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Rods with Laser Beams: Understanding Browser Fingerprinting on Phishing Pages

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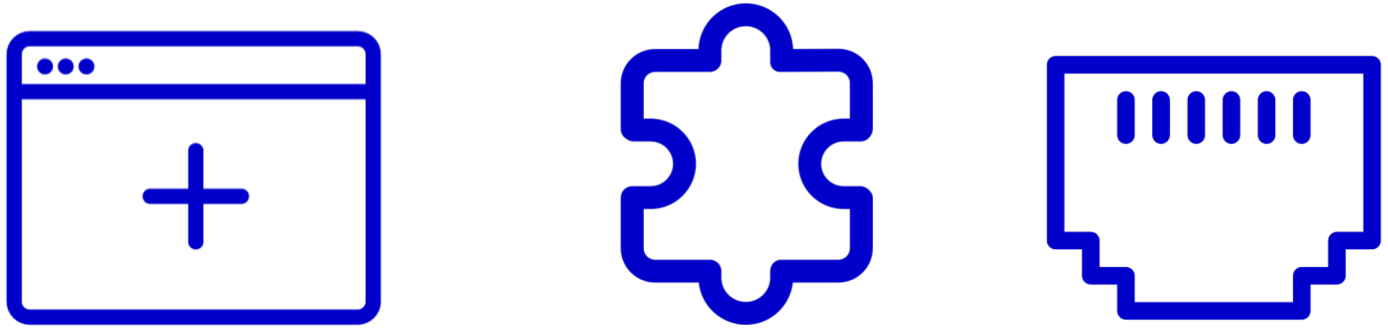
Browser Fingerprinting

Websites have access to **information exposed** by the browser, such as the type and version, IP address, plugins, and the list of available fonts. By **combining these elements**, websites can generate fingerprints.



Browser Fingerprinting

This presents an attack surface for those using fingerprints for **privacy-invasive** purposes, but it has also been used for benign purposes—such as providing additional elements of (“zero-trust”) **authentication**.

Digital Fingerprint Theft

Complementing a user’s stolen credentials with the corresponding fingerprint significantly **increases the value** of the stolen assets.

Our Analysis

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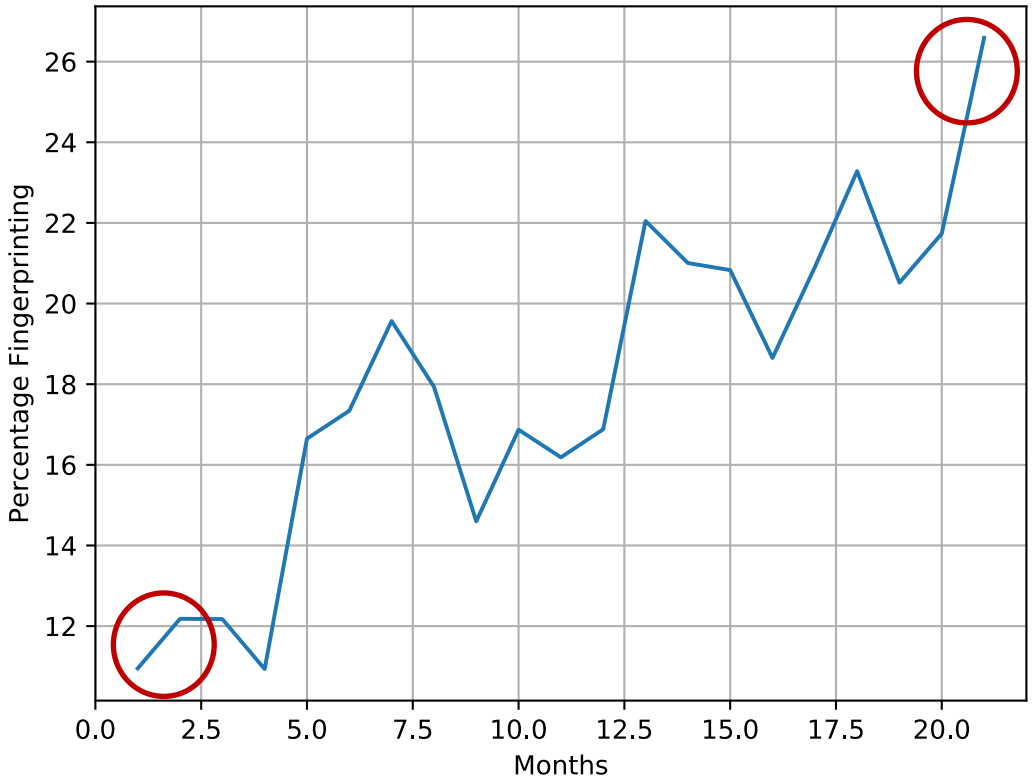
To assess the actual impact on real users, we used our **telemetry** data

