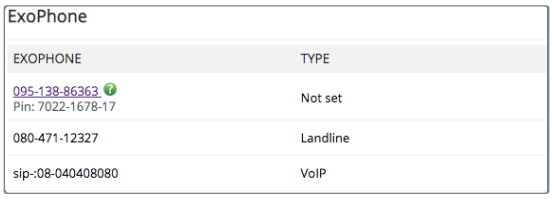
Exotel Flutter SDK Integration Guide

Introduction

ExotelVoice flutter SDK enables you to add the voip calling feature into your app. This document outlines the integration steps. The library supports only peer to peer 2-way calls. Multi-party conferencing use cases are not supported.

Licensing

Create a trial account in Exotel. To enable voip calling in the trial account, contact *exotel support*. Once Exotel support enables the voip capability in the account , a VOIP Exophone will be created as shown below and available in the account under the Exophones section .

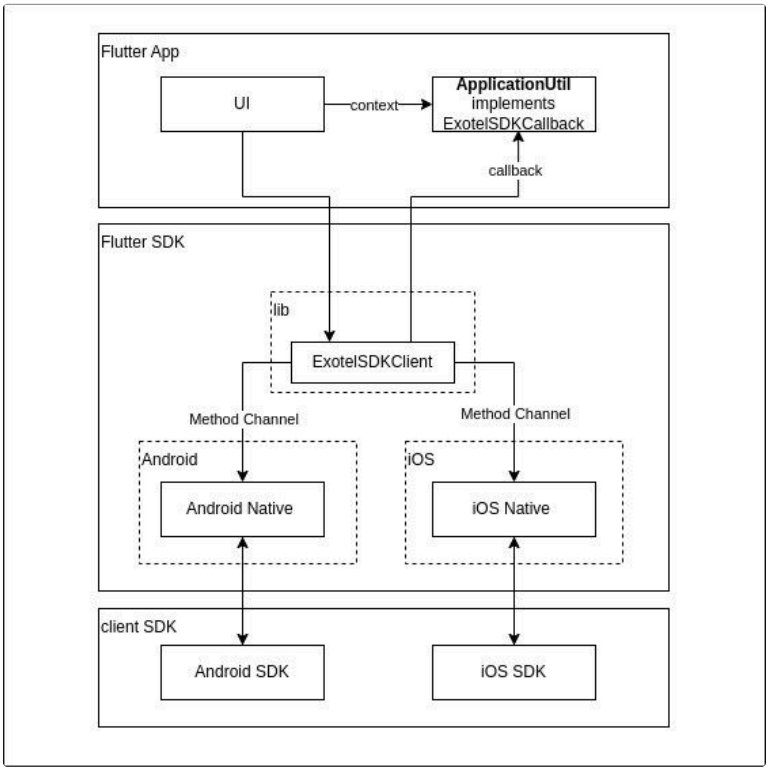


SIP Exophones discussed later in the section refers to Exophones of Voip type as shown above.

NOTE :- SIP and VOIP are used interchangeably in the document

Flutter SDK Integration

SDK Architecture



Getting Started

Software Package

- SDK (tar.gz file) includes `android` , `ios`, `lib` directories
- integration guide
- sample app for reference

Add SDK to your project

1. download the SDK from GitHub - exotel/exotel-voip-sdk-flutter
2. untar SDK

```
tar -xzvf flutter-sdk.tar.gz
```

3. copy the following directories in your flutter app
   - `flutter-sdk/android`
   - `flutter-sdk/ios`
   - `flutter-sdk/lib`
4. add native sdk
   - to `android` directory
     - go to `android` directory and run

```
make deps
```

it will download and add the aar file(`exotel-voice-release.aar`) at `<flutter path>/android/exotel-voice-sdk/`

Note: you might need to change `EXOTEL_SDK_VERSION` in Makefile to get latest version

- to `ios` directory
  - go to `ios` directory and run

```
make deps
```

it will download and add the aar file(`ExotelVoice.xcframework`) at `<flutter path>/ios/`

Note: you might need to change `EXOTEL_SDK_VERSION` in Makefile to get latest version

