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## **CS-Colloquium**

# **Network Coding - A Personal Account of Combining Theory and Practice**

**Prof. Muriel Médard**

MIT, USA

**Wann?** 19. Mai 2016, 11:30 Uhr

**Wo?** Hörsaal 1  
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## **Abstract**

This talk seeks to illustrate the interplay between theoretical development and engineering implementation, with a personal slant. It centers on Network Coding (NC), a modern information theoretic development that leverages algebraic data manipulation during transport through a network to enhance resource usage. The addition of data manipulation to network modeling went beyond traditional graph theoretic considerations, allowing a significant relaxation of constraints that had originally been treated as essential and, consequently, to the circumvention of impasses. The new model afforded opportunities for improved resource usage in existing networks through developments such as our Random Linear Network Coding (RLNC). While RLNC provided provably optimal throughput within standard theoretical frameworks, introducing it into the most common Internet transport protocol, Transmission Control Protocol (TCP), required an inventive reinterpretation of TCP's control signals. Our recent theoretical results in Equivalence Theory show there is no benefit, in terms of throughput, in combining NC with the type of coding commonly used to palliate mistransmissions in error-prone media such as wireless links. These results confirm the sense behind current operational practice, but contradict long-standing folk-theorems regarding the benefit of joint coding. However, when other performance metrics such as energy consumption are taken into account, in practice we have shown that combining NC with coding for wireless links leads to marked, cumulative gains. We shall conclude the talk with open challenges and research directions driven by the coming convergence of data storage and networking. No background knowledge will be assumed.

## **Bio**

Muriel Médard is the Cecil H. Green Professor in the Electrical Engineering and Computer Science Department at MIT and leads the Network Coding and Reliably Communications Group at the Research Laboratory for Electronics at MIT. She has co-



founded two companies to commercialize network coding, CodeOn and Steinwurf. She has served as editor for many publications of the Institute of Electrical and Electronics Engineers (IEEE), of which she was elected Fellow, and she is currently Editor in Chief of the IEEE Journal on Selected Areas in Communications. She was President of the IEEE Information Theory Society in 2012, and served on its board of governors for eleven years. She has served as technical program committee co-chair of many of the major conferences in information theory, communications and networking. She received the 2009 IEEE Communication Society and Information Theory Society Joint Paper Award, the 2009 William R. Bennett Prize in the Field of Communications Networking, the 2002 IEEE Leon K. Kirchmayer Prize Paper Award and several conference paper awards. She was co-winner of the MIT 2004 Harold E. Edgerton Faculty Achievement Award. In 2007 she was named a Gilbreth Lecturer by the U.S. National Academy of Engineering.