

Feature comparison of different MQTT brokers

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CHAPTER 1

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Broker	2lemetry	AWS IoT Services	Apache ActiveMQ	Apache Apollo**	Bevywise IoT Platform
QoS 0	*	Yes [1]	Yes [2]	Yes [3]	Yes [4]
QoS 1	*	Yes [1]	Yes [2]	Yes [3]	Yes [4]
QoS 2	*	Yes [1]	Yes [2]	Yes [3]	Yes [4]
authentication	*	Client certificates [5]	JAAS [6]	JAAS [7]	Key based [8]
\$\$SYS topics	*	No [9]	No	No	Probably yes
SSL	*	Yes [10]	Yes [11]	Yes [12]	Yes [8]
Dynamic topics	*	Some starting with \$ are reserved [9]	Yes	Yes	Yes
Clustering	*	Yes	Yes [13]	No	Unknown
Websockets	*	Yes [1]	Yes [14]	Unknown	Yes [15]
Plugin system	*	No	Yes [16]	Unknown	No
Self hosted	*	No	Yes	Yes	Possible [8]
License	*	Commercial/ Abo license	Apache 2.0 license (open source)[17]	Apache 2.0 license (open source)	Commercial with EULA [18]

Broker	emitter	EMQ	GnatMQ/M2MQTT	MQTTnet	HBMQTT
QoS 0	Yes	Yes [19]	Yes [20]	Yes [21]	Yes [22]

QoS 1	No [23]	Yes [19]	Yes [20]	Yes [21]	Yes [22]
QoS 2	No [23]	Yes [19]	Yes [20]	Yes [21]	Yes [22]
authentication	Per-channel authorization [24]	Username/Password, JWT, LDAP, ClientID, ... [19]	Username/Password [20]	Username/Password, Client certificates [25]	Password file*** [22]
\$\$SYS topics	No [26]	Yes [19]	No	No	Basic \$\$SYS topics [22]
SSL	Yes [24]	Yes [19]	Yes [20]	Yes [21]	Yes [22]
Dynamic topics	Yes	Yes [19]	Yes	Yes	Yes
Clustering	Yes [24]	Yes [19]	No	No	No
Websockets	Yes [24]	Yes [19]	No	Yes [27]	Yes [22]
Plugin system	Unknown	Yes [19]	No	No	Yes [22]
Self hosted	Possible [28]	Yes	Yes	Yes	Yes
License	Affero General Public License v3 (open source)[29]	Apache 2.0 license (open source)[30]	Eclipse Public License v1.0 (open source)[31]	MIT License (open source)[32]	MIT License (open source)[33]

Broker	HiveMQ	IBM MessageSight	IBM WebSphere MQ Middleware	JoramMQ *4	Mongoose
QoS 0	Yes [34]	Yes [35]	Yes [36]	Yes [37]	Yes [38]
QoS 1	Yes [34]	Yes [35]	Yes [36]	Yes [37]	Yes [38]
QoS 2	Yes [34]	Yes [35]	Yes [36]	Yes [37]	Yes [38]
authentication	Username/Password [39]	Username/Password [40]	Username/Password, client certificate [41]	Yes [37]	Yes [42]
\$\$SYS topics	Possible with plugin [43]	Yes [44]	Probably yes	Yes [37]	No
SSL	Yes [45]	Yes [46]	Yes [47]	Yes [37]	Yes [48]
Dynamic topics	Yes	Yes	Yes	Yes	Yes

Clustering	Yes [49]	Yes [50]	Yes [51]	Yes [37]	No [52]
Websockets	Yes [53]	Yes [54]	Yes [55]	Yes [37]	Yes [48]
Plugin system	Yes [43]	Yes [56]	No	Yes [37]	Yes [57]
Self hosted	Yes	Possible [58]	Possible	Yes	Yes
License	Commercial	Commercial/ Abo model	Commercial/ Abo model	GNU Lesser General Public Li- cense (open source) [59]	GNU Gen- eral Public License ver- sion 2 (open source) [60]

