Introduction to Apache ActiveMQ

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FuseSource
integration everywhere

About me

- **Hiram Chirino**

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  Twitter: @hiramchirino
  GitHub: https://github.com/chirino

- Software Fellow at FuseSource - http://fusesource.com
- Apache Member and ActiveMQ PMC Chair
- Apache Committer on: ActiveMQ, Camel, Karaf, ServiceMix, Geronimo, Felix, and Aries
- Lead of STOMP 1.1 SpecificationCo-Founder of many other OS projects:
  - HawtDispatch, Scalate, LevelDBJNI, Jansi, And many more!

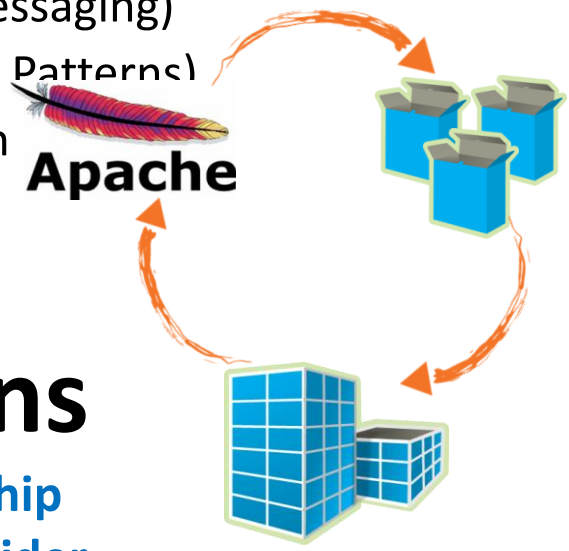
Agenda

- Who's FuseSource?
- ActiveMQ Overview
  - Core capabilities
  - Managing client connections
  - Managing persistence
  - High availability
  - Network of brokers
- What's New in ActiveMQ 5.6
- Demo

Bringing Open Source Integration & Messaging to Enterprise IT

Apache Software Foundation

- ActiveMQ (reliable messaging)
- Camel (Ent. Integration Patterns)
- ServiceMix/Karaf (con



Enterprise OSS Products:

Fuse ESB Enterprise

Fuse MQ Enterprise

- Integrated solutions
- Tested and certified
- Documented

Subscriptions

Collaborative relationship with your software provider

- Enterprise tooling
- Services level agreement
- WW support organization

Training & Consulting

- Expert training on site or via the Web
- Packaged services for all phases of the lifecycle

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FuseSource Subscription:
Collaborative relationship with your software provider

Support

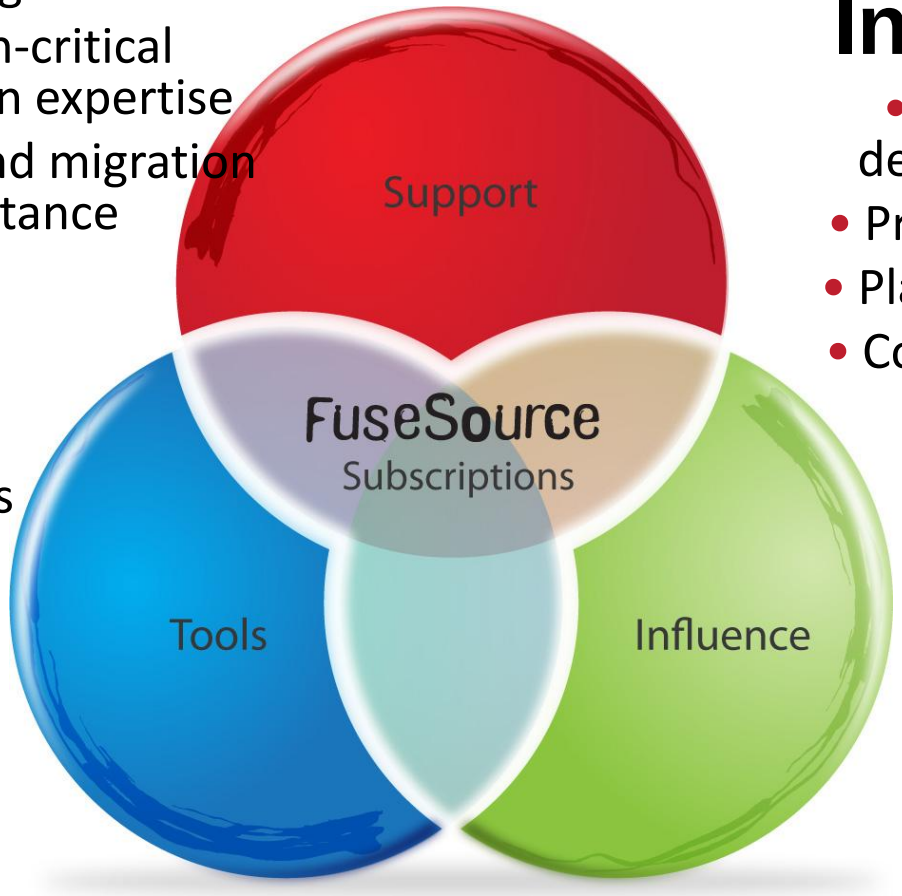
- Enterprise-class 24x7 coverage
- Global organization
- Mission-critical integration expertise
- Updates and migration assistance

Influence

- Access to the development team
- Product roadmaps
- Planning processes
- Conduit to Apache

Tools

- Certified distributions
- Dev, ops, and management tools
- Performance tuning
- Documentation



