To Session or not to Session

Session Concepts in Currently Emerging Future Networks

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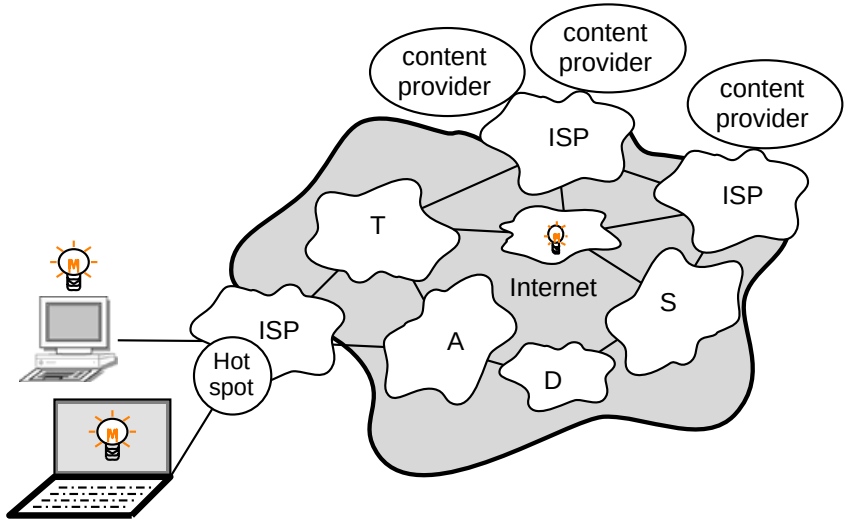
6th Würzburg Workshop on IP: "Visions of Future Generation Networks"
August 1, 2006

Outline:

- **To session in general**
- **Pros and cons of sessioning**
- **To session in particular**

Traditional Network Design Principles

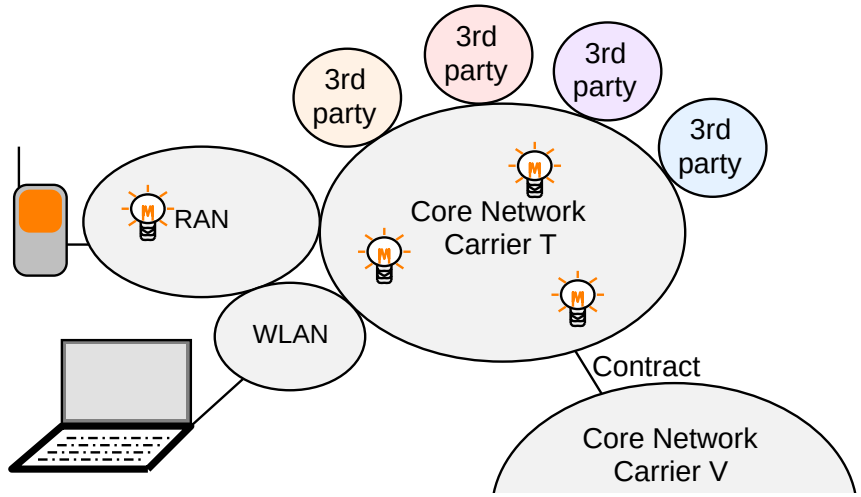
Internet



- **End-to-end argument: Intelligence is located in the end-nodes**
- **ISP provides bitpipe only**
- **Open to many new services**

➥ **User centric design**

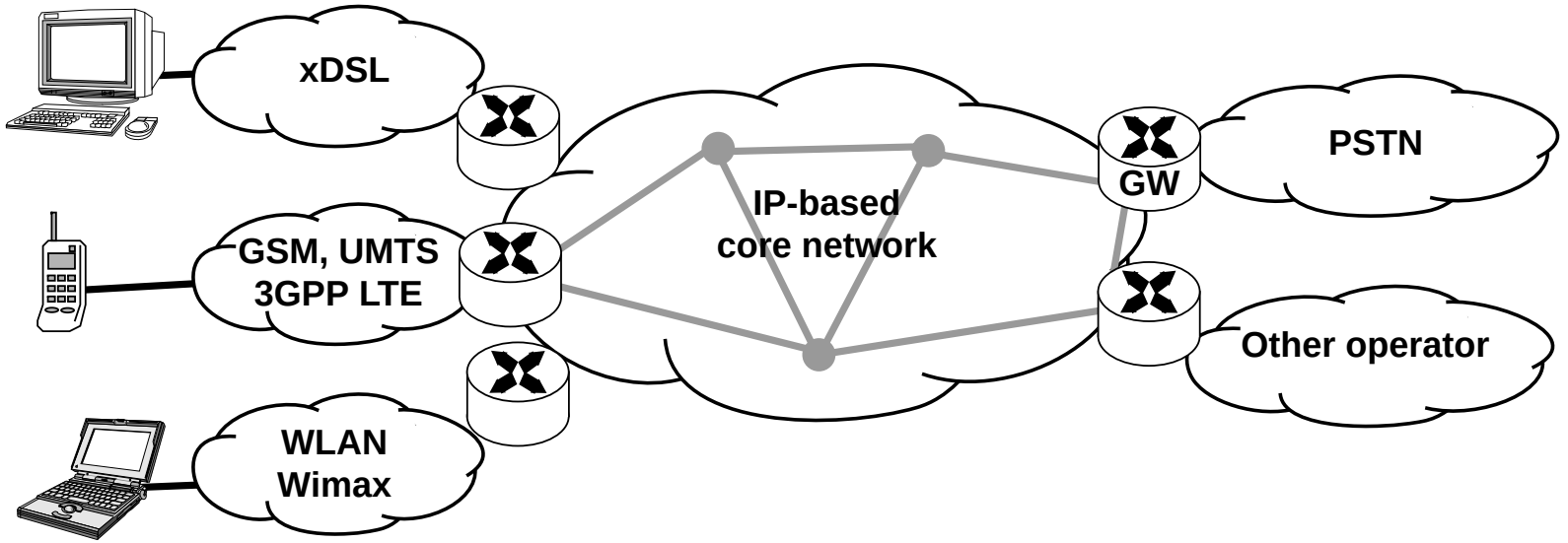
Telecommunication networks



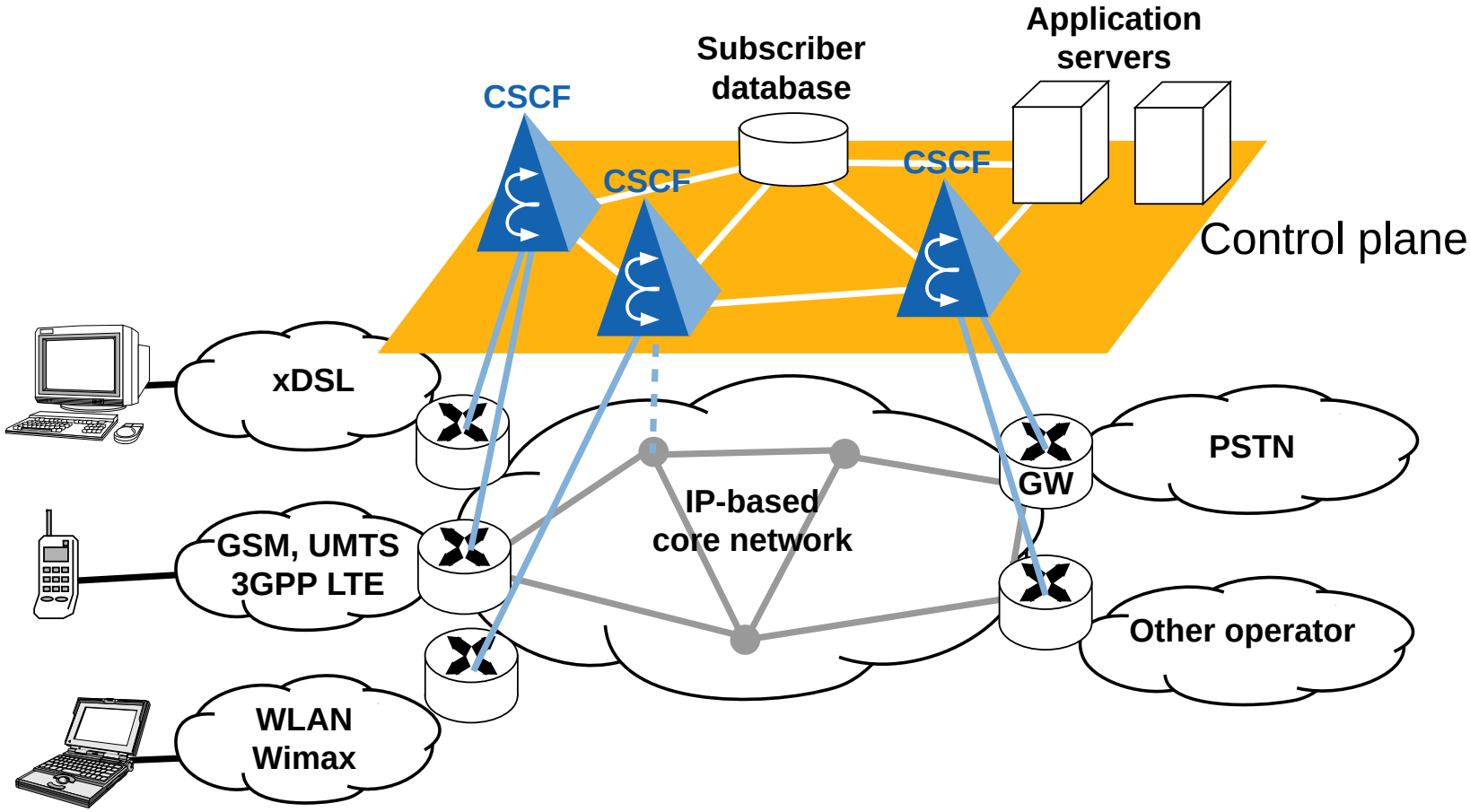
- **Operator control: Intelligence is located in the network**
- **Closed network, usage-based charging**
- **Well-standardized services**

➥ **Operator driven / network centric**

All-IP Networks ...

