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SYNOPSIS

Southeast Asia has emerged as one of the world's fastest growing hubs for [data centres](#), driven by growing [global AI demand](#). Facilities across Singapore, Malaysia, Thailand, Indonesia and Vietnam have positioned the region as a critical node in the global AI ecosystem. However, as technology titans from the [United States](#) and [China](#) are already moving to pioneer space-based data centre concepts, Southeast Asia remains absent from this first wave of orbital computing initiatives. If the region is to play a significant role in this domain in the future, they must act strategically now.

COMMENTARY

[Space-based data centres](#) are orbital platforms or satellite constellations that provide compute and storage for AI and other data-intensive workloads, leveraging the unique conditions of low Earth orbit to overcome terrestrial constraints. By harnessing continuous solar energy and the cold vacuum of space for passive radiative cooling, such systems reduce dependence on Earth-based power grids and cut down on energy and water requirements. They can support climate modelling, scientific simulations, and large-scale analytics.

The US has been moving swiftly in this direction. Initiatives like Google's [Project Suncatcher](#) indicate that the space-compute frontier is rapidly moving from concept to reality. Meanwhile, [Lonestar Data](#) has demonstrated off-planet storage and data exchange on lunar missions and plans to deploy cislunar (between Earth and Moon) storage satellites. Elon Musk's [SpaceX](#) recently acquired xAI, motivated by his aim to do AI computations in space, including building space-based data centres.

From a policy perspective, space-based data centres can be promising, but they are accompanied by technical constraints that shape what can be achieved in the near term. Early generations of orbital data centres will not simply be “plug-and-play” extensions of terrestrial cloud infrastructure. They require bespoke designs suited to the space environment.

One often-cited benefit is the natural cold of space, which can help with [cooling](#) energy-intensive computing systems. However, cooling in orbit is not straightforward. Unlike on Earth, heat cannot be dispersed through air, so excess heat must be actively transported and radiated away using large external structures. These systems add mass, cost, and design complexity – factors that matter for launch economics and long-term sustainability.

Space radiation presents another challenge. High-energy particles can disrupt or degrade electronic systems over time, increasing the need for shielding and resilient system architectures. Industry studies, including Thales Alenia Space’s [ASCEND](#) feasibility assessment, suggest that while space-based data centres are technically achievable, their climate and economic benefits depend heavily on cleaner launch systems and reliable in-orbit assembly and servicing. Without these supporting capabilities, orbital computing risks shifting emissions upstream rather than reducing them overall.

Data transmission between space and Earth poses an additional bottleneck. Communication delays exceeding 100 milliseconds make it inefficient to send raw data back to the ground for processing. This reinforces the case for performing data analysis directly in orbit, especially for space-generated data such as Earth observation imagery, with only refined or compressed outputs being transmitted. Although laser-based communication links between satellites can support high-speed data exchange in space, their effectiveness diminishes when transmitting to Earth, particularly in regions with [high cloud cover](#) and humidity. For Southeast Asia and other tropical areas, frequent cloud cover and heavy rainfall can significantly [disrupt](#) both laser and high-frequency radio links.

These constraints suggest that early space-based data centres will play a complementary rather than transformative role. Their most immediate value lies in processing space-borne data closer to its source, thereby reducing reliance on weather-sensitive downlinks while drawing on abundant solar energy in orbit. For policymakers, this shows why orbital data centres aren’t replacements for terrestrial infrastructure but are strategic enablers for specific use cases.

Why Southeast Asia Remains on the (Space) Periphery

Southeast Asia’s limited involvement in orbital initiatives contrasts with its strength in land-based AI infrastructure. The Southeast Asian data centre market is poised for [rapid expansion](#), with its value expected to reach US\$30.47 billion by 2030, growing at a compound annual rate of 14.24 per cent.

