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Optimizing MRG Messaging Performance

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Agenda

- MRG Messaging Overview
- What is Performance?
- General Tuning Guidelines
- Optimizing Throughput
- Optimizing Bandwidth
- Optimizing Latency
- Q&A

Red Hat Enterprise MRG Messaging

- Open and unencumbered
- Fully featured
- Proven and reliable
- Highly performant & scalable for diverse workloads
- True interoperability with different application platforms

Core MRG Messaging Features

- Open specification for wire level protocol - AMQP
- Supports multiple message distribution patterns
- Reliable messaging
- Transactions - local and distributed
- Interoperable clients

Advanced MRG Messaging Features

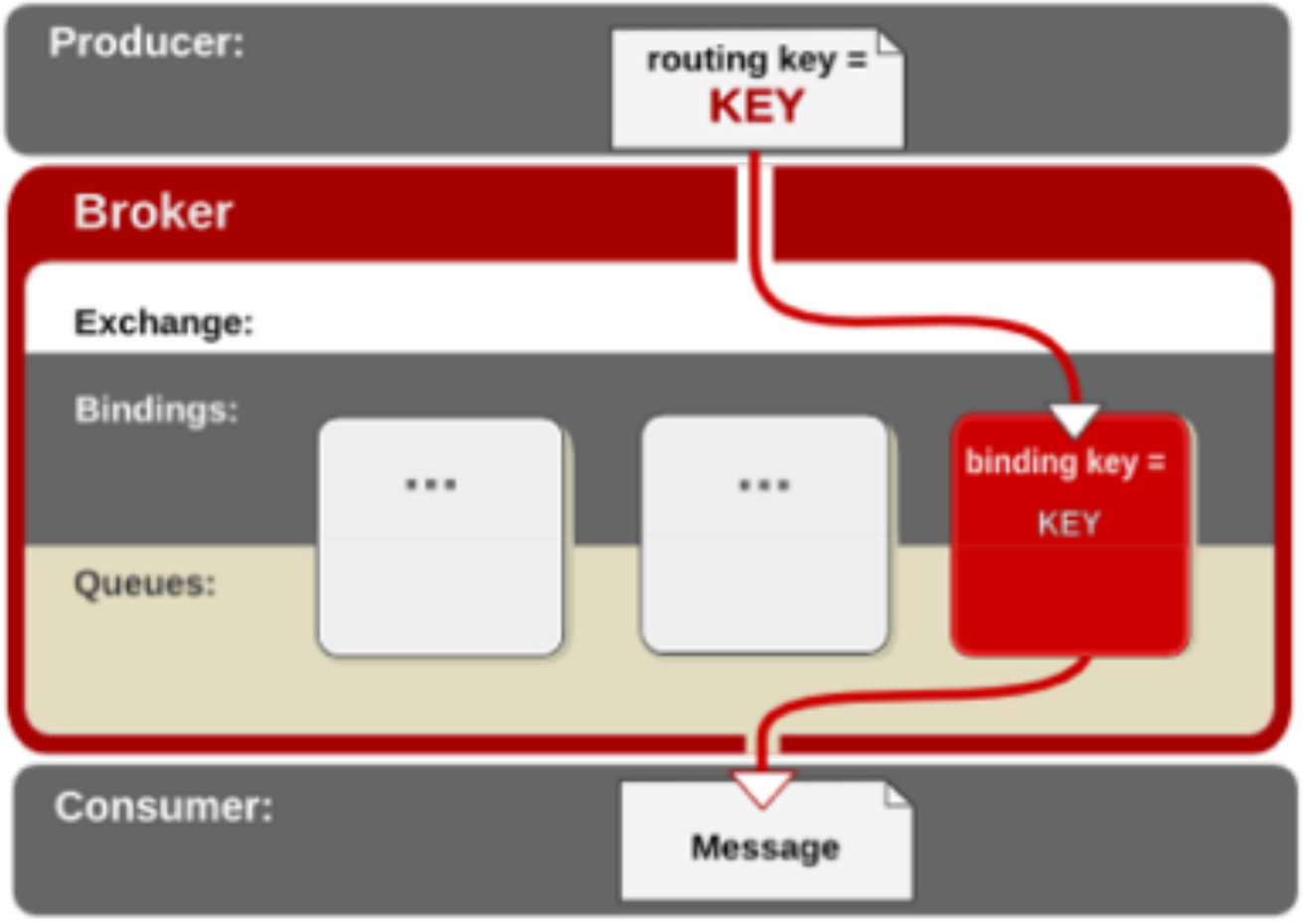
- Federation
- Management framework (QMF)
- Active-Active Clustering
- SASL authentication
- SSL encryption
- ACLs

