Network Coding for Broadband Satellite Communications

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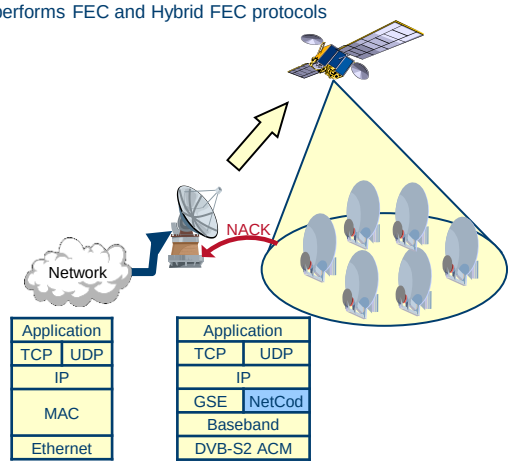
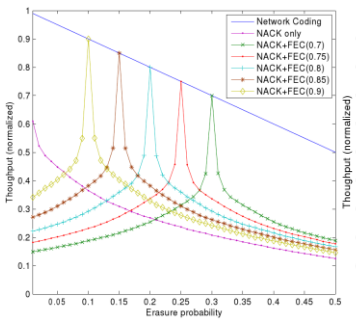
Reliable Multicast

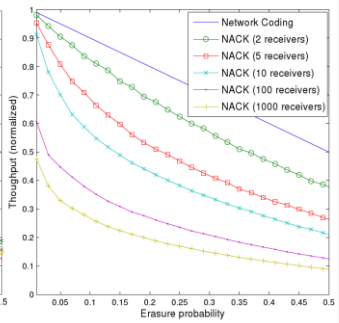
- Optimal performance for any erasure probability
- Highly scalable for large terminal populations
- Outperforms FEC and Hybrid FEC protocols



- Reliable multicast based on network coding is implemented at the encapsulation layer – compatible with any multicast application
- High efficiency gains when terminals have independent channel conditions – large geographical regions



Network coding, ARQ (NACK) and Hybrid FEC efficiency



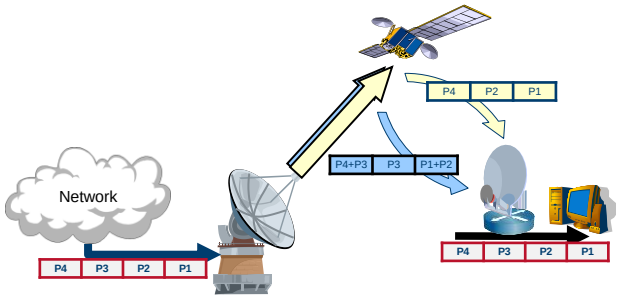
Network coding and ARQ (NACK) scalability

Conclusions

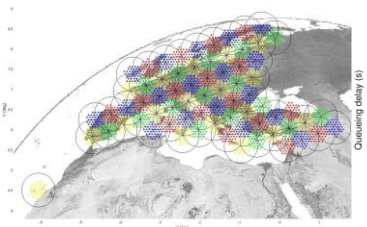
- Allows for error-free content delivery over satellite
- Reduces delivery time and overall satellite resources
- Transparent to network layer and above
- Adaptive to variant channel conditions and highly scalable

Load balancing in Multibeam Satellites

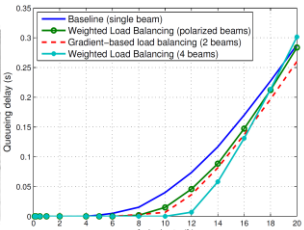
- Adjacent beams have large overlapping regions that allow for multi-path communications to terminals
- Beams with high traffic demands can off-load it to adjacent beams
- Network coding provides native mechanisms for multi-path communications that are transparent to the network layer



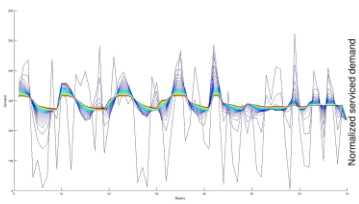
- Network coding is limited to the satellite sub-network
- Allows incremental deployment by upgrading terminals for dual and/or polarized frequency reception capabilities



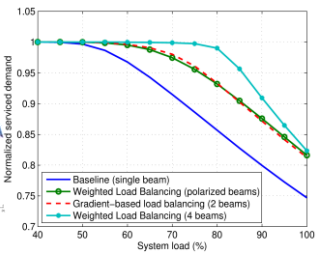
Satellite coverage with 70 beams and frequency reuse f=4



Overlay queueing delay



Converging traffic demand per beam with network coding based load balancing



Overlay serviced demand

Conclusions

- Improves efficiency of multi-beam satellites with conventional payloads and can complement beam-hopping techniques
- Transparent to network layer and above
- Overall bandwidth gains of 30% with dual beam reception terminals and 50% with four-beam reception terminals

Instituto de Telecomunicações - Porto

IT Porto is a research center at the University of Porto, affiliated with the Instituto de Telecomunicações, a national institute with six different locations and about 190 researchers with a Ph.D working on a wide range of topics related to communications engineering. IT-Porto was launched in January 2007 and has since grown steadily to a full bodied institute with more than 90 members from 17 different countries, including more than 20 PhD researchers, and a strong presence both in the School of Sciences (FCUP) and the School of Engineering (FEUP). By focusing on key competitive areas that span fundamental research in information theory, design of communication protocols, algorithms for multimedia processing and, more recently, security and human-computer interaction, IT Porto is well poised to become an international center of excellence in information and communication technologies, as well as in training high-potential young researchers from various parts of the world.

Collaborations

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