

USR-M300 Quick Start Guide with AWS IoT



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1. Introduction

USR-M300 is a high-performance and scalable edge IOT gateway. This device integrates edge collection,

data calculation, data reading and writing, active reporting, linkage control, IO collection and control and other functions. The collection protocol includes standard Modbus protocol and a variety of common PLC protocols, as well as industry-specific protocols. At the same time, the product also has routing and VPN as well as graphical programming functions to ensure data transmission security. Using graphical programming, users can develop independently to achieve the required functions.

USR-M300 is embedded in Linux kernel, with a main frequency of up to 1.2Ghz. It can access the Internet via Ethernet port, ADSL and LTE cat4 cellular network to achieve easy network deployment.

It is widely used in various industrial intelligent solutions such as industrial robot, smart factories, smart agriculture, smart water management system etc.

2. AWS IoT

USR-M300 supports connecting to AWS IoT platform via MQTT, which can be achieved via simple MQTT and SSL parameter configuration. At the same time, the device's edge computing and AWS functions support combined configuration, which is very flexible and practical.

2.1. Basic Parameters

- Protocol Select: MQTT version, supports MQTT-3.1 and MQTT 3.1.1.
- Client ID: MQTT client identifier.
- Remote Server Address: MQTT server domain name or IP address.
- Remote Port: MQTT server port.
- Heartbeat time: MQTT protocol heartbeat time.
- Reconnection Internal: The interval between the current connection failure and the next MQTT connection.
- Connection Verification: When enabled, after connecting to the MQTT server, the username and password will be sent for connection authentication.
- Username: MQTT connection username, used for connection authentication.
- Password: MQTT connection password, used for connection authentication.
- Last Will: MQTT connection flag. When the network connection is closed, the server must publish this will message.



• SSL protocol: Supports TLS1.0 and TLS1.2 versions, and the authentication mode can choose none certificate authentication, CA signed server and self signed certificate.

2.2. Publish Settings

- Topic: Publish topic name.
- QOS: Message quality of published topics.
- Message retained: MQTT retains the message flag, which is used by the server to store this application message and its quality of service (QoS).

2.3. Subscribe Settings

- Topic: Subscribe topics.
- QOS: Message quality of subscribed topics.

3. AWS Connection Test

In this case, we will show how to connect M300 to AWS.

3.1. Preparations

- USR-M300*1
- RS485 serial to USB cable*1
- Ethernet cable*1
- 12V/1A power adaptor*1

3.2. Configuration of AWS

3.2.1. Login

- 1. Login https://www.amazonaws.cn/en/
- 2. Login to the account. If you do not have an account, please create one firstly.



Sign in as IAM user Account ID (12 digits) or account allas AM user name Password Forgot password? Remember this account Sign in New to Amazon Web Services? Create a new Amazon Web Services account

3. Find Amazon IoT in Internet of Things.

至马进云科技 NWCD operating Ningxia Region Sinnet operating Beijing Region	Services			¢	⑦ Beijing ▼		100 F
Unified Settings Manage settings for the current u	All services Recently visited	Internet of Things	×	*		Reset all	٩
Localization and defau	Favorites	☆ Amazon IoT Connect Devices to the Cloud				Edit	
		IoT Analytics					
Language	Amazon Web Services Cost Management	Collect, preprocess, store, analyze and visualize data of IoT devices					
English (US)	Analytics	IoT Device Defender					
		Secure your fleet of connected IoT devices					
	Application Services						
Display	Compute	IoT Device Management				Edit	
Customize the appearance of AWS	Containers	Securely Manage Fleets as Small as One Device, or as Broad as Millions of Devices					
	③ Customer Enablement	IoT Events					
Visual mode Beta Light	Database	Monitor device fleets for changes and trigger alerts to respond					
	Desktop & App Streaming	IoT Greengrass					
	- V Developer Tools	Deploy and run code on your devices					
Settings management						Edit	
Decide if the AWE Management Co	Game Development	IoT SiteWise					
Decide if the AWS Management Co	& Internet of Things	Data driven decisions in Industrial operations					
Remember recently visited ser	Machine Learning						
Yes	Management Tools	•		Ŧ			
Language			© 202	3, Amazo	on Web Services, Inc. or	its affiliates. Privacy	Terms

