2015	2026	\$200M+	Constellation	LEO		Canada
LEOcloud (Voyager Technologies)	Demonstrated, Acquired	2021	2025	?	Edge Computing	LEO		USA
LeoTrek	Early stage	2025	?	?	Constellation	LEO		Austria
Lonestar Data Holdings	Development, Launched	2018	2024	\$5.8M+	Monolithic	Lunar Lunar LEO	Surface, Orbit,	USA
LyteLoop	Dormant	2015	Dormant	\$40M	Constellation	LEO		USA
Macro Aerospace	Cancelled	2012	Cancelled	?	Constellation	LEO		Italy

Table 3: Space Data Center Commercial Activities (Continued)

Organisation	Status	Founded	First launch	Funding	Category	Location, Orbit	Country
Madari Space	Development	2023	?	?	?	LEO	United Arab Emirates
Mu Space Corp	Development	2017	?	?	?	LEO	Thailand
NAVXCOM	Early stage	2023	?	?	Hardware	Lunar Surface	USA
Nebula Space Enterprise	Dormant, ?	2020	Dormant	Yes, ?	Hardware	LEO	USA
NTT (Nippon Telegraph and Telephone) / Space Compass	Demonstrated	1952	2025	Yes, ?	Constellation	LEO	Japan
ODC (Orbital Data Center)	Early stage	2024	?	?	Monolithic	LEO	Germany
Odyssey	Early stage	2023	?	Yes, ?	Hardware	LEO	USA
Orbit AI	Development, Demonstrated	2024	2025	\$1M	Constellation	LEO	Singapore
Orbit Grid	Early stage	2025	2028	?	Hardware	LEO	India
Orbit Twilight (Beijing Orbital Chenguang, Orbital Dawn)	Development	2024	2027	Yes, ?	Constellation	LEO	China
Orbit20	Dormant	2020	Dormant	Yes, ?	Monolithic	LEO	USA
Orbital	Development	2026	2027	\$5M	Constellation	LEO	USA
OrbitsEdge	Development	2019	2026	?	Hardware	LEO	USA
Phantom Space	Development	2020	2027	\$37M	Constellation	LEO	USA
Pixxel	Development	2018	2026	\$195M	Constellation	LEO	USA
Planetek Italia	Development, Demonstrated	1994	2025	Yes, ?	Edge Computing	LEO	Italy
Planetoid Mines Company	Early stage	2009	?	\$0.18M	Constellation	Lunar Orbit	USA
Relativity Space	Development	2016	2028	\$1.3B+	Hardware	Mars Orbit	USA
Satlyt	Development	2024	?	\$1M+	Constellation	LEO	USA
Shanghai Xingshu Tiansuan	Development	2026	2026	Yes, ?	Constellation	LEO	China
Sophia Space	Development	2023	?	\$22M	Monolithic	LEO	USA
Spacebilt (SkyCorp)	Development, ?	1998	?	Yes, ?	Monolithic	?	USA
SpaceComputer (Spacecoin)	Development	2024	?	Yes, ?	Hardware	LEO	Israel
SpaceD	Early stage	2024	?	?	Constellation	?	South Korea
SpaceX	Development	2002	2027	\$1B+	Constellation	LEO	USA
STAR.VISION	Development	2017	?	?	Constellation	LEO	China
Stara Space	Dormant, Demonstrated	2018	2019	\$1M+	Constellation	LEO	USA
Starcloud (Lumen Orbit)	Demonstrated	2024	2025	\$450M+	Constellation	LEO, Lunar Orbit	USA
StarOrigin / Xingji Yuandian	Development	2025	?	\$3M+	Constellation	LEO	China
Stellar (Zero Matter)	Early stage	2026	?	?	Constellation	LEO	United Arab Emirates
Symphony Space	Development	2025	2029	Yes, ?	Monolithic	LEO	USA

Table 3: Space Data Center Commercial Activities (Continued)

Organisation	Status	Founded	First launch	Funding	Category	Location, Orbit	Country
TakeMe2Space	Development, Demonstrated	2024	2024	\$5.6M	Constellation	LEO	India
Thales Alenia Space	Concept	2007	?	Yes, ?	Monolithic	LEO	Italy, France, UK
TransAstra	Concept	2015	?	\$6.9M+	Monolithic	LEO	USA
United Space Structures	Dormant	2009	Dormant	?	Monolithic	Lunar Surface	USA
Voyager Technologies	Development	2019	2025	Yes, ?	Hardware	LEO, ISS	USA
Xingji Tiansuan (iSpace)	Development	2026	?	Yes, ?	Constellation	?	China
Xuanwu Aerospace	Early stage	2026	?	\$7M+	Constellation	?	China
Xuechen Xinghang (Beijing Xuechen Xinghang Technology Co)	Development	2025	2026	Yes, ?	Constellation	LEO	China
Yusuan Xinghe (YuSuanXingHe)	Development	2026	2026	\$15M+	Constellation	LEO	China
Zhongke Tiansuan / CAS Space Computing	Development	2024	2026	\$15M+	Monolithic	?	China

Table 4 lists space computing or storage constellation projects. The five largest announced counts sum to 1,259,600 spacecraft.

Table 4: Space Data Center constellation subset.²⁹

Programme / Organisation	Launched	Announced	Notes
Satlyt	0	—	Planned network. Count unspecified.
NTT	0	—	Planned network. Count unspecified.
Lonestar	0	6	Other mission demonstrations are outside this constellation count.
Orbit AI	1	100	Genesis-1 demonstrator launched.
Shanghai Xingshu / Tiansuan	0	150	Proposed constellation.
AS23.Space / Nebula Data	0	210	Cancelled programme.
StarVision / OSE	0	252	Proposed constellation.
ADASPACE / Three-Body Computing	12	1,000	Initial spacecraft launched.
Cowboy Space / Stampede	0	20,000	Long-term announced scale.
Blue Origin / Project Sunrise	0	51,600	Application-scale proposal.
Starcloud	1	88,000	Demonstrator and large proposed constellation.
Orbital	0	100,000	Long-term announced scale.
SpaceX / Starmind	0	1,000,000	FCC filing is "Orbital Data Center System".

5. MAJOR PLAYERS

5.1 3K SpaceTech

3K SpaceTech was founded in Canada in 2021. It proposed using its X-Charge power stations as computing and storage nodes. The planned network would supply power and information services to other spacecraft.⁴³ The project is now dormant.