Broker	moquette	mosca	Mosquitto	RabbitMQ	RSMB
QoS 0	Yes [61]	Yes [62]	Yes [63]	Yes [64]	*5
QoS 1	Yes [61]	Yes [62]	Yes [63]	Yes [64]	*5
QoS 2	Yes [61]	No [62]	Yes [63]	No [64]	*5
authentication	Unknown	Yes [65]	Yes, different options pos- sible via plu- gin [66]	SASL [67]	*5
\$SYS topics	No	No	Yes [68]	No	*5
SSL	Yes [69]	Yes [70]	Yes [71]	Yes [72]	
Dynamic topics	Yes	Yes	Yes	Yes	*5
Clustering	No [73]	No [74]	Yes, but with additional software [75]	Yes [76]	*5
Websockets	Yes [77]	Yes [78]	Yes [79]	Yes [80]	*5
Plugin sys- tem	No	No	Yes	Yes [81]	*5
Self hosted	Yes	Yes	Yes	Yes	*5
License	Apache Li- cense Version 2.0 (open source) [82]	MIT License (open source) [83]	Eclipse Pub- lic License 1.0 (open source) [84]	Mozilla Pub- lic License v1.1 (open source) [85]	Eclipse Dis- tribution Li- cense v 1.0 (open source) [86]

Broker	Software AG Universal Messaging *6	Solace	Trafero Tstack	VerneMQ	Aedes
QoS 0	Probably yes [87]	Yes [88]	*7	Yes [89]	Yes [90]
QoS 1	Probably yes [87]	Yes [88]	*7	Yes [89]	Yes [90]
QoS 2	Probably yes [87]	No [88]	*7	Yes [89]	Yes [90]
authentication	Probably yes [87]	Basic, client certificate, Kerberos [91]	*7	Username/ Password [89]	Username/ Password [90]
\$SYS topics	No	Few [92]	*7	Yes [89]	Yes [90]
SSL	Yes [87]	Yes [93]	*7	Yes [89]	Yes [90]
Dynamic topics	Yes	Yes	*7	Yes	Yes
Clustering	Probably yes [87]	Probably yes	*7	Yes [89]	Yes [90]
Websockets	Yes [87]	Yes [94]	*7	Yes [89]	No
Plugin sys- tem	No	No	*7	Yes [89]	No
Self hosted	No	no	*7	Yes [89]	Yes
License	Commercial	Commercial/ Abo model	Apache License 2.0 (open source) [95]	Apache Li- cense 2.0 [96]	MIT License [97]

* Does not exist any longer, is now part of AWS IoT Services [98]

** Is based on Apache ActiveMQ but allegedly faster. However, the project seems to be discontinued [99]

*** Can be customized/ extended as wished

*4 Seems to be discontinued

*5 Very badly documented [100] [101]

*6 Seems to be a middleware solution but is badly documented [87] [102]

*7 Very badly documented as well [103]

Bibliography

- [1] AMAZON.COM ; AMAZON.COM (Hrsg.): Message Broker for AWS IoT Protocols. <https://docs.aws.amazon.com/iot/latest/developerguide/protocols.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [2] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ QoS levels. https://activemq.apache.org/apollo/documentation/mqtt-manual.html#Reliable_Messaging. Version: 4 2018. – Last viewed on April, 5th 2018
- [3] APACHE.ORG ; APACHE.ORG (Hrsg.): Apache Apollo QoS levels. http://activemq.apache.org/apollo/documentation/mqtt-manual.html#Reliable_Messaging. Version: 4 2018. – Last viewed on April, 5th 2018
- [4] BEVYWISE.COM ; BEVYWISE.COM (Hrsg.): Bevywise MQTT Standard. <https://www.bevywise.com/mqtt-broker/mqtt-standard.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [5] AMAZON.COM ; AMAZON.COM (Hrsg.): AWS IoT Authentication. <https://docs.aws.amazon.com/iot/latest/developerguide/iot-authentication.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [6] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ security. <http://activemq.apache.org/security.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [7] APACHE.ORG ; APACHE.ORG (Hrsg.): Apache Apollo Authentication. <http://activemq.apache.org/apollo/documentation/user-manual.html#Authentication>. Version: 4 2018. – Last viewed on April, 5th 2018

