Institut für Kommunikations-Technik

FreeSurf: Application-centric Wireless Access with SDN

IRTF SDNRG

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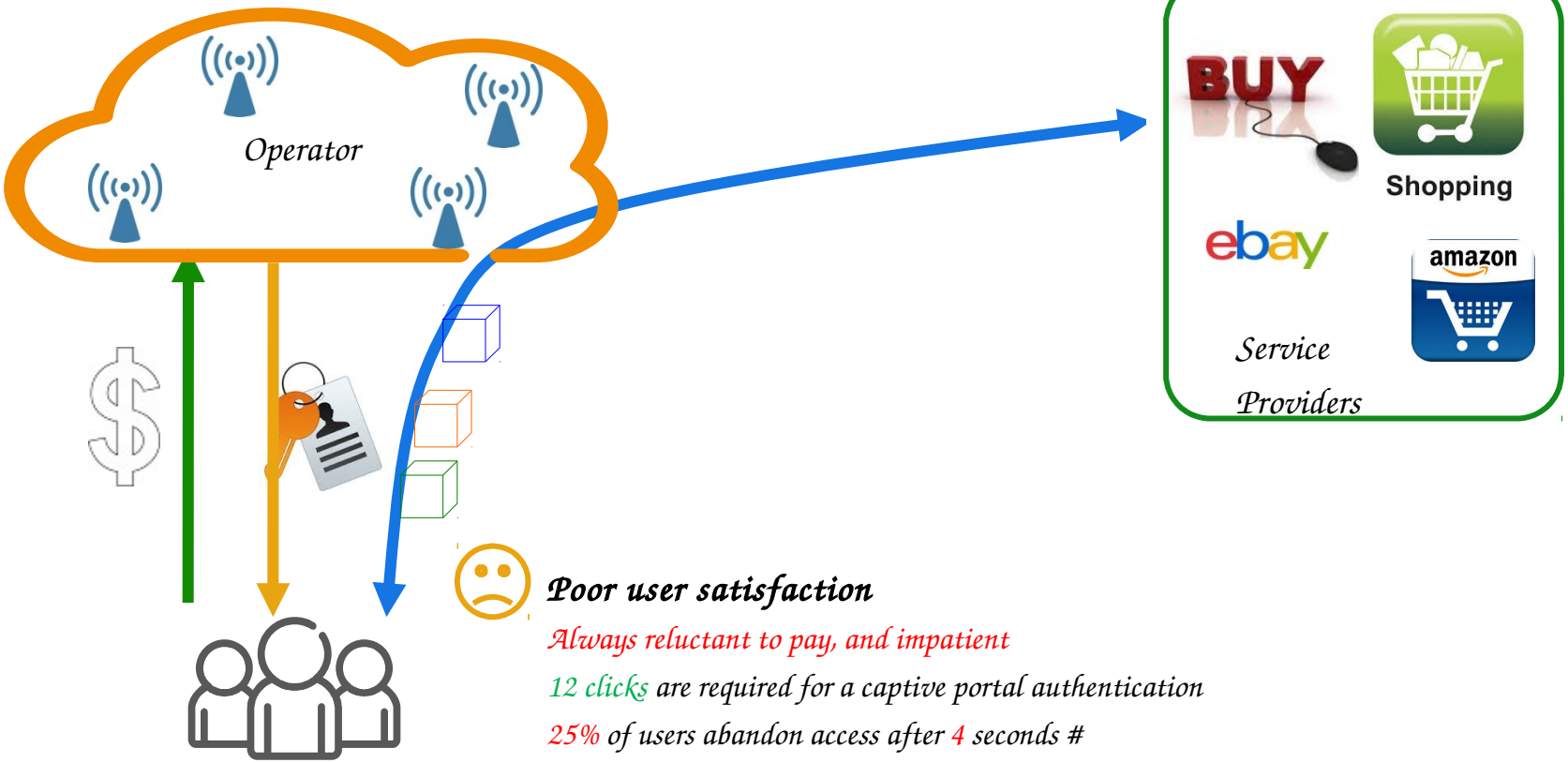
Public Wi-Fi with a Traditional setup

