Cast Companion Library for Android

Introduction

This document describes the Cast Companion Library for Android (CCL). Throughout the document, there may be references to the Cast Video application that is built using the CCL to show how the library can be used in a practical example.

CCL is written with the following objectives in mind:

- To provide a wrapper around the Cast SDK and related Google Play services to hide the mundane tasks that are needed for casting.
- To provide a collection of ready-to-use Cast-related components and features that are strongly recommended by the UX Guidelines.
- To provide an example of how the Cast SDK can be used to accomplish more complex tasks.

Since playing media is a common use case on a Chromecast device, CCL provides extensive support for casting and managing media content. In addition, it supports applications that are strictly using custom data channels.

Here is a collection of features that CCL provides for media centric applications:

- Wrapper for device discovery
- Customized notification
- Customized Cast Menu (Media Router controller dialog)
- Lock Screen remote control via `RemoteControlClient`
- Player Control while casting
- Global access via mini-controller
- Pain-free session recovery
- A single custom data channel for sending and receiving custom data
- Ability to check the installed Google Play services for compatibility

And for data centric applications:

- Wrapper for device discovery
- Wrappers for registering and using multiple custom data channels
- Pain-free session recovery
- Ability to check the installed Google Play services for compatibility

In the subsequent sections, we will describe how each of these features can be accessed by an application. In what follows, we use “client” to refer to the application that uses CCL.

Overall Design

Most of this document focuses on media-centric applications. Toward the end, we come back and discuss how data-centric apps can use this library.

To maintain the state of the application in regards to connectivity to a Cast device, there needs to be a central entity that transcends the lifecycles of individual activities in the application. The CCL’s main component, the `VideoCastManager` is the entity that does that. This class is a singleton that is responsible for managing the majority of the work by providing a rich set of APIs and callbacks, maintaining the state of the system (such as connectivity to the Cast device, status of the media on the receiver, etc), updating various components such as the CCL Notification Service and Mini-Controller.

In order to have a notification that lasts even if the client application is killed (directly by user or indirectly by the system) while casting, CCL starts a Cast Notification Service. The Cast UX guidelines request that the system notification for a Cast application to be visible only when the application is not visible. By providing simple hooks for the client, CCL handles this task as well.

Here is a subset of classes and their main responsibilities that will be discussed in more details in subsequent sections:

- *VideoCastManager*: Specifically designed for video-centric applications, this is a singleton that clients interact with directly. It internally uses other classes and components of CCL to manage and maintain the state of a video-centric application.
- *VideoCastNotificationService*. A local service that allows notifications to appear when needed beyond the availability of the main application.
- *MiniController*. A compound control that provides a mini-controller for the client.
- *RemoteControlClientCompat*. A wrapper around the `RemoteControlClient` to enable a graceful fallback for versions of Android that do not support `RemoteControlClient`. On those versions, it simply does nothing.
- *VideoCastControllerActivity*. Provides a default implementation of the Player Control screen that clients can use with their application.
- *DataCastManager*. Specifically designed for data-centric applications, it is a singleton that clients interact with directly. It internally uses other classes and components of CCL to manage and maintain the state of the data-centric application and provides means to register one or more namespaces for data communication between a sender client and a receiver application.

The MediaRouter and Cast SDK, in collaboration with the Google Play services, provide a collection of asynchronous calls that start with the discovery method and continues to route selection, device connection, `RemoteMediaPlayer` creation, etc. For each of these asynchronous calls, there is one or more callbacks that inform the caller of the success and result of the API calls, and are generally a signal that moving to the next asynchronous call is now permitted. Not all the activities or components in a client app are interested in receiving all the callbacks. CCL makes it easy for client components to only register to a subset of callbacks. Although most of the Cast API calls are made by CCL, clients can still be notified of all relevant events and callbacks, if they choose to.

Dependencies and Project Setup

Here is a list of dependencies for CCL:

- android-support-v7-appcompat
- android-support-v7-mediarouter[1] (this has a dependency on android-support-v7-appcompat)
- Google Play services (which includes the Cast SDK)

Since the two support libraries contribute resources as well, you cannot simply satisfy the dependency by including their jar files; instead you need to import them as library projects[2]. Also note that these support libraries were updated along with the release of KitKat to revision 19; if you have earlier versions of these support libraries, you need to update them first. As a result, CCL assumes you are using `ActionBarCompat` in your project.