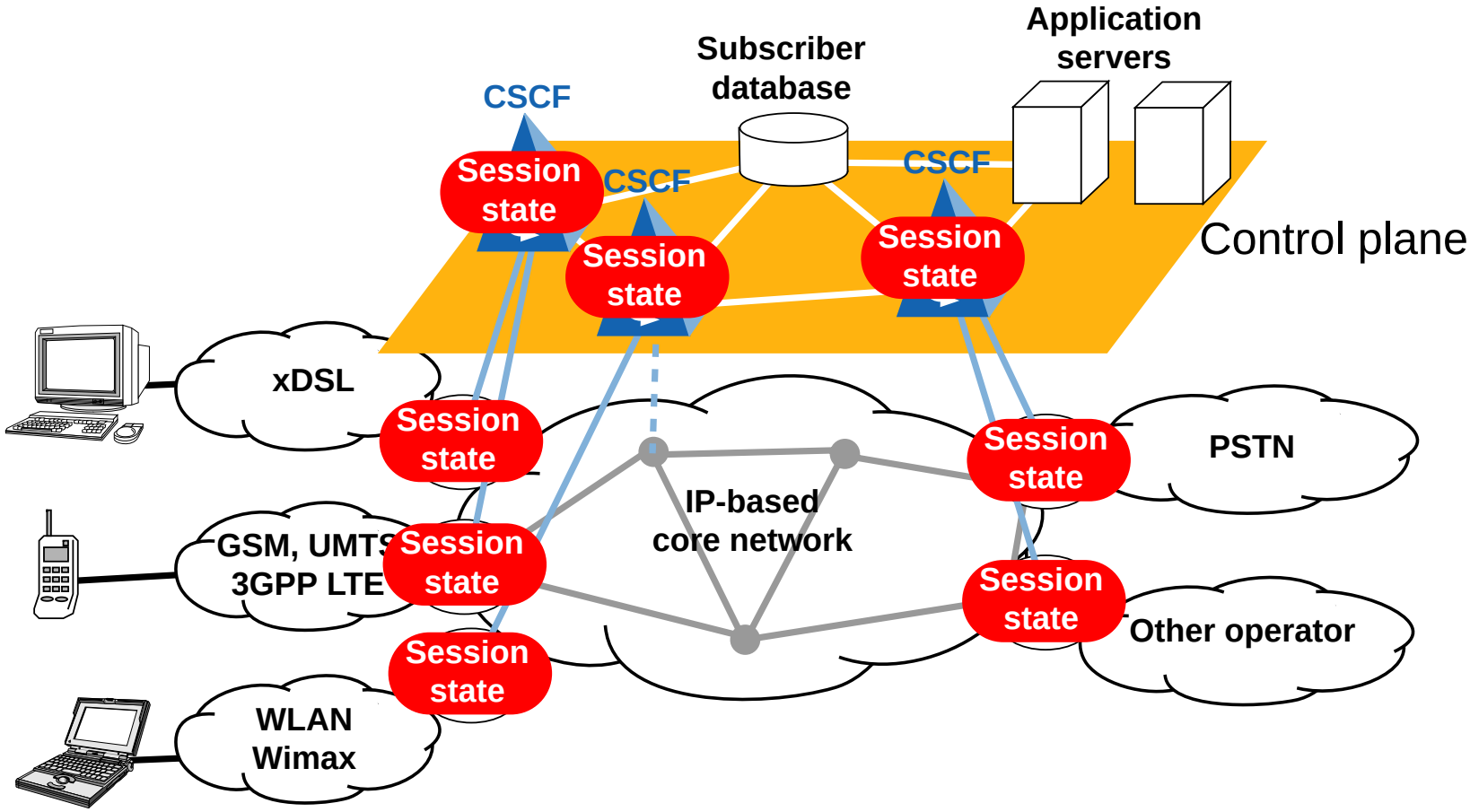


All-IP Networks ... Under Full Operator Control



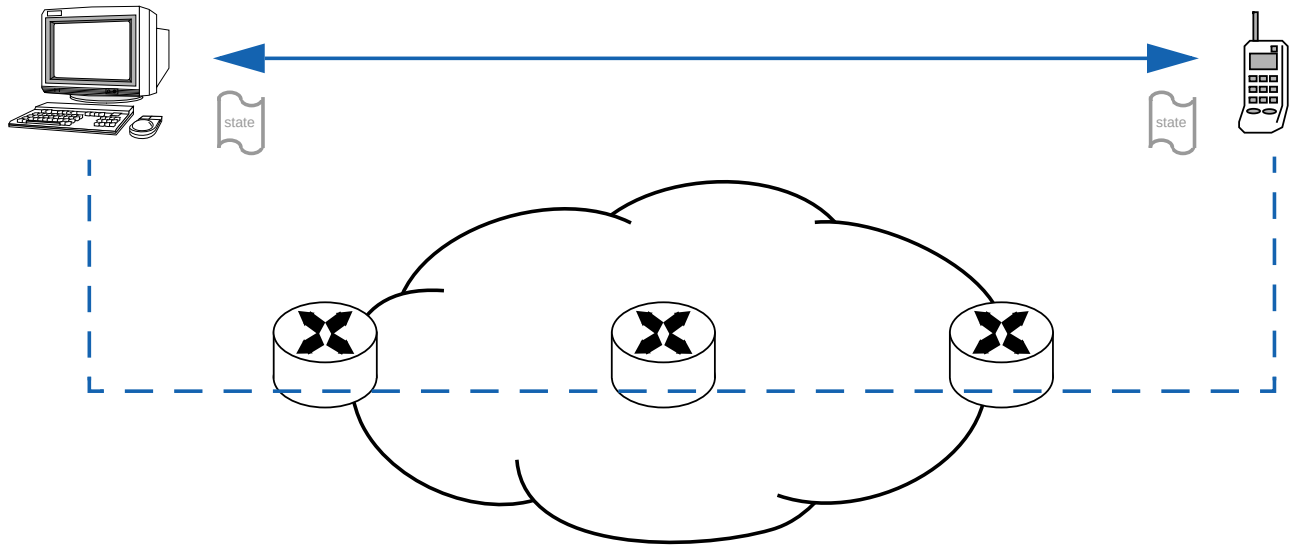
➥ **NGN architectures of 3GPP, ETSI, and ITU-T: IP Multimedia Subsystem (IMS), TISPAN, ...**

All-IP Networks ... Under Full Operator Control?



➥ **NGN architectures of 3GPP, ETSI, and ITU-T: IP Multimedia Subsystem (IMS), TISPAN, ...**

From Session to State



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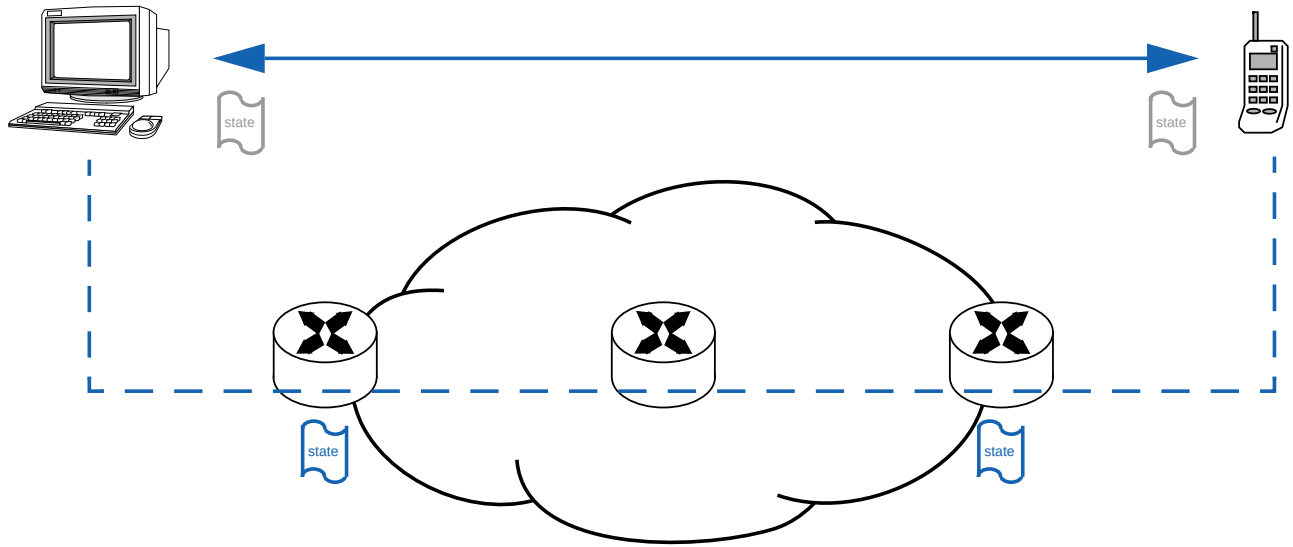

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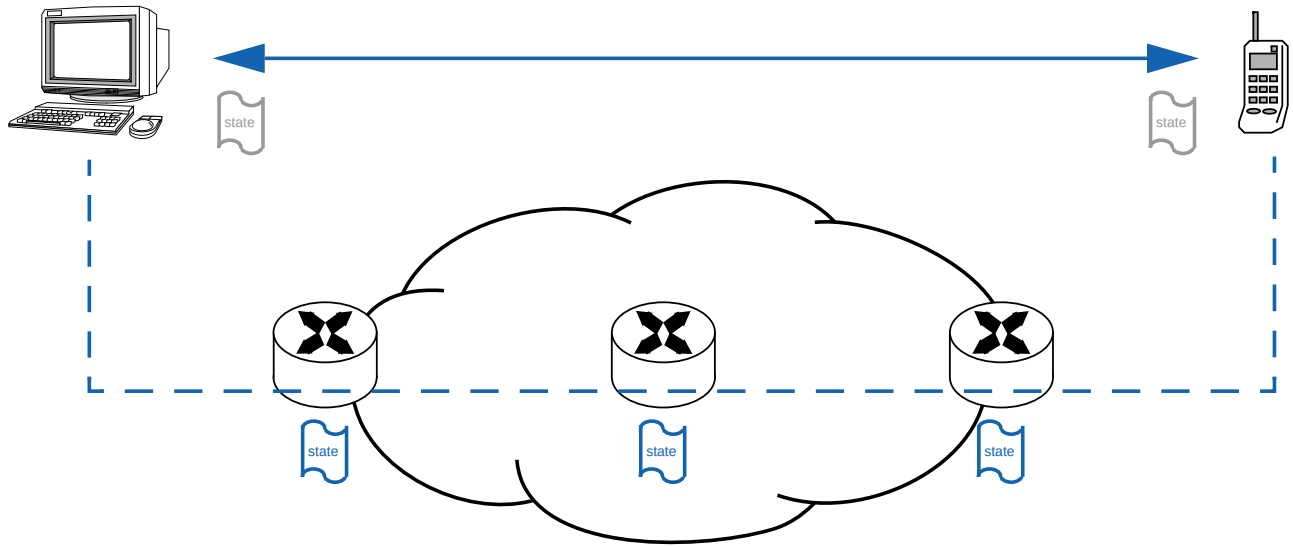

