Parallel Wireless 5G Ultra Dense Deployment

The mobile industry has been experiencing an explosive growth in data usage over the past decade. By introducing 5G network in coming years and the expectation of 1000 folds mobile data usage during this period, the concept of heterogeneous networks and deploying smaller cells and densification becomes an imminent task for mobile operators across the world.

Overview

While the concept of heterogeneous networks is not new, implementation of them in a multi-tier deployment remains a challenge. Interference and mobility related issues prevent deployment of heterogeneous networks in large scale deployments. 5G envision heterogenous and densified networks as an important part of its success and different approaches and mechanisms considered for its deployment. In this paper we address different issues related to densification and discuss 5G approaches to address them. Parallel Wireless OpenRAN Gateway is uniquely positioned to manage 5G ultra dense network by utilizing our vRU capabilities across the network.

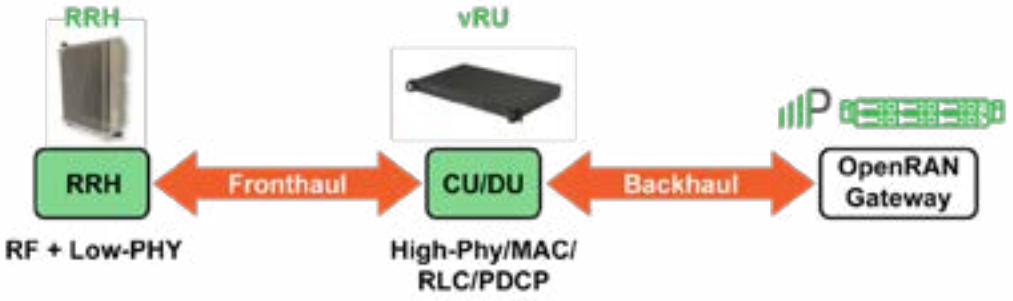
Components

Remote Radio Head (RRH)

Parallel Wireless solution utilizes standard off the shelf RRHs from different OEMs. Because of our open software-based solution most of commercially available RRHs can be integrated into our solution with minimum integration effort and reducing the overall cost of ownership for mobile operators.

Virtual Radio Unit (vRU)

Based on Intel-based COTS hardware, this component provides High-PHY, MAC, RLC and PDCP functionality in a central fashion. It communicates to a cluster of RRHs (which contains RF and lower PHY) and supports multiple carriers based on the RRH cluster's load. The interface between vRU and RRHs is based on Ethernet-based eCPRI.



