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Mobile SCTP

Transport Layer Mobility Management for the Internet

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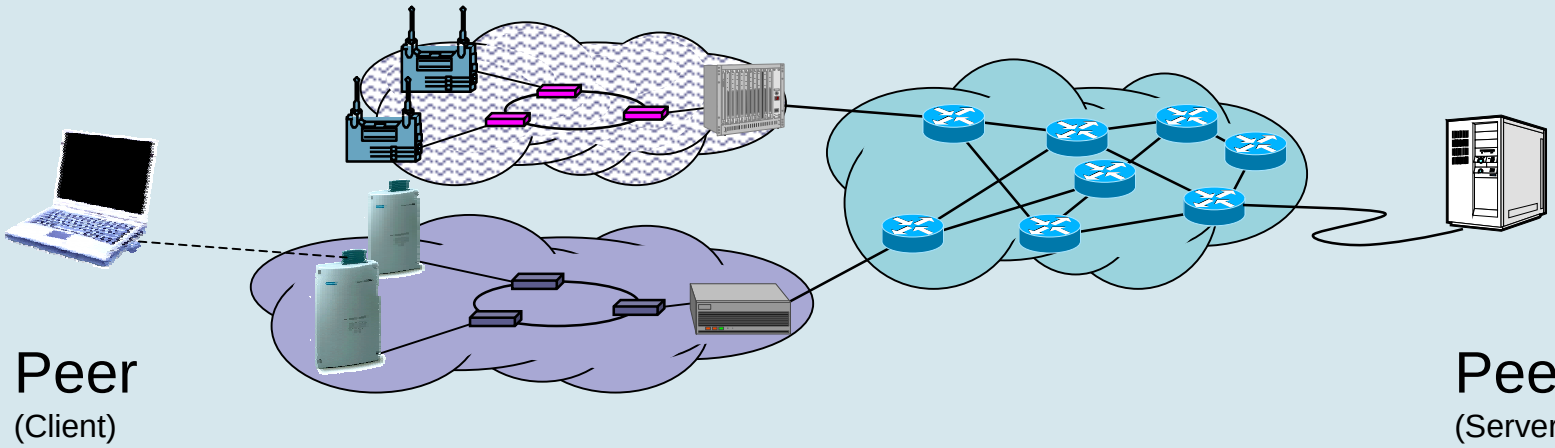
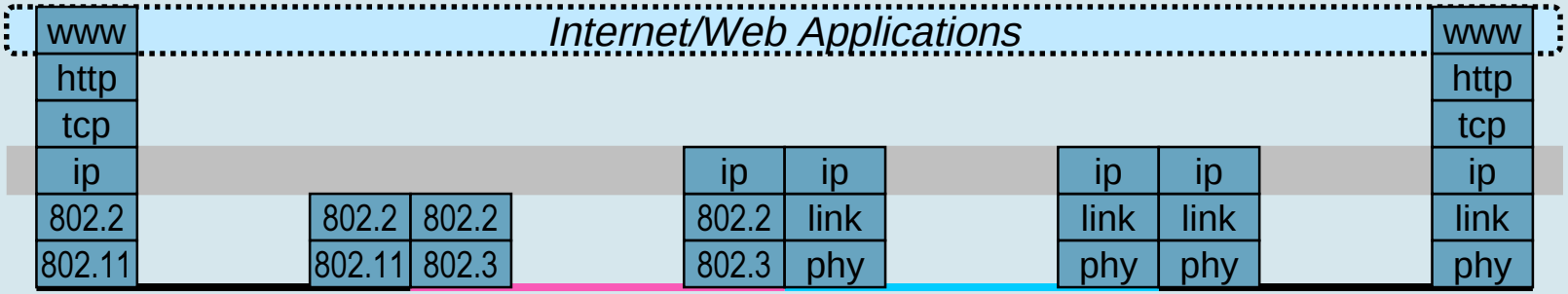
Outline

- **Layered Internet Architecture**
- **Link Layer Mobility by example**
- **Network Layer Mobility**
  - Mobile IP
  - Architectural considerations for the Internet
- **Transport Layer Mobility**
  - Requirements for a mobility enabled transport protocol
  - Mobile SCTP
  - Requirements for hosts
- **Conclusion**

The layered Internet architecture





Mobility inside a WLAN ‘hotspot’ by link layer functions...

