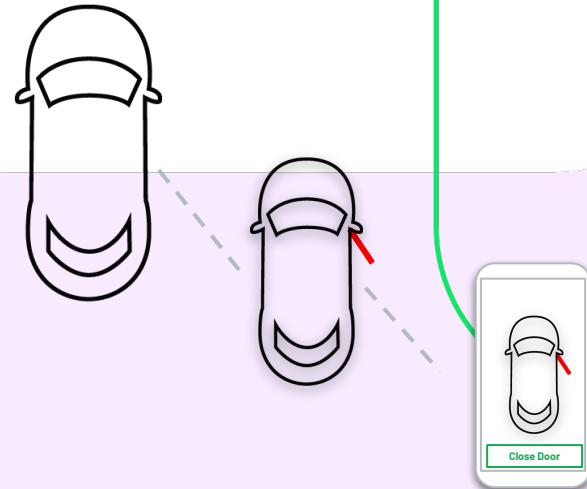


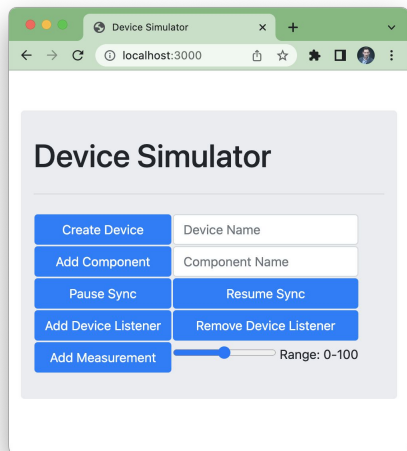


Industry  
Solutions

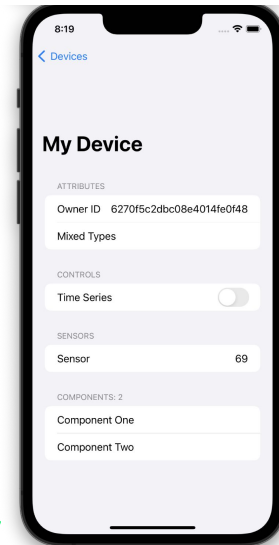
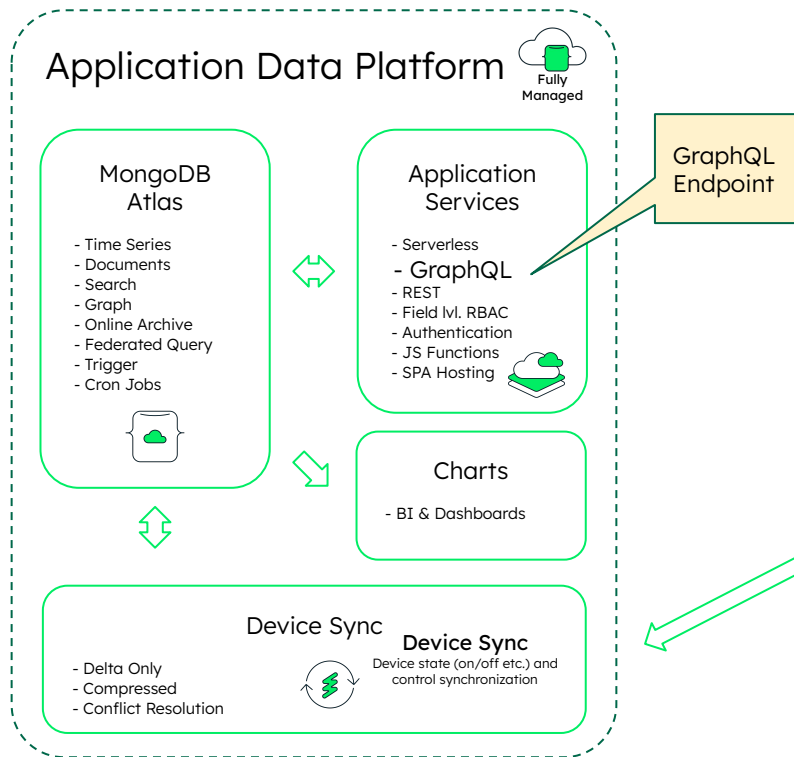
# Digital Twin Sandbox Guide