The General Picture

We observe a dramatic increase on the number of phishing sites that adopt fingerprinting techniques, **from around 12% to over 26%.** This emphasizes the ever-growing interest of phishers in using fingerprinting functions.



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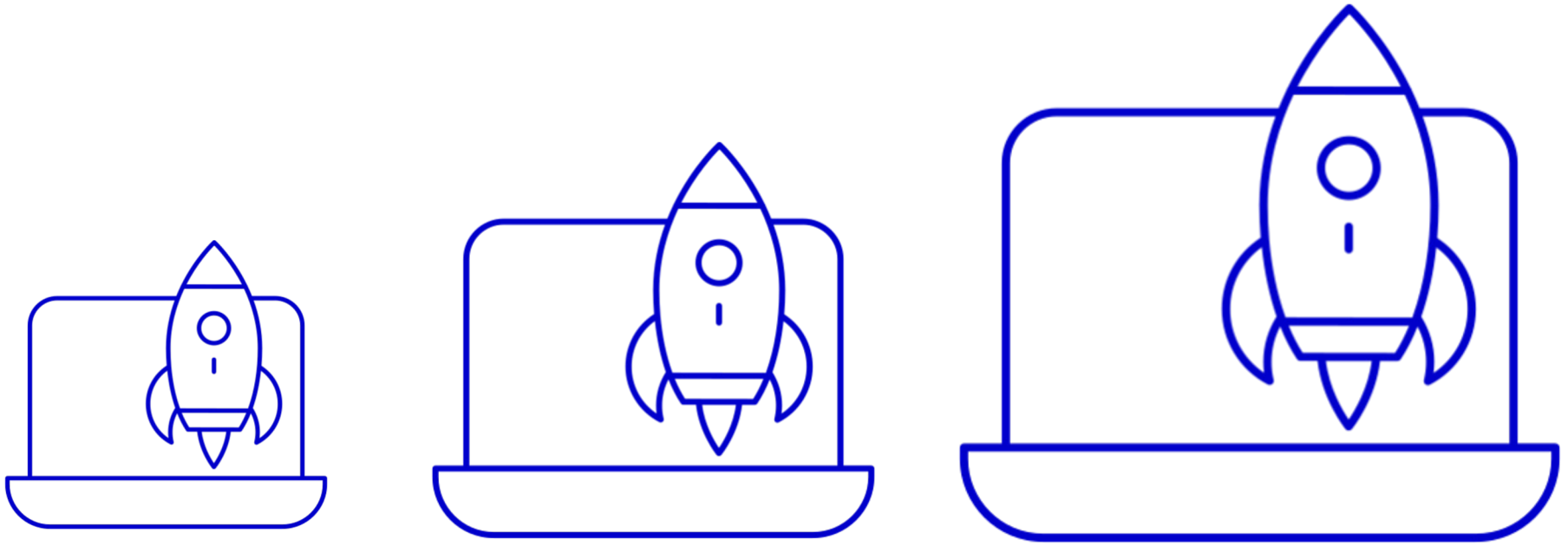
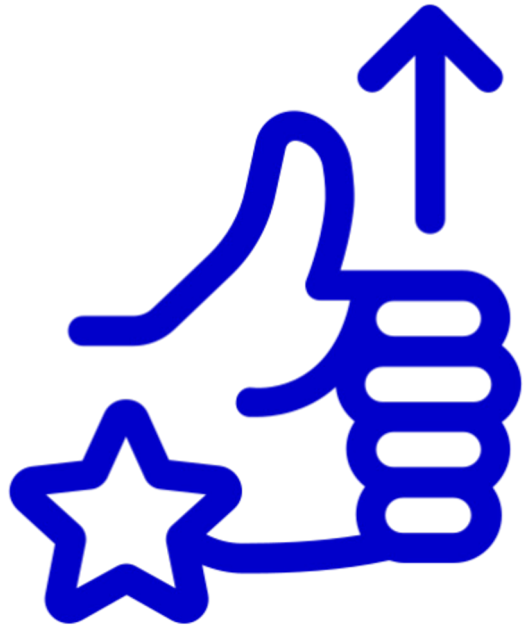