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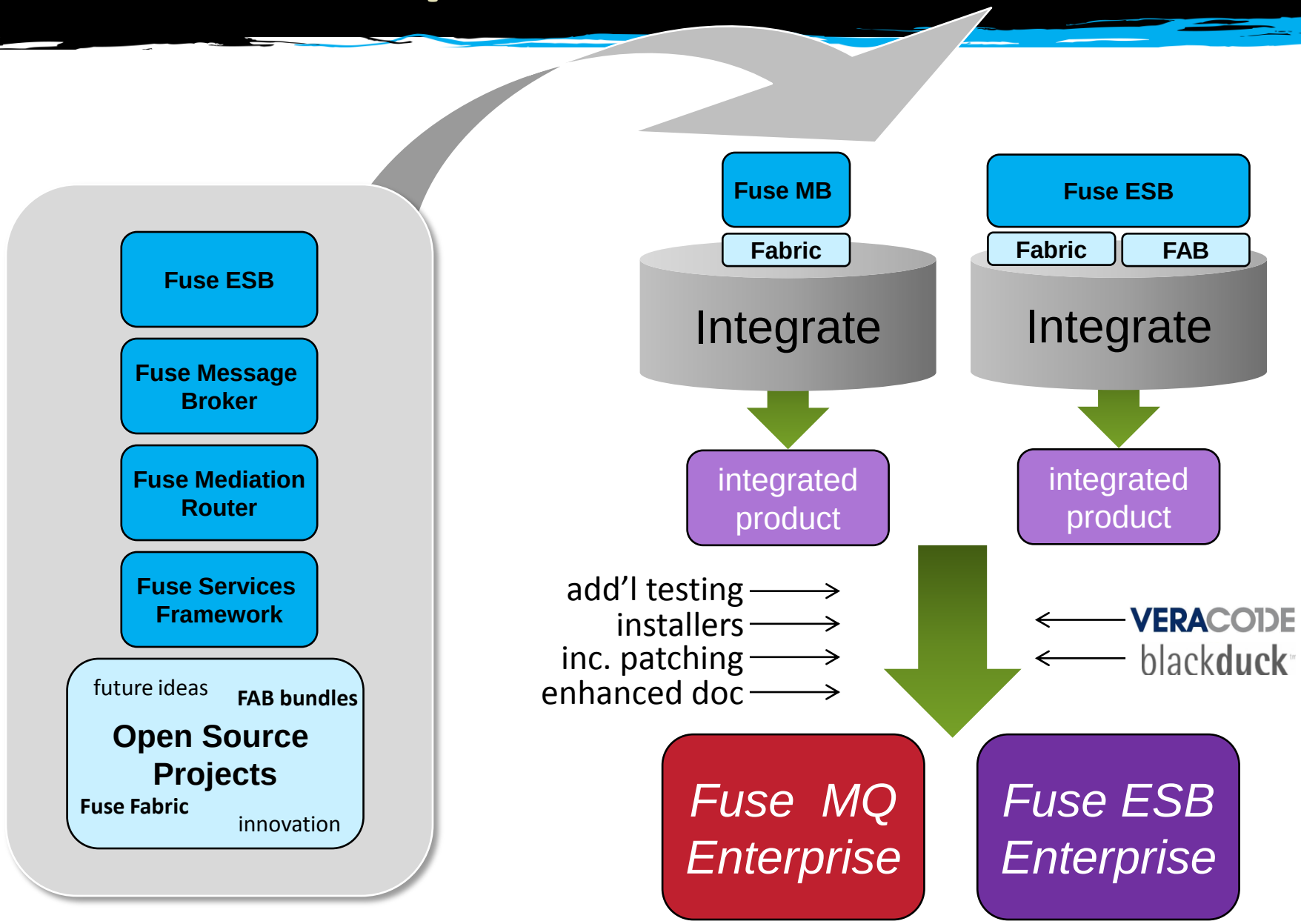
Where Enterprise Products Come From



FuseSource : Open Source Integration and Messaging

Cost-effective, enterprise-class solutions

- Over 25 active Apache committers on staff
- Business-friendly, Apache open source license
- Backed by stable, global software company

Apache Project	Capabilities
ActiveMQ	Reliable messaging for Java / JMS, C++ and .NET
ServiceMix	ESB combining the best of Apache Integration projects
Karaf	OSGI-based integration server
Camel	Enterprise Integration Pattern framework
CXF	SOAP, XML and RESTful web services

FuseSource : Team that Wrote the Code

No one knows the code, or influences the projects at Apache more than FuseSource:

- Co-founders and PMC members of ServiceMix, Karaf, ActiveMQ, Camel, and others…
- Over 25 active committers on 11 Apache projects

Guillaume Nodet

James Strachan

Rob Davis

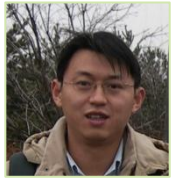
Hiram Chirino

Jon Anstey

Gary Tully

Dejan Bosanac

Gert Vanthienen



Willem Jiang

Claus Ibsen

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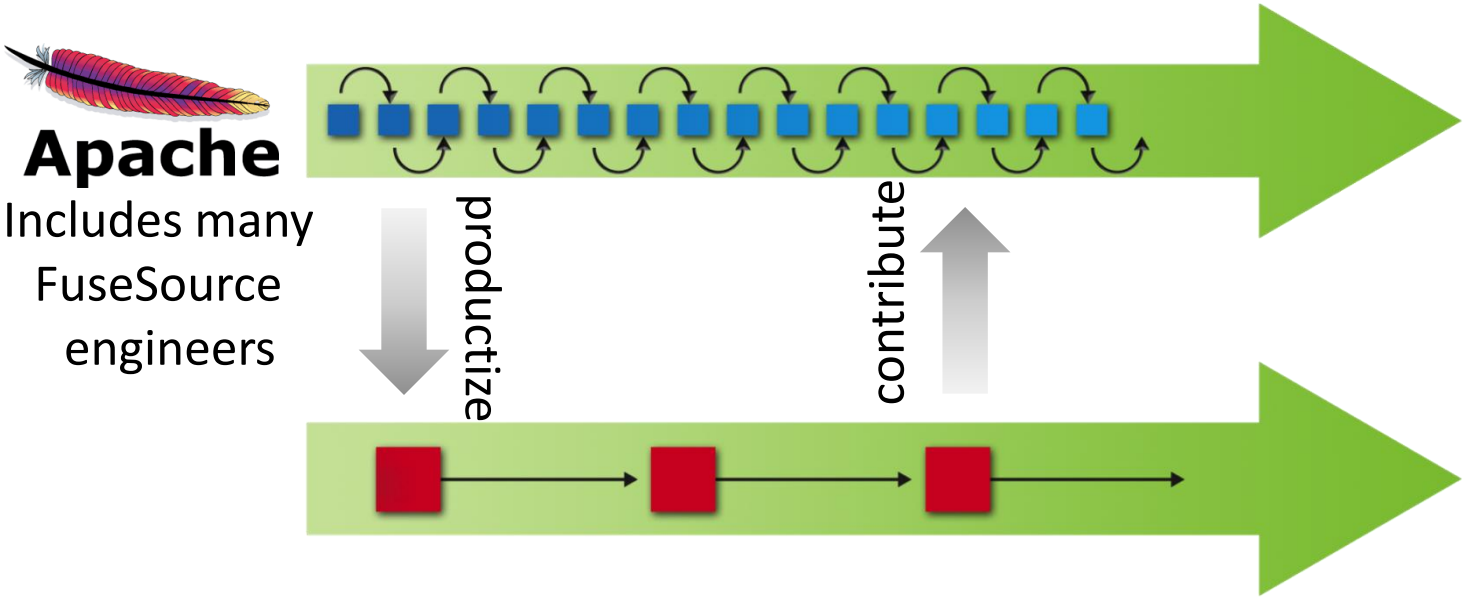
FuseSource : Alignment with Apache

