PtP Links across IEEE 802 Bridged Infrastructure

Date: 2013-08-28

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Abstract

The presentation introduces the requirements of point-to-point links across bridged infrastructures and provides initial thoughts on potential solutions.

Point-to-Point Links across IEEE 802 bridged infrastructure

(OmniRAN Gap Analysis)

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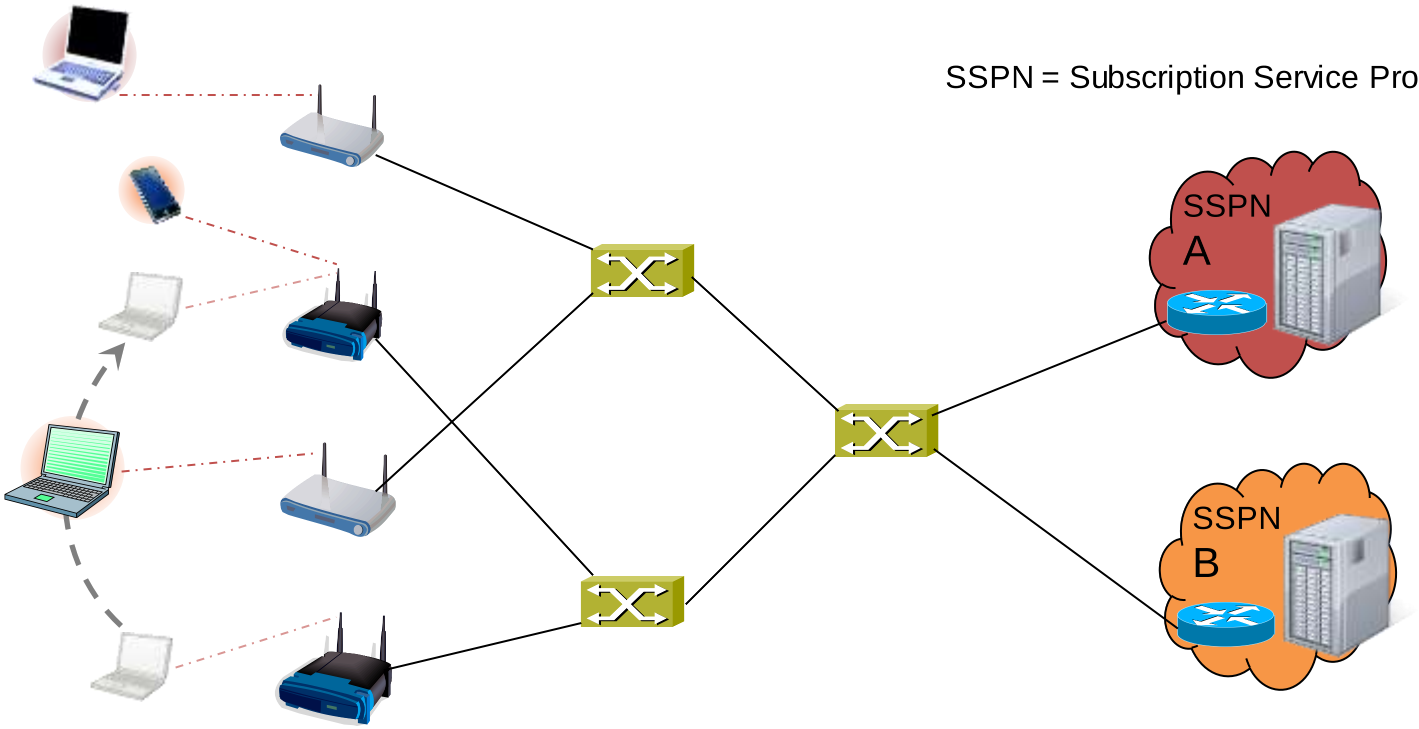
ToC

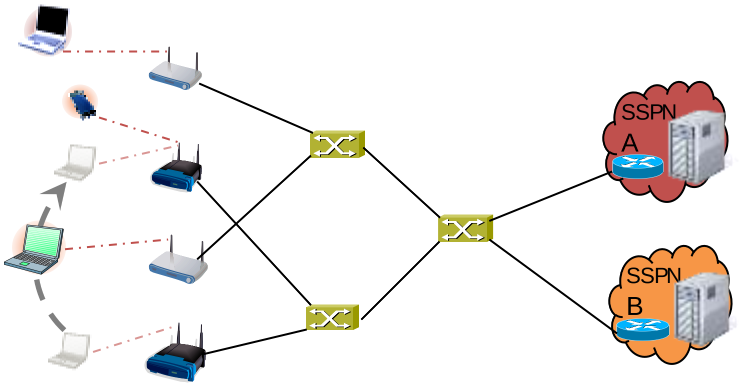
- Access Network Scenario
  - Further considerations
- References for Link Requirements
- Bridged Access Network Solutions
  - PtP Link Solution Approaches
- MAC-in-MAC
- MACsec
- Control Plane issues
  - Link Management during a session
- Conclusion