- [8] BEVYWISE.COM ; BEVYWISE.COM (Hrsg.): Bevywise MQTT Security. <https://www.bevywise.com/mqtt-broker/mqtt-security.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [9] AMAZON.COM ; AMAZON.COM (Hrsg.): AWS IoT Topics. <https://docs.aws.amazon.com/iot/latest/developerguide/topics.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [10] AMAZON.COM ; AMAZON.COM (Hrsg.): AWS IoT Security. <https://docs.aws.amazon.com/iot/latest/developerguide/iot-security-identity.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [11] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ SSL. <http://activemq.apache.org/how-do-i-use-ssl.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [12] APACHE.ORG ; APACHE.ORG (Hrsg.): Apache Apollo SSL. http://activemq.apache.org/apollo/documentation/user-manual.html#Using_SSL_TLS. Version: 4 2018. – Last viewed on April, 5th 2018
- [13] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ Clustering. <http://activemq.apache.org/clustering.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [14] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ Websockets. <http://activemq.apache.org/websockets.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [15] BEVYWISE.COM ; BEVYWISE.COM (Hrsg.): Bevywise Websockets. <https://www.bevywise.com/blog/mqtt-over-websockets/>. Version: 4 2018. – Last viewed on April, 5th 2018
- [16] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ Plugins. <http://activemq.apache.org/developing-plugins.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [17] APACHE.ORG ; APACHE.ORG (Hrsg.): ActiveMQ license. <http://www.apache.org/licenses/LICENSE-2.0.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [18] BEVYWISE.COM ; BEVYWISE.COM (Hrsg.): Bevywise license. <https://www.bevywise.com/eula.html>. Version: 4 2018. – Last viewed on April, 5th 2018

- [19] EMQTT.IO ; EMQTT.IO (Hrsg.): EMQ Features. <https://github.com/emqtt/emqtt#features>. Version: 4 2018. – Last viewed on April, 5th 2018
- [20] GITHUB.COM ; GITHUB.COM (Hrsg.): GnatMQ Features. <https://github.com/gnatmq/gnatmq#features>. Version: 4 2018. – Last viewed on April, 5th 2018
- [21] KRATKY, Christian ; KRATKY, Christian (Hrsg.): MQTTnet Features. <https://github.com/chkr1011/MQTTnet#features>. Version: 4 2018. – Last viewed on April, 5th 2018
- [22] GITHUB.COM ; GITHUB.COM (Hrsg.): HBMQTT Features. <https://github.com/beerfactory/hbmqtt/#features>. Version: 4 2018. – Last viewed on April, 5th 2018
- [23] EMITTER.IO ; EMITTER.IO (Hrsg.): emitter QoS levels. <https://github.com/emitter-io/emitter/issues/98>. Version: 4 2018. – Last viewed on April, 9th 2018
- [24] EMITTER.IO ; EMITTER.IO (Hrsg.): Emitter Features. <https://emitter.io/features/>. Version: 4 2018. – Last viewed on April, 5th 2018
- [25] KRATKY, Christian ; KRATKY, Christian (Hrsg.): MQTTnet Authorization. <https://github.com/chkr1011/MQTTnet/wiki/Client#dealing-with-special-certificates>. Version: 4 2018. – Last viewed on April, 5th 2018
- [26] EMITTER.IO ; EMITTER.IO (Hrsg.): emitter SYS support. <https://github.com/emitter-io/emitter/issues/99>. Version: 4 2018. – Last viewed on April, 9th 2018
- [27] KRATKY, Christian ; KRATKY, Christian (Hrsg.): MQTTnet Websockets. <https://github.com/chkr1011/MQTTnet/wiki/Client#websocket-connection>. Version: 4 2018. – Last viewed on April, 5th 2018
- [28] EMITTER.IO ; EMITTER.IO (Hrsg.): Emitter Github. <https://github.com/emitter-io/emitter>. Version: 4 2018. – Last viewed on April, 5th 2018
- [29] EMITTER.IO ; EMITTER.IO (Hrsg.): Emitter License. <https://github.com/emitter-io/emitter/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 5th 2018
- [30] EMQTT.IO ; EMQTT.IO (Hrsg.): EMQ License. <https://github.com/emqtt/emqtt/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 5th 2018

