OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

INF FACULTY OF COMPUTER SCIENCE

Networked Systems Lab / Seminar / Theses Introduction

Prof. Dr. David Hausheer

Networks and Distributed Systems Lab (NetSys)

OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
INF FAKULTÄT FÜR INFORMATIK
Networks and Distributed Systems Lab
Prof. Dr. David Hausheer
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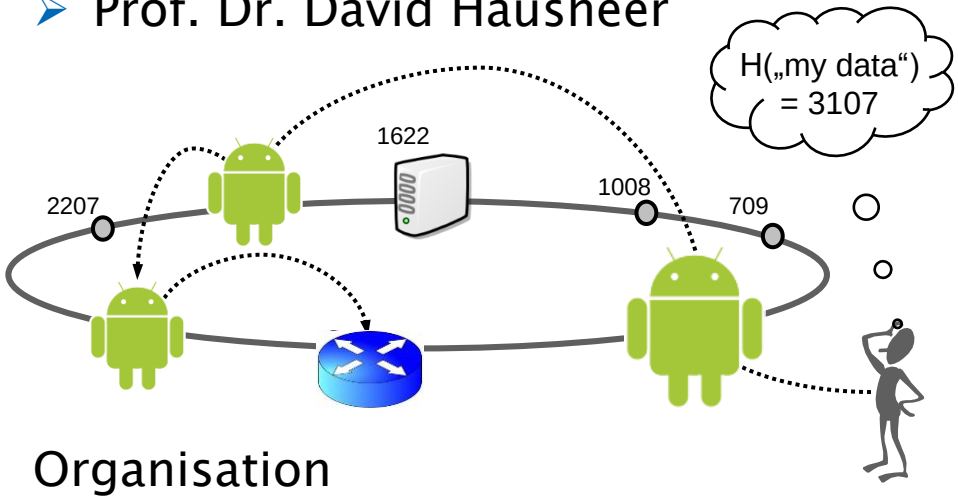
Kickoff am 04.04.2019
11:15h G02 Raum 111

Praktikum Vernetzte Systeme

Dozent:

- Prof. Dr. David Hausheer



Organisation

- Individual- oder Team-Projekt
- 6 Kreditpunkte = 180h

Voraussetzungen

- BSc/MSc CV/INF/IngINF/WIF/DigiEng
- Solide Programmiererfahrungen
- Komm. und Netze wird empfohlen

Interesse? Weitere Infos unter:
http://www.netsys.ovgu.de/

Inhalte, u.a.:

- Software-defined Networking
- Network Functions Virtualization
- Netzwerk Sicherheit
- P2P und Overlay Netze
- Mobile Netze, Video Streaming
- Energy-effiziente Netze
- Netzwerk Simulation
- Oekonomische Aspekte

Lernergebnisse

- Design & Entwicklung von Anwendungen in Kommunikationsnetzen
- Anwendung von objektorientierten Programmiertechniken

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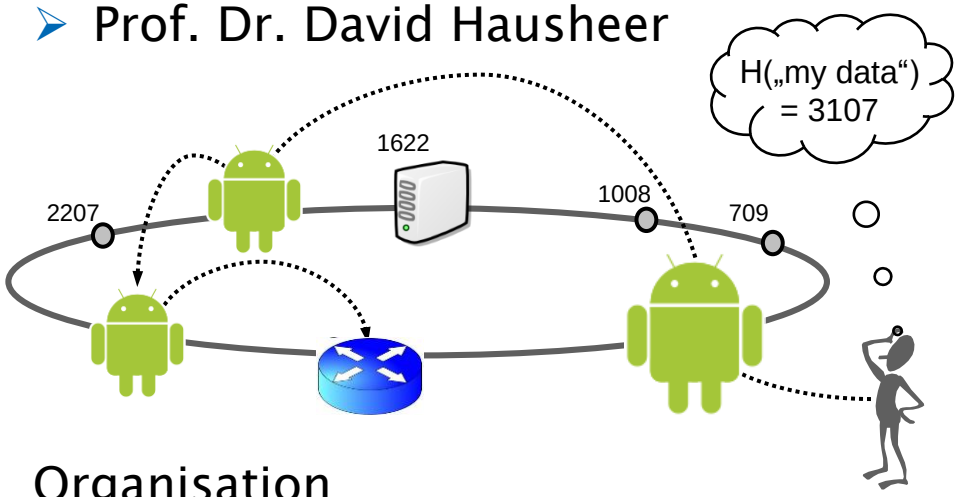
Seminar Vernetzte Systeme