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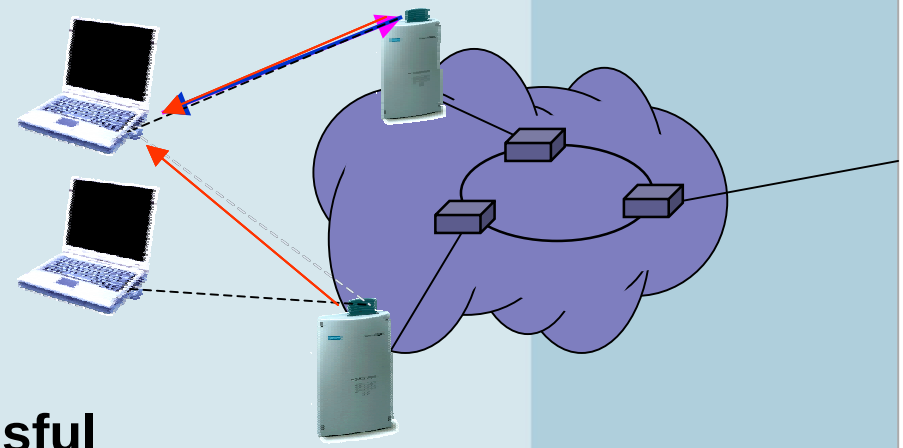
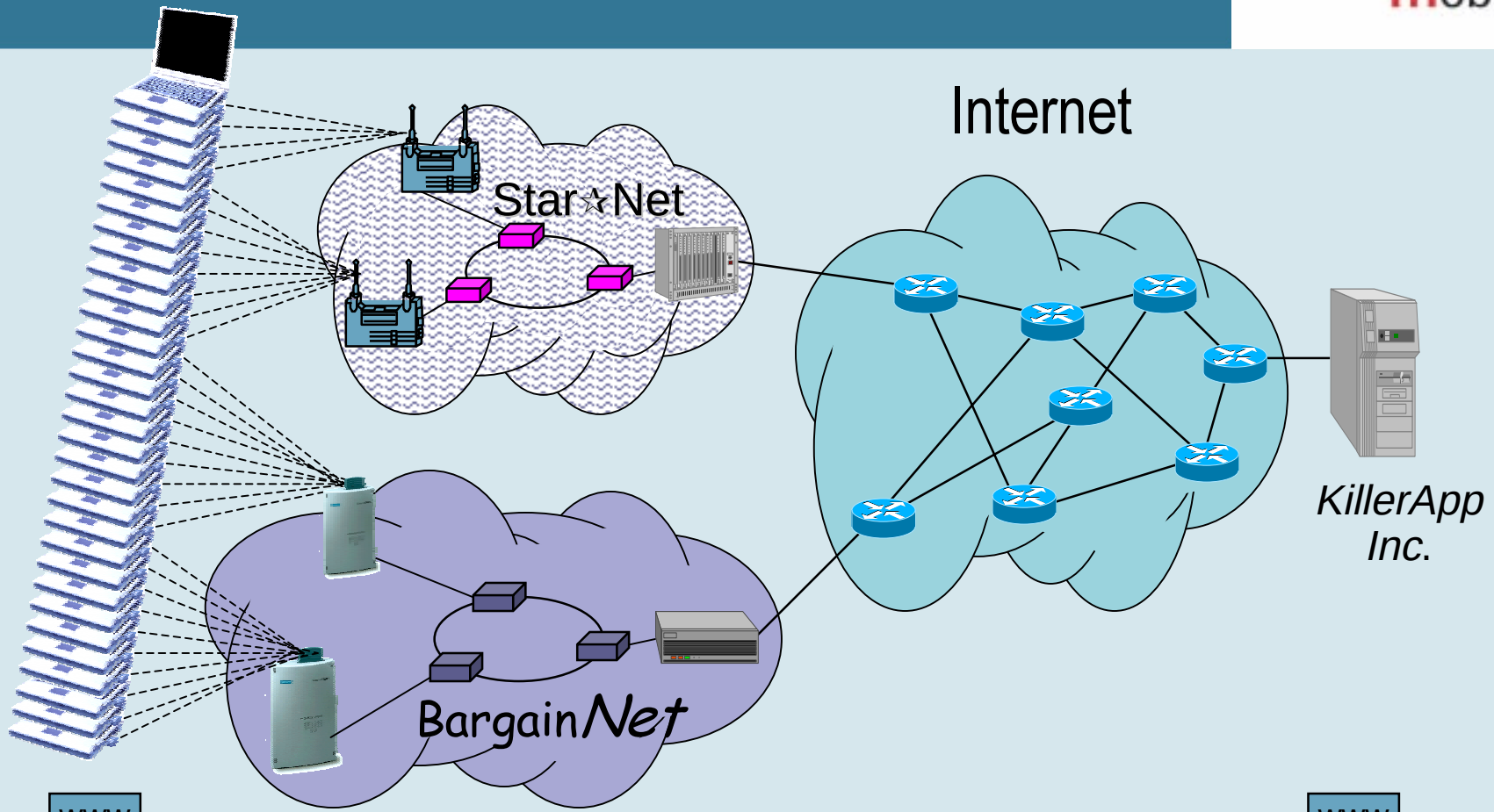
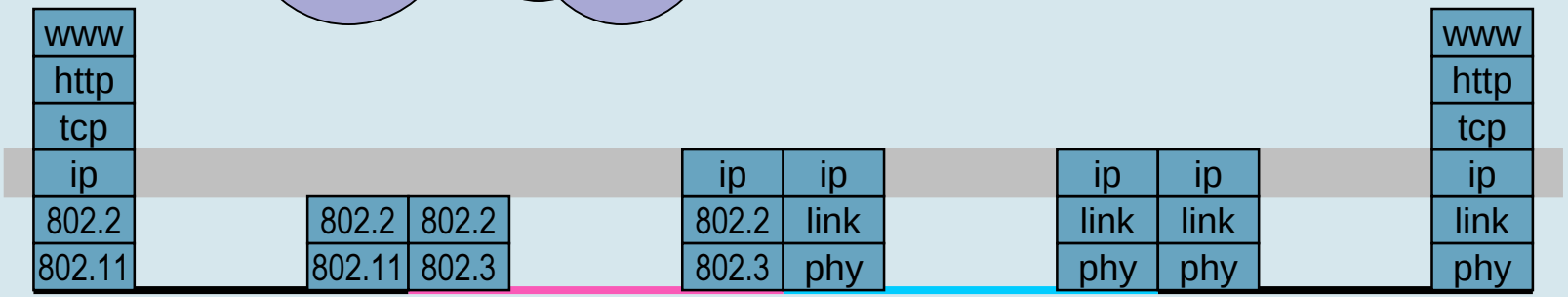
- **Station decides that link to its current AP is poor**
- **Station uses scanning function to find another AP**
  - or uses information from previous scans
- **Station sends Reassociation Request to new AP**
- **If Reassociation Response is successful**
  - then station has roamed to the new AP
  - else station scans for another AP
- **If AP accepts Reassociation Request**
  - normally old AP is notified through Distribution System
  - AP indicates Reassociation to the Distribution System

