

Understanding Handoffs in Large IEEE 802.11 Wireless Networks

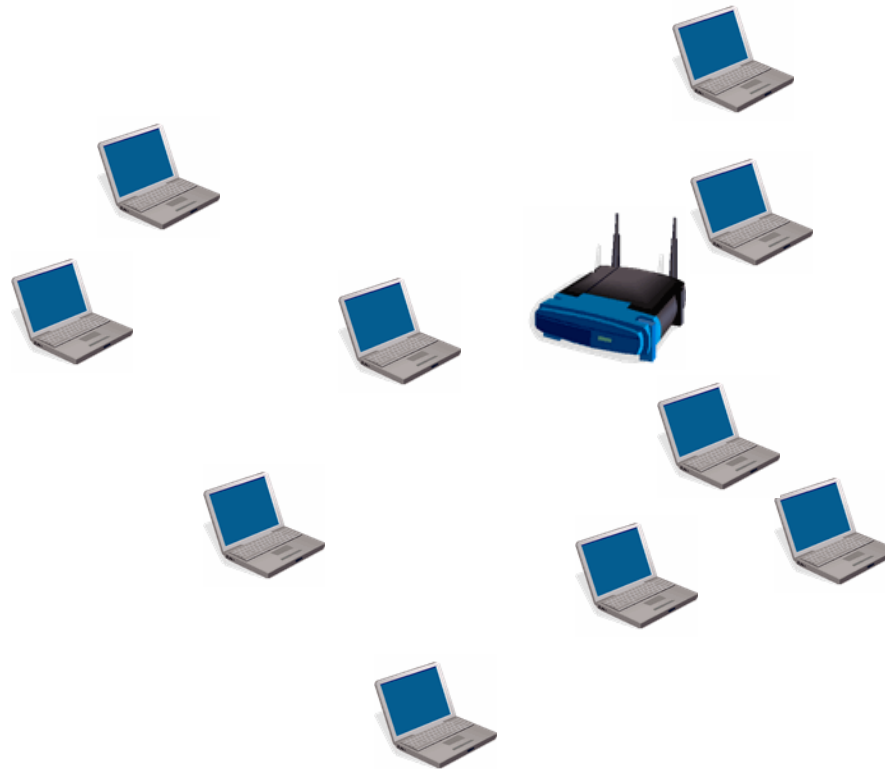
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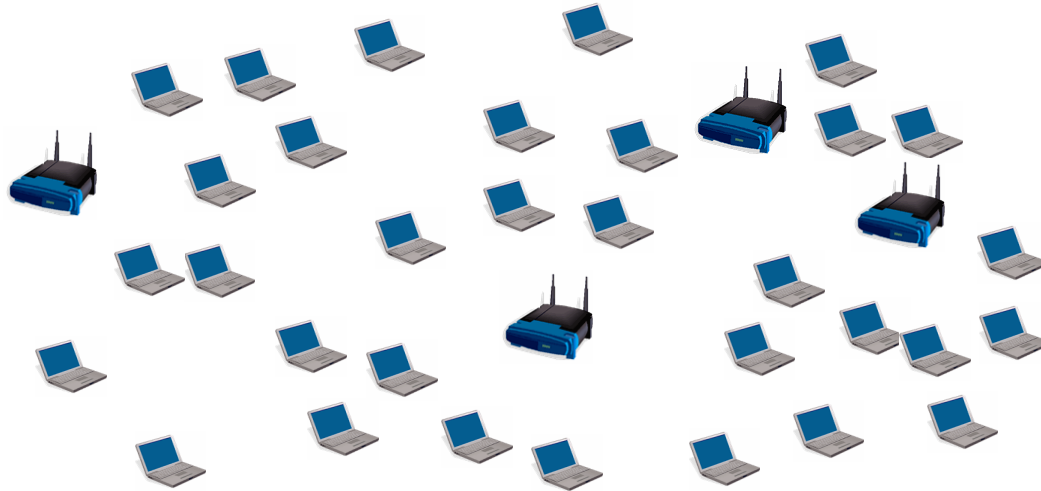
WLAN Usage