Not just a team of hackers – FuseSource drives the products

- No one knows the internals of the projects better
- FuseSource has access to product road maps
- Customer patches are contributed to Apache
- Customer feedback drives project direction

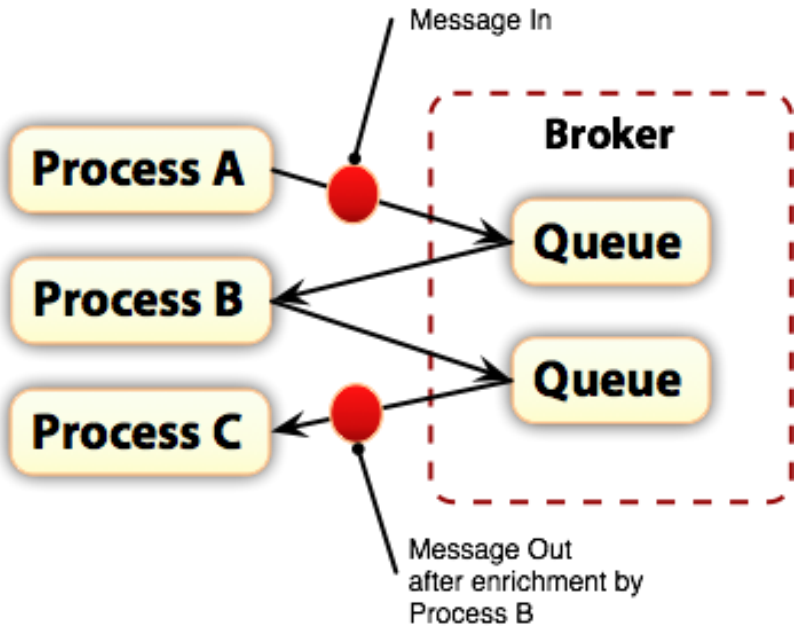


What is Apache ActiveMQ?

- Top level Apache Software Foundation project
- Wildly popular, high performance, reliable message broker
  - Supports JMS 1.1; adding support for AMQP 1.0 and JMS 2.0
  - Clustering and Fault Tolerance
  - Supports publish/subscribe, point to point, message groups, out of band messaging and streaming, distributed transactions, …
- Myriad of connectivity options
  - Native Java, C/C++, and .NET
  - STOMP protocol enables Ruby, JS, Perl, Python, PHP, ActionScript, ...
- Embedded and standalone deployment options
  - Pre-integrated with open source integration and application frameworks
  - Deep integration with Spring Framework and Java EE

Why use Messaging?

- Reliable remote communication between applications
- Asynchronous communication
  - De-couple producer and consumer (loose coupling)
- Platform and language integration
- Fault tolerant - processing can survive Processor outage
- Scalable - multiple consumers of each queue
  - Distributes processing



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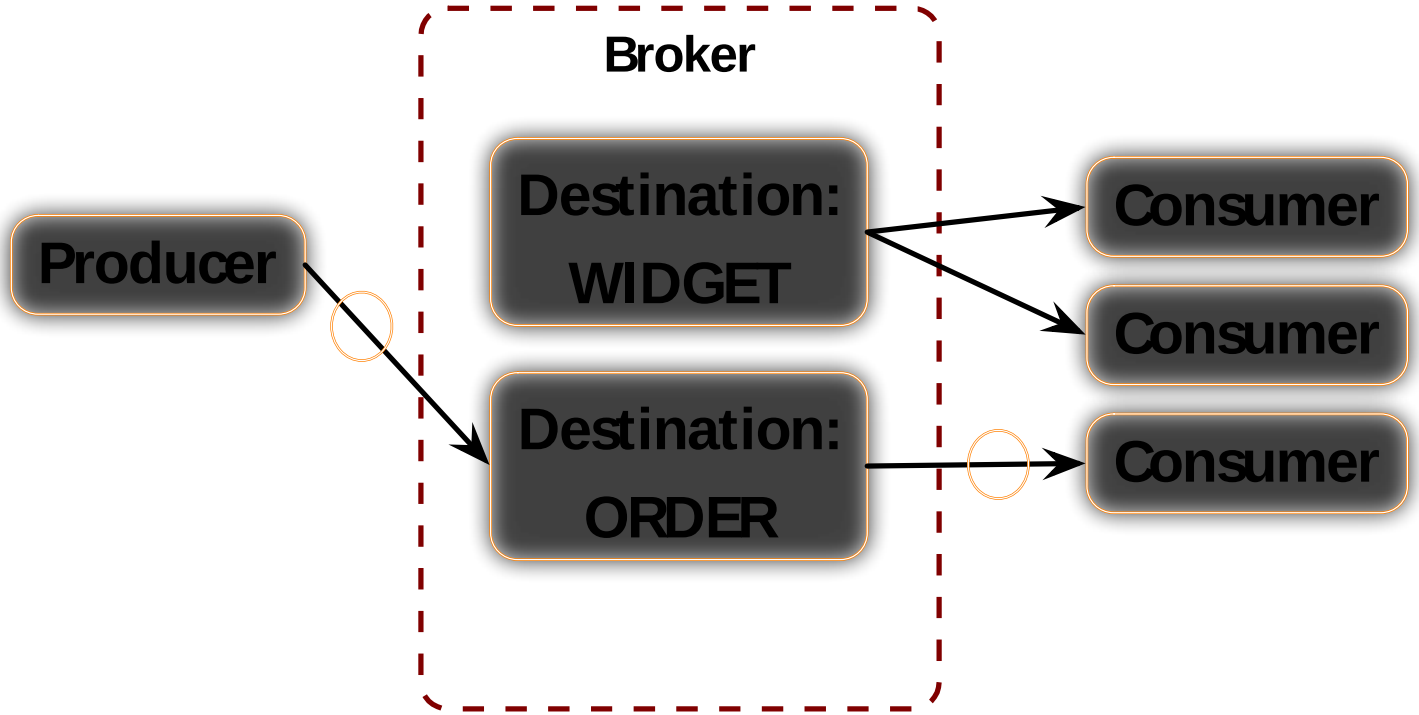
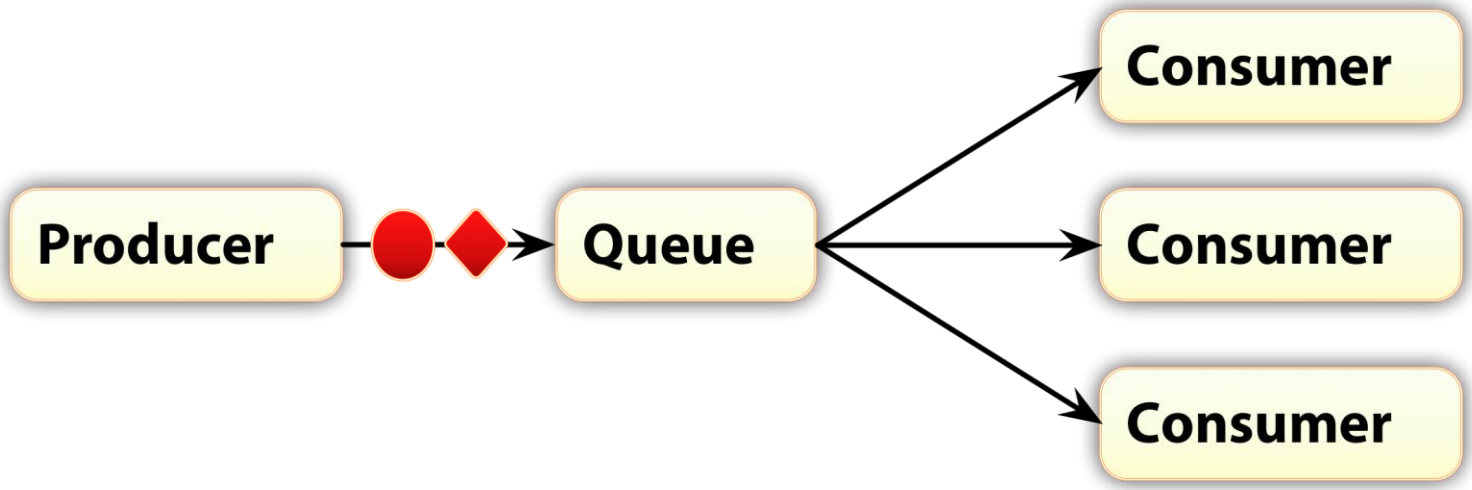
Message Channels and Routing

