TCP Download with Early Binding Updates Preliminary Simulation Results

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Implementation

- FreeBSD 5.3

- Kame-Shisa Mobile IPv6

- Userland modifications at Mobile Node and Correspondent Node for Early Binding Updates

- Kernel modifications for Credit-Based Authorization

- Thanks to Keiichi Shima and colleagues

Testbed Setup

IPFW2 simulates handovers

DummyNet simulates 256 kBps of bandwidth

Simulation Parameters
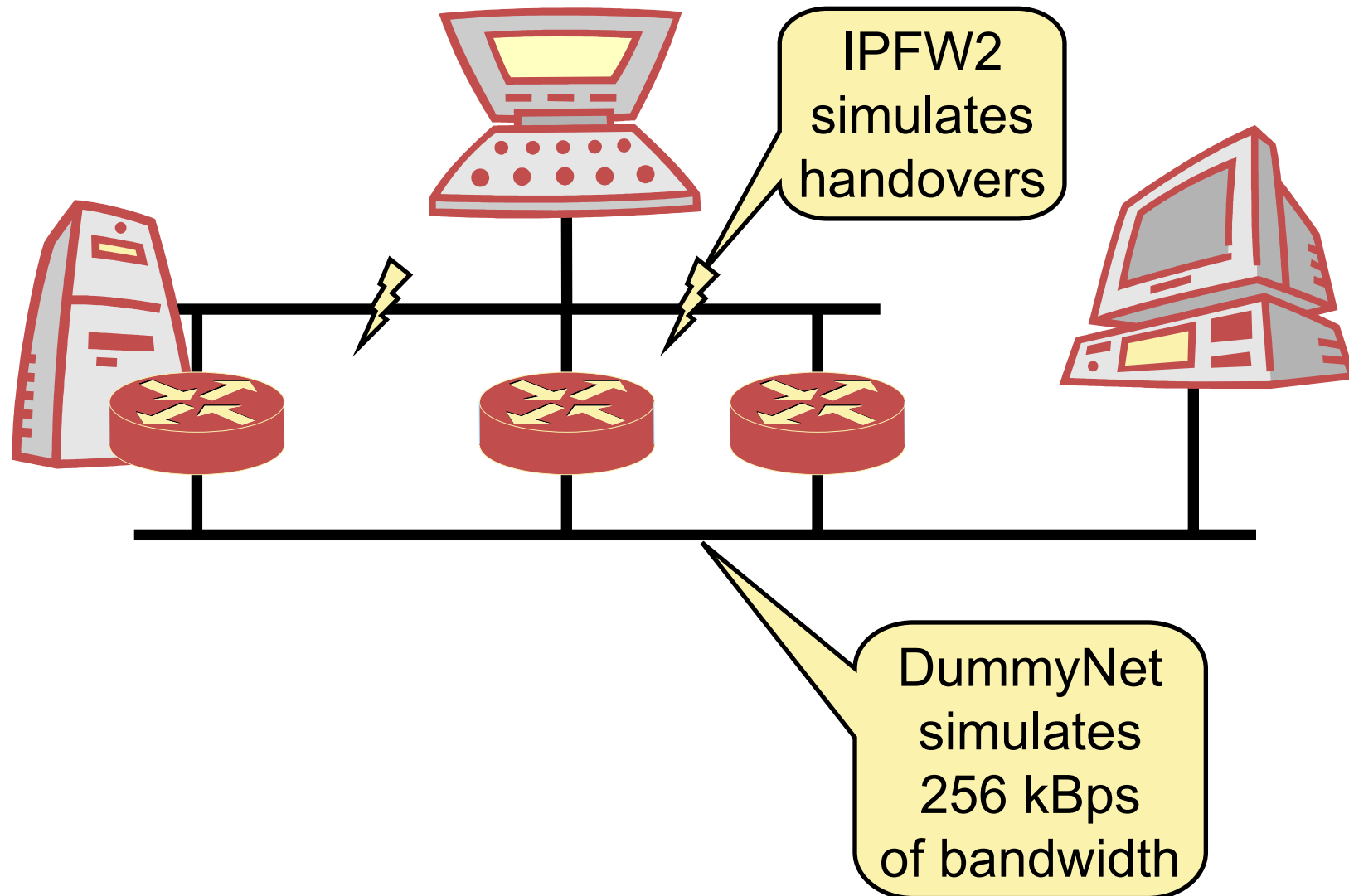
- Bandwidth: 256 kBps