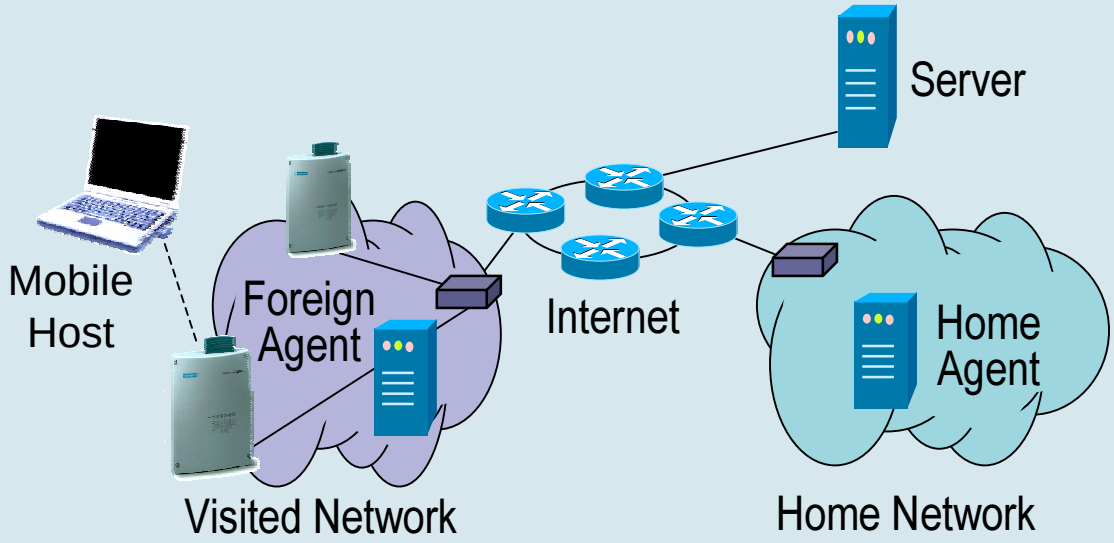


Hand-over between hotspots?