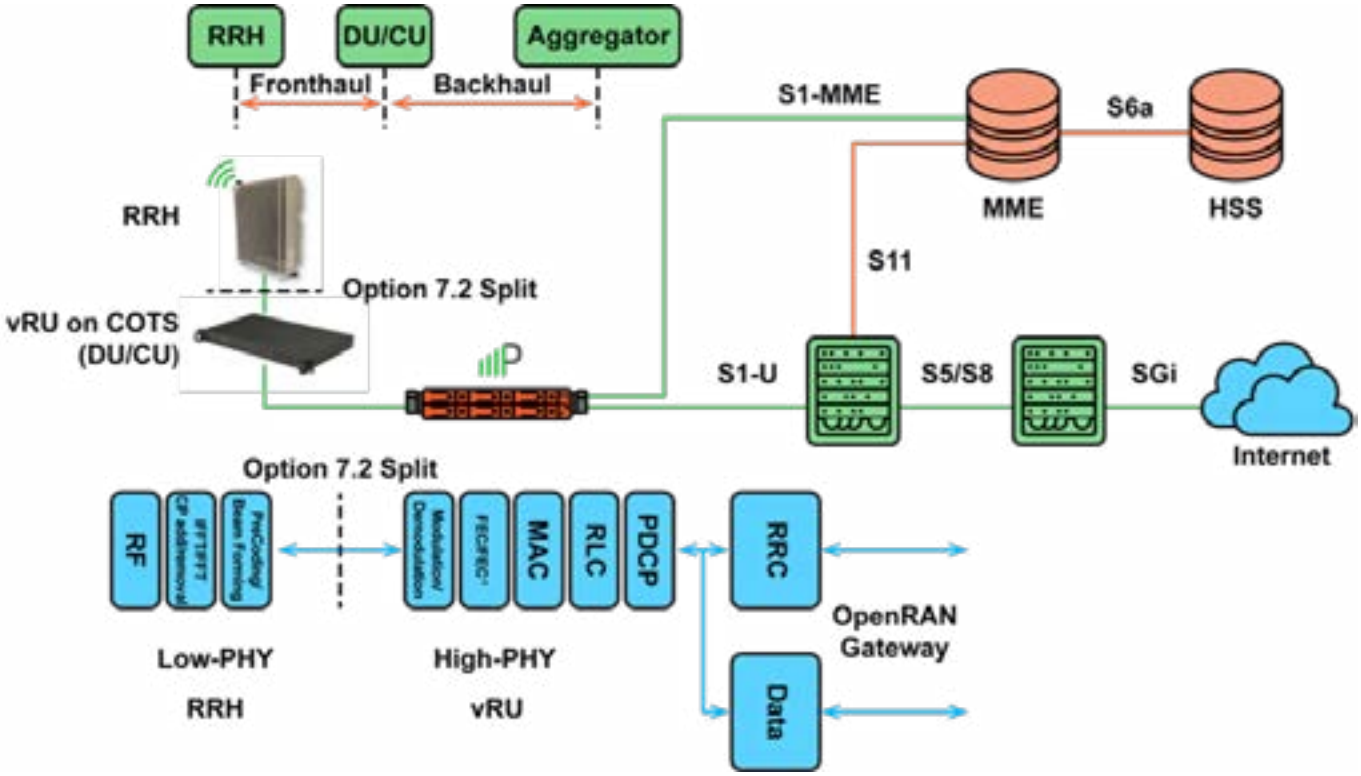
OpenRAN Gateway

OpenRAN Gateway is a key element of the Parallel Wireless solution. It encompasses Security Gateway (SeGw), virtual eNodeB for 4G (veNB) upgradable to virtual gNodeB for 5G, virtual HomeNodeB Gateway/virtual RNC (HNBGw/vRNC) for 3G, virtual BSC (vBSC) for 2G, X2+S1 Gateway, optional Home eNodeB Gateway (HeNBGw) for Small cell (aka Femto) access, optional Wi-Fi integration for Trusted and Untrusted Access + Cellular integration, optional embedded Evolved Packet Core (EPC), among

other functions. HNG is a fully virtualized, ETSI NFVI compliant, cloud-native solution that can be deployed on Intel x86-based COTS Data Center infrastructure. It also supports MEC (Multi-Access Edge Computing, formerly known as Mobile Edge Computing) for maximum deployment flexibility within a Mobile Operator's network, to suit its throughput, latency and high availability requirements. Given the breadth of functionality supported by OpenRAN Gateway, its sizing is dependent on Call Model details, as well as local and geo Redundancy, as well as Data Center needs.

Parallel Wireless Split 7.2

Parallel Wireless recommends option 7.2split of 3GPP for the case when high throughput and low latency FH is available between vRU and the RRH (see figure below). This is a very efficient and practical PHY split, considering IFFT/FFT are not load dependent and add no sharing gain by accommodating it in the CU. RRH, vRU and OpenRAN Gateway products are naturally equipped to support Split 7.2 as discussed.



Summary

By putting software at the heart of the network, operators can unify all generations of connectivity under the same umbrella and eliminate the need to spend millions of dollars on new equipment and infrastructure upgrades. This approach can help MNOs unify their cellular network infrastructure to deliver quality end-user experiences for all coverage or capacity use cases: low density/high density, indoors or public safety 4G/LTE. This is made possible by virtualization, abstraction and automation to empower them to be profitable despite margin pressure for 2G/3G/4G and 5G. Operators that take this approach will be in a strong position to win the race for early 5G commercialization. Those that don't, will struggle to survive.