

Client Mobility in IPv6 Networks

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Introduction

- Tackle Mobility Management for IPv6 networks
- Explore the limitations of Mobile IPv6
 - Handoff Management
- Test our solution in a real world environment
- Introduce a new concept to mobile computing in IP Networks

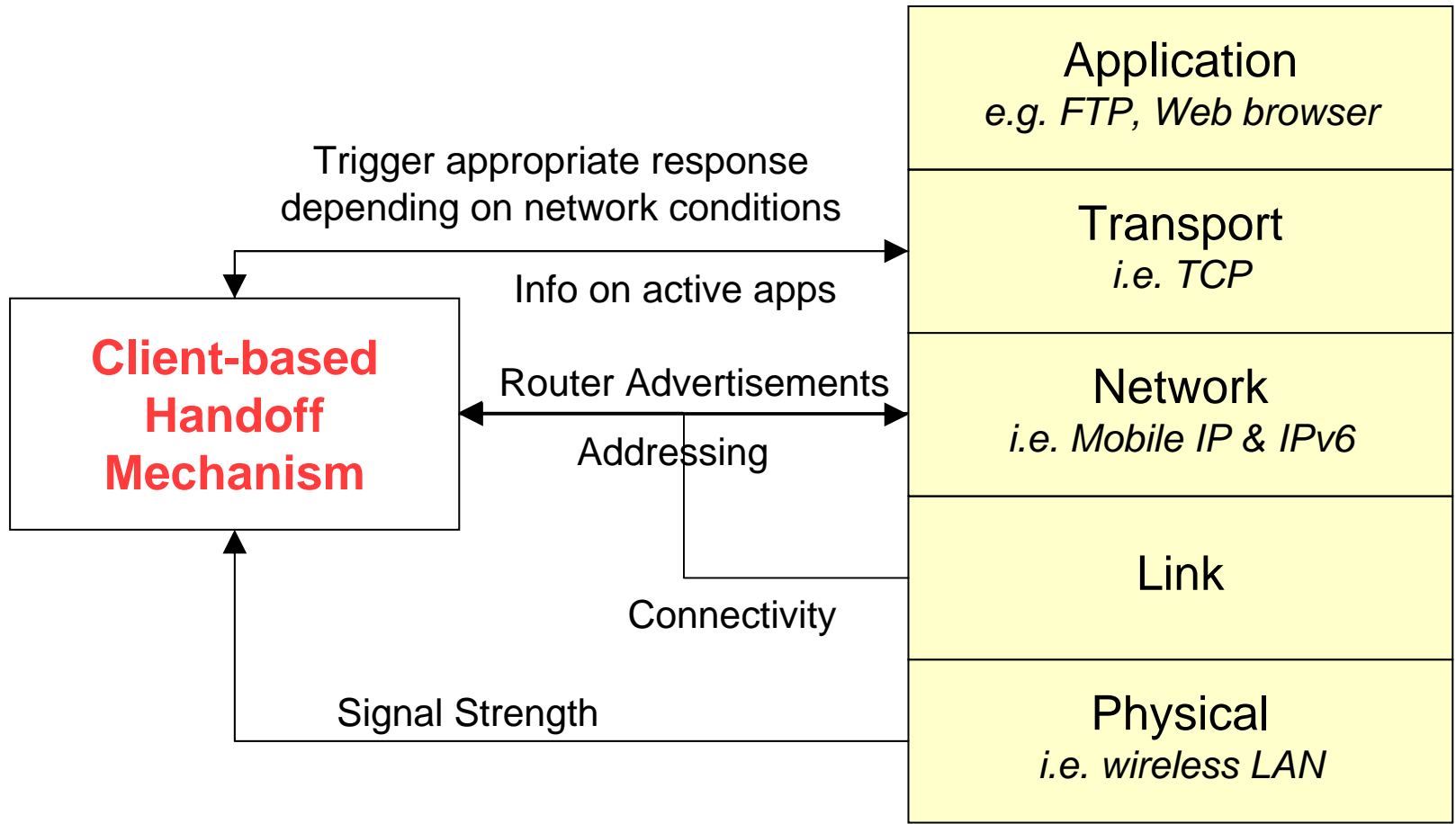
Mobility Support Issues

- Majority of mobility management solutions make changes to the core network infrastructure
- Mobile IP is an incomplete mobility management solution
- Application layer has limited knowledge of activity in the physical and link layer protocols

