AWS Mobile Hub

Developer Guide

Version 1.0

AWS Mobile Hub: Developer Guide

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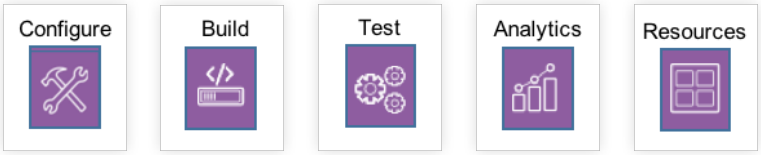
What Is AWS Mobile Hub?



AWS Mobile Hub provides an integrated console experience that enables you to quickly create and configure powerful mobile app backend features and integrate them into your mobile app. You create a project by selecting features to add to your app.

The features and AWS services that are supported by Mobile Hub are constantly evolving. Currently they include:

- App Analytics (p. 5)
- App Content Delivery (p. 6)
- Cloud Logic (p. 11)
- NoSQL Database (p. 25)
- Push Notifications (p. 31)
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When you build your project for iOS Objective-C, iOS Swift, or Android, Mobile Hub automatically provisions and configures all of the AWS service resources that your app's features require. Mobile Hub then guides you through integrating the features into your app code and downloading a fully working quickstart app project that demonstrates those features.

After your mobile app is built, you can use Mobile Hub to test your app, then monitor and visualize how it is being used.

AWS Mobile Hub enables you to select the region in which your project's resources will be created. For more information about AWS regions, see Regions and Endpoints.

When you use AWS Mobile Hub, you pay only for the underlying services that Mobile Hub provisions based on the features you choose in the Mobile Hub console. For more information, see Pricing.

How Can I Use AWS Mobile Hub?

Mobile Hub provides all the information you need to use your sample app project:

- Explore the details of AWS mobile features
- Configure AWS services as mobile back ends
- Build your custom app on top of the solid foundation of your Mobile Hub sample app
- Get the app components and functional sample code you need for an app project you build from scratch.

To get started see Setting Up AWS Mobile Hub (p. 3).

Setting Up AWS Mobile Hub

Before you use AWS Mobile Hub for the first time, you must complete the following tasks:

Topics

Signing Up for AWS

To use AWS Mobile Hub, you need an AWS account. Your account has access to all available services, but you are charged only for the services you use. If you are a new AWS customer, you can get started with the AWS Free Tier.

Creating an IAM User

To provide better security, we recommend that you do not use your AWS root account to access Mobile Hub. Instead, create an AWS Identity and Access Management (IAM) user, or use an existing IAM user, in your AWS account and then access Mobile Hub with that user. For more information, see AWS Security Credentials in the AWS General Reference. .

If you signed up for AWS but have not created an IAM user for yourself, you can create one by using the IAM console. First, create an IAM administrator group, then create and assign a new IAM user to that group.

To create an IAM administrators group

1. Sign in to the AWS Management Console and open the IAM console at https://console.aws.amazon.com/iam/.
2. In the navigation pane, choose **Groups**, and then choose **Create New Group**.
3. For **Group Name**, type a name for your group, such as **Administrators**, and then choose **Next Step**.
4. In the list of policies, select the check box next to the **AdministratorAccess** policy. You can use the **Filter** menu and the **Search** box to filter the list of policies.
5. Choose **Next Step**, and then choose **Create Group**. Your new group is listed under **Group Name**.

The following procedure describes how to create an IAM user for yourself, add the user to the administrators group, and create a password for the user.

To add an IAM user to your group and assign a password

1. In the navigation pane, choose **Users**, and then choose **Create New Users**.
2. In box **1**, type a user name. Clear the check box next to **Generate an access key for each user**. Then choose **Create**.
3. In the list of users, choose the name (not the check box) of the user you just created. You can use the **Search** box to search for the user name.
4. In the **Groups** section, choose **Add User to Groups**.
5. Select the check box next to the administrators group. Then choose **Add to Groups**.
6. Scroll down to the **Security Credentials** section. Under **Sign-In Credentials**, choose **Manage Password**.
7. Select **Assign a custom password**. Then type a password in the **Password** and **Confirm Password** boxes. When you are finished, choose **Apply**.

Enabling AWS Mobile Hub

AWS Mobile Hub administers AWS resources for mobile app projects on behalf of the customer. This includes automation that creates AWS Identity and Access Management (IAM) roles for mobile app users and updates their permissions based on the features that are enabled in a mobile app project. Because these operations require administrative privileges (the ability to create and modify IAM roles), only a user with administrative privileges may enable Mobile Hub to do this. These are the steps an administrative user must take in order to enable AWS Mobile Hub in an AWS account. This only needs to be done once.

To enable Mobile Hub in an AWS account

1. Navigate to the AWS Mobile Hub console at https://console.aws.amazon.com/mobilehub/.
2. Choose **Get Started**.
3. Review the details of the **First things first…** page.
4. Choose **Yes, grant permissions**.

Signing in to Mobile Hub and Creating Your Project

A Mobile Hub project is a logical workspace that contains the features you choose to incorporate into your mobile app. You can create as many projects as you wish.

To create a Mobile Hub project

1. Choose **Get Started** or **Create new project**.
2. For **Project name**, type a name for your project.
3. Choose **Create project**.

App Analytics

The App Analytics feature has now been replaced by the Mobile Hub User Engagement (p. 50) feature, which is based on the Amazon Pinpoint service. Your existing projects that utilize App Analytics and your access to the visualization of your apps' usage metrics in Mobile Analytics will continue to function as before.

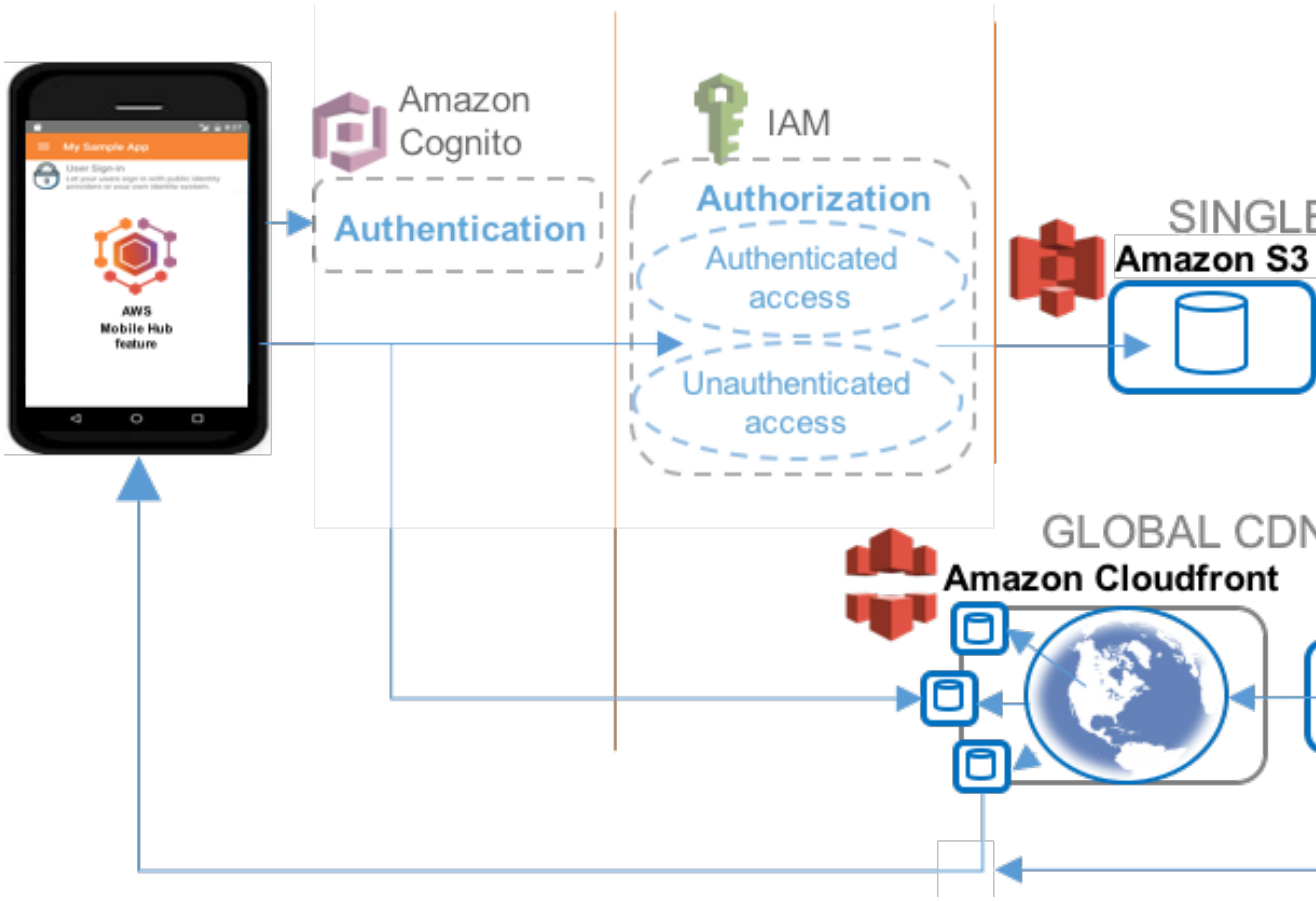
Upgrade your app from Legacy App Analytics to User Engagement

When you sign in to the Mobile Hub console and open a project for an existing app that uses App Analytics, you will see that the **User Engagement** feature card has replaced the **App Analytics** card, and is marked as enabled to show that your legacy App Analytics feature is still enabled.

Choose the **User Engagement** card, and then choose **Enable engagement** to upgrade App Analytics in your app to add Amazon Pinpoint campaigns to your app.

App Content Delivery

Choose AWS Mobile Hub App Content Delivery to add access to cloud content to your mobile app, from a single location or a global Content Delivery Network (CDN).



The App Content Delivery feature enables you to store app assets, like resource or media files, in the cloud so you can download and cache them within your app. Mobile Hub offers two choices for distributing these files: either from a single location using an Amazon S3 bucket or distributed through a global content delivery network by using Amazon CloudFront.

Topics

App Content Delivery At a Glance

AWS services and resources configured	• **Amazon CloudFront - Content Delivery Network** (see Amazon CloudFront) Concepts | Console | Pricing • **Amazon S3 Bucket** (see Amazon Simple Storage Service Getting Started Guide) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 7).
Configuration options	This feature enables the following mobile backend capabilities: • **Single location** (AWS storage in a single regional location) • **Global CDN** (AWS storage on a global Content Distribution Network) For more information, see Configuring the App Content Delivery Feature (p. 7).
Quickstart app demos	This feature adds the following to a quickstart app generated by Mobile Hub: • View file list in AWS storage, download and view files, and manage their local cache. • Same behavior from a single storage location and a global content distribution network.

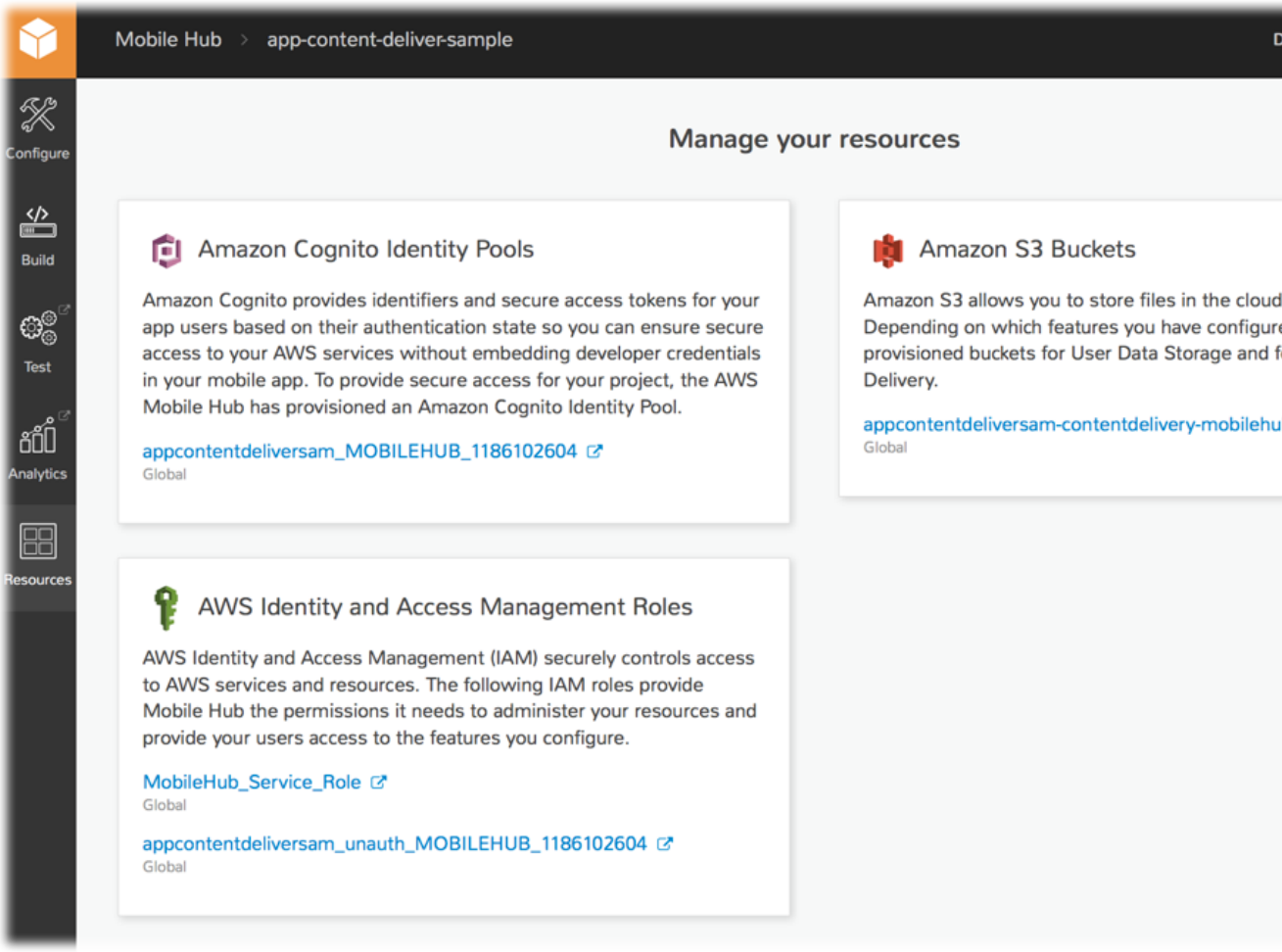
Configuring the App Content Delivery Feature

If you choose the **Single location** option, Mobile Hub creates an Amazon S3 bucket and pre-populates the bucket with a few sample files that are distributed to your quickstart app directly from there.

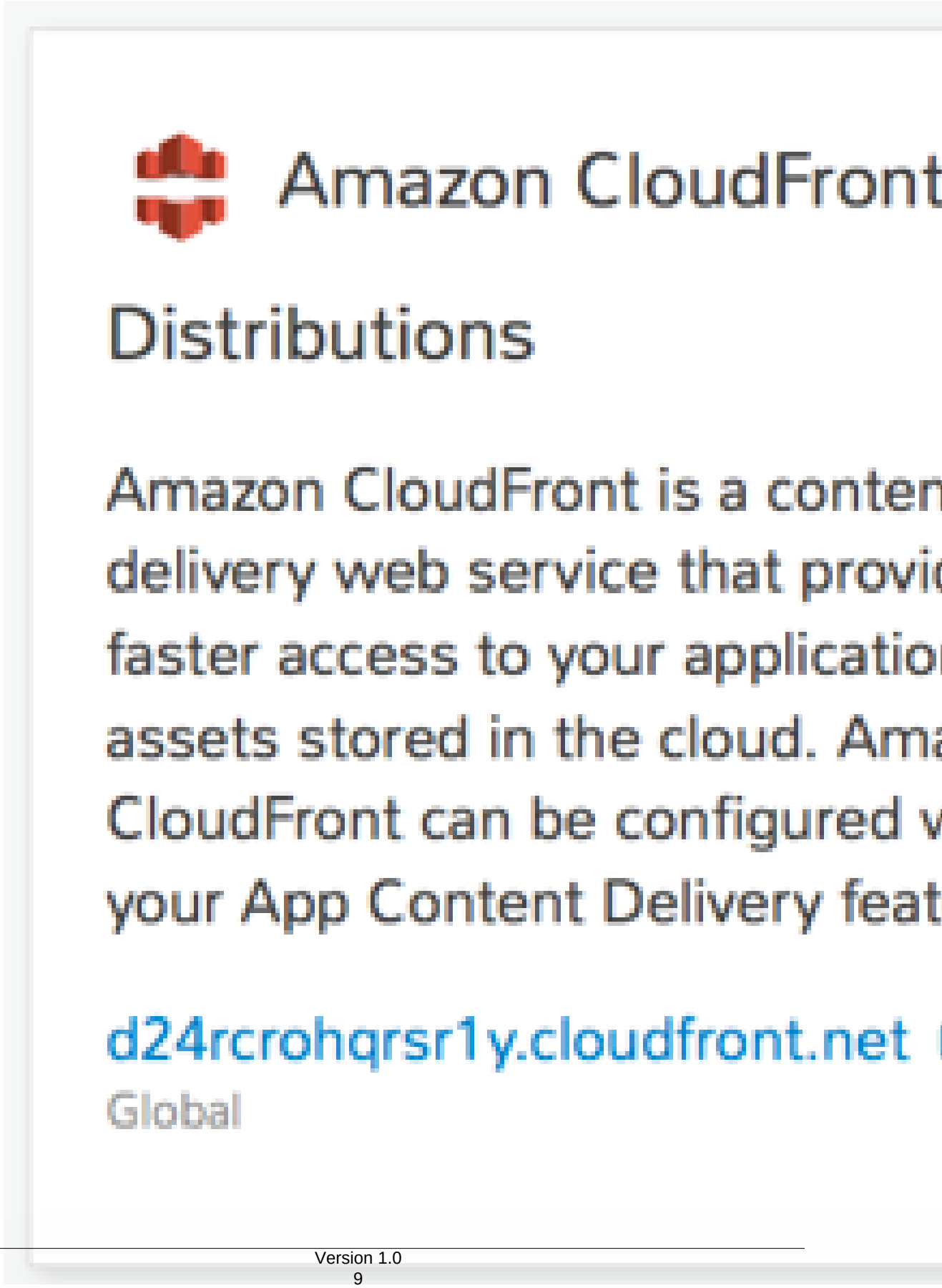
If you choose the **Global CDN** option, Mobile Hub provisions an Amazon CloudFront distribution to deliver files to your app. Amazon CloudFront caches your files using your Amazon S3 bucket as the source (origin) in edge locations around the world to provide faster, lower latency access to your files. Learn more about Amazon CloudFront.

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying elements typically provisioned for the App Content Delivery feature with **Single location** selected.



The following image illustrates the resource typically provisioned for the additional CloudFront element of the App Content Delivery feature with **Global CDN** selected.

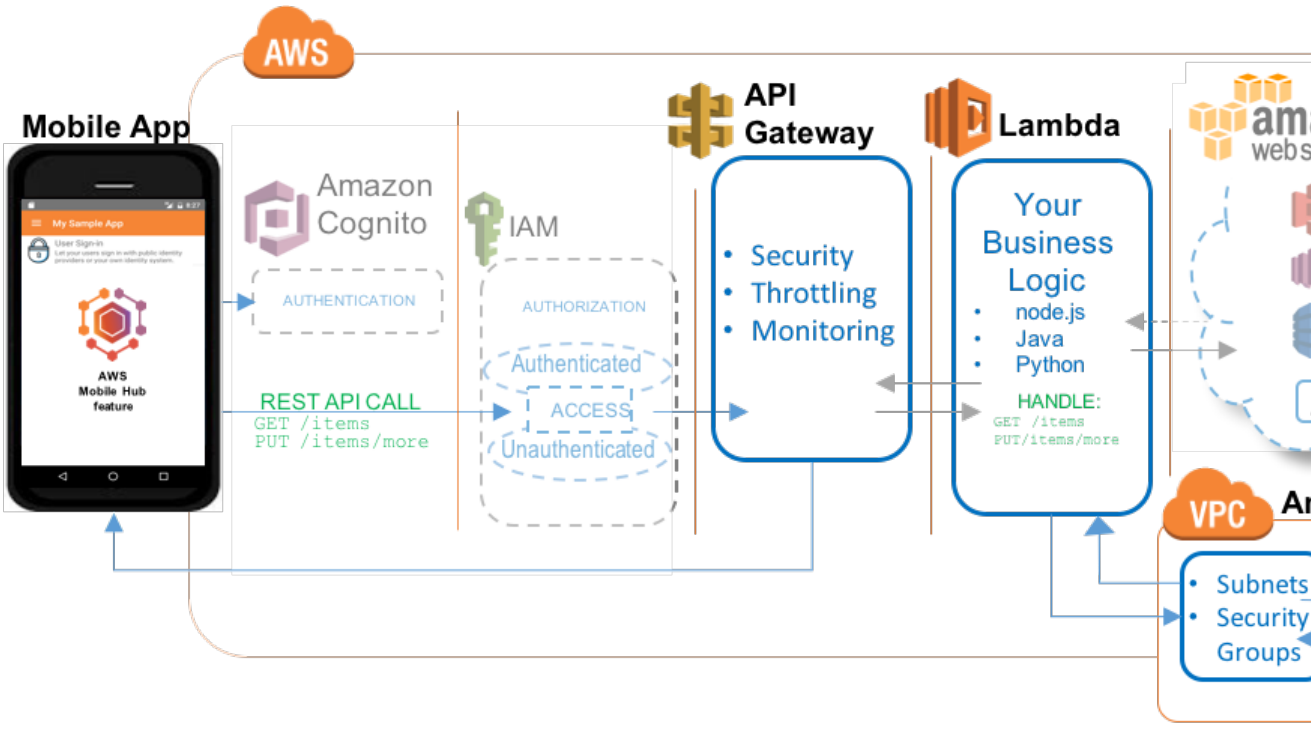

Amazon CloudFront
Distributions
Amazon CloudFront is a conten
delivery web service that provi
faster access to your applicatio
assets stored in the cloud. Ama
CloudFront can be configured v
your App Content Delivery feat
d24rcrohqrsr1y.cloudfront.net
Global

Quickstart App Details

In the Mobile Hub quickstart app, the App Content Delivery demo lists a set of image files that can be downloaded and cached locally and displayed on the device. The user can also delete the local copy of the image files.

Cloud Logic Mobile Backend Feature for Your Mobile App

Choose the AWS Mobile Hub Cloud Logic mobile backend service feature to add business logic functions in the cloud and extend to other AWS services for your app, with no cost for server set up or maintenance.



The Cloud Logic feature lets you build backend services using AWS Lambda functions that you can call from your mobile app. Using Cloud Logic, you can run code in the cloud to process business logic

for your apps and share the same code for both iOS and Android apps. The Cloud logic feature is powered by AWS Lambda functions, which allow you to write code without worrying about managing frameworks and scaling backend infrastructure. You can write your functions in JavaScript, Java, or Python.

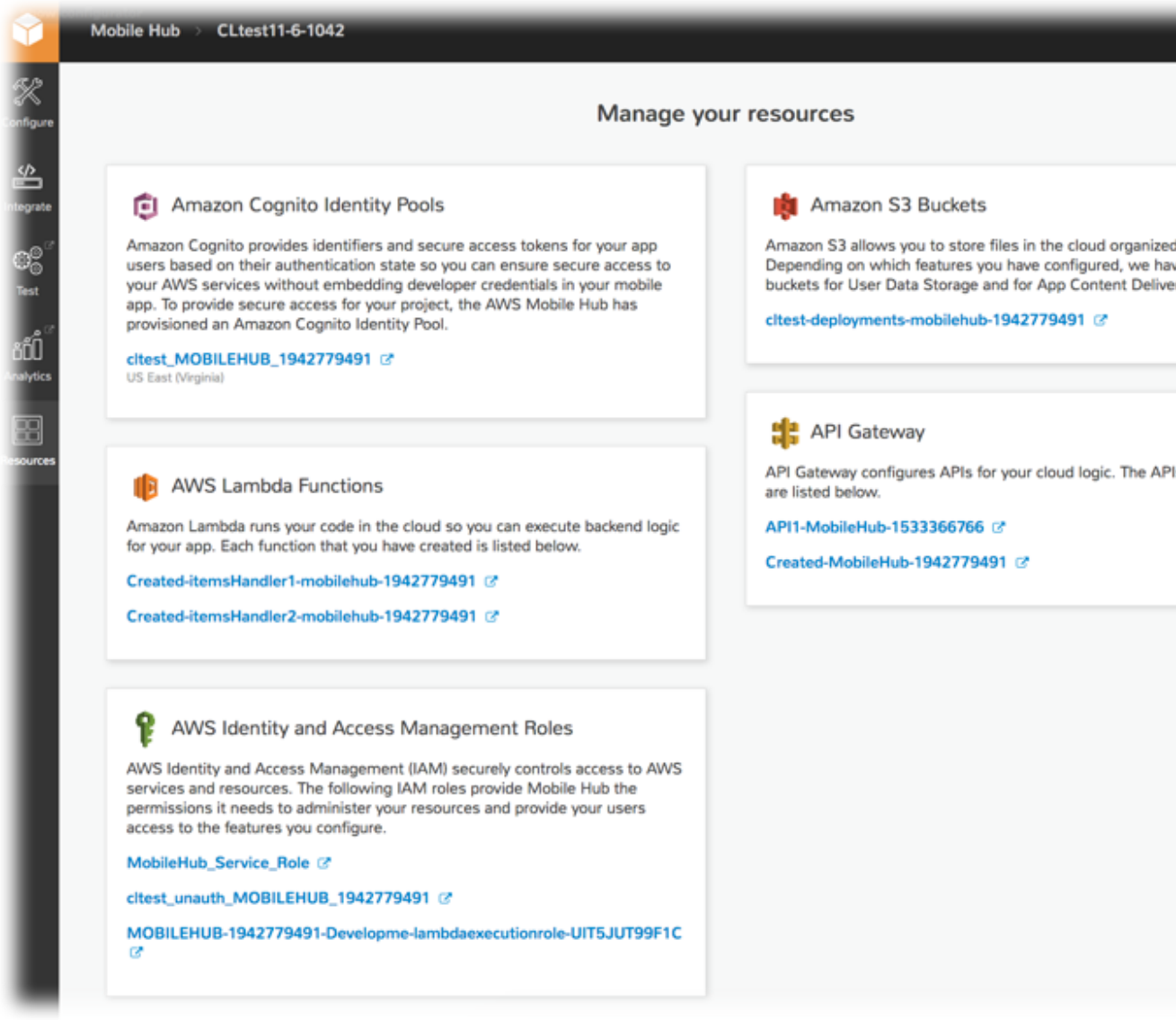
Topics

Cloud Logic At a Glance

AWS services and resources configured	• **Amazon API Gateway** (see Amazon API Gateway Developer Guide) Concepts | Console | Pricing • **AWS Lambda** (*see* AWS Lambda Developer Guide) Concepts | Console | Pricing • **Amazon Virtual Private Cloud** (see Amazon VPC User Guide) Concepts | Console | Pricing • **AWS CloudFormation** (see AWS CloudFormation User Guide) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 7).
Configuration options	This feature enables the following mobile backend capabilities: • Provides a default Hello World Lambda function that accepts the parameter value entered by the app user and returns it back to an app. • Enables you to choose an existing function from the list provided or use the AWS Lambda console to create new functions.
Quickstart app demos	This feature adds the following functionality to a quickstart app generated by Mobile Hub: • User can specify an AWS Lambda function by name, provide parameters and call a function and see the value returned by the function

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying elements typically provisioned for the Cloud Logic feature.



