The CABIN-CREW main result was **strengthening the CREW testbed facilities for easily supporting experiments on novel or adaptive MAC protocols** (not limited to parameter tuning or switching between pre-defined solutions). To this end, we exploited a novel programming model of wireless cards, based on the so called Wireless MAC Processor (WMP) architecture, able to provide a powerful API for abstracting the hardware in a set of elementary *signals* and *commands* managed by *a generic executor of state machines*. Two prototypes of programmable nodes, based on two completely different hardware systems (namely, a commercial 802.11 card and the FGPA-based WARP board) have been integrated into the testbed for demonstrating the possibility to define and run hardware-agnostic MAC programs.

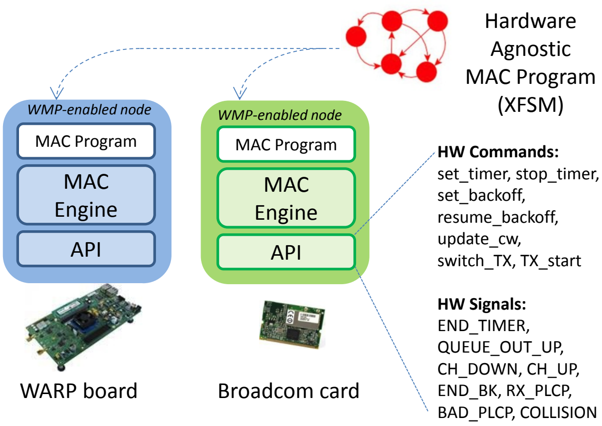

Figure 1 – *The Wireless MAC Processor architecture over CREW:* different hardware platforms expose the same configuration primitives and act as generic executors of state machines. Thanks to the decoupling between protocol logic and primitives, experimenters can program hardware-agnostic MAC protocols without knowing the card internals. For standard DCF, similar performance are achieved on both the Broadcom and WARP node.

In order to support the whole cognitive cycle on MAC adaptations, we also developed specialized software tools on top of the testbed facilities for: i) supporting **collection and analysis of low-level channel signals** (collisions, busy/idle times, inter-frame spaces, receiver errors, etc.); ii) providing a **OMF-compatible control interface** for loading and activating MAC programs on the testbed programmable nodes; iii) making available a **library of MAC programs and adaptation policies** to be used for further experiments. We exploited the testbed facilities and our extensions in several scientific experiments, devised to design MAC adaptation strategies in real network scenarios. We focused on the problem of **ISM spectrum overcrowding** due to independent 802.11 and/or 802.15.4 interfering networks, to the need of isolating multiple coexistence networks and to the performance improvements that can be achieved in case of multi-hop topologies.

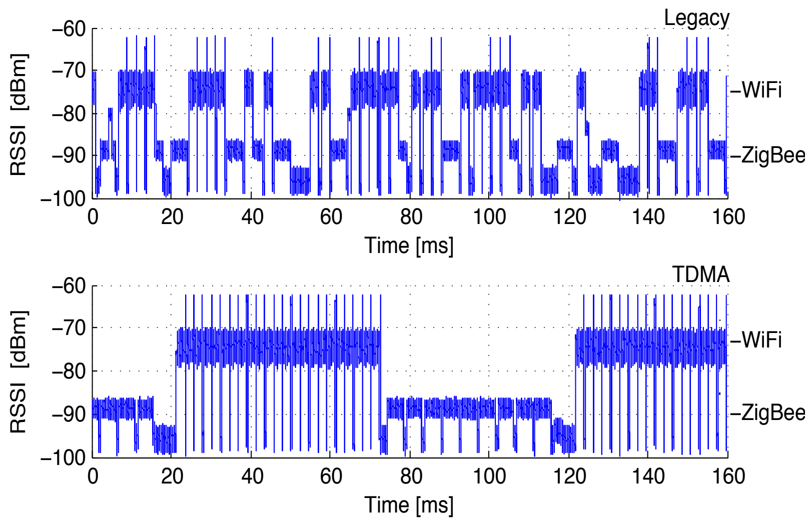

Figure 2 – *Implementing a MAC-cognitive adaptation cycle:* two interfering 802.11 and 802.15.4 links, simultaneously active, are recognized by the Experiment Controller on the basis of specific error patterns (a) and throughput fluctuations; an inter-technology TDMA (b) is enforced on the programmable testbed nodes, with periodic time intervals allocated exclusively to each technology according to the traffic (c).