DRIVENETS

Building 5G Networks Like Cloud

DriveNets Network Cloud

WHITE PAPER

Building 5G Networks Like Cloud - DriveNets Network Cloud

DriveNets Network Cloud is a cloud-native software solution that turns the physical network into a shared resource that efficiently supports multiple network service payloads.

Utilizing the Network Cloud for 5G infrastructure allows:

- Higher performance with networking-optimized processing
- Elastic cloud-native services and architecture
- Wireless-Wireline Convergence

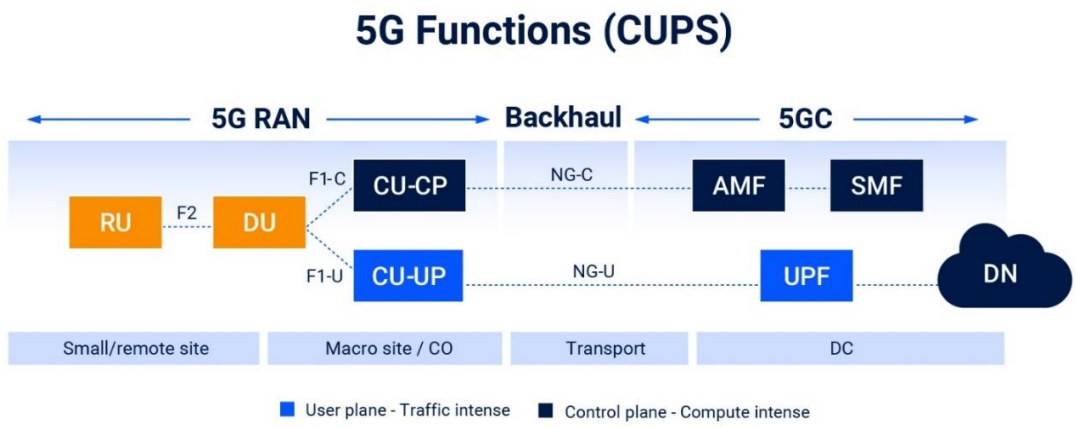
The 5G Challenge: Performance and Scaling

5G holds great business potential for operators: Creating new services, use-cases for existing and new target-market and, thus, creating new revenue streams and enhancing competitiveness.

The 5G network buildout, however, poses several challenges for those operators. Challenges that intensify when moving from the 5G-NSA (non-standalone) phase to the 5G-SA (standalone) phase and the 5GC (5G core network) buildout.

The main challenges are around performance and scaling. This is due to the extremely fast ramp-up expected for 5G traffic, alongside the fact that the 5G core and RAN can be cloud-native and run network functions over servers and other compute instances.

Looking at the 5G CUPS (Control and User Plane Separation) architecture, operators need to make sure that their user-plane functions (such as CU-UP and UPF, as illustrated below) can accommodate the required capacity and latency performance and can scale in a manner that maintains business sense (i.e., with a reasonable footprint, box count etc.)



Another challenge introduced by the 5G architecture is architecture agility. The 5G network should be agile enough to add and port network functions across the network without the need for hardware changes. This is important for services like URLLC (Ultra Reliable Low Latency Communications) that call for porting of core network functions to the network edges.