- Message Channels
  - Named communication between interested parties
  - JMS calls them ‘Destinations’
- Can fine-tune message consumption with selectors
- Can route a message based on content

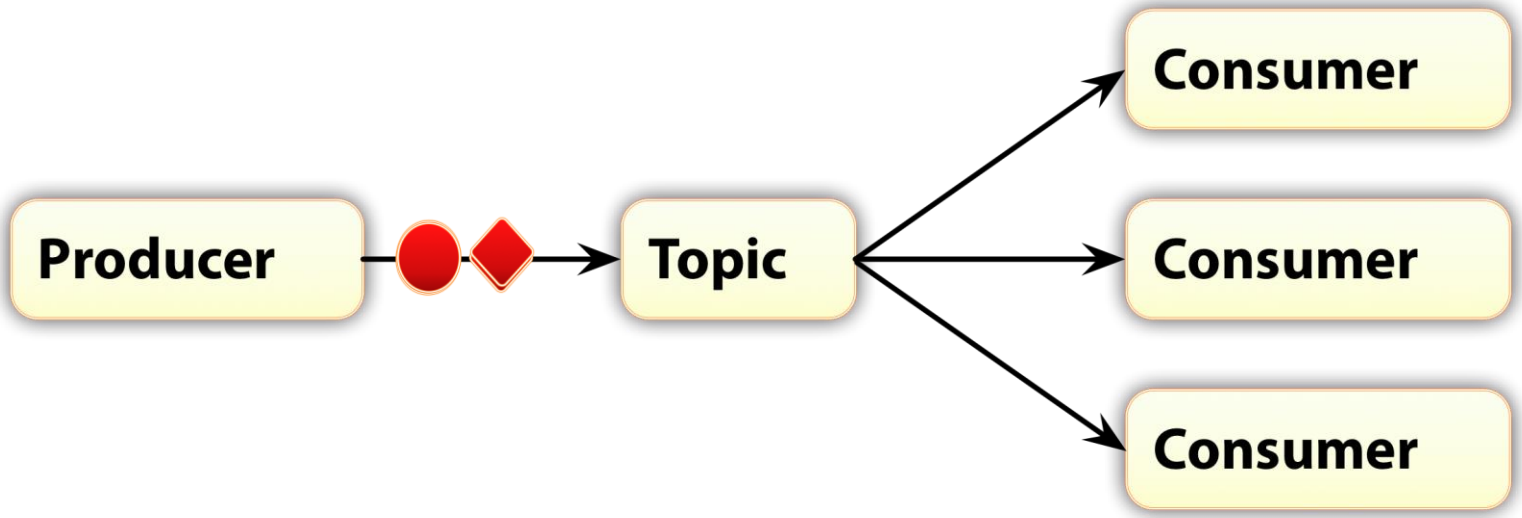
Message Channels = JMS Destinations



Point-to-Point Channel : JMS Queues

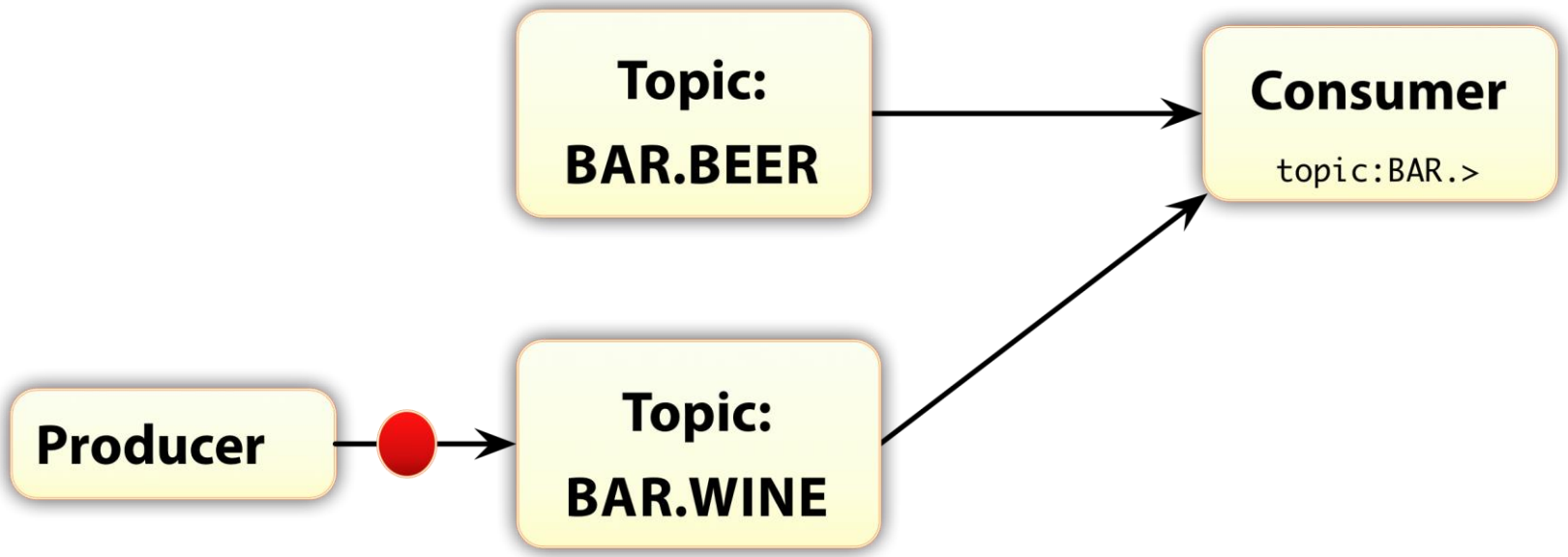


Publish/Subscribe Channel : JMS Topics



Message Routing : Selectors

Message Routing : Destination Wildcards



Managing Client Connections : Transport Connectors

- Configured in broker for client connections

- TCP – most used; socket connections using binary Openwire protocol
- NIO – like TCP, excepts uses Java NIO to reduce number of threads managing all connections
- SSL – secure TCP connection
- STOMP – text based protocol; facilitates multiple language integration
- VM – enables efficient in-process connections for embedded broker

- Examples
  - <transportConnector uri="tcp://0.0.0.0:61616"/>
  - <transportConnector uri="nio://0.0.0.0:61616"/>
  - <transportConnector uri="stomp://0.0.0.0:61617"/>
  - <transportConnector uri="stomp+nio://0.0.0.0:61617"/>

Managing Client Connections : Wrapper Transports

- Augment / wrap client side connections
- Failover – automatic reconnection from connection failures
