

HiveMQ

Feature and Specification Sheet



Updated to HiveMQ 4.26

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System Requirements

HiveMQ is highly portable and runs on any server hardware and Linux OS. The broker scales with the underlying hardware and scales vertically.

For production environments - depending on the use case - we recommend at least:

- 4 CPUs
- 4 GB RAM
- 100 GB or more disk space
- 900 IOPs
- Java 11 (or higher)

HiveMQ clusters are designed to run in the same computing center and require good (at least 1Gbit or more) connectivity between cluster nodes.

Technical Aspects

MQTT Standard Features

- MQTT 3.1, MQTT 3.1.1 and MQTT 5 supported. The protocols are supported in an interoperable way
- QoS 0, QoS 1, QoS 2 fully supported
- Retained Messages are fully supported
- MQTT Ordered Topic Guarantees for QoS 1 and 2
- Dynamic Topics
- Message Queuing
- Clean and Persistent sessions
- Last Will and Testament
- Wildcard Subscriptions
- Keep Alive
- Client Takeover
- Message Support up to 256MB
- Topic Length is restricted to 65535 (maximum for MQTT protocol)
- UTF-8 characters and topic depth is restricted to 1000 (maximum for MQTT protocol)
- Unlimited Client Subscriptions
- Maximum Client identifier length: 65535
- Username / Password fields supported
- Shared Subscriptions for MQTT Client Load Balancing
- Client Session Expiry
- Message Expiry
- Key-Value Header for MQTT packages (User Properties)
- Negative Acknowledgements
- Server-side initiated disconnect
- Flow-Control
- Client- and Server-side indication of maximum supported message size

- Server-side overwriting of client parameters
- Topic Alias
- Reason Codes

Additional MQTT Features

- MQTT over WebSocket support
- Secure WebSocket with TLS
- Special analytical topics to automatically collect detailed information (MQTT Addons:
 - \$dead topic
 - \$expired topic
 - \$dropped topic
- Pre-declared shared subscriptions

Configuration

- XML based, single file configuration
- Configuration file variable Interpolation with environment variables
- Schema-based configuration validation
- Reconfiguration at runtime via extensions
- Diagnostics Mode
- Support for multiple NICs
- Multiple simultaneous listeners:
 - MQTT over TCP
 - MQTT over TLS
 - MQTT over Websockets
 - MQTT over Secure Websockets
- Disk Persistence
- In-Memory Mode (not available in Professional Edition and Enterprise Edition)

- Global and client based throttling
- Global and client based maximum MQTT message size
- Global maximum connection limit
- Configurable maximum client identifier length
- Configurable Retry Interval
- Configurable Connection Timeouts
- Configurable file persistence
- Configurable maximum queued messages per client
- Configurable Logging
- Windows Service available
- Linux Autostart Scripts: Debian, Ubuntu, CentOS, RHEL, systemd
- PROXY Protocol support (v1 and v2) with additional TLVs *
- Auto reloadable Logging configuration
- Additional shared subscription syntax that is compatible with most MQTT libraries
- Configurable Socket Send and Receive Buffer size
- HiveMQ folder configuration via system

Control Center

- Modern web user interface
- A single Control Center instance shows the state of the whole cluster
- The Control Center is embedded with HiveMQ, no additional setup is required
- Powerful dashboard with basic monitoring options for connections, MQTT message rate (in/out), subscriptions, Retained Messages, Queued Messages and cluster nodes.
- Attention log for administrators
- Cluster node detail information with
- Memory, Disk Space, and Network statistics
- License information
- Advanced Analysis for dropped messages *
- List of installed extensions
- Client Trace Recordings *
- Multiple users configurable
- User session management
- List of all connected clients in the whole cluster. Supports > 1.000.000 concurrent client connections
- Help texts for administrative actions
- Detailed Client overview with information about the MQTT session, the TCP
- connection, TLS, LWT, Client Restrictions, Proxy Protocol and Session Attributes
- Fine grained per client historical view of client events

- Export of all available client detail information using the MQTT CLI
- Ability to add and remove MQTT client subscriptions for individual clients
- Ability to add and remove MQTT client shared subscriptions for individual clients
- Ability to invalidate and delete MQTT Client Sessions
- Cluster-wide backups
- Disaster recovery by live importing backups
- Role Based Access Control for the Control Center *
- Detailed Overview of all available retained messages, including a detailed view of each retained message
- Detailed Shared Subscription overview with information about the clients that are part of the shared group and the current queue size
- Extended HiveMQ Control Center License View for transparency to show detailed information about the active license including enabled features.
- The diagnostic Archive function automates the information collection needed to debug performance-related issues in a HiveMQ cluster quickly.
- Expanded view for extension consumers to quickly identify and rectify bottleneck

Trace Recordings *

- Detailed recordings of MQTT traffic and client behavior
- Cluster wide recordings
- Time limited with a configurable end time
- Ad-hoc executions and scheduled executions
- Filterable by MQTT message type
- Filterable by client identifier Regular Expressions
- Filterable by MQTT Topic Regular Expressions
- Human Readable text file recordings
- Ability to download zipped versions of Trace Recordings of all Cluster nodes via the Control Center
- Diagnostic Archive function that automates the collection of information needed to debug performance-related issues in a HiveMQ cluster quickly
- Readiness and Liveness Probes to measure the health of your HiveMQ cluster.

