

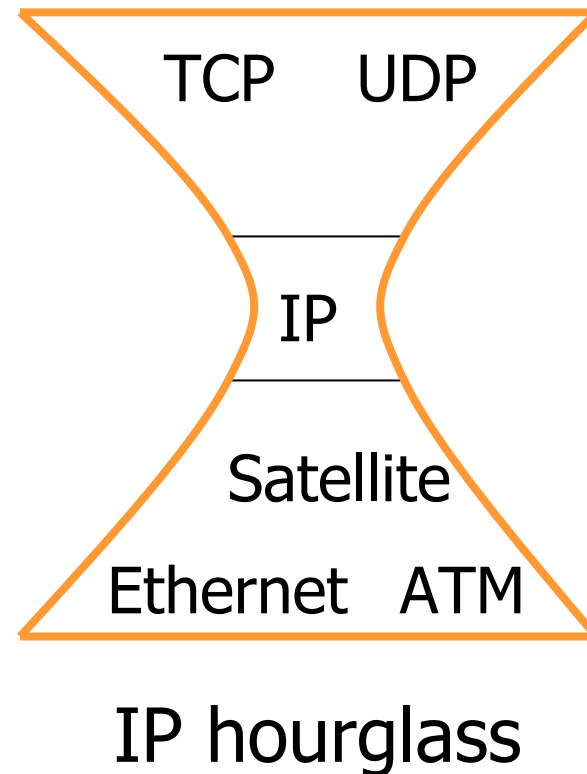
Internet Clean Slate

Prof. Anja Feldmann, Ph.D.

Deutsche Telekom Laboratories
TU-Berlin

Internet architecture idea

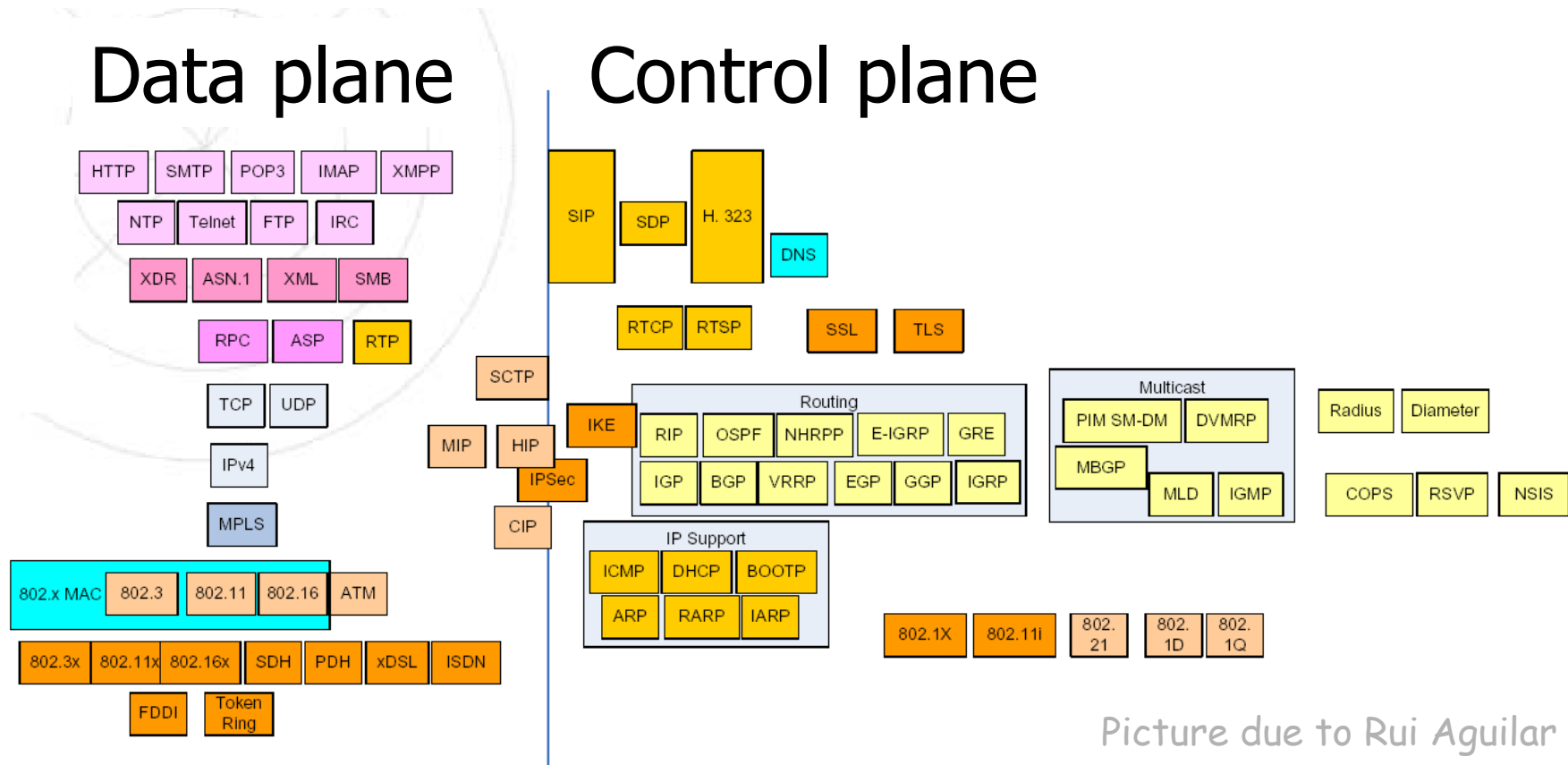
- ❑ Packet-switched datagram network
- ❑ IP is the glue (network layer overlay)
- ❑ IP hourglass architecture
 - All hosts and routers run IP
- ❑ Stateless architecture
 - No per flow state inside network