- [31] GITHUB.COM ; GITHUB.COM (Hrsg.): GnatMQ License. <https://github.com/gnatmq/gnatmq/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 5th 2018
- [32] KRATKY, Christian ; KRATKY, Christian (Hrsg.): MQTTnet License. <https://github.com/chkr1011/MQTTnet/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 5th 2018
- [33] GITHUB.COM ; GITHUB.COM (Hrsg.): HBMQTT License. <https://github.com/beerfactory/hbmqtt/blob/master/license.txt>. Version: 4 2018. – Last viewed on April, 5th 2018
- [34] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ QoS levels. <https://www.hivemq.com/blog/mqtt-essentials-part-6-mqtt-quality-of-service-levels>. Version: 4 2018. – Last viewed on April, 5th 2018
- [35] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight QoS levels. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.2.0/com.ibm.ism.doc/Planning/ov00102_.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [36] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM WebSphere MQ QoS levels. https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.0.0/com.ibm.mq.dev.doc/q029090_.htm. Version: 4 2018. – Last viewed on April, 5th 2018
- [37] JORAM.OW2.ORG ; JORAM.OW2.ORG (Hrsg.): JoramMQ Features. <http://www.scalagent.com/en/jorammq-33/technology-36/mqtt-protocol>. Version: 4 2018. – Last viewed on April, 5th 2018
- [38] LIMITED, Cesanta S. ; LIMITED, Cesanta S. (Hrsg.): Mongoose QoS levels. https://mongoose-os.com/docs/api/mgos_mqtt.h.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [39] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ Authentication. <https://www.hivemq.com/blog/mqtt-security-fundamentals-authentication-username-password>. Version: 4 2018. – Last viewed on April, 5th 2018
- [40] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Authentication. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.1.0/com.ibm.ism.doc/Security/se00000_.html. Version: 4 2018. – Last viewed on April, 5th 2018

- [41] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM WebSphere MQ Authentication. https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.0.0/com.ibm.mq.dev.doc/q029090_.htm. Version: 4 2018. – Last viewed on April, 5th 2018
- [42] GITHUB.COM ; GITHUB.COM (Hrsg.): Mongoose Authentication. <https://github.com/mongoose-os-libs/mqtt>. Version: 4 2018. – Last viewed on April, 5th 2018
- [43] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ Sys Topic Plugin. <https://www.hivemq.com/plugin/sys-topic-plugin/>. Version: 4 2018. – Last viewed on April, 5th 2018
- [44] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Sys Topic. https://www.ibm.com/support/knowledgecenter/en/SSWMAJ_2.0.0/com.ibm.ism.doc/Monitoring/admin00008_.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [45] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ SSL. <https://www.hivemq.com/blog/mqtt-security-fundamentals-tls-ssl>. Version: 4 2018. – Last viewed on April, 5th 2018
- [46] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight SSL. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.2.0/com.ibm.ism.doc/Administering/tlssecurityforjmsra.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [47] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM WebSphere MQ SSL. https://www.ibm.com/support/knowledgecenter/SSFKSJ_7.5.0/com.ibm.mq.adm.doc/q021331_.htm. Version: 4 2018. – Last viewed on April, 5th 2018
- [48] LIMITED, Cesanta S. ; LIMITED, Cesanta S. (Hrsg.): Mongoose Features. <https://github.com/cesanta/mongoose#features>. Version: 4 2018. – Last viewed on April, 5th 2018
- [49] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ Clustering. https://www.hivemq.com/papers-download/Clustering_HiveMQ.pdf. Version: 4 2018. – Last viewed on April, 5th 2018
- [50] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Clustering. <https://www.ibm.com/support/knowledgecenter/en/>

