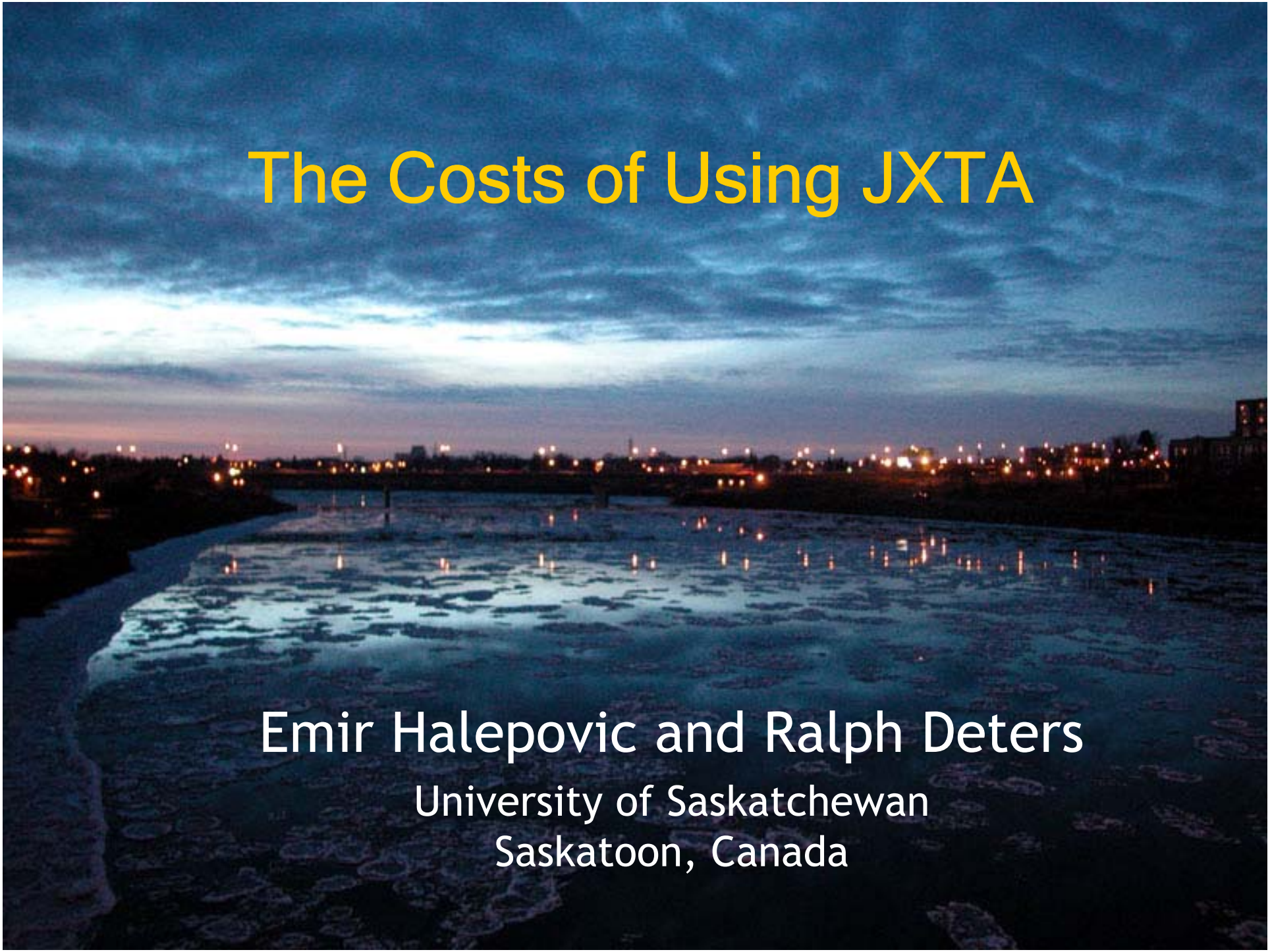


The Costs of Using JXTA

Emir Halepovic and Ralph Deters
University of Saskatchewan
Saskatoon, Canada

Outline

- JXTA Overview
- Need for Performance Evaluation
- Related Work
- JXTA Performance Model
- Results and Analysis
- Summary and Future Work

