OmniPHY® 5G Overview

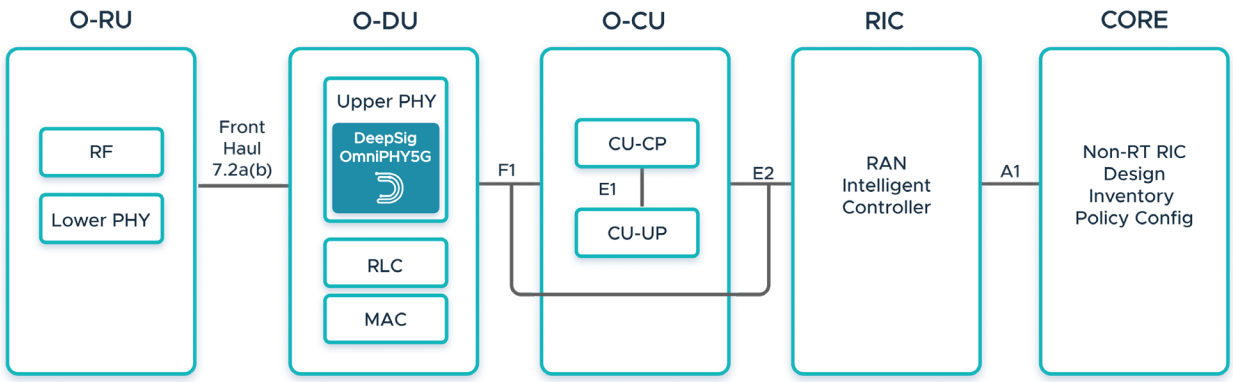
As 5GNR networks were deployed, radio access networks (RAN) evolved from proprietary, hardware-centric products to a modern virtualized architecture using general purpose servers at the network edge. The new virtualized RAN software-centric solutions provide greater processing availability, scalability and are less costly to operate.

More and more, artificial intelligence benefits are realized across many applications with remarkable outcomes compared to traditional approaches. Modern AI and machine learning (ML) systems process massive amounts of complex data for faster, more accurate decisions.

DeepSig applies the power of AI and machine learning to 5G vRAN with a data-driven approach, operating directly in the 5G baseband physical (PHY) layer. In wireless communication networks, the PHY layer transforms wireless signals to data bits.

OmniPHY-5G software patches into Layer 1 software via API's and operates transparently in the 5GNR Distributed Unit (DU) *without* additional core processing or accelerators and uses minimal memory resources. OmniPHY-5G currently runs on Intel's 3rd generation processors, Cascade Lake, Ice Lake, or Sapphire Rapids Xeon in Open RAN architecture to provide competitiveness to ORAN vendors and real value for their mobile operator customers.

Where OmniPHY-5G Operates

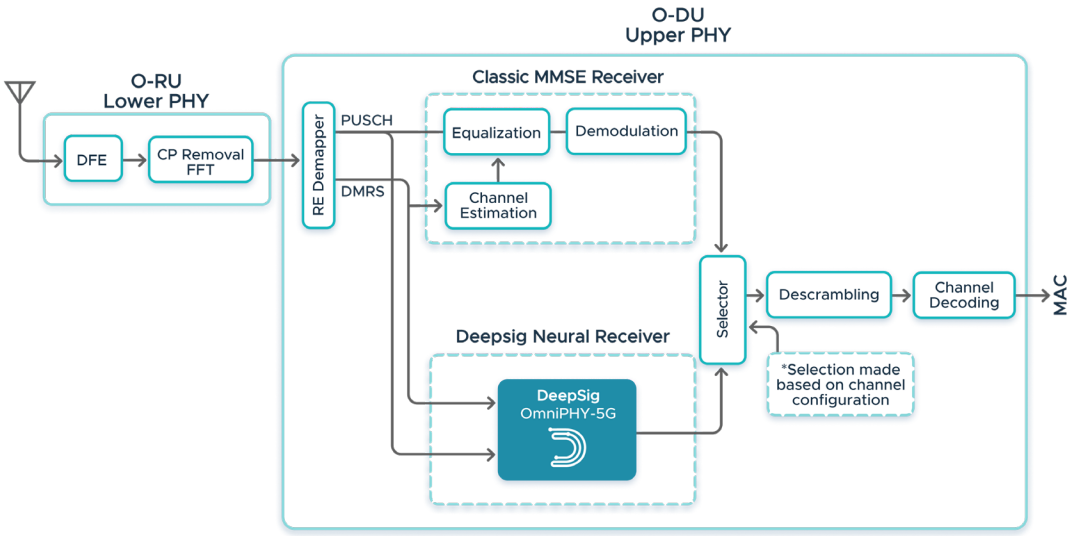


The Neural Receiver Solution

In wireless communications systems, base station receivers perform a sequence of wireless signal-processing functions to recover the information sent from user devices. The classic Layer 1 steps include channel estimation, equalization and demapping, and are used in today's 4G and 5G networks.