Environment

- Linux, Windows, Mac OSX supported for development environments.
- All Linux distributions supported for production. CentOS 7

* only available in HiveMQ EE

or other RHEL based distributions are recommended.

- Docker support
- HiveMQ Kubernetes Operator with predefined Helm Chart to easily deploy and manage a HiveMQ cluster on a Kubernetes cluster
- Public Cloud Support: AWS EC2, Google Compute Engine, Microsoft Azure, Rackspace, Profitbricks, OpenStack. Most other IaaS vendors are also supported.
- Virtual Machine (Supported Hypervisors: VMWare ESXi, Xen, KVM, Microsoft Hyper-V) and Bare Metal Support

Cluster

- Masterless cluster architecture
- Distributed cluster; linearly scalable
- Configurable Replica Count
- Transparent: A MQTT client can reconnect to any cluster node anytime and can resume its session and receive all messages.
- Hot-Standby supported by configuration of full replication
- Static and Elastic cluster discovery mechanisms (UDP Multicast, Broadcast)
- Free off-the-shelf extensions for advanced discovery mechanisms (e.g. AWS S3)
- Network Partitions are supported. Self-healing mechanisms are triggered after Split-Brain scenarios
- No loss in availability when network partitions occur. All MQTT clients stay connected and can resume operation, even in minority partitions
- Eventually consistent in Split-Brain scenarios
- All L4 load balancers are supported
- Rolling upgrades
- Pluggable cluster discovery mechanisms
- TCP and UDP transports available
- Configurable Failure Detection Mechanisms
- Configuration of external IP addresses for cloud and container environments
- Secure cluster communication with TLS
- Ability to start cluster nodes statefully
- Configurable Topic Level Distribution for Topic Trees
- Dynamic Replicates
- Node Stress Level Metrics
- Cluster Overload Protection

Disaster Recovery

- Get the ability (and the tools) to choose the right mix of data recoverability and system availability to plan for disaster recovery scenarios
- Recover data with persistence
- Get Zero-data-loss guarantees & Zero-down-time availability

Security

- SSLv3 (disabled by default), TLS 1.0, TLS 1.1, TLS 1.2, TLS 1.3 support
- All JVM cipher suites are supported
- Cipher Suite Whitelists
- JKS Key- and Truststores
- X509 client certificate authentication support
- Configurable TLS Handshake Timeouts
- Pluggable authentication and authorization mechanisms
- Authorization with mixed Black- and Whitelists possible.
- Fine-grained client authorization that allows restricting:
 - Activity (Publish / Subscribe)
 - QoS levels
 - Retained Messages
 - Topic restrictions for bandwidth throttling, message size throttling
- Authentication based on combinations of:
 - Client Identifier
 - Client IP
 - Username
 - Password
 - X509 client Certificate
- Free off-the-shelf extensions for authentication and authorization are available.
- Enterprise Integrations (via the Enterprise Security Extension) with third party enterprise security systems, like:
 - SQL databases
 - OAuth/OpenID Connect provider via JSON Web Tokens
 - LDAP server and MS Active Directory
- The Enterprise Security Extension also has:
 - Fine-grained authorization rules that can specify permissions for specific clients or groups of clients.
 - A structured access log for tracking security related device information.
 - Access control for the HiveMQ Control Center.

** only available in HiveMQ EE*

- PKCE authorization for the HiveMQ Control Center
- Connection and session-attribute-pre-processors
- Support for chaining multiple authentication and authorization extensions
- Reloadable key- and truststores
- Native SSL integration (BoringSSL) *
- OCSP Stapling support *
- Configurable limitation of concurrent
- TLS handshakes *
- Audit logs *

Extension System

- We offer a free and Open Source Extension System that enables extending HiveMQ for your business requirements
- X509 client certificate usable for custom authentication and authorization logic (part of the Enterprise Security Extension — requires Professional or Enterprise edition of the broker)
- Free extension developer guide available
- Several free and open source off-the-shelf extensions available for download
- HiveMQ offers enterprise-level integration with the following technologies (Compatible only with Professional or Enterprise editions of the HiveMQ broker):
 - **Enterprise Extension for Kafka:** Add monitored, bi-directional MQTT messaging to and from your Kafka installation.
 - **Enterprise Bridge Extension:** Stream MQTT data between different brokers and broker clusters.
 - **Enterprise Extension for Google Pub/Sub:** Seamlessly integrates HiveMQ's broker to Google Cloud through the Google Cloud Pub/Sub service. Features Bi-directional data transfer.
 - **Enterprise Extension for Amazon Kinesis:** Seamlessly integrates HiveMQ's MQTT broker with AWS. Easy, bi-directional MQTT data transmission between IoT devices and AWS via Amazon Kinesis Data Streams.
 - **Enterprise Extension for MongoDB:** Integrates MQTT data with MongoDB, supporting SCRAM Authentication and TLS encryption for secure persistent data storage.
 - **Enterprise Extension for PostgreSQL:** This PostgreSQL extension stores, processes, and analyzes IoT data. It secures MQTT data with TLS encryption and formats messages for optimized querying using customizable

templates. This extension also enables MQTT data integration with Timescale and CockroachDB..

