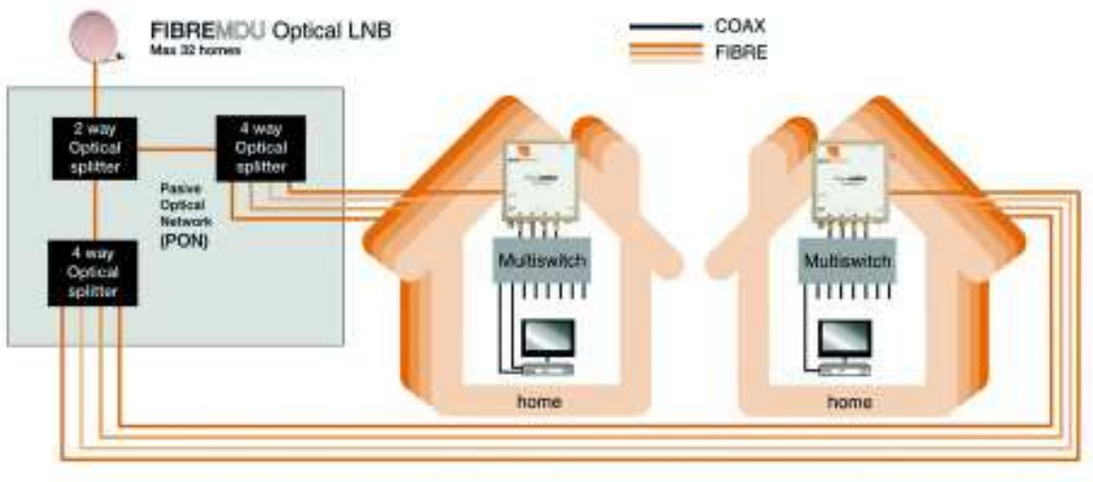
Giving co-ax the axe

An affordable fibre-optic IF distribution system is the beginning of the end for clunky old coaxial cable, says Global Invacom's Ivan Horrocks



Ivan Horrocks

Ivan is director, Sales & Marketing (Distribution) , at Global Invacom Ltd. He started his career with the Ministry of Defence. After a three-year break backpacking, he returned to the UK to the launch of Astra/BSkyB and set on a career path that has encompassed sales, installation, system design, manufacturing and distribution in the UK and abroad.

It's a quarter-century since cable and satellite began to revolutionise TV into today's multi-channel digital experience, and there's very little that's the same today as it was then – except for co-axial cable.

Trusty old co-ax has been around forever because it's cheap, (mostly) reliable, and everyone knows how to work with it. But it's far from perfect.

As every installer knows, co-ax is for short distances but try to carry satellite IF over distances greater than 150m, and even with amplifiers and heavy duty cables, the losses start to mount up. Distribution systems are expensive and time-consuming not only to install but to design in the first place.

The problem is that there's never been a worthy replacement. There are single-cable routing systems that cleverly pre-tune the signal, but they only work with compatible receivers and can feed limited numbers of boxes.

Fibre optics are ubiquitous in the IT world, but the commercial systems you can buy cost thousands of pounds even for carrying a single polarity of IF – and that's on a point-to-point system with no distribution. Add multi-point and full IF, and it costs tens of thousands.

British technology company Global Invacom plans to bring fibre to the masses. The company that brought us the first IF multi-switch – and an SCR solution for Sky+ – is set to launch a fibre-optic IF distribution system that beats co-ax on all fronts, including cost.

The company's work was somewhat prematurely leaked just over a year ago, but marketing director Ivan Horrocks is preparing to distribute hundreds of thousands of pounds' worth of stock to British trade counters and several major installation companies in May, ahead of a worldwide launch.

Stacked up

The new GI Fibre IF System, branded 'Fibre MDU' in the main is comprised of only two main components, the Fibre Optic LNB and the GTU (Gateway Termination Unit) connected together via fibre cable and optical splitters.

