

Peer-to-Peer Systems and Applications



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Lecture Organization

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<http://www.ps.tu-darmstadt.de/teaching/p2p>

*Original slides for this lecture provided by Burkhard Stiller, David Hausheer (University of Zurich, Department of Informatics, Communication Systems Group CSG, Switzerland)

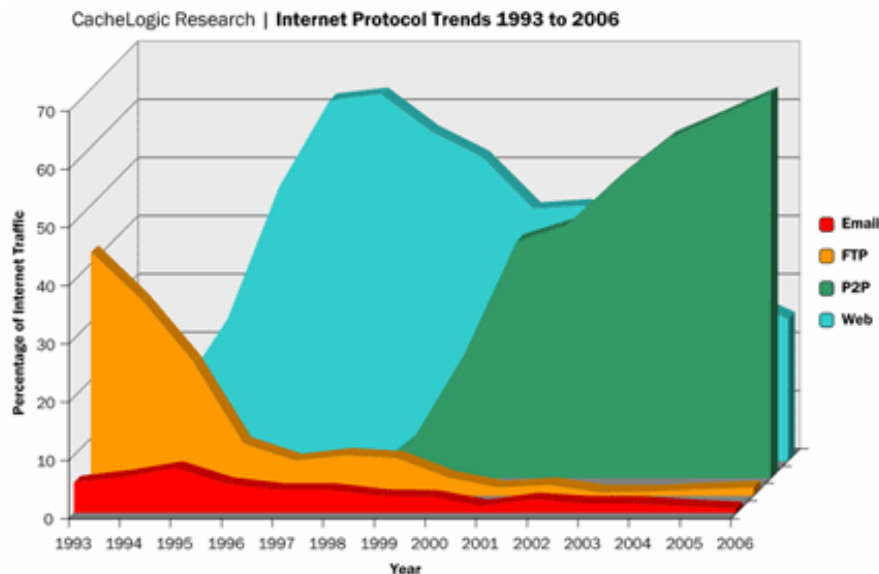


1. Motivation

- ❖ What is “Peer-to-Peer”?
 - Depends on who you ask!
- ❖ P2P in the media
 - Illegal file sharing, copyright infringement
- ❖ P2P in academia
 - A paradigm for communication in the Internet
- ❖ Is it new?
 - The Internet in the late 60s (ARPANET) was designed as a Peer-to-Peer system without any centralized control
 - Only the emergence of the Domain Name System (DNS) and the World Wide Web (WWW) changed the Internet into a Client/Server system with centralized control

1. Motivation: P2P Traffic

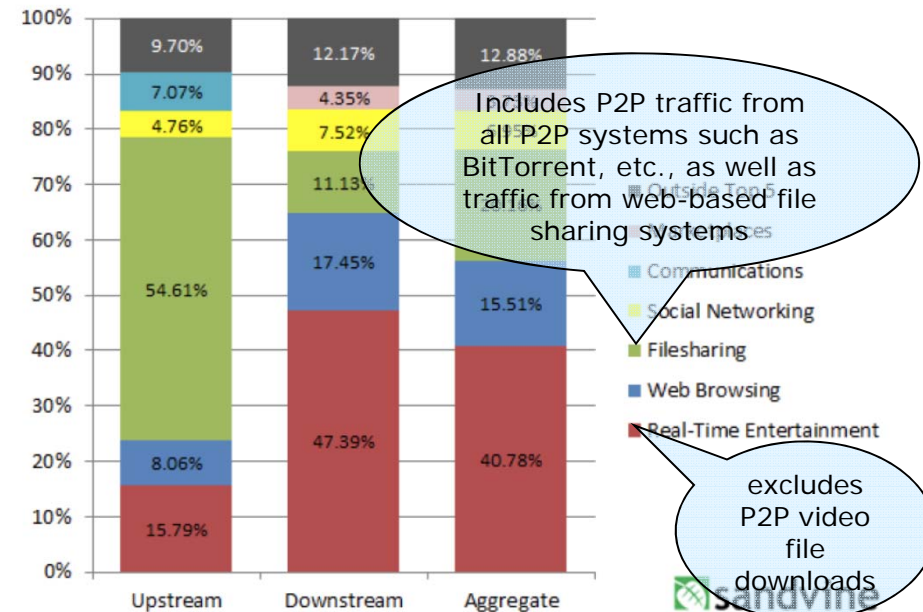
❖ IP Traffic 1993 - 2006



=> 70% of Internet traffic was due to P2P applications!

