802.1X and Faucet

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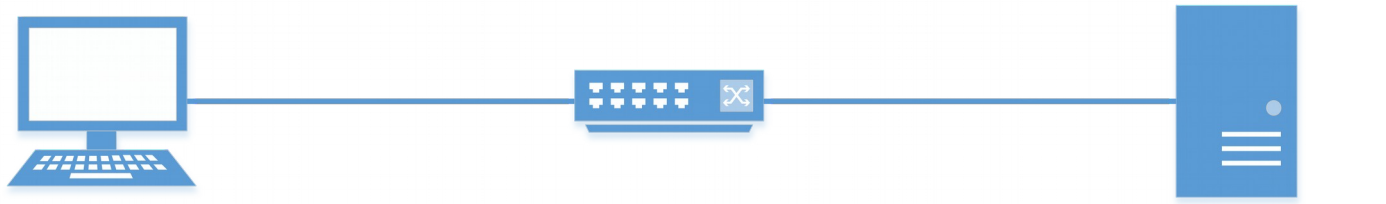
Outline

- Introduction to 802.1X
- Design
- Implementation
- Example configs/demo
- Future work

Introduction – IEEE 802.1X

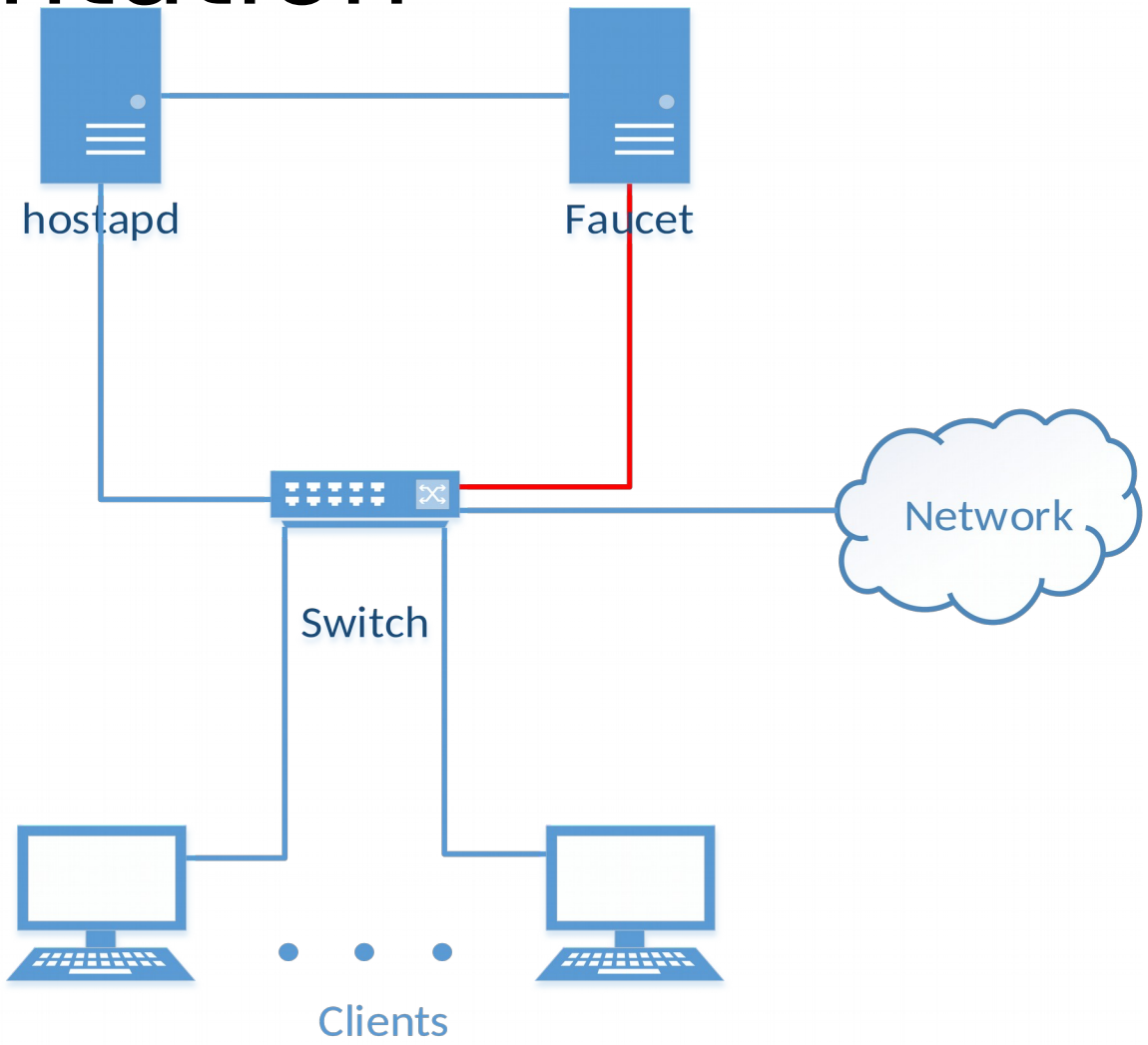
- Port-Based Network Access Control
- Framework for EAP
- Wired/WiFi



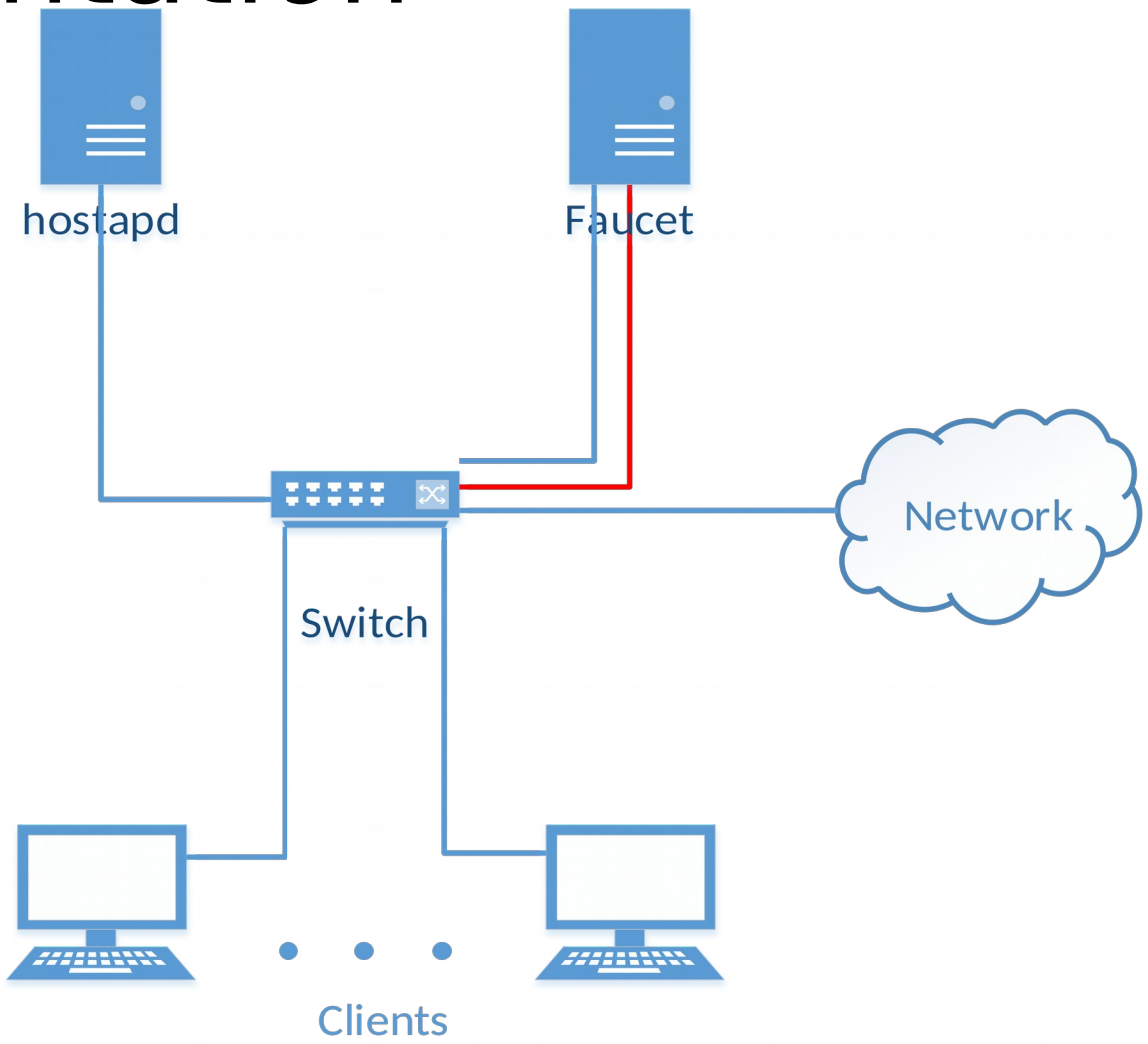
Design Goals

- NFV-ed 802.1X
- Switch doesn’t need to support 1X.
- Any RADIUS server.
- >25 EAP Methods
- Fail secure

