Space – the final frontier for connectivity and IoT?

Why space?

Space has some serious disadvantages – it's inhospitable, hard to get stuff into orbit and almost impossible to repair it once it is there. But space also as some serious advantages – delivering near ubiquitous coverage is comparatively straightforward, you can utilise optics without fibre-optics and you don't need planning permission to dig trenches or install equipment.

Why now?

SpaceX have demonstrated the re-use of rocket boosters, and a 60 tonne launch capability with the Falcon heavy test this month.

Rocketlab, with a launch facility in Mahia, New Zealand (launch of 'Still testing' pictured below), have demonstrated a low cost dedicated launch capability for small satellites.

SpaceX and Rocketlab are not alone, with others likely to enter the launch service market. It is becoming much cheaper to get satellites to orbit – when and where you want them.

Satellite costs are also falling with developments in computing, and the use of components manufactured at scale for smartphones. For constellations of satellites, production line approaches will further reduce unit costs.

Not only are the costs falling, but the capability is improving with the development of free-space laser communications links, multiple antenna technology (similar to that for 5G) and improved and cheaper sensors. Expect a flurry of announcements during 2018.

What possibilities does this open up?

Falling launch and satellite costs, and improved communications and sensors, open up three immediate possibilities:

Broadband satellite constellations

Satellite broadband has suffered from significant latency, since the geostationary satellites used were in orbits 36,000km out. However, low-earth-orbit (LEO) constellations of satellites at around 1,000 km, with latency comparable to terrestrial broadband, are now proposed.

OneWeb plans to offer limited broadband next year over Alaska, with almost global service by 2021 (the FCC have approved a fleet of 700 satellites).[1] SpaceX launched two test satellites on 22 February 2018, and have plans for a constellation of 4,425 satellites by 2024, each with a reported capacity of 17-23 Gbps,[2] though they have hinted this may be delayed.

Small satellite connectivity for the internet of things (IoT)

UK-headquartered operator Sky and Space Global plan 200 nano-satellites for IoT[3], whilst Canada's Kepler Communications launched a satellite – built by Scotland's Clyde Space - in January 2018.[4]

Satellite monitoring using visible[5], infrared and radar frequencies[6]

In effect this puts the sensors for some IoT applications in space. With sufficient satellites imagery can be acquired with reasonable frequency for any location on earth, whilst artificial intelligence (AI) can be utilised to extract value from the large volume of data. (Facebook utilised AI to create improved population density maps from satellite imagery[7]). A Planet Labs imaging satellite is pictured below.

A new meaning for "over-the-top"

Satellite systems therefore offer the prospect of ubiquitous and increasingly affordable broadband, narrowband and sensor networks. They are likely to prove both complements and (in some circumstances) substitutes for terrestrial communications and sensors – giving the term 'over-the-top' meaning beyond internet applications.

What are the policy implications?

Satellite broadband providers need agreement to use spectrum and other permissions (the US FCC Chair has expressed support[8], other regions should also act to permit the use of satellite constellations).

Broadband universal service policy should also be technology agnostic, allowing for the possibility that remote consumers might be connected more cheaply via satellite rather than terrestrial networks. In the past, satellite broadband was felt to bring unacceptable performance trade-offs – but rapid technical change means it should no longer be set aside. LEO satellite may also have implications for the application of European State Aid rules.

Satellite may also provide an important source of mobile backhaul in future, reducing the costs of coverage extension, particularly for developing countries.

What are the strategy implications?

Unlike GEO satellite broadband, LEO capacity is made available on a global basis. Some of the capacity should be available in the UK and elsewhere in Europe.

This provides new opportunities such as lower cost mobile backhaul. But it also threatens the share of anticipated demand for terrestrial broadband and IoT applications. Longer term deployment of fixed broadband in rural areas may have its investment case threatened.

Conclusion

Inflexion points are always challenging for policy makers and strategists to deal with. However, they are the natural home of venture capital. The funds currently being invested in satellite suggest something significant is afoot. In the past satellite was considered an 'edge case' in telecommunications. But satellites are moving – literally and metaphorically – closer to home.

Brian Williamson & Robert Kenny[9]
February 2018

---

[1] WSJ, *SpaceX indicates satellite-based internet system will take longer than anticipated*, 21 February 2018.
[2] Ars Technica, *SpaceX plans worldwide satellite Internet with low latency, gigabit speed*, November 2016
[3] APP, *Sky & Space Global – Nano-satellite company set to revolutionise equatorial communications*, December 2017
[4] SpaceNews, *Kepler's first satellite hitched ride on last week's Long March 11 launch*, January 2018.
[5] Financial Times, *Eyes in the sky: a revolution in satellite technology*, 15 February 2018
[6] BBC, *Finnish start-up ICEYE's radical space radar solution*, 12 January 2018
[7] Facebook, *Connecting the world with better maps*, February 2017
[8] FCC, *Chairman Pai Statement on SpaceX Satellite Broadband Application*, 14 February 2018
[9] Partners at Communications Chambers (*brian@commcham.com* and *rob@commcham.com*). This paper represents the view of the authors only and does not represent a corporate view of Communications Chambers.