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Special Report: TIP Summit 2019

Progress to open vendor ecosystem, but the same MNOs are in charge

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It is almost four years since Facebook initiated the Telecom Infra Project (TIP), with the goal of extending the scalable cloud-based economics of its Open Compute Project to the telecoms networks. It has expanded well beyond the social media giant and its goals of bringing affordable connectivity to ‘the next billion’, though the overall objective of achieving a fully open, disaggregated network on cloud infrastructure remains the same.

Large operators, especially European leaders like Deutsche Telekom, Telefónica, BT and Vodafone have become very active, as they seek to open up their supply chains and drive network costs down for the 5G era. At the TIP Summit in Amsterdam last week, it was clear how far the group has progressed. A year ago, when the event was in London, commercial reality came a big step closer when Telefónica and Vodafone announced vendors which complied with their TIP-based RFI (request for information).

In 2019, those early moves towards fully deployable networks have proved to be the basis of something far larger. Most significantly, Vodafone has thrown down the gauntlet to its traditional vendors and issued an RFQ (request for quotes) for a Europe-wide deployment of open RAN cells across its whole footprint – more than 100,000 sites. It also announced a new RFI for a 5G New Radio cell, and is now working on this with Samsung.

Even this does not mean TIP is a fully fledged operator option for large-scale commercial 5G yet. While its OpenRAN specifications are the most mature of its many projects, and the basis of Vodafone’s and Telefónica’s series of field trials this year, they are mainly being used in small cells and rural environments, and are still far from being implemented in a large MNO’s main network. More choice of vendors and more robust field trials will be needed to drive that level of confidence.

Large European MNOs seize TIP steering wheel:

At last year’s Summit, there was a strong sense that TIP was developing down two parallel tracks which might not always be compatible. Facebook itself, and some of its allies such as Intel, were heavily focused on enabling open, low cost networks for rural and underserved areas, and implicitly to enable alternative service providers. The European operators, plus other supporters like SK Telecom of Korea, were far more focused on driving down their own costs, and ending vendor lock-ins, to improve the economics of their own roll-outs and implicitly make it harder for new, open-based competitors to compete.

In Amsterdam, the focus was more heavily on the MNOs, but it will be important that the goal of enabling a wider range of service providers, not just a wider range of vendors, is not lost amid all the 5G discussions.



And another important challenge that looms over the achievements of the TIP Summit is the relationship with other groups that are working on open RAN and end-to-end network architectures for the disaggregated, cloud-based 5G era. For the past year, it has been assumed that TIP and other initiatives, particularly the Linux Foundation's ORAN Alliance, will have to grow closer and enable interworking or even convergence.

Despite positive noises by many stakeholders, and again at the Summit – including expanded collaboration with the Open Networking Foundation - there has been little public, concrete progress in this area, and that will be critical to the success of the open platform, and to avoid the distraction of a battle between 'rival' standards. It is vital that TIP finds common cause with other open groups in order to avoid fragmentation of the fledgling open platform, which could limit adoption.

It is also important that it continues to support a variety of vendors, as well as operators. For now, some independent suppliers are doing very well in the TIP trials – Parallel Wireless, Phluido and others. But Vodafone's choice of Samsung to work on its 5G NR open cell, and the increasing involvement of the big names, raises the question of whether, having achieved their TCO reduction objectives, MNOs will veer back towards their familiar – and now duly chastened – suppliers, enjoying the confidence in their decades of R&D and deployment experience.

Will start-ups really get a look-in at large mobile contracts?

For instance, there was less talk at this Summit, compared to previous ones, about a key and unique element of the TIP, the system of incubating start-ups via TIP Ecosystem Acceleration Centers (TEACs), run by operators such as BT. In September, BT announced the competition to become part of its third wave of TEAC start-ups, and the results were due to be decided on October 19, but there was none of the fanfare at the Summit that has greeted previous awards.

Stefan Pongratz, VP at research firm Dell'Oro Group, summed up the dilemma for new entrants in a research note, writing: "The R&D required to provide a competitive 5G portfolio with the increased complexity in the RAN and core, the increased use of machine learning and automation in services, and the proliferation of new use cases spanning a wide range of industries, will possibly move the needle in the opposite direction and complicate the entry for new entrants."

Some other developments discussed at the Summit, which are covered in more detail in this special report, include:

- Members are joining from different parts of the cloud and telecoms ecosystems. Dell is a particularly significant recruit because it is active in other open communities such as the Open Networking Foundation's CORD (Central Office Re-architected as a Datacenter) and its own edge-related initiatives. And Dell highlights the way that the mobile operators, the cloud suppliers and the network providers must work together if the 5G platform is to be truly carrier-grade.

- Testing labs are essential to any would-be open platform, reducing the need for each operator and vendor to carry out tests, and providing confidence that products will be certified to be interoperable. TIP is expanding its community lab program with a dozen locations now actively testing, validating, and integrating new features. And Sprint opened a new testing lab in its Kansas headquarters.
- Optical transport networks are also an important work area for TIP and Telefónica has committed to deploying the Disaggregated Cell Site Gateway (DCSG) technology, from the Open Optical Packet Transport group, at scale in Germany.
- The Summit is always the forum to announce a series of new project groups and 2019 lengthened the list considerably, adding new projects related to WiFi, open cellular frameworks, Open RAN 5G New Radio, vRAN fronthaul, open box microwaves, and non-terrestrial connectivity.
- There were some product launches harnessing TIP specifications, including fixed 5G equipment from Siklu, using the Terragraph platform; and a containerized LTE RAN for cable operators, launched by Altran, Benetel and Phluido. TIP has announced an online marketplace for compliant products, and a badge scheme to show customers where each product stands in terms of development.