SDK File structure

After extracting the sdk , it contains the following directories

- `android` : android native code that has integrated exotel android sdk.
  - `app/src/main/java/com/exotel/voice_sample`
    - `MainActivity.java` : register the flutter engine and create instance of ExotelSDKChannel.
    - `ExotelSDKChannel.java` : it is android channel interface class which communicate with flutter via Method Channel.
    - `VoiceAppService.java` : this class is communicating with android sdk as per android integration guide.
- `ios` : ios native code that has integrated exotel ios sdk.
  - `Runner/AppDelegate.swift` : register the flutter engine and create instance of ExotelSDKChannel
  - `Runner/Translator`
    - `ExotelSDKChannel.swift` :it is ios channel interface class which communicate with flutter via Method Channel. it is also communicating with ios sdk as per iOS integration guide.
- `lib` : contains flutter dart files
  - `exotelSDK`
    - `ExotelVoiceClientFactory.dart` : it is factory class of SDK which provide ExotelVoiceClient using method `getExotelVoiceClient()` .
    - `ExotelVoiceClient.java` : it Exotel Voice Client interface which exposes SDK APIs.

```
abstract class ExotelVoiceClient {
  void setExotelSDKCallback(ExotelSDKCallback callback);
  void registerPlatformChannel();
  Future<String> getDeviceId();
  Future<void> initialize(String hostname, String subsriberName, String displayName, String accountSid,S
  Future<void> reset();
  Future<void> dial(String dialTo, String message);
  Future<void> mute();
  Future<void> unmute();
  Future<void> enableSpeaker();
  Future<void> disableSpeaker();
  Future<void> enableBluetooth();
  Future<void> disableBluetooth();
  Future<void> hangup();
  Future<void> answer();
  Future<void> sendDtmf(String digit);
  Future<void> postFeedback(int? rating, String? issue);
  Future<String> getVersionDetails();
  Future<void> uploadLogs(DateTime startDate, DateTime endDate, String description);
  void relaySessionData(Map<String, dynamic> data) {}
}
```

- `ExotelSDKClient.dart` : it is SDK's implementation class which has implemented `ExotelVoiceClient`. it is also flutter channel interface class which communicate with android and ios via Method Channel.
- `ExotelSDKCallaback.dart` : it is SDK Callback or Observer interface that must be implement by your flutter app to handle callbacks from ExotelSDKClient.

```
abstract class ExotelSDKCallback {
  void onInitializationSuccess();
  void onInitializationFailure(String loginStatus);
  void onAuthenticationFailure(String loginStatus);
  void onCallInitiated();
  void onCallRinging();
  void onCallEstablished();
  void onCallEnded();
  void onMissedCall();
  void onMediaDisrupted();
  void onRenewingMedia();
  void onCallIncoming(String callId, String destination);
}
```

- `MethodChannelInvokeMethod.dart`: it contains the Channel Method strings which is used to invoke native method of android/ios from flutter.

- `Service`
  - `PushNotificationService.dart` : sample push notification class.

Dependency

- add following dependecny in `pubspec.yaml` of your flutter project
  - Add permission handling dependency.

```
  permission_handler: ^11.3.0
```

  - Add firebase dependency.

```
firebase_messaging: ^14.7.20
```

Permissions

- flutter :
  how to request permission

```
static Future<void> requestPermissions() async {
    // You can request multiple permissions at once
    Map<Permission, PermissionStatus> statuses = await [
      Permission.phone,
      Permission.microphone,
      Permission.notification,
      Permission.nearbyWifiDevices,
      Permission.accessMediaLocation,
      Permission.location,  Permission.bluetoothScan,
      Permission.bluetoothConnect,
      // Add other permissions you want to request
    ].request();
    // Check permission status and handle accordingly
  }
```