MRG Fundamentals

- Broker
- Exchanges
  - e.g., Direct, Topic, Fanout, Header, XML
- Routing Key
- Binding Key
- Queue
- Connection
- Session
- Sender / receiver

Exchange examples

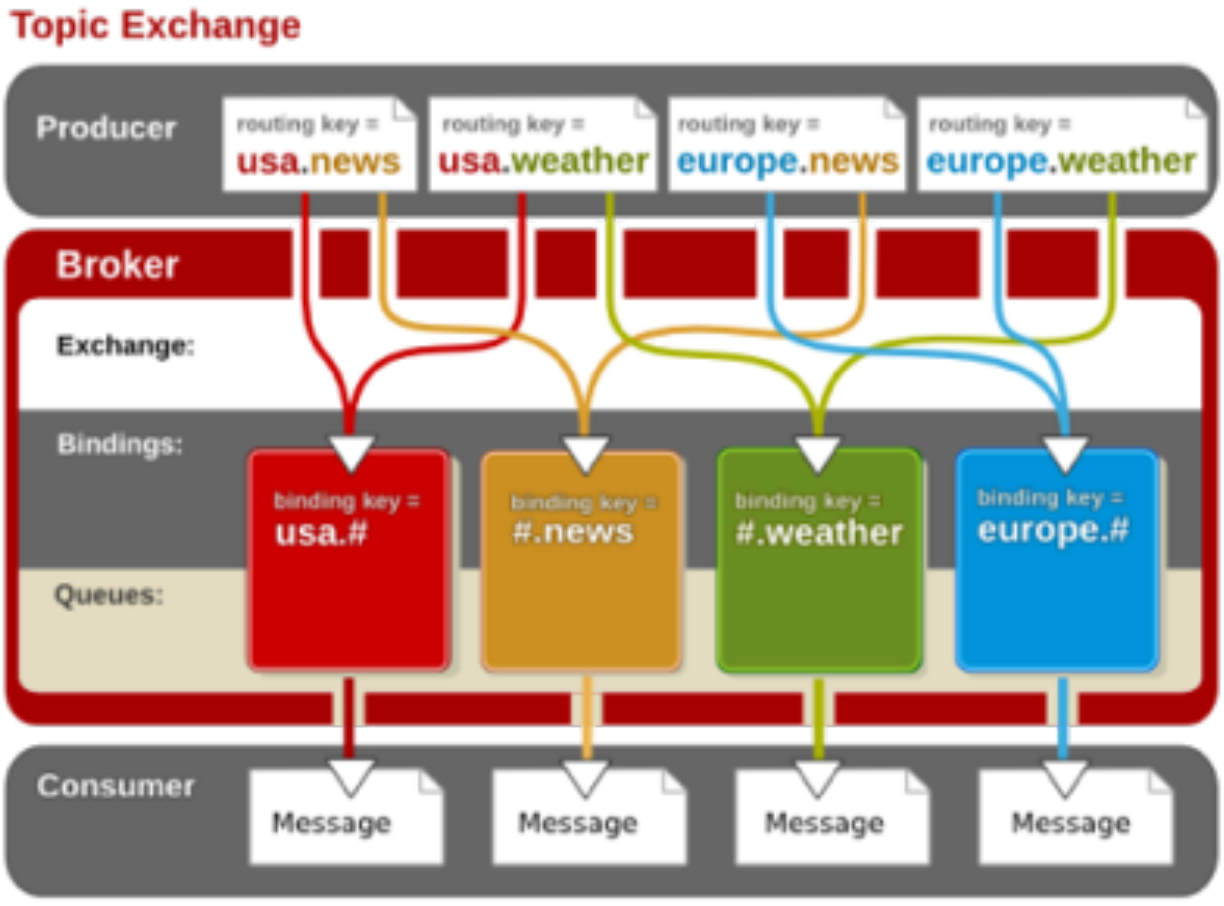
