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## Into the Limelight

by [Richard Agnew](#)

Free space optics (FSO) has a more adventurous history than many technologies, having originally been developed over 30 years ago by NASA and the US Department of Defense to use light to beam data across space and other awkward locations. But since then, FSO, which can carry traffic at high-speeds and over several kms as long as there is a clear line of sight between the source and destination, has yet to really break into the mainstream when it comes to telecoms networks.

After first being targeted at service providers around a decade ago, optical wireless solutions have come down in cost, developed higher data speeds and offered a compelling way for operators to fill gaps in their networks without shelling out for spectrum licences or disrupting the local environment to install wires. But the technology has still to win a seat at many carriers' tables.

One of the reasons for this is that FSO has tended to run up against established technologies, such as microwave and copper, in areas of the network where traditional solutions continue to be strong. "Spectrum is becoming more and more crowded and microwave is becoming less and less of a viable option for many telecoms operators," says Pete Elwick, business development manager at FSO technology supplier, PAV. "But clearly, the operators know and love microwave and have many years of experience with it. In many cases, that is the first thing they would go for, simply because that's where their experience lies," he adds.

Whereas FSO has also generated widespread uptake from enterprises to provide, for example, local area network (LAN) to LAN and storage area network (SAN) connectivity, it also takes time for up and coming technologies to acquire telecoms operators' trust.

"The vendors that have come from the enterprise market do not clearly understand how long it takes operators to adopt new technology," says Bettina Tratz-Ryan, principal analyst at Gartner Dataquest. "If you look at the broadband space, many technologies can take up to two years to go from trials to deployment. To show FSO is a carrier class technology will take a different marketing and sales effort than in the enterprise sector, and a lot of vendors don't understand how difficult it can be," she adds.

Much of the scepticism that FSO has experienced in the carrier market has also boiled down to its physical limitations, and the fact that it is much more susceptible to changes in the natural environment than alternative solutions. FSO connections operate purely where there is an uninterrupted line of sight between transmitters and receivers, but can find that link disturbed through many factors that are beyond vendors' and operators' control. These include rain and fog, which can modify the characteristics of the light beams sent over the network.

The two ends of the link can also shift out of line, despite vendors' efforts to mitigate these factors through features such as automatic tracking of the links' alignment, the addition of more than one transmitter or receiver on a single FSO unit, or the use of other technologies such as microwave to provide a back-up connection.

"Vendors have put a lot of effort into making the technology as watertight as it can be, but at the end of the day, operators need to acquire carrier grade technology if they want to send voice and data over the last link," says Tratz-Ryan. "FSO has only achieved [99.999%] reliability when [transmission distances] are below 150m. This limits the scope of where operators could use it. It also meant that FSO was harder hit in the industry's economic downturn when operators were very careful about where they were putting their money," she adds.

All this has led to something of a re-evaluation of FSO's true market over the last few years. Some vendors have stuck to the enterprise space. Others have also sought to exploit demand for alternative technologies in mobile core networks, to provide STM, E1 or multiple E1 connectivity to allow traffic to be backhauled from base stations, for example. "A lot of the FSO vendors are quite small, so were focused on the golden goose, which was broadband data,"

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says Tratz-Ryan. "They were a bit hesitant to target 2G and 3G mobile roll outs. But now they are looking at the telecoms market from different angles and taking all aspects of it into account," she adds.

PAV, for example, has deployed over 500 FSO links for Egyptian GSM operator, Mobinil, and has offered similar solutions for Vodacom, the pan African operator, as well as other subsidiaries of Mobinil's parent group, Orascom. "We now take a more realistic approach to the market," says Elwick. "It's more sensible to have a smaller number of reliable links out there than a few more links that are trying to do far too much and things that FSO just cannot do reliably," he adds.

Another area where demand for FSO is increasing is in developing countries, where copper and fibre infrastructure is scarce, vast distances often need to be covered and GSM operators are rapidly putting up cell sites to achieve wider coverage. Lightpointe, for example, had teamed up with telecoms equipment provider, Huawei, to target tier one service providers in China with FSO solutions, and recently expanded the strategic partnership to include the Middle East and Africa. Lightpointe's products have been deployed to provide backhaul links for the northern mobile operator in Iraq, Asiacell, as well as Telkom SA, South Africa's incumbent telco.

Other vendors are also generating demand in emerging markets for last-mile links to carry internet traffic. "About 50% of our business is now in the service provider market," says Walter Koenig, chief executive officer and chairman, Laserbit Communications. "A majority of that business is in the ISP vertical. We are seeing good uptake of FSO from ISPs as a last mile solution and as a backhaul technology to support Wi-Fi and hotspot deployments in the wireless local area network (WLAN) environment. In the more emerging markets, we're seeing faster uptake in those verticals than in the more emerged markets, so in places like these we're seeing a shift more towards the service provider side of the business," he adds.

FSO is also proving a more compelling proposition for high bandwidth transmission in urban environments, where spectrum can be crowded or service providers would have to go through the cost and bureaucratic hassles involved in the installation of fibre.

FSONA, for example, recently deployed a Gbits/s backbone in Istanbul for datacomm operator, Omnitek, and deployed a similar solution for Integrated Networks in Saudi. "For many years, the bandwidth capacity of free space optical solutions has been in excess of most wireless application requirements but the tide has turned, users are now demanding higher-speed services," says Carl Cagliarini, director of business development for FSONA EMEA. "FSO technology is a key delivery tool for metropolitan and urban carrier-grade networks," he adds.

While global demand for the technology has initially been slow, FSO vendors argue that regional uptake will also accelerate in de-regulating markets, where service providers are looking to undercut established players and find cheaper ways to expand network coverage into new areas. Incumbents also tend to be more accustomed to other solutions and in some monopoly markets, such as the UAE, FSO deployments have been confined to campus environments or between offices.

"Our value proposition is centred around elimination of operational expense and that typically cuts the PTT out of the loop," says Koenig. "In regulated markets, incumbent telcos see the technology more as a threat than an enabler. But in deregulated markets, we offer strategic advantages to companies that are innovative and are looking to cut capex and opex out of their models," he adds.

Ironically, this trend will also open up opportunities for other competitive technologies, such as Wi-Max, which could be deployed either for point-to-point solutions or to provide internet and voice connectivity to end-users.

"Something is always compared to something," says Michael Penner, vice president of corporate development at FSONA. "Microwave is still the yardstick that most wireless technologies including Wi-Fi and Wi-Max are measured by. But for Wi-Max, we're extremely complementary because we can aggregate Wi-Max traffic and bring it back to the core. Wi-Max also doesn't have the bandwidth yet to run video, so if you want to run high bandwidth applications, you've got to use FSO. If you want lower bandwidth connections, we can also aggregate that traffic," he adds.

With FSO becoming a more desirable option than when it was first targeted at the service provider market, vendors also argue that FSO will continue to fit into a more competitive mix.

"We view our proper competition not as other FSO vendors but alternative technologies, be they radio, Wi-Fi, Wi-Max, leased lines or fibre," says Koenig. "If you chart FSO over the last decade, ten years ago the proposition was, 'we have a neat new technology here, it doesn't work very well and it's pretty expensive, would you like to buy it?' Five years ago it was, 'the technology's still pretty expensive, it works better but it still doesn't work real well, would you like to buy it?' As of about two years ago, it was, 'we have a really good technology and the price points are excellent, would you like to buy it?' That's why the market has been growing in the last few years," he adds.

