A MALWARE SAMPLES

Table 1: Sample analysis of Google Play malware (A-G).

Column groups: Event conditions → System (Boot status, Device status, Package changes, Network status, Developer defined, SMS delivery, Battery status, Service bind, Call status), User (Application launch, Sensitive input, Button click, Install app, Clipboard text, Grant permission), Scheduling; Check conditions → Serv. (Internet, SMS), Device (Sensors, Hardware specs, Software specs, Network), Env. (Location, Time), App. (Data format, Permissions); Hiding tech. (Icon manipulation, Rich benign func., Info. blocking, Screen locking, Screen locking, Screen locking); Payloads (Info. stealing, Ad abuse, Privilege escalation, Premium charges, Crypto. mining, Clipboard hijacking, Port forwarding, Ransom, Unknown); Code properties → Location (Direct, Downloaded (remote), Hidden (local)), Language (Bytecode, Native, Web).

ID	Malware family	Year	Boot status	Device status	Package changes	Network status	Developer defined	SMS delivery	Battery status	Service bind	Call status	Application launch	Sensitive input	Button click	Install app	Clipboard text	Grant permission	Scheduling	Internet	SMS	Sensors	Hardware specs	Software specs	Network	Location	Time	Data format	Permissions	Icon manipulation	Rich benign func.	Info. blocking	Screen locking	Screen locking	Screen locking	Info. stealing	Ad abuse	Privilege escalation	Premium charges	Crypto. mining	Clipboard hijacking	Port forwarding	Ransom	Unknown	Direct	Downloaded (remote)	Hidden (local)	Bytecode	Native	Web
1	AceCard	2016						✓				✓								✓			✓						✓						✓		✓	✓						✓			✓		
2	AdClickerBN	2017			✓							✓						✓	✓				✓						✓	✓						☆	✓							✓	✓		✓		✓
3	AdloadNL	2017	✓		✓													✓	✓				✓							✓						☆								✓	✓		✓		✓
4	AdQR	2021	✓			✓													✓			✓	✓		✓					✓								✓							✓			✓		
5	AdultSwine	2018	✓	✓	✓	✓												✓	✓				✓		✓				✓	✓						✓	✓								✓			✓		
6	AgentBKY	2017						✓	✓			✓	☆	☆					✓				✓							✓						✓									✓	✓		✓		✓
7	AgentJL	2017										✓		✓	✓													✓								☆	✓								✓	✓		✓		
8	Aladdin	2018	✓									✓			✓							✓	✓						✓							☆									✓			✓		
9	AndroidOSBrata	2019		✓								✓		✓	✓		✓		✓			✓	✓					✓	✓			✓	✓	✓	✓							✓		✓			✓		
10	AndroidOSJSMiner	2017										✓																		✓									✓					✓			✓	✓	✓
11	AndroidOSXavierAXM	2017			✓														✓				✓							✓					✓								☆	✓	✓		✓		
12	AnubisDropper	2019	✓	✓	✓	✓							☆					✓	✓		✓		✓												☆									✓	✓		✓		
13	AnubisSpy	2017	✓									✓							✓				✓							✓					✓													✓	✓	
14	Asher	2019	✓	✓								✓							✓				✓		✓	✓			✓	✓					✓	✓								✓			✓		
15	AsiaHitGroup	2017				✓													✓					✓	✓				✓	✓						☆								✓	✓		✓		
16	AxentDS	2017										✓											✓			✓				✓					✓												✓	✓	
17	AxentEH	2017	✓	✓	✓	✓													✓			✓	✓							✓						✓											✓	✓	
18	Bahamut	2018				✓		✓		✓									✓			✓	✓							✓					✓									✓			✓		
