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## Prerequisites

- Cloud
  - Azure account
- IDE
  - Azure Funciton
    - Visual Studio Community 2019
  - Dashboard & Proxy
    - Visual Studio Code
- Package and Language Version
  - Azure Funciton
    - Azure.Core v1.6.0
    - Azure.DigitalTwins.Core v1.2.0
    - Azure.Identity v1.3.0
    - Microsoft.Net.Sdk.Funtions v3.0.7
    - System.Net.Http v4.3.4
  - Dashboard & Proxy
    - npm
    - Node.js v10.16.0
    - vue v2.6.12
- CLI
  - Azure CLI
- API Client
  - Postman

# SOP for Initiating Services

## 1. Download Sample Code

- 1.1 Download project
  - <https://github.com/ArcherHuang/Azure-Digital-Twins-for-RPC>
- 1.2 Click **Code > Download ZIP**

The screenshot shows the GitHub repository page for 'ArcherHuang / Azure-Digital-Twins-for-RPC'. The 'Code' dropdown menu is open, and the 'Download ZIP' button is highlighted with a red box. The repository has 1 branch and 0 tags. The 'About' section indicates no description, website, or topics provided. The 'Releases' section shows no releases published, and the 'Packages' section shows no packages published.

- 1.3 Unzip **Azure-Digital-Twins-for-RPC-main.zip**

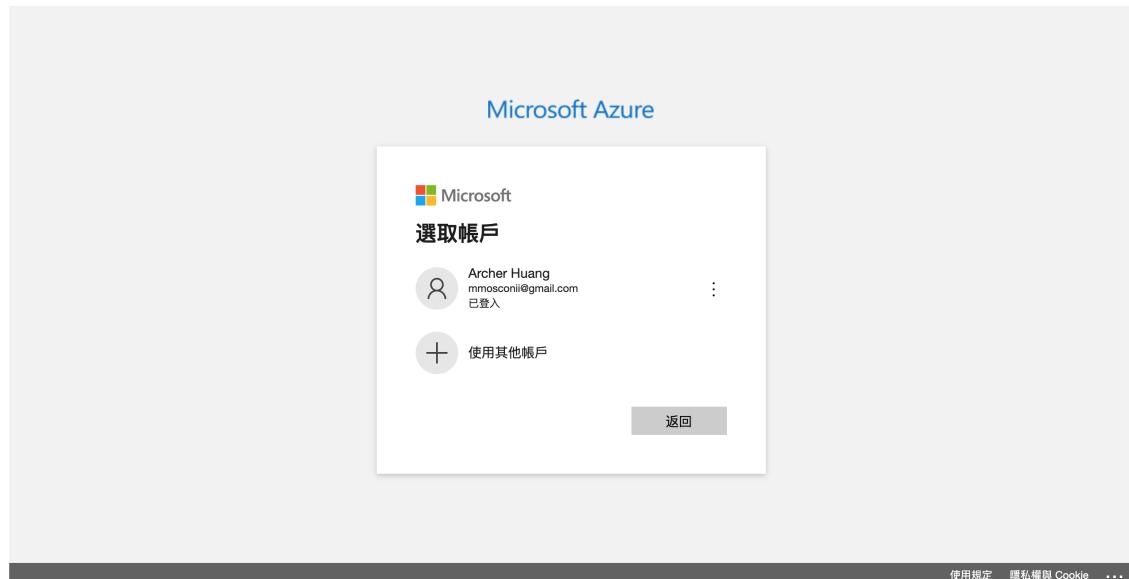
## 2. Install the Azure CLI and Login

- 2.1 Install the Azure CLI
  - [Reference documentation](#)
- 2.2 Sign in with Azure CLI
  - Run the login command

```
az login
```

- If the CLI can open your default browser, it will do so and load an Azure sign-in page.

- Sign in with your account credentials in the browser.



## ■ Login Success

### ■ Browser

```
You have logged into Microsoft Azure!
You can close this window, or we will redirect you to the Azure CLI documents in 10 seconds.
```

### ■ Terminal

```
Archer-2:~ archer$ az login
You have logged in. Now let us find all the subscriptions to which you have access...
The following tenants don't contain accessible subscriptions. Use 'az login --allow-no-subscriptions' to have tenant level access.
The following tenants require Multi-Factor Authentication (MFA). Use 'az login --tenant TENANT_ID' to explicitly login to a tenant.

[{"cloudName": "AzureCloud",
"homeTenantId": "████████████████",
"id": "████████████████",
"isDefault": true,
"managedByTenants": [],
"name": "Azure in Open",
"state": "Enabled",
"tenantId": "████████████████",
"user": {
"name": "mmosconi@gmail.com",
"type": "user"
}}
```

## 3. Create a resource group

- Azure CLI

```
az group create --name <ResourceGroup> --location <Region>
```

- e.g.

```
az group create --name rpc-adt-rg --location eastus
```

## 4. Create Azure Digital Twin

- 4.1 Search Azure Digital Twins

The screenshot shows the Microsoft Azure search interface. The search bar at the top contains the query "azure digital twins". Below the search bar, the "Azure services" sidebar is visible with options like "Create a resource" and "More services". The main search results are displayed under the "Services" section, showing "Azure Digital Twins" as the top result. To the right of the search results, there are links to "Marketplace", "Documentation", and several Azure Digital Twins-related articles and documentation pages.

- 4.2 Select Azure Digital Twins

The screenshot shows the Azure Digital Twins list view. The page title is "Azure Digital Twins". The top navigation bar includes a search bar, user information, and various icons. Below the navigation, there are buttons for "Add", "Manage view", "Refresh", "Export to CSV", "Open query", "Assign tags", and "Feedback". A filter bar at the top allows filtering by "Subscription", "Resource group", and "Location". The main content area displays two records, with a message indicating "Showing 1 to 2 of 2 records.". On the right side, there are dropdown menus for "No grouping" and "List view".

- 4.3 Click Add

The screenshot shows the Azure Digital Twins list view, similar to the previous one. However, the "Add" button in the top navigation bar is highlighted with a red box. The rest of the interface, including the filters and record count, is identical to the previous screenshot.

- 4.4 Input data

## Create Resource ...

Azure Digital Twins

\* Basics \* Networking Advanced Tags Review + create

Create an Azure Digital Twins instance to start building connected solutions that model the real world. [Learn more](#)

### Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folder to organize and manage all your resources.

Subscription \*

Azure in Open

Resource group \*

Create new

### Instance Details

Location \*

West Central US

Resource name \*

Enter the name

### Grant access to resource

To manage the elements within an instance, a user needs access to Azure Digital Twins data APIs. Select the suggested role below to grant yourself full access to the APIs. You can also use Access Control (IAM) to chose appropriate roles later. [Learn more](#)

Assign Azure Digital Twins Data Owner Role (i)

[Review + create](#)

< Previous

Next: Networking >

- Subscription field
  - Select the subscription you want to use
- Resource group field
  - Please use a recognizable name, this example uses rpc-adt-rg
- Location field
  - This example uses East US
- Resource name field
  - Please use a recognizable name, this example uses rpc-adt-example

- 4.5 When the input is complete, please click the [Review + create](#) button

- 4.6 Review your settings and select **create**

## Create Resource

Azure Digital Twins

\* Basics \* Networking Advanced Tags **Review + create**

### Summary

Subscription	Azure in Open
Resource group	rpc-adt-rg
Name	rpc-adt-example
Location	East US

---

**Create**

< Previous

Next >

Download a template for automation

- 4.7 Wait for the request to process

The screenshot shows the Microsoft Azure Deployment Overview page for a deployment named "rpc-adt-example". The main message is "Deployment is in progress". Deployment details include:

- Deployment name: rpc-adt-example
- Start time: 3/29/2021, 1:38:46 PM
- Subscription: Azure in Open
- Correlation ID: [redacted]
- Resource group: rpc-adt-rg

A "Deployment details" section shows a table with columns: Resource, Type, Status, and Operation details. The table is empty with the message "No results.". On the right side, there are links to Security Center, Free Microsoft tutorials, and Work with an expert.

- 4.8 Operation completes

The screenshot shows the Microsoft Azure Deployment Overview page for the same deployment. The main message is "Your deployment is complete". Deployment details are identical to the previous screenshot. A "Deployment details" section shows a table with columns: Resource, Type, Status, and Operation details. The table is empty with the message "No results.". Below the table, there is a "Next steps" section with a "Go to resource" button. On the right side, there are links to Security Center, Free Microsoft tutorials, and Work with an expert.

- 4.9 Once deployment complete click on **Go to resource** button

The screenshot shows the Azure Digital Twins resource 'rpc-adt-example'. The 'Host name' field, which contains 'rpc-adt-example.api.eus.digitalthings.azure.net', is highlighted with a red box. Other visible details include the Resource group ('change' to 'rpc-adt-rg'), Location ('East US'), and Provisioning state ('Active'). A 'Get started with Azure Digital Twins' section is also present.

- 4.10 Get **Azure Digital Twins Service URL**

This screenshot is identical to the one above, showing the 'rpc-adt-example' Azure Digital Twins resource details page. The 'Host name' field, containing 'rpc-adt-example.api.eus.digitalthings.azure.net', is again highlighted with a red box.

## 5. Set AD for Azure Map

- 5.1 Open **Azure Active Directory**

- 5.1.1 Search ad

The screenshot shows the Azure search results for 'ad'. The 'Azure Active Directory' service is highlighted with a red box. Other services listed include Advisor, AD Connect, Administrative units, and Azure Data Explorer Clusters.

- 5.1.2 Select **Azure Active Directory**

This screenshot is identical to the one above, showing the Azure search results for 'ad'. The 'Azure Active Directory' service is again highlighted with a red box.

- 5.2 Create App registrations

- 5.2.1 Click App registrations

The screenshot shows the Microsoft Azure portal interface. At the top, there's a navigation bar with 'Microsoft Azure', a search bar, and user information. Below it, the 'Azure Active Directory' section is titled '預設目錄 | Overview'. On the left, a sidebar lists various management options like 'Users', 'Groups', 'External Identities', etc., with 'App registrations' highlighted by a red box. The main content area has two sections: 'Tenant information' (showing role as 'Global administrator', license as 'Azure AD Free', and tenant ID) and 'Azure AD Connect' (showing status as 'Not enabled'). A search bar at the top of the content area contains the placeholder 'Search your tenant'.

- 5.2.2 Click + New registration

This screenshot shows the 'App registrations' section of the Azure Active Directory. The top navigation bar includes a 'New registration' button, which is also highlighted with a red box. The main content area displays a message about the new app registration search preview and another message about the end of support for ADAL and Graph. The sidebar on the left includes 'Overview', 'Getting started', 'Preview features', and 'Manage' sections.

- 5.2.3 Input data

This screenshot shows the 'Register an application' form. It starts with a 'Name' field, which is highlighted with a red box. Below it is a note about the user-facing display name. The next section is 'Supported account types', where the 'Accounts in this organizational directory only (預設目錄 only - Single tenant)' option is selected. There's a 'Help me choose...' link. The 'Redirect URI (optional)' section follows, with a note about returning the authentication response. A dropdown menu for 'Web' and an input field for the redirect URI ('e.g. https://example.com/auth') are shown. A note about integrating apps from outside the organization is present. At the bottom, there's a link to 'Enterprise applications' and a checkbox for agreeing to Microsoft Platform Policies, followed by a 'Register' button.

- Name field

- Please use a recognizable name, this example uses **rpc-adt-demo**

- Supported account types field
  - Select Accounts in this organizational directory only (預設目錄 only – Single tenant)
- When the input is complete, please click the Register button

Name: rpc-adt-demo

Supported account types: Accounts in this organizational directory only (預設目錄 only - Single tenant)

Redirect URI (optional): Web e.g. https://example.com/auth

[Register](#)

- 5.3 Authentication

- 5.3.1 Click Authentication

Display name: rpc-adt-demo

Supported account types: My organization only

Starting June 30th, 2020 we will no longer add any new features to Azure Active Directory Authentication Library (ADAL) and Azure AD Graph. We will continue to provide technical support and security updates but we will no longer provide feature updates. Applications will need to be upgraded to Microsoft Authentication Library (MSAL) and Microsoft Graph. [Learn more](#)

[Get Started](#) [Documentation](#)

Build your application with the Microsoft identity platform

- 5.3.2 Click + Add a platform

The screenshot shows the Azure portal interface for managing an application. The left sidebar has 'Authentication' selected under 'Manage'. The main area is titled 'Platform configurations' with a sub-section 'Supported account types'. A note at the bottom states: 'Due to temporary differences in supported functionality, we don't recommend enabling personal Microsoft accounts for an existing registration. If you need to enable personal accounts, you can do so using the manifest editor. [Learn more about these restrictions.](#)'

- 5.3.3 Click Web

The screenshot shows the 'Configure platforms' section. Under 'Web applications', the 'Web' option is highlighted with a red box. Other options include 'Single-page application' and 'Mobile and desktop applications' (iOS/macOS and Android). A note at the bottom of the 'Web' section states: 'Due to temporary differences in supported functionality, we don't recommend enabling personal Microsoft accounts for an existing registration. If you need to enable personal accounts, you can do so using the manifest editor. [Learn more about these restrictions.](#)'

- 5.3.4 Configure Web

- Redirect URIs field
  - Please input <https://www.getpostman.com/oauth2/callback>
  - Implicit grant and hybrid flows
    - Select Access tokens (used for implicit flows)

- When the input is complete, please click the **Configure** button

**Configure Web**

**Platform configurations**

Depending on the platform or device this application is targeting, specific authentication settings, or fields specific to that platform may be required.

**Supported account types**

Who can use this application or access this API?

Accounts in this organizational directory only (預設目錄 or Current directory)

Accounts in any organizational directory (Any Azure AD directory or Multi-tenant)

[Help me decide...](#)

**Advanced settings**

Allow public client flows [\(?\)](#)

**Redirect URIs**

The URLs we will accept as destinations when returning authentication responses (tokens) after successfully authenticating or signing out users. Also referred to as reply URLs. [Learn more about Redirect URLs and their restrictions](#)

**Front-channel logout URL**

This is where we send a request to have the application clear the user's session data. This is required for single sign-out to work correctly.

**Implicit grant and hybrid flows**

Request a token directly from the authorization endpoint. If the application has a single-page architecture (SPA) and doesn't use the authorization code flow, or if it invokes a web API via JavaScript, select both access tokens and ID tokens. For ASP.NET Core web apps and other web apps that use hybrid authentication, select only ID tokens. [Learn more about tokens](#)

Select the tokens you would like to be issued by the authorization endpoint:

Access tokens (used for implicit flows)

ID tokens (used for implicit and hybrid flows)

**Configure** **Cancel**

- 5.4 Set **Authorization** in Postman

- Download **Postman** and Install
  - <https://www.postman.com/downloads/>
- Open **Postman** and Click **Authorization** tab

KEY	VALUE	DESCRIPTION
Key	Value	Description

- Authorization** tab

- Type field
  - Select **OAuth 2.0**

**TYPE**

Inherit auth from parent

No Auth

API Key

Bearer Token

Basic Auth

Digest Auth

OAuth 1.0

**OAuth 2.0**

Hawk Authentication

AWS Signature

NTLM Authentication [Beta]

Akamai EdgeGrid

- Configure New Token
  - Grant Type field

- Select **Implicit**
- **Callback URL** field
  - Please input <https://www.getpostman.com/oauth2/callback>
- **Auth URL** field
  - [https://login.microsoftonline.com/TENANT\\_ID/oauth2/authorize?  
resource=0b07f429-9f4b-4714-9392-cc5e8e80c8b0](https://login.microsoftonline.com/TENANT_ID/oauth2/authorize?resource=0b07f429-9f4b-4714-9392-cc5e8e80c8b0)

■ **Modify TENANT\_ID to Directory (tenant) ID**

The screenshot shows the Azure portal's application registration interface. On the left, there's a sidebar with 'Overview', 'Quickstart', 'Integration assistant', 'Branding', 'Authentication', 'Certificates & secrets', and 'Token configuration'. The 'Authentication' section is expanded. On the right, under the 'Essentials' tab, there are fields for 'Display name' (set to 'rpc-adt-demo'), 'Application (client) ID' (highlighted with a red box), 'Object ID', and 'Supported account types' (set to 'My organization only'). Below these, there are sections for 'Redirect URLs', 'Application ID URI', and 'Managed application in local directory'.

■ **Client ID** field

This screenshot is similar to the previous one but focuses on the 'Application (client) ID' field, which is also highlighted with a red box. The rest of the interface and settings are identical to the first screenshot.

■ When the input is complete, please click the **Get New Access Token** button

The screenshot shows the Postman interface for generating an OAuth 2.0 token. The 'Authorization' tab is active. In the 'Configure New Token' section, the 'Grant Type' is set to 'Implicit' and the 'Callback URL' is set to 'https://www.getpostman.com/oauth2/callback'. The 'Auth URL' is set to 'https://login.microsoftonline.com/'. There are fields for 'Client ID' (empty), 'Scope' (set to 'e.g. read:org'), 'State' (empty), and 'Client Authentication' (set to 'Send as Basic Auth header'). At the bottom right, there is a prominent red button labeled 'Get New Access Token'.

■ Click Use Token

Token Details	
Token Name	OAuth2 Token
Access Token	eyJ0eXAiOiJKV1QiLCJhbGciOiJSUzI1NiIsIng1dCI6Im5PbzNaRHJPRFhFSzFqS1doWHNsSFjs1hFZylsImtpZCI6Im5PbzNaRHJPRFhFsZfQsS1doWHNsSFjs1hFZyj9eyJhdWQiOiwYjA3ZjQyOS05ZjRiLTQ3MTQtOTMSMi1jYzVIOGU4MGM4jAiLCjc3MiOjodhRwczovL3N0cy53aW5kb3dzLm5ldC9mYml1MWFkNy1INjY2LTrhYjkOTE4ZC1IMGRimjEwOTA1YmMvliwiwaWF0ljoxNjE4MTk3NjM2LCJuymYiOjE2MTgxOTc2MzslmV4cCI6MTYxODlwMTUzNiwiYWNyjoiMSlsImFpbj6lkFVUUfLzhUQUFBQUZzd29qN2E5ZUw1WnpKOXBpSIRTMmh6aUppYnRtQy95ZFY4U3Z0dEx6aDjST3ZBeUiYYFqak0MMmo2dVM5cTZ5bGFuOXB2ejVYbnjSjhweXlWYk1RPT0iLCJhbHzZWNPzCI6jE6bGl2Z55jb206MDAwMzAwMDBGrjdDREVDQSlsmFctil6WyJwd2QiXSwiYXBwaWQiOj5YTMxYzVhYi1mNTU2LTQ5YzAtODYyNy1hNDk4OTAzNmNiMmMlcJhcHBpZGFjci6jAiLCJlbWFpbCI6Im1tb3Njb25paUBnbWFpbC5jb20iLCjmYW1pbHlfbmFtZS16lkh1YW5nliwizZlZW5fbmFtZS16lkFy2hclslmkcc16lmxodmUuY29tliwiAxhZGRvlioimTE0LiEzNv4xNTEuMiMwliwibmFtZ

## 6. Upload DWG & manifest.json to Azure Map using Postman

- 6.1 Create Azure Maps Account

  - 6.1.1 Search map

  - 6.1.2 Select Azure Maps Accounts

  - 6.1.3 Click Add

- o 6.1.4 Input data

## Create Azure Maps Account

### PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use Resource groups like folders to organize and manage all your resources.

Subscription \*

Azure in Open

Resource group \*

Create new

### ACCOUNT DETAILS

Name \*

Enter the name

Pricing tier \*

Standard S1

[See pricing details and pricing tier guide](#)

I confirm that I have read and agree to the [License](#) and [Privacy Statement](#). \*

Note - Azure Maps shares customer-provided address/location queries ("Queries") with third party TomTom for mapping functionality purposes. Queries are not linked to any customer or end-user when shared with TomTom and cannot be used to identify individuals. Microsoft is currently in the process of adding TomTom to the Online Services Subcontractor List. Note that the Mobility and Weather Services which include integration with Moovit and AccuWeather are currently in [PREVIEW](#).

**Create**

- **Subscription field**
  - Select the subscription you want to use
- **Resource group field**
  - Please use a recognizable name, this example uses **rpc-adt-rg**
- **Name field**
  - Please use a recognizable name, this example uses **rpc-map**
- **Pricing tier field**
  - this example uses **Standard S1**
- **I confirm that I have read and agree to the License and Privacy Statement. field**
  - Please click **check**

- When the input is complete, please click the **Create** button

## Create Azure Maps Account

### PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use Resource groups like folders to organize and manage all your resources.

Subscription \*

Azure in Open

Resource group \*

rpc-adt-rg

[Create new](#)

### ACCOUNT DETAILS

Name \*

rpc-map

Pricing tier \*

Standard S1

[See pricing details and pricing tier guide](#)

I confirm that I have read and agree to the [License](#) and [Privacy Statement](#). \*



Note - Azure Maps shares customer-provided address/location queries ("Queries") with third party TomTom for mapping functionality purposes. Queries are not linked to any customer or end-user when shared with TomTom and cannot be used to identify individuals. Microsoft is currently in the process of adding TomTom to the Online Services Subcontractor List. Note that the Mobility and Weather Services which include integration with Moovit and AccuWeather are currently in [PREVIEW](#).

[Create](#)

- Once deployment complete click on **Go to resource** button

The screenshot shows the Microsoft Azure MicrosoftMaps Overview page. A modal window is open, stating "Your deployment is complete". It provides deployment details: Deployment name: MicrosoftMaps, Subscription: Azure in Open, Start time: 3/31/2021, 1:20:32 PM, Correlation ID: rpc-adt-rg. Below the modal, there are links for "Deployment details" (Download) and "Next steps". A prominent blue button labeled "Go to resource" is visible. To the right of the modal, there are sections for Security Center, Free Microsoft tutorials, and Work with an expert.

- 6.1.5 Get **subscription-key**

- Click **Authentication**

The screenshot shows the Microsoft Azure rpc-map Azure Maps Account settings page. The "Authentication" section is highlighted with a red box. Other sections visible include "Pricing Tier", "Properties", and "Locks". On the right side, there are two charts: "Total Requests" and "Total Errors", both showing values of 100, 90, and 80 over different time intervals. The top navigation bar shows the account name "rpc-map" and the "Azure Maps Account" type.

## ■ Get Primary Key

Azure Maps supports two ways to authenticate:

1. Azure Active Directory (Azure AD) – [Azure AD](#) is Microsoft's cloud-based identity and access management service. Azure Maps Azure AD integration is currently available in preview for all Azure Maps API's. Azure AD supports role-based access control (RBAC) to allow fine-grained access to Azure Maps resources. To learn more about Azure Maps Azure AD integration, see [Azure Maps and Azure AD](#).
2. Shared Key Authentication – Shared Key authentication, often referred to as subscription key, relies on passing Azure Maps account generated keys with each request to Azure Maps. We recommend regenerating your keys regularly. You are provided two keys so that you can maintain connections using one key while regenerating the other. When you regenerate your keys, you must update any applications that access this account to use the new keys. To learn more about Azure Maps authentication, see [Authentication with Azure Maps](#).

**Azure Active Directory Authentication**

Client ID:

**Shared Key Authentication**

Primary Key:  (Circled in red)

Secondary Key:

### ○ 6.1.6 Create Creator overview

#### ■ Click Creator overview

Move ▾ Delete Refresh

**Essentials**

- Resource group (change) [rpc-adt-rg](#)
- Location Global
- Subscription (change) [Azure in Open](#)
- Subscription ID
- Pricing Tier (SKU) Standard S1
- Client ID

Show data for the last 1 hour 6 hours 12 hours **1 day** 7 days 30 days

#### ■ Click + Create a Creator resource

+ Create a Creator resource

**Bring your maps data**

Creator makes it possible to create private maps and develop applications using Azure Maps API and SDK. To create and start using Creator, click Create. [Learn more](#)

Create

## ■ Input data

**Project details**

- Subscription: Azure in Open
- Resource group: rpc-adt-rg
- Azure Maps account name: rpc-map

**Instance details**

- Creator name \*
- Location \*: United States

Buttons: Review + create (highlighted), Next : Tags >, Download a template for automation

## ■ Creator name field

- Please use a recognizable name, this example uses **rpc-map-creator**
- When the input is complete, please click the **Review + create** button

**Project details**

- Subscription: Azure in Open
- Resource group: rpc-adt-rg
- Azure Maps account name: rpc-map

**Instance details**

- Creator name \*: rpc-map-creator (highlighted with a green checkmark)
- Location \*: United States

Buttons: Review + create (highlighted), Next : Tags >, Download a template for automation

## ■ Review your settings and select Create

Basics	
Subscription	Azure in Open
Resource group	rpc-adt-rg
Azure Maps account name	rpc-map
Creator name	rpc-map-creator
Location	United States

Buttons: Create (highlighted), < Previous : Tags, Download a template for automation

- When the deployment completes, you'll see a page with a success or a failure message

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes 'Microsoft Azure', a search bar, and user information (mmosconi@gmail.com). Below the navigation is the 'CreatorResource | Overview' page. A green checkmark icon indicates 'Your deployment is complete'. Deployment details show: Deployment name: CreatorResource, Start time: 3/31/2021, 3:35:53 PM, Subscription: Azure in Open Resource group: rpc-adt-rg. There are sections for 'Deployment details' (with a download link) and 'Next steps' (with a 'Go to resource' button). On the right side, there are links to 'Security Center', 'Free Microsoft tutorials', and 'Work with an expert'.

- 6.2 Download and install **Postman**
  - <https://www.postman.com/downloads/>
- 6.3 Upload a Drawing package to **Azure Map**
  - 6.3.1 Create Request
    - HTTP Method
      - POST
    - Request
      - <https://atlas.microsoft.com/mapData/upload?api-version=1.0&dataFormat=zip&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
      - Comment
        - Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

The screenshot shows the 'Azure Maps Accounts - rpc-map' page under 'Authentication'. It explains two authentication methods: Azure Active Directory (Azure AD) and Shared Key Authentication. Under 'Shared Key Authentication', the 'Primary Key' field is highlighted with a red box. The left sidebar lists account settings like 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Events', 'Creator Preview', 'Creator overview', 'Settings', and 'Help'.

- Headers
  - Content-Type: **application/octet-stream**

The screenshot shows a Postman request configuration. The method is 'POST' and the URL is 'https://atlas.microsoft.com/mapData/upload?api-version=1.0&dataFormat=zip&subscription-key=yEM2IU7LOKbjNjf...'. The 'Headers' tab is selected, showing a table with one row: 'Content-Type: application/octet-stream'. Other tabs include 'Params', 'Authorization', 'Body', 'Pre-request Script', 'Tests', 'Settings', 'Cookies', and 'Code'. Buttons for 'Send' and 'Save' are at the bottom right.