WLAN Usage

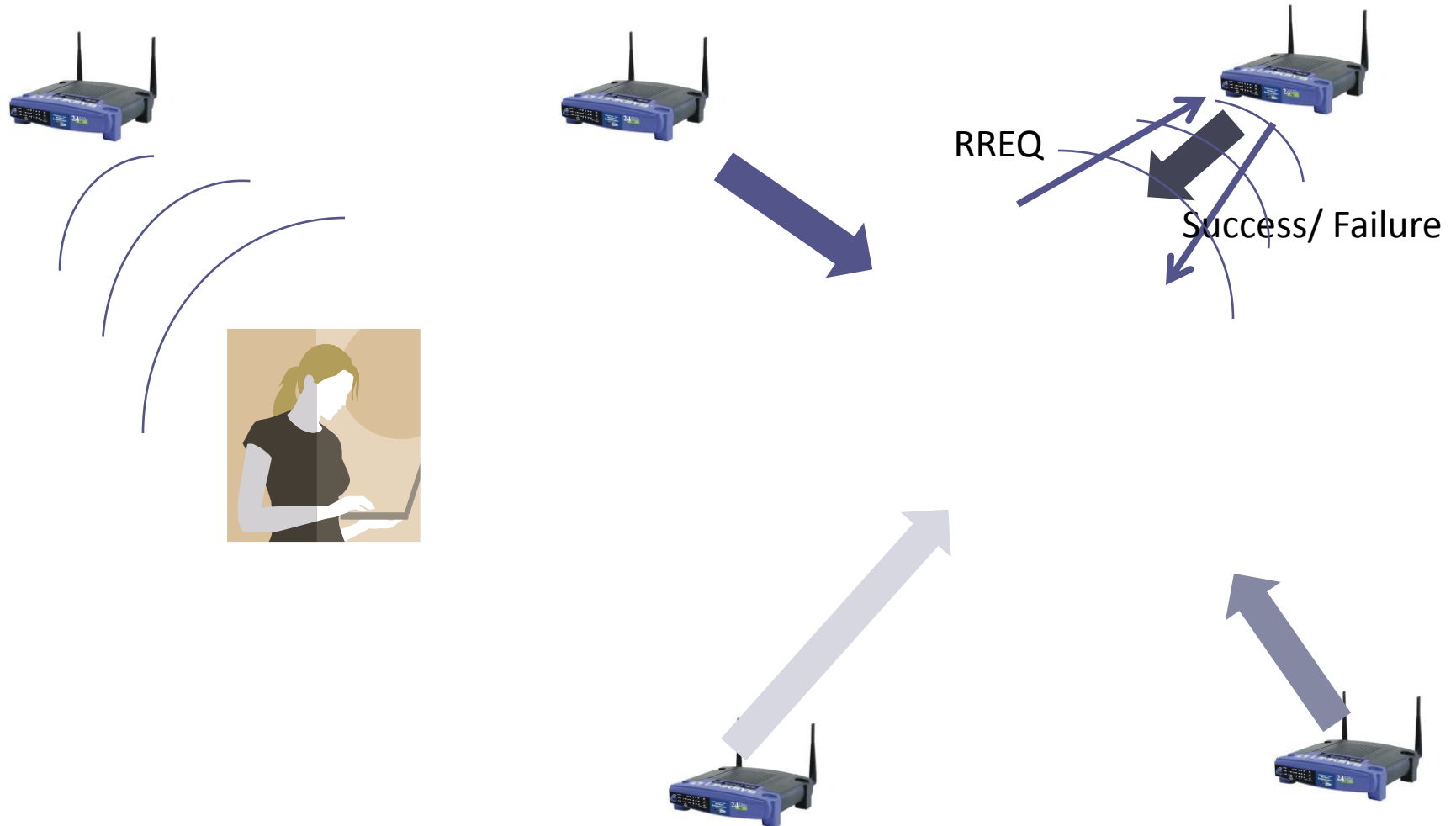


WLAN Usage



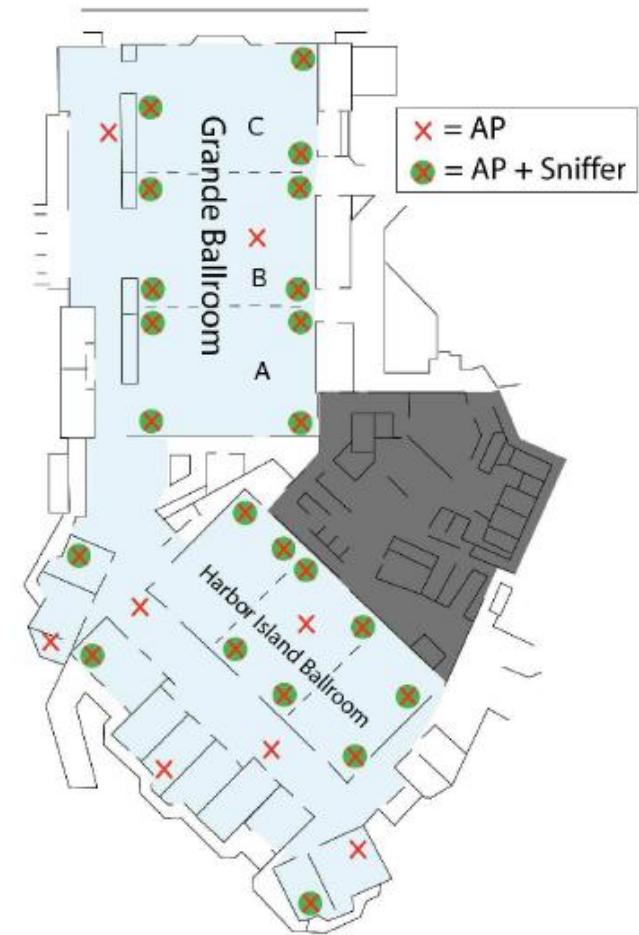
How do handoffs perform in large, congested networks?

