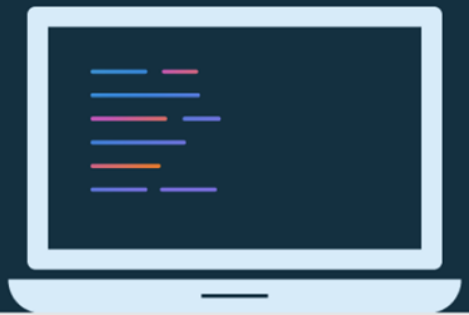
Lesson 11: Connect to the internet



About this lesson

Lesson 11: Connect to the internet

- Android permissions
- Connect to, and use, network resources
- Connect to a web service
- Display images
- Summary

Android permissions

Permissions

- Protect the privacy of an Android user
- Declared with the `<uses-permission>` tag in the `AndroidManifest.xml`

Permissions granted to your app

- Permissions can be granted during installation or runtime, depending on protection level.
- Each permission has a protection level: normal, signature, or dangerous.
- For permissions granted during runtime, prompt users to explicitly grant or deny access to your app.

Permission protection levels

Protection Level	Granted when?	Must prompt before use?	Examples
Normal	Install time	No	`ACCESS_WIFI_STATE`, `BLUETOOTH`, `VIBRATE`, `INTERNET`
Signature	Install time	No	N/A
Dangerous	Runtime	Yes	`GET_ACCOUNTS`, `CAMERA`, `CALL_PHONE`

Add permissions to the manifest

In `AndroidManifest.xml`:

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.sampleapp">

    <uses-permission android:name="android.permission.USE_BIOMETRIC" />

    <application>
        <activity
            android:name=".MainActivity" ... >
            ...
        </activity>
    </application>
</manifest>
```

Internet access permissions

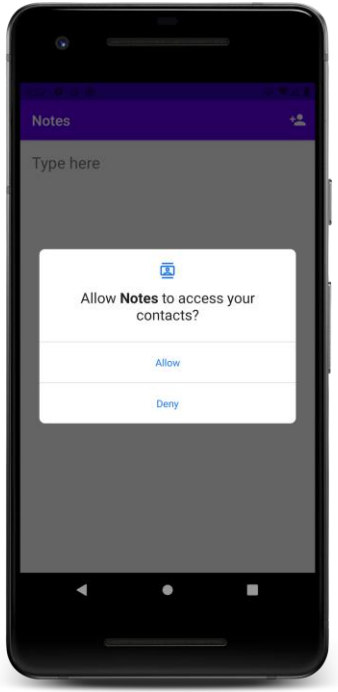
In `AndroidManifest.xml`:

```
<uses-permission android:name="android.permission.INTERNET" />
<uses-permission android:name="android.permission.ACCESS_NETWORK_STATE" />
```

Request dangerous permissions

- Prompt the user to grant the permission when they try to access functionality that requires a dangerous permission.
- Explain to the user why the permission is needed.
- Fall back gracefully if the user denies the permission (app should still function).

Prompt for dangerous permission



App permissions best practices

- Only use the permissions necessary for your app to work.
- Pay attention to permissions required by libraries.
- Be transparent.
- Make system accesses explicit.

Connect to, and use, network resources

Retrofit

- Networking library that turns your HTTP API into a Kotlin and Java interface
- Enables processing of requests and responses into objects for use by your apps
  - Provides base support for parsing common response types, such as XML and JSON
  - Can be extended to support other response types

Why use Retrofit?

- Builds on industry standard libraries, like OkHttp, that provide:
  - HTTP/2 support
  - Connection pooling
  - Response caching and enhanced security
- Frees the developer from the scaffolding setup needed to run a request

Add Gradle dependencies

```
implementation "com.squareup.retrofit2:retrofit:2.9.0"
implementation "com.squareup.retrofit2:converter-moshi:2.9.0"

