

50 Shades of Support: A Device-Centric Analysis of Android Security Updates


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Motivation – User Concerns

 **r/GalaxyS7** · 3 yr. ago
by ThinkBigger01 Join ...

Is S7 no longer getting quarterly android security updates? (latest I got was March 1)

According to link below, the S7 is still supposed to get quarterly android security level updates, however the latest I received was March 1. When I go to settings > software update > and there tap "download updates manually" I get nothing new.

 **r/GalaxyS21** · 10 mo. ago
by Impressive-Code777 Join

not getting security update on s21


question

can some one help I had updated my s21 from Samsung members app for android 13 now when all phones is officially updated to 13 ,iam still on beta and since October iam not getting security update can any one have a solution 🙏

Pixel 6, Pixel 7 users on T-Mobile fail to receive January update; others still stuck on November

T-MOBILE ANDROID SOFTWARE UPDATES GOOGLE

PUBLISHED: JAN 12, 2023, 3:21 PM


 **r/Xiaomi** · 8 mo. ago
dmaare ...

Xiaomi 12T already abandoned?

Discussion

Xiaomi specified there will be android security updates every 90 days for phones that are still supported.

However last update I got on my Xiaomi 12T was back in the beginning of February. It's June tomorrow so that's already way over 90 days of no updates.

 **r/Oppo** · 6 mo. ago
Aural-Goat72 ...

No security updates since May 2023 on Oppo Find X5?

Help

I have not had any updates for ages, My father has a X5 Lite and the June update.

Anyone else still stuck on May 2023? Just to add - I am in the UK

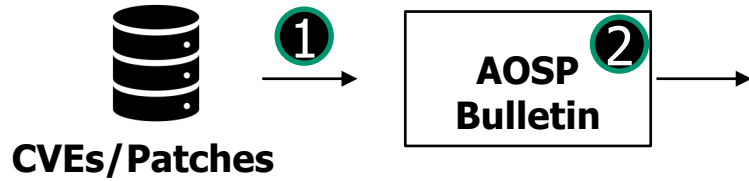
Android Security Updates Rollout



CVEs/Patches

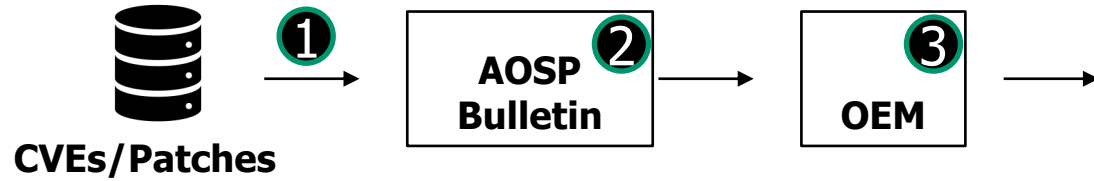
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Android Security Updates Rollout



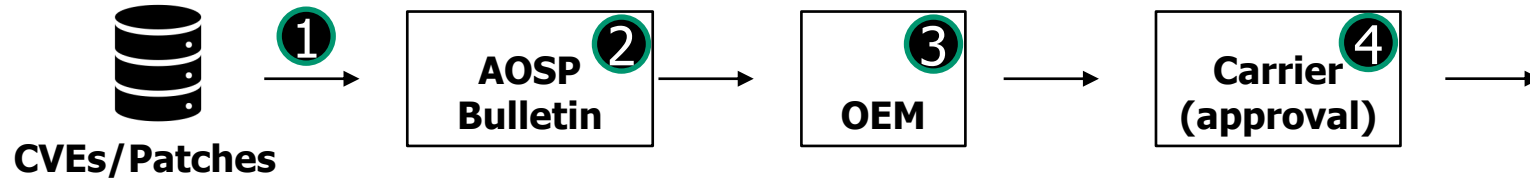
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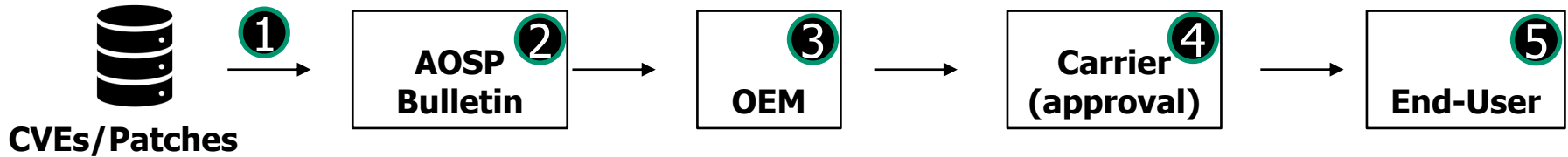
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- 4 Carrier tests and approves the firmware.
- 5 End-user accepts the update and installs it through the OTA update.

Prior Studies

- Literature:
 - Zhang et al. (USENIX '21): **Kernel vulnerabilities**
 - Hou et al. (ICSE '22): **153 OEMs but only 6261 firmware images**
 - Jones et al. (CCS '20): **152 M HTTP end-user requests but only 684 security updates from Samsung**
- More questions to be answered:
 - Average support duration?
 - Impacting factors?
 - When does it become unsafe to use?
 - Key issues and exemplary practices?

Data Collection

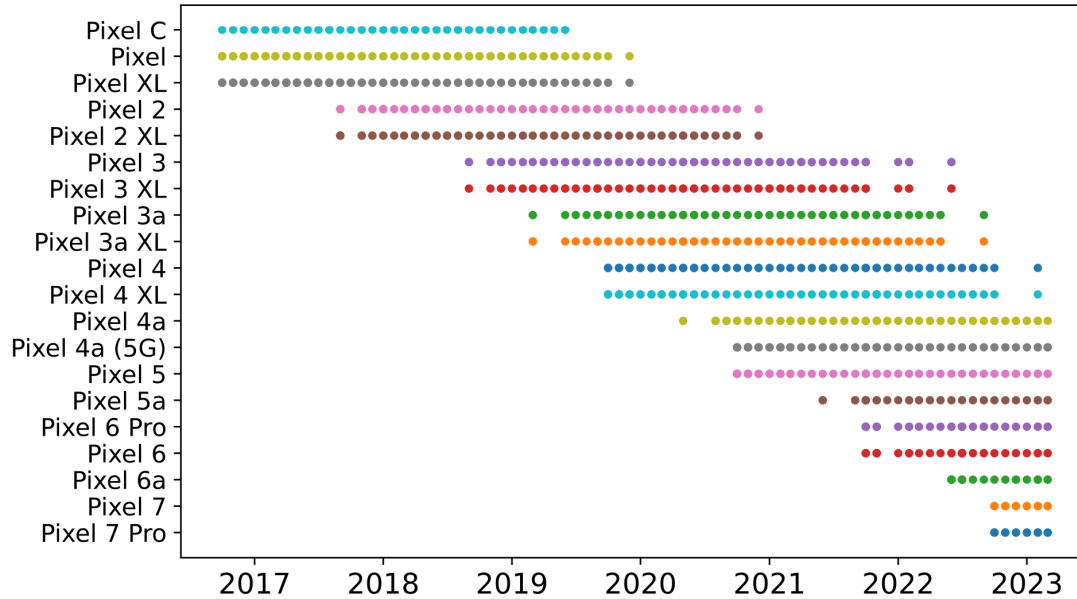
- Security Updates:

OEM	Total	Unique Device Count	Region/Country	Carrier	Duration
Samsung	354165	275	97 countries	109	Apr 2015 - Mar 2023
Xiaomi	2286	223	10 regions	-	Dec 2014 - Jun 2023
Oppo	9241	72	35 countries	-	Jan 2018 - Aug 2022
Google (Pixel)	900	20	12 regions	27	Nov 2015 - Mar 2023

- Support Lists

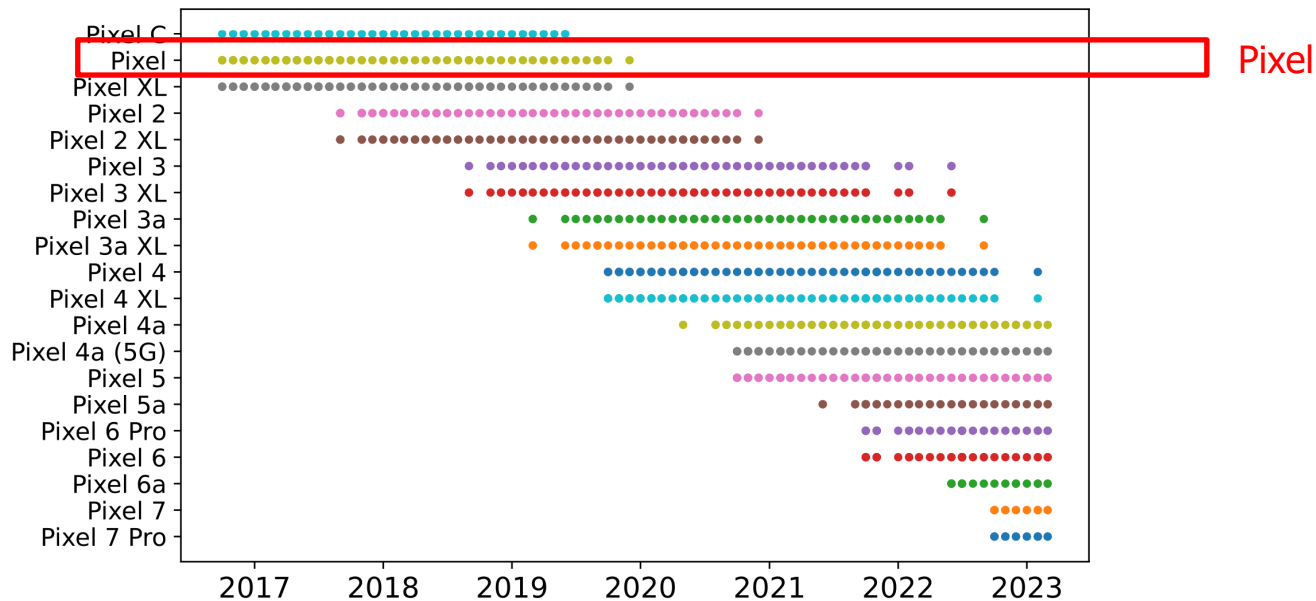
Part-1: Supported Period

- Google - baseline



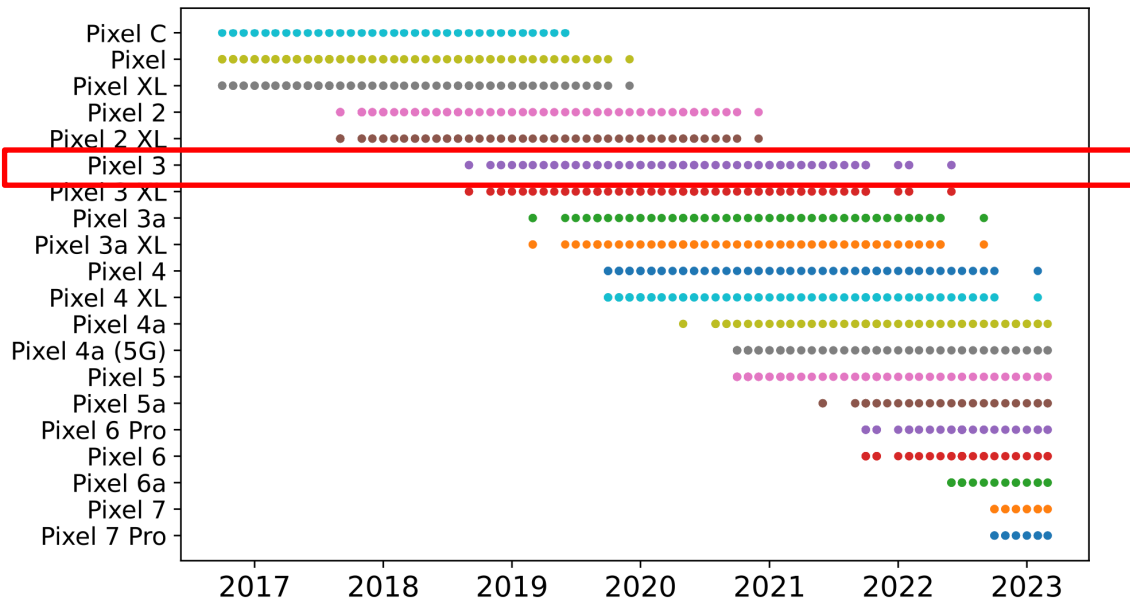
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- Google - baseline



On average:

- Count: 36 updates
- Duration: ~3 years
- Frequency: 1 month
- Delay: 0 days

Part-1: Supported Period

- Samsung:
 - Count: 16 updates
 - Duration: 757 days (~2 years)
 - Support list stay: 2197 days (~ 6 years)
 - Frequency: 50 days
 - Delay: 140 days

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- Xiaomi:

- Count: 3 updates
- Duration: 170 days
- Frequency: 48 days
- Delay: 32 days

Frequency and delay 

Count and Duration 

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Frequency and delay ✓

Count and Duration !