3.2.2. Create Things and Certificates

1. In **Manage->All devices->Things**, click **Create things** to add the device.



Amazon IoT X	Amazon IoT > Manage > Things	
Monitor	Things (18) Info C Adv An IoT thing is a representation and record of your physical device in the cloud. A physical device and thing search is order to work with departure IoT	ranced search Run aggregations Edit Delete Create things
Connect Connect one device	Q Filter things by: name, type, group, billing, or searchable attribute.	< 1 > ⊚
Connect many devices	Name Thing type	
	USR-M300 type_none	
Test	410s_RT_H7_2	
MQTT test client	П М100-Т -	
Manage	USR-M100 type_none	
 All devices 	USR-M100-PUSR -	
Things	510-sgb-test -	
Thing groups	540-4-test type_none	
Fleet metrics	□ W610test -	
Greengrass devices	- 1064-1 -	
Software packages New	0 things selected	^ ^
Remote actions		

Choose Create signal thing, fill in the Thing name and Thing type, here we configure the thing name to "USR-M300-Test", configure the thing type to "type_none".



PUSR



Next, choose Auto-generate a new certificate, you can also choose others if you have your own certificates.
 Then click Next.



Step 1 Specify thing properties Step 2 - optional Configure device certificate	Configure device certificate – <i>optional</i> Info A device requires a certificate to connect to Amazon IoT. You can choose how to register a certificate for your device now, or you can create and register a certificate for your device later. Your device won't be able to connect to Amazon IoT until it has an active certificate with an appropriate policy.
Step 3 - <i>optional</i> Attach policies to certificate	Device certificate
	 Auto-generate a new certificate (recommended) Generate a certificate, public key, and private key using Amazon IoT's certificate authority. Use my certificate Use a certificate signed by your own certificate authority.
	O Upload CSR Register your CA and use your own certificates on one or many devices.
	 Skip creating a certificate at this time You can create a certificate for this thing and attach a policy to the certificate at a later time.
	Cancel Previous Next

4. Do not create policies, directly click **Create thing.** Then it will show the certificates interface. Download the

certificate and key files, then click **Done** to back to the things interface.

pecify thing properties	ATTACH POLICIES TO CEPTIFICATE – OPTIONAL Info Amazon IoT policies grant or deny access to Amazon IoT resources. Attaching policies to the device certificate applies this
tep 2 - optional	access to the device.
omgure device certificate	Policies (21)
Step 3 - optional	Select up to 10 policies to attach to this certificate.
Attach policies to certificate	
	Q Filter policies
	Name
	sgb-default
	peng-test
	new
	myh_510
	aws_test_strategy
	□ W610test
	USR-N510
	USR-M300
	USR-M100
	USR-M00-PUSR
	N540-Test
	N510-AWS
	Cancel Previous Create thing

Download certificates and keys					
Download certificate and key files to install on your device so that it can connect to Amazon Web Services.					
Device certificate You can activate the certificate now, or later. The certificate must be active for a device to connect Amazon IoT.	t to				
Device certificate Deactivate certificate Deactivate certificate	d				
Key files The key files are unique to this certificate and can't be downloaded after you leave this page. Download them now and save them in a secure place.					
A This is the only time you can download the key files for this certificate.					
Public key file b5160b9bfa2e472c6b63bea0592a85-public.pem.key	d				
Private key file b5160b9bfa2e472c6b63bea592a85-private.pem.key					
Root CA certificates Download the root CA certificate file that corresponds to the type of data endpoint and cipher sul you're using. You can also download the root CA certificates later.	te				
Amazon trust services endpoint RSA 2048 bit key: Amazon Root CA 1	d				
Amazon trust services endpoint ECC 256 bit key: Amazon Root CA 3					
If you don't see the root CA certificate that you need here, Amazon IoT supports additional root CA certificates. These root CA certificates and others are available in developer guides. Learn more [2]	our				
Don	e				