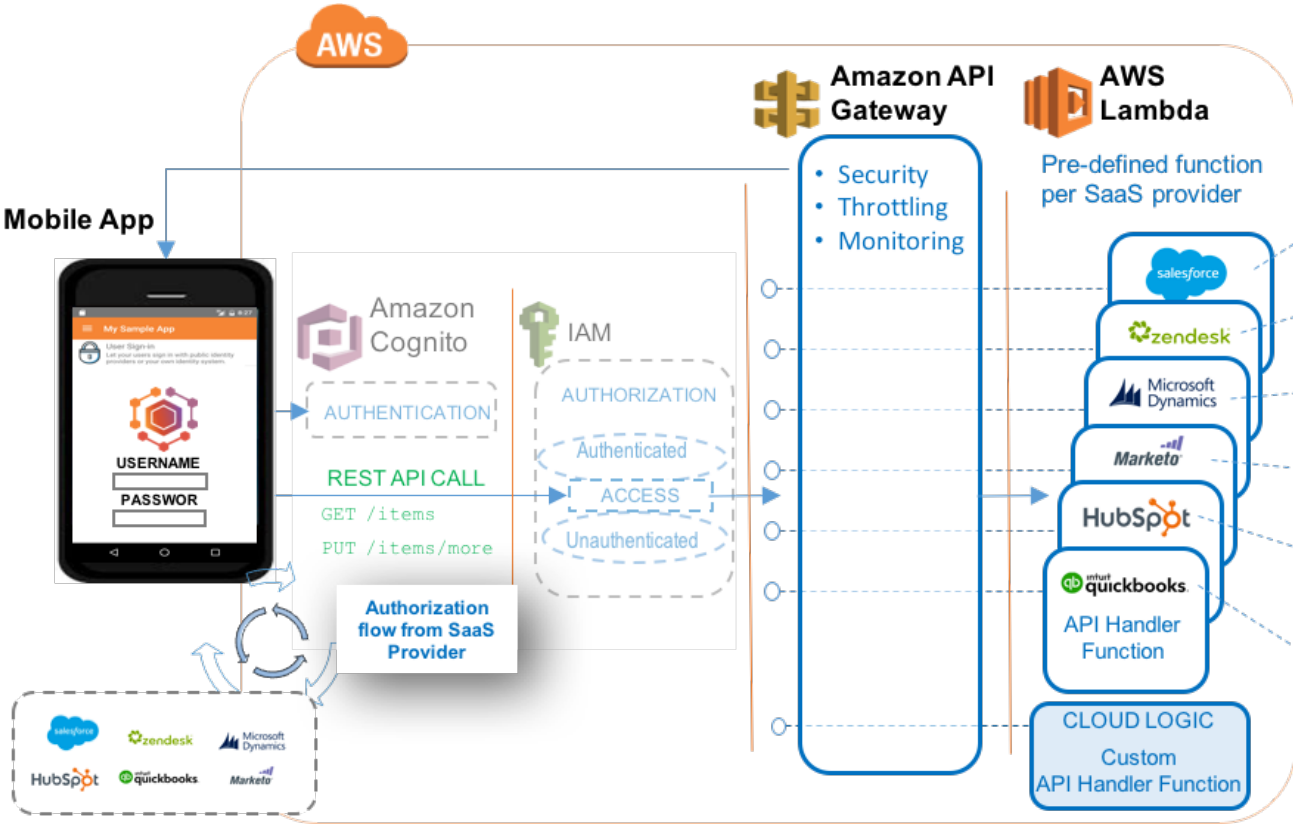
Quickstart App Details

Your quickstart app includes code to use AWS Lambda APIs to invoke any functions you have selected in your project. Adding Cloud Logic to your quickstart app provides a Hello World default Lambda function. You can also choose an existing Lambda function from your AWS account, or you can create a new one. When you choose the edit button, you are taken to the function editor in the AWS Lambda console. From the Lambda console, you can edit the code directly or upload a package of source and libraries as a .zip file.

In the demo screen of the Cloud Logic quickstart app, you can enter the name and input parameters of the Lambda function you wish to invoke. The quickstart app then calls your Lambda function and displays the results it returns.

Connectors

Choose the AWS Mobile Hub Connectors mobile backend service feature to connect your iOS and Android mobile apps to the SaaS platform you use. Using REST APIs, gain visibility into and control over your SaaS traffic. Lower the cost of your app lifecycle.



AWS Mobile Hub Connectors are AWS APIs that are pre-defined to enable you to rapidly develop mobile apps that connect to your application on a SaaS platform. Connectors optimize and simplify connecting your app to your SaaS application in several ways. The underlying SaaS APIs are normalized, which provides you a consistent object model, and paging and filtering behaviors.

Connectors provide a central point for auditing and metering API activity, for testing, and for enabling caching and throttling. That adds up to savings in time and developer and administrator costs throughout an app's lifecycle and an increase in code reusability.

Like Cloud Logic, Connectors use an Lambda function exposed to your app as a REST API by Amazon API Gateway. That means that the required AWS services and permissions are provisioned for you in minutes. You can download of a native SDK for both iOS and Android as well as a quickstart app demonstrating your provisioned services on iPhone and Android.

Unlike Cloud Logic, we author and maintain the business logic of a Connector for you. As minor SaaS platform updates happen we will adjust behind the scenes, where possible, so that you can avoid the need to republish your app.

Enabling Connectors in your project will also enables the User Data Storage (p. 46) feature. We take this step to provide the infrastructure for secure file transfer, as this is a common requirement in SaaS application scenarios.

The SaaS providers currently supported are:

Microsoft Dynamics Connector for Mobile Hub (p. 16)

HubSpot Connector for Mobile Hub (p. 17)

Marketo Connector for Mobile Hub (p. 18)

QuickBooks Connector for Mobile Hub (p. 17)

Salesforce Connector for Mobile Hub (p. 19)

Zendesk Connector for Mobile Hub (p. 19)

Connectors At a Glance

AWS services	• **Amazon API Gateway** (see Amazon API Gateway Developer Guide) Concepts | Console | Pricing

and resources configured	• **AWS Lambda** (*see* AWS Lambda Developer Guide) Concepts | Console | Pricing • **AWS CloudFormation** (*see* AWS CloudFormation User Guide) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 48).

Configuration options	This feature enables the following mobile backend capabilities:
	• Create and configure APIs for your project that connect your app to the SaaS provider you use. For configuration details for each connector see:
	  • HubSpot
	  • Marketo
	  • Microsoft Dynamics
	  • Quickbooks
	  • Salesforce
	  • Zendesk
	• Integrate your app by downloading the example of the quickstart app, and a package of native iOS and Android SDKs plus helper code, all of which are dynamically generated to match your Mobile Hub project.

Quickstart app demos	This feature adds the following functionality to a quickstart app generated by Mobile Hub: • Prompts the user to log in to the SaaS provider and performs the authorization flow • Create, read, update, and delete objects (ie. accounts, tickets, or contacts) within the SaaS backend

Microsoft Dynamics Connector for Mobile Hub

The Microsoft Dynamics Connector implements all the methods and properties available when directly calling Microsoft Dynamics APIs.

Configuring Microsoft Dynamics Authorization for Your App

To enable your app to use OAuth authentication for Microsoft Dynamics user validation, register your app with Azure Active Directory cloud services. To register, create an account at portal.azure.com, and then create an application in their system.

To configure your Connector backend to use your Microsoft Dynamics app registration, provide the following configuration values from portal.azure.com.

- **Dynamics Application ID** (OAuth Client ID)

- **Dynamics Redirect URL** (OAuth Redirect URI)
- **Dynamics Resource URI**

  The Resource URI is in the form of: **`your_Dynamics_subdomain`**`.crm.dynamics.com`.

Microsoft Dynamics Connector API Details

See the Microsoft Dynamics Connector API Reference for more details.

HubSpot Connector for Mobile Hub

The HubSpot Connector implements all the methods and properties available when directly calling HubSpot APIs.

Configuring HubSpot Authorization for Your App

To enable your app to use OAuth authentication for HubSpot user validation, register your app with their cloud services. To register, create a HubSpot account at https://app.hubspot.com, and then create an application in their system.

To find information about HubSpot accounts, applications, and OAuth validation, see HubSpot OAuth2 Authentication.

To configure your Connector backend to use your HubSpot app registration, provide the following configuration values from https://app.hubspot.com.

- **HubSpot Client ID** (OAuth Client ID)
- **HubSpot Redirect URL** (OAuth Redirect URI)

  HubSpot Redirect URLs must use the HTTPS scheme. To learn about recommended coding practices to meet this requirement, see Using HTTPS OAuth redirect URLs (p. 20).
- **HubSpot Portal ID**

  The Portal ID is available in the upper right corner of the portal page when logged in.

HubSpot Connector API Details

See the HubSpot Connector API Reference for more details.

QuickBooks Connector for Mobile Hub

The QuickBooks Connector implements all the methods and properties available when directly calling QuickBooks APIs.

Configuring QuickBooks Authorization for Your App

To enable your app to use OAuth authentication for QuickBooks user validation, register your app with their cloud services. To register, create a QuickBooks account at https://developer.intuit.com, and then create an application in their system.

To find information about QuickBooks accounts, applications, and OAuth validation, see https://developer.intuit.com.

To configure your Connector backend to use your QuickBooks app registration, provide the following configuration values from https://developer.intuit.com.

- **QuickBooks OAuth Consumer Key** (OAuth Client ID)
- **Quickbooks OAuth Callback URL** (OAuth Redirect URI)

QuickBooks Connector API Details

See the QuickBooks Connector API Reference for more details.

Marketo Connector for Mobile Hub

The Marketo Connector implements all the methods and properties available when directly calling Marketo APIs.

Configuring Marketo Authorization for Your App

To enable your app to use OAuth authentication for Marketo user validation, register your app with their cloud services. To register, create a Marketo account at https://login.marketo.com, and then create an application in their system.

To find information about Marketo accounts, applications, and OAuth validation, see Marketo REST API documentation.

To view the values, you will need to configure your Marketo Connector using Marketo credentials assigned a role that has access to developer resources. Your app should provide Marketo credentials (ClientID and Secret) on a per user basis.

To configure your Connector backend to use your Marketo app registration, provide the following configuration values from https://app.marketo.com.

- **Marketo REST API Endpoint** (OAuth Client ID)

  This URI should be in the form of: `https:xxx-xxx-xxx.mkttorest.com/rest`.
- **Marketo REST API Identity** (OAuth Redirect URI)

  This URI should be in the form of: `https:xxx-xxx-xxx.mkttorest.com/identity`.

Marketo Connector API Details

See the Marketo Connector API Reference for more details.

Salesforce Connector for Mobile Hub

The Salesforce Connector implements all the methods and properties available when directly calling Salesforce APIs.

Configuring Salesforce Authorization for Your App

To enable your app to use OAuth authentication for Salesforce user validation, register your app with their cloud services. To register, create a Salesforce account at https://login.salesforce.com, and then create an application in their system.

To learn more about Salesforce accounts, applications, and OAuth validation, see https://developer.salesforce.com/

To configure your Connector backend to use your Salesforce app registration, provide the following configuration values from https://login.salesforce.com/.

- **Salesforce Consumer Key** (OAuth Client ID)
- **Salesforce Callback URL** (OAuth Redirect URI)

Salesforce Connector API Details

See the Salesforce Connector API Reference for more details.

Zendesk Connector for Mobile Hub

The Zendesk Connector implements all the methods and properties available when directly calling Zendesk APIs.

Configuring Zendesk Authorization for Your App

To enable your app to use OAuth authentication for Zendesk user validation, register your app with their cloud services. To register, create a Zendesk account at https://developer.zendesk.com, then create an application in their system.

To configure your Connector backend to use your Zendesk app registration, provide the following configuration values from https://developer.zendesk.com.

- **Zendesk Unique Identifier** (OAuth Client ID)
- **Zendesk Redirect UR** (OAuth Redirect URI)

  Zendesk Redirect URLs must use the HTTPS scheme. To learn about recommended coding practices to meet this requirement, see Using HTTPS OAuth redirect URLs (p. 20).
- **Zendesk Subdomain**

Zendesk Connector API Details

See the Zendesk Connector API Reference for more details.

Using HTTPS OAuth redirect URLs

The SaaS providers HubSpot and Zendesk require that the OAuth2 redirect URL for your Connector must use the HTTPS scheme. To avoid a network call, we recommend the following:

- **Projects targeted at the Android platform only**

  If you are using your Mobile Hub project to create only an Android version of your app, your Redirect URL can be in the form of `https://localhost/. . . .`
- **Projects targeted at the iOS platform only**

  If you are using your Mobile Hub project to produce an iOS version of your app, use the following steps to provide a universal link as the redirect URL.
- **Projects targeted at both iOS and Android platforms**

  If you are using your Mobile Hub project to produce both iOS and Android versions of your app:
  - For iOS (iOS 9 and above), use the following steps to provide a universal link as the redirect URL.
  - For Android (API 6.0 and above), using the same domain as you configure for your iOS universal link, declare a web site association for your redirect URL using Intents as described in the Android App Links documentation.

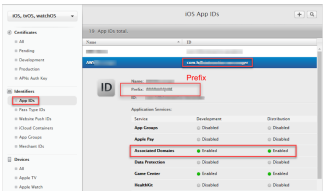
If you encounter issues with your Zendesk HTTPS OAuth Redirect URL using universal links, try using Apple URL Schemes. Set up an HTTPS website containing an URL that redirects back to your app using the URL scheme. Use the URL of that file as your Zendesk Redirect URL. You can use a protected Amazon S3 bucket as the endpoint. It can be created as part of your project by enabling User Data Storage feature, but this step should be taken before enabling your Connector so that you can use the bucket URL as the configuration value for your Connector.

Setting up universal links for iOS apps

This section describes how to set up iOS universal links that can be used for HTTPS redirect URLs for Mobile Hub SaaS Connectors.

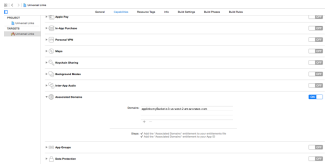
To set up universal links for iOS

1. Navigate to the S3 console at https://console.aws.amazon.com/s3/, choose **Create Bucket** and supply the name and region.
2. Enable **Associated Domains** for your **App ID** in the Apple Developer Portal by logging into the developer portal, selecting **Certificates, IDs & Profiles**, selecting **App IDs**, and then selecting your app from the list.



3. In Apple Developer Portal, copy your App ID **Prefix** value and save it for later when you create the `apple-app-site-association` file.

4. In Xcode, choose **App Target**, then choose **Capabilities**, then change the **Associated Domains** switch to **ON**



5. In the **Domains:** field of **Associated Domains**, add your S3 bucket subdomain appended to `applinks`. As an example, if your bucket name is `myBucket` and the region it is created in is `us-west-2`, then your **Associated Domains Domain** would be:

   `applinks:myBucket.s3-us-west-2.amazonaws.com`

6. Configure your app to handle **universal links** by adding the following `application:continueUserActivity:restorationHandler` to your `AppDelegate` class.

   [Swift]

```
func application(application: UIApplication, continueUserActivity
 userActivity: NSUserActivity, restorationHandler: ([AnyObject]?) -> Void)
 -> Bool {
    if userActivity.activityType == NSUserActivityTypeBrowsingWeb {
        let url = userActivity.webpageURL!
        //handle url stuff
    }
    return true
}
```

7. Create a new file named `apple-app-site-association`. The file will contain JSON but its name does not use the .json extension.

   Paste the following JSON object into the file and modify the `appID` value <`your AppPrefix.AppID`> by replacing it with your **AppID** appended to your **App Identifier Prefix**.

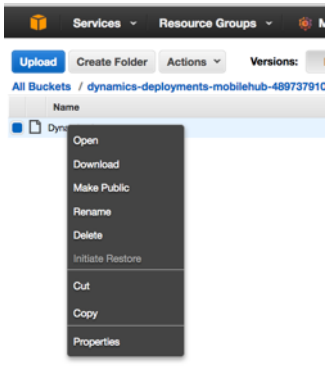
   For example if your App Prefix is `GR5IUEHB6E` and your App ID is `com.company.appname` then the value of `appID` should be:

   `GR5IUEHB6E.com.company.appname`

```
{
    "applinks": {
    "apps": [ ],
    "details": [
        {
            "appID": "<your AppPrefix.AppID>",
            "paths": [ "*" ]
        }
    ]
}
```

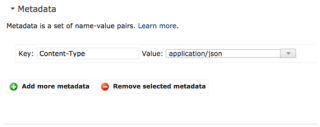
8. In the S3 console, upload the modified `apple-app-site-association` file to the root of your S3 bucket.

9. a. In the S3 console, right-click your uploaded file and select **make public**.



b. In the S3 console, open **Properties** for the uploaded file.

In the **Metadata** dropdown, modify **Value**, to `application/json`.



10. Run the app.

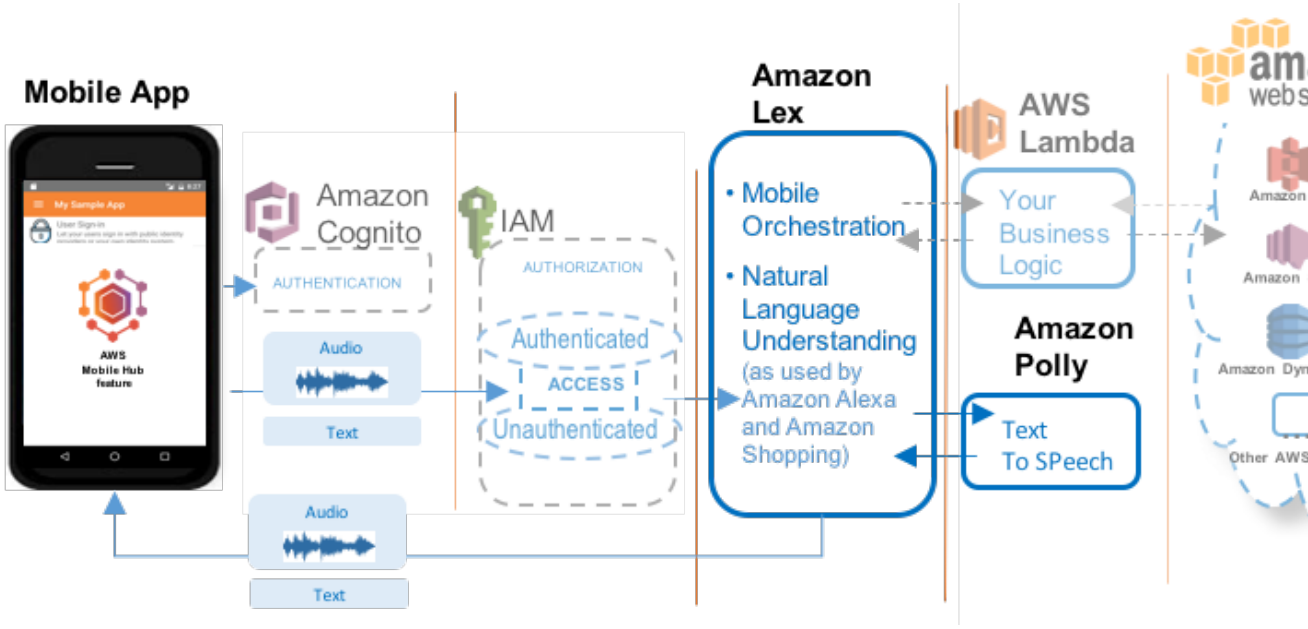
    You can test the universal link functionality by sending a link with the URL specified in associated domains to your email or SMS. Selecting the link on the device with the app installed will open the app and the apps restoration handler function in the AppDelegate will manage the link URL and any attributes.

universal link Caveats:

1. Simply pasting a link into the address bar of Safari will not launch the app as you might expect. Try clicking in the link from SMS or mail client.
2. Universal links are supported for iOS 9+. Universal links in early versions of 9 work only on the device and not the simulator.

Conversational Bots

Choose the AWS Mobile Hub conversational bots mobile backend service feature to add voice and text natural language understanding interface to your app. Integrate these with your business logic in the cloud.



AWS Mobile Hub conversational bots bring your mobile app the same natural language understanding and business logic integration that power the Amazon Alexa and Amazon Shopping voice and text conversation experiences.

Mobile Hub conversational bots use Amazon Lex, an AWS service for building voice and text conversational interfaces into applications. Amazon Lex has built-in integration with Lambda.

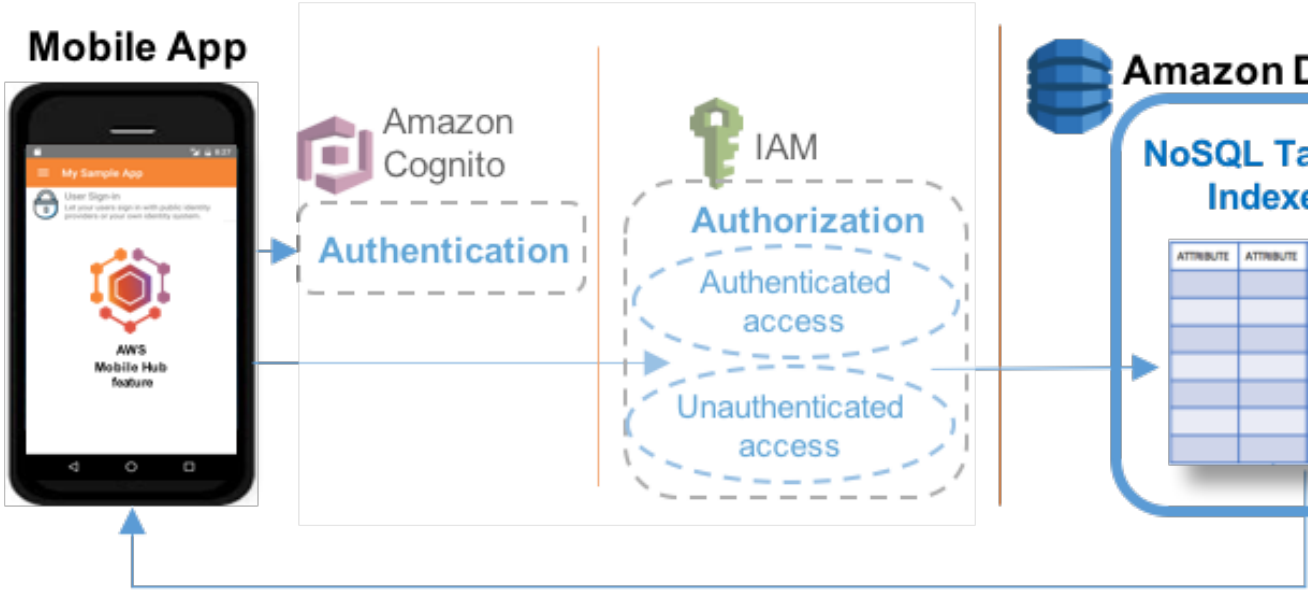
With conversational bots and Amazon Lex, no deep learning expertise is necessary. Specify the basic conversation flow in the Amazon Lex console to create a bot. The service manages the dialogue and dynamically adjusts the responses in the conversation. Using Mobile Hub conversation bots, you can provision and test bots based on demonstration templates or bots you have created in the Amazon Lex console. Mobile Hub provides integration instructions and customized components for reusing the sample app code we generate in your own app.

Conversational Bots At a Glance

AWS services and resources configured	• **Amazon Lex** (see Amazon Lex Developer Guide) Concepts | Console Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52).
Configuration options	This feature enables the following mobile backend capabilities: • Create and configure conversational bots in the Amazon Lex service based on provided demonstration templates or by using the Amazon Lex console to add your customized text and/or speech interactions to your app. • Integrate your app by downloading and reusing the code of the quickstart app, a package of native iOS and Android SDKs, plus helper code and on line guidance, all of which are dynamically generated to match your Mobile Hub project.
Quickstart app demos	This feature adds the following functionality to a quickstart app generated by Mobile Hub: • Enables user to interact with a conversational bot that interacts with Amazon Lex.

NoSQL Database

Choose the Mobile Hub NoSQL Database mobile backend feature to your mobile app to add database capabilities that are easy to develop and provide scalable performance and cost.



The NoSQL Database feature uses Amazon DynamoDB to enable you to create database tables that can store and retrieve data for use by your apps.

NoSQL databases are widely recognized as the method of choice for many mobile backend solutions due to their ease of development, scalable performance, high availability, and resilience. For more information, see From SQL to NoSQL in the *Amazon DynamoDB Developer Guide*.

Topics

NoSQL Database At a Glance

AWS services and resources configured	• **Amazon DynamoDB tables** (see Working with Tables in DynamoDB) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 29).
Configuration options	This feature enables the following mobile app backend capabilities: Configuring Your Tables (p. 27) - Using custom schema, based on a sample schema provided, or by using a wizard that guides you through choices while creating a table Data Permissions (p. 27) - Access to your app's data can be: • **Public** (enables any mobile app user to read or write any item in the table) • **Protected** (enables any mobile app user to read any item in the table but only the owner of an item can update or delete it) • **Private** (enables only the owner of an item to read and write to a table) For more information, see Configuring the NoSQL Database Feature (p. 26).
Quickstart app demos	This feature adds the following to a quickstart app generated by Mobile Hub: • Insert and remove sample data, based on the schema you specify in the console. • Perform and see the results of NoSQL operations on tables including Get, Scan, and all the example queries displayed by the console as you make design selections.

Configuring the NoSQL Database Feature

This section describes steps and options for configuring NoSQL Database features in Mobile Hub.

To add the NoSQL Database feature to your Mobile Hub project

1. Choose **Enable NoSQL**.
2. Choose **Add a new table**.
3. Choose the initial schema for the table. You can use a provided example schema, or generate a schema through the wizard.

Example Table Schemas

AWS Mobile Hub provides a set of example table schemas for typical mobile apps. If you create a table using one of the example schema templates, the table initially has a set of attributes specific to each example. You can choose one of these templates as the starting schema for your table:

- **News**, which stores author, title, article content, keywords, and other attributes of news articles.

- **Locations**, which stores names, latitude, and longitude of geographic locations.
- **Notes**, which stores private notes for each user.
- **Ratings**, which stores user ratings for a catalog of items.
- **Graffiti Wall**, which stores shared drawing items.

To add a table using one of the example schema templates in your Mobile Hub project

1. Choose the example template to use for the initial schema of the table.
2. Type a new name in **Table name** to rename the table if you wish. Each template gives the table a default name matching the name of the template.
3. Choose **Public**, **Protected**, or **Private** permissions to grant to the mobile app users for the table. For more information, see Data Permissions (p. 27).
4. (Optional) Under **What attributes do you want on this table?**, you can add, rename, or delete table attributes.
5. (Optional) Choose **Add index** to add **name**, **partition key**, and (optionally) **sort key** for a secondary index for your table.
6. Choose **Create table**.

Configuring Your Tables

This section describes options for configuring DynamoDB NoSQL tables for your app.

Contents

NoSQL Table Terminology

Similar to other database management systems, DynamoDB stores data in tables. A table is a collection of data with the following elements.

Items
: Each table contains multiple items. An item is a group of attributes that is uniquely identifiable among all of the other items. Items are similar to rows, records, or tuples in relational database systems.

Attributes
: Attributes are the columns in a DynamoDB table. The rows of the table are the individual records you add, update, read, or delete as necessary for your app.

  The table schema provides a set of initial attributes based on the needs of each example. You can remove any of these attributes by choosing **Remove**. If you remove the partition key attribute, then you must designate another attribute as the partition key for the primary index of the table.

  You can choose **Add attribute** to add a blank attribute to the table. Give the attribute a name, choose the type of data it will store, and choose whether the new attribute is the partition key or the sort key.