1 Be careful that you need to use v7 support version of MediaRouter library and not the one that is included in the Android framework

2 See http://developer.android.com/tools/support-library/setup.html for how this can be done

Your client project then needs to list CCL as its only dependency for Cast related functionalities. In other words, your client application does not need to directly import or declare a dependency on the support libraries.

Since Cast APIs are mainly provided by the Google Play services, the CCL library provides a convenient static method that all client applications should call at their startup to verify that the correct version of the Google Play services is available on the device. If the Google Play services is missing or needs to be updated, a dialog will inform user and direct her to go to the Play Store to download the appropriate version. If, however, the Google Play services is not enabled, it will direct user to the device settings page to correct the issue. To enable this important validation check, here is a sample code that calls this functionality in the onCreate() of your launcher Activity of your application:

```
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        BaseCastManager.checkGooglePlayServices(this);
        .....
    }
```

How to Use the Cast Companion Library

In what follows, we will mainly focus on the video-centric applications and use the `VideoCastManager` but in many cases, the same applies to the `DataCastManager` as well.

Initializing `VideoCastManager`

The client application needs to instantiate and initialize an instance of `VideoCastManager` as early as possible. During the initialization step, the client should provide certain data that CCL needs to perform its task. It is recommended that the clients do this step in their Application class, so they can easily access it in all activities of the client applications. The following snippet shows how the Cast Video reference application does that:

```
    public static VideoCastManager getVideoCastManager(Context ctx) {
        if (null == mCastMgr) {
            mCastMgr = VideoCastManager.initialize(ctx, APPLICATION_ID,
null, null);
            mCastMgr.enableFeatures(VideoCastManager.FEATURE_NOTIFICATION |
```

```
                                    VideoCastManager.FEATURE_LOCKSCREEN |
                                    VideoCastManager.FEATURE_WIFI_RECONNECT
|
                                    VideoCastManager.FEATURE_DEBUGGING);
        }
        mCastMgr.setContext(ctx);
        return mCastMgr;
    }
```

The "`initialize`" static method takes four arguments: a Context object, application ID, and an activity that provides the "Player Control" functionality. If the client wants CCL to provide its default Player Control page, the third argument to the `initialize()` should be set to null. Finally, the last argument is used when there is a need to have custom data channel. Leave this at `null` if no custom data channel is required. See the section on data channel later in this document to see how this can be arranged.[3]

Immediately following the initialization, clients should inform the `VideoCastManager` what features they want CCL to provide by calling the static `enableFeatures` method. Currently there are four features that can be turned on: Notifications, Lock Screen remote controller, WIFI Reconnection and logging in the Google Play services. To specify which features should be enable, construct an OR-ed expression of the desired features and pass that to the `enableFeatures` method. All features are disabled by default.

Since each Activity in your application needs to access the `VideoCastManager` instance, get a reference to that in each activity in its "`onCreate()`" and "`onResume`()" lifecycle callbacks by calling:

```
    mVideoCastManager = CastApplication.getVideoCastManager(this);
```

Doing so will also update the context for the `VideoCastManager` instance.

***Remark**. In performing certain tasks, CCL needs to have a reference to a `Context` object from the client application (for example, to access client resources or system services). As a client application transitions between various internal activities, it should update this `Context` object; for example if one transitions from one activity to another within the client, it is best to call the `VideoCastManager.setContext()` method and pass the new context to CCL. This is a very important step to ensure that CCL can do its job; for example if an error dialog needs to be presented in the UI, CCL needs to have the right context. That is the reason why the `getVideoCastManager()` method is calling the `setContext()`. It is best if each activity in the client calls this method in its `onResume()`. The `getVideoCastManager(this)` does this for you if you*

3 `initialize` will log an error message if it detects that a wrong version of Google Play services is installed, is missing or is not activated.

decide to set it up as shown in the above snippet, otherwise it is your responsibility to call `CastManger.setContext()` at the appropriate time.