Direct Exchange



Keys directly match

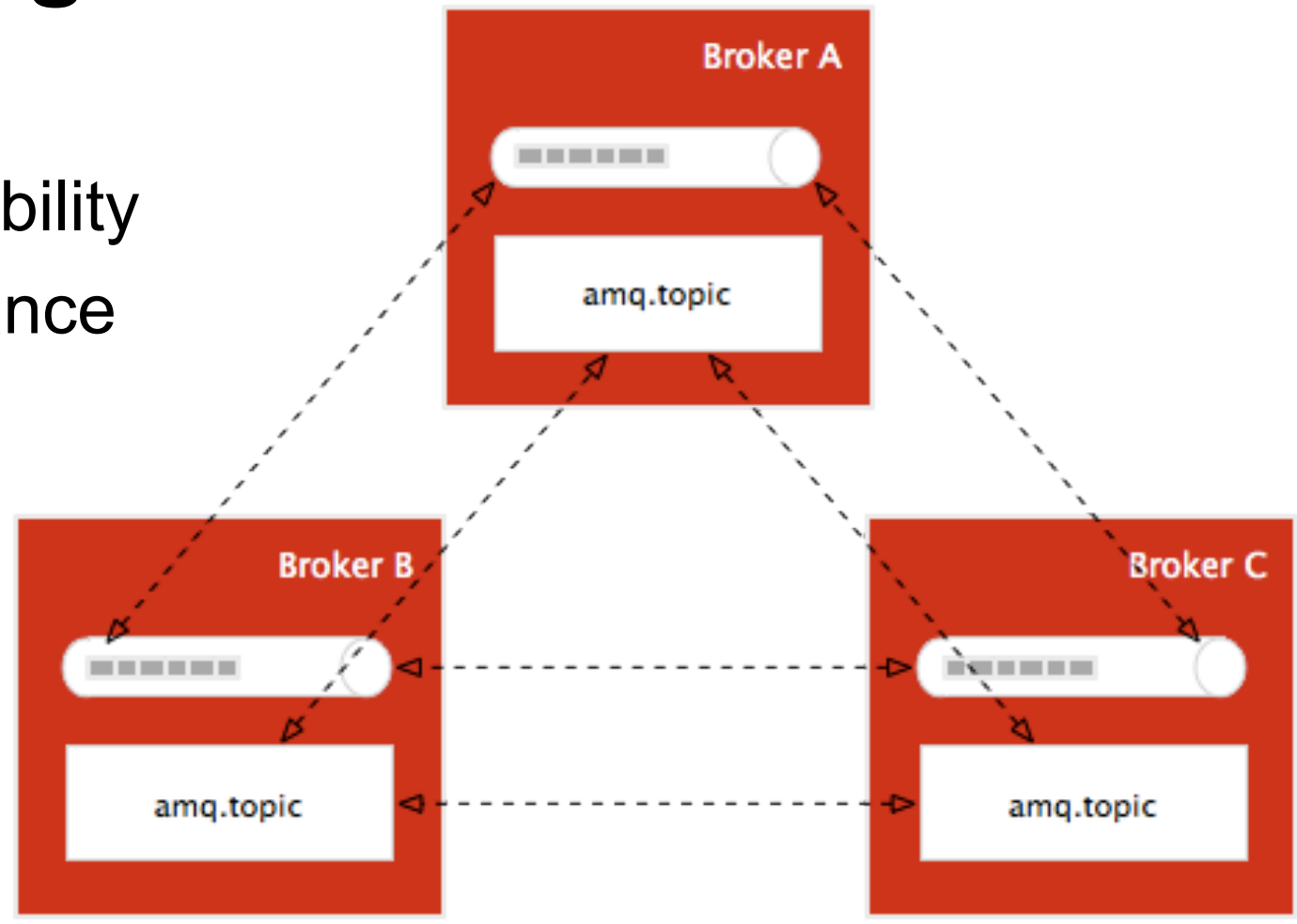
Exchange examples

Keys matched on wildcards



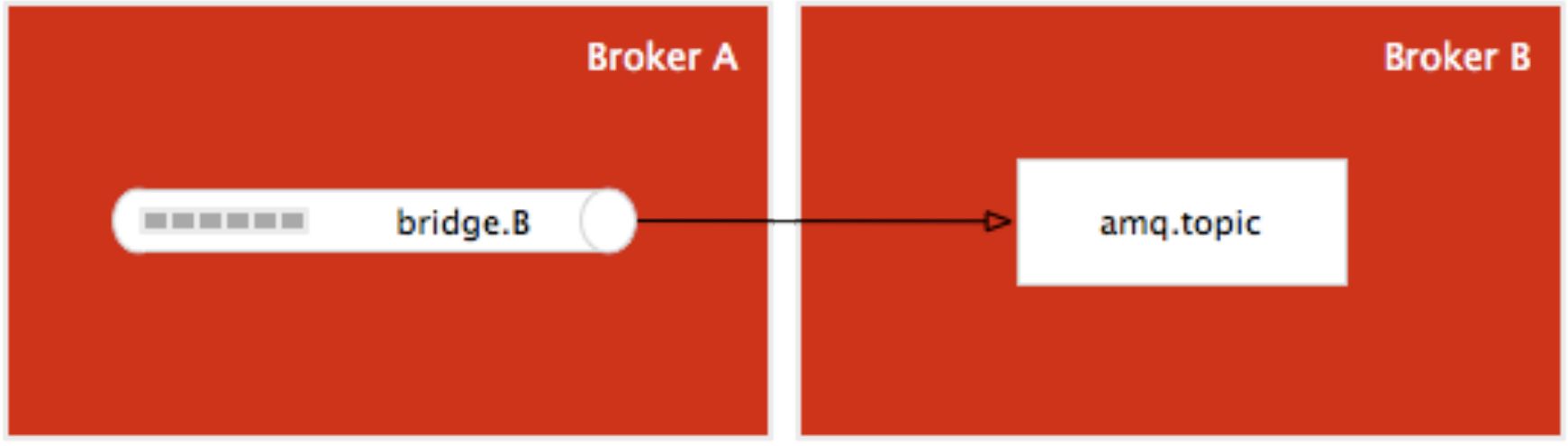
Clustering

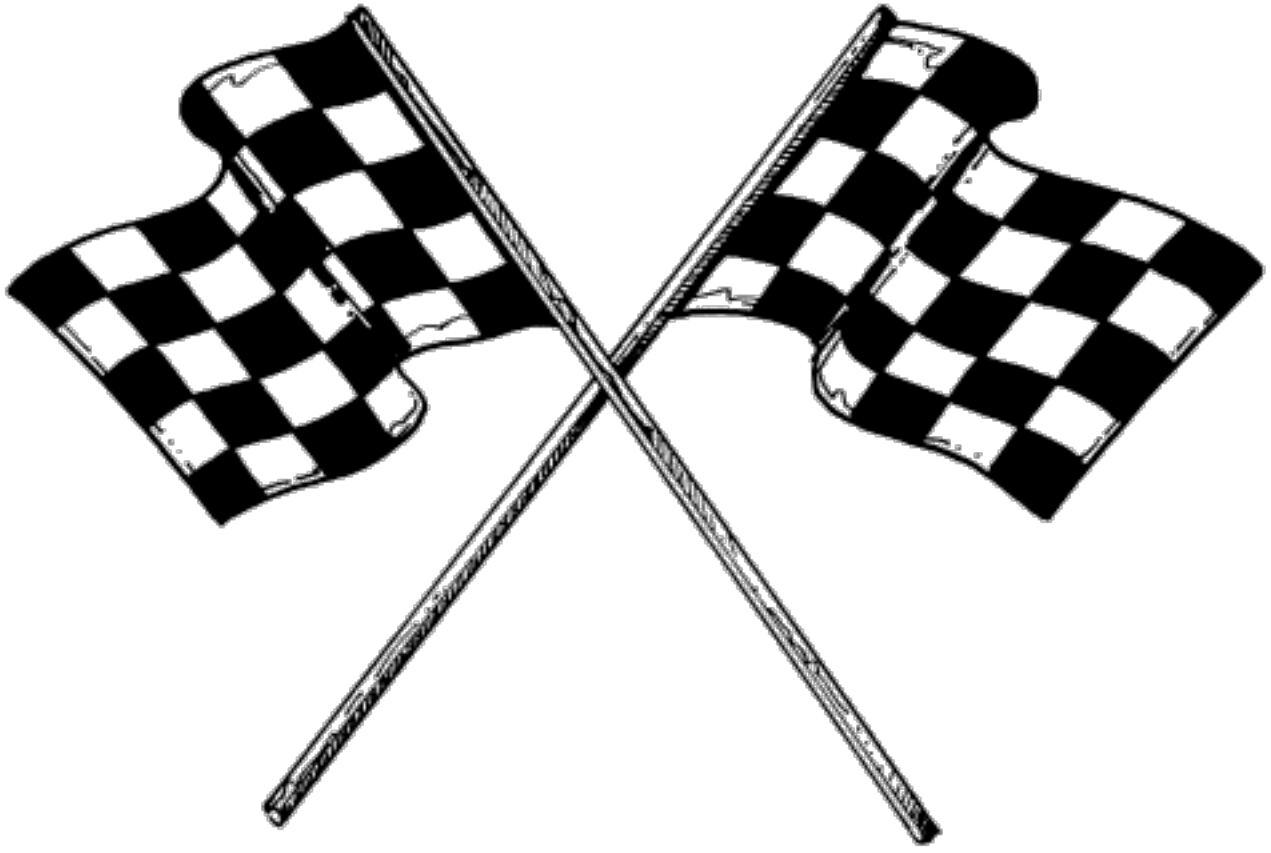
- Clustering
  - High availability
  - Fault tolerance



Federation

- Federation
  - Forward messages between brokers





What is performance?

What are the key measures of messaging performance?