- Oppo:

- Count: 8 updates
- Duration: 583 days
- Frequency: 85 days
- Delay: 35 days

Duration and delay ✓

Count and frequency !

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Duration and delay 

Count and frequency 

- Google provides monthly security updates for a fixed period of 3 years.
- Samsung's security update behavior varies depending on various factors.
- Oppo and Xiaomi offer relatively fewer security updates for a shorter duration.

Part-2: Unsupported Period

- Risks that arise in unpatched Android devices over time

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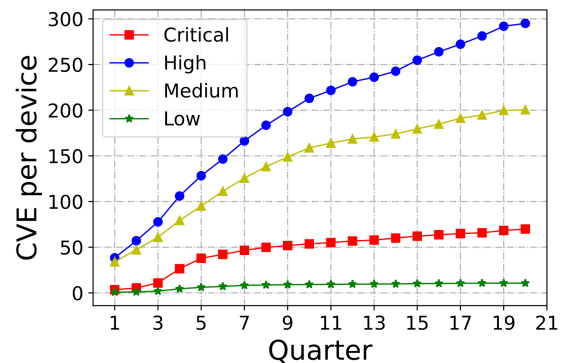
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- Located the impacting CVEs based on:
 - Last Android version
 - Chipset
- Filtered using the End-of-Life (EOL)
 - The date of last security update
- In total, we assigned CVEs to:
 - 21461 model-country/carrier pairs from Samsung
 - 756 model-region pairs from Xiaomi
 - 1124 country-device pairs from Oppo
 - 20 devices from Google

Part-2: Unsupported Period

- Pairs received **at least one impacting CVE and not received security updates** in the last three months: 8594 (36.7%)

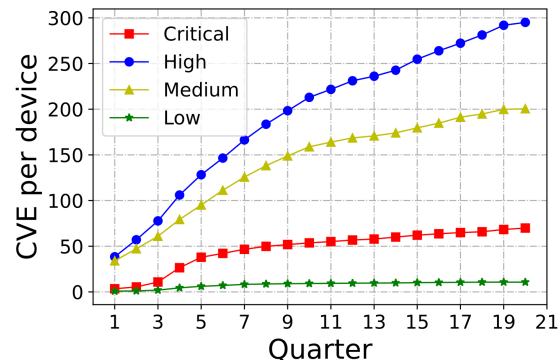
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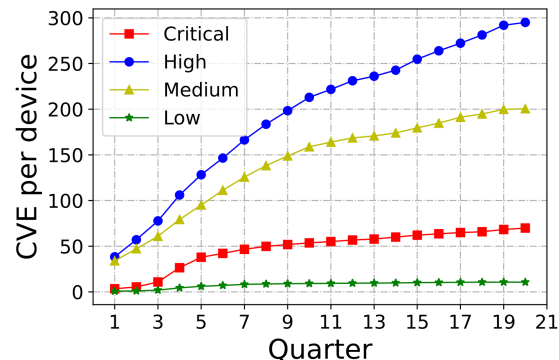
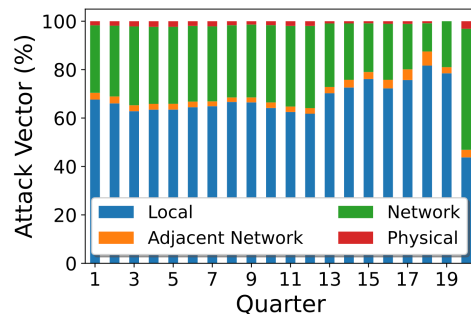
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 - 3 CVEs with **critical** severity (risk score > 9)
- 382 CVEs in two years and 600 CVEs in five years