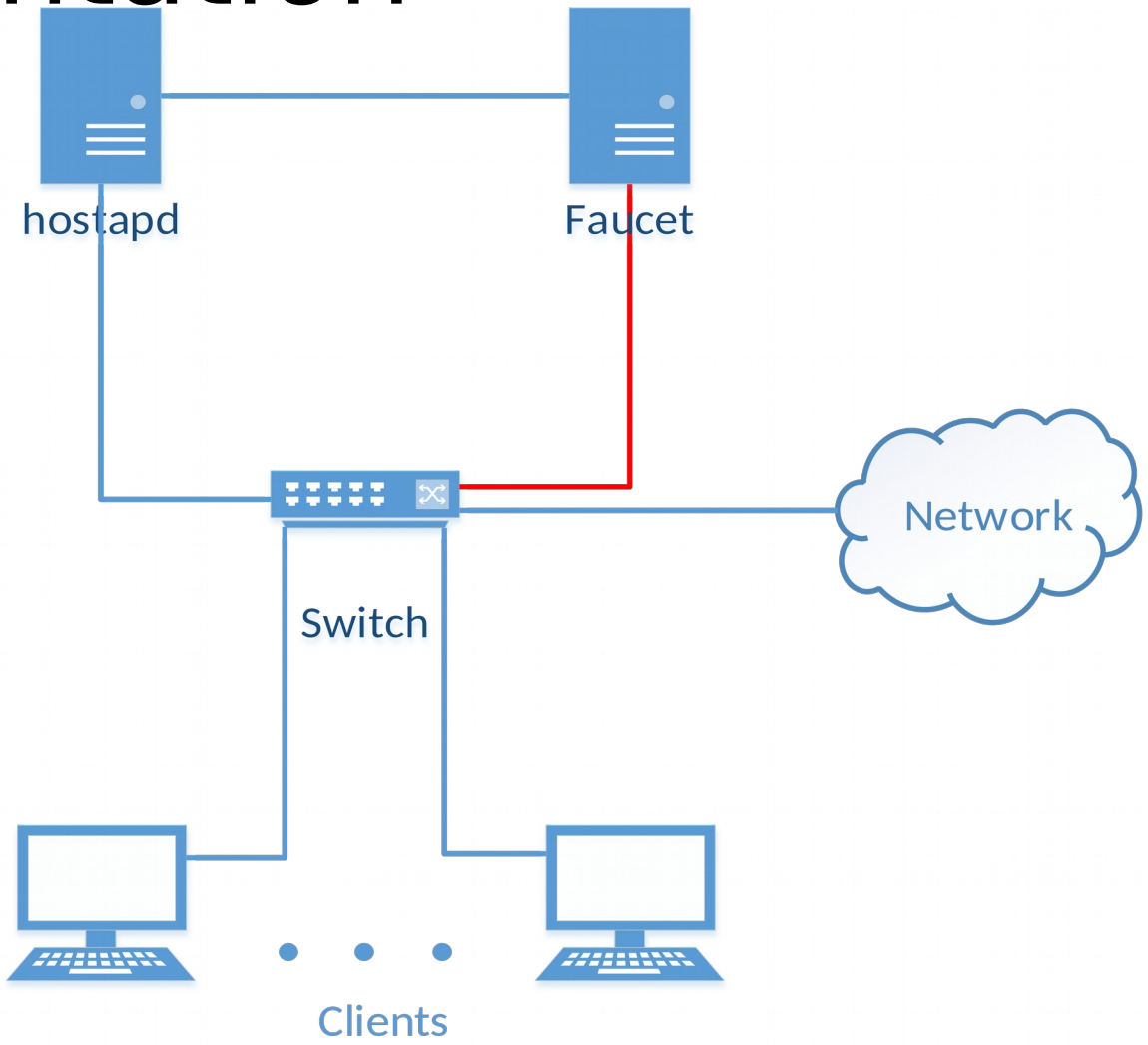
Implementation



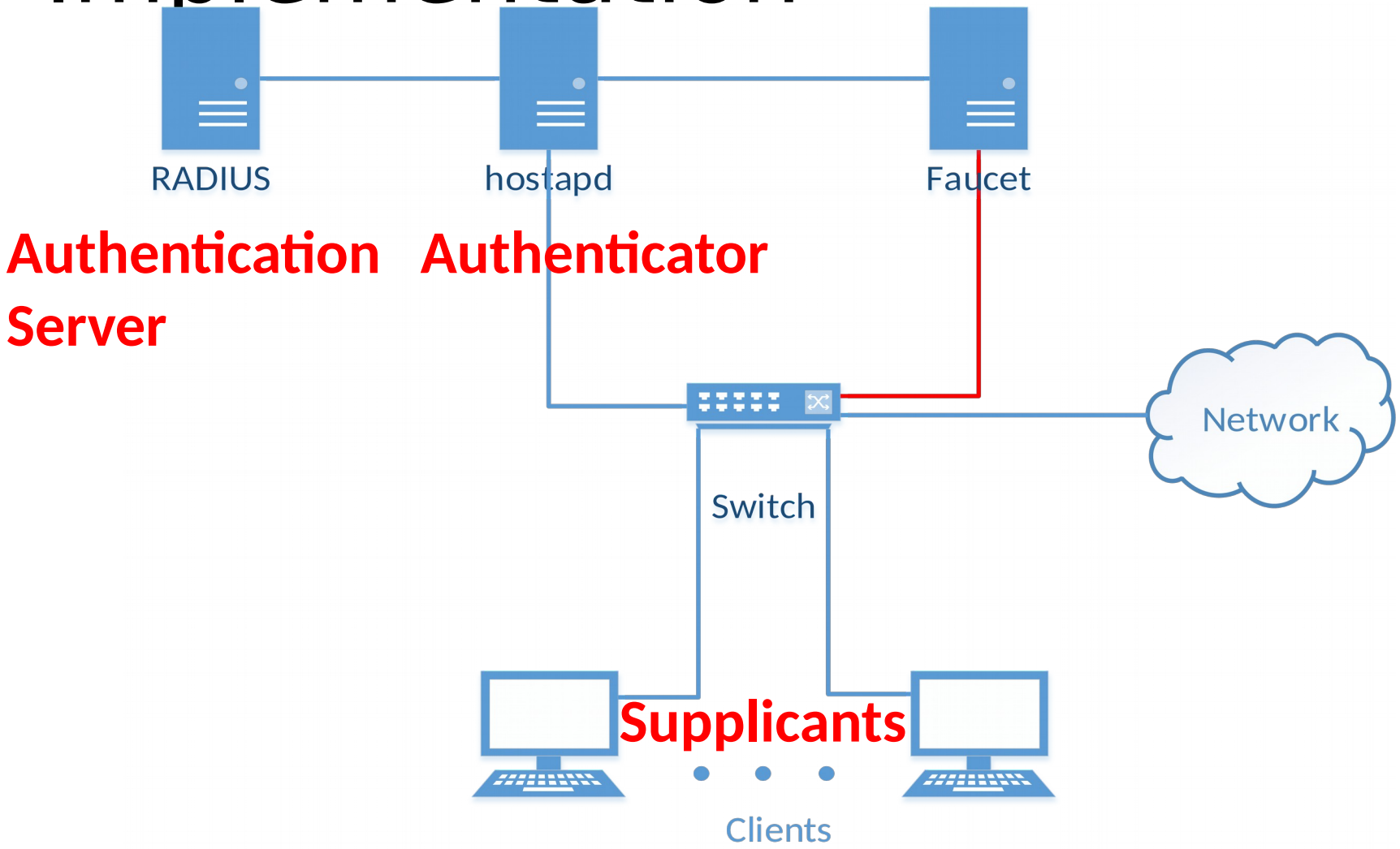
Implementation



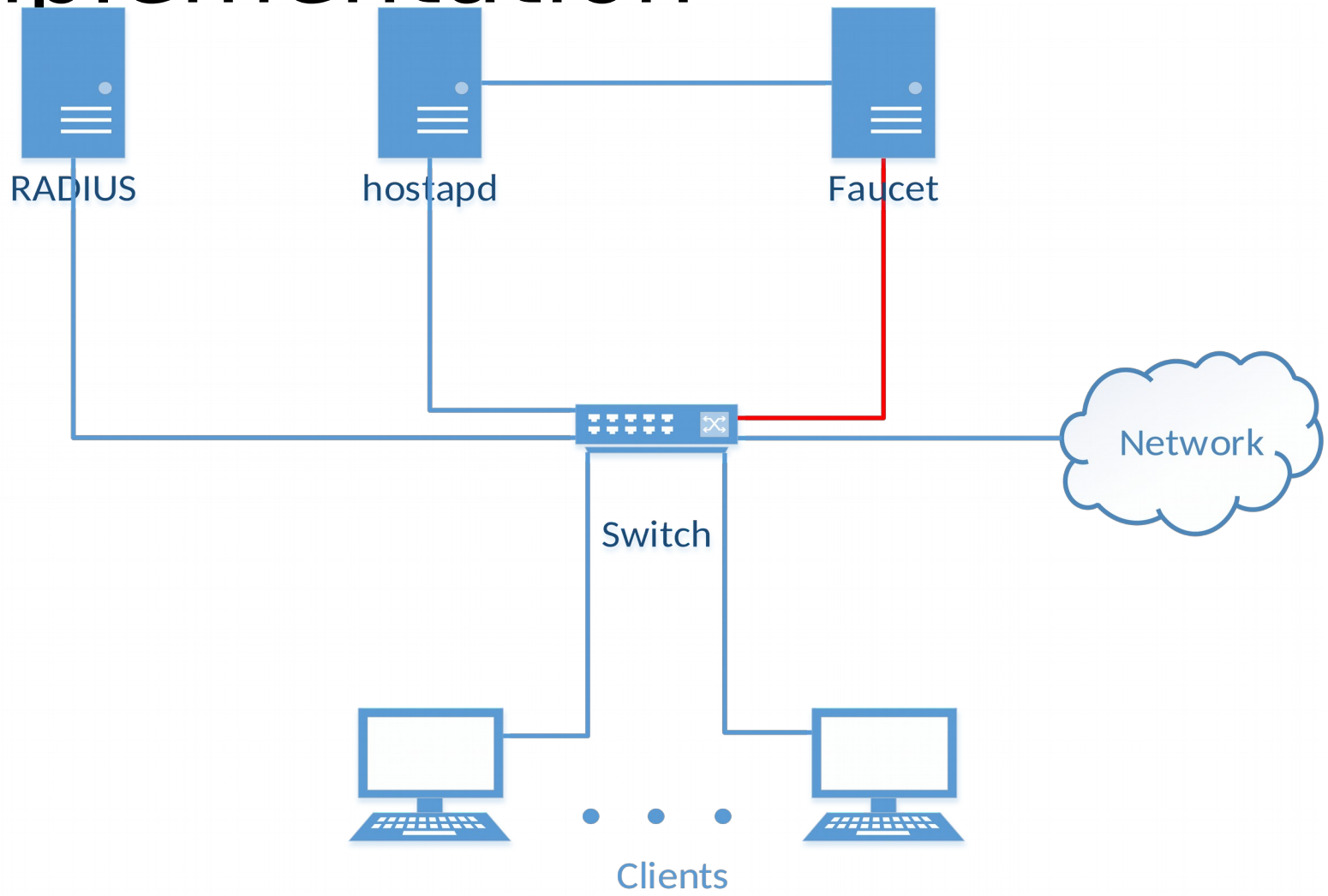
Implementation



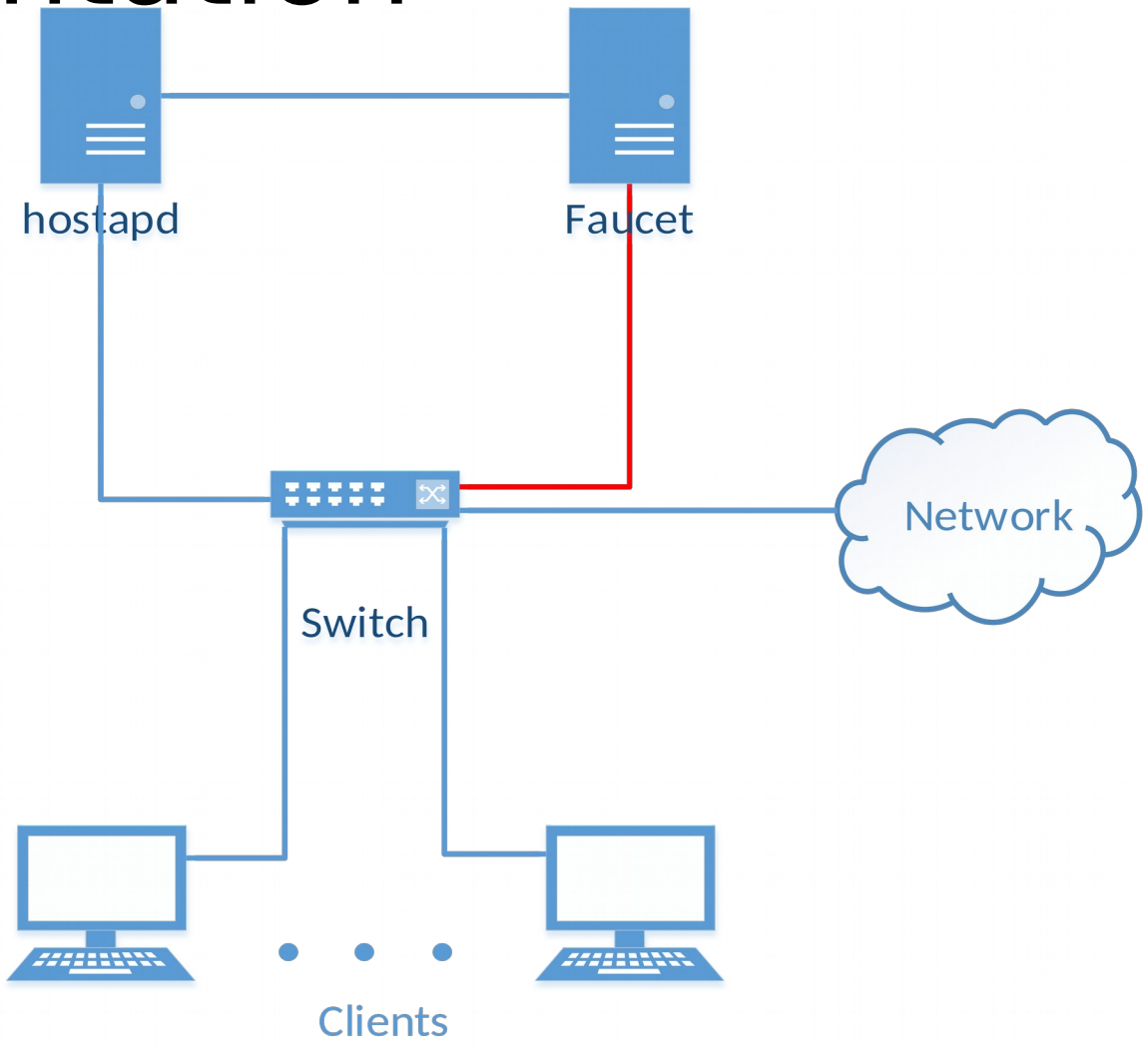
Implementation



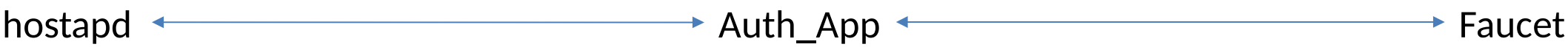
Implementation



Implementation



Implementation – Interprocess Communication



