

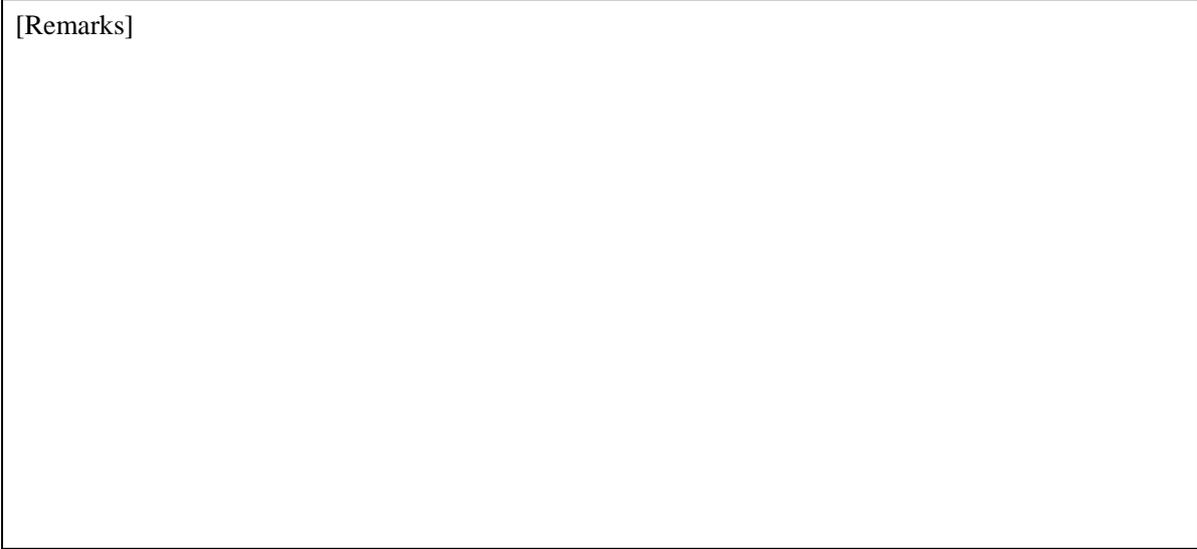
# MQTT Client provider (Subscriber)

Version 1.4.2

## User's guide

October 27, 2022

[Remarks]





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## 1. Introduction

This document is a user's guide of a CAO provider that works as a MQTT client to subscribe messages from MTQQ Broker.

CAO provider described in this document is called SUBSCRIBER provider(CaoProvMQTT\_SUBSCRIBER.dll)

Chapter 2 describes the overview of SUBSCRIBER provider, and details about variables

SUBSCRIBER provider uses an open source Mosquitto library to use MQTT protocol for communication.

For details about MQTT protocol and Mosquitto library, refer to the following URL.

The operation of MQTT Client as PUBLISHER is implemented in the PUBLISHER provider (CaoProvMQTT\_PUBLISHER.dll) that is another MQTT Client provider.

For details about PUBLISHER provider, refer to PUBLISHER provider user's guide.

In order to use this provider, "Visual C++ Redistributable for Visual Studio 2015" is required.
---

[Reference site links]

<http://mqtt.org/>

<http://mosquitto.org/>

## 2. Outline of this provider

### 2.1. Outline

SUBSCRIBER provider is a CAO provider that requests to subscribe messages for MQTT Broker with Mosquitto library. The file format is DLL (Dynamic Link Library) and it is dynamically uploaded from the CAO engine. To use SUBSCRIBER provider, you need to install ORiN2SDK, or, complete registration manually with the procedure shown below.

**Table 2-1 SUBSCRIBER provider**

File name	CaoProvMQTT_SUBSCRIBER.dll
ProgID	CaoProv.MQTT_SUBSCRIBER
Registration	regsvr32 CaoProvMQTT_SUBSCRIBER.dll
De-registration	regsvr32 /u CaoProvMQTT_SUBSCRIBER.dll



	authority). (Default: null)
Certificate[=<Certificate file name >] <sup>2</sup>	Specify a certificate file name. (Default: null)
PrivateKey[=<Private key file name >] <sup>2</sup>	Specify a private key file name. (Default: null)
PKPassword[=<Password>] <sup>2</sup>	Specify a password of private key
Insecure[=<True/False>]	Specify whether to skip the server's certificate and server consistency check when connecting secure communications.  True: Skip the check. False: Do not skip check (default)

<sup>2</sup> Secure communication is performed when the CA option is specified. If you also perform client authentication, specify Certificate, PrivateKey, and PKPassword.

