Peer-to-Peer Networks

01: Organization and Introduction
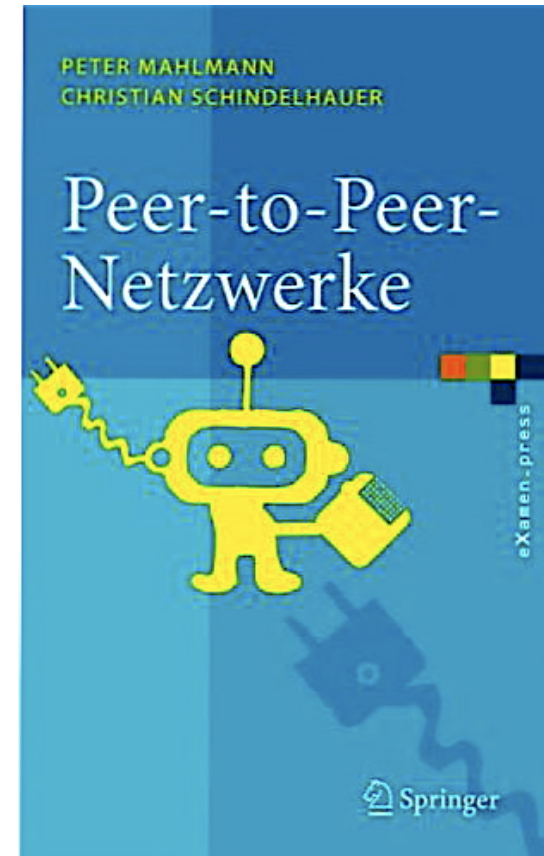
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Web & Dates

- **Web page**
  - http://cone.informatik.uni-freiburg.de/lehre/vorlesung/peer-to-peer-s10/index.html

- **Lecture**
  - Thursday, 9am-11am, building 101, SR 01-009/13
  - Friday, 11am-12am, building 101, SR 01-009/13

- **Exercise classes**
  - Arne Vater
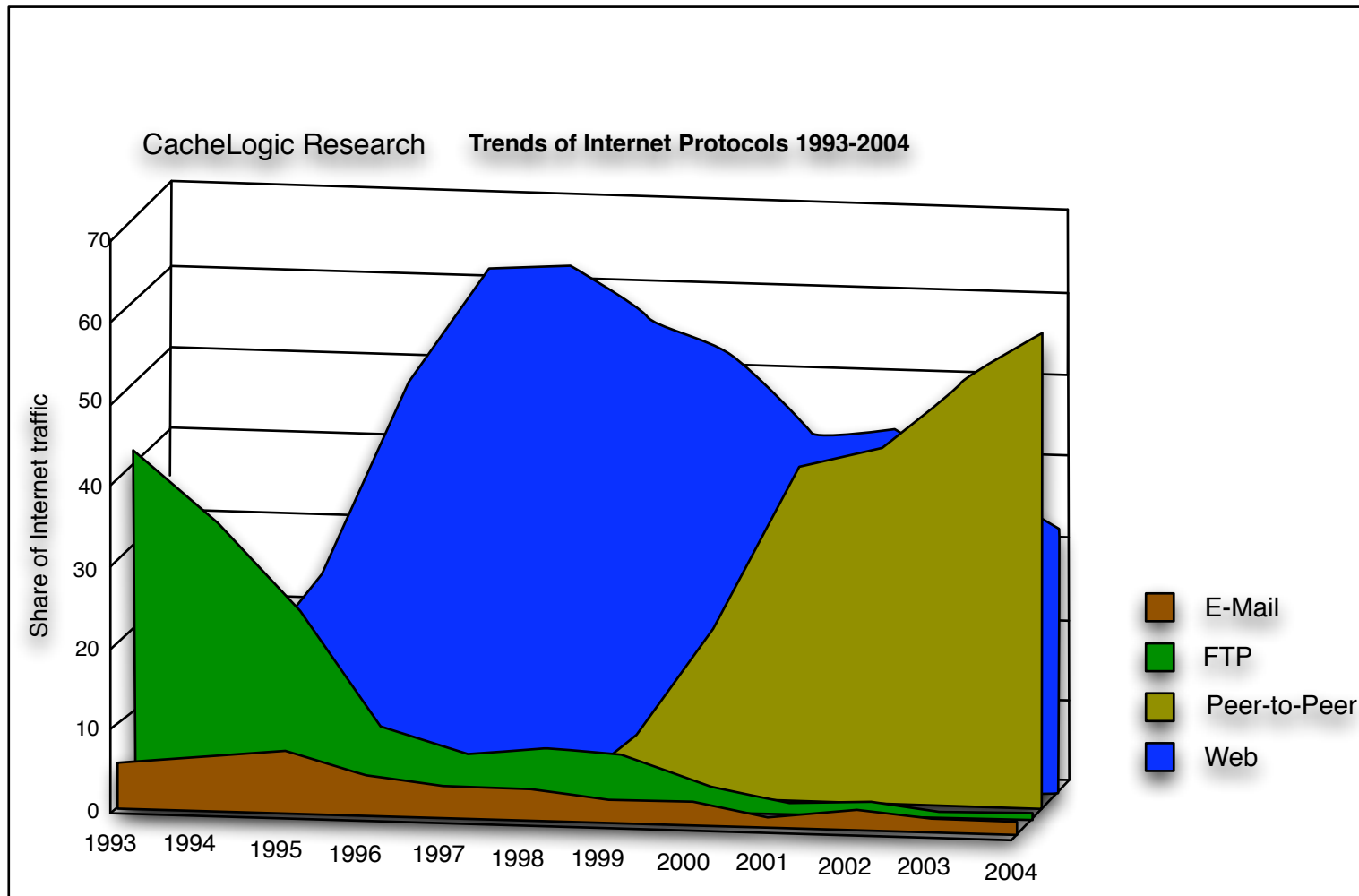 - Friday, 12am-1pm, building 101, SR 01-009/13