- Body

- Select **binary**
- Select File: Upload **./Azure-Digital-Twins-for-RPC/Indoor-Map-Files/Indoor-Map-Files.zip**

The image consists of two vertically stacked screenshots of the Postman application. Both screenshots show a POST request to `https://atlas.microsoft.com/mapData/upload?api-version=1.0&dataFormat=zip&subscription-key=yEM2IU7LOKbjNjf...`. The top screenshot has the 'Body' tab selected, with the 'binary' radio button checked. Below the tab, there is a 'Select File' button. The bottom screenshot shows the same request but with the 'Body' tab still selected, but the file 'Indoor-Map-Files.zip' is now visible in the file input field.

- 6.3.2 Click the blue **Send** button and wait for the request to process

The image shows a screenshot of the Postman application. It is a POST request to the same URL as the previous screenshots. The 'Body' tab is selected, and the 'binary' radio button is checked. The 'Send' button is highlighted with a red rectangular border, indicating it is the next step to be taken.

- 6.3.3 Request complete

The image shows the results of the API call. The status bar at the top indicates a **202 Accepted** status, a time of **3.30 s**, and a size of **459 B**. The 'Body' tab is selected, showing the number '1'. The response body is currently empty.

- 6.4 To check the status of the API call

- o 6.4.1 Go to the Headers tab of the response

The screenshot shows the Postman interface with a POST request to <https://atlas.microsoft.com/mapData/upload?api-version=1.0&dataFormat=zip&subscription-key=yEM2IU7LOKbjNjfj5/>. The 'Headers' tab is selected, containing 10 items. The body is set to 'binary' and contains the file 'Indoor-Map-Files.zip'. The response status is 202 Accepted.

- o 6.4.2 Copy the value of the Location key

The screenshot shows the Postman interface with a POST request to the same URL. The 'Headers' tab is selected, showing 8 items. The 'Location' key is highlighted with a red box and its value is <https://atlas.microsoft.com/mapData/operations/096fe4fa-0744-462b-b8b5-0fa87...>.

- o 6.4.3 Need to append your primary subscription key to the URL for authentication

- HTTP Method
  - GET
- Request
  - <https://atlas.microsoft.com/mapData/operations/<operationId>?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
  - Comment

## ■ Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

Azure Maps supports two ways to authenticate:

- Azure Active Directory (Azure AD) – **Azure AD** is Microsoft's cloud-based identity and access management service. Azure Maps Azure AD integration is currently available in preview for all Azure Maps API's. Azure AD supports role-based access control (RBAC) to allow fine-grained access to Azure Maps resources. To learn more about Azure Maps Azure AD integration, see [Azure Maps and Azure AD](#).
- Shared Key Authentication – Shared Key authentication, often referred to as subscription key, relies on passing Azure Maps account generated keys with each request to Azure Maps. We recommend regenerating your keys regularly. You are provided two keys so that you can maintain connections using one key while regenerating the other. When you regenerate your keys, you must update any applications that access this account to use the new keys. To learn more about Azure Maps authentication, see [Authentication with Azure Maps](#).

**Azure Active Directory Authentication**

Client ID: [redacted]

**Shared Key Authentication**

Primary Key: [redacted]

Secondary Key: [redacted]

- 6.4.4 Click the blue **Send** button and wait for the request to process

GET https://atlas.microsoft.com/mapData/operations/096fe4fa-0744-462b-b8b5-0fa8701da66c?api-version=1.0&subscription-key=[redacted]

Params: ● Authorization Headers (7) Body Pre-request Script Tests Settings Cookies Code

Body: none form-data x-www-form-urlencoded raw binary GraphQL

**Send**

- 6.4.5 Request complete

GET https://atlas.microsoft.com/mapData/operations/096fe4fa-0744-462b-b8b5-0fa8701da66c?api-version=1.0&subscription-key=[redacted]

Params: ● Authorization Headers (7) Body Pre-request Script Tests Settings Cookies Code

Query Params

KEY	VALUE	DESCRIPTION	...	Bulk Edit
api-version	1.0			
subscription-key				X
Key	Value	Description		

Body Cookies Headers (8) Test Results

Pretty Raw Preview Visualize JSON

```

1  {
2    "operationId": "096fe4fa-0744-462b-b8b5-0fa8701da66c",
3    "created": "2021-03-31T10:08:07.8631498+00:00",
4    "status": "Succeeded",
5    "resourceLocation": "https://atlas.microsoft.com/mapData/metadata/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0"
6  }

```

Status: 201 Created Time: 232 ms Size: 713 B Save Response

- 6.5 To retrieve content metadata

- 6.5.1 Copy the **resourceLocation** that was retrieved in Step 6.4.5

The screenshot shows a Postman request configuration for a GET operation. The URL is [https://atlas.microsoft.com/mapData/operations/096fe4fa-0744-462b-b8b5-0fa8701da66c?api-version=1.0&subscription-key=\[REDACTED\]](https://atlas.microsoft.com/mapData/operations/096fe4fa-0744-462b-b8b5-0fa8701da66c?api-version=1.0&subscription-key=[REDACTED]). The response status is 201 Created, and the resourceLocation field in the JSON response is highlighted with a red box.

- 6.5.2 Need to append your primary subscription key to the URL for authentication

- HTTP Method
  - GET
- Request
  - <https://atlas.microsoft.com/mapData/metadata/{udid}?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
  - Comment
    - Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

The screenshot shows the Azure portal's Authentication settings for the 'rpc-map' Azure Maps account. The 'Authentication' section is selected. The 'Primary Key' input field is highlighted with a red box.

- 6.5.3 Click the blue **Send** button and wait for the request to process

The screenshot shows a Postman request configuration for a GET operation. The URL is [https://atlas.microsoft.com/mapData/metadata/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0&subscription-key=\[REDACTED\]](https://atlas.microsoft.com/mapData/metadata/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0&subscription-key=[REDACTED]). The 'Send' button is highlighted with a red box.

- 6.5.4 Request complete

Postman screenshot showing a successful API call to [https://atlas.microsoft.com/mapData/metadata/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0&subscription-key=\[REDACTED\]](https://atlas.microsoft.com/mapData/metadata/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0&subscription-key=[REDACTED]). The response is a 200 OK with a size of 623 B. The JSON response body is:

```

1 "udid": "d6aedfe1-5f42-35c2-3261-dc7eb9729ecb",
2 "location": "https://atlas.microsoft.com/mapData/d6aedfe1-5f42-35c2-3261-dc7eb9729ecb?api-version=1.0",
3 "created": "3/31/2021 10:08:07 AM +00:00",
4 "updated": "3/31/2021 10:08:15 AM +00:00",
5 "sizeInBytes": 306839,
6 "uploadStatus": "Completed"
7
8

```

- 6.6 Convert a Drawing package

- 6.6.1 Create convert request

- HTTP Method

- POST

- Request

- <https://atlas.microsoft.com/conversion/convert?subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY&api-version=1.0&udid=UDID&inputType=DWG>

- Comment

- 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

Azure portal screenshot showing the 'Authentication' section for the 'rpc-map' Azure Maps account. The 'Primary Key' input field is highlighted with a red box.

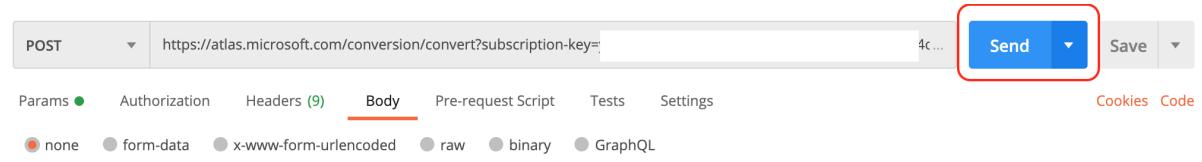
- 2. Modify UDID to udid that was retrieved in Step 6.5.2

- Headers

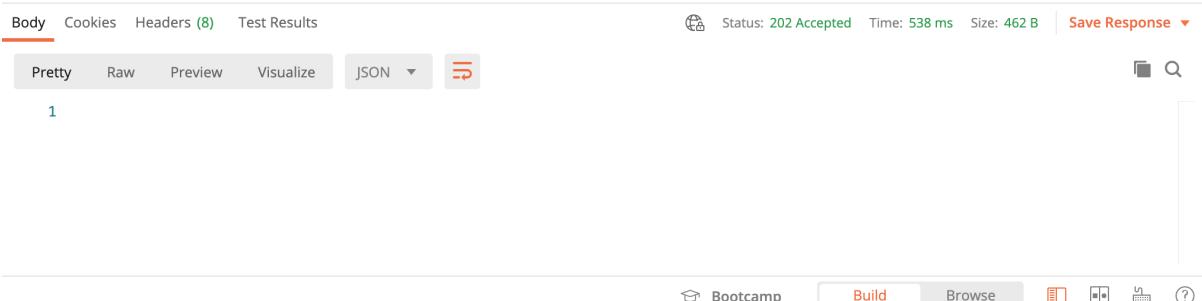
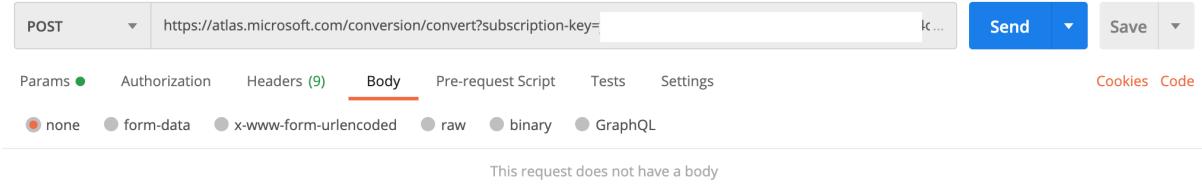
- Content-Type: application/json

Postman screenshot showing a POST request to [https://atlas.microsoft.com/conversion/convert?subscription-key=\[REDACTED\]](https://atlas.microsoft.com/conversion/convert?subscription-key=[REDACTED]). The Headers tab is selected, showing Content-Type: application/json. The response status is 401 Unauthorized.

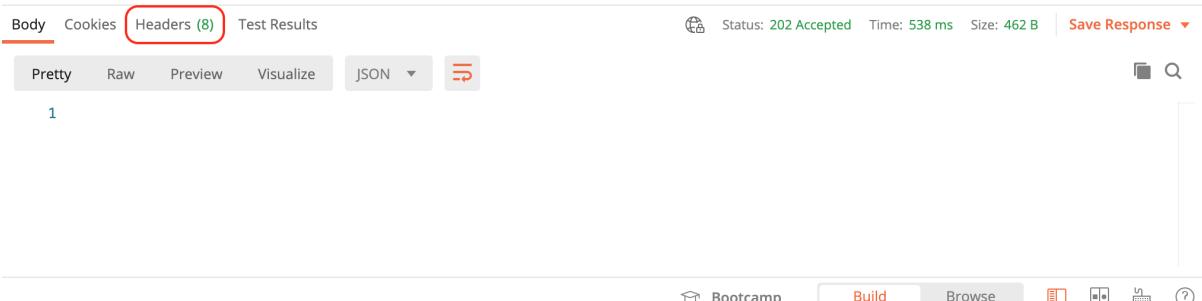
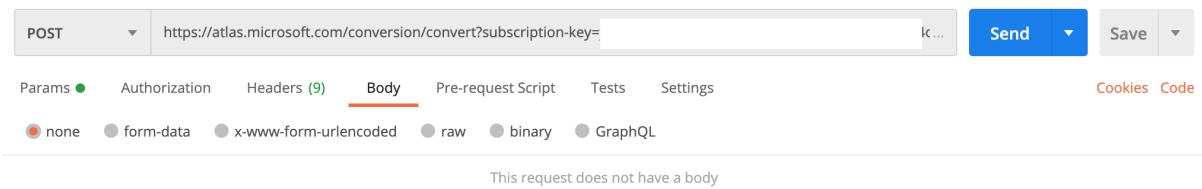
- o 6.6.2 Click the blue **Send** button and wait for the request to process



- o 6.6.3 Request complete



- o 6.6.4 Go to the Headers tab of the response, and look for the Location key



- 6.6.5 Copy the value of the Location key

POST https://atlas.microsoft.com/conversion/convert?subscription-key=

Params Authorization Headers (9) **Body** Pre-request Script Tests Settings Cookies Code

none form-data x-www-form-urlencoded raw binary GraphQL

This request does not have a body

Body	Cookies	Headers (8)	Test Results
			Status: 202 Accepted Time: 538 ms Size: 462 B Save Response ▾
<b>KEY</b>		<b>VALUE</b>	
Content-Type ⓘ		application/json	
Location ⓘ		https://atlas.microsoft.com/conversion/operations/3291f090-58e7-4662-a047-914...	
x-ms-azurermaps-region ⓘ		West US 2	
X-Content-Type-Options ⓘ		nosniff	
Strict-Transport-Security ⓘ		max-age=31536000; includeSubDomains	

Bootcamp Build Browse

- 6.6.6 Need to append your primary subscription key to the URL for authentication

- HTTP Method
  - GET
- Request
  - https://atlas.microsoft.com/conversion/operations/<operationId>?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY**
  - Comment
    - Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

Microsoft Azure Search resources, services, and docs (G+)

Home > Azure Maps Accounts > rpc-map

rpc-map | Authentication ...

Search (Cmd+)

Azure Maps supports two ways to authenticate:

- Azure Active Directory (Azure AD) – Azure AD is Microsoft's cloud-based identity and access management service. Azure Maps Azure AD integration is currently available in preview for all Azure Maps API's. Azure AD supports role-based access control (RBAC) to allow fine-grained access to Azure Maps resources. To learn more about Azure Maps Azure AD integration, see [Azure Maps and Azure AD](#).
- Shared Key Authentication – Shared Key authentication, often referred to as subscription key, relies on passing Azure Maps account generated keys with each request to Azure Maps. We recommend regenerating your keys regularly. You are provided two keys so that you can maintain connections using one key while regenerating the other. When you regenerate your keys, you must update any applications that access this account to use the new keys. To learn more about Azure Maps authentication, see [Authentication with Azure Maps](#).

Azure Active Directory Authentication

Client ID

Creator Preview

Creator overview

Settings

Authentication (highlighted with a red box)

Pricing Tier

Properties

Locks

Help

Getting Started

Shared Key Authentication

Primary Key (highlighted with a red box)

Secondary Key

- 6.6.7 Click the blue Send button and wait for the request to process

GET https://atlas.microsoft.com/conversion/operations/3291f090-58e7-4662-a047-9149f53b21c8?api-version=1.0&subsc...

Params Authorization Headers (7) **Body** Pre-request Script Tests Settings Cookies Code

none form-data x-www-form-urlencoded raw binary GraphQL

Send Save

- 6.6.8 Request complete

The screenshot shows a Postman interface with a successful API call. The URL is <https://atlas.microsoft.com/conversion/operations/3291f090-58e7-4662-a047-9149f53b21c8?api-version=1.0&subsc...>. The response status is 201 Created, and the response body is:

```

1  {
2      "operationId": "3291f090-58e7-4662-a047-9149f53b21c8",
3      "created": "2021-03-31T10:09:13.5245384+00:00",
4      "status": "Succeeded",
5      "resourceLocation": "https://atlas.microsoft.com/conversion/8648ea79-14c1-b00e-d898-4fed5c846474?api-version=1.0",
6      "properties": {}
7  }

```

- Comment
  - Copy the conversionId from the resourceLocation URL for the converted package. The conversionId is used by other API to access the converted map data.
  - <https://atlas.microsoft.com/conversion/8648ea79-14c1-b00e-d898-4fed5c846474?api-version=1.0>
  - <https://atlas.microsoft.com/conversion/CONVERSIONID?api-version=1.0>

- 6.7 Create a dataset

- 6.7.1 Create dataset request

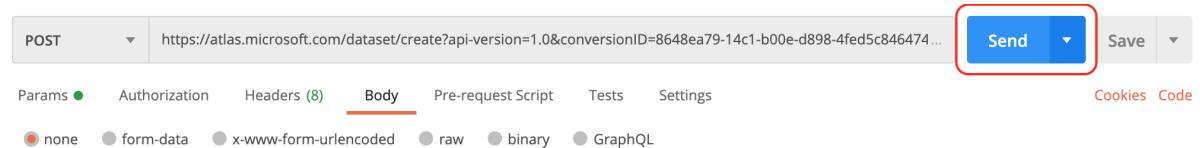
- HTTP Method
  - POST
- Request
  - <https://atlas.microsoft.com/dataset/create?api-version=1.0&conversionID=CONVERSIONID&type=facility&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
- Comment

- 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

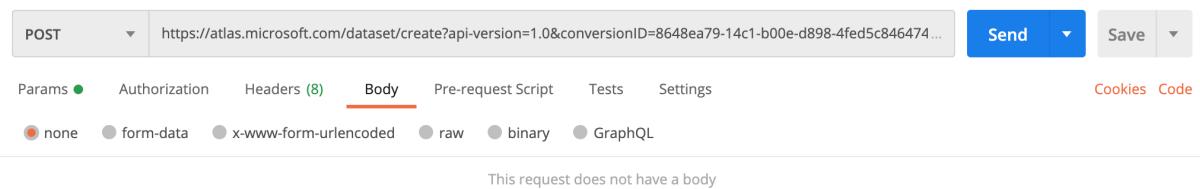
The screenshot shows the Azure portal's Authentication settings for the 'rpc-map' Azure Maps account. The 'Authentication' section is highlighted with a red box. The 'Primary Key' input field is also highlighted with a red box.

- 2. Modify CONVERSIONID to CONVERSIONID that was retrieved in Step 6.6.8

- o 6.7.2 Click the blue **Send** button and wait for the request to process

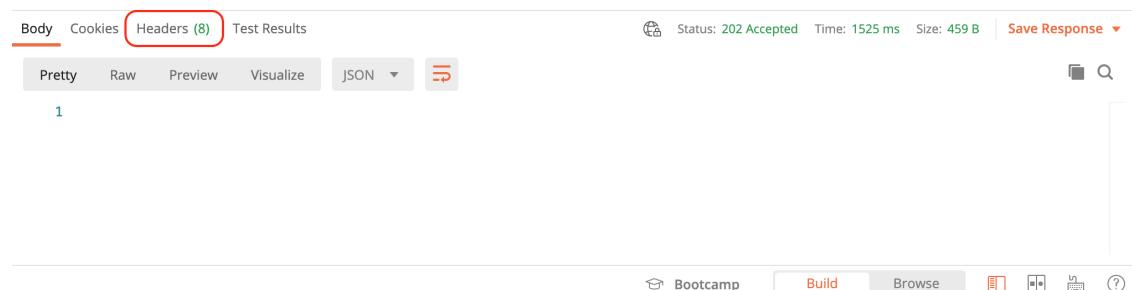
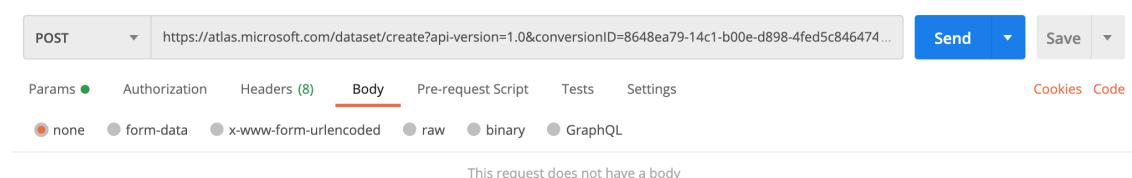


- o 6.7.3 Request complete



- o 6.7.4 Get datasetId

- Go to the Headers tab of the response



- Copy the value of the Location key

KEY	VALUE
Content-Type ⓘ	application/json
Location ⓘ	https://atlas.microsoft.com/dataset/operations/9340dad3-f3dd-4118-bc64-c38de964977a
x-ms-azurermaps-region ⓘ	West US 2
X-Content-Type-Options ⓘ	nosniff
Strict-Transport-Security ⓘ	max-age=31536000; includeSubDomains

- Need to append your primary subscription key to the URL for authentication

- HTTP Method
  - GET
- Request
  - <https://atlas.microsoft.com/dataset/operations/<operationId>?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
  - Comment
    - Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

- Click the blue Send button and wait for the request to process

- Request complete

The screenshot shows the Postman interface with a successful API call. The URL is `https://atlas.microsoft.com/dataset/operations/9340dad3-f3dd-4118-bc64-c38de964977a?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY`. The response status is 201 Created, and the body contains the following JSON:

```

1  {
2      "operationId": "9340dad3-f3dd-4118-bc64-c38de964977a",
3      "created": "2021-03-31T11:00:06.5956085+00:00",
4      "status": "Succeeded",
5      "resourceLocation": "https://atlas.microsoft.com/dataset/9352e113-9133-b24b-64ee-adb5b9d92857?api-version=1.0"
6  }

```

- Comment

- The response header will contain the DATASETID for the created dataset.

Copy the DATASETID. You'll need to use the DATASETID to create a tileset.

- <https://atlas.microsoft.com/dataset/9352e113-9133-b24b-64ee-adb5b9d92857?api-version=1.0>
- <https://azure.microsoft.com/dataset/DATASETID?api-version=1.0>

- 6.8 Create a tileset

- 6.8.1 Create tileset request

- HTTP Method

- POST

- Request

- `https://atlas.microsoft.com/tileset/create/vector?api-version=1.0&datasetID=DATASETID&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY`

- Comment

- 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary

The screenshot shows the Azure portal's 'Authentication' settings for an Azure Maps account. The account name is 'rpc-map'. The 'Primary Key' field is highlighted with a red box. The 'Secondary Key' field is also visible below it.

- 2. Modify DATASETID to DATASETID that was retrieved in Step 6.7.4

- o 6.8.2 Click the blue **Send** button and wait for the request to process

The screenshot shows the Postman interface with a POST request to the specified URL. The 'Body' tab is selected. The 'Send' button at the top right is highlighted with a red box.

- o 6.8.3 Request complete

The screenshot shows the Postman interface after sending the request. The 'Body' tab is selected. The 'Send' button at the top right is highlighted with a red box. A message 'This request does not have a body' is displayed below the tabs.

The screenshot shows the Postman interface displaying the response details. The 'Headers (8)' tab is selected. The response status is 202 Accepted, and the response body contains the number '1'.

- o 6.8.4 Get tilesetId

- Go to the Headers tab of the response

The screenshot shows the Postman interface with a POST request to the specified URL. The 'Body' tab is selected. The 'Send' button at the top right is highlighted with a red box. A message 'This request does not have a body' is displayed below the tabs.

The screenshot shows the Postman interface displaying the response details. The 'Headers (8)' tab is selected. The response status is 202 Accepted, and the response body contains the number '1'.

- Copy the value of the Location key

KEY	VALUE
Content-Type ⓘ	application/json
Location ⓘ	https://atlas.microsoft.com/tileset/operations/3140a495-eb3e-40d6-85d2-98dcc59...
x-ms-azurermaps-region ⓘ	West US 2
X-Content-Type-Options ⓘ	nosniff
Strict-Transport-Security ⓘ	max-age=31536000; includeSubDomains

- Need to append your primary subscription key to the URL for authentication

- HTTP Method

- GET

- Request

- <https://atlas.microsoft.com/tileset/operations/<operationId>?api-version=1.0&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>

- Comment

- Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

**Authentication**

Primary Key

Client ID

- Click the blue **Send** button and wait for the request to process

## ■ Request running

This request does not have a body

```

1  {
2      "operationId": "3140a495-eb3e-40d6-85d2-98dcc591a6db",
3      "created": "2021-03-31T11:28:28.6952243+00:00",
4      "status": "Running"
5  }

```

## ■ Request complete

This request does not have a body

```

1  {
2      "operationId": "3140a495-eb3e-40d6-85d2-98dcc591a6db",
3      "created": "2021-03-31T11:28:28.6952243+00:00",
4      "status": "Succeeded",
5      "resourceLocation": "https://atlas.microsoft.com/tileset/35120fec-a07b-c6fa-49e2-cf30e23e2a6b?api-version=1.0"
6  }

```

## ■ Comment

- The response header will contain the TILESETID for the created dataset. Copy the TILESETID. You'll need to use the TILESETID to create a tileset.
  - <https://atlas.microsoft.com/tileset/35120fec-a07b-c6fa-49e2-cf30e23e2a6b?api-version=1.0>
  - <https://atlas.microsoft.com/tileset/TILESETID?api-version=1.0>

## • 6.9 Query datasets with WFS API

- 6.9.1 Make a GET request to view a list of the collections in the dataset

### ■ HTTP Method

- GET

### ■ Request

- <https://atlas.microsoft.com/wfs/datasets/DATASETID/collections?subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY&api-version=1.0>

### ■ Comment

- 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

Azure Maps supports two ways to authenticate:

1. Azure Active Directory (Azure AD) – [Azure AD](#) is Microsoft's cloud-based identity and access management service. Azure Maps Azure AD integration is currently available in preview for all Azure Maps APIs. Azure AD supports role-based access control (RBAC) to allow fine-grained access to Azure Maps resources. To learn more about Azure Maps Azure AD integration, see [Azure Maps and Azure AD](#).
2. Shared Key Authentication – Shared Key authentication, often referred to as subscription key, relies on passing Azure Maps account generated keys with each request to Azure Maps. We recommend regenerating your keys regularly. You are provided two keys so that you can maintain connections using one key while regenerating the other. When you regenerate your keys, you must update any applications that access this account to use the new keys. To learn more about Azure Maps authentication, see [Authentication with Azure Maps](#).