19	BanBraA	2020							✓			✓		✓			✓		✓				✓					✓		✓					✓									✓			✓		
20	BeaverGang	2016										✓							✓				✓				✓			✓					✓									✓			✓		
21	BKotlindHRX	2018				✓						✓						✓	✓				✓		✓					✓					✓				☆					✓			✓		
22	BlackLister	2018										✓		✓																✓							✓							✓			✓		
23	ChatSpyA	2017							✓			✓	✓						✓											✓					✓									✓			✓		
24	Clast82	2021										✓	☆	✓	✓				✓				✓							✓					☆								☆	✓	✓		✓		
25	ClickAds	2018										✓		✓																✓						✓								✓			✓		
26	ClickerGenG	2016										✓			✓			✓					✓	✓																			☆	✓	✓		✓		
27	ClickrAd	2018	✓									✓						✓	✓					✓	✓					✓						☆								✓	✓		✓		
28	ClipperC	2019										✓				✓												✓		✓										✓				✓			✓		
29	CoinHive	2018										✓		✓																✓									✓							✓			✓
30	CoinminerQ	2018	✓		✓							✓						✓	✓			✓								✓									✓					✓			✓	✓	✓
31	CPUMiner	2017	✓									✓						✓	✓		✓	✓								✓									✓								✓	✓	
32	Cyberpunk	2020										✓															✓		✓												✓		✓	✓			✓		
33	DoubleHidden	2017	✓			✓						✓						✓	✓		✓	✓		✓			✓	✓	✓	✓						✓	✓							✓			✓		
34	DroidPlugin	2017		✓	✓	✓	✓					✓						✓	✓			✓	✓												☆									✓	✓		✓		
35	Etinu	2021	✓			✓			✓			✓		✓			✓		✓				✓					✓		✓					✓			✓						✓			✓	✓	
36	FakeAppCQ	2016										✓											✓													✓								✓		✓		✓
37	FakeAppFG	2017										✓	☆	☆																					☆									✓			✓		✓
38	FakeAppFK	2017										✓	✓	✓																✓					✓									✓			✓		
39	FakeAppHZ	2018										✓		✓		✓																									✓			✓			✓		
40	FakeAppKO	2019										✓	✓	✓																					✓									✓			✓		
41	FakeAppKP	2019							✓			✓	✓											✓				✓							✓									✓			✓		
42	FakeFlash	2017										✓																																		✓			✓
43	FakeInsta	2019										✓	✓	✓										✓											✓									✓			✓		✓
44	FakeQuadRooter	2016										✓		✓																							✓							✓			✓		
45	FakeWhatsApp	2017										✓		✓																✓					✓									✓			✓		
46	Fakeyouwon	2019	✓		✓													✓	✓											✓						☆								✓			✓		✓
47	FalseGuide	2017	✓			✓						✓							✓											✓												✓		✓	✓		✓		
48	Fasurke	2016										✓		✓																					✓									✓			✓		
49	FlixOnline	2021	✓	✓								✓		✓		✓	✓	✓	✓			✓	✓		✓			✓	✓						✓		✓							✓			✓		✓
50	FlokiSpy	2018						✓																					✓						✓									✓			✓		
51	FraudApp	2018										✓		✓																					✓									✓			✓		
52	GhostTeam	2018				✓													✓				✓							✓					☆	☆	☆							✓	✓		✓		
53	Godless	2016		✓															✓											✓							✓					✓		✓	✓		✓	✓	
54	GoldenCup	2018				✓													✓											✓					✓									✓	✓		✓		
55	Gooligan	2017	✓									✓							✓	✓															✓	☆	✓								✓		✓	✓	✓
56	GravityRAT	2020	✓	✓		✓					✓	✓							✓				✓	✓					✓		✓				✓									✓			✓		
57	GuerillaA	2018	✓	✓	✓	✓													✓	✓										✓					✓	☆											✓	✓	
58	GuerillaD	2018	✓	✓	✓	✓													✓	✓										✓					✓	☆											✓	✓	