Novel Solution to Handoff Management

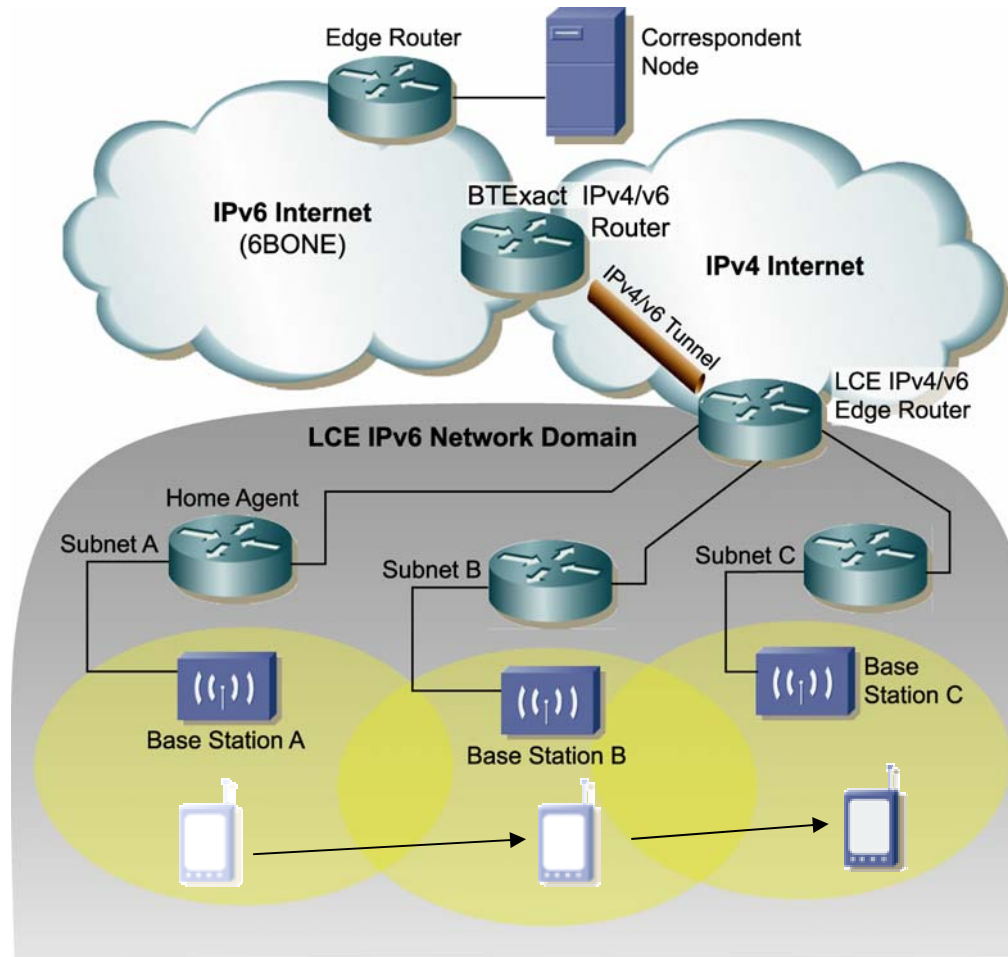
- Gives control to the mobile node
- Handoff decision based on:
physical, link, network & transport layers
- Support for subnetwork outages
- Benefits
 - Highly scalable
 - Handoff decision made w/ end-to-end considerations
 - Support multiple network technologies