Adding Cast Button to Action Bar

After having `VideoCastManager` set up, the next step is to put the Cast button in the Action Bar. The assumption here is that your activity is subclass of `ActionBarActivity`, from appcompat-v7 library (see the next section for adding `MediaRouteButton` when your `Activity` inherits from `FragmentActivity`):

A. Add the following snippet to the xml file that defines your menu:

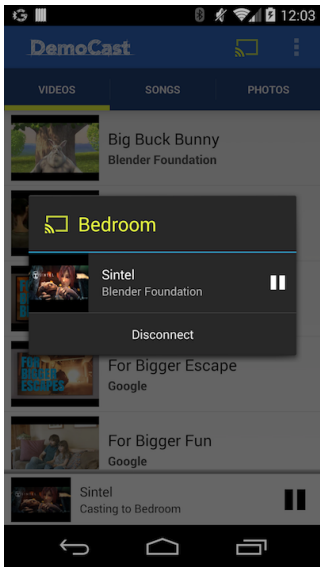
```
   <item
        android:id="@+id/media_route_menu_item"
        android:title="@string/media_route_menu_title"

app:actionProviderClass="android.support.v7.app.MediaRouteActionProvider"
    app:showAsAction="always"/>
```

B. Add the following line to the "`onCreateOptionMenu()`" of all your activities:

```
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        super.onCreateOptionsMenu(menu);
        getMenuInflater().inflate(R.menu.main, menu);
       mVideoCastManager.addMediaRouterButton(menu,
R.id.media_route_menu_item);
        return true;
    }
```

Adding the above line will put a Cast button in your Action Bar and puts the `VideoCastManager` in charge of all the required plumbing to provide the appropriate dialogs, etc. Note that this additional line also returns a pointer to the MenuItem that represents the Cast button if you need to have access to it. CCL also provides a custom Cast MediaRouter dialog when the client is connected:



Adding `MediaRouteButton`

If your `Activity` inherits (directly or indirectly) from the `FragmentActivity`, you have an additional option of using the `MediaRouteButton`. To add that button, add a snippet like the following to your layout:

```
    <android.support.v7.app.MediaRouteButton
        android:id="@+id/media_route_button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:mediaRouteTypes="user"
        android:visibility="gone" />
```

Then obtain a reference to this component in your activity and use the CCL library to set it up:

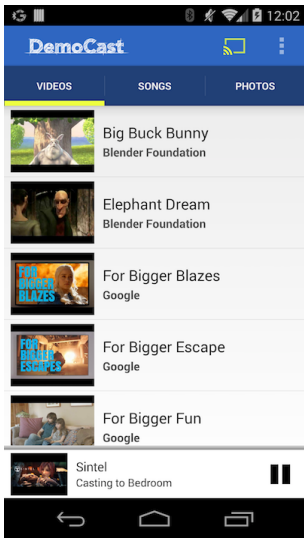
```
mMediaRouteButton = (MediaRouteButton)
findViewById(R.id.media_route_button);
mVideoCastManager.addMediaRouterButton(mMediaRouteButton);
```

For controlling the visibility, however, you need to hook into a callback from the `VideoCastManager`:

```
mVideoCastConsumer = new VideoCastConsumerImpl() {
      .....
      @Override
```

```
      public void onCastAvailabilityChanged(boolean castPresent) {
      mMediaRouteButton.setVisibility(castPresent ? View.VISIBLE :
View.INVISIBLE);
      }
      .....
}
```

Adding Mini-Controller



The mini-Controller is a small persistent component that enables users to quickly see the content that is playing on the Cast device, to perform basic operations on the remote media (such as play/pause) and to provide a way to get back to the Cast Player page (by clicking on album art). The mini-Controller should be visible if and only if the remote video is playing[4].