Special Report: TIP Summit 2019

Vodafone promises 100,000 OpenRAN sites in shake-up to ecosystem

The Telecom Infra Project (TIP) is a broad church in terms of membership, but increasingly, its key commercially focused activities look dominated by traditional mobile operators. That has a certain irony, considering TIP was founded by Facebook, whose messaging and social platforms have helped decimate MNOs' SMS business and push the rewards of mobile revenue growth from telcos to over-the-top players.

It is very valuable to TIP's progress and credibility that Vodafone, Telefonica, MTN and others are conducting field trials and discussing commercial roll-outs. But it is important to the bigger goals of TIP that its operator base, as well as its vendor ecosystem, remains diversified.

Otherwise, the risk is that traditional telcos will use the initiative to drive a low cost, open platform to improve their own economics and reduce their reliance on the major OEMs – but that Facebook's original objective, of bringing affordable connectivity to 'the next billion' will be lost. That goal almost certainly requires a wider variety of service providers, including specialists in rural access and



neutral host players. Otherwise, even with lower cost network platforms, MNOs will still find it hard to make an attractive case for rural, remote and industrial connectivity, and will continue to prioritize the users and applications that lie in their comfort zones.

Vodafone plans to deploy over 100,000 OpenRAN sites:

Certainly, this year's TIP Summit in Amsterdam was more centered on the big operators, as opposed to non-traditional service providers or even Facebook itself, than in the past.

This was partly because of some high impact announcements made by several large operators, particularly Vodafone.

This high profile announcement followed directly from last year's Summit highlight, at which Vodafone and Telefónica announced a list of non-traditional vendors which complied with their TIP OpenRAN RFI (request for information). This time, Vodafone's head of network strategy and architecture, Santiago Tenorio, pledged to issue an RFQ (request for quotes) for OpenRAN technology for its whole European footprint (14 countries).

"That's significantly more than 100,000 sites, and all the technologies are to tender — 2G, 3G, 4G and 5G," said Tenorio. "We've invited the incumbent suppliers in Europe of course, but we've also invited the open RAN suppliers."

This was a bombshell announcement in that it relates to large-scale commercial networks, not to localized greenfield trials or roll-outs, often for rural areas, which have been the main proving ground for the various open RAN candidates to date. It opens up the prospect of the shake-up of the architecture, and therefore the supply chain, which operators have talked about for so long as a key enabler of new network economics. It gives hope to alternative equipment vendors that they might be able to bid for tier one contracts, or at least for a share of such deals, in a multivendor environment. (Japan's Rakuten is often the template, with its mixture of established OEMs, start-ups like Altiostar and systems integrators, though this operator's focus is on the ORAN Alliance specs).

Is this more than lip service to new vendors?

But the proof will come with Vodafone's actual contract awards. Will the operator do more than play lip service to new vendors and award the lion's share of its potentially huge deployment to new

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suppliers? Assuming it has a well-proven integrator to tie everything together, what will be the relationship with the new players? Will its 100,000 sites be primarily small cells for densification and rural coverage, or will the open platforms infiltrate the main macro network in the first phase?

The answers to all these will help shape the open networking space and provide lessons for other MNOs about how to work with a new supply chain. There is the risk, of course, that Vodafone will end up choosing a traditional supplier, giving subsidiary roles, or none, to the start-ups.

The TIP Summit announcement had echoes of Vodafone's once-traditional keynotes at Mobile World Congress, where its CEO would threaten to move to alternative architectures, as a clear bid to put very public pressure on its established OEMs to be cheaper and more compliant.

Vodafone has form in putting pressure on OEMs:

A particularly memorable example was in 2008, when then-CEO Arun Sarin said Vodafone was considering including WiMAX in its 4G platform. At the time, WiMAX was challenging the established cellular order by promising a new supply chain, WiFi-like testing and certification, and open interoperability. At the time, nobody really believed Vodafone was serious about turning against LTE and its traditional vendors. A decade later, with the various open initiatives offering similar promises to those of WiMAX, will it put its money where its mouth is?

There are two risks to the dream of a genuinely diverse and competitive ecosystem in which new vendors can move into the main networks alongside the giants. One is that, once the major OEMs can be manoeuvred into supporting open platforms, they will have greater ability to scale the systems up in order to deliver dramatic price reductions.

The other is that open platforms need to become far simpler to deploy and run, if they are to deliver their TCO promises. The Rakuten example – and the delays to that project – highlight the complexity of pursuing a solution which involves many vendors all cooperating on an unfamiliar architecture. This involves significant spending on integrators to coordinate all the technologies and vendors, and to carry out the robust testing and optimization to make the resulting network truly scalable and carrier-grade.



But without doubt, Vodafone’s announcement, and other trials and partnerships showcased in Amsterdam, provide the greatest hope for a new open platform and supply chain, since the WiMAX days (and with a more forward-looking approach that could help accelerate the move towards cloud-native networks).

Tenorio said: “I think that right now this is the biggest tender that there is in this industry in the world. Our ambition is to have modern up-to-date, lower cost kit in every site. We are willing to swap out sites if we have to. This is going to come in the next few months. It may be a significant acceleration of the open RAN ecosystem.”