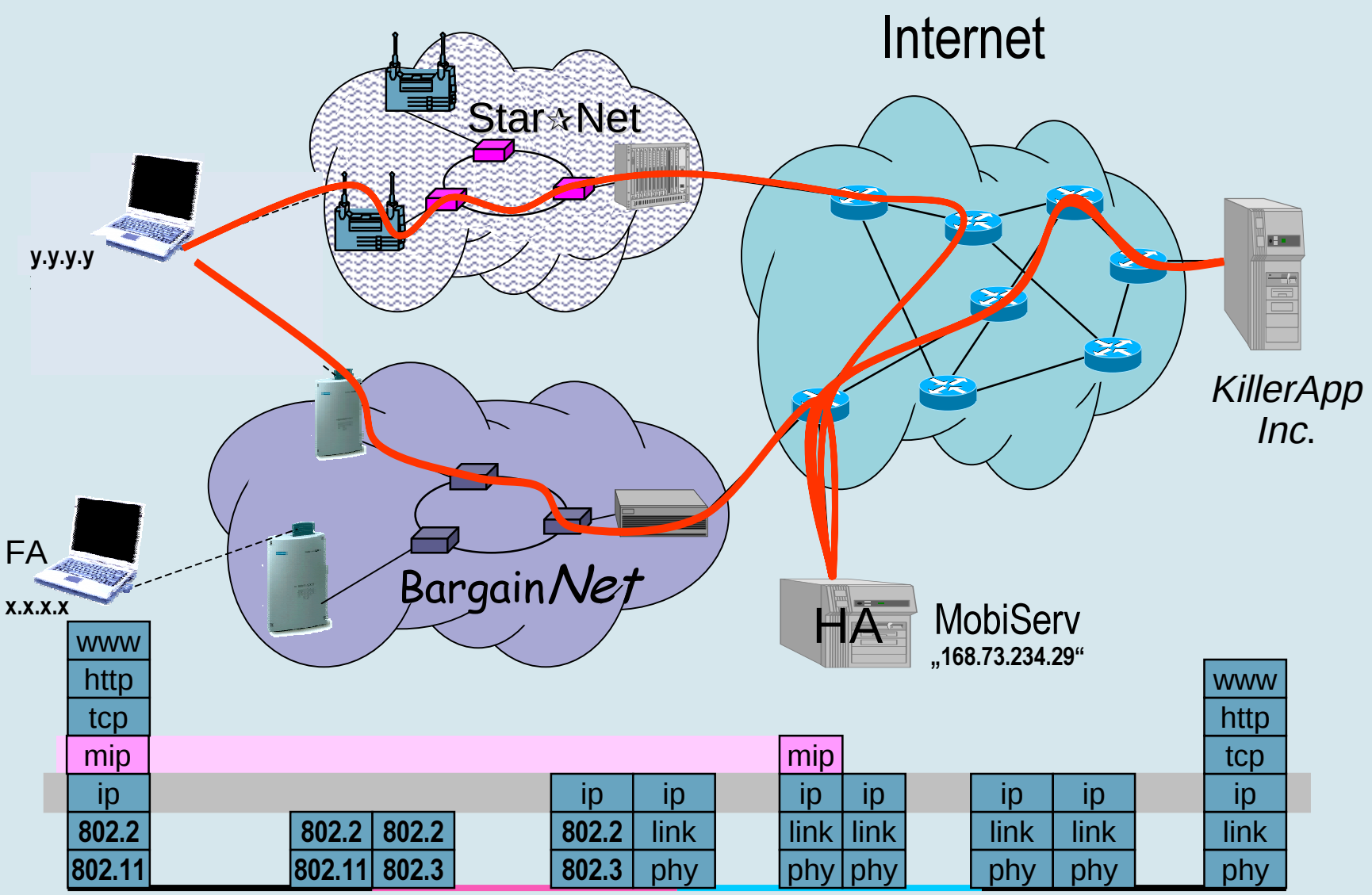


Today‘s standard solution: Mobile IP



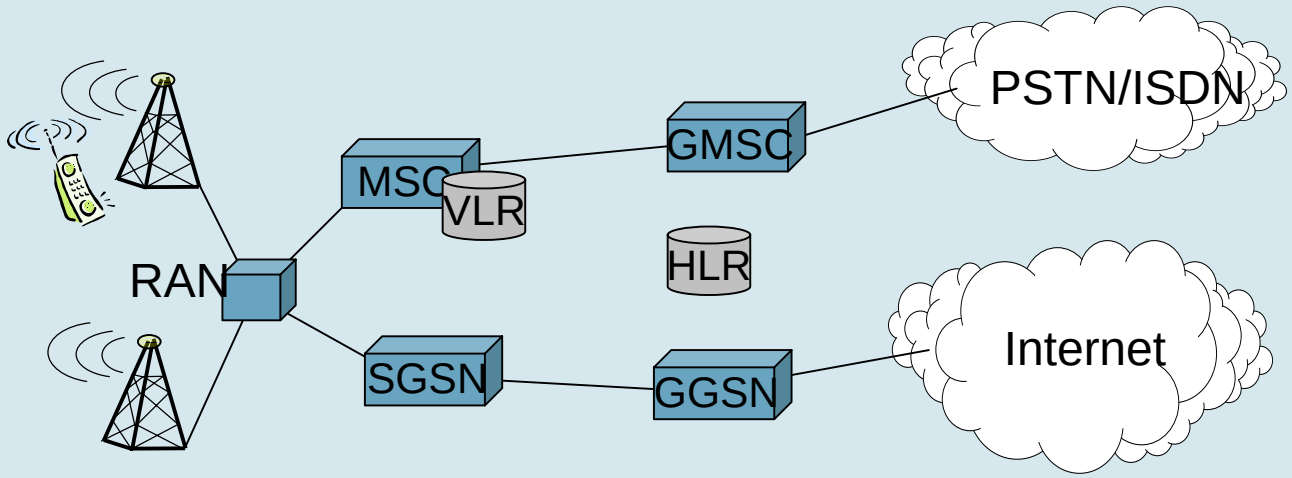
- An agent in the home network takes care of the location of the mobile host intercepting all packets for the distant Mobile Host.
- The Home Agent forwards all packets to a Foreign Agent in the visited network (GRE tunnel).
- The Foreign Agent acts as default gateway for the Mobile Host in the visited network.
- The Foreign Agent may be colocated with the Mobile Host simplifying the mobile network.

