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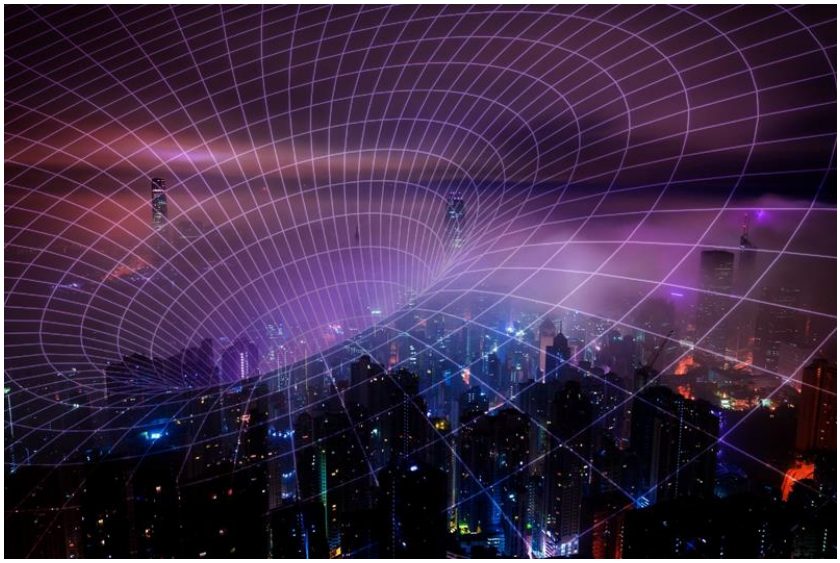
Case Study

5G Network Infrastructure Interoperability Demands

5G Mobile Network Operators are being motivated to change and broaden their range of infrastructure suppliers, adding more vendors to the traditional mix of large brand names. This is in some part due to geo-political issues relating to Chinese infrastructure vendors, as well as the commercial and technical opportunities being offered through the Open RAN infrastructure interface standards.



NVIOT Testing

Mobile Network Operators have a critical duty to ensure that new network infrastructure roll-out interoperates and work seamlessly with existing equipment and terminals (smartphones). Operators typically perform this type of testing in their own Network Vendor Interoperability (NVIOT) labs. They conduct new infrastructure, regression, multi-vendor and load/performance testing.

The layout of a typical NVIOT lab normally comprises of an equipment room which houses the core and Radio Access Network (RAN) elements, then additional rooms that house terminal test stations. The stations use commercial devices or special test terminals that measure radio and protocol conformity. Connecting the RAN from the equipment room to the terminal test stations are extensive RF coaxial cable runs.

Challenges with NVIOT Testing

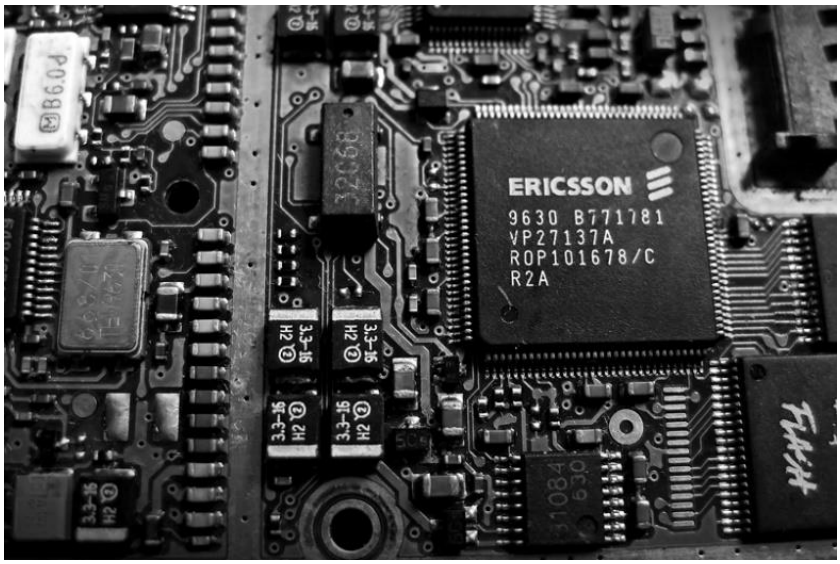
With the number of suppliers and 5G solutions increasing and the introduction of new Open RAN interface opportunities, there are a number of challenges now facing NVIOT lab management.

Firstly with incoming vendors supplying new equipment, floor space becomes a tight premium. In some cases new equipment rooms need to be constructed or even temporary shelters built outside of the main building. This creates the need for long and expensive RF coaxial cable runs. Coaxial cables also present other challenges. As you move up in radio frequency the cables have higher attenuation losses. If you try to reduce those losses through better quality cable they are physically much wider and heavier, making it difficult to install and accommodate.

5G, by design, has a significantly higher number of radio connection ports compared to previous cellular generations, with some radios in the order of 16 ports. This multiplies the coaxial needs greatly and adds to the previously described issues with coax.

Another significant issue is that the NVIOT lab operators need to be able to switch or change the routing of the RAN radio signals to different terminal test stations or test systems. The test systems particularly, are a limited (and in some cases expensive) resource, so need to be efficiently used across all the RAN infrastructures under test. The traditional approach is to use large “patch” interfaces to manually redirect the RAN ports to the equipment rooms, but with more infrastructures to test and with more ports, this solution does not scale up easily.

Even with the introduction of virtualized core and RAN elements, ultimately there will always be a radio connection and a need to connect RAN to terminal. Therefore, these challenges will always have to be addressed.



***ViaLite*’s Solution**

ViaLite Communications is a business purely focused on helping customers reduce their issues with coaxial cable and problematic radio-switching, by applying the significant benefits of fiber optic, low loss transmission technology.

Fiber optic cable is:

- extremely low loss
- low cost and abundant
- highly immune to electrically noisy environments
- small and lightweight
- easy to install
- a perfect medium for very wide RF signal bandwidth.

ViaLite uses a particular solution architecture called RF over Fiber (RFoF) which converts RF signals into optical signal through “transmitters”, and optical back into RF through “receivers”. The technology is entirely modulation agnostic and is already proven to work with 5G modulations such as Orthogonal Frequency Division Multiplexing (OFDM) and Quadrature Amplitude Modulation (QAM).

RFoF benefits from multiple GHz bandwidth, so is not throttled in any way. The frequency response is also incredibly flat across the band.

ViaLite has been trialing the application of its RFoF solutions with 5G NVIOT labs and successfully demonstrating the move from burdensome coax cables across to small and lightweight fiber optic cable. This NVIOT solution also includes the switching elements using optical switching products, which offer the benefit of very flat response, very little signal loss and high isolation – all needed in the NVIOT environment.

There is future potential to also capitalize on the capabilities of Dense Wavelength Division Multiplexing (DWDM) in the optical domain, this creates the opportunity to move all radio signals through just a single optical fiber core, potentially making the routing and distribution even simpler.

Conclusion

The introduction of 5G networks and Open RAN standards are really driving a richer and diverse infrastructure market. The methods network operators use to qualify and test the new infrastructure combinations need to be smart, efficient and fit within the given facilities available. ***ViaLite Communications*** has been supplying optical based solutions to radically reduce the need for large, cumbersome and expensive coaxial cable runs and improve the switching performance needed for full interoperability testing.

Written by: Richard Jacklin, Director of ViaLite Communications

Richard is the Global Director of Sales and Business Development for ***ViaLite Communications*** - a leading manufacturer of RF over fiber solutions - and has worked more than 30 years in the wireless communication markets.