

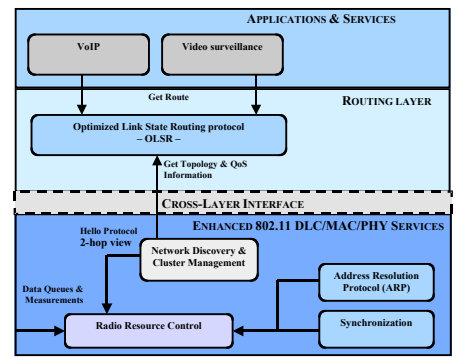
# Enhanced Integrated IP/MAC/PHY Services for Ad hoc Networks

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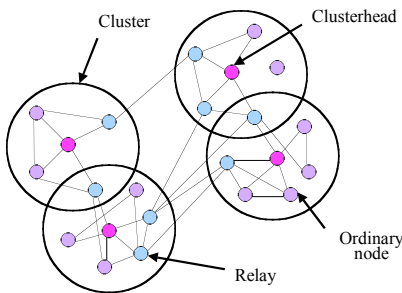
## System Architecture

### Main components:

- The **Enhanced 802.11 DLC/MAC/PHY Services** that provide reliable communication mechanisms to support synchronized transmission and QoS. It cooperates with the other components through the optimized cross layer interface.
- The **Optimized Link State Routing (OLSR) protocol** is the basic routing component; this choice resulted from the analysis of mobility patterns, nodes density and traffic loads.



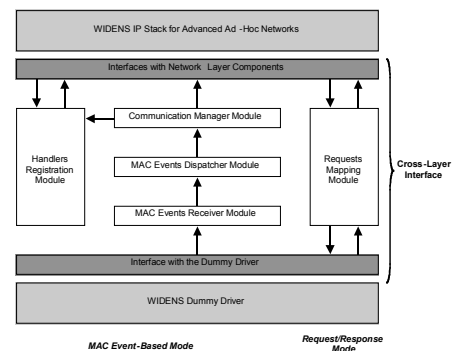
## MAC/PHY Overview



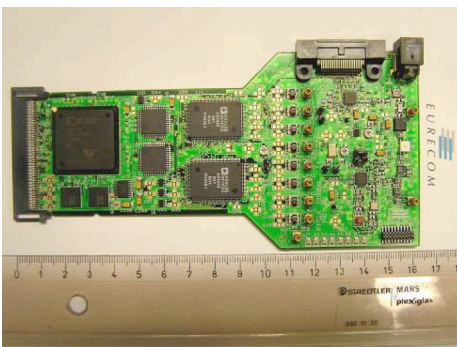
- The PHY layer provides **high bit rate wireless links** using OFDM(A) modulation (802.16x proposals, 3GPP HSDPA) with high-order QAM constellations.
- The network topology is organized (at the MAC layer) in **1-hop clusters**.
- Cluster heads manage the radio resource** within their clusters and are elected by a clustering algorithm selecting the nodes that have the maximum number of neighbors.
- The timing and frequency synchronization is achieved with specially designed **synchronization sequences periodically broadcasted** by the cluster-head.
- Enhanced link quality information** in support of the network layer routing protocol.

## IP/MAC Integration

- Optimized Link State Routing (OLSR) protocol** is used.
- The **IP and MAC layers are closely integrated** in order to provide not only optimizations to OLSR but also faster reactivity.
- Neighborhood information is gathered **directly from the MAC layer** using a specific cross-layer design.
- This tight interaction between routing and MAC is completed by a **QoS framework** relying on scheduling at the MAC layer.
- OLSR has been modified to support QoS routing based on metrics reported by the MAC.



## Demonstration



- Each node is an **RT Linux based PC** equipped with the Dual Channel PCMCIA card.
- Each one implements the **full IP/MAC/PHY stack**.
- Nodes run VoIP (for **audio**) and Chat (for **data**) applications to demonstrate the multi-hop wireless communications.

would like to acknowledge our partners from the WIDENS IST project with whom we have worked on the integration of this work to support different classes of service.

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