### 2.2.1.1. Conn option

The following shows connection parameter strings for Conn option.

“Conn=<host>[:<port>[:<keepalive>]]”

- <host> : Connection destination host name or IP address  
Example: “localhost”, “192.168.0.1”
- <port> : Connection port number 1883, 8883, ... any number (Default: 1883)
- <keepalive> : Keep alive value that is set to MQTT Broker. (sec)  
(Default: 60)

### 2.2.1.2. MqttProtocol option

The following shows connection parameter strings for MqttProtocol option.

“MqttProtocol[=<version>]”

- <version> : MQTT protocol version used for communication.  
Either V3.1 or V3.1.1 is available.  
v31, v311. (Default: v311)

### 2.2.1.3. Will option

The following shows connection parameter strings for Will option.

Will[=<topic>:<payload>[:<qos>[:<retain>]]]

- <topic> : Topic
- <payload> : Text message in Will.
- <qos> : QoS. 0, 1, 2. (Default : 0)
- <retain> : Retain. True, False. (Default: False)

### 2.2.2. CaoController::AddVariable method

AddVariable method of CaoController class is a method to create variable objects that enables each provider to subscribe.

To execute Subscribe, use the variable name as a topic. (Refer to 2.2.2.1)

SUBSCRIBER provider executes Subscribe/Unsubscribe by registration and deregistration of a variable.

**Syntax** AddVariable(<bstrVariableName:VT\_BSTR>[,<bstrOption:VT\_BSTR>])

<bstrVariableName> : [in] Variable Name

<bstrOption> : [in] Option character string

The following shows a list of option character string items.

**Table 2-3 Option strings of CaoController::AddVariable**

Option <sup>3</sup>	Description
QoS[=<0/1/2>]	QoS at Subscribe <u>0</u> , 1, 2. (Default : 0)
QueueMaxSize [=<The maximum queue size>]	The maximum queue size that stores received topic data. (Default : 5) (Refer to 2.2.2.2)
Tupe [=<0 / 1>]	Data type for Payload. <u>0</u> (VT_BSTR) 1 (VT_UI1   VT_ARRAY)
CodePage[=<Code page>]	Code page of the message to publish. <u>0</u> or higher (Refer to 2.2.2.3)

<sup>3</sup> Items enclosed with square brackets (“[]”) are omissible. Underlined part shows the default value when the option is not specified.

### 2.2.2.1. Specifying a topic with a variable name

SUBSCRIBER provider uses a variable name as a topic.

A topic has a format of layer using “/” (slash) as a delimiter. It also can be specified with wildcards, such as “#” (sharp) or “+” (plus). (You can combine such wildcards to use.)

- / : Delimiter of layer structure
- # : All topics in this layer and lower layers will be the target.
- + : Treat this layer as a wildcard

Example) Office/# All topics in “Office” and the lower layer will be the target.

- Match : Office/Tokyo
- Match : Office/Osaka
- Match : Office/Nagoya/4F
- Do not match : House/Tokyo/1F

Example) Office/+/3F If the first layer and the third layer matches, any topic is allowed in the second layer.

- Match : Office/Tokyo/3F
- Match : Office/Osaka/3F
- Do not match : Office/Nagoya/4F
- Do not match : Office/Tokyo/1F

### 2.2.2.2. QueueMaxSize option

SUBSCRIBER provider creates a queue for each topic that has been registered as a variable name at the timing of AddVariable, and then stores the received topic data.<sup>4</sup>

Up to the maximum queue size (data count) created by QueueMaxSize option can be specified. If the received data size exceeds the maximum queue size, the oldest data will be deleted and the received data will be stored in this area.

