

An Overview and Performance Evaluation of an EPON-based 5G RAN Architecture enabled by Distributed Network Control Management

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Abstract

The multifaceted technological boom as driven by mobile and IoT devices requires more bandwidth by the day. Some applications such as gaming and real-time streaming services in ultra-high definition have higher bandwidth as well low latency requirement. The only viable solution for these data hungry applications is fiber-wireless (FiWi) network architecture. Though numerous hybrid Fiber-Wireless network architectures have been expected to utilize the fiber-based PON (Passive Optical Network) access infrastructure to backhaul mobile traffic, most of these architectures, however, have utilized the typically centralized tree-based PON topology, which can only support a centralized RAN (Radio Access Network) architecture. A converged PON-5G access infrastructure must be capable of supporting a distributed architecture as well as distributed network control and management (NCM) operations. The major weakness is that mainstream PONs are typically deployed as tree topologies and the tree-based topology can neither support the distributed access architecture nor intercommunication among the access nodes (ONUs) attached to the PON. In this study we devise a fully distributed ring-based EPON architecture that enables the support of a converged PON-5G LTE access networking transport infrastructure utilizing distributed network control management to seamlessly backhaul both mobile and wireline multimedia traffic and services.