Dozent:

- Prof. Dr. David Hausheer



Organisation

- Wissenschaftliches Seminar
- 3 Kreditpunkte

Voraussetzungen

- BSc/MSc CV/INF/IngINF/WIF/DigiEng
- Kommunikation und Netze wird empfohlen

Interesse? Weitere Infos unter:
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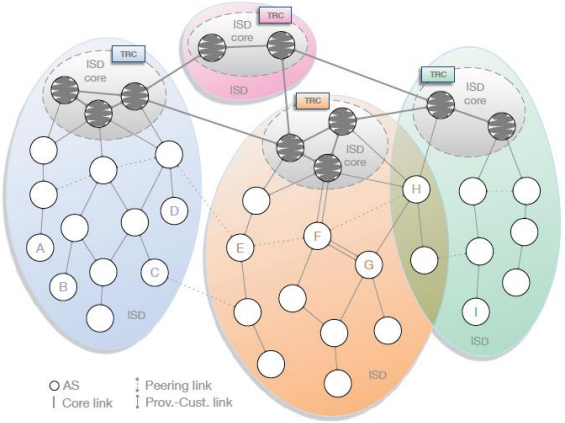
Lernergebnisse

- Literatursuche, Klassifizierung, Evaluation, Vergleich
- Bericht (6-10 Seiten) und Präsentation (20-30min) einer Literaturstudie

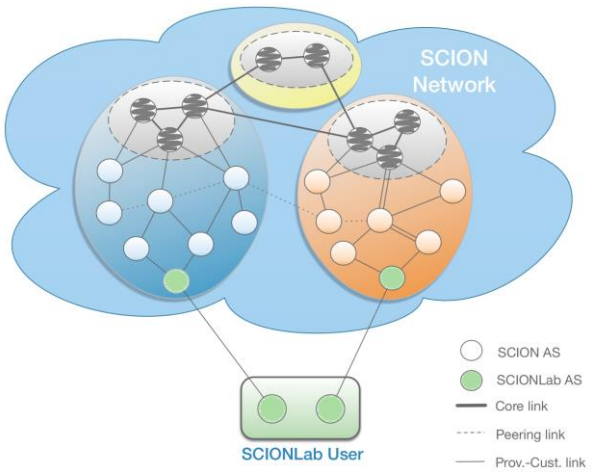
Network Security



- SCION: Scalability, Control, and Isolation on Next-Generation Networks
  - A Software-defined WAN approach
- SCION Design Goals
  - Availability in the presence of adversaries (e.g. DDoS)
  - Transparency and control over forwarding paths
  - Multipath forwarding
  - Efficiency, Scalability, and Extensibility
  - Deployability
- SCION provides incentives for deployment to overcome the resistance for upgrading today's core Internet infrastructure
  - ISPs are able to define new business models and sell new services.
  - Migration requires minimal added complexity (and cost) to the existing infrastructure.
- In cooperation with Adrian Perrig (ETH Zurich)

SCION

SCIONLab



- Fast setup, low entry bar for users
- Little required technical expertise: Setup of a SCION should be simple, intuitive and automated
- SCION AS can be instantiated as a VM in few clicks
  - http://www.scionlab.org/

- Past and ongoing projects:
  - Design and Implementation of User-based Attachment Points in the SCIONLab Coordinator
  - A Fast Image and Package Creation for SCION AS Installations
  - Deployment of SCION over the EU GEANT Topology
  - Machine-Learning based Performance Prediction in SCION
  - Connecting SCION based Blockchain and Distributed Storage to boost Decentralized IoT Applications

- Joint work with Leopold Ryll, Martin Koppehel, Leon Wehmeier, Lars-Christian Schulz, Agostino Moosdorf et al.