Access Network Szenario



- Point-to-point link behavior is required to
  - Enforce all traffic passing through the SSPN
  - Isolate terminal communication in a shared infrastructure
- Mobility support is required in the bridged infrastructure
  - Without impacting IP connectivity, i.e. IP session has to be maintained while moving
- Point-to-point link state signalling required towards SSPN

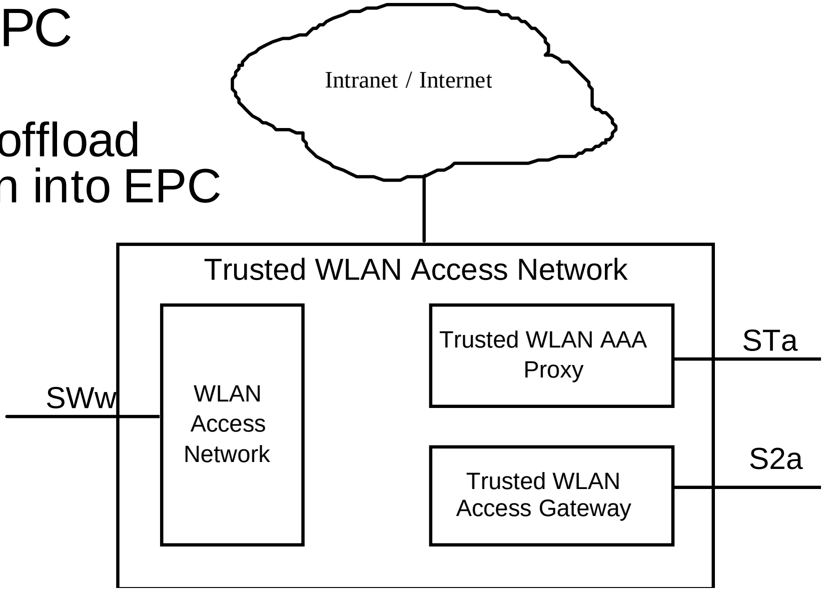
Further Considerations



- An access network may be deployed by multiple SSPNs
  - Making use of VLAN tag to segregate access domains
- An SSPN may deploy VLANs to differentiate services
  - E.g. setting up dedicated VLANs for data, guest and voice terminals
- Terminals being either end-stations or bridges eventually deploying (C-)VLAN
  - C-VLAN tag may be carried over to terminals
- Access network may be spotty and being spread across large areas
  - Making use of provider bridging to connect together disjunct access areas

References for Link Requirements

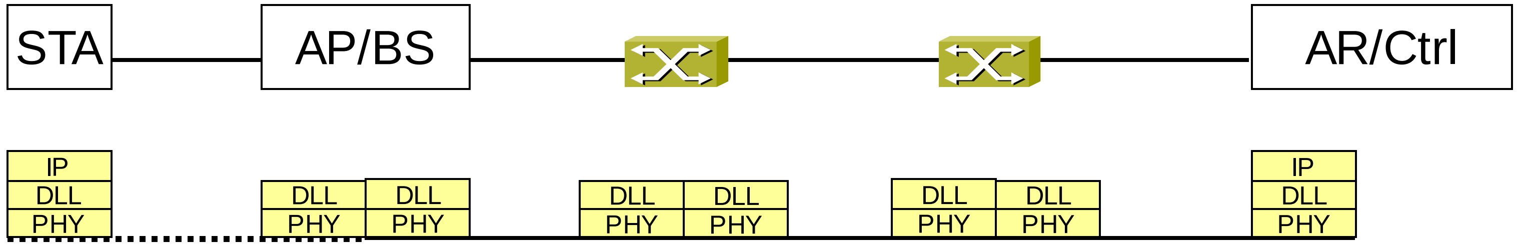
- 3GPP Trusted WLAN Access to EPC TS 23.402 V11.6.0 (2013-03)
  - Support for non-seamless WLAN offload (NSWO) or single PDN connection into EPC
  - Definition of a
    - WLAN Access Network,
    - Trusted WLAN AAA Proxy
    - Trusted WLAN Access Gateway
  - Requiring a point-to-point link between UE and Trusted WLAN Access Gateway across WLAN Access Network
  - Requiring also link state signaling of WLAN Access Network towards Trusted WLAN Access Gateway
- Very similar requirements exist also in other access networks carrying Ethernet frames between terminal and access router
  - E.g. WiMAX



