A tipping point?

The Telecommunications Infrastructure Project is looking to apply open source technologies to next generation fixed and mobile networks. By **John Walko**.

The Telecom Infra Project (TIP), conceived by Facebook to light a fire under the traditional telecommunications infrastructure market, continues to expand into new areas.

Launched at the 2016 Mobile World Congress in Barcelona, the highly disruptive project takes an open ecosystem approach to foster network innovation and improve the cost efficiencies of both equipment suppliers and network operators.

"We know from our experience with the Open Compute Project that the best way to accelerate the pace of innovation is for companies to collaborate and work in the open. We helped to found TIP with the same goal – bringing different parties together to strengthen and improve efficiencies in the telecom industry," according to Aaron Bernstein, Facebook's director of connectivity ecosystem programmmes.

The project was launched by Facebook, SK Telecom, Intel, Nokia and Deutsche Telekom with the aim of improving global connectivity, notably in areas that currently lack access to the internet or to mobile networks.

BT, Vodafone and Telefonica soon joined the party and all now have representation on the TIP board. Conspicuous by their absence are the big US mobile operators and the likes of Ericsson and Huawei.

The group boasts 500 members, and last November's second annual TIP summit in Santa Clara drew 1200 attendees, 400 more than the previous year.

"Unfortunately, the number of active members contributing to research and development in a meaningful way is more like 100, with, let's say, 80% of members simply monitoring progress," said Axel Clauberg, VP of transport, aggregation and IP at Deutsche Telekom and current TIP chairman. "Such a transformative project takes time to embed. Look at Facebook's previous initiative in the area – the Open Compute Project. That took some five years to gain real traction."

The TIP is not just an altruistic initiative on Facebook's part. At its core, it is trying to solve a problem partly created by the company, which depends hugely on the ability of network operators to keep pace with explosive growth in demand for bandwidth.

Neither is it a coincidence that the projects underway include collaboration into areas such as open-source based long distance antennas that will help bring internet to remote locations and the development of tiny

Above: TIP is about solving the problem of how network operators keep pace with the explosive growth in bandwidth demand

cellular base stations that could be planted on street lighting to speed deployment of wireless services.

Clauberg pointed to another reason why operators are keen on the TIP approach. "[It's] one of the ways we could and must improve on capital efficiency. We are seeing massive growth in data traffic, yet are struggling with flat average revenues per user in many markets.

"We need more radical and disruptive approaches to improve the way in which we develop and implement existing infrastructure, while maintaining good relationships with our existing suppliers."

The TIP chairman also pointed to another stark reality for network operators and, to a lesser extent their suppliers. "The best, brightest people leaving colleges and universities want to work for the big and increasingly influential web companies, such as Facebook, Google and Amazon, or do their own thing. We are struggling to attract the talent that, for decades, we took for granted."

Interestingly, the large US carriers

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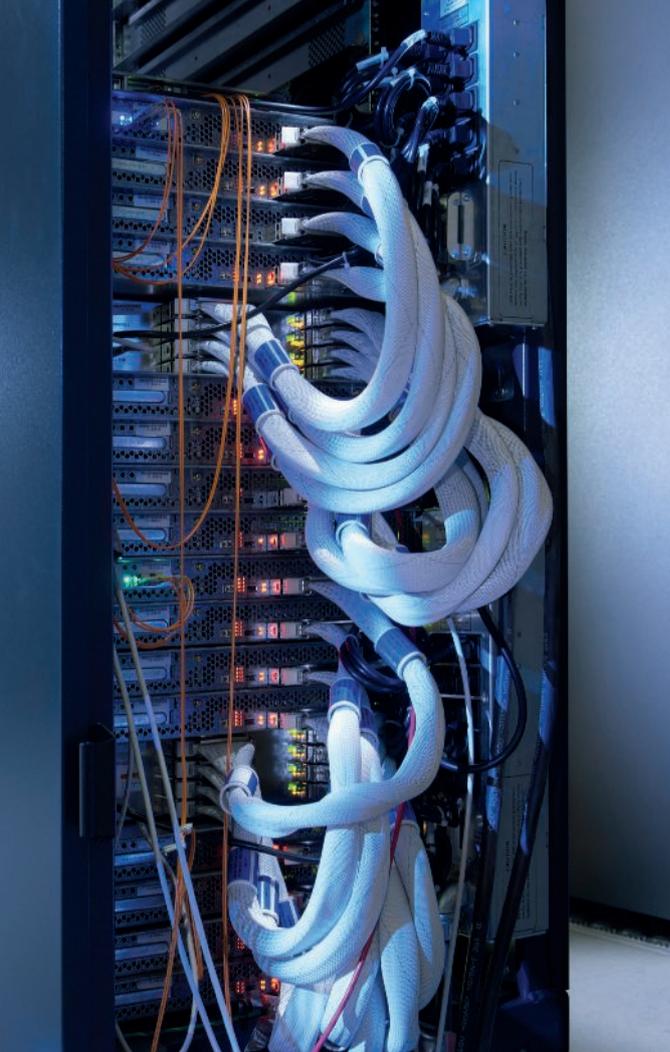
more to the cost of getting electricity to remote base stations and finding concrete roads to help erect the necessary towers and accompanying infrastructure. This is misleading; minor improvements in the cost of electronics in infrastructure gear will not make a big difference here."

