

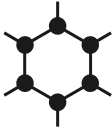




Comparison of Android ROMs

This is a comparison of popular Android "ROMs" (or better: AOSP distributions). Please note I'm not affiliated with any of these projects and I am not giving any specific recommendation. If you think anything is factually incorrect, please let me know.

Comparison of Android ROMs

Source: eylenburg.github.io

Last updated: 30 July 2024

	<div>GrapheneOS<div></div><div>AOSP</div></div>	<div>DivestOS<div></div><div>LineageOS</div></div>	<div>CalyxOS<div></div><div>AOSP</div></div>	<div>IodéOS<div></div><div>LineageOS</div></div>	<div>le/<div></div><div>LineageOS</div></div>	<div>LineageOS<div></div><div>AOSP</div></div>	<div>"Stock" Android<div></div><div>AOSP</div></div>
Based on							
Freedom	Yes	Yes	Yes	Yes	Yes	Yes	No
Free and open source (FOSS)?	Yes, significantly	Yes, extensively	Yes, significantly	Yes, minimal	Yes, minimal	Yes, minimal	No
Deblobbed?							
Features							
Network controls for apps	Direct and indirect access	Direct and indirect access	Direct access only	Direct access only	Direct access only	Direct access only	No
Network-based location (without GNSS)	Emulated ^{default} or Play Services	No	microG location	microG location	microG location	No	Play Services
System-wide connection/tracker blocking	Private DNS setting, or via VPN app	hosts file, Private DNS, or VPN	Private DNS setting, or via VPN app	iode-snort app, Private DNS, or VPN	Private DNS setting, or via VPN app	Private DNS setting, or via VPN app	Private DNS setting, or via VPN app
E2E-encrypted phone backups	Yes (Seedvault)	Yes (Seedvault)	Yes (Seedvault)	Yes (Seedvault)	Yes (Seedvault)	Yes (Seedvault)	Yes, but requires Google login
Notification forwarding from other user profiles	Yes	No	No	No	No	No	No
Duress PIN (to wipe device)	Yes, see here	No	No	No	No	No	No
Android Auto compatible	Yes (sandboxed), see here	No	No	No	Yes, see here	No	Yes
Google Pay compatible	No	No	No	No	No	No	Yes
Degoogling (connections to Google)							
eSIM activation	Google eUICC w/o data sharing	OpenEUICC	Google eUICC (preinstalled)	Google eUICC (preinstalled)	Google eUICC (preinstalled)	Google eUICC (preinstalled)	Google eUICC (preinstalled)
Provider for network-based location	Emulated/GNSS ^{default} or Google	n/a	microG location	microG location	microG location	n/a	Google
SUPL	GrapheneOS ^{default} , Google or none	Google ^{default} , or none	Google ^{default} , or none	Google ^{default} , or none	None ^{default} , or Google	Google ^{default} , or none	Google
PSDS - Google Pixel 6 and later	GrapheneOS ^{default} , Google, or none	Broadcom ^{default} , or none	Broadcom ^{default} , or none	Broadcom ^{default} , or none	None ^{default} , or Google	Google ^{default} , or none	Google
Connectivity check/captive portal	GrapheneOS ^{default} , Google, or none	Multiple presets offered	Google (can be changed)	Kuketz.de	Murena.io	Google (can be changed)	Google (can be changed)
DNS connectivity check	GrapheneOS ^{default} , or Google	Google	Google	Google	Google	Google	Google
DNS server fallback	Cloudflare	Quad9	Cloudflare	Quad9	Quad9	Google	Google
Network time	GrapheneOS ^{default} , or none	NTP.org (can be changed) & carrier	Google (can be changed) & carrier	NTP.org (can be changed) & carrier	NTP.org (can be changed) & carrier	Google (can be changed) & carrier	Google (can be changed) & carrier
Hardware attestation provisioning	GrapheneOS ^{default} , or Google	Google	Google	Google	Google	Google	Google
DRM (Widevine) provisioning	GrapheneOS ^{default} , or Google	DRM not supported	Google	Google	Google	Google	Google
Google Play Services							
Implementation	GmsCompat (sandboxed Google Play)	microG	microG	microG	microG	None by default. It's possible to install microG manually (LineageOS supports signature spoofing for microG since 2024). Alternatively, there are ROMs with microG preinstalled or one can add Google apps during the installation process, but this is not officially supported by LineageOS.	Google Play Services
Optional?	Yes (not preinstalled)	Yes (not preinstalled)	Yes (preinstalled but opt-out)	Yes (preinstalled but opt-out)	No (preinstalled without opt-out)	microG manually (LineageOS supports signature spoofing for microG since 2024). Alternatively, there are ROMs with microG preinstalled or one can add Google apps during the installation process, but this is not officially supported by LineageOS.	No (preinstalled without opt-out)
Runs in standard app sandbox?	Yes	Yes	No	No	No		No
Can be limited to user or work profile?	Yes	Yes	Yes	? (TBC)	? (TBC)		No
Signature spoofing needed/allowed?	No	Only for Google signature	Only for Google signature	Allowed for any app & signature	Allowed for any app & signature		No
Push notifications via Google FCM?	Yes	Optional	Optional	Optional	Optional		Yes
Google Play Integrity?	Passes Basic Integrity only, see here	No	No	No	No		Yes
Privacy							
Storage scopes	Yes, see here	No	No	No	No	No	No
Contact scopes	Yes, see here	No	No	No	No	No	No
Per-app sensor controls	Yes, see here	Yes	No	No	No	No	No
Per-connection DHCP state flushing	Yes	Yes	No	No	No	No	No
MAC address randomization	Per connection, see here	Per connection	Per network	Per network	Per network	Per network	Per network
SUPL: IMSI or phone number sent?	No	No	No	No	No	No	Yes
PSDS: user agent sent?	No	No (device-specific), see here	Partially for Qualcomm chips	Partially for Qualcomm chips	Partially for Qualcomm chips	Partially for Qualcomm chips	for Qualcomm GPS chips
Closed cross-profile package leaks?	Yes	Partially	No	No	No	No	No
Closed device identifier leaks?	Yes, see here	No	No	No	No	No	No
Metadata stripping for screenshots	Yes, see here	Yes, see here	Yes, see here	No	No	No	No
EXIF metadata stripping for photos	Yes, see here	No	No	No	Available as option	No	No
Tracking through Android Advertising ID?	Not part of the system	Not part of the system	Randomized ID	Randomized ID	Randomized ID	Not part of the system	Yes, but can be deleted in settings
Security							
Verified boot (if supported by device)?	Yes, incl. system app updates	Yes, but excl. system app updates	Yes, but excl. system app updates	Yes, but excl. system app updates	w/ test keys; excl. system app updates	No	Yes, but excl. system app updates
Hardware-based security verification	Yes, see here	No	No	No	No	No	Some devices, see here
System app downgrade protection	For updates and boot, with fs-verity	For updates and boot	For updates (incomplete)	For updates (incomplete)	For updates (incomplete)	For updates (incomplete)	For updates (incomplete)

