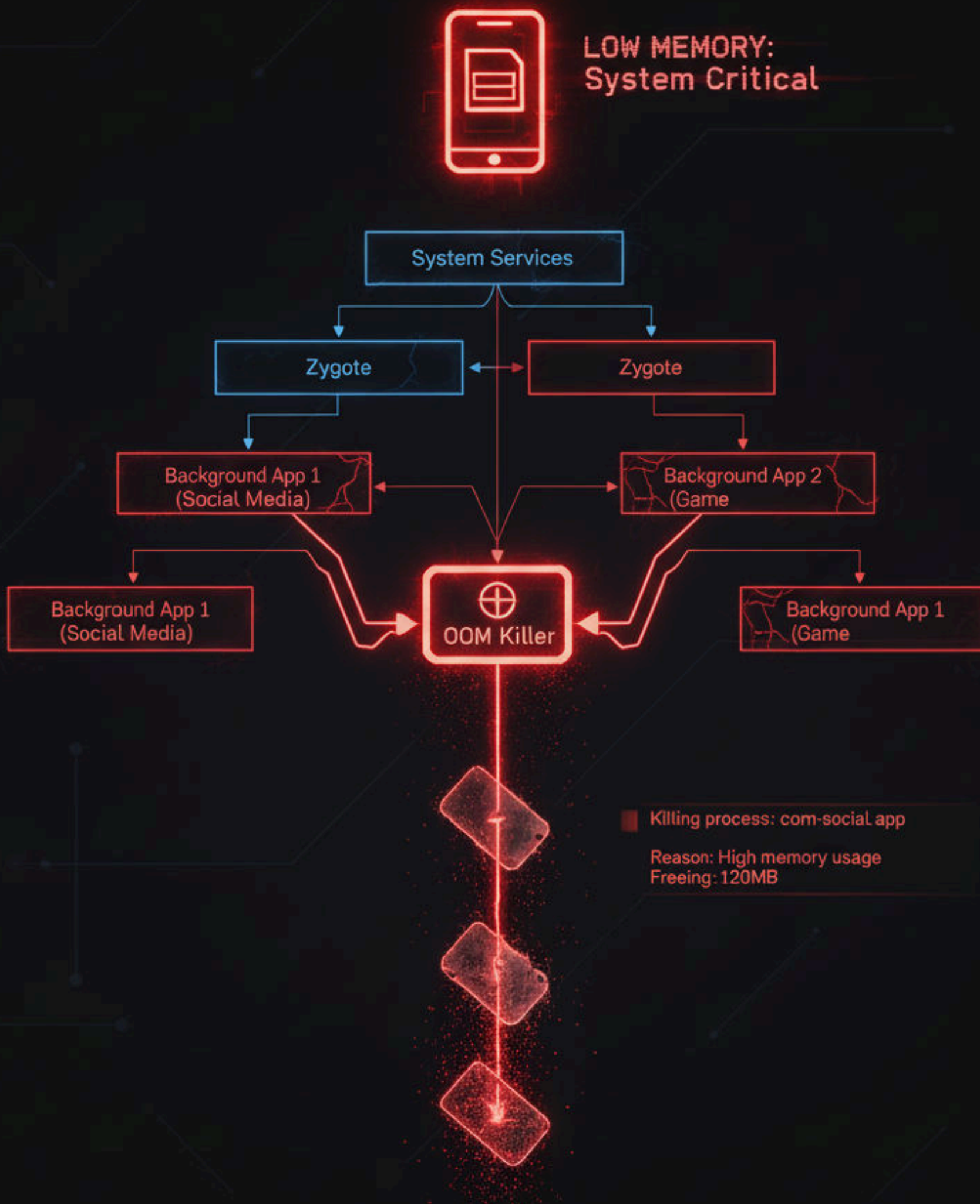


LMKD:

Why Android Kills Your Apps (The Survival Strategy)



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The final architectural pillar:

How the system manages memory pressure and proactively chooses which processes must die.

(Swipe to see the OOM Score hierarchy.)



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Free Memory Is Wasted Memory.

Unlike traditional operating systems, Android intentionally operates under high memory pressure.

- **Goal:** Keep closed apps in RAM as Cached Apps for immediate relaunch (Warm Start) and fast user switching.
- **Result:** The system always lives on the edge, demanding a specialized mechanism to prevent crashes.



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LMKD: The Proactive Killer

Transition from LinuxOOM Killer to LMKD (Low Memory Killer Daemon):

- **Traditional OOM Killer (Reactive):** Only acts when memory is totally exhausted (a crash is imminent).
- **LMKD (Proactive):** Operates in User Space and constantly monitors memory pressure (vmpressure/PSI).
- **The Goal:** Kill non-essential processes (like Cached Apps) before a critical crisis occurs, preserving resources for foreground processes.



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The OOM Score Hierarchy

ActivityManagerService (AMS) —→ oom_score_adj

AMS maps the application's semantic state (criticality) to a numerical Kernel score:

- **Lowest Score (-1000):** Foreground App (Protected, least likely to be killed).
- **Highest Score (+1000):** Background/Cached Apps (First to be killed).

The Key: LMKD executes the kill command on the process with the highest oom_score_adj when memory pressure thresholds are crossed.



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Kernel Paging and 16KB Optimization

Memory Efficiency Beyond LMKD

To further reduce overhead, AOSP is moving to larger memory pages:

- **The Problem:** 4KB pages create high TLB Miss overhead and consume excessive memory for Page Table Metadata.
- **The 16KB Solution:** Using 16KB pages significantly reduces the number of Page Table entries, improving the CPU's TLB Hit Rate and reducing system Latency.

This is a deep Kernel-level change to support high-performance RAM usage.



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Final Conclusion

The Android Architecture Trilogy: A Summary

1. **Zygote/CoW**: Fast, memory-efficient Process Birth.
2. **Binder IPC**: Secure, Single-Copy Inter-Process Communication.
3. **LMKD/OOM Score**: Proactive RAM management and Process Survival.

This deep understanding moves you from being an Android developer to an Android engineer.



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