Client-based Handoff Mechanism



TCP/IP Protocol Stack

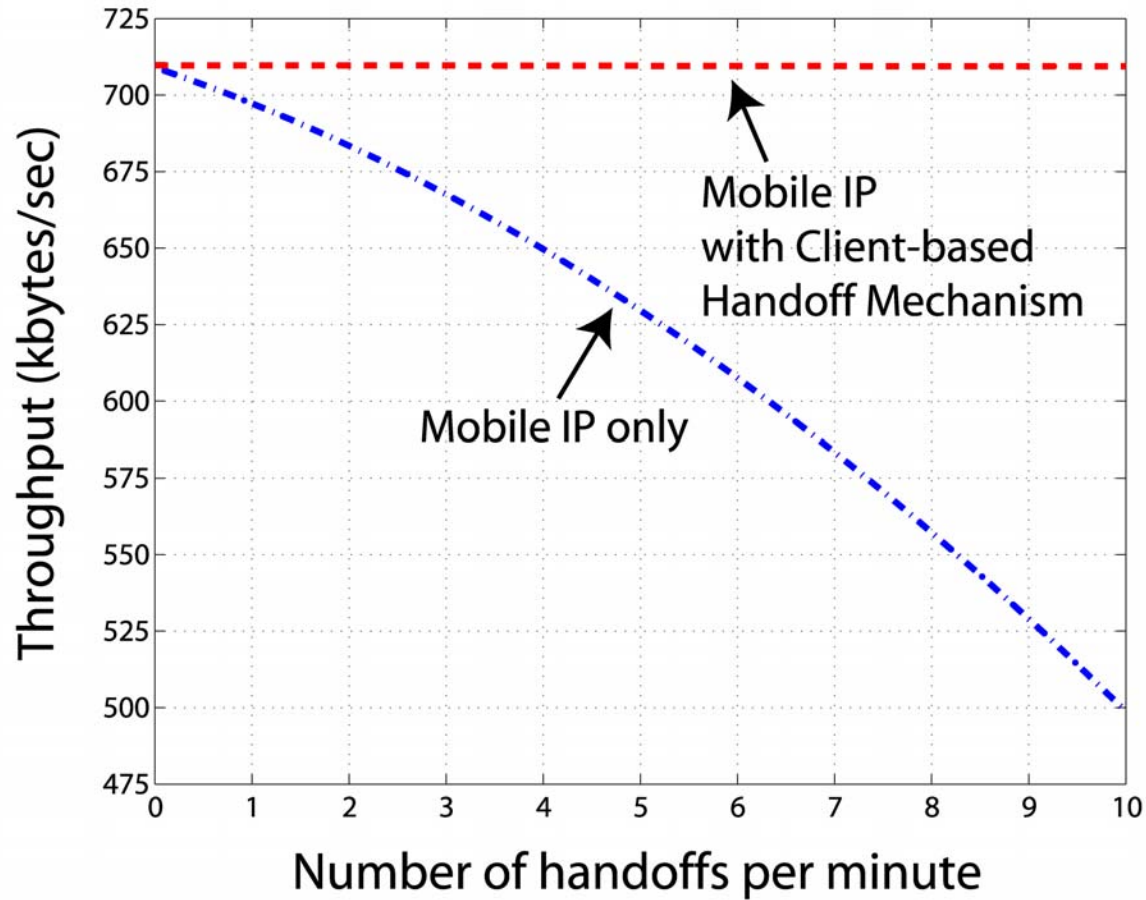
The LCE Mobile IPv6 Testbed



Summary of Experiments

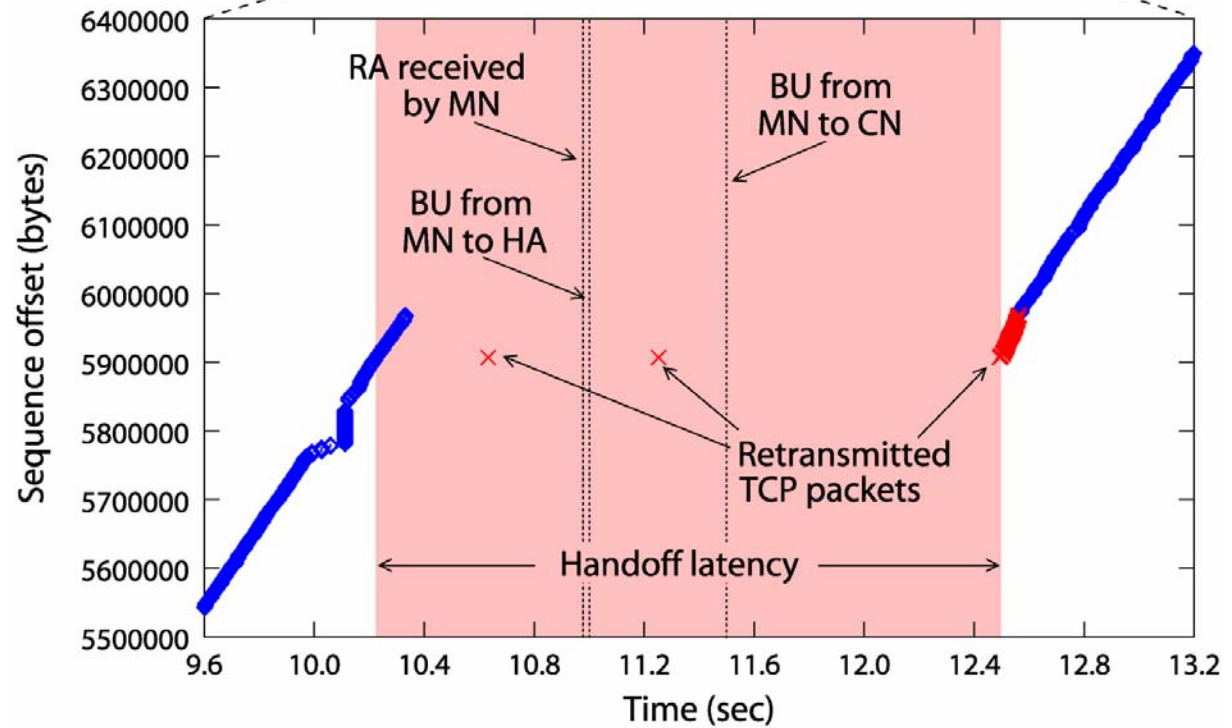