Network highly underutilized

*Only ONE connection per user per month**

10% active customers

No way to provide ubiquitous connectivity for customers



Poor user satisfaction

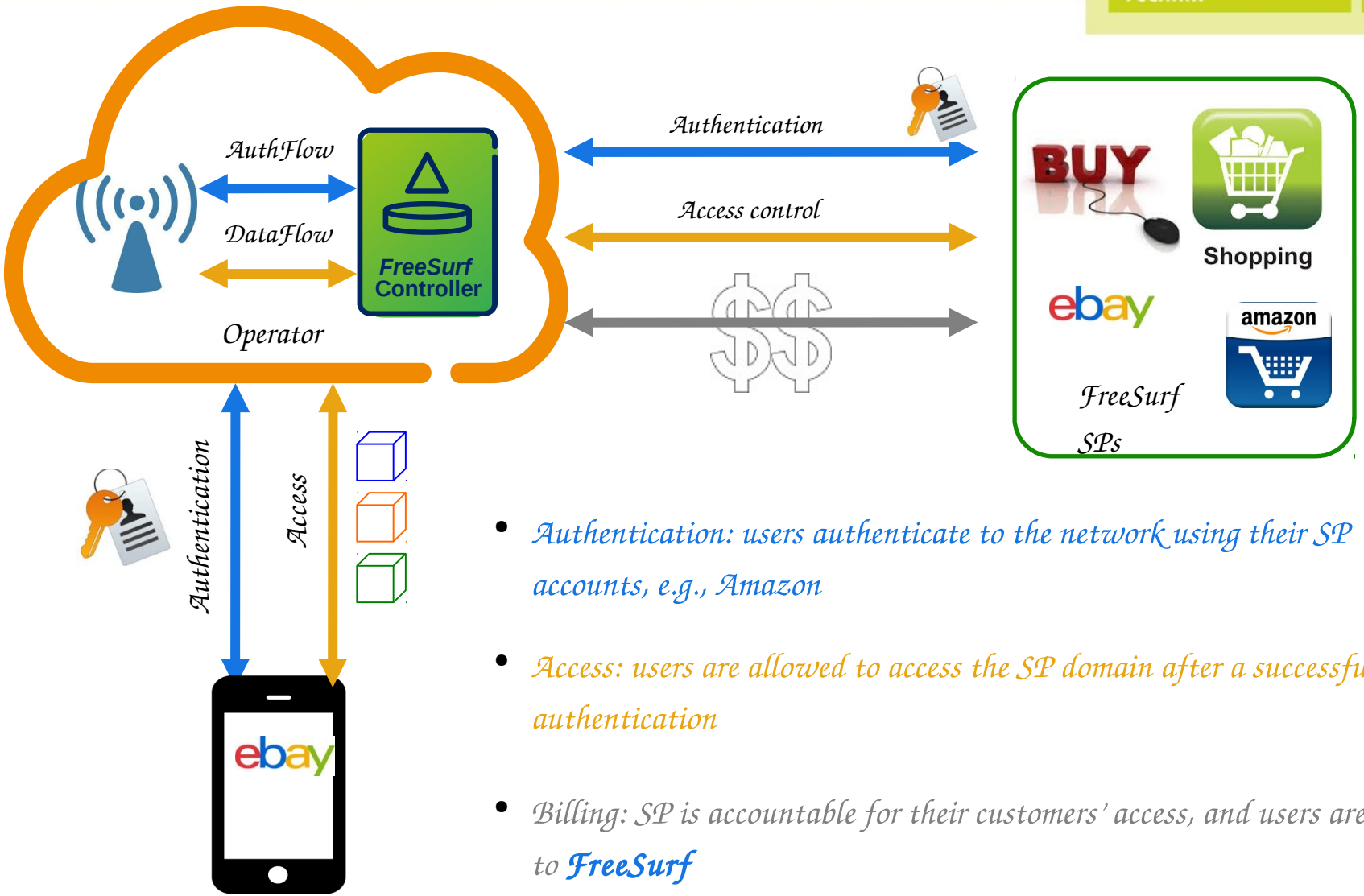
