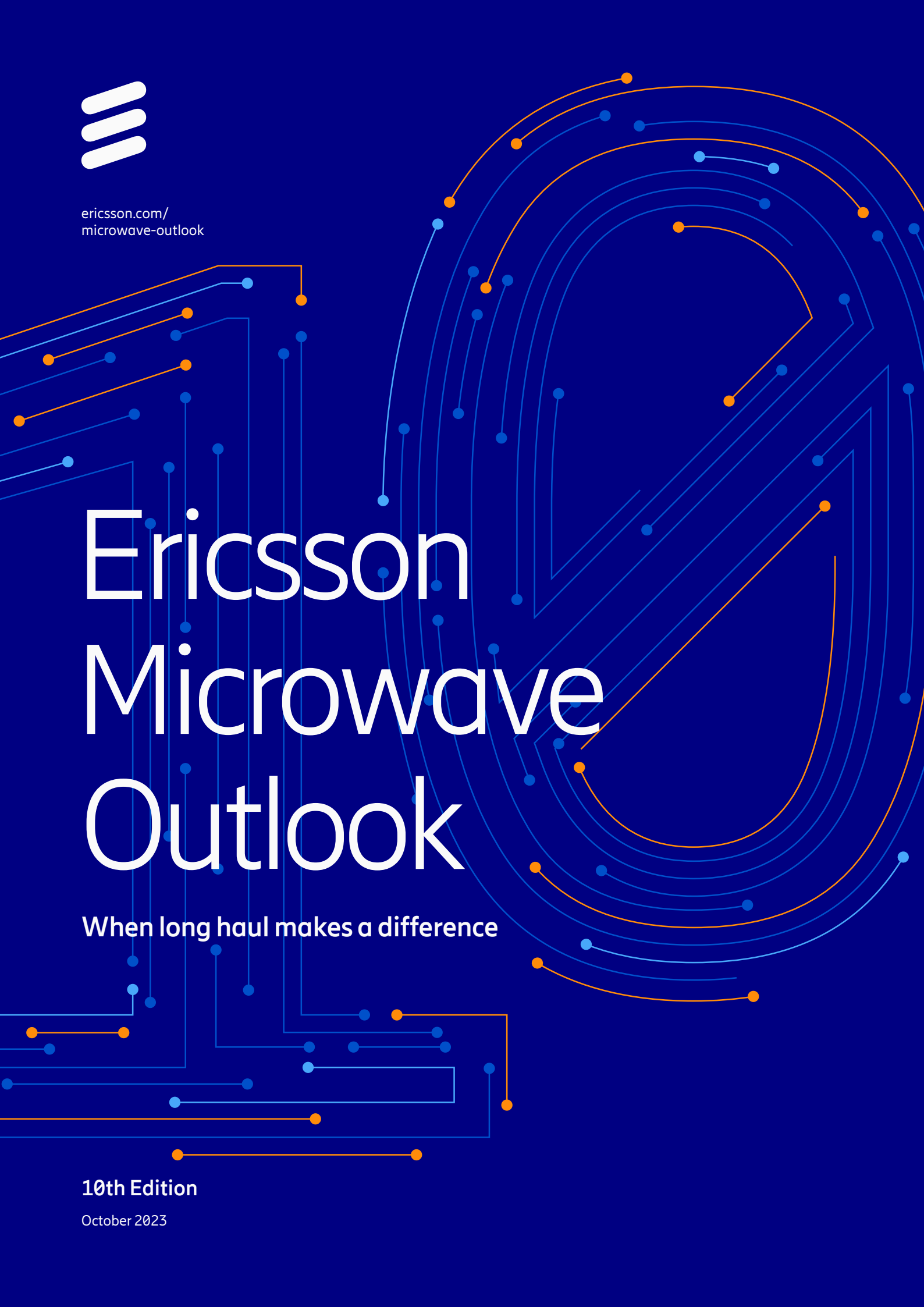

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Ericsson Microwave Outlook

When long haul makes a difference

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When long haul makes a difference

Mobile communications have made easy access to news, social media, high-speed mobile communications, online shopping and banking an integral part of modern life that most of us take for granted.

In addition, modern healthcare requires broadband communication services for a range of medical services, such as X-ray analysis from experts.