Mobile IP establishes an IP-in-IP tunnel over the Internet



Architectural considerations

- **Mobile IP complicates the network by introducing special functions for maintaining connection states in the core network (tunnel between HA and FA).**
  - The Internet is well-known for maintaining no connection states in the core network.
- **Database in the core network store associations between identity addresses and location addresses**
  - There are similarities between Mobile IP and the mobility management of 2G/3G networks:



Mobility management in the transport layer

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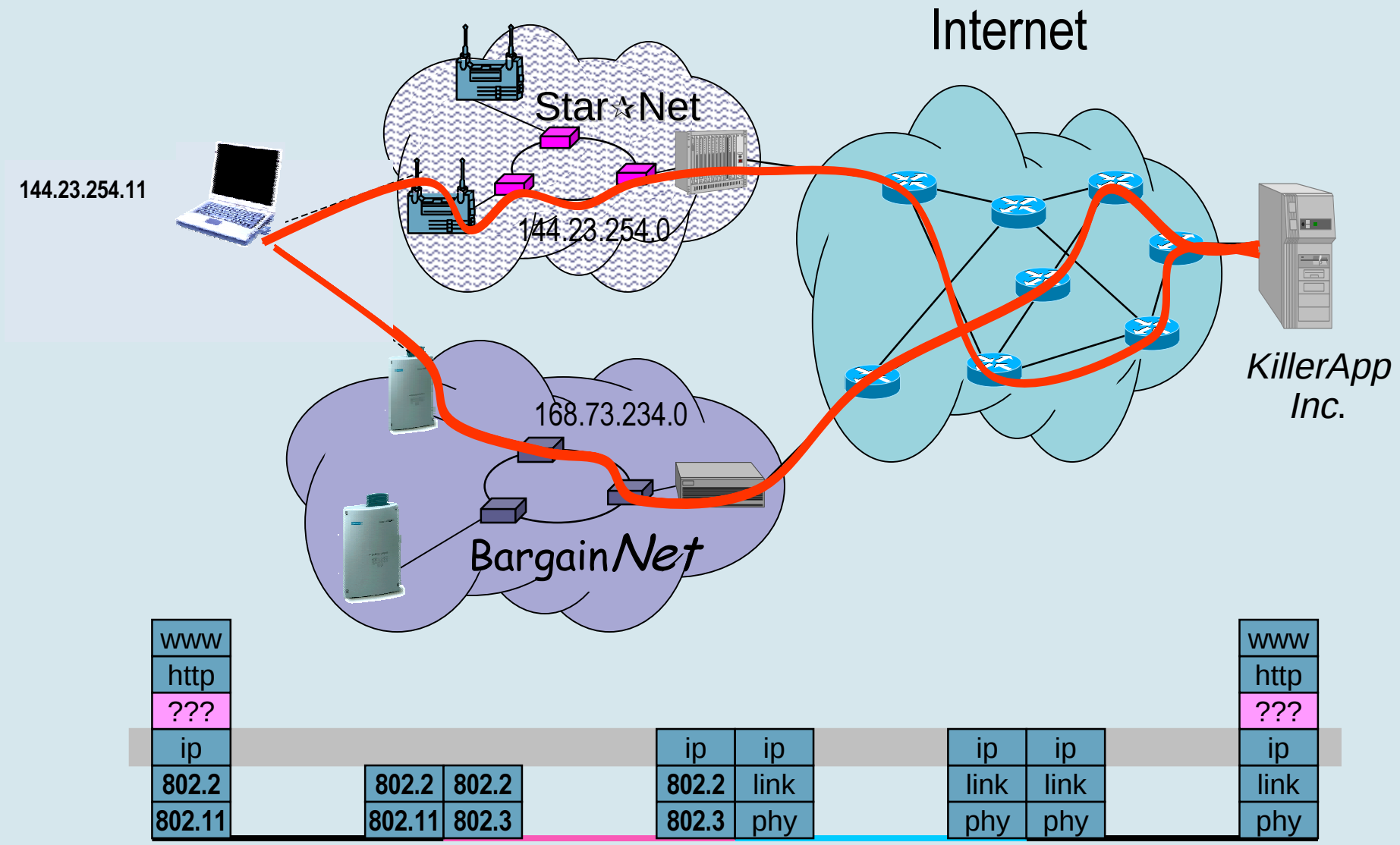

Requirements for a mobility enabled transport protocol

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- **the transport connection continues while changing the associated IP address**
  - an end-point can use multiple IP-addresses for one connection (multi homing)
- **the transport connection automatically switch over to a new IP address when the used path fails**
  - the quality of the connection is monitored by some kind of feedback function
- **IP addresses can be added to or removed from the transport connection**
  - an end-point can add or delete IP addresses for one connection without affecting the established association.
- **the transport protocol allows reliable as well as non-reliable connections**
  - TCP is always reliable,
    UDP does not establish connections.