Throughput = Messages / second

Bandwidth = MB / second

Latency = Transit time / message

General Tuning Guidelines

- Broker deployment architecture
- Exchange types
- Broker configuration
- Processor affinity
- Persistence and durability
  - Journal size
  - Queue depth

Clustering and Federation

- Clustering
  - Multicast token ring for active-active replication
  - Performance implications
  - Use RHCS to prevent split-brain
  - Client failover timing
- Federation
  - Only 1 connection between 2 broker peers
  - Acknowledgements

Optimizing throughput - Msg/sec

- Connection per thread
- Sender capacity
  - 1 - 4,300 msgs/sec
  - 30 - 25,000 msgs/sec
  - 50 - 30,000 msgs/sec
  - 100 - 34,000 msgs/sec
  - 1000 - 41,000 msgs/sec

Optimizing throughput - Msg/sec

- Receiver capacity
  - 1 - 4,300 msgs/sec
  - 30 - 20,000 msgs/sec
  - 50 - 34,000 msgs/sec
  - 100 - 39,000 msgs/sec
  - 1000 - 42,000 msgs/sec

Optimizing throughput - Msg/sec

- Message acknowledgement
  - Ack every message: 27,000 messages/sec
  - Ack in batches of 2: 36,000 messages/sec
  - Ack in batches of 10: 43,000 messages/sec
  - No acks: 45,000 messages/sec