Handoff Operation



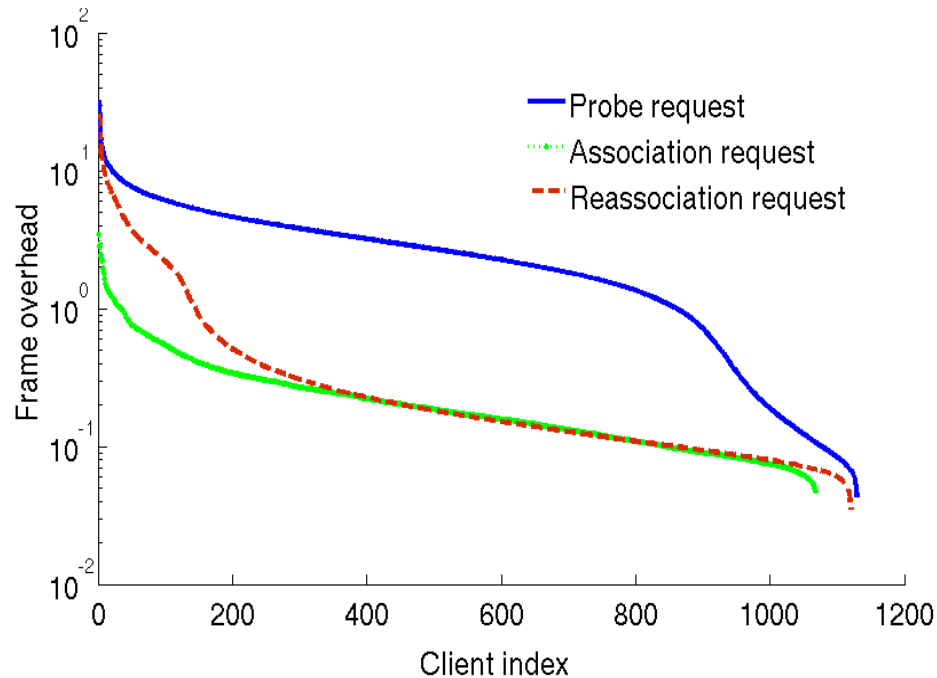
Monitoring Setup

- IETF 67 wireless network
 - 55 APs, 1200+ clients
 - Plenary session(4 hours)
 - 802.11g network
 - 8 sniffers