5.2 ADA Space

ADA Space, also known as Guoxing Aerospace, is a Chinese satellite company founded in 2018. It developed the first 12 satellites of Zhejiang Lab's Three-Body Computing constellation under its Star-Compute programme. The satellites launched in May 2025, and the company reported completion of on-orbit testing and delivery review later that year. Further satellite groups are under development.³⁵

5.3 Aethero

Aethero is a U.S. company developing space computing hardware. Its first NxN edge computer launched aboard the Deimos demonstrator in August 2024.⁶³ The company has since expanded its offering to the Altus orbital cloud. Its proposed network connects computing nodes through radio and optical links. Altus Core offers shared computing, while Altus Prime is intended to provide dedicated spacecraft.⁸²

5.4 Agnikul Cosmos and NeevCloud

Agnikul Cosmos is an Indian launch company founded in 2017. In February 2026, it announced a partnership with Indian cloud provider NeevCloud to develop solar-powered AI computing in low Earth orbit.⁸³ The proposed service would run AI inference in space, combining Agnikul's launch and spacecraft work with NeevCloud's computing platform.⁶⁹

5.5 ALATYR

ALATYR, formerly ASTROLAB, is a French company founded in 2023. It proposes CITADEL, a network of modular orbital data centres assembled and serviced by its BYLD robotic system. The company targets 1–5 MW per launch and a first commercial deployment in 2030. Computing equipment would be replaced every three to five years while the supporting infrastructure remains in service.³⁰

5.6 AS23.Space

AS23.Space was founded in the UK in 2023. It proposed Nebula Data, starting with a station-hosted computing payload and expanding to a constellation connected by radio and optical links. Pan Galactic partnered with the company to provide blockchain technology.⁸⁴ Founder Barry Leeson announced the company's closure in 2026.³⁸

5.7 Axiom Space

Axiom Space is a U.S. company founded in 2016 to develop commercial space stations. In April 2022, it flew an Amazon Web Services (AWS) Snowcone edge computer to the International Space Station (ISS) during the Ax-1 mission. The device processed images using machine learning and received an updated model from Earth.⁸⁵

The same computer supported further demos in 2023. Japan Manned Space Systems Corporation (JAMSS) tested automated file transfer in April. Southwest Research Institute (SwRI) tested remote software updates and repair in June. SpiderOak tested secure communications between the ISS and Earth using its OrbitSecure software in August.⁸⁶

Axiom announced orbital data-centre plans with Kepler and Skyloom in December 2023.⁵⁶ Its AxDCU-1 computing prototype was deployed on the ISS in 2025, followed by the launch of two computing nodes on Kepler satellites on 11 January 2026. The company is developing an orbital cloud service combining equipment on space stations with satellite nodes.⁸⁷

5.8 Blue Origin

Blue Origin entered the orbital data centre field with its Project Sunrise FCC application in March 2026. The proposed constellation would comprise up to 51,600 satellites on sun-synchronous orbits at altitudes of approximately 500–1,800 km.⁶⁷

5.9 China Aerospace Science and Technology Corporation (CASC)

CASC is a Chinese state-owned aerospace group established in 1999. In January 2026, it announced plans for gigawatt-class space computing infrastructure as part of its five-year development programme. The proposed system combines computing, storage and communications, linking central computing facilities with edge processors and user terminals.⁸⁸

5.10 Cloud Constellation

Cloud Constellation is a U.S. company founded in 2015. It introduced SpaceBelt in May 2016 as a satellite network for data storage and transfer.⁸⁹ Its later design proposed 8 satellites in LEO for storing and transferring sensitive data. Optical links would connect the satellites, supporting managed storage and secure communications for customers.⁹⁰

5.11 ConnectX

ConnectX is a U.S. company founded in 2017. It proposes a private network for storing and accessing sensitive data. Its deployment plan starts with terrestrial servers and dedicated access devices, followed by satellite-based storage.⁹¹

5.12 Cowboy Space

Cowboy Space was founded in the United States in 2024 as Aetherflux, initially to transmit solar power from space to Earth. It announced an orbital data-centre programme in December 2025.⁵⁷ Following its 2026 rebranding, the company is developing Stampede, a constellation of solar-powered orbital data centres.⁹² In May 2026, it announced a \$275 million Series B round at a \$2 billion valuation. The company is also developing a launch vehicle whose upper stage would operate as a 1 MW data centre after reaching orbit.⁵⁸

5.13 D-Orbit

D-Orbit is an Italian company founded in 2011 to provide orbital transportation and logistics. Its computing services grew from hosted payloads aboard its ION vehicles. It launched its Nebula computing and storage demonstration on the ION Wild Ride mission in June 2021, using Unibap's SpaceCloud hardware.⁶² Its Space Cloud Services allow customers to deploy applications and process data on ION's on-board computers. The company's Intelligence Logistics architecture is intended to receive, process and route data from multiple satellites.³²

5.14 Deep Space Matrix

Deep Space Matrix, also known as Shengkong Juzhen, was founded in Beijing, China, in February 2026. Its Star Ring Plan proposes an initial network of about 210 satellites combining Earth observation, communications and computing. In September 2026, the company announced an RMB 100 million angel round following a seed round earlier that year.⁴⁷

5.15 Dunvegan Space Systems

Dunvegan Space Systems was founded in the US in 2013. Its BitSat proposal called for a 24-satellite network to provide communications, processing, storage and broadcasting services through an open platform.⁹³ The project is now dormant.

5.16 Ethos Space

Ethos Space is a U.S. company founded in 2022 to develop lunar resource and construction technologies. It proposes using silicon and other materials extracted from lunar regolith to build solar-power infrastructure. In June 2026, the company outlined how this manufacturing capability could support large space data centres.^{40,94}

5.17 Exlumina

Exlumina is a German company founded in 2023. It is developing orbital data centres for AI inference, with additional processing services for partner satellites. Its roadmap starts with a CubeSat carrying a GPU payload, followed by spacecraft with optical links and a larger computing constellation.⁷¹

5.18 Google: Project Suncatcher

Google announced Project Suncatcher in November 2025. The research programme studies solar-powered satellites carrying Tensor Processing Units (TPUs) and connected by laser links.²¹ As of 30 September 2026, its first prototype, developed with Planet, was awaiting launch on Transporter-18 to test the processors and their cooling system in orbit. A two-satellite mission was planned for 2027 to test optical connections between spacecraft.²²

5.19 Hewlett Packard Enterprise

Hewlett Packard Enterprise's Spaceborne Computer programme operates commercial computing hardware aboard the ISS. The first system launched in 2017, followed by Spaceborne Computer-2 in 2021 and a further mission in January 2024. The systems support scientific data processing, image analysis and AI workloads on the station.^{14,61}

5.20 Indicium

Indicium was founded in Poland in 2018. It proposed a lunar data centre for storing sensitive information. Dedicated customer communication links would provide access without relying on terrestrial internet.⁸¹ The project has been cancelled.