Source: CacheLogic Research

❖ IP Traffic Composition 2013



=> P2P filesharing traffic declined, but still accounts for the majority of upstream traffic

Source: Sandvine Global Internet Phenomena Report, 2H 2013, Peak Period Aggregate Traffic Composition - Europe, Fixed Access

2. Goals

- ❖ Provide a in-depth view into advanced Peer-to-Peer methods and concepts
 - Fully decentralized communication paradigm
 - Alternative to client/server paradigm
 - Benefits and drawbacks
 - Scalability, security, efficiency, fault-tolerance, manageability
 - Selected concepts and approaches
 - Structured versus unstructured P2P systems, Distributed Hash Tables, P2P search, Hybrid P2P systems
 - Applications and related systems
 - Mobile P2P systems, P2P storage, P2P video streaming
 - Economic aspects
 - P2P Incentives, Accounting, P2P Currencies, Energy-efficiency of P2P

3. Lecture Overview (Tentative)



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Apr 13 (DH)	Lecture 1:	Introduction to P2P Systems
Apr 20 (DH)	Lecture 2:	Distributed Hash Tables (1)
Apr 27 (DH)	Lecture 3:	Distributed Hash Tables (2)
May 04 (NN)	Lecture 4:	P2P Video Streaming
May 11 (DH)	Lecture 5:	Hybrid Approaches and Testbeds
May 18 (DH)	Lecture 6:	Selected P2P Concepts
May 25		Pentecost Monday
June 01 (NN)	Lecture 7:	P2P Economics (1): P2P Incentives
June 08 (DH)	Lecture 8:	P2P Economics (2): BitTorrent and BitCoin
June 15 (DH)	Lecture 9:	Mobile P2P (1)
June 22 (NN)	Lecture 10:	Mobile P2P (2)
June 29 (DH)	Lecture 11:	P2P Accounting
July 06 (DH)	Lecture 12:	Current Topics and Outlook
July 13 (DH)	Lecture 13:	Backup

4. Teaching Aids

❖ Basics and background information available within:

- R. Steinmetz, K. Wehrle (Eds.): *Peer-to-Peer Systems and Applications*; Springer Publisher, Berlin-Heidelberg, Germany, Lecture Notes in Computer Science LNCS, Vol. 3485, 2005.
- Selected chapters and additional material as indicated
- Available online within TUD: <http://dx.doi.org/10.1007/11530657>

Furthermore, detailed studies of important aspects in

- Journal, conference, or workshop papers.
- Web sites and white papers.
- Code examples.

5. Exercise Overview (Tentative)



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Apr 14	No Exercise – Introduction to CN Lab
Apr 21	Lab Work Introduction / Lab Work 1 Hand-out
Apr 28	Lab Work 1 Discussion / Lab Work 2 Hand-out
May 05	Lab Work 2 Discussion / Lab Work 3 Hand-out
May 12	Exercise Introduction / Exercise 1 Hand-out
May 19	Lab Work 3 Discussion / Lab Work Backup
May 26	Exercise 1 Discussion / Exercise 2 Hand-out
June 02	Exercise 2 Discussion / Exercise 3 Hand-out
June 09	Exercise 3 Discussion / Exercise 4 Hand-out
June 16	Exercise 4 Discussion / Exercise 5 Hand-out
June 23	Exercise 5 Discussion / Exercise 6 Hand-out
June 30	Exercise 6 Discussion / Exercise 7 Hand-out
July 07	Exercise 7 Discussion / Exercise Backup
July 14	Consultation hour for the exam