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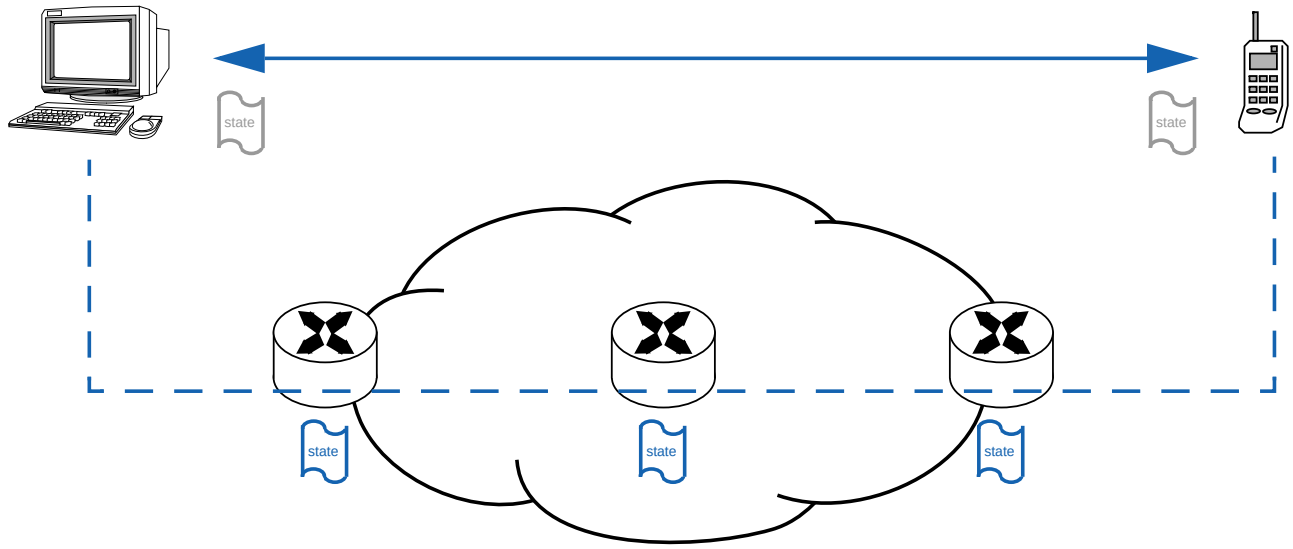

State semantics

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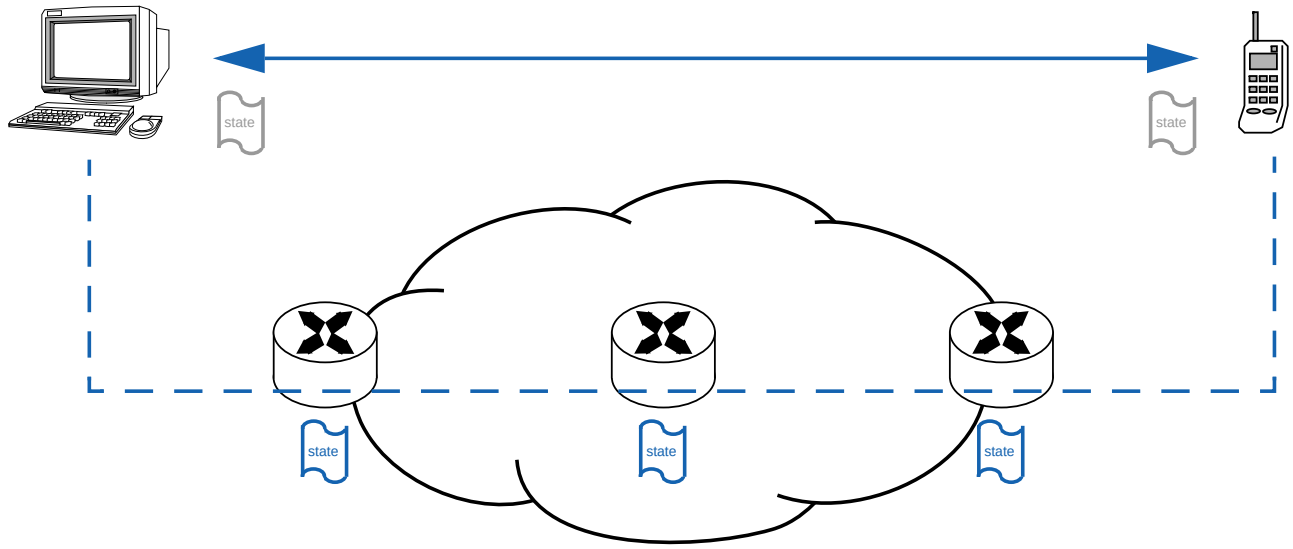

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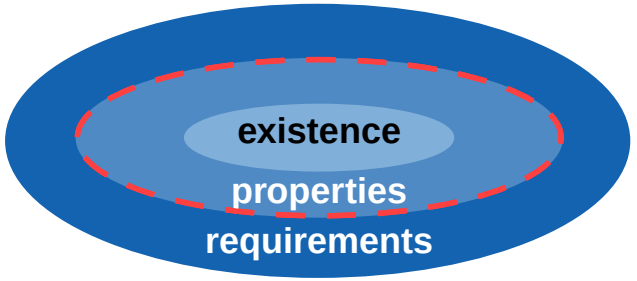

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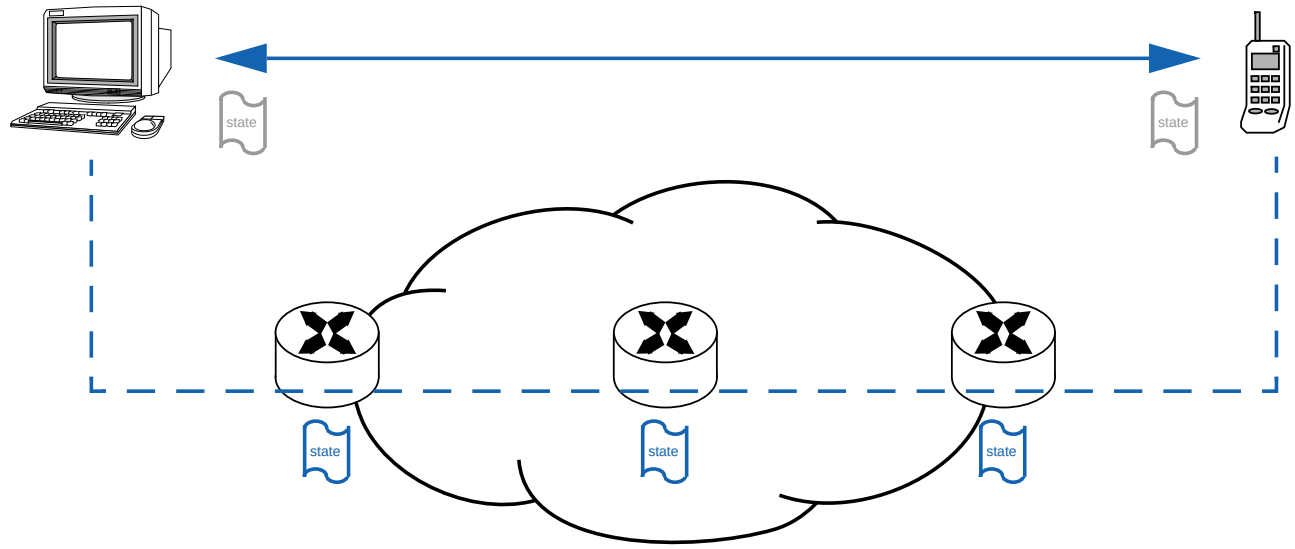
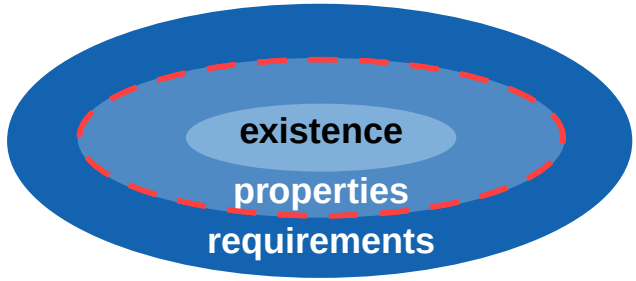
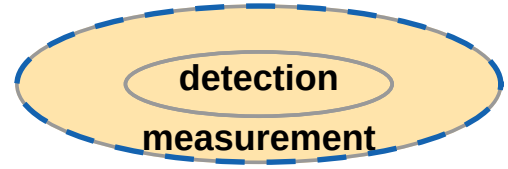


State semantics

Functionality of network element





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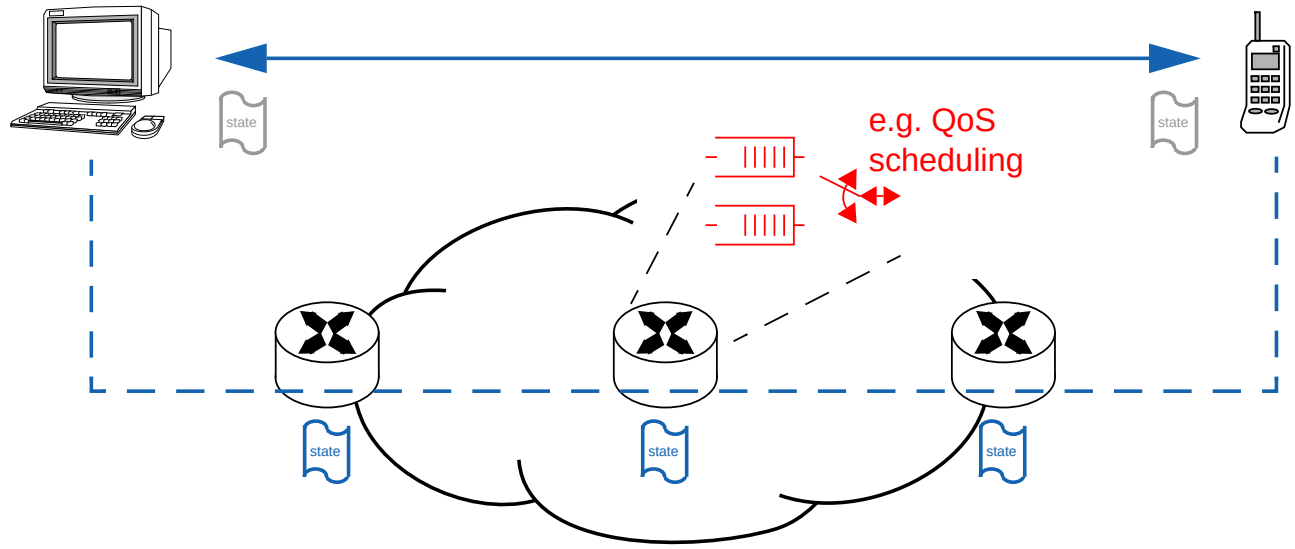

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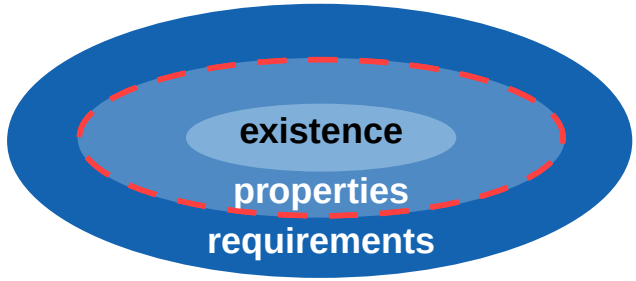