SSWMAJ_2.0.0/com.ibm.ism.doc/Overview/ov00150_.html. Version: 4 2018. – Last viewed on April, 5th 2018

- [51] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM WebSphere MQ Clustering. <http://www-01.ibm.com/support/docview.wss?uid=swg27009247&aid=1>. Version: 4 2018. – Last viewed on April, 5th 2018
- [52] LIMITED, Cesanta S. ; LIMITED, Cesanta S. (Hrsg.): Mongoose Clustering. <https://github.com/cesanta/mongoose-os/issues/207>. Version: 4 2018. – Last viewed on April, 5th 2018
- [53] GMBH dc-square ; GMBH dc-square (Hrsg.): HiveMQ Websockets. <https://www.hivemq.com/blog/mqtt-over-websockets-with-hivemq>. Version: 4 2018. – Last viewed on April, 5th 2018
- [54] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Websockets. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.2.0/com.ibm.ism.doc/Overview/ov00050.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [55] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM WebSphere MQ Websockets. https://www.ibm.com/support/knowledgecenter/en/SSFKSJ_9.0.0/com.ibm.mq.mig.doc/q121540_.htm. Version: 4 2018. – Last viewed on April, 5th 2018
- [56] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Plugins. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.2.0/com.ibm.ism.doc/Developing/devplug-in.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [57] LIMITED, Cesanta S. ; LIMITED, Cesanta S. (Hrsg.): Mongoose Plugins. <http://mongoosejs.com/docs/plugins.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [58] CORPORATION, IBM ; CORPORATION, IBM (Hrsg.): IBM MessageSight Hosting Options. https://www.ibm.com/support/knowledgecenter/en/SSCGGQ_1.2.0/com.ibm.ism.doc/Overview/virtualappliances.html. Version: 4 2018. – Last viewed on April, 5th 2018
- [59] JORAM.OW2.ORG ; JORAM.OW2.ORG (Hrsg.): JoramMQ License. <http://joram.ow2.org/license.html>. Version: 4 2018. – Last viewed on April, 5th 2018

- [60] LIMITED, Cesanta S. ; LIMITED, Cesanta S. (Hrsg.): Mongoose License. <https://github.com/cesanta/mongoose/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 5th 2018
- [61] SELVA, Andrea ; SELVA, Andrea (Hrsg.): moquette License. <https://github.com/andsel/moquette>. Version: 4 2018. – Last viewed on April, 5th 2018
- [62] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca QoS levels. <http://www.mosca.io/>. Version: 4 2018. – Last viewed on April, 6th 2018
- [63] MOSQUITTO.ORG ; MOSQUITTO.ORG (Hrsg.): mosquitto QoS levels. <https://mosquitto.org/man/mqtt-7.html>. Version: 3 2018. – Last viewed on April, 13th 2018
- [64] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ general features. <http://www.rabbitmq.com/blog/2012/09/12/mqtt-adapter/>. Version: 4 2018. – Last viewed on April, 6th 2018
- [65] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca Authentication. <https://github.com/mcollina/mosca/wiki/Authentication-&-Authorization>. Version: 4 2018. – Last viewed on April, 6th 2018
- [66] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): Mosquitto Authentication. <https://github.com/jpmens/mosquitto-auth-plugin>. Version: 4 2018. – Last viewed on April, 6th 2018
- [67] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ Authentication. <https://www.rabbitmq.com/authentication.html>. Version: 4 2018. – Last viewed on April, 6th 2018
- [68] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): Mosquitto SYS topics. <https://mosquitto.org/man/mosquitto-8.html>. Version: 4 2018. – Last viewed on April, 6th 2018
- [69] SELVA, Andrea ; SELVA, Andrea (Hrsg.): moquette SSL. http://andsel.github.io/moquette/documentation.html#_ssl_configuration. Version: 4 2018. – Last viewed on April, 5th 2018
- [70] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca SSL. <https://github.com/mcollina/mosca/wiki/TLS-SSL-Configuration>. Version: 4 2018. – Last viewed on April, 6th 2018

