Connecting IoT Devices and Mobile Applications to your Enterprise with IBM IoT MessageSight & IBM MQ

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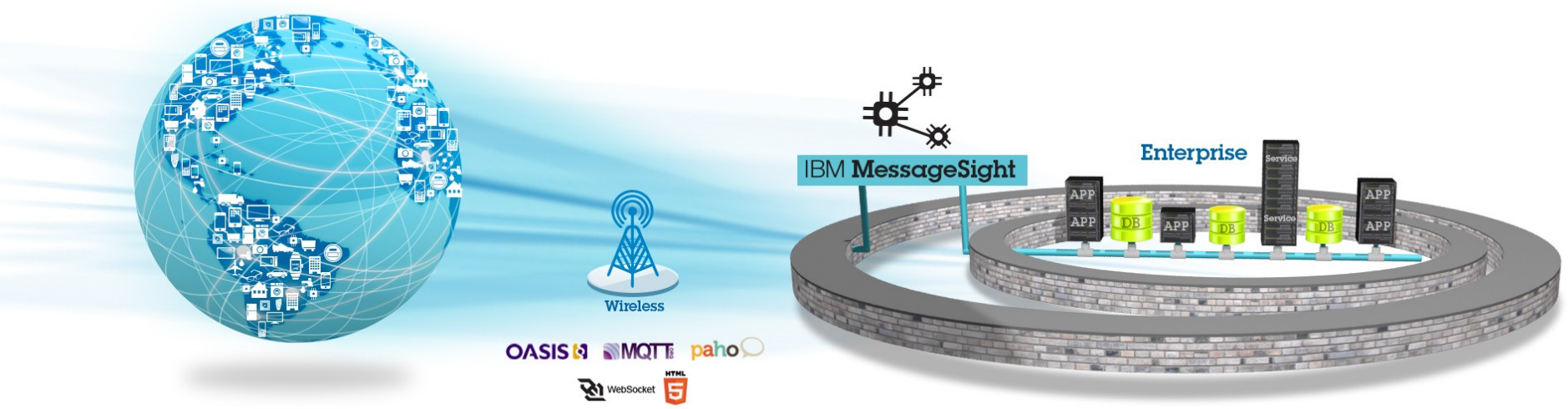
Agenda

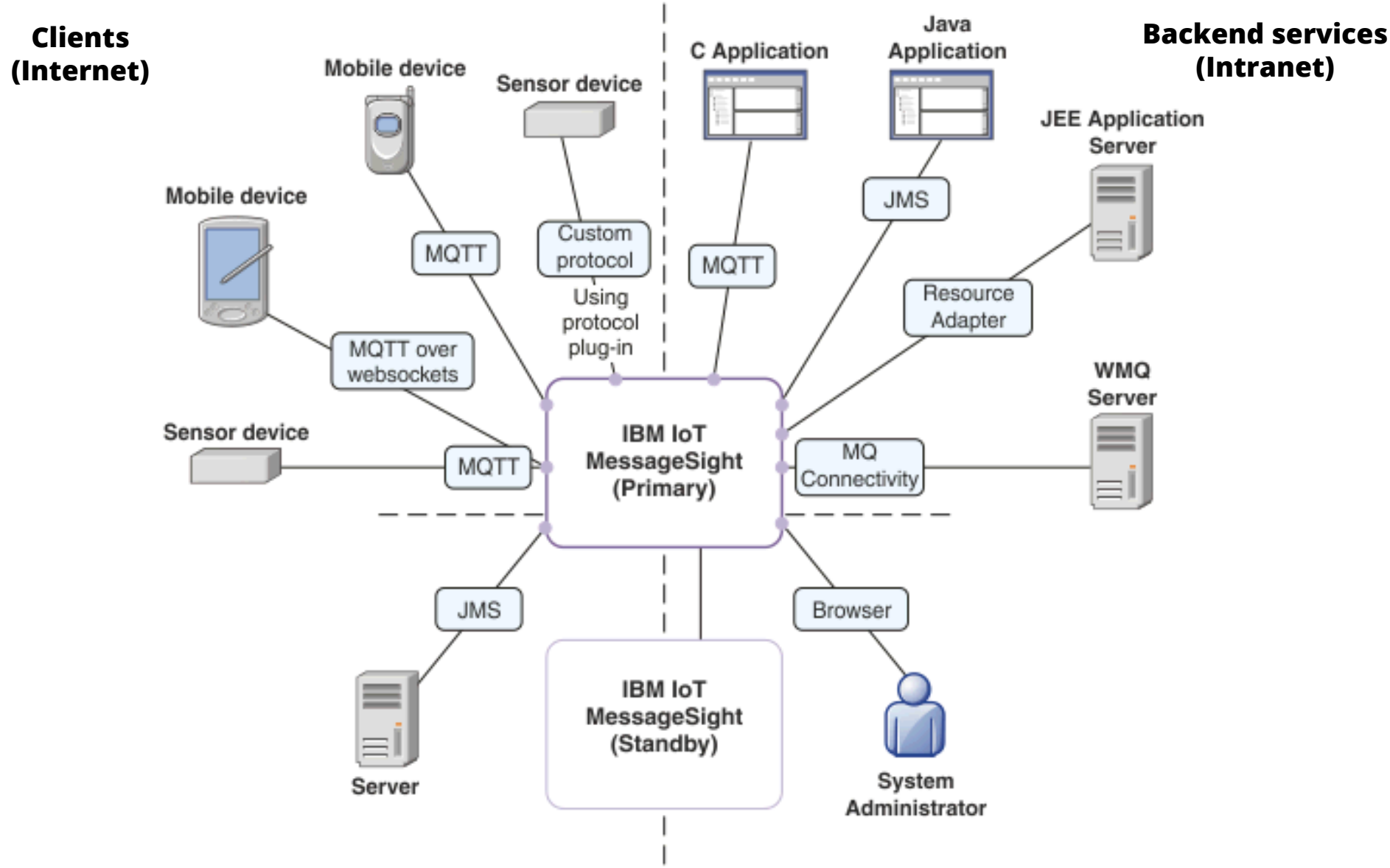
- What is MessageSight?
- Brief MQTT Overview
- Connecting MessageSight to MQ
- A Closer Look at MessageSight's Features
- A couple of MessageSight Usecases
- Q&A

MessageSight – Gateway to the World

MessageSight is designed to make it **simple** to **reliably** and **securely connect** mobile and Internet of Things devices & data

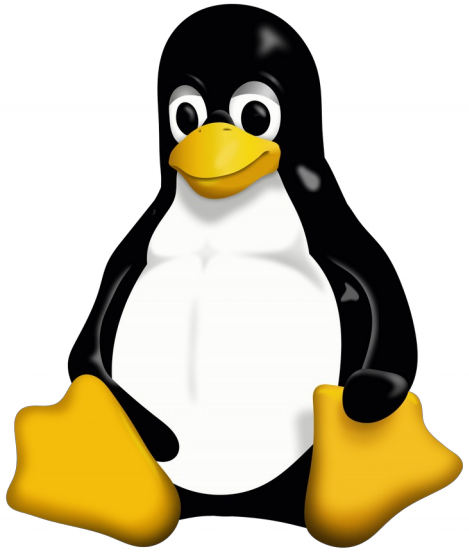


MessageSight Eye-View of the World



Installation Options for Linux

- Standard Linux RPM
  - CentOS V7 or Redhat V7
- Cloud configurations
- Allows other software to be installed
  - Monitoring, security, administration
- Cloud, Virtualized environments
  - Public or private
- Support for Docker
- Developer edition now available on IBM Cloud Private

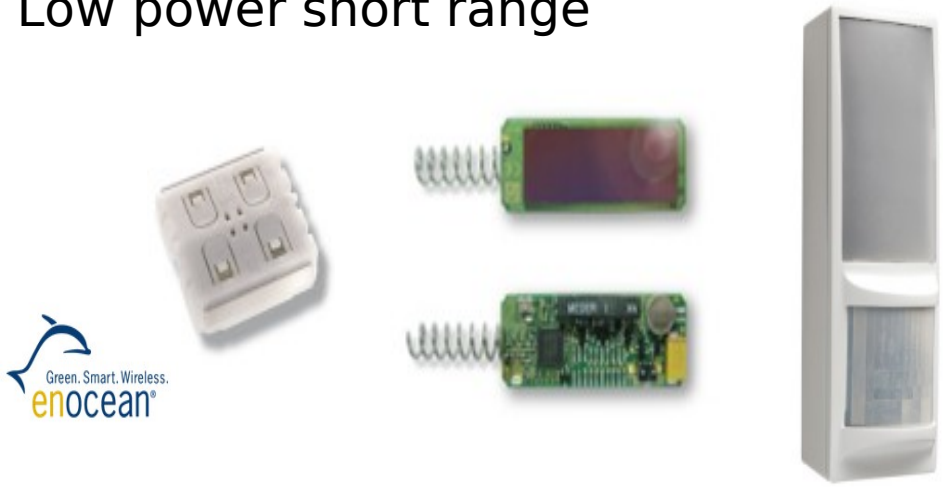


Supported Protocols

- MQTT over TCP/IP
  - Clients
    - C
    - Java
    - Android
    - iOS
- MQTT over WebSockets
- JMS
- Custom Protocols
  - Extensible framework enables customers to write their own protocol plug-ins