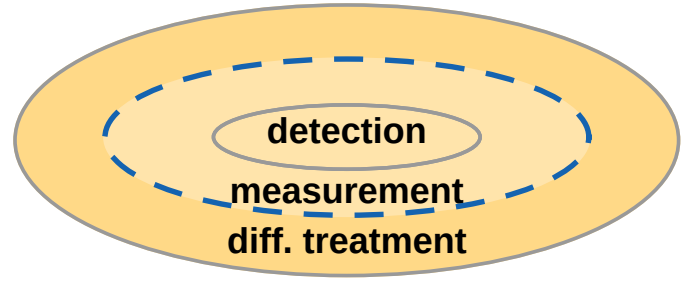

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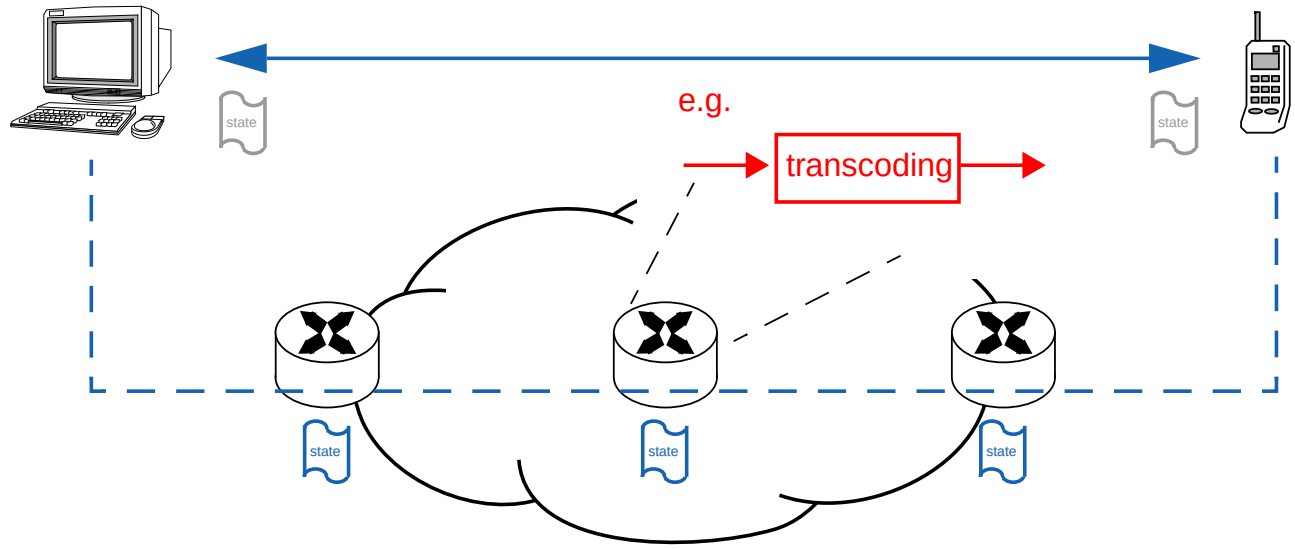

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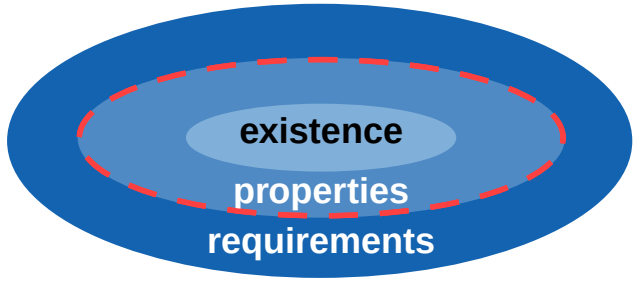

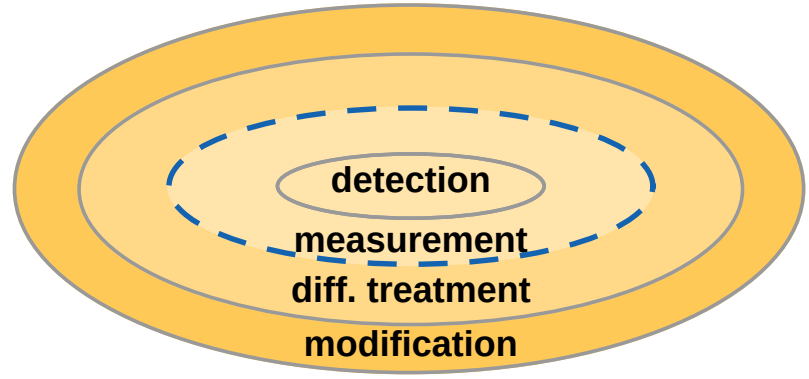

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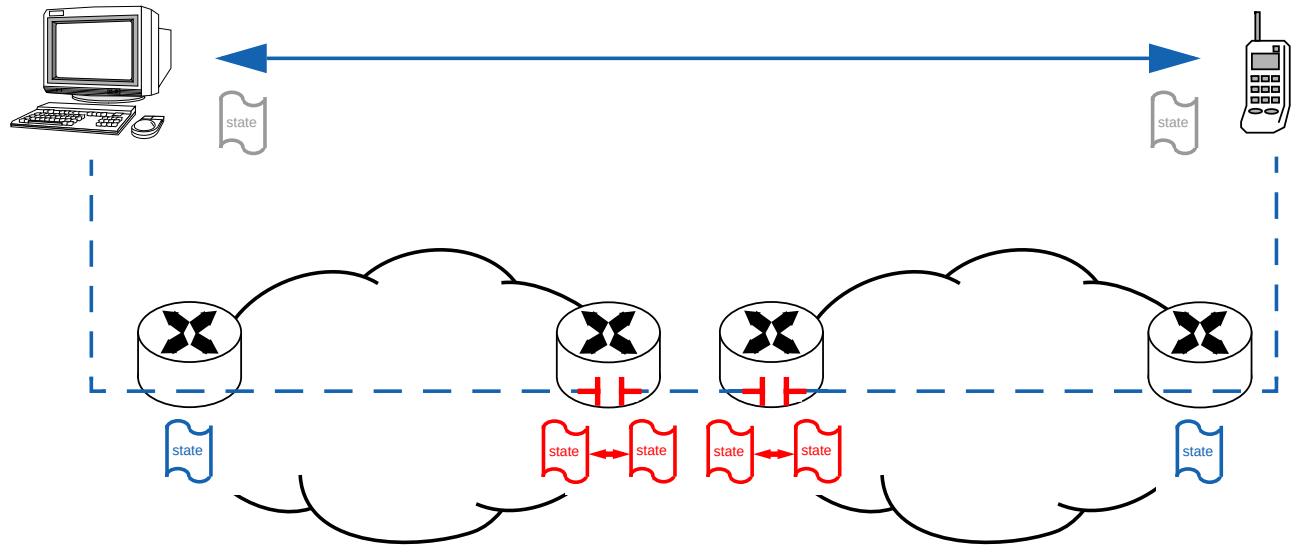

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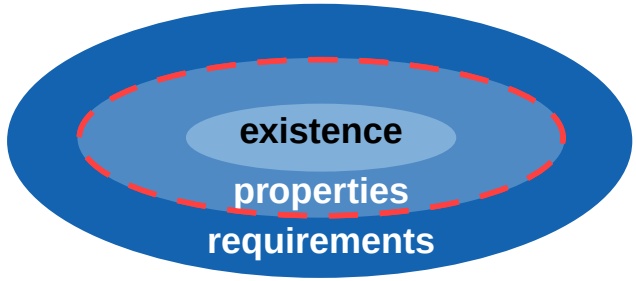

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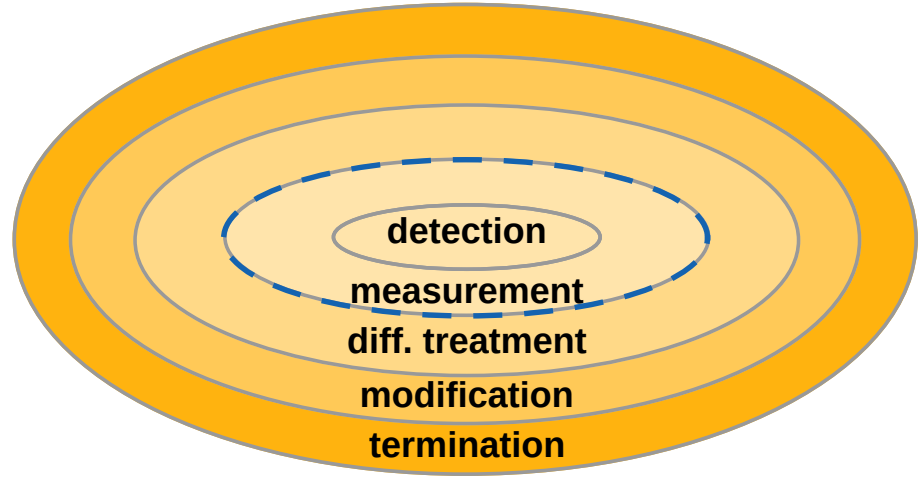

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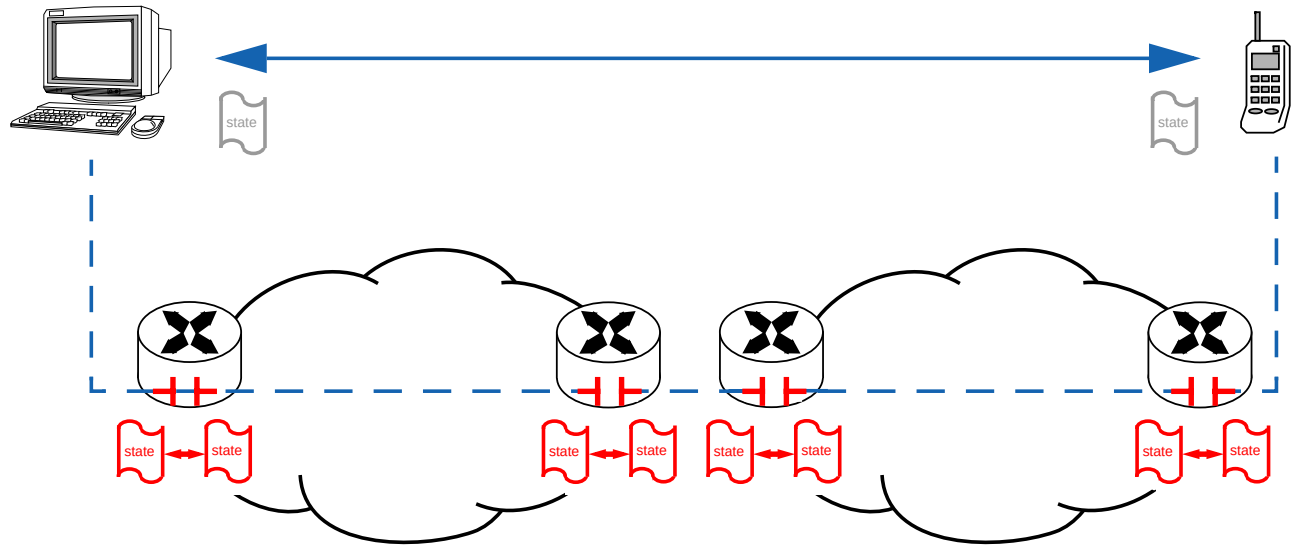

