Satellite internet technology

A double-edged sword

Medical care is increasingly reliant on the internet, thus alternatives, such as satellite internet, should be available in case terrestrial services fail. William Nahm, who is pursuing dual MD/MBA degrees from NYU Grossman School of Medicine and Harvard Business School, USA, emphasises the need for faster and more reliant satellite internet, especially in healthcare. While satellite internet provides a lifeline for people in remote areas and those affected by conflict or natural disaster, it can also be used to gain authoritarian control. Nahm and fellow researchers argue that internet should be decentralised to prevent any single entity or government from gaining overall control.

Since its introduction to the public in the 1990s, the internet has revolutionised daily life. Initially based on terrestrial cable or fibre-optic network technologies, the last 20 years have seen the development of a new space race, with global tech companies vying with one another to launch communications satellites to provide next-generation internet services from space.

The potential is enormous, as satellites currently carry just about 1% of global internet traffic. The remaining 99% is carried by undersea cables, which are vulnerable to malicious cyberattacks as well as damage due to geographical events, such as earthquakes, and by fishing trawlers. Among those seeking to take advantage of satellites' potential, tech billionaire Elon Musk plans to launch up to 42,000 low-orbit satellites as part of his SpaceX programme, while e-commerce giant Amazon's founder Jeff Bezos plans to launch 3,236 more through his $10 billion Kuiper project.

Aspiring physician William Nahm, who is currently pursuing dual MD/MBA degrees from New York University's Grossman School of Medicine and Harvard Business School, USA, argues that the recent global political events have shown how valuable satellite technology can be in conflict zones as well as in enabling humanitarian aid in natural disasters. It can also help to provide real-time updates to governments and citizens in the rest of the world.

At the start of the conflict between Russia and Ukraine, SpaceX sent 20,000 satellite terminals to Ukraine to allow the government and military to use its Starlink satellite service for high-speed internet that functions, despite the country's damaged infrastructure. As a result, the government has been able to coordinate its defense and communications strategies. In the medical arena, satellite internet has allowed doctors from around the world to train and communicate with their Ukrainian counterparts from the safety of their own countries. It has also enabled medical personnel in Ukraine to treat casualties under remote guidance from doctors at home and abroad. As Nahm explains, 'Just as the internet is indispensable in times of war, so is it vital for the practice of medicine and surgery.'

IMPROVING HEALTH ACCESS

Nahm emphasises that satellite internet is vital in providing remote access to health services in the USA and across the globe. Satellite internet allows people to receive medical care regardless of their locations, including at sea and in the air, thereby bridging the digital divide and reducing inequalities of access. This is becoming increasingly important, given that patient healthcare is tremendously reliant on internet technologies. Whether it is to make a doctor's appointment, receive test results, or order a prescription, the world is now going online to seek medical help. COVID-19 encouraged such behaviours, rendering remote access as the norm for many patient interactions. Recent research indicates that 'telehealth' usage

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in the USA is now 38 times higher than before the global pandemic.

As well as speeding up access to care and helping to save lives, 'telemedicine' can reduce the logistical burden for some patients of having to travel to medical appointments. Healthcare practitioners are also becoming growingly dependent on the internet for surgical procedures, as well as for training and exchanging information with fellow physicians and accessing new research and medical guidelines.

Unsurprisingly, telemedicine requires stable internet connections and sufficient capacity or 'throughput' (units of information processed at a time) to allow vast quantities of data to be transmitted. The additional challenge for satellite internet technologies is therefore speed, as information first has to be transmitted to satellites in space before it can be downloaded back to Earth. Nahm states that the opportunities for satellite internet to be used in healthcare will really take off when reliable speeds of 500 Mbps become achievable.

TACKLING AREAS WITH POOR INFRASTRUCTURE

Satellite internet can bring healthcare benefits as well as education, business, and economic opportunities to even remote areas of the world where cable and fibre-optic networks are non-existent, or are unlikely to be provided due to geographical location and cost issues. For satellite internet to be accessible, all that is required is a clear sight line between the user's internet terminal and the satellite in space.

Nahm quotes a recent study that finds that even in a fairly prosperous country such as USA, some areas are so geographically remote, and current broadband service so poor, that five million people have no access to an orthopaedic surgeon. Another study estimates that more than 42 million Americans suffer healthcare disparities because they have limited internet access. Thus, all over the world, access to satellite internet would be transformative. However, the costs are currently high and provision is controlled by a small number of companies.

THE DARK SIDE

There are downsides to most new technologies. Satellite internet can be interrupted by extreme weather or difficult terrain, and in rare cases, by geomagnetic storms. Due to the significant distance that the information has to travel, time lag or latency can also be an issue, particularly for medical surgery. Although access to power might be an additional problem in some areas, satellite internet is still a suitable

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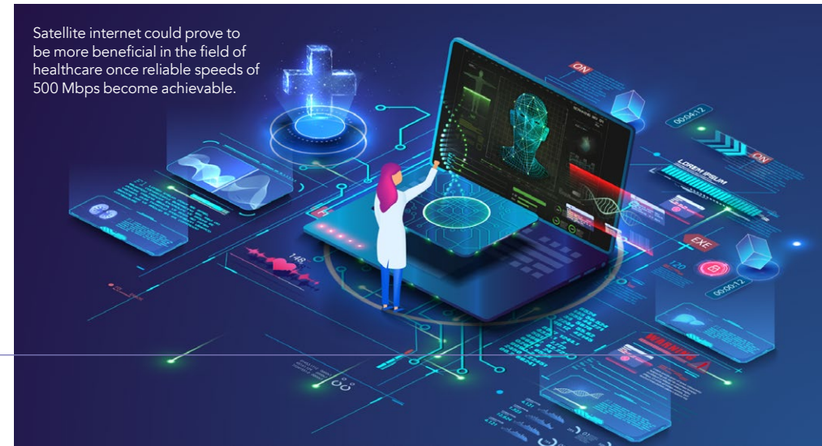

Satellite internet could prove to be more beneficial in the field of healthcare once reliable speeds of 500 Mbps become achievable.