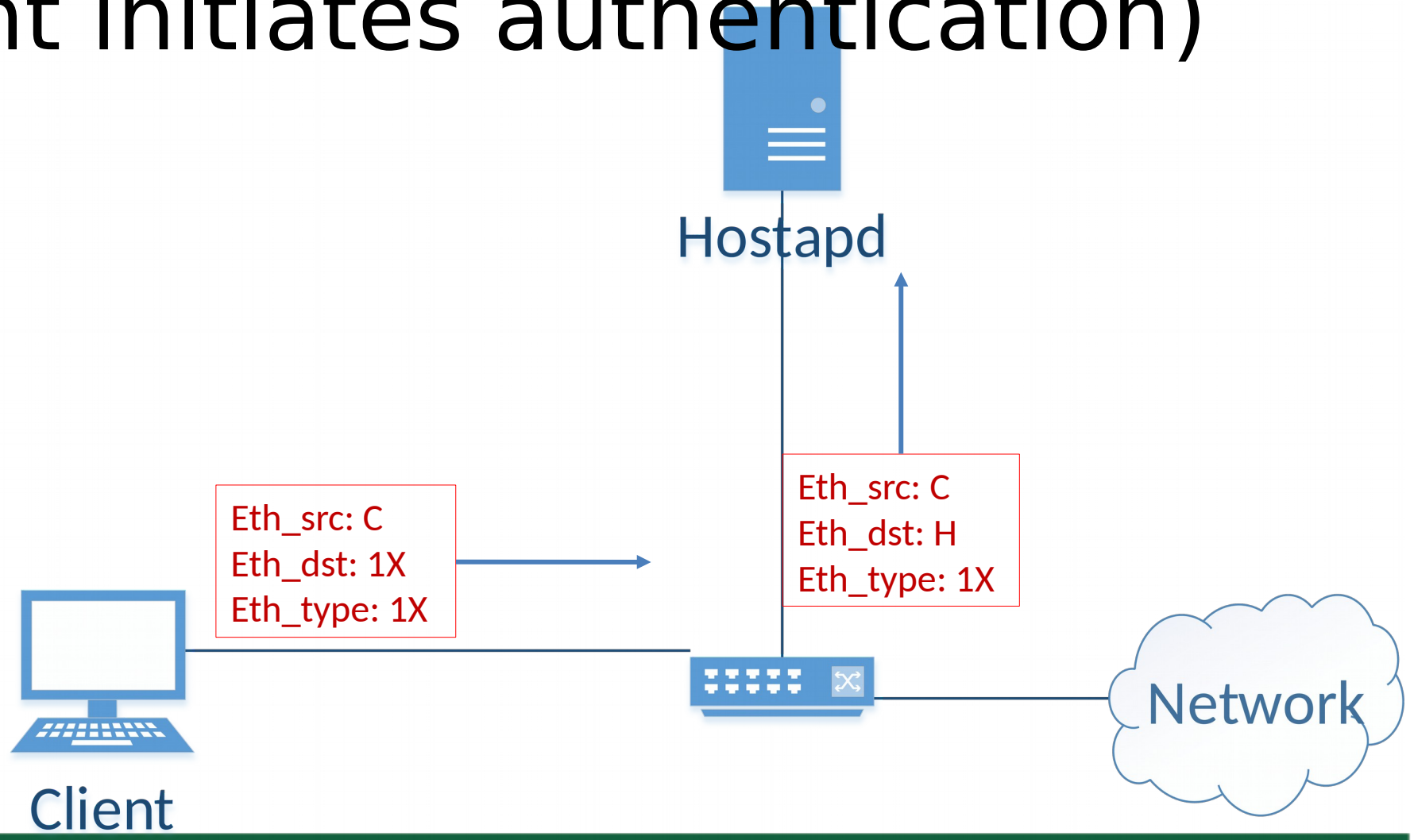
- UNIX Socket
  - Same Machine
- UDP Socket
  - Network

- Receive Events on station state changes (Success, Logoff, …)
- Request client data (Username, ACL names, …)

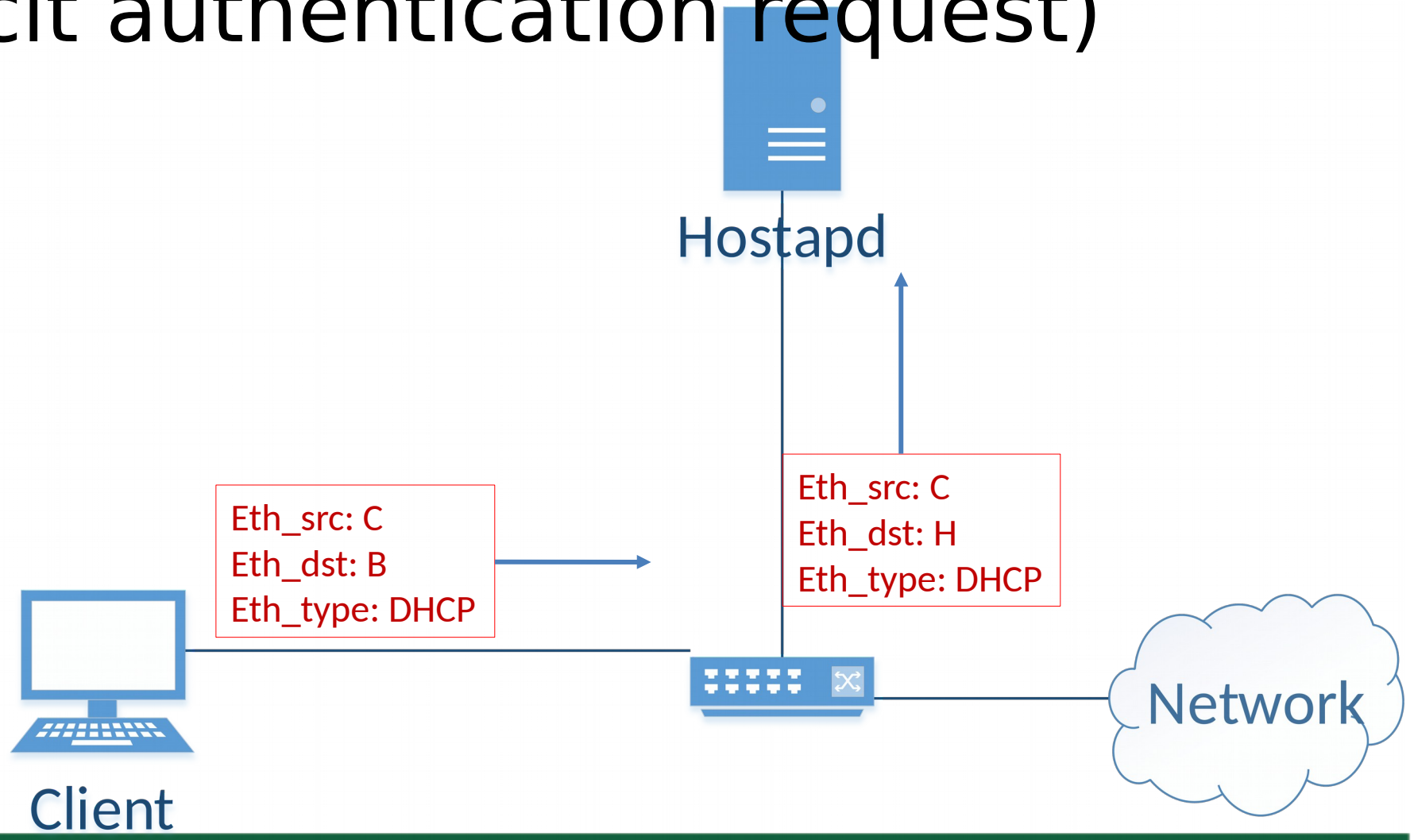
- Config File & SIGHUP
  - To Faucet
- Prometheus
  - From Faucet