- [71] GUIDE.COM steves-internet ; GUIDE.COM steves-internet (Hrsg.): Mosquitto SSL. <http://www.steves-internet-guide.com/mosquitto-tls/>. Version: 4 2018. – Last viewed on April, 6th 2018
- [72] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ SSL. <https://www.rabbitmq.com/ssl.html>. Version: 4 2018. – Last viewed on April, 6th 2018
- [73] SELVA, Andrea ; SELVA, Andrea (Hrsg.): moquette Clustering. <https://github.com/andsel/moquette/issues/131>. Version: 4 2018. – Last viewed on April, 5th 2018
- [74] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca Clustering. <https://github.com/mcollina/mosca/issues/22>. Version: 4 2018. – Last viewed on April, 6th 2018
- [75] RABINOVITCH, Matt ; RABINOVITCH, Matt (Hrsg.): Mosquitto Clustering. <https://github.com/roobytwo/mosquitto-HA>. Version: 4 2018. – Last viewed on April, 6th 2018
- [76] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ Clustering. <https://www.rabbitmq.com/clustering.html>. Version: 4 2018. – Last viewed on April, 6th 2018
- [77] SELVA, Andrea ; SELVA, Andrea (Hrsg.): moquette Websockets. <https://github.com/andsel/moquette/blob/master/broker/src/test/java/io/moquette/server/MQTTWebSocket.java>. Version: 4 2018. – Last viewed on April, 5th 2018
- [78] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca Websockets. <https://github.com/mcollina/mosca/wiki/MQTT-over-Websockets>. Version: 4 2018. – Last viewed on April, 6th 2018
- [79] GUIDE.COM steves-internet ; GUIDE.COM steves-internet (Hrsg.): Mosquitto Websockets. <http://www.steves-internet-guide.com/mqtt-websockets/>. Version: 4 2018. – Last viewed on April, 6th 2018
- [80] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ Websockets. <https://www.rabbitmq.com/blog/tag/websockets/>. Version: 4 2018. – Last viewed on April, 6th 2018
- [81] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ Plugins. <https://www.rabbitmq.com/plugins.html>. Version: 4 2018. – Last viewed on April, 6th 2018

- [82] SELVA, Andrea ; SELVA, Andrea (Hrsg.): moquette License. <https://github.com/andsel/moquette/blob/master/license.txt>. Version:4 2018. – Last viewed on April, 5th 2018
- [83] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Mosca License. <https://github.com/mcollina/mosca#license---mit-license>. Version:4 2018. – Last viewed on April, 6th 2018
- [84] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): Mosquitto License. <https://github.com/eclipse/mosquitto/blob/master/LICENSE.txt>. Version:4 2018. – Last viewed on April, 6th 2018
- [85] SOFTWARE, Pivotal ; SOFTWARE, Pivotal (Hrsg.): RabbitMQ License. <https://github.com/rabbitmq/rabbitmq-server/blob/master/LICENSE-MPL-RabbitMQ>. Version:4 2018. – Last viewed on April, 6th 2018
- [86] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): RSMB License. <https://github.com/eclipse/mosquitto.rsmb/blob/master/edl-v10>. Version:4 2018. – Last viewed on April, 6th 2018
- [87] AG, Software ; AG, Software (Hrsg.): UniversalMessaging documentation first part. https://www.softwareag.com/corporate/products/az/universal_messaging/default. Version:4 2018. – Last viewed on April, 6th 2018
- [88] CORPORATION, Solace ; CORPORATION, Solace (Hrsg.): Solace QoS levels. <https://docs.solace.com/Open-APIs-Protocols/Using-MQTT.htm>. Version:4 2018. – Last viewed on April, 6th 2018
- [89] GMBH, Erlio ; GMBH, Erlio (Hrsg.): VerneMQ Features. <https://github.com/erlio/vernemq>. Version:4 2018. – Last viewed on April, 6th 2018
- [90] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Aedes Features. <https://github.com/erlio/vernemq>. Version:4 2018. – Last viewed on April, 6th 2018
- [91] CORPORATION, Solace ; CORPORATION, Solace (Hrsg.): Solace Authentication. <https://docs.solace.com/Features/Client-Authentication.htm>. Version:4 2018. – Last viewed on April, 6th 2018