With big or small vendors, OpenRAN is accelerating:

Efforts like this do have the potential to light a fire under emerging open specifications, because they take these architectures out of the realms of lab tests, proof of concepts and demonstrations, and into live networks where they can prove their capabilities (or not). If they prove themselves, there will be real hope that operators can get away from a world where, even though standards are set, vendor have the market power to implement those standards in their own, incompatible ways, and get away with it because there is so little choice in the market.

Tenorio spoke about the latest OpenRAN trials Vodafone has been conducting in the UK and Ireland, where it has been testing its own open-sourced CrowdCell small cell, with RF partner RF provider Lime Microsystems and manufacturer Alpha. The company has also previously conducted trials in Democratic Republic of Congo and Turkey, where it has worked with Parallel Wireless, and plans one in Mozambique.

Last month, Vodafone’s group CEO Nick Read said the operator was “ready to fast track” new RAN architectures in Europe “as we actively expand our vendor ecosystem. OpenRAN improves the network economics enabling us to reach more people in rural communities and that supports our goal to build digital societies in which no one is left behind.”

Driving down costs in all Vodafone’s markets, and especially those outside Europe, are particularly urgent for the UK-based MNO. It is under particular pressure to transform its cost base, especially if it is to make its Indian strategy work – it is the market leader in India following its acquisition of Idea Cellular, but that lead is under



threat from newcomer Reliance Jio, and while the sub-continent is a major growth engine for Vodafone, it is tough to make it profitable without slashing the costs of extending 4G and moving towards 5G.

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Telefónica follows AT&T, bringing white box economics to cell site gateways

While Vodafone and OpenRAN dominated the big news at the Telecom Infra Project (TIP) Summit last week, Telefónica was once again in the spotlight too, this time driving forward TIP's other commercially mature solution, DCSG (Distributed Cell Site Gateway).

The Spanish group will deploy DCSG commercially "at scale" in Germany and also in Ecuador, it said. This will be valuable in building vendor and operator confidence in the DCSG specs, as will new lab trials for the platform, with India's Bharti Airtel, South Africa's MTN, TIM Brasil and Vodafone. Vodafone, Orange and TIM Brasil also plan to announce a joint Request for Information (RFI) to assess what the vendors, new and old, can offer in compliance with the new specs.

The DCSG project is important because it highlights that TIP is not just about the RAN but that it is seeking to drive open disaggregation and commoditized hardware in all network domains.

Telefónica's head of R&D, and TIP board member, David del Val Latorre, said: "The whole value chain, the whole technology stack of telcos needs innovation ... in access, transport, operations and support ... I think we need to continue working for a few years until we have this ambition of a fully disaggregated network from end to end where innovation really happens at the speed it is happening in other areas of computing or elsewhere in the Internet."

The DCSG project was kicked off at the TIP Summit last year within the Open Optical & Packet Transport (OOPT) project group, and quickly produced specs for an open white box gateway which can be deployed in current networks while including the port speeds and density that 5G will require.

The DCSG gateways being used by Telefónica were developed via a collaboration between TIP, Infinera and Edgecore Networks and this is the first large-scale live roll-out.

A cell site gateway is a router that is located near the cell site to support various functions for 4G and 5G base stations, including time synchronization, and routing Internet packets between the base stations and the packet core for backhaul.

More vendors line up behind DCSG and Odyssey:

The specific design that Telefónica is deploying is a 100G version of a DCSG design called Odyssey, supplied by Edgecore and running Infinera's Converged Network Operating System (this is not open source, highlighting the hybrid nature of TIP's licensing processes, which do not insist on full open sourcing). Telefónica has also specified a 10G version of Odyssey.

Odyssey-DCSG was the first result of the DCSG working group, and promises to support open operations and management (O&M) approaches in order to allow MNOs greater freedom to select different technologies for each layer of the stack. Edgecore contributed the hardware design of the cell site gateway to TIP and it is being adopted by various software partners such as Infinera, Volta and ADVA.

The platform is becoming more multivendor. For the software, ADVA and IP Infusion have been approved to provide network operating system code, while Volta Networks has been chosen for its cloud-native routing engine. As well as Edgecore, two other Taiwanese vendors are producing hardware – Alpha Networks and Delta Electronics – and of course, the Taiwanese electronics manufacturing ecosystem is always critical to scaling up products to mass market.

At the show, Altran announced its own DCSG offering, a combination of its Intelligent Switching Solution (ISS) software framework and network OS, with a DCSG white box based on Edgecore's AS731x, which is powered by Broadcom StrataDNX Qumran-AX.

Earlier this year, two vendors - Aviat and Metaswitch - cooperated to develop a product based on DCSG specs, using Aviat's network operating system, AOS, and a routing stack and network operating system toolkit from Metaswitch, an early pioneer in virtualized networks including the core. The combination of software runs on hardware which conforms with the TIP specs.

And Edgecore has also worked with Volta on an open virtualized cell site gateway, running Volta's cloud-native virtual routing soft-

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ware, the Elastic Virtual Routing Engine (VEVRE), on Edgecore's AS7316-26XB cell site gateway switch.

Telefónica's initial roll-out will be just "a handful" of white box routers in each country and then, if all goes well, the deployment will be scaled up and could be extended to other markets.