Mobile SCTP = SCTP w/ ADDIP extension provides all the needed functions

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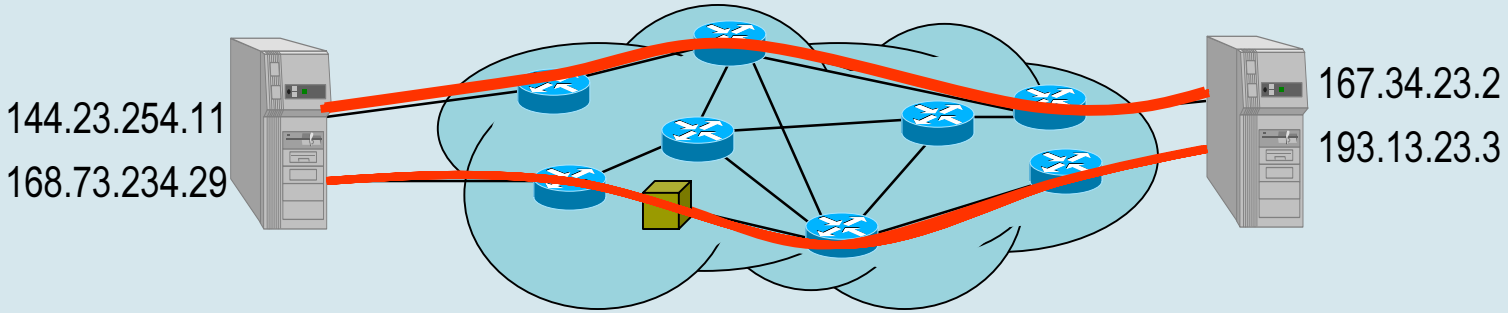
- SCTP (Stream Control Transport Protocol) was developed to provide higher reliability for signaling transport over the Internet.
- Key feature of SCTP is the multihoming capability allowing immediate switch-over to a alternative path when anything fails.



- Automatic switch-over when a link breaks is exactly the function needed for hand-over.
- Dynamic establishment of new associations (adding new IP addresses - ADDIP) allows unlimited mobility.

