Converged Optical-Wireless Access Network Architectures

C. Christodoulou† and G.Ellinas†
†*KIOS Research Center, Department of ECE, University of Cyprus*

Center for Intelligent Systems & Networks

Πανεπιστήμιο Κύπρου
University of Cyprus

Rapid developments in broadband access technologies for both fixed and mobile network infrastructures are pushing the need for converged optical-wireless access networks that combine mobility with high-capacity. These networks can then deliver high-capacity services with quality-of-service to different types of end users.

Passive Optical Networks

- **Multipoint topologies with tree, tree-and-branch, ring and bus architectures.**
- **Transmission in a PON: between an optical line terminal (OLT) and optical network units (ONUs).**
- **OLT resides in the central office, connecting the optical access network to the metro backbone.**
- **ONU is located at either the curb (FTTC) or the end-user location (FTTH and FTTB).**
- **In the downstream (from OLT to ONUs) a PON is a point-to-multipoint network, and in the upstream direction it is a multipoint-to-point network.**

PON-based Networks

Two major standards of PONs are **: TDM-PONs** and **WDM-PONs. Ethernet PON (EPON**) , **Gigabit PON (GPON)** are both TDM-PONs.

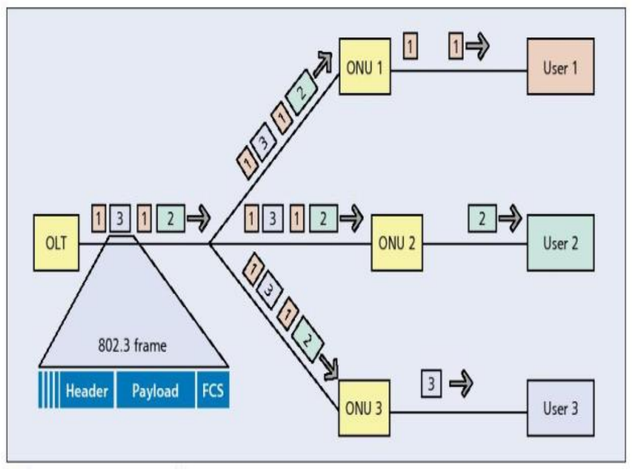

Fig.1. Downstream traffic in EPON

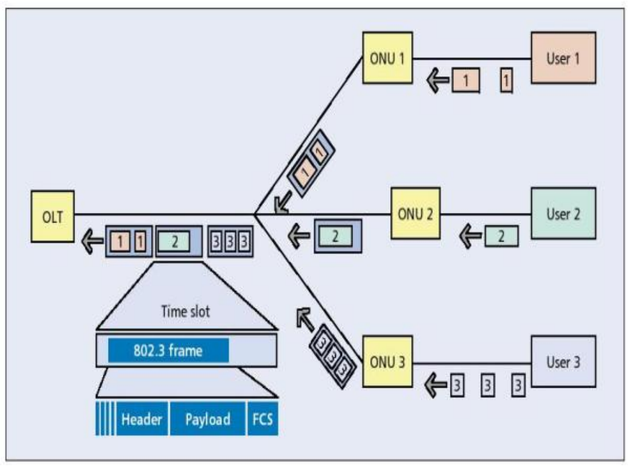

Fig.2. Upstream traffic in EPON

Integrated Network Architectures

GEPON and WiMAX

- Integration of GEPON and WiMAX networks
- GEPON covers longer distance & with more bandwidth
- GEPON MAC does not support QoS directly
- QoS architecture of integrating GEPON with WiMAX, was proposed
- Integration provides high bandwidth at low cost.
- Provided admission control and uplink scheduling
- ONU is combined with a WiMAX antenna to facilitate wireless communication

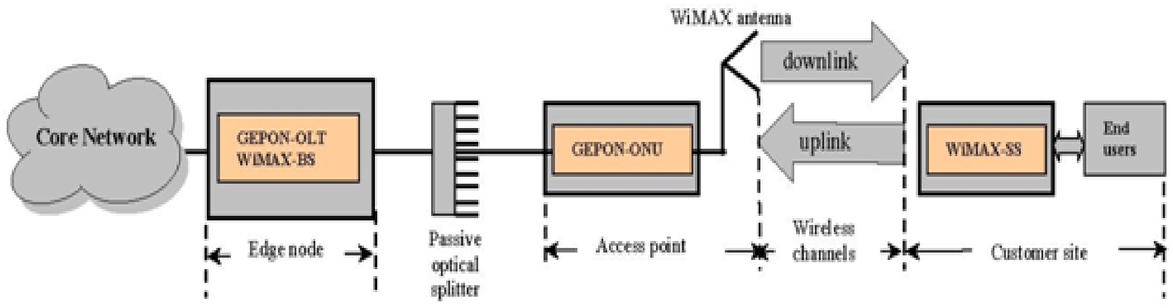

Fig.3. GEPON and WiMAX integration.