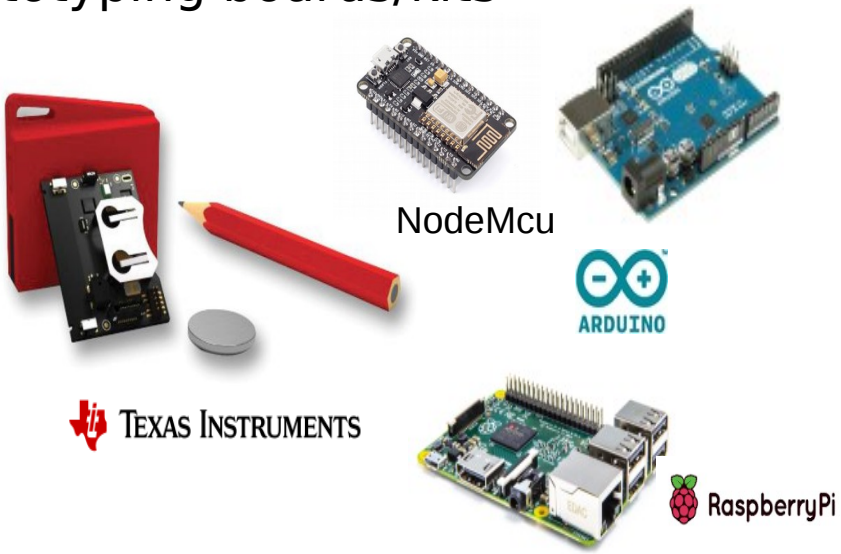
So… Devices?

Low power short range



Energy harvesting sensors

Prototyping boards/kits

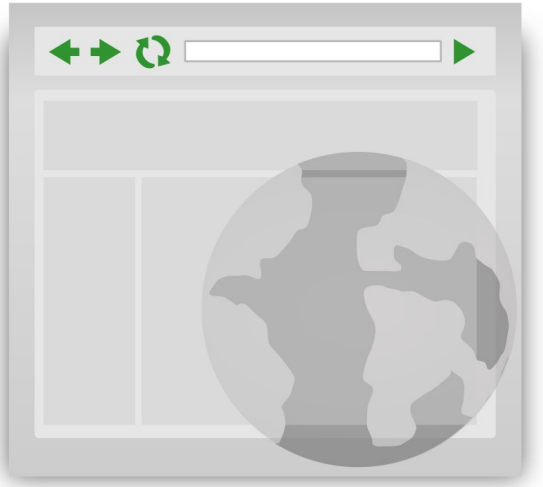


Meshing nodes

Low power wide area

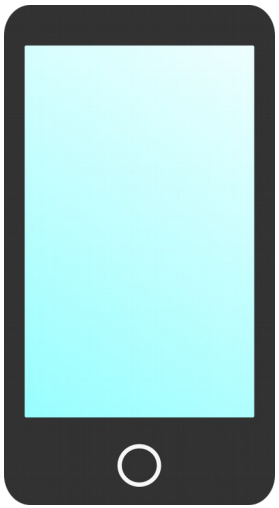
But also….

Web Browsers



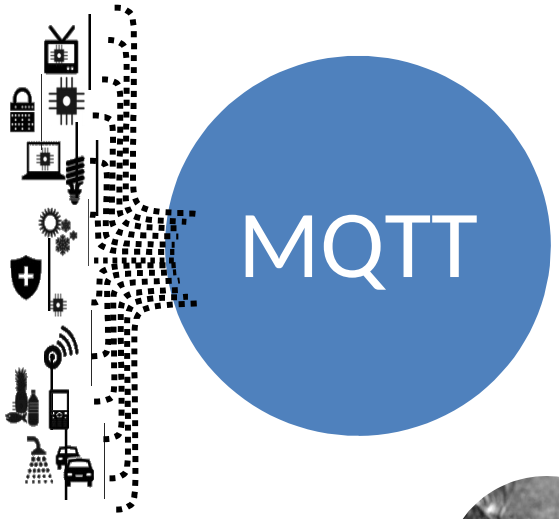
(WebSockets)

Phone



(Often in combination with push notification)

Reliably and quickly deliver data with MQTT



Open

Open royalty free specification
Wide variety of clients and servers
- Hobbyist to enterprise
- Open source to commercial

Lean

Minimized on-the-wire format
- Smallest packet size 2 bytes

Scalable
Low footprint
- Clients: C=30Kb; Java=100Kb

Simple

Minimal pub/sub messaging semantics
- Asynchronous (“push”) delivery
- Simple set of verbs -- connect, publish, subscribe and disconnect

Reliable

Three qualities of service
- 0 – at most once delivery
- 1 – assured delivery dups ok
- 2 – once and once only delivery

Copes with loss of contact between client and server.
- “Last will and testament” to publish a message if the client goes offline.

MQTT 3.1.1 current ISO Standard

MQTT v5

The OASIS MQTT Technical Committee has developed a new version of the MQTT standard, to be called v5:

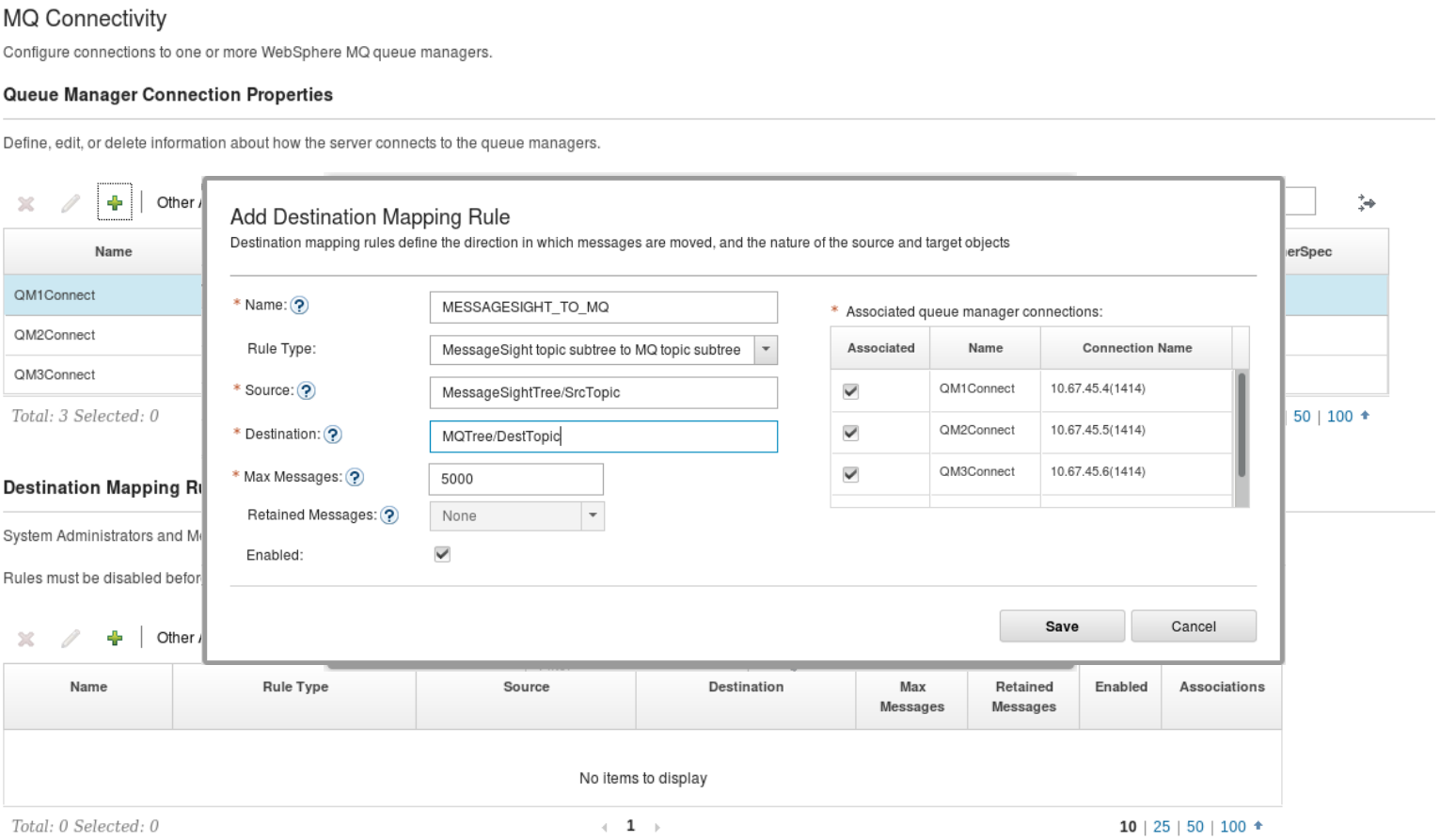
– The number jumps from v3.1.1 straight to v5, without having a v4. This is to align the spec version number with the version in the Connect packet