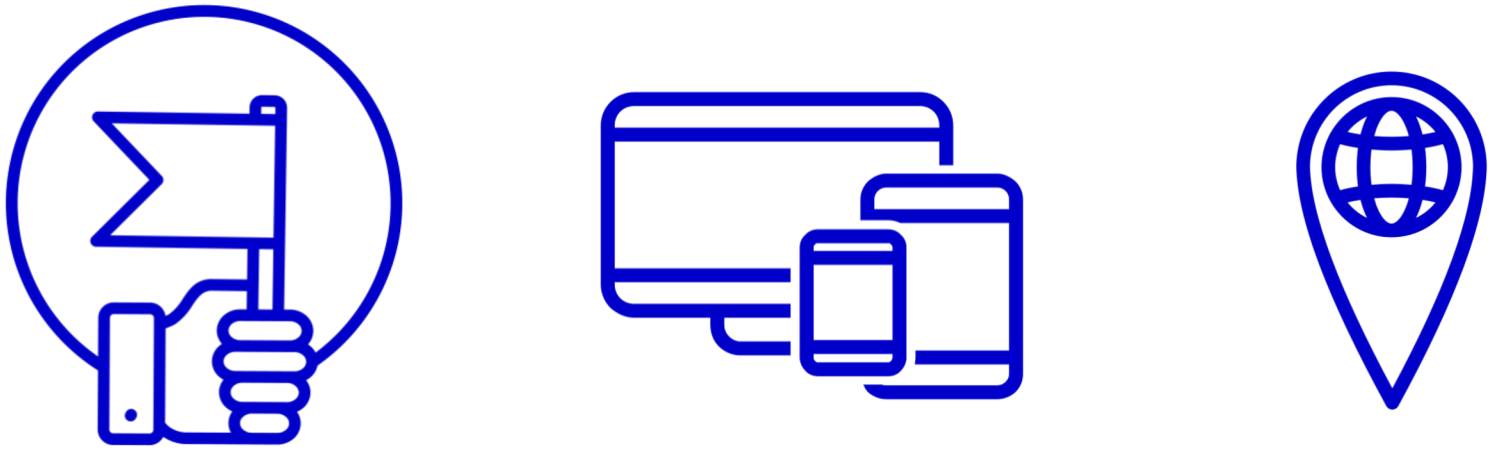
The fraction of phishing websites that use fingerprinting has **more than doubled** over the past two years. Today, **one in four** phishing sites invoke fingerprinting APIs.

Real-World Impact

Restricting the analysis to **most popular** phishing pages – computed according to the number of victims in the telemetry – we observe that the percentage of those using fingerprinting APIs significantly increases to **44.5%** if we consider the **top 50K**.



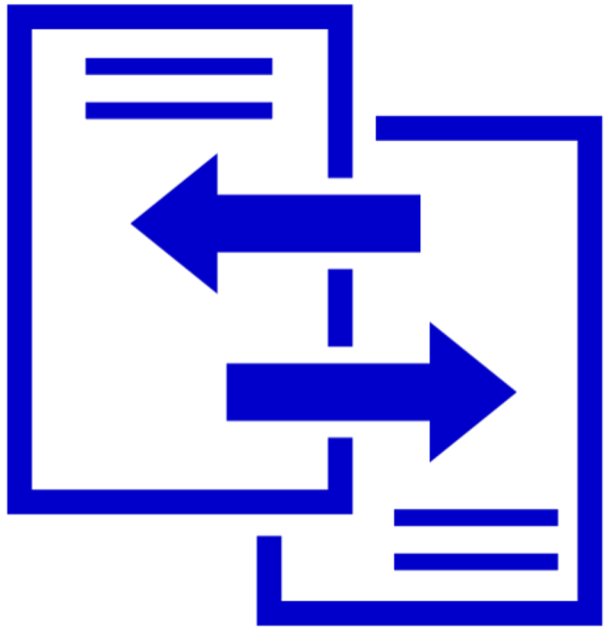
Real-World Impact



Phishing websites that are more successful at **attracting users**, target **more devices**, or whose victims span **more countries**, tend also to be the ones that use **fingerprinting the most**.

