"Implementation of Messaging and Neighbour Discovery Service over a TDMA MAC for a Carrier-Grade Wireless Mesh Network"

Student Project at TU-Berlin/Internship at Deutsche Telekom Laboratories, Berlin

Start: ASAP

Overview:

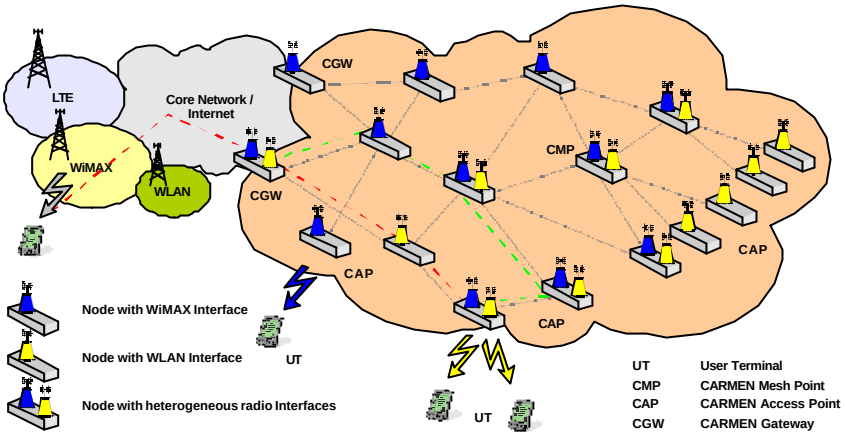

Figure 1: CARMEN network scenario showing different CARMEN nodes and mesh interaction

We are looking for motivated students for a student/internship project within the EU FP7 project CARMEN (CARrier grade MEsh Networks). A primary concern for operators is to provide access to voice, video and data services via their existing radio access networks, thereby, leveraging the capital already invested in these networks. To achieve carrier-grade quality while preserving flexibility and cost efficiency is a key challenge due to the inherent limitations of wireless mesh networks, namely limited throughput and scalability. The goal of the CARMEN project is to overcome this challenge and realize such a carrier-class mesh network over heterogeneous wireless network technologies (Figure 1).

Topic:

The different wireless technologies are categorized in the CARMEN project as (Figure 2):

- Coordinated MAC technologies: Implies a centralized scheduler arbitrating physical resources, e.g., spectrum, time (e.g., IEEE 802.16 WIMAX)
- Uncoordinated MAC technologies: Implies a contention-based channel access (e.g., IEEE 802.11)

CARMEN nodes have multiple interfaces fitted with these different MAC technologies. To support this heterogeneity, a MAC Layer Abstraction Interface is proposed to translate service primitives between upper layers (such as routing, self-configuration and spectrum management) and the different technologies. The MAC Layer Abstraction Interface builds on and extends IEEE 802.21 MIH (Media Independent Handover) architecture. The different modules and interactions between them are depicted in Figure 2.

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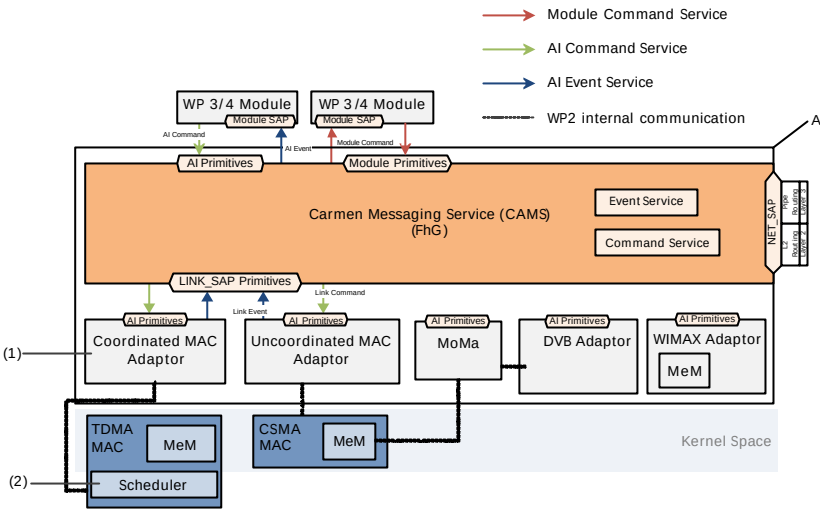

Figure 2: CARMEN Abstract Interface and implementation overview

The student is expected to work on the coordinated MAC adaptor (Figure 2). The goal is to forward the messages that are received from the CAMS (CARMEN Messaging Service) using the underlying TDMA MAC protocol. To this end, the student will work on the open source implementation of the Soft TDMAC protocol [1,2] and implement the following functionalities (list represents an overview):

- Forwarding CARMEN-specific control messages: These include broadcast messages that carry information about the mesh network, and mesh node registration messages destined to the gateway. The implementation requires extending beacon messages already used by the TDMA MAC protocol to carry mesh specific information.
- Reporting the detected mesh links to CAMS: The receipt of a mesh-specific beacon messages (defined in the previous bullet) must be notified to CAMS.
- Neighbourhood scanning: Reporting the number of neighbours and neighbour statistics to CAMS.

Basics/requirements:

Sound knowledge about network and Linux kernel programming, C/C++ is required. Knowledge about IEEE 802.11 and "madwifi" Linux driver is a plus (and will be needed during the project). Finally, the student is expected to be able to work both independently and in a team.

If you are interested to do your student project or internship in this topic, do not hesitate to contact us and we can arrange an informal meeting to talk about the details.

References

[1] http://spirit.cs.ucdavis.edu/SoftTDMAC

[2] P. Djukic and P. Mohapatra, "Soft-TDMAC: Software TDMA-based MAC over commodity 802.11 hardware", INFOCOM 2009. The 28th conference on Computer Communications. IEEE, pp. 1836-1844, April 2009.

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