QueueMaxSize[=<The maximum queue size>]

- <The maximum queue size> : The maximum queue size (data count).
- 1 or higher : The number of queue data is limited to the entered value.
- 0 : The number of queue data is unlimited.

<sup>4</sup> When several variables are registered, if a wildcard is used to specify variable, as a result, several queues match the condition, the queue whose variable registration order is the youngest will store the received data.

### 2.2.2.3. Code page specification

Specify code page or constant.

#### 2.2.2.3.1. Code page

example)

932	:	Japanese(Shift JIS)
1200	:	Unicode
65001	:	Unicode(UTF-8)

#### 2.2.2.3.2. Constant

0	:	The system default Windows ANSI code page.
1	:	The current system OEM code page.
2	:	The current system Macintosh code page.
3	:	The Windows ANSI code page for the current thread.
42	:	Symbol code page.

### 2.2.2.4. Queue storage format of received topic data

#### 2.2.3. CaoVariable:get\_Value property

This property obtains data from the queue that corresponds to a variable name (= topic).

If there is no receiving data, VT\_EMPTY is returned.

Received topic data is stored in the queue with the following format.

```
VT_VARIANT | VT_ARRAY
[0] VT_BSTR   : Topic
[1] VT_I4     : Message ID
[2] VT_I4     : QoS
[3] VT_BOOL   : Retain
[4] VT_DATE   : Reception time stamp
[5] VT_BSTR   : Reception data (Payload)
    or VT_UI1 |
VT_ARRAY
```



## 2.2.4. CaoController::OnMessage event

The following causes trigger OnMessage events of CaoController class

**Table 2-4 Message type**

Message type		Trigger
0	Topic received	This message appears when a topic (including Will message) is received.
1	Disconnection detected	This message occurs when a client disconnects from MQTT Broker by any causes.
2	Queue size over (specified queue size exceeded)	This message appears when the receive data exceeds the specified queue size and the oldest data was deleted to store the newly received data.
3	Queue size over (memory shortage)	This message appears when the data storage to the queue failed due to the memory shortage.

### 2.2.4.1. Topic received

Data type obtained by “Topic received” message is as follows.

Number	:	Message type (0)
Value	:	Payload data (VT_BSTR or VT_UI1   VT_ARRAY)
DateTime	:	Time stamp
Destination	:	Received topic
Source	:	Connection destination host name or IP address
Description	:	Null

### 2.2.4.2. Disconnection detected

Data type obtained by “Disconnection detection” message is as follows.

Number	:	Message type (1)
Value	:	Response code of the cause of disconnection (VT_I4)
DateTime	:	Time stamp
Destination	:	Null
Source	:	Connection destination host name or IP address
Description	:	Text description of the response code

**2.2.4.3. Queue size over (specified queue size exceeded)**

Data type obtained by “Queue size over (specified size exceeded)” message is as follows.

Number	:	Message type (2)
Value	:	Null
DateTime	:	Time stamp
Destination	:	Received topic
Source	:	Connection destination host name or IP address
Description	:	Null

**2.2.4.4. Queue size over (memory shortage)**

Data type obtained by “Queue size over (memory shortage)” message is as follows.

Number	:	Message type (3)
Value	:	Null
DateTime	:	Time stamp
Destination	:	Received topic
Source	:	Connection destination host name or IP address
Description	:	Null

## 2.3. Variable list

### 2.3.1. CaoController class

**Table 2-5 CaoController class User variable list**

Variable name	Data type	Description	Attribute	
			get	put
Arbitrary (used as a topic)	VT_VARIANT   VT_ARRAY	Execute Subscribe/UnSubscribe at the variable registration/deregistration. Obtain the topic data that has been received by get_Value from the queue.	✓	—

**Table 2-6 CaoController class System variable list**

Variable name	Data type	Description	Attribute	
			get	put
@VERSION	VT_BSTR	Provider version information	✓	—
@MQTT_LIB_VERSION	VT_BSTR	Mosquitto library Version information	✓	—

## 2.4. Error code

In SUBSCRIBER provider, the following original error codes are defined.

For about ORiN2 common errors, refer to the error code section of [ORiN2Programming guide](#).