5.21 Inorbii

Inorbii is an Indian company founded in 2026. It is developing orbital data-centre infrastructure for AI and high-performance computing. Its proposed systems use solar power and radiative cooling in sun-synchronous low Earth orbit.⁵³

5.22 Intercosmic Energy

Intercosmic Energy is a U.S. company founded in 2024. It proposes using solar power in orbit for computing, including Bitcoin mining. Its Space-Based Blockchain Mining Platform would generate revenue from computation in space and transmit the results to Earth. The company also proposes licensing the system to constellation operators.⁹⁵

5.23 IZN

IZN is a South African company founded in 2016. It proposed StarBlade, a deployable computing satellite approximately 70 m long. The design uses folding structures and optical links, with multiple spacecraft forming a larger AI computing network.⁸⁰ The StarBlade project is now considered dormant.

5.24 Kepler Communications

Kepler Communications was founded in Canada in 2015 to develop satellite communications. Its optical data-relay network also provides hosted computing capacity. In March 2026, the company reported commissioning 40 NVIDIA Jetson Orin modules across ten satellites. Optical links connect the spacecraft, allowing customers to run shared workloads such as AI processing and data fusion.¹⁷

5.25 LEOcloud

LEOcloud was founded in the United States in 2021. It developed Space Edge, a managed cloud-computing platform for users in space. Voyager Technologies acquired the company in April 2025 and later announced deployment of its multi-cloud capability in orbit.^{34,39}

5.26 LeoTrek

LeoTrek is an Austrian company founded in 2025. It is developing a distributed AI platform for satellites in low Earth orbit. Its initial applications include wildfire monitoring and other time-sensitive Earth-observation services. The platform processes data near the sensors and prioritises results for transmission to Earth.⁷³

5.27 Lonestar Data Holdings

Lonestar Data Holdings was founded in the United States in 2018 to provide off-Earth backup and storage. Its Independence payload flew on Intuitive Machines' IM-1 mission in February 2024, followed by the Freedom payload on IM-2 in 2025. The company reported storage and data-transfer tests during the lunar missions.^{10,96} Its plans now include the StarVault orbital network. In April 2026, it announced an order for two storage payloads from Sidus Space, with the first scheduled for October 2026.⁴⁶ Its lunar plans cover facilities on the surface and in orbit.¹⁰

5.28 LyteLoop

LyteLoop was founded in the United States in 2015. It proposed storing data in continuously circulating optical signals along long light paths in space. The company announced a \$40M financing round in 2021.⁶⁰ The project is now dormant.

5.29 Macro Aerospace

Macro Aerospace was founded in Italy in 2012. It proposed a CubeSat constellation for secure satellite data storage. Founder Gianni Cuzzo reports that the company raised €4.5M in 2013 and was sold in 2015.⁹⁷ The project has been cancelled.

5.30 Madari Space

Madari Space was founded in the United Arab Emirates in 2023. It proposes space data centres for government and enterprise customers. Its planned services include encrypted communications, protected data storage and backup outside Earth facilities.⁷⁸

5.31 mu Space

mu Space is a Thai satellite company founded in 2017. Alongside its satellite manufacturing and communications work, it proposes a Space Internet Data Center (Space IDC) combining server computers with satellite communications equipment. The system is intended to provide computing and storage for orbital and surface applications.⁷⁷

5.32 NAVXCOM

NAVXCOM is a U.S. company founded in 2023. It proposes navigation, communications and cloud-computing infrastructure for the lunar surface. Its plans support connected surface vehicles and facilities, with a later extension to Mars.⁴¹

5.33 *Nebula Space Enterprise*

Nebula Space Enterprise is a U.S. company working on computing, data fusion and cybersecurity. Its Nebula Compute initiative proposed space-based servers. The systems are intended to process data close to their sources and combine information from multiple inputs.⁹⁸ The current status of the orbital server programme is uncertain.

5.34 *NTT and Space Compass*

Japanese companies NTT and SKY Perfect JSAT announced their Space Integrated Computing Network initiative in May 2021.⁹⁹ They established the joint venture Space Compass in July 2022 to develop space communications and computing infrastructure.⁷⁴ Its roadmap starts with optical data-relay services and expands towards computing satellites.^{100,101}

5.35 *ODC: Orbital Data Center*

ODC is a German company founded in 2024. It proposes modular data centre platforms in LEO that can be serviced and expanded. Planned services include archival storage, backup and computing.⁷²

5.36 *Odyssey*

Odyssey is a U.S. company founded in 2023. It proposes orbital computers connected by laser links. Its roadmap targets an initial Odysseus-1 mission in 2027, followed by larger fleets and later expansion towards the Moon.¹⁰²

5.37 *Orbit AI*

Orbit AI is a Singapore-based company founded in 2024 and identified as Smartlink AI in PowerBank announcements. It is developing an Orbital Cloud combining DeStarlink communications satellites with DeStarAI computing satellites.⁷⁵ PowerBank reported the launch of DeStarlink Genesis-1 on 10 December 2025 and announced in January 2026 that it was running an AI model in orbit.^{103,104}

5.38 *Orbit Grid*

Orbit Grid is an Indian company founded in 2025. It is developing Gaia 1.0, a modular computing payload for AI inference on commercial satellite platforms. Its roadmap targets a hosted demonstration in 2028 and dedicated computing satellites from 2029. The proposed service would process data from space and terrestrial sensors.⁷⁰

5.39 *Orbit Twilight*

Beijing Orbit Twilight Technology is a Chinese company founded in 2024. It works with the Beijing Astro-future Institute of Space Technology on orbital data centres. Their 2025 proposal describes 16 facilities in dawn-dusk orbits at 700–800 km, with a combined power target of 16 GW. The roadmap starts with computing and relay demos in 2025–2027 and extends to large facilities in 2031–2035.¹⁰⁵

5.40 *Orbit20*

Orbit20 was founded in the US in 2020. It proposed an orbital data centre for confidential computing and storage.¹⁰⁶ The project is now dormant.

