Opportunistic Protocols in Multi-Rate Environments

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Abstract—In recent years the research of opportunistic protocols for wireless mesh networks gained lots of attention. A great number of protocols like Extreme Opportunistic Routing (ExOR) and Multiuser Diversity Forwarding (MDF) was proposed. Most of the performance evaluations were conducted in a constant bit-rate environment. This paper presents simulation results of the performance of existing opportunistic protocols as well as a new opportunistic protocol called Hybrid Opportunistic Routing (HOR) in a constant- and multi-rate environment.

In a constant-rate environment with a slow fading channel ExOR outperforms MDF and HOR by around 20%. This is mainly due to its small signaling overhead. ExOR is also the best choice in a fast fading channel. However, here HOR is able to outperform MDF.

In a multi-rate environment our proposed ETT-RCA rate control algorithms outperforms the existing Adaptive Auto Rate Fallback (AARF) significantly. AARF is only suitable for short, high quality links. The biggest problem with ExOR is that is cannot be used together with ETT-RCA. In a slow fading channel MDF with ETT-RCA is the best choice. It outperforms ExOR with AARF by multiple times (up to 360%). In a fast fading channel HOR with ETT-RCA is the best choice for medium-distances (e.g. 80% and 330% higher throughput than MDF with ETT-RCA and ExOR AARF). Only for very large distances ExOR with AARF is able to offer the highest throughput. Here in the multi-rate environment the degrees of freedom (candidate and bit-rate selection) are too large for ExOR and AARF.

Index Terms—Wireless Mesh Networks, Opportunistic Routing, Multi-User Diversity, Bit-Rate Selection