Exercises

- **Exercise class**
  - Friday, 12am-1pm, building 101, SR 01-009/13
  - start: 30.04.2010
- **Exercises**
  - appear every Friday on the web-pages
  - should be solved by students
  - are the bases for the oral exam
  - solutions of the exercises are discussed in the following week

Exam

- **Dates by appointment**
  - possible dates are presented in the last four lectures
    - probably first week after the lecture and in the middle of the lecture free summer
  - Contact me during the lecture or send an E-Mail to
    schindel@informatik.uni-freiburg.de

- **Oral exam**
  - based on the lecture and the exercises

- **Mandatory registration**
  - Students of computer science register at the secretary of exams (Prüfungssekretariat)
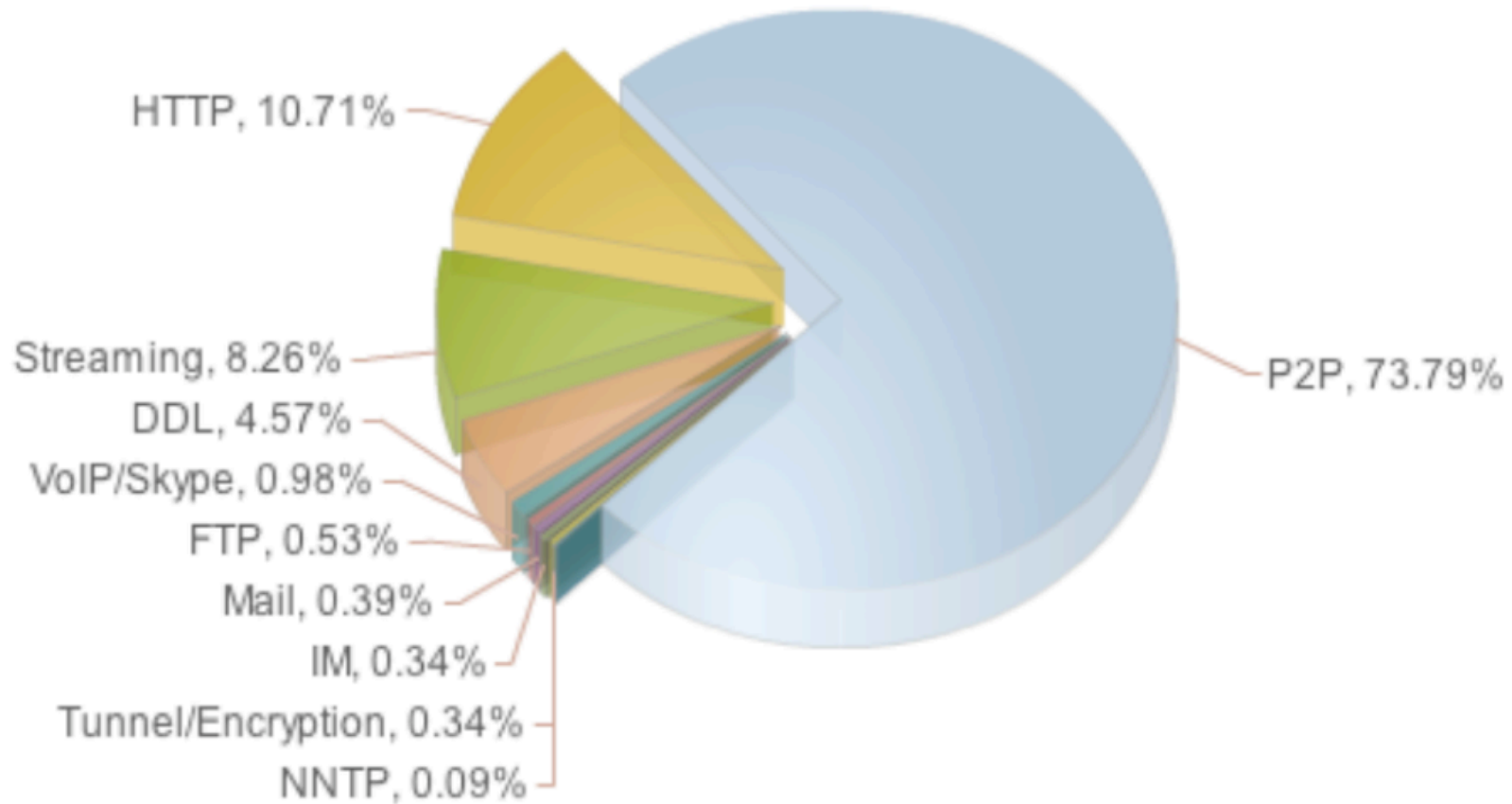
Materials

- **Slides**
  - appear before the lecture on the web-page

- **Book**
  - at least 70% of the lecture can be found in *Mahlmann, Schindelhauer, Peer-to-Peer-Netzwerke — Methoden und Algorithmen, Springer 2007*

- **Further Literature**
  - Research papers will be presented during the lecture on the slides and on the web-page