- [92] CORPORATION, Solace ; CORPORATION, Solace (Hrsg.): Solace SYS topics. <https://docs.solace.com/Configuring-and-Managing-Routers/Managing-MQTT-Sessions.htm>. Version: 4 2018. – Last viewed on April, 6th 2018
- [93] CORPORATION, Solace ; CORPORATION, Solace (Hrsg.): Solace SSL. <https://docs.solace.com/Configuring-and-Managing-Routers/Managing-TLS-SSL-Service.htm>. Version: 4 2018. – Last viewed on April, 6th 2018
- [94] CORPORATION, Solace ; CORPORATION, Solace (Hrsg.): Solace Websockets. <https://docs.solace.com/MQTT-311-Prtl-Conformance-Spec/Using%20WebSocket%20as%20a%20network.htm>. Version: 4 2018. – Last viewed on April, 6th 2018
- [95] GIBBONS, Douglas ; GIBBONS, Douglas (Hrsg.): Trafo TStack License. <https://github.com/trafero/tstack/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 6th 2018
- [96] GMBH, Erlio ; GMBH, Erlio (Hrsg.): VerneMQ License. <https://github.com/erlio/vernemq/blob/master/LICENSE.txt>. Version: 4 2018. – Last viewed on April, 6th 2018
- [97] COLLINA, Matteo ; COLLINA, Matteo (Hrsg.): Aedes License. <https://github.com/mcollina/aedes/blob/master/LICENSE>. Version: 4 2018. – Last viewed on April, 6th 2018
- [98] TECHCRUNCH.COM ; TECHCRUNCH.COM (Hrsg.): Amazon Has Quietly Acquired 2lemetry To Build Out Its Internet Of Things Strategy. <https://techcrunch.com/2015/03/12/amazon-has-quietly-acquired-2lemetry-to-build-out-its-internet-of-things-strategy/>. Version: 4 2018. – Last viewed on April, 5th 2018
- [99] APACHE.ORG ; APACHE.ORG (Hrsg.): Is Apache Apollo dead? <http://activemq.2283324.n4.nabble.com/Is-Apollo-Support-Cluster-Deployment-td4699916.html>. Version: 4 2018. – Last viewed on April, 5th 2018
- [100] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): RSMB documentation first part. <https://github.com/eclipse/mosquitto.rsmb>. Version: 4 2018. – Last viewed on April, 6th 2018

- [101] FOUNDATION, Eclipse ; FOUNDATION, Eclipse (Hrsg.): RSMB documentation second part. <https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=d5bedadd-e46f-4c97-af89-22d65ffee070>. Version: 4 2018. – Last viewed on April, 6th 2018
- [102] AG, Software ; AG, Software (Hrsg.): UniversalMessaging documentation second part. <http://techcommunity.softwareag.com/web/guest/pwiki/-/wiki/Main/Universal+Messaging+with+MQTT>. Version: 4 2018. – Last viewed on April, 6th 2018
- [103] GIBBONS, Douglas ; GIBBONS, Douglas (Hrsg.): Trafo TStack Documentation. <https://github.com/trafero/tstack>. Version: 4 2018. – Last viewed on April, 6th 2018