Always reluctant to pay, and impatient

12 clicks are required for a captive portal authentication

25% of users abandon access after 4 seconds #

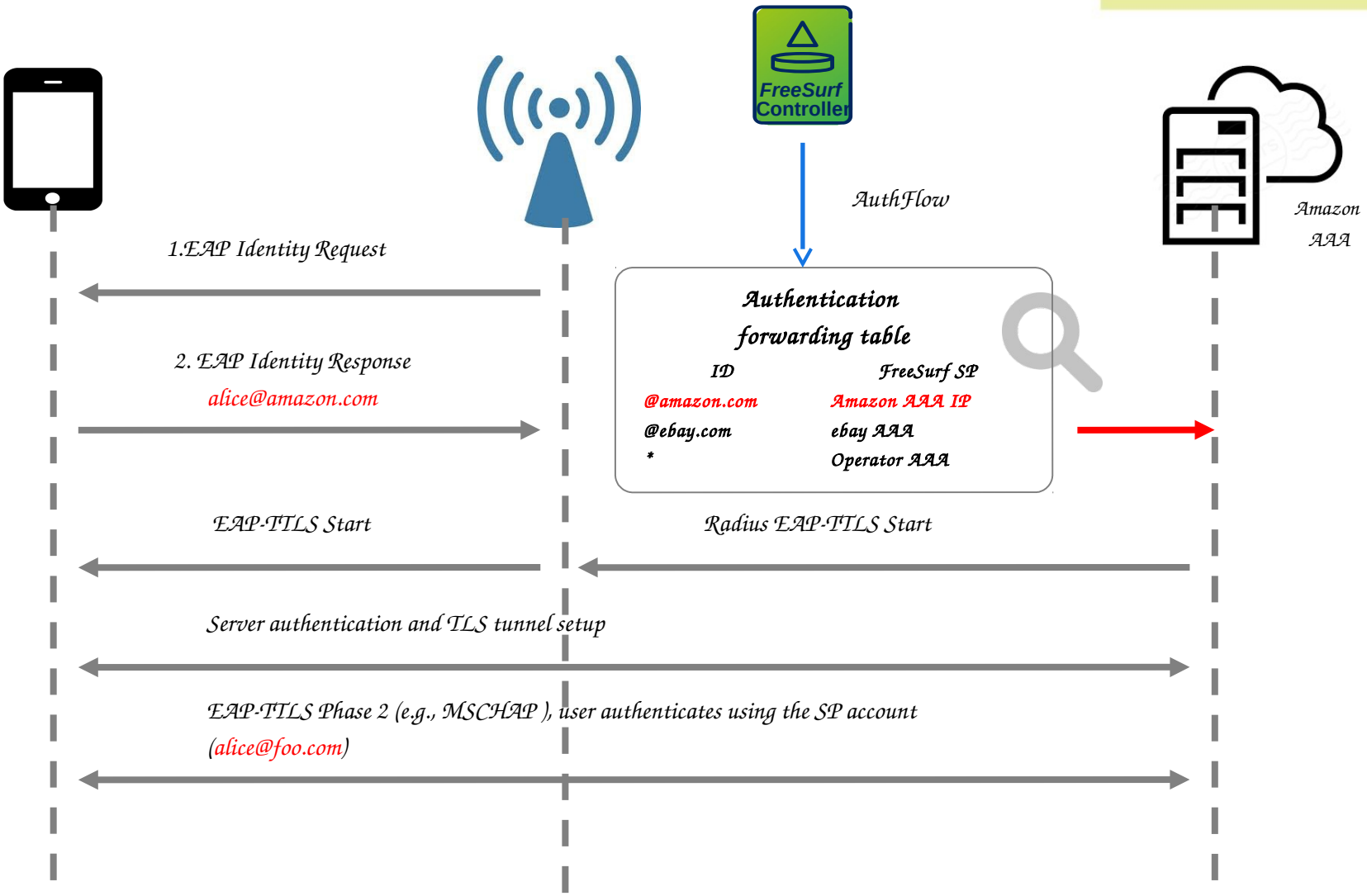
50% of users abandon access after 10 seconds

