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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NSN
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

SSPN = Subscription Service Provider Network
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

Control Plane

- Scanning
- Network Selection
- Association
- Authentication
  - Link Establishment
  - Host Configuration
- Application

User Plane

- Application
- Transport
- Network
- Data Link
- Physical

Scope of IEEE 802

- Network
  - Data Link
    - Physical
  - Data Link
    - Physical
  - Data Link
    - Physical

- Network
  - Data Link
    - Physical
  - Data Link
    - Physical
  - Data Link
    - Physical

Medium

Medium

Medium

Medium
Link Management during a session

Scanning
Network Selection
Association
Authentication
Authorization
Link Establishment
Accounting
Host Configuration
Application
Policy Control
Link Mobility
Application
Host Config Release
Disassociation
Link Teardown
Accounting

Access Technology
Control I/f

Access Network
ANQP
AAA Policy Configuration
DHCP
Application
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