- 2. Modify **DATASETID** to **DATASETID** that was retrieved in **Step 6.7.4**

- 6.9.2 Click the blue **Send** button and wait for the request to process

- 6.9.3 Request complete

```

1 "collections": [
2   {
3     "name": "unit",
4     "description": "A physical and non-overlapping area which might be occupied and traversed by a navigating agent. Can be a hallway, a room, a courtyard, etc. It is surrounded by physical obstruction (wall), unless the isOpenArea attribute is equal to true, and one must add openings where the obstruction shouldn't be there. If isOpenArea attribute is equal to true, all the sides are assumed open to the surroundings and walls are to be added where needed. Walls for open areas are represented as a lineElement or areaElement with isObstruction equal to true."
5   }
]
  
```

- 6.10 Make a request for the unit feature collections

- 6.10.1 Make a GET request

- HTTP Method

- GET

- Request

- [https://atlas.microsoft.com/wfs/datasets/DATASETID/collections/unit/items?  
subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY&api-version=1.0](https://atlas.microsoft.com/wfs/datasets/DATASETID/collections/unit/items?subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY&api-version=1.0)

- Comment

- 1. Modify **AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY** to **Primary Key**

Azure Maps supports two ways to authenticate:

1. Azure Active Directory (Azure AD) – [Azure AD](#) is Microsoft's cloud-based identity and access management service. Azure Maps Azure AD integration is currently available in preview for all Azure Maps APIs. Azure AD supports role-based access control (RBAC) to allow fine-grained access to Azure Maps resources. To learn more about Azure Maps Azure AD integration, see [Azure Maps and Azure AD](#).
2. Shared Key Authentication – Shared Key authentication, often referred to as subscription key, relies on passing Azure Maps account-generated keys with each request to Azure Maps. We recommend regenerating your keys regularly. You are provided two keys so that you can maintain connections using one key while regenerating the other. When you regenerate your keys, you must update any applications that access this account to use the new keys. To learn more about Azure Maps authentication, see [Authentication with Azure Maps](#).

■ 2. Modify **DATASETID** to **DATASETID** that was retrieved in **Step 6.7.4**

- 6.10.2 Click the blue **Send** button and wait for the request to process

- 6.10.3 Request complete

```

30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
      ],
    },
    "properties": {
      "originalId": "cf52b7fd-c337-4b1e-b31d-3af79765c841",
      "categoryId": "CTG6",
      "isOpenArea": true,
      "isRouteable": true,
      "routeThroughBehavior": "allowed",
      "levelId": "LVL11",
      "occupants": [],
      "addressId": "DIR9",
      "name": "303"
    },
    "id": "UNIT20",
    "featureType": ""
  },
]
  
```

■ Comment

- Copy the feature **id** for a unit feature, we'll use this feature id in the next section.

- 6.11 Create a feature stateset

- 6.11.1 Make a POST request to the Create Stateset API

■ HTTP Method

- POST

■ Request

- <https://atlas.microsoft.com/featureState/stateset?api-version=1.0&datasetId=DATASETID&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>

- Comment

■ 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

The screenshot shows the Azure portal interface for managing an Azure Maps account named 'rpc-map'. In the left sidebar, under 'Creator Preview', the 'Authentication' section is selected and highlighted with a red box. Below it, the 'Shared Key Authentication' section is also highlighted with a red box. The 'Primary Key' input field is clearly visible and highlighted with a red box.

■ 2. Modify DATASETID to DATASETID that was retrieved in Step 6.7.4

■ Headers

■ Content-Type: application/json

The screenshot shows the Postman interface for a POST request. The 'Headers' tab is active and highlighted with a red box. It contains two entries: 'Content-Type' with a value of 'application/json' and 'Key' with a value of 'Value'. Other tabs like 'Params', 'Authorization', 'Body', and 'Tests' are visible but not selected.

KEY	VALUE	DESCRIPTION	***	Bulk Edit	Presets ▾
Content-Type	application/json				
Key	Value	Description			

■ Body

■ raw:

```
{
  "styles": [
    {
      "keyname": "setAlarm",
      "type": "string",
      "rules": [
        {
          "alarm": "#FF0000",
          "normal": "#00FF00",
          "init": "#7DF9FF",
          "no": "#d9e6f3",
          "gray": "#E6E6E6"
        }
      ]
    }
  ]
}
```

```

1 {
2   "styles": [
3     {
4       "keyname": "setAlarm",
5       "type": "string",
6       "rules": [
7         {
8           "alarm": "#FF0000",
9           "normal": "#00FF00",
10          "init": "#7DF9FF",
11          "no": "#d9e6f3",
12          "gray": "#E6E6E6"
13        }
14      ]
15    }
16  ]
17 }

```

- 6.11.2 Click the blue **Send** button and wait for the request to process

- 6.11.3 Request complete

```

1 {
2   "statesetId": "71141f8c-c2fb-23de-7532-cd0ff0b54371"
3 }

```

Body Cookies Headers (7) Test Results Status: 200 OK Time: 3.73 s Size: 411 B Save Response ▾

Pretty Raw Preview Visualize JSON ↴

- Comment
  - Copy the **statesetId** from the response body

- 6.12 Update the state

- 6.12.1 Make a POST request to the Create Stateset API

- HTTP Method
  - POST
- Request
  - <https://atlas.microsoft.com/featureState/state?api-version=1.0&statesetID=STATESETID&featureID=FEATUREID&subscription-key=AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY>
  - Comment

■ 1. Modify AZURE-MAPS-PRIMARY-SUBSCRIPTION-KEY to Primary Key

The screenshot shows the Azure portal interface for managing an Azure Maps account. The left sidebar has 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Events', 'Creator Preview', 'Creator overview', 'Settings', and 'Help'. The 'Authentication' section is selected and highlighted with a red box. Under 'Shared Key Authentication', the 'Primary Key' input field is also highlighted with a red box. The 'Secondary Key' field is below it.

■ 2. Modify STATESETID to statesetId that was retrieved in Step 6.11.3

■ 3. Modify FEATUREID to id that was retrieved in Step 6.10.3

■ Headers

■ Content-Type: application/json

The screenshot shows a Postman request configuration. The method is 'POST' and the URL is 'https://atlas.microsoft.com/featureState/state?api-version=1.0&statesetID=71141f8c-c2fb-23de-7532-cd0ff0b54371&...'. The 'Headers' tab is selected, showing a table with one row: 'Content-Type' set to 'application/json'. Other tabs include 'Params', 'Authorization', 'Body', 'Pre-request Script', 'Tests', and 'Settings'.

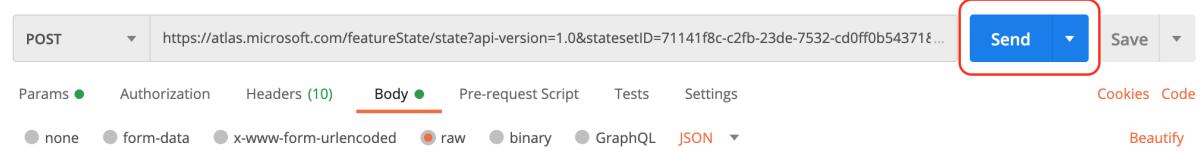
■ Body

■ raw

```
{
  "states": [
    {
      "keyName": "setAlarm",
      "value": "init",
      "eventTimestamp": "2021-03-31T11:39:01"
    }
  ]
}
```

The screenshot shows a Postman request configuration. The method is 'POST' and the URL is 'https://atlas.microsoft.com/featureState/state?api-version=1.0&statesetID=71141f8c-c2fb-23de-7532-cd0ff0b54371&...'. The 'Body' tab is selected, showing a JSON editor with the same raw JSON content as the previous screenshot. Other tabs include 'Params', 'Authorization', 'Headers', 'Pre-request Script', 'Tests', and 'Settings'.

- Comment
  - The update will only be saved if the time posted stamp is after the time stamp of the previous request.
- 6.12.2 Click the blue **Send** button and wait for the request to process



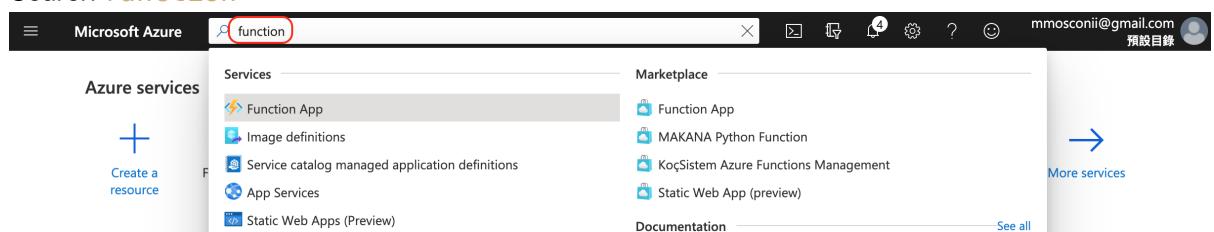
- 6.12.3 Request complete

The screenshot shows the Postman interface after sending the request. The JSON body is displayed in the 'Pretty' format. The status bar at the bottom indicates a successful 200 OK response with a duration of 18.53 seconds and a size of 342 B. The 'Save Response' button is also visible.

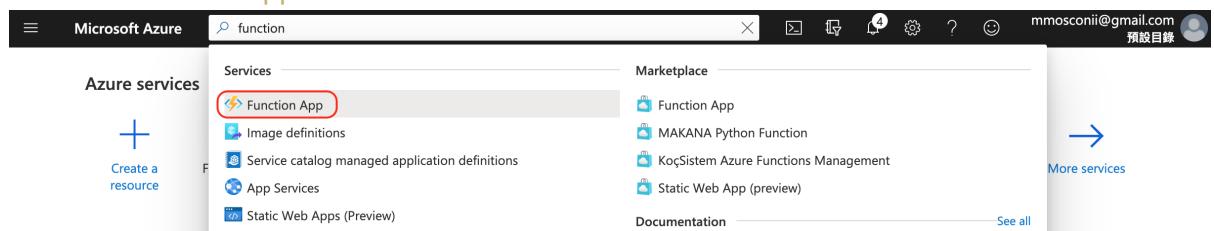
## 7. Create & Deploy to ADT Function

- 7.1 Create Azure Functions

- Search **function**



- Select **Function App**



- Click Add

The screenshot shows the Microsoft Azure portal interface. At the top, there's a search bar and a navigation bar with icons for Home, Function App, and other services. Below the navigation is a toolbar with buttons for Manage view, Refresh, Export to CSV, Open query, Assign tags, Start, Restart, Stop, Delete, and Feedback. A filter bar at the bottom allows filtering by Subscription (all), Resource group (all), and Location (all). The main area displays a table with one record, showing 'Showing 1 to 4 of 4 records.' On the right, there are dropdown menus for 'No grouping' and 'List view'.

- Input data

## Create Function App

**Basics**

Create a function app, which lets you group functions as a logical unit for easier management, deployment and sharing of resources. Functions lets you execute your code in a serverless environment without having to first create a VM or publish a web application.

**Project Details**

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription *	Azure in Open
Resource Group *	Create new

**Instance Details**

Function App name *	Function App name .azurewebsites.net
Publish *	<input checked="" type="radio"/> Code <input type="radio"/> Docker Container
Runtime stack *	Select a runtime stack
Version *	Select a runtime stack version
Region *	Central US

**Buttons:**

- Review + create
- < Previous
- Next : Hosting >

- **Subscription field**
  - Select the subscription you want to use
- **Resource group field**
  - Please use a recognizable name, this example uses **rpc-adt-rg**
- **Function App name field**
  - Please use a recognizable name, this example uses **rpcIngestADTFunctions**
- **Publish field**
  - Select **Code**
- **Runtime stack field**
  - Select **.NET**
- **Version 欄位**
  - Select **3.1**
- **Region field**
  - This example uses **East US**

- When the input is complete, please click the **Review + create** button

## Create Function App ...

Basics    Hosting    Monitoring    Tags    Review + create

Create a function app, which lets you group functions as a logical unit for easier management, deployment and sharing of resources. Functions lets you execute your code in a serverless environment without having to first create a VM or publish a web application.

**Project Details**

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ    Azure in Open

Resource Group \* ⓘ    rpc-adt-rg    Create new

**Instance Details**

Function App name \*    rpcingestADTFunctions .azurewebsites.net

Publish \*     Code     Docker Container

Runtime stack \*    .NET

Version \*    3.1

Region \*    East US

**Buttons**

**Review + create**    < Previous    **Next : Hosting >**

- Review your settings and select **Create**

# Create Function App

Basics    Hosting    Monitoring    Tags    **Review + create**

## Summary

 **Function App**  
by Microsoft

### Details

Subscription	
Resource Group	rpc-adt-rg
Name	rpcIngestADTFunctions
Runtime stack	.NET 3.1

### Hosting

#### Storage (New)

Storage account	storageaccountrpcad9cab
-----------------	-------------------------

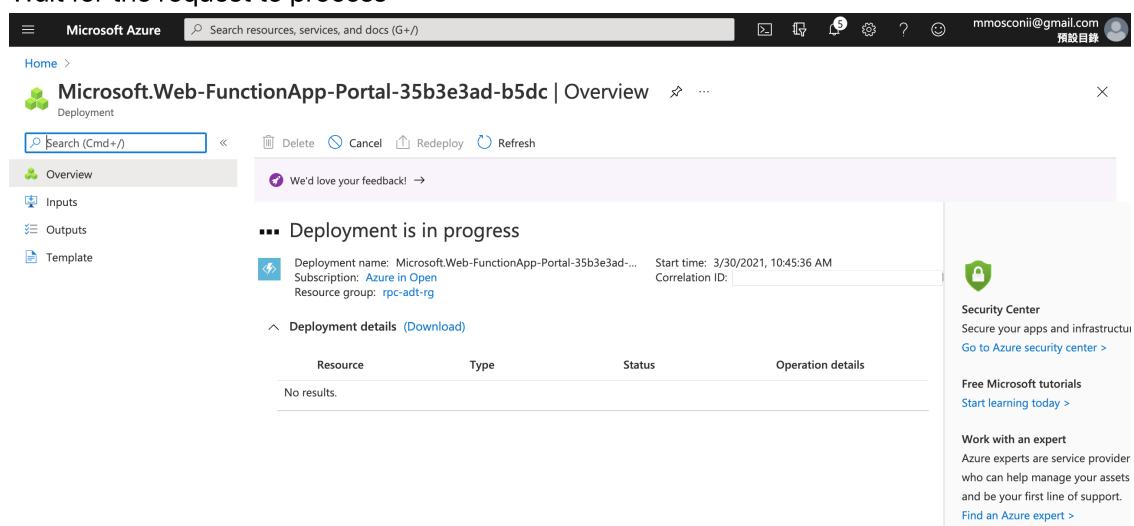
#### Plan (New)

Plan type	Consumption (Serverless)
Name	ASP-rpcadtrg-b8fa
Operating System	Windows
Region	East US
SKU	Dynamic

---

**Create**
< Previous
Next >
Download a template for automation

### Wait for the request to process



- Once deployment complete click on Go to resource button

The screenshot shows the Microsoft Azure Overview page for a function app named "Microsoft.Web-FunctionApp-Portal-35b3e3ad-b5dc". The main message is "Your deployment is complete". Deployment details include name: Microsoft.Web-FunctionApp-Portal-35b3e3ad..., Start time: 3/30/2021, 10:45:36 AM, Subscription: Azure in Open, Resource group: rpc-adt-rg. Below this, there's a "Deployment details" section with a "Download" link, a "Next steps" section with "Add a function" and "Manage deployments for your app" links, and a prominent blue "Go to resource" button.

- 7.2 Set Configuration

- Click Configuration

The screenshot shows the Azure Function App configuration page for "rpcIngestADTFunctions". The left sidebar has sections for Functions (Functions, App keys, App files, Proxies), Deployment (Deployment slots, Deployment Center, Deployment Center (Classic)), and Settings (Configuration, Authentication / Authorization, Authentication (preview), Application Insights, Identity, Backups). The main area shows "Essentials" details: Resource group (change) : rpc-adt-rg, Status : Running, Location : East US, Subscription (change) : Azure in Open, Subscription ID : [redacted], URL : https://rpcingestadtfunctions.azurewebsites.net, Operating System : Windows, App Service Plan : ASP-rpcadtrg-b8fa (Y1: 0), Properties : See More, Runtime version : 3.0.15405.0. Below this is a "Metrics" section with two charts: "Memory working set" and "Function Execution Count".

- Click New application setting

Name	Value	Source	Deployment slot setting
APPINSIGHTS_INSTRUMENTATIONKEY	Hidden value. Click to show value	App Config	
APPLICATIONINSIGHTS_CONNECTION_STRING	Hidden value. Click to show value	App Config	
AzureWebJobsStorage	Hidden value. Click to show value	App Config	
FUNCTIONS_EXTENSION_VERSION	Hidden value. Click to show value	App Config	
FUNCTIONS_WORKER_RUNTIME	Hidden value. Click to show value	App Config	
WEBSITE_CONTENTAZUREFILECONNECTIONSTRING	Hidden value. Click to show value	App Config	
WEBSITE_CONTENTSHARE	Hidden value. Click to show value	App Config	

- Input data

- In the Name field, please enter ADT\_SERVICE\_URL
- In the Value field ( Add prefix https:// in URL )

- Please click **OK** button after entering the above information

Microsoft Azure

Search resources, services, and docs (G+)

Home > Microsoft.Web.FunctionApp-Portal-35b3e3ad-b5dc > rpcingestADTFunctions

**rpclngestADTFunctions | Configuration**

Add/Edit application setting

Name	ADT_SERVICE_URL
Value	https://rpc-adt-example.api.eus.digitatwins.azure.net

OK Cancel

Functions

Deployment

Settings

- Click **Save**

Microsoft Azure

Search resources, services, and docs (G+)

Home > Microsoft.Web.FunctionApp-Portal-35b3e3ad-b5dc > rpcingestADTFunctions

**rpclngestADTFunctions | Configuration**

Save Discard

Application settings \* Function runtime settings General settings

Application settings

New application setting Show values Advanced edit

Name	Value	Source	Deployment slot setting
ADT_SERVICE_URL	Hidden value. Click to show value	App Config	
APPINSIGHTS_INSTRUMENTATIONKEY	Hidden value. Click to show value	App Config	
APPLICATIONINSIGHTS_CONNECTION_STRING	Hidden value. Click to show value	App Config	
AzureWebJobsStorage	Hidden value. Click to show value	App Config	
FUNCTIONS_EXTENSION_VERSION	Hidden value. Click to show value	App Config	
FUNCTIONS_WORKER_RUNTIME	Hidden value. Click to show value	App Config	
WEBSITE_CONTENTAZUREFILECONNECTIONSTRING	Hidden value. Click to show value	App Config	
WEBSITE_CONTENTSHARE	Hidden value. Click to show value	App Config	

- Click **Continue**

Microsoft Azure

Search resources, services, and docs (G+)

Home > Microsoft.Web.FunctionApp-Portal-35b3e3ad-b5dc > rpcingestADTFunctions

**rpclngestADTFunctions | Configuration**

Save changes

Any changes to applications settings and connection strings will restart your application. Are you sure you want to continue?

Continue Cancel

controls below. Application Settings are exposed as environment variables for access by your application at runtime. Learn more

- 7.3 Assign access role

- Select **Identity** in the navigation bar on the left to work with a managed identity for the function

The screenshot shows the Azure portal interface for a Function App named 'rpcIngestADTFunctions'. The left sidebar has 'Identity' selected. The main content area displays basic app details like Resource group (change), Status (Running), and URL (https://rpclingestadtfunctions.azurewebsites.net). A prominent red box highlights the 'Identity' section in the left sidebar.

- Click the **On** button

The screenshot shows the 'Identity' settings for the same Function App. The 'Status' switch is currently set to 'On', which is highlighted with a red box. Other options include 'System assigned' and 'User assigned'.

- Click the **Save** button

The screenshot shows the 'Identity' settings again. The 'Save' button at the bottom left is highlighted with a red box. The status remains 'On'.

- Click the **Yes** button

The screenshot shows a confirmation dialog box titled 'Enable system assigned managed identity'. It asks if you want to enable the system assigned managed identity for the function. The 'Yes' button is highlighted with a red box. The 'No' button is also visible.

- Select the Azure role assignments button

The screenshot shows the Azure portal interface for managing the identity of a Function App. The top navigation bar includes 'Microsoft Azure', a search bar, and user information. Below the navigation is the app name 'rpcIngestADTFunctions | Identity'. On the left, a sidebar lists various settings like Configuration, Authentication, Application Insights, and Identity (which is currently selected). The main content area shows the 'System assigned' identity status as 'On'. Under 'Permissions', there is a button labeled 'Azure role assignments' which is highlighted with a red box.

- Select the + Add role assignment (Preview) button

The screenshot shows the 'Azure role assignments' page. At the top, there is a header with the page title and a 'Refresh' button. Below the header, a message states 'If this identity has role assignments that you don't have permission to read, they won't be shown in the list.' A 'Learn more' link is provided. The main area contains a table with columns: 'Role', 'Resource Name', 'Resource Type', and 'Assigned To'. A dropdown menu for 'Subscription' is set to 'Azure in Open'. A note at the bottom says 'No role assignments found for the selected subscription.'

- Input data

The screenshot shows the 'Add role assignment (Preview)' dialog. It includes fields for 'Scope' (with a dropdown for 'Select a scope'), 'Subscription' (set to 'Azure in Open'), 'Role' (with a dropdown for 'Select a role'), and a link 'Learn more about RBAC'. At the bottom, there are 'Save' and 'Discard' buttons.

- Scope: Select Resource group
- Subscription: Select your Azure subscription
- Resource group: Select your resource group from the dropdown
- Role: Select Azure Digital Twins Data Owner from the dropdown

- When the input is complete, please click the **Save** button

Microsoft Azure

Search resources, services, and docs (G+)

Add role assignment (Preview)

Azure role assignments

If this identity has role assignments that you don't have permission to read, they won't be shown in the list. [Learn more](#)

Subscription \* Azure in Open

Resource group rpc-adt-rg

Role Azure Digital Twins Data Owner

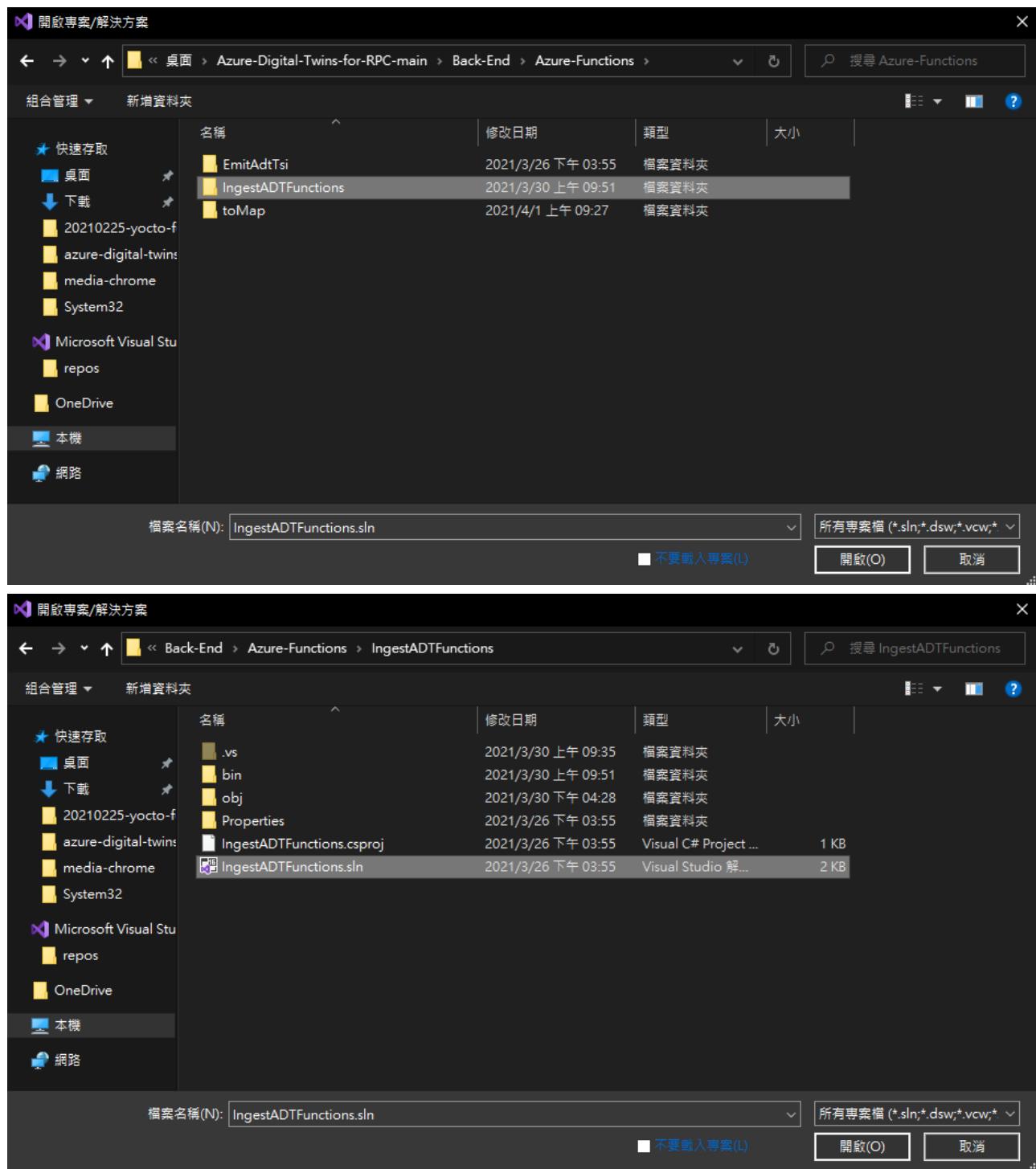
Learn more about RBAC

**Save** Discard

- Save finish

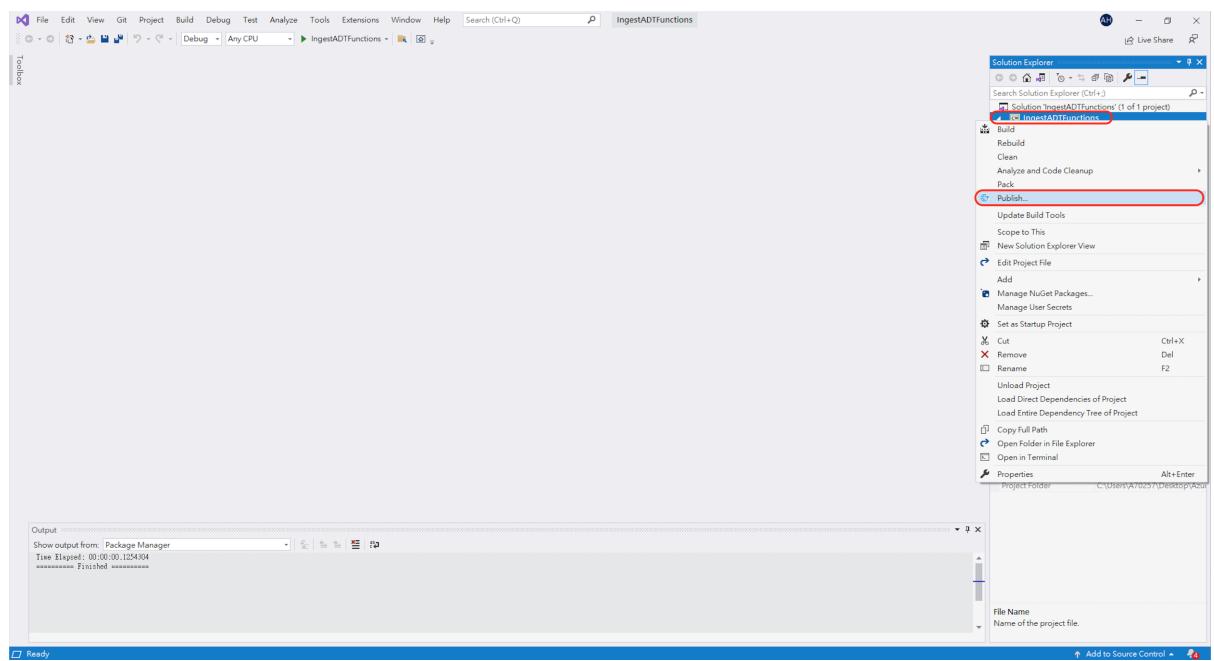
Role	Resource Name	Resource Type	Assigned To
Azure Digital Twins Data Owner	rpc-adt-rg	Resource Group	rpcIngestADTFunctions

- 7.4 Opening **IngestADTFunctions.sln** from /Back-End/Azure-Functions/IngestADTFunctions in Visual Studio 2019

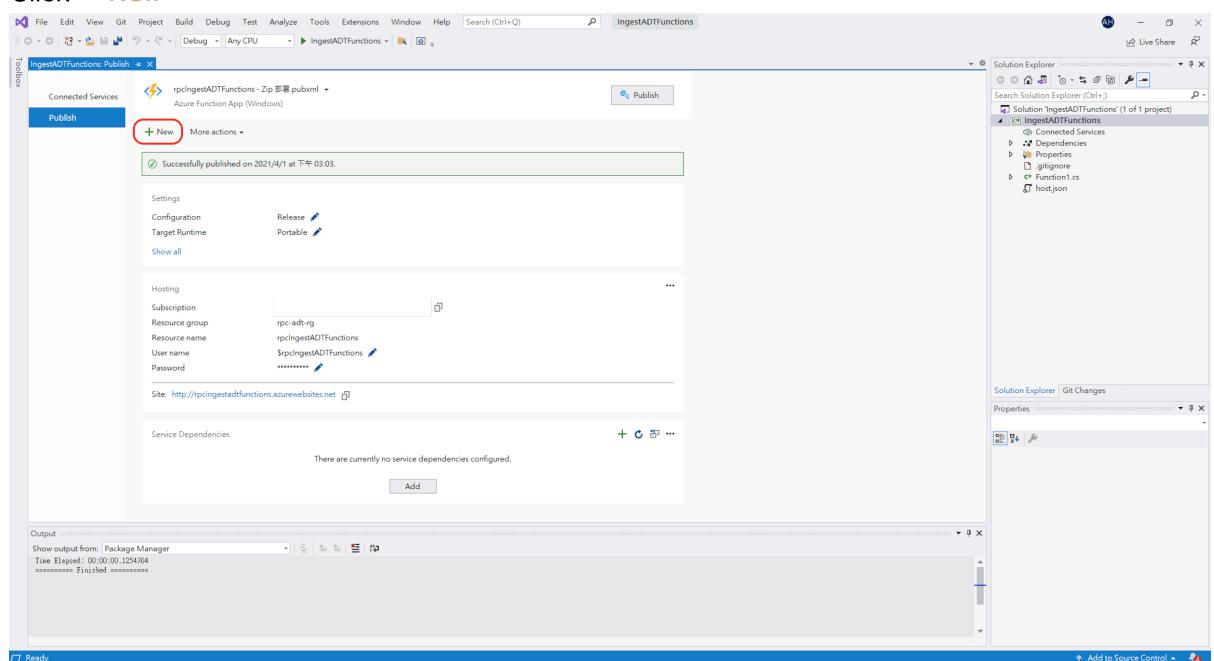


- 7.5 Deploy **IngestADTFunctions** to Azure Function

- Click Publish...



