

Table 1. Detected Vulnerabilities. The ‘Cause’ column represents the reasons for the awake lock vulnerabilities. ‘I’ indicates that the application implements the awake lock through inheritance from a parent class, but the activity (I)nherits from a parent activity class that lacks the awake lock functionality. ‘O’ indicates that the application implements the awake lock in each activity, but the awake lock implementation is (O)mitted in this activity. ‘T’ indicates that this activity is from a (T)hird-party library.

APK/Version	Downloads	NO.	Vulnerable Activity	Type	Cause	APK/Version	Downloads	NO.	Vulnerable Activity	Type	Cause
APF Lock 1.1.4.1	10M+	1	ProxyBillingActivity	Global	T	Journey 5.1.1B-play	1M+	68	SignInHubActivity	Global	T
Azar 5.27.2	100M+	2	EditImageActivity	Local	T	KeepLock 2.3.2	500K+	69	ProxyBillingActivity	Global	T
		3	EditLiveRoomInfoActivity	Local	I	LockMyPix 5.2.6.7 Gemini	10M+	70	ProxyBillingActivity	Global	T
		4	LiveActivity	Local	I			71	UCropActivity	Global	T
		5	MainActivity	Global	I			72	OnboardingActivity	Global	O
Best Wallet 1.5.0	10K+	6	AdActivity	Global	T	My Calendar 1.75.298.GP	100M+	73	SignInHubActivity	Global	T
Caculator 2.3.8 (com.cutestudio.calculator.lock)	5M+	7	ProxyBillingActivity	Global	T	My Diary 1.013.GP (diary.journal.lock.mood.daily)	1M+	74	ProxyBillingActivity	Global	T
Calculator 1.0.14 (com.eco.calculator.vault.hide.photos)	100K+	8	ProxyBillingActivity	Global	T	My Diary 1.36 (com.msint.mypersonal.diary)	100K+	75	SignInHubActivity	Global	T
(calculator.lock.calculator.vault.photovault.hider)	10M+	9	MoveToActivity	Global	I			76	ProxyBillingActivity	Global	T
Calculator 1.3.0 (calculator.vault.hide.app.lock.photos.free)	100K+	10	QuestionActivity	Global	I			77	SignInHubActivity	Global	T
		11	CapturePhotoActivity	Global	O			78	ProxyBillingActivity	Global	T
		12	CaptureVideoActivity	Global	O	Photo Vault 1.53	10K+	79	IAPActivity	Global	I
		13	ChatFilePickerActivity	Global	O			80	ProxyBillingActivity	Global	T
Calculator 1.97 (com.calculator.lock.hide.photo.video)	10M+	14	CalculatorActivity	Global	I			81	SettingsDisplayActivity	Global	I
Calculator Vault 1.6.9	100K+	15	ProxyBillingActivity	Global	T	PixFolio 5.4.42	100K+	82	SettingsMusicActivity	Global	I
ClevNote 2.23.11	5M+	16	ActivityFolderEdit	Local	O			83	SettingsSlideshowActivity	Global	I
Clock+ 1.1.5	100K+	17	ActivityTextMemoEdit	Global	O			84	SettingsSlideshowClockActivity	Global	I
		18	VideoPlayerActivity	Global	I			85	SettingsSlideshowDisplayActivity	Global	I
		19	VideosGalleryVideosSingleActivity	Global	I	POPdiary 4.3.2	100K+	86	SettingsSlideshowActivity	Global	I
		20	VideosHiddenSingleActivity	Global	I			87	SettingsVLCActivity	Global	I
Clover 4.28.0	5M+	21	ProxyBillingActivity	Global	T			88	CropActivity	Global	O
Cosmostation 1.10.1	100K+	22	ImportBarcodeActivity	Global	I			89	ProxyBillingActivity	Global	T
Daily Diary 1.0.15	500K+	23	NaraePickerActivity	Global	I	Q-Diary V1.7.64	100K+	90	SketchActivit	Global	O
DailyLife 4.1.3.10	5M+	24	SignInHubActivity	Global	T			91	RestoreStorage	Global	O
		25	AdActivity	Global	T			92	PlacesActivity	Global	O
		26	AudienceNetworkActivity	Global	T			93	YearCalendarActivity	Global	O
Day One 2023.12	500K+	27	ProxyBillingActivity	Global	T	QQ 8.9.68 (Membership)	600M+	94	ProxyBillingActivity	Global	T
