SpaceX-xAI merger points to space-based AI

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SEVENTY-FIVE years ago, the idea of harnessing the power of the skies was little more than fantasy spun by futurists like Arthur C. Clarke and Isaac Asimov.

Elon Musk's mega-merger of his companies xAI and SpaceX this week brings this sci-fi dream a step closer.

National Aeronautics Space and Administration (Nasa) engineers and technologists have speculated for nearly two decades about moving energy-hungry computing off the planet. More recently, the idea has captured the attention of Big Tech, including Alphabet and Jeff Bezos' Blue Origin.

There is some sense to the idea: solar energy is abundant in space, but the challenges seemed insurmountable.

Musk, though, may finally be laying the groundwork to make data centres in space a reality, armed with the world's busiest satellite launch fleet, an artificial intelligence (AI) startup, and an appetite for infrastructure that stretches from Earth to vacuum.

"In the long term, space-based AI is obviously the only way to scale," said Musk on Monday.

The merger sharpens investor focus on how he might overcome big hurdles through a tightly woven ecosystem of rockets, satellites and AI systems, to take AI infrastructure beyond Earth.

It comes just as SpaceX is preparing for a potential US$1.5 trillion initial public offering.

SpaceX has sought permission to launch up to one million solar-powered satellites engineered as orbital data centres, far beyond anything currently deployed or proposed.

In a filing with the Federal Communications Commission, SpaceX describes a solar-powered, optical-link-driven "orbital data-centre system", though it did not say how many Starship launches would be required to scale the space data centre network to an operational degree.

"Compute in space isn't sci-fi any more," said David Ariosto, author and founder of space intelligence firm The Space Agency.

"And Elon Musk has already proven himself capable across multiple domains."

Advocates argue space-based data centres would be a cheaper alternative to data centres on Earth, thanks to constant solar energy and the ability to dump heat directly into space.

But some experts have warned that big commercial gains are years from reality as the concept faces daunting challenges and is fraught with technical risks: radiation, debris, heat management, latency and formidable economics that include high maintenance costs.

"There's some real challenges here, and how do you then make that cost-effective?" said Armand Musey, founder of Summit Ridge Group, who added that the financial details of a project such as this was hard to model because the "technical unknowns haven't been clarified".

"But never say never," said Musey, who called Musk's track record "unbelievable".

"I think a large part of it is, it's a bet on Elon. His success is really hard for people to ignore."

Even with Musk's ambitions, data centres in space may not be achievable for another decade, some experts have said.

A SpaceX rocket carrying 20 Starlink mini satellites is seen streaking over California in 2024. REUTERS PIC

The underlying physics behind space-based infrastructure is not new. Harnessing solar power in orbit dates back to Cold War-era research, when the United States Department of Energy and Nasa studied space-based solar power concepts in the 1970s, ultimately concluding that launch and materials costs made them impractical.

What makes Musk's efforts different is that his companies have more direct control over key elements of the system — from the rockets that will carry the hardware, to the links to beam data back to Earth, to a Musk-owned social network to generate demand for cheap AI computing.

"SpaceX has structural advantages that few others can match. It controls the world's most active launch fleet, has demonstrated mass production of spacecraft through Starlink, and has access to substantial private capital," said Kathleen Curlee, a research analyst at Georgetown University.

Among the biggest challenges facing space data centres are radiation and cooling. Data centre hardware will be bombarded by cosmic rays from the sun.

More recently, Alphabet's Google bombarded one of its AI chips with radiation at a university lab in California to see how it would endure a five- or six-year mission in space for a research effort to network solar-powered satellites into an orbital AI cloud called Project Suncatcher.

"They held up quite well against that," said Travis Beals, a senior executive at Google and lead of the project, which is set for a prototype launch to space next year.

The writers are from Reuters