Private by design Android apps

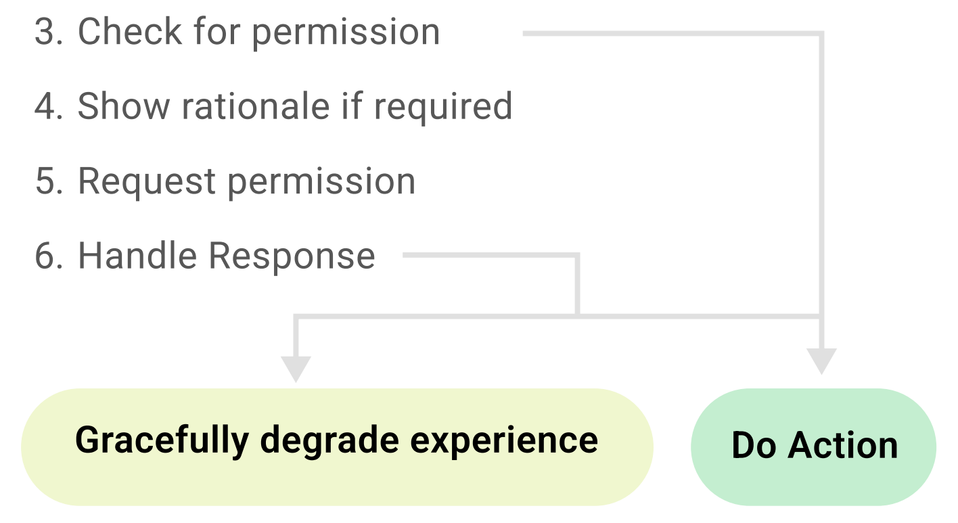
https://d.android.com/design-for-safety

android developers

Requesting runtime permissions

https://d.android.com/training/permissions/requesting

1. Declare permissions
2. Increase situational context & wait for user action
3. Check for permission
4. Show rationale if required
5. Request permission
6. Handle Response



```
ContextCompat.checkSelfPermission(
     context,
     Manifest.permission.REQUESTED_PERMISSION
) == PackageManager.PERMISSION_GRANTED
```

```
val requestPermission =
  registerForActivityResult(RequestPermission()) {
    isGranted: Boolean ->
      if (isGranted) { … } else { … }
  }
```

```
requestPermissionLauncher.launch(
    Manifest.permission.REQUESTED_PERMISSION
)
```

Permission minimized requests

https://d.android.com/training/permissions/evaluating

```
registerForActivityResult(PickContact()) { uri -> … }
```

Show nearby places · Create & access files · Identify device · Pair over Bluetooth · Manage phone calls & text

More at https://d.android.com/reference/androidx/activity/result/contract/ActivityResultContracts

Permission denials

If the user denies a permission, gracefully degrade your app's experience

- ✓ Clearly highlight the feature / part of your app with limited functionality due to the permission denial
- ✓ Let users continue to use other features in your app normally

Data Safety Labels

https://d.android.com/guide/topics/data/collect-share

- ✓ The Data safety section on Google Play specifies the user data your app collects or shares
- ✓ Fill out the form in Play Console (Policy > App content) based on your app and 3rd party SDK data usage.
- ✓ Info from your app's Data safety form will be highlighted in your app's Play Store page and for certain critical in-app permission requests.

Use photo picker

https://d.android.com/training/data-storage/shared/photopicker

Use Photo Picker to provide a seamless and permissonless user experience to select visual media files and simplify developer costs

```
// or PickMultipleVisualMedia(num) for multiple selection
val pickMedia = registerForActivityResult(PickVisualMedia()) { uri ->
    // If media selected URI != null
}

pickMedia.launch(PickVisualMediaRequest(PickVisualMedia.ImageAndVideo))
```

Choose the right storage

https://d.android.com/training/data-storage

Plan your storage and file locations carefully

- ✓ App-specific storage
- ✓ Shared storage
- ✓ Preferences
- ✓ Databases

Understanding where and how your app is accessing user data

https://d.android.com/training/guide/topics/data/audit-access

Use data access audit APIs to gain insights into how your app & its dependencies (including SDKs + 3rd party libraries) access private data from users

Set up callback to log different forms of data access

```
val appOpsManager = getSystemService<AppOpsManager>()
appOpsManager.setOnOpNotedCallback(
    mainExecutor,
    appOpsCallback
)
```

Set up callback to log different forms of data access

```
val appOpsCallback = object : AppOpsManager.OnOpNotedCallback() {
    override fun onNoted(syncNotedAppOp: SyncNotedAppOp){
      // log synchronous data access (eg. microphone access)
    }

    override fun on AsyncNoted(asyncNotedAppOp: AsyncNotedAppOp){
      // log asynchronous data access (eg. getting location)
    }

    override fun onSelfNoted(syncNotedAppOp: SyncNotedAppOp) {
      // log self data access - fairly rare occurrence}
    }
```

Revoke permissions

On Android 13 onward, remove previously granted permission when no longer needed.

```
revokeSelfPermissionOnKill(
    Manifest.permission.CALL_PHONE
)
```

Testing permissions

Use ADB commands to grant/revoke permissions for testing purposes.

```
// Grants all apk permissions
adb shell install -g PATH_TO_APK_FILE✎

adb shell pm grant com.name.app/
android.permission.CAMERA

adb shell pm revoke com.name.app/
android.permission.CAMERA
```

Package visibility

https://d.android.com/training/package-visibility

Declare package visibility needs when requesting information from other apps (outside of the ones that are visible by default)

```
<manifest package="com.example.game">
   <queries>
   <!-- Specific package names -->
     <package android:name="com.example.store" />

   <!-- Match an intent filter signature -->
   <intent>
     <action android:name="android.intent.action.SEND" />
     <data android:mimeType="image/jpeg" />
    </intent>

   <!-- Specific authority -->
    <provider
     android:authorities="com.example.settings.files" />
    </queries>
    ...
</manifest>
```

Location minimization

https://d.android.com/training/location/permissions

- ✓ Always request **ACCESS_COARSE_LOCATION** only/first
- ✓ Ensure your app still works if user grants coarse access only
- ✓ Reduce location computation by choosing the best location estimate
- ✓ Use **FusedLocationProvider** to ensure compat across form factors (e.g. tablets)

```
val locationService = LocationServices.getFusedLocationProviderClient()

val lastKnownLocation = locationService.getLastLocation()
```

Background location

https://d.android.com/training/location/background

- ✓ Only a few use cases allowed (such as geofencing)
- ✓ Before requesting, user must grant **fine** and/or **coarse** permissions first
- ✓ Requires **ACCESS_BACKGROUND_LOCATION** permission
- ✓ Location frequency might be affected by background location limits

```
<manifest>
  <uses-permission
    android:name="android.permission.ACCESS_BACKGROUND_LOCATION" />
</manifest>
```

Android 11

- ✓ Scoped storage enhancements
- ✓ Separate request for background location
- ✓ Data access auditing

Android 12

- ✓ Approximate location
- ✓ Privacy dashboard
- ✓ Bluetooth permissions

Android 13

- ✓ Notification permission
- ✓ Wi-Fi and storage permissions
- ✓ Photo picker

Android 14

- ✓ Selected media access
- ✓ Data safety in permissions
- ✓ Screenshot detection

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