- ACLs to apply
- MAC – Port Learning table

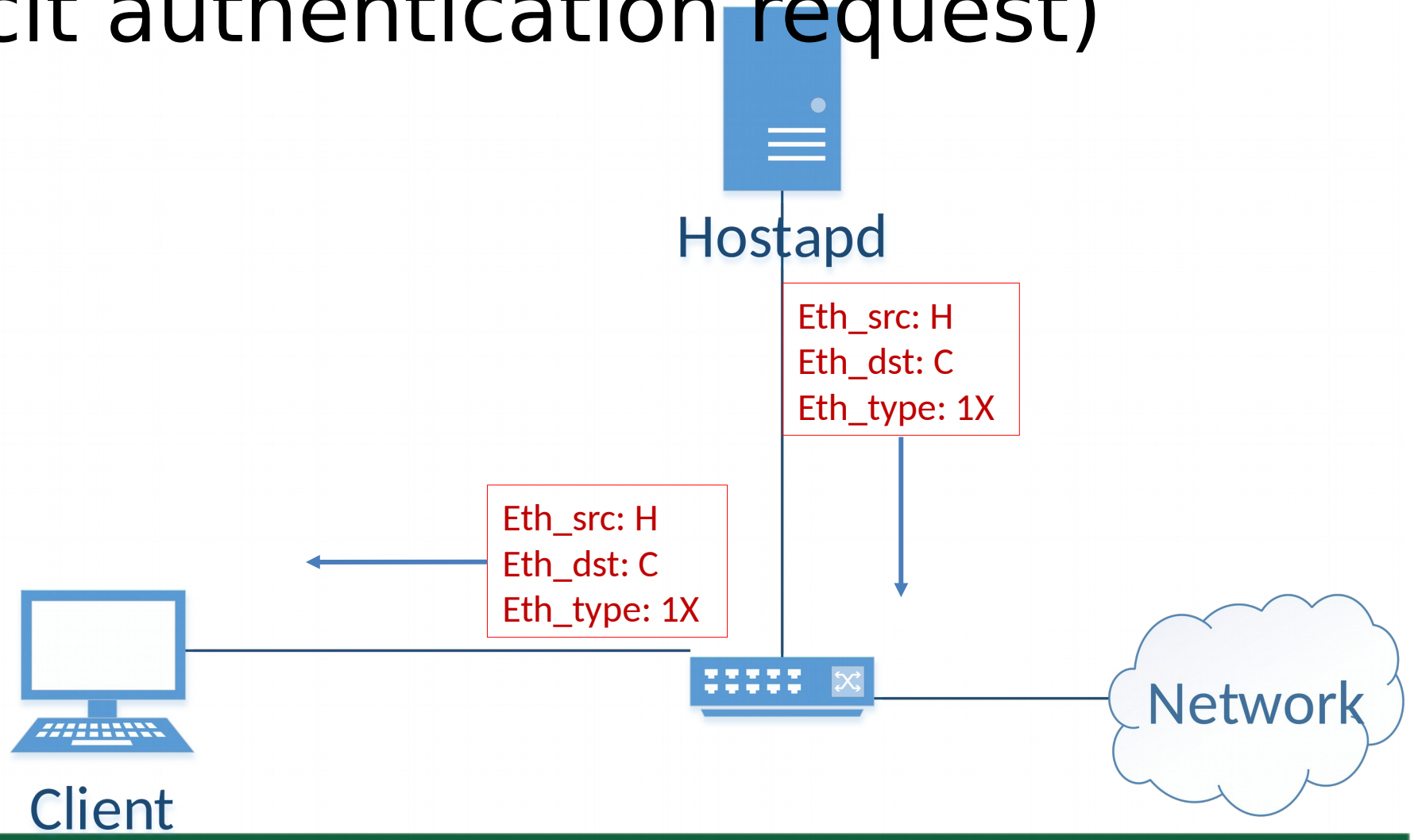
Implementation – 1X Redirect #1 (client initiates authentication)



Implementation – 1X Redirect #2 (client implicit authentication request)



Implementation – 1X Redirect #2 (client implicit authentication request)



Implementation - ACLs

- Matches:
  - Ethernet, VLAN, IP, TCP/UDP, …
- Actions:
  - Drop, allow, output port, mirror, change VLAN, …

faucet.yaml

```
acls:
   no_smtp:
      - rule:
         dl_src: 00:00:00:00:00:01
         dl_type: 0x800   # ipv4
         nw_proto: 6      # tcp
         tcp_dst: 25      # smtp
         actions:
            allow: 0     # drop
      - rule:
         dl_src: 00:00:00:00:00:01
         dl_type: 0x86dd  # ipv6
         nw_proto: 6      # tcp
         tcp_dst: 25      # smtp
         actions:
            allow: 0     # drop
```

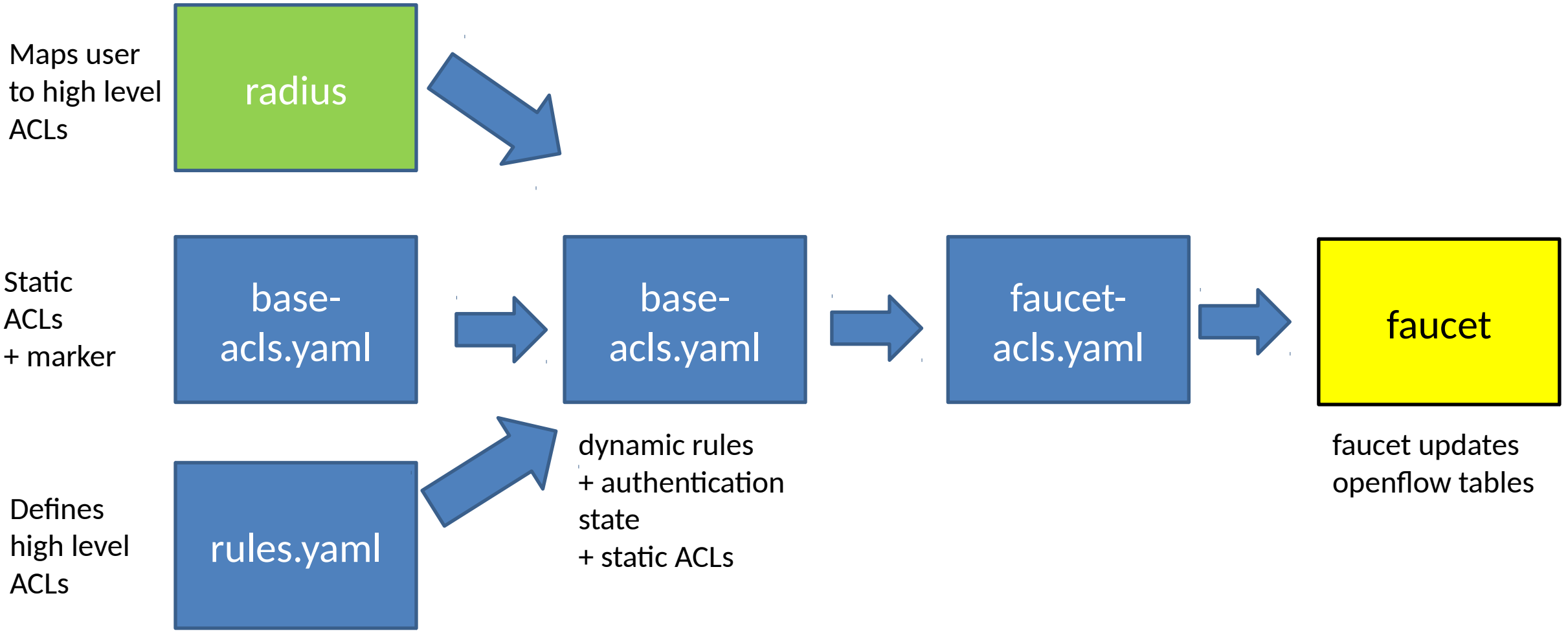
Implementation - ACLs

faucet.yaml

```
...
faucet-1:
 interfaces:
        1:
            name: network
            native_vlan: 100
        2:
            name: h0
            native_vlan: 100
            acl_in: port_faucet-1_3
         3:
            name: h1
            native_vlan: 100
            acl_in: port_faucet-1_4
        4:
            name: hostapd
            native_vlan: 100
```

- Each port has unique ACL
- port_<dp name>_<port #>

Implementation - ACLs



Implementation - ACLs

- RADIUS Attribute Vendor-Specific “Faucet-ACL-Names”
- List of ACL names
- Limited to 255 characters
- Applied in list order (first = highest priority)
  - “No-SMTP, No-SSH, No-ICMP, Allow-All”
  - “Student”

Implementation - ACLs

- Matches:
  - Ethernet, VLAN. IP, TCP/UDP, …
- Actions:
  - Drop, allow, output port, mirror, change VLAN, …