**Table 2-7 Original error code**

Error name	Error number	Description
E_MOSQ_CONN_PENDING	0x80100001	Error code of Mosquitto library MOSQ_ERR_CONN_PENDING occurred.
E_MOSQ_NOMEM	0x80100002	Error code of Mosquitto library MOSQ_ERR_NOMEM occurred.
E_MOSQ_PROTOCOL	0x80100003	Error code of Mosquitto library MOSQ_ERR_PROTOCOL occurred.
E_MOSQ_INVALID	0x80100004	Error code of Mosquitto library MOSQ_ERR_INVALID occurred.
E_MOSQ_NO_CONN	0x80100005	Error code of Mosquitto library MOSQ_ERR_NO_CONN occurred.
E_MOSQ_CONN_REFUSED	0x80100006	Error code of Mosquitto library MOSQ_ERR_CONN_REFUSED occurred.
E_MOSQ_NOT_FOUND	0x80100007	Error code of Mosquitto library MOSQ_ERR_NOT_FOUND occurred.
E_MOSQ_CONN_LOST	0x80100008	Error code of Mosquitto library MOSQ_ERR_CONN_LOST occurred.
E_MOSQ_TLS	0x80100009	Error code of Mosquitto library MOSQ_ERR_TLS occurred.
E_MOSQ_PAYLOAD_SIZE	0x8010000A	Error code of Mosquitto library MOSQ_ERR_PAYLOAD_SIZE occurred.
E_MOSQ_NOT_SUPPORTED	0x8010000B	Error code of Mosquitto library MOSQ_ERR_NOT_SUPPORTED occurred.
E_MOSQ_AUTH	0x8010000C	Error code of Mosquitto library MOSQ_ERR_AUTH occurred.
E_MOSQ_ACL_DENIED	0x8010000D	Error code of Mosquitto library MOSQ_ERR_ACL_DENIED occurred.
E_MOSQ_UNKNOWN	0x8010000E	Error code of Mosquitto library MOSQ_ERR_UNKNOWN occurred.

---

E_MOSQ_ERRNO	0x8010000F	Error code of Mosquitto library MOSQ_ERR_ERRNO occurred.  The MQTT Broker of the connection destination may not be running. Start MQTT Broker and reconnect.
E_MOSQ_EAI	0x80100010	Error code of Mosquitto library MOSQ_ERR_EAI occurred.
E_MOSQ_PROXY	0x80100011	Error code of Mosquitto library MOSQ_ERR_PROXY occurred.

## Appendix A. Terms of MQTT protocol

This chapter describes terms used in the MQTT protocol.

➤ **Broker**

A server of the MQTT protocol communication.

A Broker receives a topic message from a Publisher and then provides it to an interested Subscriber.

➤ **Subscriber**

A Client on the MQTT protocol communication (message receiving side).

A Subscriber registers at a Broker to subscribe a desired topic, and then receive messages.

➤ **Publisher**

A Client on the MQTT protocol communication (message sending side).

A Publisher sends messages to a Broker with specifying a topic. There is no need of thinking about Subscriber.

➤ **QoS**

QoS defines how difficult the Broker/Client tries to assure that a message is received.

QoS0 : The Broker/Client delivers the message at most once.

QoS1 : The Broker/Client delivers the message at least once.

QoS2 : The Broker/Client delivers the message exactly once.

➤ **Will**

When a Client connects to a Broker, the Client can inform the Broker that it has a Will.

If the Client disconnects from Broker unexpectedly, a topic and a message specified by Will are sent to a Subscriber which connects to the Broker.