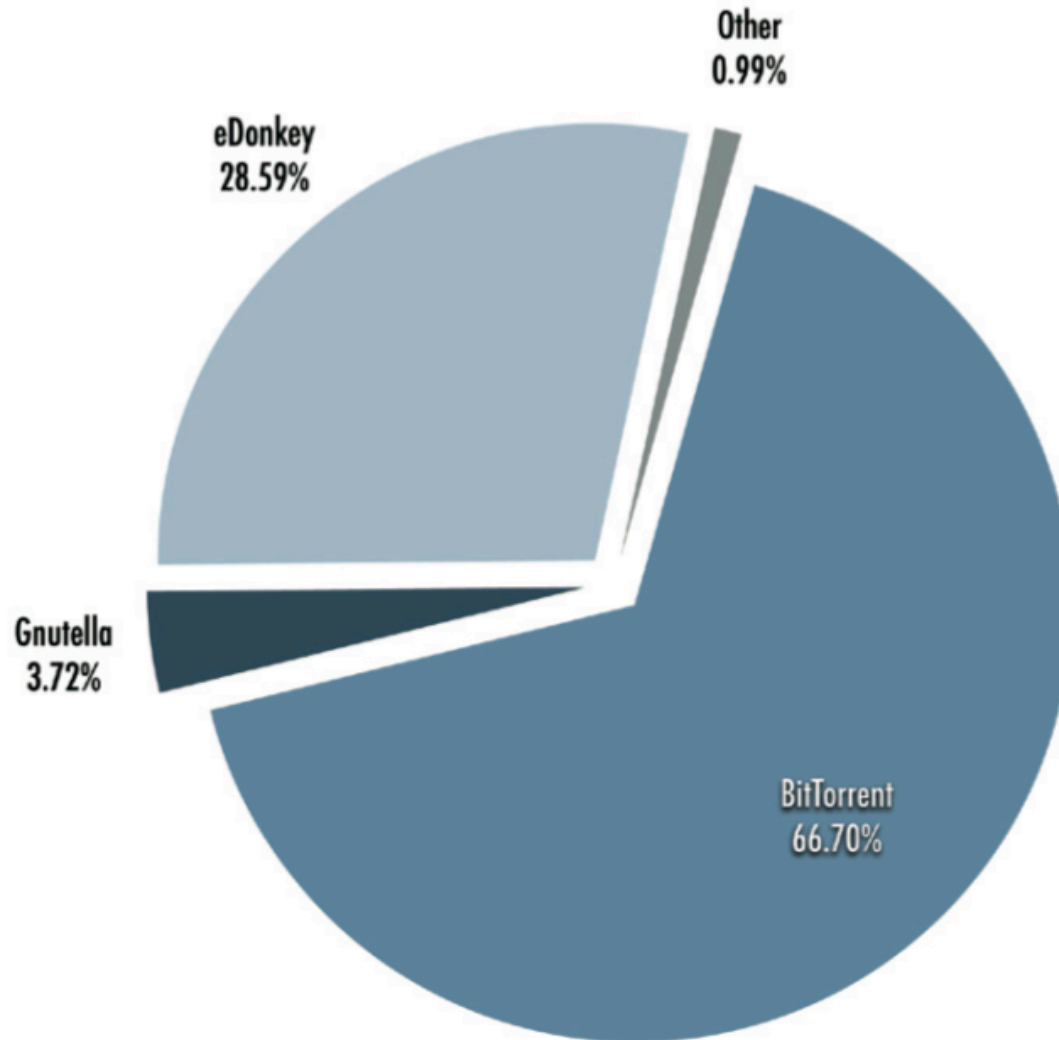# Global Internet Traffic Shares 1993-2004