- Click + New



- Click Azure

## Publish

Where are you publishing today?

The screenshot shows the 'Publish' dialog with the 'Target' tab selected. There are four options listed:

- Azure**: Publish your application to the Microsoft cloud. This option is highlighted with a red box.
- Docker Container Registry**: Publish your application to any supported Container Registry that works with Docker images.
- Folder**: Publish your application to a local folder or file share.
- Import Profile**: Import your publish settings to deploy your app.

At the bottom of the dialog are buttons for Back, Next, Finish, and Cancel.

- o Click Azure Function App (Windows) > Next

## Publish

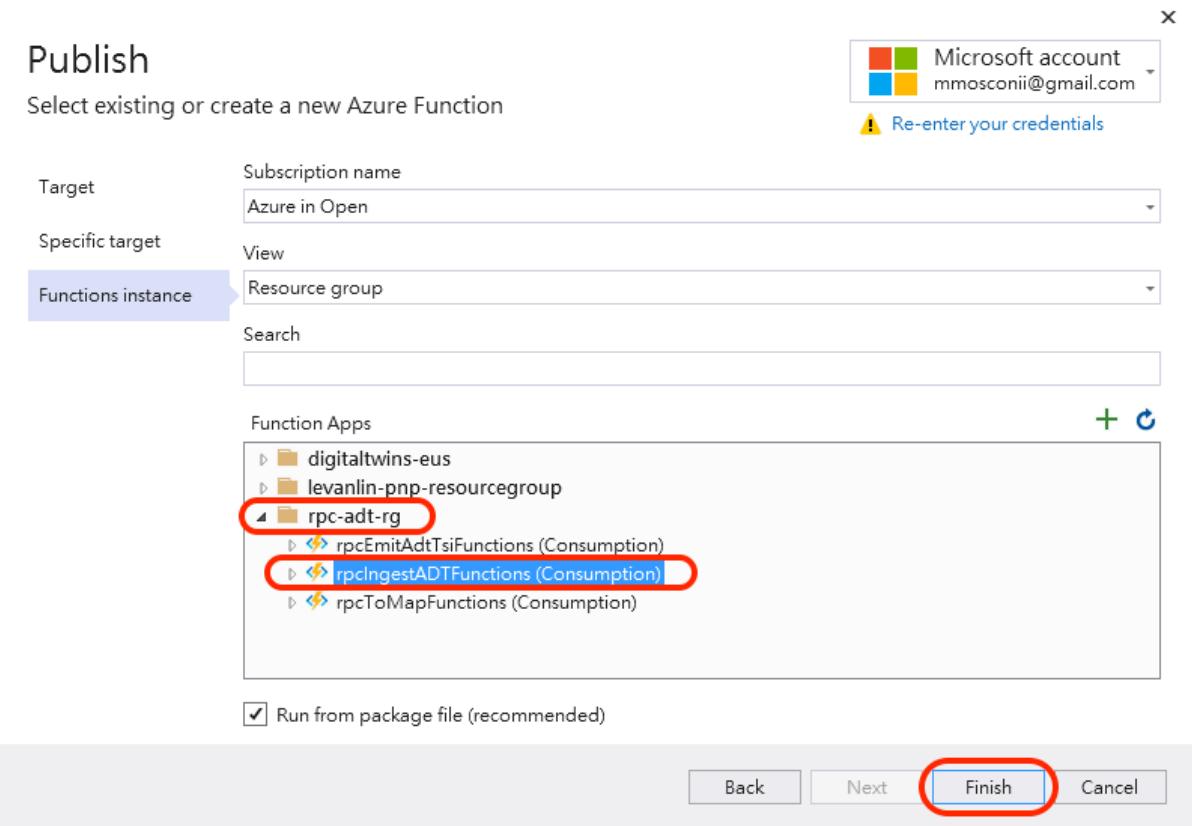
Which Azure service would you like to use to host your application?

The screenshot shows the 'Publish' dialog with the 'Specific target' tab selected. There are four options listed:

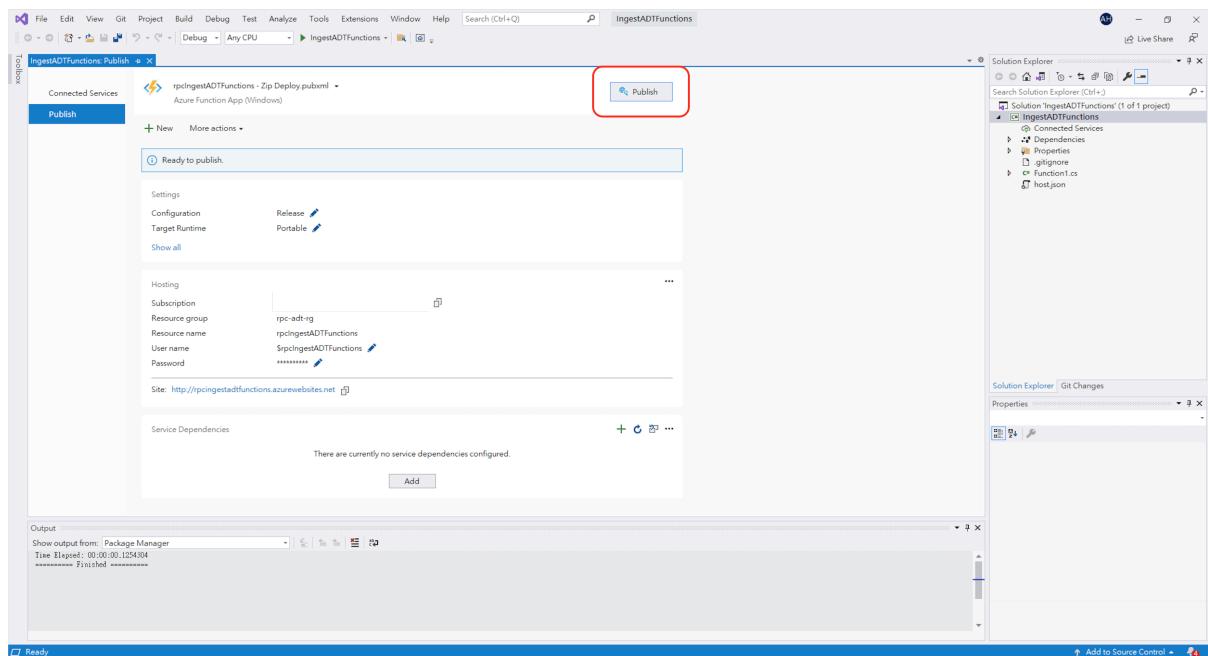
- Azure Function App (Windows)**: Publish your application code to a serverless compute that scales dynamically and runs code on-demand. This option is highlighted with a red box.
- Azure Function App (Linux)**: Publish your application code to a serverless compute that scales dynamically and runs code on-demand.
- Azure Function App Container**: Publish your application as a Docker image to Azure Container Registry and run it on Azure Function App.
- Azure Container Registry**: Publish your application as a Docker image to Azure Container Registry.

At the bottom of the dialog are buttons for Back, Next, Finish, and Cancel. The 'Next' button is highlighted with a red circle.

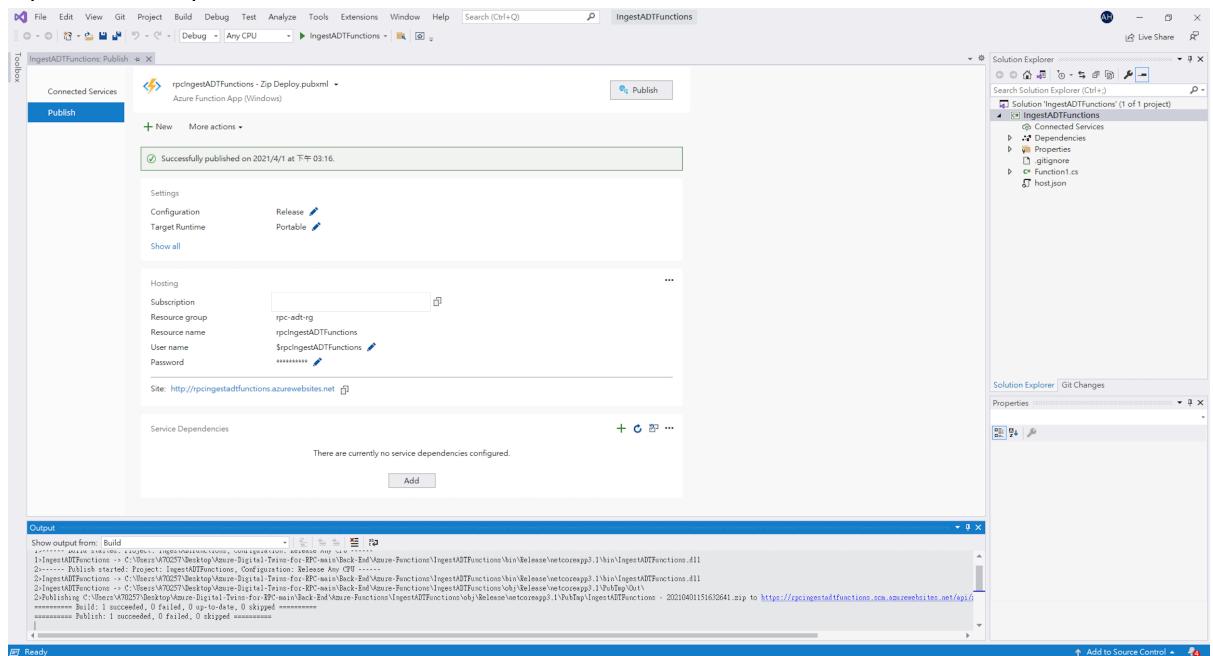
- Please select the function created in Step 7.1



- Click Publish



- Operation completes



## 8. Create Azure IoT Hub, Set Event Grid, Create IoT Device

- 8.1 Search **iot hub**

The screenshot shows the Microsoft Azure portal search results for 'iot hub'. The 'IoT Hub' service is highlighted with a red box. Other services listed include Device Update for IoT Hubs, Notification Hubs, and Event Hubs.

- 8.2 Select **IoT Hub**

The screenshot shows the Microsoft Azure portal search results for 'iot hub'. The 'IoT Hub' service is highlighted with a red box. Other services listed include Device Update for IoT Hubs, Notification Hubs, and Event Hubs.

- 8.3 Click **+ Add**

The screenshot shows the Microsoft Azure portal 'IoT Hub' list page. The '+ Add' button is highlighted with a red box. The page includes a search bar, a 'Manage view' dropdown, and several filter buttons: 'Subscription == all', 'Resource group == all', and 'Location == all'. At the bottom, there are buttons for 'No grouping' and 'List view'.

- 8.4 Input data

**IoT hub** ...  
Microsoft

**Basics** Networking Management Tags Review + create

Create an IoT hub to help you connect, monitor, and manage billions of your IoT assets. [Learn more](#)

**Project details**

Choose the subscription you'll use to manage deployments and costs. Use resource groups like folders to help you organize and manage resources.

Subscription \* ⓘ  ▼

Resource group \* ⓘ  ▼  
[Create new](#)

Region \* ⓘ  ▼

IoT hub name \* ⓘ

---

[Review + create](#) [< Previous](#) [Next: Networking >](#)

- **Subscription** field
  - Select the subscription you want to use
- **Resource group** field
  - Please use a recognizable name, this example uses `rpc-adt-rg`
- **Region** field
  - This example uses `East US`
- **IoT hub name** field
  - Please use a recognizable name, this example uses `rpc-adt-hub`

- 8.5 When the input is complete, please click the **Review + create** button

IoT hub ...

Microsoft

Basics Networking Management Tags Review + create

Create an IoT hub to help you connect, monitor, and manage billions of your IoT assets. [Learn more](#)

**Project details**

Choose the subscription you'll use to manage deployments and costs. Use resource groups like folders to help you organize and manage resources.

Subscription \* ⓘ Azure in Open ▼

Resource group \* ⓘ rpc-adt-rg ▼  
[Create new](#)

Region \* ⓘ East US ▼

IoT hub name \* ⓘ rpc-adt-hub ✓

---

Review + create < Previous Next: Networking >

- 8.6 Review your settings and select **create**

**IoT hub** ...  
Microsoft

Validation passed.

Basics Networking Management Tags **Review + create**

---

**Basics**

Subscription	Azure in Open
Resource group	rpc-adt-rg
Region	East US
IoT hub name	rpc-adt-hub

**Networking**

Connectivity method	Public endpoint (all networks)
Private endpoint connections	None

**Management**

---

**Create** < Previous: Tags Next > Automation options

- 8.7 Wait for the request to process

Deployment is in progress

Deployment name: rpc-adt-hub-329162017 Start time: 3/29/2021, 4:20:20 PM  
Subscription: Azure in Open Correlation ID:  
Resource group: rpc-adt-rg

Resource	Type	Status	Operation details
No results.			

- 8.8 Operation completes

Your deployment is complete

Deployment name: rpc-adt-hub-329162017 Start time: 3/29/2021, 4:20:20 PM  
Subscription: Azure in Open Correlation ID:  
Resource group: rpc-adt-rg

Next steps

Add and configure IoT Devices Recommended  
Configure routing rules for device messaging Recommended

[Go to resource](#)

- 8.9 Set Event to IngestADTFunctions Azure Function

- Click Events

Move Delete Refresh

Overview

Essentials

Resource group (change) : rpc-adt-rg	Hostname : rpc-adt-hub.azure-devices.net
Status : Active	Pricing and scale tier : S1 - Standard
Current location : East US	Number of IoT Hub units : 1
Subscription (change) : Azure in Open	System-assigned ID :
Subscription ID :	Minimum TLS Version : 1.0
Tags (change) : Click here to add tags	

JSON View

- Click + Event Subscription

The screenshot shows the Microsoft Azure IoT Hub Events page. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it, the path 'Home > IoT Hub > rpc-adt-hub' is shown. The main title is 'rpc-adt-hub | Events'. On the left, there's a sidebar with links like 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', and 'Events'. The 'Events' link is highlighted. In the center, there are two tabs: 'Get Started' and 'Event Subscriptions', with 'Event Subscriptions' being the active one. Below these tabs, there's a section titled 'Essentials' with 'System Topic test' and 'Topic Type Microsoft.Devices.IoTHubs'. At the bottom, there are metrics for 'General', 'Errors', 'Latency', and 'Dead-Letter', and a time range selector from '1 hour' to '30 days'.

- Input data

The screenshot shows the 'Create Event Subscription' page. At the top, there's a navigation bar with 'Microsoft Azure' and a search bar. Below it, the path 'Home > IoT Hub > rpc-adt-hub > Create Event Subscription' is shown. The main title is 'Create Event Subscription'. There are four tabs: 'Basic' (selected), 'Filters', 'Additional Features', and 'Delivery Properties'. To the right, there's a link 'Advanced Editor'. The 'EVENT SUBSCRIPTION DETAILS' section has a 'Name \*' field and an 'Event Schema' dropdown set to 'Event Grid Schema'. The 'TOPIC DETAILS' section shows 'Topic Type' as 'IoT Hub', 'Source Resource' as 'rpc-adt-hub', and 'System Topic Name' as 'test'. The 'EVENT TYPES' section has a 'Filter to Event Types' dropdown set to '4 selected'. The 'ENDPOINT DETAILS' section has an 'Endpoint Type \*' dropdown. At the bottom is a 'Create' button.

- **Name field**
  - Please use a recognizable name, this example uses **adtEvent**
- **System Topic Name field**
  - Please use a recognizable name, this example uses **test**
- **Filter to Event Types field**
  - Please select **Device Created**、**Device Deleted**、**Device Connected**、**Device Disconnected**、**Device Telemetry**
- **Endpoint Type field**
  - Please select **Azure Function**
- **Endpoint field**
  - Please select **Select an endpoint**
  - **Select Azure Function View**
    - **Subscription field**
      - Select the subscription you want to use
    - **Resource group field**
      - Select your resource group from the dropdown, this example uses **rpc-adt-rg**
    - **Function app field**

- Select your azure function from the dropdown, this example uses **IngestADTFunctions**
- **Slot** field
  - Please select **Production**
- **Function** field
  - Please select **Function1**
- When the input is complete, please click the **Confirm Selection** button

## Select Azure Function

Event Grid

X

Subscription

Azure in Open

▼

Resource group

rpc-adt-rg

▼

Function app \*

rpcIngestADTFunctions

▼

Slot \* ⓘ

Production

▼

Function \* ⓘ

Function1

▼

---

**Confirm Selection**

- When the input is complete, please click the **Create** button

**Event Subscription Details**

Name \* adtEvent

Event Schema Event Grid Schema

**Topic Details**

Topic Type IoT Hub

Source Resource rpc-adt-hub

System Topic Name test

**Event Types**

Endpoint Type \* Azure Function (change)

Endpoint \* Function1 (change)

**Create**

- 8.10 Create IoT Devices

- Please create **rpc-adt-001**、**rpc-adt-002**、**rpc-adt-003**、**rpc-adt-004**
- Click **IoT Devices**

rpc-adt-hub IoT Hub

Search (Cmd+)

Move Delete Refresh

Identity

Pricing and scale

Networking

Certificates

Built-in endpoints

Failover

Properties

Locks

Explorers

Query explorer

IoT devices

Automatic Device Management

IoT Edge

IoT device configuration

Device updates

Resource group (change)  
rpc-adt-rg

Status  
Active

Current location  
East US

Subscription (change)  
Azure in Open

Subscription ID

Hostname  
rpc-adt-hub.azure-devices.net

Pricing and scale tier  
S1 - Standard

Number of IoT Hub units  
1

Minimum TLS Version  
1.0

Tags (change)  
Click here to add tags

Need a way to provision millions of devices?  
IoT Hub Device Provisioning Service enables zero-touch, just-in-time provisioning to the right IoT hub without requiring human intervention.

Need a way to monitor and secure your IoT solution?  
Defender for IoT is a unified security management service. It provides end-to-end threat analysis and protection across hybrid cloud workloads and your Azure IoT solution.

- Click + New

The screenshot shows the Microsoft Azure IoT Hub interface for the 'rpc-adt-hub'. The top navigation bar includes 'Microsoft Azure', a search bar, and user information. The main title is 'IoT devices' under 'IoT Hub'. On the left, there's a sidebar with links like 'Networking', 'Certificates', 'Built-in endpoints', 'Failover', 'Properties', and 'Locks'. The main area displays a table with columns: Device ID, Status, Last Status Update (UTC), Authentication Type, and Cloud to Device Message ...'. A query editor is visible at the bottom with fields for 'Field' (select or enter a property name), 'Operator' (=), and 'Value' (specify constraint value). A 'Query devices' button is present, along with a link to 'Switch to query editor'.

- Input data

## Create a device

**Find Certified for Azure IoT devices in the Device Catalog**

**Device ID \*** ⓘ  
The ID of the new device

**Authentication type** ⓘ  
**Symmetric key** X.509 Self-Signed X.509 CA Signed

**Primary key** ⓘ  
Enter your primary key

**Secondary key** ⓘ  
Enter your secondary key

**Auto-generate keys** ⓘ

**Connect this device to an IoT hub** ⓘ  
**Enable** Disable

**Parent device** ⓘ  
**No parent device**  
Set a parent device

**Save**

- Device ID field

- Input **rpc-adt-001**
- When the input is complete, please click the **Save** button

## Create a device

Find Certified for Azure IoT devices in the Device Catalog

Device ID \*  ✓

Authentication type (i)

Symmetric key X.509 Self-Signed X.509 CA Signed

Primary key (i)  
Enter your primary key

Secondary key (i)  
Enter your secondary key

Auto-generate keys (i)

Connect this device to an IoT hub (i)

Enable Disable

Parent device (i)

**No parent device**

[Set a parent device](#)

**Save**

### ■ Create **rpc-adt-002**、**rpc-adt-003**、**rpc-adt-004**

Microsoft Azure mmosconi@gmail.com 預設目錄

Home > IoT Hub > **rpc-adt-hub** ×

**rpc-adt-hub | IoT devices** ...

Search (Cmd+ /) New Refresh Delete

Certificates View, create, delete, and update devices in your IoT Hub.

Built-in endpoints

Failover

Properties

Locks

Explorers

Query explorer

IoT devices Query devices Switch to query editor

Field	Operator	Value
<input type="text" value="select or enter a property name"/>	<input type="text" value="="/>	<input type="text" value="specify constraint value"/>
<a href="#">Add a new clause</a>		

Device ID Status Last Status Update (UTC) Authentication Type Cloud to Device Message ...

rpc-adt-004	Enabled	--	Sas	0
rpc-adt-002	Enabled	--	Sas	0
rpc-adt-003	Enabled	--	Sas	0
rpc-adt-001	Enabled	--	Sas	0

## 9. Set Event & toTsi Function

- 9.1 Create an event hub namespace that will receive events from your Azure Digital Twins instance

- Azure CLI

```
az eventhubs namespace create --name <name for your Event Hubs namespace> --resource-group <resource group name> -l <region>
```

- e.g.

```
az eventhubs namespace create --name rpchubspace --resource-group rpc-adt-rg -l eastus
```

- 9.2 Create an event hub within the namespace to receive twin change events. Specify a name for the event hub.

- Azure CLI

```
az eventhubs eventhub create --name <name for your Twins event hub> --resource-group <resource group name> --namespace-name <Event Hubs namespace from above>
```

- e.g.

```
az eventhubs eventhub create --name rpcadteventhub --resource-group rpc-adt-rg --namespace-name rpchubspace
```

- 9.3 Create an authorization rule with send and receive permissions. Specify a name for the rule.

- Azure CLI

```
az eventhubs eventhub authorization-rule create --rights Listen Send --resource-group <resource group name> --namespace-name <Event Hubs namespace from above> --eventhub-name <Twins event hub name from above> --name <name for your Twins auth rule>
```

- e.g.

```
az eventhubs eventhub authorization-rule create --rights Listen Send --resource-group rpc-adt-rg --namespace-name rpchubspace --eventhub-name rpcadteventhub --name rpcadteventrules
```

- 9.4 Create an Azure Digital Twins endpoint that links your event hub to your Azure Digital Twins instance.
  - Azure CLI

```
az dt endpoint create eventhub -n <your Azure Digital Twins instance name> --endpoint-name <name for your Event Hubs endpoint> --eventhub-resource-group <resource group name> --eventhub-namespace <Event Hubs namespace from above> --eventhub <Twins event hub name from above> --eventhub-policy <Twins auth rule from above>
```

- e.g.

```
az dt endpoint create eventhub --endpoint-name rpchubadtendpoint --eventhub-resource-group rpc-adt-rg --eventhub-namespace rpchubspace --eventhub rpcadteventhub --eventhub-policy rpcadteventrules -n rpc-adt-example --resource-group rpc-adt-rg
```

- 9.5 Create a route in Azure Digital Twins to send twin update events to your endpoint. The filter in this route will only allow twin update messages to be passed to your endpoint.

