

## **1. Introduction**

All of Infinite's devices that support the MQTT protocol, are capable to connect to any local or remote MQTT Broker. Microsoft Azure, commonly referred to as Azure, is a cloud computing service created by Microsoft for building, testing deploying, and managing applications and services through Microsoft-managed centers. This document is a brief how-to guide for all device communications between Infinite's devices and Microsoft Azure.

# 2. Generating Self-Signed Device Certificate and Key

Azure requires TLS communications so we will have to create our own self-signed certificate and key for our device. We do that with the commercial-grade TLS toolkit openssl. The easiest way to do that is to simply install <u>git</u> on your computer and locate the openssl.exe file in this directory: C:\Program
Files\Git\usr\bin\openssl.exe.

Open a Command Prompt or PowerShell window in the above directory and type the following commands to create the device certificate and key:

req -x509 -nodes -sha256 -days 365 -newkey rsa:2048 -keyout device.key -out device.crt - creates device certificate and private key

(These commands are for testing purposes and should be adjusted for different requirements.)

### **3. Creating an IoT Hub**

After creating a Microsoft Account, the first step of this procedure is to create an IoT Hub. On the homepage of Microsoft Azure, click Create a resource and then search for IoT Hub.

Azure service	es								
+	x	+	t <sup>1</sup> t	4	4		4>	32	$\rightarrow$
Create a resource	loT Hub	Subscriptions	Event Grid Topics	Event Grid Domains	Event Grid Partner	Azure Resource Mover	Function App	Event Hubs	More service
Recent resou	rces								
Recent resou	rces			Туре				Last Viewed	
Recent resou	rces			Type IoT Hub				Last Viewed	
Recent resou	rces			Type IoT Hub Subscrip	tion			Last Viewed 2 days ago a week ago	
Recent resou	rces			Type IoT Hub Subscrip Resource	tion e group			Last Viewed 2 days ago a week ago a week ago	

Create an IoT Hub by filling out the project details and creating a new Resource group. You must choose East US as your region for the time being as Microsoft is working on enabling TLS1.2 on all regions.

Home > Create a resource > IoT Hub >			
IoT hub … <sup>Microsoft</sup>			
Basics Networking Management	Tags	Review + create	
Create an IoT hub to help you connect, mo	onitor, and n	nanage billions of your IoT assets. Learn more	
Project details Choose the subscription you'll use to mana organize and manage resources.	age deployn	nents and costs. Use resource groups like folders to help you	
Subscription * (i)	Azure su	bscription 1	$\sim$
Resource group * 🛈	indinf Create nev	ı.	$\sim$
Instance details			
IoT hub name * 🕡	MyVeryF	rstHub	~
Region * ①	East US		$\sim$



Make sure that you configure the minimum TLS version as well.



oT hub ···			
crosoft Scale tier and units			
Pricing and scale tier * (i)	F1: Free tier		~
-	😵 Free loT h	ubs are limited to one per subscription Learn how to choose the right IoT hub	o tier for your solutio
lumber of F1 IoT hub units ① Detern	nines how your IoT	hub can scale. You can change this later i	f your needs increas
efender for IoT Turn on Defender for IoT and add an e	Off extra layer of threat	protection to IoT Hub, IoT Edge, and you	ır devices. Learn mo
Pricing and scale tier ①	F1	Device-to-cloud-messages (i)	Enabled
Messages per day 🛈	8,000	Message routing ①	Enabled
Cost per month	0.00 EUR	Cloud-to-device commands ①	Enabled
Defender for IoT 🛈	Disabled	IoT Edge ()	Enabled
		Device management (i)	Enabled
dvanced settings cale levice-to-cloud partitions ① ransport Layer Security (TLS) finimum TLS Version ①	O		2
	• • 1.2	MuniteTana	



# 4. Creating a device

While you are on your IoT Hub page, enter the IoT devices tab and click New to

create an IoT device.

Search (Ctrl+/) «	🕂 New 💍 Refresh	🗓 Delete	
Overview	View, create, delete, and upda	ate devices in your IoT Hub.	
Activity log	Field		
Access control (IAM)	+ × select or	enter a property name	$\sim$
Tags	+ Add a new clause		
Diagnose and solve problems	Query devices		
vents			
js	Device ID	Status	Last
ed access policies	No devices found		
у			
and scale			
orking			
ficates			
in endpoints			
rer			
erties			
ks			

On the next page name your device, choose X.509 Self-Signed as the authentication type and enter your certificates Primary Thumbprint. You can find this thumbprint by opening the device.crt file we created earlier.