Mobile SCTP: Mobility management without any provisions inside the network

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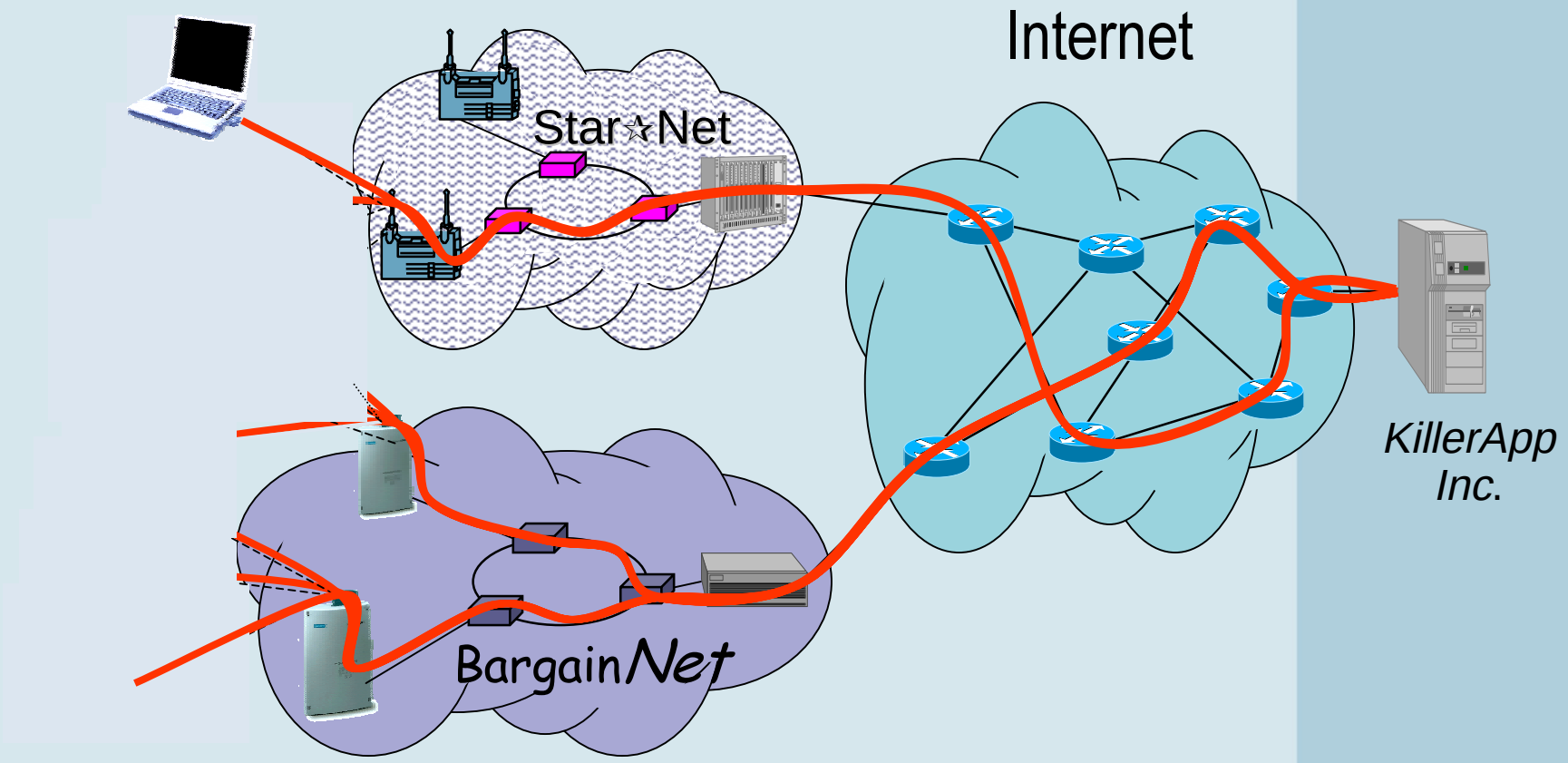
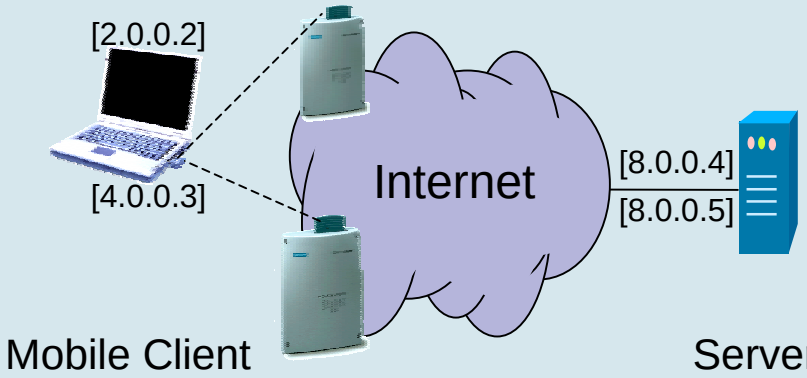


Requirements for *Mobile SCTP* enabled hosts



- **Clients:**
  - when more networks are reachable, all networks should be used
  - quality of the links should continuosly be monitored and the better link should be used when appropriate
  - careful hand-over to avoid oscillation and frequent switching
  - forwarding table according to connectivity state
  - *may favourably use link layer hand-over for micro-mobility*
- **Servers:**
  - must be multi-homed but does not need several link layer interfaces

Conclusion

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- SCTP provides the basic functionality for mobility management at the end of the network (Internet-like approach)
- SCTP is a general purpose reliable transport protocol for the Internet
- SCTP can be applied to non real-time traffic (reliable mode) as well as to real-time traffic (non reliable mode)
- SCTP provides smooth transport of streaming media (avoiding UDP aggressive mode)

Open issues:

- SCTP does currently not cooperate well with NATs.
- Small experimental experiences available until now.

The end

- Thank you for your attention.
- Questions and comments?
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