Indexes
: Each table has a built-in primary index, which has a partition key and may also have a sort key. This index allows specific types of queries. You can see the types of queries the table can perform by expanding the **Queries this table can perform** section. To enable queries using other attributes, create additional secondary indexes. Secondary indexes enable you to access data using a different partition key and optional sort key from those on the primary index.

Data Permissions

When you create a new table, you must set permissions that determine which mobile app users can read and/or write the table's data. You can set these permissions to control access to each table as: public, protected, or private.

Enforcing Permissions

Use the settings in the **What permissions would you like for this table?** section to enable your mobile app to directly access your NoSQL tables in the Amazon DynamoDB service. Because there is no middle layer between the mobile app and the database service, it is important that you use an appropriate access policy to restrict access to your tables. When you choose permissions for each table, Mobile Hub provisions a fine-grained access control policy for your mobile app users. If you select **Protected** or **Private**, then every operation that is attempted on an item in your table will first check if the **userId** field in the table item (or row) matches the user's Amazon Cognito Identity.

As the value of the primary partition key of a restricted NoSQL Database table will contain the Amazon Cognito Identity of the app user whose action created the item, the key must be called **userId** and be of type **string**). The name and data type of secondary indexes for restricted tables must follow the same pattern: **'userId'** (**string**).

Restricting Permissions for Multiple Writers

After Mobile Hub provisions access restrictions for your tables with **Protected** or **Private** permissions, IAM ensures that only the mobile app user whose action creates an item in the table will be able to write to the attribute values of that item. To design your schema for the case where multiple users need to write data to an existing item, one strategy is to structure your schema in a way that users write to different tables. In this design, the app queries both tables to join data.

For example, customers may create orders in an **`orders`**table and delivery service drivers may write delivery tracking information to a **`deliveries`** table, where both tables have secondary indexes that allow fast lookup based on **`orderId`** or **`customerId`**.

Table Permissions Options in Mobile Hub

When you create a new table, you must set the table's permissions. These permissions determine who can read data from and who can write data to the table. Mobile Hub offers the following table permissions configurations.

Public
: Public permissions allow all mobile app users to read or write all items in the table. There is no restriction on how you configure the partition key.

Protected
: Protected permissions allow all mobile app users to read all items in the table but only the owner of an item can update or delete it. These permissions grant full access to retrieve data from the table but limited access to update or remove existing items.

  Only app users with an Amazon Cognito Identity ID matching the item's partition key can write to the item. The partition key for the table must follow the pattern of **'userId' (string)** value.

Private
: Private permissions allow only the owner of an item to read and write to it. This enforces the most restrictive set of permissions for accessing the table; however, these permissions offer a higher degree of protection by limiting access.

  Only app users with an Amazon Cognito Identity ID matching the item's partition key can read or write to the item. The partition key for the table and for any secondary indexes must follow the pattern of **'userId' (string)**value.

Retrieving Data

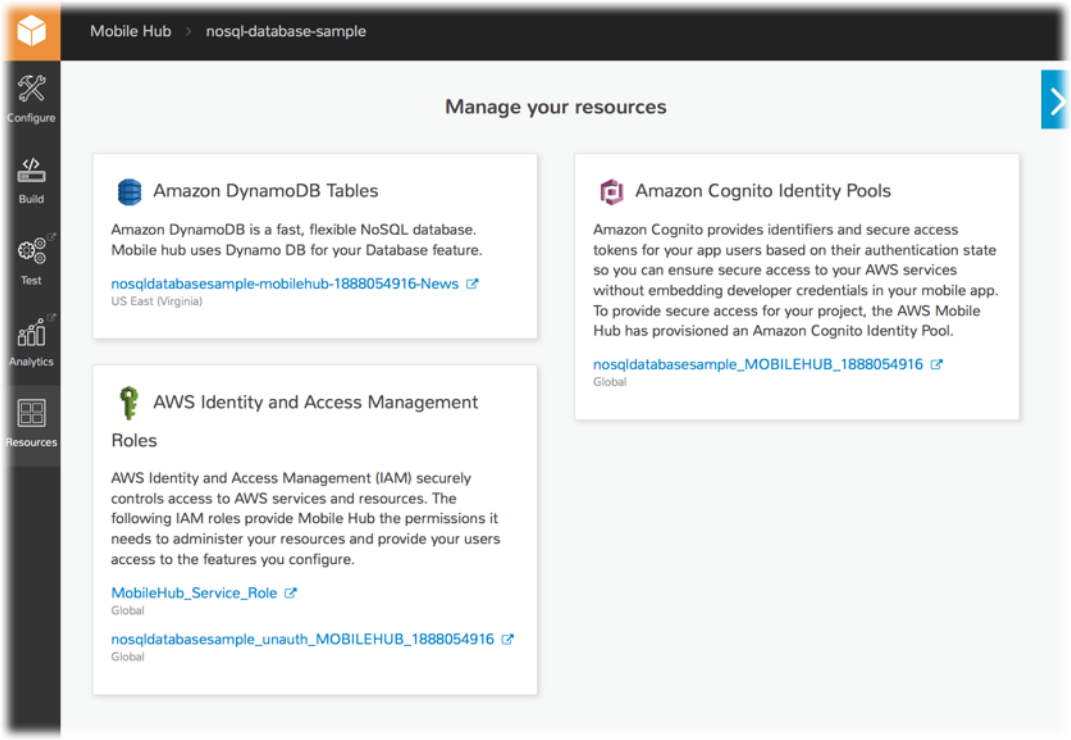
The operations you can use to retrieve data from your NoSQL database include the following:

- `Get`, which retrieves a single item from the table based on matching the primary key.
- `Query`, which finds items in a table or a secondary index using only primary key attribute values.
- `Scan`, which reads every item in a table or secondary index. By default, a `Scan` operation returns all of the data attributes for every item in the table or index. You can use `Scan` to return only some attributes, rather than all of them.
- `Query with Filters`, which performs a `Query` but returns results that are filtered based on a filter expression you create.
- `Scan with Filters`, which performs a `Scan` but returns results that are filtered based on a filter expression you create.

For more information, see Query and Scan Operations in DynamoDB.

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying the AWS elements typically provisioned for the NoSQL Database feature:



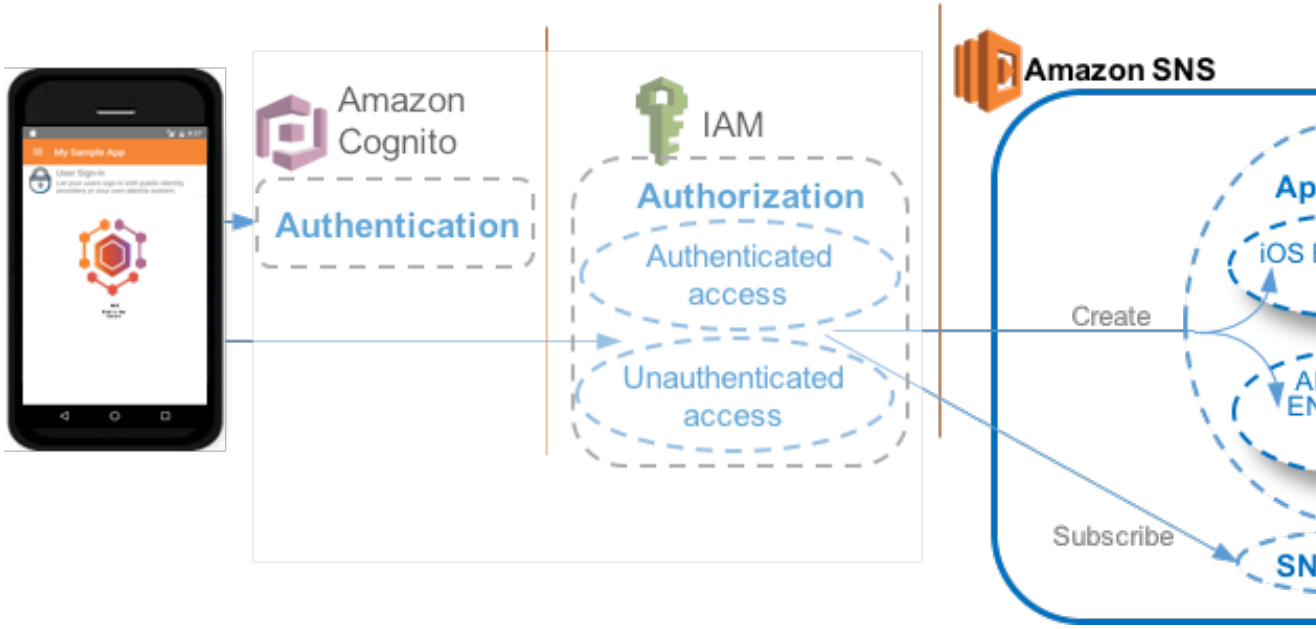
Quickstart App Details

In the Mobile Hub quickstart app, the NoSQL Database demo shows a list of all tables created during app configuration. Selecting a table shows a list of all queries that are available for that table, based on the choices made regarding its primary indexes, secondary indexes, and sort keys. Tables that you make using the example templates enable an app user to insert and remove sample data from within the app.

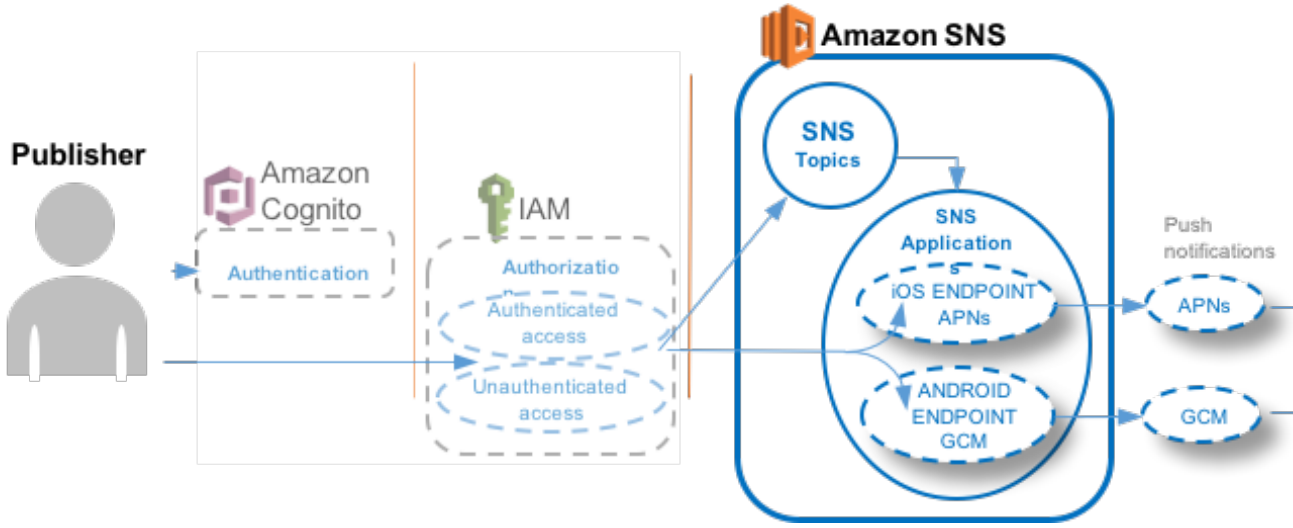
Push Notifications

Choose AWS Mobile Hub Push Notifications mobile backend feature to add mobile messaging to your mobile app.

The following image shows client perspective on subscription of a mobile app to Amazon SNS applications and topics.



The following image shows the server side developer perspective on publishing of push notifications to devices subscribed to Amazon SNS applications and topics.



The Push Notifications feature enables you to send push notification messages to your iOS and Android apps using Amazon Simple Notification Service (Amazon SNS). You can integrate with Apple and Google messaging services by providing credentials that are provided by those services. You then can send messages directly to individual devices, or publish messages to the SNS topics that installed apps are subscribed to.

Topics

Push Notifications At a Glance

AWS services and resources configured	• **Amazon SNS** (see Amazon Simple Notification Service Developer Guide) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 43).
Configuration options	This feature enables the following mobile backend capabilities: **Messaging Service Integration** • via **Google Cloud Messaging (GCM)** (see Setting Up Android Push Notification (p. 40)) • via **Apple Push Notification service (APNs)** (see Setting Up iOS Push Notification (p. 33))

	For more information, see Configuring the Push Notifications Feature (p. 33).
Quickstart demo features	This feature adds the following to a quickstart app generated by Mobile Hub: • App is registered to receive and display push messages sent to the device individually, and those sent to a topic the device has been subscribed to.

Configuring the Push Notifications Feature

When you include Push Notifications in your project, Mobile Hub creates an Amazon SNS Platform Application based on your choice of push platform. Mobile Hub also creates an Amazon Simple Notification Service topic named **`ALL_DEVICES`** and modifies the IAM role to allow your app to create a platform endpoint and subscribe that endpoint to the **`ALL_DEVICES`** topic and any others you configured when creating your project.

For more information on choosing a push provider, see Setting Up Push Notification Services (p. 33).

Setting Up Push Notification Services

Using AWS Mobile Hub, you can enable a user push notification feature for your app. Push notification works with native platform support for sending push notifications, including Apple Push Notification service (APNs) for iOS apps and Google Cloud Messaging (GCM) for Android apps. Mobile Hub helps you configure push notifications for APNs or iOS; however you also must set up push notifications with the platforms you plan to use.

The topics in this section detail the setup you must complete with push notification support for iOS and Android apps and obtain data values Mobile Hub needs to configure your push notification feature.

Topics

- Setting Up iOS Push Notification (p. 33)
- Setting Up Android Push Notification (p. 40)

Setting Up iOS Push Notification

Mobile Hub sends push notifications to iOS apps using Apple Push Notification service (APNs). To integrate this service with Mobile Hub, you must obtain and provide a certificate for APNs. To do this, you must prepare a certificate request, and then create an app ID and associated SSL certificate on the Apple Developer website. The certificate allows the Amazon Simple Notification Service server to send push notifications to the app identified by the App ID.

Topics

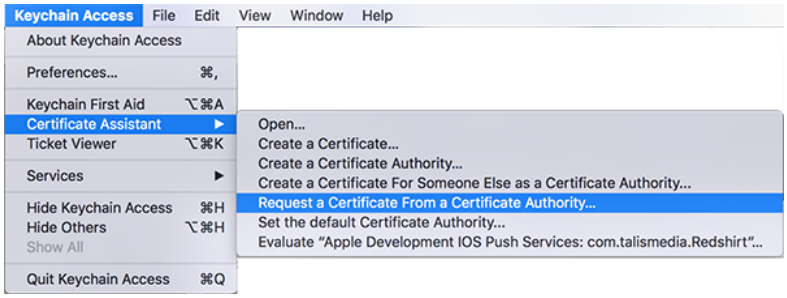
- Generating a Certificate Request (p. 33)
- Setting up an App ID (p. 34)
- Configuring the App ID for Development Push Notifications (p. 36)

Generating a Certificate Request

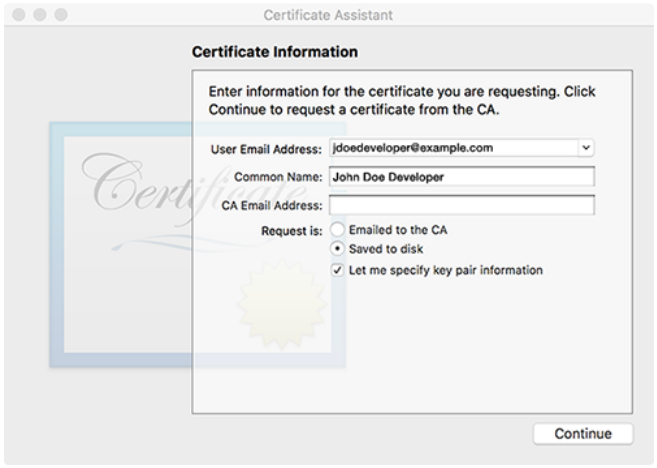
To create the certificate required by iOS to enable push notifications for your app, start by generating a certificate request on your Mac that you will use later to create the certificate.

To generate a certificate request

1. On your Mac, start the Keychain Access application.
2. From the **Keychain Access** menu, choose **Certificate Assistant** and then choose **Request a Certificate From a Certificate Authority…**



3. Enter your e-mail address and name.



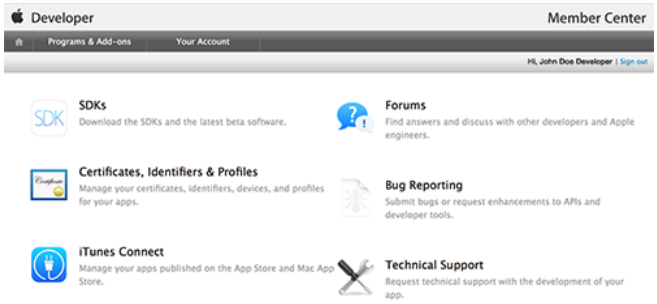
4. Select **Saved to disk** to create a file that contains the certificate request.

Setting up an App ID

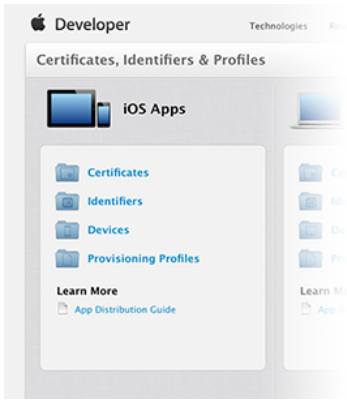
You need to provide an app ID for your app. Every app installed on a developer device needs an app ID. Typically, an app ID consists of a reversed web address, for example com.amazon.mysampleapp. You can use an existing app ID if it doesn't contain a wildcard character ("*").

To assign an app ID to your app

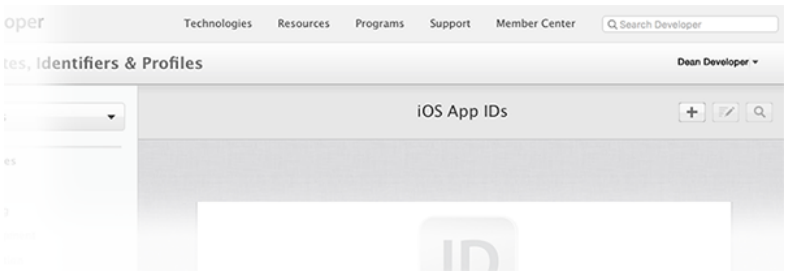
1. Sign into the Apple Developer Member Center website at https://developer.apple.com/membercenter/index.action.
2. Choose **Certificates, Identifiers & Profiles**.



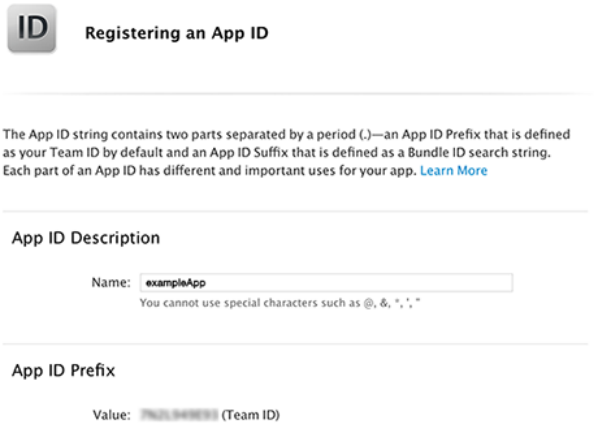
3. In the **iOS Apps** section, choose **Identifiers**.



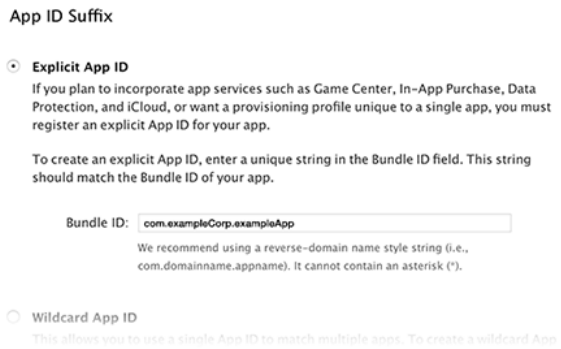
4. At the top of the list of your iOS apps IDs, select **+**.



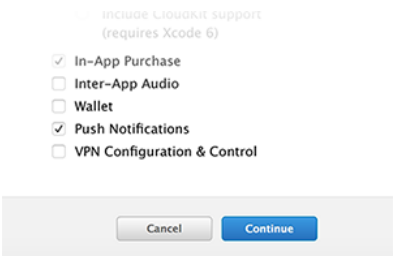
5. Type a name for the new app ID.



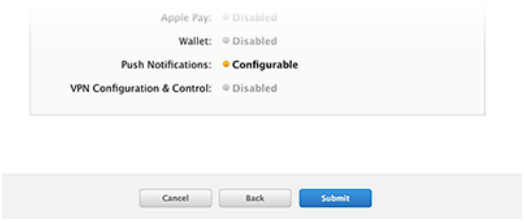
6. Choose the default selection for **App ID Prefix**.
7. For **App ID Suffix**, choose **Explicit App ID** and then enter the **Bundle ID** for your app. This ID must match the Bundle Identifier in your app's Info.plist.



8. Under **App Services** choose **Push Notification**.



9. Choose **Continue**. Check that all values were entered correctly. The identifier must match your app's bundle identifier and app ID prefix.



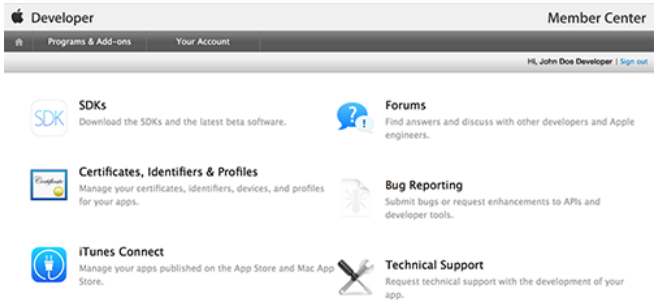
10. Choose **Submit** to register the new app ID.

Configuring the App ID for Development Push Notifications

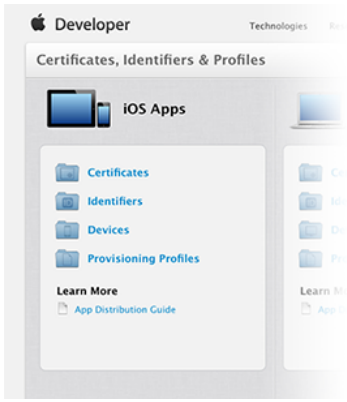
After creating a new app ID or choosing an existing explicit app ID, you must configure the app ID for push notifications.

To configure an app ID for push notifications

1. Sign into the Apple Developer Member Center website at https://developer.apple.com/membercenter/index.action.
2. Choose **Certificates, Identifiers & Profiles**.

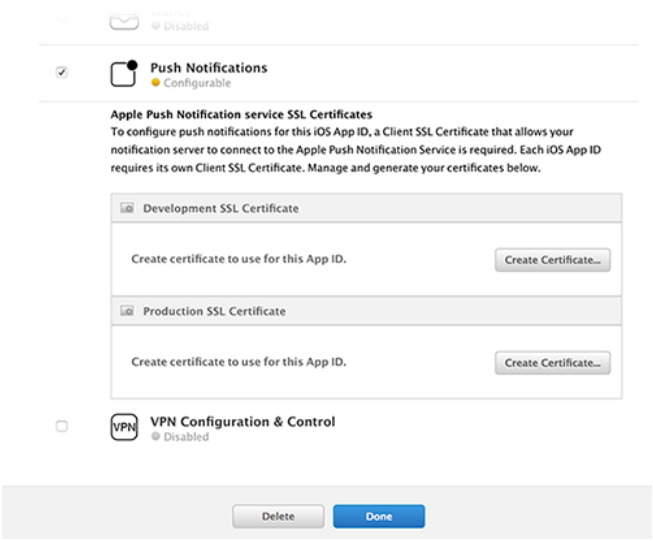


3. From the **iOS Apps** section, choose **Identifiers**.

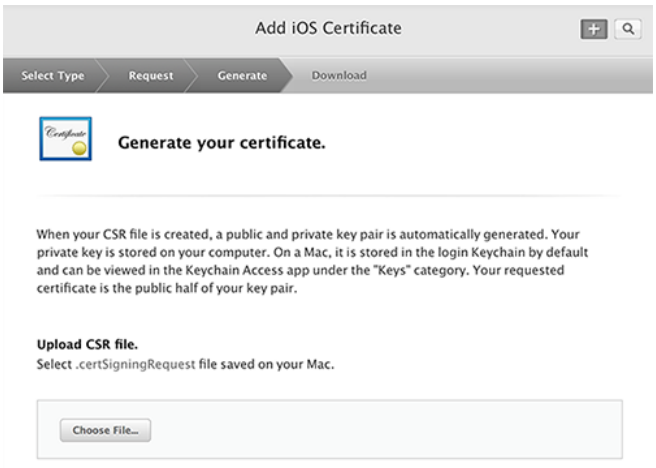


4. Select your newly created app ID from the list of iOS app IDs.
5. Choose **Edit**.

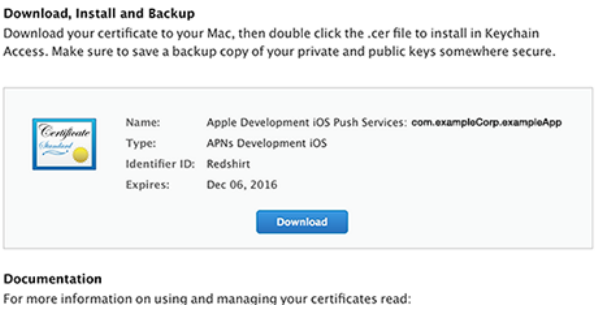
6. Under **Push Notifications** there are options to create a development SSL Certificate as well as a production SSL Certificate. Select **Create Certificate...** in the **Development SSL Certificate** section.



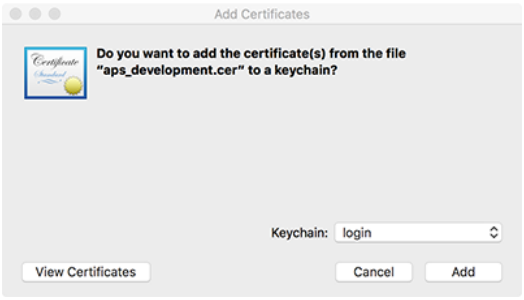
7. Choose **Continue** on the page that provides instructions on generating a Certificate Signing Request (CSR). This is the same certificate request created in Generating a Certificate Request (p. 33) and does not need to be created again.
8. In **Generate your certificate**, select **Choose File...** and then select the CSR file you created.



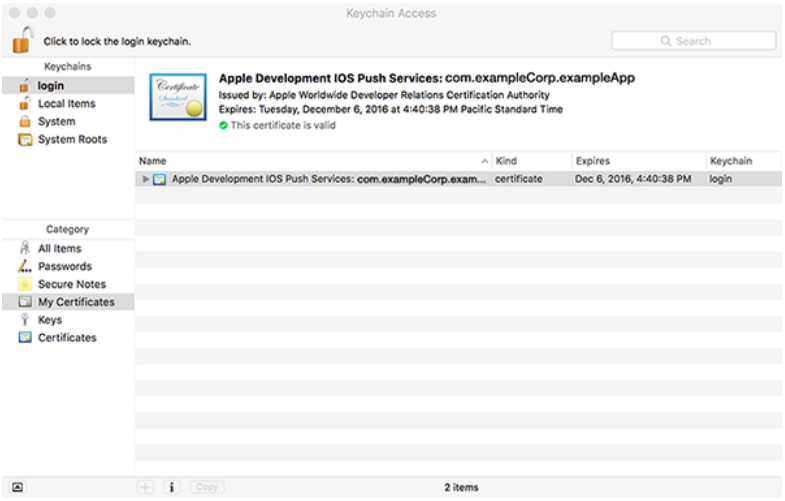
9. Choose **Generate**.
10. When the certificate is ready, choose **Download** and then save the certificate to your computer.