Digital Twin with MongoDB / Realm





- Device**
- Nodejs / Typescript application



- Device Controller**
- Swift mobile app



# MongoDB Atlas Setup

1. Go to [cloud.mongodb.com](https://cloud.mongodb.com) -> create account or login
2. Create a new cluster ->  
<https://www.mongodb.com/docs/atlas/tutorial/create-new-cluster/>
3. Create a new Realm App -> see following slides

## Create a Shared Cluster

PREVIEW Serverless

Dedicated

FREE Shared

For learning and exploring MongoDB in a sandbox environment. Basic configuration controls.



No credit card required to start. Upgrade to dedicated clusters for full functionality.

Explore with sample datasets. Limit of one free cluster per project.

### Cloud Provider & Region

AWS, Frankfurt (eu-central-1) ▼

aws

 Google Cloud

 Azure

★ Recommended region ⓘ

 Paid tier region ⓘ

★ Recommended region ⓘ  Paid tier region ⓘ

#### NORTH AMERICA

 **Oregon** (us-west-2) ★

 **N. Virginia** (us-east-1) ★

 **Ohio** (us-east-2) ★ 

 **N. California** (us-west-1) 

 **Montreal** (ca-central-1) 

#### SOUTH AMERICA

 **Sao Paulo** (sa-east-1)

#### EUROPE

 **Paris** (eu-west-3) ★

 **Frankfurt** (eu-central-1) ★

 **Stockholm** (eu-north-1) ★

 **Ireland** (eu-west-1) ★

 **London** (eu-west-2) ★ 

 **Milan** (eu-south-1) ★ 

#### MIDDLE EAST

 **Bahrain** (me-south-1) ★

#### AFRICA

 **Cape Town** (af-south-1) ★

#### AUSTRALIA

 **Sydney** (ap-southeast-2) ★

#### ASIA

 **Mumbai** (ap-south-1)


 **Tokyo** (ap-northeast-1)

 **Seoul** (ap-northeast-2)

 **Hong Kong** (ap-east-1) ★

 **Singapore** (ap-southeast-1) ★

 **Jakarta** (ap-southeast-3) ★ 

 **Osaka** (ap-northeast-3) ★ 

## Cluster Tier

M0 Sandbox (Shared RAM, 512 MB Storage)

Encrypted



## Additional Settings

MongoDB 5.0, No Backup



Your cluster  
name

## Cluster Name

Digital-Twin



**One time only:** once your cluster is created, you won't be able to change its name.

Digital-Twin

Cluster names can only contain ASCII letters, numbers, and hyphens.

**FREE**

**Free forever!** Your M0 cluster is ideal for experimenting in a limited sandbox. You can upgrade to a production cluster anytime.

Cancel

Create Cluster

← Digital-Twin

Connect

View Monitoring

Browse Collections

...



**Your cluster is being created..**

New clusters take between 7-10 minutes to provision.

| VERSION | REGION                    | CLUSTER TIER | TYPE                  | BACKUPS  | LINKED REALM APP | BI CONNECTOR | ONLINE ARCHIVE | ATLAS SEARCH |
|---------|---------------------------|--------------|-----------------------|----------|------------------|--------------|----------------|--------------|
| 5.0.8   | AWS / Ireland (eu-west-1) | FREE         | Replica Set - 3 nodes | Inactive | None Linked      | Disabled     | None           | Create Index |