The committee has completed its technical work – the final Committee Specification is now available at

http://docs.oasis-open.org/mqtt/mqtt/v5.0/cs02/mqtt-v5.0-cs02.html

The new specification addresses a number of points that users have raised with MQTT 3.1.1, as well as adding new features

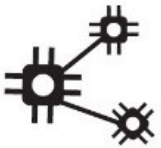
Connecting MessageSight to MQ



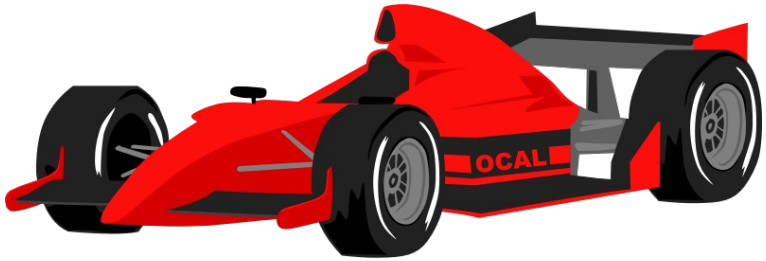
More on MQ<->MessageSight

- Each connection is a standard MQ Client connection under the covers
- Can have multiple connections to different (or the same) queue manager
- Uses 2-phase transactions for transport of reliable messages

MessageSight is easy, scalable and secure

Designed for Things	• Optimized gateway for Things and Mobile devices • Efficient open protocol • Event-driven awareness • Open and industry agnostic • Fine-grained security policies	***Developer Friendly***	• Active dev community • Free developer edition • Simple yet powerful APIs • Simple messaging paradigm • 40+ MQTT client libraries	***Easy to Deploy***	• Up and running < 30 minutes • Task oriented UI guides administrator through first steps • Simple and scalable management through policies
 IBM MessageSight		***Easy to Integrate***	• JMS • WebSockets • MQ • Integration Bus • Worklight • InfoSphere Streams… • Supports Oasis standard MQTT 3.11	***Internet Scale***	• Large numbers of concurrent connections • High throughput • Highly available • Horizontally scalable

MessageSight Performance



128 byte messages on server with:
Dual Xeons 10-core, 256GB RAM, SSDs, multiple 10GbE NICs

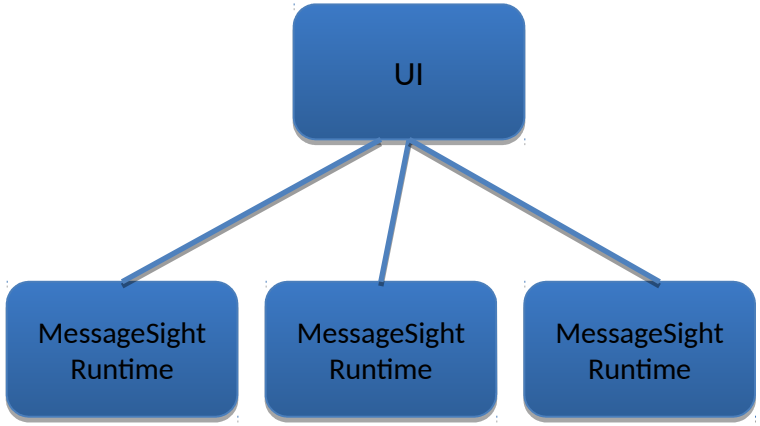
QoS	#Pubs	#Subs	Max Rate
0	Many	~100	~500K/sec
1	Many	~100	~200K/sec
2	Many	~100	~200K/sec

Connection Rate: 10K conn/sec non-TLS, 1-4K conn/sec TLS

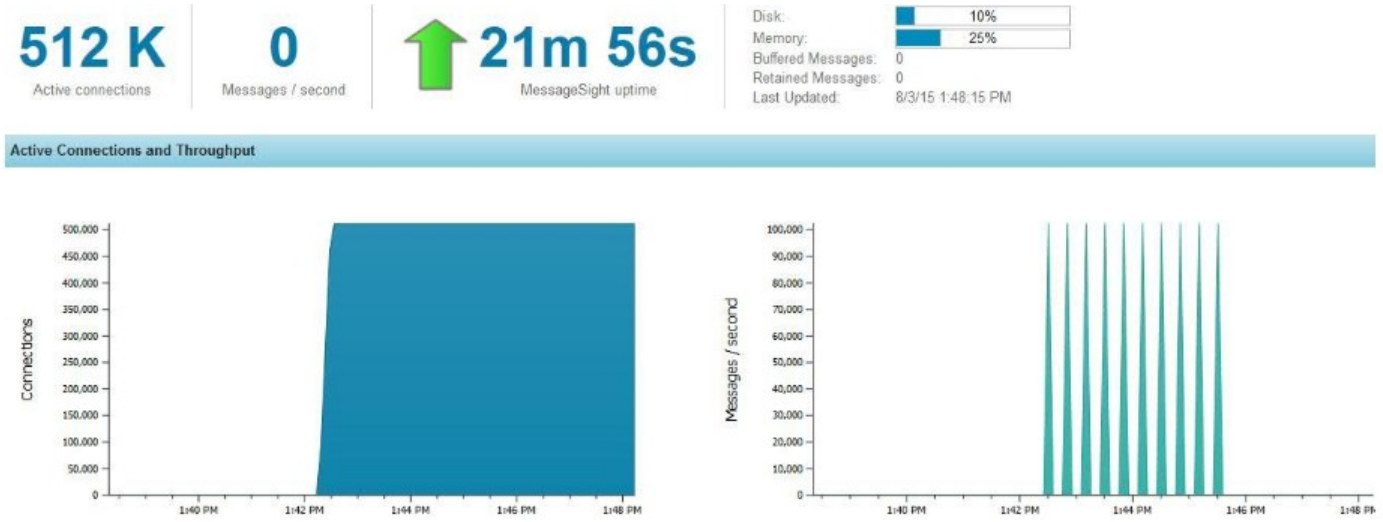
4K concurrent/conn per GB up to 1M concurrent connections

Single WebUI for multiple MessageSights

- **WebUI administers multiple MessageSight Instances**
- **Separate Install (RPM/Docker)**
- **Same or different server**
- **WebUI uses port 9087**
  - **Runtime instances use port 9089 for REST Commands**