Optimizing bandwidth - MB/sec

- Minimum AMQP 0-10 frame size - 12 bytes

Fewer frames

+ More data per frame

Higher bandwidth utilization

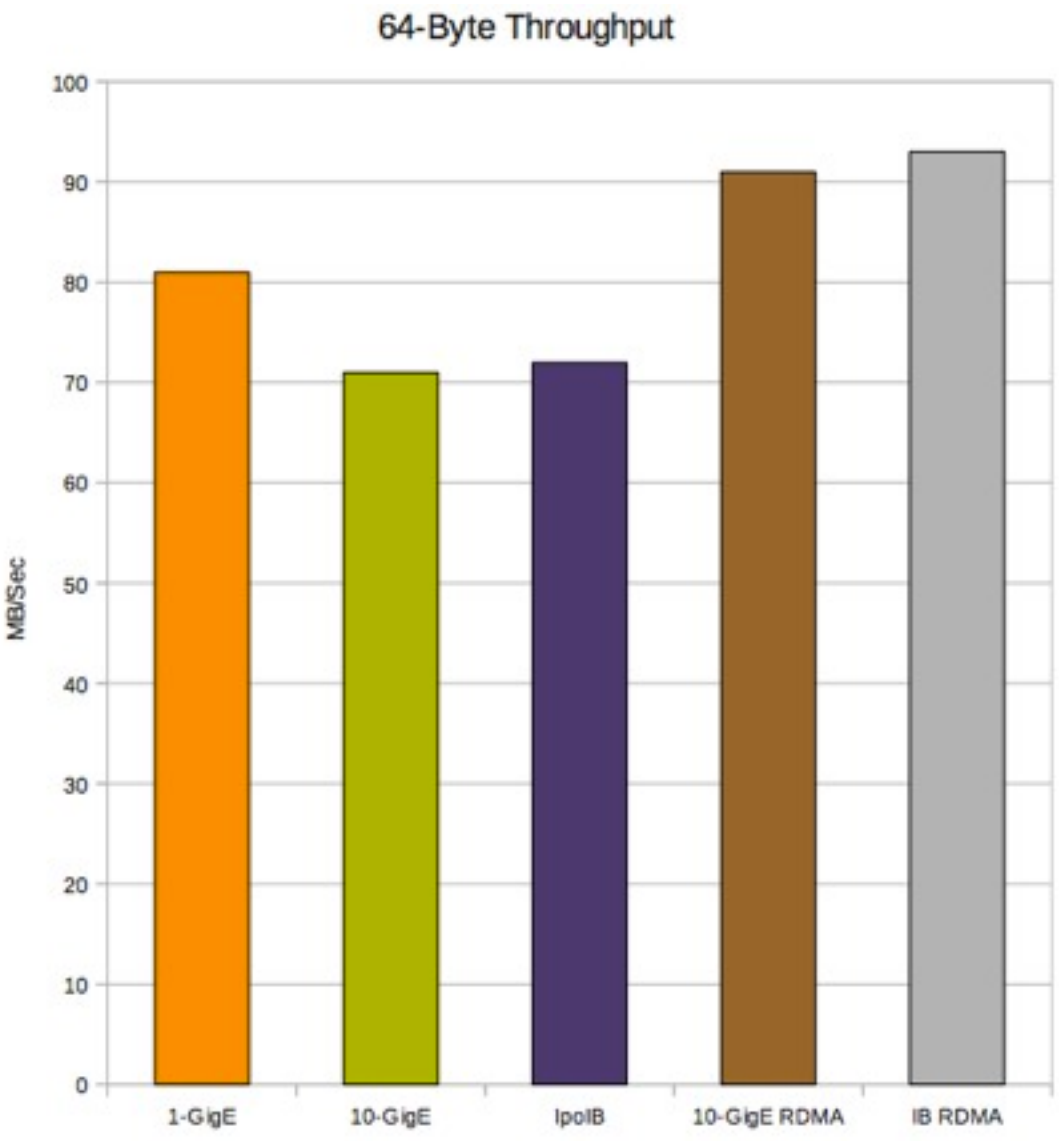
- "Container" message option

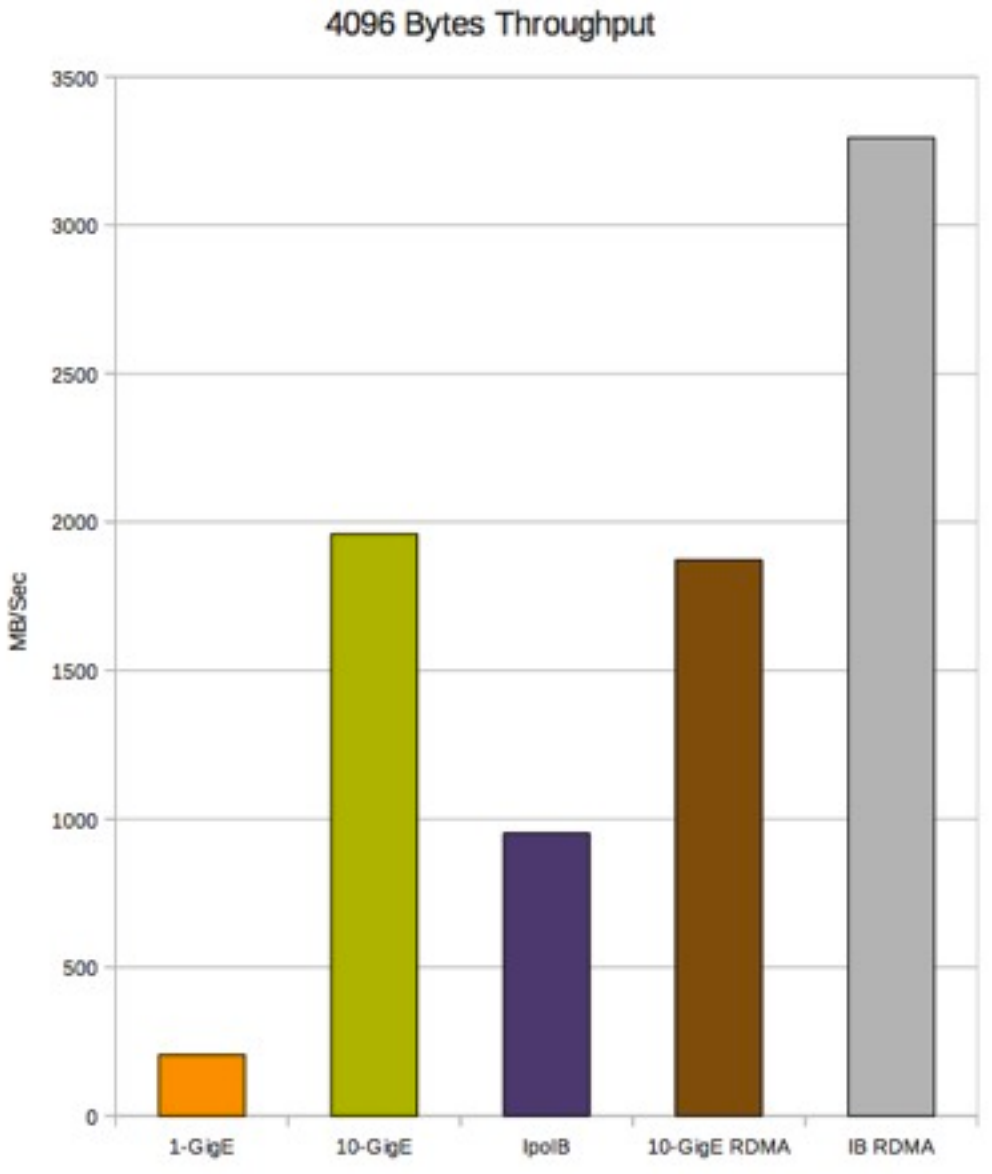
Optimizing bandwidth - MB/sec

- Utilize the fastest networking technology available
  - 10 Gigabit Ethernet
  - Infiniband