5.41 *Orbital*

Orbital is a U.S. company founded in 2026. It is developing computing satellites to serve terrestrial AI customers. Its roadmap starts with a hosted inference demonstration in 2027, followed by dedicated spacecraft carrying multiple GPU nodes.¹⁰⁷

5.42 *OrbitsEdge*

OrbitsEdge is a U.S. company founded in 2019. It develops SatFrame, a satellite platform for commercial computing hardware. The platform combines power, radiation protection and thermal control. Its 445 LE configuration accommodates 5U of equipment in a standard 19-inch rack.¹⁰⁸

5.43 *Phantom Space*

Phantom Space is a U.S. launch and satellite company. Its Phantom Cloud programme extends activities to orbital processing and third-party data services. In April 2026, the company acquired Thermal Management Technologies to support cooling-system development for its Block I spacecraft.¹⁰⁹

5.44 *Pixxel*

Pixxel was founded in 2018 and operates in India and the United States. Its original business centres on hyperspectral Earth observation. In May 2026, it partnered with Sarvam on the Pathfinder satellite, combining data-centre-class GPUs, AI models and hyperspectral imaging. The mission intends to demonstrate image processing in orbit and support the development of dedicated computing satellites.¹¹⁰

5.45 Planetek Italia

Planetek Italia is an Italian Earth-observation and space-software company founded in 1994. In 2023, it was selected to lead the Italian Space Agency's In-Orbit Space Lab with D-Orbit and AIKO, including its Space App Store software.¹¹¹ The same partners develop AI-eXpress with co-funding from ESA's InCubed programme. The system provides orbital edge-computing services using Earth-observation instruments and computing payloads hosted on D-Orbit's ION spacecraft. Users can configure data acquisition and processing workflows using shared onboard resources. Its Space App Store supports the testing and deployment of AI applications in orbit.^{33,112}

The first mission, AIX-1p, launched in January 2025 using D-Orbit's ION platform on Transporter-12 mission. AIX-1 followed on 23 June 2025 and AIX-1+ on 28 November 2025, progressively adding sensing, processing and software capabilities.^{33,65}

In June 2026, the partners demonstrated remote access to AIX-1+ aboard D-Orbit's ION SCV-021 through Viasat's geostationary relay satellites. A continuous connection was maintained for ten minutes, with round-trip latency below six seconds. During the session, the team requested onboard processing, retrieved telemetry and transferred files.¹¹³

5.46 Planetoid Mines

Planetoid Mines is a U.S. company founded in 2009. It proposes a lunar data-centre network alongside its work on lunar mining and manufacturing. The company develops excavation and resource processing equipment for use on the Moon.^{44,114}

5.47 Relativity Space

Relativity Space is a U.S. launch vehicle developer. Eric Schmidt acquired the company in March 2025 and later confirmed that plans to launch data centres into orbit helped motivate the purchase.¹¹⁵

The company's Interplanetary Sciences Program proposes a Mars orbiter for 2028 carrying a Relay Data Center. The design combines server-class processing, storage, optical and radio communications, and delay-tolerant networking for scientific missions.⁴⁵

5.48 Satlyt

Satlyt is a U.S. company founded in 2024. It develops software that distributes AI workloads across computers in space. Its agreement with Rogue Space Systems covers demonstrations on hosted computing platforms aboard OTP-2 and OTP-2B.¹¹⁶

After the survey cutoff, Satlyt announced an \$8 million seed round on 1 October 2026, bringing its reported total funding to more than \$10 million. The funding supports a software-based computing network on partner satellites.¹¹⁷

5.49 Shanghai Xingshu Tiansuan Space Technology

Shanghai Xingshu Tiansuan Space Technology was established in China in 2026. It is developing the Xingshu programme with Fudan University and other partners. Announced in May 2026, the proposed network combines orbital processing, communications and on-demand allocation of resources.⁴⁸

5.50 Sophia Space

Sophia Space was founded in the United States in 2023 and incubated by Mandala Space Ventures.¹¹⁸ It develops TILE modules that combine computing, solar power and radiative cooling. The modules can be connected to form larger computing platforms. In June 2026, the company announced a \$7 million SAFE financing round, bringing its reported total funding to \$22 million.³¹ A joint patent with Caltech and research agreement followed in 2026.¹¹⁹

In September 2026, Sophia Space and SLI announced a \$300 million asset-financing framework for a ten-satellite computing constellation, with launches planned from 2028. SLI would purchase the satellites and lease them to customers.⁵⁹

On 30 September 2026, Sophia Space and Redwire announced a MoU to explore joint work on orbital computing infrastructure.[?]

5.51 SpaceBilt

SpaceBilt is a U.S. company whose work includes in-space assembly and modular computing hardware. Its earlier activities include the SMART-1 platform aboard the ISS and hardware for lunar data storage. With Axiom Space, it plans to deploy an optically connected data-centre node aboard the ISS in 2027. The node would provide storage and AI services to spacecraft and space station users.¹²⁰

5.52 SpaceComputer

SpaceComputer is an Israeli company founded in 2024. It develops a satellite computing network for confidential processing, cryptographic verification and security services. Its system connects terrestrial users with computing hardware in orbit.⁷⁹

5.53 *SpaceD*

SpaceD is a South Korean company founded in 2024. It proposes Software-Defined Datacenter Satellites (SDDS) combining computing, reconfigurable radios and virtualised software. The system would allocate processing, power, storage and communications capacity between customer tasks.⁷⁶

5.54 *SpaceX*

SpaceX's Starmind programme proposes a constellation of solar-powered satellites that run AI workloads for users on Earth. The company acquired xAI in Feb 2026, bringing AI development into the same group as its launch and satellite businesses.^{121, 122}

On 30 January 2026, SpaceX applied to the FCC for permission to launch and operate an orbital data centre system of up to one million satellites. The proposed system covers altitudes from 500 to 2,000 km, with satellites at 30° inclination and in sun-synchronous orbits. The FCC accepted the application for filing and public comment on 4 February 2026.⁶⁶