Tentative, more infos
on 21.04.2015

6. Organizational Issues – Lectures

- ❖ Lectures: Monday
 - Time: 11:40 - 13:20 hours
 - Location: S3|11 Room 0012

- ❖ In case of questions, concerns, help, or ideas concerning the lecture please contact:
 - David Hausheer
 - By e-mail hausheer@ps.tu-darmstadt.de
 - Matthias Wichtlhuber, Leonhard Nobach (Coordinators)
Christian Koch, Fabian Kaup, Jeremias Blendin
 - By e-mail [\[mwichtlh|lnobach|ckoch|fkaup|jblendin\]@ps.tu-darmstadt.de](mailto:[mwichtlh|lnobach|ckoch|fkaup|jblendin]@ps.tu-darmstadt.de)

7. Organizational Issues – Exercises



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- ❖ Exercises / Lab Work: Tuesday
 - Time: 16:15 - 17:55 hours
 - Location: S1|01 Room A5

- ❖ Introduction: **21.04. 16:15 (S101/A5)**

- ❖ Support:
 - Matthias Wichtlhuber, Leonhard Nobach (Coordinators)
Christian Koch, Fabian Kaup, Jeremias Blendin
 - By e-mail [mwichtlh|lnobach|ckoch|fkaup|jblendin]@ps.tu-darmstadt.de
 - Room: S3|19 [7/8] (**only upon appointment!**)

8. Teaching Resources

- ❖ All resources will be available on the Moodle platform
 - Lecture slides as PDF, on regular basis before the lecture date
 - Exercise assignments (typically two weeks before the exercise date) and solutions (directly after the exercise date)

- ❖ Location
 - <https://moodle.tu-darmstadt.de/>
 - Course: Peer-to-Peer Systems 18-hh-2010-vI SoSe 2015
 - Direct link: <https://moodle.tu-darmstadt.de/course/view.php?id=4764>

- ❖ You will be registered to the Moodle course automatically, after signing up in TUcAN.

9. Registration in TUCaN

❖ ETiT/CS students

- Register for (1) the module, (2) the lecture, and (3) the exercises
- Register for module:
«Peer-to-Peer Systems and Applications» (18-hh-2010)
- Register for lecture: 18-hh-2010-vI
- Register for exercises: 18-hh-2010-ue

❖ Since SS2015 module 18-hh-2010 is offered for **CS students**

- Replaces former module 18-hh-3010 «Peer-to-Peer II - Methods»

9. Registration in TUCaN



My TUCaN | Course Catalogue | Schedule | **Teaching** | Examinations | Service | Application | Help |

Your Courses

Your Modules

Courses of Prof. Dr. David Hausheer

Semester selection

Choose a semester

Semester: [Refresh](#)

Events

No.	Name	Instructors	Time period	Credits
Lehrveranstaltung				
18-hh-2010-ue	Peer-to-Peer Systems and Applications	Prof. Dr. David Hausheer	Tue, 14. Apr. 2015 - Tue, 14. Jul. 2015	
18-hh-2010-vl	Peer-to-Peer Systems and Applications	Prof. Dr. David Hausheer	Mon, 13. Apr. 2015 - Mon, 13. Jul. 2015	
18-hh-3010-ue	Peer-to-Peer II - Methods	Prof. Dr. David Hausheer	Tue, 14. Apr. 2015 - Tue, 14. Jul. 2015	
18-hh-3010-vl	Peer-to-Peer II - Methods	Prof. Dr. David Hausheer	Mon, 13. Apr. 2015 - Mon, 13. Jul. 2015	

* And related study programs (Wi-CS, Wi-ETiT, iST, etc.)

10. Exam

- ❖ The written exam will take place on **<tbd>**
- ❖ 90 minutes exam
- ❖ Exam material: lecture and exercise slides
 - Further reading helps to understand the material better
- ❖ Max. 90 points
 - General P2P knowledge questions
 - Understanding and application of basic P2P concepts
 - E.g. completion of signaling scheme for a specific use case
 - Understanding of differences between alternatives
 - Calculations based on specific use case examples
 - Etc.
- ❖ *In case of few registrations, an oral exam will be held.*

11. Summary

❖ Register in TUCaN

➤ Module, Lecture, and Exercises

- ETiT/CS students: «P2P Systems and Applications» (18-hh-2010)