- Fanout – simultaneously replicate commands and message to multiple brokers
- Example – client connection URI
  - tcp://master:61616
  - failover:(tcp://master:61616,tcp://slave:61616)
  - failover:(tcp://virtualIp:61616)
  - fanout:(static:(tcp://host1:61616,tcp://host2:61616))

Managing Client Connections : Configuring Transports

- tcp://hostname:port?key=value

- Examples
  - tcp://myhost:61616? trace=false&soTimeout=60000
  - failover:(tcp://master:61616?soTimeout=60000,tcp://slave:61616)?randomize=false

- Lot more details at
  - http://fusesource.com/documentation/fuse-message-broker-documentation/
  - http://activemq.apache.org/configuring-transports.html

Managing Persistence : Persistence Adapters

- File system based
  - kahaDB – recommended; improved scalability and quick recovery
  - amqPersistenceAdapter – legacy; fast, but slow recovery
- RDBMS based
  - jdbcPersistenceAdapter – quick and easy to setup
  - journaledJDBC – faster than pure JDBC; file journaling with long term JDBC storage
- Memory based
  - memoryPersistenceAdapter – testing only; same as
    - <broker persistent="false">

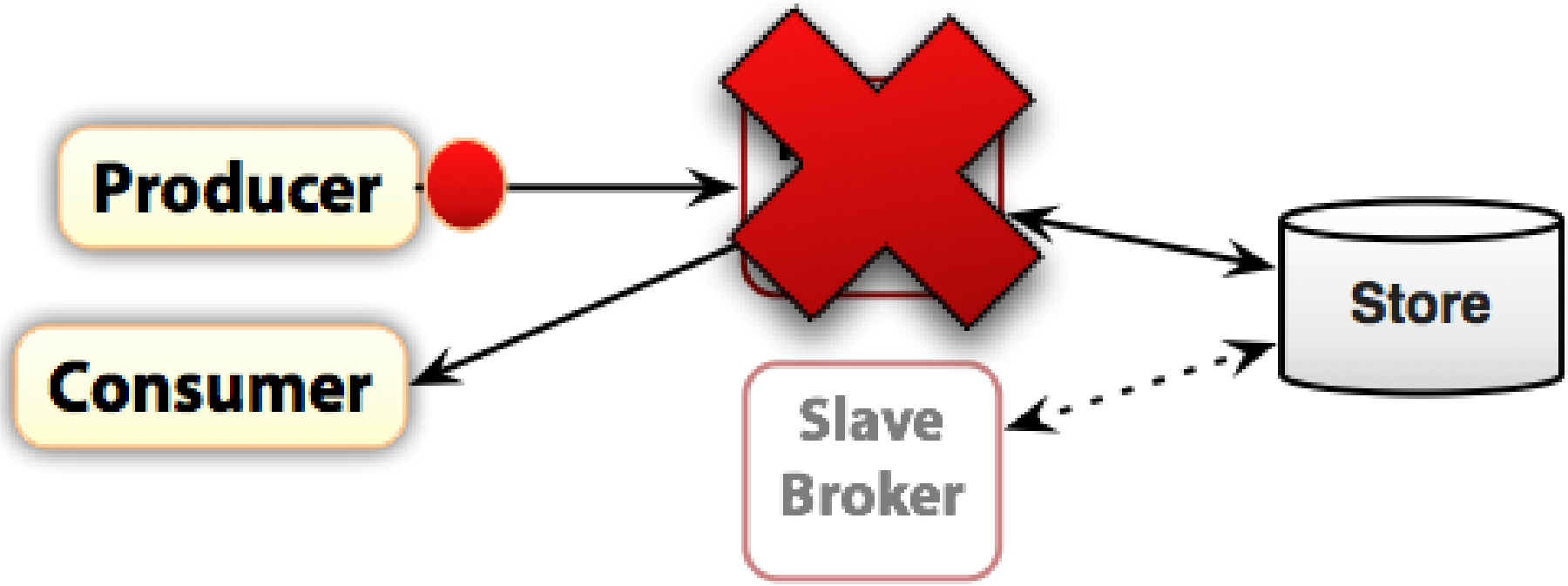
High Availability

- Two complementary approaches:
  - Master/Slave – access to persistent messages after broker failure
  - Network of Brokers – Scale out message processes - next slides…