JXTA Overview

- A peer-to-peer (p2p) infrastructure
- Set of protocols for peer discovery, identification, communication etc…
- Virtual structured overlay network
  - *Edge, rendezvous, relay* peers
  - *Advertisements*
  - Messaging through *pipes*
- Java reference implementation

Need for Performance Evaluation

- Performance and scalability of JXTA networks are not well understood
- Some open questions:
  - Search, discovery, connectivity latency
  - Message round-trip time and throughput
  - Overhead of intermediate peers (relays)
  - Impact of XML message size and composition
- Essential for system designers and simulation-based research

Related Work

- JXTA as a research tool
  - In the context of a specific application
- JXTA Bench Project
  - pipe and rendezvous tests in a controlled environment – for platform developers
- Complexity of JXTA makes it hard to encompass all relevant aspects

JXTA Performance Study

- A research project at the U of Saskatchewan
- Goals
  - Develop a JXTA Performance Model
  - Evaluate and characterize JXTA performance
- Methods
  - Develop standard benchmarks
  - Measure protocol implementation in Java

JXTA Performance Model

- Peer-centric view of the JXTA network performance:
  - Latency of typical peer operations
  - Message round-trip time (RTT)
  - Message and data throughput
  - Rendezvous query-response throughput
  - Relay message throughput

Results and Analysis

- Benchmark Suite for measuring performance of JXTA components
- Measurements from a small JXTA network on a campus LAN (one test uses outside relay peer)

