Chair of Connected Mobility
Department of Computer Science
Technische Universität München

Future Internet Protocols:
Design Principles and Deployment

Master Seminar Course

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Designing the Future Internet

Motivation

- ▶ IP Address Space Exhaustion (scalability)
- ▶ IP Locator and Identifier separation (scalability)
- ▶ Multiplex TCP over multiple link layers (reliability)
- ▶ Workaround Middleboxes (engineering)
- ▶ Reduce latency during protocol negotiation (performance)
- ▶ Secure and Authenticate DNS and Email messages (security)
- ▶ Let server push HTTP content; avoid HOL blocking (performance)
- ▶ Video conferencing without plugins. (engineering)

Topics

- Applications
  - Web Real Time Communication (WebRTC)
  - HTTP/2

- Security
  - Transport Layer Security (TLS) 1.3
  - Email Security (DKIM, SPF, DMARC)
  - DNS Security (DNSSEC) and
    DNS-based Authentication of Named Entities (DANE)

- Transport Protocols
  - Quick UDP Internet Connection (QUIC)
  - Multipath TCP (MPTCP)
  - Stream Control Transmission Protocol (SCTP)

Topics

- Congestion Control and Loss Recovery
    - BBR Congestion Control
    - TCP Recent ACKnowledgment (RACK), Tail Loss Probe (TLP) and Selective ACKnowledgment (SACK)

- Networks
    - IPv6
    - The Locator/ID Separation Protocol (LISP)
    - TRansparent Interconnection of Lots of Links (TRILL)

Relevant Publications and Conference Proceedings

- ▶ IEEE/ACM Transactions on Networking
- ▶ ACM SIGCOMM & Computer Communication Review
- ▶ IEEE INFOCOM

- ▶ USENIX Security & Networked System Design and Implementation
- ▶ Internet Engineering Task Force
- ▶ Internet Protocol Journal

Additional Literature

- ▶ Articles on how to read and review papers.

Course Expectations and Grading

- ▶ A written paper review before the presentation (20% grade)
- ▶ Weekly presentations during the semester (70% grade)
- ▶ Group discussions (10% grade)