The CCL provides a compound component for the mini-controller that can be added to the layout XML of your pages. Here is an example:

```
    <com.google.sample.castcompanionlibrary.widgets.MiniController
        android:id="@+id/miniController1"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:layout_alignParentBottom="true"
        android:background="@drawable/shadow4"
```

4 For Audio-only content such as music, it may be required to have this component available even for local playback.

```
        android:visibility="gone">
    </com.google.sample.castcompanionlibrary.widgets.MiniController>
```

Then you need to register this component with the instance of `VideoCastManager` by adding the following lines to your Activities' "`onCreate()`":

```
    mMini = (MiniController) findViewById(R.id.miniController1);
    mVideoCastManager.addMiniController(mMini);
```

Remember to unregister this component when you are done by adding the following line of code to "`onDestroy()`" for example:

```
    mVideoCastManager.removeMiniController(mMini);
```

Upon registration, the CastManger handles updating the metadata shown in this component, updating the status of the play/pause button, and also the visibility of the whole control (e.g. if you disconnect your client application from the Cast device, it will hide this component). Note that the play/pause/stop buttons are drawables that are defined as aliases to the real assets so you can easily customize them in your application if needed. These aliases can be found in the res/drawable directory of the CCL and are named as `ic_mini_controller_pause` and similar names for the other two). You can copy those aliases to your application and change where they should point to.

Notifications

Notifications will be provided for you if you enabled that feature after initializing the `VideoCastManager`. What remains to be done is to help CCL discover when the client application is visible (to hide the notification) and when it is not visible (to show the notification). This can be accomplished by adding the following line to your "`onResume()`":

```
    mVideoCastManager.incrementUiCounter();
```

and the following line to "`onPause()`" of all your activities:

```
    mVideoCastManager.decrementUiCounter();
```

Lock Screen Controllers and Volume

CCL can provide default lock screen controllers based on the RemoteControlClient. If desired, this feature needs to be enabled at the initialization time of the VideoCastManager. When this feature is enabled, a Play/Pause button will be shown on Android devices running Jelly Bean or above. On KitKat devices, the layout of the lock screen controllers is different and uses a full-screen album art while on Jelly Bean it is a small version of the album art.

In addition, when this feature is enabled, CCL provides the ability for users to control the Cast device's system's volume even if the application is in the background. On KitKat devices, it provides that capability even if the screen is off.

Cast Player Screen

If during the initialization of `VideoCastManager` you opted for the default Cast Player screen, you will get that without any additional settings.

The Cast Player page shows a full screen artwork with some additional metadata and some controls to manage the playback of the media on a remote device. It is important to provide a larger size image for your media for the best experience.

If user clicks on the artworks in the mini-controller or notification, a transition to the Cast Player page will happen automatically. If, however, you want to start casting from within the client application, the Cast Manager provides a simple mechanism for you to launch that screen:

```
mVideoCastManager.startCastControllerActivity(context, mSelectedMedia,
position, autoPlay);
```

Here, `mSelectedMedia` is the `MediaInfo` object that represents your desired media that needs to be casted, `position` (integer) is the starting point of the video and the `autoPlay` (boolean) signals whether you want to automatically start the playback of the media remotely or not.

***Remark 1**. To have all the metadata for a movie available when needed, you need to build and populate an instance of `MediaInfo (defined in the Cast SDK)` to represent a movie. The field that will be used in various places are:*

- metadata: use an instance of `MovieMetadata` that is populated with:
    - title
    - sub-title
    - studio
    - images
        - index 0: small size image used for notification, mini-controller and Lock Screen on JB
        - index 1: large image, used on the Cast Player page and Lock Screen on KitKat
- contentId (populate this with the URL pointing to the media)
- contentType: e.g. “video/mp4”
- streamType: typically of type `MediaInfo.STREAM_TYPE_BUFFERED`

***Remark 2**. It is very tempting to try to pass around `MediaInfo` objects from one activity to another. For example, if user is browsing a catalog and selects a video to be taken to the next activity that has detailed info on the media, it is ideal to use the `MediaInfo` that represents the selected media and pass that to the next activity. Unfortunately, `MediaInfo` is neither `Serializable` nor `Parceable` so you cannot pass that in an intent; however, CCL uses a simple `Bundle` to wrap the `MediaInfo`, and provides two static utility methods `Utils.toMediaInfo()` and `Utils.fromMediaInfo()` for conversion between the two types:*

```
    public static Bundle fromMediaInfo(MediaInfo info);
    public static MediaInfo toMediaInfo(Bundle wrapper);
```