Daybook 6.12.0	1M+	28	PlacePickerActivity	Global	I			95	SignInHubActivity	Global	T
Daylio 1.52.0	10M+	29	DexterActivity	Local	T			96	AioResourceContainerActivity	Global	I
		30	BackupActivity	Local	I			97	DatalinePluginProxyActivity	Global	I
		31	EditDayEntryNoteActivity	Local	I			98	QQGalleryActivity	Global	I
		32	RestoreBackupActivity	Local	I	QZoneFeedXGalleryActivity	100K+	99	QQVideoEditActivity	Global	I
DecoDiary 3.2.6	50K+	33	SignInHubActivity	Global	T			100	QQWinkActivity	Global	I
		34	CropActivity	Global	O			101	QZoneFeedXGalleryActivity	Global	I
		35	ProxyBillingActivity	Global	T			102	QZoneFriendFeedXActivity	Global	I
Diarium 2.9.84	100K+	36	RestoreStorage	Global	O	SecureCard 1.5.4	100K+	103	QZoneShellActivity	Global	I
		37	AuthorizationManagementActivity	Global	O			104	WinkHomeActivity	Global	I
		38	ProxyBillingActivity	Global	T			105	WxaContainerActivity1	Global	I
		39	WebAuthenticationCallbackActivity	Global	O	SkyFolio 5.4.41	10K+	106	BarcodeScannerActivity	Global	I
Diario 3.92.10	1M+	40	PhotoPickerActivity	Global	T			107	InputPinActivity	Global	I
		41	PickImageActivity	Global	T			108	PromoScreenActivity2	Global	I
		42	SignInHubActivity	Global	T			109	ProxyBillingActivity	Global	T
Diary 1.16	50K+	43	AlbumActivity	Global	T	Tenyear diary 6.1.0	100K+	110	SelectCurrencyActivity	Global	I
		44	AudioRecorderActivity	Local	T			111	AboutExtActivity	Global	I
		45	AuthActivity	Global	T			112	IAPActivity	Global	I
		46	CameraActivity	Global	T			113	ProxyBillingActivity	Global	T
Diary++ 6.8	1M+	47	CollageActivity	Global	T	Time 35	1M+	114	SettingsDisplayActivity	Global	I
		48	DrawingActivity	Local	T			115	SettingsMusicActivity	Global	I
		49	ImageEditorActivity	Global	T			116	SettingsSlideshowActivity	Global	I
		50	SignInHubActivity	Global	T			117	SettingsSlideshowClockActivity	Global	I
Dropbox 340.2.4	1B+	51	SignInHubActivity	Global	T	Universum 3.53	1M+	118	SettingsSlideshowDisplayActivity	Global	I
		52	BulkRenameActivity	Local	I			119	SettingsSupportActivity	Global	I
		53	GroupedPhotoPreviewActivity	Local	I			120	SettingsVLCActivity	Global	I
		54	LicensesActivity	Global	O			121	CancelLockActivity	Global	I
FotoX pro 1.3	5K+	55	SettingsActivity	Global	O	WeVault 2.9.8	100K+	122	ChangeLockActivity	Global	I
Gallery 2.4.0	1M+	56	ProxyBillingActivity	Global	T			123	NotepadAct	Local	I
		57	IAPActivity	Global	I			124	UCropActivity	Local	T
		58	SettingsSlideshowClockActivity	Global	I			125	ProxyBillingActivity	Global	T
gFolio 5.4.38	50K+	59	ProxyBillingActivity	Global	T	YallaChat 1.10.1	5M+	126	ProxyBillingActivity	Global	T
		60	SettingsSlideshowDisplayActivity	Global	I			127	YamiActivity0	Global	I
		61	SettingsDisplayActivity	Global	I			128	YamiActivity1	Global	I
		62	SettingsSupportActivity	Global	I			129	YamiActivity2	Global	I
Journal 3.6.5	100K+	63	SettingsMusicActivity	Global	I	Zangi 5.9.6	10M+	130	YamiActivity3	Global	I
		64	SettingsVLCActivity	Global	I			131	YamiActivity4	Global	I
		65	SettingsSlideshowActivity	Global	I			132	CroplmageActivity	Local	T
		66	ProxyBillingActivity	Global	T			133	EditImageActivity	Local	I
Journey 5.1.1B-play	1M+	67	ProxyBillingActivity	Global	T						

Table 2. Statistics data on the causes of awake lock vulnerabilities.

	I	O	T	I&T	O&T
Activity Numbers	65	17	51	-	-
App Numbers	19	7	33	8	3