AT&T has its own gateway project, but with OCP:

It will take some time before it gets to the scale envisaged by AT&T for its own open cell site gateway/router, which it aims to deploy in about 60,000 sites. This white box product has also been submitted to a Facebook-initiated group, but to the Open Compute Project (OCP) rather than TIP.

In line with other discussions about TIP's relationship to other open groups, TIP chairman Axel Clauberg said that the DCSG was aligned with similar work on cell site equipment, being undertaken at the OCP. Like TIP, OCP was initially founded by Facebook to drive the development of an open, white box cloud platform, and last year, AT&T submitted its specs for a white-box cell site router to this group. The US carrier is now deploying products based on this design in its commercial transport network.

Clauberg told FierceWireless that TIP had decided to develop its own specs, while staying aligned with OCP, because TIP members had some specific requirements. "When you look at the Edgecore

Background to DCSG:

DCSG is a project within the CANDI (converged architecture for network disaggregation and integration) working group. CANDI is led by one of TIP's most active operators, Telefónica, plus Japan's NTT. This is, in turn, a sub-group within the existing, and highly active, Open Optical Packet Transport (OOPT) initiative.

That was established near the start of the TIP adventure, and has already increased its potential impact by collaborating with another high profile open effort in the same area, the Open Networking Foundation's (ONF's) ODTN (Open Disaggregated Transport Network), which is also led by Telefónica and NTT, plus China Unicom, Comcast and TIM.

The OOPT and the ODTN are focused on disaggregation of hardware and software, and on white box platforms, for the transport networks, focusing on technologies such as open transponders, disaggregated cell site gateways, software abstraction interfaces and routers. The founding product in the OOPT was the Facebook-designed Voyager, a DWDM optical transponder whose reference design has been adopted by several companies such as ADVA.



product, that is something that is accepted by OCP and used in TIP,” he said. “We did everything possible to align with the OCP working group and the OOPT group within TIP. Nevertheless, our members, for example Vodafone, had separate requirements that were not 100% aligned with the AT&T spec.”

AT&T’s reference design runs its own network operating system, dNOS, which has also been placed in open source via the Linux Foundation’s DANOS project. The US telco aims to replace all its current cell site routers (it has 60,000 towers and 5,000 central offices). Any supplier wanting to be part of that roll-out will have to conform to the specs, which will enable AT&T to source boxes from multiple suppliers, choosing the cheapest or most innovative, while ensuring interoperability.

If the design is taken up by other OCP members, the scale of the ecosystem, and the consequent price competition, could be very significant. AT&T’s reference design can be used as a guideline by any hardware vendor, though it currently has to be based on a specific chip (the Broadcom Qumran-AX switch-chip). Submitting it to OCP should encourage more suppliers to rise to that challenge (and other chips might follow in future). The gateway router design is supposed to support current and future cellular backhaul systems, being future-proof to some extent, by embracing a wide range of speeds on the client side, including 5G baseband units operating at 10G/25G and backhaul speeds up to 100Gbps.

Meanwhile, Telefónica said it went through a request for proposal (RFP) process before deciding on a white box approach, and studied submissions from traditional router vendors too, but went for the flexibility and low cost of a disaggregated, multivendor solution.

Others may follow - BT, Orange, TIM Brasil and Vodafone have been working to develop the DCSG blueprints, and MTN and Airtel have adopted the platform for trials.

The next TIP-based open hardware to come to commercial availability is likely to be the OOPT group’s Cassini packet/optical transponder unit, which has been in field trials with Telefónica and NTT, and even deployed in a live network by Japanese specialist operator Mixi. Another important project in the OOPT transport network environment is the Apollo optical transponder.



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Vodafone's 5G RFI—positive for ORAN pact, less so for open supply chain

The large-scale RFQ (see previous item) was not Vodafone's only big announcement at the TIP Summit. It also announced the results of a new request for information (RFI), this time for OpenRAN 5G New Radio (NR), the focus of a recently formed new working group.

There are two very significant aspects to this.

One, although many small vendors responded, the winner was Samsung – not a major RAN vendor, but a traditional MNO partner and a company of huge resources. This did not entirely chime with the focus on shaking up the supply chain, but looked more like an old-school operator attempt to build up a single alternative, but low-risk, supplier to keep the incumbents honest – rather as Vodafone did in the early 4G era when it first introduced Huawei to its approved supplier list.

Two was the insistence that suppliers should support both the ORAN Alliance specification – often presented as an alternative to TIP OpenRAN – and be TIP members. This was the latest in a series of signals that these two efforts should converge, and that operators are pushing them in that direction, though a clearer commitment to work together in a complementary way is badly needed to allay fears of fragmentation.

Samsung is the only large vendor to respond:

Vodafone sent the RFI to its incumbent suppliers in Europe and to various smaller vendors. Piling the pressure onto the big OEMs,

Vodafone works on TIP radio reference design:

Vodafone is working with TIP to create a reference design for a “killer” 1.8 GHz, 4x4 MIMO, 160-watt radio.

Reference designs can greatly reduce cost and time to market in an open equipment market, making cellular systems closer to WiFi in terms of ecosystem and design process. The aim is to create TIP designs that distill the requirements of the whole group of operator members.

“If I’m speaking at TIP 2020, I’ll come with one of these white boxes,” said Tenorio.

Santiago Tenorio, head of networks and architecture, said: “Unfortunately, the incumbent suppliers did not respond.”

