WHAT'S INSIDE

BT USES ITRINEGY SOFTWARE DEFINED TEST NETWORKS TO ASSESS THE IMPACT OF NON-IDEAL FRONTHAUL ON VIRTUALIZED RAN

BT is one of the world's leading communications services companies. They serve the needs of customers in the UK and in 180 countries worldwide. Their main activities are the provision of fixed-line services, broadband, mobile and TV products and services as well as networked IT services.

BT serve multinational organizations across the globe with their security, cloud and networking services. In the United Kingdom they are a leading communications services provider selling products and services to consumers, small and medium sized enterprises and the public sector. They also sell wholesale products and services to communications providers in the United Kingdom and around the world. iTrinegy and BT are both members of Innovation Martlesham, an established high-tech cluster of ICT companies located at Adastral Park at Martlesham Heath, Suffolk in the UK. Innovation Martlesham is a 'collaborative ecosystem' for technology companies.

THE REQUIREMENT

In order to support the demanding requirements of 5G services, the telecommunications industry is exploring the opportunity to leverage virtualization into the different parts of the network. As part of this process, BT is conducting research to assess the impact of non-ideal fronthaul on virtualized Radio Access Networks (vRAN) which involves the use of iTrinegy Software Defined Test Network (SDTN) technology to create the required adverse network conditions.

Open RAN (O RAN) is a term for industry-wide interface standards that allow RAN equipment and software from different vendors to communicate. The objective of O RAN is to move away from hardware-oriented networks and achieve softwarization and cloudification of networks through Software-Defined Networking (SDN) and Network Function Virtualization (NFV). This approach means that while the antennae stay at the cell site, management of the network can be centralized through the cloud. The two main organizations working on Open RAN architecture are the Telecom Infra Project (TIP) and the O-RAN Alliance. The TIP community lab is hosted at BT Labs at Adastral Park, UK, BT's global research and development headquarters. It is here that Farhad Mehran, Research Specialist and Richard MacKenzie, Principal Researcher at BT have been deploying iTrinegy Software Defined Test Networks to conduct their testing.

Farhad Mehran, Research Specialist at BT

Richard MacKenzie, Principal Researcher at BT

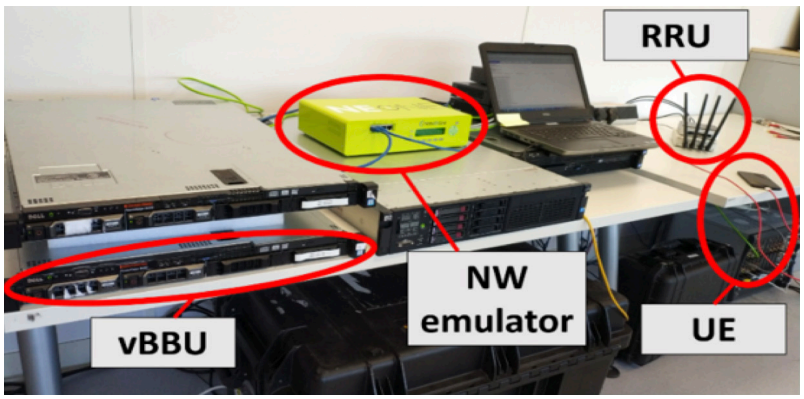
THE REQUIREMENT (CONT./)

Richard explains "We are looking to centralize all of the baseband processing. This approach, using CPRI (Common Public Radio Interface) has been around for at least a decade but it has always been very challenging as you need lots of fiber and it is very bandwidth hungry. For example, if you have a LTE base station that delivers 150Mbps of user throughput you need about 2.5Gbps on the fronthaul link. When you look at 5G we will want to go to much higher bandwidths than a typical 20MHz LTE carrier. We want to use more spectrum overall and that all scales up. With LTE you typically expect 2 antennae but for 5G we might be going up to 32 or 64 antennae, so, that 2.5 Gbps figure gets multiplied by the increasing bandwidth and the increasing number of antennae and even if you go to very expensive optics, not yet used for access networks, it still might not work. However, there is a new version of CPRI, known as eCPRI which can be aligned with the O-RAN fronthaul interface. The fronthaul requirements for eCPRI are much more efficient than for CPRI, which makes it more suitable when using existing transport as fronthaul. This also makes eCPRI better suited to 5G, which will use more spectrum and more antennae." Richard continues, "TIP is trying to create an ecosystem that works for everyone, not just BT. So, what we need to do is have a way of moving all operators to the new Open RAN architecture with realistic expectations of what can be achieved on their own fronthaul.

THE SOLUTION

"This is where the iTrinegy technology comes in as we want to look at the impact of all types of what we call 'non-ideal' fronthaul. Examples could include very limited throughput, high latency or jitter. Using iTrinegy's NE-ONE Professional Network Emulator we can test different radio solutions and ascertain their tolerance to a range of different non-ideal fronthaul scenarios." Farhad and Richard selected iTrinegy's NE-ONE Professional appliances to be part of the test set-up as they were aware of their use by other divisions of BT including the WiFi team. Initially, they deployed the 1Gbps, ethernet-based NE-ONE Professional Model 20 but later on moved to the NE-ONE Professional Model X2 which has 10Gbps fiber optic as well as 1Gbps interfaces.

The NE-ONE Professional appliances were used to create a Software Defined Test Network that produce fronthaul link impairments, focusing on throughput and latency. Richard comments, "For each radio test, we would start with unlimited capacity and zero latency, and then use your simple-to-use GUI to manually increment one degradation at a time. In some tests a single parameter was adjusted but for others multiple network impairments were changed. The objective was to observe if there are any unusual behaviors in radio performance. Would there be a graceful degradation as the fronthaul throughput decreased and/or latency increased, or would there be a sudden point of failure?"



The NE-ONE Professional Network Emulator is used in-line to create fronthaul impairments including latency, jitter and packet loss from 10Mbps to 10Gbps

CONCLUSION

The end result of this project was to objectively characterize the performance of different vendor fronthaul offerings, be they built around millimeter wave, DOCSIS, cable, PON or G.Fast. Richard concludes, "This project was all about making the business case for the new vRAN architecture more appealing. Being able to use the existing transport removes a significant cost because rolling out a full transport network upgrade is a massive, time-consuming and expensive task. If you have to do that before you turn on a radio then that is a big problem. The amount of maintenance and ease of installation is another major cost in deployment of these systems. So we want to identify radio units that are essentially 'plug and play' and then able to 'stay up'."

Farhad and Richard are considering further investigations using different forms of ideal and non-ideal fronthaul technologies which will involve use of the NE-ONE Professional appliances to create the required test profiles. There will also be a role for them to play in further testing of 5G which could necessitate simulating 25Gbps links.

The iTrinegy NE-ONE Professional Network Emulator referenced in this case study is available on a variety of different platforms

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