Navigate to the  
App Services tab

Create new App

The screenshot displays the MongoDB Atlas App Services interface. The top navigation bar includes a dropdown menu for 'SA-NA-NE-01', an 'OK' button, and links for 'Access Manager', 'Billing', 'All Clusters', 'Admin', 'Get Help', and a user profile 'Felix'. The main navigation bar features 'EntMod', 'ACTIVE', 'Atlas', 'App Services' (highlighted with a green underline), and 'Charts'. Below the navigation bar, the breadcrumb 'SA-NA-NE-01 > ENTMOD > REALM APPS' is visible, followed by the 'Applications' section header. A green callout box points to the 'App Services' tab, and another green callout box points to the 'Create a New App' button. The 'Create a New App' button is a green button with white text, located next to a 'Create App from Template' button. A light blue notification banner at the bottom states: 'MongoDB Realm applications are free until you exceed the free tier. You can now see the state of your project's total usage as well as the specific usage of each of your apps.' Below the notification, the text 'Total App Usage, This Month' is followed by a link to 'View docs for more info on tracking usage.'

SA-NA-NE-01 > ENTMOD > REALM APPS

## Applications

**Create App from Template** **Create a New App**

**Total App Usage, This Month**

[View docs](#) for more info on tracking usage.



## 1 Name

This name will be used internally and cannot be changed later.

Digital-Twin-Backend

Names must only include: ASCII letters, numbers, \_ -

Your app name

## 2 Link your Database

App Services securely stores your application data in your linked MongoDB Atlas cluster(s).

☐ We'll automatically create a free 5.0 sandbox cluster for you with 512 MB of space

☒ Use an existing MongoDB Atlas Data Source

Digital-Twin

AWS, Cluster IDLE (EU\_WEST\_1)



Use **mongodb-atlas** as the service name when referring to this data source in your app's Functions or SDKs.

> CONNECT TO GITHUB *(optional)*

> ADVANCED CONFIGURATION *(optional)*

Create new App

[Cancel](#)

Create App Service

1. Navigate here

2. Navigate here

🏠 Digital-Twin-Ba

NO ENVIRONMENT

DATA ACCESS

- Rules
- Schema
- App Users
- Authentication**
- BUILD
- SDKs
- Sync
- GraphQL
- Functions

Users Custom User Data **Authentication Providers**

MongoDB Realm provides several authentication providers that you can integrate into a client application to allow users to log in to your Realm app.  
[Learn more about how to configure authentication for any of our authentication providers.](#)

| Provider                          | Enabled | Edit                  |
|-----------------------------------|---------|-----------------------|
| Allow users to log in anonymously | Off     | <button>EDIT</button> |
| Email/Password                    | Off     | <button>EDIT</button> |
| Facebook                          | Off     | <button>EDIT</button> |

3. Navigate here

# Authentication

Users

Custom User Data

**Authentication Providers**

## *Provider Enabled*

Allow your users to sign in with this authentication method.



### ▼ USER CONFIRMATION

#### User Confirmation Method

- ☐ Send a confirmation email
- ☐ Run a confirmation function
- ☒ Automatically confirm users

### ▼ PASSWORD RESET

#### Password Reset Method

- ☒ Send a password reset email
- ☐ Run a password reset function

## Password Reset URL

The Password Reset URL should point to a page that allows users to, at minimum, input a new password for their account. Realm will automatically append the user's token and tokenId to this URL in the email. The URL must include a scheme, such as http or https. Learn how to support password resets [here](#).

URL does **not** need to work!

https://sample.com

## Reset Password Email Subject

The subject line of the email sent to users to when they request to reset their password. If this is not specified, Realm will use a default subject instead. The subject may have a maximum of 256 characters.

https://sample.com

Save

Message pops up ->  
push the button and  
confirm on the pop up  
screen

Discard Changes

Save Draft

Changes have been made to your Realm app since the last deploy.

REVIEW DRAFT & DEPLOY

# Users

Users Custom User Data Authentication Providers

CONFIRMED

PENDING

Providers (All) ▾

Enabled (Any) ▾

Find a user by ID... 🔍

Apply

| Name | Id | User Type | Providers | Created Date (UTC) | Last Login Date (UTC) | User Status | Enabled | Actions |
|------|----|-----------|-----------|--------------------|-----------------------|-------------|---------|---------|
|------|----|-----------|-----------|--------------------|-----------------------|-------------|---------|---------|

No users found.