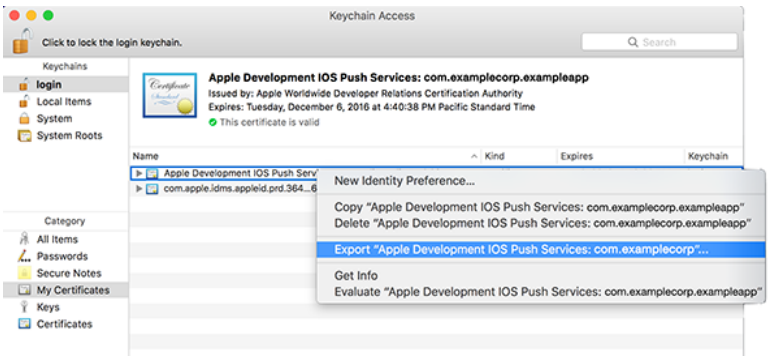
11. Double-click the downloaded certificate to install it to the Keychain on your Mac. In the **Add Certificates** dialog box, choose **Add**.



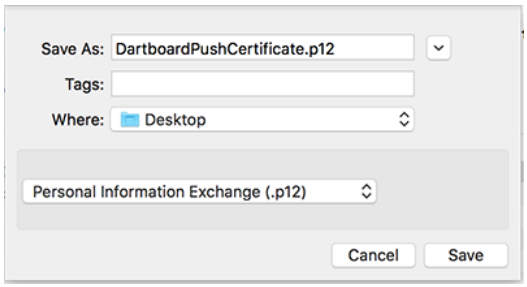
12. On your Mac, start the Keychain Access application.
13. In **My Certificates**, navigate to the certificate you just added. It should be called "Apple Development IOS Push Services:".



14. Context-select this certificate and then choose **Export...** from the context menu to export a file that contains the certificate.



15. Name the exported certificate "MobileHubPushCertificate.p12" and then save it to your computer. Do not provide an export password when prompted. You need to upload this certificate when creating your app in the Mobile Hub console.



Push notification is now enabled for your app in development mode. Prior to releasing your app on the App Store, you must repeat these steps but choose **Production Push SSL Certificate**.

Setting Up Android Push Notification

Mobile Hub sends push notifications to Android apps using Google Cloud Messaging (GCM). To use GCM, you must set it up for your app.

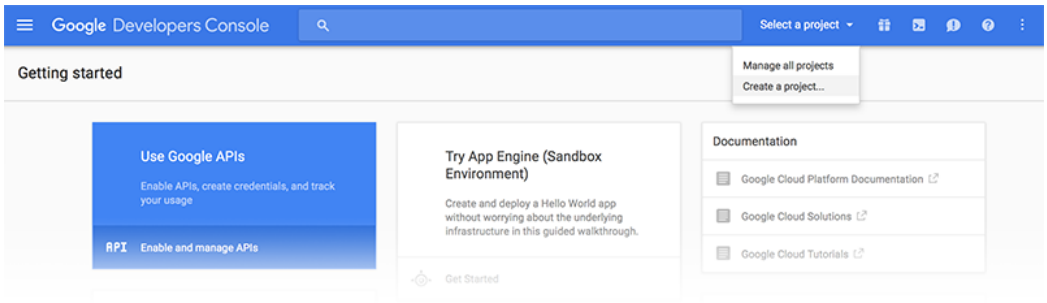
You will need the following:

- The app server's sender ID. This is a unique numerical value that is created when you configure your API project. The sender ID is used in the registration process to identify an app server that is permitted to send messages to the client app.
- A server API key. The key is saved on the app server that is authorized to access Google services.

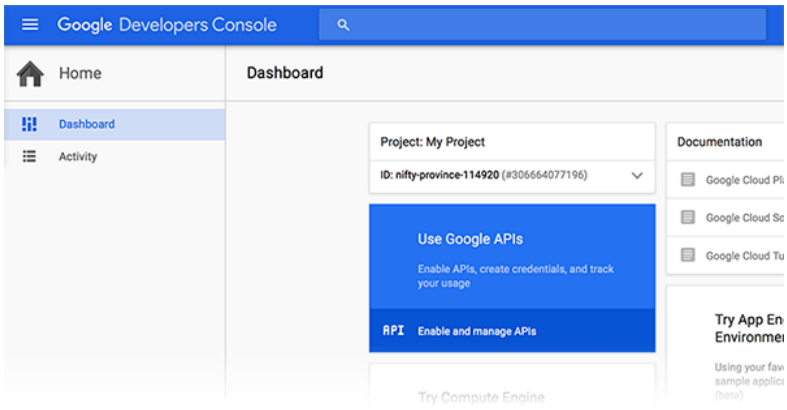
For more information about GCM, see Google Cloud Messaging: Overview.

To set up Google Cloud Messaging

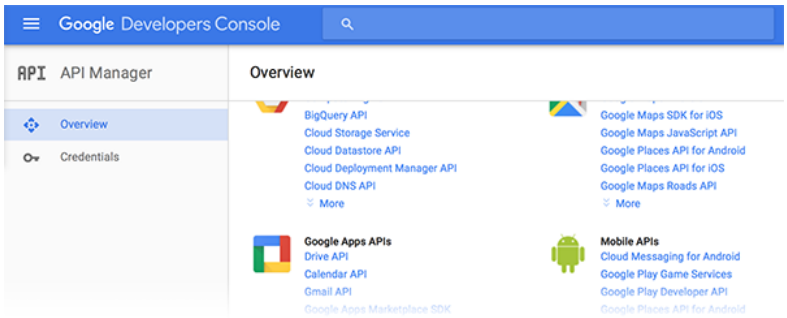
1. Go to the Google Developer Console at https://console.developers.google.com.
2. If you have not created a project yet, choose **Select a project** from the menu bar, and then choose **Create a project...**.



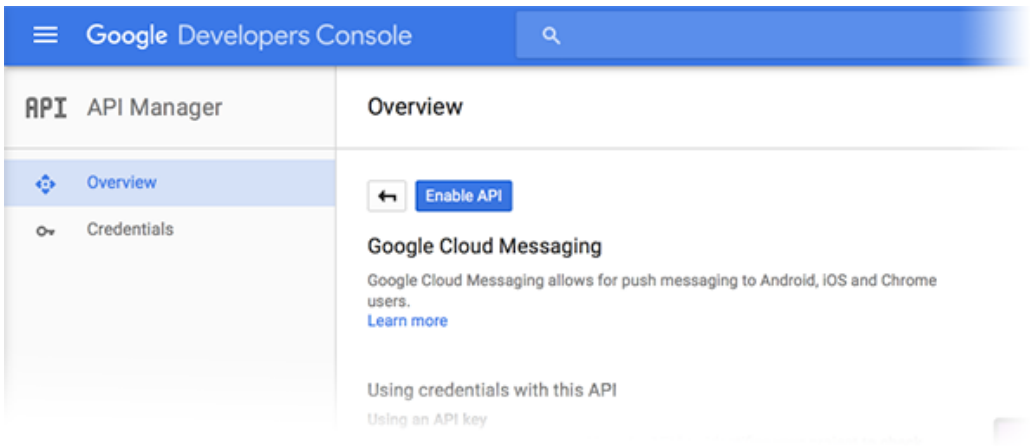
3. Complete the form displayed to create your new project.
4. In the **Dashboard** for your project, go to the **Use Google APIs** section and then choose **Enable and manage APIs**.



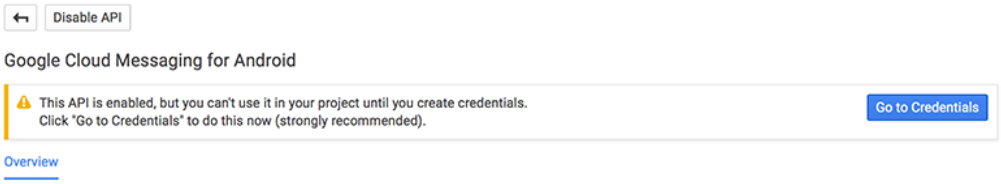
5. In the API Manager, find the **Mobile APIs** section and then choose **Cloud Messaging for Android**.



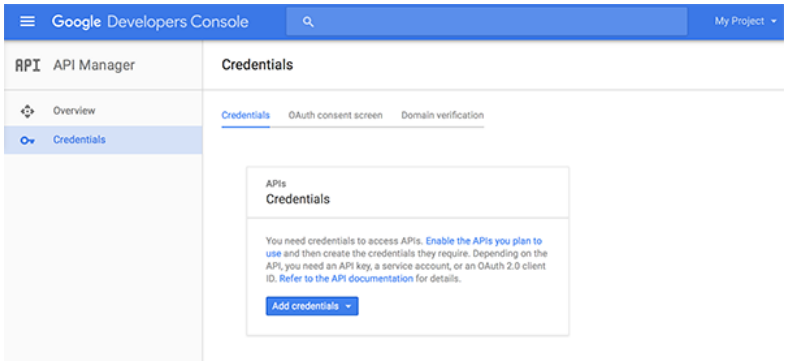
6. In the **Overview** for Cloud Messaging for Android, choose **Enable API**.



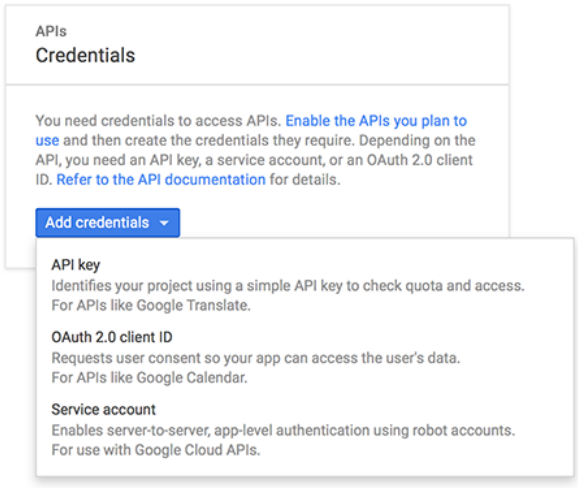
7. A message appears to inform you that the API is enabled but that it requires credentials before you can use it. Choose **Go to Credentials**.



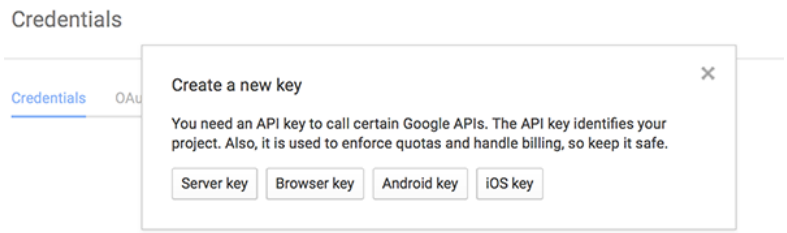
8. In **Credentials**, choose **Add credentials**.



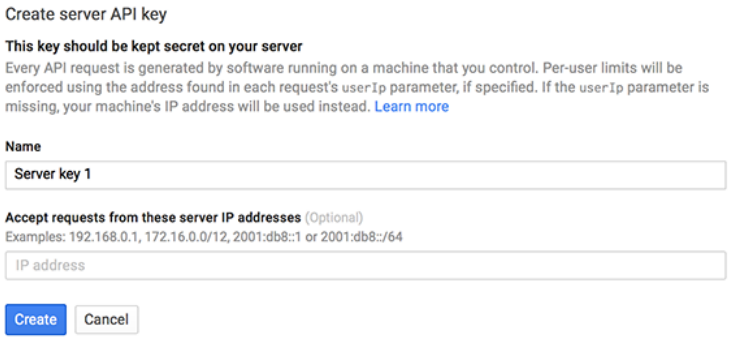
9. From **Add credentials**, choose **API key**.



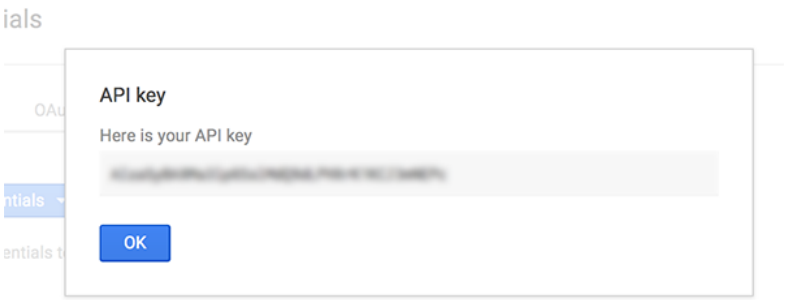
10. In **Create a new key**, choose **Server key**.



11. In **Create server API key**, type a name for the key and then choose **Create**.



12. The API key is displayed. Save this key. You need it to register your app for push notifications. You supply this key to Mobile Hub when creating your app in the console.

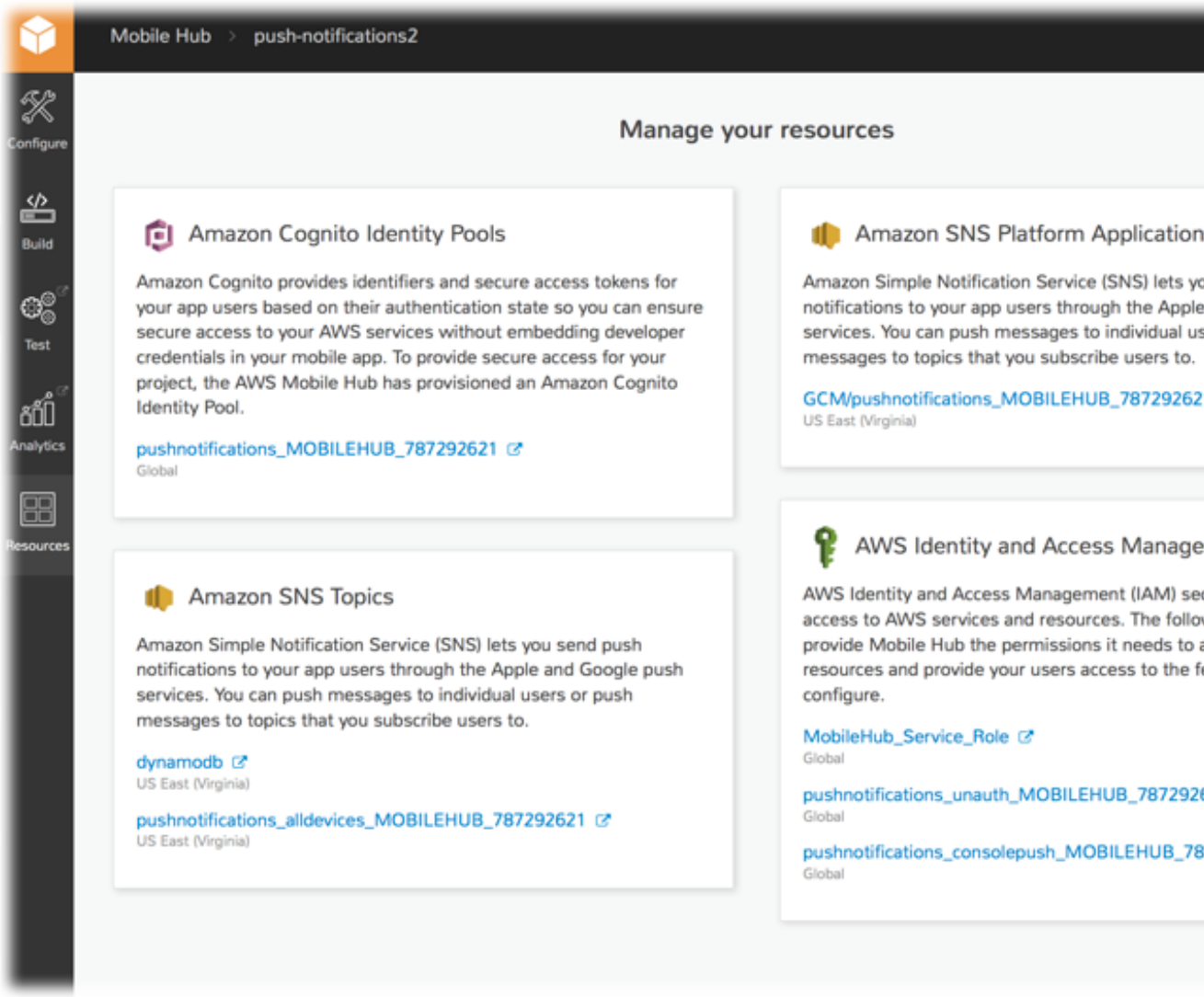


13. The sender ID is the project ID you used in the Google Developers Console to sign up. It is a numeric string. For example, in the following URI, the sender ID is `0123456789`. You need to provide the sender ID for your app in the Mobile Hub console when configuring push notifications for Android apps.

```
https://code.google.com/apis/console/#project:0123456789
```

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying elements typically provisioned for the Push Notifications feature:



Quickstart App Details

Upon launch, the Push Notification demo in a quickstart app automatically registers the installed app for push notifications with the configured provider. The app obtains a push token from the provider and passes it to create a new platform endpoint in the Amazon SNS application created for your project.

In addition to creating the Amazon SNS platform application, Mobile Hub provisions the **`ALL_DEVICES`** topic that will be automatically subscribed to by the quickstart app. The IAM role is also modified to allow the quickstart app to create a platform endpoint and subscribe to the Amazon SNS topic. The demo also provides a list of all Amazon Amazon SNS topics that the device can subscribe to which includes the **`ALL DEVICES`** topic and any others you configured while creating your project. Selecting/unselecting a topic from the list of topics subscribes or unsubscribes the device's Amazon SNS platform endpoint from that topic.

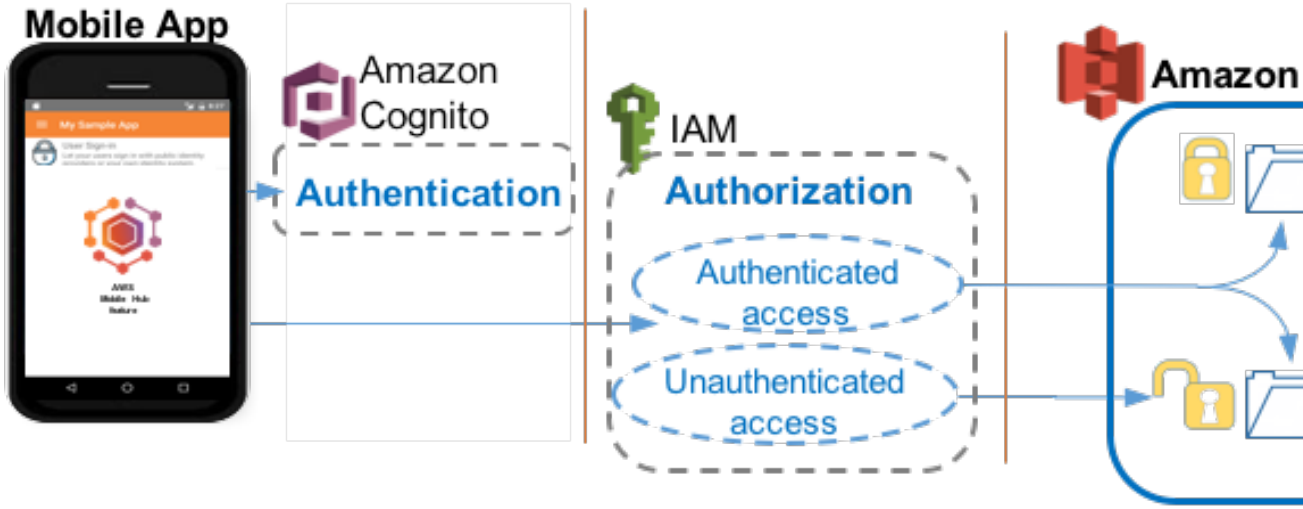
Creating Test Push Notifications for the Quickstart app with Amazon SNS

To demonstrate the Push Notification feature and send messages to your quickstart app, you can open the Amazon SNS console, choose the application, select the endpoint you wish to notify, and choose **Publish to Endpoint**. If you want to test publishing notifications via SNS topic, choose **Topics**, select the topic, and choose **Publish to topic**.

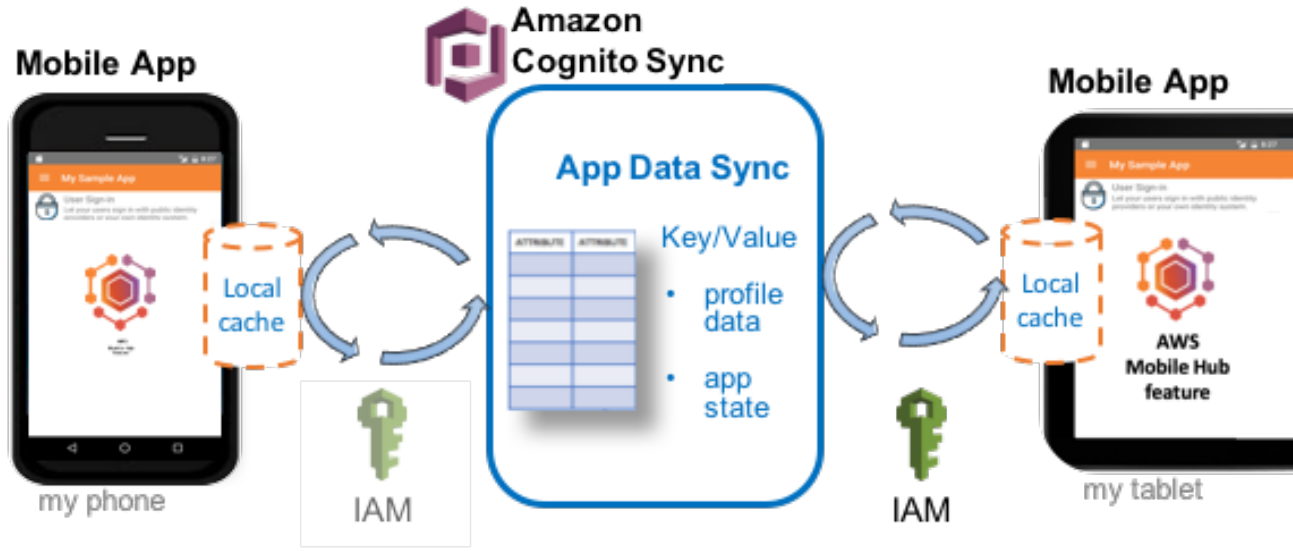
User Data Storage

Choose AWS Mobile Hub User Data Storage to add cloud storage of user files, profile data, and app state to your mobile app. This feature enables sync and caching of data between devices using a simple programming model.

The following image shows access policy enforcement for public and private user files.



The following image shows user profile data sync for persisting user data and synchronizing it across devices.



The User Data Storage feature enables you to store user files such as photos or documents in the cloud, and it also allows you to save user profile data in key/value pairs, such as app settings or game state. When you select this feature, an Amazon S3 bucket is created as the place your app will store user files.

Mobile Hub will also configure Amazon Cognito Sync so you can save user profile data in key/value pairs and synchronize that data across a user's authenticated devices.

Topics

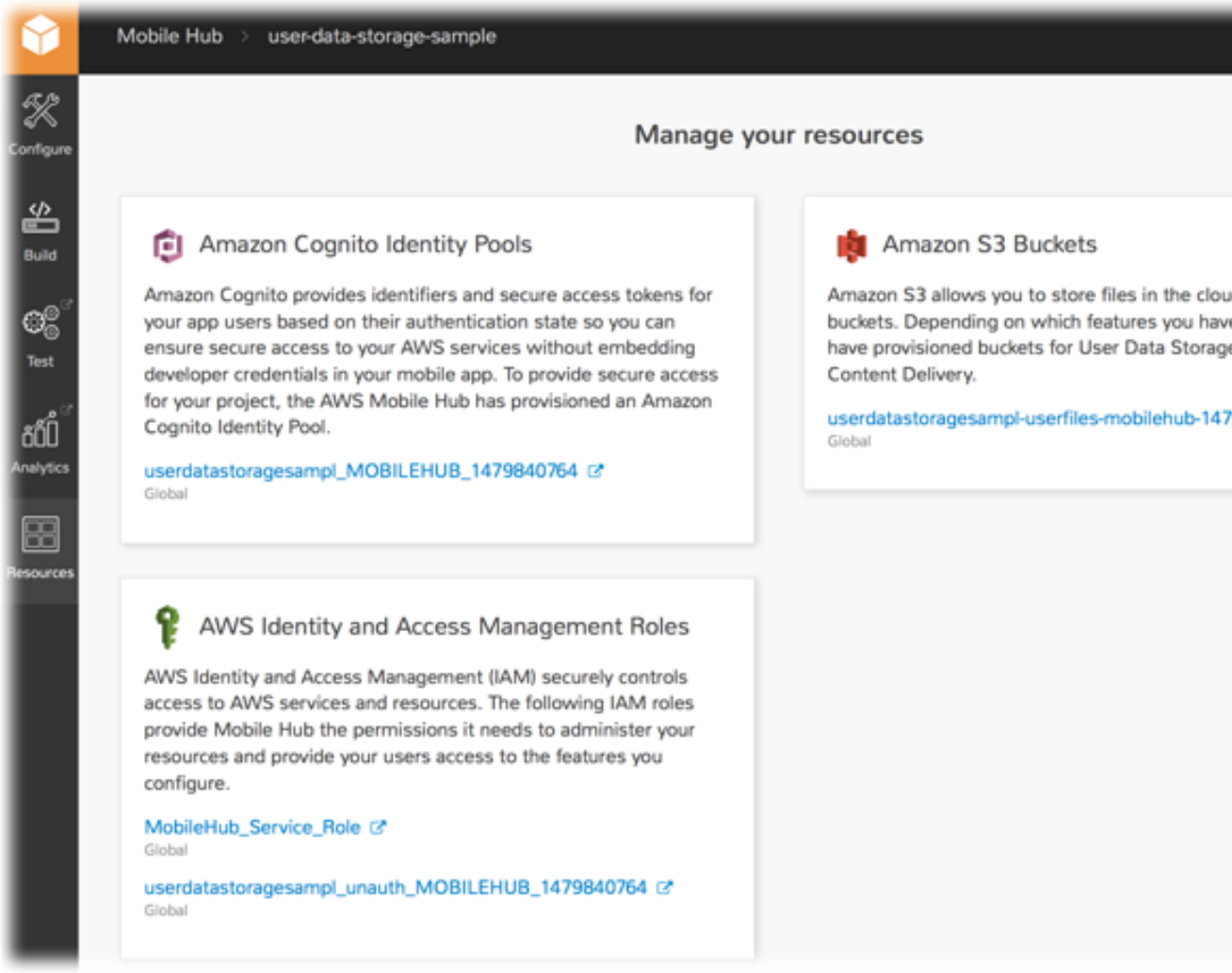
User Data Storage At a Glance

AWS services and resources configured	• **Amazon S3 bucket** (see Amazon Simple Storage Service Getting Started Guide) Concepts | Console | Pricing • **Amazon Cognito Sync** (*see* Amazon Cognito Sync) Concepts | Console | Pricing Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52). For more information, see Viewing AWS Resources Provisioned for this Feature (p. 48).
Configuration options	This feature enables the following configuration options mobile backend capabilities: • Store user files and app data using Amazon S3. When you enable User Data Storage four folders are provisioned, each with a distinct access policy configuration:

	• `private` - Each mobile app user can create, read, update, and delete their own files in this folder. No other app users can access this folder. • `protected` - Each mobile app user can create, read, update, and delete their own files in this folder. In addition, any app user can read any other app user's files in this folder. • `public` – Any app user can create, read, update, and delete files in this folder. • `uploads` - Any app user can only create files in this folder. • Synchronize data to the cloud and between a user's devices using Amazon Cognito Sync.
Quickstart demo features	This feature adds the following to a quickstart app generated by Mobile Hub: • File explorer for accessing sample files in the public and private folders in your S3 bucket. • User settings sync persists user's choice of color theme to the cloud.