3.2.3. Create Policies

1. In Manage->Security->Policies interface, click Create policy.

Test	Amazon IoT > Security > Policies	
MQTT test client	Amazon IoT policies (21) Info C Delete Create policy	/
Manage	Amazon IoT policies allow you to control access to the Amazon IoT Core data plane operations. Amazon IoT policies are separate and different from IAM policies. Amazon IoT policies apply only to Amazon IoT data plane operations.	m
All devices	Q, Find policies < 1 >	0
Software packages New	Policy name	
Remote actions	W610test	
Message routing	USR-N510	
▼ Security		
Intro	USR-M100	
Certificates Policies	USR-M00-PUSR	
Certificate authorities	sgb-default	
Role aliases	peng-test	
Audit		
▶ Detect	N540-Test	
	□ N510-AWS	

- 2. Fill in the **Policy name**, add new statement in **Policy document**. There is a default statement which can be directly operated.
- 3. Add 4 policies: iot:Connect, iot:Publish, iot:Receive, iot:Subscribe.
- 4. Policy resource format: arn:aws:iot:region:AWS-account-ID:Resource-type/Resource-name, AWS-account-ID is your account ID of AWS.
- 5. Then click **Create** to create the policies.



Policy properties Amazon IoT Core supports named policies so that many identities car	reference the same policy document.			
Policy name USR-M300-Test A policy name is an alphanumeric string that can also contain period	(.), comma (.), hyphen(-), underscore (_), plus sign (+), equal sign (+),	and at sign (@) characters, but no spaces.		
▶ Tags - optional				
Policy statements Policy examples				
Policy document Info An Amazon IoT policy contains one or more policy statements. Each p	policy statement contains actions, resources, and an effect that grant	s or denies the actions by the resources.		Builder JSON
Policy effect	Policy action	Policy resource		
Allow	iot:Connect 🔻	arn:aws:iot:cn-north-1:944284229783:client/*	Remove	
Allow	iot:Publish 🔻	arn:aws:iot:cn-north-1:944284229783:topic/*	Remove	
Allow	iot:Receive 🔻	arn:aws:iot:cn-north-1:944284229783:topic/*	Remove	
Allow	iot:Subscribe	arn:aws:iot:cn-north-1:944284229783:topicfilter/*	Remove	
Add new statement				

3.2.4. Attach Polices to Certificate

1. We have bound certificate and the thing when creating the device, so we can directly find the device in

Manage->All devices->Things, click Certificates in USR-M300-Test.

Connect many devices	USR-M300-Test Info		Create secure tunnel	Edit Delete
Test	Thing details			
Manage All devices	Name USR-M300-Test ARN D arn:aws-cn:iot:cn-north-1:944284229783:thing/USR-M300-Test	Type type_none Billing group -		
Thing groups Thing types Fleet metrics	Attributes Certificates Thing groups Device Shadows Activity	Packages and versions	Jobs Alarms Defende	er metrics
Greengrass devices Software packages Remote actions Message routing	Certificates (1) Info The device certificates attached to this thing resource.		C Detach C	reate certificate
Retained messages Security	Q, Find certificates	Status		< 1 > ©
Device software Billing groups	b5160b9bfa2e472c6b63bea35efba45348c82f024048782c458e4bdbd0592	⊘ Active		

2. Find **Polices** under certificate, click **Attach policies**, choose the polices you have created.



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Policies Things Nonco	mpliance
Policies (0) Info Amazon IoT policies allow you to control	C Detach policies Attach policies
Name	∇
	No policies You don't have any policies attached to this certificate.
	Attach policies to the certificate × b5160b9bfa2e472c6b63bea35efba45348c82f024048782c458e 4bdbd0592a85.
	Policies Choose policies to attach to this certificate. The certificate can have up to 10 policies attached to it. Choose Amazon IoT policy ▼ C USR-M300-Test X
	Cancel Attach policies