CacheLogic Research   **Trends of Internet Protocols 1993-2004**

Share of Internet traffic

Legend:
- E-Mail
- FTP
- Peer-to-Peer
- Web

1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004

P2P Share Germany 2007

HTTP, 10.71%

Streaming, 8.26%

DDL, 4.57%

VoIP/Skype, 0.98%

FTP, 0.53%

Mail, 0.39%

IM, 0.34%

Tunnel/Encryption, 0.34%
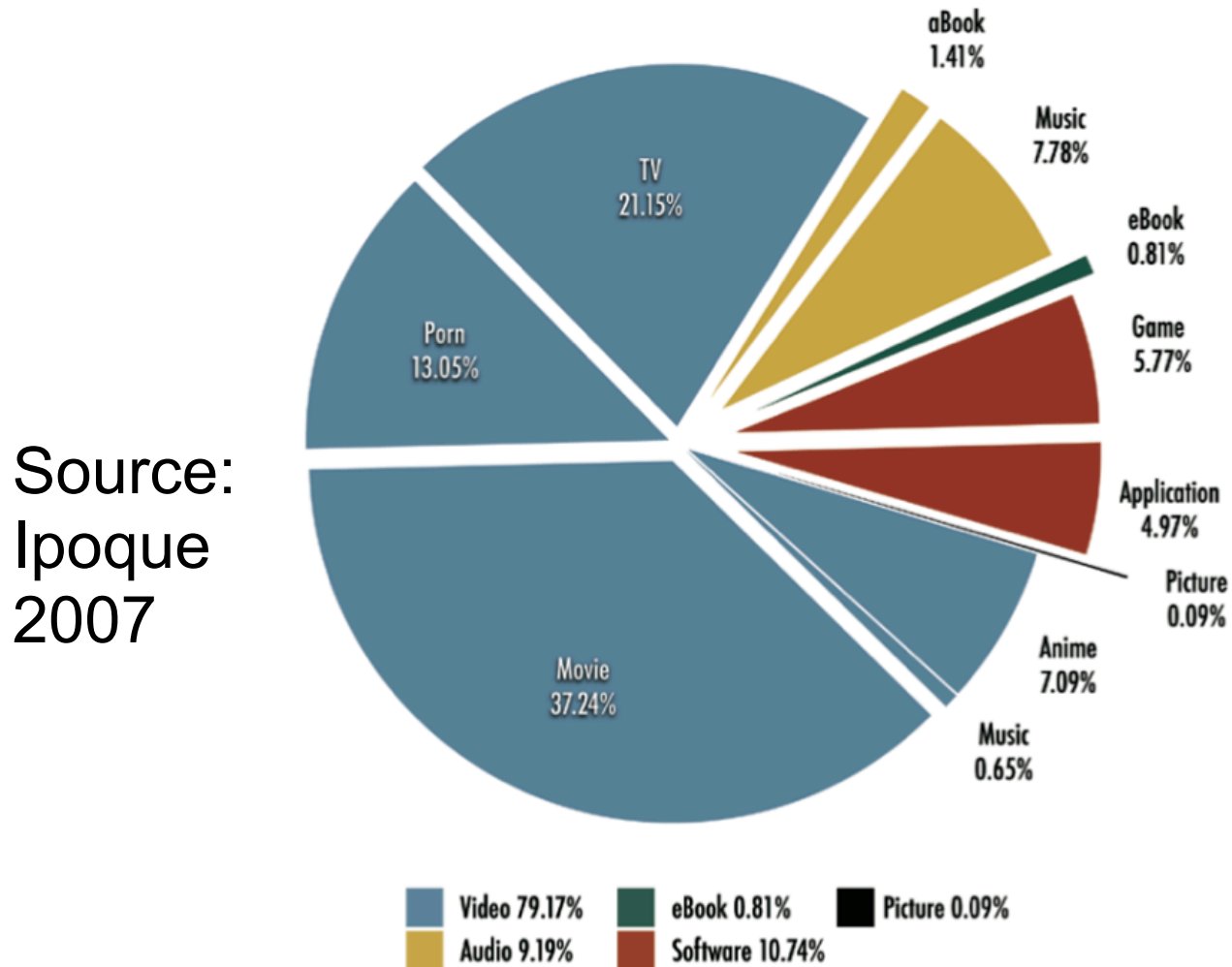
NNTP, 0.09%

