Simulation-Based Evaluation of a Delay-Based Forwarding Concept

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Outline

1. Introduction to Future Networking Applications and QoS

2. Delay-Based Forwarding Concept

3. Implementation with OMNeT++/INET

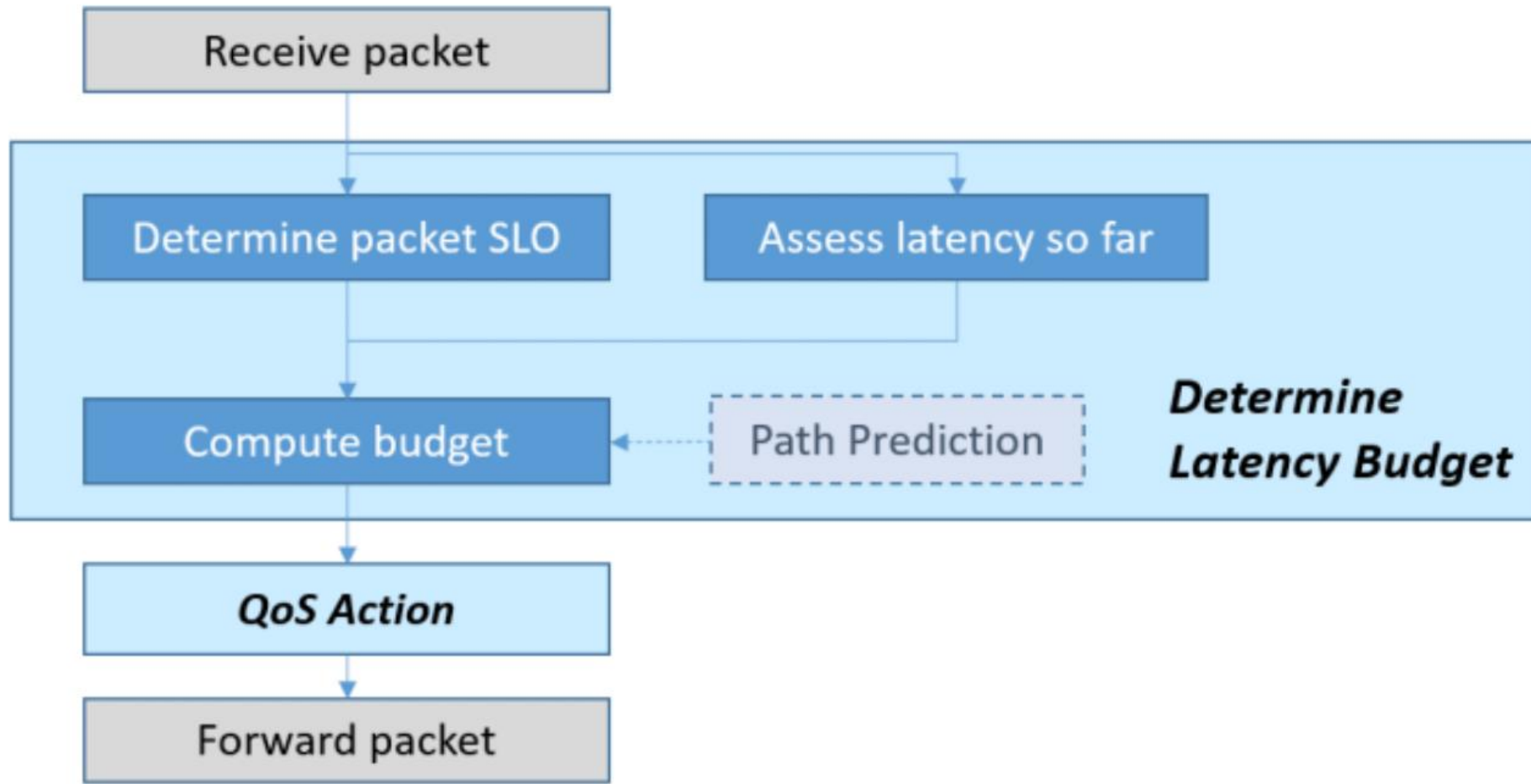4. Simulation-Based Evaluation

5. Conclusion & Outlook

Introduction to Future Networking Applications and QoS

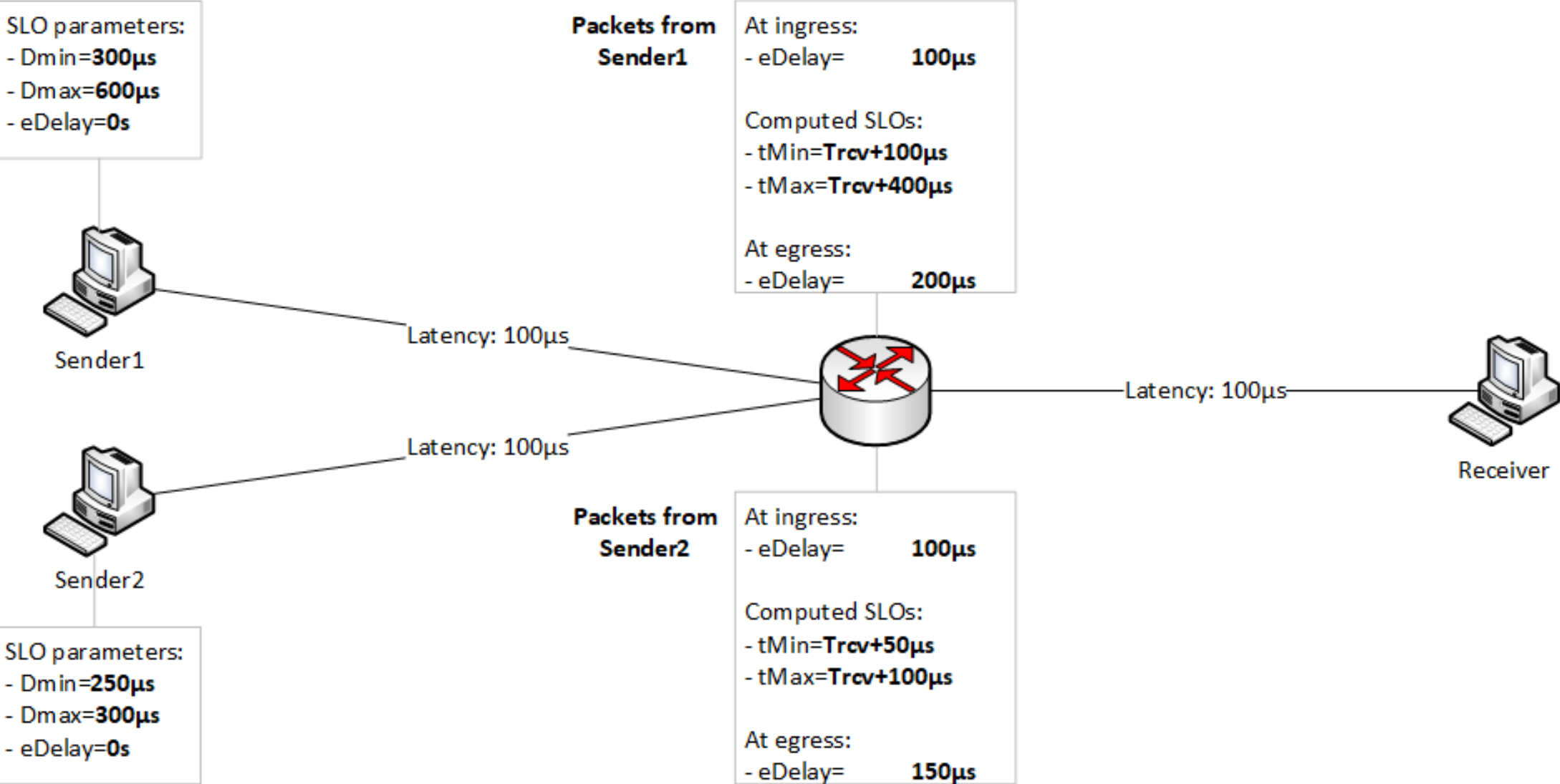# Introduction to Future Networking Applications and QoS

- Future networking applications have high demands in communication
  - Industry 4.0
  - Haptic applications
  - Virtual Reality (VR)
- Present QoS-Mechanisms can prioritize network traffic
- IntServ can prioritze particular traffic
- Clemm and Eckert propose the novel approach Delay-Based Forwarding (DBF) with using packet metadata
- DBF wants to provide fairness in the network
- We proof our simulation results against the paper results