(below) Global Invacom's Fibre MDUs can imitate a twin, quad or quattro LNB, and you can have up to 32 MDUs from one Fibre Optic LNB

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Ivan explains: 'Traditional IF distribution requires single co-ax per tuner, so each band and polarity has got to have its own cable. Traditional IF distribution has always been limited by the loss and physical attributes of the co-ax cables. So if you design systems and you know how systems work that is the biggest limitation – without question – the loss of co-ax cable.

'Fibre allows much greater flexibility, reduced installation time and virtually unlimited distances can be covered. We stack all four polarities on top of each other, modulate them on to light, stick them through a laser and off they go down a single cable – simple!'

The front end of the fibre LNB is like a normal quattro LNB, quartering the Ku-band by band and polarity, but whereas a normal quattro would pass these to four individual IF co-ax cables, the Fibre LNB stacks them at frequencies between 1GHz and 5GHz before passing them through a solid state laser. The original signal isn't processed, it's simply modulated over a laser beam instead of a microwave. The laser is then injected into the optical fibre to reach the users. There is a coaxial F-connector on the fibre LNB, but it doesn't carry any signals – it's for power, from either existing equipment or a simple DC power adapter – providing about 350-400mA.

The cost so far is about five times that of a typical quattro LNB but the performance is extremely good – in fact, Global Invacom has already won an Astra Innovation Award for its work. Coaxial LNBs with similar noise figures are far from cheap either.

But it's with the fibre that the system starts to make financial and practical sense. First, the losses are in the region of 0.3-0.5dB per kilometre – and we were demonstrated a setup running through a 5.2km reel of fibre that had no significant impact on the final signal level or quality. It's already been displayed at this year's CAI roadshows, and will be at both ANGA Cable in May and the CAI Show in June.

Global Invacom is specifying a new kind of fibre optic cable for its systems, called G657a – but it will be sold as GI3.0 because it's 3mm thick! It's designed for tough environments, with a low-smoke zero-halogen (LSZH) outer jacket that won't produce dangerous fumes in the event of a fire. Inside this is a flexible steel armour jacket, a Kevlar braid, an optical buffer layer and, finally, the hair-thin optical fibre itself. Unlike typical telecoms cable, it can handle near right-angle turns without affecting the signal and won't suffer if it's crushed or twisted-up double during installation or construction work.

'You've got no EM problems, there's no interference, it's glass, it's light, so there is simply nothing,' adds Ivan.

'You can run it by the side of high-voltage cables, there's just no interference problems and no Earth bonding requirements because you have no power transference and no way to pass it. There's no current being sent anywhere apart from the piece of co-ax up to the LNB. No water ingression because it's a piece of glass.

'It's OK for putting anywhere. You've got this fabulous new flexible steel armour, so our technical boys with hammers can punish this stuff.'

The GI3.0 fibre costs about 10 per cent less than typical benchmarked CT100 co-ax, it's lighter, less bulky to carry, tougher, and there's no Earth bonding required. In large installations, where heavy-duty nine-wire co-ax is used to reduce losses and amplifiers

Making Connections

Case studies

As an experienced installer and IRS designer, Ivan Horrocks, Global Invacom's marketing director, has already seen some great opportunities to showcase his new product.

A typical mid-sized example came up overseas, where a multi-satellite upgrade was being designed for more than 250 flats with cable runs of up to 480m. The complicated system involved nine-wire co-ax and three sets of dishes to minimise cable runs, even though two of the antennas had to be 2.5m across to accommodate international signals.

With existing fibre optic point-to-point technology it would have cost more than £50,000 just to feed the switch system. The Global Invacom quote came to under £4,000, including the fibre.

'It took me five minutes to redesign the system because I left the existing multi-switch architecture there and just used the fibre as the backbone,; said Ivan. 'It's a question of should I put a two-way optical splitter in or a four-way splitter? It's excellent because of the flexibility it now gives you as a designer and to the architects.