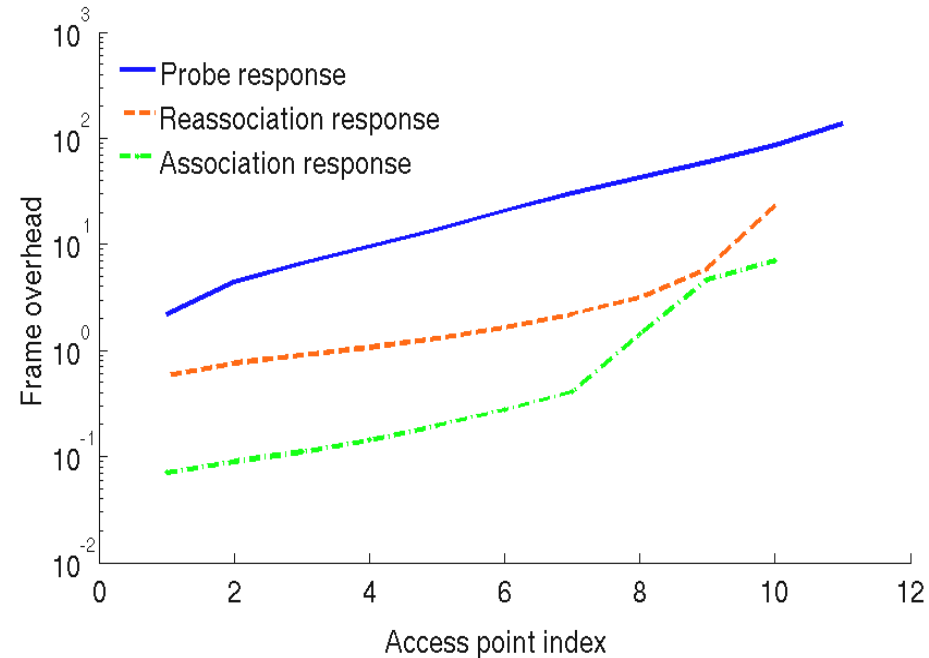


Frame Overhead

Client



Access Point



of control packets sent per data packet transmitted.

Handoff Analysis

- Large number of handoffs

Channel 1	Channel 6	Channel 11
614	586	627

- Handoffs to same channel

	Channel 1	Channel 6	Channel 11
Channel 1	33%	7%	2%
Channel 6	2%	24%	6%
Channel 11	4%	3%	19%

- 50% of handoffs to same AP!