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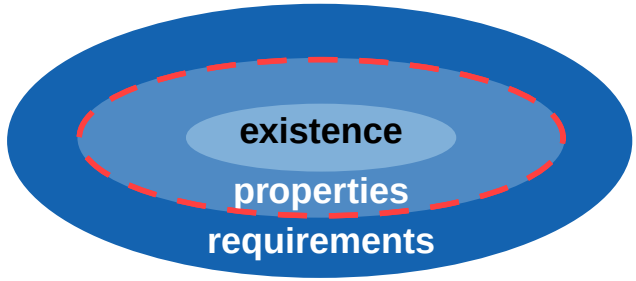

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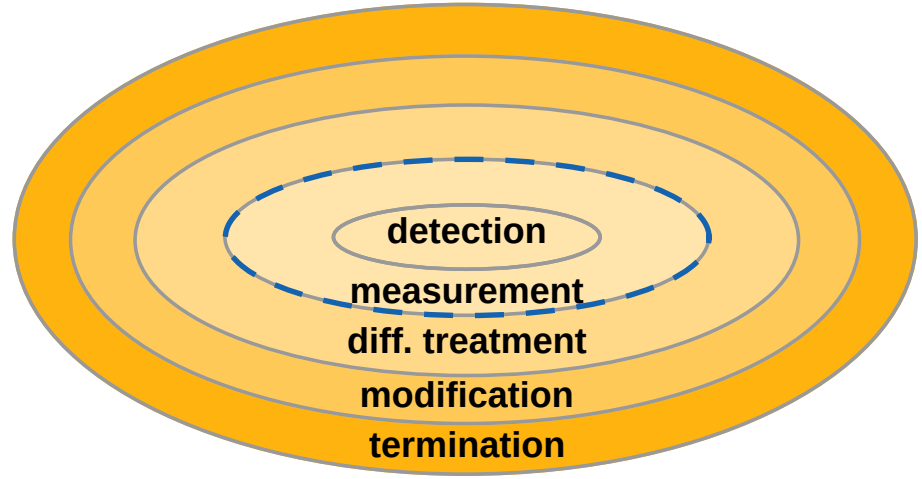
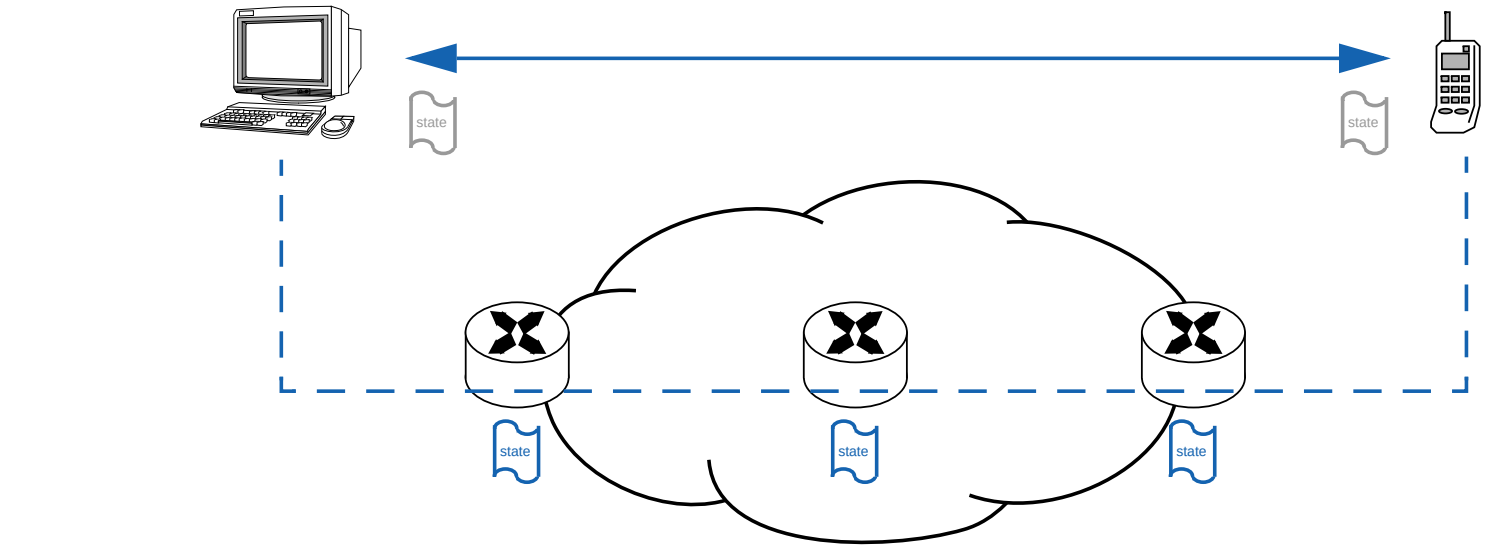
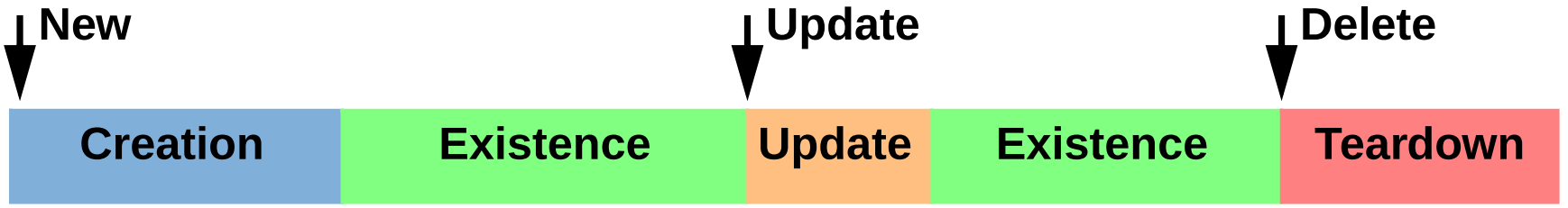


Lifeline of Network State





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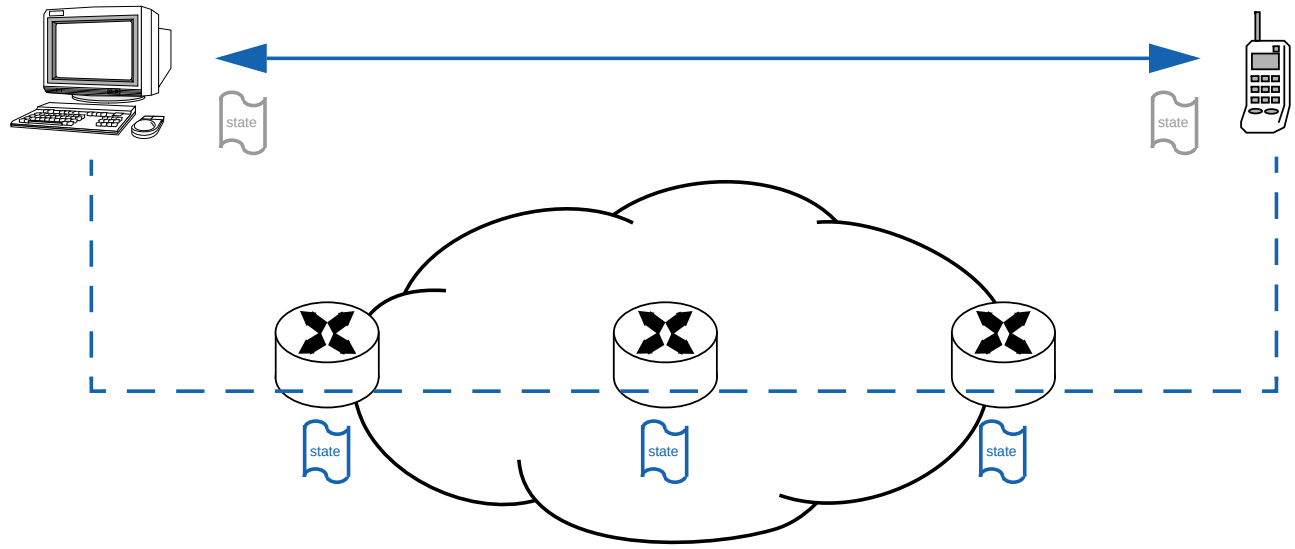