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candidate for trials using alternative energy sources, like solar power.

Despite these setbacks, Nahm believes that the greatest problem facing the development of satellite internet is what happens when authoritarian states or regimes launch their own satellite services. These could be used against another state, for example to guide drones or carry out intelligence reconnaissance, and to guide precision missiles. They could also be utilised for cyber-attacks to block, jam, or destroy other states' communications. On the domestic front, authoritarian regimes might control satellite internet services to censor content, monitor users, and suppress dissent.

ANONYMITY AND DECENTRALISATION

To ensure that all users have free and unbiased access to information, Nahm calls for the decentralisation of the internet. He reasons that this is necessary to prevent any single entity or government from controlling or censoring the internet and suppressing citizens' internet access. He further maintains that decentralisation would help democracy, providing support for the politically oppressed and acting as a tool for human rights.

Nahm and fellow researchers warn against the misuse of satellite internet by authoritarian regimes.

Nahm and fellow researchers have identified the anonymity for internet users as being key to this process, which has led to the development of a start-up technology called 'myHAVEN'. Free to download and use, the digital platform aims to help users keep their personal data confidential and protects them from unwanted intrusion into their private lives. By allowing users to grant access only to parties they choose, the app empowers users to maintain control over their own data. In addition, it helps them choose which communities, businesses, and ideas they want to engage with, and to what degree.

In the move towards a future of digital inclusivity, Nahm argues that satellite internet combined with technology such as myHAVEN are crucial. He explains: 'myHAVEN is more than just a platform, it's a movement towards reclaiming the digital space as a realm of freedom, creativity, and collaboration. It doesn't facilitate crime or irresponsible behaviour but provides a shield against the overreach of surveillance and control.'

PERILS AND PROMISE

Satellite internet holds both perils and promise. Nahm urges tech innovators, policymakers, and users to work together to ensure that the internet remains, or perhaps returns to, what it set out to be: 'a tool for freedom, global knowledge, and global unity', as he describes it, guided by 'the principles of democratisation of information, fostering global connections, and facilitating unhindered communication.'

Above all, Nahm states that the internet is now so important for medical practice that satellite services should always be available in medical settings in case terrestrial internet services fail. He concludes, 'Successful transmission of internet services is vital for healthcare, and such technologies should be employed to ensure medical professionals and patients always have reliable sources for internet services.'

Behind the Research

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Research Objectives

The research team highlights the importance of satellite internet with a special focus on healthcare.

Detail

Bio

William Nahm is an aspiring physician pursuing dual MD/MBA degrees at NYU Grossman School of Medicine and Harvard Business School. Beyond his fervour for medicine, William is deeply invested in entrepreneurship and health technology. He is the co-founder of myHAVEN, an innovative startup designed to revolutionise online interactions through anonymised intentions.

Collaborators

- Carter J Boyd, MD, MBA, Hansjörg Wyss Department of Plastic Surgery, NYU Langone Health, New York, NY.
- Robert A Montgomery, MD, DPhil, NYU Langone Health, New York, NY.

Competing interest statement

In the interest of full transparency, Nahm would like to declare that he is a co-founder of myHAVEN, a startup focused on promoting decentralisation and anonymity in online interactions. While he has endeavored to present an unbiased view on satellite internet technology and its merits, Nahm acknowledges that his association with myHAVEN could be perceived as a potential influence on the perspectives shared in this article. He affirms that the insights provided are based on thorough research and a genuine belief in the importance of these technologies for the future of the internet.

Harvard Business School

NYU Grossman School of Medicine

References

Nahm, WJ, Boyd, CJ, Montgomery, RA, (2023) Satellite internet technology implementation for the practice of medical surgery. *The American Journal of Surgery*, 225(5), 941–942. doi.org/10.1016/j.amjsurg.2023.01.018

Personal Response

Could you tell us a bit more about the myHAVEN app? How does it work, and how does it address the concerns raised in your paper?

myHAVEN is a digital platform designed to prioritise user privacy and data control. Recognising the perils of centralised internet control and potential surveillance overreach, myHAVEN was conceived as a shield against these threats. At its core, myHAVEN allows users to create an anonymous, secure profile. Within this environment, they can express their needs, health-related or otherwise, without fear of unwarranted intrusion into their personal lives. Users grant access only to parties they select, ensuring they have full autonomy over their personal information. In essence, instead of the platform dictating the terms, the users do.

Regarding the concerns raised in the paper, the centralisation and potential misuse of satellite internet by authoritative regimes can lead to internet censorship, surveillance, and suppression of dissent. myHAVEN, by championing decentralisation and anonymity, acts as a countermeasure. It provides a digital space characterised by freedom, creativity, and collaboration without compromising on user privacy.