- **Enterprise Extension for MySQL:** Store, process, and analyze IoT data with this MySQL extension. Secure MQTT data with TLS encryption and format messages for optimized querying using customizable templates.
- **Enterprise Extension for Snowflake:** This extension enables seamless MQTT data integration into the Snowflake Data Cloud via the Snowflake Snowpipe Streaming API. It was built using native Snowflake technology and allows you to send specific/relevant MQTT topics to Snowflake.
- **Enterprise Data Lake Extension:** This extension effortlessly integrates MQTT data from millions of IoT devices into Cloud Storage, supporting Data Lake architectures for top Data Cloud companies like Databricks, AWS, Azure, and Snowflake.
- Installing, enabling and disabling of Extensions at runtime (Hot-Reload)
- Maven Plugin Archetype available
- Gradle Plugins for Extension Development available
- Debug your extension from Eclipse and IntelliJ IDEA.
- Commercial Enterprise Integrations
- Customized Authentication and Authorization
- Lifecycle support
- Support for adding and removing interceptors at runtime
- Multiple Services for interacting with the HiveMQ core:
 - Retained Message Store
 - Subscription Store
 - Client Service
 - Publish Service
 - Cluster Service
 - Managed Extension Executor Service
 - Initializer Registry
 - Security Registry
 - Event Registry
 - Metric Registry
- Interceptors available that allow modifying MQTT behaviour
- Configurable Extension Service Overload Protection which provides rate-limiting for custom extensions
- Enterprise SDK for commercial extensions

* only available in HiveMQ EE

Distributed Tracing

- The Distributed Tracing extension enables end-to-end MQTT message tracking across IoT environments.
- Get a high level of observability for all of their IoT applications.
- With the OpenTelemetry specification, get complete transparency for every transaction that uses the HiveMQ MQTT broker.
- The MQTT broker is instrumented with a Kafka extension – enabling you to capture and expose tracing information as defined by the “OpenTelemetry” specification.



Sparkplug 3.0 Compliant and Aware

- What makes our broker compliant with SP 3.0?
- Supports QoS levels 0 & 1
- Supports “Retain” messages
- Supports Last Will & Testament of MQTT messages
- What makes our broker “Sparkplug Aware?”
- The broker can forward all certificates to a kind of sparkplug systopic as retained Message
- The broker can update the LWT timestamp of the NDEATH message to the current timestamp, when the edge node goes offline.

REST API

- Authenticate users with simple usernames and passwords
- Manage authenticated access to the HiveMQ Broker REST API on every end-point
- Configure each endpoint’s access on both an individual or role-based authentication

Data Hub

- Create the blueprint for how Data is formatted with Data Schemas- JSON and Protobuf formats are supported
- Use Data Policies to define rules and guidelines for how data payloads are processed and handled in the broker
- Establish Behavior Policies to determine agreed-upon behaviours for how devices will work with the broker
- Data Transformation allows for the conversion of data into a desired format as it moves through the broker
- Dashboard overview of quality metrics to locate bad data sources and bad actors

HiveMQ Edge

- Convert industrial and automation protocols (e.g. OPC-UA, Modbus, Siemens S7, Allen-Bradley, and more) into MQTT for data integration between OT and IT systems. Create your own protocol adapters using a template in HiveMQ Edge.
- Supports MQTT 3.1.1, 3.1, and 5.0
- Address limited transmission bandwidth in wireless sensor networks (WSN) with MQTT-SN 1.2 support.
- Establish a secure and encrypted channel for communication between edge devices and central enterprise systems with TLS/SSL security.
- Use UNS Prefixes to build your UNS using readily accessible ISA-95 profiles.
- Use Offline Buffering, which allows HiveMQ Edge to queue and publish messages in case of an MQTT bridge connection failure, ensuring zero data loss**.
- Use HiveMQ Data Hub to ensure data quality standards are centrally defined and enforced at the edge**.
- Get enterprise-grade support from HiveMQ’s experienced team for setup and trouble-shooting in HiveMQ Edge**

** Commercial license features

Additional Resources

- ▷ [HiveMQ Documentation](#)
- ▷ [HiveMQ Broker](#)
- ▷ [HiveMQ Download](#)

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