😽 Certif	ficate		×
General	Details Certification Path	1	
Show:	<all></all>	~	
Field Sul Pul Sul Bas Th	oject olic key olic key parameters oject Key Identifier thority Key Identifier sic Constraints umbprint becd 4 f f 8 4 7 2 7 f 2 a 6 5	Value subber, Internet Widgits Pty L RSA (2048 Bits) 05 00 0ae3163acb6dc845efa0ec47a KeyID=0ae3163acb6dc845efa Subject Type=CA, Path Lengt b5ddbecd4ff84727f2a65b0fa9	
	E	dit Properties Copy to File	К
Home > MyVeryFirstHub >			×
Find Certified for Azure IoT de	vices in the Device Catalog		්
Device ID * (i)			
NewDevice			
Authentication type ① (Symmetric key (X.509 Self-Signed)	X.509 CA Signed		
Primary Thumbprint * ① b5ddbecd4ff84727f2a65b0fa9bd0837	7b8249285		~
Secondary Thumbprint * ①		•	
b5ddbecd4ff84727f2a65b0fa9bd0837	7b8249285		~
Connect this device to an IoT hub () Enable Disable			
No parent device Set a parent device			



### **5. Device Configuration with WA Manager**

In the Edit Device window in WA Manager, tick the Use SSL box.

5/N: 1 Type	e: ADS-300	Autonomous NB-IoT Node	: Firmware Ve	rsion 1.2
Unit Identification				
Device name ADS-300			Unit ID	0
NB-lot Identification & Parameter Use SSL	PSM Mode		Phone Offeret	
NB-lot Identification & Parameter Use SSL  [] RTC Correction [Nr. of Messages]	PSM Mode	○ On	Phone Offset0	
NB-lot Identification & Parameter Use SSL 🛛 RTC Correction [Nr. of Messages]	PSM Mode	○ On ⑧ Off UTC Time □	Phone Offset 0	
NB-lot Identification & Parameter Use SSL 🛛 🗍 🥌 RTC Correction [Nr. of Messages] [	PSM Mode	○ On ● Off UTC Time □	Phone Offset 0	
NB-lot Identification & Parameter Use SSL  [] RTC Correction [Nr. of Messages] [	PSM Mode	○ On	Phone Offset 0	
NB-lot Identification & Parameter Use SSL 🛛 🗍 🔧 RTC Correction [Nr. of Messages] [	PSM Mode	○ On ● Off UTC Time □	Phone Offset 0	
NB-lot Identification & Parameter Use SSL [20]	PSM Mode	○ On ● Off UTC Time □	Phone Offset 0	

Next, we configure the MQTT parameters.

Although Azure supports MQTT connectivity, it is not a pure MQTT Broker and so it has some limitations regarding its MQTT parameters.

For the Broker IP, the IoT Hub endpoint must be used that can be found in the IoT Hub page.

MyVeryFirstHub 🖇	÷			
P Search (Ctrl+/) «	→ Move ∨ 📋 Del	ete 💍 Refresh		
🕺 Overview 🄶				$\mathbf{N}$
<ul> <li>Activity log</li> </ul>	Resource group (change	) : indinf	Hostname	: MyVeryFirstHub.azure-devices.net
Access control (IAM)	Status	: Active	Pricing and scale tier	: F1 - Free
Taos	Current location	: East US	Number of IoT Hub units	÷ 1
0	Subscription (change)	: Azure subscription 1	Minimum TLS Version	: 1.0
Diagnose and solve problems	Subscription ID	: c4c26b13-c221-43a5-a467-6bfff4e176a9		
🗲 Events	Tags (change)	: Click here to add tags		

For the Client ID, the Device ID must be used that we used to create our device.



GPRS Conne	ction Settings	
GPRS Conne	ction Settings	
User name		
Password		
APN String	lot. Ince.net	
IP version	4 ~	
TCP Paramet	ters	
Broker IP	MyVeryFirstHub.azure-	
Port	8883	
MQTT Param	neters	
Client ID	NewDevice	
Client ID User Name	NewDevice MyVeryFirstHub.azure-devices.net/NewDevice	
Client ID User Name Password	NewDevice MyVeryFirstHub.azure-devices.net/NewDevice	
Client ID User Name Password Topic	NewDevice MyVeryFirstHub.azure-devices.net/NewDevice ADS-300/TILT	
Client ID User Name Password Topic	NewDevice MyVeryFirstHub.azure-devices.net/NewDevice ADS-300/TILT	
Client ID	NewDevice	

The username must be of this format based on the name of our DeviceID and IoT Hub name: MyVeryFirstHub.azure-devices.net/NewDevice/?api-version=2018-06-30 Lastly, in the SSL Parameters tab, we copy and paste the three files needed for the TLS communication: Server Certificate (CA), Device Certificate and Device Private Key.





The Server Certificate is <u>this</u> Digicert CA, the Device Certificate is the device.crt file and the Device Private Key is the device.key file. These files should be first opened with Notepad++ and their contents should be copy and pasted in the above tab. All files must be PEM formatted.

Your device can now connect Azure and send your encrypted data safely.

#### **Disclaimer:**

Azure is a registered trademark of Microsoft Corporation, USA. All products and software mentioned in this document for educational and demonstration purposes.

Revision: 1.0

© 2021, Infinite Informatics Ltd

#### **Infinite Informatics, Ltd**

1, Valaoritou Street GR-54626 Thessaloniki, Greece Phone: +30-2310-553545 E: info@indinf.gr W: www.infinite.com.gr