P2P, 73.79%

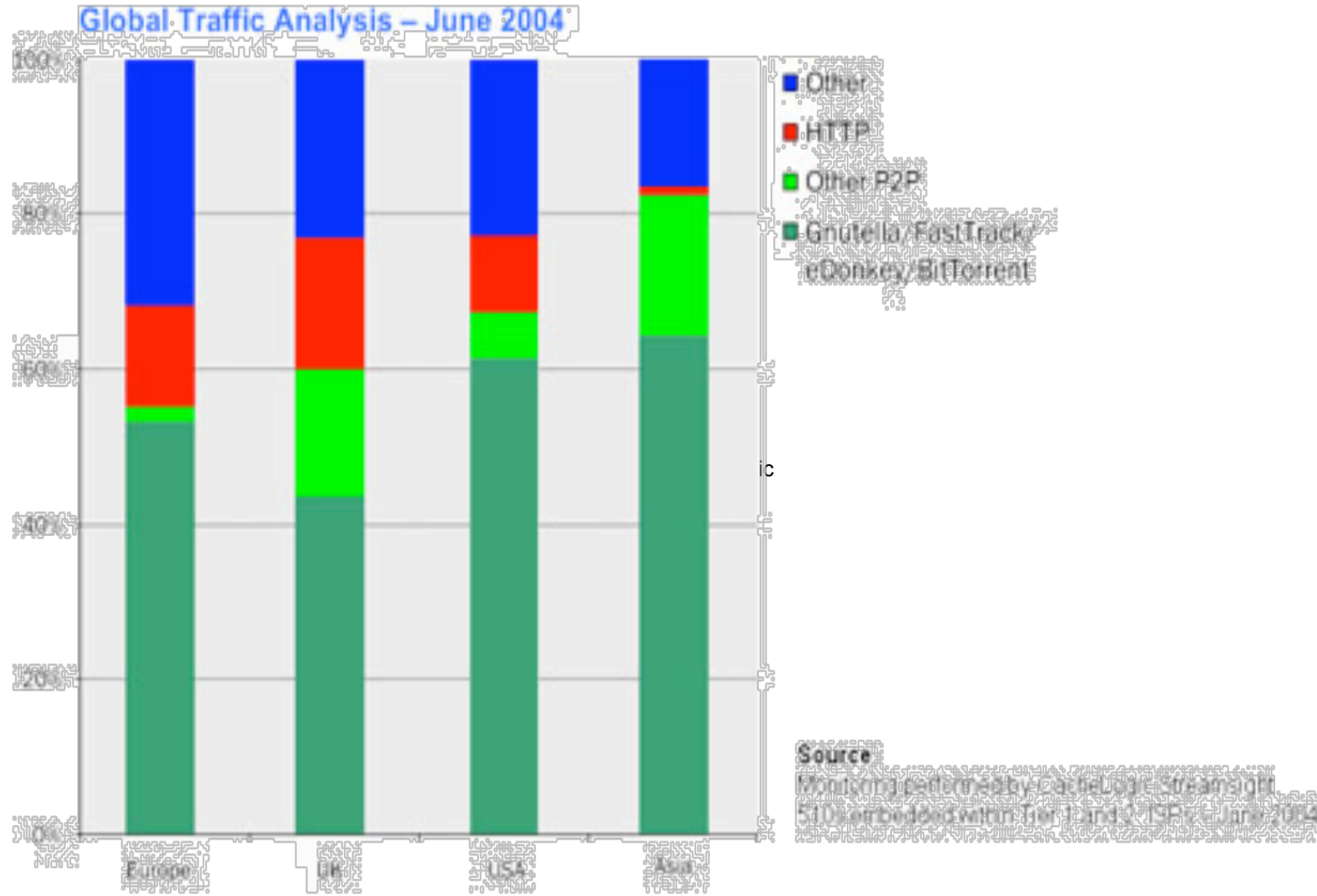# P2P Systems Germany 2007 by Volume

Source:
Ipoque 2007

What Germans Download 2007 by Volume

Traffic Volume per Content Type
Germany, BitTorrent

Source: Ipoque 2007

aBook 1.41%
Music 7.78%
TV 21.15%
eBook 0.81%
Porn 13.05%
Game 5.77%
Application 4.97%
Picture 0.09%
Movie 37.24%
Anime 7.09%
Music 0.65%

Video 79.17%   eBook 0.81%   Picture 0.09%