❖ Check out the Moodle

➤ <https://moodle.tu-darmstadt.de/course/view.php?id=4764>

❖ Check out the course website for all infos

- Scan the QR code with your smartphone
- Direct link: <http://tinyurl.com/p2psystems>
- or <http://www.ps.tu-darmstadt.de/teaching/p2p/>



Seminar Software Defined Networking

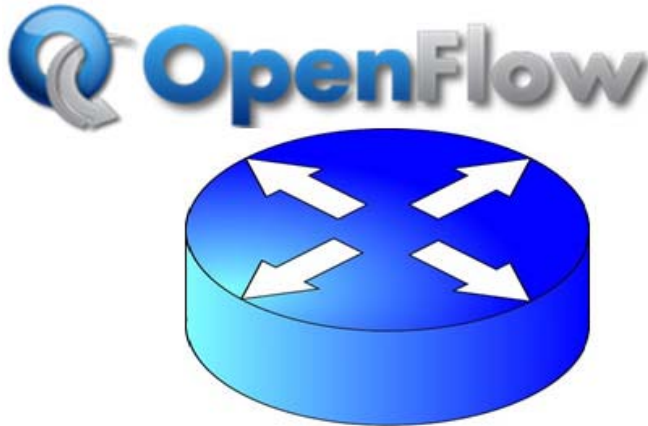
Introduction on 13.04.15
16:15h S3/11 Room 006



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❖ Lecturer

- Prof. Dr. David Hausheer



❖ Competencies

- Literature search, classification, evaluation, and comparison
- Writing (10-12 pages) and presentation (30min) of a literature study

❖ Prerequisites

- Knowledge of Communication Networks I and II is recommended
- Students of M.Sc. ETiT, B. Sc./M. Sc. CS

❖ Topics, not limited to:

- SDN Architecture
- SDN Interfaces (North/South-bound vs. East/West-bound interface)
- SDN Applications
- Network Virtualization and Slicing
- Network Function Virtualization (NFV) and Network Service Chaining
- SDN Security
- Network Operating Systems and Languages
- OpenFlow Controller (e.g. NOX, Beacon)
- Hardware vs. Software Switches
- Software Defined Networking in Wireless Networks (e.g. OpenWRT)

Interested?
Scan the QR code with
your smartphone or
visit the course page:
<http://tinyurl.com/seminar-sdn>



CN Lab – Advanced Topics in Communication Networks

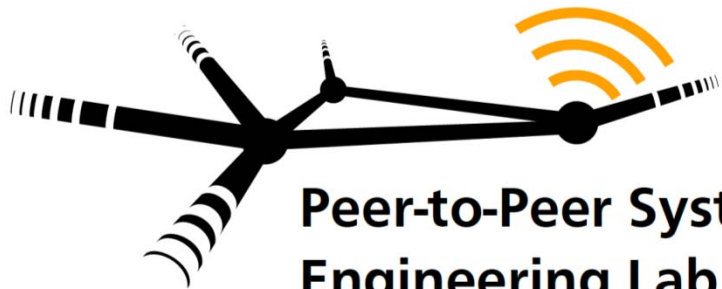
Introduction on 14.04.15
16:15h S1/01 Room A5



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❖ Lecturer

- Prof. Dr. David Hausheer



**Peer-to-Peer Systems
Engineering Lab (PS)**

❖ Organization

- Single/group work, 2-6 hours/week, 3-9 CP
- Offered in parallel as four modules:
18-hh-2030-pr, 18-hh-2040-pj,
18-hh-3020-pr, 18-hh-3030-pr

❖ Prerequisites

- Solid programming experience; Interest to develop challenging network applications
- Students of M.Sc. ETiT, B. Sc./M. Sc. CS

❖ Contents, not limited to:

- Peer-to-peer and overlay networks
- Mobile P2P networks, P2P video streaming
- Network functions virtualization
- Software-defined networking
- Energy-efficient networking
- Network simulation
- Economic aspects

❖ Competencies

- Design & development of communication networks & applications
- Application of object-oriented programming techniques