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying elements typically provisioned for the User Data Storage feature.



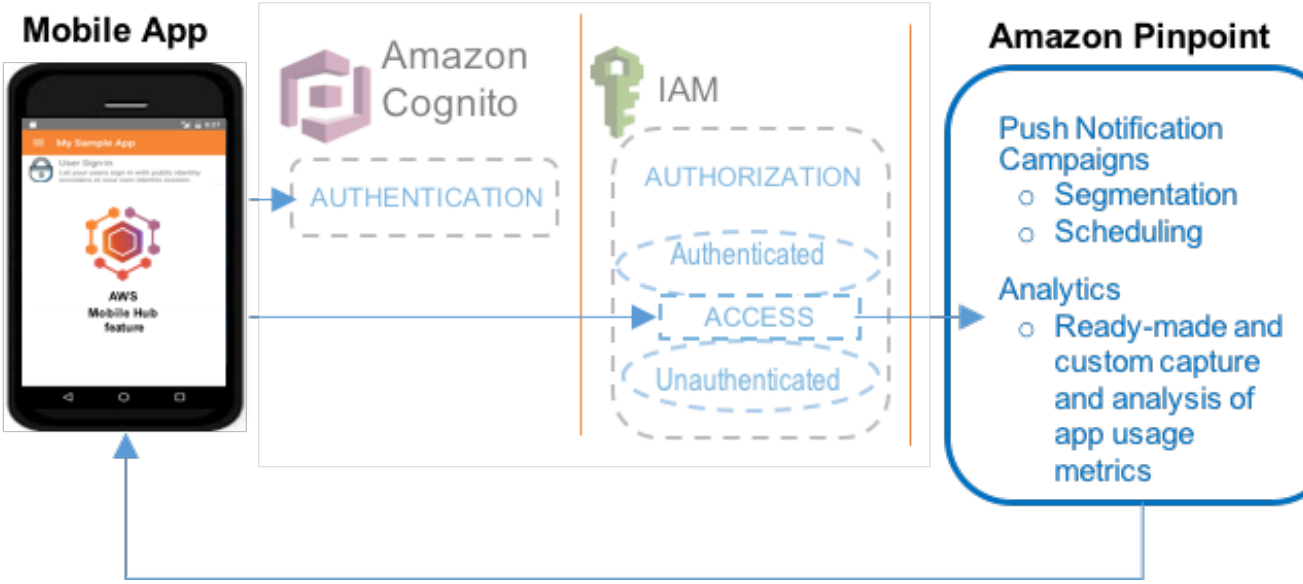
Quickstart App Details

In the Mobile Hub quickstart app, the User Data Storage demo enables all users to see the contents of a public folder. When this feature is used in combination with User Sign-in, users who are signed in are able to access a private folder; unauthenticated users are not.

The demo also includes an option for the user to change the color scheme of the app. That choice is stored in Amazon Cognito Sync Profile. Any time the user returns to the app, their chosen theme is loaded from the stored user profile. If the user is authenticated, the same theme can sync across all devices they own.

User Engagement

Choose the AWS Mobile Hub User Engagement feature to add push notification campaigns to reach your app users, and to understand how they are engaging with your app.



AWS Mobile Hub User Engagement helps you understand how your users use your app and enables you to engage them through push notification, based on a pattern you design.

User Engagement uses Amazon Pinpoint to carry out campaigns that interact with your app users based on the way you configure Amazon Pinpoint options. You decide which users receive notification, why a notification gets pushed to them, and the timing of when the notification is sent. You decide if the notification displays a text message, opens an application deep link, or passes a custom JSON statement to the client.

Amazon Pinpoint performs capture, visualization, and analysis of app usage event metrics that describe how your users use your app. You can choose Amazon Pinpoint default options or custom design the data that gets collected to align with your app design and campaign goals. Amazon Pinpoint enables you to use this data as a factor in your campaign parameters.

User Engagement At a Glance

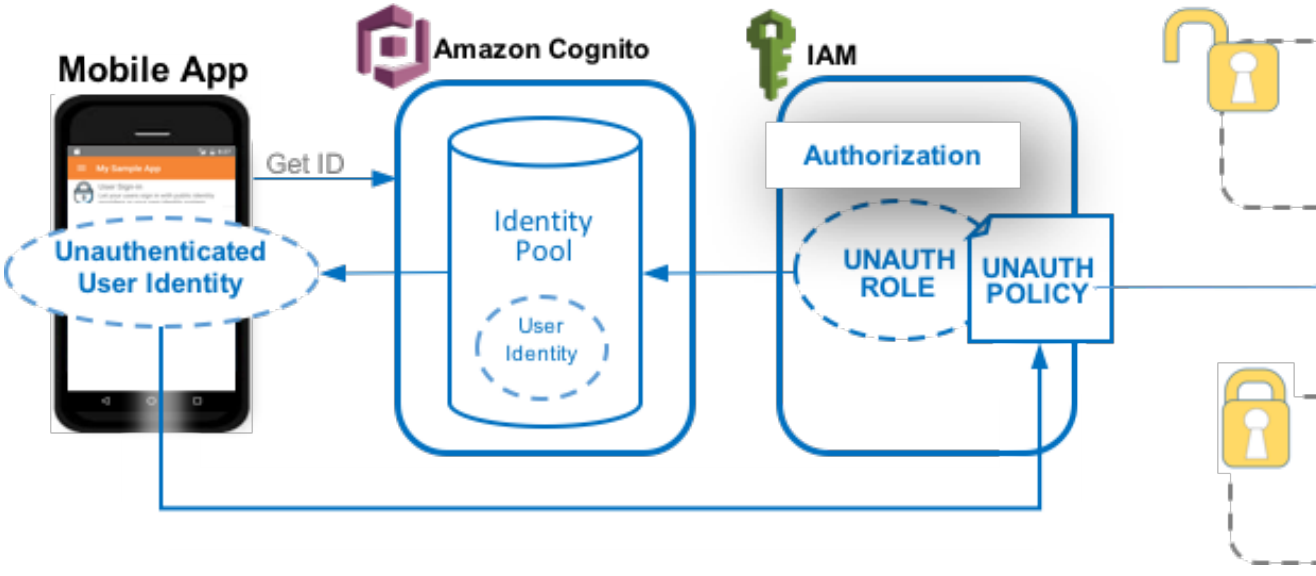
AWS services and resources configured	• **Amazon Pinpoint** (see Amazon Pinpoint Developer Guide) Concepts | Console Mobile Hub-enabled features use Amazon Cognito for authentication and IAM for authorization. For more information, see User Sign-in (p. 52).
Configuration options	This feature enables the following mobile backend capabilities: • Integrate Amazon Pinpoint campaigns into your mobile app. • Integrate push notifications through APNs, GCM, and FCM. • Integrate your app by downloading and reusing the code of the quickstart app, a package of native iOS and Android SDKs, plus helper code and developer guidance, all of which are dynamically generated to match your Mobile Hub project.
Quickstart app demos	This feature adds the following functionality to a quickstart app generated by Mobile Hub: • Demonstrate enabling the app user to receive campaign notifications. • Demonstrate providing the app user with a view of an Amazon Pinpoint data visualization, on their mobile phone.

User Sign-in

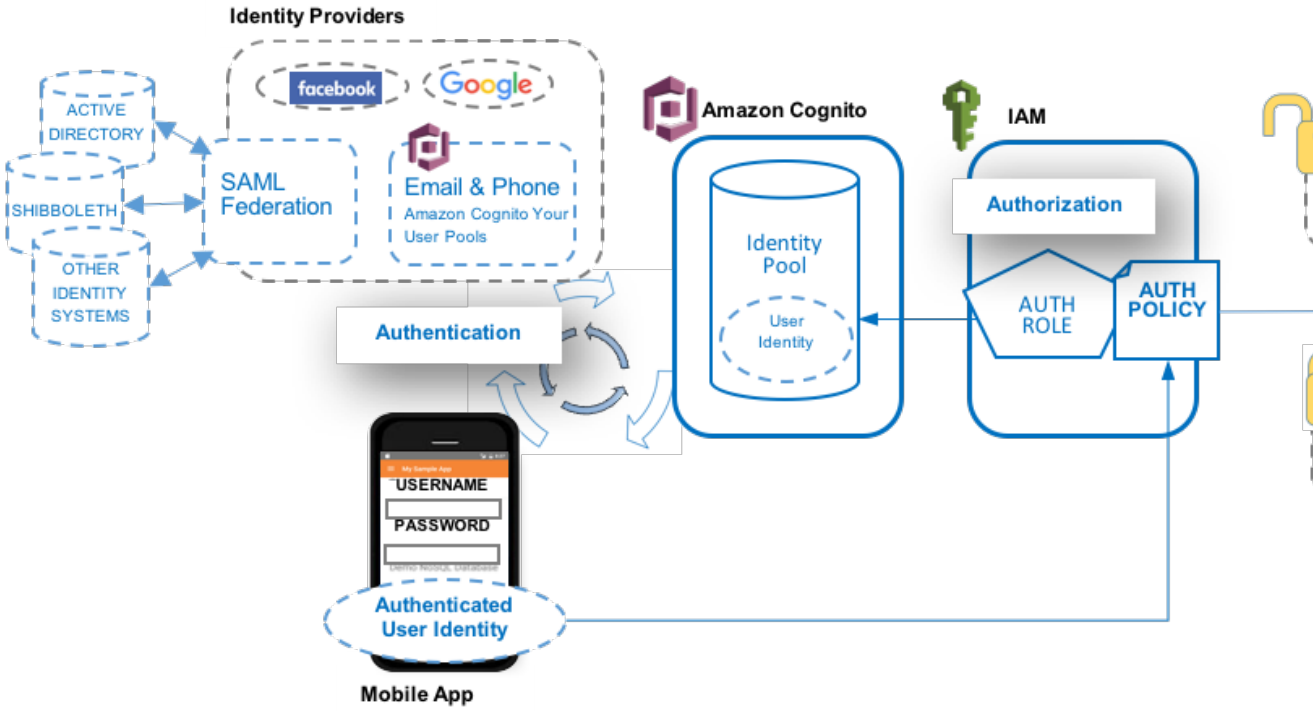
Choose the AWS Mobile Hub User Sign-in mobile backend feature to add AWS user authentication and identity access management to your mobile app. Your app can include access to AWS resources for unauthenticated users and/or integrate the sign-in process for one or more identity providers like Facebook, Google or your own user directory created in AWS.

You can also federate your existing user directory outside of AWS that uses an identity provider like Microsoft Active Directory Federation Services or Shibboleth. This allows your users to sign-in to use your backend features in AWS using their familiar credentials.

The following image shows a resource access policy being enforced for an unauthenticated user.



The following image shows a resource access policy being enforced for an authenticated user.



This feature enables you to configure how your users gain access to AWS resources and services used by your app, either with no sign in process or through authentication provided by one or more identity providers. In both cases, AWS identity creation and credentials are provided by Amazon Cognito Identity, and access authorization comes through AWS Identity and Access Management (IAM).

When you create a project, Mobile Hub provisions the AWS identity, user role, and access policy configuration required to allow all users access to unrestricted resources. When you add the User Sign-in feature to your app, you are able to restrict access to allow only those who sign in with credentials validated by an identity provider to use protected resources. Through Amazon Cognito Identity, your app user obtains AWS credentials to directly access the AWS services that you enabled and configured for your Mobile Hub project. Both authenticated and unauthenticated users are granted temporary, limited-privilege credentials with the same level of security enforcement.

Amazon Cognito can federate validated user identities from multiple identity providers to a single AWS identity. Mobile Hub helps you integrate identity providers into your mobile app so that users can sign in using their existing credentials from Facebook, Google, and your own identity system. You can also create and configure your own email- and password-based user directory using Amazon Cognito Your User Pools.

Topics

User Sign-in Feature At a Glance

AWS services and resources configured	• **Amazon Cognito** Concepts | Console | Pricing • **Amazon Cognito Identity Pool** (see Using Federated Identities) • **Amazon Cognito Your User Pools** (see Creating and Managing User Pools) • **Amazon Cognito SAML Federation** (see Overview of Configuring SAML 2.0-Based Federation) • **IAM role and security policies** (see Controlling Access to Mobile Hub Projects (p. 77)) Concepts | Console | Pricing For more information, see Viewing AWS Resources Provisioned for this Feature (p. 72).
Configuration options	This feature enables the following mobile backend capabilities: **Sign-in Providers** (users gain greater access when they sign in) • via **Google** authentication (see Setting Up Google Authentication (p. 60)) • via **Facebook** authentication (see Setting Up Facebook Authentication (p. 57)) • via **Email and Password** authentication (see User Sign-in Providers (p. 55)) • via **SAML Federation** authentication (see User Sign-in Providers (p. 55)) **Required Sign-in** (authenticated access) **Optional Sign-in** (users gain greater access when they sign in) For more information, see Configuring User Sign-in (p. 54)
Quickstart demo features	This feature adds the following to a quickstart app generated by Mobile Hub: • Unauthenticated access (if allowed by your app's configuration), displaying the ID that AWS assigns to the app instance's device. • Sign-in screen that authenticates users using the selected method: Facebook, Google, or Custom. • With **Optional Sign-in** and **Require Sign-in**, the app demonstrates an access barrier to protected folders for unauthenticated users.

Configuring User Sign-in

The following options are available for configuring your users' sign-in experience.

User Sign-in Providers

Facebook
: To enable Facebook user authentication, register your application with Facebook.

  If you already have a registered Facebook app, copy the **App ID** from the Facebook Developers **App Dashboard**. Paste the ID into the Facebook **App ID** field and choose **Save Changes**.

  If you do not have a Facebook App ID yet, you'll need to create one before you can integrate Facebook in your mobile app. The Facebook Developers portal takes you through the process of setting up your Facebook application.

  For full instructions on integrating your application with Facebook, see Setting Up Facebook Authentication (p. 57). .

Google
: To authenticate your users through Google, fully integrate your sample app with Google+ Sign-in.

  If you already have a registered Google Console project with the Google+ API, a web application OAuthClient and a client ID for the platform of your choice set up, then copy and paste the Google Web App Client ID and client ID(s) from the Google Developers Console into those fields and choose **Save Changes**.

  Regardless of the platform you choose (Android or iOS), you'll need to at least create the following.

  - A Google Console project with the Google+ API enabled (used for Google Sign-in)
  - A web application OAuth client ID
  - An iOS and/or Android client ID, depending on which platform you are supporting

  For full instructions on integrating your application with Google+, see Setting Up Google Authentication (p. 60). .

Email and Password
: Choose Email and Password sign-in when you want to create your own AWS-managed user directory and sign-in process for your app's users. Configure the characteristics of their sign-in experience by:

  - Selecting user login options (*email, username, and/or phone number*)
  - Enabling multi-factor authentication (*none, required, optional*) which adds delivery of an entry code via text message to a user's phone, and a prompt to enter that code along with the other factor to sign-in
  - Selecting password character requirements (*minimum length, upper/lower cases, numbers or special characters allowed*).

SAML Federation
: SAML Federation enables users with credentials in your existing identity store to sign in to your mobile app using their familiar username and password. A user signs into to your identity provider (IdP) which is configured to return a validating SAML assertion. Your app then uses Amazon Cognito Federated Identities to exchange the SAML assertion for typical temporary, limited privilege credentials to access your AWS backend services.

  SAML 2.0 (Security Assertion Markup Language 2.0) is an open standard used by many IdPs, including Microsoft Active Directory Federation Service and Shibboleth. Your IdP must be SAML 2.0 compatible to use this Mobile Hub option. To establish federation between AWS and your IdP the two systems must exchange SAML federation metadata. AWS federation metadata can be found at https://signin.aws.amazon.com/static/saml-metadata.xml. This xml file demonstrates the form that your IdP's metadata should take. For more information on SAML federation metadata for your IdP, see Integrating Third-Party SAML Solution Providers with AWS.

To implement this exchange, view your IdP's documentation to understand how to use the AWS federation metadata file to register AWS as a service provider. Then provide upload your IdP's federation metadata file using SAML Federation page of the Mobile Hub console.

To learn more about how AWS supports SAML federation, see Overview of Configuring SAML 2.0-Based Federation.

User Sign-in Requirement

Sign-in is optional
: Users have the option to sign in (authenticate) with your chosen sign-in identity provider(s) or users can skip sign-in (unauthenticated). Your app receives temporary, limited privilege access credentials from Amazon Cognito Identity as either an authenticated user or an unauthenticated guest user so that your app can access your AWS services securely.

Sign-in is required
: Users are required to sign in with one of your chosen sign-in providers. Your app receives temporary, limited privilege access credentials from Amazon Cognito Identity as an authenticated user so that your app can access your AWS services securely.

User Sign-in and AWS Identity and Access Management (IAM)

When your mobile app is saved, Mobile Hub creates an Amazon Cognito identity pool and a new IAM role. These are used to generate temporary AWS credentials for the quickstart app users to access your AWS resources. The AWS IAM role security policies are updated based on the sign-in features enabled.

At this point, your mobile project is set up for users to sign in. Each chosen identity provider has been added to the login screen of the quickstart app.

For more information, see Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77).

Setting Up User Authentication

With AWS Mobile Hub, you can enable a user sign-in feature for your app. User sign-in works with various user authentication services, including Facebook, Google, and custom authentication. Mobile Hub helps you to configure sign-in with Facebook, Google, or your own identity system; however, you may also need to set up user authentication with the different authentication services you plan to use.

Learn more about how Amazon Cognito performs authentication using external identity providers, see Understanding Amazon Cognito Authentication.

The topics in this section detail the setup you must complete with various user authentication services and how to obtain the data values Mobile Hub needs to configure your sign-in feature.

Topics

Setting Up Facebook Authentication

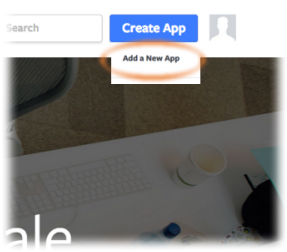
You must first register your application with Facebook by using the Facebook Developers portal.

Mobile Hub generates code that enables you to use Facebook to provide federated authentication for your mobile app users. This topic explains how to set up Facebook as an identity provider for your app.

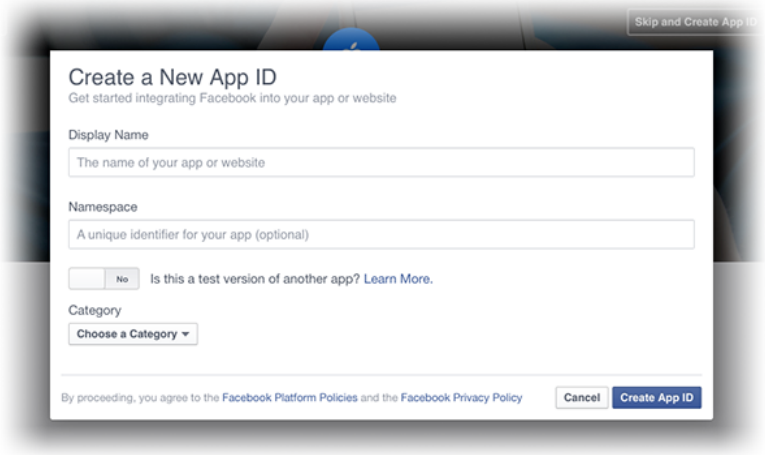
If you already have a Facebook app ID, copy and paste it into the **Facebook App ID** field in the Mobile Hub console, and choose **Save changes**.

To get a Facebook app ID

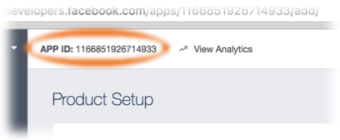
1. In the Facebook Developers portal, sign in with your Facebook credentials.
2. From **Created App**, choose **Add a New App** (note: this menu label will be **My Apps** if you have previously created an app.



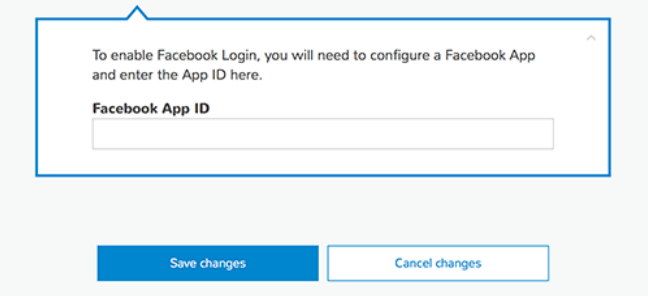
3. If asked, choose the platform of your app that will use Facebook sign-in, and **basic setup**.
4. Type a display name for your app, select a category for your app from the **Category** drop-down list, and then choose **Create App ID**.



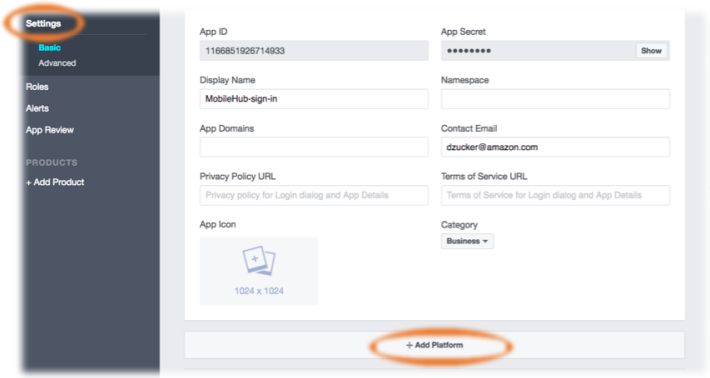
5. Complete the **Security Check** that appears. Your new app then appears in the **Dashboard**.



6. Copy the App ID and paste it into the **Facebook App ID** field in the Mobile Hub console.



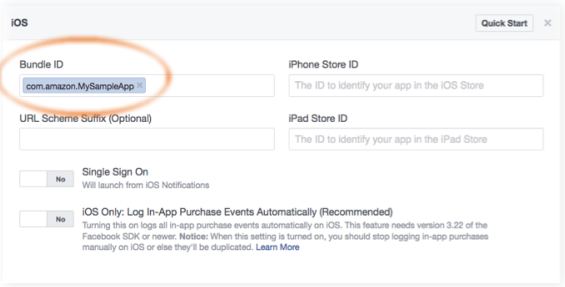
7. In the Facebook Developer portal's left hand navigation list, choose **Settings**, then choose **+ Add Platform**.



8. Choose your platform and provide information about your Mobile Hub app that Facebook will use for integration during credential validation.

   For iOS:

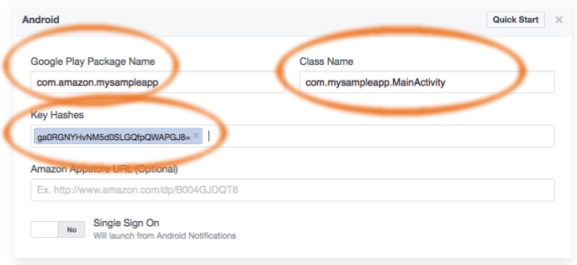
   - Add your app's **Bundle ID**. (ie. **`com.amazon.YourProjectName`**). To use the AWS Mobile Hub sample app project, set your this value to **`com.amazon.MySampleApp`**.



   For Android:

   a. Provide your app's **Google Play Package Name**. (ie. **`com.yourprojectname`**). To use the AWS Mobile Hub sample app project, set this value to **`com.amazon.mysampleapp`**.

   b. Provide your **Class Name** that handles deep links (ie. **`com.yourprojectname.MainActivity`**). To use the AWS Mobile Hub sample app project, set your class name to **`com.mysampleapp.MainActivity`**.



c. Provide your app's Facebook development **Key Hashes**. This is a value that you generate via a terminal in your development environment, and is unique to that environment.

   To generate a development key for your Android environment on Mac, run the following command line.

```
keytool -exportcert -alias androiddebugkey -keystore ~/.android/
debug.keystore | openssl sha1 -binary | openssl base64
```

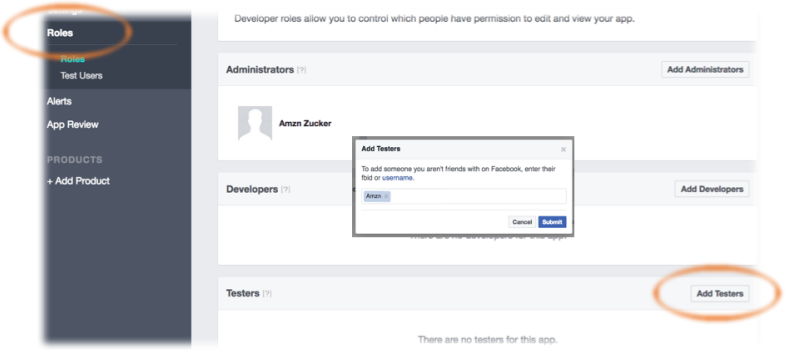
   To generate a development key for your Android environment on Windows, run the following command line.

```
keytool -exportcert -alias androiddebugkey -keystore %HOMEPATH%
\.android\debug.keystore | openssl sha1 -binary | openssl base64
```

   For more information, choose the **Quick Start** button in the upper left of the Facebook Developer Portal Add Platform dialog.

9. In the Facebook Developers portal, choose **Save changes**, then **Use this package name** if a dialog appears saying that Google Play has an issue with your package name.
10. Only users with roles assigned in the Facebook portal will be abel to authenticate through your app while it is in development (not yet published).

    To authorize users, in the Facebook Developer portal's left hand navigation list, choose **Roles**, then **Add Testers**. Provide a valid Facebook ID.



11. In the Mobile Hub console, choose **Save changes**.

For more information about integrating with Facebook Login, see the Facebook Getting Started Guide.

Setting Up Google Authentication

With AWS Mobile Hub, you can configure a working Google Sign-In feature for both Android and iOS apps. To fully integrate Google Sign-In with your sample app, Mobile Hub needs information that you must first obtain through Google's setup process. The process has several parts, one of which is required regardless of which platforms you're supporting with your app. There are other parts to complete only for specific platforms:

- Create a Google Developers project and an OAuth Web Application Client ID (required for **all apps** regardless of platform)
- Create an OAuth Android client ID (required for all **Android apps**)
- Create an OAuth iOS client ID (required for all **iOS apps**)

This section details the Google Sign-In requirements as well as how to integrate Google Sign-In for both iOS and Android apps.

Topics

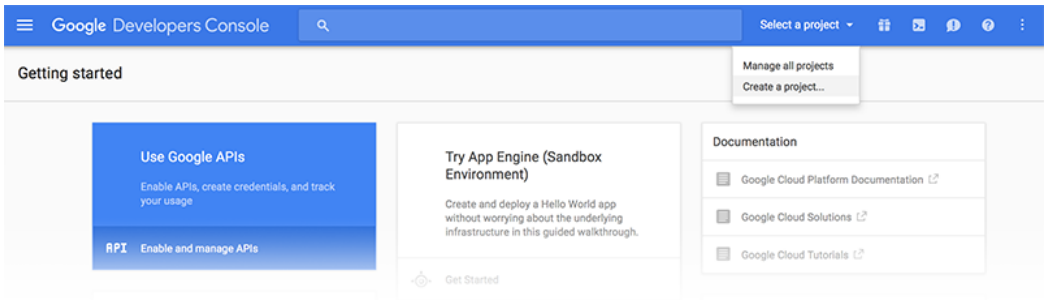
Creating a Google Developers Project and OAuth Web Client ID

Before you enable Google Sign-In in an app, you must create a project in the Google Developers Console. Google recommends using a single project to create and manage all of the platform instances of your app, such as iOS, Android, and web.