Volume Control

In Cast Player screen, user is able to control the remote volume using the hardware volume. The increment (or decrement step) is set to 0.05 (see VideoCastControllerActivity.DEFAULT_VOLUME_INCREMENT) but can be changed by the client application. For example, if you want to set that to 0.1, you need to call the following prior to using that activity:

```
Utils.saveFloatToPreference(getApplicationContext(),
                VideoCastManager.PREFS_KEY_VOLUME_INCREMENT, 0.1);
```

CCL also provides an easy way for developers to handle volume control in their applications. Inside an activity, one can override dispatchKeyEvent:

```
@Override
public boolean dispatchKeyEvent(KeyEvent event) {
    if (mCastManager.onDispatchVolumeKeyEvent(event, VOLUME_INCREMENT)) {
        return true;
    }
    return super.dispatchKeyEvent(event);
}
```

CCL will then handle the rest, i.e. it enables controlling the cast volume through the hard volume button on the phone inside that activity and also shows a visual volume bar when casting on supported versions.

Session Recovery (Reconnection)

To provide a seamless experience for users, we need to support the following scenario: assume that a client application is connected to a Cast device. If the user closes the application without calling an explicit disconnect, and later on opens the same application, the client application needs to try to re-establish the connection to the same device as long as the Cast device is still running the same session that the user had started earlier. If system has not yet killed your application, this does not require any effort but if your application has been killed by the system (or your connectivity was lost because you stepped outside of the wifi range, etc), some work needs to be done. To accomplish that, CCL provides an API that client application can call in the "`onCreate()`" of the launcher activity:

```
  mVideoCastManager.reconnectSessionIfPossible(context, showDialog,
timeoutInSeconds);
```

This method makes a best-effort attempt to reconnect to the same device if the same session is still running. The (boolean) showDialog parameter causes a dialog to be shown[5] during this period and the optional (int) timeoutInSeconds limits how long (in seconds) the whole reconnection effort should be attempted. If the last parameter is not present, a 10 seconds timeout will be enforced. If during this timeout period the client was not able to establish a connection, the effort will be stopped.

There are more subtle, yet important, cases that are required to be handled. As an example, the user starts casting a long video and puts down her phone on the table; the phone goes to sleep and the wifi radio is turned off by the system. When, after a while, the user picks up her phone to pause the movie using the lock screen controls but since her phone had lost connectivity, she cannot take any immediate actions. Reconnection logic should handle such scenarios and as soon as the wifi connectivity is up again, it should try to connect to the same session and make the lock screen controls operational.

To handle those and other related cases that are explained in the Cast UI Checklist, CCL manages a long-running service `ReconnectionService` that can monitor the wifi connectivity and using the persisted connection and media information, tries to reconnect if possible. An application developer, however, can decide that in a specific situation she doesn't want the reconnection to happen. The proper way to handle this is to clear the persisted data by calling `VideoCastManager.clearPersistedInfo(what)` (or

[5] The text shown in the dialog can be customized via a string resource with id `session_reconnection_attempt`

`DataCastManager.clearPersistedInfo(what)`). The argument "`what`" can be one or a combination of different values that can restrict what portion(s) of the persisted information should be cleared, see the JavaDoc for more details.

Note. *The long running service `ReconnectionService` will only start if the `FEATURE_WIFI_RECONNECT` has been set during the `VideoCastManager` initialization.*

Single Custom Data Channel

For media-centric applications, CCL also provides a single data channel (in addition to the standard media channel) to enable out-of-bound communication between the sender and receiver applications. For example, a sender application may need to provide a mechanism for its users to give a thumbs-up or thumbs-down when they are watching a content, or toggle the Closed Caption. These types of communications require a custom data channel.

To facilitate this, the last argument to the `initialize()` call to initialize the `VideoCastManager` can be used. You can choose a namespace of your choice and pass that as the last argument to that call. Then CCL will set up the sender part of the data channel and provides a single API for you to send a message to the receiver (`sendDataMessage()`), and two callbacks for you to remain informed when a message is received from receiver (`onDataMessageReceived()`) and when the send command encounters an error (`onDataMessageSendFailed()`). CCL also provides an API for you to remove your custom data channel (`removeDataChannel()`), but does the appropriate clean up for you when you disconnect from a device. Refer to the JavaDoc for the library for the documentation on these APIs and callbacks.