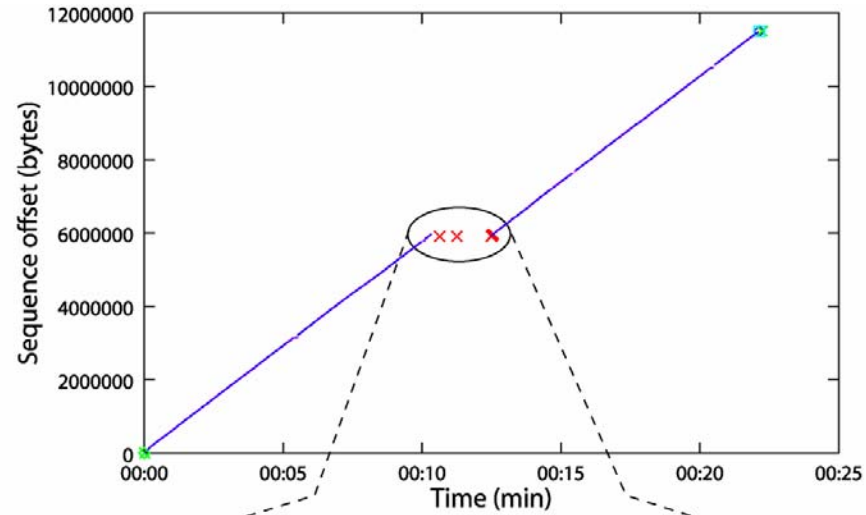
- Looked at the effects of handoffs on UDP traffic between CN and MN
- Dissection of a handoff during an active TCP data transfer for:
 - continuous handoffs
 - discontinuous handoffs