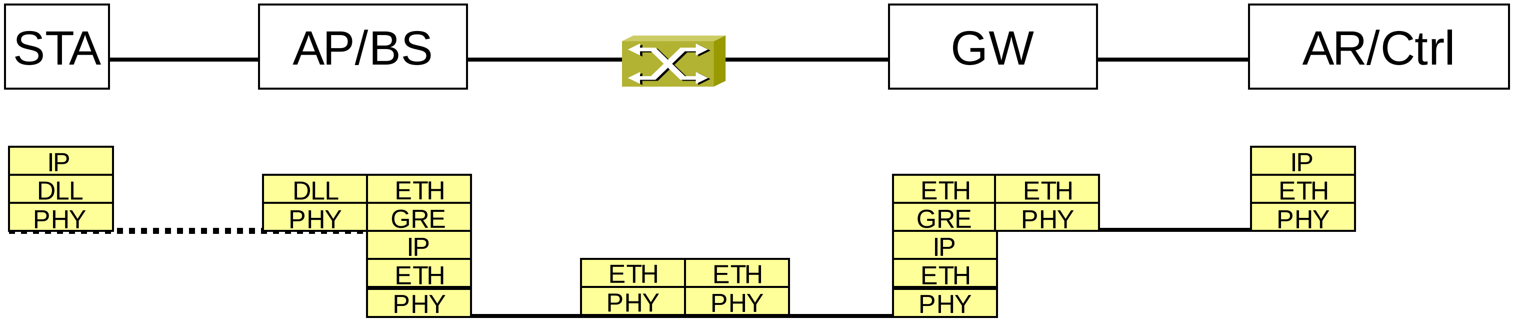
Bridged Access Network Solutions

supporting point-to-point link behavior

Access Network Model – desired solution



Access Network Model – nowadays real world solution



PtP Link Solution Approaches

- Establish dedicated VLAN for each terminal
  - Q-in-Q
    - Scalability issue, max 4094 ptp links may not be enough
  - MAC-in-MAC
    - Seems to be feasible, for further study
- Establish secured connection for each terminal across bridged infrastructure
  - MACsec
    - Seems to be feasible, for further study

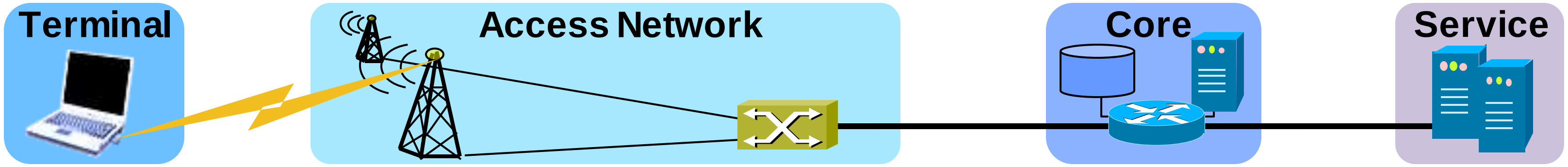
MAC-in-MAC (Provider Backbone Bridging) Some Thoughts

- AP/BS effectively representing ‘BEB’
- Link identified by B-SA + I-SID
  - B-SA uniquely correlated to terminal MAC address
    - Would it work using terminal MAC as B-SA (C-SA = B-SA)?
  - B-DA represents access router peer
  - I-SID for further study;
- Mobility support by learning B-bridges
- How would link establishment be done?
  - Which protocol to use to dynamically configure PBBN?
- Link state signaling?
- Security threats by dangling entries in filtering database in B-bridge?

MACsec
Some Thoughts

- MACsec establishes single hop across multiple bridges
- MACsec peers are terminal specific port in AP/BS and access router at the border of the access network
- Control protocol by 802.1X
  - EAP based establishment of security association
    - How to tie with EAP based access authentication
  - Well defined link state management
- Mobility support?
  - Wouldn't be a kind of 802.11r applicable to MAC sec ptp links?
- Scalability and performance issues
  - MACsec Ys well distributed on AP/BS side, however the entity at the access router peer may have to handle a huge number of sessions.
  - MACsec without confidentiality to keep performance requirements low?