Each platform requires its own OAuth client ID, which you obtain through the project you create for your app in the Google Developers Console. The first thing you must do is create a project for your app in the Google Developers Console that has the Google+ API enabled, and then enable an OAuth web client ID that Amazon Cognito uses to enable user authentication for your app.

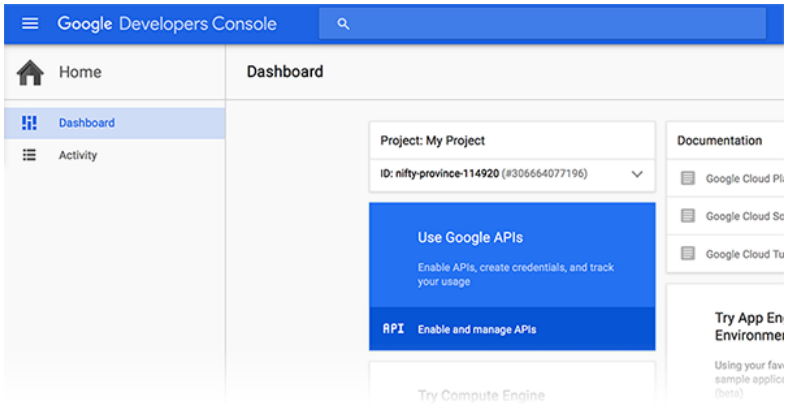
To create a Google Developers project and OAuth web client ID

1. Go to the Google Developers Console at https://console.developers.google.com.
2. If you have not created a project yet, choose **Select a project** from the menu bar, and then choose **Create a project...**.

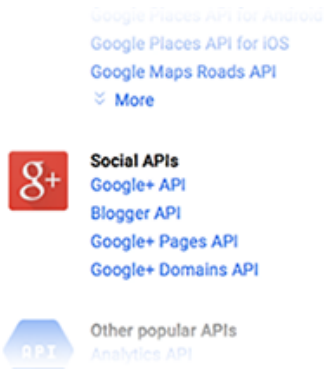


3. Complete the form that is displayed to create your new project.

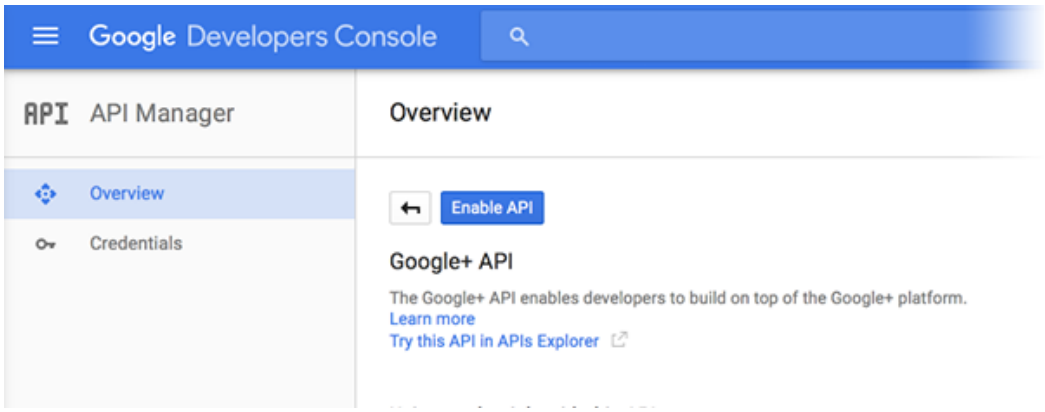
4. In the **Dashboard** for your project, go to the **Use Google APIs** section and then choose **Enable and manage APIs**.



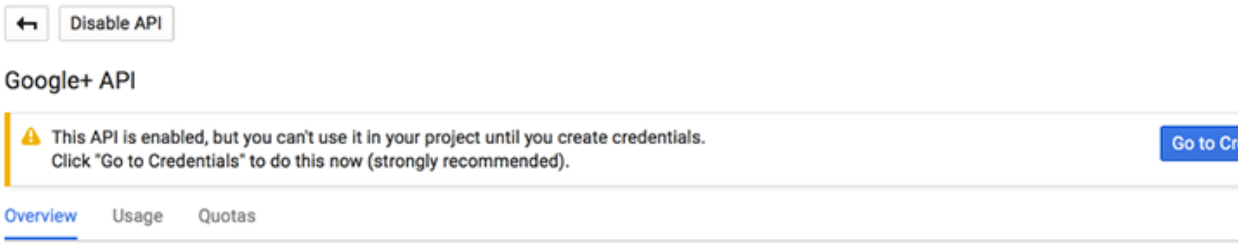
5. In the API Manager, in the **Social APIs** section, choose **Google+ API**.



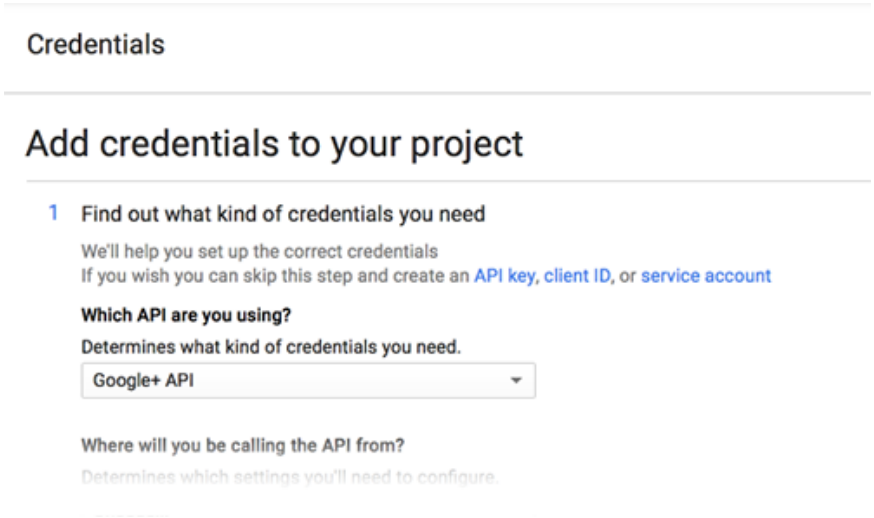
6. In the **Overview** for Google+ API, choose **Enable API**.



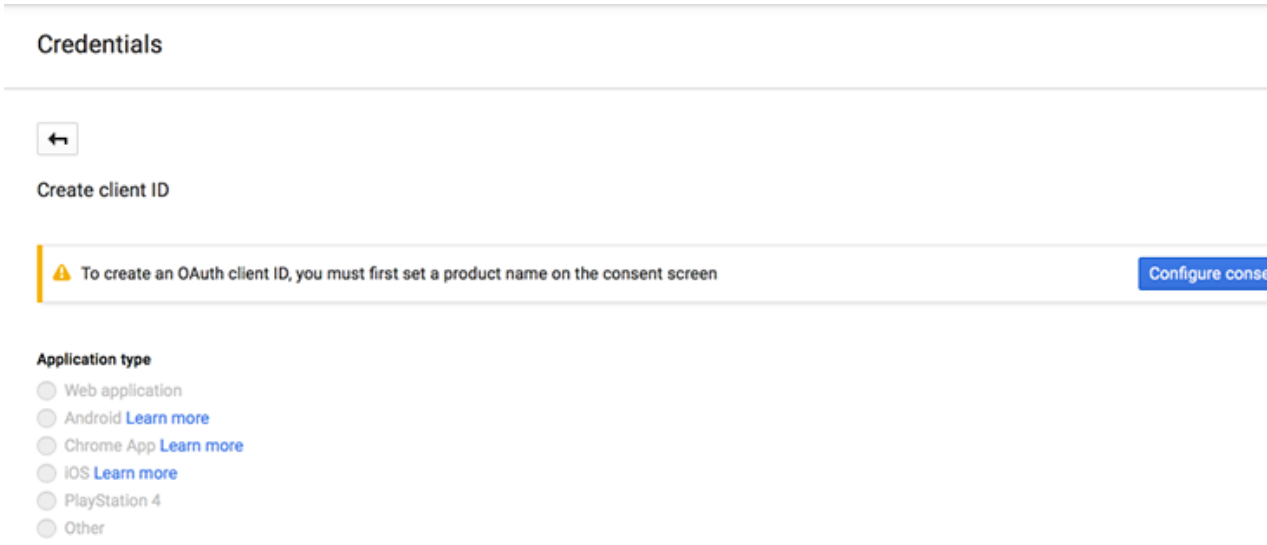
7. A message appears to inform you that the API is enabled but that it requires credentials before you can use it. Choose **Go to Credentials**.



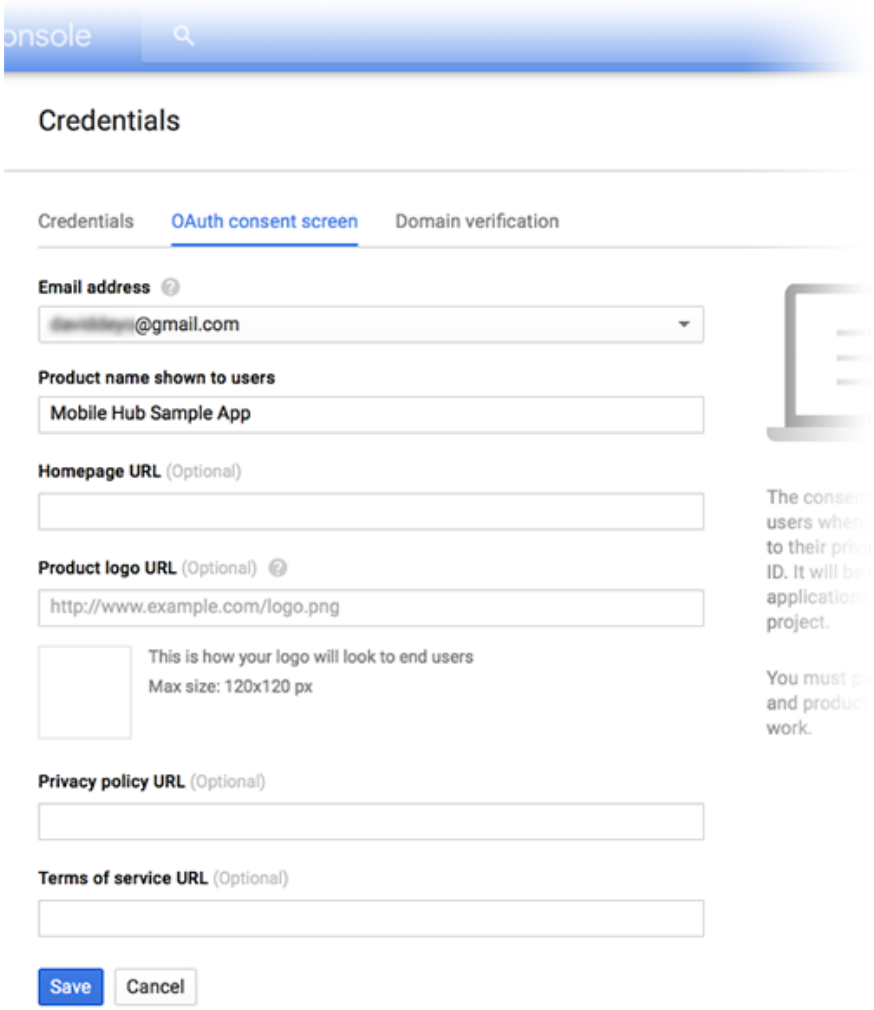
8. Your Mobile Hub sample app authenticates users through Amazon Cognito Identity, so you need an OAuth web application client ID for Amazon Cognito. In **Credentials**, choose **client ID** from the links in the first step.



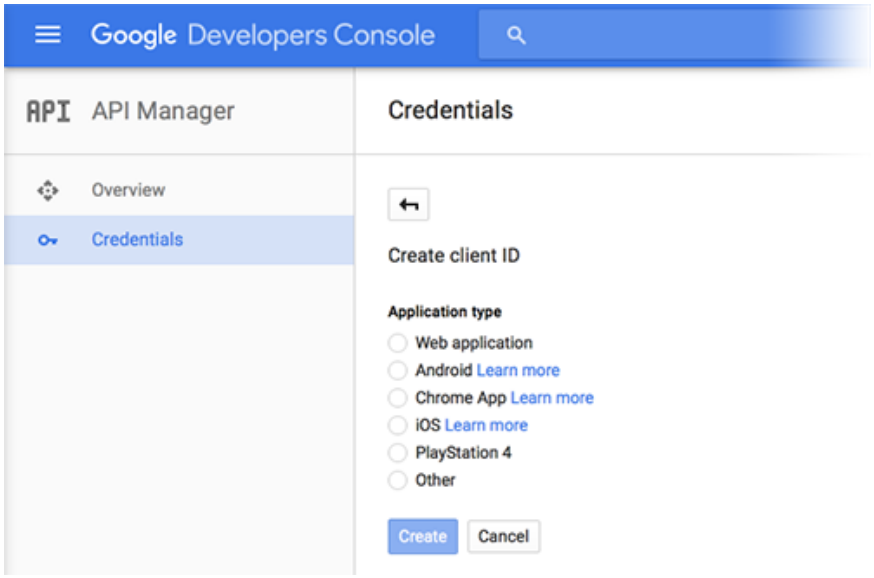
9. A message appears to inform you that you must set a product name. Choose **Configure consent screen**.



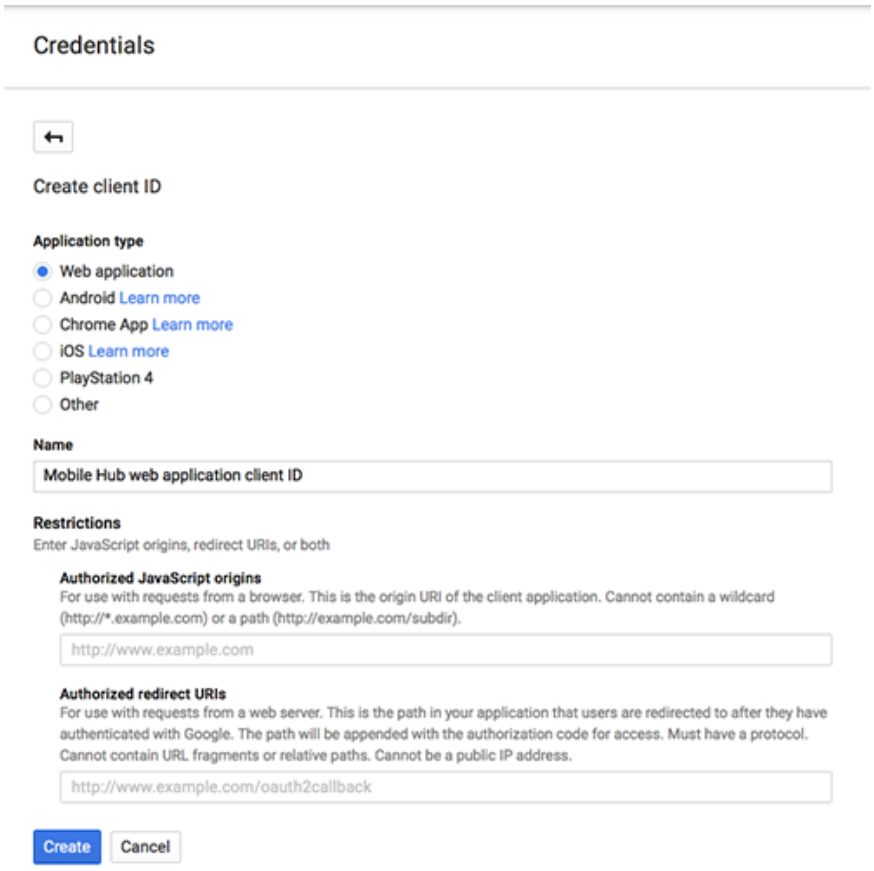
10. In **OAuth consent screen**, enter the name of your app in **Product name shown to users**. Leave the remaining fields blank. Then choose **Save**.



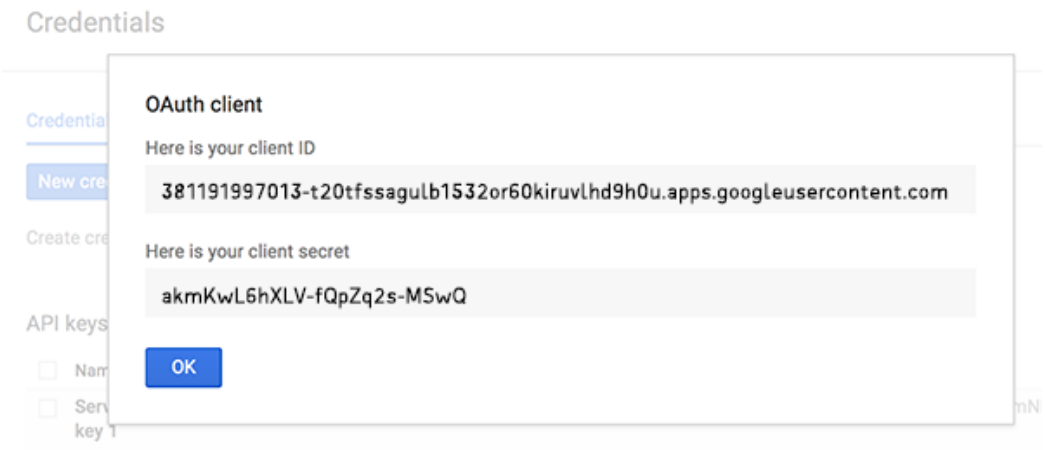
11. In **Create client ID**, choose **Web application**.



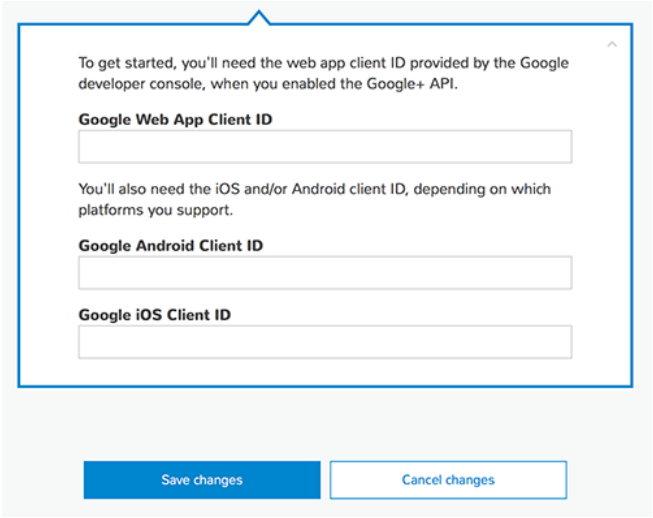
12. In **Name**, enter a name for the web client credentials for your app. Leave the **Authorized JavaScript origins** and **Authorized Redirect URIs** fields blank. Mobile Hub configures this information indirectly through Amazon Cognito Identity integration. Choose **Create**.



13. In the **OAuth client** pop-up, copy and save the value that was generated for your client ID. You will need the client ID to implement Google Sign-In in your Mobile Hub app. After you copy the client ID, choose **OK**.



14. Paste the web application client ID value into the Mobile Hub **Google Web App Client ID** field for your project.



Creating an OAuth Android Client ID

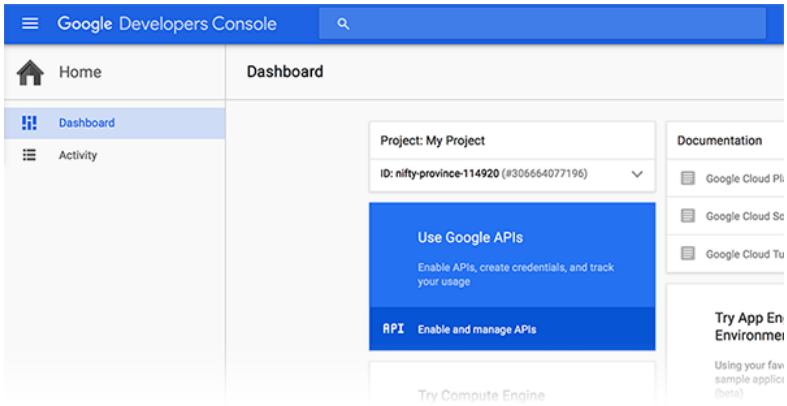
To enable Google Sign-In for your Android Mobile Hub sample app, you must create an Android OAuth client ID so that the Android sample app that is generated by Mobile Hub can access Google APIs directly and manage token lifecycle through Amazon Cognito Identity. This Android OAuth client ID is in addition to the Web application OAuth client ID you created while Creating a Google Developers Project and OAuth Web Client ID (p. 60).

To integrate Google Sign-In for your Android sample app, you must generate an Android OAuth client ID in the Google Developers Console. You will provide this client ID to Mobile Hub during the Google Sign-In configuration.

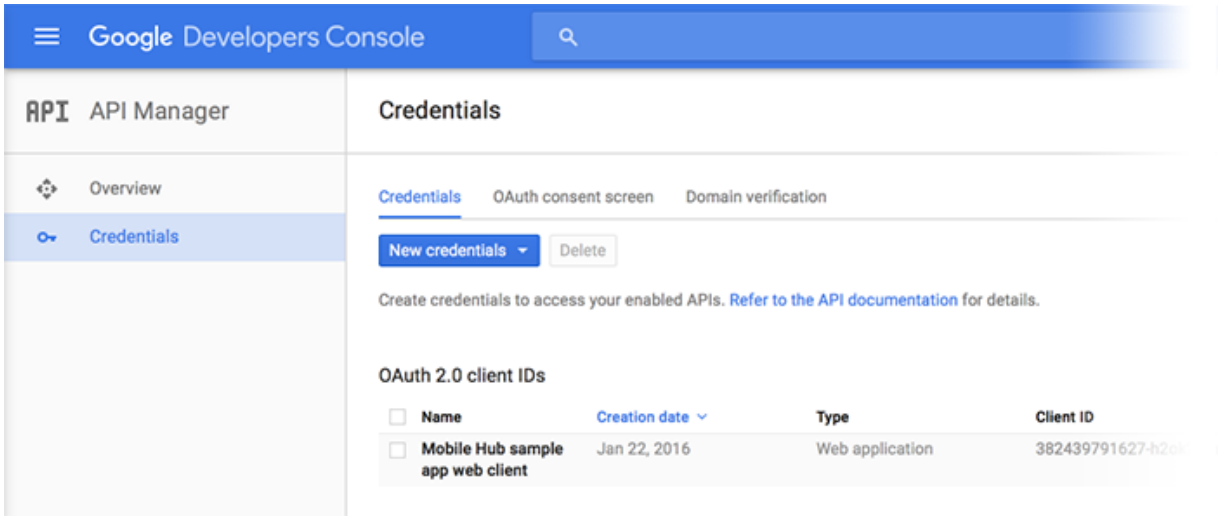
To create an OAuth Android client ID

1. Go to the Google Developers Console at https://console.developers.google.com.

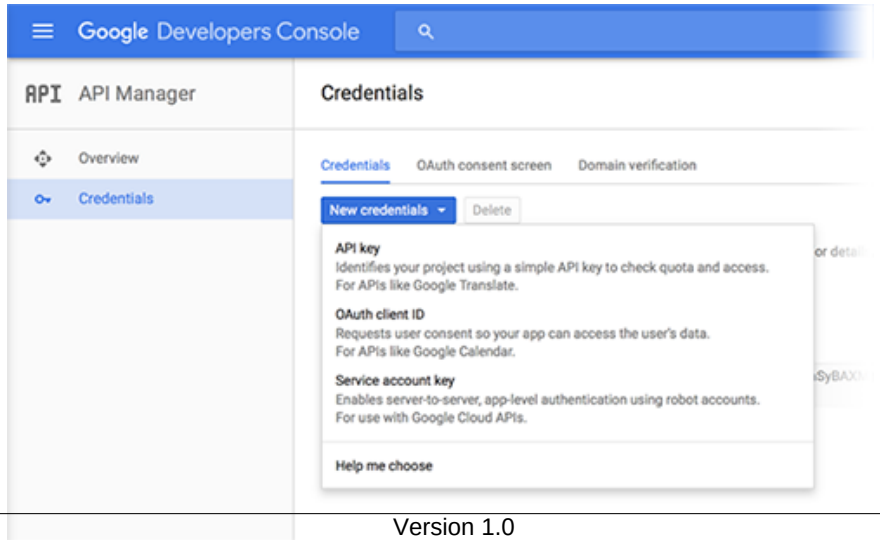
2. In the **Dashboard** for your project, go to the **Use Google APIs** section and then choose **Enable and manage APIs**.



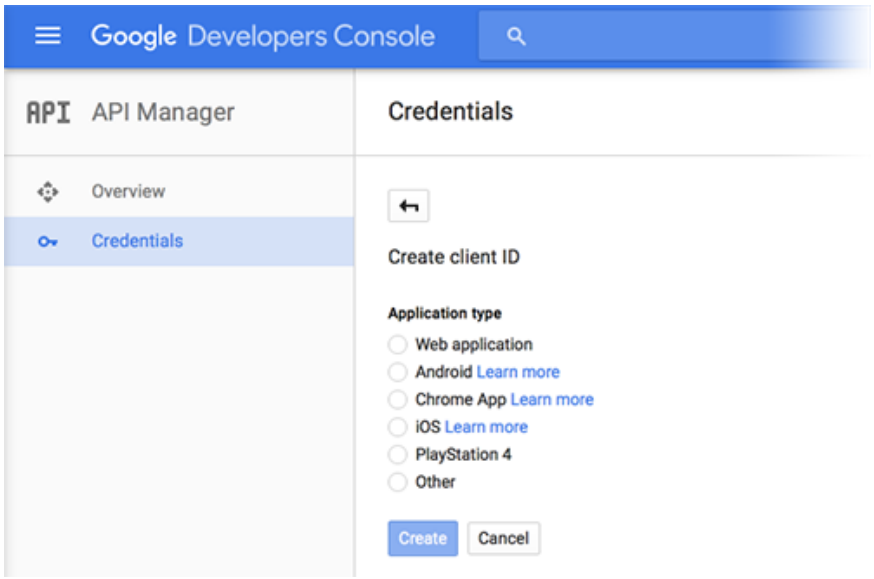
3. In the API Manager, choose **Credentials** in the left side menu.