The first satellite design, AI1, has a deployed wingspan of 75 m and a height of 30 m. Its computing payload is rated at 175 kW average power and up to 250 kW peak power. The payload architecture is modular and designed to accommodate computing modules from different suppliers.¹²²

The first generation is planned to use an adapted NVIDIA Vera Rubin NVL72 system. The companies are adapting the system for the power, cooling, communications and reliability requirements of orbital operation while retaining NVIDIA's computing architecture and software environment.¹²³

SpaceX plans to redirect workloads when hardware fails and move older processors to less demanding tasks as newer satellites enter service. It does not plan to service or repair in orbit.^{122, 124}

Optical links would connect the computing satellites to one another and to Starlink, which would relay data between the orbital computers and Earth.^{66, 122}

Deployment depends on Starship's planned reusable launch capability and payload capacity. SpaceX aims to manufacture and deploy thousands of AI satellites starting as early as late 2027. Its deployment approach uses Starship's satellite dispenser and draws on the production methods developed for Starlink.^{122, 124}

5.55 *STAR.VISION*

STAR.VISION is a Chinese company founded in 2017. It combines Earth observation, onboard AI and data services through its Oriental Smart Eye

programme. The company also proposes a computing constellation that would support software applications and processing across multiple satellites.^{125, 126}

5.56 *Stara Space*

Stara Space was founded in the United States in 2018. It proposed a constellation providing data relay, storage and computing services to other satellites. Alba Orbital built its two NOOR proof-of-concept spacecraft, which launched in 2019.^{37, 127} The constellation project is now dormant.

5.57 *Starcloud*

Starcloud was founded in the United States in 2024 as Lumen Orbit. It develops orbital computing infrastructure for satellite users and terrestrial AI workloads. Its Starcloud-1 demonstrator launched in November 2025 carrying an NVIDIA H100 GPU. The company subsequently reported AI model training, fine-tuning and inference experiments in orbit.³⁶

In August 2026, Starcloud raised a \$250 million Series A extension, bringing its total funding to \$450 million at a valuation of \$2.3 billion. Manhattan West led the round, with NVIDIA and Cisco joining as investors alongside existing backers including Benchmark and EQT. The funding supports spacecraft development, engineering work with NVIDIA and procurement of future launch capacity.³⁶

Two 8 kW Starcloud-2 satellites are planned for 2027.¹²⁸ Starcloud also collaborates with NVIDIA on the Space-1 Vera Rubin Module, with its satellites intended to provide early flight testing of the hardware. Its longer-term plans call for a constellation of 88,000 satellites providing 20 GW of orbital computing capacity.³⁶

On 30 September 2026, Firefly announced an agreement to carry Starcloud's SC-1L computing payload into lunar orbit aboard Elytra, with launch targeted for no earlier than 2028. The payload would process data from Firefly's Solux vision system and transmit the results to Earth. The mission would test computing capabilities for future lunar surface and orbital infrastructure.¹¹

5.58 *StarOrigin*

StarOrigin, also known as Xingji Yuandian, is a Chinese company founded in 2025. It is developing computing satellites and plans to operate its own constellation. Its Xuanji-1 design is a 500 kg-class spacecraft with 7–10 kW of power and space for 9–16 computing payloads. The company announced seed and angel financing rounds in July 2026.¹²⁹

5.59 Stellar

Stellar is a Zero Matter venture established in the United Arab Emirates in 2026. It focuses on orbital edge computing and a sovereign space cloud.⁵⁴

5.60 Symphony Space

Symphony Space is a U.S. company founded in 2025. It proposes modular orbital platforms that can host computing payloads and be reconfigured after launch. A LoI with Catalyst Data Centers covers the development of orbital computing services.¹³⁰

5.61 TakeMe2Space

TakeMe2Space is an Indian company founded in 2024. It develops remotely accessible orbital computers through its MOI programme. Initial applications focus on processing Earth-observation data near the sensor.¹³¹ Its roadmap also proposes a 50 kW space data centre.⁶⁴

5.62 Thales Alenia Space

Thales Alenia Space was selected to lead ASCEND in Nov 2022, a Horizon Europe study of solar-powered data centres in orbit.⁵⁵ The proposed facilities would use modular structures assembled by robots, with a target of reaching 1 GW before 2050. Results published in 2024 examined technical, economic and environmental feasibility, including the need for much lower launcher life-cycle emissions.¹⁹

5.63 TransAstra

TransAstra is a U.S. company founded in 2015. It has proposed AstroCloud for data processing in space.¹³² The company also develops space tugs, orbital logistics and resource-processing technologies.¹³³

5.64 United Space Structures

United Space Structures was founded in the US in 2009. It proposed lunar data centres as part of its work on lunar facilities, robotics and cislunar logistics.⁴² Its lunar data-centre project is now dormant.

5.65 Voyager Technologies

Voyager Technologies is a U.S. company founded in 2019. It expanded its orbital-computing business through the acquisition of LEOcloud in April 2025. Its Space Edge service incorporates the acquired cloud-computing platform. It also develops

modular spacecraft computing hardware through Voyager Nebula. The systems support cloud services and local processing for users in space.^{39,134}

5.66 Xingji Tiansuan

Xingji Tiansuan is a Chinese iSpace subsidiary established in March 2026 to develop and operate space computing infrastructure. In July 2026, it announced a partnership with Enflame Technology covering general computing, data relay and AI computing services.⁴⁹

5.67 Xuanwu Aerospace

Xuanwu Aerospace was founded in China in January 2026 to develop reusable launch vehicles and space computing infrastructure. In June 2026, it signed an RMB 50 million financing agreement. The funds primarily support rocket engine production and vehicle assembly facilities, alongside its space computing activities.⁵⁰

5.68 Xuechen Xinghang

Xuechen Xinghang was founded in Beijing, China, in October 2025 and is developing a 30-satellite computing constellation. Its first two spacecraft, Xuechen 01A and 01B, are planned for launch at the end of 2026. The proposed service combines Earth observation, optical communications and computing capacity rented to customers.¹³⁵