- Azure CLI

```
az dt route create -n <your Azure Digital Twins instance name> --endpoint-name <Event Hub endpoint from above> --route-name <name for your route> --filter "type = 'Microsoft.DigitalTwins.Twin.Update'"
```

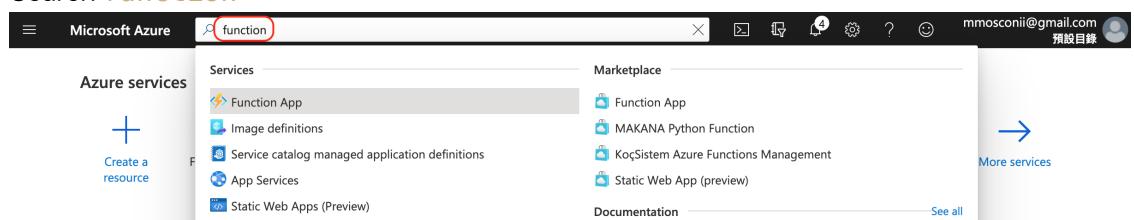
- e.g.

```
az dt route create -n rpc-adt-example --endpoint-name rpchubadtendpoint --route-name rpcroutename --filter "type = 'Microsoft.DigitalTwins.Twin.Update'" --resource-group rpc-adt-rg
```

- 9.6 Create & Deploy a function in Azure

- 8.6.1 Create Azure Functions

#### ■ Search function



## ■ Select Function App

The screenshot shows the Microsoft Azure portal interface. At the top, there's a search bar with the text 'function'. Below it, under 'Azure services', the 'Function App' option is highlighted with a red box. Other options like 'Image definitions', 'Service catalog managed application definitions', 'App Services', and 'Static Web Apps (Preview)' are also listed. To the right, there's a 'Marketplace' section with links to 'Function App', 'MAKANA Python Function', 'KoçSistem Azure Functions Management', and 'Static Web App (preview)'. A 'Documentation' link and a 'See all' button are at the bottom right.

## ■ Click Add

This screenshot shows the 'Function App' list page in the Azure portal. At the top, there's a search bar and a navigation bar with 'Home > Function App'. Below, there's a toolbar with buttons for '+ Add', 'Manage view', 'Refresh', 'Export to CSV', 'Open query', 'Assign tags', 'Start', 'Restart', 'Stop', 'Delete', and 'Feedback'. There are also filters for 'Subscription == all', 'Resource group == all', 'Location == all', and a 'Add filter' button. The main area shows a table with one record: 'Showing 1 to 4 of 4 records.' At the bottom, there are grouping and view selection buttons.

## ■ Input data

### Create Function App ...

The screenshot shows the 'Create Function App' wizard, step 1: Basics. It has tabs for 'Basics', 'Hosting', 'Monitoring', 'Tags', and 'Review + create'. The 'Basics' tab is selected. The 'Project Details' section asks to select a subscription and resource group. The 'Subscription' dropdown shows 'Azure in Open'. The 'Resource Group' dropdown shows 'Create new'. The 'Instance Details' section includes fields for 'Function App name' (with '.azurewebsites.net' suffix), 'Publish' (set to 'Code'), 'Runtime stack', 'Version', and 'Region' (set to 'Central US'). At the bottom, there are buttons for 'Review + create', '< Previous', and 'Next : Hosting >'.

### ■ Subscription field

- Select the subscription you want to use

### ■ Resource group field

- Please use a recognizable name, this example uses `rpc-adt-rg`

### ■ Function App name field

- Please use a recognizable name, this example uses  
`rpcEmitAdtTsiFunctions`

### ■ Publish field

- Select `Code`

### ■ Runtime stack field

- Select `.NET`

### ■ Version field

- Select `3.1`

- **Region field**
  - This example uses **East US**
  - When the input is complete, please click the **Review + create** button
- Create Function App** ...

[Basics](#)   [Hosting](#)   [Monitoring](#)   [Tags](#)   [Review + create](#)

Create a function app, which lets you group functions as a logical unit for easier management, deployment and sharing of resources. Functions lets you execute your code in a serverless environment without having to first create a VM or publish a web application.

#### Project Details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ

Azure in Open

Resource Group \* ⓘ

rpc-adt-rg

[Create new](#)

#### Instance Details

Function App name \*

rpcEmitAdtTsiFunctions

.azurewebsites.net

Publish \*

Code  Docker Container

Runtime stack \*

.NET

Version \*

3.1

Region \*

East US

[Review + create](#)

< Previous

Next : Hosting >

- Review your settings and select **Create**

## Create Function App ...

Basics    Hosting    Monitoring    Tags    **Review + create**

### Summary



### Details

#### Subscription

Resource Group	rpc-adt-rg
Name	rpcEmitAdtTsiFunctions
Runtime stack	.NET 3.1

### Hosting

#### Storage (New)

Storage account	storageaccountrpcad91aa
-----------------	-------------------------

#### Plan (New)

Plan type	Consumption (Serverless)
Name	ASP-rpcadtrg-a7fd
Operating System	Windows
Region	East US
SKU	Dynamic

### Monitoring (New)

Application Insights	Enabled
Name	rpcEmitAdtTsiFunctions
Region	East US

**Create**

< Previous

Next >

Download a template for automation

- wait for the request to process

The screenshot shows the Microsoft Azure Deployment Overview page for a function app named "Microsoft.Web-FunctionApp-Portal-c2f1c35a-85b1". The main message says "Deployment is in progress". Below it, a table lists deployment details:

Resource	Type	Status	Operation details
rpcEmitAdtTsiFunctions	microsoft.insights/compon...	OK	<a href="#">Operation details</a>
rpcEmitAdtTsiFunctions	microsoft.insights/compon...	OK	<a href="#">Operation details</a>
ASP-rcadtry-a7fd	Microsoft.Web/serverfarms	OK	<a href="#">Operation details</a>
storageaccountrpcad91aa	Microsoft.Storage/storage...	OK	<a href="#">Operation details</a>

- Once deployment complete click on **Go to resource** button

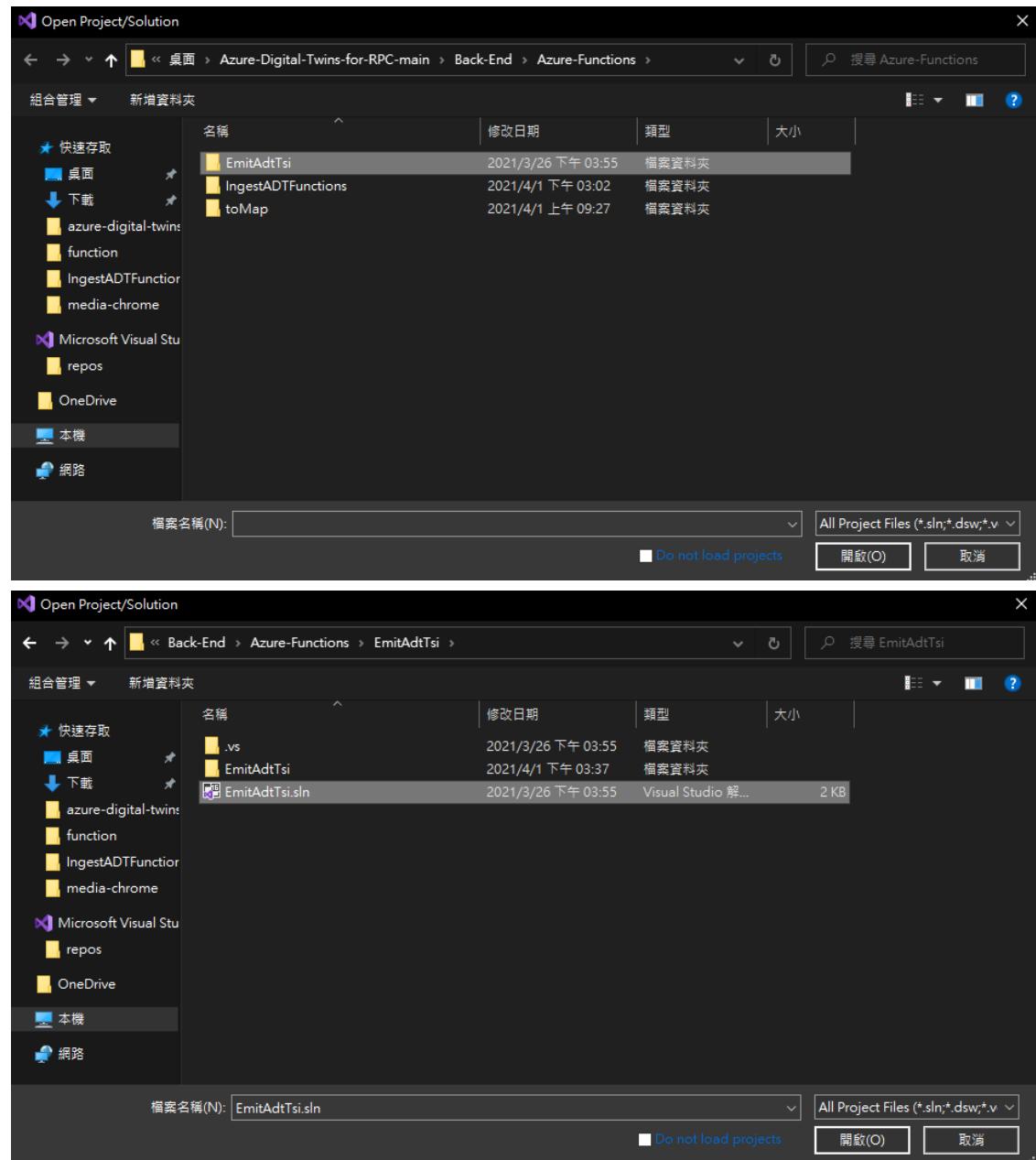
The screenshot shows the Microsoft Azure Deployment Overview page for the same function app. The main message says "Your deployment is complete". Below it, a table lists deployment details:

Resource	Type	Status	Operation details
rpcEmitAdtTsiFunctions	microsoft.insights/compon...	OK	<a href="#">Operation details</a>
rpcEmitAdtTsiFunctions	microsoft.insights/compon...	OK	<a href="#">Operation details</a>
ASP-rcadtry-a7fd	Microsoft.Web/serverfarms	OK	<a href="#">Operation details</a>
storageaccountrpcad91aa	Microsoft.Storage/storage...	OK	<a href="#">Operation details</a>

At the bottom, there is a blue "Go to resource" button.

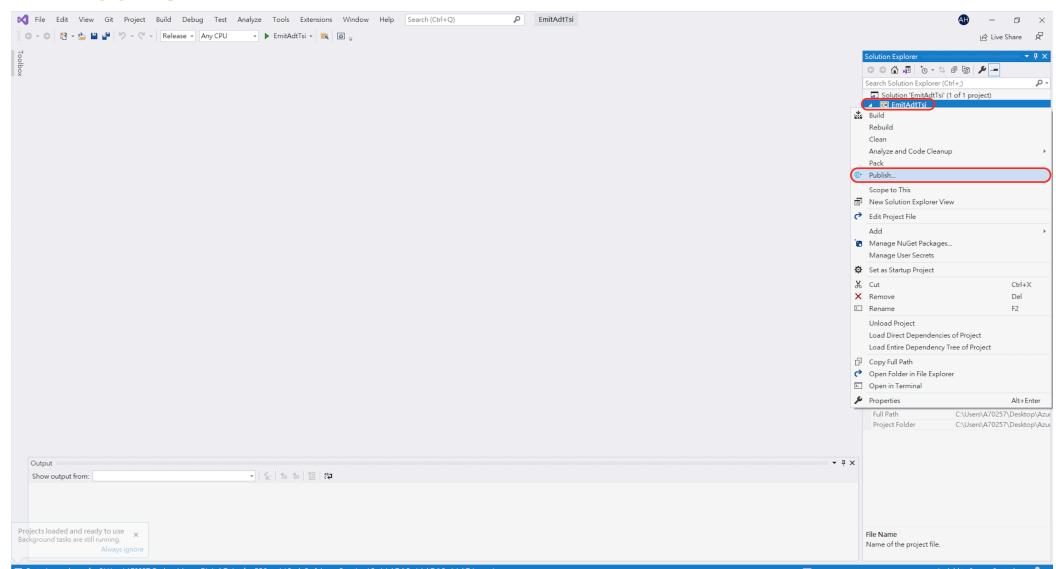
- 9.6.2 Deploy

- Opening `EmitAdtTsi.sln` from `/Back-End/Azure-Functions/EmitAdtTsi` in Visual Studio 2019

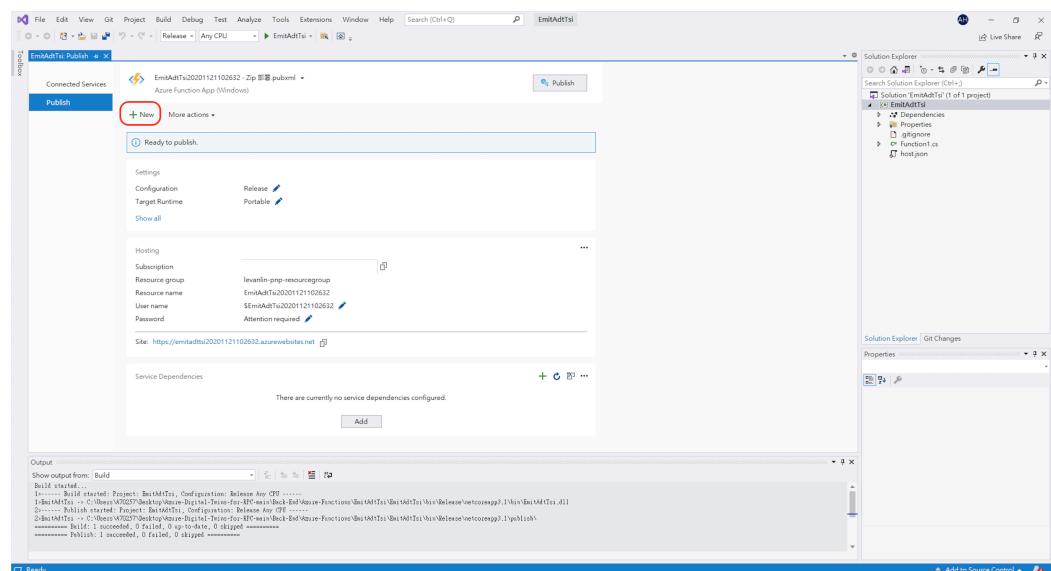


## ■ Deploy EmitAdtTsi to Azure Function

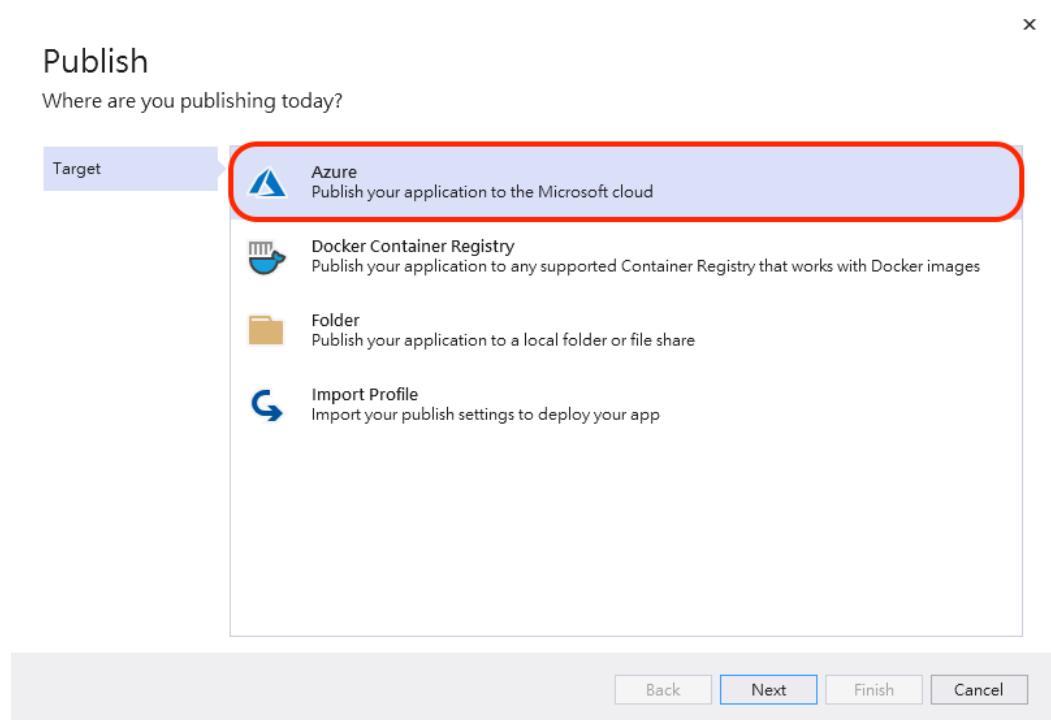
### ■ Click Publish...



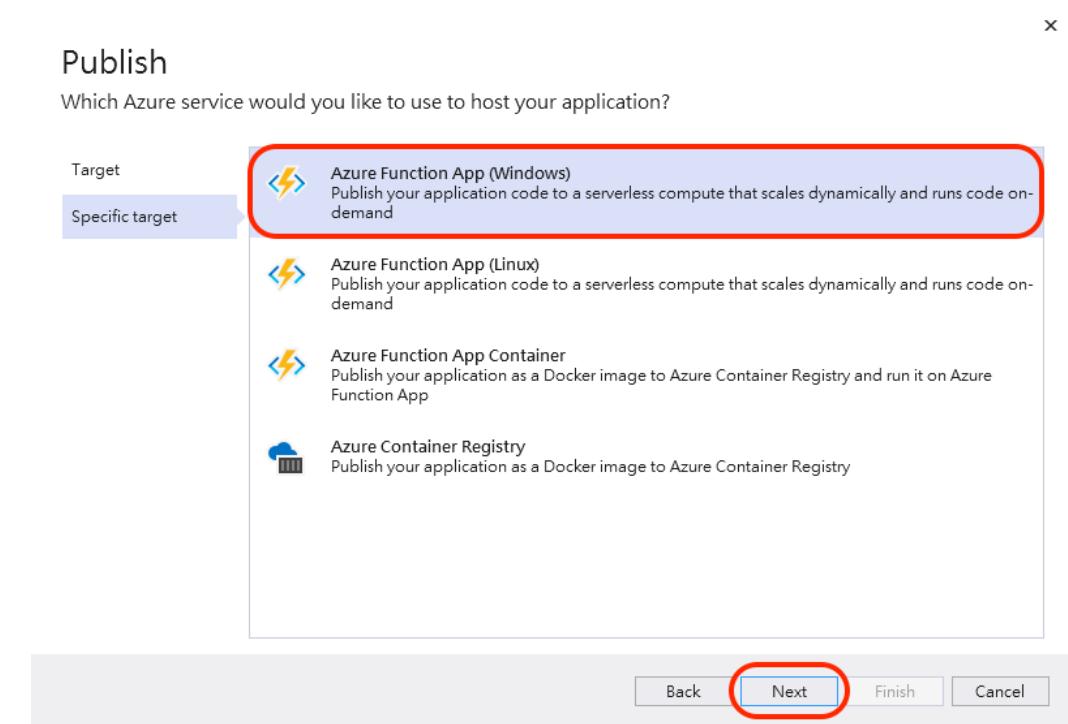
### ■ Click + New



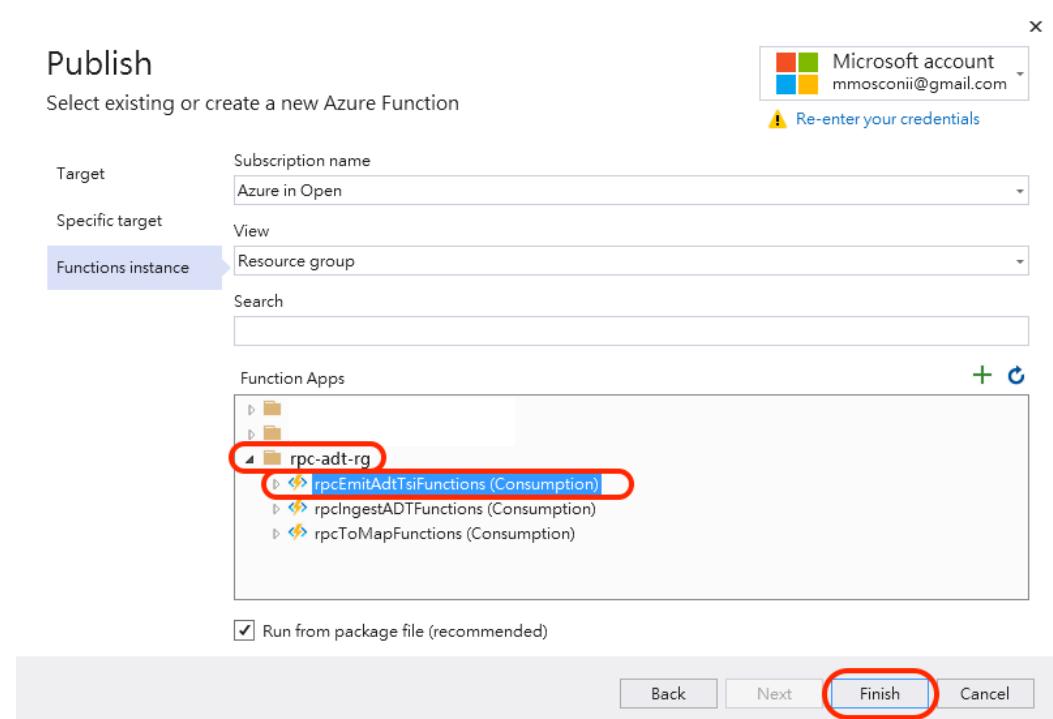
- Click Azure



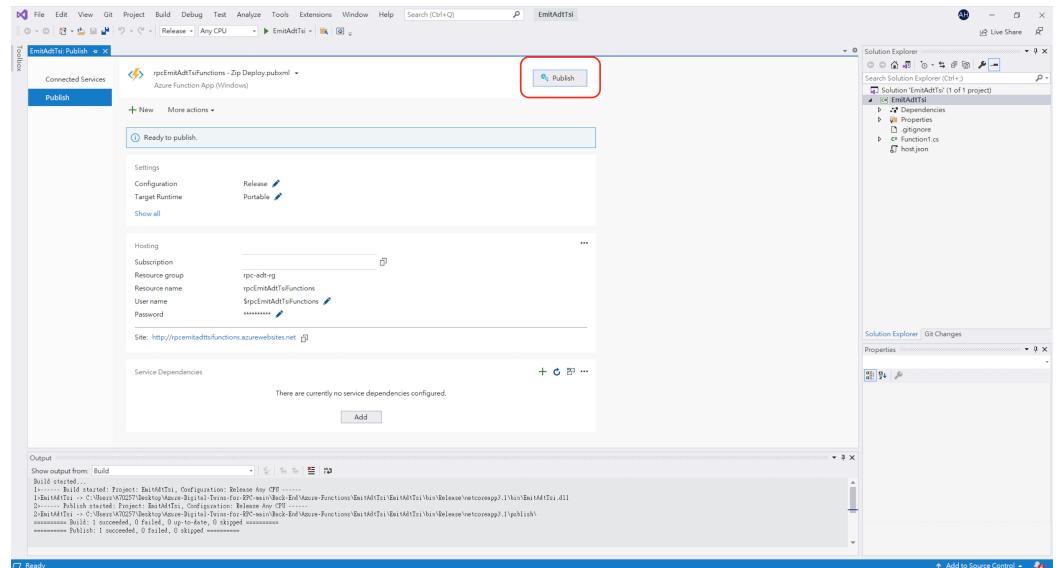
- Click Azure Function App (Windows) > Next



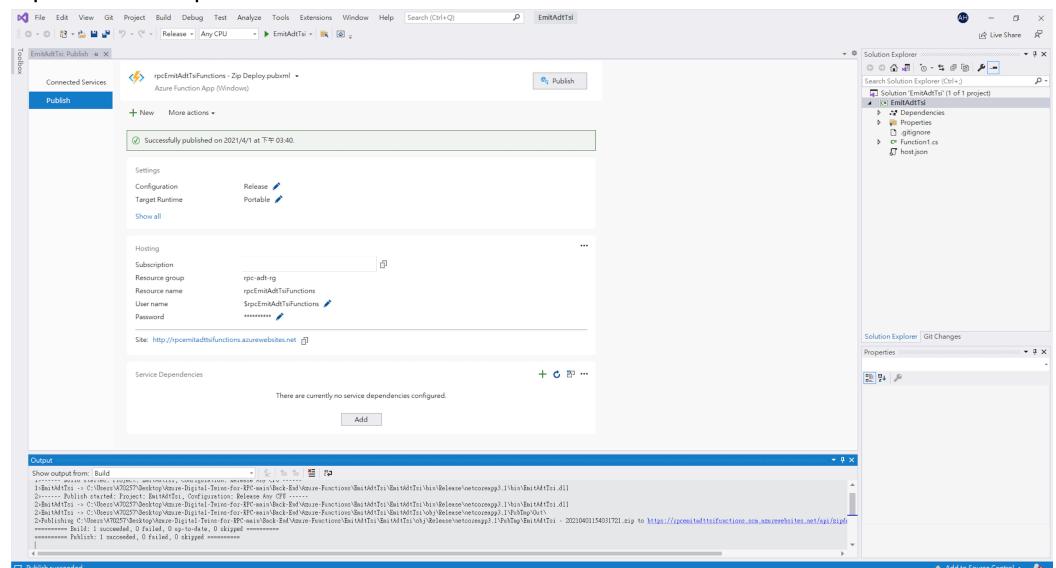
- Please select the function created in Step 9.6.1



## ■ Click Publish



## ■ Operation completes



- 9.7 Create a new event hub. Specify a name for the event hub.

- Azure CLI

```
az eventhubs eventhub create --name <name for your TSI event hub>
--resource-group <resource group name from earlier> --namespace-
name <Event Hubs namespace from earlier>
```

- e.g.

```
az eventhubs eventhub create --name rptsieventhub --resource-
group rpc-adt-rg --namespace-name rpchubspace
```

- 9.8 Create an authorization rule with send and receive permissions. Specify a name for the rule.