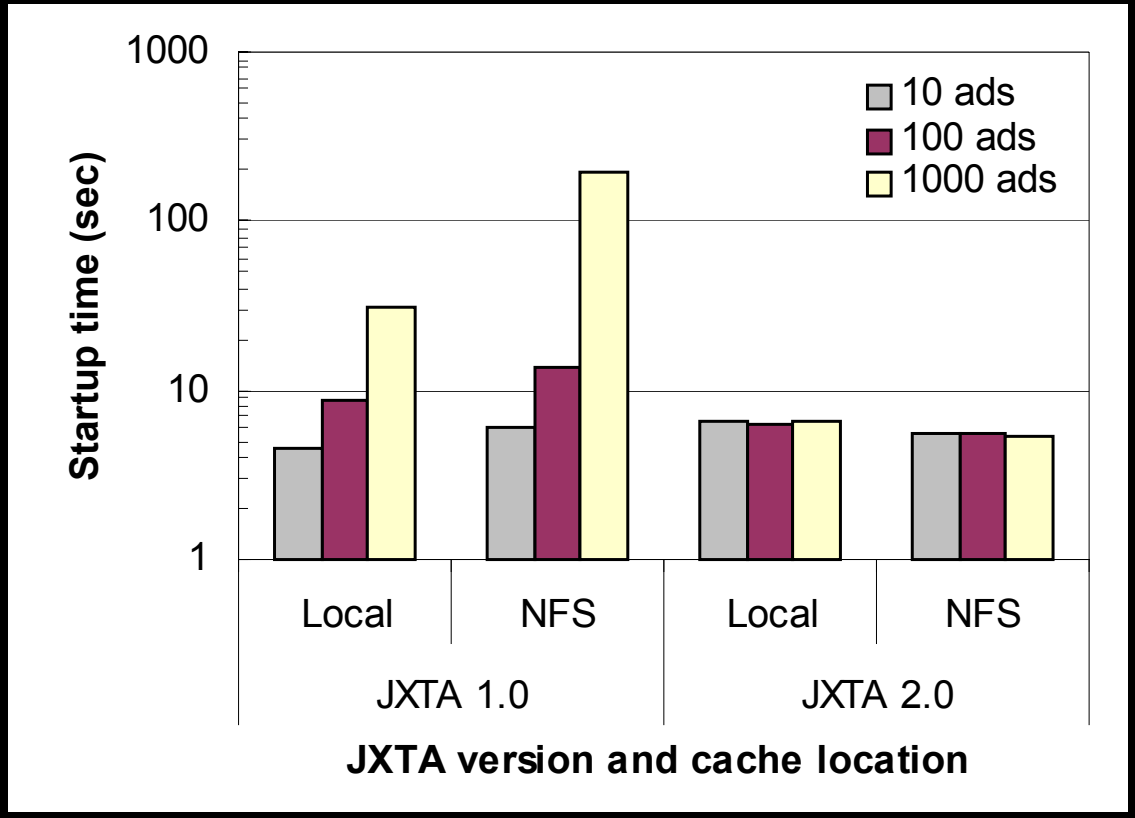
Results: Typical Operations

- Typical peer operations
  - Startup is costly and strongly affected by local cache size (v1.0) and distance to the rendezvous
  - Advertisement cache saves discovery time
  - Group and pipe creation costly

Peer Configuration	Start JXTA	Get group	Join group	Get cached pipes	Get remote pipes	Open out-pipe	Sequence Total
JXTA 1.0 (rel. 092402)							
No Rdv	4465.8	1257.5	6.0	25.4	221.2	159.0	6695.0
No Rdv [with 40 ads]	8218.7	1337.2	6.0	28.4	236.1	173.5	10557.1
Rdv on same LAN	5858.3	968.7	6.0	47.6	414.7	248.8	8467.4
Rdv 6 hops away	6074.1	1190.1	6.6	29.8	1173.4	693.2	11012.1
JXTA 2.0 (rel. 030301)							
Rdv on same LAN	6203.9	963.6	9.8	3.5	86.2	436.1	7986.2