- Android

  android native code must add following permission in `AndroidManifest.xml`

```
  <uses-permission android:name="android.permission.INTERNET" />
  <uses-permission android:name="android.permission.ACCESS_NETWORK_STATE" />
  <uses-permission android:name="android.permission.BROADCAST_STICKY" />
  <uses-permission android:name="android.permission.RECORD_AUDIO" />
  <uses-permission android:name="android.permission.MODIFY_AUDIO_SETTINGS" />
  <uses-permission android:name="android.permission.READ_PHONE_STATE" />
  <uses-permission android:name="android.permission.WAKE_LOCK" />
  <uses-permission android:name="android.permission.DISABLE_KEYGUARD" />
  <uses-permission android:name="android.permission.FOREGROUND_SERVICE" />
  <uses-permission android:name="android.permission.POST_NOTIFICATIONS"/>
  <uses-permission android:name="android.permission.BLUETOOTH"/>
  <uses-permission android:name="android.permission.BLUETOOTH_ADMIN"/>
  <uses-permission android:name="android.permission.BLUETOOTH_CONNECT" />
  <uses-permission android:name="android.permission.FOREGROUND_SERVICE" />
  <uses-permission android:name="android.permission.FOREGROUND_SERVICE_PHONE_CALL"/>
  <uses-permission android:name="android.permission.MANAGE_OWN_CALLS"/>
  <uses-permission android:name="android.permission.RECEIVE_BOOT_COMPLETED"/>
```

- iOS

  add following depedencies in your `Info.plist`

```
<key>UIBackgroundModes</key>
<array>
    <string>audio</string>
    <string>fetch</string>
    <string>remote-notification</string>
    <string>voip</string>
</array>
<key>NSMicrophoneUsageDescription</key>
<string>Enable microphone access to allow other people to hear you.</string>
```

  The permission_handler plugin use macros to control whether a permission is enabled.

  You must list the permission you want to use in your application:

  Add the following to your `Podfile` file:

```
post_install do |installer|
  installer.pods_project.targets.each do |target|
    flutter_additional_ios_build_settings(target)
    target.build_configurations.each do |config|
          config.build_settings['GCC_PREPROCESSOR_DEFINITIONS'] ||= [
            '$(inherited)',

            ## dart: PermissionGroup.microphone
            'PERMISSION_MICROPHONE=1',
          ]
        end
  end
end

```

please refer permission_handler | Flutter package to know in detail about permission handling.

SDK Initialization

Exotel Flutter SDK provide a interface class `ExotelVoiceClient.dart` that exposes login api to inialize the SDK(Android/iOS).

```
// get ExotelVoiceClient object from Factory class.
ExotelVoiceClient exotelVoiceClient = ExotelVoiceClientFactory.getExotelVoiceClient();

var mApplicationUtil =  ApplicationUtils.getInstance(context); // implemented ExotelSDKCallback
exotelVoiceClient.setExotelSDKCallback(mApplicationUtil);
exotelVoiceClient.registerPlatformChannel();
```

```
//initialization
try {
  exotelVoiceClient.initialize(hostname!, subscriberName!, displayName!,mAccountSid!, subscriberToken!)
} catch (e) {
  log("Error while login");
}
```

Parameter	Description
`hostname`	https://miles.apac-sg.exotel.in/v2
`subscriberName`	Param “subscriber_name” returned as part of the Subscriber management API to create a subscriber.
`displayName`	Subscriber name.
`accountSid`	Account SID param from API settings page in the Exotel Dashboard.
`subscriberToken`	can be gotten from the API in the `Get Subscriber Token` section in the Subscriber Management API document. In the *subscriberToken*, both the *refresh token* and *access token* are base64 encoded. Subscriber token format example: `{ "refresh_token":"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJ "access_token":"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJl }`

Note:

- Copying manually generated subscriber token has issues. Best way is to make API calls in source code and pass them by converting to jobject to the `exotelVoiceClient.initialize();`
- Pass the **proper device ID** to the login api to avoid invalid refresh token error. Device_id is the actual device id in which the app is running using below sample code.

```
String deviceId = exotelVoiceClient.getDeviceId();
```

In Above code,

> 1. first you need to get the ExotelSDKClient instance
> 2. register the Method Handler to handle the callback from android/iOS native module
> 3. set the callback so that ExotelSDKClient can send callback to UI for some events like *onLoggedInSuccess*, *onLoggedInFailure.* Here it is assumed that ApplicationUtil must implement `ExotelSDKCallback`

> 4. call the login api with required fields
>
>   `userId` : sub
>
>   Internal working for `initialize` api
>
>   - invoking Method `"initialize"` via MethodChannel with required arguments
>   - on Method `"initialize"` , Android/iOS native method handler will initialize the android/iOS library as mentioned in android integration guide.