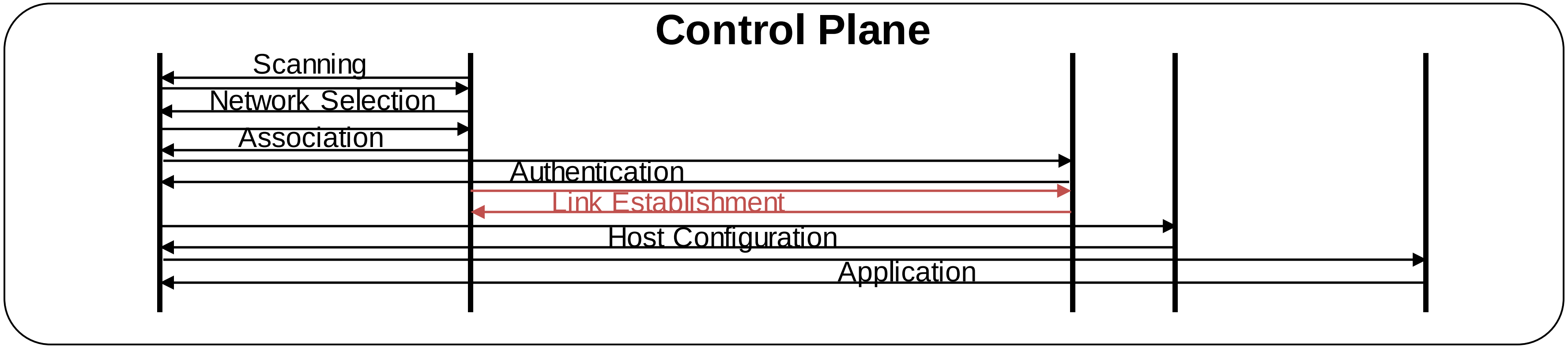
Dynamic PtP Link management adds to the Control Plane