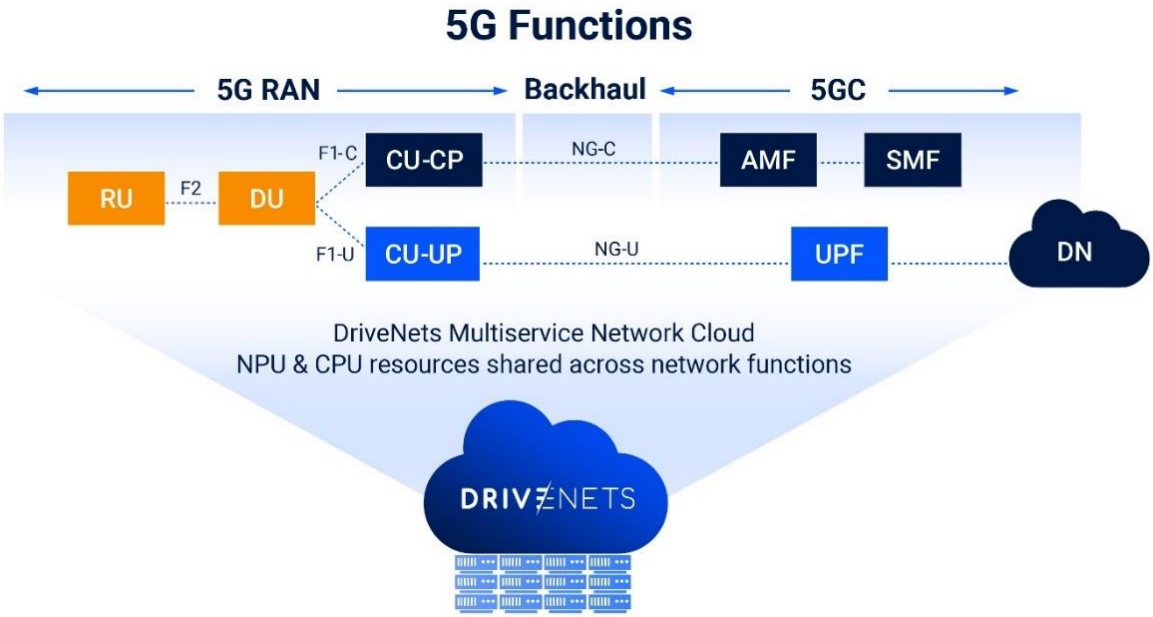
Finally, convergence is a significant challenge. 5G is no longer a mobile-only technology. The 5G network supports an FWA (Fixed Wireless Access) use-case as well as the convergence of other access technologies into a unified user-management architecture and a single underlaying infrastructure for fixed and mobile services.

All of the challenges above call for a cloud-native, networking-optimized infrastructure, implemented with the DriveNets Network Cloud solution.

DriveNets Network Cloud and 5G

The DriveNets Network Cloud solution offers the unique capability for abstracting both networking and compute hardware resources into a shared resource pool that could be used by a variety of network functions, sharing the same hardware cluster.

This allows operators to leverage a unified infrastructure for all 5G domains: 5G core, 5G IP backhaul and 5G RAN, as illustrated in the following diagram.



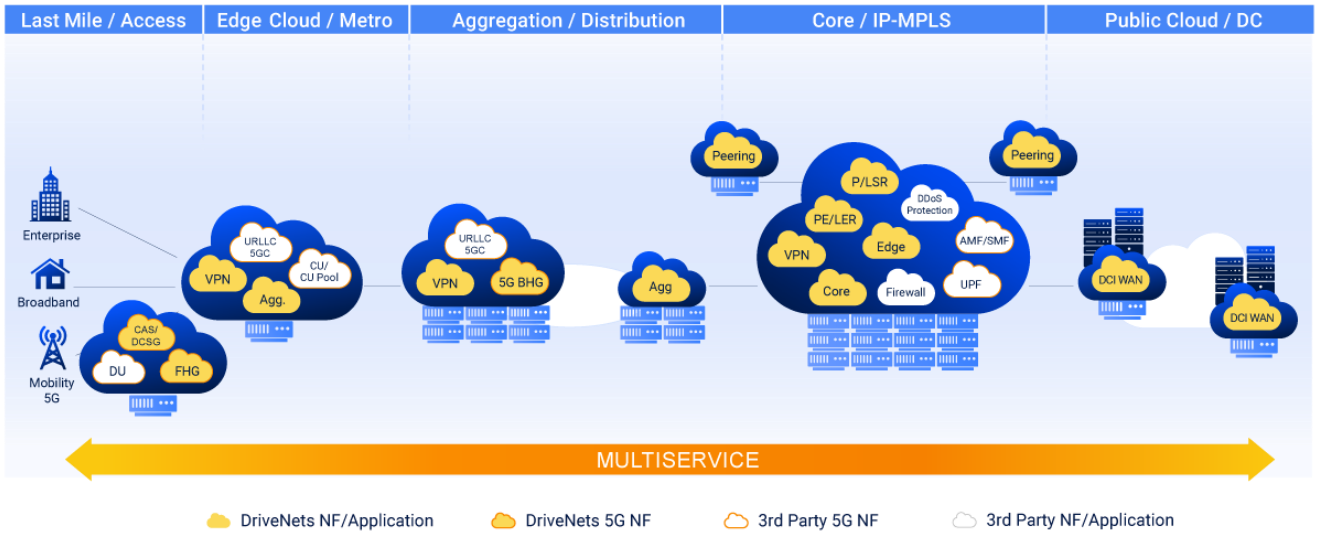
The DriveNets Network Cloud allows operators to use it as an infrastructure for both routing functions across their network and for other network functions from DriveNets or from a third-party vendor.