implementation "com.squareup.moshi:moshi:$moshi_version"
implementation "com.squareup.moshi:moshi-kotlin:$moshi_version"
kapt "com.squareup.moshi:moshi-kotlin-codegen:$moshi_version"
```

Connect to a web service

HTTP methods

- GET
- POST
- PUT
- DELETE

Example web service API

URL	DESCRIPTION	METHOD
`example.com/posts`	Get a list of all posts	`GET`
`example.com/posts/username`	Get a list of posts by user	`GET`
`example.com/posts/search?filter=queryterm`	Search posts using a filter	`GET`
`example.com/posts/new`	Create a new post	`POST`

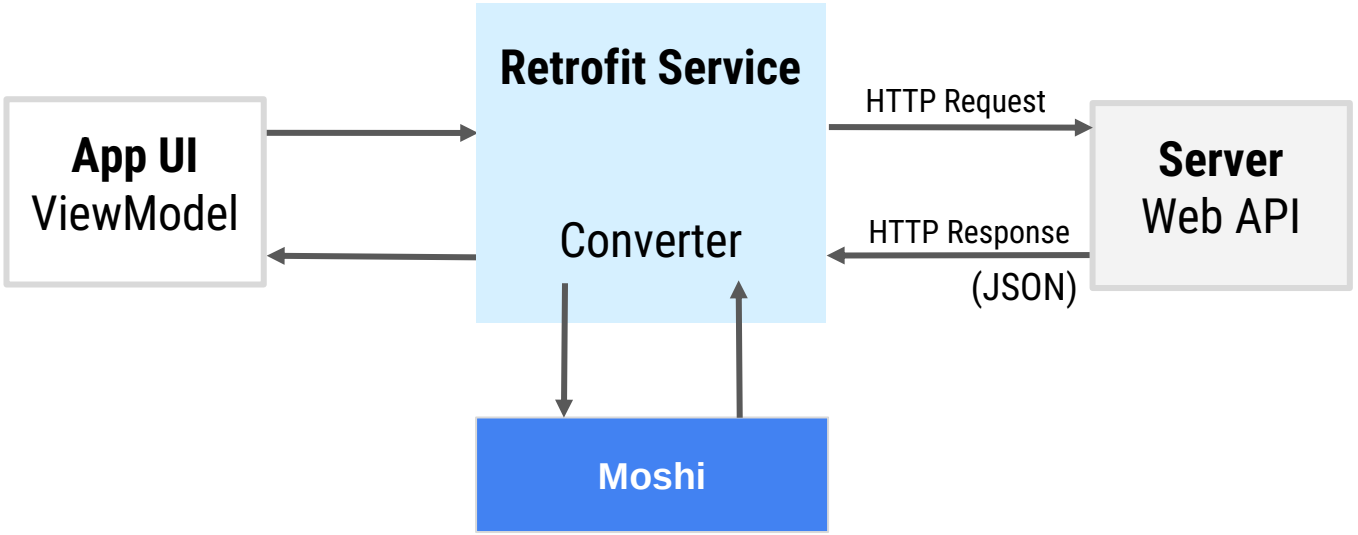
Define a Retrofit service

```
interface SimpleService {

    @GET("posts")
    suspend fun listPosts(): List<Post>

    @GET("posts/{userId}")
    suspend fun listByUser(@Path("userId") userId:String): List<Post>

    @GET("posts/search")  // becomes post/search?filter=query
    suspend fun search(@Query("filter") search: String): List<Post>

    @POST("posts/new")
    suspend fun create(@Body post : Post): Post
}
```

Create a Retrofit object for network access

```
val retrofit = Retrofit.Builder()
    .baseUrl("https://example.com")
    .addConverterFactory(...)
    .build()

val service = retrofit.create(SimpleService::class.java)
```

End-to-end diagram



Converter.Factory

Helps convert from a response type into class objects

- JSON (Gson or Moshi)
- XML (Jackson, SimpleXML, JAXB)
- Protocol buffers
- Scalars (primitives, boxed, and Strings)

Moshi

- JSON library for parsing JSON into objects and back
- Add Moshi library dependencies to your app's Gradle file.
- Configure your Moshi builder to use with Retrofit.

Moshi JSON encoding

```
@JsonClass(generateAdapter = true)
data class Post (
    val title: String,
    val description: String,
    val url: String,
    val updated: String,
    val thumbnail: String,
    val closedCaptions: String?)
```

JSON code


```
{
    "title":"Android Jetpack: EmojiCompat",
    "description":"Android Jetpack: EmojiCompat",
    "url":"https://www.youtube.com/watch?v=sYGKUtM2ga8",
    "updated":"2018-06-07T17:09:43+00:00",
    "thumbnail":"https://i4.ytimg.com/vi/sYGKUtM2ga8/hqdefault.jpg"
}
```

Set up Retrofit and Moshi

```
private val moshi = Moshi.Builder()
    .add(KotlinJsonAdapterFactory())
    .build()

val retrofit = Retrofit.Builder()
    .addConverterFactory(MoshiConverterFactory.create(moshi))
    .baseUrl(BASE_URL)
        .build()

object API {
    val retrofitService : SimpleService by lazy {
        retrofit.create(SimpleService::class.java)
    }
}
```

Use Retrofit with coroutines

Launch a new coroutine in the view model:

```
viewModelScope.launch {
    Log.d("posts", API.retrofitService.searchPosts("query"))
}
```

Display images

Glide

- Third-party image-loading library in Android
- Focused on performance for smoother scrolling
- Supports images, video stills, and animated GIFs

Add Gradle dependency

```
implementation "com.github.bumptech.glide:glide:$glide_version"
```

Load an image

```
Glide.with(fragment)
     .load(url)
     .into(imageView);
```

Customize a request with RequestOptions

- Apply a crop to an image
- Apply transitions
- Set options for placeholder image or error image
- Set caching policies

RequestOptions example

```
@BindingAdapter("imageUrl")
fun bindImage(imgView: ImageView, imgUrl: String?) {

    imgUrl?.let {
        val imgUri = imgUrl.toUri().buildUpon().scheme("https").build()

        Glide.with(imgView)
            .load(imgUri)
            .apply(RequestOptions()
                .placeholder(R.drawable.loading_animation)
                .error(R.drawable.ic_broken_image))
            .into(imgView)
    }
}
```

Summary

Summary

In Lesson 11, you learned how to:

- Declare permissions your app needs in `AndroidManifest.xml`
- Use the three protection levels for permissions: normal, signature, and dangerous (prompt the user at runtime for dangerous permissions)
- Use the Retrofit library to make web service API calls from your app
- Use the Moshi library to parse JSON response into class objects
- Load and display images from the internet using the `Glide` library

Learn More

- App permissions best practices
- Retrofit
- Moshi
- Glide

Pathway

Practice what you've learned by completing the pathway:

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