Criticism of the project

Clauberg was assertive about criticism from some that the TIP project was undermining the industry's standardisation efforts. "We are most definitely not replacing standards bodies and our work in no way undermines the strenuous efforts towards what we all believe is a hugely important issue – a good outcome to the efforts towards 5G standardisation.

"This is a critical challenge for the industry."

Nor does the TIP chairman accept that 'open source' is an issue.

He suggested there seems to be some confusion between 'openness' – basically interoperability between infrastructure solutions offered by different vendors, but based on standard interfaces and APIs – and 'open source'.

Clauberg stressed there is room for both approaches within the project and noted that two of the working groups follow the 'royalty free' approach. OpenCellular is targeting cheaper base stations, while the majority of members have opted for the RAND licensing approach – the so called 'reasonable and non-discriminatory' licensing terms.

This, Clauberg continued, accurately reflects the IPR reality faced by the industry. "Start-ups wishing to join or who have been chosen to work within the group should not be worrying about their intellectual property rights."

Another criticism of the TIP is that there are just too many projects and that it would be better to focus on some key issues facing the sector.

The TIP board clearly rebuffed this

at last November's TIP Summit, where a number of innovative work groups were launched. One of these, led by BT, focuses on end-to-end network slicing – the concept of automatically provisioning a cross-domain data pipe that specifically targets the requirements of a particular service, whether that is low-capacity, intermittent IoT use or high capacity, latency sensitive. The work should be particularly relevant to forthcoming network architectures, Clauberg contended.

The TIP chairman also said the important mmWave Networks project group, co-chaired by Deutsche Telekom with Facebook, now has 200 members, including chip-set makers, operators, backhaul network vendors, system integrators and test and measurement companies.

The target is to make mmWave a complementary broadband option to fibre and the group will focus its efforts on the 60GHz band, which can support the bandwidth required by almost all current and emerging applications, such as 4K video streaming and smart sensors.

The group is building on some of the data and lessons gleaned by Facebook from its Terragraph project. This involved building and running field trials of a 60GHz multi-node wireless system that it said overcame the signal range and absorption limitations that have, to date, confined this frequency band to indoor use.

Bernstein pointed to progress by the OpenCellular project in developing cost-effective and sustainable base stations that are now undergoing lab and field trials with an all open source platform. "Vodafone, MTN and Telefonica are among the leading operators looking to use OpenCellular to potentially serve millions in small rural towns and villages that lack network coverage," he said.

The LTE eNodeB reference design is provided by Cavium, while NuRAN Wireless designed the 1800MHz front-end. Facebook and Keysight

– such as Verizon, AT&T and Sprint – have not joined the initiative as yet and the only big North American carrier on board is BCE (Bell Canada), alongside some mid-size cable networks, such as CableLabs and Equinix.

There are also some glaring omissions on the infrastructure equipment side. While Nokia is a founding member, it has contributed little to the development work and Ericsson has yet to sign up.

"Facebook is giving the impression that telecoms infrastructure is expensive today and that its approach will lower costs. We disagree," suggested Martin Bäckström, head of technology and portfolio in Ericsson's business area. "Our and other suppliers' gear still offers an excellent return on investment for the operators.

"They are also pushing the idea that the project is targeting better connectivity in emerging markets and in remote areas. Having worked for many years at a major operator in The Philippines, the real problems relate

"We need more radical and disruptive approaches to improve the way in which we develop and implement existing infrastructure."
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devised the firmware software and testing infrastructure, and a series of radio and core interoperability testing yielded Rev-B spec performance. The next step is to develop systems that will work at lower frequencies (700, 800 and 850MHz).