Application-centric Wireless Access

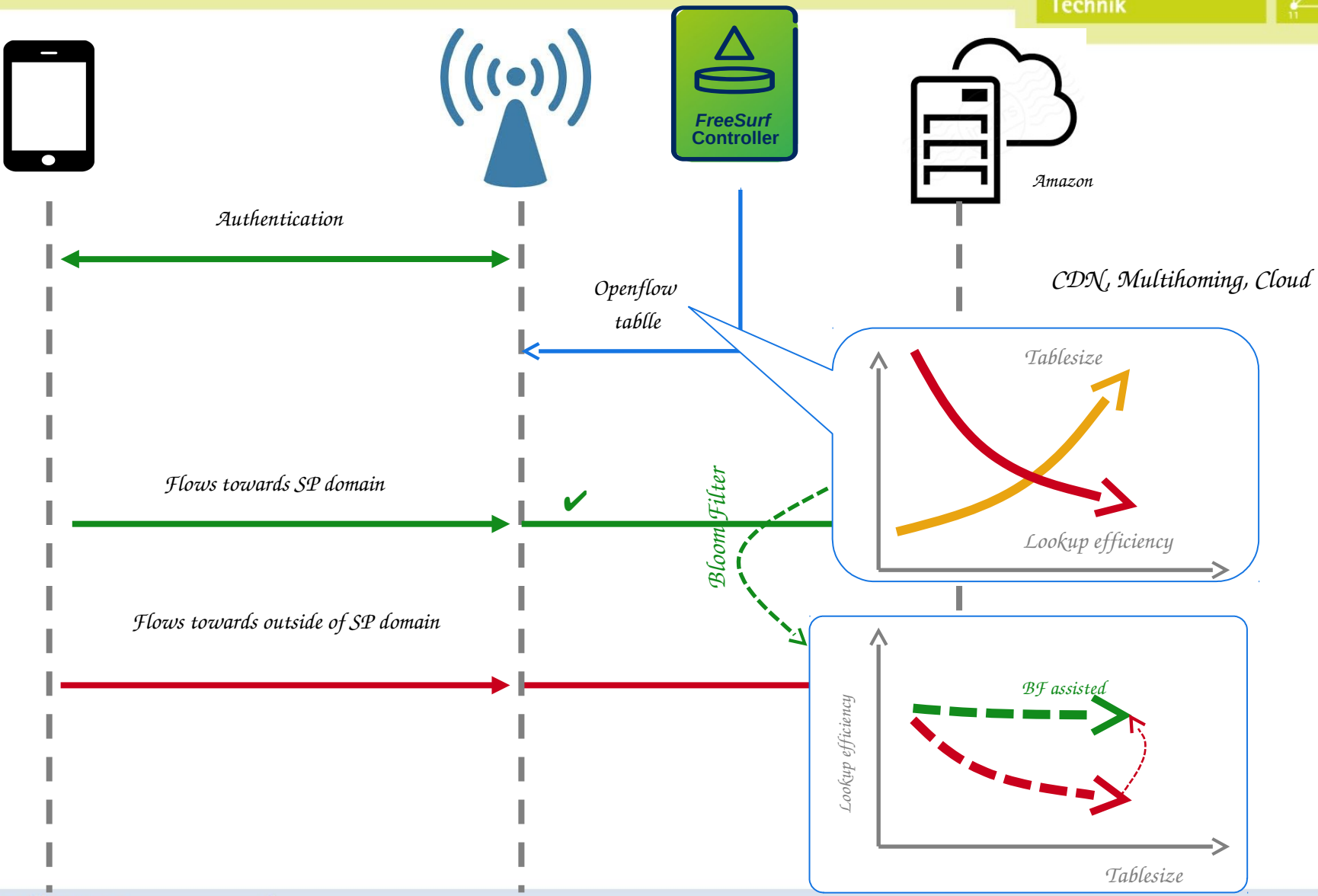


- *Authentication: users authenticate to the network using their SP accounts, e.g., Amazon*
- *Access: users are allowed to access the SP domain after a successful authentication*
- *Billing: SP is accountable for their customers' access, and users are left to* ***FreeSurf***