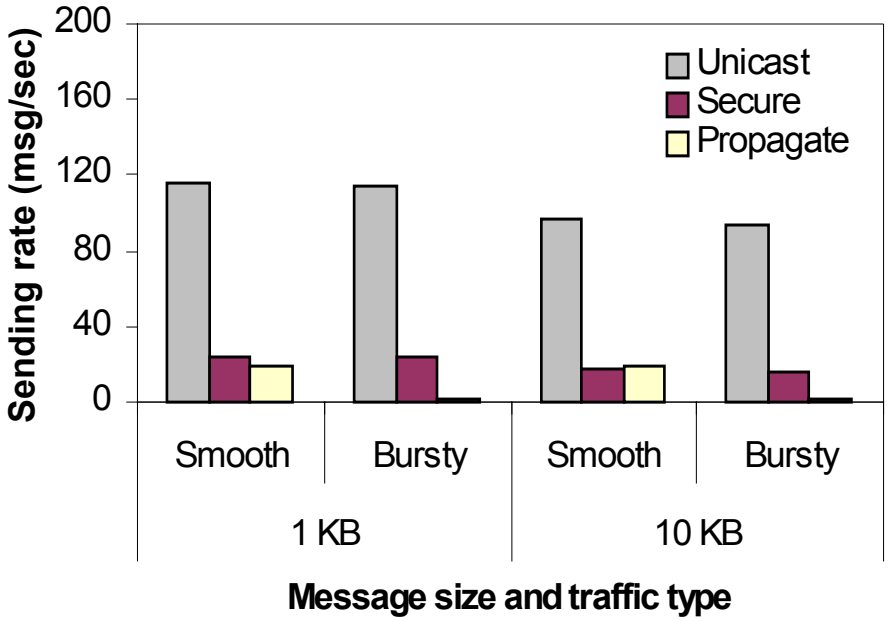
Results: Peer Startup

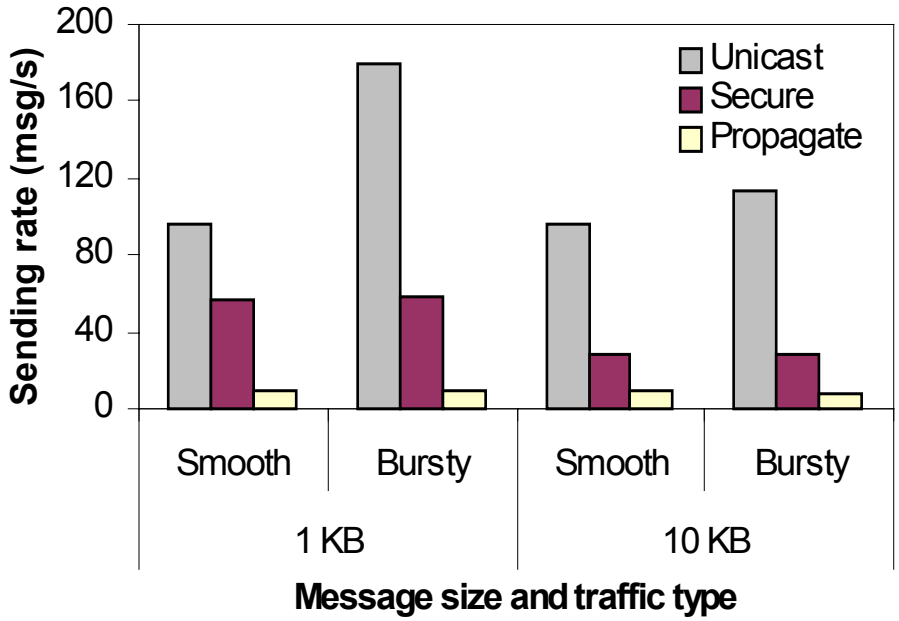
- Rendezvous peer startup



Results: Pipe Throughput

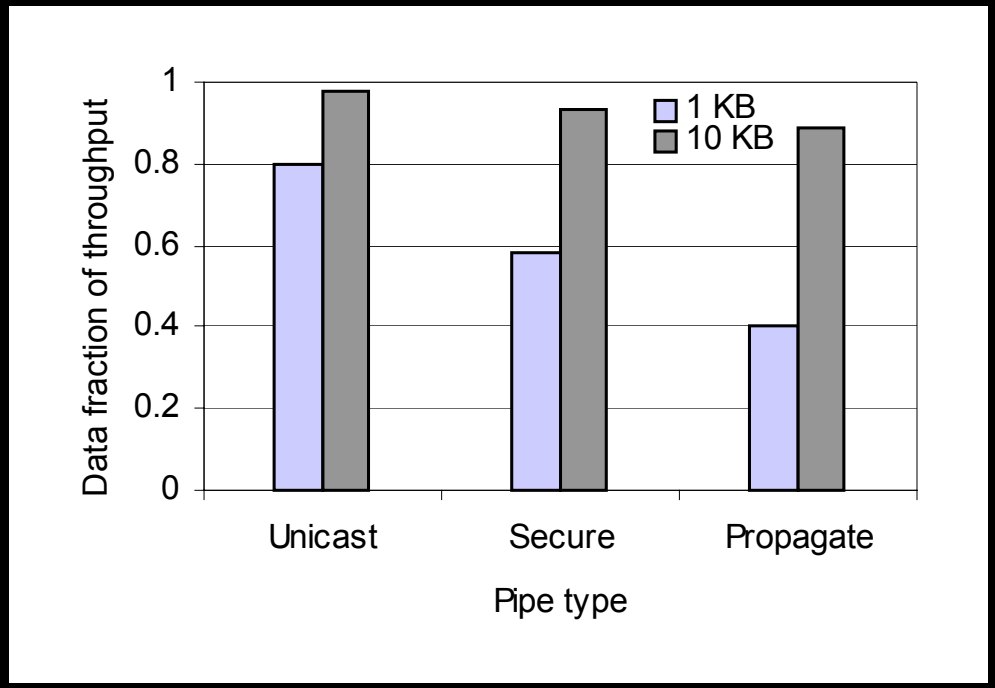
- JXTA 1.0
- JXTA 2.0





Results: Control Overhead

- Overhead of control information in JXTA messages
- 1 KB message
  - 20-60%
- 10 KB message
  - 3-12 %



Conclusions

- Benchmarking reveals
  - Relative cost of JXTA operations
  - Pipe throughput limits
  - Message control overhead → Exchange larger messages with fewer elements and less frequently
  - Reuse advertisements and open pipe handlers
- Results can be translated into simulation parameters

Summary and Future Work

- JXTA performance model through benchmarking
- Performance results provide insight in issues and trade-offs
- Future work
  - Performance in large peer groups
  - Performance in wide-area networks
  - Performance over slow links
- More info at http://bosna.usask.ca