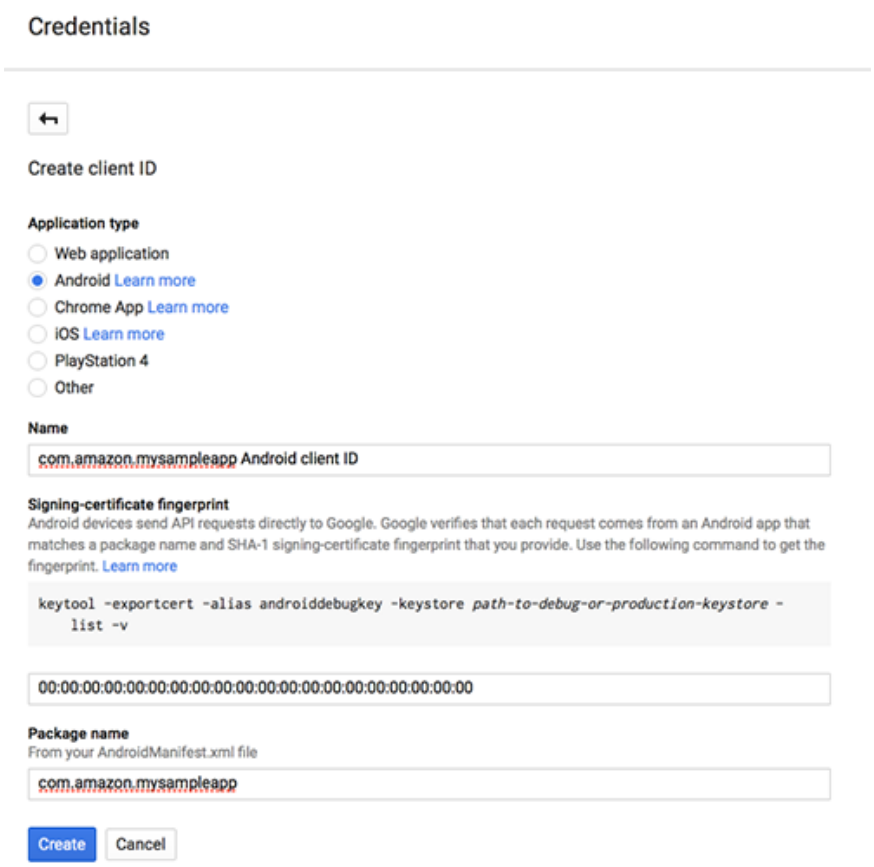
4. Choose **New credentials** and then choose **OAuth client ID**.



5. In **Create client ID**, choose **Android**.

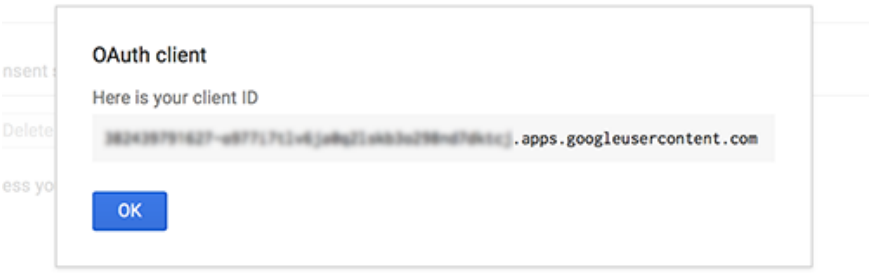


6. In **Name**, enter a name in the format *com.amazon.mysampleapp Android client ID*.
7. In **Signing-certificate fingerprint**, enter the SHA-1 fingerprint. For more information about Google's process for obtaining your SHA-1 fingerprint, see this Google support article.

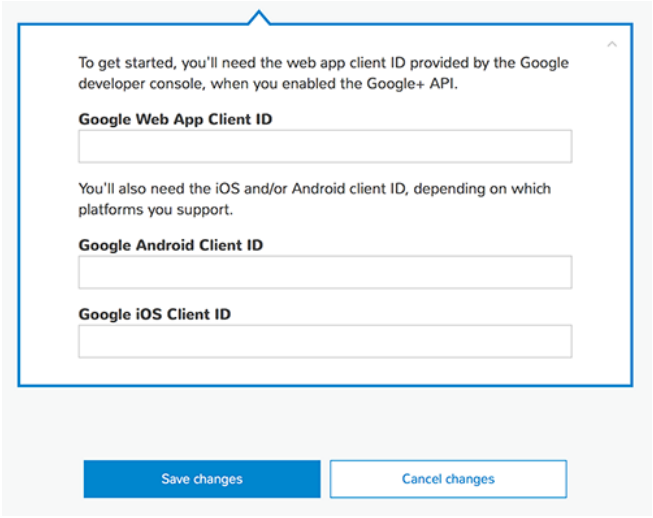


8. In **Package name**, enter the package name in the format *com.amazon.mysampleapp*.

9. Choose **Create**.
10. In the **OAuth client** pop-up, copy and save the value generated for your Android client ID. You will need this client ID to implement Google Sign-In in your Mobile Hub app. After you copy the client ID, choose **OK**.



11. Paste the Android client ID value into the Mobile Hub **Google Android Client ID** field for your project.



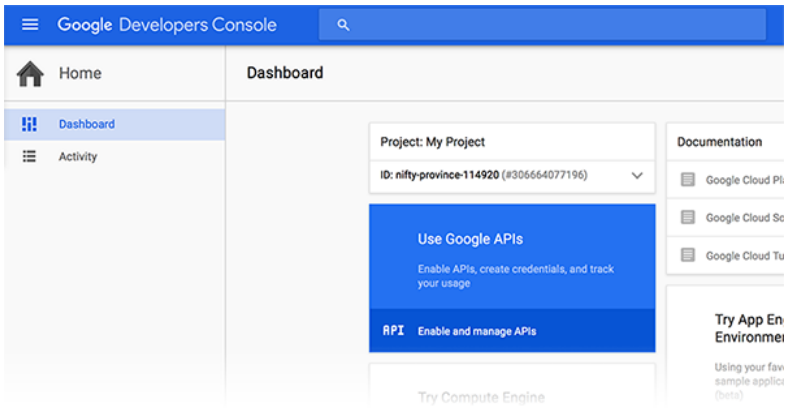
Creating an OAuth iOS Client ID

To enable Google Sign-In for your iOS Mobile Hub sample app, you must create an iOS OAuth client ID for your app. This enables your Mobile Hub sample app to access Google APIs directly and to manage token lifecycle through Amazon Cognito Identity. This iOS OAuth client ID is in addition to the web application OAuth client ID that you created while Creating a Google Developers Project and OAuth Web Client ID (p. 60).

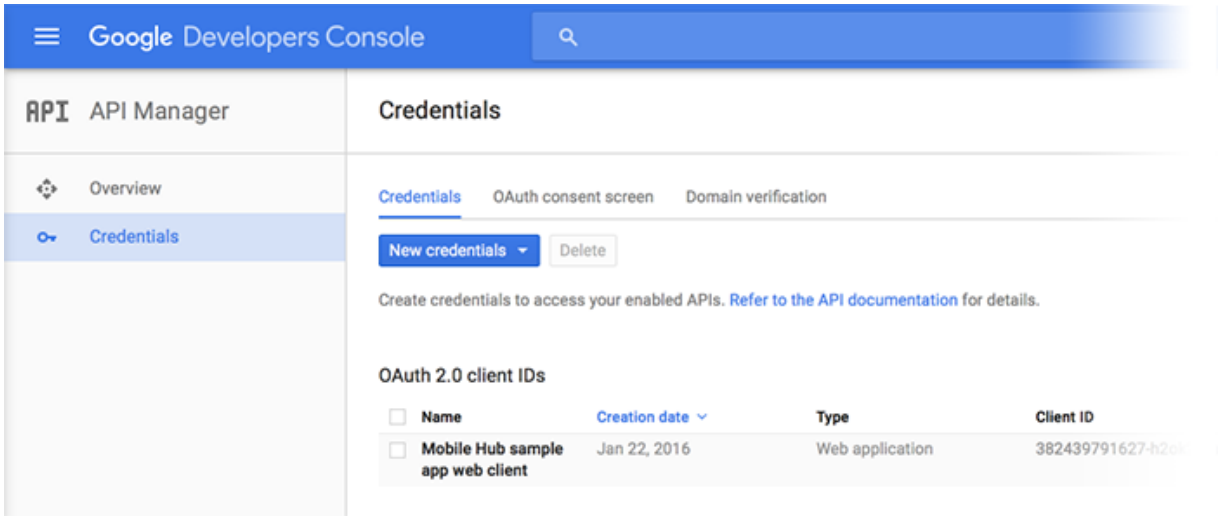
To integrate Google Sign-In for your iOS sample app, you must generate an iOS OAuth client ID in the Google Developers Console. You will provide this client ID to Mobile Hub during the Google Sign-In configuration.

To create an OAuth iOS client ID

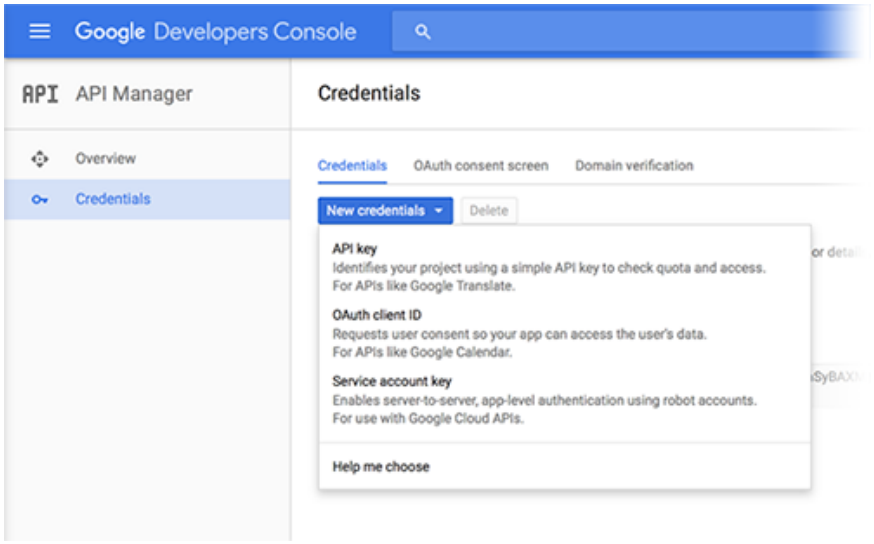
1. Go to the Google Developers Console at https://console.developers.google.com.
2. In the **Dashboard** for your project, go to the **Use Google APIs** section and then choose **Enable and manage APIs**.



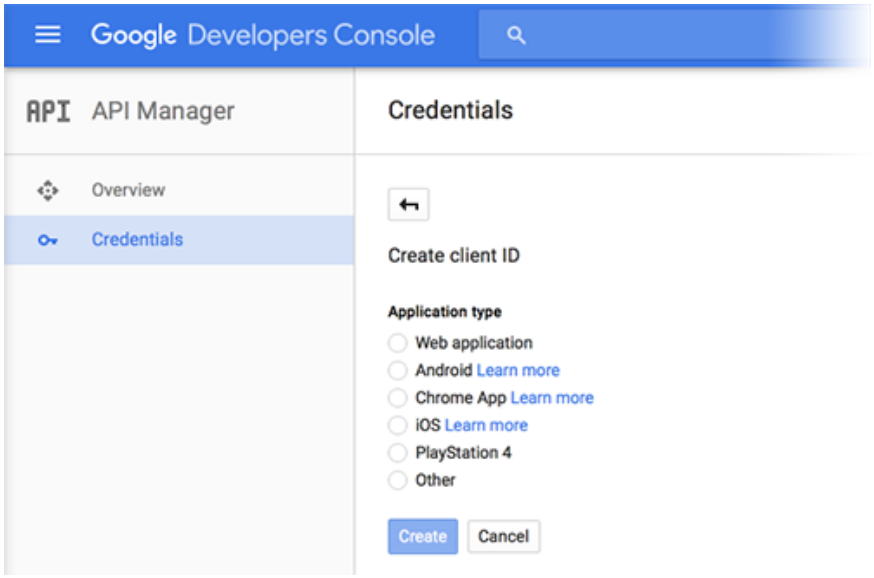
3. In the API Manager, choose **Credentials** in the left side menu.



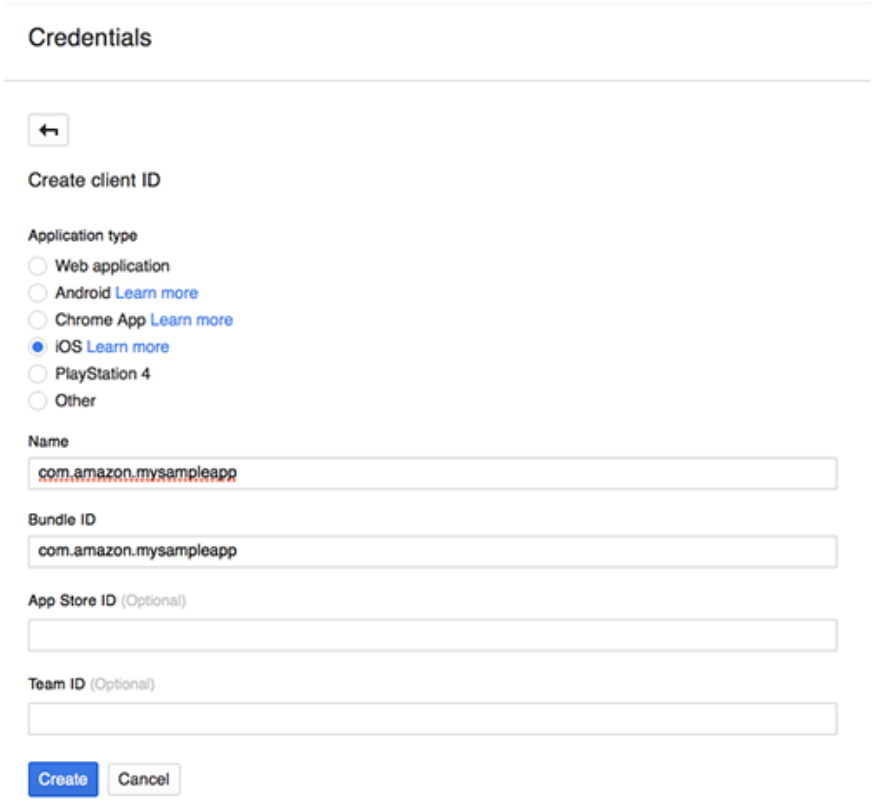
4. Choose **New Credentials** and then choose **OAuth client ID**.



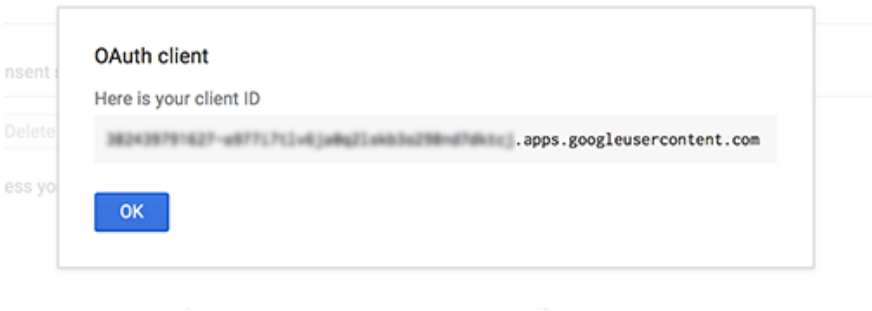
5. In **Create client ID**, choose **iOS**.



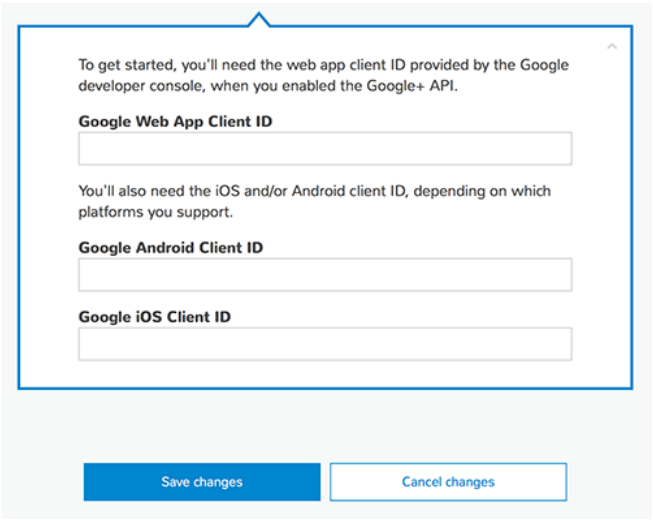
6. In **Name**, enter a name in the format *`com.amazon.mysampleapp iOS client ID`*.
7. In **Bundle ID**, enter the bundle name in the format *`com.amazon.mysampleapp`*.



8. Choose **Create**.
9. In the **OAuth client** pop-up, copy and save the value that was generated for your iOS client ID. You will need these values to implement Google Sign-In in your Mobile Hub app. After you copy the client ID, choose **OK**.

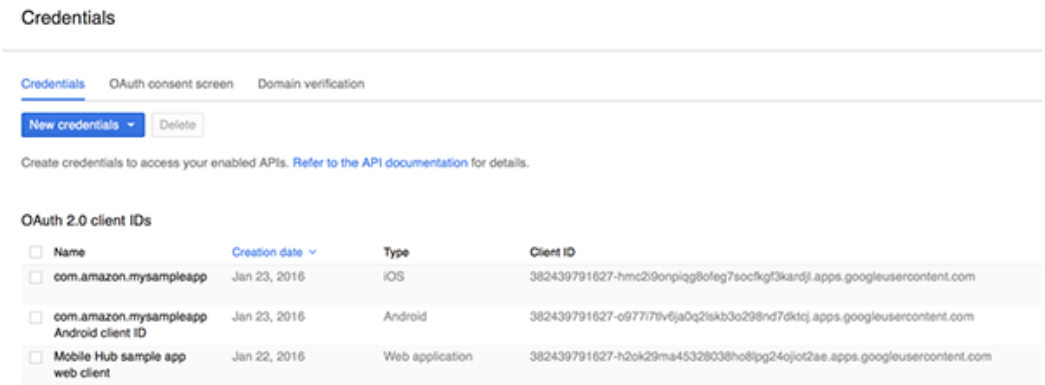


10. Paste the iOS client ID value into the Mobile Hub **Google iOS Client ID** field for your project.



Verifying All Platform Client IDs

If your app supports both Android and iOS platforms, then your app project in the Google Developers Console will now have three client IDs: one for web application, one for Android, and one for iOS. You can verify that you have all of the credentials for all of the platforms by looking at the **Credentials** panel in the API Manager for your app, as shown in the following.



Setting Up Custom Authentication

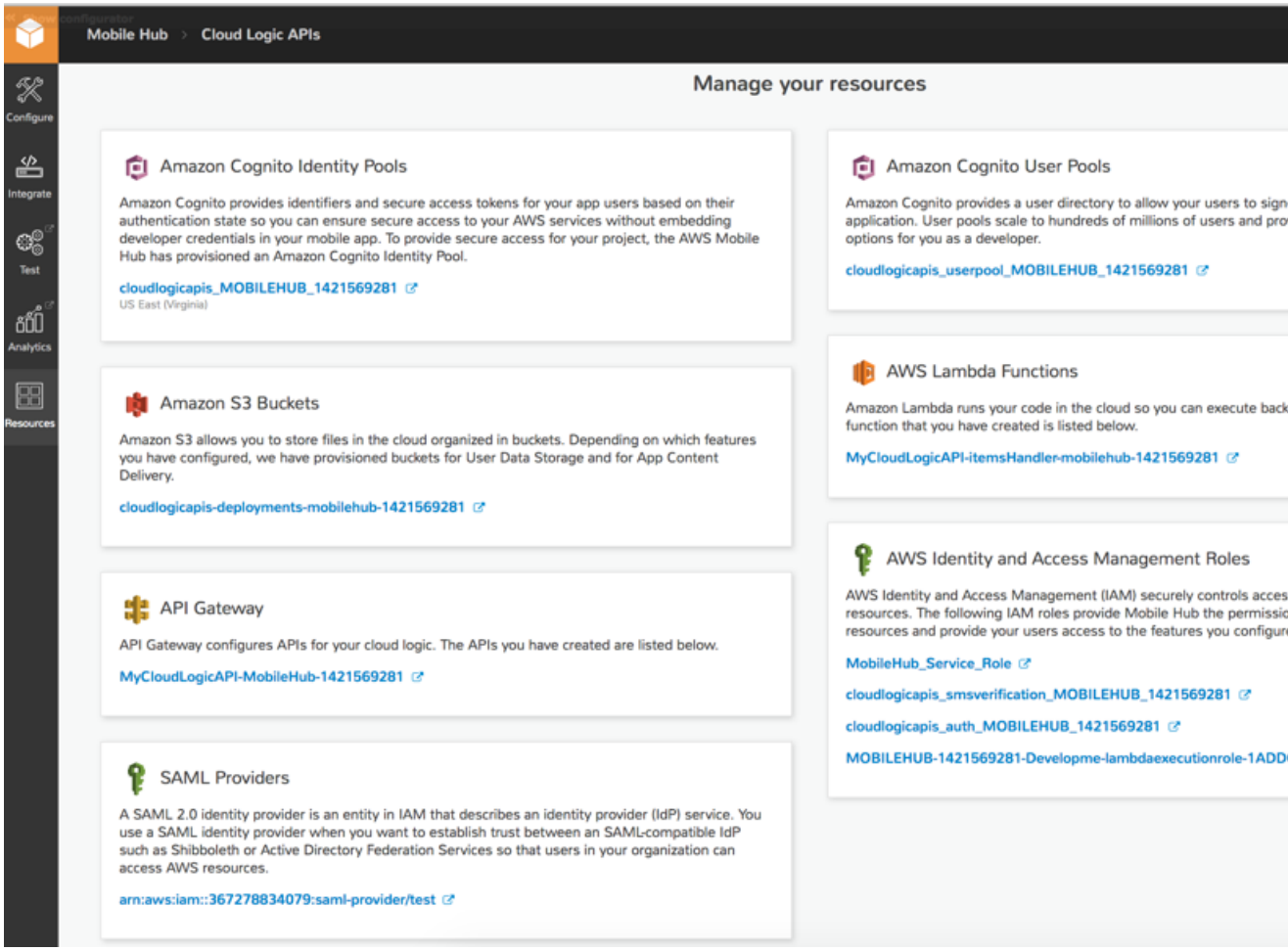
You can use your own authentication system, rather than identity federation provided by Facebook or Google, to register and authenticate your customers. The use of developer-authenticated identities involves interaction between the end-user device, your authentication back end, and Amazon Cognito. For more information, see the following blog entries:

- Understanding Amazon Cognito Authentication
- Understanding Amazon Cognito Authentication Part 2: Developer-Authenticated Identities

To use your own authentication system, you must implement an identity provider by extending the `AWSAbstractCognitoIdentityProvider` class and associating your provider with an Amazon Cognito identity pool. For more information, see Developer Authenticated Identities in the Amazon Cognito Developer Guide.

Viewing AWS Resources Provisioned for this Feature

The following image shows the Mobile Hub **Resources** pane displaying elements typically provisioned for the User Sign-in feature.



Quickstart App Details

In the Mobile Hub quickstart app, the User Sign-in demo enables users to use features that access AWS resources without authentication or by signing in to the app via identity providers including Facebook, Google, SAML Federation or Email and Password.

When you add User Sign-in to your project with the **Optional Sign-in** option, choosing the app's quickstart sign-in demo returns and displays the user's Amazon Cognito Identity Pool ID. This identifier is associated with the app instance's device currently accessing AWS resources.

When you add User Sign-in to your project with **Required Sign-in**, choosing the app's quickstart sign-in demo displays a sign-in experience branded to match the identity provider(s) configured in the project. Signing in to the demo authenticates the user in the selected identity provider service and returns and displays the Amazon Cognito Identity Pool ID identifier of the user.

Document History for AWS Mobile Hub

The following table describes important changes to the documentation since the release of AWS Mobile Hub.

- **Latest documentation update:** August 19, 2016

Change	Description	Date Changed
AWS Mobile Hub Developer Guide Redesign	Site restructured around using the key mobile app backend features Mobile Hub facilitates. Most pages in the site are updated with additional information.	August 17, 2016
iOS and Android Push Notification Setup Documentation	The documentation for setting up iOS push notifications in the Apple Developer Member Center website and Android push notifications in the Google Developers Console website has been updated to provide more detail about the process for setting up these features outside the Mobile Hub console.	February 9, 2016
Facebook and Google Authentication Process Documentation	The documentation now has a section describing how to create a Google Developers Console project and create all client IDs Mobile Hub needs to enable Google Sign-In in both iOS and Android apps. For more information, see Setting Up Google	January 26, 2016

Change	Description	Date Changed
	Authentication (p. 60). The documentation on creating a Facebook app ID has been updated to reflect changes in the Facebook Developer portal. For more information, see Setting Up Facebook Authentication (p. 57).	
IAM Managed Policies Added	Details about the managed policies required to view and modify configuration for any project with AWS Mobile Hub. For more information, see AWS Managed (Predefined) Policies for Mobile Hub Project Access (p. 77).	January 4, 2016
IAM Service Role for Mobile Hub Added	Details about the service policy and permissions for the `MobileHub_Service_Role` IAM role created by Mobile Hub to configure the features of each mobile app is documented. For more information, see Mobile Hub Service Role and Policies Used on Your Behalf (p. 78).	November 9, 2015
New Guide	This is the first release of the AWS Mobile Hub service. This is a beta release and is subject to change.	October 8, 2015

AWS Mobile Hub Reference

The reference topics in this section provide more detailed information about how Mobile Hub works.

Topics

AWS Identity and Access Management Usage in AWS Mobile Hub

Note
In depth understanding of IAM and AWS authentication and access controls is not required to build a mobile app using AWS Mobile Hub.

Controlling Access to Your Mobile Hub Project

To learn how to grant permissions for configuration of your Mobile Hub project, see Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77).

Understanding Mobile Hub Permissions

To learn more about permissions you give Mobile Hub to configure AWS resources and services, see Mobile Hub Service Role and Policies Used on Your Behalf (p. 78)

Understanding AWS Identity and Access Management

To learn about the details of IAM and AWS authentication and access controls, see IAM Authentication and Access Control for Mobile Hub (p. 86).

Using AWS Managed Policies to Control Access to Mobile Hub Projects

This section describes how to control access to your projects using the **AWSMobileHub_FullAccess** and **AWSMobileHub_ReadOnly** AWS managed policies provided by Mobile Hub.

To understand how Mobile Hub uses IAM policies attached to the **MobileHub_Service_Role** to create and modify services on your behalf, see Mobile Hub Service Role and Policies Used on Your Behalf (p. 78).

To understand AWS Identity and Access Management (IAM) in more detail, see IAM Authentication and Access Control for Mobile Hub (p. 86) and Overview of Access Permissions Management for Mobile Hub Projects (p. 88).

AWS Managed (Predefined) Policies for Mobile Hub Project Access

The AWS Identity and Access Management service controls user permissions for AWS services and resources. Specific permissions are required in order to view and modify configuration for any project with AWS Mobile Hub. These permissions have been grouped into the following managed policies, which you can attach to an IAM user, role, or group.

- **AWSMobileHub_FullAccess**

  This policy provides read and write access to AWS Mobile Hub projects. Users with this policy attached to their IAM user, role, or group are allowed to create new projects, modify configuration for existing projects, and delete projects and resources. This policy also includes all of the permissions that are allowed under the **AWSMobileHub_ReadOnly** managed policy. After you sign in to the Mobile Hub console and create a project, you can use the following link to view this policy and the IAM identities that are attached to it.

  https://console.aws.amazon.com/iam/home?region=us-east-1#policies/arn:aws:iam::aws:policy/AWSMobileHub_FullAccess

- **AWSMobileHub_ReadOnly**

  This policy provides read-only access to AWS Mobile Hub projects. Users with this policy attached to their IAM user, role, or group are allowed to view project configuration and generate sample quick start app projects that can be downloaded and built on a developer's desktop (e.g., in Android Studio or Xcode). This policy does not allow modification to Mobile Hub project configuration, and it does not allow the user to enable the use of AWS Mobile Hub in an account where it has not already been enabled. After you sign in to the Mobile Hub console and create a project, you can use the following link to view this policy and the IAM identities that are attached to it.

  https://console.aws.amazon.com/iam/home?region=us-east-1#policies/arn:aws:iam::aws:policy/AWSMobileHub_ReadOnly

Viewing the Mobile Hub Console with Read-only Permissions

If your IAM user, role, or group has read-only permissions for use in an AWS Mobile Hub project, then the project information you see in the console will not reflect any changes made outside of Mobile Hub. For example, if you remove a Cloud Logic API in API Gateway, it may still be present in the Cloud Logic Funtions list of your Mobile Hub project, until a user with **`mobilehub:SynchronizeProject`** permissions visits the console. Users who are granted console access through the **`AWSMobileHub_FullAccess`** policy have those permissions. If you need additional permissions in Mobile Hub, please contact your administrator and request the Full Access policy.