- Propagation latencies: 50ms, 75ms, 100ms (one-way)

- Router Advertisement interval: 30ms~70ms (RFC 3775)

- DAD: assuming ODAD (NS timeout: 10ms)

- Application: Chargen over TCP

- Movement: between foreign networks

- Focus of this presentation: signaling, no Credit-Based Authorization

Home registration

- Binding Update
  MN→HA→MN = 100ms
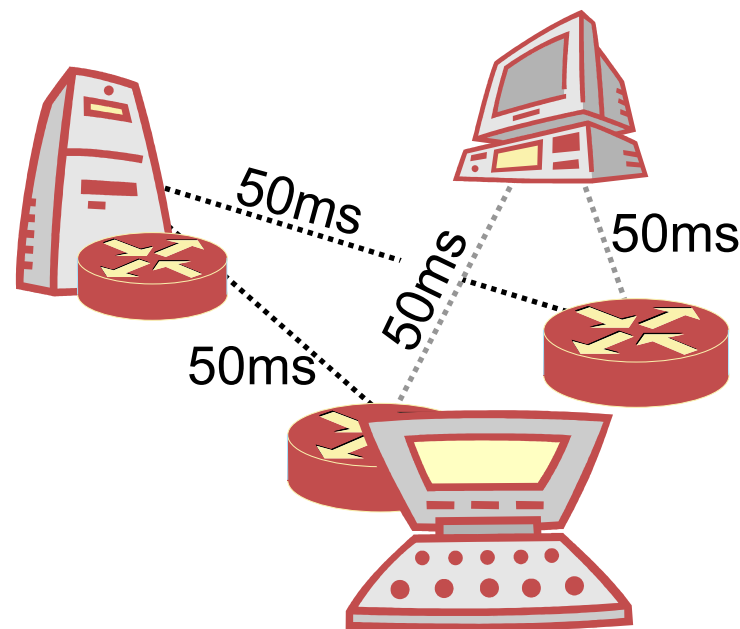
Correspondent registration