3.2.5. Obtain Product Information

1. Client ID is the Things name of the device, you can find the device name in **Manage->All devices->Devices**.

Connect many devices	Amazon IoT > Manage > Things	
Test MQTT test client	C Advanced search Run aggregations Edit 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 Amazon IoT. Edit Edit	Delete Create things
Manage	Q Filter things by: name, type, group, billing, or searchable attribute.	< 1 > @
▼ All devices	Name	Thing type
Things	USR-M300-Test	type_none
Thing groups	USR-M300	type_none
Fleet metrics	□ 410s_RT_H7_2	-
 Greengrass devices 	□ M100-T	-
Software packages New	USR-M100	type_none
 Remote actions Message routing 	USR-M100-PUSR	-
Retained messages	510-sgb-test	-
Security	540-4-test	type_none
Device software	U W610test	-
Billing groups	0 1064-1	-

2. Find the server domain address that M300 device needs to connect in **Settings**, port defaults to **8883**.

MQTT test client	Amazon IoT > Settings				
Manage	Logging now sup By upgrading, log	ports JSON logs and fine-grained ging has four levels of log verbosit	control. y and roles can be specific at the	account-level.	Upgrade
Things Thing groups	Settings Info				
Fleet metrics	Device data endpo	int Info			C
 Greengrass devices 	Your devices can use your ac	count's device data endpoint to connect	to Amazon Web Services.		_
Software packages New					
Remote actions	Each of your things has a	a REST API available at this endpoin	nt. MQTT clients and Amazon IoT	Device SDKs 🖸 also use this endp	point.
 Message routing 	Endpoint				
Retained messages	awwis0u7xuagf.ats.id	ot.cn-north-1.amazonaws.com.cn			
Security					
	Domain configurat			Acti	ons Create domain configuration
Device software	You can create domain confi	gurations to simplify tasks such as migra	ting devices to Amazon IoT Core, migr	ating application infrastructure to Amaz	on IoT Core and maintaining brand identity.
lilling groups					
ettings	Name	Domain name	Status	Service type	Date updated
eature spotlight			No domain confi	gurations	
Documentation 🗹	-				

3.3. Device Configuration

- (1) Enable MQTT communication protocol.
- (2) Configure the Client ID, Remote port 8883 and Remote server address.
- (3) Enable **Connection verification**, **Username** and **Password** can be custom.
- (4) Add the SSL certificates, configure the SSL protocol to TLS1.2, Self signed certificate. Upload

AmazonRootCA1.pem in CA File.

🛠 USR IoT 🛛 🔅	Overview 🕃 Network	💽 Edge Computing] System Management	🕑 Python Applie	cation
Edge Mode	Communication				
Drocat Extensio	A	Communication1 💽			
Preset Extensio	Communication1	Rasic settings Publish	settings Subscribe se	attings	
	Communication2		oubscribe st	stango	
Data Point		* Communication Protocol:	MQTT	~	
Protocol		* Protocol Select:	MQTT-3.1.1	~	
Edge Gateway ^					
Serial Port		* Remote Server Address:	awwis0u7xuagf.ats.iot.cn-norti	h-1.amazonaws.cc 🔶	 Server address
Communication		* Client ID:	USR-M300-Test	-	Thing name
Data Reporting		* Remote Port:	8883		
Linkage Control					
		* Heartbeat time:	60	S	
		* Reconnection Internal:	5	s	
		* Clean Session:			
		* Connection verification:			
		* Username:	admin		
		* Password:	admin		
		Enable Last Will			
V1.0.18		Chable Last Will.			
v 1.v. lo		* SSL Protocol:	TLS1.2	~	



* Reconnection Internal:	5 s
* Clean Session:	
* Connection verification:	
* Username:	admin
* Password:	admin
* Enable Last Will:	
* SSL Protocol:	TLS1.2 v
* Authentication Mode:	Self signed certificate \lor
* CA File:	Please select
	AmazonRootCA1.pem CA1.pem
* Client Certificate File:	Please select certificate.pem.crt
	b5160b9bfa2e472c6b63bea35efba45348c8
* Client Key File:	Please select private.pem,key
	b5160b9bfa2e472c6b63bea35efba45348c8
* Report Cache Data:	

- (5) After above configurations, click **Apply** and then configure the topics.
- (6) Publish settings: Configure the publish topic to **M300-Pub**, click Apply.

