Internet Clean Slate

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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!!!

Data plane

Control plane

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