5.69 Yusuan Xinghe

Yusuan Xinghe was established in Guangzhou, China, in May 2026 with investment from PCI Technology.⁵¹ The company develops AI models for use in orbit and the Pazhou Intelligent Computing Constellation. In September 2026, it announced plans for 24 satellites deployed in four groups, with the first group scheduled for October 2026. Its services target satellite-image analysis and the return of processed results to Earth.¹³⁶

5.70 Zhongke Tiansuan

Zhongke Tiansuan, also known as CAS Space Computing, is a Chinese company founded in 2024. It develops onboard computing systems and the Tiansuan space supercomputing programme. In March 2026, it announced an RMB 100 million angel-plus round. Its roadmap targets an experimental computing node in the second half of 2026 and a space computing centre with about 10,000 GPUs by 2030.⁶⁸

6. DISCUSSION OF CLAIMS AND ECONOMICS

The surveyed projects propose different services, from processing payload data to supplying computing capacity to users on Earth. Their technical requirements, customers and economic prospects differ. This section discusses recurring claims, compares selected published assessments and identifies the evidence needed to assess commercial progress. Numerical results are attributed to their sources.

6.1 Claims and supporting evidence

Claims about space data centres need to specify the application, system design and timescale. Processing an image close to its source may reduce downlink demand or enable a faster response. Moving a terrestrial computing workload into orbit introduces a different communication requirement. Support for one application therefore provides limited evidence about the prospects of another. Published studies of Earth observation, lunar applications and distributed AI training illustrate these differences.^{137,138}

Solar power. Certain orbits can provide long periods of sunlight and avoid weather-related interruptions. This motivates proposals such as Google's Project Suncatcher.²¹ However, useful electrical power requires solar arrays, power electronics, deployment hardware and, where necessary, storage. These systems must be manufactured, launched and maintained over their operating lifetime. The relevant economic quantity is the cost of delivering power to the computing hardware.

Cooling. Describing space as cold gives little information about the difficulty of removing heat from a computer. In vacuum, heat rejection to the external environment relies on radiation. Heat must first be transferred from processors and other equipment to suitable emitting surfaces. Radiator temperature, area, orientation and exposure to the Sun and Earth affect performance.¹³⁹ Large computing loads therefore require a complete thermal system, whose mass, power demand and reliability contribute to cost.

Environmental benefits. Avoiding cooling-water consumption is possible on Earth too. Microsoft has described designs that avoid water evaporation, with a small increase in electricity use relative to its evaporative designs.²⁶ An orbital comparison must account for manufacturing, launch, operation, replacement and disposal, together with the terrestrial electricity supply used as the alternative. The ASCEND assessment identifies a major reduction in launcher life-cycle carbon intensity as a condition for

substantial climate benefits. It also identifies effects outside its assessment, including upper-atmosphere impacts.¹⁴⁰ Reduced demand on terrestrial grids or water supplies is therefore only part of the trade.

Demonstrations and commercial readiness.

An experiment can show that selected hardware or software works under particular conditions. It does not establish the availability, performance or cost of a complete commercial service. A funding round demonstrates willingness to finance development. Long-term economic sustainability additionally requires customers whose payments cover development, deployment, operation and replacement. Current experiments and fundraising leave that question open.

Company communications serve a commercial purpose. Developers need investment, customers and partners, which gives them an incentive to emphasise expected advantages and future markets. This does not make their claims incorrect, but it makes the supporting evidence important. Proposed capacity, regulatory applications and funding announcements should be distinguished from measured performance and services delivered to users.

Repeated coverage can increase the apparent support for a claim. A company announcement may be reproduced in news articles, market reports and investment presentations. Several references may then lead back to the same assumptions, without additional tests or independent calculations. Due diligence based on these publications can become circular. Claims about launch prices, cooling, hardware lifetime and demand should be traced to their original sources, and each later source assessed for the evidence it adds. Limited visible criticism should not be treated as agreement.

6.2 Published assessments and economic assumptions

Table 5 compares found published assessments. The sources include company white papers, technical preprints, consultancy studies and an interactive calculator. They examine different workloads, architectures and comparison periods. Some estimate electricity or infrastructure costs; others consider computing performance, financial returns or environmental effects. Their numerical results therefore describe different questions and should not be combined into a single cost ratio or break-even price.

Four outcomes need to be distinguished: the cost of electricity, the cost of supporting infrastructure, the cost of useful computing and the financial return to an operator. An advantage in one does not establish an advantage in the others. Google's compar-

Table 5: Selected published assessments of space data centres available by 30 September 2026.

