

# Dynamic Bandwidth Allocation in Integrated FiWi Access Networks

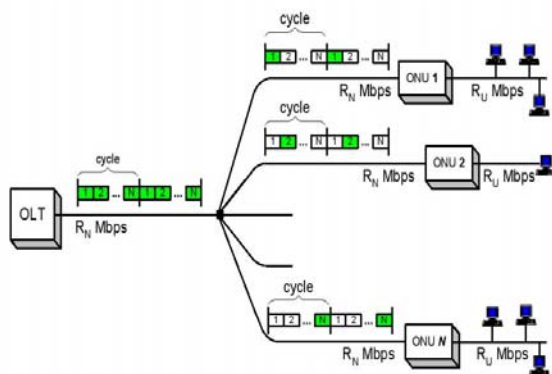
C. Christodoulou and G. Ellinas

KIOS Research Center, Department of ECE, 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 form a powerful platform for the support and creation of emerging as well as future unforeseen applications and services.

PONs (Passive Optical Network) provide high bandwidth and reliability but are limited in the coverage they provide. On the other hand wireless networks provide less bandwidth but increased mobility. Optical and wireless networks jointly build in a single infrastructure can provide high capacity and extended coverage for high bandwidth applications.

## DBA in standalone tree-based Optical Access Network



**Pareto Distribution** is the most appropriate choice for traffic generation. Probability density function (pdf):

$$f(x) = \frac{ab^\alpha}{x^{\alpha+1}} \quad x \geq b$$

$\alpha$  is a shape parameter with bounds  $1 < \alpha < 2$   
 $b$  is a location parameter.

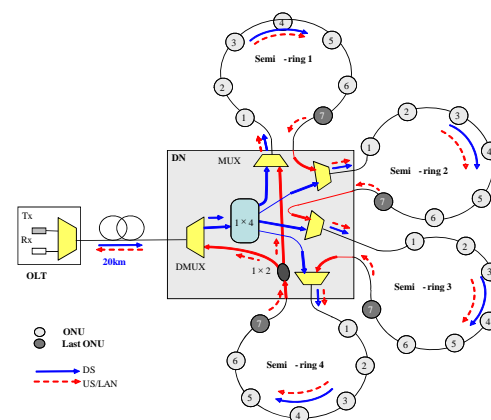
- The generation of self-similar traffic is an aggregation of multiple streams, each consisting of alternating Pareto-distributed ON/OFF periods.
- To generate the Pareto-distributed values, we used the formula :

$$X_{\text{pareto}} = \frac{b}{U^\alpha}$$

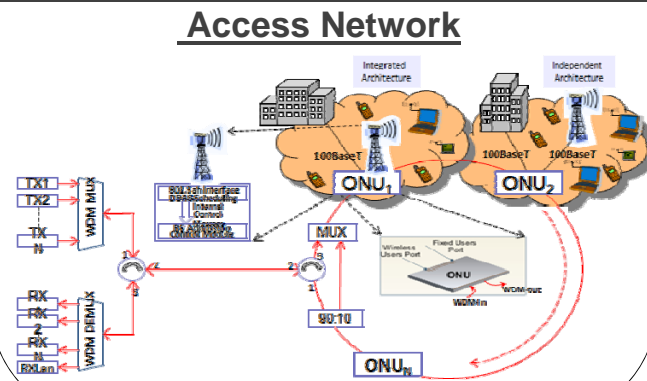
where  $U$  is a uniform random variable ( $0 < U \leq 1$ ).

- Each one of these sources generates windows of bytes which later are going to be filled with multiple Ethernet packets of size 64 to 1518 bytes.

## Tree/ Ring-based PON



## Converged Ring-based Optical-Wireless Access Network



## Future Challenges

- Determine scalable and resilient FiWi architectures
- Development of DBA algorithms to improve bandwidth efficiency
- Design of logical topologies for reconfigurable optical backhaul networks
- Development of appropriate handoff techniques
- Development of integrated control plane