

# **AWS IOT** User Manual

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### **Overview of AWS IoT**

AWS (Amazon Web Service) is a cloud platform now widely used on the market, and AWS IoT (Internet of Things) supports MQTT protocol. Observing the market trend, from EBPro V6.00.01, Maple Systems has adopted AWS IoT service and integrated it with the MQTT feature released earlier. Apart from using AWS IoT as a broker in the publish-subscribe mode, users can also create Thing and Shadow offered by AWS IoT to make the most of MQTT.

This manual covers hosting a MQTT server, configuring EBPro, and establishing an IoT.

### **Hosting MQTT Server**

AWS is a cloud platform; therefore, the settings are all configured on the web. Please sign up on the Amazon website before hosting an MQTT server.

1. Visit Amazon Web Service at <u>https://aws.amazon.com</u> and sign up.

aws	aws
Root user sign in	Sign in as IAM user Account ID (12 digits) or account alias
Email *****	IAM user name
Sign In	Password
Sign in to a different account	Remember this account

2. After signing in, browse for IoT Core.

### AWS IoT User Manual





3. On the AWS IoT page, Policy and Certificate can be created.



4. Open Manage > Security > Policies and then click Create policy.

aws Services	Q Search for services, features, blogs, docs, and more [Alt+S]	2	\$	0	N. Virginia 🔻
<ul> <li>Device Advisor</li> <li>MOTT test client</li> </ul>	AWS IOT > Security > Policies				
Manage <ul> <li>All devices</li> <li>Greengrass device</li> </ul>	AWS IoT policies (1) Info         AWS IoT policies allow you to control access to the AWS IoT Core data plane operations. AWS IoT policies are separate and different from IAM p plane operations.         C       Delete         Create policy         Q. Find policies	oolicies. A	WS IoT p	olicies ap	ply only to AWS IoT
<ul> <li>LPWAN devices</li> <li>Remote actions</li> <li>Message Routing</li> </ul>	Policy name				
Retained messag Security	, myLightPolicy				
Intro Certificates					
Policies Certificate aut	orities				
Role Aliases Authorizers					
Audit Detect					
Fleet Hub					

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aws Services Q Search for s	ervices, features, blogs, docs, and more [Alt+S]	D	\$	0	N. Virginia 🔻
<ul> <li>Device Advisor</li> <li>MQTT test client</li> </ul>	AWS IoT > Security > Policies				
Manage  All devices  Greengrass devices  LPWAN devices	AWS IoT policies (1) Info         AWS IoT policies allow you to control access to the AWS IoT Core data plane operations. AWS IoT policies are separate plane operations.         C       Delete         Create policy         Q       Find policies	te and different from IAM policie	i. AWS lot	policies a	oply only to AWS loT
<ul> <li>Remote actions</li> <li>Message Routing Retained messages</li> </ul>	Policy name       myLightPolicy				
▼ Security Intro					
Certificates Policies Certificate authorities					
Role Aliases Authorizers					
Audit Detect					
▶ Fleet Hub					

5. This page is for defining actions that can be performed by a resource. You may use the settings in the screenshot below or set your own. Click **Create** when finished.