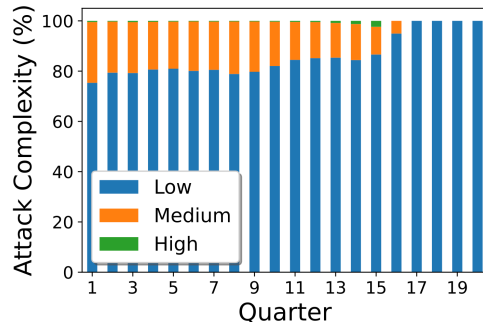
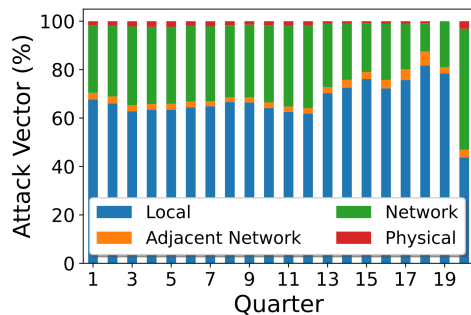
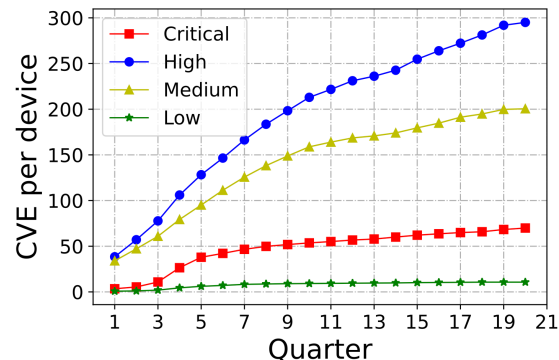
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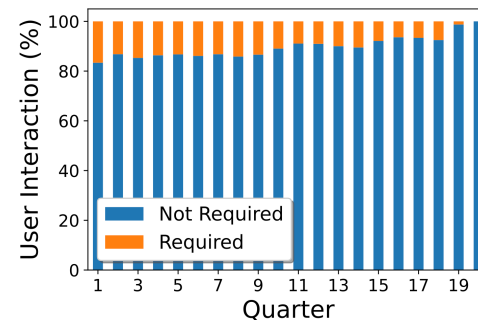
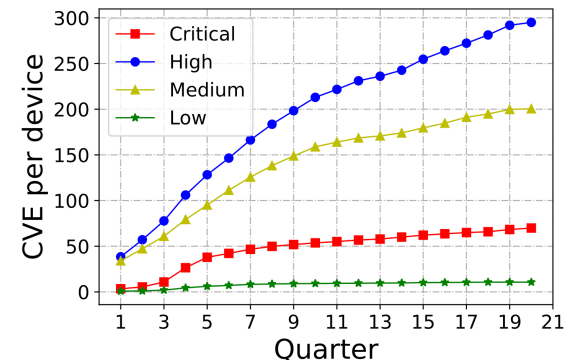
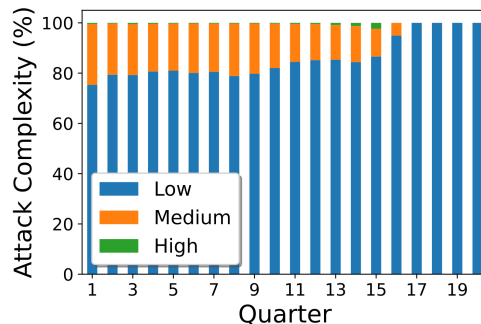
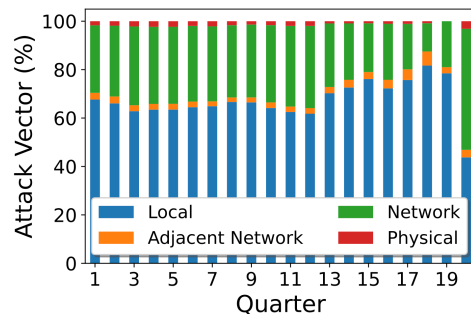
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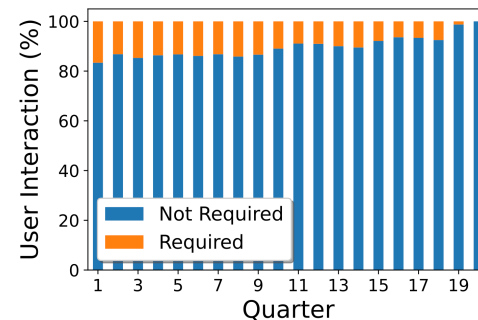
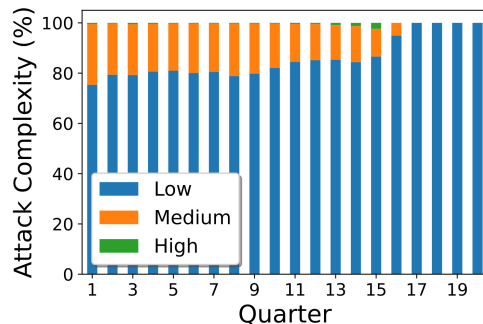
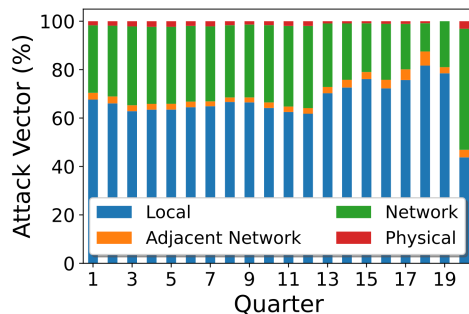
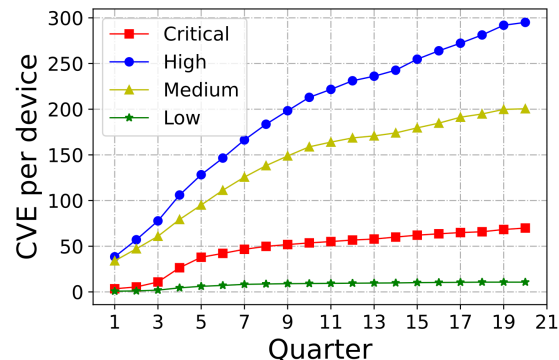
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89% of the CVEs do not require user interaction, 86% can be exploited with minimal effort on the attacker's part, while 27% can be exploited remotely.

Part-2: Unsupported Period

- **Case Study: Galaxy Z Fold3 5G**

Part-2: Unsupported Period

AER: Android Enterprise Recommended

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Not receiving security updates for more than a year

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- Assigned 11 CVEs using the chipset and 426 CVEs impacting Android 12
- Filtered out the CVEs published before August 2022

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Final result: **142 impacting CVEs; 6 of them are critical and can be remotely exploited without user interaction.**

Impacting Factors

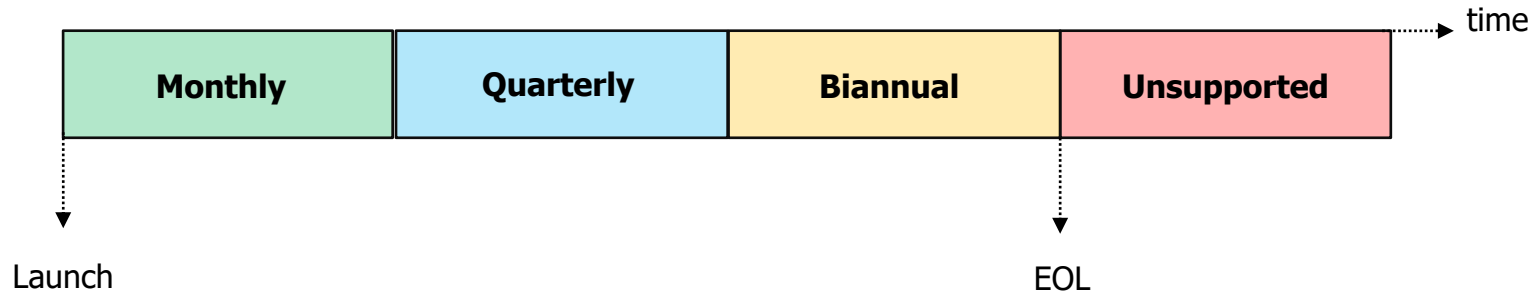
- Support Type
- Geolocation
- Device Type
- Carrier Association
- Partnership Agreements and Platform Solutions