- Runtime insertion of authenticated clients ***username & MAC address***
- Rulelist have two ‘types’:
  - *Runtime auth port* – apply rules to ACL that belongs to the port authentication occurred on.
  - *ACL name* – any other Faucet ACL.
- YAML Anchors

rules.yaml

```
acls:
   no-smtp:
      _auth-port_:
      - rule:
         _name_: _user-name_
         _mac_: _user-mac_
         dl_src: _user-mac_
         dl_type: 0x800   # ipv4
         nw_proto: 6      # tcp
         tcp_dst: 25      # smtp
         actions:
            allow: 0     # drop
      port_faucet-1_3:
      - rule:
         _name_: _user-name_
         _mac_: _user-mac_
         dl_dst: _user-mac_
         dl_type: 0x800   # ipv4
         actions:
            allow: 1   # allow
```

Implementation - ACLs

- Matches:
  - Ethernet, VLAN. IP, TCP/UDP, …
- Actions:
  - Drop, allow, output port, mirror, change VLAN, …

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        _name_: _user-name_
        _mac_: _user-mac_
        dl_src: _user-mac_
        dl_type: 0x800   # ipv4
        nw_proto: 6      # tcp
        tcp_dst: 25      # smtp
        actions:
          allow: 0     # drop
    port_faucet-1_3:
    - rule:
        _name_: _user-name_
        _mac_: _user-mac_
        dl_dst: _user-mac_
        dl_type: 0x800   # ipv4
        actions:
          allow: 1   # allow
```

Implementation - ACLs

- Matches:
  - Ethernet, VLAN. IP, TCP/UDP, …
- Actions:
  - Drop, allow, output port, mirror, change VLAN, …

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- YAML Anchors

rules.yaml

```
acls:
    block-smtp: &block-smtp
      - rule:
          _name_: _user-name_
          _mac_: _user-mac_
          dl_src: _user-mac_
          dl_type: 0x800   # ipv4
          nw_proto: 6      # tcp
          tcp_dst: 25      # smtp
          actions:
            allow: 0     # drop

…
acls:
  student:
    _auth-port_:
        *block-smtp
        *block-ssh
        *allow-all
```

Implementation - ACLs

‘Base-ACLs’

- Base-ACLs -> Faucet-ACLs

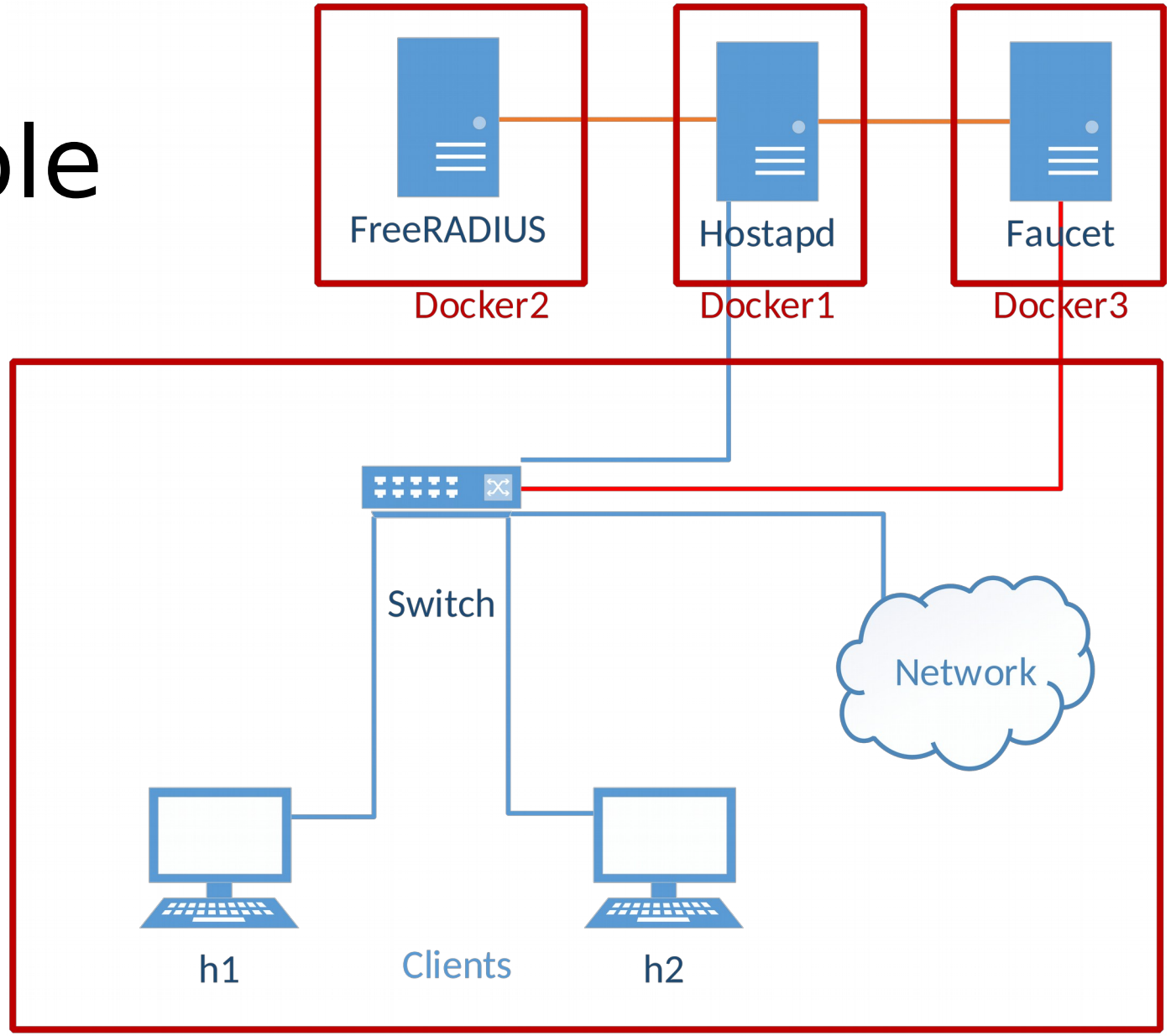
- Marker – where new rules (host authorisation) applied.
- State of what rules belong to which user & MAC
- Allows YAML anchors