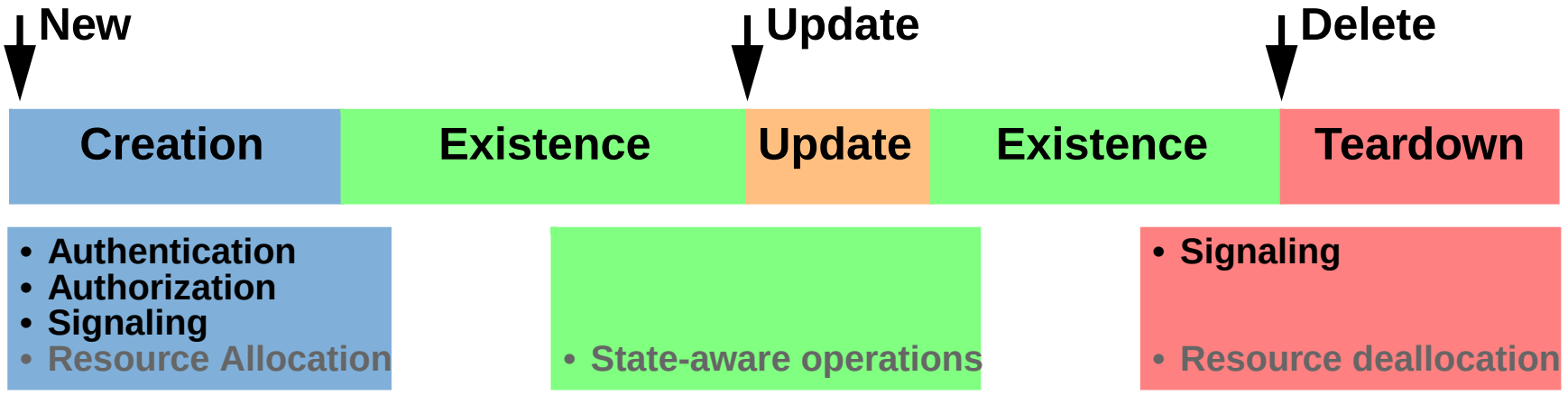

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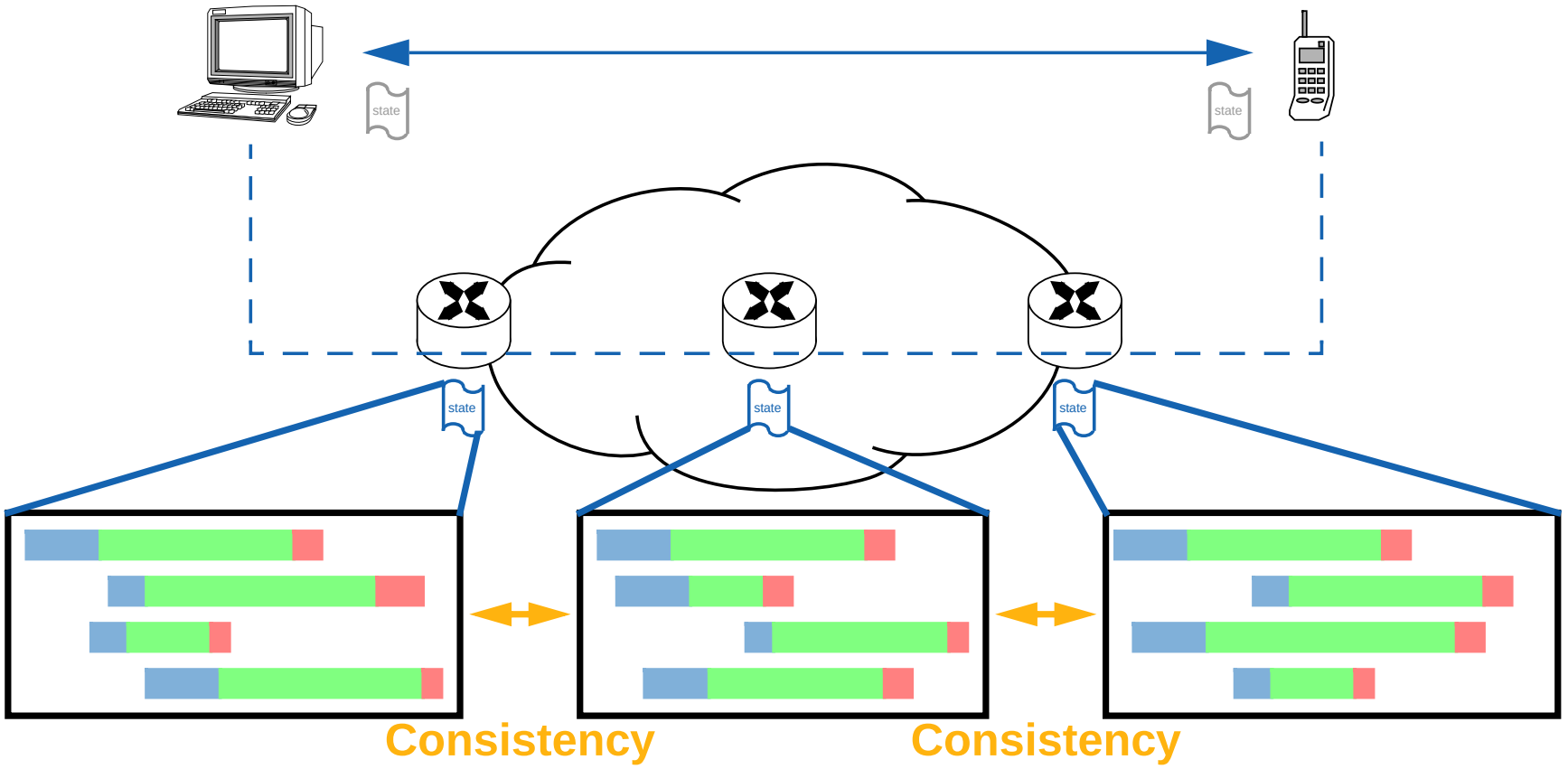
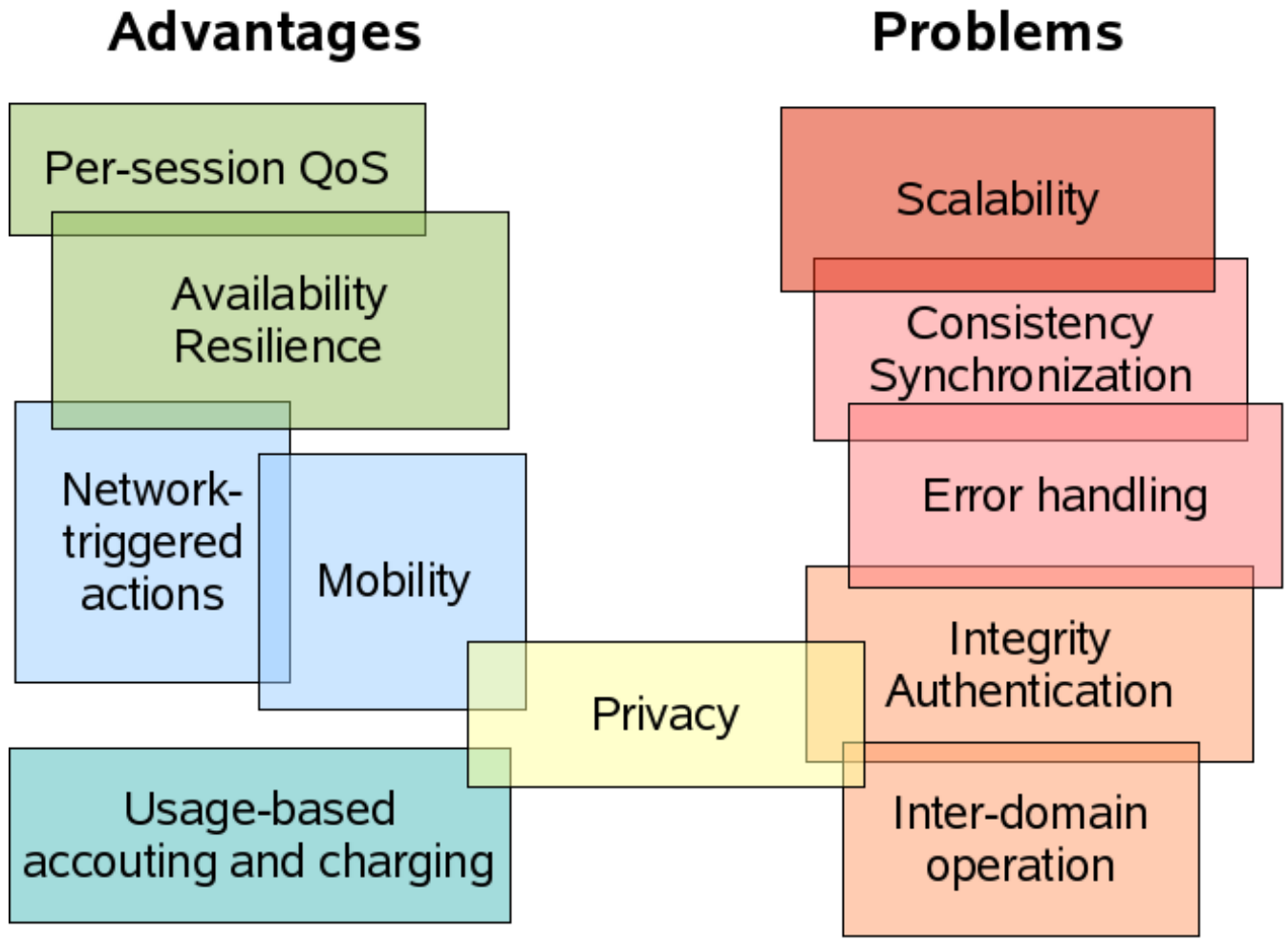


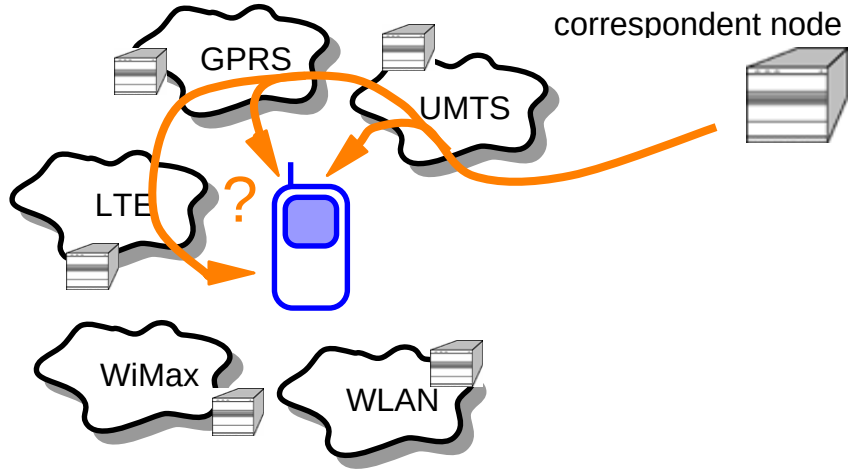
Pros and Cons of State in the Network



➥ **Reasons beyond QoS!**

Mobility Management

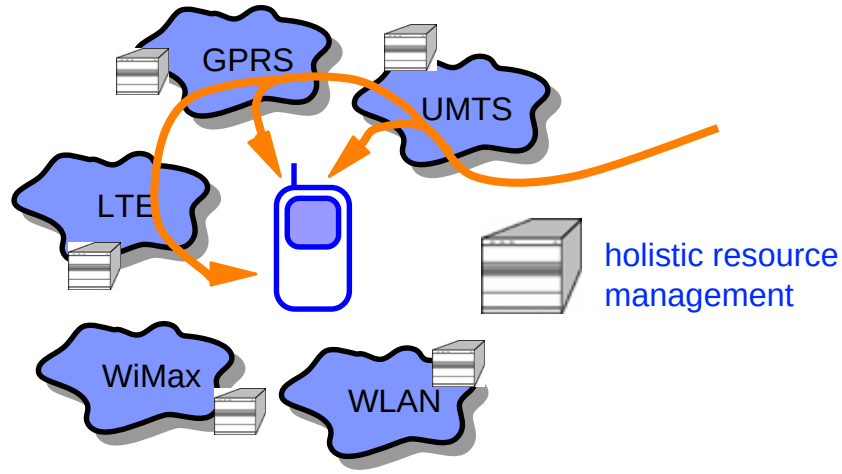
- **Mobile IP: End-to-end solution**



Mobility

Mobility Management

- **Mobile IP: End-to-end solution**
- **Cellular networks: Highly stateful**



Resource Management

- **Challenge: Common resource management for heterogeneous networks**
- **Needs to be network driven, or at least network assisted**