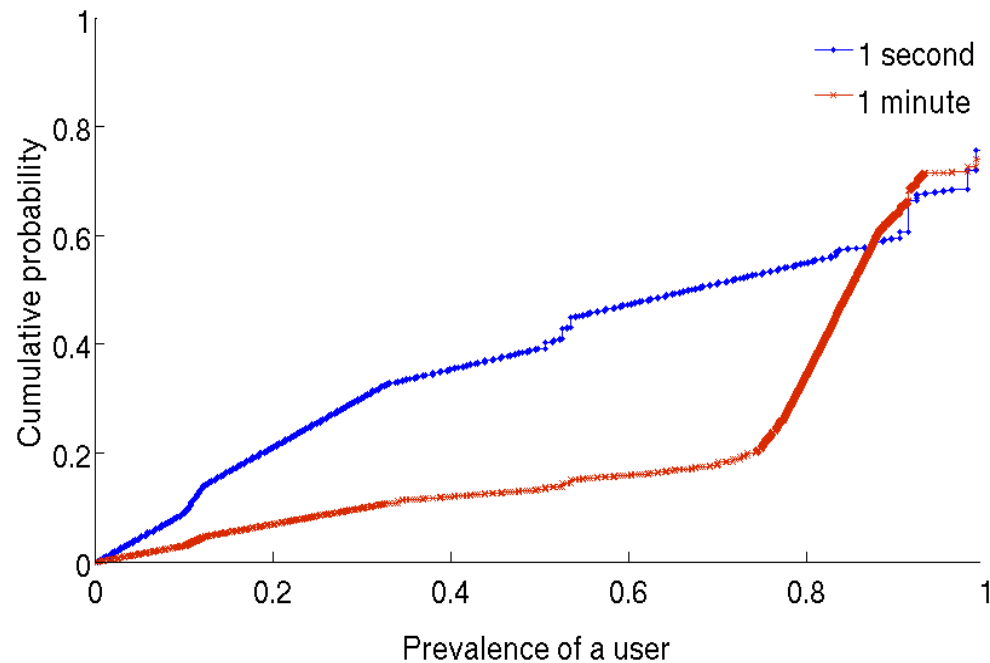
Prevalence

- Probability of association in future

$$\pi = \frac{k}{n}$$

k = active intervals

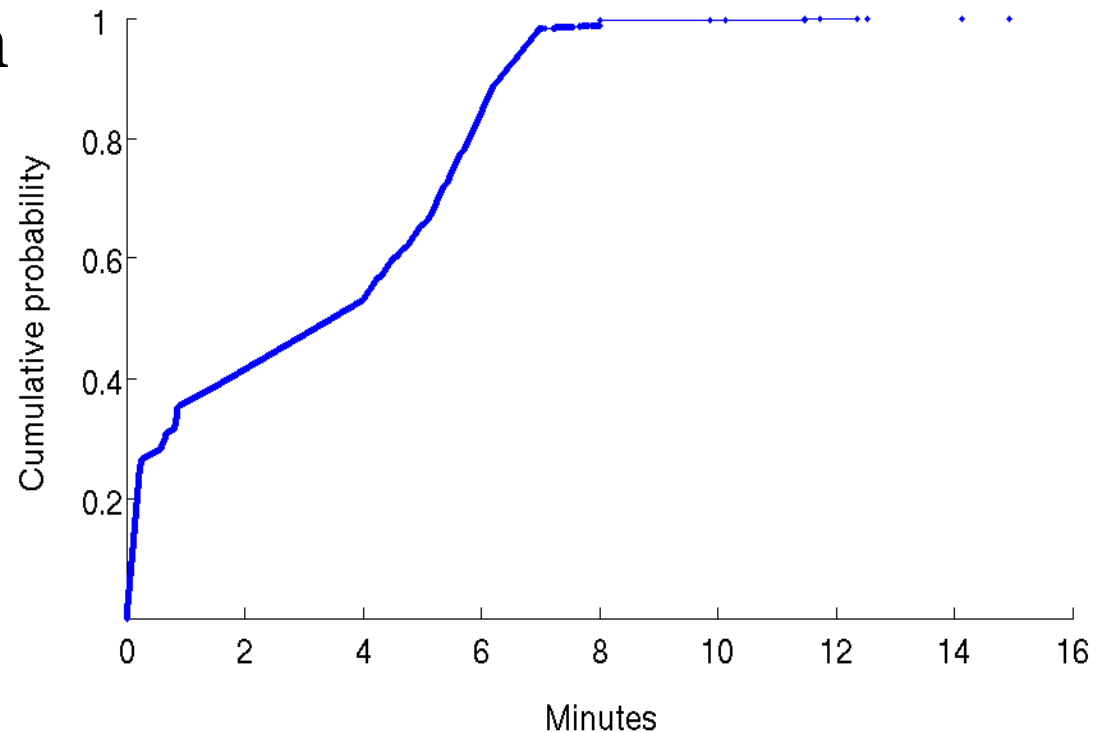
n = total intervals



- Low prevalence at 1 second

Persistence

- Length of association
- Dominant AP
 - AP with highest prevalence per client
- Low persistence

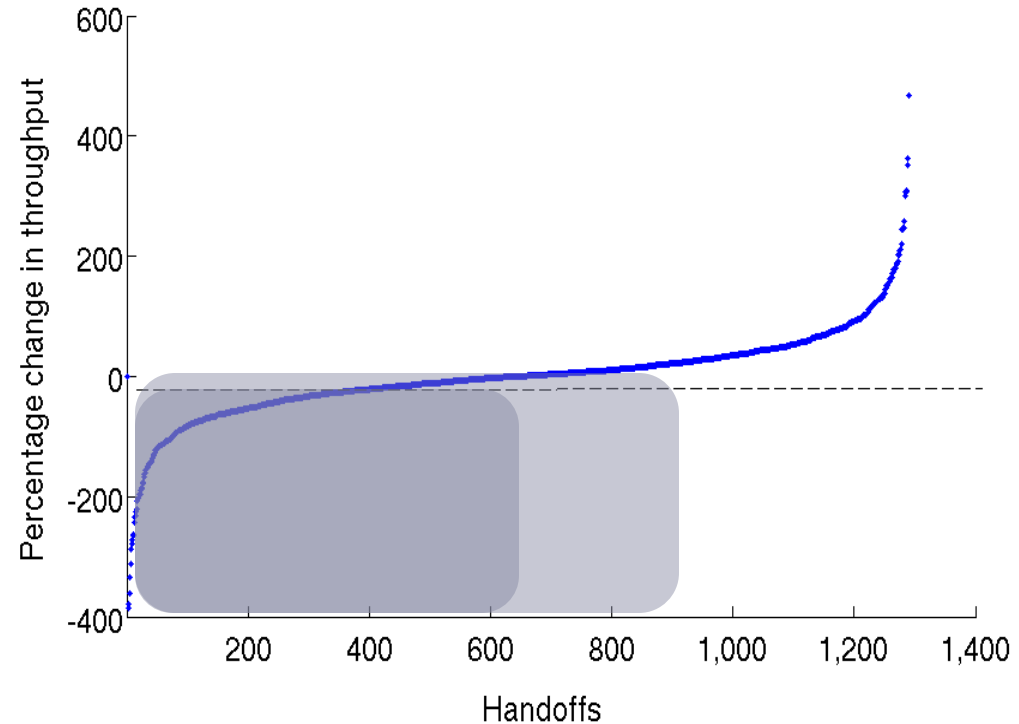


Understanding Handoffs

- Handoff falsely triggered due to congestion
- Signal strength for reassociation
- Handoffs to same channel/AP useless

Are Handoffs Beneficial?

- 50% suffered
- 70% obtained under 10% improvement
- **Congestion Aware Handoffs**



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