Source	Reported result	Scope and main assumptions
ASCEND / Carbone 4 (2024) ¹⁴⁰	Deployment contributes more than 70% of the modelled carbon footprint. Substantial carbon savings require roughly a tenfold reduction in launcher life-cycle carbon intensity per kilogram delivered.	Environmental comparison. Upper-atmosphere and rebound effects are outside the assessment. Lower operating electricity demand alone does not establish lower life-cycle emissions.
Starcloud, white paper v1.03 ²⁰	Estimates energy cost near \$0.002/kWh. Selected costs for a 40 MW system over ten years total \$8.2 million in orbit and \$167 million on Earth.	Assumes a \$5 million launch. Enclosures and other computing hardware are treated as approximately equal costs. This is a comparison of selected cost differences.
Google Project Suncatcher ²¹	At \$200/kg launch, a Starlink-derived example gives annualised launch expenditure near \$810/kW/year, compared with terrestrial electricity expenditure of \$570–3,000/kW/year.	Uses spacecraft mass-to-power ratios and assumed lifetime. The comparison does not include all costs or establish equivalent computing-service performance.
McCalip, interactive calculator ¹⁴¹	Compares orbital and terrestrial infrastructure for 1 GW over five years. Outputs vary with launch price, spacecraft cost, specific power and other inputs.	Excludes computing hardware and financing. No dedicated radiator or liquid-cooling-loop mass and assumes heat rejection through the solar-array area. The terrestrial case uses on-site gas generation.
Turyshev (2026) ¹⁴²	A 1 MW example requires 34–59 kg/kW. At 40 kg/kW, the terrestrial benchmark allows \$250–1,000/kg for launch and spacecraft construction combined.	Uses a terrestrial infrastructure benchmark of \$10,000–40,000/kW, before further communications, operations, utilisation and lifetime penalties. The allowance is not launch-only.
Novaspace (2026) ¹⁴³	Estimates \$46 billion in orbit and \$17 billion on Earth for 1 GW over five years. A lower-cost orbital scenario reaches approximately \$14 billion.	The orbital scenarios use launch prices of \$1,000/kg and \$150/kg, and satellite costs of \$25/W and \$10/W. Initial development and revenue uncertainty remain outside the simplified comparison.
Weiss et al. (2026) ¹³⁷	Models future services for Earth observation and lunar applications. One 2032 example uses a 500 W power and a 16 kg spacecraft.	Forecasts based on technology roadmaps and specific edge-computing workloads. Results describe proposed systems, not measured flight performance.
Parrack and Moorhouse, Forethought (2026) ¹⁴⁴	Estimates power-cost parity near \$250/kg launch. Its wider data-centre comparison approaches parity near \$100/kg with hardware mass reductions.	Includes alternative terrestrial off-grid power supplies, different infrastructure lifetimes and replacement for failed hardware. Power parity and data-centre parity are separate results.
Nishball et al., SemiAnalysis (2026) ¹⁴⁵	Estimates reliability-adjusted computing cost at \$10.91/GPU-hour (B300) in orbit and \$2.49/GPU-hour on Earth for its 2026 scenario.	Includes computing hardware, financing, infrastructure lifetime and extra capacity to meet service availability requirements. Results depend on hardware and reliability assumptions.
Chaturvedi, Calculus VC (2026) ¹⁴⁶	A 100 kW satellite has about \$6 million capital cost and \$1.8 million annual revenue. Reported net present value is about \$0.95 million.	Assumes 3,000 kg mass, \$200/kg launch, seven years of operation, 80% utilisation, \$2.75/GPU-hour and a 15% discount rate. Annual operating cost is about \$130,000. The model assumes zero labour, energy and water costs and excludes insurance.
Cavalier, ABI Research (2026) ¹⁴⁷	Reports at least ten times the terrestrial cost per GPU-year, despite assuming \$44/kg launch and terrestrial electricity at \$0.20/kWh.	A rough ownership-cost comparison of an H100 server rack with spacecraft power and thermal systems. Hardware and qualification assumptions differ from the optimistic studies.
Siegenthaler, Laniakea Research (2026) ¹⁴⁸	Selected infrastructure scenarios give break-even launch prices of about \$215–750/kg; the headline case is near \$500/kg.	Excludes active AI computing hardware. Assumes a five-year lifetime and projected satellite manufacturing costs. Results depend on those costs and terrestrial electricity prices.
van Berkel (2026) ¹³⁸	Finds two to three orders of magnitude lower training performance for the studied orbital torus networks than for the terrestrial comparison.	Models a 1 GW constellation. The penalty depends on network topology, bandwidth and workload; it does not apply directly to inference within one satellite.
Elbert et al., BCG (2026) ¹⁴⁹	Estimates orbital ownership costs at 2.5–3 times terrestrial costs. Improvement scenarios reduce the ratio to 1.5–1.8, or 1.1–1.2 under more aggressive assumptions.	Uses a 20-year ownership period. Launch price, spacecraft mass and satellite failure rates drive the results. Technical and manufacturing challenges are assumed to be overcome.

ison of annualised launch expenditure with terrestrial electricity expenditure, for example, addresses one part of the cost of operating a data centre.²¹ McCalip and Laniakea exclude computing hardware from their comparisons, while SemiAnalysis includes hardware and adjusts for reliability.^{141, 145, 148}

Different launch-price thresholds also have different meanings. Forethought separates power parity near \$250/kg from wider data-centre parity near \$100/kg under its assumptions.¹⁴⁴ Turyshv's \$250–1,000/kg allowance covers launch and spacecraft construction together, before several additional costs and performance penalties.¹⁴² None of these values is a general threshold for the whole industry.

The workload further changes the result. A network suited to independent inference tasks may perform poorly when thousands of processors must exchange data repeatedly during training. Van Berkel's results concern particular network designs and training workloads, while Weiss et al. examine services for data generated in space.^{137, 138} Electrical capacity and processor count alone do not show how much useful work a system will deliver.

These differences explain part of the wide range of published conclusions. A useful comparison needs the same workload, service quality, operating period and treatment of replacement. It also needs clear statements of which costs are included. Future cost reductions should remain identified as assumptions, with their effect on the result made visible.

6.3 Commercial prospects and remaining uncertainties

The survey records 70 companies and programmes, of which 52 are classified as concept, early stage or development, and six as demonstrated. The demonstrated category records selected hardware or software achievements. It does not establish commercial readiness or operation at the full announced scale. The reviewed public evidence did not identify an operational megawatt-scale orbital data centre by 30 September 2026. The economics of large orbital data centres remain unproven.

Processing data generated in space offers reasons for computing near the source. Potential benefits include reducing downlink demand, delivering useful results sooner and allowing spacecraft to act autonomously. However, their value remains mission-specific. Added computing hardware, power, thermal control and software must be compared with the cost and performance of transmitting the data for ground processing. Shared orbital services also require suitable links, scheduling and enough customer

demand to support the additional infrastructure.¹⁴²

For terrestrial customers, the provider needs to deliver a useful service at a competitive price or offer an advantage for which customers will pay a premium. Comparisons should use a completed task, a defined inference service or reliably retrievable storage, with the required quality and availability. Paid utilisation matters because unused capacity still carries development and deployment costs.

Launch remains a major uncertainty. Independent operators need a price and delivery schedule available to them as customers. A launch provider's internal production cost is insufficient for this purpose. Payload mass and volume, the required orbit, integration and replacement launches also affect the effective cost. Studies that rely on very low future launch prices therefore depend on both technical progress and access to those prices.^{21, 144}

Low launch prices would still leave substantial costs elsewhere. Computing hardware, power and thermal systems, communications, ground infrastructure and mission operations all contribute. Failed hardware reduces available capacity or creates a replacement requirement. SemiAnalysis and BCG show how assumptions about hardware lifetime and reliability affect the cost comparison.^{145, 149} Serviceable modules may allow longer use of supporting infrastructure, but their additional interfaces and servicing operations also need an economic justification.