Delay-Based Forwarding Concept
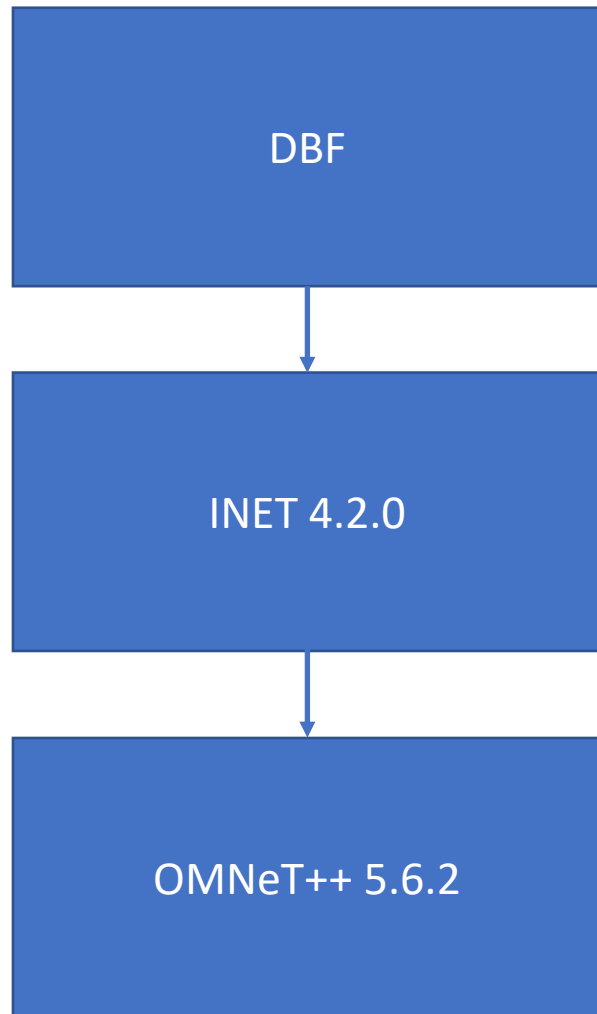
Delay-Based Forwarding Concept

Delay-Based Forwarding Concept

SLO parameters:
- Dmin=**300μs**
- Dmax=**600μs**
- eDelay=**0s**

Packets from Sender1

At ingress:
- eDelay=   100μs

Computed SLOs:
- tMin=**Trcv+100μs**
- tMax=**Trcv+400μs**

At egress:
- eDelay=   200μs

Latency: 100μs

Sender1

Latency: 100μs

Latency: 100μs

Receiver

Sender2

SLO parameters:
- Dmin=**250μs**
- Dmax=**300μs**
- eDelay=**0s**

Packets from Sender2

At ingress:
- eDelay=   100μs

Computed SLOs:
- tMin=**Trcv+50μs**
- tMax=**Trcv+100μs**

At egress:
- eDelay=   150μs

Implementation with OMNeT++/INET

Implementation with OMNeT++/INET

DBF

INET 4.2.0

OMNeT++ 5.6.2

Dependencies on INET:
- StandardHost
- Router
- Ipv4NetworkLayer
- ITrafficConditioner
  - ingressTC
  - egressTC
- PriorityQueue
  - PriorityClassifier
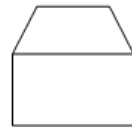 - PacketQueue
  - PriorityScheduler

Implementation with OMNeT++/INET
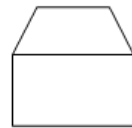
Layer 3
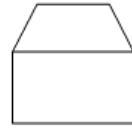
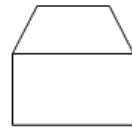DBFComputer — Computes DBF Parameters