Audio 9.19%   Software 10.74%

CoNe Freiburg

Global Traffic Analysis – June 2004

Legend:
- Other (blue)
- HTTP (red)
- Other P2P (green)
- Gnutella / FastTrack / eDonkey / BitTorrent (teal)

Categories: Europe, UK, USA, Asia

Source
Monitoring performed by CacheLogic StreamSight 510 embedded within Tier 1 and 2 ISPs – June 2004
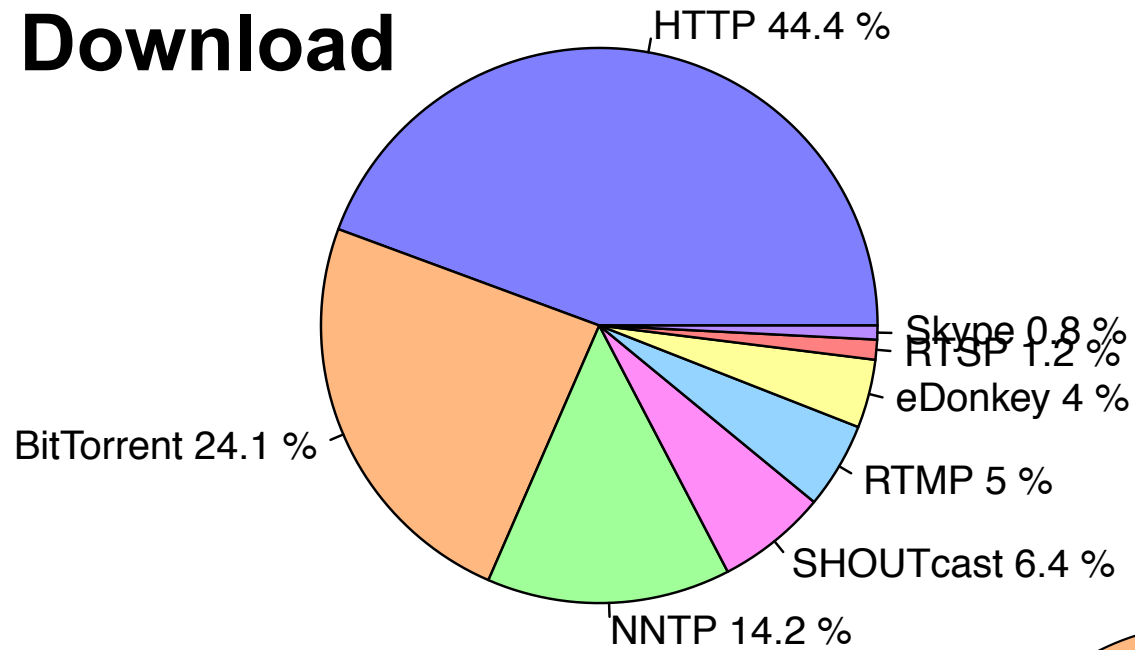
Global Internet Traffic 2007