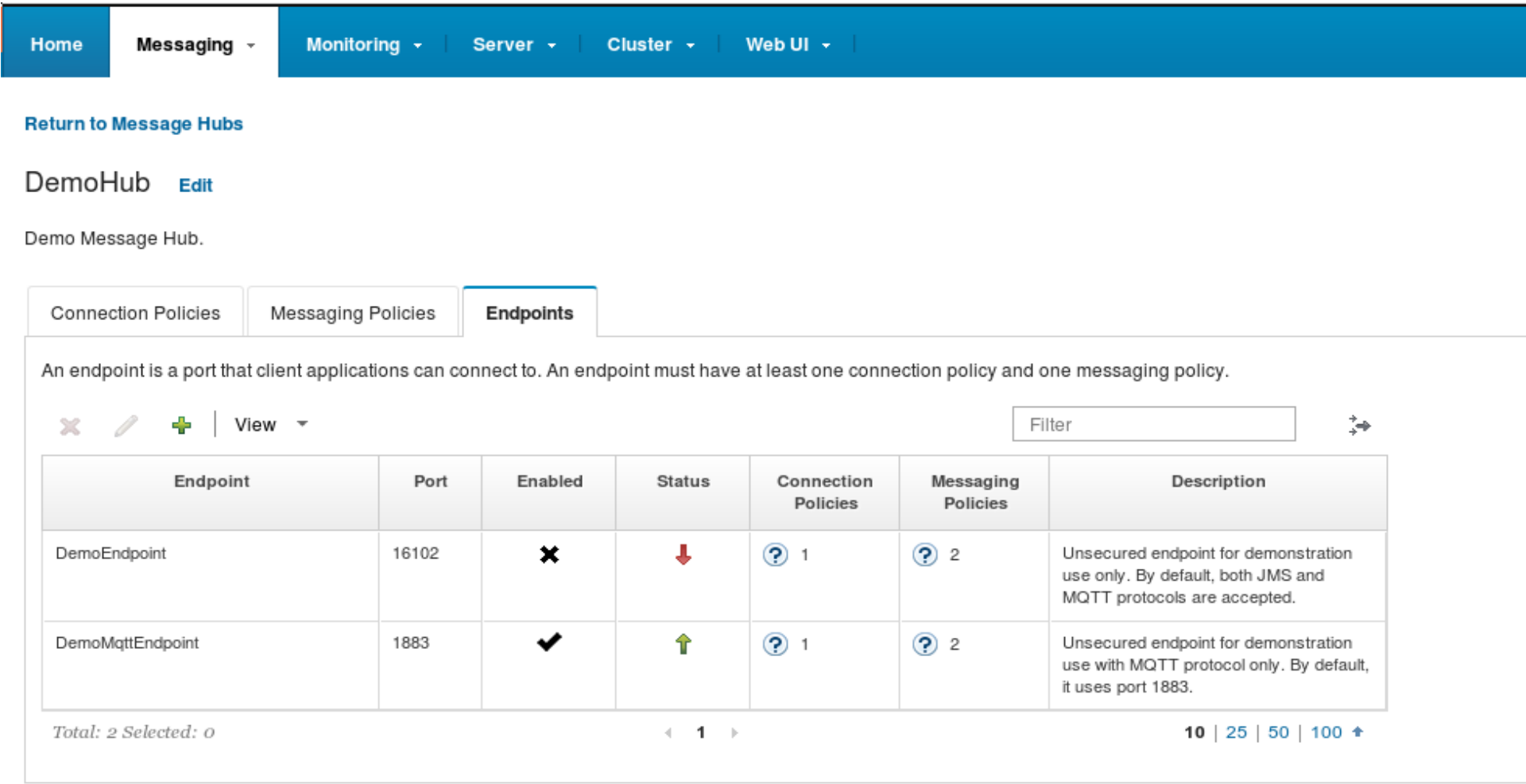


Status Overview

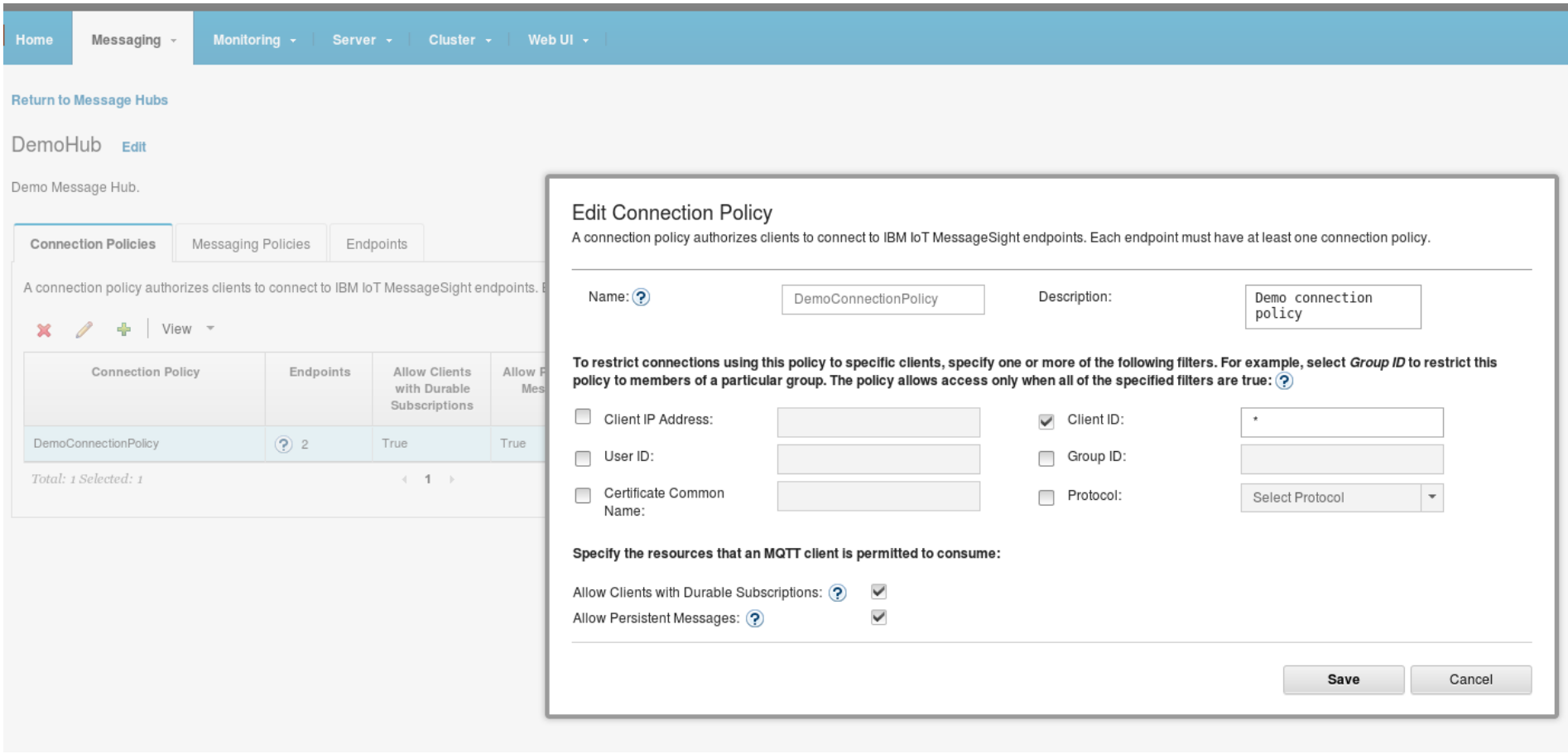


Web UI and REST Interfaces

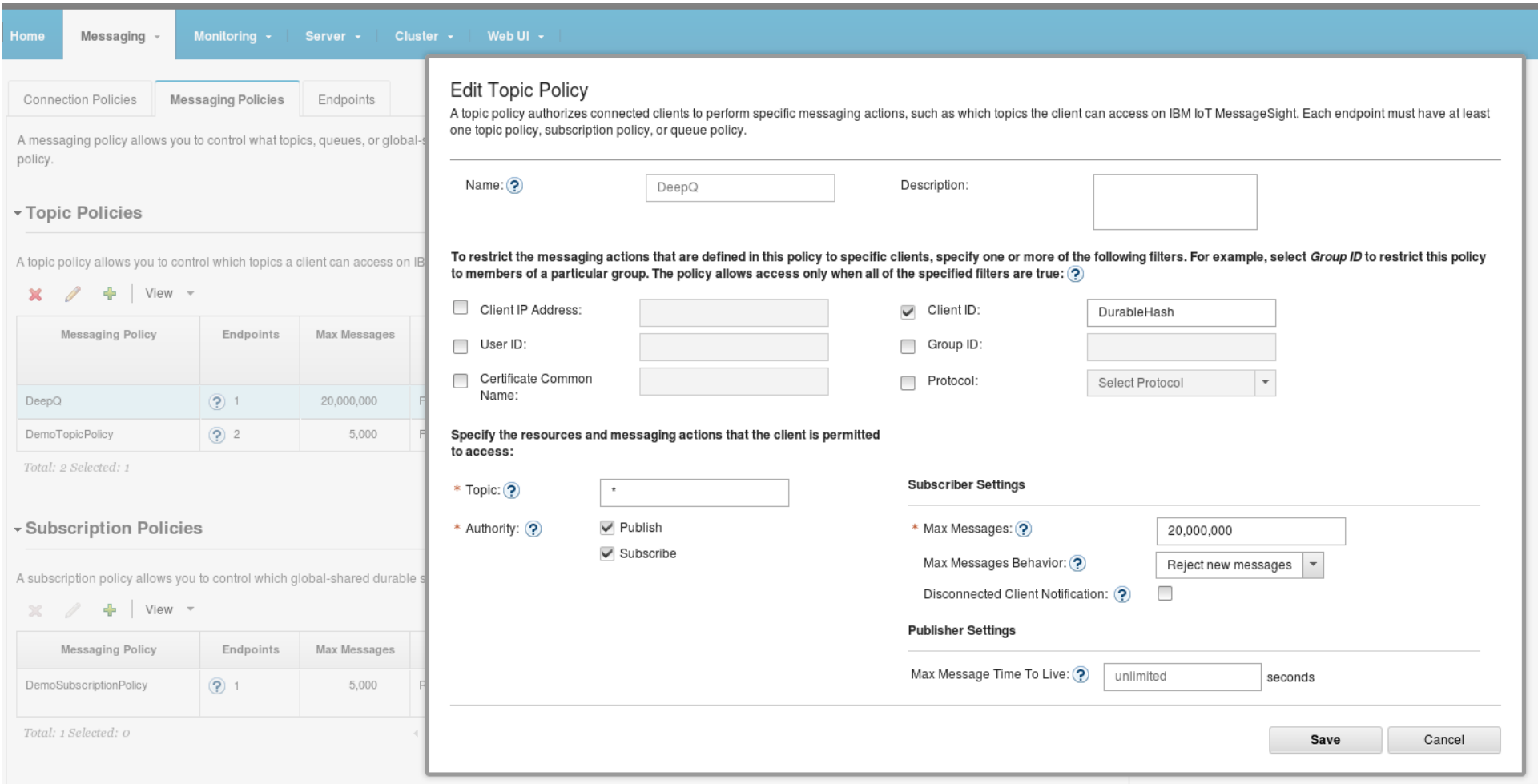
Endpoints and Policies



Who can connect?