Physical lifetime and commercial lifetime differ. A processor can remain functional while newer hardware offers a lower cost per task. Rental prices, customer use and the value of its output may change before the spacecraft reaches the end of its design life. The Calculus VC example illustrates the importance of explicit revenue assumptions: its positive investment result depends on the stated utilisation, service price, operating costs and seven-year period.¹⁴⁶

Terrestrial alternatives will also change during orbital development. New electricity supplies, other locations and flexible scheduling may address some constraints that motivate space-based proposals. Google has described agreements to shift or reduce machine-learning workloads during periods of grid stress.²⁸ An orbital proposal should therefore be compared with the terrestrial options available when it enters service, including their schedules and prices.

The next useful evidence concerns sustained service performance and economics. Public results would be particularly valuable for:

- useful computing output, accuracy and availability over representative operating periods;
- power consumption, heat rejection, commu-

nication capacity and time to deliver a completed task;

- error rates, lost work, hardware failures and replacement requirements;
- complete deployment and operating costs, together with paying customers and utilisation.

These results would help establish which demonstrated capabilities can support reliable services and which assumptions still limit scaling. Demos can also reveal where an application needs to change or where ground processing remains preferable.

The potential space computing opportunity remains large. If orbital providers can serve even a small share of terrestrial computing demand competitively, they could create substantial demand for spacecraft manufacturing, launch, communications, power and thermal systems, and possibly assembly and servicing. This gives continued development a clear purpose. The scale of that opportunity depends on the workloads that can be served reliably and profitably, and cannot be inferred from announced capacity or the size of the terrestrial market alone.

7. CONCLUSIONS

Space data centres remain at an early experimental stage. Technical work is progressing, but operating experience and commercial evidence remain limited. As of 30 September 2026, no megawatt-scale orbital data centre was operational. The economics of large orbital data centres remain unproven.

The main findings are:

- **Useful applications could emerge at small scale.** Image filtering, event detection and support for spacecraft operations can be tested with small computing payloads. Some users may value faster results or the ability to make decisions without waiting for a connection to Earth. Such applications could provide a gradual path towards wider use.
- **Nearly a decade of experiments has produced limited adoption.** HPE first sent its Spaceborne Computer to the ISS in 2017. Its experiments benefit from the station's power, cooling and supporting infrastructure. Other projects have tested individual processors, small computing payloads and network functions. Shared orbital computing remains uncommon. Even sustained kilowatt-scale computing on a dedicated satellite is not clearly established by the reviewed public evidence.
- **Most of the industry exists as plans and**

development programmes. The survey identifies 70 companies and programmes, including dormant and cancelled projects. In the survey classification, 52 are at concept, early-stage or development stages. Six are classified as demonstrated. This category does not mean commercial readiness yet.

- **Processing data in space still needs an economic case.** Onboard processing can reduce the data sent to Earth and shorten response times. These benefits have been discussed and tested for years. Their value depends on the mission. The relevant comparison is the full cost of processing in orbit against transmitting the data and processing it on Earth. Added hardware, power, cooling and software costs can outweigh communications savings. Faster results may justify a higher price for some applications, but the size of that market remains unclear.
- **The engineering work has wider uses.** Better power systems, cooling, optical communications and reliable computing could also support Earth observation, space stations and exploration. Modular hardware and robotic servicing could make future spacecraft easier to maintain and upgrade.
- **Space offers a long-term route to additional computing capacity.** Orbital systems could reduce dependence on terrestrial grids and sites. Over very long timescales, this could allow computing to grow beyond some of Earth's energy and heat constraints.
- **A successful experiment can leave the business case unresolved.** Running an AI model in orbit demonstrates a capability under particular conditions. Commercial operation also requires sustained performance, reliable access, sufficient customer use and affordable hardware replacement. The reviewed evidence does not establish that large orbital facilities can deliver computing at a competitive price over their operating lifetime.
- **The proposed scale is far ahead of operating experience.** SpaceX's application seeks permission for up to one million satellites. Starcloud proposes 88,000. These figures describe ambitions. They provide little evidence about the capacity that will be built, its cost or its customers.
- **Large funding rounds leave the economics unproven.** Starcloud reported total funding of \$450 million, while Cowboy Space announced

a \$275 million funding round. Such funding allows companies to develop and test their systems. A sustainable business must eventually earn enough to cover development, deployment, operation and replacement. Investor interest and growth in AI spending do not establish demand for orbital computing at prices that recover these costs.

- **Repeated coverage can overstate the available evidence.** Several articles, market reports and investment presentations may rely on the same company announcement. The number of references can grow without additional tests or independent analysis. Companies also need publicity to attract funding, customers and partners. Claims about cost, cooling, launch prices and demand should be traced to their original sources. Limited public criticism should not be treated as agreement.
- **Environmental advantages remain conditional.** Orbital computing could reduce some demands on terrestrial land, electricity networks and cooling water. A complete comparison must also include manufacturing, launch, hardware replacement, re-entry, orbital debris and effects on astronomy. Moving equipment into space does not by itself establish an environmental benefit.

Companies and programmes worth following for further evidence include:

- **HPE, Starcloud, Kepler, Axiom Space and ADA Space.** These provide examples of deployed computing hardware. Starcloud has reported experiments with an NVIDIA H100 processor. Kepler reported 40 computing modules across ten satellites, while ADA Space launched the first twelve Three-Body Computing satellites. The useful next evidence is sustained workload performance, service availability, paying customer use and complete operating costs.
- **Google's Project Suncatcher and Sophia Space.** Their work addresses processors, communications, power and cooling. Flight results are needed to assess the benefits. Ground tests, partnerships and financing agreements leave questions about operation in orbit.
- **SpaceX, Blue Origin and Cowboy Space.** Their proposals involve much larger deployments. Their progress should be assessed through hardware built, computing capacity commissioned and services delivered.

Space data centres may find useful markets. The

reviewed evidence does not yet establish their size, profitability or rate of adoption. Even edge computing for space remains commercially uncertain.

The potential opportunity is large. Global investment in data centres reached approximately \$500 billion in 2024. The share that orbital providers could serve remains unknown. If orbital computing becomes competitive, even a small share of this wider market could support a very large space industry. It could create substantial demand for spacecraft manufacturing, launch, power and cooling systems, in-space assembly and servicing.

The long-term opportunity therefore deserves attention. Its size will depend on the workloads that can be served reliably and profitably from space. Large demand for computing on Earth alone does not establish demand for computing in orbit.

The central question is whether customers will pay enough for useful computing to cover the full cost of providing it. More experiments and more funding have yet to answer that question.

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