```
base-acls.yaml
acls:
 port_faucet-1_4:
 - rule:
     dl_type: 0x888e
     actions:
      allow: 1
      output:
       dl_dst: '44:44:44:44:44:44'
 - authed-rules
 - rule:
          _name_: michael
          _mac_: ’00:00:00:00:00:01’
          dl_dst: ’00:00:00:00:00:01’
          dl_type: 0x800   # ipv4
          actions:
             allow: 1   # allow
 - rule:
     actions:
      allow: 1
      output:
       dl_dst: '44:44:44:44:44:44'
```

Fail Secure

- Faucet - network should stay the same.
- auth_app - Either reset config or reload last good.
- Switch – Faucet applies latest config.

Example

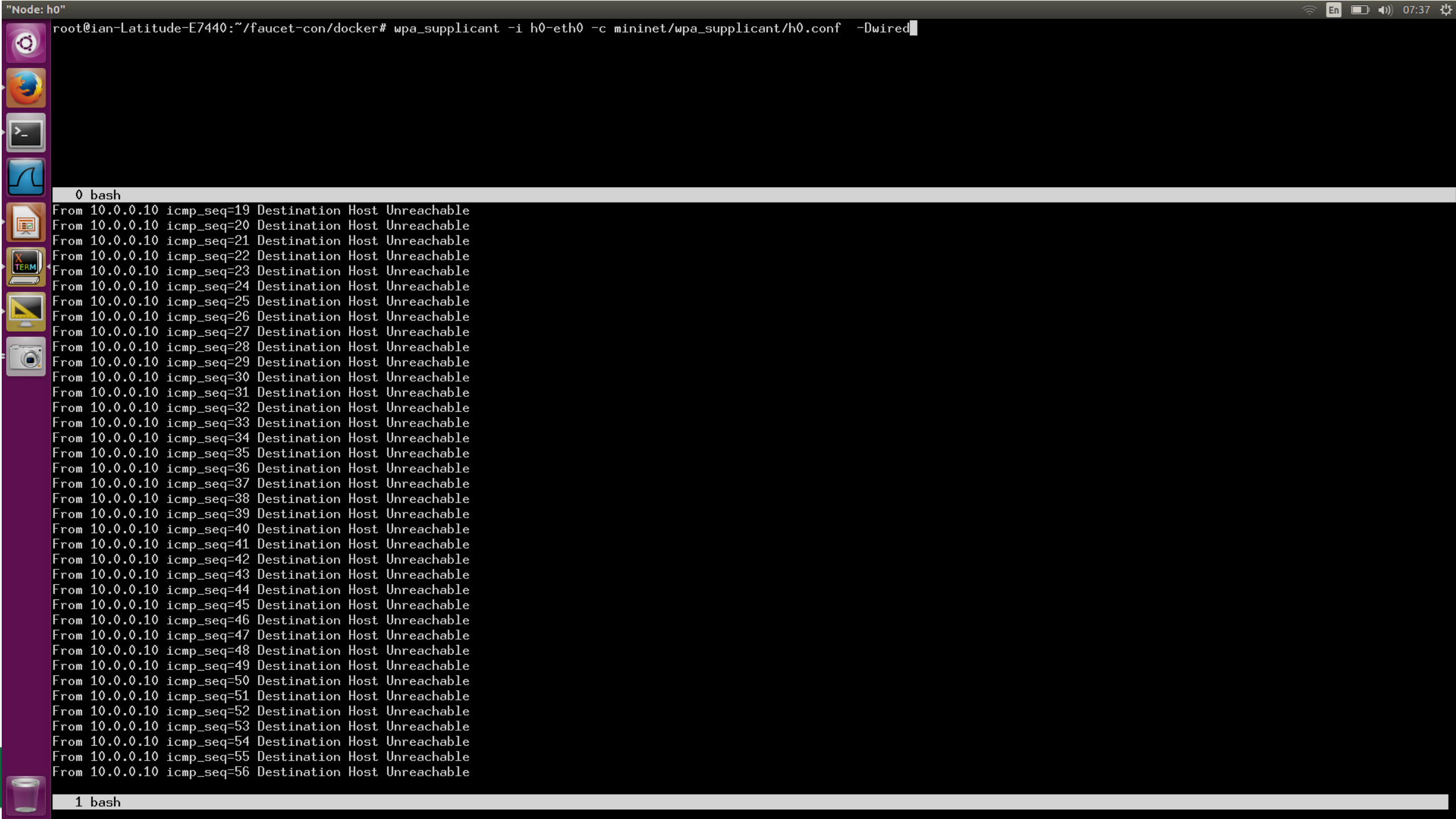

FreeRADIUS
Hostapd
Faucet
Docker2
Docker1
Docker3
Switch
Network
h1
Clients
h2

Demo

- H1 windows for ping.
- H1 windows for running logon and logoff.

- Wireshark all switch interfaces. – showing mac rewrite.

- Bring up the changed base acl/original


"Node: h0"
root@ian-Latitude-E7440:~/faucet-con/docker# wpa_supplicant -i h0-eth0 -c mininet/wpa_supplicant/h0.conf -Dwired
0 bash
From 10.0.0.10 icmp_seq=19 Destination Host Unreachable
From 10.0.0.10 icmp_seq=20 Destination Host Unreachable
From 10.0.0.10 icmp_seq=21 Destination Host Unreachable
From 10.0.0.10 icmp_seq=22 Destination Host Unreachable
From 10.0.0.10 icmp_seq=23 Destination Host Unreachable
From 10.0.0.10 icmp_seq=24 Destination Host Unreachable
From 10.0.0.10 icmp_seq=25 Destination Host Unreachable
From 10.0.0.10 icmp_seq=26 Destination Host Unreachable
From 10.0.0.10 icmp_seq=27 Destination Host Unreachable
From 10.0.0.10 icmp_seq=28 Destination Host Unreachable
From 10.0.0.10 icmp_seq=29 Destination Host Unreachable
From 10.0.0.10 icmp_seq=30 Destination Host Unreachable
From 10.0.0.10 icmp_seq=31 Destination Host Unreachable
From 10.0.0.10 icmp_seq=32 Destination Host Unreachable
From 10.0.0.10 icmp_seq=33 Destination Host Unreachable
From 10.0.0.10 icmp_seq=34 Destination Host Unreachable
From 10.0.0.10 icmp_seq=35 Destination Host Unreachable
From 10.0.0.10 icmp_seq=36 Destination Host Unreachable
From 10.0.0.10 icmp_seq=37 Destination Host Unreachable
From 10.0.0.10 icmp_seq=38 Destination Host Unreachable
From 10.0.0.10 icmp_seq=39 Destination Host Unreachable
From 10.0.0.10 icmp_seq=40 Destination Host Unreachable
From 10.0.0.10 icmp_seq=41 Destination Host Unreachable
From 10.0.0.10 icmp_seq=42 Destination Host Unreachable
From 10.0.0.10 icmp_seq=43 Destination Host Unreachable
From 10.0.0.10 icmp_seq=44 Destination Host Unreachable
From 10.0.0.10 icmp_seq=45 Destination Host Unreachable
From 10.0.0.10 icmp_seq=46 Destination Host Unreachable
From 10.0.0.10 icmp_seq=47 Destination Host Unreachable
From 10.0.0.10 icmp_seq=48 Destination Host Unreachable
From 10.0.0.10 icmp_seq=49 Destination Host Unreachable
From 10.0.0.10 icmp_seq=50 Destination Host Unreachable
From 10.0.0.10 icmp_seq=51 Destination Host Unreachable
From 10.0.0.10 icmp_seq=52 Destination Host Unreachable
From 10.0.0.10 icmp_seq=53 Destination Host Unreachable
From 10.0.0.10 icmp_seq=54 Destination Host Unreachable
From 10.0.0.10 icmp_seq=55 Destination Host Unreachable
From 10.0.0.10 icmp_seq=56 Destination Host Unreachable
1 bash

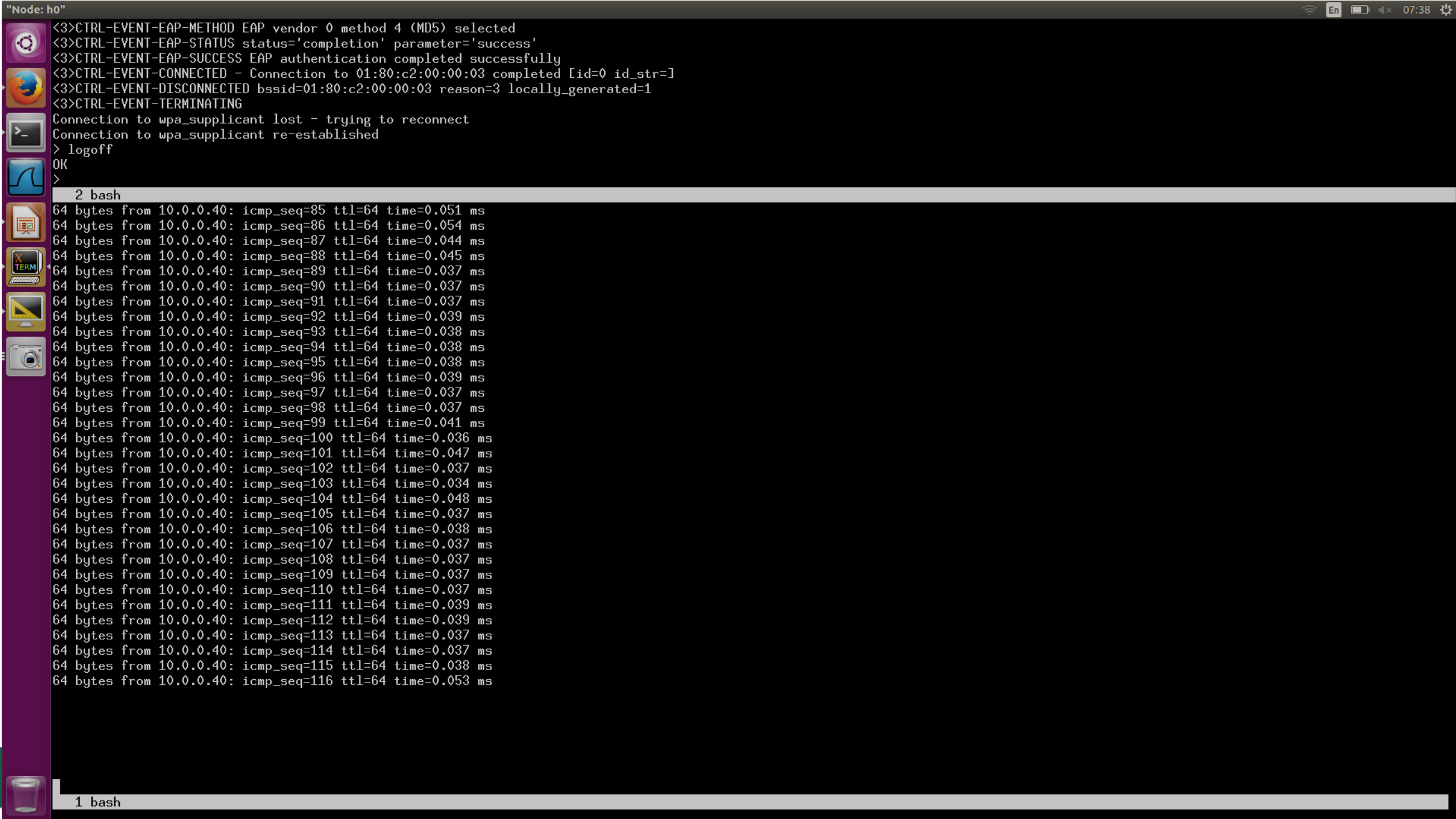
```
root@ian-Latitude-E7440:~/faucet-con/docker# wpa_supplicant -i h0-eth0 -c mininet/wpa_supplicant/h0.conf  -Dwired
Successfully initialized wpa_supplicant
h0-eth0: Associated with 01:80:c2:00:00:03
WMM AC: Missing IEs
h0-eth0: CTRL-EVENT-EAP-STARTED EAP authentication started
h0-eth0: CTRL-EVENT-EAP-PROPOSED-METHOD vendor=0 method=4
h0-eth0: CTRL-EVENT-EAP-METHOD EAP vendor 0 method 4 (MD5) selected
h0-eth0: CTRL-EVENT-EAP-SUCCESS EAP authentication completed successfully
h0-eth0: CTRL-EVENT-CONNECTED - Connection to 01:80:c2:00:00:03 completed [id=0 id_str=]
^[[F
```

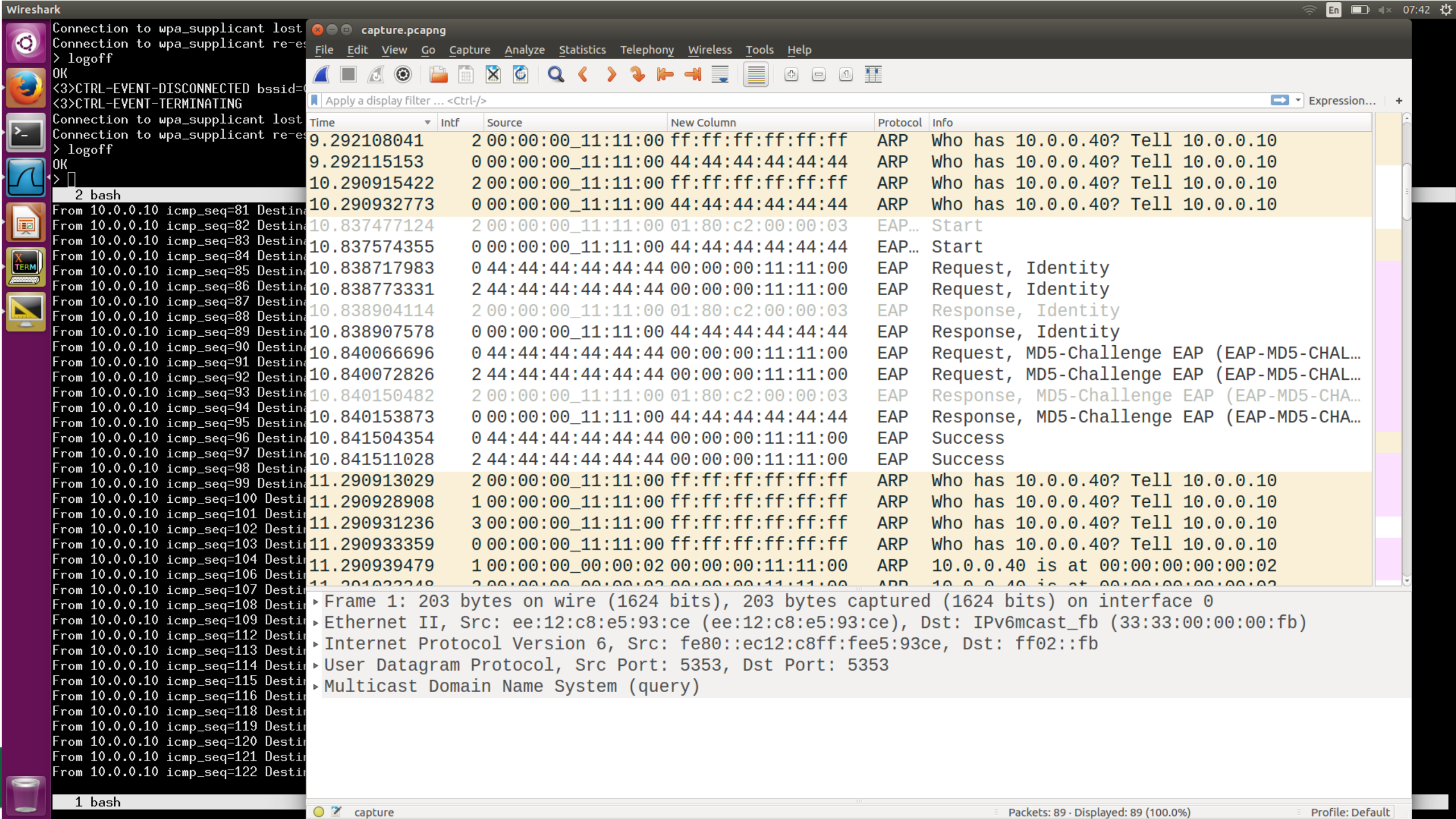
Wireshark

0 bash