- Put messaging and cluster traffic on dedicated network

Optimizing bandwidth - MB/sec





Optimizing latency

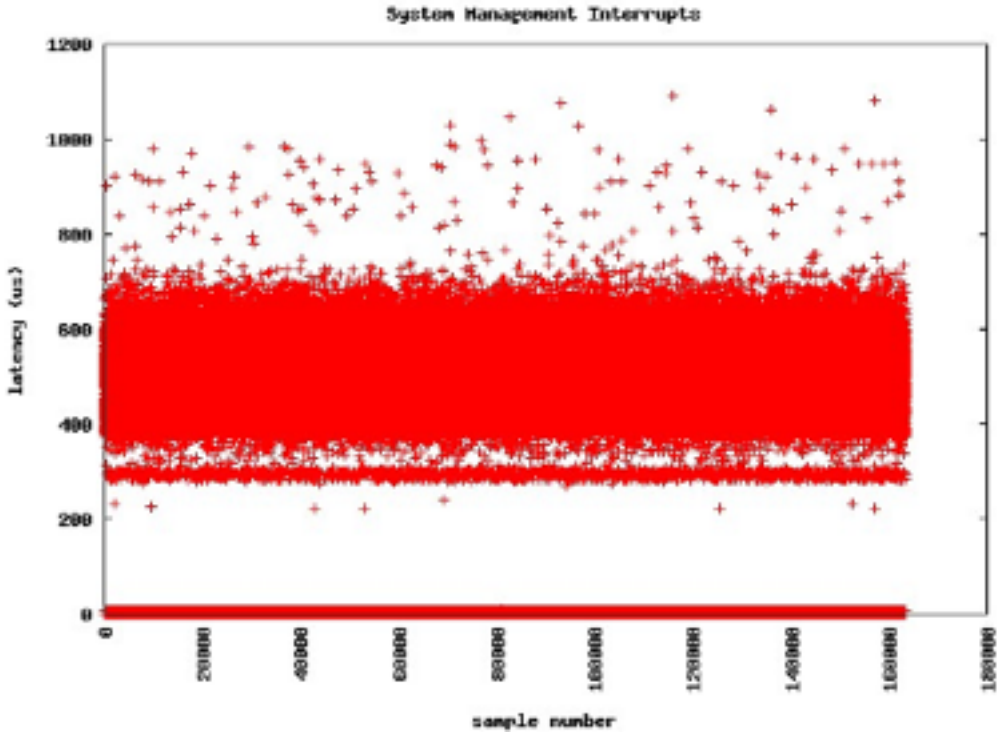
- OS induced latency
- Realtime kernel
- Make the right I/O choice
- TCP nodelay
- Look for latency in your application

Latency - Dealing with SMIs

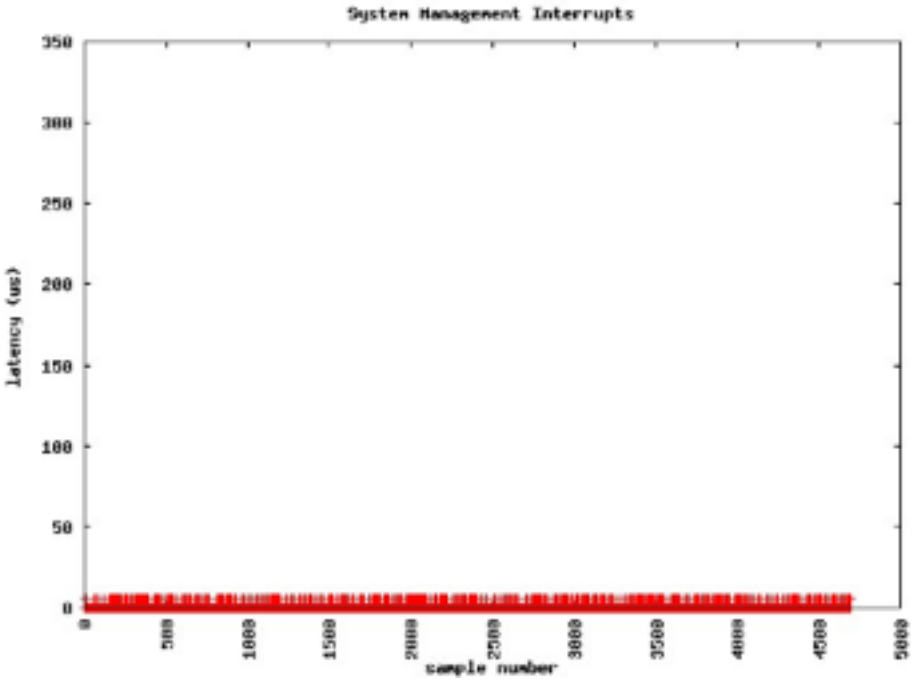
- Disable SMIs
  - Dynamic Power Savings Mode
  - CPU Utilization monitoring
  - P-state monitoring
  - ECC monitoring
- Benefits both RHEL & MRG operating environments