This reminded the audience of the large vendors’ understandable ambiguity about open RAN platforms, given that they threaten to end a long history of profitable lock-in.

Nokia has been the most willing of the majors to accept the inevitable and support open platforms, presumably with the aim of seizing market share from more slow-moving rivals and defending its customers from new entrants. Nokia has been very focused on the ORAN Alliance, which even Ericsson has joined.

One large company did respond to the RFI, and that was Samsung – not a major RAN equipment player of course, but with huge resources to scale up its business by leveraging open platforms while promising the reassurance of a large OEM. The other companies which responded, providing “fantastic work in record time”, according to Tenorio, were Mavenir, Parallel Wireless, Altran, Phluido, AltioStar and Radisys.

Vodafone selected Samsung as the winner. “There is one company that is particularly bright, and that is Samsung,” said Tenorio. “Their level of compliance to our requirements is spectacular; it’s beyond 80%. That tells us that if we want to put 5G into open RAN and take it to suburban and urban areas, we are probably more ready than we thought.”

All of which highlights the risk to the small vendors – their resources and ability to move quickly to fully carrier-grade 5G, by contrast with 3G/4G where many had existing products, especially in the small cell arena, which could be repurposed for open specifications.

TIP and ORAN specs are growing closer:

This is reminiscent of the early days of the small cell market, when there was considerable excitement about a new architecture with a new supply chain – the hoped-for progress failed to materialize at any scale, partly because it took far longer for the start-ups to migrate their products to 4G than had been expected, opening the space up to major providers like Huawei.

The conditions of the RFI are interesting as they will be true of any commercial procurements for open 5G from Vodafone. They were:

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Santiago Tenorio, Vodafone

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- the software must run on x86 servers
- the vendors must be willing and able to open their interfaces and support multivendor environments
- they must support the ORAN specification
- they must be a member of TIP.

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We're agnostic when it comes to the technologies that we incorporate in our project groups. We're not looking to own a space in any way so we're open to working with 3GPP, ETSI, and other organizations to take a specification, work it through a set of requirements, and define a solution

Attilio Zani, TIP

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This indicates how ORAN and TIP OpenRAN specifications are coming together in a complementary way in operators' planning, even if the groups remain, for now, quite separate. Operators which have been prominent in ORAN development and trials, like Rakuten, are starting to join TIP too (Rakuten signed up at the show and said it would participate in the OpenRAN and 5G NR OpenRAN groups).

OpenRAN is focused “on developing a vendor-neutral hardware and software-defined technology based on open interfaces and community-developed standards”, with decoupled hardware and software. But instead of designing that virtualized, decomposed architecture from scratch, OpenRAN is drawing up agreed requirements, which could then be met, in theory, by a range of approaches. And the core of its work is on platforms that can harness commoditized hardware to the same performance levels as proprietary boxes, and on driving availability of that hardware at scale.

This can then support actual specifications from other groups. ORAN Alliance is developing specs that will be alternatives to existing, semi-proprietary interfaces like CPRI fronthaul and X2 RAN interface.

Deutsche Telekom's Axel Clauberg, who is also chair of TIP and a leading light in several other open groups, called last year for greater collaboration between different initiatives. He showed how OpenRAN and ORAN could complement one another, highlighting that Telefónica and Vodafone, as well as being leaders of the TIP OpenRAN project, also plan to base their work on the ORAN specs.

He explained the difference between the groups, saying that TIP “has not done any specs from the ground up. They have not built architecture but are looking at how the architecture specified by the ORAN Alliance could be built and deployed in a commercial way. In this area, TIP would do solutions integration and prove it is possible to build such an open RAN in real life.”

“We're agnostic when it comes to the technologies that we incorporate in our project groups so when it comes to looking for a

specification to create a product in the OpenRAN space we'll look around to see if there's something pre-existing," said Attilio Zani, executive director of TIP. "We are not at all defensive with anyone else. We're not looking to own a space in any way so we're open to working with 3GPP, ETSI, and other organizations to take a specification, work it through a set of requirements, and define a solution."

TIP is also working closely with Open Networking Foundation:

A more formal cooperation between TIP OpenRAN and the ORAN Alliance is, therefore, important to confidence and unity in the emerging open platform. But there are other open initiatives which could either complement or confuse the TIP effort, depending how they are approached. One is the Open Networking Foundation (ONF), which announced an extended collaboration with TIP in Amsterdam.

"The natural synergies between ONF and TIP are numerous," said ONF's VP of marketing and ecosystem, Timon Sloane. He told FierceTelecom: "We're both operator-driven organizations focused on transformation across the networking industry. But we are different in that ONF focuses on open software, whereas TIP's focus is on open hardware. The beauty is that hardware needs software

The Vodafone/ Telefónica RFIs:

At last year's TIP Summit in London this autumn, Vodafone and Telefónica announced the vendors which best met the scope of an RFI (request for information) from the TIP's OpenRAN project group.

The aim of the process was to identify and highlight suppliers which might be well positioned to execute on the vision of an open, disaggregated, virtualized mobile network in future. Vodafone and Telefónica both issued their own RFIs, based on the TIP OpenRAN one. Unlike Vodafone's 5G decision (see main article), there was a genuinely multivendor and disruptive flavor to the list of winners, which were selected in seven categories as follows:

- For most compliant end-to-end platform: Mavenir; Parallel Wireless; Altiostar.
- For 2G software: Fairwaves; Parallel Wireless.
- For 3G software: Mavenir; Parallel Wireless.
- For 4G software: Altiostar; Parallel Wireless; Radisys.
- For Remote radio head/ radio hardware: Baicells; NEC; Parallel Wireless.
- Innovators: ASOCS; Phluido.
- Challengers: Comba; Dali; Fairwaves; Vanu.



and software needs hardware, so deepening the collaboration between our organizations makes a lot of sense."

