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From desert island to low earth orbit

Most people have at some time considered what they might take with them to a desert island. Folklore would have it that one such apparently trivial thought was the catalyst for the inception of what we know today as the Iridium communication system. Sat on an island in 1985 in the middle of the Atlantic, the wife of a Motorola executive bemoaned the fact that she couldn't make an urgent call home. After taking the idea back to base, and following some major R&D, the result was the world's first (and only) commercial communication system with full coverage of the globe - a system that allows people to communicate wherever they are, as long as they have a clear view to the sky. Since then, Iridium has evolved considerably, and is now one of the leading players in the mobile satellite services market.

From 2003, Cambridge Consultants has enjoyed the role of Iridium's 'virtual design team', developing its core platform technology including handsets, data modems and other forms of transceiver. The work has provided a deep and fascinating insight into one of the engineering marvels of our time. Dealing with tiny power levels received from the satellites (barely an order of magnitude larger than the natural heat of the Earth) and communicating over a sophisticated network of 66 satellites travelling at five miles per second (somewhat akin to playing catch between cars driving at speed down opposite lanes of a highway) has provided one of our most fulfilling engineering challenges to date. The result is a communication system of outstanding reliability, which people depend on around the world.

The initial Iridium concept was a low data rate system, capable of supporting just one voice channel or 2.4 Kbit/s data communication. This constrained the available market and application areas, so Iridium engaged Cambridge Consultants to explore new ways of increasing data rate, to expand its market reach.

From the outset, a practical solution was far from clear. These were challenges far beyond the vision of the system developers back in the 1980s. The need to access more frequency channels and/or timeslots was evident, but this had to be achieved whilst maintaining backward compatibility with the vast majority of Iridium's system infrastructure, not least its 66 low earth orbit satellites. The key to developing a solution was to meticulously identify and solve the complete set of design challenges. For example, a tenfold increase in efficiency in the use of satellite resources was needed to ensure that the greater traffic level did not increase power consumption within the solar-charged satellites.

To meet these challenges, we developed a platform based on the very latest parallel Digital Signal Processing technology. This enabled us to perform the significantly larger signal processing task in an efficient printed circuit board format. Additionally, we developed a multiple-element antenna with steerable beams. With no moving parts, the antenna allows the user, who may be moving on the ground or rolling on the sea, to track the fast moving satellites in the sky - a highly novel requirement compared with other typical communication systems. Additionally, a new access protocol was developed to support the higher traffic rates.

The new technology platform now forms the basis of Iridium's highly successful OpenPort maritime communications product, and provides a powerful building block to support Iridium's continued growth.

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