

5G and Position, Navigation and Timing

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1. 5G networks are expected to drive new markets which will require greater PNT accuracy, and 5G technology itself is expected to help with that.



5G will enable new products which need greater position accuracy.

The advent of 5G, with its low latency and high speeds is expected to open the door to an influx of new applications, products and industry verticals and will fuel the Internet of Things revolution, expected to see billions of connected devices. Some of these new applications and services, for example autonomous vehicles and logistics tracking services are expected to demand much greater levels of PNT accuracy (CM) and in traditionally challenging environments, such as in-building or at sea.

5G will deliver greater accuracy and in traditionally challenging environments.

Whilst some would argue that positioning technology in 5G cells sites is a little crude, many believe that some 5G radio features do have the capability to deliver more accurate positioning in environments which have traditionally been challenging to serve. Massive antenna arrays, higher band frequencies, beam forming, and ultra dense networks are features which have the potential to deliver much greater positioning accuracy and in locations which current PNT technologies find difficult, such as complex and cluttered urban environments.

Current PNT technologies alone cannot support market expectations of greater accuracy.

Current solutions in the PNT genre of technologies are not considered to be adequate to meet new market expectations of increased PNT accuracy. GNSS, for example, suffers from inaccuracies caused by no clear line of sight to the sky, multipath, and ionospheric errors, whilst mobility localisation technologies such as lidar, HD maps and video can be slow and computationally heavy to process in real time on the vehicle.

MNOs are looking for opportunities to increase revenues.

Due to a decline in their core businesses, MNO aspirations of improvements in positioning delivered by 5G are heightened by a pressing need for additional revenue streams. As a result, global standards body 3GPP are investing heavily in strengthening positioning standards in their latest standard release (16) expected to be locked down in Q2 2020. This paves the way for operators to implement positioning advancements in their future network roll outs.

2. It is widely recognised however, that 5G will need to work in combination with other PNT technologies to meet new market needs, both to enable ubiquitous 5G coverage and to meet accuracy expectations.

5G will not negate the need for Satellite

Whilst native positioning in 5G is improving, there are multiple reasons why 5G on its own is unlikely to be able to meet new market PNT expectations.

- 5G networks are capital intensive and there is currently no clear business case for national 5G coverage.
- Delivering 5G is technically challenging in some areas such as at sea, in the mountains or in airspace.
- 5G still relies on satellite in its base stations initially to get time and location and is therefore unable to exist in isolation.

The Rise of Hybrid Positioning Platforms

There is a solid case for meeting new market demands in PNT accuracy through combining 5G with other technologies such as LEO satellites, Wifi, Ultra Wide Band, Lidar/Radar/video, terrestrial beacon systems and local correction services to provide accurate, immediate, highly available PNT, regardless of the environment. These heterogeneous or hybrid PNT platforms, aim to deliver seamless, accurate positioning, everywhere and there is extensive academic research, government investment and projects looking to prove interoperability and benefits of these different network types.

Satellite as a delivery channel for high speed, secure comms

In addition to a next generation approach to PNT which uses 5G in concert with other technologies to meet new market demands, some PNT technologies such as satellite (especially LEOs) are being used in trials to see if they could work as a lower cost, alternative mechanism for delivering 5G in areas which are technically or capially challenging using terrestrial approaches such as mountainous terrain, out at sea or in busy air space. Whilst delivering data services over GNSS is not new, new LEO technology is significantly reducing the cost of delivering connectivity over satellite and many of the tech giants including Google, Facebook, Amazon, Virgin, and Telefonica are actively investing billions into trials in this new area. The objective is to be delivering high speed data services to currently under served populations/terrains.

3. Assuming new markets for highly accurate PNT develop, new revenue generation opportunities from bi-directional integration of PNT and 5G are expected to emerge, however, there are risks to note.

The benefits of PNT integration with 5G are bi-directional.

