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Layer 2 user isolation in Eduroam.si

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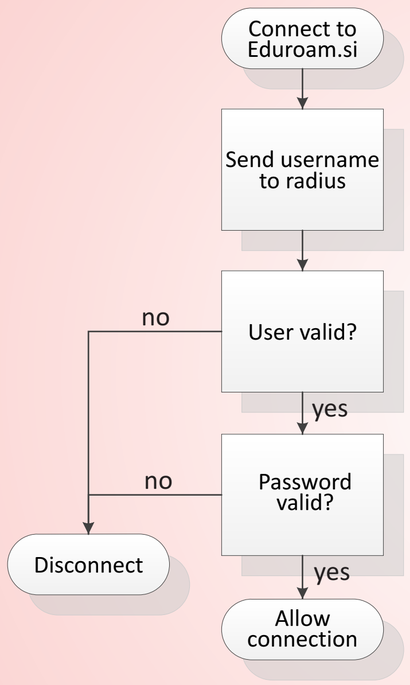
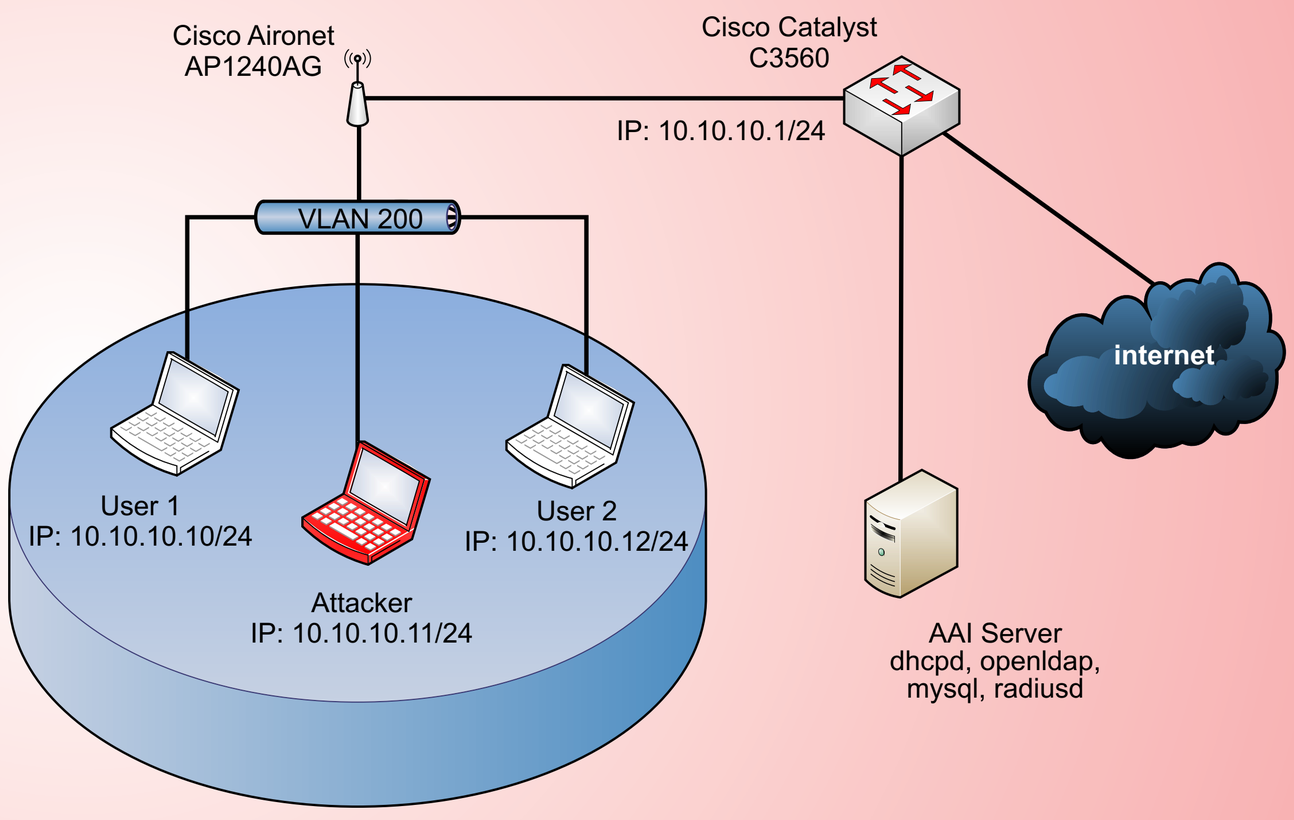
About

- Layer 2 attacks are still a threat
- Autonomous access points have no proper mitigation techniques
- Sometimes even worse - no logging

Research

- *bridge-group port-protected* command - blocks ALL communication between clients
- PVLANs - not supported on autonomous access points





Previous work

In most Eduroam.si networks all clients are on the same Layer 2 segment. This can lead to various:

- IPv4 attacks [1], e.g. ARP poisoning
- IPv6 attacks [2], e.g. IPv6 rouge RA

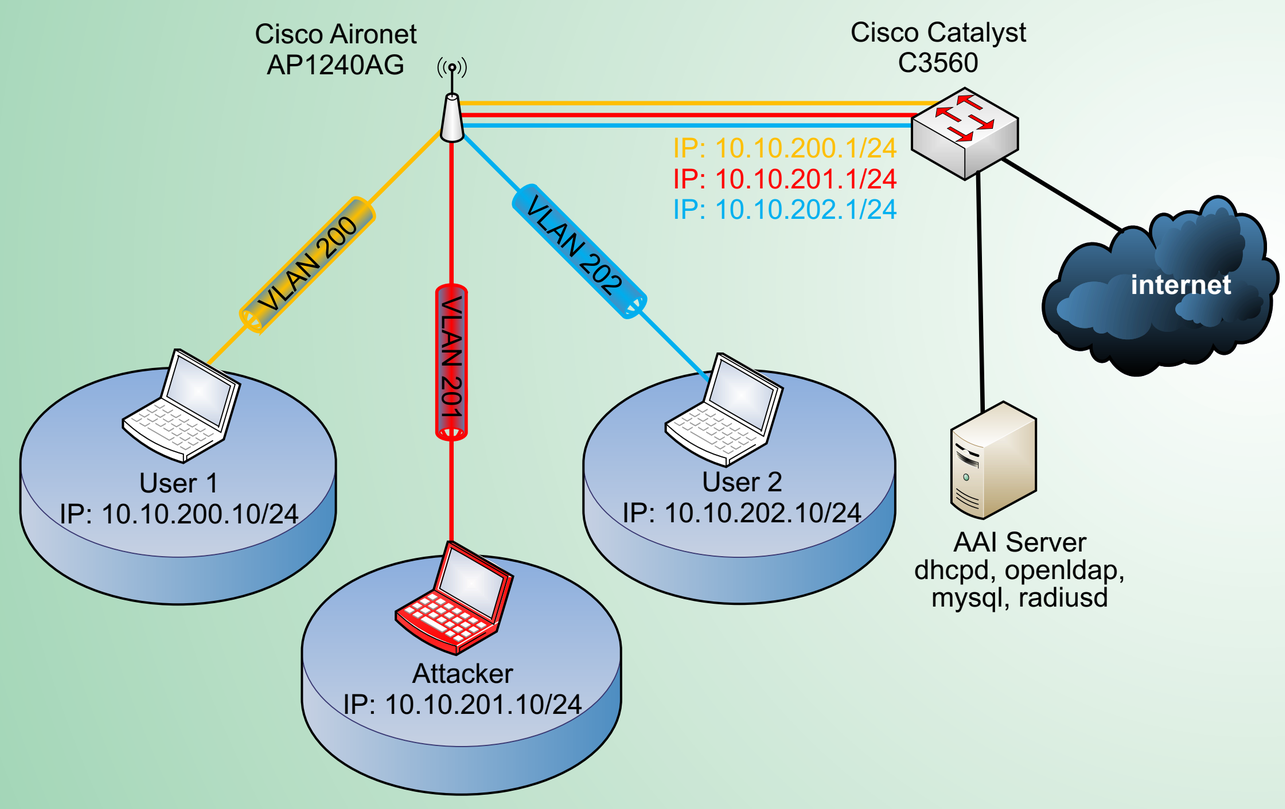
More attacks on posters:
[1] https://tnc2011.terena.org/core/poster/24
[2] https://tnc2012.terena.org/core/poster/20

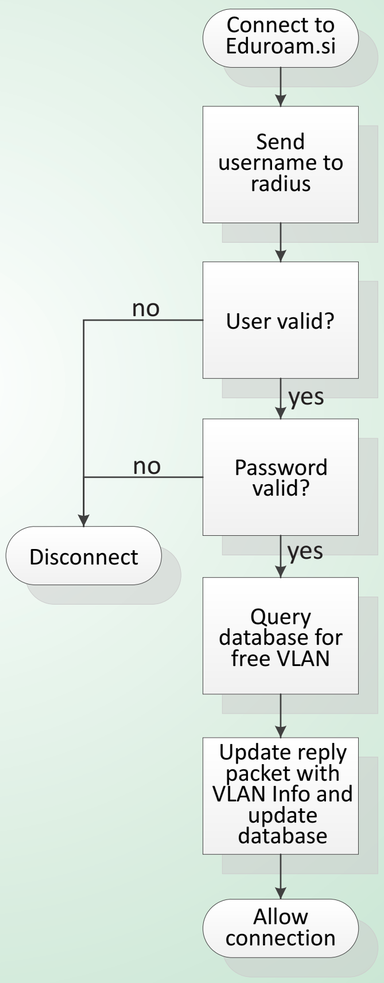
Solution

- VLAN segmentation of network: each user in a separate VLAN
- Mitigates L2 attacks

Implementation

- FreeRadius calls a script when a user connects, then updates the reply packet with VLAN attributes given from that script
- DHCP server updated with as many subnets as there are VLANs
- DHCP forwarding configured on Cisco switch to enable DHCP request/reply





Limitations

- 4 IP addresses per client (user, router, network, broadcast)
- NAT has to be used
- Maximum number of users limited to number of simultaneous VLANs supported by the switch

Future work

- This proof of concept solution stores a list of free VLANs in a text file. We would like to keep this information in a proper database
- 1:1 NAT would keep public connectivity and not waste additional public IPs - a concept that remains to be tested
- On-the-fly configuration of VLANs (as a user connects) - this would simplify base hardware configuration

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