[Singapore](#) anchors this ecosystem, operating at high utilisation across its gigawatt-scale capacity. This growth reflects both scale and technical sophistication in power

management and high-density computing. Singapore launched the world's first [Sustainable Tropical Data Centre Testbed](#) to trial high-efficiency air- and liquid-cooling systems and water-saving measures tailored to hot, humid climates, with the aim of reducing cooling energy use by up to 40 per cent. It sets an example for the innovation and testing of energy-efficient technologies that could potentially be upscaled for use in space environments.

Despite these strengths, Singapore and the rest of ASEAN remain largely absent from first-mover efforts in space-based data centres. Although member countries have built small satellite capabilities, space-grade compute manufacturing, radiation-hardened component supply, and in-orbit servicing ecosystems are still [emerging](#). The lack of launch sites and affordable launch technology widens the gap. This nudges potential orbital compute projects to source for critical subsystems and on-orbit operations abroad.

Regional space activities also focus on small satellites and Earth observation, with no publicly announced Southeast Asian-led orbital compute projects. Several [gaps](#) contribute to this absence. The space industrial base remains limited, with constraints on advanced infrastructure and talent even in more technologically advanced countries such as Singapore.

Regulatory readiness also lags, as fragmented space and data governance frameworks rarely address orbital cloud services, cross-border satellite data flows, or space-specific cybersecurity concerns. Finally, while billions are invested in land-based AI infrastructure, investments in space-based ventures remain concentrated in major powers, particularly the [United States and China](#), restricting early-stage participation in the region.

At this stage, Southeast Asia's strategic question is not (or at least not yet) whether it should build orbital data centres independently, but rather how it can play a significant role in this emerging ecosystem. Singapore is well-positioned to drive engagement by leveraging terrestrial AI strengths while addressing gaps in space capacity and governance. Workforce pipelines would require interdisciplinary training in machine learning, systems engineering, and space systems, supported by the [National AI Strategy](#) (which should be complemented by a national space strategy sooner rather than later).

Lessons from the Jurong Island [pilot data centre](#) in Singapore indicate that near-term Earth orbit hybrid testbeds could help reduce risk in first-generation orbital computing deployments. Singapore's newly announced [National Space Agency](#) is a promising step toward engaging the broader space ecosystem in shaping national space legislation, with potential implications for space-based computing.

That said, Singapore need not act alone to strengthen its role in the emerging space-AI ecosystem. It can collaborate with other ASEAN countries, leveraging [shared capabilities](#) in data collection, analysis, and innovation ecosystems to fill regional gaps, such as collecting equatorial satellite data, improving climate and sustainability outcomes, and building stronger multi-stakeholder partnerships across public, private, and academic sectors.

To address disruptions to optical satellite links caused by [tropical cloud cover](#), Singapore can leverage its position as a [submarine cable hub](#) by working with regional partners to diversify ground-station locations across [ASEAN](#). For example, when monsoon clouds block satellite signals over Singapore, data can be sent to clear-sky stations elsewhere in ASEAN and quickly relayed back through regional cable networks, ensuring reliable connectivity.

Eventual regional participation should also emphasise data governance and spectrum cooperation as much as hardware. [ASEAN's Data Management Framework](#) and [Model Contractual Clauses for Cross-Border Data Flows](#) provide templates for data ownership, processing, and transfer which can be extended to orbital cloud and space-based data centre operations in future.

Realising this vision of space-based data centre participation requires coordinated policy action at national, regional, and international levels. Southeast Asia must develop space strategies – recognising orbital cloud infrastructure as strategic – and integrate spectrum management and data sovereignty with operational realities. Regional collaboration, alongside international partnerships, can accelerate capability development, standardise frameworks, and create shared platforms for research, testing, and workforce training.

As global demand for AI grows and Earth's resources become limited, the regions that can explore and use space effectively will lead the future of orbital computing infrastructure. For Southeast Asia, that is not yet on the near horizon. However, by linking terrestrial strengths with progressive policies, regional collaboration, and international partnerships, the region can begin building foundational space capabilities needed to advance into the space-based compute era.

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