Throughput of UDP traffic



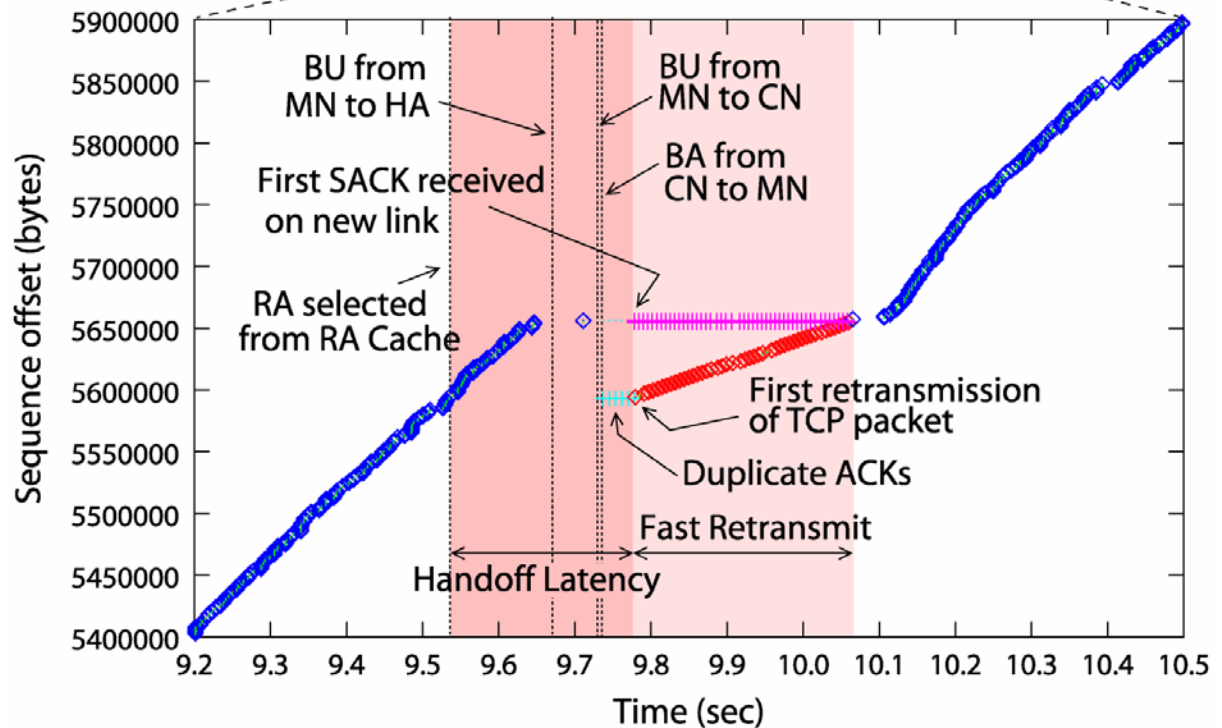
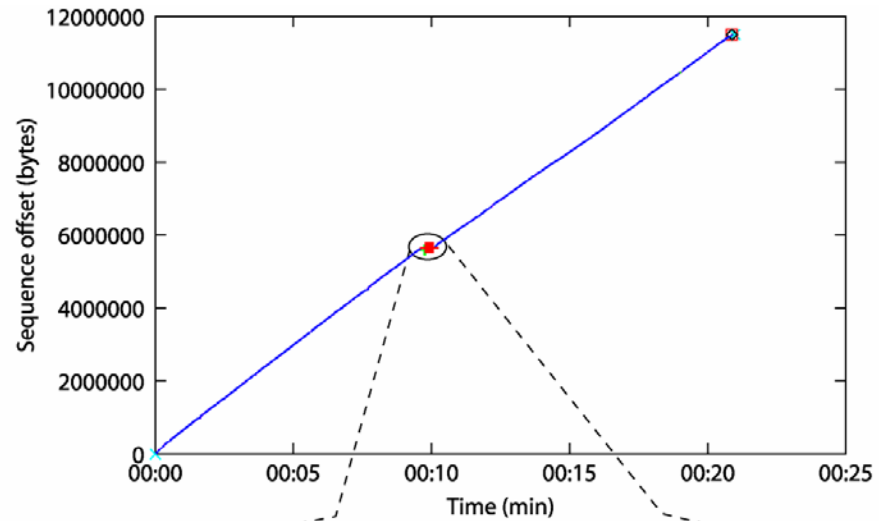
Sequence plot of a TCP download:

Client-based Handoff Mechanism Disabled



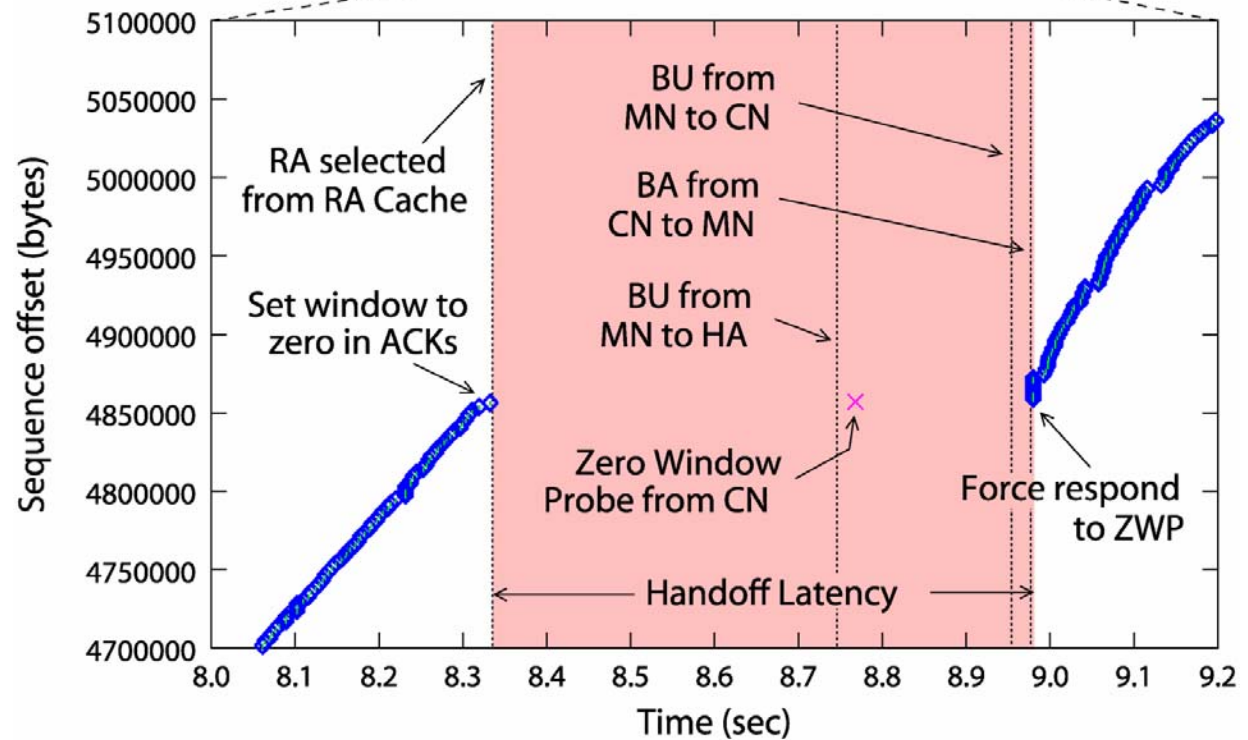
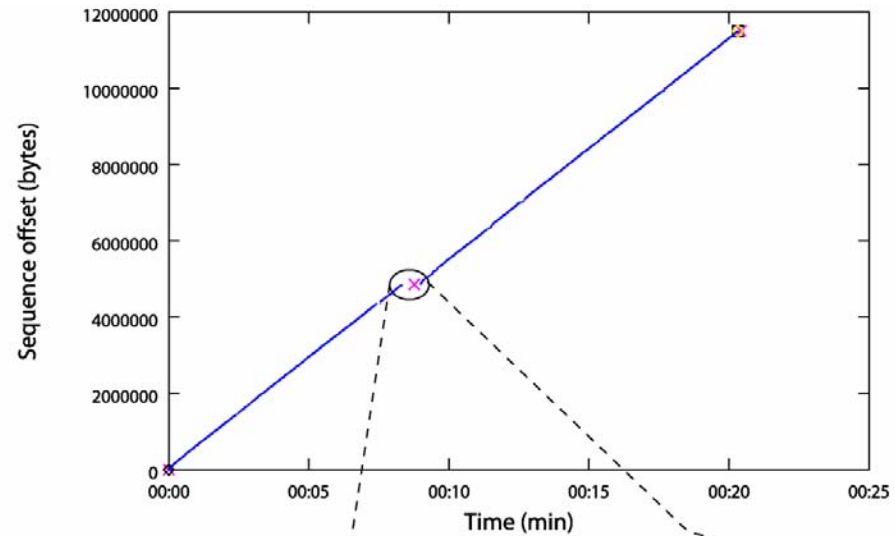
Sequence plot of a TCP download:

Continuous handoff with Client-based Handoff Mechanism



Sequence plot of a TCP download:

Discontinuous
handoff
with
Client-based
Handoff
Mechanism



Mobile Computing Application Example

- Thin-Client Computing Approach !!!
- Reliable and higher data rates more widely available: both outdoor & indoor
 - e.g. 3G, wireless LAN, UWB, etc.
- Mobile “thick-clients” are prone to
 - damage, theft, loss of data
 - has a high administration overhead
- Benefits of mobile thin-clients
 - devices can be disposable
 - zero administration overhead

Background to Mobile Computing with Thin-Clients



- The **Videotile** was the first mobile thin-client
 - Wireless ATM
 - Indoor use only
 - VNC-based client

- Problem: QoS is essential
 - cannot be guaranteed in IP Networks

Global Mobility for Thin-Clients?

- World dominated by IP
- Unsupported network infrastructure for thin-client computing
- Bandwidth: unlike ATM, QoS is not guaranteed in IP networks
 - poor user experience

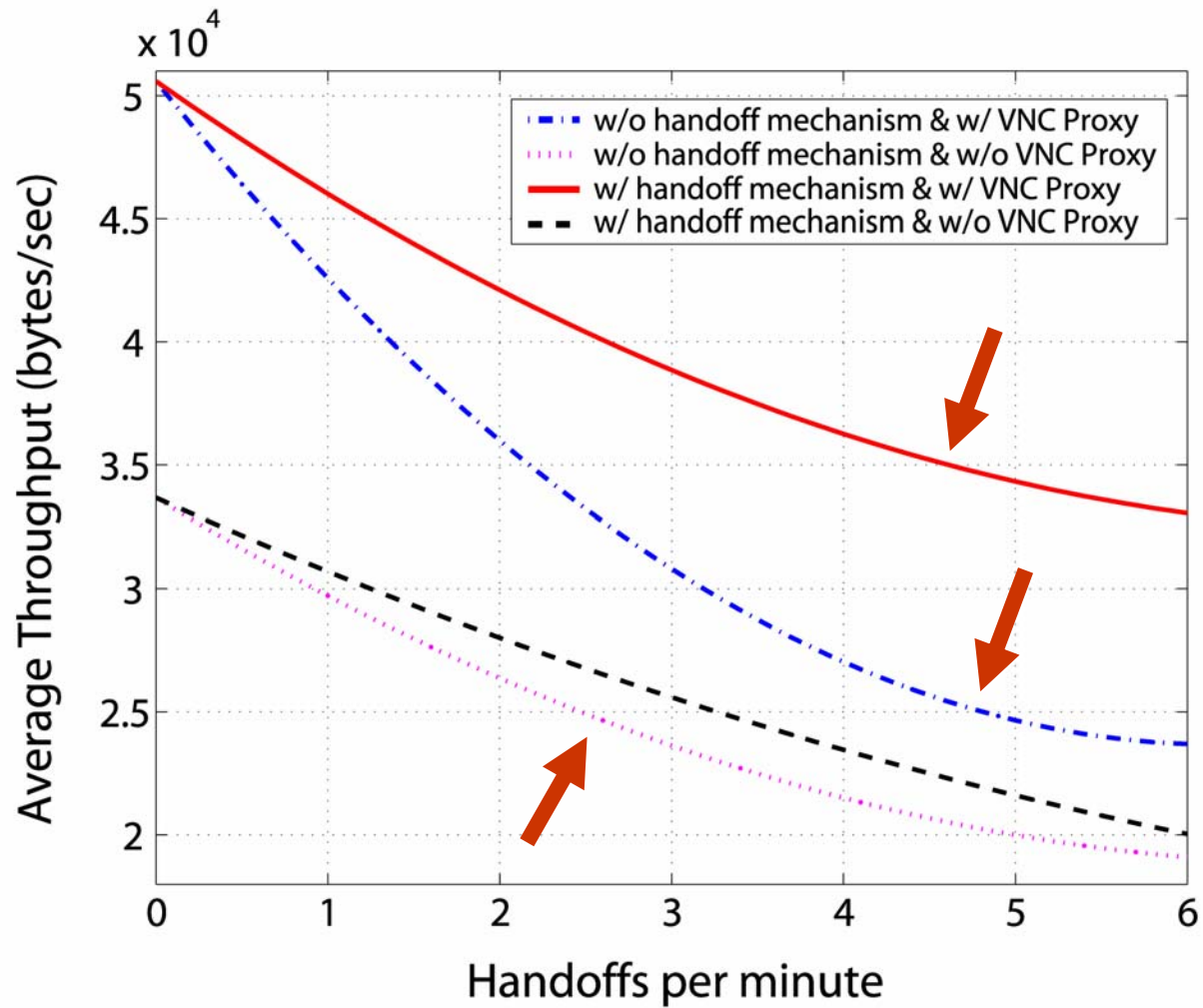
Solution: Mobile VNC Architecture

- Place a VNC proxy server close to the MN
 - QoS guaranteed in the core network
- Mobility supported by
 - Mobile IP
 - Client-based Handoff Mechanism
- Handoff between VNC Proxy Servers
 - Signaling: Context Transfer Protocol variant

For more info, see Proceedings of the IST EVOLUTE International Workshop, Nov 2003

Key result:

VNC session interrupted by discontinuous handoffs



Conclusion

- Client-based Handoff Mechanism
 - Highly scalable
 - Reduce packet loss, avoid slow start
 - Intelligent handoff algorithm
 - Supports vertical handoffs

- Example Mobile Computing Application
 - Mobile VNC Architecture
 - Thin-client computing can work

- Future
 - Vertical handoff support (*Pablo Vidales, LCE*)
 - Unbundling of network services:
operators == utilities, ISPs == content providers
 - Unified access to on-demand content and services.



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