	AWS lot > Security > Policies > Create policy
lage All devices	Create policy
Freengrass devices PWAN devices	AV/S for Core policies allow you to manage access to the AW/S for Core data plane operations.
lemote actions lessage Routing	Policy properties ANS In'T Care supports named policies so that many identifies can referenze the same policy document.
retained messages	Policy name
Intro	Document
Certificates	A policy same is an alphanumeric tring that can also contain period (), comma (), hyphen(-), underscere (), plus sign (+), end at sign (p) characters, but no spaces.
Policies	
Certificate authorities	► Tags - optional
Role Aliases	
Authorizers	Policy statements Policy examples
Audit	
Detect	
Audit • Detect leet Hub	Policy document info An ARYS bit policy sontains one or more policy statements. Each policy statement contains actions, resources, and an effect that grants or dones the actions by the resources. Biolider JSON
Audit • Detect leet Hub ce Software	Policy document into An AuX soft policy statements. Each policy statement contains actions, resources, and an effect that grants or dones the actions by the resources. Policy effect: Policy action Policy resource
Audit • Detect leet Hub ce Software 1g groups	Policy document into         Intervention         Interventintervention         Interventintervention
Audit • Detect leet Hub ce Software 19 groups ings	Policy document info     As Aris's tot policy statements. Each policy statements. Each policy statements. Each policy estatement. Each policy estatement. Each policy estatement estates actions, resources, and an effect their genets or dones the actions by the resources.     Builder JSON       Policy effect:     Policy estatement     Policy resource       Allow     Image: Image
Audit > Detect leet Hub ice Software ng groups ings n	Policy document inte     Builder     JSON       An aris in party contains one or more policy statements. Each paley statement contains actions, resources, and an effect that grants or denies the actions by the measures.     Builder     JSON       Policy effect:     Policy resource     *     *     *     Remove       Allow     V     *     *     *     Remove
Audit > Detact Leest Hub (ce Software ng groups ings mure spotlight	Policy document info     Interface     Policy document info       An ANS ist pulsy contains one or more policy statement. Each policy statement contains actions, resources, and an effect that grants or donors the actions by the mesures.     Builder     JSON       Policy effect:     Policy resource     Allow     V     X     Remove       Allow     V     X     V     X     Remove
Audit - - Detect leet Hub ce Software rg groups ings n ure spotlight urnentation [2]	Policy document info     Builder     J50N       An ANS toT policy contains one or more policy statements. Each policy statement contains actions, resources, and an effect that grants or denses the actions by the mesares.     Builder     J50N       Policy effect:     Policy action     Policy resource     Remove       Allow     *     *     Remove       Add new statement     Add new statement     Remove

6. Click Security > Certificates and then click Add certificate > Create certificate.

aws 🏭 Services	Q Search for services, features, blogs, docs, and more [Alt+5]	D
Manage	AWS IoT > Security > Certificates	
<ul> <li>All devices</li> <li>Greengrass devices</li> <li>LPWAN devices</li> <li>Remote actions</li> <li>Message Routing Retrieved more actions</li> </ul>	Certificates Info X.509 certificates authenticate device and client connections. C Certificates Certificates you've transferred	ertificates must be registered with AWS IoT and activated before a device or client can communicate with AWS IoT.
♥ Security	Certificates (1)	C Actions V Add certificate
Certificates	Q Find certificates	Create certificate Register certificates
Policies	Certificate ID	▼ Status ⊽ Created ▽

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 Select Auto-generate new certificate (recommended), set Certificate Status to Active, and then click Create.

VS Services C	Search for services, features, blogs, docs, and more [Alt+S]
Connect Connect one device Connect many device	AWS IoT > Security > Certificates > Create certificate Create certificate Info Certificates authenticate devices and clients so that they can connect to AWS IoT. Your device won't be able to connect to AW IoT without authentication and an appropriate policy.
<ul> <li>Device Advisor</li> <li>MOTT tort client</li> </ul>	Certificate
Manage <ul> <li>All devices</li> <li>Greengrass devices</li> </ul>	<ul> <li>Auto-generate new certificate (recommended)</li> <li>Generate a new certificate (recommended)</li> <li>Generate a new certificate, public key, and private key</li> <li>using AWS IoT's certificate authority and register it with</li> <li>AWS IoT.</li> <li>Create certificate with certificate signing request (CSR)</li> <li>Upload your own certificate signing request (CSR) file to</li> <li>create and register a certificate that's based on a private</li> <li>key you own.</li> </ul>
<ul> <li>LPWAN devices</li> <li>Remote actions</li> <li>Message Routing Retained messages</li> </ul>	Certificate status Assign the initial state of the new certificate. The certificate must be active before it can be used to connect to AWS IoT. You can change its status later in the certificate's detail page.
<ul> <li>Security</li> <li>Intro</li> <li>Certificates</li> <li>Policies</li> </ul>	<ul> <li>Inactive         <ul> <li>A device won't be able to connect to AWS using this certificate until it's activated.</li> <li>Active</li></ul></li></ul>
Certificate authori Role Aliases	25 Cancel Create

 Download and save these files: Device Certificate, Public Key File, Private Key File, and RSA 2048 bit key: Amazon Root CA 1.