10,000 homes in Kent

An even bigger experiment is going on at Ebbsfleet in Kent, where Global is working with BT and Sky to connect almost 10,000 homes. Here, they're using higher-powered commercial lasers which can serve thousands of points and the system also carries terrestrial digital TV signals, but the underlying IF technology is the same, so every home gets satellite TV without a dish, but at far lower cost than traditional fibre technology.

Credit: iStockPhoto/Peter Austin

Making connections

Like any cable, the fibre requires a termination at each end. Optical cables can be terminated in the field with acceptable losses, but it's harder than fitting an F-connector, so Global will sell pre-terminated cables at lengths from a metre to 200m, with a loss of 0.2dB per connection. All you need for this is a pocket-sized mechanical cleaner to pick up dust when the end-cap comes off.

But whereas the pre-terminated cable is fine for international markets, Global Invacom marketing director Ivan Horrocks is confident the UK's professionals won't be happy with hanging up loops of cable at the end of a job, and it has other benefits.

'I'm sure the more professional installers will want to terminate themselves, because if you're doing a new-build block of flats you could first fix it three months before you've got to go and put any electronics in there,' says Ivan.

'If you leave a pre-terminated length of fibre hung in a riser for three months, with all the other services going to be working in that riser, three months later that connector is not going to be in one piece. They will destroy it – electricians going, 'Oh, what's this?' – painters, scaffolders – it gets destroyed, so they're going to want to terminate themselves.'

Telecoms professionals use fusion splicer/terminators that literally melt the fibre into a connector so there's no join, but they cost thousands of pounds and the 0.05dB connection achieved isn't necessary in Global's field-ready system.

Field termination of the Fibre will require some training and Master distributors of this product will be able to provide a certificated training course based around GI's new offering.

A tool is being developed to remove the steel armour, special scissors are required to cut the Kevlar layer, and a special stripper is needed to remove the buffer without damaging the fibre. There's then a special alignment tool to match the incoming fibre to the one in the connector, followed by a quick light test to see there's no leakage, and the connection should be way less than the 0.5dB Global has built in to its calculations for each connection.

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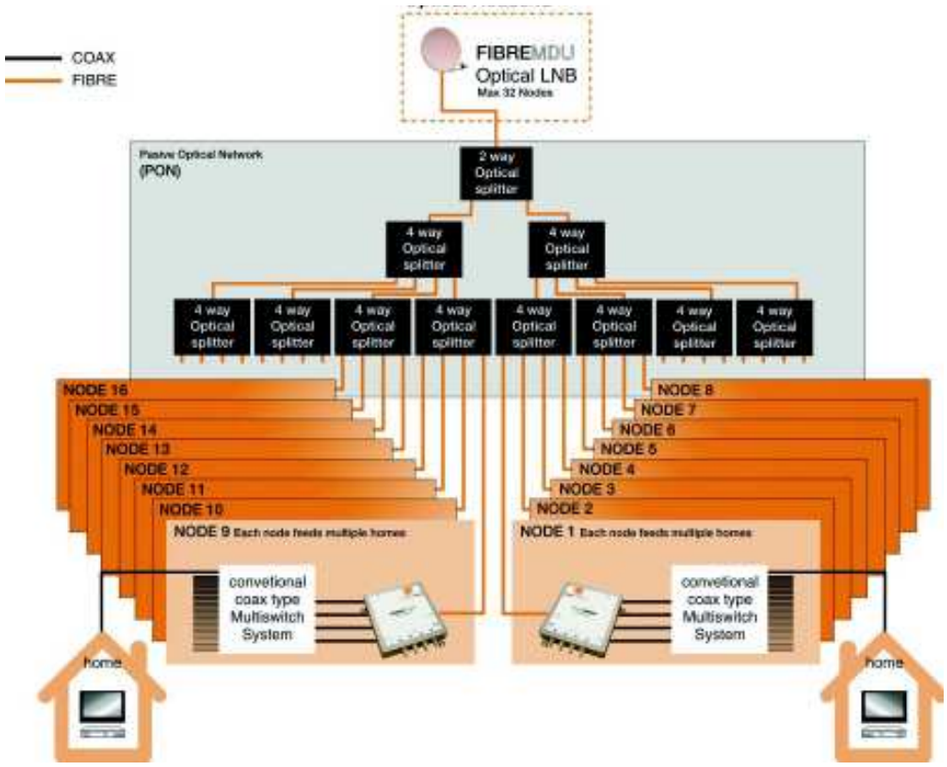