FreeSurf Authentication



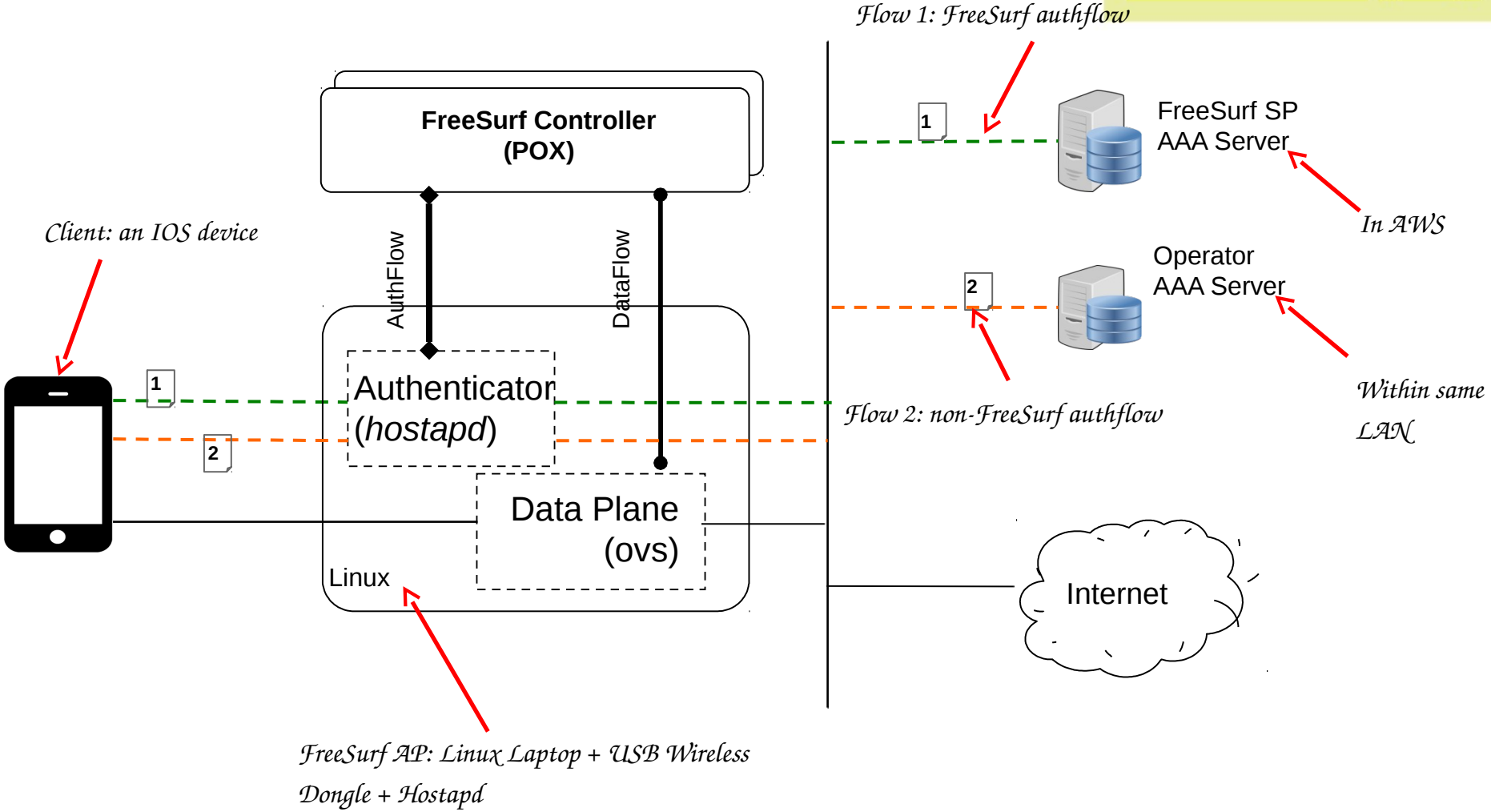
FreeSurf Access Control



Operation Modes

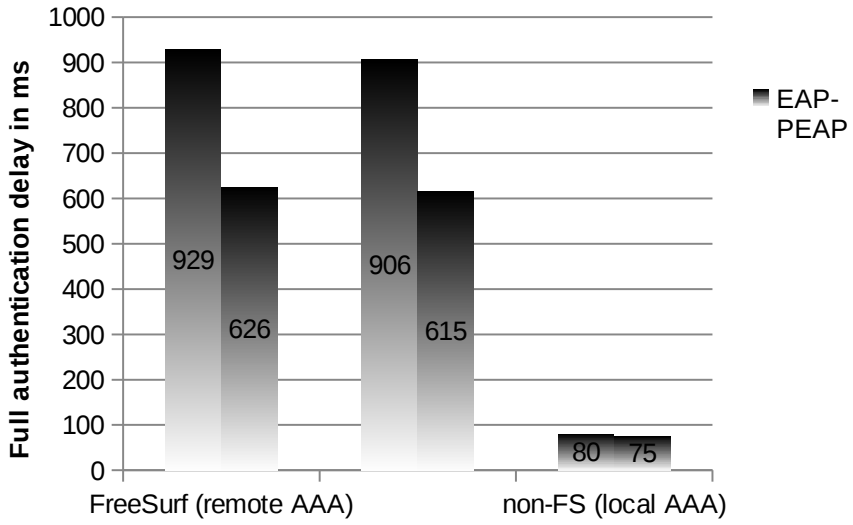
- *Direct mode:*
  - *SPs take over the authentication procedure and provide Internet access to their clients*
    - *Direct control of clients' credentials*
  - *Better suited to large SPs*

- *Broker mode:*
  - *A broker takes over the client authentication on behalf of multiple SPs*
  - *Better suited to small SPs*