In the 5G case, 5G network functions, including user plane function (UPF), core access and mobility management function (AMF) and session management function (SMF) in the 5G

network core and RAN central units (CU) and RAN distributed units (DU) in the network RAN are available as software packages. This is due to the growing traction of cloud-native 5G solutions such as the ones suggested by O-RAN and TIP, combined with the 3GPP standardization that set the 5G core architecture to be cloud-native.

Running those 5G functions over the DriveNets Network Cloud solution is as simple as running a DDoS mitigation function, or a Deep Packet Inspection function over this Network Cloud.

The following diagram illustrates the co-existence of 5G network functions alongside other network functions (from DriveNets and from other vendors) over DriveNets Network Cloud.



Network Cloud 5G Core

Implementing 5G network core functions, and the user-plane core function (UPF) in particular, over the Network Cloud infrastructure provides multiple benefits for any network operator deploying 5G as a part of its move from 5G-NSA to 5G-SA:

1. Accelerated Performance

   Running the 5G core functions on servers or a standard cloud infrastructure is limited in terms of user-plane scalability. As 5G traffic grows across the network, the UPF needs to significantly scale. This results in racks over racks of expensive CPU resource being utilized for traffic handling. The Network Cloud provides a networking-optimized infrastructure as it offloads pure I/O tasks from software CPU based to hardware utilizing the abstracted NPUs, allowing the UPF to work over a much leaner infrastructure, while improving performance.

2. Multiservice and Wireless Wireline Convergence (WWC)

   The Network cloud enables true convergence of fixed and mobile services, on the infrastructure level. The cloud-native, multiservice nature of this architecture allows operator to run 5G core, IP core and other access-technologies aggregation functions (such as BNG) over the same platform, eliminating the need to maintain hardware duplication for the different types of services.

   Operators can migrate the OSS, BSS and operational procedures at their own pace. While the hardware infrastructure of the fixed and mobile services is unified, the logical view of the network can remain separated until the operator's organization is ready for the full convergence between services.

3. Networking Slicing

   5G services require network slicing. This is supported, in the 5G technology, from end to end (including phy-level slicing support in 5G-NR).

   Utilizing a cloud-native infrastructure in the 5G core enables easy duplication of network functions, to be used in different slices of the network.

   Moreover, derived from it's hardware abstracted architecture, it also allows dynamic resource allocation to different network slices, according to changes in requirements, or network events.

Network Cloud 5G RAN & EDGE

DriveNets Network Cloud can serve in the 5G RAN and Edge, thanks to its wide range of scaling options.

The benefits of hardware resource abstraction and sharing are valid even when the hardware resources are scaled down to a single white box.

Extending the Network Cloud unified architecture to the 5G edge and RAN allows mobile operators to benefit from the following benefits:

1. Cell Site optimization

   As 5G networks densify (due to the growing need for capacity and the propagation nature of mid and millimeterwave bands used in 5G-NR) optimizing the Cell Site architecture becomes a major task. Both because of the limited space and power resources in new cell sites and due to the cost multiplication factor.

   Collapsing all Cell Site functions into a single box serves exactly this need. A white box or a cluster (at the network edge, for instance), can accommodate the cell site router (CSR) in a disaggregated cell site gateway format (DCSG) as well as the CU and DU, based on a RAN vendor software. Reducing the box-count at the site.

2. URLLC

   Ultra-Reliable Low-Latency Communications services, which are a major part of the 5G offering, require extremely low latency between the end device and the relevant core function. This calls for porting of some network functions (e.g., intermediate-UPF) to the network edges. Such a function can co-exist on the Network Cloud, alongside functions like a CU-pool and other Edge-Cloud functionality. Reducing, once again, the box-count at the site and fully utilizing hardware resources.

3. C-RAN optimization

   The move from split-8 CPRI based fronthaul, used in 4G, to split 7.2, eCPRI fronthaul in 5G, complicated the architecture of cell sites. The Network Cloud, when bundled with specific white boxes, can also provide a fronthaul gateway functionality (running CPRI over ethernet, RoE traffic) as well as to co-locate 5G CU and DU with 4G BBU functions.

Conclusion

DriveNets Network Cloud multiservice architecture allows operators to enjoy synergies between different network functions, which require a different set of hardware resources, in order to resolve the inherent inefficiency of the monolithic router architecture.

This allows operators to leverage significant cloud attributes translating into CapEx and OpEx savings, derived from reduced port-count and hardware resources required in the network, simplified operations, lower footprint, power consumption, cabling efforts etc.