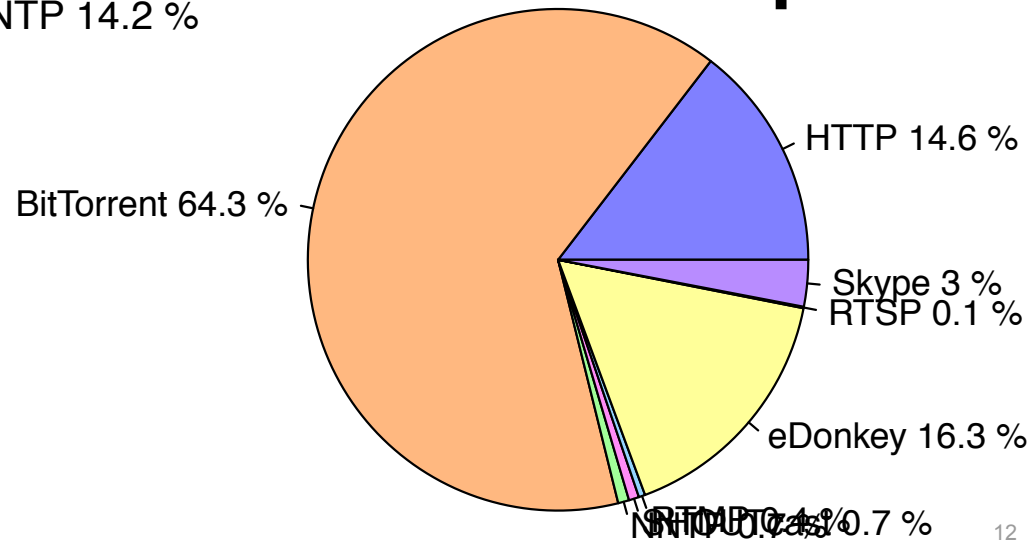■ **Ellacoya report (June 2007)**

  - worldwide HTTP traffic volume overtakes P2P after four years continues record

■ **Main reason: Youtube.com**

P2P
37 %

gaming
2 %

non-HTTP video streaming
3 %

Newsgroups
9 %

VoIP
1 %

rest
2 %

HTTP
46 %

Internet Traffic of a German ISP
August 2009

Download

HTTP 44.4 %

Skype 0.8 %

RTSP 1.2 %

eDonkey 4 %

RTMP 5 %

SHOUTcast 6.4 %

NNTP 14.2 %

BitTorrent 24.1 %

Upload

HTTP 14.6 %

Skype 3 %

RTSP 0.1 %

eDonkey 16.3 %

BitTorrent 64.3 %

RTMP 0.4 % SHOUTcast 0.7 %

NNTP 0.7 %

Milestones P2P Systems
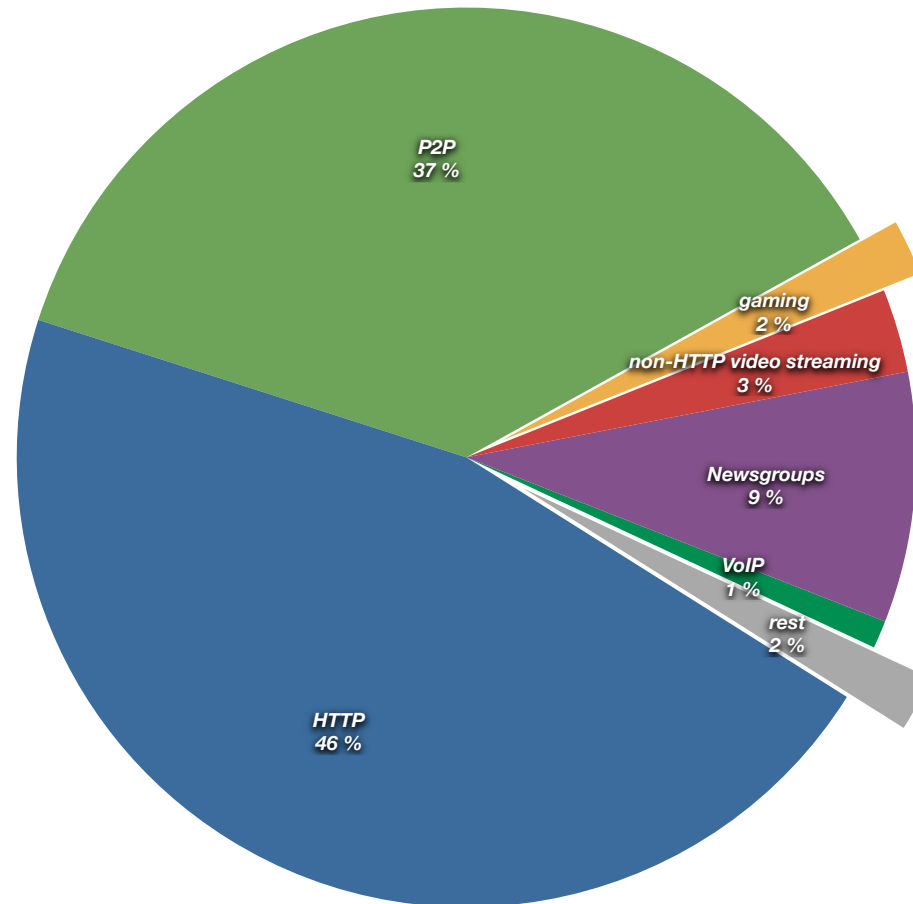
- Napster (1st version: 1999-2000)
- Gnutella (2000), Gnutella-2 (2002)
- Edonkey (2000)
  - later: Overnet usese Kademlia
- FreeNet (2000)
  - Anonymized download
- JXTA (2001)
  - Open source P2P network platform
- FastTrack (2001)
  - known from KaZaa, Morpheus, Grokster
- Bittorrent (2001)
  - only download, no search
- Skype (2003)
  - VoIP (voice over IP), Chat, Video

Milestones Theory

- **Distributed Hash-Tables (DHT) (1997)**
  - introduced for load balancing between web-servers
- **CAN (2001)**
  - efficient distributed DHT data structure for P2P networks
- **Chord (2001)**
  - efficient distributed P2P network with logarithmic search time
- **Pastry/Tapestry (2001)**
  - efficient distributed P2P network using Plaxton routing
- **Kademlia (2002)**
  - P2P-Lookup based on XOr-Metrik
- **Many more exciting approaches**
  - Viceroy, Distance-Halving, Koorde, Skip-Net, P-Grid, ...
- **Recent developments**
  - Network Coding for P2P
  - Game theory in P2P
  - Anonymity, Security

What is a P2P Network?

- ## What is P2P NOT?

  - a peer-to-peer network is not a client-server network

- ## Etymology: peer

  - from latin par = equal

  - one that is of equal standing with another

  - P2P, Peer-to-Peer: a relationship between equal partners

- ## Definition

  - a Peer-to-Peer Network is a communication network between computers in the Internet

    - without central control
    - and without reliable partners

- ## Observation

  - the Internet can be seen as a large P2P network

Contents

- Short history

- First Peer-to-Peer Networks

  - Napster

  - Gnutella

- CAN

- Chord

- Pastry und Tapestry

- Game theory

- P2P traffic

- Codes

- P2P in the real world

Peer-to-Peer Networks

01: Organization and Introduction

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