Latency - Dealing with SMIs

Latency spikes with standard BIOS settings



Latency when SMIs disabled in BIOS



Source: ftp://ftp.hp.com/pub/c-products/servers/linux/realtime/HPConWS-panel-Trieloff-Fisher-090914.pdf

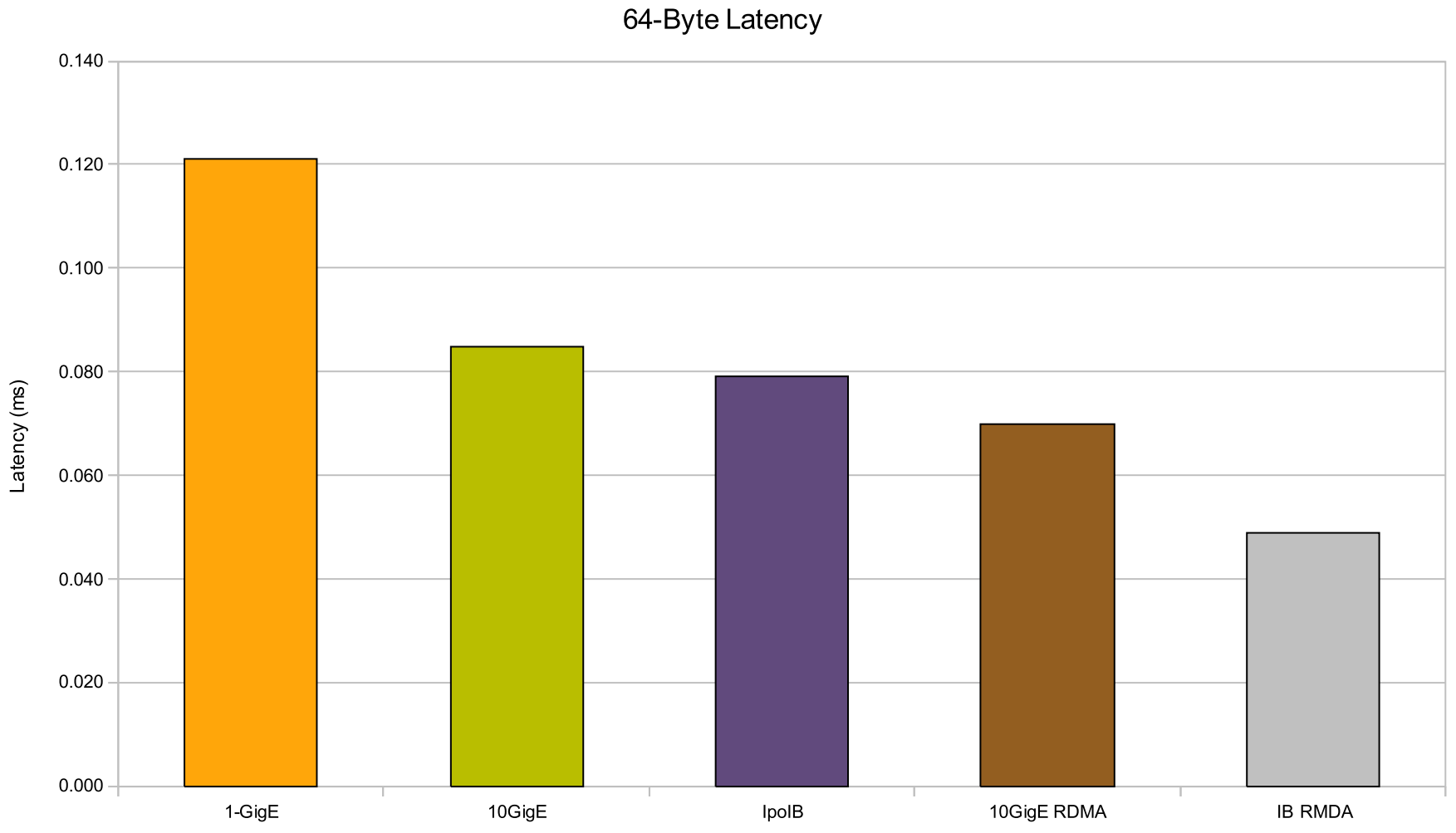
I/O Technology Choices

- Network
  - InfiniBand
  - 10gigE
  - RDMA
- Disk
  - FC / FCoE
  - iSCSI
  - Infiniband

What is RDMA?

- Remote Direct Memory Access
  - Originated with InfiniBand
  - Adopted in 10gigE as RoCE
- Direct memory to memory data copy
- Little CPU or OS overhead
- Latest iteration is QDR (40 Gbit/sec bandwidth and sub 3 µs latency)

Network Type & Latency



Operating System Tuning

- NUMA
  - Maximize CPU cache hits
  - Localize memory
- Move IRQ handlers
- Tune networking parameters

Q&A

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