Support for data-centric applications

If you are working with an application that is mainly data-centric and need one or more custom data channels but no media data channel, you can initialize and use a different class in the library, the "`DataCastManager`". This class is the equivalent of the `VideoCastManager` and behaves similarly when you are setting it up. The initialization of this singleton is done by calling the following method:

```
initialize(Context context, String applicationId, String...namespaces)
```

As is clear from the above, you can register one or more namespaces by appending them as last arguments of this method. Note that you can add/remove namespaces later on by calling:

```
addNamespace(String namespace); // to add a new namespace
removeNamespace(String namespace); // to remove
```

The library takes care of setting up the data channel(s) for you. You can then use the following API to send a message on any of these channel(s):

```
void sendDataMessage(String message, String namespace)
```

This will send a message. Messages that are sent to the sender from the receiver can be captured by extending `DataCastConsumerImpl` class and overriding the following callbacks:

```
    public void onMessageReceived(CastDevice castDevice, String namespace,
String message) {}

    public void onMessageSendFailed(CastDevice castDevice, String namespace,
long messageId, int errorCode) {}
```

Hooking into Lifecycle Callbacks

The CCL library tries to handle most common scenarios but it also provides clients with access to events that can be useful in more advanced cases. For media-centric applications, clients can implement `IVideoCastConsumer` interface and register the implementation with the `VideoCastManager` instance. In case of data-centric apps, implement `IDataCastConsumer` and register the implementation with the instance of `DataCastManager`.

If you refer to the documentation on these interfaces, you will notice a long list of callbacks that range from connectivity success to application launch failure, etc. To make your life easier, the library introduces two no-op implementations of these interfaces: `VideoCastConsumerImpl` and `DataCastConsumerImpl`. Consequently, you can extend these classes and ignore all the interface methods except the ones that you are interested in and only override those methods. For example, here is how you can extend and register one:

```
        mVideoCastManager.addVideoCastConsumer(new VideoCastConsumerImpl() {
            @Override
            public boolean onApplicationConnectionFailed(int errorCode) {
                // do what your application wants
                return true;
            }
        }
```

Remark 1. *In order to use the custom data channels properly, you need to implement the custom data related methods of these interfaces to at least receive messages from the receiver.*

Remark 2. *Most methods in these two interfaces have no return values. However, there are few of them that should return a `boolean`. These methods are related to failures in various stages (for example "launching application failed"). CCL can provide a standard error dialog for your application if your implementation of these methods returns `true` (that is the behavior of the default implementation classes, as well). If you want to provide your own error dialogs, make sure you override these methods and return `false`.*

Remark 3. *All the lifecycle callbacks are called on the Main (i.e. UI) Thread.*

Advanced Topics

Live Streams

For live streams, the “pause” action should be interpreted somewhat differently. In general, if user starts playback after a pause in a live stream, player will not resume from the last point but instead will start from the current time in the live stream (in other words, there is no DVR functionality). As such, some applications prefer to use a “stop” icon instead of a “pause” when dealing with the live streams. Another difference is that a live stream cannot be “seeked” and most likely doesn’t have a duration. CCL provides mechanisms for application developers to handle these. First, one has to set the correct stream type on a media item so that CCL can recognize that as a live stream:

```
MediaInfo.Builder(url).setStreamType(MediaInfo.STREAM_TYPE_LIVE)....
```

For media items with the above stream type, CCL automatically uses a “stop” icon instead of a “pause” icon in all relevant places: in Mini Controllers, Notifications, Lock Screen, Media Router Controller Dialog and `VideoCastControllerActivity`. In addition, the `VideoCastControllerActivity` hides the seekbar and the duration for live streams. There are two technical details that you need to be aware of:

- For live streams, when user presses the “stop” button, the CCL library still sends the same “pause” command to the receiver. The reason for this is two fold: the receiver needs to provide its custom logic for handling this functionality, so it can interpret the “pause” command based on the type of media accordingly, and the second reason is that the standard “stop” command has a special functionality associated with it, for example it unloads the media and that is not the desired behavior for the live streams.
- When a live stream is “stopped”, receiver **has** to send a media status update message back to the sender and should report the state as `MediaStatus.PLAYER_STATE_IDLE` with the reason `MediaStatus.IDLE_REASON_CANCELED`. For live streams, the CCL library will interpret this status appropriately.