➥ **Optimal resource management requires session information** **state needed**

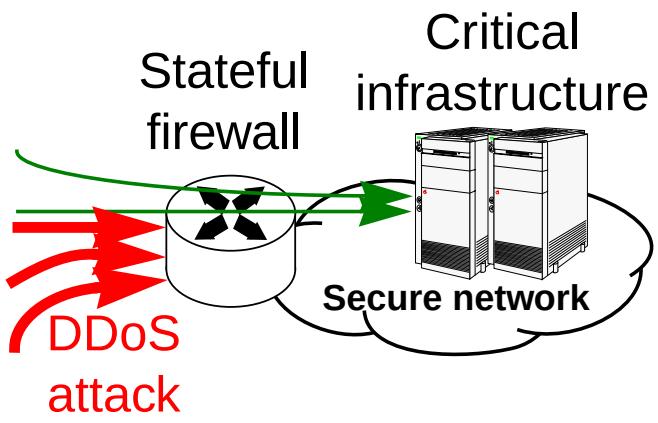
Research Issues

- **Architectures and protocols for holistic resource management**
- **Mobility management across heterogeneous access networks** **state needed**
- **Cross-layer indications (e. g., for adaptive applications)**

Availability

Distributed Denial-of-Service Attacks (DDoS)

- **Serious problem in today's Internet**
- **DDoS countermeasures**
  1. Massive overprovisioning and replication (e. g., content delivery networks)
  2. Protection by packet filters and firewalls
- **Possible solution: Per-flow access control by firewalls** state needed
  - Packet filters or firewalls at domain boundaries
  - Blacklist or whitelist approach possible

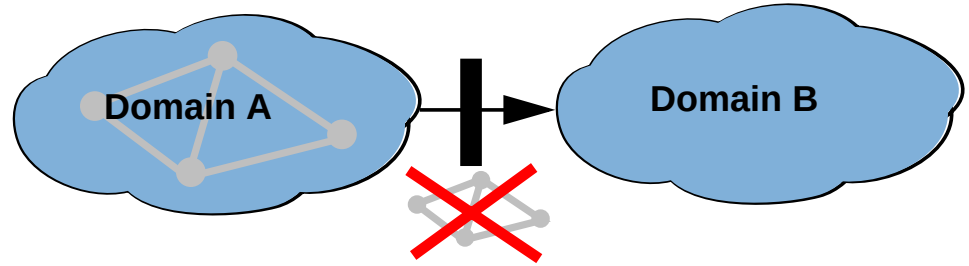


Reseach Issues

- **Interaction with session signaling protocols (e. g., SIP)**
- **"Path-coupled" vs. "path-decoupled" firewall signaling**

Problem 1: Topology Hiding

- Non-disclosure of internal network details
- Requirement by operators
- Signaling filtering state needed
- Research issue: Interdomain-operation with limited knowledge



Privacy

Problem 1: Topology Hiding

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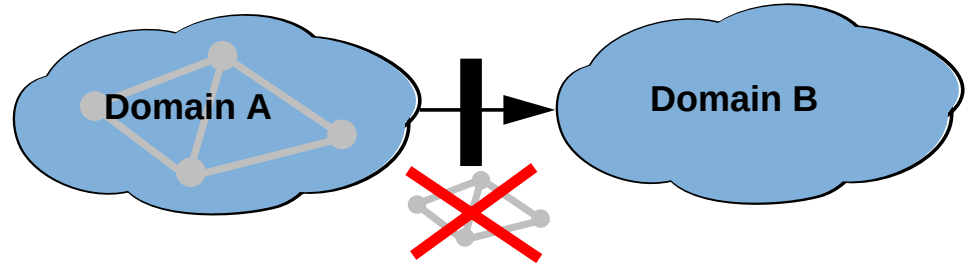
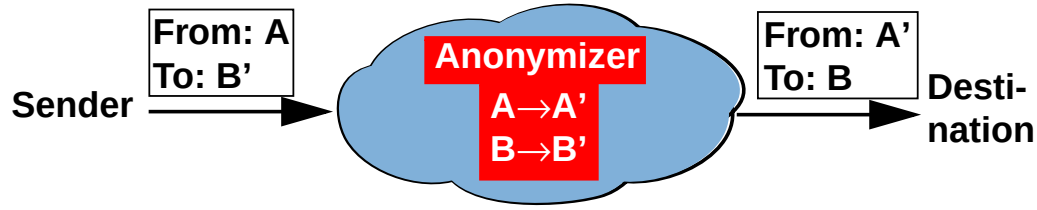


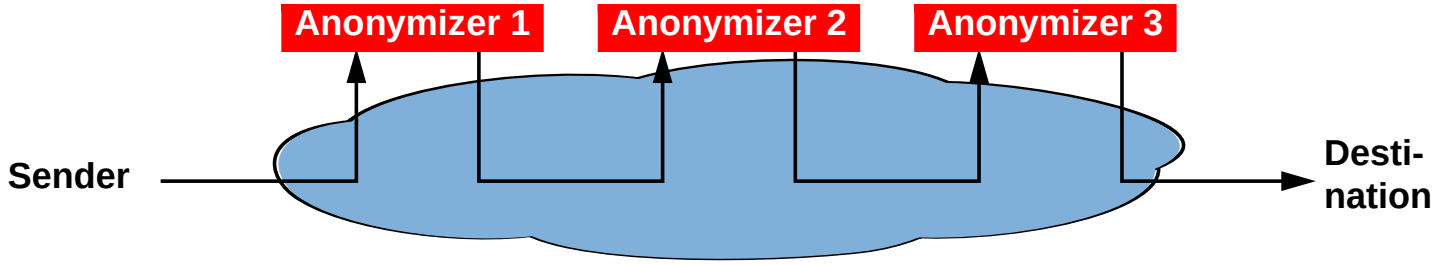
Problem 2: User Location Privacy

- Hiding of sensible user data (e. g., IP address)
- Address mapping, e. g., by network address port translation (NAPT), JAP
- Requires session state at intermediary anonymizers state needed
- "Feature": May prevent end-to-end communication by users (P2P)
- Research issue: Interworking with end-to-end protocols



Problem 3: Anonymity

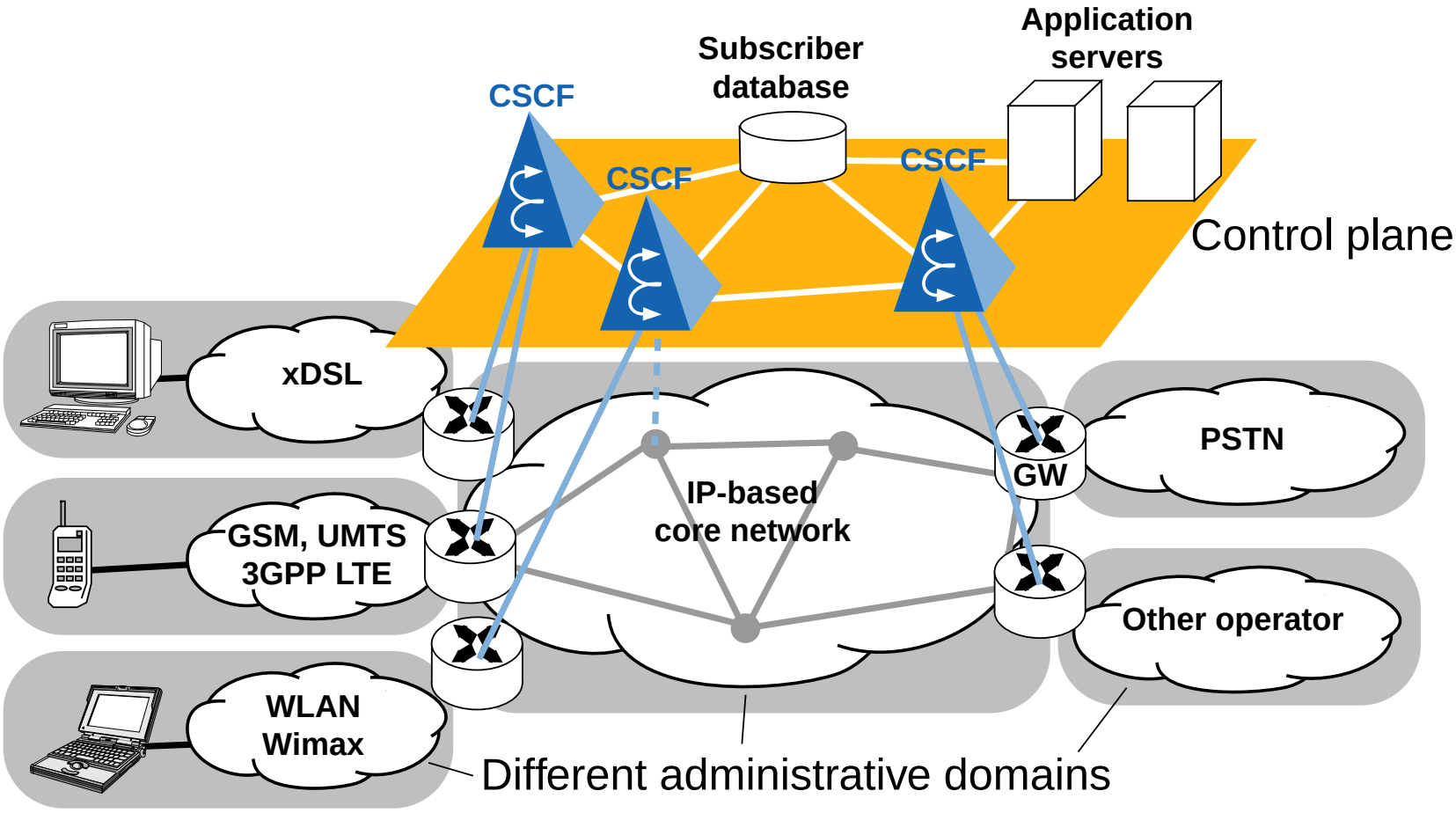
- **Usual trust model: Network operator is fully trusted**
  - But: Aggregation of knowledge at operator raises privacy issues
  - More and more operators and service providers
  - Internet does not only span democratic countries
- **Anonymity can achieved by encryption and multiple anonymizers**