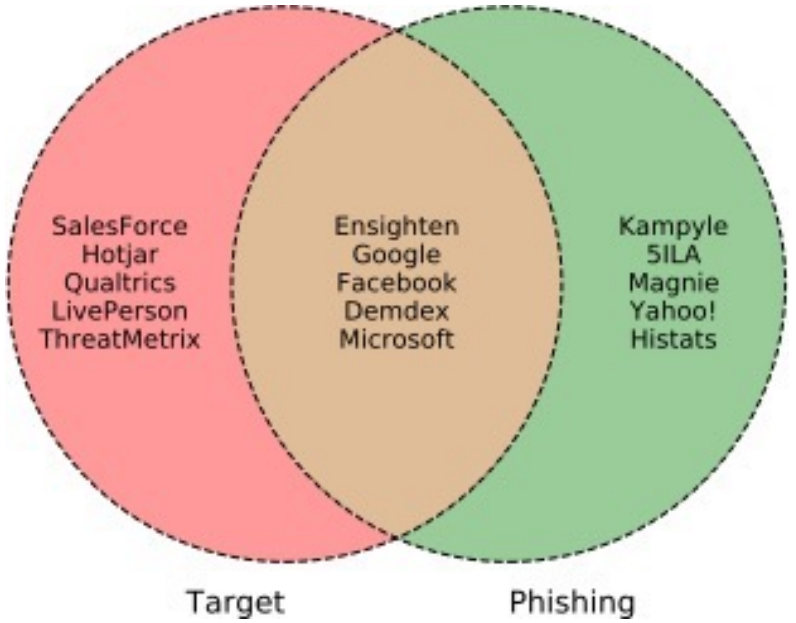
Additional Fingerprinting

On **53.7%** of the phishing pages, fingerprinting content is sent directly by the first-party. Moreover, **77.8%** of the websites which use third parties for fingerprinting **do not copy them** from the legitimate website they impersonate.



Additional Fingerprinting

While **top trackers** observed on legitimate websites are present in both cases, we also observe **less popular entries** that are not among the common trackers in legitimate websites. This shows that phishers tend to use **different trackers** than legitimate pages.

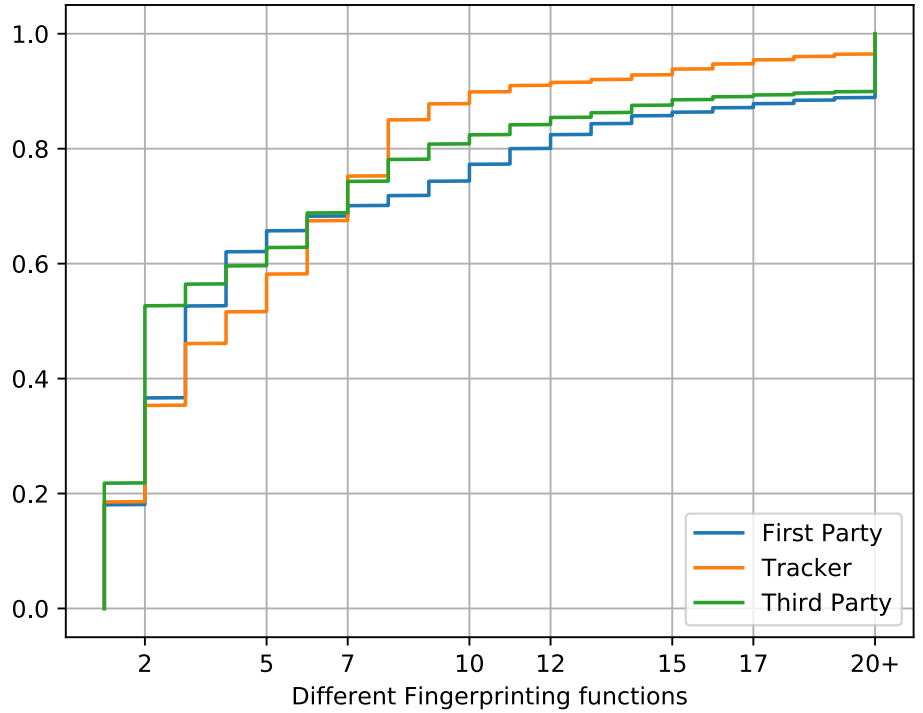


Additional Fingerprinting

Overall, **90%** of the phishing websites that send or store fingerprints, compute them from **newly included code** (not present in their target site).