Today's Internet: Complex System

- ❑ Point-to-point connectivity: NIC, switches
 - Distributed hardware, protocols - local management
- ❑ End-to-end connectivity: Routers
 - Forwarding, addressing, routing
 - Distributed hardware, protocols, software, management by Internet Service Providers (ISPs)
- ❑ Process-to-process connectivity: TCP, UDP
 - De-/multiplexing, reliability, congestion control, ...
- ❑ Applications: Web, P2P, Multimedia...
 - Users
 - Distributed, independent, autonomous, ...

Today's Internet – out of shape!!!



Redesign needed?

Why rethink the Internet architecture

- ❑ Reliability, availability, debuggability
 - ❑ Security
 - ❑ Scale, diversity, manageability
 - ❑ Support for new applications/services
 - ❑ Economics
- ☞ All of the above are **control plane** issues!

Clean slate design: thoughts

- Different **communication paradigm's**
 - Phone networks were about wires, Internet about communication and networking of users, the Future Internet is more and more about sharing of **user-generated content**
 - The **network** itself is becoming more and more a **large distributed database**
 - The **push and pull paradigm** is changing due to the increase of storage in the network, which mediates the communication between users
 - Enable applications to move functionality inside the network: **changing the end-to-end paradigm**

Clean slate design: thoughts (2.)

- ❑ Maybe multiple architectures are needed to consider **different** requirements at the **same** time:
 - **Anonymity** and **accountability** and **security**
 - **Bulk data** transfer and **real-time** communication
 - **Performance** and **functionalities**
- ❑ **Design for**
 - **Tussles?**
 - Multiple **virtualized networks** on one architecture?

Clean slate design: thoughts (3.)

- The Internet itself has always been a large experimental infrastructure in itself, so could an experimental infrastructure be a good model or starting point for a future internet?
- Is Internet becoming more about programmable hosts rather than the network?
- Move services inside the network? Placement of/responsibility for functionality?

Clean slate design: thoughts (4.)

- ❑ Internet has **no built-in** security mechanisms, because it relies on cooperation and trust – **can** or **should** this be maintained?
- ❑ Internet is more and more about **wireless access**
 - Spectrum allocated to Internet access is only a tiny fraction – most spectrum is unused
 - Integration of wired/wireless networks
 - Seamless mobility of users/services/networks

Rethinking the Internet architecture

- ❑ Explore alternative architectures
- ❑ Clean slate design (CSD)
 - Start from scratch
- ❑ Advantage CSD
 - Architecture not intrinsic
 - Experiments and failures are possible
 - No limitations: enables rethinking of the network and service architecture
- ❑ Approach:
 - Experimental facility
 - Research into new architectures