- Azure CLI

```
az eventhubs eventhub authorization-rule create --rights Listen  
Send --resource-group <resource group name> --namespace-name  
<Event Hubs namespace from earlier> --eventhub-name <TSI event  
hub name from above> --name <name for your TSI auth rule>
```

- e.g.

```
az eventhubs eventhub authorization-rule create --rights Listen  
Send --resource-group rpc-adt-rg --namespace-name rpchubspace --  
eventhub-name rptsieventhub --name rpctsieventrules
```

- 9.9 Get the Twins event hub connection string, using the authorization rules you created above for the Twins hub.

- Azure CLI

```
az eventhubs eventhub authorization-rule keys list --resource-  
group <resource group name> --namespace-name <Event Hubs  
namespace> --eventhub-name <Twins event hub name from earlier> --  
name <Twins auth rule from earlier>
```

- e.g.

```
az eventhubs eventhub authorization-rule keys list --resource-  
group rpc-adt-rg --namespace-name rpchubspace --eventhub-name  
rpkadteventhub --name rpkadteventrules
```

- 9.10 Get Twins event hub connection string (primaryConnectionString)

- Azure CLI

```
az eventhubs eventhub authorization-rule keys list --resource-  
group <resource group name> --namespace-name <Event Hubs  
namespace> --eventhub-name <Twins event hub name> --name <Twins  
auth rule>
```

- e.g.

```
az eventhubs eventhub authorization-rule keys list --resource-  
group rpc-adt-rg --namespace-name rpchubspace --eventhub-name
```

```
rpcadteventhub --name rpcadteventrules
```

- Result ( To get **primaryConnectionString** )

```
{
  "aliasPrimaryConnectionString": null,
  "aliasSecondaryConnectionString": null,
  "keyName": "rpcadteventrules",
  "primaryConnectionString":
    "Endpoint=sb://rpchubspace.servicebus.windows.net/;SharedAccessKey=LnJ4NE3V05pq6RYsY2Fpm5sCTR9WGuyWd46yZ70fJA8=;EntityPath=rpcadteventhub",
    "primaryKey": "LnJ4NE3V05pq6RYsY2Fpm5sCTR9WGuyWd46yZ70fJA8=",
    "secondaryConnectionString":
      "Endpoint=sb://rpchubspace.servicebus.windows.net/;SharedAccessKey=FTsyYp7TEW0JcHCHNBUC55+NyvFm7cdGpH+eLhMhqG4=;EntityPath=rpcadteventhub",
      "secondaryKey": "FTsyYp7TEW0JcHCHNBUC55+NyvFm7cdGpH+eLhMhqG4="
}
```

- 9.11 Use the **primaryConnectionString** value from the result to create an app setting in your function app that contains your connection string:

- Azure CLI

```
az functionapp config appsettings set --settings
"EventHubAppSetting-Twins=<Twins event hub connection string>" -g
<resource group> -n <your App Service (function app) name>
```

- e.g.

```
az functionapp config appsettings set --settings
"EventHubAppSetting-
Twins=Endpoint=Endpoint=sb://rpchubspace.servicebus.windows.net/;
SharedAccessKeyName=rpcadteventrules;SharedAccessKey=LnJ4NE3V05pq6RYsY2Fpm5sCTR9WGuyWd46yZ70fJA8=;EntityPath=rpcadteventhub" -g
rpc-adt-rg -n rpcEmitAdtTsiFunctions
```

- 9.12 Get the TSI event hub connection string, using the authorization rules you created above for the Time Series Insights hub

- Azure CLI

```
az eventhubs eventhub authorization-rule keys list --resource-
group <resource group name> --namespace-name <Event Hubs
```

```
namespace> --eventhub-name <TSI event hub name> --name <TSI auth rule>
```

- e.g.

```
az eventhubs eventhub authorization-rule keys list --resource-group rpc-adt-rg --namespace-name rpchubspace --eventhub-name rptsieventhub --name rpctsieventrules
```

- 9.13 Get **TSI event hub connection string** ( **primaryConnectionString** )

- Azure CLI

```
az eventhubs eventhub authorization-rule keys list --resource-group <resource group name> --namespace-name <Event Hubs namespace> --eventhub-name <TSI event hub name> --name <TSI auth rule>
```

- e.g.

```
az eventhubs eventhub authorization-rule keys list --resource-group rpc-adt-rg --namespace-name rpchubspace --eventhub-name rptsieventhub --name rpctsieventrules
```

- Result ( To get **primaryConnectionString** )

```
{  
    "aliasPrimaryConnectionString": null,  
    "aliasSecondaryConnectionString": null,  
    "keyName": "rpctsieventrules",  
    "primaryConnectionString":  
        "Endpoint=sb://rpchubspace.servicebus.windows.net/;SharedAccessKeyName=rpctsieventrules;SharedAccessKey=xFE9i04ojQHDRQkZ4F8J6mIsWo9o4sAVyVbn/uv7tk=;EntityPath=rptsieventhub",  
        "primaryKey": "xFE9i04ojQHDRQkZ4F8J6mIsWoo9o4sAVyVbn/uv7tk=",  
        "secondaryConnectionString":  
        "Endpoint=sb://rpchubspace.servicebus.windows.net/;SharedAccessKeyName=rpctsieventrules;SharedAccessKey=gS2UcdeTC+32FPBLc208dAGFWPSo/nA0F5WJXHRBkvA=;EntityPath=rptsieventhub",  
        "secondaryKey": "gS2UcdeTC+32FPBLc208dAGFWPSo/nA0F5WJXHRBkvA="  
}
```

- 9.14 Use the **primaryConnectionString** value from the result to create an app setting in your function app that contains your connection string

- Azure CLI

```
az functionapp config appsettings set --settings
"EventHubAppSetting-TSI=<TSI event hub connection string>" -g
<resource group> -n <your App Service (function app) name>
```

- e.g.

```
az functionapp config appsettings set --settings
"EventHubAppSetting-
TSI=Endpoint=Endpoint=sb://rpchubspace.servicebus.windows.net;/Sh
aredAccessKeyName=rpcTSIEVENTRULES;SharedAccessKey=xFE9i04ojQHDRQ
kZ4F8J6mIsWoo9o4sAVyVbn/uv7tk=;EntityPath=rptsieventhub" -g rpc-
adt-rg -n rpcEmitAdtTsiFunctions
```

- 9.15 Create Consumer groups of rptsieventhub

- Please select the Consumer groups created in Step 9.7

The screenshot shows the Azure portal interface for the 'rpc-tsi-event-hub' Event Hubs instance. The left sidebar includes 'Overview', 'Access control (IAM)', 'Diagnose and solve problems', 'Settings' (with 'Shared access policies', 'Properties', and 'Locks' options), and 'Entities' (with 'Consumer groups', 'Capture', and 'Process data'). The 'Consumer groups' option is highlighted with a red box. The main content area displays the 'Essentials' tab with the following data:

Resource group (change)	Status
rpc-adt-rg	Active
Location	Namespace
East US	rpc-event-hub-ep
Subscription (change)	Created
Azure in Open	Wednesday, March 31, 2021, 24:17:06 GMT+8
Subscription ID	Updated
	Wednesday, March 31, 2021, 24:24:00 GMT+8
Partition Count	Message Retention
4	7 days

Below the essentials, there are two cards: 'Capture events' (Use Capture to save your events to persistent storage) and 'Process data' (Produce insights with Azure's data processing services).

- Click + Consumer groups

The screenshot shows the 'Consumer groups' blade for the 'rpc-tsi-event-hub' instance. The left sidebar includes 'Overview', 'Access control (IAM)', 'Diagnose and solve problems', 'Settings' (with 'Shared access policies', 'Properties', and 'Locks' options), and 'Entities' (with 'Consumer groups', 'Capture', and 'Process data'). The 'Consumer groups' option is highlighted with a red box. The main content area shows a table with one row:

Name	Location
\$Default	East US

- Input data

Microsoft Azure | Search resources, services, and docs (G+)

Home > Event Hubs > rpc-event-hub-ep > rpc-tsi-event-hub (rpc-event-hub-ep/rpc-tsi-event-hub) | Consumer groups

Consumer groups

Name	Location
\$Default	East US

**Create consumer group**

Name \*

Create

- Name field

- Please use a recognizable name, this example uses **rpc-pnp-resourcegroup**
- When the input is complete, please click the **Create** button

- Operation completes

Microsoft Azure | Search resources, services, and docs (G+)

Home > Event Hubs > rpc-event-hub-ep > rpc-tsi-event-hub (rpc-event-hub-ep/rpc-tsi-event-hub) | Consumer groups

Consumer groups

Name	Location
\$Default	East US
rpc-pnp-resourcegroup	East US

## 10. Create and set TSI Service

- 10.1 Create and connect a Time Series Insights instance

- Search **time series insights**

Microsoft Azure | Search resources, services, and docs (G+)

time series insights

Azure services

- Time Series Insights access policies
- Time Series Insights environments
- Time Series Insights event sources
- Time Series Insights reference data sets
- Application Insights

See all Marketplace

Time Series Insights

Documentation

Azure Time Series Insights Documentation - Quickstarts ...  
Overview: What is Azure Time Series Insights? - Azure Time ...  
Overview: What is Azure Time Series Insights Gen2? - Azure ...

More services

- Select Time Series Insights environments

The screenshot shows the Microsoft Azure portal interface. In the top left, there's a 'Create a resource' button. On the left sidebar, under 'Azure services', there's a 'Time Series Insights environments' option which is highlighted with a red box. The main content area shows a list of services including 'Time Series Insights access policies', 'Time Series Insights environments', 'Time Series Insights event sources', 'Time Series Insights reference data sets', and 'Application Insights'. To the right, there's a 'Time Series Insights' section with links to documentation and marketplace.

- Click Add

The screenshot shows the 'Time Series Insights environments' blade. At the top, there are buttons for 'Add', 'Edit columns', 'Refresh', 'Feedback', and 'Assign tags'. Below that, there's a search bar for 'Subscriptions' with the placeholder 'Azure in Open – Don't see a subscription? Open Directory + Subscription settings'. There are also filters for 'Filter by name...', 'All resource groups', 'All locations', 'All tags', and 'No grouping'.

- Input data

- Basics

### Create TSI Environment

**\*Basics**   \*Event Source   Tags   Review + Create

Create a Time Series Insights environment that you'll use to explore and query time series data. [Learn more](#)

#### Video: Provisioning your environment

If you're not sure where to start, that's OK—we'll walk you through it.



#### Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ①

Azure in Open

Resource group \* ①

[Create new](#)

#### Instance details

Environment name \*

Location \*

East US

Tier \* ①

Gen2 (L1)

Capacity ①

Ingress rate: Scalable based on usage needs. [View current limits](#).

Storage capacity: Subject to [Azure Storage limits](#).

Estimated cost: Varies depending on usage. [View metered pricing information](#).

**Time series ID**

**Info** Time Series ID acts as a partition key for your data and as a primary key for your time series model. It is important that you specify the appropriate Time Series ID during environment creation, since you can't change it later.

* Property name ⓘ	For example, deviceId, objectId or a tag name
-------------------	---

**Cold store**

Creates a new Azure Storage resource in the subscription and region you've chosen for the TSI environment. You will incur data storage and transaction charges for the data that Time Series Insights reads and writes to this storage resource. [Learn more](#)

Storage account name * ⓘ	Create a new storage account
Storage account kind * ⓘ	StorageV2 (general purpose v2)
Storage account replication * ⓘ	Locally redundant storage (LRS)

**Data Lake Storage Gen2**

Hierachial namespace \* ⓘ  Enabled  Disabled

**Warm store**

Creates a warm store for the TSI environment optimized for higher query performance and unlimited queries. The warm store can be removed from the environment at a later time. By selecting "Yes", you will incur data storage costs.

Enable warm store * ⓘ	<input checked="" type="radio"/> Yes <input type="radio"/> No
Data retention time (in days) ⓘ <input type="range" value="7"/> 7	

---

[Review + Create](#) [Next : Event Source >](#) [Download Template ⓘ](#)

- **Subscription** field
  - Select the subscription you want to use
- **Resource group** field
  - Please use a recognizable name, this example uses `rpc-adt-rg`
- **Environment name** field
  - Please use a recognizable name, this example uses `rpc-tsi`
- **Location** field
  - This example uses `East US`
- **Tier** field
  - This example uses `Gen2 (L1)`
- **Property name** field
  - Please use a recognizable name, this example uses `ADTid` \ `Timestamp`
- **Storage account name** field
  - Please use a recognizable name, this example uses `rpctsi`
- **Storage account kind** field
  - This example uses `StorageV2 (general purpose v2)`
- **Storage account replication** field
  - This example uses `Locally redundant storage (LRS)`
- **Hierachial namespace** field
  - This example uses `Disabled`
- **Enable warm store** field
  - This example uses `No`

## ■ Event Source

\* Basics   \* **Event Source**   Tags   Review + Create

An event source is the IoT Hub or Event Hub that feeds data into your Time Series Insights environment. [Learn more](#)

Create an event source? *	<input checked="" type="radio"/> Yes <input type="radio"/> No
Source type *	<input checked="" type="radio"/> IoT Hub <input type="radio"/> Event Hub
Name *	Type a name here
Subscription *	Azure in Open
IoT Hub name *	Select an IoT Hub
IoT Hub access policy name	Select an access policy
IoT Hub consumer group	Select a consumer group <input type="button" value="New"/>
<b>Timestamp</b>	
Create an event source timestamp property name. If you don't enter a value, we'll use the message enqueued time from the event source. <a href="#">Learn more</a>	
Property name	Timestamp property name

### ■ Create an event source? field

- This example uses Yes
- Source type field
  - This example uses Event Hub
- Name field
  - This example uses rpc-tsi-event-hub
- Subscription field
  - Select the subscription you want to use
- Event Hub namespace field
  - Please select the Endpoint created in Step 9.1 (rpchubspace)
- Event Hub name field
  - Please select the TSI Event Hub created in Step 9.7 (rptsieventhub)
- Event Hub access policy name field
  - Please select the Shared access policies created in Step 9.8 (rpctsieventrules)
- Event Hub consumer group field
  - Please select the Consumer groups created in Step 9.15 (rpc-pnp-resourcegroup)

- When the input is complete, please click the **Review + create** button

The screenshot shows the 'Create TSI Environment' wizard in the Microsoft Azure portal. The current step is 'Event Source'. The configuration includes:

- Create an event source?**: Yes (radio button selected)
- Source type**: Event Hub (radio button selected)
- Name**: rpc-tsi-event-hub
- Subscription**: Azure in Open
- Event Hub namespace**: rpchubspace
- Event Hub name**: rptsieventhub
- Event Hub access policy name**: rpctsieventrules
- Event Hub consumer group**: rpc-pnp-resourcegroup
- Timestamp**: Create an event source timestamp property name. If you don't enter a value, we'll use the message enqueued time from the event source.
- Property name**: Timestamp property name

At the bottom, there are buttons for **Review + Create**, **< Previous : Basics**, **Next : Tags >**, and **Download Template**.

- Review your settings and select **Review + create**

The screenshot shows the 'Create TSI Environment' wizard in the Microsoft Azure portal. The current step is 'Review + Create'. The summary and environment details sections are displayed:

**Summary**

- Time Series Insights with LTS by Microsoft
- Pricing: Pay-As-You-Go
- [Terms of use](#) | [Privacy policy](#)
- [Pricing for other TSI SKUs](#)

**Environment Details**

Setting	Value
Environment name	rpc-tsi
Tier	Gen2 (L1)
Storage account replication	Standard_LRS
Storage account name	rptcsi
Time series ID	ADTid, Timestamp
Warm store enabled	Disabled
Warm store data retention (days)	7

At the bottom, there are buttons for **Review + Create**, **< Previous : Tags**, and **Download Template**.

- wait for the request to process

The screenshot shows the 'Microsoft.TimeSeriesInsightsEnvironment | Overview' page in the Microsoft Azure portal. The deployment status is shown as 'Deployment is in progress'.

**Deployment details**

Resource	Type	Status	Operation details
rpctsi	Microsoft.Storage/storage... Accepted	Accepted	<a href="#">Operation details</a>
rpchubspace/rptsieventhub	Microsoft.EventHub/nam... OK	OK	<a href="#">Operation details</a>

**Security Center**

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**Work with an expert**

Azure experts are service provider partners who can help manage your assets and be your first line of support.  
[Find an Azure expert >](#)

- Once deployment complete click on **Go to resource** button

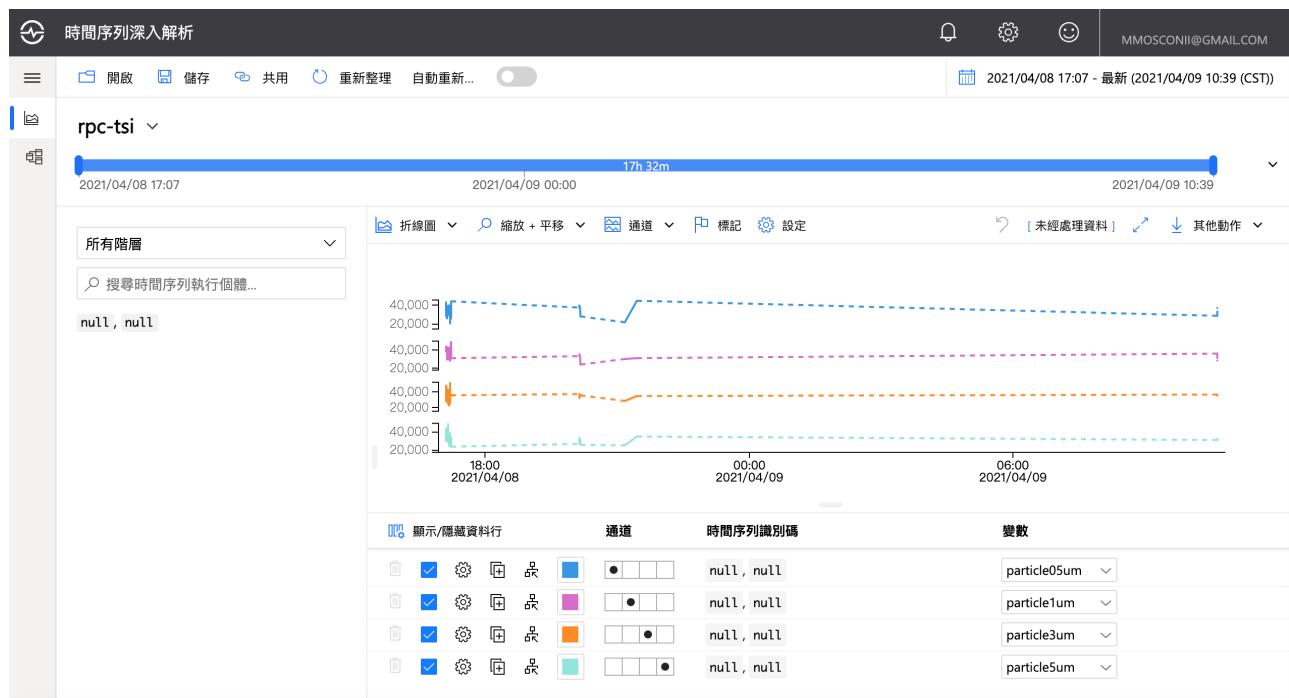
The screenshot shows the Microsoft Azure Overview page for a deployment named "Microsoft.TimeSeriesInsightsEnvironment". The main message is "Your deployment is complete". Deployment details include: Deployment name: Microsoft.TimeSeriesInsightsEnvironment, Start time: 4/9/2021, 10:09:30 AM, Subscription: Azure in Open, Resource group: rpc-adt-rg. Below this, there are sections for "Deployment details" (with a download link) and "Next steps". A prominent blue "Go to resource" button is located at the bottom left of the main content area. To the right, there are links to Security Center, Free Microsoft tutorials, and Work with an expert.

- 10.2 Get to TSI Explorer

The screenshot shows the Microsoft Azure Overview page for a Time Series Insights environment named "rpc-tsi". The main message is "Your deployment is complete". Deployment details include: Deployment name: Microsoft.TimeSeriesInsightsEnvironment, Start time: 4/9/2021, 10:09:30 AM, Subscription: Azure in Open, Resource group: rpc-adt-rg. Below this, there are sections for "Deployment details" (with a download link) and "Next steps". A prominent blue "Go to resource" button is located at the bottom left of the main content area. To the right, there are links to Security Center, Free Microsoft tutorials, and Work with an expert.

- 10.3 TSI Explorer View

The screenshot shows the Microsoft Time Series Insights Explorer view for the "rpc-tsi" environment. The interface displays a timeline from 2021/04/08 17:07 to 2021/04/08 21:27, showing a single data series with a duration of 4h 20m. The chart shows several sharp peaks and troughs. On the left, there is a sidebar with a search bar and dropdown menus for "所有階層" and "搜尋時間序列執行個體...". On the right, there is a large lightbulb icon with a graph inside, and a button labeled "還原上一個工作階段". The top right corner shows the user's email: MMOSCONII@GMAIL.COM.



## 11. Set Event & toMap Function

- 11.1 Create a route and filter to twin update notifications
  - Create an event grid topic, which will receive events from your Azure Digital Twins instance.
    - Azure CLI

```
az eventgrid topic create -g <your-resource-group-name> --name <your-topic-name> -l <region>
```

- e.g.

```
az eventgrid topic create -g rpc-adt-rg --name rpcmap -l eastus
```

- Create an endpoint to link your event grid topic to Azure Digital Twins.

- Azure CLI

```
az dt endpoint create eventgrid --endpoint-name <Event-Grid-endpoint-name> --eventgrid-resource-group <Event-Grid-resource-group-name> --eventgrid-topic <your-Event-Grid-topic-name> -n <your-Azure-Digital-Twins-instance-name> --resource-group <resource group name>
```

- e.g.

```
az dt endpoint create eventgrid --endpoint-name
rpcadteventgridmap --eventgrid-resource-group rpc-adt-rg --
eventgrid-topic rpcmap -n rpc-adt-example --resource-group
rpc-adt-rg
```

- Create a route in Azure Digital Twins to send twin update events to your endpoint.

- Azure CLI

```
az dt route create -n <your-Azure-Digital-Twins-instance-
name> --endpoint-name <Event-Grid-endpoint-name> --route-
name <my_route> --filter "type =
'Microsoft.DigitalTwins.Twin.Update'" --resource-group
<resource group name>
```

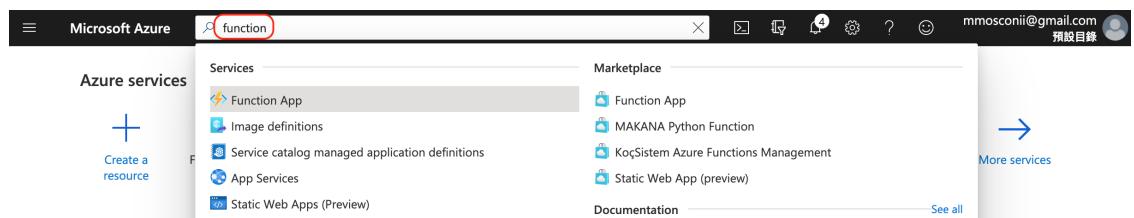
- e.g.

```
az dt route create -n rpc-adt-example --endpoint-name
rpcadteventgridmap --route-name rpcadtmaproute --filter
"type = 'Microsoft.DigitalTwins.Twin.Update'" --resource-
group rpc-adt-rg
```

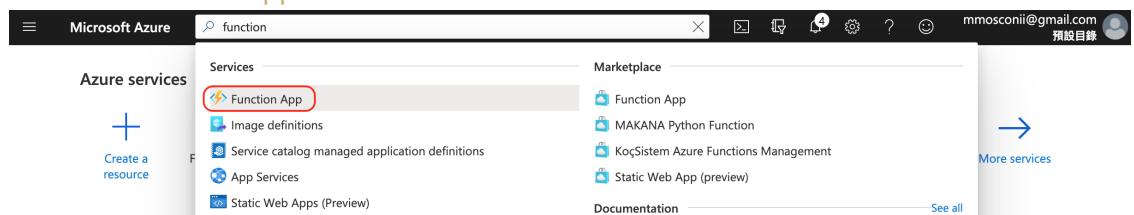
- 11.2 Create & Deploy a function in Azure

- 11.2.1 Create Azure Functions

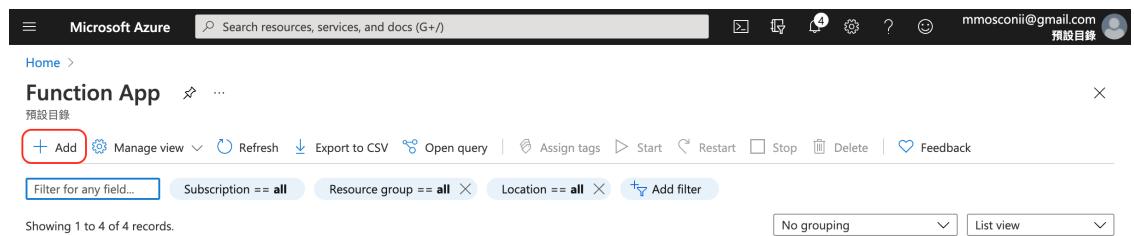
- Search function



- Select Function App



- Click Add



- Input data

## Create Function App ...

**Basics**   [Hosting](#)   [Monitoring](#)   [Tags](#)   [Review + create](#)

Create a function app, which lets you group functions as a logical unit for easier management, deployment and sharing of resources. Functions lets you execute your code in a serverless environment without having to first create a VM or publish a web application.