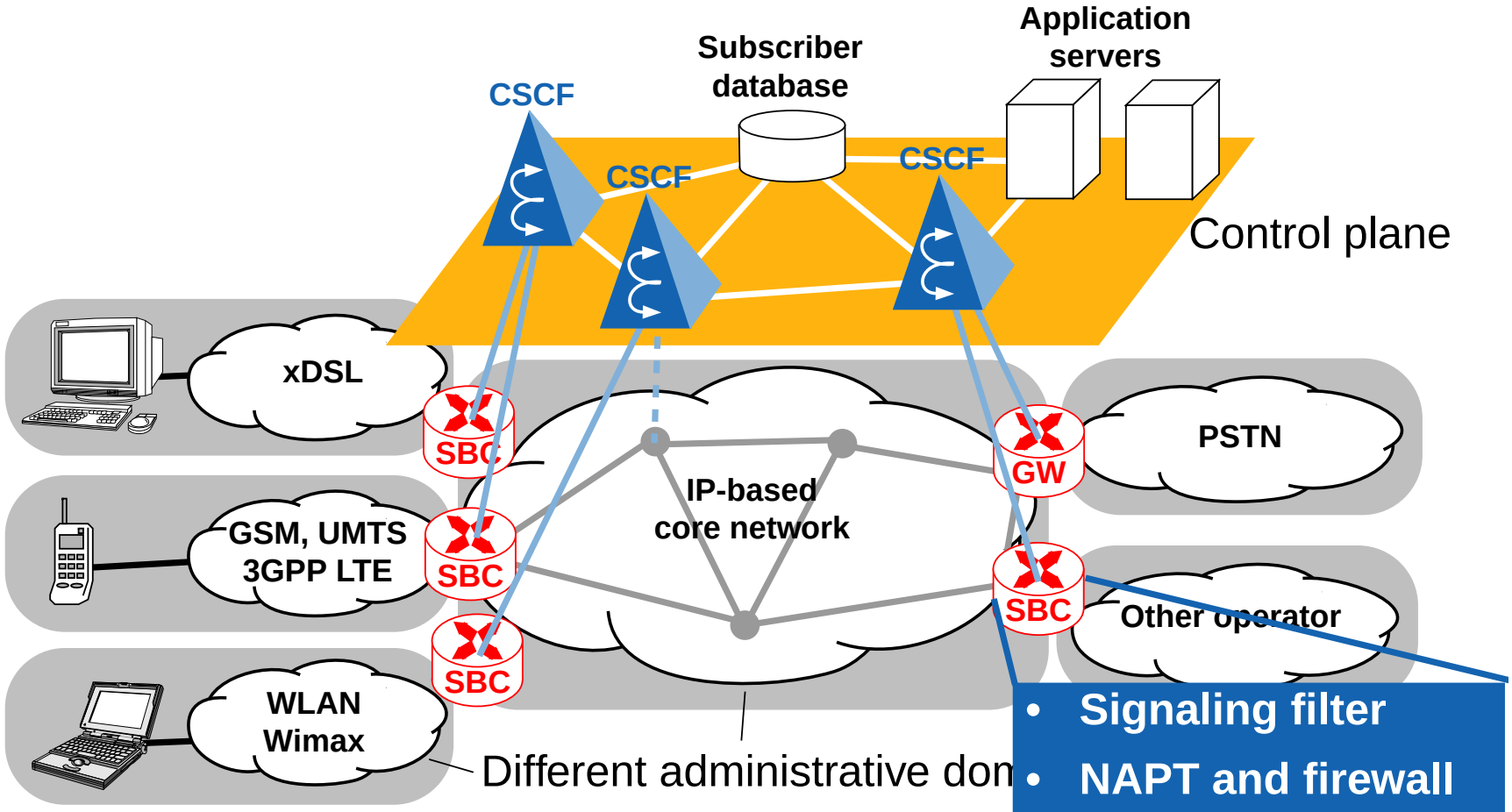
- **Information is encoded in packets, no state in anonymizers**
- **Research issue: Preventing inference by cooperation, ...**

➥ **Protection of user *against network operator***

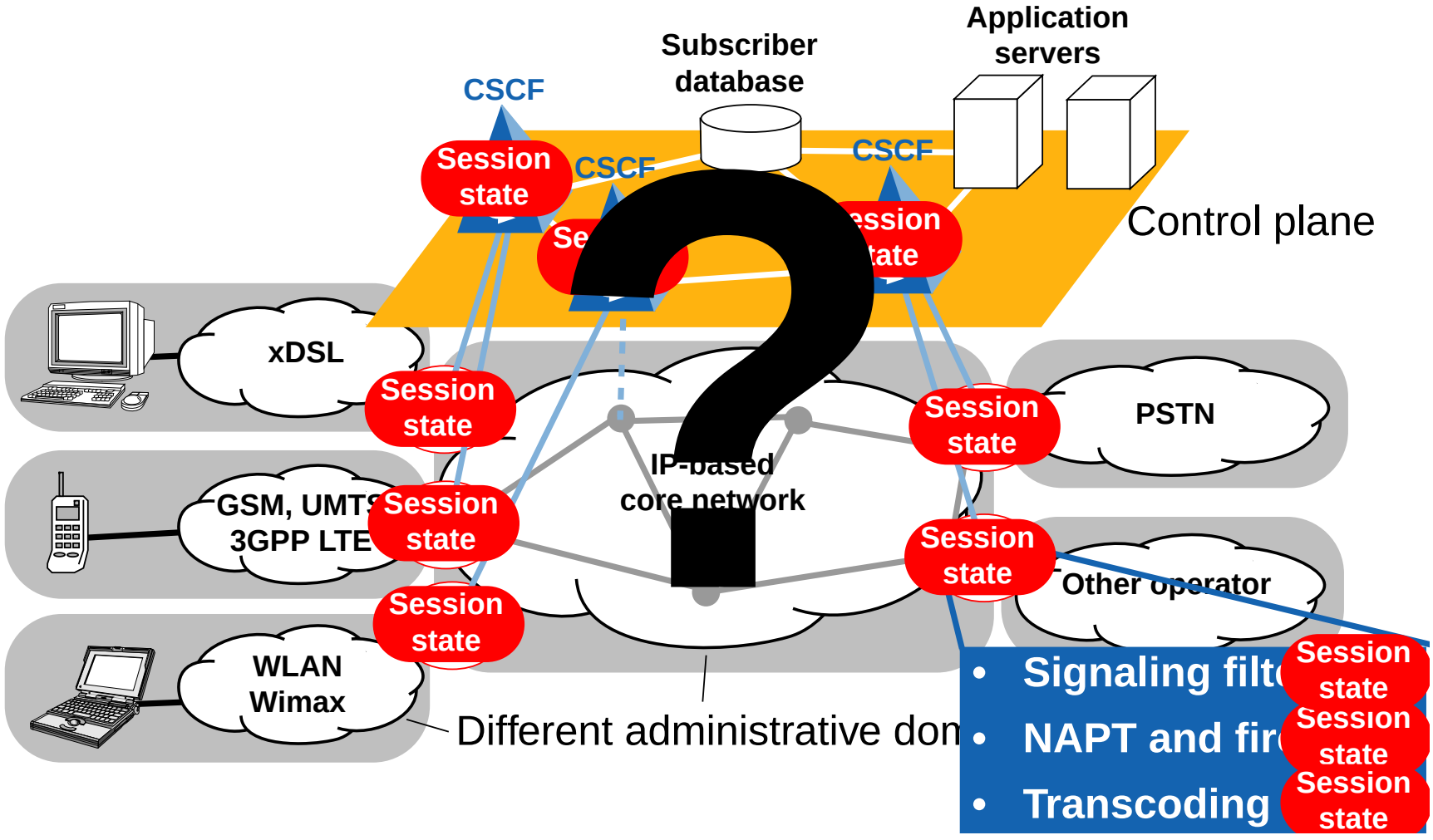
The Raise of ...


Application servers
Subscriber database
CSCF
CSCF
CSCF
Control plane
xDSL
GSM, UMTS 3GPP LTE
WLAN Wimax
IP-based core network
GW
PSTN
Other operator
Different administrative domains

The Raise of Session Border Controllers (SBC)

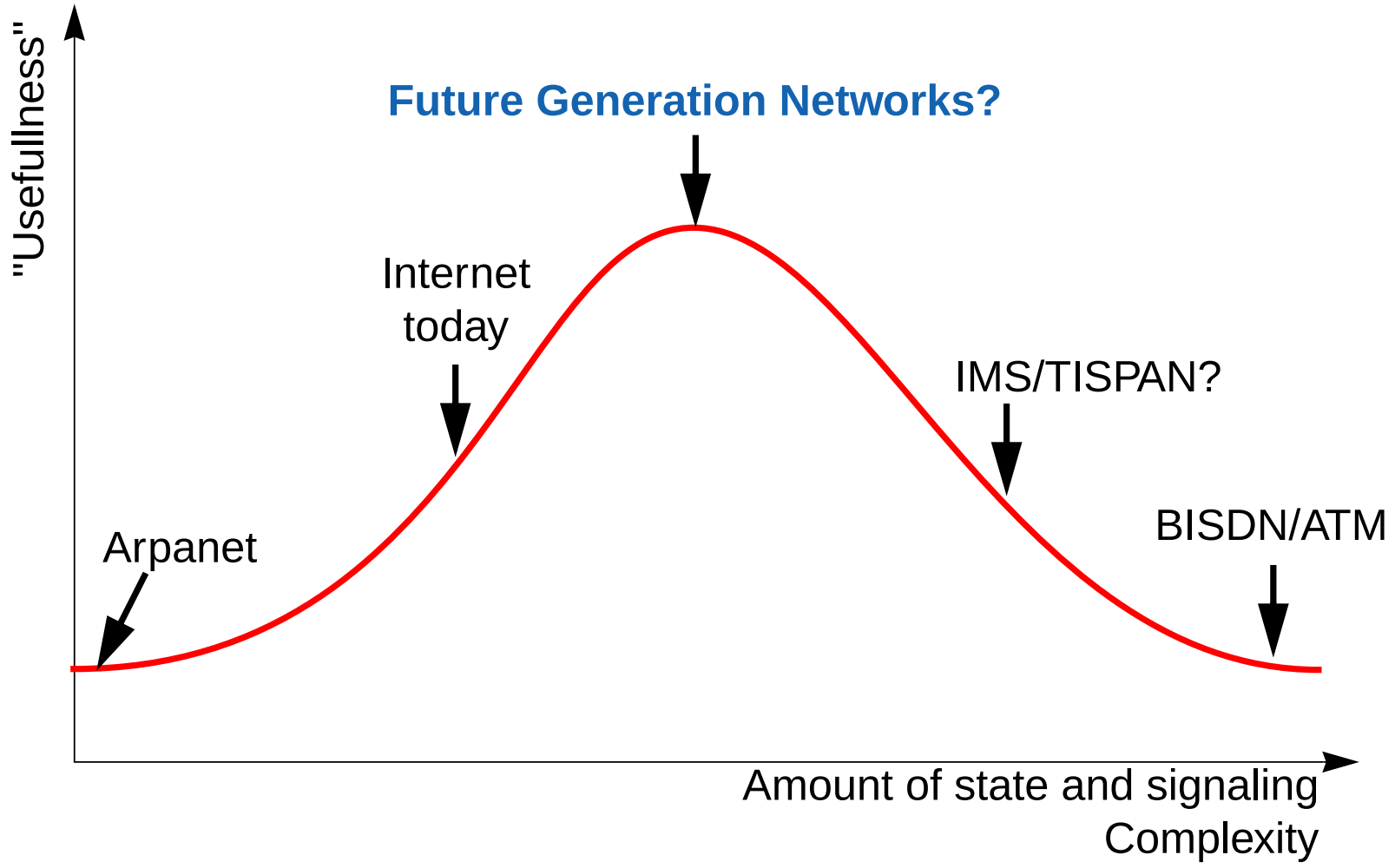


The Raise of Session Border Controllers (SBC)?



➥ **IMS/TISPAN/... as "one-does-it-all" solution?**

Conclusion


"Usefullness"
Future Generation Networks?
Internet
today
IMS/TISPAN?
BISDN/ATM
Arpanet
Amount of state and signaling
Complexity