Terminal

Access Network

Core

Service


Control Plane

Scanning

Network Selection

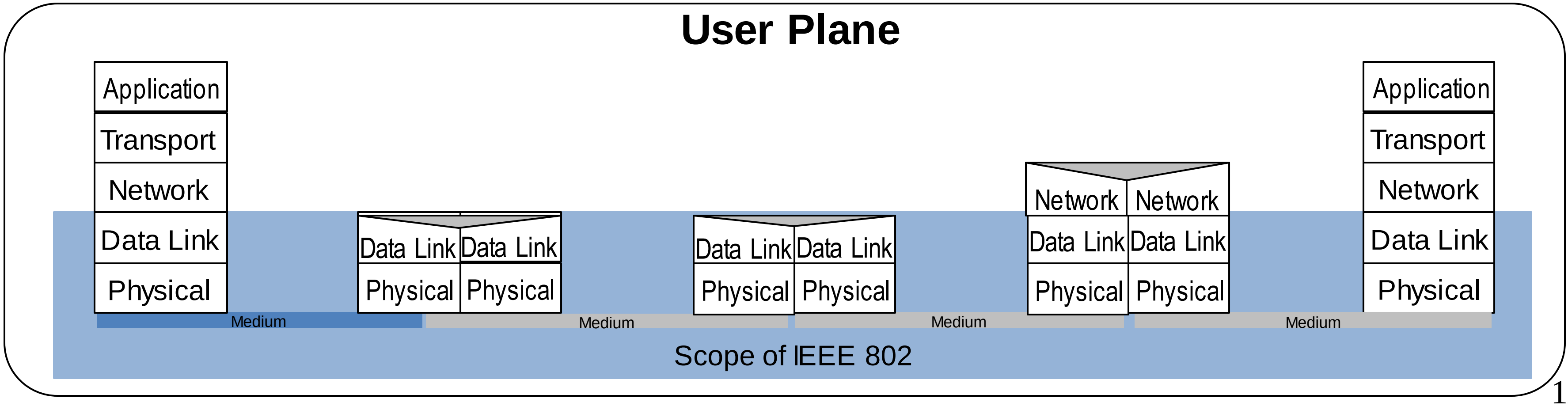
Association

Authentication

Link Establishment

Host Configuration

Application


User Plane

Application

Transport

Network

Data Link

Physical

Data Link | Data Link

Physical | Physical

Data Link | Data Link

Physical | Physical

Network | Network

Data Link | Data Link

Physical | Physical

Application

Transport

Network

Data Link

Physical

Medium

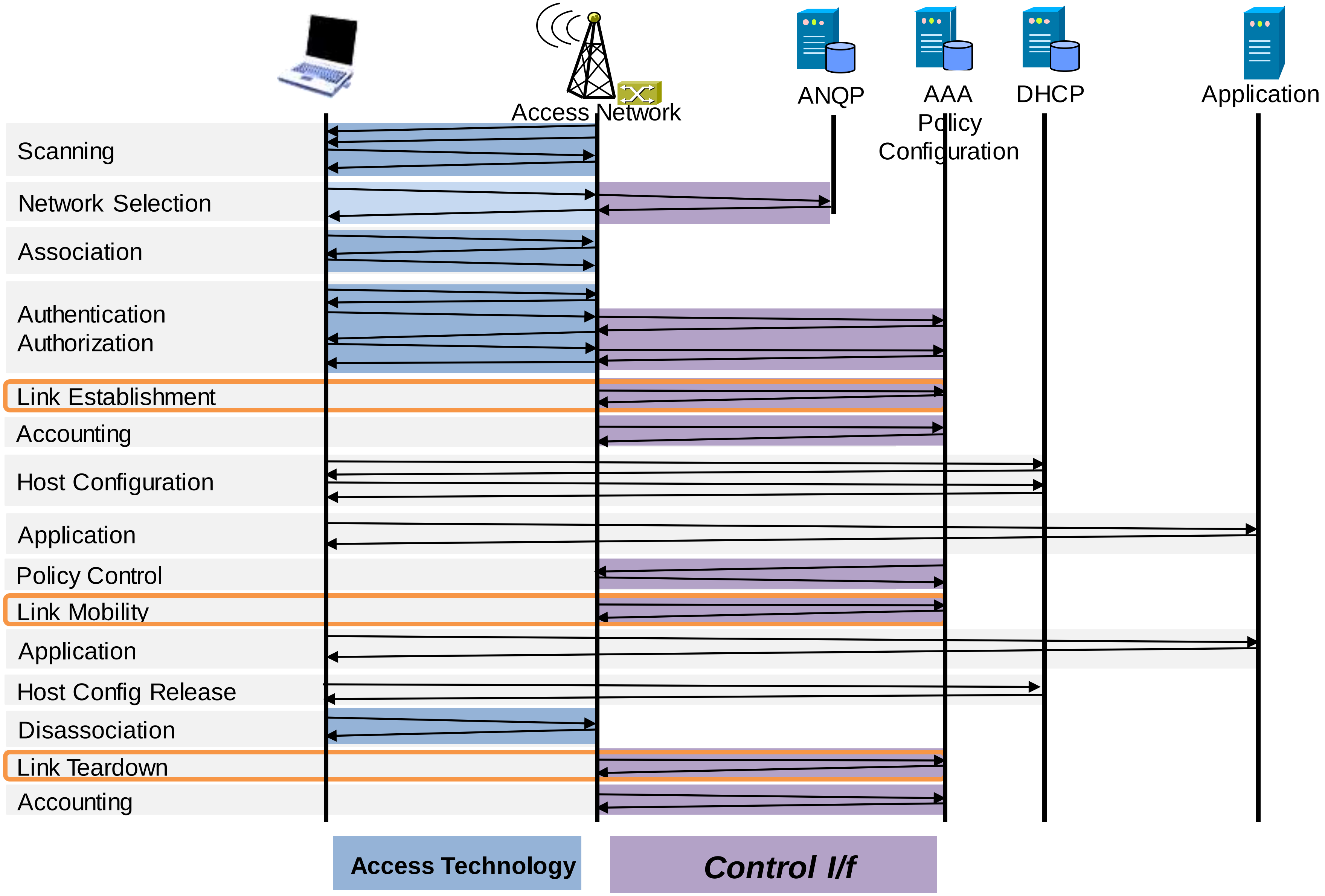
Medium

Medium

Medium

Scope of IEEE 802

Link Management during a session



Conclusion

- Point-to-point links across bridged infrastructures are feasible
- MACsec seems to provide the more promising approach for realization of ptp links
  - Well suited control protocol available by 802.1X
  - Works across any bridged infrastructure
    - Creates single hop over multiple bridges
  - Well defined link state signaling and management
  - Further investigations necessary regards mobility support.
- Proposed next step: create a detailed functional description based on MACsec