Add new user

Add New User

Navigate here



## Add New User

**i** Edits to this page will be updated in your application immediately and will not be included as draft changes.

Email Address

demo

Password

demopw

Confirm Password

demopw

Cancel

Create

Realm Apps

Digital-Twin-Bac...

NO ENVIRONMENT

DATA ACCESS

Rules

Schema

App Users

Authentication

BUILD

SDKs

Sync

GraphQL

Functions

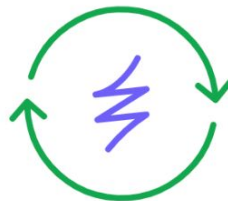
Triggers

HTTPS Endpoints

Values

## Sync

Navigate here





## Enable Syncing

Use [MongoDB Realm Sync](#) to synchronize data between MongoDB Atlas and Realm SDK enabled devices.

Start Syncing



## Already have data in Atlas?

The first step to syncing data is setting up a Sync Schema. If you already have data in Atlas, you can use the structure of those documents for your data model. Learn more about [Realm Schema](#) . If you don't want to define your schema you can skip straight to Sync and instead use [Development Mode](#)  which will set the schema based on the object model defined on a sync client SDK.

Generate a Schema

No thanks, continue to Sync

Continue to sync



Realm Apps

Digital-Twin-Bac...

NO ENVIRONMENT

DATA ACCESS

Rules

Schema

App Users

Authentication

BUILD

SDKs

Sync

GraphQL

Functions

Triggers

HTTPS Endpoints

# Sync

## 1 Select Development Details

### Sync Type

Learn more about the differences between [Partition-based Sync](#) and [Flexible Sync](#)

Partition Based

Flexible **PREVIEW**

Choose flexible sync

**Flexible Sync** enables you to send a query from your device using a set of q the Atlas data.

### Development Mode

[Development Mode \(Dev Mode\)](#) allows you to define and test data models in your client application before you are ready to go into production.

Enable development mode

ON



Dev Mode disables drafts (i.e. changes made in your Realm app deploy immediately).

### Select a Cluster to Sync

All data from collections in this cluster can be synced. Selecting a new cluster to sync will restart the syncing process. Sync requires an Atlas cluster using MongoDB version 5.0.

Digital-Twin - (Service: mongodb-atlas) - 5.0.8

Choose the database cluster

**Note:** When Sync is enabled, Realm will create a copy of all data from collections with a defined JSON schema in your Atlas cluster.

### Define a Database Name

When adding new tables in your mobile app, a new collection will be created in MongoDB. Select the database where you want new collections to be created in.

Select or add a database name

Create a new database

Digital-Twins

Cancel

Create



## Select Queryable Fields

Select up to 10 queryable fields from your Realm JSON Schema to construct queries on. Note that the `_id` field is always queryable.

Only top-level, primitive fields containing scalars are provided here. Note that you must turn Mode ON and define a database above to create a new queryable field. [View Docs](#)

owner\_id

Create "owner\_id"

\_id

Add owner\_id



## Define Permissions

Select a template or manually define which application users have Read and/or Write access.

[View Example](#)

Users can only read and write their own data



You may have to choose which field specifies ownership. (e.g owner\_id in the template below)

```
1 {  
2   "defaultRoles": [  
3     {  
4       "name": "owner-read-write",  
5       "applyWhen": {},  
6       "read": {"owner_id": "%user.id"},  
7       "write": {"owner_id": "%user.id"}  
8     }  
9   ]  
10 }
```

Ln 1 Col 1

Advanced Configuration *(optional)*



Discard Changes

Save Changes

Save changes

## Advanced Configuration *(optional)*



### Asymmetric Sync

Using this feature allows you to sync data unidirectionally from your client device directly to your Atlas database. [Learn more about Asymmetric Sync.](#)

⚠ To remove or add more tables after sync has been enabled, you will need to terminate and re-enable your current sync session.  
[Learn about adding/removing asymmetric tables.](#)

Designate the tables from your schema that you would like to sync unidirectionally.