When login is successful,

> - client SDK will send callback `onInitializationSuccess()`
> - Android/iOS native method handler will then invoke flutter Method `"inialize-result"`
> - on flutter Method `"inialize-result"`, `ExotelSDKClient` will check status and then send `onInitializationSuccess()` callback.

When login is fail,

> - client SDK will send callback `onInitializationFailure()` / `onAuthenticationFailure()`
> - Android/iOS native method handler will then invoke flutter Method `"inialize-result"`
> - on flutter Method `"inialize-result"`, `ExotelSDKClient` will check status and then send `onInitializationFailure()/onAuthenticationFailure()` callback.

Managing Calls

After successful initialization, the library is ready to handle calls. Dialing-out calls or receiving incoming calls is managed through same class ExotelSDKClient.

Make Outbound Calls

To make outgoing calls, Provide from username and dial to number in `dial()` API of ExotelSDKClient Interface to make outgoing calls.

```
exotelVoiceClient.dial(dialTo,message);
```

Param	Mandatory	Description
`dialTo`	Yes	ExotelVoice library always routes the call via SIP Exophone configured for your account. SIP Exophones are different from the PSTN / Mobile Exophones. They can be identified using sip: prefix. Contact exotel support to enable SIP Exophone in your account. Similar to the number masking workflow, the application backend must maintain the call context between caller and callee. On receiving the call at SIP Exophone, the exotel platform will request the callee details from the application backend to bridge the call. Refer section Dial Whom Endpoint for details.
`message`	No	The string that will be passed here will be sent to the DialWhom Endpoint under the “CustomField” param. All alphanumeric characters are allowed along with comma `,` colon `:` and all kinds of brackets - `{}()[]`

In Above Code,

1. `ExotelSDKClient` will invoke `"dial"` method
2. on Method `"dial"` , Android/iOS native method handler will dial the exophone and set the destination number as call context of current user.

When destination user is getting dialed,

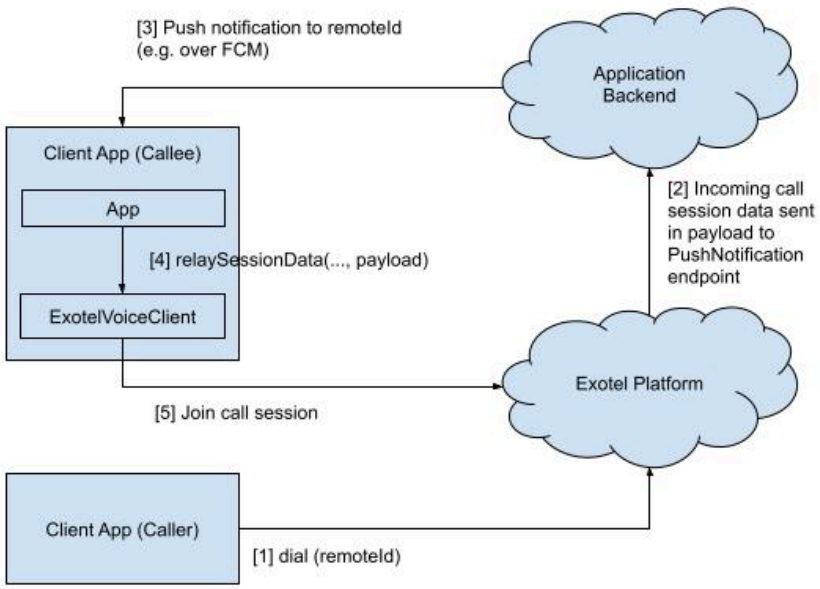
- client SDK will send callback `onCallRinging()`
- Android/iOS native method handler will then invoke flutter Method `"on-call-ringing"`
- on flutter Method `"on-call-ringing"` , `ExotelSDKClient` will check status and then send `onCallRinging()` callback.