- Master/Slave Context
  - A given message is in one and only one broker (persistence store)
  - If a broker instance fails, all persistent messages are recoverable upon broker restart
  - Master/Slave allows a 2nd broker instance (slave) to be ready to process persistent messages upon master (1st broker) failure
  - Clients should use Failover transport for automatic connect to slave
    - failover:(tcp://master:61616,tcp://slave:61616)?randomize=false

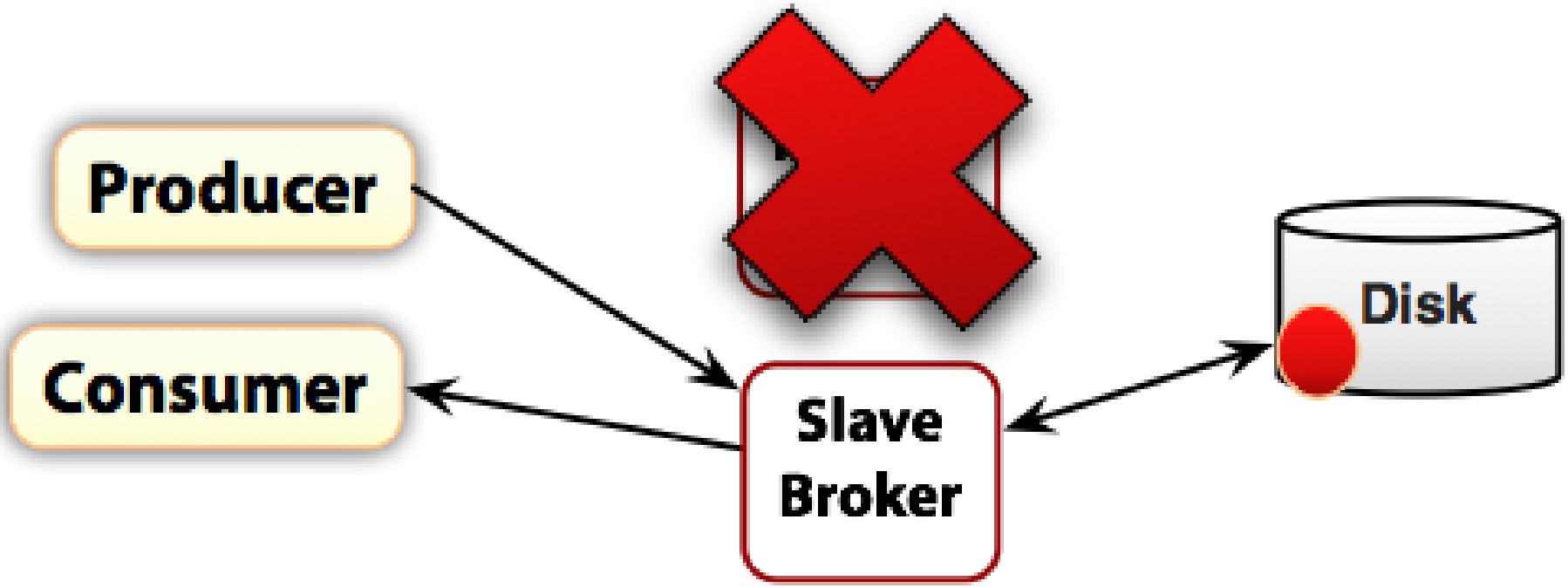
High Availability : Master/Slave

- failover:(tcp://master:61616,tcp://slave:61616)?randomize=false



High Availability : Master/Slave

- failover:(tcp://master:61616,tcp://slave:61616)?randomize=false



Network of Brokers : Geographically Dispersed

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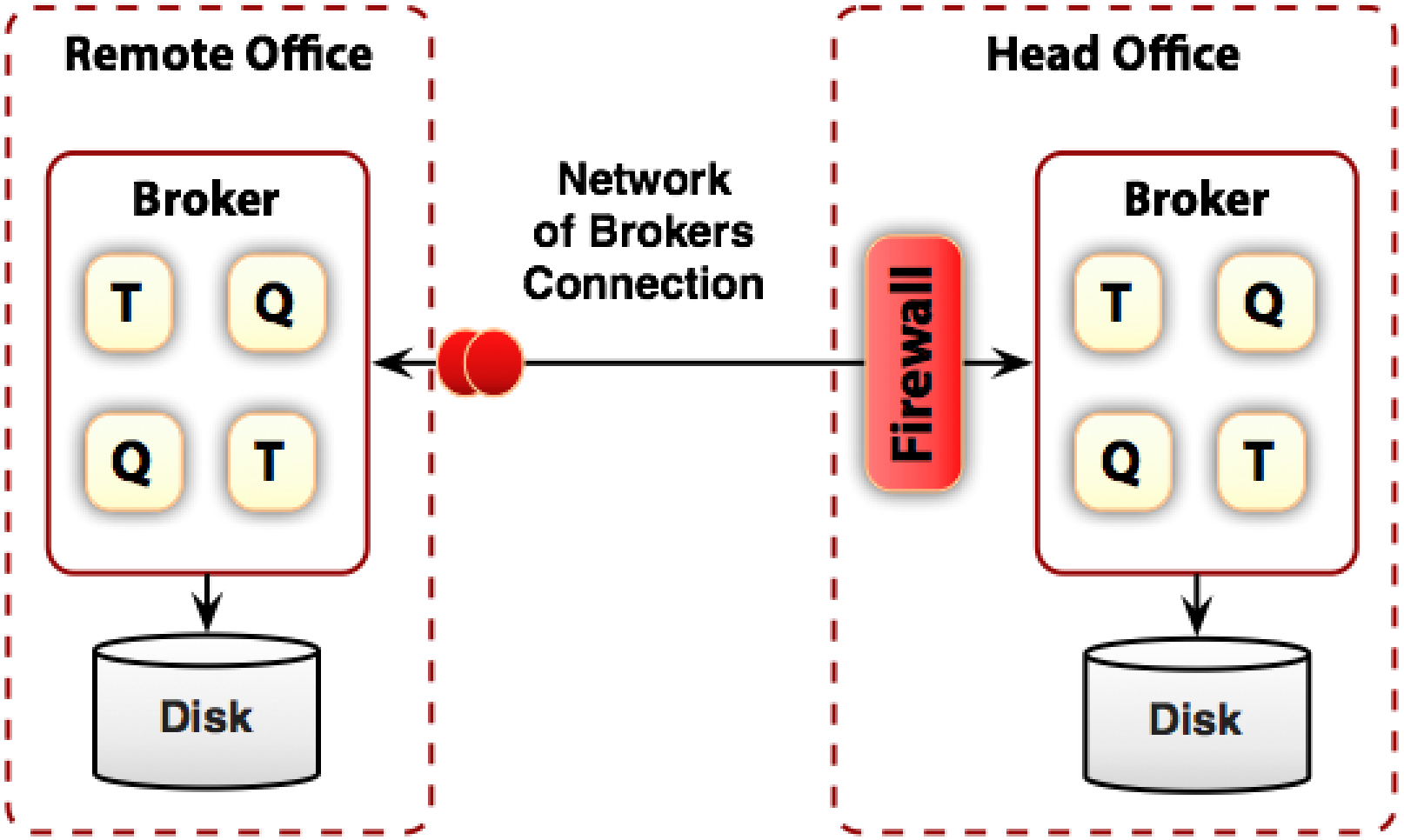
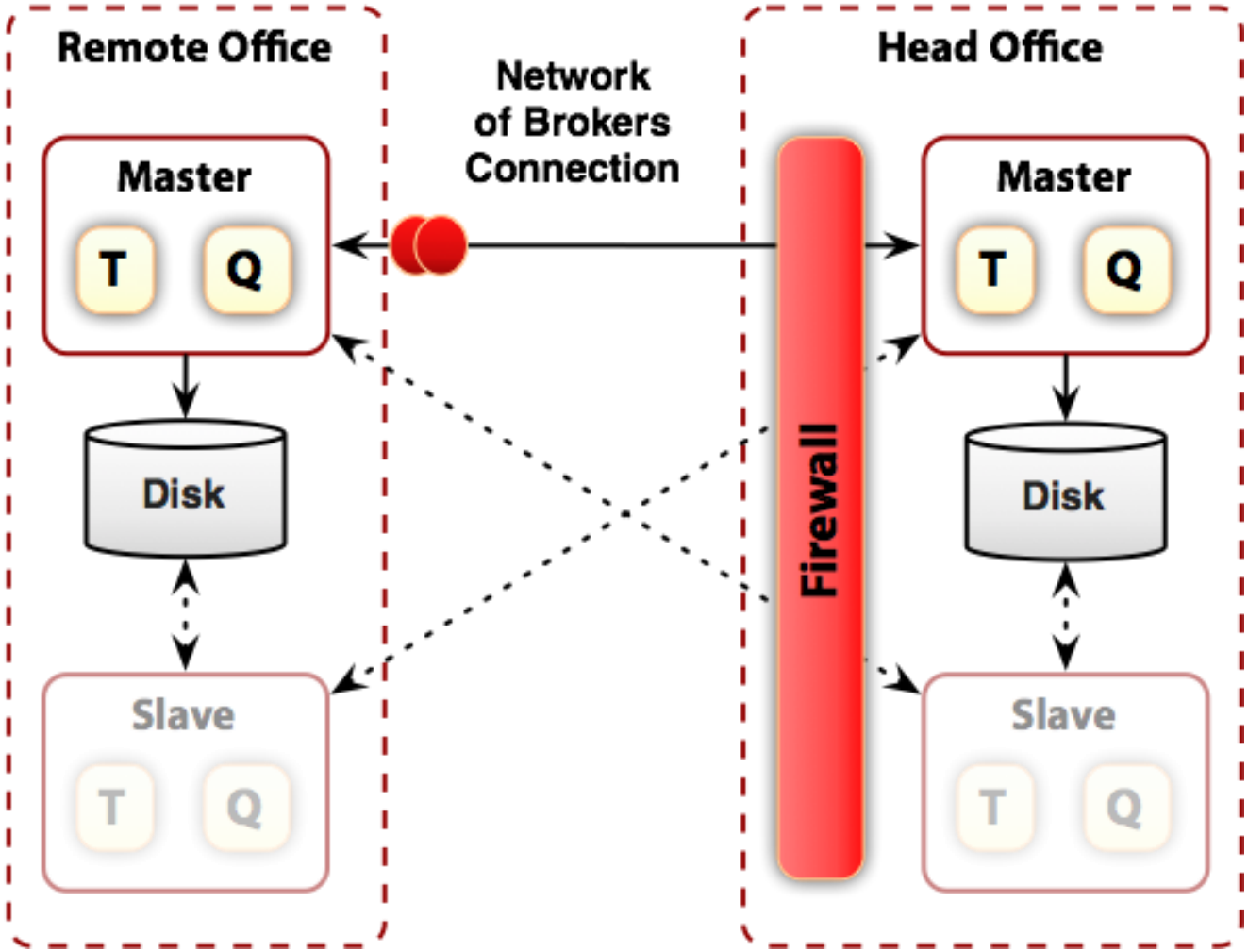