Reconnection

One of the parameters that the Reconnection logic uses to control its behavior is the duration of the media that is playing on the cast device. When we are dealing with a live stream, there is no clear duration so the library uses a default value of “2 hrs”. This, however, can be changed if needed; call `VideoCastManager.setLiveStreamDuration(duration)` where `duration` should be specified in milliseconds.

Obtaining Authorization prior to playback

There are situations where an application needs to authorize a user before it allows the playback of a content. The CCL library has certain hooks and mechanisms in place to help with this process. Here is a list of steps:

1. Client applications need to provide an implementation of `IMediaAuthService`[6]. The implementation is responsible for encapsulating the process internally but should not start the authorization process till its `start()` method is called.
2. When ready, the client application needs to call the following library method and pass the implementation of the interface to the framework:

```
VideoCastManager.startCastControllerActivity(Context context,
IMediaAuthService authService)
```

3. Framework will build and pass an instance of `IMediaAuthListener` to the implementation; this listener interface provides two callback methods, `onResult()` and `onFailure()`, using which, the implementation can communicate back with the library when its work is done, or if it encounters an error.
4. Framework will start the `VideoCastControllerActivity` and at an appropriate time calls the `start`() method of the `IMediaAuthService` to start the authorization process. It also calls the `getMediaInfo()` on that interface to get the current media information. It is possible that at that point in the process, the `getMediaInfo()` returns a very limited information since, for example, the URL to the media may not yet be available until the authorization succeeds. The framework, however, expects to find the artwork assets in that early `MediaInfo` object so it can provide a background image for the `VideoCastControllerActivity` while the authorization process is happening. Note that the implementation has to provide a timeout (obtained through `IMediaAuthService.getTimeout()`) so the framework can interrupt the process after a reasonable period.
5. When the authorization process is finished, the implementation has to call the `onResult()` of the `IMediaAuthListener` to inform the framework that the authorization process is completed; the arguments passed to this method will determine if authorization was granted or rejected. If the authorization process encounters an unrecoverable error, it has to call the `onFailure()` of the `IMediaAuthListener` to inform the framework.

Supporting Configuration Changes in `VideoCastControllerActivity`

A client application may need to support different configurations for the `VideoCastControllerActivity` and provide different layouts for each configuration, for example a landscape and a portrait layout. To provide continuity during the configuration changes (especially if a pre-authorization or a normal load is happening), the framework uses a `Fragment` (`VideoCastControllerFragment`) to maintain the state and to handle the work; this

6 Despite the name, this has nothing to do with an Android Service; it can be a simple POJO.

fragment does not contribute any UI; the UI is completely handled by the `VideoCastControllerActivity`. A common approach to customize the UI is to copy the layout resources from the library to your project (layout is defined in `cast_activity.xml`) and modify the layout in your own project (without changing the IDs of the components). In some cases, this is still not as flexible as an application needs. To further accommodate that, the CCL library allows you to define your own activity and yet use the `VideoCastControllerFragment` to manage the lifecycle and interaction with a cast device. In order for that to work, your activity should implement `IVideoCastController` interface (`VideoCastControllerActivity` itself is an implementation of that interface). Please take a look at the `VideoCastControllerActivity` to see how the `VideoCastControllerFragment` needs to be called.

Configuration and Setup

Manifest file

Your `AndroidManifest.xml` file needs to include certain elements and metadata for the library and Cast SDK proper operation. Here is a list of requirements:

- Minimum SDK version: the minimum SDK version that the library works with is 10 (GingerBread 2.3.3).
- Permissions: using the cast functionality does not require any additional permissions.
- Application Metadata: add the following metadata to your application declaration:

```
      <meta-data
                  android:name="com.google.android.gms.version"

      android:value="@integer/google_play_services_version" />
```