Communication							
Communication1	Communicati	Communication1 💽					
Communication2	Basic settings	Publish settings Subso	cribe settings				
					Add	Delete	
	ID	topic	QOS	mssage retained	Description	Operation	
	□ 1	M300-Pub	QOS0	not retained		Edit Delete	
	apply						
*							

(7) Subscribe settings: Configure the subscribe topic to **M300-Sub**, click **Apply**, then restart the device to take the parameters effect.



Edge Computing > Edge Gateway > Communication							
Communication							
Communication1	Com	Communication1 💽					
Communication2	Basic	settings	Publish settings Subscribe setting	gs			
	Add Delete						
		ID	topic	QOS	Description	Operation	
		1	M300-Sub	QOS0		Edit Delete	
	apply						

3.4. Device Activity

In Manage->All devices->Things, find the created device, click Activity, there will show Connected.

Amazon loT ×	Amazon loT > Manage > Things > USR-M300-Test	
Monitor	USR-M300-Test Info	Create secure tunnel Edit Delete
Connect	Thing details	
Connect one device Connect many devices	Name USR-M300-Test	Type type_none
Test MQTT test client	ARN D arn:aws-cn:iot:cn-north-1:944284229783:thing/USR-M300-Test	Billing group -
Manage	Attributes Certificates Thing groups Device Shadows Activity	y Packages and versions Jobs Alarms Defender metrics
Thing groups Thing types	Activity (2) Info Lists the most recent MQTT messages related to Device Shadow activity since you opened the thing details page. To see more messages related to this activity, choose the MQTT test client button.	Clear MQTT test client 🛽
Fleet metrics Greengrass devices Software packages New	Connected Saws/events/presence/connected/USR-M300-Test	November 10, 2023, 10:35:23 (UTC+08:00)

3.5. Data Transmission Test

1. Add a new serial Modbus RTU sensor in **Data Point**. And configure the Modbus registers of the sensor.



📌 USR IoT	(•) o	Overview	60	Network	[-] Edge Computi	ng [·] System Mana	agement 🔃 Pyti	non Application				🚯 简体中文	
Edge Mode		> Data	a Point										
IO Module ~		Slave	Slave										
Data Point Protocol		Version:	16995853	77						Add	Import Export	Node Priori	ity
Edge Gateway ^		<mark> Іос</mark> мзо	:al_io 00 IO从机			Serial Sensor							
Communication Data Query/Co		Acquisition protocol: local_iol协议			办议	Acquisition protocol: m	ib-rtu协议 nobelete						
Data Reporting													
Linkage Control		List	ofslave	points									
											Add	Delete	
			ID	Node name	Data Type	Address	Read Write Status	Priority	Timeout(ms)	Data	Computational formu Ia	Operation	
			1	Humidity	ushort	4 0002	Read/Write	Level 1	2000	35		Edit Delete	
			2	Temperature	ushort	4 0001	Read/Write	Level 1	2000	12		Edit Delete	
V1.0.18									Total 2	15/page v	Last 1 Ne	Go to	1

2. In Edge Gateway->Data Reporting, click New to add the Data reporting groups.

🛠 USR IoT 🛛 🔅] Overview [·] Network	Edge Computing		[•] Python Application	
Edge Mode	Edge Computing > Edge Gateway	> Data Reporting			
Preset Extensio	Data Reporting	Edit data reportin	g groups		×
Data Point	New Import Export	Da * Group name	M300-Tests		
Protocol	Test	B • Up channel	link1	~	
Serial Port		* Public topic A Data Reporting rules	M300-Pub	~	
Communication Data Query/Co		interval reporti			
Data Reporting Linkage Control		periodic reporti)		7
		* Reporting cycle ti me	5	S	
		Data change			
	*	report regulari			
		y Reporting data for	Primitive data type	~	
V1.0.18		mat			



3. Configure the reporting template, here we configure the device reporting the RS485 sensor data and D01/D01/D11/D12 status to AWS.