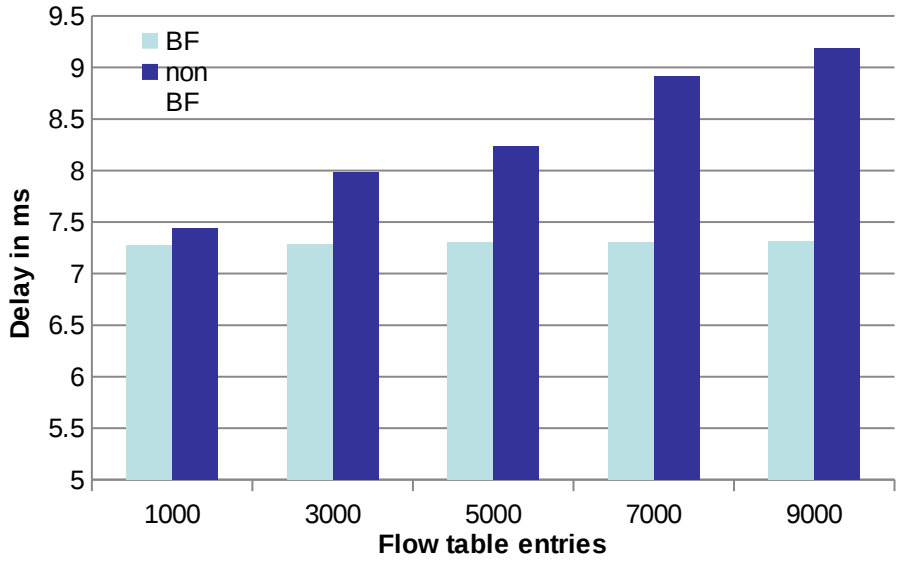

Flow 1: FreeSurf authflow
FreeSurf Controller
(POX)
AuthFlow
DataFlow
Client: an IOS device
1
2
Authenticator
(hostapd)
Data Plane
(ovs)
Linux
FreeSurf SP
AAA Server
In AWS
Operator
AAA Server
Within same
LAN
Flow 2: non-FreeSurf authflow
Internet
FreeSurf AP: Linux Laptop + USB Wireless
Dongle + Hostapd

FreeSurf Evaluation

- *Minimal increase in authentication delay with FreeSurf*
  - *1.7% additional delay with EAP-TTLS*
  - *2.4% additional delay with EAP-PEAP*