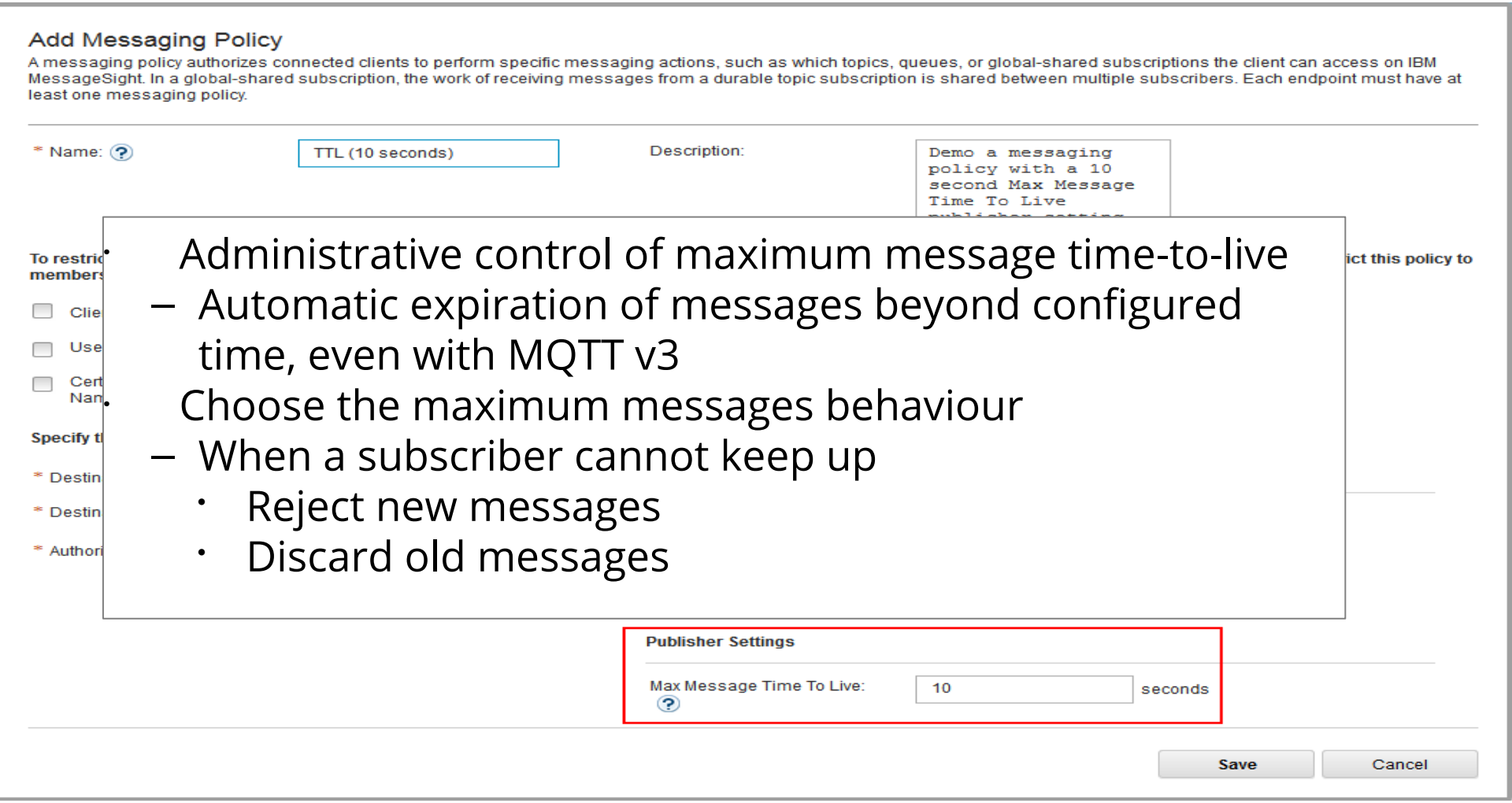
Configuring Topic Policies



Flexible Policies

Policies can have variables substitution, a small number of policies can apply to many users and topics

Expiry and Discard



- Administrative control of maximum message time-to-live
  - Automatic expiration of messages beyond configured time, even with MQTT v3
- Choose the maximum messages behaviour
  - When a subscriber cannot keep up
    - Reject new messages
    - Discard old messages

Monitoring Subscriptions

Subscription Monitor

Monitor subscriptions using various subscription statistics. Delete durable subscriptions. Up to 100 subscriptions can be viewed.

Topic String: *

Client ID: *

Messaging Policy *

* Subscription Name: *

Subscription Type: All

Query: Subscriptions with Most Messages Published

Refresh

Last Updated: **8/11/16 1:54:08 PM**

Actions View Filter

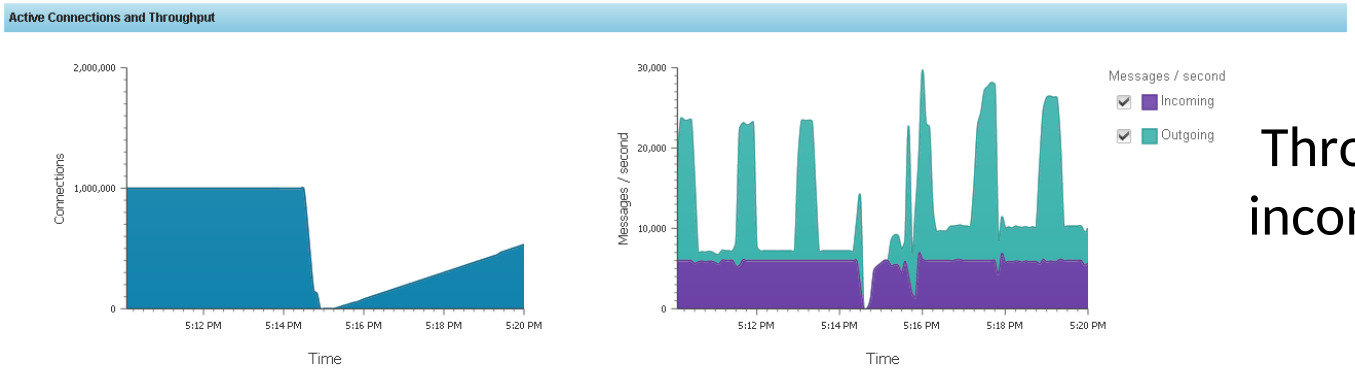
Topic String	Subscription Properties					Total Messages			Buffered Messages				
	Name	Client ID	Type	Consumers	Messaging Policy	Published	Rejected	Expired / Discarded	Maximum	Current	Current % of Maximum	Peak	Peak % of Maximum
#	#	DurableHash	Durable	0	DeepQ	772,846	0	0	20,000,000	772,836	3.9	772,836	3.9
topic1	topic1	dursubber0	Durable	0	DemoTopicPolicy	0	0	0	5,000	0	0.0	0	0.0
topic1	topic1	dursubber2	Durable	0	DemoTopicPolicy	0	0	0	5,000	38	0.8	38	0.8
topic1	topic1	dursubber1	Durable	0	DemoTopicPolicy	0	0	0	5,000	38	0.8	38	0.8