➤ **Retain**

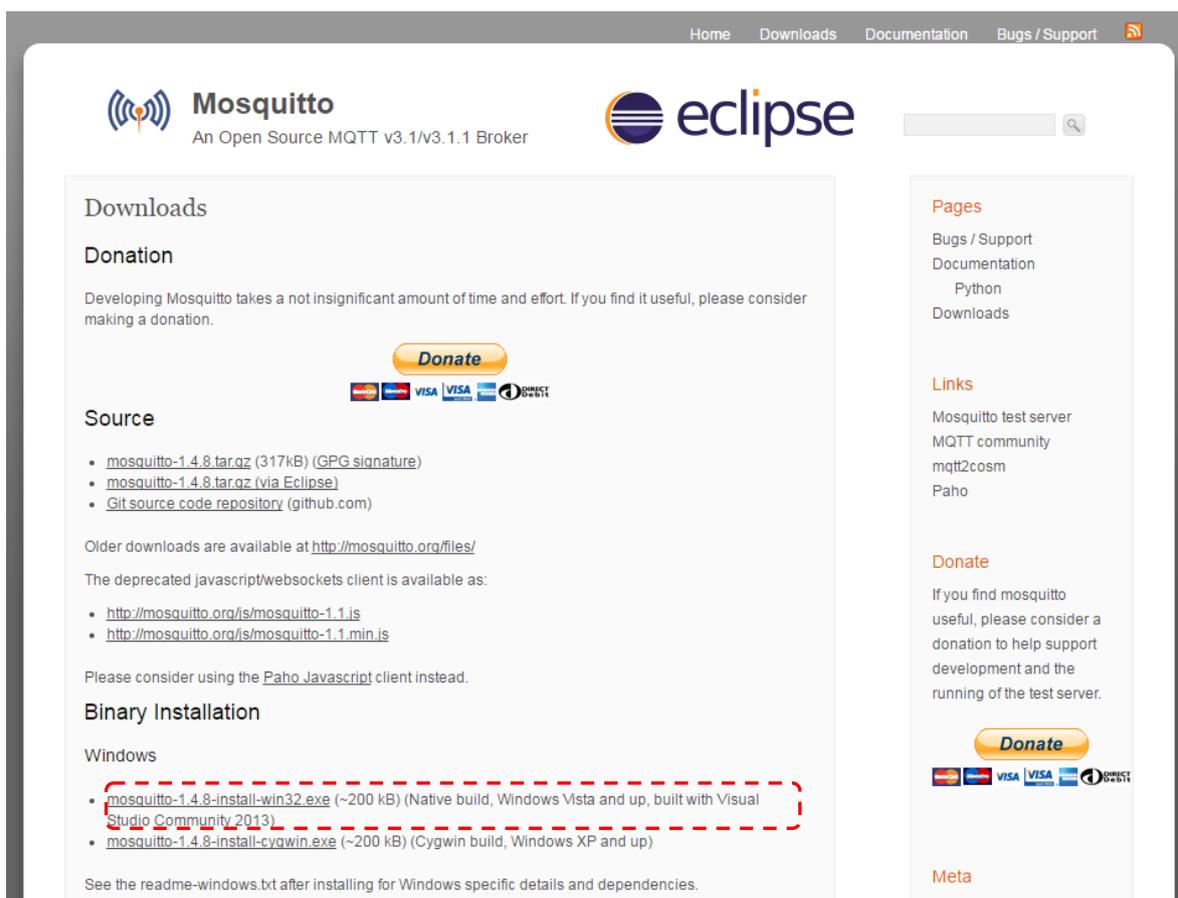
“Retain” is a function that Broker retains the latest message in each topic after publishing it. If a new subscription is made that matches the topic of the retained message, the message is sent to the subscriber.

## Appendix B. Implementation of MQTT Broker

This chapter explains how to implement MQTT Broker with Mosquitto that is an open source message broker.

### [For Windows]

1. Download an installer from <http://mosquitto.org/download/> ..



The screenshot shows the Mosquitto website with the following content:

- Navigation: Home, Downloads, Documentation, Bugs / Support
- Logos: Mosquitto (An Open Source MQTT v3.1/v3.1.1 Broker), Eclipse
- Downloads section:
  - Donation: Developing Mosquitto takes a not insignificant amount of time and effort. If you find it useful, please consider making a donation. Includes a 'Donate' button and logos for MasterCard, Visa, and Bitcoin.
  - Source:
    - [mosquitto-1.4.8.tar.gz \(317kB\) \(GPG signature\)](#)
    - [mosquitto-1.4.8.tar.gz \(via Eclipse\)](#)
    - [Git source code repository \(github.com\)](#)
  - Older downloads are available at <http://mosquitto.org/files/>
  - The deprecated javascript/websockets client is available as:
    - <http://mosquitto.org/files/mosquitto-1.1.js>
    - <http://mosquitto.org/files/mosquitto-1.1.min.js>
  - Please consider using the [Paho Javascript](#) client instead.
  - Binary Installation:
    - Windows:
      - [mosquitto-1.4.8-install-win32.exe \(~200 kB\) \(Native build, Windows Vista and up, built with Visual Studio Community 2013\)](#) (highlighted with a red dashed box)
      - [mosquitto-1.4.8-install-cygwin.exe \(~200 kB\) \(Cygwin build, Windows XP and up\)](#)
    - See the [readme-windows.txt](#) after installing for Windows specific details and dependencies.
- Right sidebar:
  - Pages: Bugs / Support, Documentation, Python, Downloads
  - Links: Mosquitto test server, MQTT community, mqtt2cosm, Paho
  - Donate: If you find mosquitto useful, please consider a donation to help support development and the running of the test server. Includes a 'Donate' button and logos for MasterCard, Visa, and Bitcoin.
  - Meta

2. Execute the downloaded installer.
3. You will find a message that asks you to install OpenSSL (libeay32.dll, ssleay32.dll) and pthreads (pthreadVC2.dll) manually though, ignore this message in this step and go next. (Details are explained later.)
4. Leave the components as default settings.
5. Change the install destination to “C:\mosquit” from “C:\Program Files (x86)\mosquitto”, which is the default setting. (This is because the default path includes spaces that makes difficult to later settings.)
6. Complete the install.

- Download the Win32 installer (the latest version) of OpenSSL that have been compiled from <http://slproweb.com/products/Win32OpenSSL.html>. (Leave as a default.)

**Download Win32 OpenSSL**

Download Win32 OpenSSL today using the links below!

File	Type	Description
<a href="#">Win32 OpenSSL v1.0.2h Light</a>	2MB Installer	Installs the most commonly used essentials of Win32 OpenSSL v1.0.2h (Recommended for users by the creators of <a href="#">OpenSSL</a> ). Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
<a href="#">Win32 OpenSSL v1.0.2h</a>	16MB Installer	Installs Win32 OpenSSL v1.0.2h (Recommended for software developers by the creators of <a href="#">OpenSSL</a> ). Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
<a href="#">Win64 OpenSSL v1.0.2h Light</a>	2MB Installer	Installs the most commonly used essentials of Win64 OpenSSL v1.0.2h (Only install this if you are a software developer needing 64-bit versions of Windows. Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
<a href="#">Win64 OpenSSL v1.0.2h</a>	16MB Installer	Installs Win64 OpenSSL v1.0.2h (Only install this if you are a software developer needing 64-bit versions of Windows. Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
<a href="#">Win32 OpenSSL v1.0.1t Light</a>	2MB Installer	Installs the most commonly used essentials of Win32 OpenSSL v1.0.1t (Recommended for users by the creators of <a href="#">OpenSSL</a> ). Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
<a href="#">Win32 OpenSSL v1.0.1t</a>	16MB Installer	Installs Win32 OpenSSL v1.0.1t (Recommended for software developers by the creators of <a href="#">OpenSSL</a> ). Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.
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<a href="#">Win64 OpenSSL v1.0.1t</a>	16MB Installer	Installs Win64 OpenSSL v1.0.1t (Only install this if you are a software developer needing 64-bit OpenSSL for Windows. Only installs on 64-bit versions of Windows. Note that this is a default build of OpenSSL and is subject to local and state laws. More information can be found in the legal agreement of the installation.

Make sure to install Win32 regardless of your Windows environment (x86 or x64).  
(Align with Broker)

- Download an compressed file (the latest version) of pthreads from <http://windows.php.net/downloads/pecl/releases/pthreads/> and then expand it to any directory.