```
From 10.0.0.10 icmp_seq=48 Destination Host Unreachable
From 10.0.0.10 icmp_seq=49 Destination Host Unreachable
From 10.0.0.10 icmp_seq=50 Destination Host Unreachable
From 10.0.0.10 icmp_seq=51 Destination Host Unreachable
From 10.0.0.10 icmp_seq=52 Destination Host Unreachable
From 10.0.0.10 icmp_seq=53 Destination Host Unreachable
From 10.0.0.10 icmp_seq=54 Destination Host Unreachable
From 10.0.0.10 icmp_seq=55 Destination Host Unreachable
From 10.0.0.10 icmp_seq=56 Destination Host Unreachable
From 10.0.0.10 icmp_seq=57 Destination Host Unreachable
From 10.0.0.10 icmp_seq=58 Destination Host Unreachable
From 10.0.0.10 icmp_seq=59 Destination Host Unreachable
From 10.0.0.10 icmp_seq=60 Destination Host Unreachable
From 10.0.0.10 icmp_seq=61 Destination Host Unreachable
From 10.0.0.10 icmp_seq=62 Destination Host Unreachable
From 10.0.0.10 icmp_seq=63 Destination Host Unreachable
From 10.0.0.10 icmp_seq=64 Destination Host Unreachable
From 10.0.0.10 icmp_seq=65 Destination Host Unreachable
From 10.0.0.10 icmp_seq=66 Destination Host Unreachable
From 10.0.0.10 icmp_seq=67 Destination Host Unreachable
From 10.0.0.10 icmp_seq=68 Destination Host Unreachable
From 10.0.0.10 icmp_seq=69 Destination Host Unreachable
From 10.0.0.10 icmp_seq=70 Destination Host Unreachable
From 10.0.0.10 icmp_seq=71 Destination Host Unreachable
From 10.0.0.10 icmp_seq=72 Destination Host Unreachable
From 10.0.0.10 icmp_seq=73 Destination Host Unreachable
From 10.0.0.10 icmp_seq=74 Destination Host Unreachable
From 10.0.0.10 icmp_seq=75 Destination Host Unreachable
From 10.0.0.10 icmp_seq=76 Destination Host Unreachable
From 10.0.0.10 icmp_seq=77 Destination Host Unreachable
64 bytes from 10.0.0.40: icmp_seq=78 ttl=64 time=0.312 ms
64 bytes from 10.0.0.40: icmp_seq=79 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=80 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=81 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=82 ttl=64 time=0.040 ms
64 bytes from 10.0.0.40: icmp_seq=83 ttl=64 time=0.048 ms
64 bytes from 10.0.0.40: icmp_seq=84 ttl=64 time=0.053 ms
64 bytes from 10.0.0.40: icmp_seq=85 ttl=64 time=0.051 ms
```

1 bash


"Node: h0"
07:38
<3>CTRL-EVENT-EAP-METHOD EAP vendor 0 method 4 (MD5) selected
<3>CTRL-EVENT-EAP-STATUS status='completion' parameter='success'
<3>CTRL-EVENT-EAP-SUCCESS EAP authentication completed successfully
<3>CTRL-EVENT-CONNECTED - Connection to 01:80:c2:00:00:03 completed [id=0 id_str=]
<3>CTRL-EVENT-DISCONNECTED bssid=01:80:c2:00:00:03 reason=3 locally_generated=1
<3>CTRL-EVENT-TERMINATING
Connection to wpa_supplicant lost - trying to reconnect
Connection to wpa_supplicant re-established
> logoff
OK
>
2 bash
64 bytes from 10.0.0.40: icmp_seq=85 ttl=64 time=0.051 ms
64 bytes from 10.0.0.40: icmp_seq=86 ttl=64 time=0.054 ms
64 bytes from 10.0.0.40: icmp_seq=87 ttl=64 time=0.044 ms
64 bytes from 10.0.0.40: icmp_seq=88 ttl=64 time=0.045 ms
64 bytes from 10.0.0.40: icmp_seq=89 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=90 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=91 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=92 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=93 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=94 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=95 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=96 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=97 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=98 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=99 ttl=64 time=0.041 ms
64 bytes from 10.0.0.40: icmp_seq=100 ttl=64 time=0.036 ms
64 bytes from 10.0.0.40: icmp_seq=101 ttl=64 time=0.047 ms
64 bytes from 10.0.0.40: icmp_seq=102 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=103 ttl=64 time=0.034 ms
64 bytes from 10.0.0.40: icmp_seq=104 ttl=64 time=0.048 ms
64 bytes from 10.0.0.40: icmp_seq=105 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=106 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=107 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=108 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=109 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=110 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=111 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=112 ttl=64 time=0.039 ms
64 bytes from 10.0.0.40: icmp_seq=113 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=114 ttl=64 time=0.037 ms
64 bytes from 10.0.0.40: icmp_seq=115 ttl=64 time=0.038 ms
64 bytes from 10.0.0.40: icmp_seq=116 ttl=64 time=0.053 ms
1 bash


Wireshark
07:42
Connection to wpa_supplicant lost
Connection to wpa_supplicant re-es
> logoff
OK
<3>CTRL-EVENT-DISCONNECTED bssid=
<3>CTRL-EVENT-TERMINATING
Connection to wpa_supplicant lost
Connection to wpa_supplicant re-es
> logoff
OK
2 bash
From 10.0.0.10 icmp_seq=81 Destina
From 10.0.0.10 icmp_seq=82 Destina
From 10.0.0.10 icmp_seq=83 Destina
From 10.0.0.10 icmp_seq=84 Destina
From 10.0.0.10 icmp_seq=85 Destina
From 10.0.0.10 icmp_seq=86 Destina
From 10.0.0.10 icmp_seq=87 Destina
From 10.0.0.10 icmp_seq=88 Destina
From 10.0.0.10 icmp_seq=89 Destina
From 10.0.0.10 icmp_seq=90 Destina
From 10.0.0.10 icmp_seq=91 Destina
From 10.0.0.10 icmp_seq=92 Destina
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From 10.0.0.10 icmp_seq=96 Destina
From 10.0.0.10 icmp_seq=97 Destina
From 10.0.0.10 icmp_seq=98 Destina
From 10.0.0.10 icmp_seq=99 Destina
From 10.0.0.10 icmp_seq=100 Destin
From 10.0.0.10 icmp_seq=101 Destin
From 10.0.0.10 icmp_seq=102 Destin
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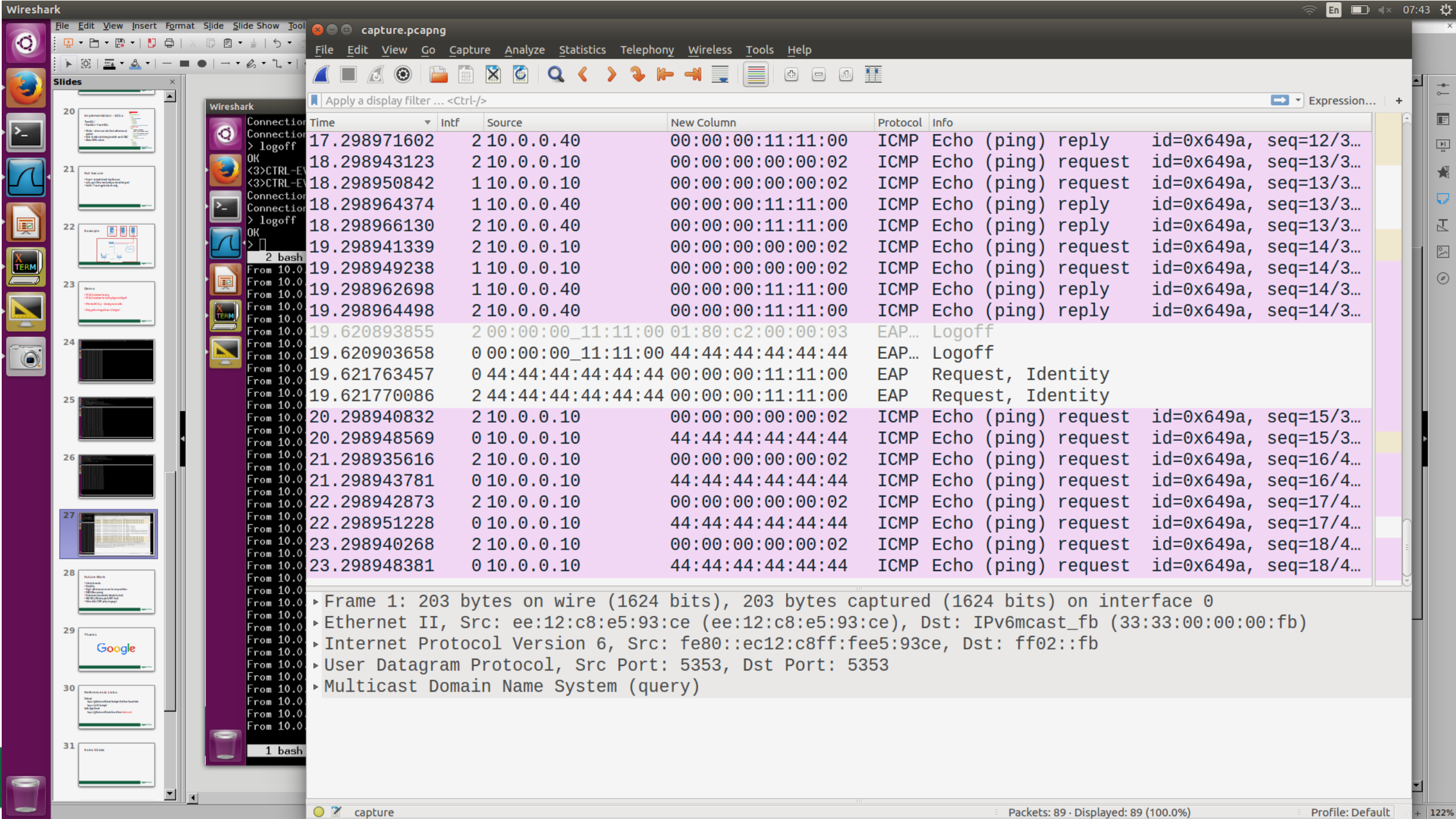