Total: 4 Selected: 0

1

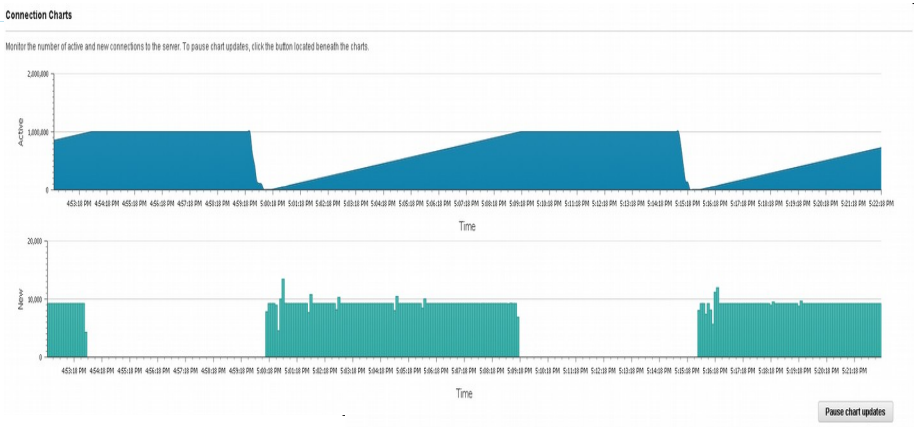
10 | 25 | 50 | 100

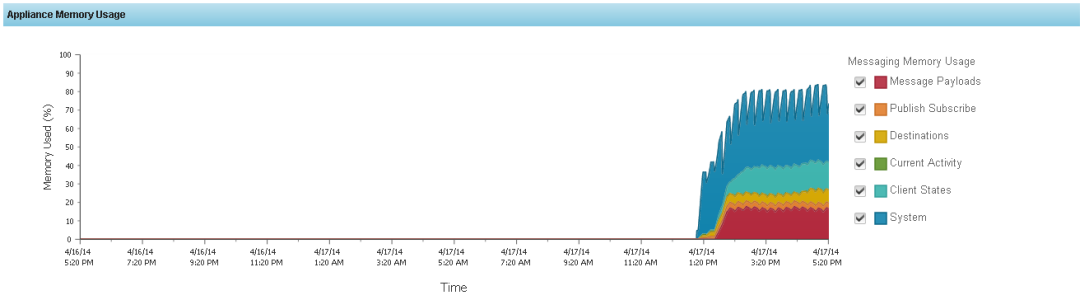
Lots of other graphs



Throughput charts with incoming/outgoing rates

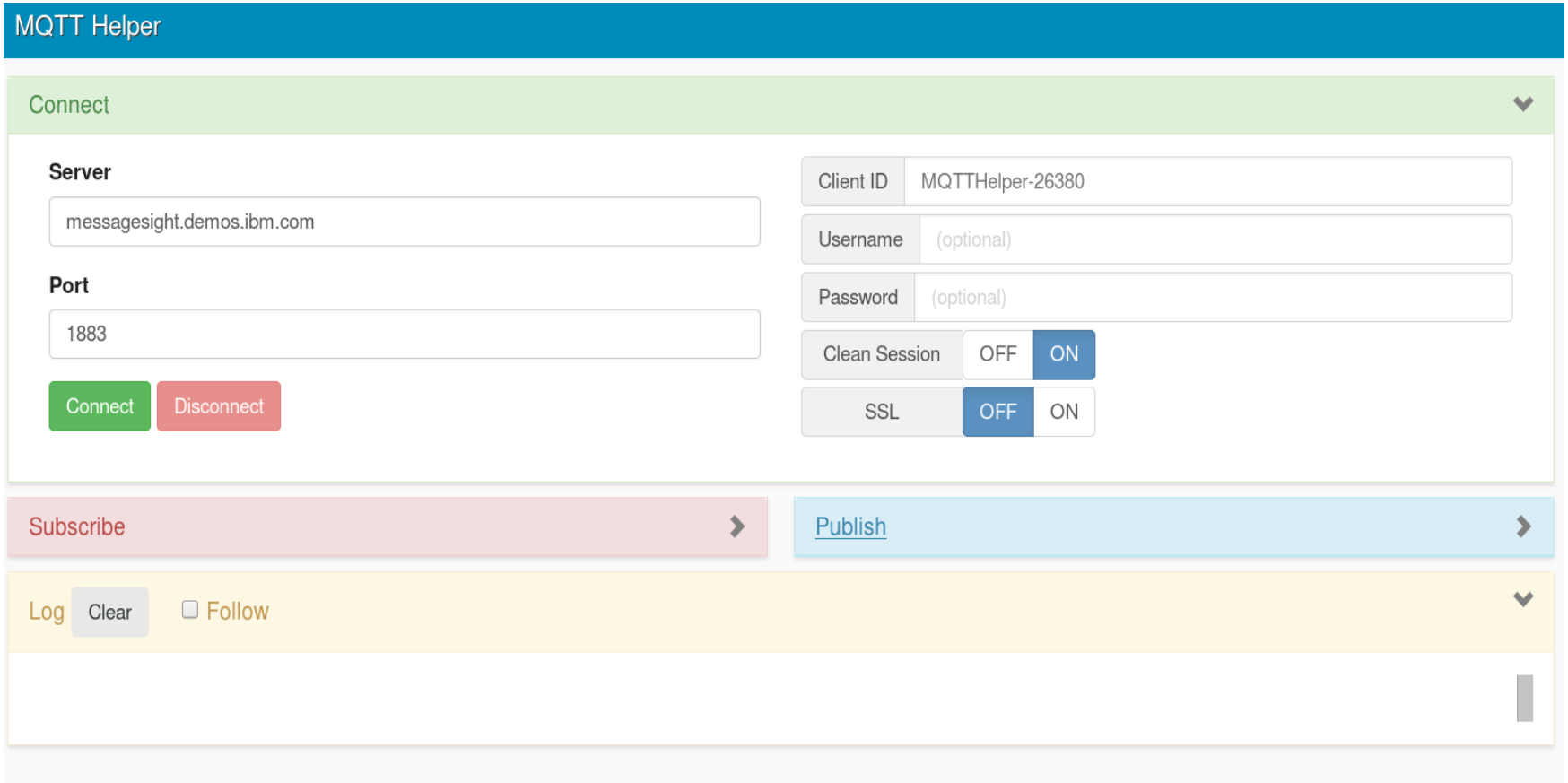
Connection charts





Detailed resource usage charts

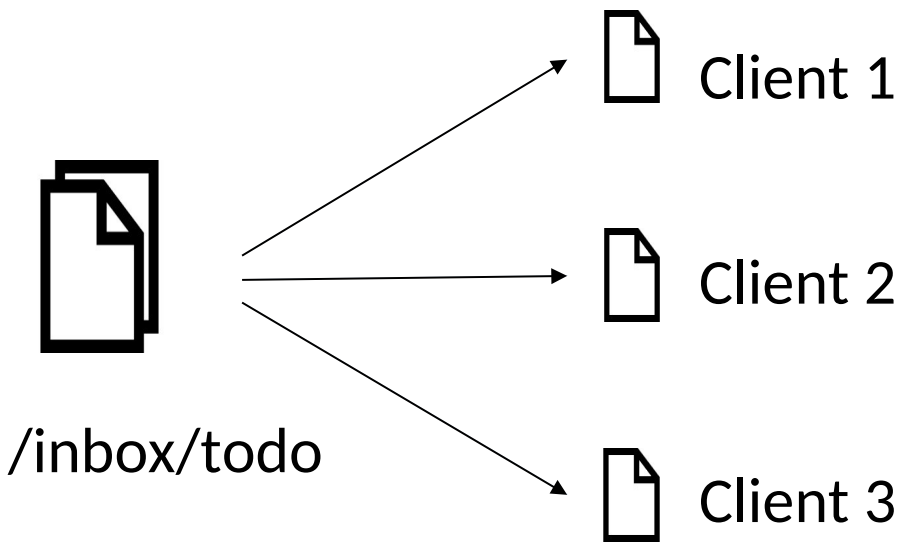
Interactive MQTT Client



http://mqtt-helper.mybluemix.net/

Shared Subscriptions

- Sharing messages on a subscription amongst multiple clients
- From MQTT, subscribe from **standard client** by modifying topic filter: $SharedSubscription/<subname>/<topicfilter>



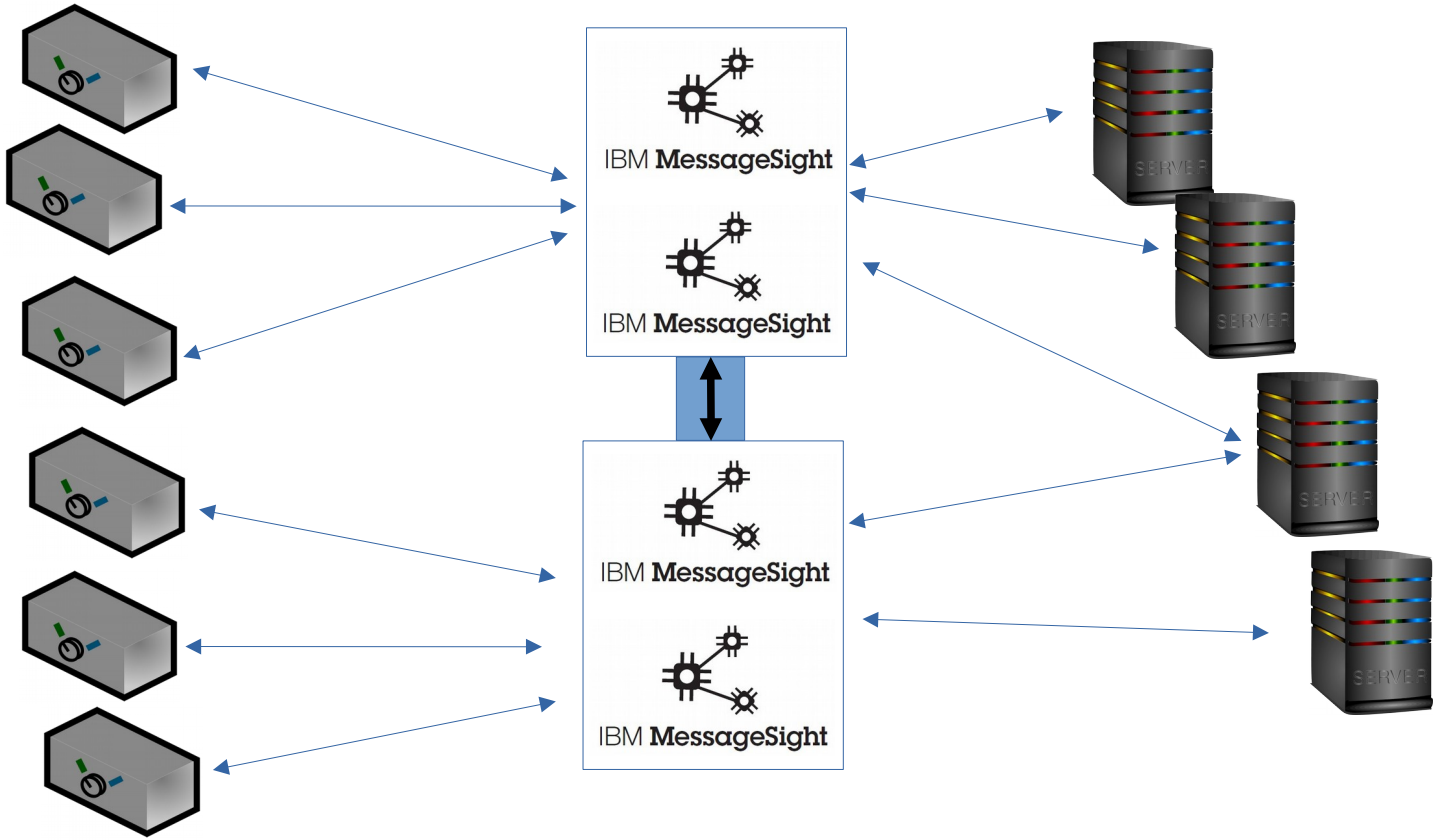
Highly Available Pairs

- An HA Pair is consists of a actively running system (“Primary”) and another MessageSight ready to take over (“secondary”).
- Communication between Primary & Secondary takes place over two separate Network Interfaces (discovery & replication) to minimise chances of “Split Brain”
- Messages (QoS > 0) are recorded at both systems before ack is sent to client.
- No Shared Storage

Clusters

Clusters add a link that messages can flow over between MessageSights.