The ONF – whose initiatives include CORD (Central Office Re-architected as a Datacenter) and ODTN (Open Disaggregated Transport Network) - is creating open source software that can run on the TIP hardware as one of the stack options. While some vendors will build their own stacks for the TIP boxes, others may choose to reduce their cost and time to market by adopting an open option.

Earlier this year, ONF announced a collaboration between ODTN and TIP's Open Optical and Packet Transport (OOPT) group, which also houses the DCSG (Distributed Cell Site Gateway – see separate item). That work has led to a field trial which is about to kick off in South America.

For fixed wireless broadband, an important application for rural and underserved areas – where many of TIP's transport and fixed wireless activities are focused - the ONF is working to enable its SEBA (SDN-Enabled Broadband Access) platform to support TIP millimeter wave mesh technology. This would be another option to join SEBA's first target access network of passive optical network (PON) fiber and the ONF aims to support multiple access technologies simultaneously.

Andreas Gladisch, VP of emerging technologies and technology innovation at Deutsche Telekom, and co-chair of the TIP mmWave Networks project group, said in a statement: "We welcome this initiative between TIP and ONF to explore hybrid access networks using PON, mmWave and other wired and wireless technologies under an SDN architecture."

ONF and TIP set out new program of cooperations:

The two bodies also have ongoing cooperations in the mobile domain where they are marrying ONF software with TIP hardware platforms. Potential joint projects outlined in Amsterdam include:

- Integrating TIP's OpenRAN 5G NR hardware with an enhanced version of ONF's OMEC (Open Evolved Mobile Core) to create a Non-Standalone end-to-end solution
- Integration with ONF's ORAN-compliant RIC controller for 5G RANs, which runs its ONOS (Open Network Operating System) and allows for programmatic, policy-driven control of the RAN



- Integration with ONF's planned RAN-Distributed Unit and RAN-Central Unit software stacks based on the ORAN architecture
- Integration with ONF's COMAC (Converged Multi-Access and Core) platform to introduce 5G to converged wired and wireless systems in a standard way

In February, the ONF announced COMAC as its fifth reference design, and a 5G converged extension of OMEC. The stack will manage high speed subscriber traffic regardless of a user's access link.

COMAC will be configurable for mobile 4G and 5G as well as PON, WiFi, DOCSIS cable and fixed wireless; and will support unified subscriber management, across 4G's Mobility Management Entity (MME), the mobile Home Subscriber Server (HSS), and broadband's BNG-Authentication.

By disaggregating all the elements and running them as micro-services, the ONF says operators will be able to place those elements dynamically where they are most needed, on access, edge, core or public clouds.

"5G technology is a profound technology shift taking place in parallel with a massive upgrade in broadband networks," said Oguz Sunay, chief architect for mobile at the ONF.

"COMAC is on a path to become a pivotal piece of the edge network for operators, playing a very important role in the realization of next generation infrastructure where enhanced mobile connectivity must be paired with broadband to support new use cases and the development of next generation services."

T-Mobile and Sprint plan to take OMEC into field trials this year. Durga Satapathy, director of technology innovation and architecture at Sprint and co-chair of TIP's OpenRAN 5G NR Project Group, said in a statement: "Sprint is delighted to see TIP and ONF collaborating to accelerate open and disaggregated 5G network solutions."



Some interesting TIP-compliant launches in Amsterdam:

Altran has been a big player in driving reference designs for open systems, and its latest covers a containerized 4G vRAN that supports LTE services over cable networks. Applying cloud-native container and microservices technology to the RAN is in the earliest stages, but these modern architectures will be vital to make open RANs affordable and flexible in future. And increasingly, operators are eyeing convergence of mobile and wireline networks to create a common, high capacity pool of network resources.

Altran worked with Benetel and Phluido to create a disaggregated, multi-organization, containerized LTE RAN reference solution that provides 4G RAN services over existing cable fronthaul. The work was done under the auspices of CableLabs, the US cable industry's R&D arm, and the TIP vRAN Fronthaul project group. The new design would allow cablecos to leverage DOCSIS cable networks for fronthaul transport.

Containerization will be important in the difficult challenge of allowing the demanding RAN functions to run on general purpose processors to the same level of performance as a physical RAN, and without the need for long optimization processes to tune the cloud hardware to support the RAN.

Altran used its LTE Cloud-RAN software framework which implements the 3GPP Option 7.2 split of network functions between centralized, distributed and remote units. Altran's LTE Layers 2 and 3 integrated with Phluido's Layer 1 and Benetel's 4G/5G remote radio unit (RRU).

Brian Bronson, president of platforms and solutions at Altran, commented: "As 5G starts to proliferate, a growing number of operators are now virtualizing their networks and investing billions in SDN/NFV infrastructure. All our partners have an excellent track record of innovation, and that will translate into operators being able to fundamentally change the way networks are built and at a significantly lower cost. At the same time, the containerization of RAN solutions will help operators to align their 4G and 5G network deployment strategy – to future-proof their networks."