- Makes sure your application's "theme" is correctly set based on the min SDK version. For example, you may need to use a variant of `Theme.AppCompat` or one that inherits from these themes. Note that this is not a requirement for Cast, per se.
- Declare the VideoCastControllerActivity:

```
    <activity
android:name="com.google.sample.castcompanionlibrary.cast.player.Video
CastControllerActivity"
            android:screenOrientation="portrait"
            android:label="@string/app_name"
            android:launchMode="singleTask"
            android:parentActivityName="*MY_PARENT_ACTIVITY*"
            android:theme="*AN_OVERLAY_THEME*">
            <meta-data
                android:name="android.support.PARENT_ACTIVITY"
                android:value="*MY_PARENT_ACTIVITY*" />
```

```
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
            </intent-filter>
        </activity>
```

There are a few things that you need to set in the above snippet. Assume that user clicks on your application's notification from the status bar while casting. The desired behavior is to open your application and direct user to the `VideoCastControllerActivity`. However, this is not the main launcher activity of your application, so if the user were to press the back button, she should not be sent out of the application. The correct behavior would be to send the user to the parent activity; the one that in a normal execution of your application would show up when user goes back from the `VideoCastControllerActivity`. This special behavior can be achieved by creating a "back stack" for the `PendingIntent` in the notification service. CCL can handle this for you if you declare in the manifest what activity is the correct parent activity; you need to enter the name of that activity (possibly a fully qualified name) in the two places in the above snippet where the `*PARENT_ACTIVITY*` is used[7]. In addition, the `VideoCastControllerActivity` is best presented if you use an overlay Action Bar theme; the CastVideos reference app defines one (`DemocastOverlay`) that you can copy and use, or you can define your own theme; it should replace the `*AN_OVERLAY_THEME*` in the above snippet.

- Declare the following receiver:

```
<receiver
android:name="com.google.sample.castcompanionlibrary.remotecontrol.VideoInten
tReceiver" >
   <intent-filter>
      <action android:name="android.media.AUDIO_BECOMING_NOISY" />
      <action android:name="android.intent.action.MEDIA_BUTTON" />
      <action
android:name="com.google.sample.castcompanionlibrary.action.toggleplayback" /
>
      <action
android:name="com.google.sample.castcompanionlibrary.action.stop" />
   </intent-filter>
</receiver>
```

This receiver is called when user interacts with the `VideoCastNotificationService` or `RemoteControlClient`; each of these components broadcast a message that this receiver catches and handles appropriately.

- Declare the following service (for `VideoCastNotificationService`):

7 See http://developer.android.com/guide/topics/ui/notifiers/notifications.html#NotificationResponse for more information

```
<service
android:name="com.google.sample.castcompanionlibrary.notification.VideoCastNo
tificationService"
android:exported="false">
   <intent-filter>
      <action
android:name="com.google.sample.castcompanionlibrary.action.toggleplayback" /
>
      <action
android:name="com.google.sample.castcompanionlibrary.action.stop" />
      <action
android:name="com.google.sample.castcompanionlibrary.action.notificationvisib
ility" />
   </intent-filter>
</service>
```

Configurable Messages

Here is a list of strings defined in the strings.xml file that the application client can override in its own strings.xml, please consult that file for an up-to-date list:

```
    <!--  Used in Error Dialog -->
    <string name="ok">OK</string>

    <!-- Title of the Error Dialog -->
    <string name="error">Error</string>

    <!-- Shown in VideoCastControllerActivity -->
    <string name="casting_to_device">Casting to %1$s</string>
    <string name="loading">Loading&amp;#8230;</string>

    <!-- Used in Router Controller Dialog -->
    <string name="no_media_info">No media information available</string>

    <!-- Session Recovery Dialog message -->
    <string name="session_reconnection_attempt">Attempting to recover
previous session&amp;#8230;</string>

    <!-- onApplicationConnectionFailed() errors -->
    <string name="failed_to_launch_app">Failed to lauch application</string>
    <string name="failed_app_launch_timeout">The request to launch the
application has timed out!</string>
    <string name="failed_to_find_app">The application you are trying to
launch is not availabled on your Chromecast device</string>

    <!--  Error messages for the play.pause in mini player -->
    <string name="failed_to_play">Failed to start the playback of
```

```
media</string>
    <string name="failed_to_pause">Failed to pause the playback of
media</string>
    <string name="failed_unknown">An unknown error was encountered</string>

    <!--  Failure to connect -->
    <string name="failed_to_connect">Could not connect to the
device</string>
```