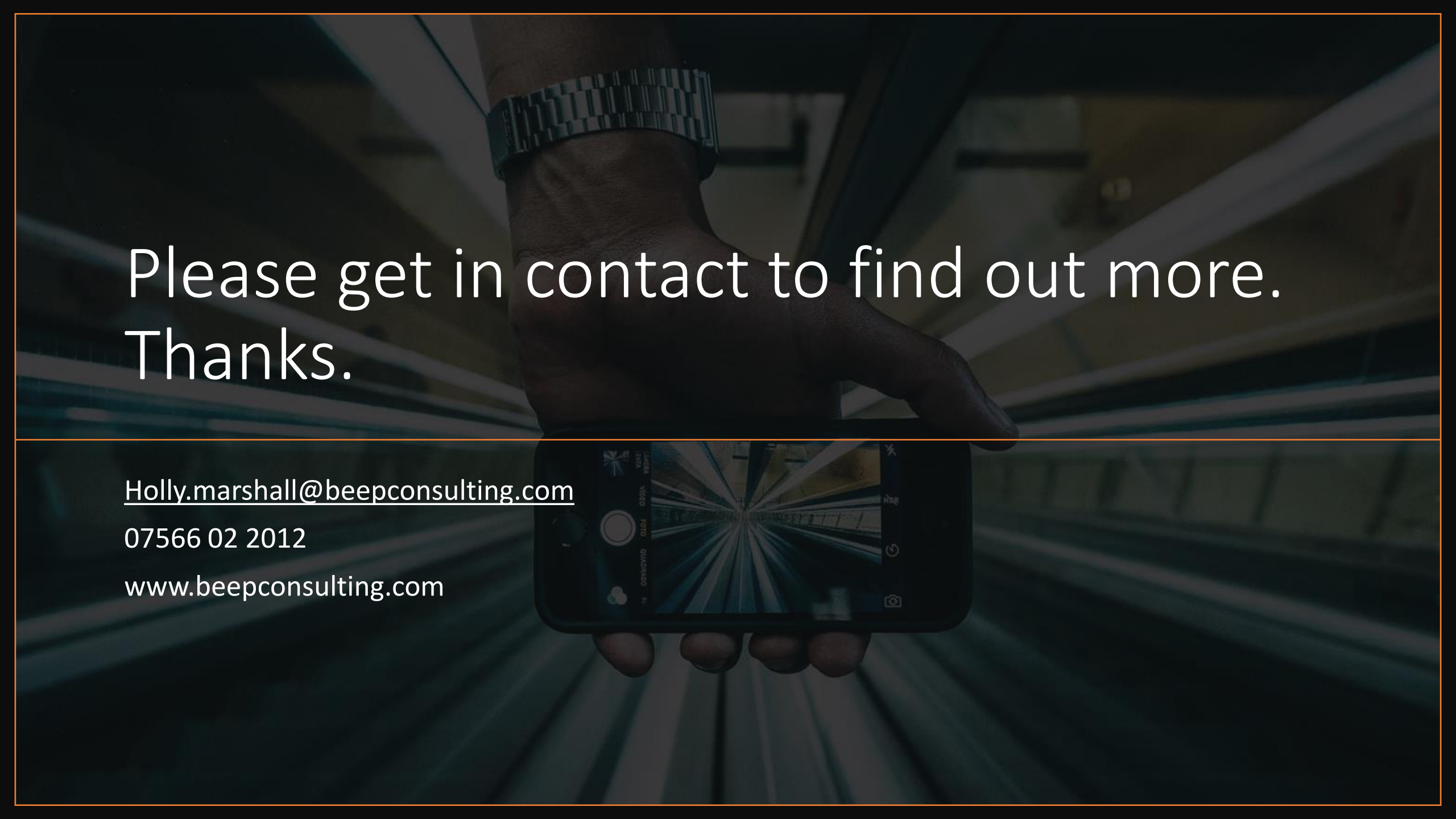
Not only is PNT 5G integration expected to deliver greater PNT accuracy for new markets enabled by 5G but PNT/5G integration is also being trialled by many tech giants to provide a lower cost alternative to delivering seamless, ubiquitous 5G coverage in hard to reach areas. As a result of 5G PNT integration delivering advantages both to the PNT and to the 5G industries, new opportunities and eco systems are expected to rise for industry players.

Reliance on other nations constellations could mean lower levels of control both from a military and commercial perspective

With the UKs exit from the EU, the UK is reliant on access to other nations for constellations. Some believe it will be hard to deliver safe and high quality PNT without a constellation of our own. In addition, different constellations work at different frequency bands and testing therefore will be complex. Whilst there is talk of a national UK positioning MEO constellation being planned – this will require a multi billion-pound investment which some consider prohibitive to roll out. A positioning constellation would also not deliver the comms advantages needed to deliver low cost ubiquitous coverage in currently unreachable areas but the government position seems to be that this needs to be managed by commercial organisations.

Lock step timing is critical and development strategies need to be agile.

New markets come with a degree of uncertainty and therefore consideration needs to be given to when and even if, the flood of use cases demanding next generation PNT accuracies will arrive. In addition, MNOs will have their own schedules for wanting to roll out national 5G coverage. As a result, any bi-directional integration or hybrid platform development will need to stay close to both timetables for payback timescales to be acceptable.

A hand wearing a silver metal-link watch holds a black smartphone. The phone's screen displays a perspective view of a long, brightly lit tunnel with many parallel lines receding into the distance. The background of the entire image is a similar perspective view of a tunnel, but it is dimmer and serves as a backdrop for the text.

Please get in contact to find out more.
Thanks.

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