The AI approach DeepSig pioneered replaces the MMSE linear functions of channel estimation and equalization algorithms with a convolutional neural network in the Layer 1 upper PHY. The trained ML algorithms in the ***neural receiver*** now perform channel estimation and equalization more efficiently and with greater performance.

PUSCH Layer 1 Signal Processing | ORAN 7.2x Architecture



OmniPHY-5G operates transparently in vRAN Layer 1 with no integration needed for Layer 2/3 or fronthaul with radio units. Our software architecture is ideal for multi-vendor O-RAN systems. Currently designed for easy integration to Intel FlexRAN Layer 1 reference software, OmniPHY-5G can also be integrated to other Layer 1 implementations.

DeepSig's neural receiver uses pre-trained models developed on our customized training simulators and finely tuned pipelines for data accuracy and efficiency. Trained models are optimized for specific environments or use-cases and can be optimized with local, real-world data before or after deployment.

Benefits

OmniPHY-5G's current release improves two critical areas in RAN performance:

- Increased user data throughput
- Reduced baseband processing
- Does not require additional HW compute resources to operate

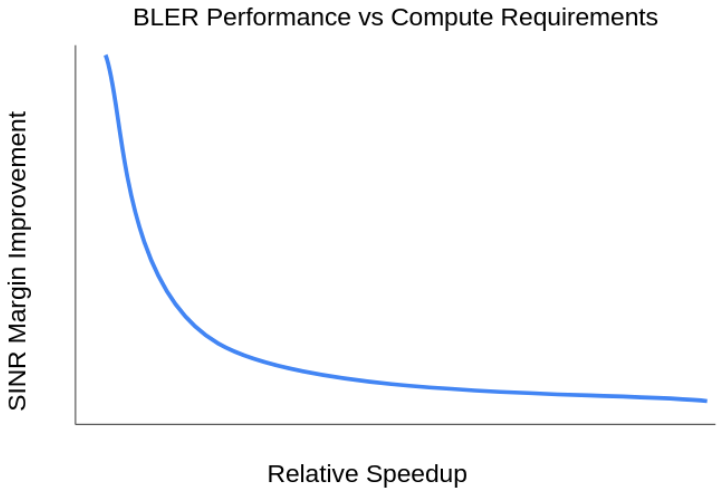
Mobile operators gain value from AI/ML in the RAN Physical layer with a more performant base station receiver especially for the most complex RF conditions. The improved uplink channel provides higher user connection quality which effectively extends the cell coverage.

vRAN vendor's benefits from implementing DeepSig's ML in Layer 1 include reduced internal DU software development costs and time to harden the PHY for enhanced uplink performance and to establish highly competitive first-steps toward full AI-Native operations beyond 5G.

DeepSig's online training capability in a coming release will allow mobile operators to autonomously sample live radio channel conditions for inputs to unsupervised training of the neural network. The ML training feature has a flexible architecture that can operate in the DU or as an xAPP in the RIC. Updated trained models are then sent back to the Neural Receiver in the DU for a channel model most performant to the local environment.

Performance

A valuable feature of DeepSig's Neural Receiver software is the flexibility to optimize Layer 1 for either link performance or compute performance, depending on use-case priorities. A balanced model is also available. The Neural Receiver model can be up-sized to increase compute complexity for greatest link margin under harsh propagation conditions compared to classic MMSE, or reduced model size to lower CPU requirements without degrading link performance.



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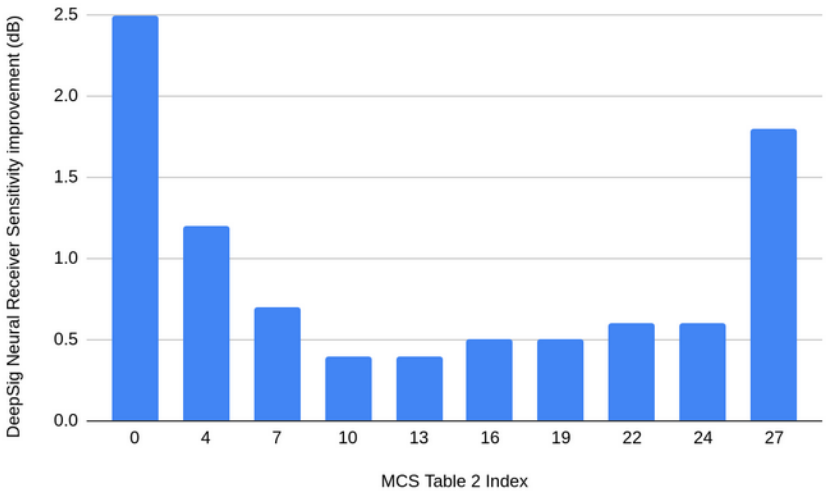
Throughput Performance Improvements

OmniPhy-5G's Neural Receiver has demonstrated receiver sensitivity improvements of up to 2.5dB when compared to a classic MMSE receiver, resulting in effective throughput improvements of up to 300%.



For more information on DeepSig's OmniPHY-5G features and integration please contact us at info@deepsig.ai.