DBFIpv4 — Adds DBFIpv4Options

Layer 2

DBFClassifier — Classifies Packets

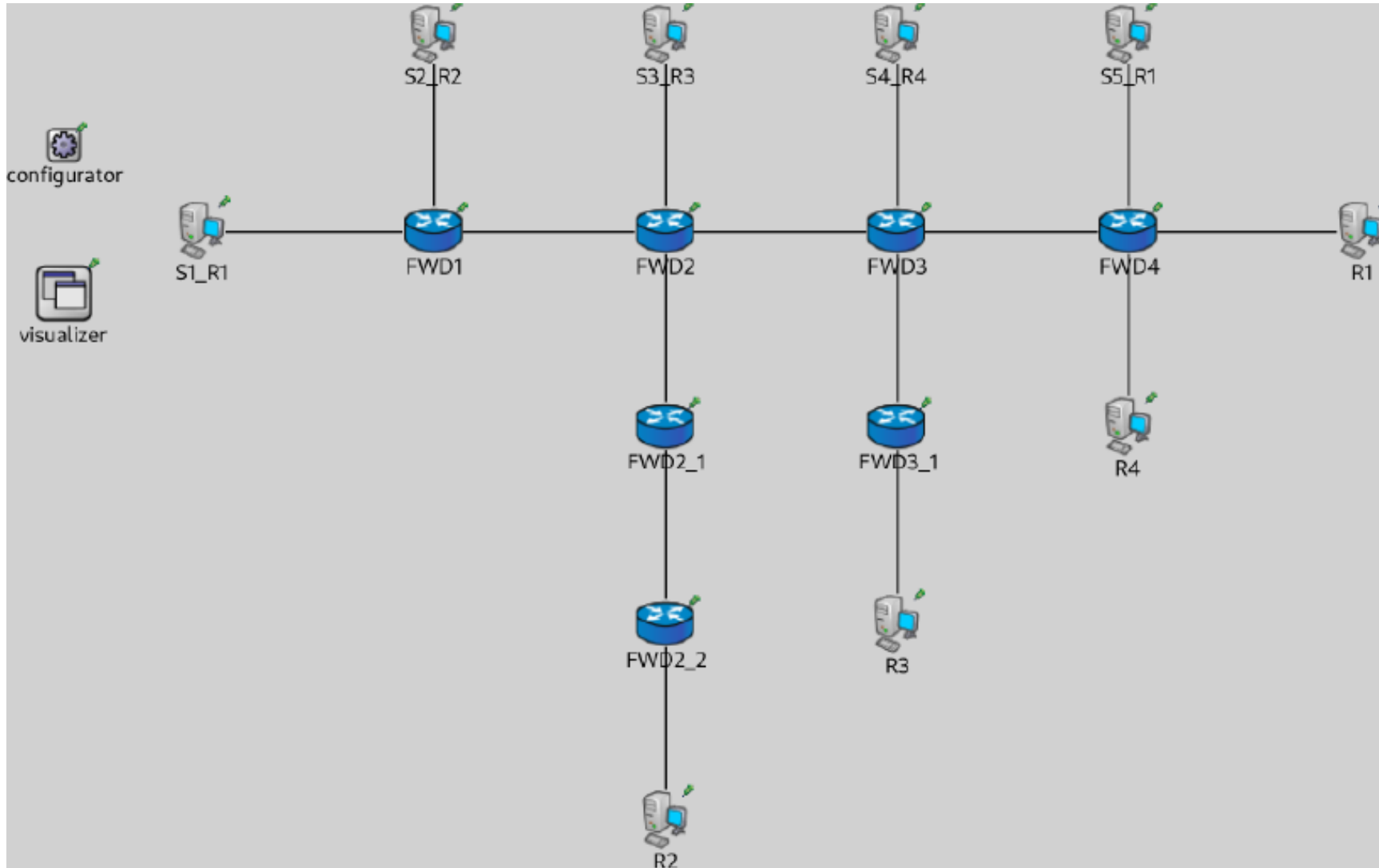