Siklu - a specialist in millimeter wave networks for fixed wireless and backhaul – was one of the first companies to develop commercial products based on the Terragraph design for mmWave small cells. Facebook originally developed Terragraph and then donated the reference design to TIP for other companies to commercialize.

The Siklu Terragraph family was unveiled in Amsterdam, joining the vendor's existing mmWave portfolio in the unlicensed 60 GHz band, which has an installed base of 80,000 units, with a particular focus on smart cities. The company said the Terragraph iteration is a third generation for the 60 GHz multipoint range, and increases its performance and interoperability.

The company also offers point-to-point products in the E-Band (70/80GHz) and in 60GHz. Siklu expects to be in initial field trials of its Terragraph products in the first quarter of 2020 and in commercial deployments in by mid-year 2020.

Special Report: TIP Summit 2019

Wipro's TIP framework highlights key role of integrators

As noted, in the early years of an open platform, there is considerable complexity in integrating unfamiliar products and vendors. Though the end goal is an automated, plug-and-play multivendor environment, it will take a long time to achieve that at a level that brings confidence for operators to deploy the new systems in their central networks.

For now, there is a major opportunity for systems integrators to pull together equipment and software from multiple suppliers, some of them small companies with limited integration and roll-out capabilities of their own; and to tune and optimize those systems to work optimally with common cloud infrastructure (that has been a major challenge for Rakuten and its integrators, Cisco and TecMahindra).

A major TechM competitor, Wipro, is eyeing the TIP opportunity and announced its intention to work with the group on 5G solutions for enterprise and operators.

Sanjay Bhartiya, VP of industrial and engineering services at Wipro, positioned the firm as a trusted implementation partner, saying: "Our Engineering NXT approach is the synthesis of our broad industry design experience for creating connected devices, software and data platforms to drive customer innovation at scale. Working within TIP, we will be able to deliver the next generation wireless solutions that will have the potential to revolutionize the wireless industry."

Wipro plans to create a TIP-based blueprint for a 5G reference architecture as well as a 5G operational model, both aiming to reduce cost and time to market for open deployments.

Over time, such approaches will reduce the need for customized integration projects and make deployment more automated – that will threaten some traditional SI business, so it is important for them to pivot towards offering deployment frameworks and software, leveraging their proprietary expertise for more common blueprints that can broaden their addressable market.

Within that broad objective, the firm will work in four areas of TIP implementation:



- Continuous physical end-to-end integration and validation of TIP OpenRAN technologies
- Creation of an autonomous, open source, 5G-ready OSS/BSS platform that harnesses machine learning
- Work on a modular end-to-end cybersecurity model
- Work on a new optimized operations model, leveraging Wipro's Holmes AI and Automation Platform

Wipro's role will be to provide interoperability lab services and the end-to-end roll-out of 5G networks.

Many companies are converging on the SI opportunity:

Attilio Zani, TIP's executive director, acknowledged the vital role of integrators in the early years of a new platform. "At TIP we recognize the important role that system integrators play in our ever-expanding ecosystem," he said. "This type of collaboration is fundamental to TIP's mission, and we welcome their efforts to move the industry forward."

Other companies are converging on the integration opportunity, and the chance to establish their software frameworks as core to the emerging open systems. Examples include Radisys, which expanded its traditional protocol stack business by developing services and reference designs for the Open Networking Foundation's CORD technology (it is now part of Indian operator Reliance Jio); as well as Amdocs.

Amdocs helped AT&T to create Open Networking Automation Protocol (ONAP) which has become a significant Linux Foundation open specification for management and orchestration of virtualized networks. This has formed the basis of an expansion of its familiar BSS business into services to support open implementations. The company now has its sights on TIP too, announcing that it will provide expanded integration and validation services within the TIP initiative.

Special Report: TIP Summit 2019

TIP extends community lab program to drive interoperability

A vital element of turning specifications into robust, deployable platforms is a trusted testing program, and in open environments, this will typically be provided centrally, by an independent body. This saves time and money for operators and vendors, which can reduce their own interoperability and performance testing.

It can also lead to a certification initiative, which can enable a genuinely mix-and-match, plug-and-play platform akin to that in WiFi equipment. This adds a major dose of confidence for operators which want to buy from multiple, and unfamiliar, vendors; and improves price competition.

The TIP community is gearing up for this major testing role as its specs move into commercial products and at the TIP Summit, it announced that it was expanding its community lab program. A dozen labs are now actively testing, validating and integrating new features.

Attilio Zani, executive director of TIP, said the community labs are one of the clear differentiators of TIP from other groups. “It’s a crucial kind of crux where collaboration within our community of operators, and vendors, and the entire ecosystem of our members actually physically get together,” he said.

Facebook and several operators open community labs:

Among the new labs are some focused on the newest developments in mobile network processes. Facebook had a relatively low profile at the Summit this year, as if the group is trying to play down the role of the social media giant in shaping the next generation ecosystem, in order to emphasize its broad, collaborative and operator-driven base.

But TIP’s founder made an important announcement, that it is opening the first integration-focused TIP labs in two of its locations (Los Angeles and Menlo Park, California).

In other forward-looking testing regimes, Telefónica is launching the first TIP software lab supporting CI/CD (continuous integration, continuous deployment) processes, in Madrid. Meanwhile, Sprint, which leads the OpenRAN 5G NR working group, said it



plans to open a lab in its Overland Park, Kansas headquarters devoted to this technology.