**Project Details**

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \* ⓘ

Resource Group \* ⓘ    
[Create new](#)

**Instance Details**

Function App name \*  [Function App name .azurewebsites.net](#)

Publish \*  [Code](#)  [Docker Container](#)

Runtime stack \*

Version \*

Region \*

[Review + create](#)   [< Previous](#)   [Next : Hosting >](#)

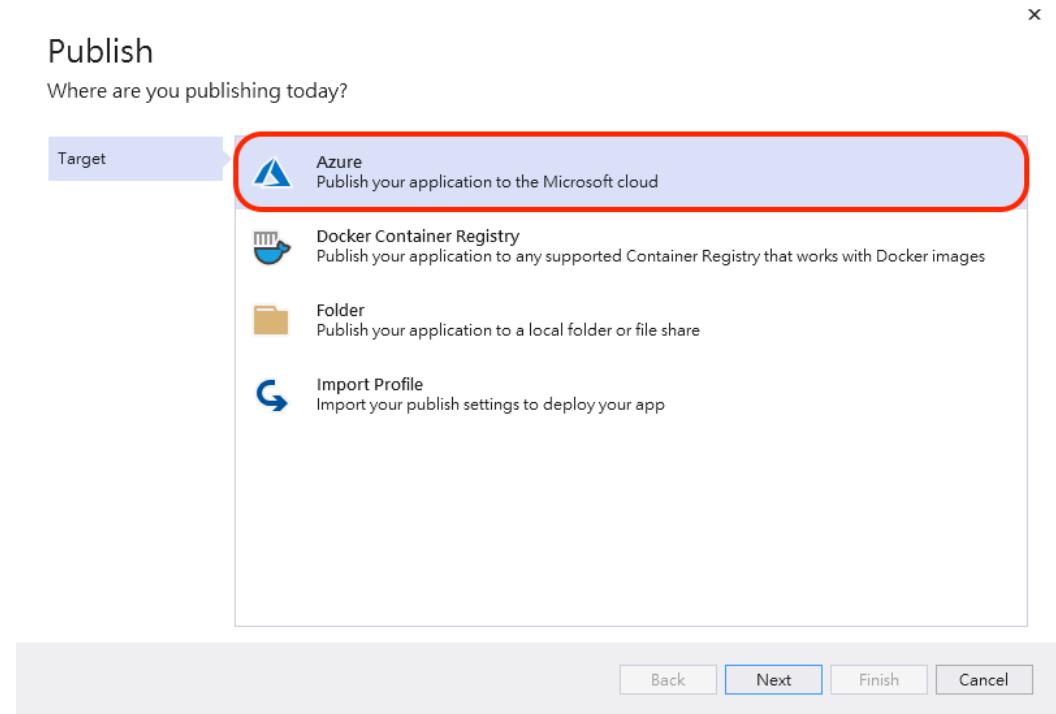
- **Subscription** field
  - Select the subscription you want to use
- **Resource group** field
  - Please use a recognizable name
- **Function App name** field
  - Please use a recognizable name, this example uses `rpcToMapFunctions`
- **Publish** field
  - Select `Code`
- **Runtime stack** field
  - Select `.NET`
- **Version** field
  - Select `3.1`
- **Region** field
  - This example uses `East US`
- Click on the **Review + create** button
- Review all the details and click on the **Create** button
- wait for the request to process
- 建立完成，請點選 **Go to resource**

- 11.2.2 Deploy

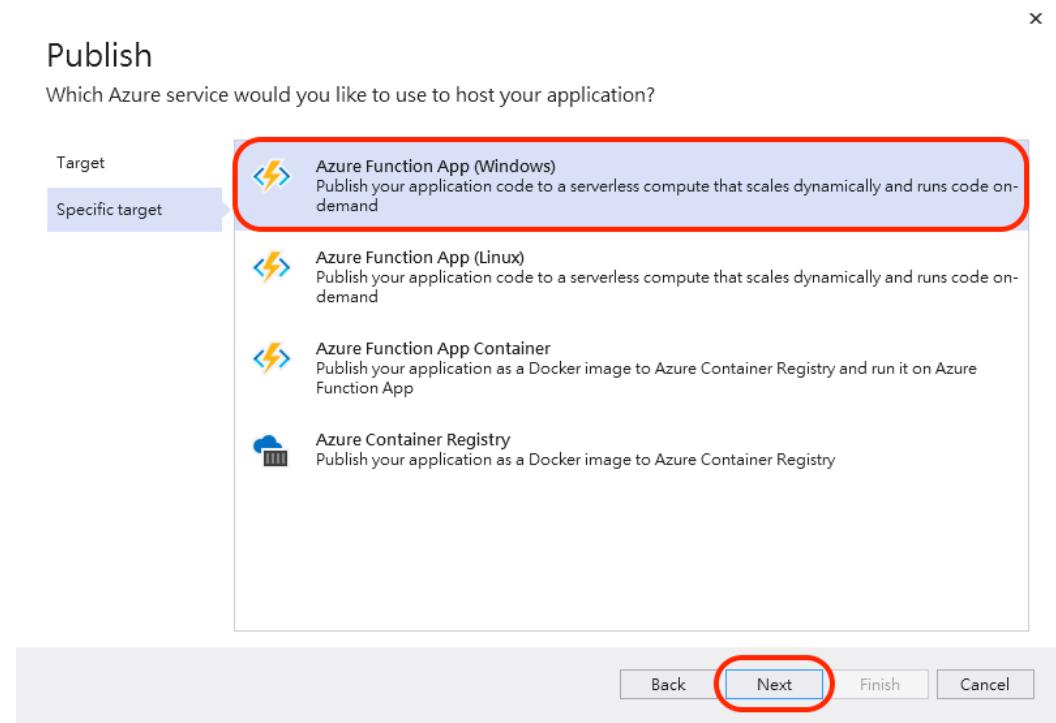
- Opening `toMap.sln` from `/Back-End/Azure-Functions/toMap` in `Visual Studio 2019`
- Deploy `toMap` to `Azure Function`
  - Click **Publish...**

- Click + New

- Click Azure



- Click Azure Function App (Windows) > Next



- Please select the function created in Step 11.2.1

- Click Publish

- Operation completes

- 11.2.3 Set Configuration

- Azure Maps primary subscription key

- Azure CLI

```
az functionapp config appsettings set --name <your-App-Service-(function-app)-name> --resource-group <your-resource-group> --settings "subscription-key=<your-Azure-Maps-primary-subscription-key>"
```

- e.g.

```
az functionapp config appsettings set --name rpcToMapFunctions --resource-group rpc-adt-rg --settings "subscription-key=yEM2lU7L0KbjNJfJ5Aujo0scWRjQZ-tyG5g4pudf4o"
```

- Azure Maps stateset ID

- Azure CLI

```
az functionapp config appsettings set --name <your-App-Service-(function-app)-name> --resource-group <your-resource-group> --settings "statesetID=<your-Azure-Maps-stateset-ID>"
```

- e.g.

```
az functionapp config appsettings set --name rpcToMapFunctions --resource-group rpc-adt-rg --settings "statesetID=0dac1372-a147-b3b3-9d93-6765981b9213"
```

- 11.2.4 Set Event Subscription

## ■ Click + Event Subscription

The screenshot shows the Microsoft Azure Event Grid Topics page for the 'rpcmap' topic. The 'Essentials' section on the right displays various details about the topic, including its resource group ('change'), status ('Active'), location ('East US'), and subscription endpoint ('https://rpcmap.eastus-1.eventgrid.azure.net/api/events'). A prominent red box highlights the '+ Event Subscription' button at the top right of the main content area.

## ■ Input data

The screenshot shows the 'Create Event Subscription' wizard. The 'Basic' tab is selected, showing fields for 'Name' (with a red asterisk) and 'Event Schema' (set to 'Event Grid Schema'). Below these, under 'TOPIC DETAILS', it shows 'Topic Type' as 'Event Grid Topic' and 'Source Resource' as 'rpcmap'. Under 'EVENT TYPES', there is a 'Filter to Event Types' dropdown and a 'Add Event Type' button. Under 'ENDPOINT DETAILS', there is a 'Endpoint Type' dropdown. At the bottom is a blue 'Create' button.

### ■ Name field

- Please use a recognizable name, this example uses **rpc-event-grid-map**
- Endpoint Type field
  - Select **Azure Function**
- Endpoint field
  - Click **Select an endpoint**

## ■ Select Azure Function view

The screenshot shows the Azure portal interface. On the left, the 'Create Event Subscription' page is displayed with various configuration options like Topic Type, Source Resource, and Endpoint Details. On the right, a modal window titled 'Select Azure Function' is open, showing dropdown menus for Subscription (set to 'Azure in Open'), Resource group ('rpc-adt-rg'), Function app ('rpc EmitAdtsFunctions'), Slot ('Production'), and Function ('Function1'). The 'Function' field in the modal is currently empty.

### ■ Subscription field

- Select the subscription you want to use

### ■ Resource group field

- Please select the resource group created in Step 3

### ■ Function app field

- Please select the function created in Step 11.2

### ■ Slot field

- Select Production

### ■ Function field

- Select Function1

- When the input is complete, please click the Confirm Selection button

This screenshot is identical to the one above, but the 'Function' field in the 'Select Azure Function' modal now contains the value 'Function1', indicating that the user has selected it from the dropdown list.

- When the input is complete, please click the **Create** button

Microsoft Azure Search resources, services, and docs (G/)

Home > Event Grid Topics > rpcmap >

## Create Event Subscription

Event Grid

**Basic** **Filters** **Additional Features** **Delivery Properties** **Advanced Editor**

Event Subscriptions listen for events emitted by the topic resource and send them to the endpoint resource. [Learn more](#)

**EVENT SUBSCRIPTION DETAILS**

Name \*  ✓

Event Schema  ▼

**TOPIC DETAILS**

Pick a topic resource for which events should be pushed to your destination. [Learn more](#)

Topic Type Event Grid Topic

Source Resource rpcmap

**EVENT TYPES**

Pick which event types get pushed to your destination. [Learn more](#)

Filter to Event Types Add Event Type

**ENDPOINT DETAILS**

Pick an event handler to receive your events. [Learn more](#)

Endpoint Type \* Azure Function (change)

Endpoint \* Function1 (change)

**Create**

## 12. Set Dashboard and Upload Model

- 12.1 Set role assignment for the Azure Digital Twins

The screenshot shows the Azure Digital Twins blade for the resource 'rpc-adt-example'. On the left, there's a navigation menu with options like 'Add', 'Manage view', 'Filter for any field...', 'Name', 'Access control (IAM)', 'Tags', 'Diagnose and solve problems', 'Settings' (with sub-options for Identity (preview), Networking (preview), Properties, and Locks), 'Connect outputs' (Endpoints, Event routes), and 'Monitoring' (Alerts, Metrics). The 'Access control (IAM)' option is highlighted with a red box. The main content area has a title 'rpc-adt-example | Access control (IAM)' and a sub-header 'Check access'. It includes sections for 'My access' (with a 'View my access' button), 'Check access' (describing user, group, service principal, or managed identity access), and 'Grant access to this resource' (with a prominent 'Add role assignments' button). There are also sections for 'View access to this resource' (listing role assignments) and 'View deny assignments' (listing denied role assignments). The top right corner shows the user's email (mmosconii@gmail.com) and a '預設目錄' (Default Directory) button.

**Add role assignment**

**Role** Select a role

Assign access to User, group, or service principal

Select Search by name or email address

Selected members: No members selected. Search for and add one or more members you want to assign to the role for this resource.

Learn more about RBAC

**Save Discard**

**Add role assignment**

**Role** Select a role az

Azure Digital Twins Data Owner

Azure Digital Twins Data Reader

Selected members: No members selected. Search for and add one or more members you want to assign to the role for this resource.

Learn more about RBAC

**Save Discard**

**Add role assignment**

Role: Azure Digital Twins Data Owner

Assign access to: User, group, or service principal

Select: Search by name or email address

Selected members: Archer Huang (mmosconii@gmail.com#EXT#@mmoscon...)

**Save** **Discard**

**Archer Huang assignments - rpc-adt-example**

Assignments for the selected user, group, service principal, or managed identity at this scope or inherited to this scope.

Role	Description	Scope	Group assignment
Azure Digital Twins Data Owner	Full access role for Digital Twins...	This resource	--
Owner	Grants full access to manage all ...	Management group (Inherited)	--

**Save** **Discard**

- 12.2 Install Node.js, npm and Vue on the local server

- o [npm](#)
- o [Node.js v10.16.0](#)
- o [vue v2.6.12](#)

- 12.3 Proxy Server

- o Enter the project folder

```
$ cd ./Azure-Digital-Twins-for-RPC/Back-End/Proxy
```

- o Install packages via npm

```
$ npm install
```

- Create .env file

```
$ touch .env
```

- Store Key in .env file and save

- Add ./Azure-Digital-Twins-for-RPC/Back-End/Proxy/.env content

```
AZURE_DIGITAL_TWINS_HOST_NAME=https://
```

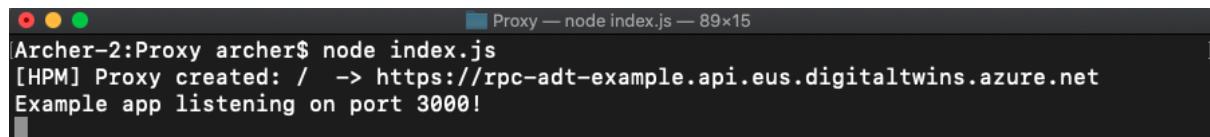
- Comment
  - Copy the Host name that was retrieved in Step 3.8

- Activate the server

```
$ node index.js
```

- Find the message for successful activation

```
[HPM] Proxy created: / -> https://rpc-adt-example.api.eus.digitaltwins.azure.net
Example app listening on port 3000!
```



Proxy — node index.js — 89x15  
Archer-2:Proxy archer\$ node index.js  
[HPM] Proxy created: / -> https://rpc-adt-example.api.eus.digitaltwins.azure.net  
Example app listening on port 3000!

- 12.4 Dashboard Server

- Enter the project folder

```
$ cd ./Azure-Digital-Twins-for-RPC/Front-End
```

- Install packages via npm

```
$ npm install
```

- Create .env file

- Add ./Azure-Digital-Twins-for-RPC/Front-End/.env content

```
VUE_APP_MAP_SUBSCRIPTION_KEY=
VUE_APP_MAP_TILESETID=
VUE_APP_MAP_STATESETID=
VUE_APP_LONGITUDE=
VUE_APP_LATITUDE=
VUE_APP_COMPANY_NAME=
VUE_APP_EVENT_HUB_CONNECTIONSTRING=
VUE_APP_EVENT_HUB_NAME=
VUE_APP_IOT_HUB_ENDPOINT=
VUE_APP_IOT_HUB_DEVICEKEY=
VUE_APP_IOT_HUB_POLICYNAME=
```

- Comment

- VUE\_APP\_MAP\_SUBSCRIPTION\_KEY

The screenshot shows the Azure Maps Authentication settings for the 'rpc-map' account. The 'Authentication' tab is active. Under 'Shared Key Authentication', the 'Primary Key' input field is highlighted with a red box.

- VUE\_APP\_MAP\_TILESETID was retrieved in Step 6.8.4
- VUE\_APP\_MAP\_STATESETID was retrieved in Step 6.11.3
- VUE\_APP\_EVENT\_HUB\_CONNECTIONSTRING

The screenshot shows the Azure Event Hubs Shared access policy settings for the 'rpc-tsi-event-hub' instance. The 'Shared access policies' tab is active. The 'Policy' dropdown is set to 'rpc-tsi-evnet-rule', which is highlighted with a red box. The 'Connection string-primary key' input field is also highlighted with a red box.

## ■ VUE\_APP\_EVENT\_HUB\_NAME

**Event Hubs**

**Overview**

**Settings**

Name	Status	Message Retention	Partition Count
rpc-adt-event-hub	Active	7 days	4
rpc-tsi-event-hub	Active	7 days	4

## ■ VUE\_APP\_IOT\_HUB\_ENDPOINT

**IoT Hub**

**Overview**

**Essentials**

Hostname: rpc-adt-hub.azure-devices.net

## ■ VUE\_APP\_IOT\_HUB\_DEVICEKEY & VUE\_APP\_IOT\_HUB\_POLICYNAME

**iotHubOwner**

**Access policy name**

**Permissions**

**Shared access keys**

- Activate the server

```
$ npm run serve
```

- Find the message for successful activation

```
App running at:  
- Local: http://localhost:8081/  
- Network: http://172.20.10.2:8081/
```

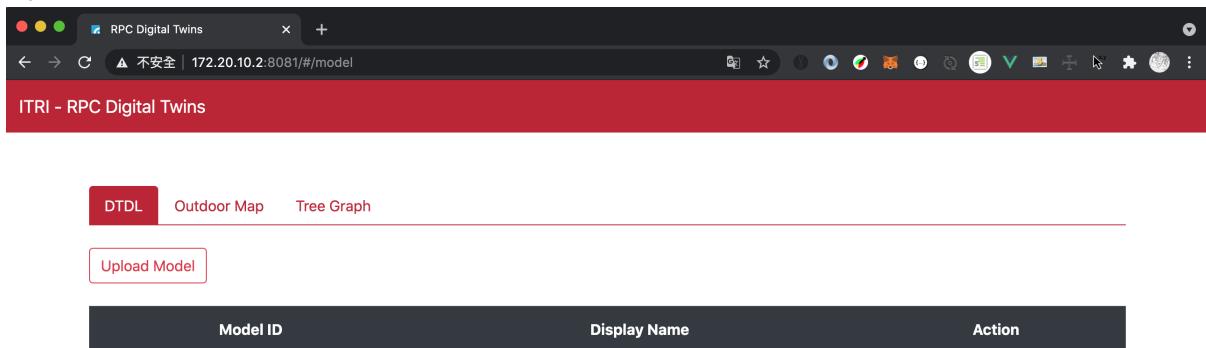
Note that the development build is not optimized.  
To create a production build, run `npm run build`.



```
Front-End — node - npm TERM_PROGRAM=Apple_Terminal NVM_CD_FLAGS= TERM=xterm-256color — 104x15  
DONE Compiled successfully in 5756ms 3:47:36 PM  
  
App running at:  
- Local: http://localhost:8081/  
- Network: http://172.20.10.2:8081/  
  
Note that the development build is not optimized.  
To create a production build, run npm run build.
```

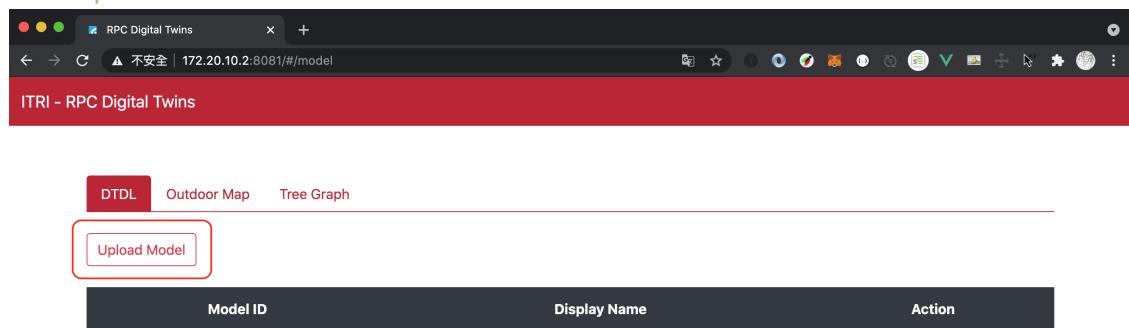
- 12.5 Upload DTDL

- Open Dashboard

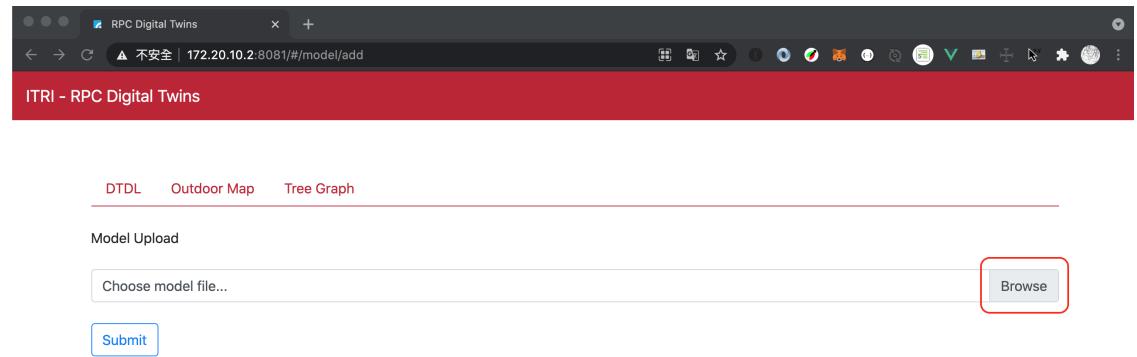


- Upload floor-v3.json

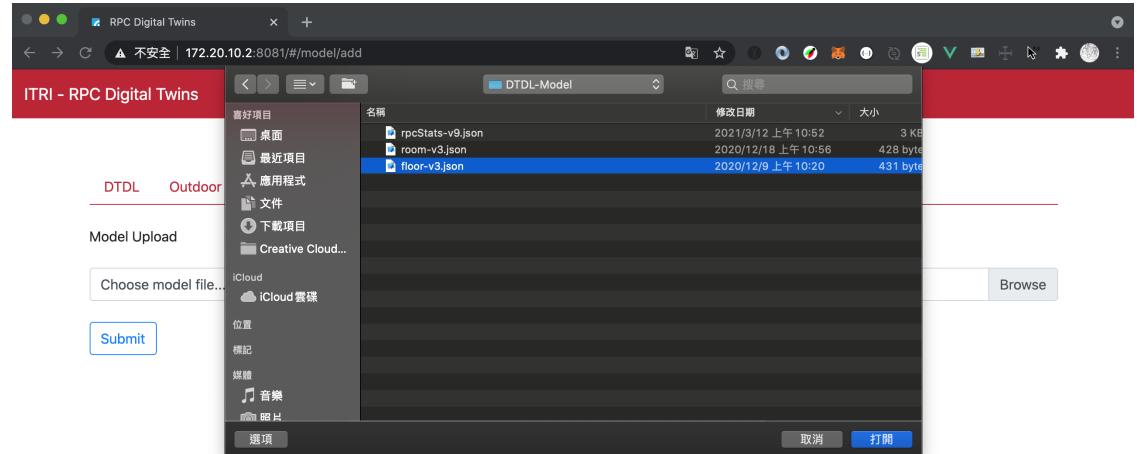
- Click **Upload Model**



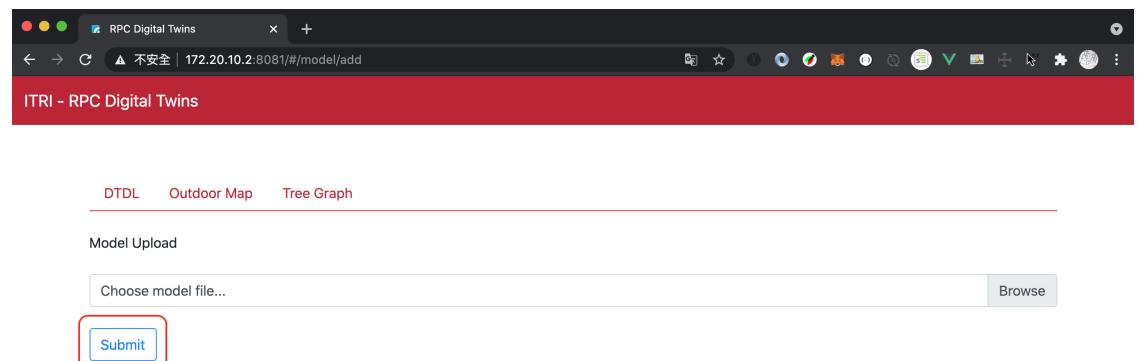
■ Click Browse



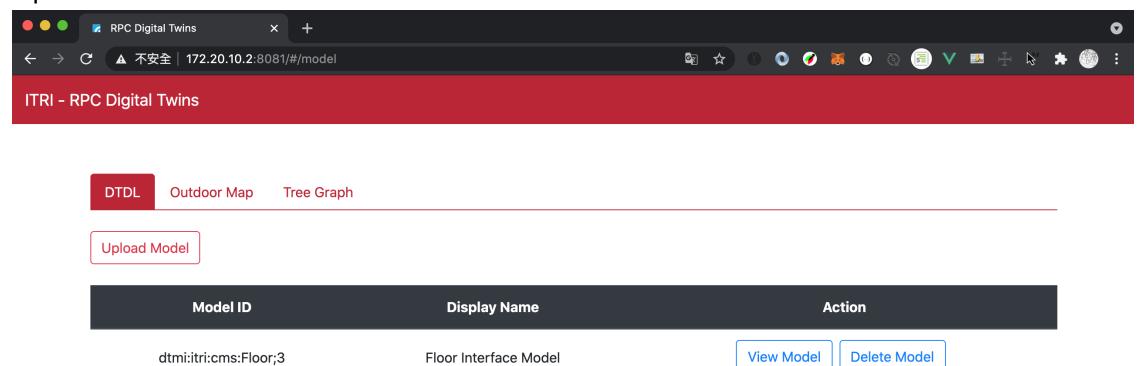
■ Select ./Azure-Digital-Twins-for-RPC/DTDL-Model/floor-v3.json



■ Click Submit



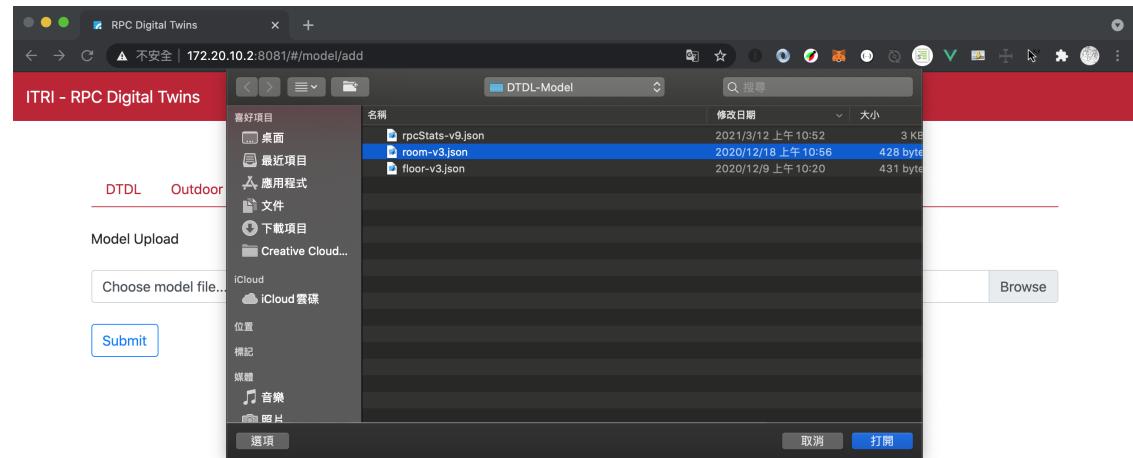
■ Upload finish



- Upload room-v3.json

- Click Upload Model
- Click Browse

- Select `./Azure-Digital-Twins-for-RPC/DTDL-Model/room-v3.json`



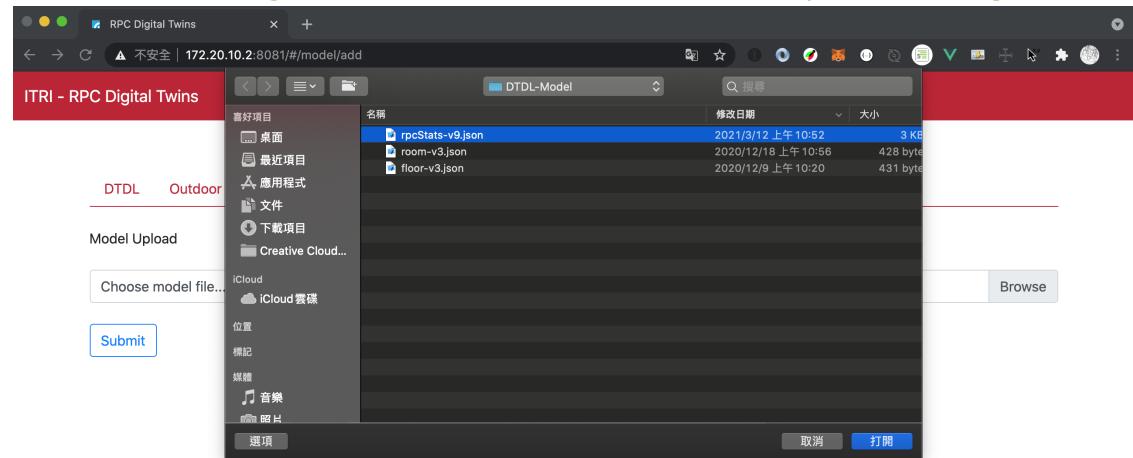
- Click **Submit**

- Upload finish

Model ID	Display Name	Action
dtmi:itri:cms:Floor;3	Floor Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>
dtmi:itri:cms:Room;4	Room Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>

- rpcStats-v9.json

- Click **Upload Model**
- Click **Browse**
- Select `./Azure-Digital-Twins-for-RPC/DTDL-Model/rpcStats-v9.json`



- Click **Submit**

■ Upload finish

Model ID	Display Name	Action
dtmi:itri:cms:Floor;3	Floor Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>
dtmi:itri:cms:Room;4	Room Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>
dtmi:itri:cms:RPCstat;9	RPC STATS 9	<a href="#">View Model</a> <a href="#">Delete Model</a>

### 13. Start Device by running rpc\_pnp.py

- 13.1 Add IoT Devices

- Search iot hub

- Select IoT Hub

- Click on the IoT Hub created in Step 8.4

- Click IoT Devices

**Essentials**

Resource group ([change](#))  
rpc-adt-rg

Status  
Active

Current location  
East US

Subscription ([change](#))  
[Azure in Open](#)

Subscription ID

Hostname  
rpc-adt-hub.azure-devices.net

Pricing and scale tier  
S1 - Standard

Number of IoT Hub units  
1

Minimum TLS Version  
1.0

Tags ([change](#))  
[Click here to add tags](#)

**Need a way to provision millions of devices?**  
IoT Hub Device Provisioning Service enables zero-touch, just-in-time provisioning to the right IoT hub without requiring human intervention.