- HoA test dominates CoA test
  MN→HA→CN→HA→MN = 200ms

- Binding Update
  MN→CN→MN = 100ms

One-Way Times
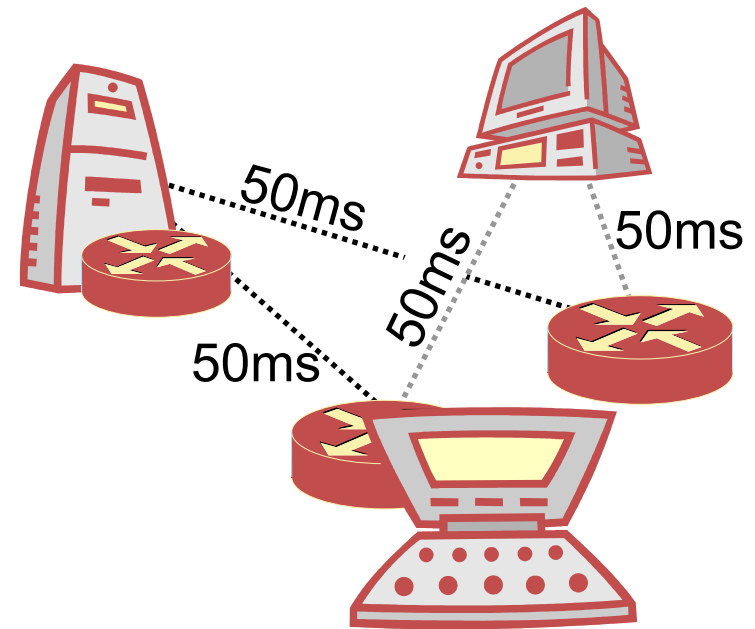
50ms 50ms 50ms 50ms

Measured total signaling latency: 416.5ms

Scenario 1: Early Binding Updates
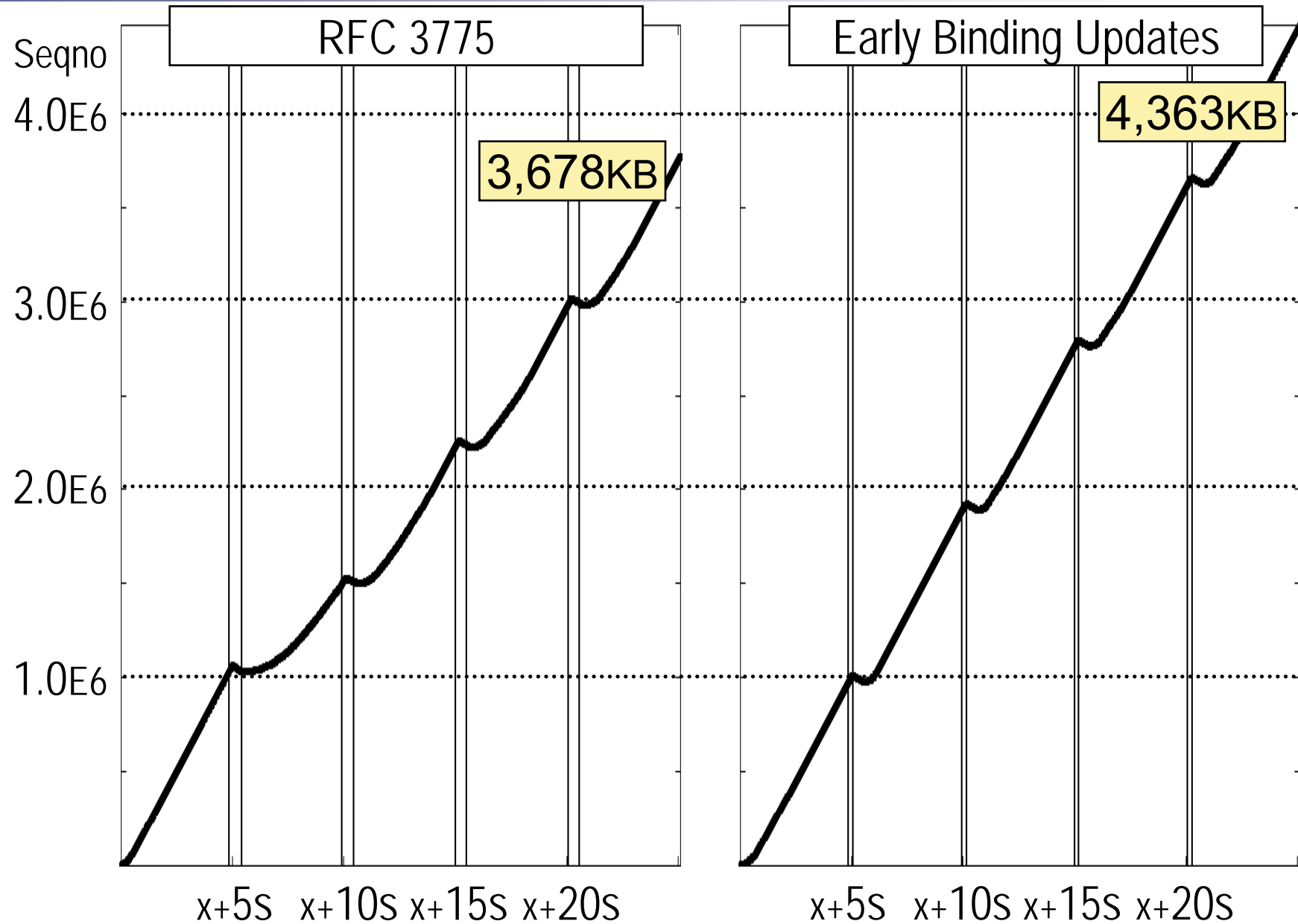
Home registration
non-critical

Correspondent registration

- Early Binding Update
  MN→CN→MN = 100ms

- HoA and CoA tests non-critical

- Std. Binding Update non-critical

50ms

50ms

50ms

50ms

One-Way Times

Measured total signaling latency: 107.3ms
(compared to 416.5ms)