Reporting data for	Primitive data type	\sim
mat		
Reporting Templat e	{ "Temperature":"Temperature", "Humidity":"Humidity", "DO01":"D001", "D002":"D002", "D101":"D101", "D102":"D102" }	

4. After configuring the reporting template, add the data points that need to be reported in **Node Table**.

cancel

"Humidity":"Humidity",
"DO01":"DO01",
"DO02":"DO02",
"DI01":"DI01",
"DI02":"DI02"
}

Node Table						
					Add Import Expor	t Delete
	ID	Node name	Slave Name	Data Type	Read Write Status	Operation
	1	Humidity	Serial Sensor	ushort	Read/Write	Delete
	2	Temperature	Serial Sensor	ushort	Read/Write	Delete
	3	DO02	local_io	bit	Read/Write	Delete
	4	DO01	local_io	bit	Read/Write	Delete
	5	DI02	local_io	ulong-ABCD	Only Read	Delete
	6	DI01	local_io	ulong-ABCD	Only Read	Delete
	7	AI02	local_io	float-ABCD	Only Read	Delete
	8	AI01	local_io	float-ABCD	Only Read	Delete
				Total 8 10/pa	age ~ Last 1 Ne	oxt Go to

- 5. After configuring all the parameters, restart the M300 device to take the parameters effect.
- After the device connecting to the AWS again, click MQTT test client in Test, subscribe the publish topic of M300:
 M300_Pub. Then we can receive the reporting message from M300.



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Amazon IoT	×	Subscribe to a topic Pu	ublish to a topic		
Monitor		Topic filter Info The topic filter describes the topic(s) to wil M300-Pub Additional configuration	hich you want to subscribe. The topic filter can include MQTT wildcard charr	aders.	
Connect one device Connect many devices		Subscribe			
Test MQTT test client		Subscriptions	M300-Pub		Pause Clear Export Edit
Manage ► All devices ► Greengrass devices Software packages New ► Remote actions ► Message routing		M300-Pub VX	Message payload { "message": "Hello from AWS IoT console" } Additional configuration Publish		
Retained messages Security			▼ M300-Pub		November 10, 2023, 11:05:25 (UTC+0800)
Device software Billing groups Settings Feature spotlight Documentation 🗳			<pre>{ "Temperature": 12, "Humidity": 35, "oool1": 0, "Do02": 1, "D02": 0, "D102": 0 }</pre>		
		Edge Computing > IO Module	> Status	🔉 Modbus Slave - Mbslave1	-
		Status	ad control	File Edit Connection Setup Display View Window Help Image: Imag	
			DO02	Alias 00000 0 12 1 35 2 3	
		DI Status		4 5 6	
		0 DI01	0 0	7 8 9	
		Al Status			_
		Al01 0uA	A102 OuA		

7. M300 also supports writing the register values from the server side, we can enable **Data Query/Control** function in M300 device firstly. Configure the writing and reading JSON message according to the JSON format in below interface.





8. Publish writing and reading JSON message to the subscribe topic of M300 from AWS.

Amazon IoT	Subscribe to a topic Publish to a topic
Monitor	Topic name The topic name identifies the message. The message payload will be published to this topic with a Quality of Service (QoS) of 0.
Connect Connect one device Connect many devices	Message payload { "rw_prot": { "Ver": "1.0.1",
Test MQTT test client	"dir": "down", "id": "12345", Read → "r_data": [("name": "Temperature" ←),
Manage	{ "name": "Humidity" }
 An devices Greengrass devices Software packages New Remote actions Message routing Retained messages Security], Write → "w_data": [{ "name": "DO01", "value": "1" }, { "name": "DO02", "value": "0" }
Device software Billing groups Settings	
Feature spotlight Documentation 🗹	Additional configuration Publish



9. Receive the response from M300 device.









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