**Need a way to monitor and secure your IoT solution?**  
Defender for IoT is a unified security management service. It provides end-to-end threat analysis and protection across hybrid cloud workloads and your Azure IoT solution.

- Click + New

**IoT devices**

View, create, delete, and update devices in your IoT Hub.

Field	Operator	Value
<input type="text" value="select or enter a property name"/>	=	<input type="text" value="specify constraint value"/>
<a href="#">+ Add a new clause</a>		

[Query devices](#) [Switch to query editor](#)

No devices found

- o Input data

 **Create a device** ...

 Find Certified for Azure IoT devices in the Device Catalog 

Device ID \*   
The ID of the new device

Authentication type   
 Symmetric key  X.509 Self-Signed  X.509 CA Signed

Primary key   
Enter your primary key

Secondary key   
Enter your secondary key

Auto-generate keys 

Connect this device to an IoT hub   
 Enable  Disable

Parent device   
**No parent device**  
[Set a parent device](#)

**Save**

- **Device ID** field
  - Input **rpc-adt-001**

- When the input is complete, please click the **Save** button

**Create a device**

Find Certified for Azure IoT devices in the Device Catalog

Device ID \* ⓘ  
rpc-adt-001 ✓

Authentication type ⓘ  
**Symmetric key** X.509 Self-Signed X.509 CA Signed

Primary key ⓘ  
Enter your primary key

Secondary key ⓘ  
Enter your secondary key

Auto-generate keys ⓘ

Connect this device to an IoT hub ⓘ  
**Enable** Disable

Parent device ⓘ  
**No parent device**  
Set a parent device

**Save**

- Create **rpc-adt-002**、**rpc-adt-003**、**rpc-adt-004**

Microsoft Azure Search resources, services, and docs (G+/)

Home > IoT Hub > rpc-adt-hub

**rpc-adt-hub | IoT devices**

Device ID	Status	Last Status Update (UTC)	Authentication Type	Cloud to Device Message ...
rpc-adt-004	Enabled	--	Sas	0
rpc-adt-002	Enabled	--	Sas	0
rpc-adt-003	Enabled	--	Sas	0
rpc-adt-001	Enabled	--	Sas	0

- Click **rpc-adt-001**

Device ID	Status	Last Status Update (UTC)	Authentication Type	Cloud to Device Message ...
rpc-adt-001	Enabled	--	Sas	0

- Get Connection String

Device ID: rpc-adt-001

Primary Key: [REDACTED]

Secondary Key: [REDACTED]

Primary Connection String: [REDACTED] (highlighted with a red box)

Secondary Connection String: [REDACTED]

Enable connection to IoT Hub:  Enable  Disable

Parent device: No parent device

Module Identities Configurations

Module ID Connection State Connection State Last Updated ... Last Activity Time (UTC)

There are no module identities for this device.

- 13.2 Install Python 3.7.0 on the Plug and Play Device
  - Download And Install
- 13.3 Install Package on the Plug and Play Device
  - Enter the project folder

```
$ cd ./Azure-Digital-Twins-for-RPC/PnP-Device/rpc
```

- Install

```
pip install -r requirements.txt
```

- 13.4 Run code on the Plug and Play Device
  - Change values in `rpc_pnp.py`
    - Device ID

rpc\_component\_name\_01 = 'rpc-adt-001'

The screenshot shows the Microsoft Azure IoT Hub devices page. The URL is [https://portal.azure.com/#blade/Microsoft\\_IoT/IoTHubDeviceListBlade/~/iotHub/rpc-adt-hub/devices](#). The page title is "rpc-adt-hub | IoT devices". On the left, there's a sidebar with "IoT Hub" selected. Under "Explorers", "IoT devices" is highlighted. The main area shows a table with one row for "rpc-adt-001". The columns are Device ID, Status, Last Status Update (UTC), Authentication Type, and Cloud to Device Message ... . The "Device ID" column contains "rpc-adt-001", which is highlighted with a red box.

## ■ IoT Hub connection string

IOTHUB\_DEVICE\_CONNECTION\_STRING\_DEV="";SharedAccessKeyName=iothubowner"

The screenshot shows the Microsoft Azure IoT Hub device details page for "rpc-adt-001". The URL is [https://portal.azure.com/#blade/Microsoft\\_IoT/IoTHubDeviceBlade/~/iotHub/rpc-adt-hub/devices/rpc-adt-001](#). The page title is "rpc-adt-001". The "Primary Connection String" field is highlighted with a red box.

## ○ Run Python

```
$ python3 rpc_pnp.py
```

## 14. Create Twin

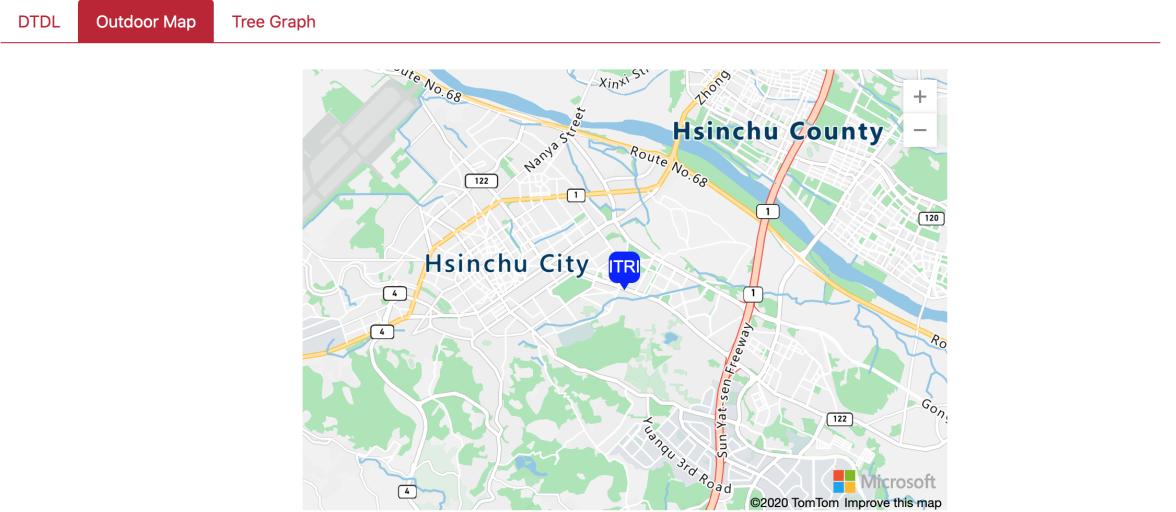
- 14.1 Click **Outdoor Map**

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Model ID	Display Name	Action
dtmi:itri:cms:Floor;3	Floor Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>
dtmi:itri:cms:Room;4	Room Interface Model	<a href="#">View Model</a> <a href="#">Delete Model</a>
dtmi:itri:cms:RPCstat;9	RPC STATS 9	<a href="#">View Model</a> <a href="#">Delete Model</a>

- 14.2 Click **ITRI**

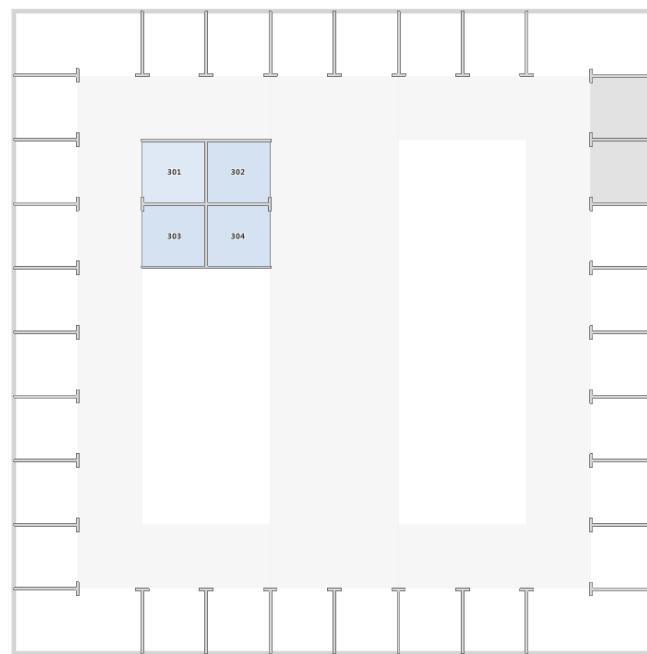
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- 14.3 Click 301

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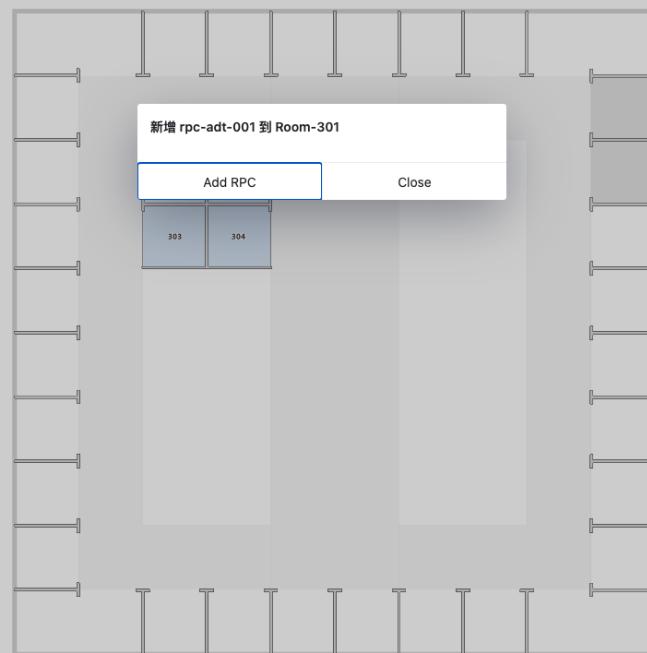
DTDL Outdoor Map Tree Graph



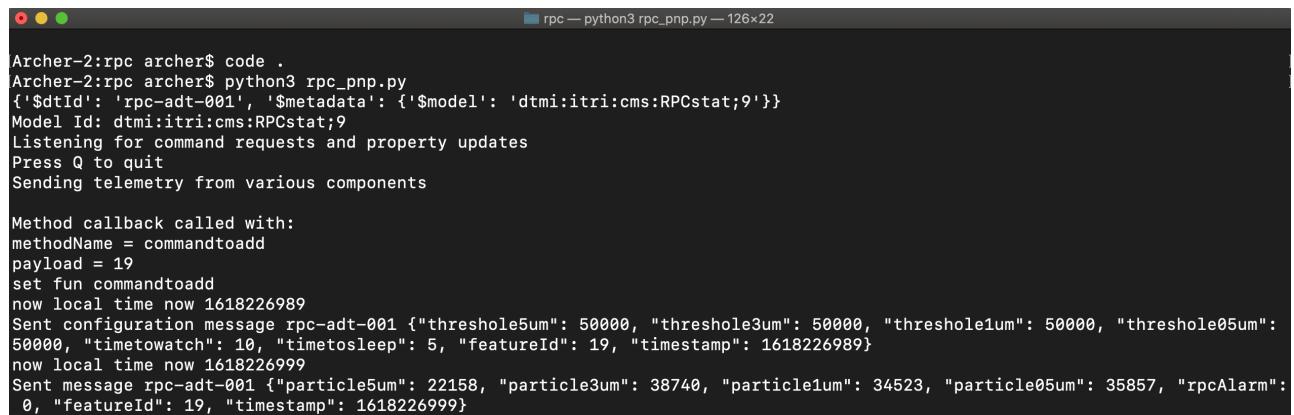
- 14.4 Click Add RPC

ITRI - RPC Digital Twins

DTDL Outdoor Map Tree Graph



- 14.5 PnP Terminal



```

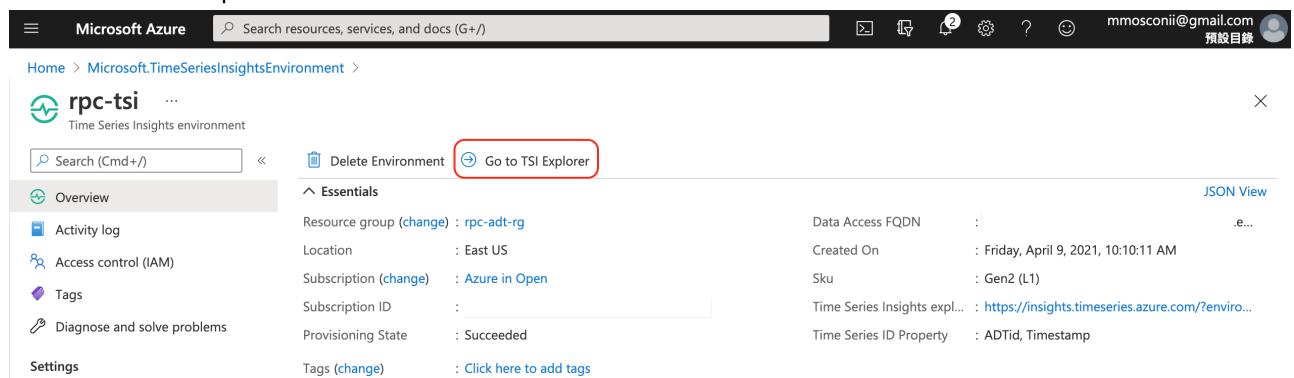
Archer-2:rpc archer$ code .
Archer-2:rpc archer$ python3 rpc_pnp.py
{'$dtId': 'rpc-adt-001', '$metadata': {'$model': 'dtmi:itri:cms:RPCstat;9'}}
Model Id: dtmi:itri:cms:RPCstat;9
Listening for command requests and property updates
Press Q to quit
Sending telemetry from various components

Method callback called with:
methodName = commandtoadd
payload = 19
set fun commandtoadd
now local time now 1618226989
Sent configuration message rpc-adt-001 {"threshold5um": 50000, "threshold3um": 50000, "threshold1um": 50000, "threshold05um": 50000, "timetowatch": 10, "timetosleep": 5, "featureId": 19, "timestamp": 1618226989}
now local time now 1618226999
Sent message rpc-adt-001 {"particle5um": 22158, "particle3um": 38740, "particle1um": 34523, "particle05um": 35857, "rpcAlarm": 0, "featureId": 19, "timestamp": 1618226999}

```

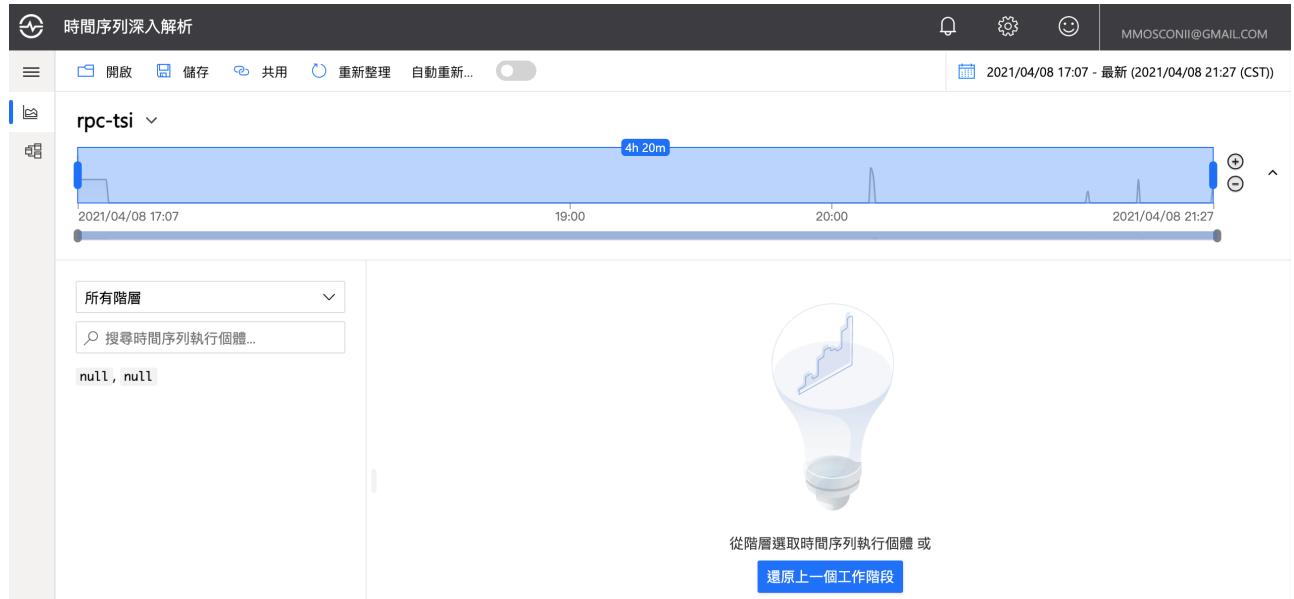
## 15. Visualize your data in Time Series Insights

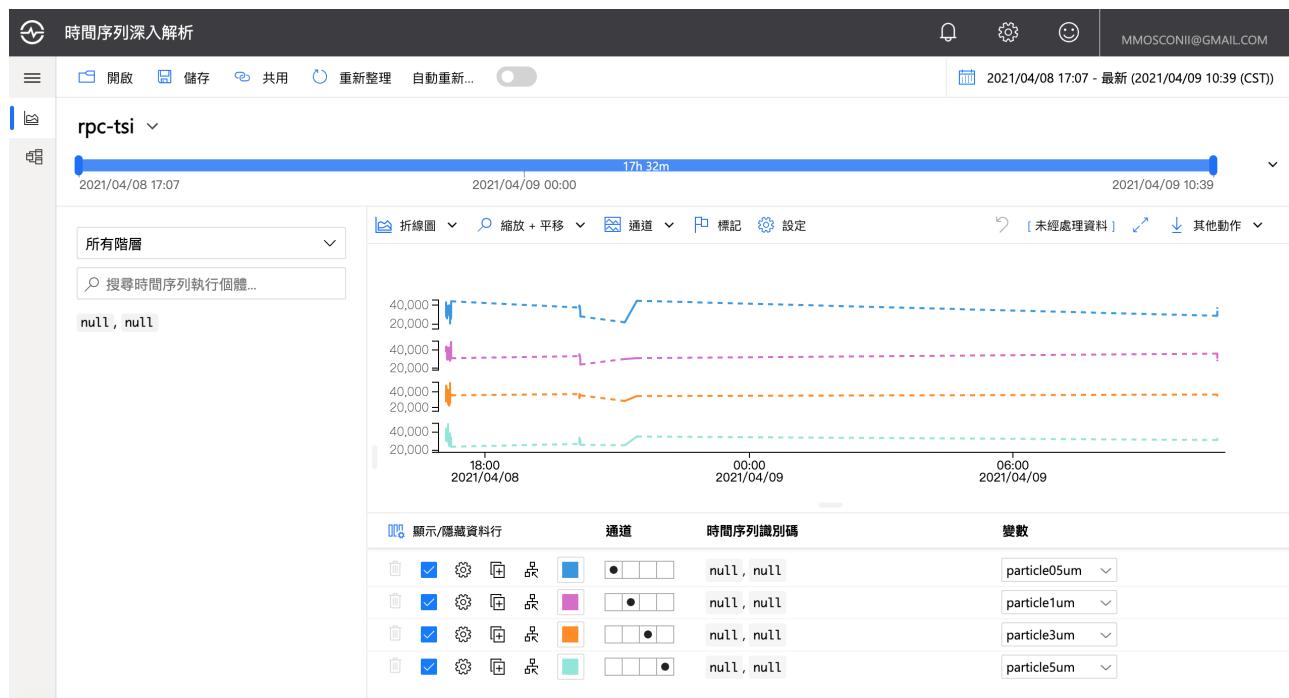
- 15.1 Get to TSI Explorer



The screenshot shows the Microsoft Azure portal interface. In the top navigation bar, the user is in the 'Microsoft Azure' account, with the search bar containing 'Search resources, services, and docs (G+/-)'. On the right, there are icons for notifications, help, and a user profile. Below the navigation bar, the URL 'Home > Microsoft.TimeSeriesInsightsEnvironment' is visible. The main content area displays the 'rpc-tsi' Time Series Insights environment. It includes a sidebar with options like 'Overview', 'Activity log', 'Access control (IAM)', 'Tags', and 'Diagnose and solve problems'. The 'Essentials' section provides key details: Resource group (change) : rpc-adt-rg, Location : East US, Subscription (change) : Azure in Open, Subscription ID : [redacted], Provisioning State : Succeeded, Data Access FQDN : [redacted], Created On : Friday, April 9, 2021, 10:10:11 AM, Sku : Gen2 (L1), Time Series Insights expl... : https://insights.timeseries.azure.com/?enviro..., and Time Series ID Property : ADTid, Timestamp. A button labeled 'Go to TSI Explorer' is highlighted with a red box.

- 15.2 TSI Explorer View

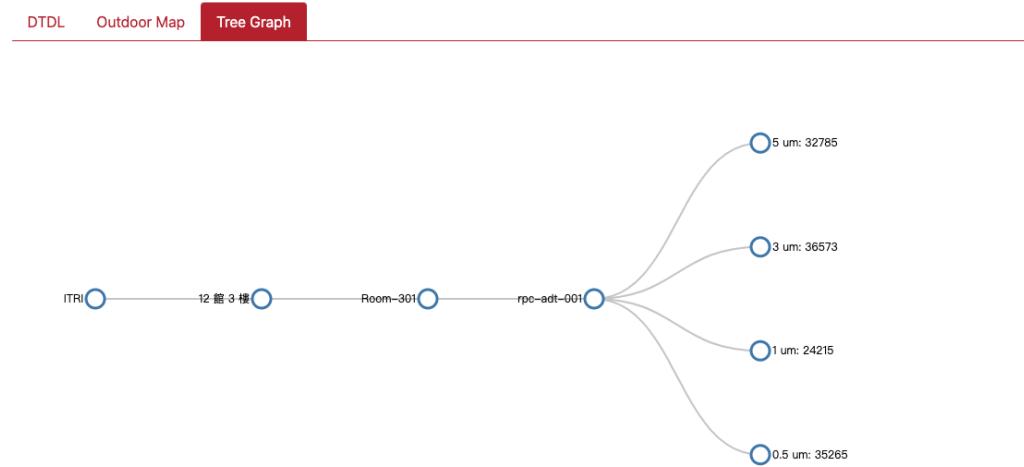




## 16. View live updates on your dashboard

- Click Tree Graph

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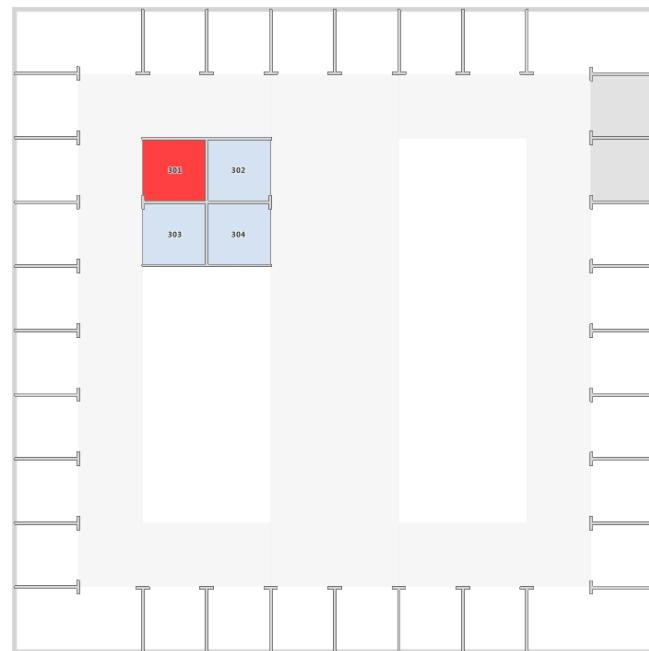


## 17. View live updates on your map

- Alarm

ITRI - RPC Digital Twins

DTDL   Outdoor Map   Tree Graph



 Microsoft  
Improve this map