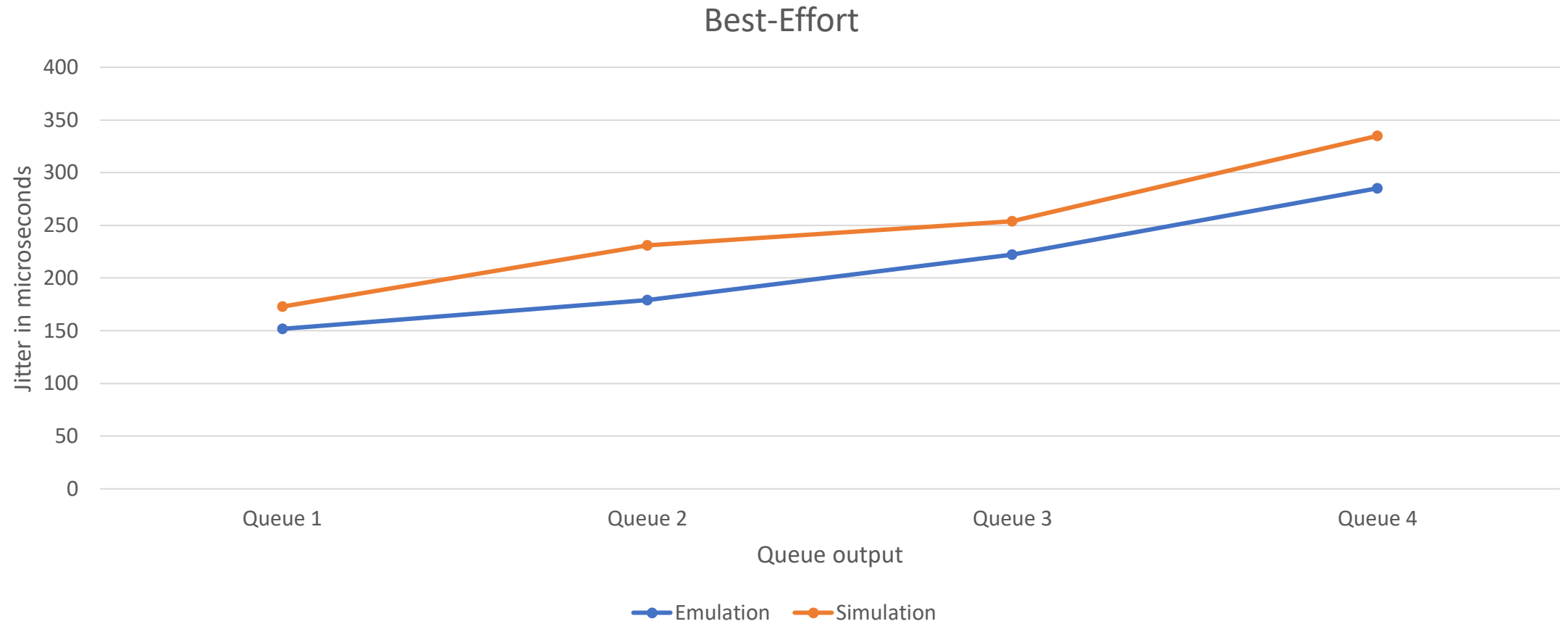DBFPriorityQueue — Provides Priority Queues
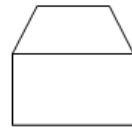