Table 2: Sample analysis of Google Play malware (H-Z).

			Event conditions																Check conditions										Hiding tech.						Payloads									Code properties					
			System									User							Serv.		Device					Env.		App.																Location			Language		
ID	Malware family	Year	Boot status	Device status	Package changes	Network status	Developer defined	SMS delivery	Battery status	Service bind	Call status	Application launch	Sensitive input	Button click	Install app	Clipboard text	Grant permission	Scheduling	Internet	SMS	Sensors	Hardware specs	Software specs	Network	Location	Time	Data format	Permissions	Icon manipulation	Rich benign func.	Info. blocking	Screen locking	Screen locking	Screen locking	Info. stealing	Ad abuse	Privilege escalation	Premium charges	Crypto. mining	Clipboard hijacking	Port forwarding	Ransom	Unknown	Direct	Downloaded (remote)	Hidden (local)	Bytecode	Native	Web
59	Haken	2020	✓		✓	✓												✓	✓			✓	✓	✓		✓				✓					✓	✓								✓			✓		
60	HiddadAJN	2020	✓																✓				✓						✓	✓					✓	✓								✓	✓		✓		✓
61	HiddadBZ	2017										✓			✓								✓					✓		✓						✓								✓			✓	✓	
62	HiddenAd	2018	✓									✓		✓				✓	✓																✓	✓								✓			✓		
63	HiddenAdGLCA	2019		✓								✓						✓				✓	✓		✓				✓							✓								✓			✓		
64	HiddenAdHRXH	2019		✓								✓											✓		✓				✓	✓						✓								✓			✓		
65	HiddenAdHRXJA	2020	✓	✓						✓								✓					✓							✓					✓	✓								✓			✓		
66	HiddenAdOS	2020			✓	✓						✓						✓	✓			✓	✓							✓					✓	✓								✓			✓		
67	HidenAd	2019	✓	✓								✓						✓	✓						✓					✓						✓								✓			✓		
68	HummingBad	2017	✓	✓	✓													✓	✓				✓						✓	✓					✓	☆								✓	✓		✓		
69	Inazigram	2017										✓	☆	☆																					✓													✓	✓
70	IndexY	2019							✓			✓											✓							✓					✓									✓			✓		
71	InstaDetector	2016										✓	✓	✓																					✓														✓
72	InstaZuna	2017										✓	☆	☆																					✓														✓
73	Joker	2020						✓				✓		✓			✓	✓	✓			✓					✓	✓		✓										☆				✓	✓		✓	✓	✓
74	JokerV2	2020						✓				✓		✓			✓		✓									✓	✓	✓										☆				✓	✓	✓	✓	✓	✓
75	LightsOut	2018							✓			✓							✓				✓		✓				✓	✓											✓			✓			✓		
76	MalBus	2019										✓	☆	☆					✓				✓					✓		✓					☆									✓			✓	✓	✓
77	MilkyDoor	2017	✓	✓		✓													✓										✓	✓					✓						✓			✓			✓		
78	MobstSpy	2019					✓						✓	✓				✓	✓		✓	✓	✓	✓						✓					✓									✓			✓		
79	Necron	2019										✓							✓				✓							✓					✓								✓	✓			✓	✓	
80	PletorD	2017	✓									✓						✓	✓							✓	✓										✓					✓		✓			✓		
81	PornClicker	2016		✓		✓												✓	✓										✓	✓							✓							✓	✓		✓		✓
82	ProjectSpyHRX	2020							✓			✓		✓			✓	✓				✓	✓						✓	✓					✓									✓			✓		
83	PSWAndroidOSMyVK	2017										✓	✓	✓																✓					✓									✓	✓		✓	✓	✓
84	RedDawn	2018						✓										✓	✓			✓	✓	✓						✓					✓		✓						✓	✓	✓		✓		
85	Reputation1	2019	✓	✓								✓						✓	✓				✓		✓				✓	✓						✓								✓			✓		
86	Reputation1	2018	✓		✓							✓	☆	☆				✓	✓								✓		✓						☆	✓	✓							✓			✓		✓
87	Reputation2	2018	✓	✓	✓	✓	✓											✓	✓			✓	✓		✓					✓					✓	✓								✓			✓		
88	SideWinder	2020										✓		✓			✓					✓	✓							✓					✓	☆				✓			✓	✓	✓		✓	✓	
89	SimBad	2019							✓			✓		✓	✓			✓	✓				✓						✓	✓						✓							✓	✓			✓		
90	Smesh	2016										✓	✓	✓					✓											✓					✓									✓			✓		
91	SMSAndroidOSWesp	2017					✓					✓	✓	✓					✓		✓							✓	✓						✓			☆						✓	✓		✓		✓
92	SockBot	2017	✓									✓							✓				✓							✓						☆								✓	✓		✓		
93	SocksbotA	2016	✓									✓																		✓											✓			✓			✓		
94	Solid	2017	✓		✓							✓						✓	✓						✓			✓		✓							✓	✓						✓	✓		✓		✓
95	Sonyvpay	2018			✓	✓						✓														✓	✓			✓					✓			☆						✓	✓		✓		
96	SpyAgntX	2017										✓						✓	✓				✓							✓					☆									✓	✓		✓		
97	SpyBankerAIF	2018										✓	✓	✓																					✓									✓			✓		
98	SpyBankerAJZ	2018							✓			✓	✓	✓			✓		✓				✓					✓						✓	✓									✓	✓		✓		✓
99	SpyBankerHU	2017	✓	✓	✓			✓		✓			☆	☆				✓	✓				✓					✓			✓	✓	✓		✓	✓								✓	✓		✓		
100	SpyBankerPV	2017	✓									✓						✓	✓				✓			✓	✓	✓	✓	✓											✓		✓	✓	✓		✓		
101	Tekya	2020	✓	✓														✓												✓						✓											✓	✓	
102	TekyaHRX	2020	✓																✓				✓		✓			✓	✓	✓					✓												✓	✓	
103	ToastAmigo	2017					✓												☆											✓	☆				☆	☆	☆							✓			✓		
104	TrojanClicker	2018										✓						✓	✓				✓							✓					✓	✓								✓			✓		
105	TrojanDropperAgentCIQ	2018										✓						✓	✓				✓					✓	✓	✓									✓				✓	✓	✓		✓	✓	✓
106	TrojanDropperAgentGY	2016	✓									✓	☆	☆				✓	✓			✓			✓			✓		✓					☆	✓								✓			✓		
107	TrojanPornClicker	2016			✓							✓		✓				✓	✓				✓													☆								✓			✓		✓
108	Vilny	2018	✓									✓						✓	✓		✓		✓		✓					✓											✓			✓	✓		✓	✓	
109	ZtorgA	2017					✓					✓						✓	✓				✓						✓	✓					✓	✓								✓	✓		✓		✓
	Total Families		40	22	16	17	15	8	9	5	1	77	22	39	7	2	9	45	70	1	5	13	37	30	5	26	5	21	31	66	2	3	2	2	62	51	15	9	5	2	2	2	13	94	53	21	101	9	25
	Total Families Percentage		37	20	15	16	14	7	8	5	1	71	20	36	6	2	8	41	64	1	6	17	48	28	5	24	6	19	40	86	2	3	2	2	81	47	19	12	5	2	2	2	12	86	49	19	93	8	23