A separate aspect of the project is the development and field testing of an open source power system dubbed OpenCellular Power, aimed specifically at rural deployments. The work is a joint effort linking Delta, Facebook, Bel Power, Panasonic and Clear Blue Technologies. Key features include the ability to power a maximum load of 150W through five individually monitored and switchable DC output lines; an input of up to 150W from solar and grid power; lithium-ion battery modules that can last for more than five years; and open interface specifications to allow incorporation of hardware and software modules.

Another new initiative is the Artificial Intelligence and Machine Learning group, co-chaired by Deutsche Telekon and Telefonica. Amongst the projects planned for this group are: techniques that can spot and predict network outages; network planning routines that will help operators put cell towers in optimal locations; and an exploration of how latency-critical services, such as autonomous vehicles, can be refined by predicting customer behaviour.

Perhaps the most important and concrete success of the TIP to date has been the development of Voyager within the Open Optical Packet Transport (OOPT) group. The white box DWDM transponder and router is now going through the final stages of engineering and, according to Clauberg, continues to gain momentum worldwide.

ADVA Optical Networks has

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Martin Bäckström

been working closely with Facebook engineers on the design and the German company has started taking orders for the transponder. The device uses a Broadcom Tomahawk switch ASIC, which Facebook also specified for the Wedge 100 switch designed to drive down costs in the same way in the data-centre sector.

European carrier Telia has used Voyager to close an optical link of more than 1000km at 200Gbit/s using 16QAM. Orange has also been trialling the device in Senegal and Equinix and MTC in South Africa, while South American carriers have also started field trials. Vodafone said it too is planning field trials in Europe this year.

The OOPT group is chaired by Hans-Juergen Schmidtke, Facebook's director of engineering, who is said by insiders to have been one of the instigators of and the driving forces behind the whole TIP crusade.

Telecommunications Infrastructure Project looks to generate a new wave of innovative start-ups

One of the most important aspects of the Telecom Infra Project is the way it intends to get large organisations to work with, mentor and kick-start a new wave of infrastructure start-ups.

The key to achieving this is not only to ensure emerging companies have access to funding, but also to adapt their technologies for real operational requirements within a network infrastructure and to test these ideas. This is why the project has been establishing what it terms TIP Ecosystem Acceleration Centres (TEAC).

"We are excited about the level of VC participation. For example, in 2017, UK-based investors committed $170million towards the TEAC in the UK supported by BT, while $115m was committed by French VCs to bolster the French TEAC supported by Orange," said Aaron Bernstein, Facebook's director of connectivity ecosystem programmes. Bernstein stressed neither Facebook nor the hosting operators are planning to make equity investments in companies chosen to work within TEACs.

Currently, there are four TEACs. BT is using its R&D facilities at Adastral Park and, to some extent, its operation at London's TechCity, while SK Telecom is hosting companies at its research group in Seoul. More recently, Deutsche Telekom has set up a TEAC in Bonn.

BT was also the first to announce the winning

Howard Watson, CEO of BT Technology, Service and Operations, pictured: "It's more important than ever that we seek expertise, not only from our home-grown talent and established partners, but also from newly created small businesses."

TEAC start-ups, following pitches to the supporting group of operators. They were: Zeetta Networks; Unmanned Life, which is developing a drone–based platform for infrastructure testing; and KETS Quantum Security, whose quantum chip to is set to boost internet security.

The operators say such technology, meeting challenging size, weight and power requirements, will be crucial in 5G infrastructure and device developments.

The TEAC concept is augmented by TIP Community Labs that provide space and innovation support from operators targeting specific project groups. The first was established at Facebook's Menlo Park facility, followed by one in Berlin hosted by Deutsche Telekom focusing on mmWave network projects. Another lab at SK Telecom in Seoul is targeting emerging testing technologies.

Last November, the initiative was expanded with labs in Rio de Janeiro, set up by TIM to support efforts within the Open Optical Packet Transport project group; in India, where Bharti Airtel will support a focus on technologies related to the vRAN Fronthaul project group; and in the US, where CableLabs will target virtualisation of the radio access network.

There are also plans to open a lab at Facebook's London headquarters to support European based projects.