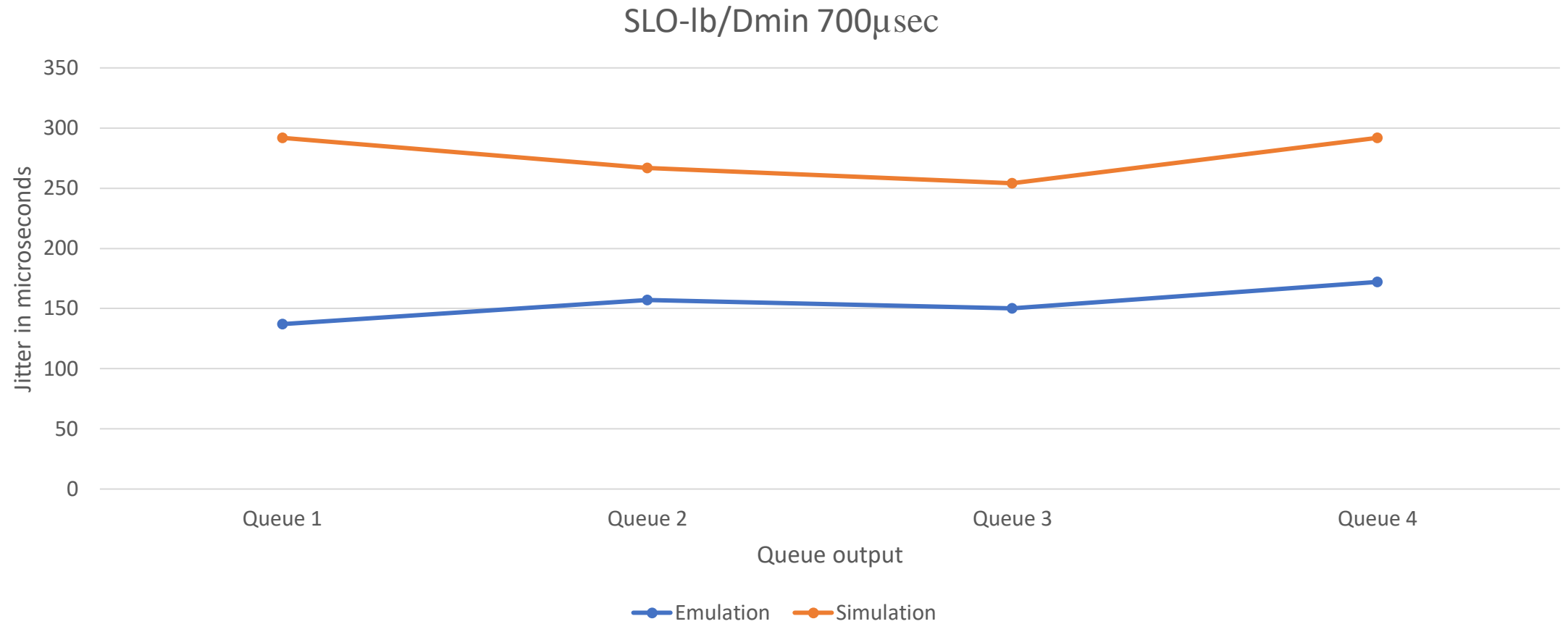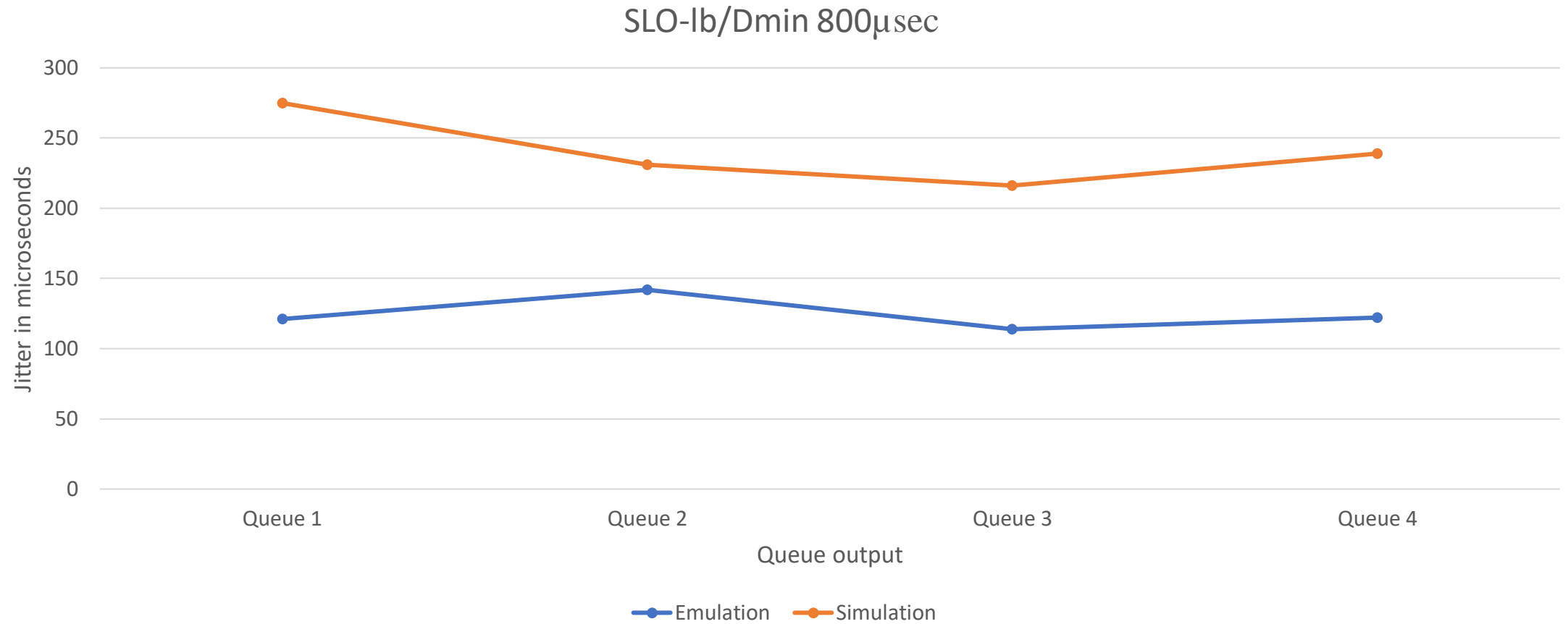DBFScheduler — Schedules and Dequeues Packets