“Device-like” subscriptions made on one MessageSight are advertised around the cluster and other nodes in the cluster forward publications to a MessageSight if it has matching subscriptions....

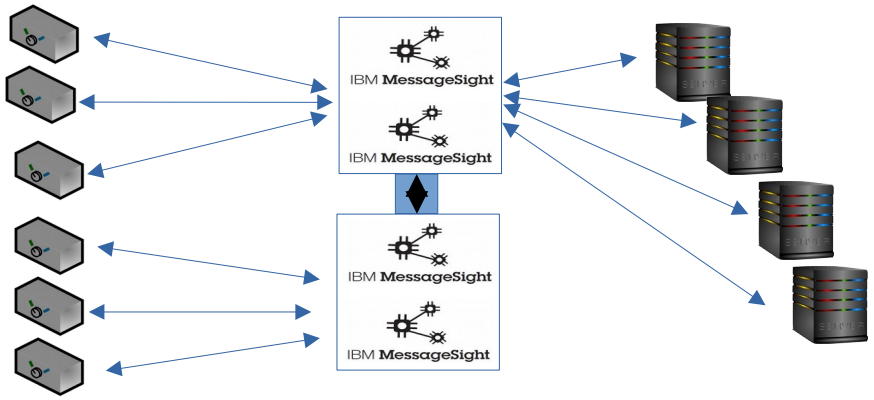


A Few Clustering Key Points

Durable clients still need a home - and to be able to find it
Buffered messages and which messages are inflight are not broadcast around the cluster

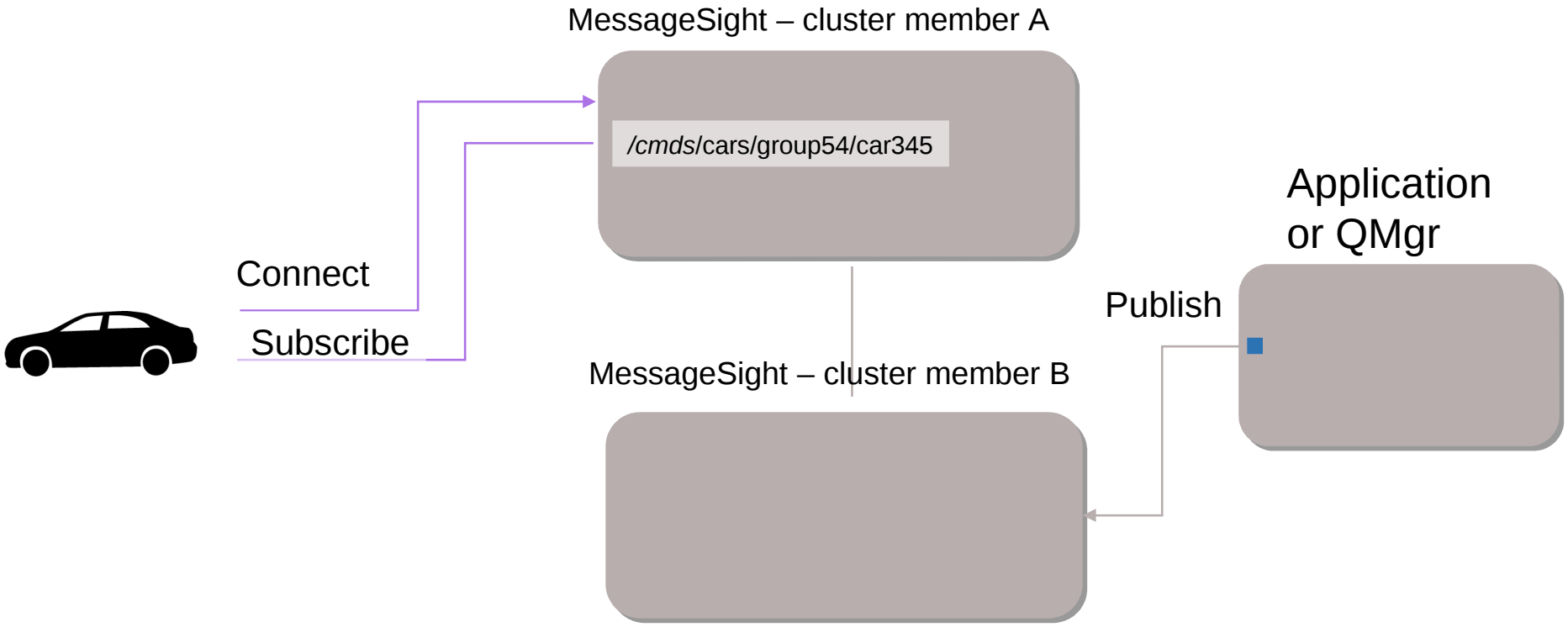
Back-end apps consuming large message volumes need to consume from all nodes where messages are incoming.

Usually
Do Not Want:



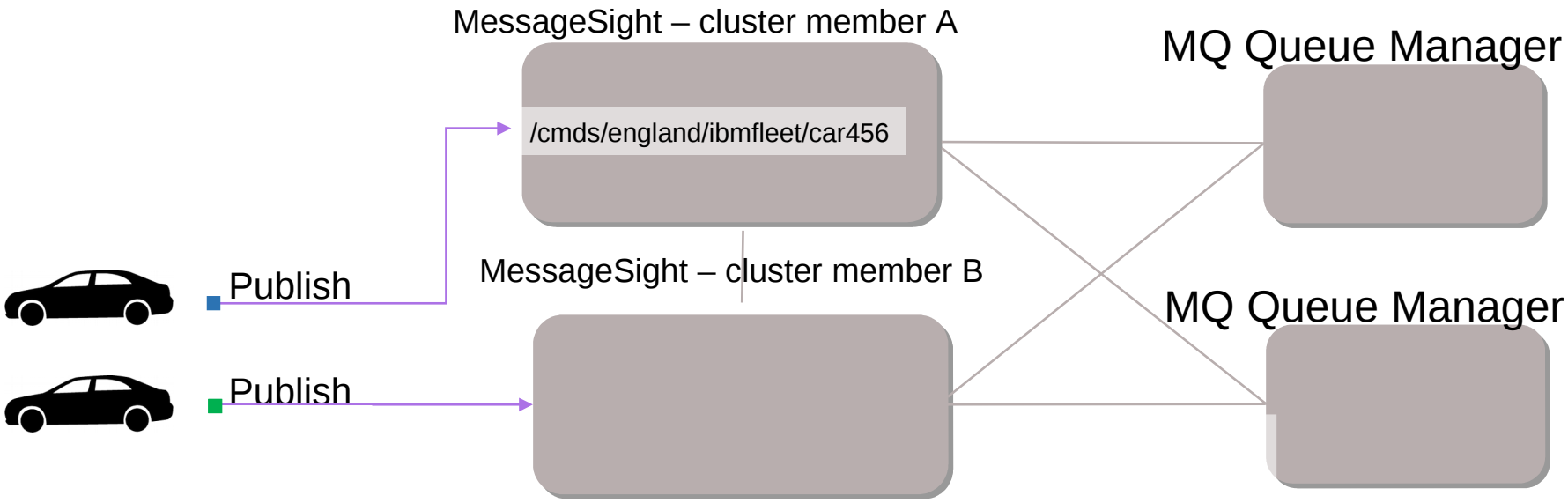
To help prevent this MQ Connectivity, JMS and shared subs (usually associated with high message volumes) are not advertised around the cluster; a separate sub needs to be created on each node.