When destination user has accepted the call,

- client SDK will send callback `onCallEstablished()`
- Android/iOS native method handler will then invoke flutter Method `"on-call-established"`
- on flutter Method `"on-call-established"` , `ExotelSDKClient` will check status and then send `onCallEstablished()` callback.

Receive Incoming Calls

The Mobile application receives incoming call data in Push Notification sent by your application backend. Refer section *Push Notification Endpoint* for details.



To Receive Push Notification from Push Notification Server, FirebaseMessaging must be initialized and subscribed for firebase message. refer Following `PushNotificationService` class which is provided as part of sdk.

```
// main.dart
main() async {
 await Firebase.initializeApp(options: DefaultFirebaseOptions.currentPlatform);
}
```

```
// PushNotificationService.dart
```

```
class PushNotificationService {

  static final PushNotificationService _instance = PushNotificationService._internal();

  FirebaseMessaging? _fcm;

  static PushNotificationService getInstance() {
    return _instance;
  }
  PushNotificationService._internal(){
    _fcm = FirebaseMessaging.instance;
  }

  Future initialize() async {
    FirebaseMessaging.onMessage.listen((RemoteMessage message) {
      ...
    }
    );
  }
  ...
}
```

The sample application uses Firebase Cloud Messaging to push call data to the device. Once received at the mobile app, it is sent to *ExotleClientSDK* through `relaySessionData` API.

```
FirebaseMessaging.onMessage.listen((RemoteMessage message) {
    exotelVoiceClient.relaySessionData(message.data);
});
```

in Above code,

> 1. you must inialize the `PushNotificationService` class
> 2. when push notification comes, data will be relayed to ExotelSDKClient using `relayFirebaseMessagingData()`
> 3. `ExotelSDKClient` will invoke `"relay-session-data"` Method.
> 4. on Method `"relay-session-data"`, Android/iOS native method handler will relay data to client SDK. which will be processes by client SDK and client SDK send callback onIncomingCall().
> 5. Android/iOS native method handler will then invoke flutter Method `"on-incoming-call"`
> 6. on flutter Method `"on-incoming-call"`, `ExotelSDKClient` will send callback `onCallIncoming()` .

Hangup

The application can call hangup() API on the call object to decline an incoming call or reject ongoing call.

```
exotelVoiceClient.hangup();
```

in Above code,

> 1. `ExotelSDKClient` will invoke `"hangup"` Method.
> 2. on Method `"hangup"`, Android/iOS native method handler will decline and terminate the call.

when call is successfully rejected,

> - client SDK will send callback `onCallEnded()`
> - Android/iOS native method handler will then invoke flutter Method `"on-call-ended"`.
> - on flutter Method `"on-call-ended"`, `ExotelSDKClient` will check call status and then send `onCallEnded()` callback.

Audio Management

Before the call begins, Exotel's SDK checks the current audio output mode and sets the audio route accordingly. By default, it is in the earpiece mode. For example, If a wired headset is plugged in, audio will get routed via wired headset.

Speaker phone mode can be enabled and disabled using `ExotelSDKClient` object APIs.

```
// change audio route to speaker
exotelVoiceClient.enableSpeaker();
// change audio route to phone earpiece
exotelVoiceClient.disableSpeaker();
```

Bluetooth mode can be enabled and disabled using `ExotelSDKClient` object APIs. This will only work when any bluetooth device is connected to the phone.

```
// enable the bluetooth
exotelVoiceClient.enableBluetooth();
// disable the bluetooth
exotelVoiceClient.disableBluetooth();
```

Local mic can be muted and unmuted during in-call using `ExotelSDKClient` object APIs.

```
// mute the call
exotelVoiceClient.mute();
// unmute the call
exotelVoiceClient.unmute()
```

Reporting Problems

The voice client library logs are stored in the application internal storage. Any issue along with the logs can be reported by app to Exotel using uploadLogs() API of `ExotelSDKClient` .

```
// Upload logs with description from startDate and endDate
 exotelVoiceClient.uploadLogs(startDate, endDate, description);
```

The API triggers onUploadLogSuccess() or onUpLoadLogFailure() callback based on the success or failure of the operation.