Simulation-Based Evaluation

Simulation-Based Evaluation

Simulation-Based Evaluation

Best-Effort

Simulation-Based Evaluation

SLO-lb/Dmin 700µsec

Simulation-Based Evaluation

SLO-lb/Dmin 800µsec

Simulation-Based Evaluation

SLO-lb/Dmin 900µsec

Simulation-Based Evaluation

SLO-lb/Dmin 1000μsec

Simulation-Based Evaluation

SLO-lb/Dmin 1100μsec
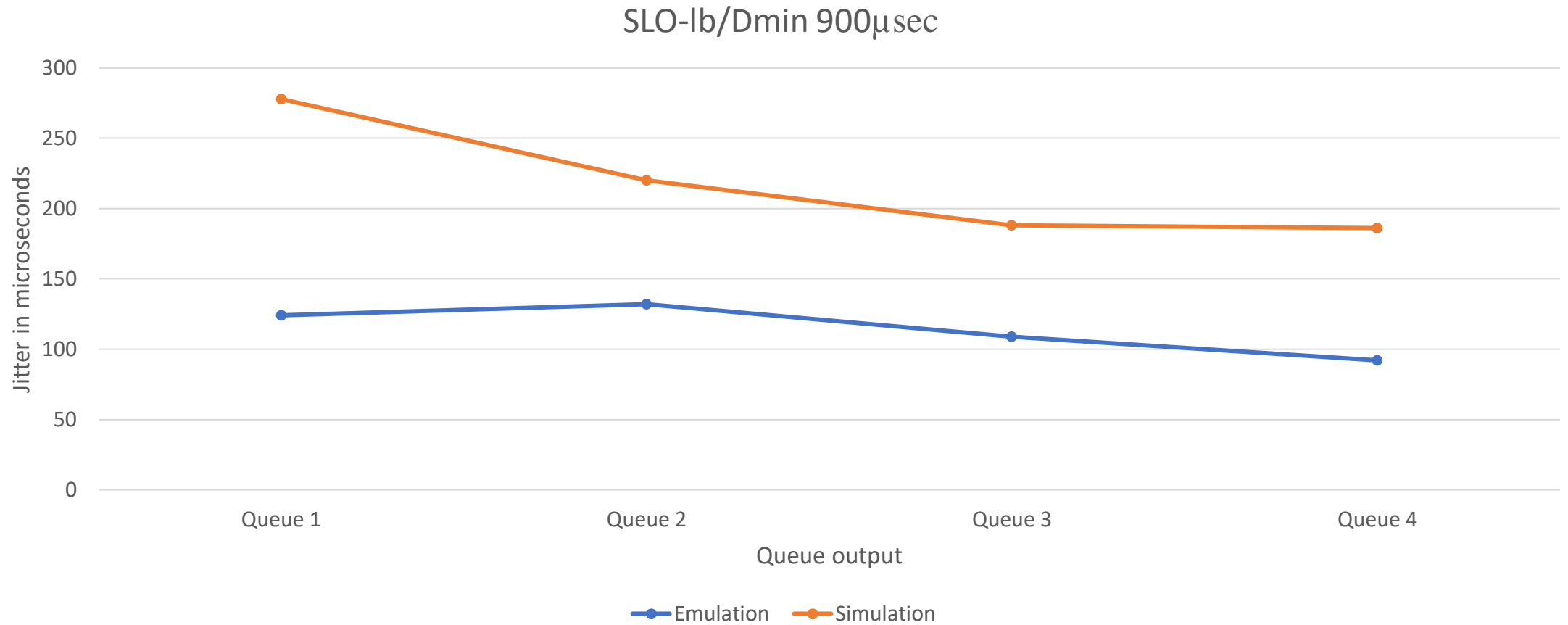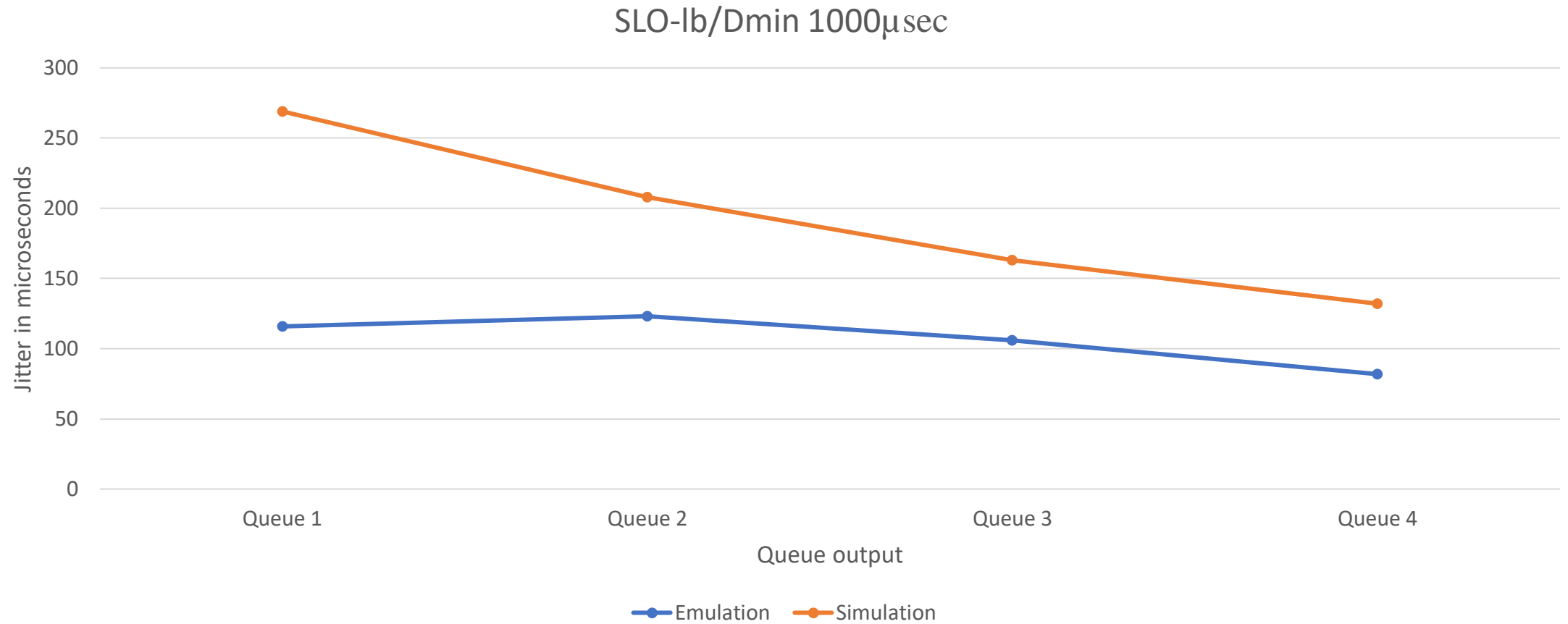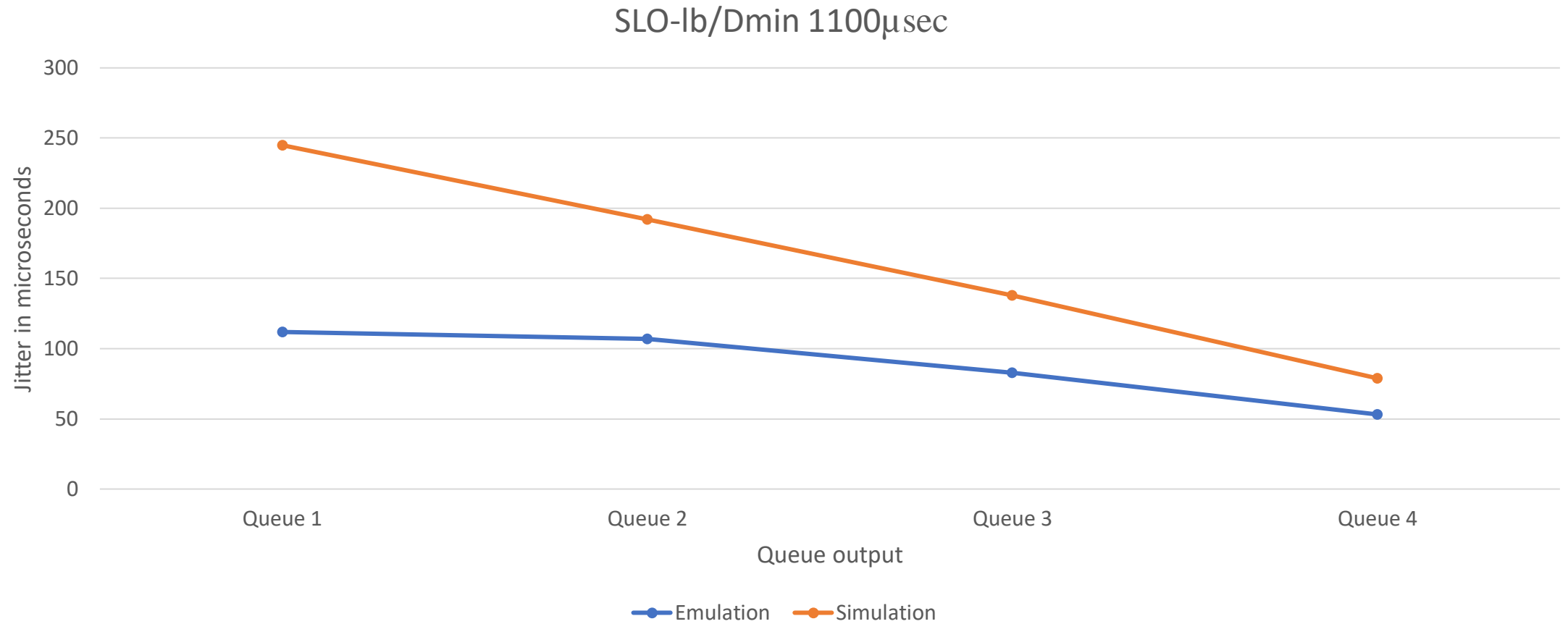
Conclusion & Outlook

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Conclusion

- Transparency to higher Layers with using DBF at Layer 3 and 2
- Differences in results but similar behavior

Outlook

- Figuring out the differences between emulation and simulation
- Further investigations with TCP in a heterogeneous network
- Modification of DBF which increases priority using eDelay