Exam preparation

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Internet Design Goals

1. Internet communication must continue despite loss of networks or gateways.
2. The Internet must support multiple types of communications service.
3. The Internet architecture must accommodate a variety of networks.
4. The Internet architecture must permit distributed management of its resources.
5. The Internet architecture must be cost effective.
6. The Internet architecture must permit host attachment with a low level of effort.
7. The resources used in the internet architecture must be accountable.

(David Clark, 1988)
Are those design goals suitable for our society?
Example: Network Neutrality

Phone system design:

- Quality-of-service for voice (provisioned bandwidth)
- Payment models:
  - charges based on source and destination (country, mobile / landline / service numbers)
  - caller-pays
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Internet design:

- "best-effort" IP forwarding, agnostic to source, destination, and payload
- Payment model? DARPA!
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Phone companies charge where they can, not where it makes technical sense!
Ideas for Internet Surcharges

- Global IP address (IPv4, IPv6)
- Incoming connections
- non-HTTP traffic
- Using Voice-over-IP
- Downloading videos
- Accessing Google (advanced search) in addition to Bing (basic search)
- Accessing non-European service providers
- Using UDP
- Privacy (not selling your connection data)
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Have you read your ISP’s terms of service?
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Would your friends understand such restrictions?
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Would enough of them care to switch providers?
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Can they switch providers?
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Would enough of them care to switch providers?

Can they switch providers?

Should business models be regulated?
Creative Methods

- Sell "low-latency" plan to service providers
  - Microsoft pays for 50 ms Bing, Google gets 5s penalty latency
- Give customers illusion of speed
  - Prefer traffic to URLs with "speedtest" in them
- Reduce quality of VoIP calls via artificial drops
  - Force customers to pay extra for voice service
- Reduce bandwidth for P2P traffic
  - Entice users to pay for services
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Can we detect such creative methods?
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How can we circumvent them?
Can we detect such creative methods?

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Can enough of society understand the problem?
Can we detect such creative methods?

How can we circumvent them?

Can enough of society understand the problem?

Will society establish laws to ward against this?
General rules:

▶ Bring a calculator and a pen
▶ No notes, no textbooks
▶ No need to learn packet layouts by heart
▶ But: know the semantics of the different fields and how they are used in protocols!
▶ No need to know formulas by heart
▶ But: need to know how and when to apply which one!
Timing

- Exam designed for 90 minutes
- Deadline “soft” like last time
1. Woche

- Anwendung und Ausdehnung von Netzwerken: no
- Rechnernetze: Strukturen / Basiskonzepte: indirekt
- ISO/OSI: yes
2. Woche

- Bandbreiten limitierte signale: yes\(^1\)
- Zeichensätze: no

\(^1\)But no need to perform Fourier transforms.
3. Woche

- Informationstheorie: yes\(^2\)
- Übertragungsmedien: yes

\(^2\)Including being able to use it!
4. Woche

- Bitübertragungsschicht: yes
- Sicherungsschicht: yes³

³Including being able to apply it to problems!
6. Woche

- HDLC/PPP: no
- LAN: yes

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4How does Ethernet work?
7. Woche

- Geschichte: no
- Internet Gremien und Organisationen: yes\(^5\)
- Internet Standards: indirekt

\(^5\)Who does what.
8. Woche

- IP protocol family: indirekt
- IPv4 packet format: yes
- ICMP: indirekt
9. Woche

- IPv4 Addressierung: yes\textsuperscript{6}
- IP routing: no

\textsuperscript{6}Including special ranges.
10. Woche

- IPv4 Fragmentierung: no
- ARP: no
11. Woche

- IPv4 multicast: yes
- UDP: no
12. Woche

- Client-server: indirekt
- TCP segment header: yes
- TCP funktionsweise: yes
13. Woche

- TCP extensions: yes
- TCP congestion control: no
- TCP socket programmierung: yes
14. Woche

- tcpdump: indirekt
- libpcap: no
But...

- IP routing essential for 7072
- Zeichensätze/ARP/UDP/TCP congestion control are all essential in practice

⇒ Ill-advised to just ignore!