EPON and WiMAX

Convergence of an Ethernet passive optical Network (EPON) and multiple WiMAX networks. Improves:

- Access flexibility
- Bandwidth efficiency of the network.

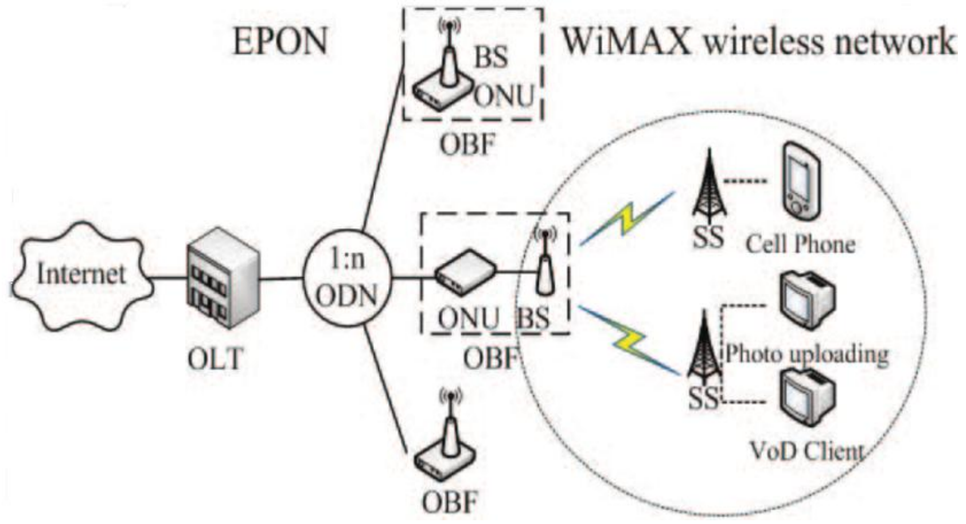

Fig.4. Convergence of EPON and WiMAX

Integration of Next-Generation PON with 4G mobile broadband access technologies

- Integration of next-Generation PON (NG-PON) with the 4G mobile broadband access technologies into a fixed-mobile platform utilizing an innovative ring-based WDM-PON.

- **Provides:**
  - The best overall system performance
  - Cost-effectiveness
  - Bandwidth utilization
  - Better QoS
  - Speedy handoff schemes for the mobile nodes.

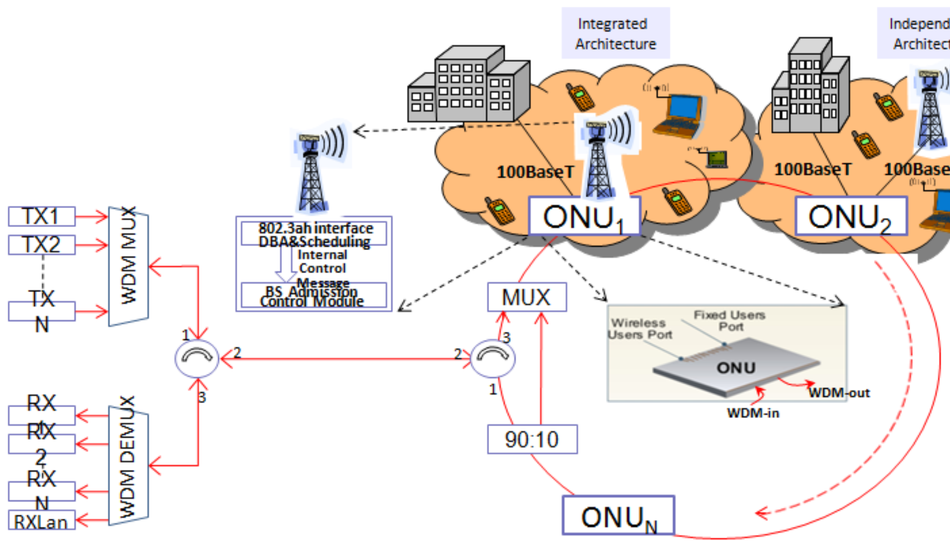

Fig.5. Converged Optical/Wireless Access Networks

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