But the benefits of the array of services enabled by connectivity are not available to all, as geographical constraints continue to be a major barrier to inclusion via a modern 5G network.

Establishing 5G services requires access sites, electrical power and some means of signal transport to the core network. This transport often uses optical fibers, but this network option may not be feasible in remote locations such as distant islands or in the rural outback. In these situations, the alternatives are satellite communication or long haul microwave, with the latter often enabling higher capacity and lower total cost of ownership. Mobile communications connectivity is a challenge that occurs all over the globe from Greenland and Alaska in the north and through to Africa and Australia in the south.

In large parts of the world, there are connectivity challenges, where there are long distances between towns and out to islands. Long haul has emerged as the perfect high-capacity solution for enabling wideband services, and in doing so is bringing communities access to modern communications. Common issues in these areas include:

- Existing SDH transport over traditional long haul is already fully utilized.
- Replacement with optical cables is costly and takes time.

Modernizing the microwave to a packet-based transport service unleashes more capacity, allows for adding additional spectrum into the multi-band link, and provides end users with increased digital connectivity.

The positive impacts on business, education and health services from having access to HD services such as video calls cannot be underestimated. Even small things such as being able to pay with a credit card at the market in an African village can make a large difference to people.

Let us look at the 6 GHz band as an example, since it is widely used for long-distance communication in remote areas. Traditional long haul has been using SDH/SONET as the layer 1 technology and even if the full 6 GHz spectrum has been available for use, the capacity has still been heavily restricted by limitations imposed by the underlying technology. A maximum of 4 Gbps could be achieved when using the spectrum of 6L and 6U with SDH/SONET radio technology at the expense of 32 radio channels. With modern microwave technology and packet-based systems, it is possible to better utilize the spectrum with wider channels and adaptive modulation. This makes it possible to enable up to 10 Gbps with only 16 radio channels and still have the same availability. Space diversity protection is in most cases being used to further secure the availability of the link. This means that at each site, there are two wide-band dual-polarized antennas covering the 6L and 6U bands. A transport solution like this will also enable local deployment of 5G access sites in remote towns and islands and thus include people in the modern digital lifestyle of the city.

Salesperson in Africa benefiting from mobile services in everyday life

Greenland

An interesting example can be found in Greenland. The west coast of Greenland has a long series of settlements over the extreme distance of 2,134 km, and these settlements also need access to modern digital services. Since 1977, the local service provider, Tusass, has been using a microwave network to serve the needs of these settlements. It started with telephony and evolved with SDH services in 1996, and then later into IP and internet. Now, Tusass is upgrading and expanding the network to cater for the even higher capacities of 5G. The expansion is using 6L and 6U spectrum, but increasingly, links are also being added in higher bands to meet capacity requirements.

In Greenland, challenges include remote sites that are difficult to electrify, many of which have been using diesel generators and are now starting to use solar panels and windmills. Therefore, power consumption is a vital parameter in order to reduce the need to send out helicopters with fuel as well as being able to cope with locally generated power. The total chain of sites in Greenland stretches over 2,134 km, from Kullorsuaq in the north to Ikerasassuaq in the south with multiple sites in between. Many of these sites can only be visited during the summer months, so redundant functionality is vital. With helicopters needed to access many of the sites, it is essential that equipment is easy to transport and install to keep time on-site as low as possible.

The enablers

The combination of using wide channels, multiple frequency bands, adaptive modulation and radio-link bonding of all the available capacity creates the possibility of achieving high capacities with high availability, where SDH links could provide up to 50 percent of the capacity with the same number of channels. But using wide channels also reduces the hardware required, as fewer radios are needed.

This is visualized in Figure 15 where SDH and modern technology are compared in terms of what can be achieved. Using the full 6L and 6U band with traditional SDH/SONET links would have required the use of the lowest static modulation possible, for example, in 56 MHz (16 QAM) or 40 MHz (64 QAM) channels. This would also be used in combination with 7+1 protection to reach 5 9's availability, using 24 separate channels with 150 Mbps in each or a maximum of 3.1–3.6 Gbps. The same amount of equipment operating in wide channels can now enable up to 10 Gbps of services in the same spectrum.