(above) The true benefits of fibre optic distribution are realised in large systems where each GTU output becomes a node for a regular coax multiswitch system

have to be added to maintain the signal, the savings really build up.

With the fibre terminated in the field or supplied with a ready-made connection (see panel), it can be distributed to up to 32 points using optical splitters. Splitters already exist for telecoms, but Global Invacom is having its own compact heavy-duty splitters designed for the world of IF distribution, which will plug-and-play without any special tools.

Three flavours

Each of the 32 end-points doesn't have to be a single receiver, in fact that would be very rare. Instead, there will be a Gateway Termination Unit, which turns the laser IF back into a coaxial IF – again with almost no loss. The GTUs come in three flavours: twin, quad and quattro virtual LNBs. The twin and quads can go directly into receivers, while the quattro can fit into an existing multi-switch architecture and they're powered from via co-ax from the receiver or switch, just like a regular LNB. The GTUs will be competitively costed with multi-switches, although with the very high signal levels achieved, an attenuator might be required for installations where a single receiver is all that's required.

If there are multiple feeds or multiple dishes using a DiSEqC switch – as there often are in Europe – then Ivan says it will be cheaper to run two fibre cables from the LNB to a second GTU and place any switches on the co-ax side of the GTUs. That wouldn't work for a motorised system, but then the fibre's not intended for those kinds of domestic installations.

(below) The Fibre Optic LNB can feed the whole Ku-band to up to 32 end-points. That F-connector is just for power

The typical installer's package will include a few other tools, such as a steel rod for pushing the very flexible cable through walls, 3mm cable grommets to fill 10mm drilled holes (both currently in development), a cable end-cleaner, plus a few special tools for those who decide to terminate the cable themselves instead of using Global's pre-terminated cable.

The final challenge will be measuring the signal to align and fault-check the dish because there aren't any meters with direct fibre inputs. Global is talking to some meter makers about modifying their products, but for now the installer will simply have to carry a GTU with them and connect their meter via that, or align the dish with an old-fashioned LNB before they fit the fibre unit.

Bigger and better

Andrew Collar, Global Invacom's project manager for fibre, says the system uses just a fraction of the fibre's potential bandwidth and they've already reserved frequencies below 1GHz for terrestrial signals, which will make it into a complete IRS technology, although they'll also need GTUs with a UHF output. It's also capable of working with Ka-band as that becomes more popular for broadband, but the priority is increasing the number of outputs: a sidecar laser amplifier unit will enable 64 and 128 points, then the system scales up to around 500 points, finally, more powerful commercial lasers will enable fibre IF to reach thousands or tens of thousands of homes, as they're already doing at Ebbsfleet in Kent.

Within five years Global also expects to see the first satellite receivers with direct fibre inputs, which would place no limit on the number of virtual 'tuners' a receiver can have.

The system has obvious benefits for enabling property owners and developers to turn analogue-era distribution systems into something that can allow multi-tuner PVRs and multi-room in every dwelling. Fibre IF could also replace ailing self-help schemes in remote communities that have a dish or aerial several kilometres away on a high point without the need for a relay transmitter. It will also be popular in markets like Africa, where co-ax is being stolen for its copper.

It looks like the company that invented the multi-switch has another bright idea.

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