FreeSurf: Application-Centric Wireless Access with SDN

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Motivation

Public Wi-Fi Networks with a traditional setup

Network highly underutilized
Only ONE connection per user per month*
10% active customers

Inability to provide ubiquitous connectivity for customers, despite the fact that their revenue highly depends on user's connection time

FreeSurf Architecture

Authentication delegation: users authenticate to the network using their SP accounts, e.g., Amazon

Policy based Access Control: users are allowed to access the SP domain after a successful authentication

FreeSurf Operation: could be operated in Direct Mode and Broker Mode

FreeSurf Authentication

1. EAP Identity Request
2. EAP Identity Response
Alice@amazon.com
EAP-TTLS Start
radius eap-aaa
EAP-TTLS Phase 2 (e.g., MSCHAP), user authenticates using the SP account (Alice@foo.com)

FreeSurf Authentication Tablesize vs. Lookup efficiency

Policy-based Access Control

Authentication

Flows towards SP domain

Flows towards outside of SP domain

FreeSurf Prototype

FreeSurf Controller (POX)
FreeSurf SP AAA Server
FreeSurf Prototype

1. FreeSurf authflow
2. Non-FreeSurf authflow

FreeSurf Controller

CDN, Multihoming

Bloom Filter

Tablesize

Lookup efficiency

Minimal increase in authentication delay with FreeSurf

- 1.7% additional delay with EAP-TTLS
- 2.4% additional delay with EAP-PEAP

FreeSurf (remote AAA)
non-FS (remote AAA)
FreeSurf (local AAA)
non-FS (remote AAA)

1000 2000 3000 4000 5000 6000 7000 8000 9000
Flow table entries

7 8 9
Delay in ms

FreeSurf
non-FreeSurf

5 6 7 8 9
Delay in ms

1. FreeSurf authflow
2. Non-FreeSurf authflow