Impacting Factors

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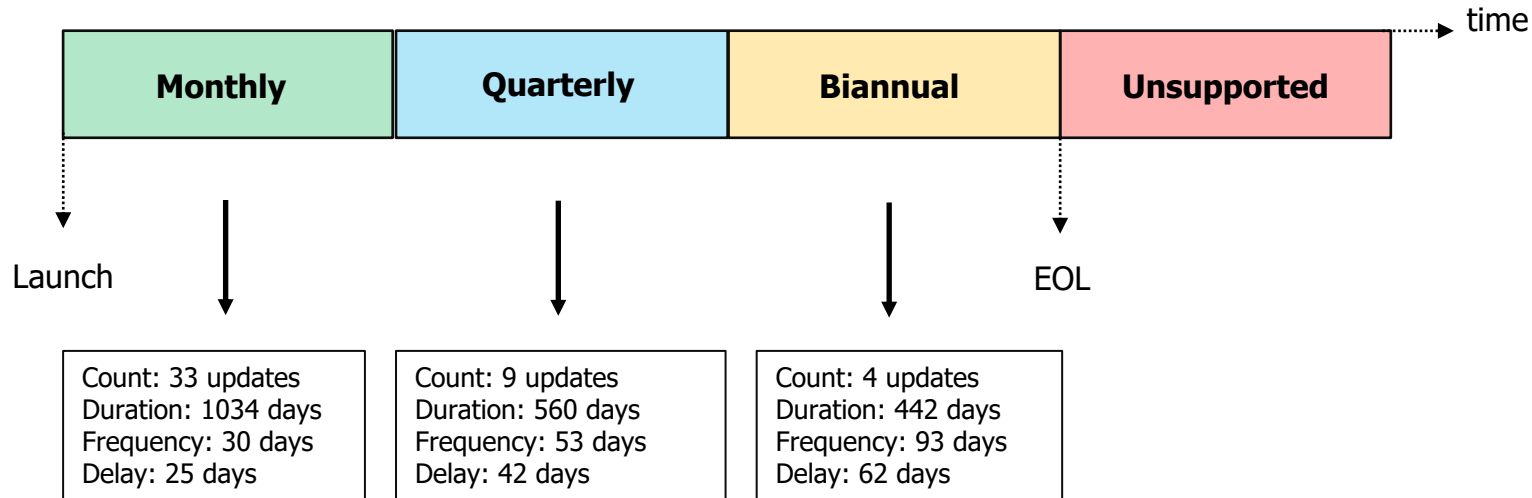
Support Type

- No single support type, gradual transition over time



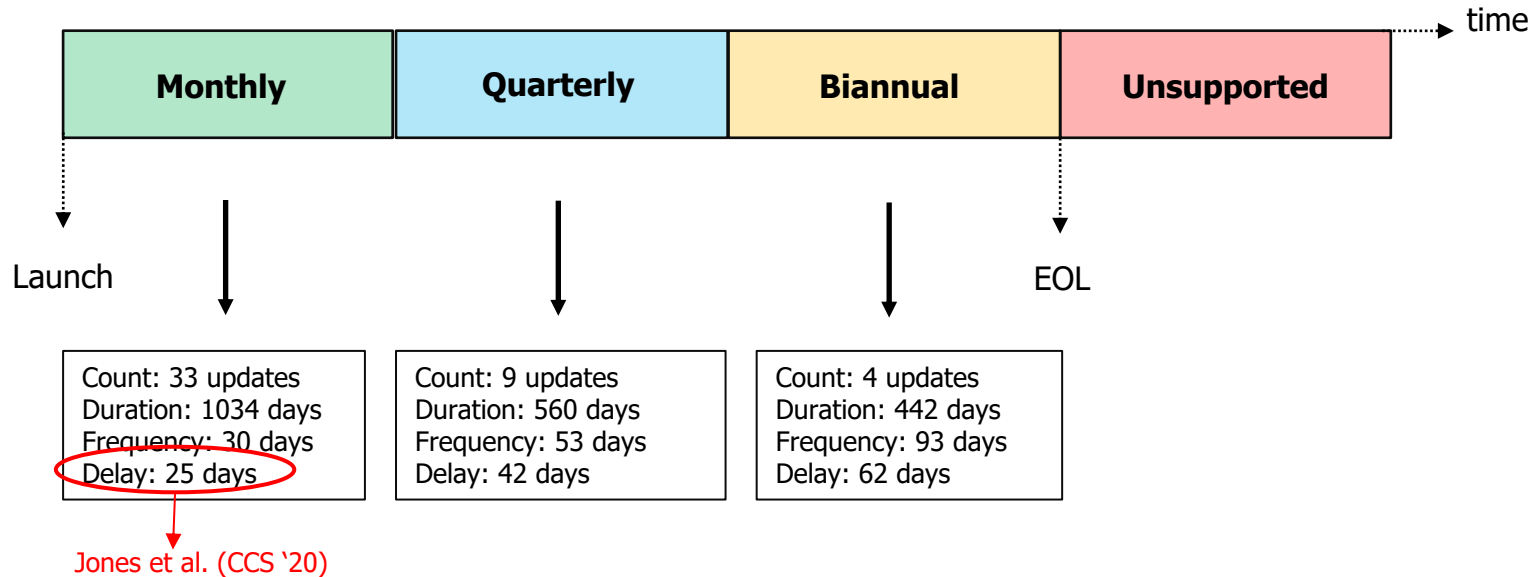
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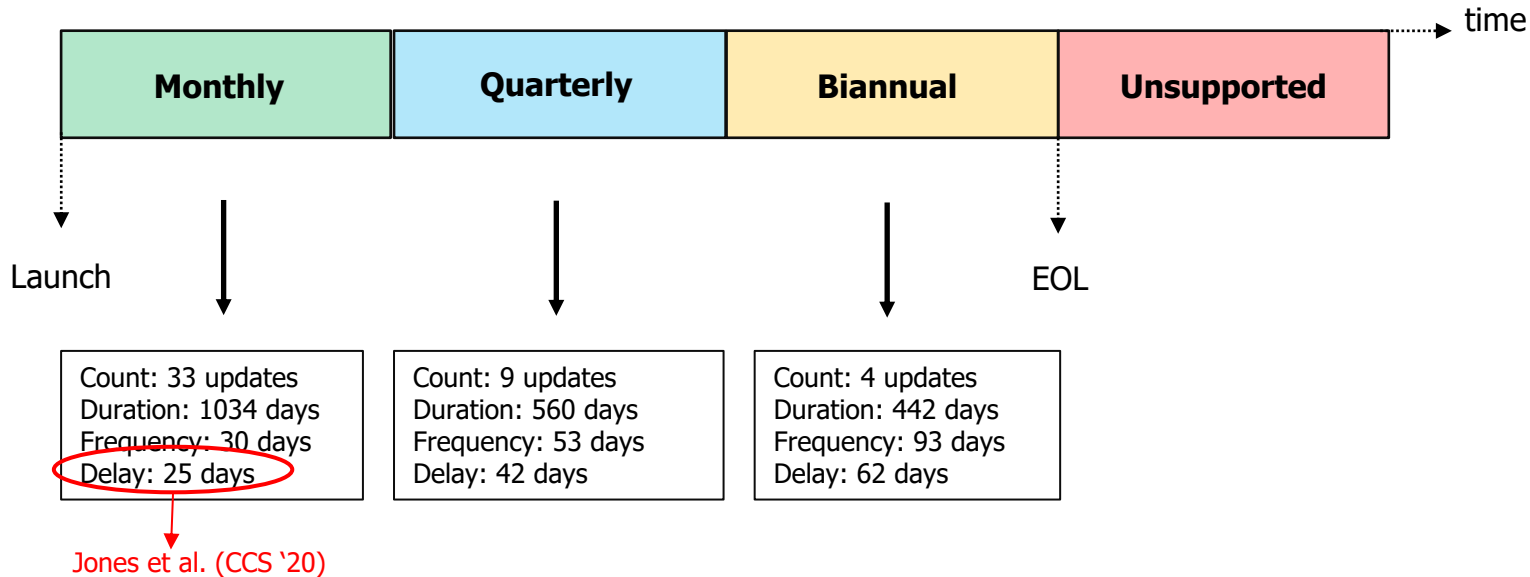
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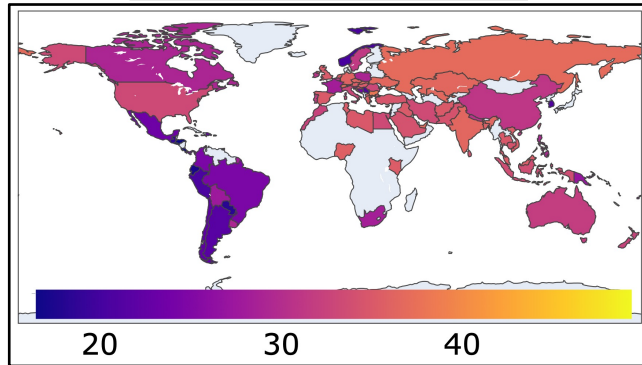
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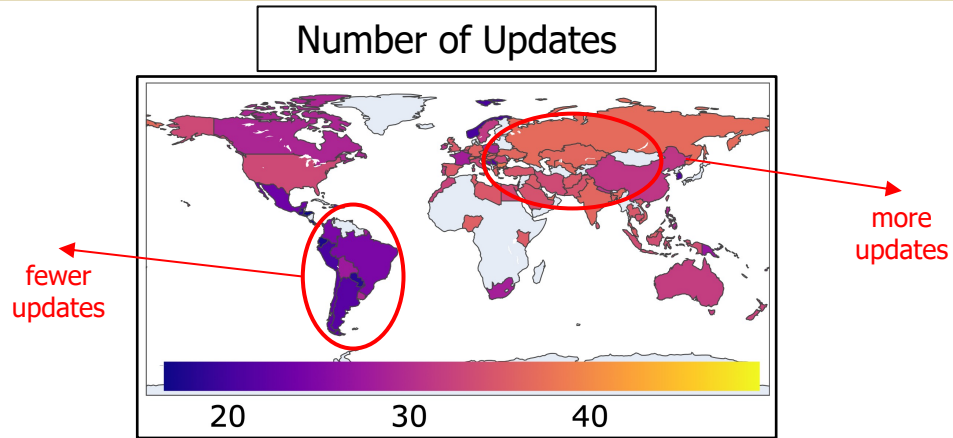
Timeliness and availability of security updates vary significantly for different support types.