Reporting Call Quality Feedback

Call quality can be queried from the user and reported to the exotel platform at the end of the call.

```
// Upload logs with description from startDate and endDate
int rating = 3
CallIssue issue = BACKGROUND_NOISE
exotelVoiceClient.postFeedback(rating, issue);
```

The rating is a quality score that can take values 1 to 5.

5	Excellent quality. No issues.
4	Good quality. Negligible issues.
3	Average quality. Minor audio noise.

2	Bad quality. Frequent choppy audio or high audio delay.
1	Terrible. Unable to communicate. Call drop, No-audio or one-way audio.

The call issue is a descriptive explanation of the issue.

NO_ISSUE	No issues observed
BACKGROUND_NOISE	Low audio clarity due to noisy audio
CHOPPY_AUDIO	Frequent breaks in audio or garbling in audio
HIGH_LATENCY	Significant delay in audio
NO_AUDIO	No audio received from far user
ECHO	Echo during the call

Platform Integration

Customer API Endpoints

Exotel provides full control to customers to implement call routing business logic. For this, customers need to host the following HTTP endpoints to handle callbacks from Exotel platform.

Dial Whom Endpoint

Host a HTTP endpoint which will be queried by the Exotel platform to get to the destination user.

Method: GET

Request URL (Example): https://company.com/v1/accounts/exotel/dialtonumber

Note: This URL needs to be provided to Exotel or configured in the connect applet.

Request Body:

- `CallSid` - unique call identifier
- `CallFrom` - caller username
- `CallTo` - exophone

Expected Response:

On success, the API should return with response code 200 OK. The response body should be a string of type *sip:<remoteId>*. “sip:” tag is needed to hint the exotel platform to connect calls over voip. At present, SIP and PSTN intermixing is not supported. Any other response is treated as failure. remoteId is the username with which the call destination subscriber was registered with Exotel platform.

Example:

Request

> `GET /v1/accounts/exotelip2ipcalling1/dialtonumber?`
> `CallSid=743ddcf5a0552050bc37b6d0ff9613bn&CallFrom=sip:Alice&CallTo=sip:08040408080&CallStatus=ringing&Directio`
> `n=incoming&Created=Sat,+23+Nov+2019+22:00:37&DialCallDuration=0&StartTime=2019-11-23+22:00:37&EndTime=1970-01-`

> `01+05:30:00&CallType=call-attempt&DialWhomNumber=&flow_id=249196&tenant_id=113828&From=sip:Alice&To=sip:08040408080&CurrentTime=2019-11-23+22:00:37`

Response

```
{
    "fetch_after_attempt": false,
    "destination": {
        "numbers": [
            "sip:1234567890"
        ]
    },
    "outgoing_phone_number": "08080808080",
    "record": false,
    "recording_channels": "dual",
    "max_ringing_duration": 30,
    "max_conversation_duration": 3600,
    "request_id": "2e48100e6b474714b1a64bfa9f5b7a55",
    "method": "GET",
    "http_code": 200,
    "code": null,
    "error_data": null,
    "status": null
}
```

Push Notification Endpoint

Exotel implements registration-less dialing where a user need not periodically register with SIP registrar for receiving incoming calls. Instead the call details are pushed to the device as push notification using which call can be established. This method is beneficial as calls will reach the user even when the app is not in foreground or swipe killed. It saves battery since it does not need to keep persistent voip connection when idle.

Exotel will provide call data as payload & payloadVersion to your push notification endpoint that needs to be pushed to the client device from your application backend.

Refer section Receive Incoming Call for handling of push notification payload.

Note - Headers are not supported in the notify endpoints.