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Topics (1): SCION – A Secure Internet Architecture

- Virtual Credit based Incentive Mechanism for SCION (T, L)
- Design and Evaluation of Large File Transfer using Path-Awareness (T, L)
- Implementation of User Attachment Points in the SCIONLab Coordinator (L)
- Bandwidth Measurements as a Basis to Evaluate SCION (T, L)
- Implementation of a SCION App for Android Smartphones (T, L)
- Performance Evaluation of SCION on Small-Scale Devices (T, L)
- Design and Analysis of IoT Applications on SCION (T, L)
- SCION as a Platform for Smart Home Environments (T, L)
- Machine-Learning based Performance Prediction in SCION (T, L)
- Deployment of SCION on Baremetal Switches (T, L)
- Network Function Virtualization Support for SCION (T, L)
- Deployment of SCION in the Linux Kernel using XDP (T, L)
- Deployment of BitTorrent on SCION (T, L)
- Video Streaming over the SCION Network (T, L)
- Bandwidth Measurements using Iperf over the SCION Network (T, L)

Type: T(hesis), L(ab), S(eminar)

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Topics (2): Distributed Systems and Overlays

- Design and Evaluation of Multi-path over EU GEANT Topology (T, L)
- Design and Evaluation of Large File Transfer over Multi-path (T, L)
- Evaluation of SpeedCam: Monitoring of Multipath Resource Usage (T)
- Does Multi-path lead to more resource usage? (T, S)
- Comparison of MP-QUIC with other Multi-path Approaches (S)

Type: T(hesis), L(ab), S(eminar)

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Topics (3): Software-defined Networking (SDN)

- Evaluation and Comparison of DDoS Mitigation Approaches (S)
- Implementation of DDoS Mitigation on Bare Metal Switches (T, L)
- Fast DDoS Mitigation using the P4 Programming Language (T, L)
- In-band Network Telemetry based on the P4 Programming Language (T, L)
- Fast Packet Matching and Rewriting on Bare Metal Switches (T, L)

Type: T(hesis), L(ab), S(eminar)

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Topics (4): Bring Your Own Topic (BYOT) in...

- Software-defined Networking and network functions virtualization
- Decentralized systems and overlay networks (e.g. Blockchains)
- Network security
- Network measurements and analysis
- Mobile networks, video streaming
- Energy-efficient networking
- Network simulation
- Economic aspects (network economics, incentive mechanisms)
- Advanced networking topics...

Type: T(hesis), L(ab), S(eminar)

Organization

- This week: Write me an e-mail to hausheer@ovgu.de with:
  - Topics you are interested (may be multiple, in order of preference)
  - Type (Lab, Seminar, Thesis)
  - Individual- or Teamproject
  - Name(s) of involved person(s)

- Next week: Make an appointment with me to discuss the topic and initiate the work and register with the exam office (in case of lab work)

- Deadlines:
  - Presentations will take place after the end of the semester
  - Reports (+ Code) have to be handed in a week prior to the presentation (<tbd>)
  - A preliminary version needs to be handed in for feedback (<tbd>)

- Templates:
  - Presentation template will be provided later
  - Report template: IEEE Template for Transactions http://www.ieee.org/publications_standards/publications/authors/author_templates.html#sect1

Requirements

- Report
  - Team projecs: 5 pages for 1 person, 5,5 pages for 2 persons, 6 pages for 3 persons
  - Seminar work: xxx
- Presentation
  - Team projecs: 20min (+5-10min demo)
  - Seminar work: 20-30min (+15min discussion)
- Exam registration
  - To be done with the corresponding exam registration form
  - To bring with you for my signature, once the presentation date is fixed
- Plagiarism
  - Please take care to correctly reference other work and dont copy/paste content from other documents
  - Reports will be checked for plagiarism and plagiarism will be reported