Geolocation-1

Number of Updates

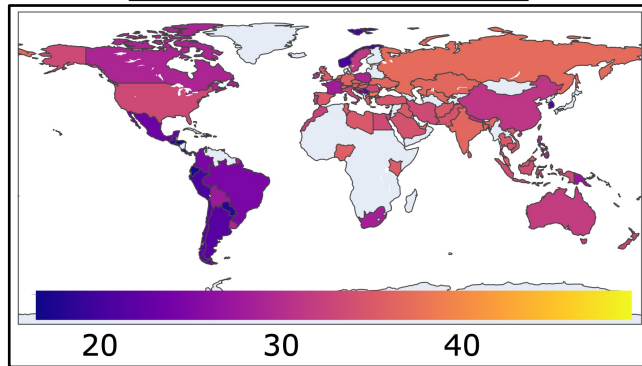


Geolocation-1

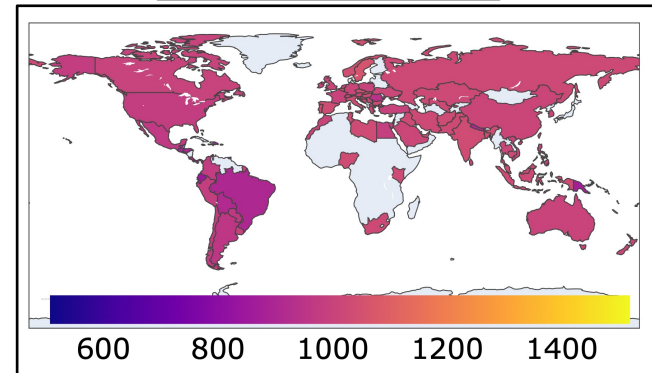


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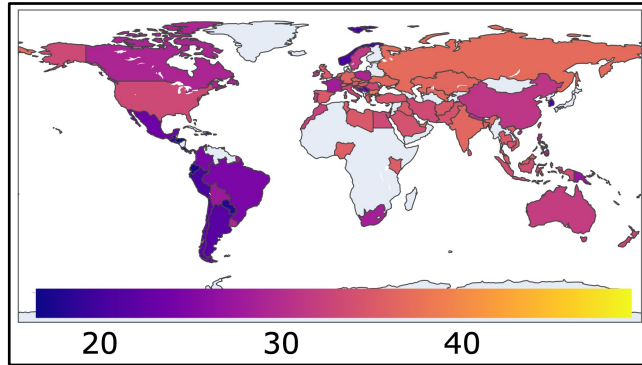


Duration (days)