Method: POST

Request URL (Example): https://<your_api_key>:<your_api_token>@company.com/v1/accounts/exotel/pushtoclient

Note: This URL needs to be configured in Exotel platform

Request Body:

- `subscriberName` - Name with which subscriber registered with Exotel platform
- `payload` - call data which should be passed to the client SDK
- `payloadVersion` - version of payload scheme

Expected Response:

On success, the API should return with response code 200 OK. Any other response is treated as failure.

Exotel API Endpoints

Subscriber Management

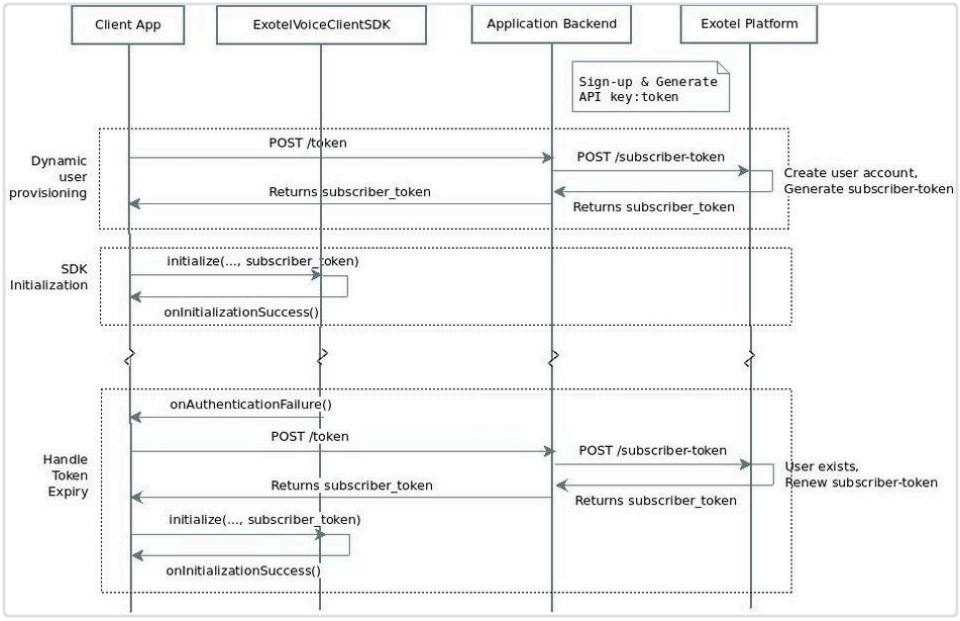
Customers can manage their subscribers in the Exotel platform using the APIs listed *"Subscriber-Management-API"* document.

For clients to be able to use voip calling features they need to be added as subscribers under your account. There are two ways in which your client registration with Exotel account happens,

1. Pre-provisioning
   The customer pre-configures the client accounts even before the app is installed by the client. Refer to the *"Subscriber-Management-API"* document for details on creating client accounts.
2. Dynamic provisioning
   A client account is created after the app is installed by the user and signs-up with the application backend. Refer to *Authentication and Authorization* for workflow details. Once client provisioning happens, clients can be managed using Subscriber Management APIs.

Authentication and Authorization

Access to the exotel platform by *ExotelVoice* is authenticated using a set of bearer tokens - *subscriber_token*. The Application backend must obtain these tokens from the exotel platform and provide them to the client on request. Refer to the *"Subscriber-Management-API"* document for details.



On receiving the *onAuthenticationFailure* event, the application should request a new *subscriber_token* from its backend and reinitialize the SDK as shown in section *Initialize Library*. Contact *exotel support* if you get *onAuthenticationFailure* even after token renewal.

onAuthenticationError() event provides following error types:

- AUTHENTICATION_INVALID_TOKEN - token parameters are invalid
- AUTHENTICATION_EXPIRED_TOKEN - token expired

Reference Documents

- Exotel Voice Client Android SDK Integration Guide
- Exotel Voice Client IOS SDK Integration Guide
- permission_handler | Flutter package

Support Contact

Please write to hello@exotel.in for any support required with integration.