Select or create an asymmetric table



Create an asymmetric table "Sensor"

Tables from your schema

Sensor





## Confirm: Enabling Sync

Enabling sync will create a copy of all data that matches a JSON schema in your selected cluster Digital-Twin - (Service: mongodb-atlas) - 5.0.8. Learn more about [enabling Sync](#)



### Check your cluster's storage before proceeding.

Before enabling Sync please ensure that your cluster is using less than 50% of its available storage or enable auto-scale for your cluster's storage. Learn more about [auto-scale](#)

Cancel

Enable Sync

Enable sync

Hit the button

Changes have been made to your Realm app since the last deploy.

REVIEW DRAFT & DEPLOY



# Deploy the demo app

- <https://github.com/mongodb-industry-solutions/Connected-Devices/tree/main/device-ts>
- Follow the steps documented in the readme



# Use the demo app

## Digital-Twin "Onboard UI"

Create Device

Add Component

Play with the buttons and look into the database

← → ↻ localhost:3000

Update

Elements Console Recorder Sources Network

Filter ☐ Invert ☐ Hide data URLs

All Fetch/XHR JS CSS Img Media Font Doc WS Wasm Manifest Other

☐ Has blocked cookies ☐ Blocked Requests ☐ 3rd-party requests

|  | 2000 ms | 4000 ms | 6000 ms | 8000 ms | 10000 ms | 12000 ms | 14000 ms |
|--|---------|---------|---------|---------|----------|----------|----------|
|  |         |         |         |         |          |          |          |

| Name                               | Url                  | St... | Type  | Initiator   | Size  | Waterfall |
|------------------------------------|----------------------|-------|-------|-------------|-------|-----------|
| <input type="checkbox"/> create... | http://localhost:... | 200   | fetch | (index);... | 31... | 3.        |
| <input type="checkbox"/> add_c...  | http://localhost:... | 200   | fetch | (index);... | 31... | 3.        |
| <input type="checkbox"/> add_c...  | http://localhost:... | 304   | fetch | (index);... | 17... | 2.        |

3 requests | 802 B transferred | 229 B resources

Console

Filter

No Issues

```
{
  "devices": [
    {
      "device_id": "6270fc8eec7aabcd6e52288d",
      "device_name": "MyDevice"
    }
  ]
}
(index):33

{"success": "Component created and related to id: 6270fc8eec7aabcd6e52288d"}
(index):39
```

Add devices and components





NO ENVIRONMENT

DATA ACCESS

Rules

Schema

App Users

Location

ID

Keys

Sync

GraphQL

Functions

Triggers

HTTPS Endpoints

Values

MANAGE

Linked Data Sources

Deployment

Hosting

Logs

App Settings

Explore  
GraphQL

# GraphQL

Explore

Schema

Custom Resolvers

Settings

## GraphQL Endpoint

Note: GraphQL runs queries as a [System User](#), but all client requests to the GraphQL endpoint must be authenticated. [Learn how to retrieve and refresh access tokens.](#)

GraphiQL



Prettify

Merge

Copy

History

```
1 #
2 # Keyboard shortcuts:
3 #
4 # Prettify Query: Shift-Ctrl-P
5 #
6 # Merge Query: Shift-Ctrl-M
7 #
8 # Run Query: Ctrl-Enter (o
9 #
10 # Auto Complete: Ctrl-Space (o
11 #
12
13 query {
14   device {
15     _id
16     name
17     owner_id
18     components {
19       name
20     }
21   }
22 }
```

```
{
  "data": {
    "device": {
      "_id":
"6270fc8eec7aabcd6e52288d",
      "components": [
        {
          "name": "MyComponent"
        },
        {
          "name": "MyComponent"
        }
      ],
      "name": "MyDevice",
      "owner_id":
"6270f5c2dbc08e4014fe0f48"
    }
  }
}
```