

The MAC data rate of Mobile WiMAX

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I. INTRODUCTION

For Mobile WiMAX [1], which relies on IEEE Std 802.16-2009, numerous methods exist for calculating its data rate. However, none of the current methods is able to provide good throughput figures at the Medium Access Control (MAC) layer. We have therefore developed a method for MAC throughput prediction in [2], which we briefly explain below and in the accompanying poster.

In the model, we calculate the exact control overhead that precedes a WiMAX TDD frame, which depends on the number of users in downlink and uplink. We furthermore take the header and CRC overhead per packet into account. This model also reckons for burst allocations on a per slot basis and for a ranging subchannel. To obtain our results, the model was applied to the official set of parameters for Mobile WiMAX for a 5 MHz channel, a cyclic prefix of 1/8, a 16-QAM modulation and 1/2 coding rate and PUSC permutation in downlink and uplink.

II. RESULTS

For a packet size of 500 bytes and one user, we obtain a MAC throughput of 4.57 Mbps for downlink and 1.20 Mbps for uplink. This is a big difference to the physical data rate of 7.00 Mbps in downlink and 5.29 Mbps in uplink which is often only cited.

The MAC data rate is furthermore plotted as function of packet size in Fig. 1 for dif-

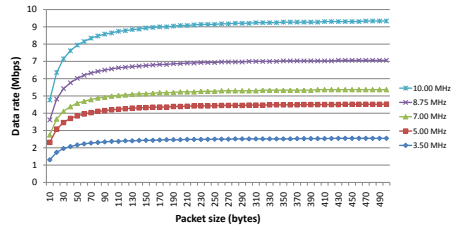


Figure 1. Comparison of downlink data rate for different channel bandwidths and packet sizes

ferent channel bandwidths. When inspecting smaller packet sizes (e.g 10 bytes), throughput lowers significantly to 2.34 Mbps downlink and 0.61 Mbps uplink. This decrease is due to the increasing relative overhead per packet, caused by the header and the CRC.

III. CONCLUSIONS

Our model for MAC throughput for WiMAX was briefly explained. It incorporates the overhead that is introduced per packet, next to the overhead that is required per frame.

Using our new method, we showed a throughput decrease for smaller packet sizes.

ACKNOWLEDGMENTS

D. Pareit would like to thank the IWT-Vlaanderen for financial support through his Ph.D. grant.

REFERENCES

- [1] Jeffrey G. Andrews, Arunabha Ghosh, and Rias Muhamed, *Fundamentals of WiMAX: Understanding Broadband Wireless Networking*, Pearson Edu., 2007.
- [2] Daan Pareit, et al, "A throughput analysis at the MAC layer of Mobile WiMAX", Wireless Communications and Networking Conference (WCNC), 2010 IEEE, apr. 2010, pp. 1–6.

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