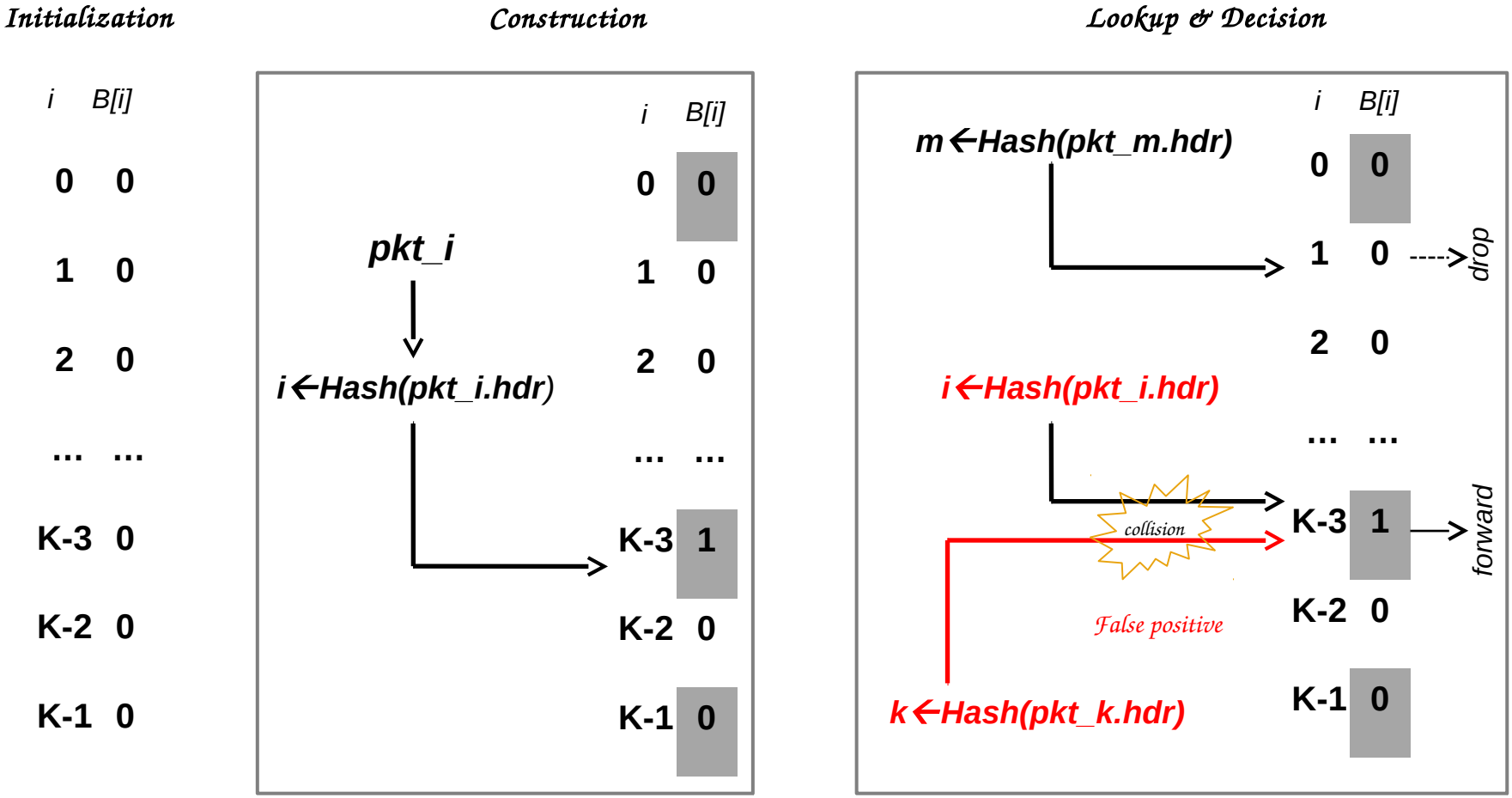


- *BF promotes lookup efficiency*
  - *The larger the flow table is , the more BF helps*
  - *Lookup with the BF is constant irrespective of flow table size*



Thank you

For more information, checkout our paper and code at https://github.com/freesurf



Complexity: Size K irrespective of the number of flows; Lookup O(number of hash functions)

False positive can be tuned by use of larger bit vector and more hash computations

BF False Positives

- No false negatives:
  - Discarded packets are absolutely not permitted
- Existence of false positives:
  - Impact: allowing some traffic from authenticated users to unallowed addresses
  - Rescue: twisting the false positive rate as small as possible by a choice of larger bit vector and use of more hash functions