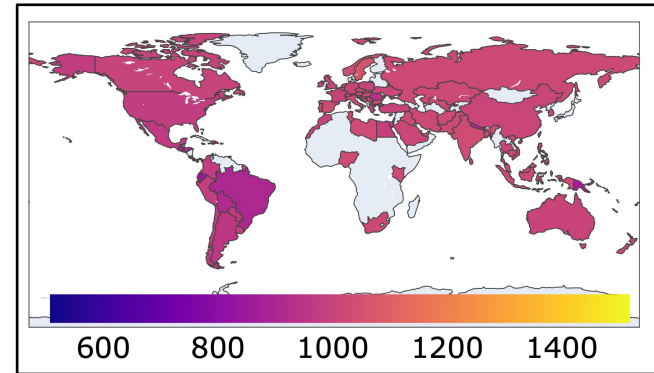


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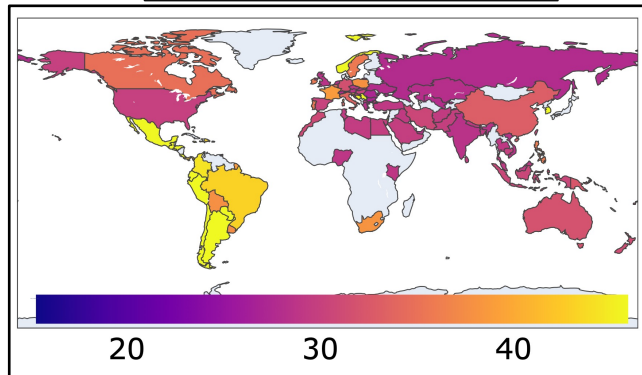
Number of Updates



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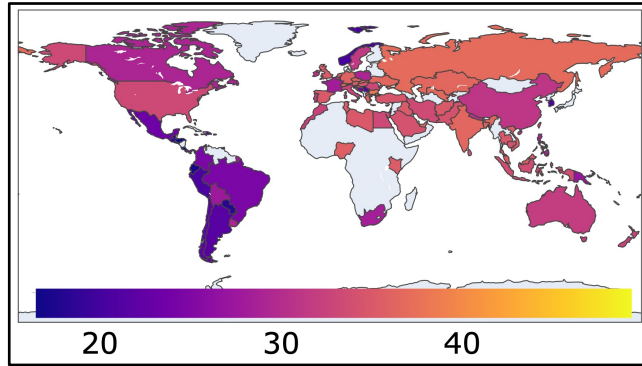


Frequency (days)

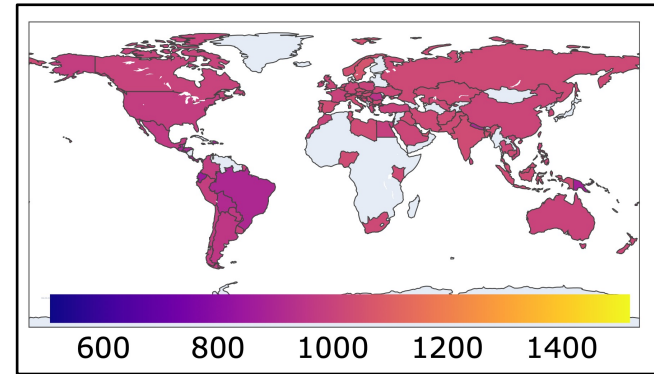


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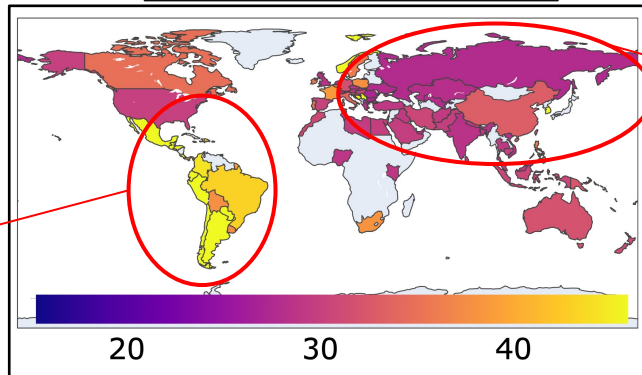
Number of Updates



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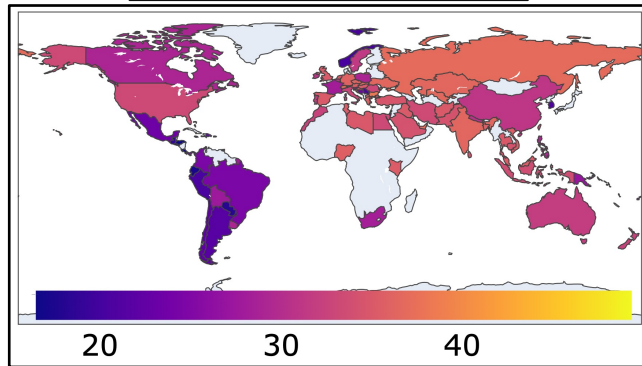


Less frequent updates

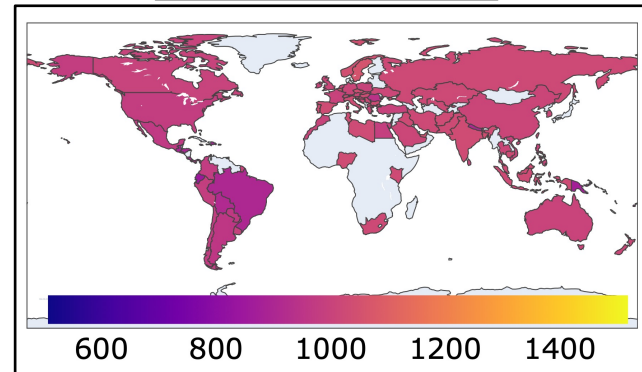
More frequent updates

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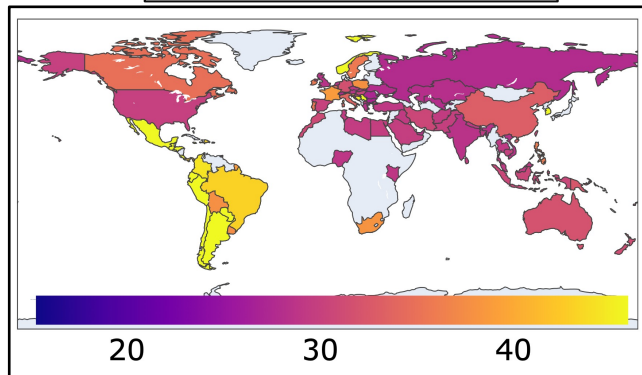
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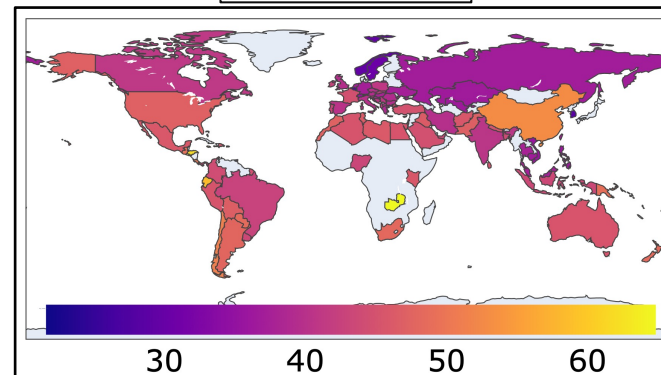
Duration (days)