## windows.php.net – /downloads/pecl/releases/pthreads/

[\[To Parent Directory\]](#)

10/22/2013	5:31 AM	<dir>	<a href="#">0.0.43</a>
10/22/2013	5:58 AM	<dir>	<a href="#">0.0.44</a>
10/22/2013	6:24 AM	<dir>	<a href="#">0.0.45</a>
1/18/2014	10:54 AM	<dir>	<a href="#">0.1.0</a>
3/7/2014	6:32 PM	<dir>	<a href="#">1.0.0</a>
3/9/2014	1:05 AM	<dir>	<a href="#">1.0.1</a>
3/14/2014	11:45 AM	<dir>	<a href="#">2.0.0</a>
3/16/2014	10:51 PM	<dir>	<a href="#">2.0.1</a>
10/1/2014	9:21 AM	<dir>	<a href="#">2.0.10</a>
3/17/2014	7:51 PM	<dir>	<a href="#">2.0.2</a>
3/27/2014	10:52 AM	<dir>	<a href="#">2.0.3</a>
4/10/2014	11:52 PM	<dir>	<a href="#">2.0.4</a>
5/9/2014	10:05 PM	<dir>	<a href="#">2.0.5</a>
5/10/2014	1:19 PM	<dir>	<a href="#">2.0.6</a>
5/10/2014	7:19 PM	<dir>	<a href="#">2.0.7</a>
9/15/2014	8:20 AM	<dir>	<a href="#">2.0.8</a>
9/24/2014	8:52 PM	<dir>	<a href="#">2.0.9</a>
9/10/2015	6:13 PM	<dir>	<a href="#">3.0.0</a>
9/12/2015	9:03 PM	<dir>	<a href="#">3.0.1</a>
9/13/2015	9:45 AM	<dir>	<a href="#">3.0.2</a>
9/17/2015	12:15 PM	<dir>	<a href="#">3.0.3</a>
9/18/2015	2:15 PM	<dir>	<a href="#">3.0.4</a>
9/20/2015	9:45 PM	<dir>	<a href="#">3.0.5</a>
9/22/2015	7:15 AM	<dir>	<a href="#">3.0.6</a>
9/27/2015	2:45 PM	<dir>	<a href="#">3.0.7</a>
10/7/2015	3:35 PM	<dir>	<a href="#">3.0.8</a>
11/20/2015	3:04 PM	<dir>	<a href="#">3.1.0</a>
11/20/2015	3:44 PM	<dir>	<a href="#">3.1.1</a>
11/22/2015	11:15 PM	<dir>	<a href="#">3.1.2</a>
11/25/2015	12:45 PM	<dir>	<a href="#">3.1.3</a>
12/2/2015	8:45 AM	<dir>	<a href="#">3.1.4</a>
12/6/2015	10:15 AM	<dir>	<a href="#">3.1.5</a>
2/13/2016	9:48 AM	<dir>	<a href="#">3.1.6</a>

- Add the path to OpenSSL and pthreads.
- Restart your computer..

Now you can use Mosquitto Broker. In default setting, Mosquitto Broker starts as a service at the startup of your computer. You need to close a running service if you start an option by specifying with a command line or read a conf file which setting has been modified.

**[For Linux (Ubuntu)]**

1. Start Terminal, and then execute the following commands.

2. Update a package list.

```
$ sudo apt-get update
```

3. Implement a Broker.

```
$ sudo apt-get install mosquitto
```

4. Implement a Client.

```
$ sudo apt-get install mosquitto-clients
```

If any dependent packages such as OpenSSL are not installed, you need to install it separately.

If mosquitto does not appear in the package list, add a repository with the following command.