Download certificates and keys	×
Download certificates and keys	t can connect securely to AWS
IoT. You can download the certificate now, or later, but the key files can	only be downloaded now.
Device certificate	Download
9c3c9550dfdte.pem.crt	
Key files	
The key files are unique to this certificate and can't be downloaded after Download them now and save them in a secure place.	you leave this page.
A This is the only time you can download the key files for	r this certificate.
Public key file	[₩] Download
9c3c9550dfdb7324bd367824d1c4fd-public.pem.key	
Private key file	Download
9c3c9550dfdb7324bd36782d1c4fd-private.pem.key	
Root CA certificates	
Download the root CA certificate file that corresponds to the type of dat you're using. You can also download the root CA certificates later.	a endpoint and cipher suite
Amazon trust services endpoint	Download
RSA 2048 bit key: Amazon Root CA 1	
Amazon trust services endpoint	Download
ECC 256 bit key: Amazon Root CA 3	
If you don't see the root CA certificate that you need here, AW root CA certificates. These root CA certificates and others are developer guides.	'S IoT supports additional available from our
	Continue

9. Click the certificate created previously and click **Attach policies** under Policies. In the window that follows, select the Policy created previously and then click **Attach policies**.

Attach policies to the certifi	cate ×
Policies Choose policies to attach to this certificate. Choose AWS IoT policy	The certificate can have up to 10 policies attached to it.
Document X	Cancel Attach policies



Security setting is done successfully when the following box shows:
 Successfully attached the policy Document to certificate

#### $\oslash$ Successfully attached the policy Document to certificate

11. Click **Settings**. The URL marked in the red frame below is the domain name of the AWS IoT server and will be used when setting MQTT in EBPro; please remember it. AWS is gradually replacing servers using Symantec CA with Amazon Trust Service. As a result, please check whether the domain name contains "-ats", for example: a2xxxxxx-ats.iot.xxxxx.amazon.aws.com. The Amazon Root CA 1 certificate created in step 9 works only when the endpoint is in this format.

aws Services Q Search for se	rvices, features, blags, docs, and more [Alt+S]	D 4 0
Message Routing	AWS IoT > Settings	
Retained messages		
<ul> <li>Security</li> </ul>	Settings Info	
Intro		
Certificates	Device data endpoint Info C	
Policies	Your devices can use your account's device data endpoint to connect to AWS.	
Certificate authorities		
Role Aliases	Each of your things has a REST API available at this endpoint. MQTT clients and AWS IoT Device SDKs 🗹 also use this endpoint.	
Authorizers	Endnaint	
Audit	a2gbh2bus0sam1-ats.iot.us-east-1.amazonaws.com	
Detect		
Device Software Billing groups Settings	Domain configurations         You can create domain configurations to simplify tasks such as migrating devices to AWS IoT Core, migrating application infrastructure to AWS IoT Core and maintaining brand identity.         Actions       Create domain configuration	
Learn	Name Domain name Status Service type Date updated	
Feature spotlight		
Documentation 🖸	No domain configurations You don't have any domain configurations.	
New console experience     Tell us what you think	Create domain configuration	
.cu us what you think		
*	Logs Info Manage logs	
Feedback Looking for language selection? Fi	nd it in the new Unified Settings 🗗 © 2022,	, Amazon Web Services, Inc. or its affiliates.

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### **EBPro Settings**

After hosting an MQTT server, launch EBPro.

1. Click **IIoT/Energy** > **MQTT** to open the MQTT settings window.



 In the General tab, select Normal as cloud service to use publish-subscribe mode, or select AWS IoT to use Thing mode, and the rest will be introduced later. Use the URL obtained in Chapter 2 as domain name and use port 8883.