Frequency (days)

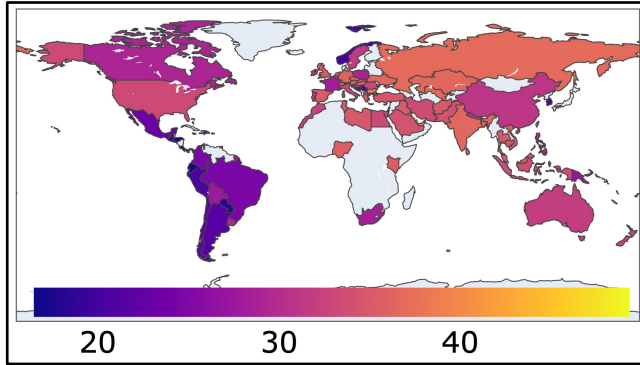


Delay (days)

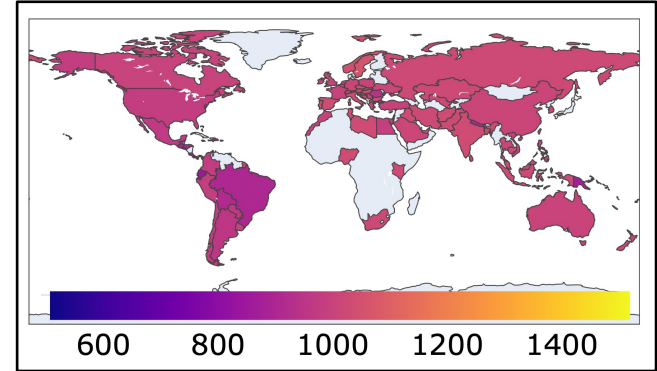


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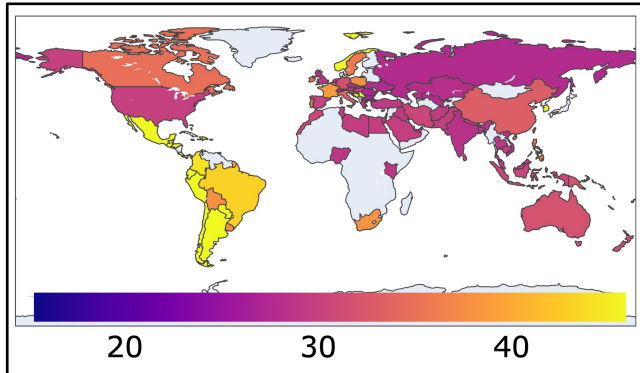
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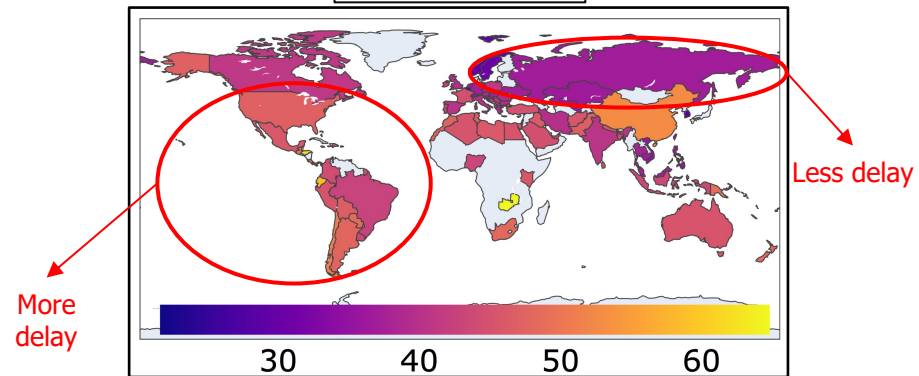
Duration (days)



Frequency (days)



Delay (days)



Geolocation-2

- Grouped, sorted, and selected top/bottom five countries

Subregion	Country	Monthly			
		Update Count	Support Duration	Update Freq	Release Delay
Western Europe	Luxembourg	39.0	1068.0	26.8	21.0
Eastern Europe	Russia	38.0	1053.0	27.2	20.0
Western Europe	Switzerland	38.0	1050.0	27.8	18.0
Central Asia	Uzbekistan	38.0	1043.0	27.8	18.0
Southern Asia	India	37.5	1050.0	27.2	19.5
Latin America and the Caribbean	Honduras	17.0	978.0	55.9	48.0
Latin America and the Caribbean	Costa Rica	16.5	1041.5	56.1	46.5
Latin America and the Caribbean	Paraguay	16.0	972.0	60.1	48.0
Latin America and the Caribbean	Ecuador	16.0	929.0	48.1	51.0
Latin America and the Caribbean	Jamaica	15.0	903.0	56.4	52.0

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Latin America and the Caribbean	Costa Rica	16.5	1041.5	56.1	46.5
Latin America and the Caribbean	Paraguay	16.0	972.0	60.1	48.0
Latin America and the Caribbean	Ecuador	16.0	929.0	48.1	51.0
Latin America and the Caribbean	Jamaica	15.0	903.0	56.4	52.0

- 3 times more updates
- More frequent
- Less delay

- Fewer updates
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- Three times more delay

Geolocation-2

- Grouped, sorted, and selected top/bottom five countries

Subregion	Country	Monthly			
		Update Count	Support Duration	Update Freq	Release Delay
Western Europe	Luxembourg	39.0	1068.0	26.8	21.0
Eastern Europe	Russia	38.0	1053.0	27.2	20.0
Western Europe	Switzerland	38.0	1050.0	27.8	18.0
Central Asia	Uzbekistan	38.0	1043.0	27.8	18.0
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Variations in support across different regions and countries are observable.

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Device type is a major factor impacting security updates for some OEMs.

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- **4: Misleading Announcements**
 - “at least four years of security updates”, Feb 2021
 - 343/8033 pairs already stopped receiving updates
 - “five years of security updates”, Feb 2022
 - 2 pairs never received



Exemplary Practices

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- Room for accountability and improvement:
 - publish the support duration of all device models/pairs,
 - maintain the timeliness of their security updates.

Q&A

Thank You!

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Code & Data

Code & Data: github.com/cslfu/Android-Security-Updates