Scenario 1: TCP Throughput

Home registration

- Binding Update

  MN→HA→MN = 200ms

One-Way Times

Correspondent registration

- HoA test dominates CoA test

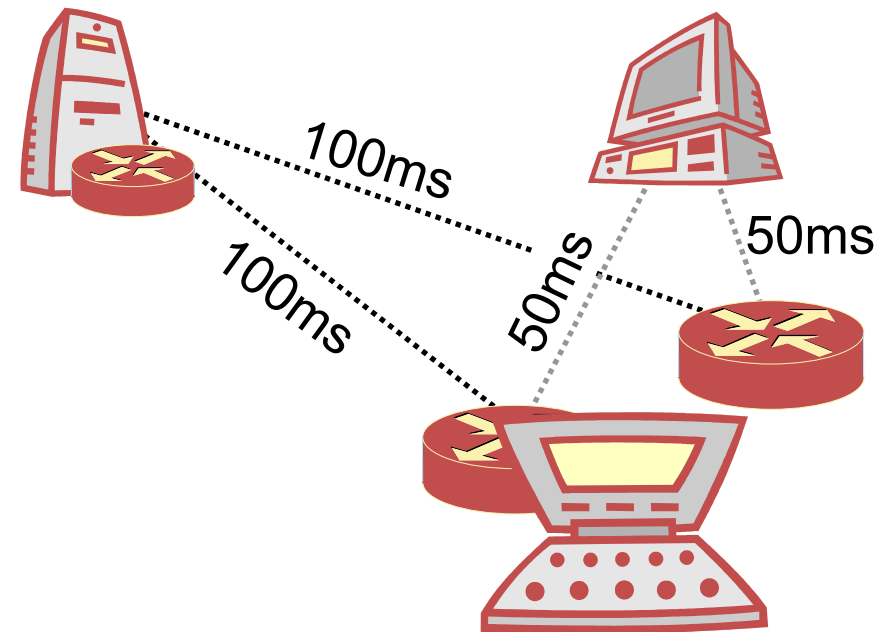 MN→HA→CN→HA→MN = 400ms

- Binding Update
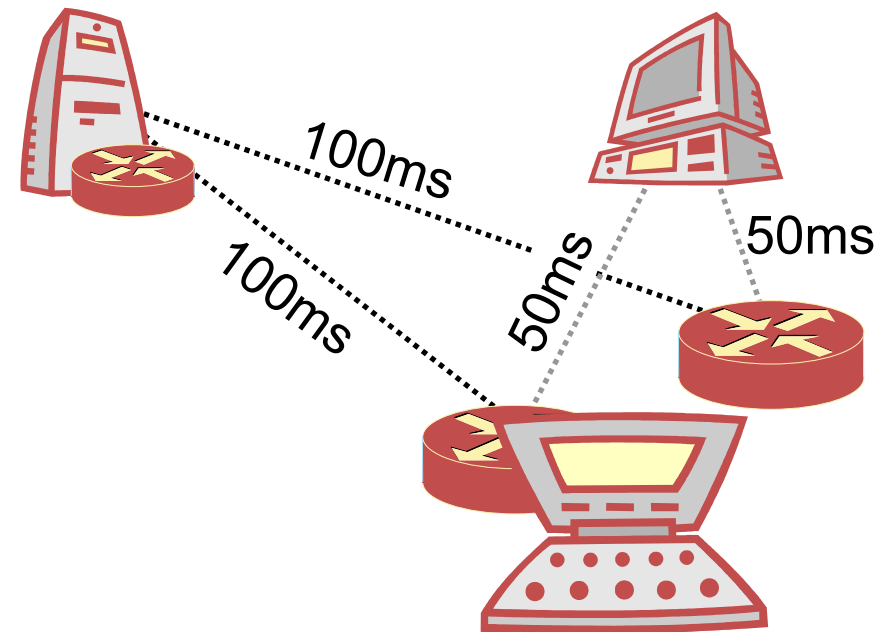
  MN→CN→MN = 100ms

Measured total signaling latency: 716.5ms

Scenario 2: Early Binding Updates

Home registration
non-critical

Correspondent registration

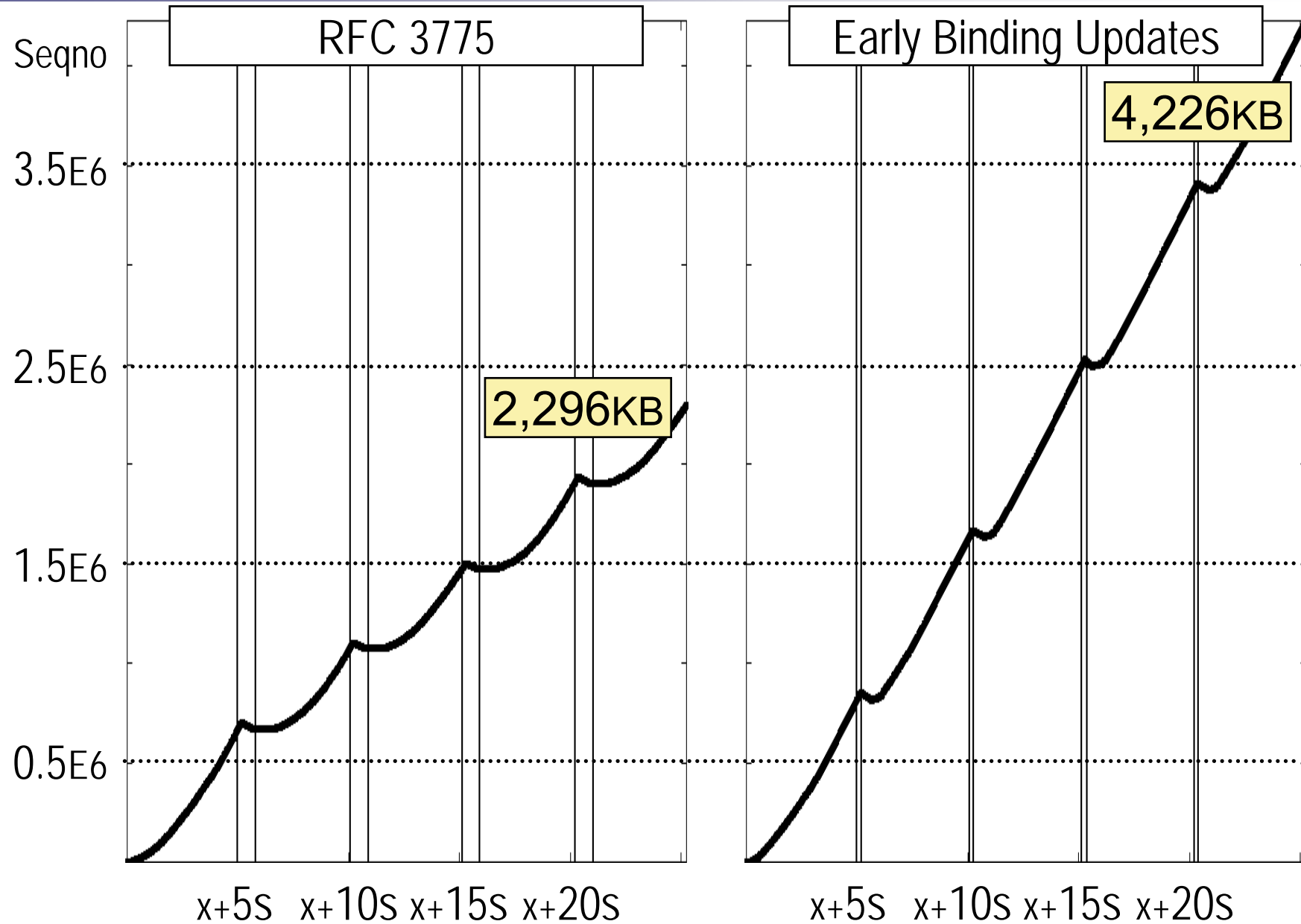- Early Binding Update
  MN→CN→MN = 100ms

- HoA and CoA tests non-critical

- Std. Binding Update non-critical

100ms

100ms

50ms

50ms

One-Way Times

Measured total signaling latency: 104.7ms
(compared to 716.5ms)

Scenario 2: TCP Throughput

Conclusions

Evaluated optimizations

- Early Binding Updates vs. RFC 3775

- Simultaneous Home and Correspondent Registrations (Optimistic behavior, also a stand-alone optimization)

- Extreme conditions, though not unrealistic

High signaling latencies…

- have grave impact on throughput

- cause longer TCP adjustment times

Conclusions

Future work includes…

- Deeper analysis of TCP behavior

- Different applications (e.g., voice)

- Impact of Credit-Based Authorization