AQTT Ser	ver Objec	t's Properties	
General	Address	TLS/SSL System Topic	
С	omment :		
Cloud	d service :	Normal 🔹 🚯	
	Protocol :	MQTT v3.1.1 •	
8		Customize length for client ID/username/password	
		Client ID : 20 🚔 words	
		Username/password : 16 🗣 words	
Doma	in name :	a2gbh2bus0sam1-ats.iot.us-east-1.amazonaws.com	ain name
	Port :	8883 (e.g., 1883, 800	00~9000
	Client ID :	%2	
		%0 : HMI name	
		%2 : Random %% : Character %	
2			
Keen a	live time :	10 second(s)	
Tin	nestamn :		
	nestamp.	* If timestamp in MQTT is incorrect, please check your time zone sett [Time Sync./DST] page of [System Parameters] dialog.	ing in
		Clear message buffer when disconnecting gracefully.	
		Close inactive MQTT connection automatically	

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3. Configure addresses in the **Address** tab.

MQTT Server Ob	ject's Properties	×
General Addre	rss TLS/SSL System Topic	
Status address	5	
Device :	Local HMI	~ G
Address :	LW ~ 0	16-bit Unsigned
		Usage
🗹 Buffer usag	e address	
Device :	Local HMI	~ 4
Address :	LW ~ 1	16-bit Unsigned
		Usage
✓ Control add	dress	
Device :	Local HMI	~ G
Address :	LW ~ 2	16-bit Unsigned
		Usage

- 4. In the **TLS/SSL** tab, import the file generated when creating the certificate.
  - Server verification, CA certificate: Import a .pem file. (Amazon Root CA 1)
  - Client verification, Certificate: Import a .crt file. (certificate.pem.crt)
  - Client verification, Private key: Import a .key file (private.pem.key)

IQTT Server Object's Properties	
General Address TLS/SSL	
Enable	
Version : TLS 1.2 *	
Server verification	
Use certificate on HMI first (if existed). Otherwise, use imported files below	v.
CA certificate : Imported <u>more</u>	
Import Reset	
Server name must match certificate's information	
Use certificate on HMI first (if existed). Otherwise, use imported files below	v.
Certificate : Imported <u>more</u>	
Import Reset	
Use private key on HMI first (if existed). Otherwise, use imported files belo	w.
Private key : Imported	



5. The System topic includes Topic List and Connection State that HMI will automatically send once it connects to server.

AQTT Server Obj	ect's Properties	3
General Addres	ss TLS/SSL System Topic	
Topic List		
Birth Topic		
Close Topic		
Last Will		
Fnable		
	lopic: t-2/type/mt/id/%1/evt/topics_update/tmt/json	Jefault
	%0 : HMI name	
	%1 : Client ID for server %% : Character %	
	A Potain message	
	[v] Retain message	
	QoS : 1	
Content	format : JSON (Default) •	
		Reset

- 6. Restrictions of using AWS IoT as MQTT server:
  - 1. Only QoS 0 and QoS 1 are available.
  - 2. Retain message is not supported.
  - 3. The maximum number of layers is 8.
- 7. See EBPro user manual for more information for publish and subscribe settings.

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### **Thing and Shadow**

With AWS IoT, Publisher->Broker->Subscribe is no longer the only path that data is accessed over MQTT. By introducing Thing Shadow service, a Thing (a device, app, etc.) can interact with cloud applications and other devices connected to AWS IoT. A Shadow can be maintained for each Thing connected to AWS IoT. The Shadow can be used to get/set the state of a Thing over MQTT, regardless of whether the Thing is connected to the Internet.

This chapter explains the configuration of AWS IoT and EBPro.

#### AWS IoT

1. Click Manage > All devices > Things > Create things.

aws III Services Q Search for	services, features, blogs, docs, and more [Alt+S]		
AWS IoT ×	AWS IOT > Manage > Things		
Monitor	Things (1) Info An IoT thing is a representation and record of your physical device in the cloud. A physical device needs a thing record in order to work with AWS IoT.	C Advanced search Run aggregations Edit Del	Create things
Connect Connect one device	Q Filter things by: name, type, group, billing, or searchable attribute.		< 1 > @
Connect many devices	Name	Thing type	
Test Device Advisor MQTT test client	cotthing-1		
Manage			
Things			
Thing groups			
Thing types			
Fleet metrics			