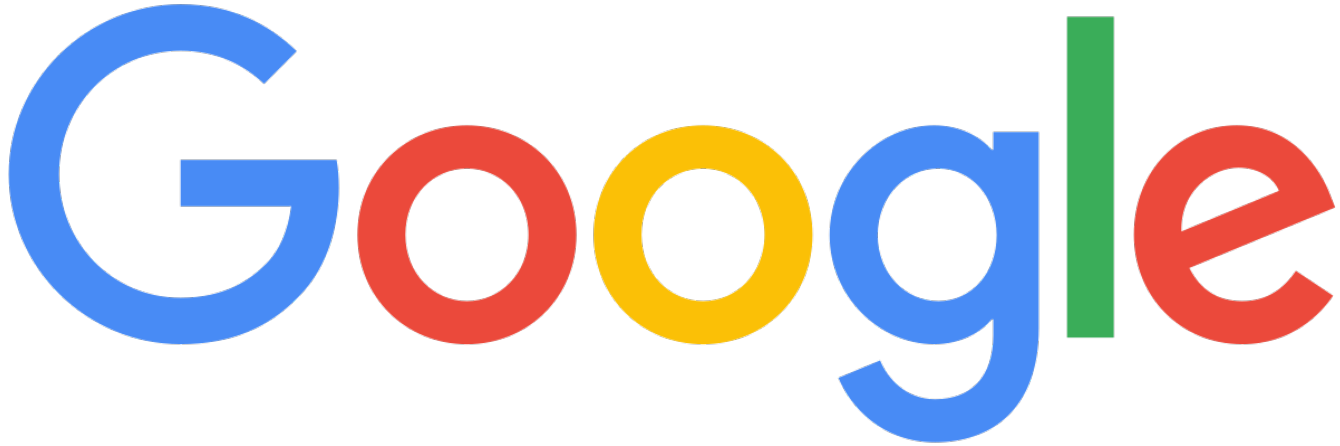
From 10.0.0.10 icmp_seq=104 Destin
From 10.0.0.10 icmp_seq=106 Destin
From 10.0.0.10 icmp_seq=107 Destin
From 10.0.0.10 icmp_seq=108 Destin
From 10.0.0.10 icmp_seq=109 Destin
From 10.0.0.10 icmp_seq=112 Destin
From 10.0.0.10 icmp_seq=113 Destin
From 10.0.0.10 icmp_seq=114 Destin
From 10.0.0.10 icmp_seq=115 Destin
From 10.0.0.10 icmp_seq=116 Destin
From 10.0.0.10 icmp_seq=118 Destin
From 10.0.0.10 icmp_seq=119 Destin
From 10.0.0.10 icmp_seq=120 Destin
From 10.0.0.10 icmp_seq=121 Destin
From 10.0.0.10 icmp_seq=122 Destin
1 bash
capture.pcapng
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>
Expression…
Time Intf Source New Column Protocol Info
9.292108041 2 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
9.292115153 0 00:00:00_11:11:00 44:44:44:44:44:44 ARP Who has 10.0.0.40? Tell 10.0.0.10
10.290915422 2 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
10.290932773 0 00:00:00_11:11:00 44:44:44:44:44:44 ARP Who has 10.0.0.40? Tell 10.0.0.10
10.837477124 2 00:00:00_11:11:00 01:80:c2:00:00:03 EAP… Start
10.837574355 0 00:00:00_11:11:00 44:44:44:44:44:44 EAP… Start
10.838717983 0 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, Identity
10.838773331 2 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, Identity
10.838904114 2 00:00:00_11:11:00 01:80:c2:00:00:03 EAP Response, Identity
10.838907578 0 00:00:00_11:11:00 44:44:44:44:44:44 EAP Response, Identity
10.840066696 0 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, MD5-Challenge EAP (EAP-MD5-CHAL…
10.840072826 2 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, MD5-Challenge EAP (EAP-MD5-CHAL…
10.840150482 2 00:00:00_11:11:00 01:80:c2:00:00:03 EAP Response, MD5-Challenge EAP (EAP-MD5-CHA…
10.840153873 0 00:00:00_11:11:00 44:44:44:44:44:44 EAP Response, MD5-Challenge EAP (EAP-MD5-CHA…
10.841504354 0 44:44:44:44:44:44 00:00:00:11:11:00 EAP Success
10.841511028 2 44:44:44:44:44:44 00:00:00:11:11:00 EAP Success
11.290913029 2 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
11.290928908 1 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
11.290931236 3 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
11.290933359 0 00:00:00_11:11:00 ff:ff:ff:ff:ff:ff ARP Who has 10.0.0.40? Tell 10.0.0.10
11.290939479 1 00:00:00_00:00:02 00:00:00:11:11:00 ARP 10.0.0.40 is at 00:00:00:00:00:02
Frame 1: 203 bytes on wire (1624 bits), 203 bytes captured (1624 bits) on interface 0
Ethernet II, Src: ee:12:c8:e5:93:ce (ee:12:c8:e5:93:ce), Dst: IPv6mcast_fb (33:33:00:00:00:fb)
Internet Protocol Version 6, Src: fe80::ec12:c8ff:fee5:93ce, Dst: ff02::fb
User Datagram Protocol, Src Port: 5353, Dst Port: 5353
Multicast Domain Name System (query)
capture
Packets: 89 · Displayed: 89 (100.0%)
Profile: Default


Wireshark
capture.pcapng
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>
Expression…
Time Intf Source New Column Protocol Info
17.298971602 2 10.0.0.40 00:00:00:11:11:00 ICMP Echo (ping) reply id=0x649a, seq=12/3…
18.298943123 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=13/3…
18.298950842 1 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=13/3…
18.298964374 1 10.0.0.40 00:00:00:11:11:00 ICMP Echo (ping) reply id=0x649a, seq=13/3…
18.298966130 2 10.0.0.40 00:00:00:11:11:00 ICMP Echo (ping) reply id=0x649a, seq=13/3…
19.298941339 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=14/3…
19.298949238 1 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=14/3…
19.298962698 1 10.0.0.40 00:00:00:11:11:00 ICMP Echo (ping) reply id=0x649a, seq=14/3…
19.298964498 2 10.0.0.40 00:00:00:11:11:00 ICMP Echo (ping) reply id=0x649a, seq=14/3…
19.620893855 2 00:00:00_11:11:00 01:80:c2:00:00:03 EAP… Logoff
19.620903658 0 00:00:00_11:11:00 44:44:44:44:44:44 EAP… Logoff
19.621763457 0 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, Identity
19.621770086 2 44:44:44:44:44:44 00:00:00:11:11:00 EAP Request, Identity
20.298940832 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=15/3…
20.298948569 0 10.0.0.10 44:44:44:44:44:44 ICMP Echo (ping) request id=0x649a, seq=15/3…
21.298935616 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=16/4…
21.298943781 0 10.0.0.10 44:44:44:44:44:44 ICMP Echo (ping) request id=0x649a, seq=16/4…
22.298942873 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=17/4…
22.298951228 0 10.0.0.10 44:44:44:44:44:44 ICMP Echo (ping) request id=0x649a, seq=17/4…
23.298940268 2 10.0.0.10 00:00:00:00:00:02 ICMP Echo (ping) request id=0x649a, seq=18/4…
23.298948381 0 10.0.0.10 44:44:44:44:44:44 ICMP Echo (ping) request id=0x649a, seq=18/4…
Frame 1: 203 bytes on wire (1624 bits), 203 bytes captured (1624 bits) on interface 0
Ethernet II, Src: ee:12:c8:e5:93:ce (ee:12:c8:e5:93:ce), Dst: IPv6mcast_fb (33:33:00:00:00:fb)
Internet Protocol Version 6, Src: fe80::ec12:c8ff:fee5:93ce, Dst: ff02::fb
User Datagram Protocol, Src Port: 5353, Dst Port: 5353
Multicast Domain Name System (query)
capture
Packets: 89 · Displayed: 89 (100.0%)
Profile: Default
Slides
Wireshark
2 bash
1 bash

Future Work

- Link state events.
- Flexibility
- Single authentication server for many switches.
- RADIUS Accounting
- Packetfence (dynamically allocate to vlans)
- MACSEC (offload crypto to NFV host)
- Richer ACLs (VUW policy language)

Thanks



References & Links

Hostapd

https://github.com/Bairdo/hostapd-d1xf/tree/faucet-tests

https://w1.fi/hostapd/

Auth_App/Faucet

https://github.com/Bairdo/faucet/tree/radius-acls

Extra Slides

Link State Events

- Listen for Ryu Link event Messages
- Switch port goes down – all on that port should reauth