Attaching a Managed Policy to a User, Role, or Group

To use these managed policies, a user with administrative privileges must attach one of them to a user, role or group in the AWS Identity and Access Management console.

To attach a managed policy

1. Choose the link for the managed policy you want to attach.
   - https://console.aws.amazon.com/iam/home?region=us-east-1#policies/arn:aws:iam::aws:policy/AWSMobileHub_FullAccess
   - https://console.aws.amazon.com/iam/home?region=us-east-1#policies/arn:aws:iam::aws:policy/AWSMobileHub_ReadOnly
2. Choose **Attached Entities**.
3. Choose **Attach**.
4. Choose the users, roles, or groups you want to grant permissions.
5. Choose **Attach Policy**.

Mobile Hub Service Role and Policies Used on Your Behalf

The following section describes the `MobileHub_Service_Role` IAM role that allows Mobile Hub to create and modify your AWS resources and services for the project you configure.

To understand how to grant and restrict permissions to your projects in the Mobile Hub console, see Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77).

To understand AWS Identity and Access Management in more detail, see IAM Authentication and Access Control for Mobile Hub (p. 86) and Overview of Access Permissions Management for Mobile Hub Projects (p. 88).

Topics

Source of Mobile Hub Service Role Permissions

AWS Mobile Hub provides an integrated console experience in which you select mobile back-end features you can access from a mobile app. When you select and enable a feature, Mobile Hub configures multiple AWS services and resources on your behalf. Configuring AWS service or resource requires your permission to allow Mobile Hub to manage AWS services and resources for you. When you agree to the Mobile Hub console one-time request to manage AWS resources and services for you, you are giving Mobile Hub permissions that allow it to create a pre-defined IAM administrative service role, called `MobileHub_Service_Role`.

After this service role is created, you can see it at https://console.aws.amazon.com/iam/home?region=us-east-1#roles/MobileHub_Service_Role.

Trust Relationship

In the IAM console at https://console.aws.amazon.com/iam/home?region=us-east-1#roles/MobileHub_Service_Role, there is a section for the trust relationship. The trust relationship dictates

which entities can assume this role and make use of its permissions. The trust relationship for this service role has an access control policy that looks like this:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "",
            "Effect": "Allow",
            "Principal": {
                "Service": "mobilehub.amazonaws.com"
            },
            "Action": "sts:AssumeRole"
        }
    ]
}
```

This access control policy dictates that only AWS Mobile Hub (`mobilehub.amazonaws.com`) can assume this role. This policy should not be modified. No other user or system can assume this role and use its permissions.

Administrative Privileges

By allowing Mobile Hub to create and assume the `MobileHub_Service_Role` role, you give Mobile Hub permissions to create additional roles as necessary to support the features enabled in your project. The `MobileHub_Service_Role` gives Mobile Hub permission to enable any service policies necessary on these additional roles for proper operation of the mobile app.

There are no limits on the number or scope of service policies or roles Mobile Hub may create. Actions taken by Mobile Hub in this regard are always in response to your actions in the Mobile Hub console. Roles or policies are never created without direct action from you, such as creating a Mobile Hub project or configuring an app feature.

Revoking Privileges

To disallow Mobile Hub access to any users of your account, delete the `MobileHub_Service_Role` role. Make sure your users don't have permission to re-create the role, for example by having the `IAM:CreateRole` permission.

Service Policy

The service policy states which operations an entity that assumes the `MobileHub_Service_Role` role can perform. If the role has been created, go to https://console.aws.amazon.com/iam/home?region=us-east-1#roles/MobileHub_Service_Role to see the service policy used by AWS Mobile Hub. It looks like the following example:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "cloudformation:CreateUploadBucket",
        "cloudformation:ValidateTemplate",
        "cloudfront:CreateDistribution",
        "cloudfront:DeleteDistribution",
        "cloudfront:GetDistribution",
        "cloudfront:GetDistributionConfig",
```

```
        "cloudfront:UpdateDistribution",
        "cognito-identity:CreateIdentityPool",
        "cognito-identity:UpdateIdentityPool",
        "cognito-identity:DeleteIdentityPool",
        "cognito-identity:SetIdentityPoolRoles",
        "cognito-idp:CreateUserPool",
        "dynamodb:CreateTable",
        "dynamodb:DeleteTable",
        "dynamodb:DescribeTable",
        "dynamodb:UpdateTable",
        "iam:AddClientIDToOpenIDConnectProvider",
        "iam:CreateOpenIDConnectProvider",
        "iam:GetOpenIDConnectProvider",
        "iam:ListOpenIDConnectProviders",
        "iam:CreateSAMLProvider",
        "iam:GetSAMLProvider",
        "iam:ListSAMLProvider",
        "iam:UpdateSAMLProvider",
        "lambda:CreateFunction",
        "lambda:DeleteFunction",
        "lambda:GetFunction",
        "mobileanalytics:CreateApp",
        "mobileanalytics:DeleteApp",
        "sns:CreateTopic",
        "sns:DeleteTopic",
        "ec2:DescribeSecurityGroups",
        "ec2:DescribeSubnets",
        "ec2:DescribeVpcs"
      ],
      "Resource": [
        "*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "sns:CreatePlatformApplication",
        "sns:DeletePlatformApplication",
        "sns:GetPlatformApplicationAttributes",
        "sns:SetPlatformApplicationAttributes"
      ],
      "Resource": [
        "arn:aws:sns:*:*:app/*_MOBILEHUB_*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "s3:CreateBucket",
        "s3:DeleteBucket",
        "s3:DeleteBucketPolicy",
        "s3:ListBucket",
        "s3:ListBucketVersions",
        "s3:GetBucketLocation",
        "s3:GetBucketVersioning",
        "s3:PutBucketVersioning"
      ],
      "Resource": [
        "arn:aws:s3:::*-userfiles-mobilehub-*",
```

```
        "arn:aws:s3:::*-contentdelivery-mobilehub-*",
        "arn:aws:s3:::*-deployments-mobilehub-*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "s3:DeleteObject",
        "s3:DeleteVersion",
        "s3:DeleteObjectVersion",
        "s3:GetObject",
        "s3:GetObjectVersion",
        "s3:PutObject",
        "s3:PutObjectAcl"
      ],
      "Resource": [
        "arn:aws:s3:::*-userfiles-mobilehub-*/*",
        "arn:aws:s3:::*-contentdelivery-mobilehub-*/*",
        "arn:aws:s3:::*-deployments-mobilehub-*/*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "lambda:AddPermission",
        "lambda:CreateAlias",
        "lambda:DeleteAlias",
        "lambda:UpdateAlias",
        "lambda:GetFunctionConfiguration",
        "lambda:GetPolicy",
        "lambda:RemovePermission",
        "lambda:UpdateFunctionCode",
        "lambda:UpdateFunctionConfiguration
      ],
      "Resource": [
        "arn:aws:lambda:*:*:function:*-mobilehub-*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "iam:CreateRole",
        "iam:DeleteRole",
        "iam:DeleteRolePolicy",
        "iam:GetRole",
        "iam:GetRolePolicy",
        "iam:ListRolePolicies",
        "iam:PassRole",
        "iam:PutRolePolicy",
        "iam:UpdateAssumeRolePolicy",
        "iam:AttachRolePolicy",
        "iam:DetachRolePolicy"
      ],
      "Resource": [
        "arn:aws:iam::*:role/*_unauth_MOBILEHUB_*",
        "arn:aws:iam::*:role/*_auth_MOBILEHUB_*",
        "arn:aws:iam::*:role/*_consolepush_MOBILEHUB_*",
        "arn:aws:iam::*:role/*_lambdaexecutionrole_MOBILEHUB_*",
        "arn:aws:iam::*:role/*_smsverification_MOBILEHUB_*",
```

```
        "arn:aws:iam::*:role/MOBILEHUB-*-lambdaexecution*",
        "arn:aws:iam::*:role/MobileHub_Service_Role"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "logs:CreateLogGroup",
        "logs:CreateLogStream",
        "logs:PutLogEvents"
      ],
      "Resource": [
        "arn:aws:logs:*:*:log-group:/aws/mobilehub/*:log-stream:*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "iam:ListAttachedRolePolicies"
      ],
      "Resource": [
        "arn:aws:iam::*:role/MobileHub_Service_Role"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "cloudformation:CreateStack",
        "cloudformation:DeleteStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:DescribeStackResource",
        "cloudformation:GetTemplate",
        "cloudformation:ListStackResources",
        "cloudformation:UpdateStack"
      ],
      "Resource": [
        "arn:aws:cloudformation:*:*:stack/MOBILEHUB-*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "apigateway:DELETE",
        "apigateway:GET",
        "apigateway:HEAD",
        "apigateway:OPTIONS",
        "apigateway:PATCH",
        "apigateway:POST",
        "apigateway:PUT"
      ],
      "Resource": [
        "arn:aws:apigateway:*::/restapis*"
      ]
    },
    {
      "Effect": "Allow",
      "Action": [
        "cognito-idp:DeleteUserPool",
```

```
        "cognito-idp:DescribeUserPool",
        "cognito-idp:CreateUserPoolClient",
        "cognito-idp:DescribeUserPoolClient",
        "cognito-idp:DeleteUserPoolClient"
      ],
      "Resource": [
        "arn:aws:cognito-idp:*:*:userpool/*"
      ]
    }
  ]
}
```

All of these permissions pertain to resources Mobile Hub creates on your behalf. You can see these resources by choosing **Resources** in the left navigation panel of the Mobile Hub console.

AWS Identity and Access Management

These are the items in the service policy for the Mobile Hub service role defining IAM permissions.

```
"iam:CreateRole",
"iam:DeleteRole",
"iam:DeleteRolePolicy",
"iam:GetRole",
"iam:ListRolePolicies",
"iam:PassRole",
"iam:PutRolePolicy",
"iam:UpdateAssumeRolePolicy",
"iam:AttachRolePolicy",
"iam:DetachRolePolicy",
"iam:CreateSAMLProvider",
"iam:GetSAMLProvider",
"iam:ListSAMLProvider",
"iam:UpdateSAMLProvider"
```

Mobile Hub creates one or more IAM roles to use with your mobile app project, depending on the configuration options you choose for each feature. By default, IAM creates an unauthenticated app user role to allow users of your app to get temporary permissions to perform various operations with other services you've enabled. For example, you need this role when your app calls an AWS Lambda function in the Cloud Logic feature.

If you enable the Cloud Logic feature, Mobile Hub also creates an AWS Lambda execution role. This role provides your AWS Lambda functions the permissions they need to carry out their tasks; for example, writing debug logs to Amazon CloudWatch.

If you enable the User Sign-in feature, Mobile Hub creates an authenticated app user role. This authenticated app user role is used by the users of your app when they sign in using a sign-in provider such as Facebook or Google+. If you select the **Sign-in is required** option in User Sign-in, the unauthenticated app user role is removed. All access to your resources from the app then require use of the authenticated role.

In addition, if you select Google as a sign-in provider, Mobile Hub needs access to the following Open ID Connect Provider APIs from IAM:

```
"iam:AddClientIDToOpenIDConnectProvider",
"iam:CreateOpenIDConnectProvider",
"iam:GetOpenIDConnectProvider",
"iam:ListOpenIDConnectProviders",
```

These permissions allow the service to create an Open ID Connect Provider for Google if it does not already exist, and add ClientIDs to that provider.

Amazon API Gateway

These are the items in the service policy for the Mobile Hub service role defining API Gateway permissions.

```
"apigateway:DELETE",
"apigateway:GET",
"apigateway:PATCH",
"apigateway:POST",
"apigateway:PUT",
"apigateway:HEAD",
"apigateway:OPTIONS"
```

These policies enable Mobile Hub to configure REST APIs for mobile back-ends.

Amazon Cognito

These are the items in the service policy for the Mobile Hub service role defining Amazon Cognito permissions.

```
"cognito-identity:CreateIdentityPool",
"cognito-identity:UpdateIdentityPool",
"cognito-identity:DeleteIdentityPool",
"cognito-identity:SetIdentityPoolRoles",
"cognito-idp:CreateUserPool",
"cognito-idp:DeleteUserPool",
"cognito-idp:DescribeUserPool,
"cognito-idp:CreateUserPoolClient",
"cognito-idp:DescribeUserPoolClient",
"cognito-idp:DeleteUserPoolClient""
```

Amazon Cognito provides temporary credentials that give app users access to your AWS resources. By default Mobile Hub creates an Amazon Cognito identity pool to provide a scope or namespace for user identities. If you enable the User Sign-in feature and configure a sign-in provider, such as Facebook or Google+, Mobile Hub updates the identity pool to support that feature in your app.

Amazon Elastic Compute Cloud

These are the items in the service policy for the Mobile Hub service role defining Amazon EC2 permissions.

```
"ec2:DescribeSecurityGroups",
"ec2:DescribeSubnets",
"ec2:DescribeVpcs"
```

Amazon Mobile Analytics

These are the items in the service policy for the Mobile Hub service role defining Mobile Analytics permissions.

```
"mobileanalytics:CreateApp",
"mobileanalytics:DeleteApp",
```

When you enable the App Analytics feature in Mobile Hub, it creates an App ID for your app in Amazon Mobile Analytics. This App ID can be removed if you delete the project.

Amazon Simple Notification Service

These are the items in the service policy for the Mobile Hub service role defining Amazon SNS permissions.

```
"sns:CreateTopic",
"sns:DeleteTopic",
"sns:CreatePlatformApplication",
"sns:DeletePlatformApplication",
"sns:GetPlatformApplicationAttributes",
"sns:SetPlatformApplicationAttributes",
```

When you enable the Push Notifications feature, Mobile Hub creates an Amazon SNS platform application for each push platform you configure. It also creates a default Amazon SNS topic you can use to push messages to all users of your app. The topic and platform application are deleted if you delete the associated Mobile Hub project.

Amazon Simple Storage Service

These are the items in the service policy for the Mobile Hub service role defining Amazon S3 permissions.

```
"s3:CreateBucket",
"s3:DeleteBucket",
"s3:DeleteBucketPolicy",
"s3:ListBucket",
"s3:ListBucketVersions",
"s3:DeleteObject",
"s3:DeleteVersion",
"s3:PutObject",
"s3:PutObjectAcl",
"s3:GetBucketLocation",
"s3:GetObject",
"s3:GetObjectVersion",
```

App Content Delivery and User Data Storage features both use Amazon Simple Storage Service. When you enable one of these features, Mobile Hub creates an Amazon S3 bucket on your behalf. Mobile Hub also puts example files and folders in the bucket so you can demonstrate your app downloading and navigating between folders. Some of these permissions are required to set up your Amazon S3 bucket for use with Amazon CloudFront if you enable the App Content Delivery feature and select Multi-Region CDN. Other policies enable storage capabilities needed by mobile back-end features that use multiple AWS services.

Amazon CloudFront

These are the items in the service policy for the Mobile Hub service role defining CloudFront permissions.

```
"cloudfront:CreateDistribution",
"cloudfront:DeleteDistribution",
"cloudfront:GetDistribution",
"cloudfront:GetDistributionConfig",
"cloudfront:UpdateDistribution",
```

If you enable the App Content Delivery feature and configure it for Multi-Region CDN, Mobile Hub creates a CloudFront distribution with your Amazon S3 bucket set as the origin.

AWS CloudFormation

These are the items in the service policy for the Mobile Hub service role defining AWS CloudFormation permissions.

```
"cloudformation:CreateUploadBucket",
"cloudformation:ValidateTemplate",
"cloudformation:CreateStack",
"cloudformation:ListStackResources",
"cloudformation:DeleteStack",
"cloudformation:DescribeStacks",
"cloudformation:DescribeStackEvents",
"cloudformation:DescribeStackResource",
"cloudformation:GetTemplate",
"cloudformation:UpdateStack"
```

These policies allow Mobile Hub to dynamically provision and configure back-end stacks to support your mobile app's requirements.

AWS Lambda

These are the items in the service policy for the Mobile Hub service role defining Lambda permissions.

```
"lambda:CreateFunction",
"lambda:DeleteFunction",
"lambda:GetFunction",
"lambda:CreateAlias",
"lambda:DeleteAlias",
"lambda:GetFunctionConfiguration",
"lambda:GetPolicy",
"lambda:UpdateFunctionCode",
"lambda:UpdateAlias",
"lambda:UpdateFunctionConfiguration"
```

If you enable the Cloud Logic feature, Mobile Hub creates an example Lambda function. You can use this function to demonstrate invocation of a Lambda function from your app.

IAM Authentication and Access Control for Mobile Hub

In depth understanding of AWS authentication and access controls is not required to build a mobile app using AWS Mobile Hub.

Mobile Hub uses AWS credentials and permissions policies in two ways:

- Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77).
- Providing Mobile Hub Service Role and Policies Used on Your Behalf (p. 78) to create and configure the back-end features you select for your mobile app.

The following sections provide details on how IAM works, how you can use IAM to securely control access to your projects, and what IAM roles and policies Mobile Hub configures on your behalf.

Topics

Authentication

AWS resources and services can only be viewed, created or modified with the correct authentication using AWS credentials (which must also be granted access permissions (p. 88) to those resources and services). You can access AWS as any of the following types of identities:

- **AWS account root user**

  When you sign up for AWS, you provide an email address and password that is associated with your AWS account. These are your root credentials and they provide complete access to all of your AWS resources.

  > **Important**
  > For security reasons, we recommend that you use the root credentials only to create an administrator user, which is an IAM user with full permissions to your AWS account. Then, you can use this administrator user to create other IAM users and roles with limited permissions. For more information, see IAM Best Practices and Creating an Admin User and Group in the *IAM User Guide*.

- **IAM user**

  An IAM user is simply an identity within your AWS account that has specific custom permissions (for example, read-only permissions to access your Mobile Hub project). You can use an IAM user name and password to sign in to secure AWS webpages like the AWS Management Console, AWS Discussion Forums, or the AWS Support Center.

  In addition to a user name and password, you can also generate access keys for each user. You can use these keys when you access AWS services programmatically, either through one of the several SDKs or by using the AWS Command Line Interface (CLI). The SDK and CLI tools use the access keys to cryptographically sign your request. If you don't use the AWS tools, you must sign the request yourself.

- **IAM role**

  An IAM role is another IAM identity you can create in your account that has specific permissions. It is similar to an IAM user, but it is not associated with a specific person. An IAM role enables you to obtain temporary access keys that can be used to access AWS services and resources. IAM roles with temporary credentials are useful in the following situations:

  - **Federated user access**

    Instead of creating an IAM user, you can use preexisting user identities from your enterprise user directory or a web identity provider. These are known as federated users. AWS assigns a role to a federated user when access is requested through an identity provider. For more information about federated users, see Federated Users and Roles in the *IAM User Guide*.

  - **Cross-account access**

    You can use an IAM role in your account to grant another AWS account permissions to access your account's resources. For an example, see Tutorial: Delegate Access Across AWS Accounts Using IAM Roles in the *IAM User Guide*.

  - **AWS service access**

    You can use an IAM role in your account to grant an AWS service permissions to access your account's resources. For example, you can create a role that allows Amazon Redshift to access an Amazon S3 bucket on your behalf and then load data stored in the bucket into an Amazon Redshift cluster. For more information, see Creating a Role to Delegate Permissions to an AWS Service in the *IAM User Guide*.

- **Applications running on Amazon EC2**

  Instead of storing access keys within the EC2 instance for use by applications running on the instance and making AWS API requests, you can use an IAM role to manage temporary credentials for these applications. To assign an AWS role to an EC2 instance and make it available to all of its applications, you can create an instance profile that is attached to the instance. An instance profile contains the role and enables programs running on the EC2 instance to get temporary credentials. For more information, see Using Roles for Applications on Amazon EC2 in the *IAM User Guide*.

Access Control

You can have valid credentials to authenticate your requests, but unless you have permissions you cannot access or modify a Mobile Hub project. The same is true for Mobile Hub when it creates and configures services and resources you have configured for your project.

The following sections describe how to manage permissions and understand those that are being managed on your behalf by Mobile Hub.

- Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77)
- Mobile Hub Service Role and Policies Used on Your Behalf (p. 78)

Overview of Access Permissions Management for Mobile Hub Projects

In depth understanding of AWS authentication and access controls is not required to build a mobile app using AWS Mobile Hub.

Every AWS resource is owned by an AWS account, and permissions to create or access the resources are governed by permissions policies. This includes:

- Policies for Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77).
- AWS Mobile Hub Service Role and Policies (p. 78) to create and configure the back-end features you select for your mobile app.

An account administrator can attach permissions policies to IAM identities (that is, users, groups, and roles), and some services (such as AWS Lambda) also support attaching permissions policies to resources.

> **Note**
> An *account administrator* (or administrator user) is a user with administrator privileges. For more information, see IAM Best Practices in the *IAM User Guide*.
> When granting permissions, you decide who is getting the permissions, the resources they get permissions for, and the specific actions that you want to allow on those resources.

Topics

- Understanding Resource Ownership for AWS Mobile Hub (p. 89)
- Managing Access to Resources (p. 89)
- Specifying Policy Elements: Actions, Effects, Resources, and Principals (p. 90)

Understanding Resource Ownership for AWS Mobile Hub

The primary resource of a Mobile Hub project is the project itself. In first use of the Mobile Hub console, you allow Mobile Hub to manage permissions and access the project resource for you. A resource owner is the AWS account that created a resource. That is, the resource owner is the AWS account of the principal entity (the root account, an IAM user, or an IAM role) that authenticates the request that creates the resource. The following examples illustrate how this works:

- If you use the root account credentials of your AWS account to create an AWS Mobile Hub project, your AWS account is the owner of the resources associated with that project.
- If you create an IAM user in your AWS account and grant permissions to create Mobile Hub projects to that user, the user can also create projects. However, your AWS account, to which the user belongs, owns the resources associated with the project.
- If you create an IAM role in your AWS account with permissions to create AWS Mobile Hub projects, anyone who can assume the role can create, edit, or delete projects. Your AWS account, to which the role belongs, owns the resources associated with that project.

Managing Access to Resources

A *permissions policy* describes who has access to what. The following section explains the available options for creating permissions policies.

> **Note**
> This section discusses using IAM in the context of AWS Mobile Hub. It doesn't provide detailed information about the IAM service. For complete IAM documentation, see What Is IAM? in the *IAM User Guide*. For information about IAM policy syntax and descriptions, see AWS Identity and Access Management Policy Reference in the *IAM User Guide*.

Policies attached to an IAM identity are referred to as identity-based policies (IAM polices) and policies attached to a resource are referred to as resource-based policies.

Topics

Identity-Based Policies (IAM Policies)

You can attach policies to IAM identities. For example, you can do the following:

- **Attach a permissions policy to a user or a group in your account** – An account administrator can use a permissions policy that is associated with a particular user to grant permissions for that user to view or modify an AWS Mobile Hub project.
- **Attach a permissions policy to a role (grant cross-account permissions)** – You can attach an identity-based permissions policy to an IAM role to grant cross-account permissions. For example, when you first enter Mobile Hub and agree, as account principal, to grant it permissions to provision and configure your project, you are granting the AWS managed `MobileHub_Service_Role` role cross-account permissions. An AWS managed policy, `AWSMobileHub_ServiceUseOnly`, is attached to that role in the context of your Mobile Hub project. The role has a trust policy that allows Mobile Hub to act as account principal with the ability to grant permissions for services and resources used by your project.

  For more information about using IAM to delegate permissions, see Access Management in the *IAM User Guide*.

As an example of using an identity-based policy, the following policy grants permissions to a user to create an Amazon S3 bucket. A user with these permissions can create a storage location using the Amazon S3 service.

```
{
       "Version":"2012-10-17",
       "Statement":[
          {
             "Effect":"Allow",
             "Action":"s3:CreateBucket*",
             "Resource":"*"
          }
       ]
    }
```

For more information about using identity-based policies with Mobile Hub , see Using AWS Managed Policies to Control Access to Mobile Hub Projects (p. 77) and Mobile Hub Service Role and Policies Used on Your Behalf (p. 78).

For more information about users, groups, roles, and permissions, see Identities (Users, Groups, and Roles) in the *IAM User Guide*.

Resource-Based Policies

Other services, such as Amazon S3, also support resource-based permissions policies. For example, you can attach a policy to an Amazon S3 bucket to manage access permissions to that bucket.

Specifying Policy Elements: Actions, Effects, Resources, and Principals

Each service that is configured by Mobile Hub defines a set of API operations. To grant Mobile Hub permissions for these API operations, a set of actions is specified in an AWS managed policy. Performing an API operation can require permissions for more than one action.

The following are the basic policy elements:

- **Resource** – In a policy, you use an Amazon Resource Name (ARN) to identify the resource to which the policy applies.
- **Action** – You use action keywords to identify resource operations that you want to allow or deny. For example, the `s3:Createbucket` permission allows Mobile Hub to perform the Amazon S3 `CreateBucket` operation.
- **Effect** – You specify the effect when the user requests the specific action—this can be either allow or deny. If you don't explicitly grant access to (allow) a resource, access is implicitly denied. You can also explicitly deny access to a resource, which you might do to make sure that a user cannot access it, even if a different policy grants access.
- **Principal** – In identity-based policies (IAM policies), the user that the policy is attached to is the implicit principal. For resource-based policies, you specify the user, account, service, or other entity that you want to receive permissions (applies to resource-based policies only).

Amazon S3 Security Considerations for Mobile Hub Users

In Mobile Hub, if you use the User Data Storage feature, it creates an Amazon S3 bucket in your account. This topic describes the key Amazon S3 security-related features that you might want to use for this bucket.

Object Lifecycle Management

You can use object lifecycle management to have Amazon S3 take actions on files (also referred to in Amazon S3 as *objects*) in a bucket based on specific criteria. For example, after a specific amount of time since a mobile app user uploaded a file to the bucket, you might want to permanently delete that file or move it to Amazon Glacier. You might want to do this to reduce the amount of data in files that other mobile app users can potentially access. You might also want to manage your costs by deleting or archiving files that you know you or mobile app users no longer need.

For more information, see Object Lifecycle Management in the *Amazon Simple Storage Service Developer Guide*.

Object Encryption

Object encryption helps increase the protection of the data in files while they are traveling to and from a bucket as well as while they are in a bucket. You can use Amazon S3 to encrypt the files, or you can encrypt the files yourself. Files can be encrypted with an Amazon S3-managed encryption key, a key managed by AWS Key Management Service (AWS KMS), or your own key.

For more information, see the Protecting Data Using Encryption section in the *Amazon Simple Storage Service Developer Guide*.

Object Versioning

Object versioning helps you recover data in files more easily after unintended mobile app user actions and mobile app failures. Versioning enables you to store multiple states of the same file in a bucket. You can uniquely access each version by its related file name and version ID. To help manage your costs, you can delete or archive older versions that you no longer need, or you can suspend versioning.

For more information, see the Using Versioning section in the *Amazon Simple Storage Service Developer Guide*.

Bucket Logging

Bucket logging helps you learn more about your app users, helps you meet your organization's audit requirements, and helps you understand your Amazon S3 costs. Each access log record provides details about a single access request, such as the requester, bucket name, request time, request action, response status, and error code, if any. You can store logs in the same bucket or in a different one. To help manage your costs, you can delete logs that you no longer need, or you can suspend logging.

For more information, see Managing Bucket Logging in the *Amazon Simple Storage Service Console User Guide*.