Publish to Device



Application can publish without knowing where the client is connected in the cluster

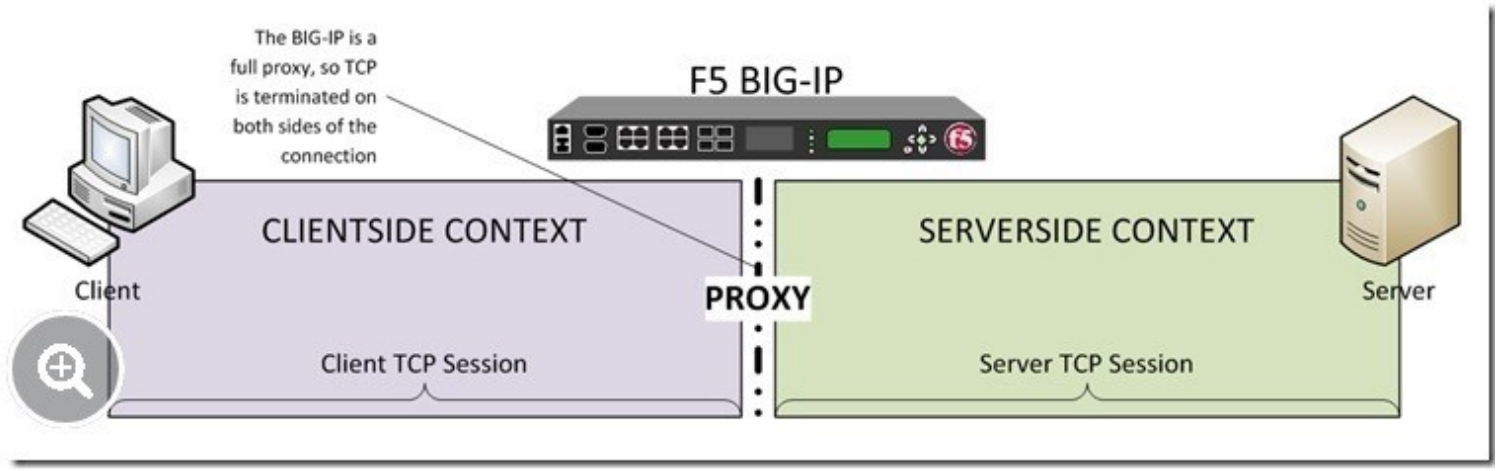
Clusters: Device to BackEnd



- Need to prevent all messages going through a single point – becoming a bottleneck
- Back-end Subs will not pull data through the cluster connector from other members
- Picture would be same if QMgr replaced with JMS App or MQTT shared sub

Balancing your workload

- Route connection requests
  - Recognize previous state
- Hide MessageSight topology
  - Multiple servers and/or HA instances
  - F5 has native MQTT support



Load Balancers: More Details

"Easy" for cleanSession=true clients and QoS < 2 publishers

For CleanSession=false, need client affinity to a particular "home" server (or server pair)

Client Affinity can be done e.g. based on ClientID by F5

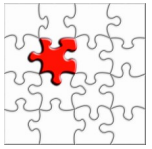
Can instead have clients know about individual servers (or server-pairs) e.g. by group devices into groups of say 5000 and having a DNS entry per group

(So a device might connect to:
group53.iot.mycompany.com

(Can then redirect DNS entry to move devices)

Protocol plugin point

- A protocol plug-in point in MessageSight
  - Gives the ability for IBM and trusted third-parties to extend the protocols supported by the appliance
- There is a plug-in protocol SDK to develop plug-ins
  - Protocols must be written in Java
    - Plug-ins run in an isolated environment to ensure robustness
    - The plug-in sends and receives data through MessageSight transport component
    - The plug-in uses a messaging interface into the MessageSight engine
    - The common engine ensures any-to-any communication between protocols
    - Integrated into MessageSight configuration and security models
    - Plugins do not get direct network access
  - Sample HTTP style plugin
- Intended for:
  - Legacy sensors which cannot be changed to MQTT
  - Industry-specific protocols
  - Co-existence with initial versions of IoT deployments



The Chamberlain Group Inc. developed a mobile IoT app that provides competitively differentiated capabilities and user interface

One million users can now access platform without drop off in service – 10X performance improvement

Speeds deployment and development of new features with total platform control

Opens new business opportunities for additional connected products

European Bank uses IBM MessageSight and push technology to drive personalized loan and savings offers directly to customers' mobile devices

- Innovation driven from banking transaction data
- Ensured security, confidentiality and delivery of transactions
- Lightweight responsiveness for users

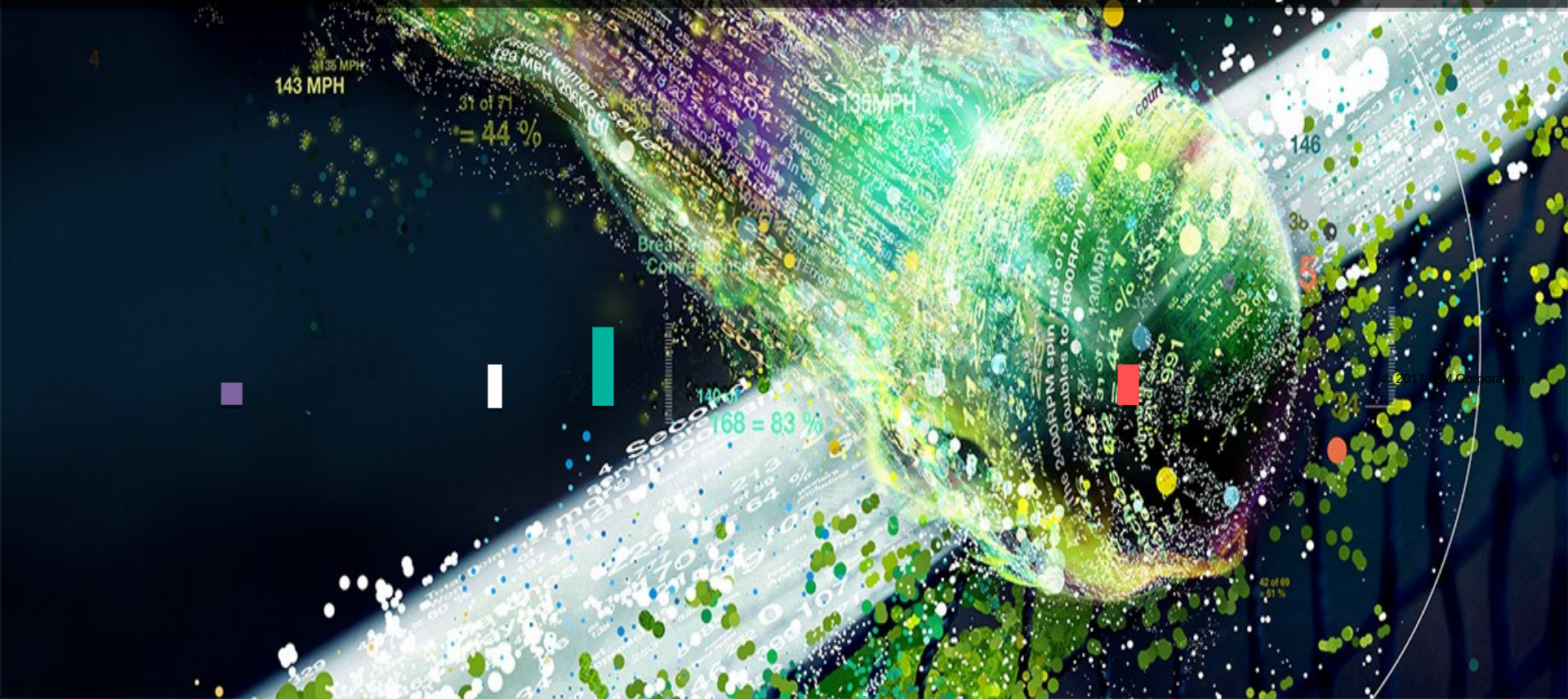
GreatCall's innovative suite of easy-to-use mobile products and approach to customer care helps aging consumers live more independent lives.

An IBM IoT MessageSight – driven IoT solution connects mobile and wearable devices that scale to meet GreatCall's rapid growth, with:

- Secure support for projected 40,000 messages per second
  Single publish with multiple subs
- low latency connections that provide real time results

Grand Slam tennis tournaments use MessageSight for their scoring system to provide live scores to millions of fans using different devices

- Tens to hundreds of thousands of concurrently clients connected to MessageSight, and experiencing tournament play via iPad, Android, mobile and web sites
- Scoreboard loads are 60% faster than original flash-based I solution, with subsecond response times compared with 3-5 seconds previously



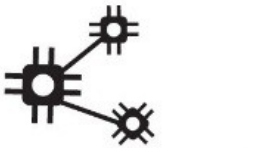
Wimbledon 2015

- Publish Live Scores to Desktop and Mobile Users
- Sending over 10 million messages a minute at peak

"I was sat at the side of Centre Court one day with my smartphone app, and I heard the umpire call the point in the match after I saw my mobile phone update."

Sam Seddon,
IBM Wimbledon Client and Programme Executive

MessageSight is easy, scalable and secure

Designed for Things	• Optimized gateway for Things and Mobile devices • Efficient open protocol • Event-driven awareness • Open and industry agnostic • Fine-grained security policies	***Developer Friendly***	• Active dev community • Free developer edition • Simple yet powerful APIs • Simple messaging paradigm • 40+ MQTT client libraries	***Easy to Deploy***	• Up and running < 30 minutes • Task oriented UI guides administrator through first steps • Simple and scalable management through policies
		***Easy to Integrate***	• JMS • WebSockets • MQ • Integration Bus • Worklight • InfoSphere Streams… • Supports Oasis standard MQTT 3.11	***Internet Scale***	• Large numbers of concurrent connections • High throughput • Highly available • Horizontally scalable

Questions & Answers

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“Grass Court Season is Here!” by Kate
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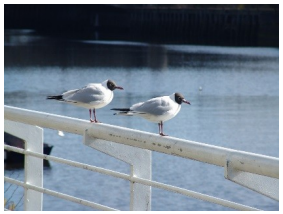

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