David del Val Latorre, CEO of R&D at Telefónica and a TIP board member, told the audience that the community labs system “works quite well because when you put together a bunch of engineers that want to make something together, magic happens.”

He explained how the labs work. First they bring participants together to determine the scope and expectations. The lab then sources the necessary materials and hardware, and then the lab members work together on configuring to the specifications to be tested. Once a spec has been tested, participants provide feedback to its authors and suggest changes.

As well as opening the new lab, Sprint has contributed code to the 5G NR project group which it chairs. Based on operator input, the group is developing modelling techniques and a test framework for specific applications and deployment scenarios, using both standalone and non-standalone 5G NR systems, in sub-6 GHz bands, for macro and small cells.

In August, Sprint contributed a draft technical specification to the group for a 2.5 GHz (Band 41) white box 5G NR base station.

TIP Exchange provides product marketplace:

Also with an eye on creating a broad, interoperable ecosystem and wide range of compatible products, TIP announced the TIP Exchange, an online marketplace to help operators find hardware and software that has been validated by the community. The Exchange initially contains 45 solutions from 28 member companies.

Zani said the Exchange was designed to be more than a marketplace, but should also help ensure that development work is not duplicated at multiple organizations. “We’ve built a very strong relationship with OCP [Open Compute Project] to make sure we’re aligned,” said Zani. “We’re looking for further relationships with other organizations to ensure there is broad industry alignment.” The OCP, like TIP, was founded by Facebook and aims to drive open platforms with broad stakeholder contributions and support – in OCP’s case, for the cloud platform.

Some of the Exchange products were developed under TIP or OCP projects, but it will also house equipment and software created by



vendors directly, as long as they comply with the specs, or even products developed inhouse by service providers.

TIP has also developed a badge scheme to show shoppers where each product stands in terms of development. The badges will indicate whether an offering is being integrated in one of TIP's community labs, is in a field trial or commercial deployment, has been used in a plugfest, or is following a blueprint.

Axel Clauberg, chairman of the TIP board, said: "With all the activities we're driving with TIP, it's very hard to see where a device is integrated. At TIP we're focused a lot on building things. An important element is to do real integration in a lab."

Special Report: TIP Summit 2019

Parallel Wireless and OpenRAN—the face of the new mobile vendor?

Parallel Wireless has been a leading light in the small cell market with its virtualized architecture, which has been deployed in markets where traditional architectures can be hard to cost-justify, including public safety systems in large venues, and rural networks in the UK, USA and elsewhere.

The company is looking to accelerate its progress by becoming a very active player in the Telecom Infra Project, where it gained high profile last year when it was accepted as compliant with five out of seven request for information (RFI) elements, issued by Vodafone and Telefónica.

Now, Parallel is piling up trials and some commercial roll-outs based on TIP OpenRAN specifications, with new developments like Vodafone's major request for quotes (RFQs – see lead item) holding out the tantalizing prospect of being able to move into operators' mainstream RANs.

Parallel is behind one of the first commercial OpenRAN networks, being deployed in 4G by Internet para Todos, a wholesale service provider owned by Telefónica, Facebook and two Latin American banks, IDB Invest and CAF.

Internet para Todos operates around 650 mobile sites covering about 800,000 people in Peru. About half of these have come from a traditional OEM (reported to be Huawei), while the other half are OpenRAN from Parallel.



David del Val Latorre, Telefónica's CEO of R&D, said the OpenRAN sites cost half the amount of the others to procure and deploy, which makes it more feasible to extend connectivity to remote and low income communities, and start to chase Facebook's stated goal of connecting "the next billion". Internet para Todos has signed up 450,000 subscribers since its launch in May this year.

Del Val Lattore said Parallel had been selected because it was the first to be ready with commercial OpenRAN products and was "getting there" in terms of full open interoperability. Telefónica has also made an investment in Altiostar, which is developing virtual network functions (VNFs) for OpenRAN too.

So del Val Latorre is clearly looking for a fully multivendor system in future, as more vendors' products come to maturity; and he also believes there is a long way to go in terms of the total cost of ownership (TCO) of open networks. While capex and roll-out costs may have been driven down, well below the prices of closed systems, the operating costs are more important. "When you take everything together, the difference is not as great," del Val Latorre told the TIP Summit.

And operators are also concerned about operational complexity in multivendor environments, at least before the industry reaches the nirvana of fully automated, fully plug-and-play networks. The old monolithic OSS and network management will not work in a virtualized, multivendor, disaggregated system, but the Telefónica executive admitted this is currently hardly too manage at scale.

Parallel has announced another new OpenRAN win, with pan-African group MTN. The vendor says it is delivering a software-defined end-to-end OpenRAN solution to support 5,000 rural small cell sites across MTN's 21-country footprint.

The operator's CEO, Rob Shuter, said in a statement: "Our group technology team has been pioneering OpenRAN, concluding field trials in Zambia in 2018 and deploying commercial sites from the beginning of 2019. We focus on creating viable new RAN solutions alongside the traditional deployments of network technology suppliers in order to accelerate the rural expansion in our markets."

The Parallel solution is allowing MTN to run 2G, 3G and 4G on the same virtualized base station, and the remote radio units are also software upgradable to 5G. The supplier's OpenRAN Controller virtualizes the BSC for 2G, RNC for 3G, and small cell and core gateways for 4G.



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