Interested?
Scan the QR code with
your smartphone or
visit the course page:
<http://tinyurl.com/ps-cnlab>



❖ Open Theses

➤ <http://www.ps.tu-darmstadt.de/> => Teaching => Theses

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Teaching

- Winter Term 2014/2015
- Summer Term 2014
- Winter Term 2013/2014
- Summer Term 2013
- Winter Term 2012/2013
- Summer Term 2012
- Winter Term 2011/2012
- Summer Term 2011

Theses

- Open
- In Progress
- Completed
- Guidelines
- Templates

Currently open theses

- [Extension of a Simulator for Video Consumption Prediction](#)
A major fraction of today's Internet traffic is caused by video streaming from platforms like YouTube, Vine, or Facebook. This is highly noticeable in the user habits as well as on the network operator side. On the user side, watching of music videos on a regul... [\[more\]](#)
Tutor: [Christian Koch](#)
- [Development of a Crawling and Monitoring Service for Detection of Fake Hits in YouTube](#)
YouTube is one of today's most popular video streaming services. It provides a wide range of different videos for its users, e.g. music, tutorials, movies, and "let's plays". For the video producer YouTube is also interesting as a marketing channel ... [\[more\]](#)
Tutor: [Christian Koch](#)
- [Improving User Experience of Video Content Consumption by Leveraging Social Information](#)
Video streaming has been steadily increasing over the last few years resulting in a major fraction of today's Internet traffic. Different mechanisms were introduced to reduce the network load while maintaining a high Quality of Experience (QoE) for the end user. Examp... [\[more\]](#)
Tutor: [Christian Koch](#)
- [Social Mobile Offloading](#)
The proliferation of mobile devices such as smart phones and tablets has led to an explosion of mobile data traffic, bringing the existing cellular infrastructure to its limit. Moreover, according to recent studies, this trend is going to continue and mobile data traffic vol... [\[more\]](#)
Tutor: [Matthias Wichhuber](#)
- [GPU Based Video Quality Assessment](#)
The visual cortex of the human brain can assess the perceived quality of a video sequence within split seconds. As this information is very valuable for video encoding and transmission schemes, Quality of



**Peer-to-Peer Systems
Engineering Lab (PS)**

Contact

[Prof. Dr. David Hausheer](#)
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Quality-of-Service in Telecommunication Networks (V2 + Ü0)

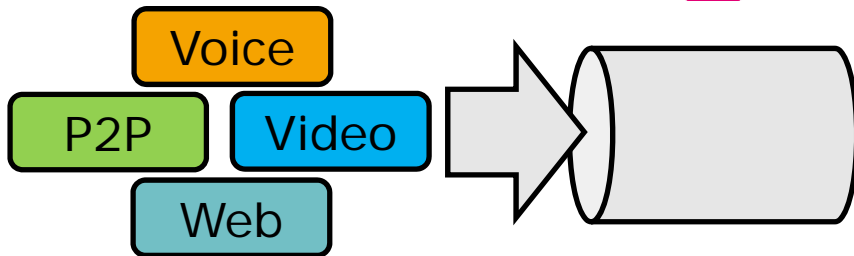
Introduction on 13.04.15
09:50h S3/20 Room 005



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❖ Lecturer:

- PD Dr. Gerhard Hasslinger
(Deutsche Telekom AG)



❖ Organization

- 2 + 0 hours per week, 3.0 credit points
- Lecture: Mondays, 09:50 – 11:30, S320/5

❖ Prerequisites

- Knowledge of Communication Networks I and II is recommended
- Students of M.Sc. ETiT, B.Sc./M.Sc. CS (and related study programs)

❖ Contents, not limited to:

- Architecture, services and protocols for Broadband Access and Core Networks
 - BGP, OSPF, MPLS
 - Overlay Networks for Content Delivery (CDN & Caching, P2P)
- Quality-of-Service (QoS) Architectures
 - IntServ, DiffServ, IP Traffic Mgmt.

❖ Competences

- Insights into the state of the art in managing Internet Service Provider networks

Interested?
Scan the QR code with
your smartphone or
visit the course page:
<http://tinyurl.com/qos-telco>