Figure 14: West coast of Greenland with 5G-ready backhaul transport

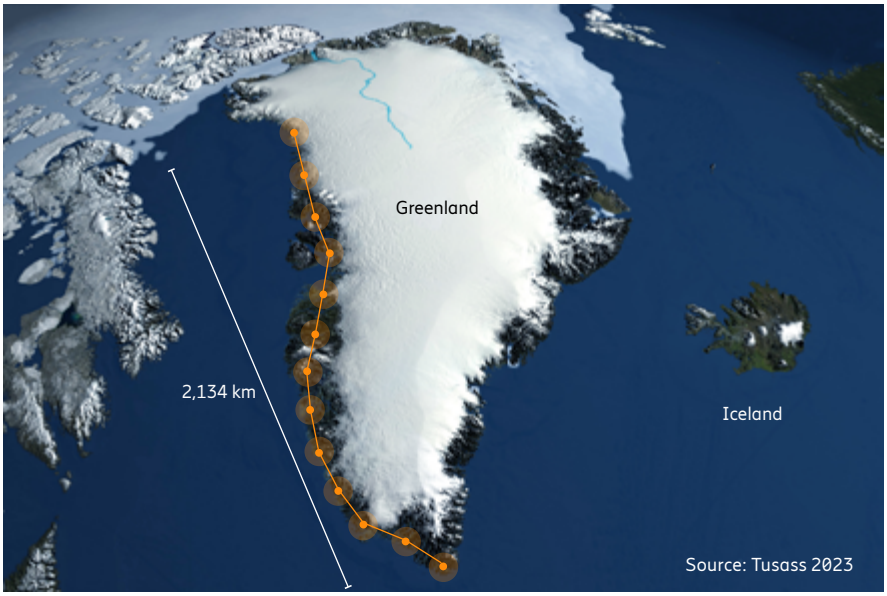
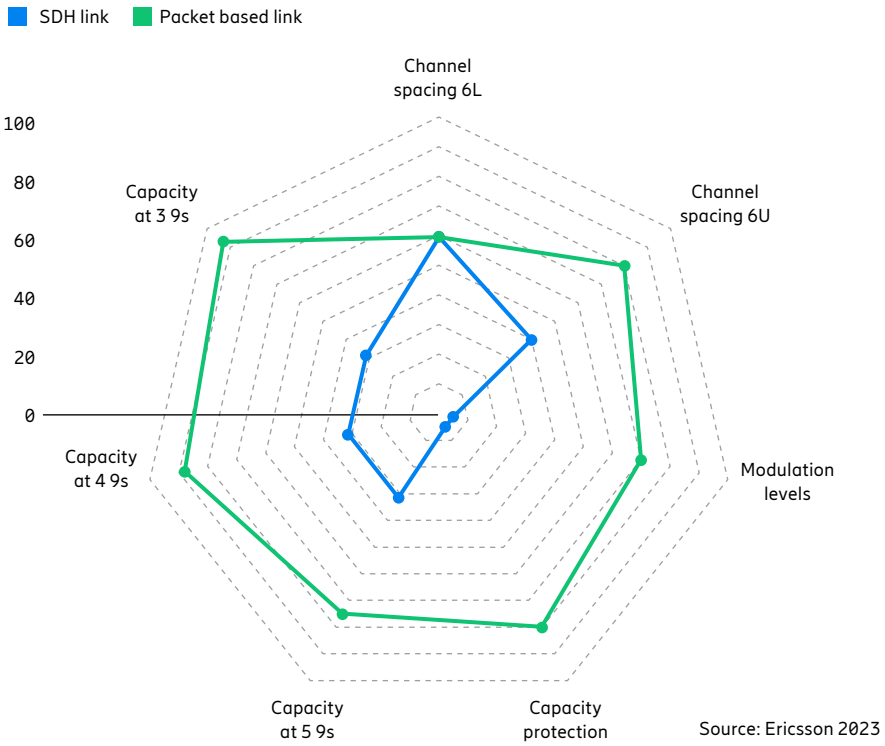


Figure 15: Comparing SDH and packet-based link capabilities



In summary, modern long haul provides a resilient, high-capacity transport solution that can handle demanding conditions in remote areas where an optical network may be too expensive to deploy.

About Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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