	GrapheneOS	DivestOS	CalyxOS	IodéOS	/e/	LineageOS	"Stock" Android
Secure application spawning?	Yes (exec)	Yes (exec)	No	No	No	No	No
Hardened memory allocator?	Yes	Yes	No	No	No	No	No
Hardware memory tagging?	Yes, if supported by device	No	No	No	No	No	No
Hardened kernel?	Yes, highest	Yes, high (device-specific)	No	No	No	No	No
Hardened libc?	Yes, highest	Yes, high	No	No	No	No	No
Hardened webview?	Yes (Vanadium)	Yes (Mulch)	No	No	No	No	No
Hardened SELinux policy?	Yes	No	No	No	No	No	No
Android Runtime JIT compilation/profiling	AOT compilation w/o profiling	Interpreter/JIT with profiling	Interpreter/JIT with profiling	Interpreter/JIT with profiling	Interpreter/JIT with profiling	Interpreter/JIT with profiling	Interpreter/JIT with profiling
Additional hardening	Highest, see here	Medium, see here	No	No	No	No	No
Secure TLS for SUPL?	TLSv1.2 if supported by device	TLSv1.2 if supported by device	TLSv1.1 or TLSv1.0	TLSv1.1 or TLSv1.0	TLSv1.1 or TLSv1.0	TLSv1.1 or TLSv1.0	TLSv1.1 or TLSv1.0
Fallback DNS server with DNSSEC?	Yes	Yes	Yes	No	Yes	Yes	Yes
Can disable USB-C and pogo pins data?	Default (while locked), see here	No	No	No	No	No	No
Can disable USB-C charging?	Opt-in (after boot), see here	No	No	No	No	No	No
Can disable USB connections?	Default (while locked), see here	? (TBC - like Lineage or stock?)	Default (while locked), software only	? (TBC - like Lineage or stock?)	? (TBC - like Lineage or stock?)	Opt-in, software only	Device admin API
Secure connection to network time server?	HTTPS via GrapheneOS server	NTP w/o NTS and carrier-based time	NTP w/o NTS and carrier-based time	NTP w/o NTS and carrier-based time	NTP w/o NTS and carrier-based time	NTP w/o NTS and carrier-based time	NTP w/o NTS and carrier-based time
Updates							
Security update speed (AOSP subset of ASB)	usually same day	1-2 weeks	2-4 days, sometimes longer	2-4 weeks, sometimes longer	1-2 months, sometimes longer	1-2 weeks, sometimes longer	Depends on phone vendor
Partial security updates (ASB) after EoL date	until 5 years from launch	Several years	1-3 years	Several years	Several years	Several years	By definition: No
Number of Android versions supported	Usually 1 Android version	7 Android versions (incl. backports)	Usually 1 Android version	Usually 1 Android version	2-3 Android versions	Usually 3 Android versions	Usually 3 Android versions
Webview update speed	<2 days	<2 days	<1 week, sometimes longer delays	<2 weeks	Several weeks/months	<2 weeks	Depends on phone vendor
Supported devices	Hardware requirements		Hardware requirements				
Asus*	No	Older devices only	No	No	Older devices only	Older devices only	Yes (ZenUI)
Fairphone	No	Yes	Yes	Yes	Yes	Yes	Yes
Google	Yes	Yes	Yes	Older devices only	Yes	Yes	Yes
Motorola	No	Older devices only	Yes	No	Yes	Yes	Yes
Oneplus	No	Older devices only	No	Older devices only	Older devices only	Yes	Yes (OxygenOS)
Samsung*	No	Older devices only	No	Older devices only	Older devices only	Older devices only	Yes (OneUI)
Sony	No	Older devices only	No	Older devices only	Older devices only	Yes	Yes
Xiaomi	No	Older devices only	No	Older devices only	Older devices only	Yes	Yes (HyperOS)
* these manufacturers don't support bootloader unlocking anymore for all or most of their new devices. "Older devices only" = no devices released since 2023.							

Do you have any comments or corrections? [Please drop me an e-mail](#) or [create an issue on Github](#)

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