The Android Prep Lab (Kotlin)

Part - 10 of 10
Performance Optimization

What is profiling in Android, and why is it important?

Profiling is the process of analyzing an app’s CPU usage, memory consumption, battery impact, and network performance to identify bottlenecks and optimize performance. It helps ensure smooth and efficient app operation.

What tools can you use for performance profiling in Android?

Android provides multiple profiling tools:

- **Android Profiler** (CPU, memory, network analysis)
- **Systrace** (detailed system performance tracking)
- **LeakCanary** (memory leak detection)
- **Battery Historian** (battery consumption analysis)
- **StrictMode** (detects UI thread violations)

How do you detect and fix memory leaks in an Android app?

- Use **LeakCanary** to detect leaks.
- Avoid keeping long-lived references to Context.
- Unregister listeners, observers, and receivers in onDestroy().
- Use WeakReference for objects that shouldn’t prevent garbage collection.

Best practices for optimizing memory usage in Android

- Use RecyclerView to reuse views efficiently.
- Optimize bitmaps by resizing images.
- Prefer Parcelable over Serializable for data transfer.
- Reduce autoboxing by using primitive types instead of wrapper classes.

What is StrictMode, and how does it help in performance optimization?

StrictMode helps detect accidental disk/network operations on the main thread, reducing UI lag and ANRs (Application Not Responding).

Example usage:

```
if (BuildConfig.DEBUG) {
    StrictMode.setThreadPolicy(StrictMode.ThreadPolicy.Builder()
        .detectDiskReads()
        .detectDiskWrites()
        .detectNetwork()
        .penaltyLog()
        .build())
}
```

How do you optimize battery consumption in Android apps?

- Use **WorkManager** or **JobScheduler** instead of background services.
- Reduce **wake locks** by using PARTIAL_WAKE_LOCK only when necessary.
- Optimize **location updates** with FusedLocationProvider.
- Use **Doze Mode & App Standby** to minimize background activity.

How does Android’s Doze mode work?

Doze mode restricts background network activity and processing when the device is idle, helping conserve battery. Apps can use setAndAllowWhileIdle() for critical tasks.

What are the best practices for network optimization?

- Use **OkHttp + Retrofit** with caching and connection pooling.
- Reduce API calls by batching requests.
- Enable **gzip compression** for large responses.
- Use **Glide or Picasso** to optimize image loading.

How do you optimize UI rendering performance?

- Use ConstraintLayout instead of nested layouts.
- Enable hardware acceleration when needed.
- Minimize overdraw by optimizing layouts.
- Use ViewStub for lazily loading heavy UI components.

How do you optimize database performance in Android?

- Use Room Database instead of raw SQLite.
- Optimize queries with proper indexes.
- Use pagination for large datasets.
- Perform database operations on background threads using Coroutines.

Happy Learning

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