2. Select Create single thing and then click Next.





3. Enter the Thing name.

Step 1 Specify thing properties	Specify thing properties Info		
Step 2 - optional	A thing resource is a digital representation of a physical device or logical entity in AWS IoT. Your device or entity needs a thing resource in the registry to use AWS IoT features such as Device Shadows, events, jobs, and device management features.		
Step 3 - optional	Thing properties Info		
Attach policies to certificate	Thing name		
	Tutoria		
	Enter a unique name containing only: letters, numbers, hyphens, colons, or underscores. A thing name can't contain any spaces.		
	Additional configurations		
	You can use these configurations to add detail that can help you to organize, manage, and search your things.		
	Thing type - optional		
	Searchable thing attributes - optional		
	▶ Thing groups - optional		
	Billing group - optional		

4. Create a certificate.





5. Select the corresponding Policy and then click **Create thing**.

Step 1 Specify thing properties	Attach policies to certificate - <i>optional</i> Info AWS IoT policies grant or deny access to AWS IoT resources. Attaching policies to the device certificate applies this access to		
Step 2 - optional Configure device certificate	the device.		
Step 3 - optional Attach policies to certificate	Policies (1/2) Select up to 10 policies to attach to this certificate.	C         Create policy [2]           < 1 >         ⊚	
	Name		
	myLightPolicy		
	☑ Document		

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### **EBPro**

1. Select AWS IoT as cloud service in the MQTT Server settings window and follow the settings in Chapter 3 in this manual.

MQTT Server Object	t's Properties ×
General Address	TLS/SSL
Comment :	
Cloud service :	AWS IoT 🔹
Protocol :	MQTT v3.1.1 😁
Domain name :	a2gbh2bus0sam1-ats.iot.us-east-1.amazonaws.com
Port :	8883 (e.g., 1883, 8000~9000)
Client ID :	%2
	%0 : HMI name %2 : Random %% : Character %
Keep alive time : Timestamp :	10 second(s) UTC Time •
	* If timestamp in MQTT is incorrect, please check your time zone setting in [Time Sync./DST] page of [System Parameters] dialog.

2. Click New to add a device.

ττς		
Enable		
Settings Domain name : a2gbh2bus0sam	11-ats.iot.us-east-1.amazonaws.com, Port : 8883	
WS IoT Thing		
Thing Name	Description	
New Delete Settings		
		Exit



3. Enter Thing name and set minimal time between messages. Only QoS 0 and QoS 1 are available.

New AWS IoT Thing Object	×
General Address	
Description :	
Thing name : default	
Min. time between messages : 0 🗭 ms QoS : 1 👻 Content format : JSON 😙	
✓ Include timestamp	
✓ Use top-level key "d" for all addresses	

4. Go to the Address tab and set the addresses for reported status (LB-0) and desired setting (LB-1). ->, <-> stands for the direction in which data is transmitted.

			[	Advanced mode
Name : defa	ult1			
Type: Bit	•			
Status (D	evice address -> AWS IoT "reported")			
Device :	Local HMI	$\sim$	<b></b>	4
Address :	LB ~ 0			
Setting ([	Device address <-> AWS IoT "desired")			
Device :	Local HMI	~	6	4
Address :	LB ~ 1			

5. In the Advanced Mode settings window, Status (reported) and Setting (desired) can use different addresses, and data is transmitted to/from AWS IoT/device.



Address se	tting	×
		Advanced mode
Name : defa	ult1	
Type : Bit	•	
Status (D	vevice address -> AWS IoT "reported")	
🖌 Send in	itial value when HMI starts	
Device :	Local HMI ~	G G
Address :	LB ~ 0	
🗸 Status (A	WS IoT "reported" -> Device address)	
Device :	Local HMI ~	A      A  A     A
Address :	LB ~ 1	
Setting (I	Device address -> AWS IoT "desired")	
🗸 Send in	itial value when HMI starts	
Device :	Local HMI v	<b></b>
Address :	LB ~ 2	
Setting (/	AWS IoT "desired" -> Device address)	
Device :	Local HMI ~	<b>G</b>
Address :	LB ~ 3	
Remove	JSON array bracket '[' and ']'	OK Cancel

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