Network of Brokers : Network with Master/Slave



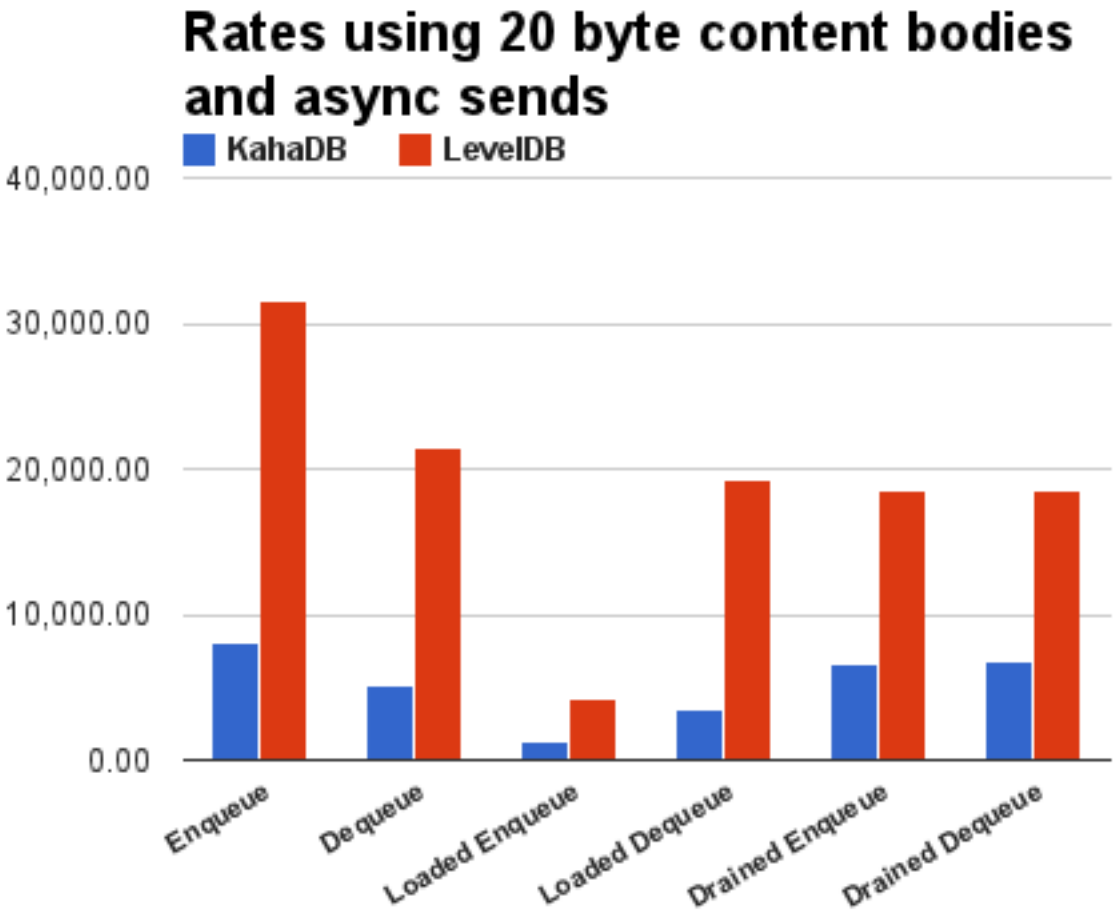
What's New In ActiveMQ 5.6

- LevelDB Store
- MQTT transport
- New LDAP security module
- Stomp Enhancements
- Multi KahaDB persistence
- Priority Failover URIs
- Automatic client rebalance in broker cluster

LevelDB Store vs KahaDB

- Fewer index entries per message than KahaDB
- Faster recovery when a broker restarts
- LevelDB index out-perform Btree index at sequential access .
- LevelDB indexes support concurrent read access.
- Pauseless data log file garbage collection cycles.
- Fewer IOPS to load stored messages.
- It exposes it's status via JMX for monitoring

ActiveMQ 5.6: LevelDB Store



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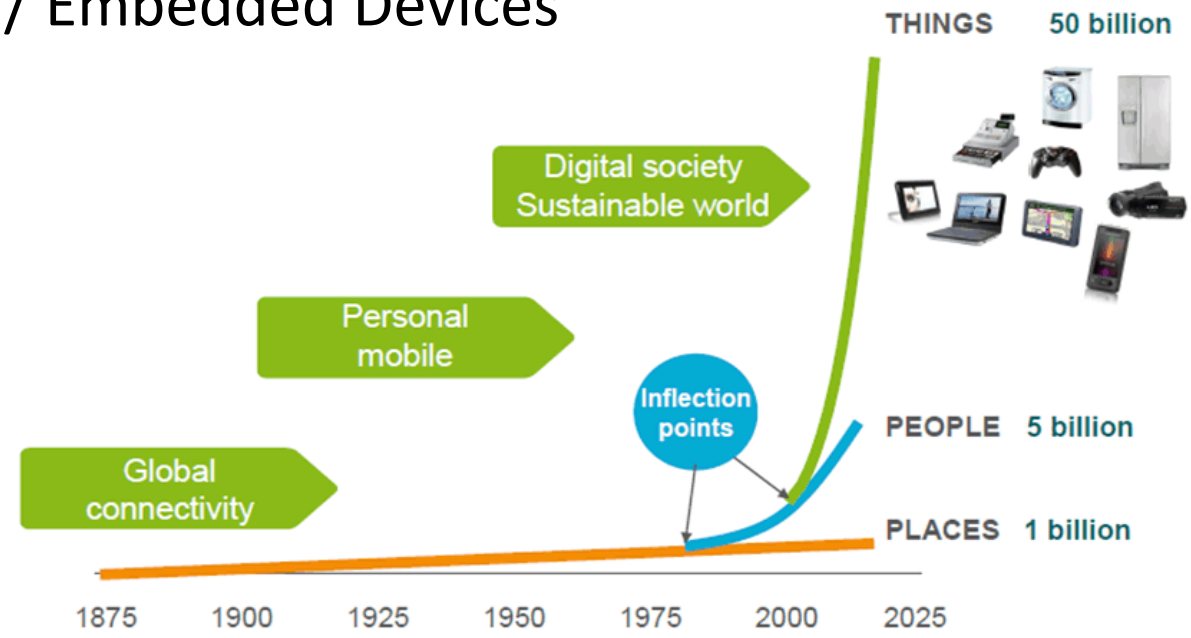
Protocol: MQTT

- Focused on:
  - Pub/Sub
  - Unreliable, low bandwidth networks
  - Small footprint / Embedded Devices
- Interoperates with Apollo, WebsphereMQ, Mosquitto, …



Source: Ericsson AB, "Infrastructure Innovation - Can the Challenge be met?," Sept 2010

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ActiveMQ 5.6 STOMP Enhancements

- STOMP 1.1 Support
  - Protocol Version
  - Heartbeat
  - NACK frames
- Additional STOMP Extensions
  - Queue Browsing
  - Numeric Selectors
  - stomp+nio+ssl://0.0.0.0:61614

DEMO