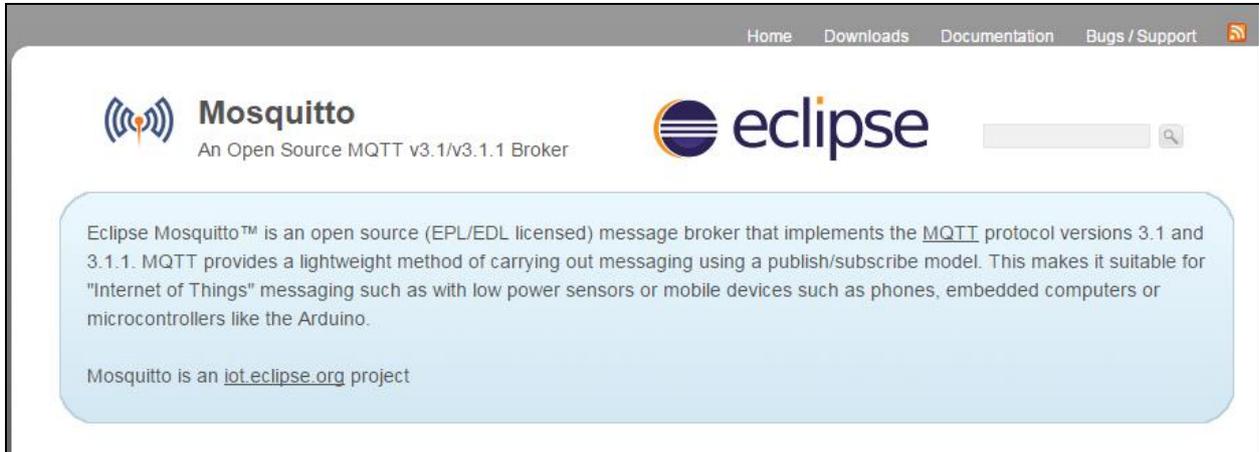
```
$ sudo add-apt-repository ppa:mosquitto-dev/mosquitto-ppa
```

Once the Mosquitto package has been implemented, Broker becomes a service-state.

Just like the Windows environment, you need to close a running service if you start an option by specifying with a command line or read a conf file which setting has been modified.

## Appendix C. Mosquitto

URL: <https://mosquitto.org/>



### EPL

## Eclipse Public License - v 1.0

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i) changes to the Program, and

ii) additions to the Program;

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## Appendix D. Pthread\_win32

URL: <http://sources.redhat.com/pthreads-win32>



**Open Source  
POSIX Threads for Win32**

**Current release: 2.9.1 (2012-05-27)**  
See the [ANNOUNCEMENT](#) and [NEWS](#) for details.

**Pthreads-w32 release 1.11.0 (2005-06-04) was [the last series 1.x.x version!](#)**  
(Version 1.11.0 is a back-port of the 2.7.0 functionality and bug fixes. See the NEWS file inside the package for more information.)

### What is this project about?

The [POSIX 1003.1-2001](#) standard defines an application programming interface (API) for writing multithreaded applications. This interface is known more commonly as *pthread*s. A good number of modern operating systems include a threading library of some kind: Solaris (UI) threads, Win32 threads, DCE threads, DECthreads, or any of the draft revisions of the pthreads standard. The trend is that most of these systems are slowly adopting the pthreads standard API, with application developers following suit to reduce porting woes.

Win32 does not, and is unlikely to ever, support pthreads natively. This project seeks to provide a freely available and high-quality solution to this problem.

Various individuals have been working on independent implementations of this well-documented and standardised threading API, but most of them never see the light of day. The tendency is for people to only implement what they personally need, and that usually does not help others. This project attempts to consolidate these implementations into one implementation of pthreads for Win32.

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pthread-win32 - a POSIX threads library for Microsoft Windows

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#### Why pthreads-win32 did not use the GNU General Public License

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The goal of the pthreads-win32 project has been to provide a quality and complete implementation of the POSIX threads API for Microsoft Windows within the limits imposed by virtue of it being a stand-alone library and not

linked directly to other POSIX compliant libraries. For example, some functions and features, such as those based on POSIX signals, are missing.

Pthreads-win32 is a library, available in several different versions depending on supported compilers, and may be used as a dynamically linked module or a statically linked set of binary modules. It is not an application on it's own.

It was fully intended that pthreads-win32 be usable with commercial software not covered by either the GPL or the LGPL licenses. Pthreads-win32 has many contributors to it's code base, many of whom have done so because they have used the library in commercial or proprietry software projects.

Releasing pthreads-win32 under the LGPL ensures that the library can be used widely, while at the same time ensures that bug fixes and improvements to the pthreads-win32 code itself is returned to benefit all current and future users of the library.

Although pthreads-win32 makes it possible for applications that use POSIX threads to be ported to Win32 platforms, the broader goal of the project is to encourage the use of open standards, and in particular, to make it just a little easier for developers writing Win32 applications to consider widening the potential market for their products.