Fingerprinting Functions

If we break down the number of functions called by first-party, tracker and third-party scripts, the average number of **fingerprinting functions** we observed in phishing pages is between **5.4** and **6.7**.



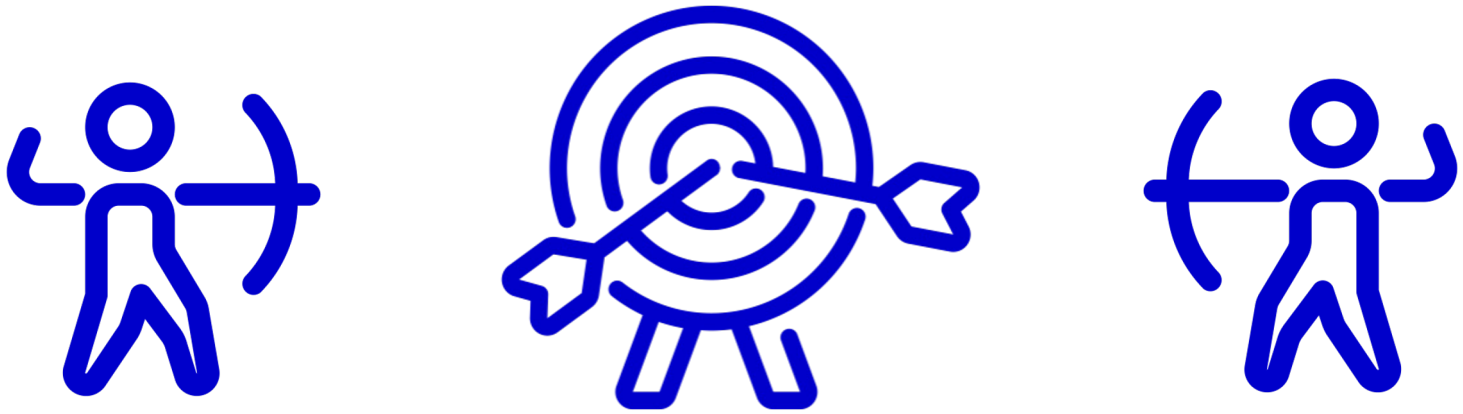
Fingerprinting Functions

Phishers often go beyond using basic approaches, and are starting to **implement advanced methods (24.6%)** such as webGL, canvas or audio fingerprinting, to refine the information needed for operations.

Target Brand Analysis

Financial Services, Social Networking and Technology/Internet are the most targeted categories with between half and three-quarters adopting **complex fingerprinting** techniques.

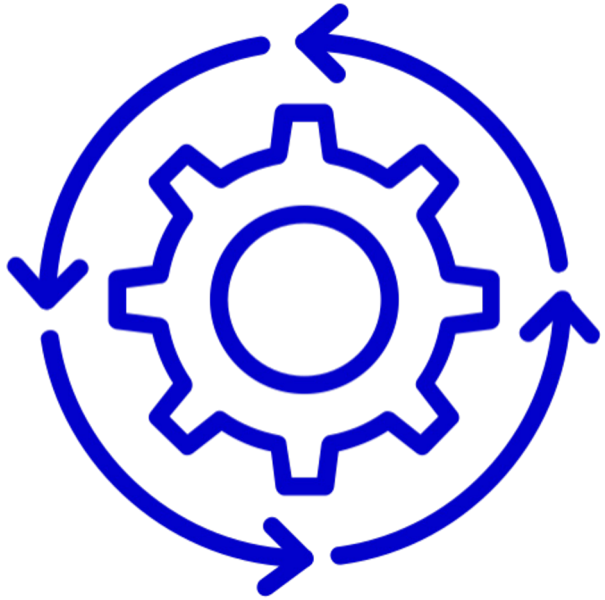
Target Brand Analysis



On average, over **80%** of highly targeted brands, categories or countries, implement **multiple fingerprinting** functions, as their benign counterparts do.

Comparing Phishing with Their Targets

One might expect phishers to simply **copy the exact same** fingerprinting functionality used by their targets. However, this would be a **poor and very time-consuming**. Instead, a better strategy would be to deploy **generic** fingerprinting code snippets, which could be **easily reused.**



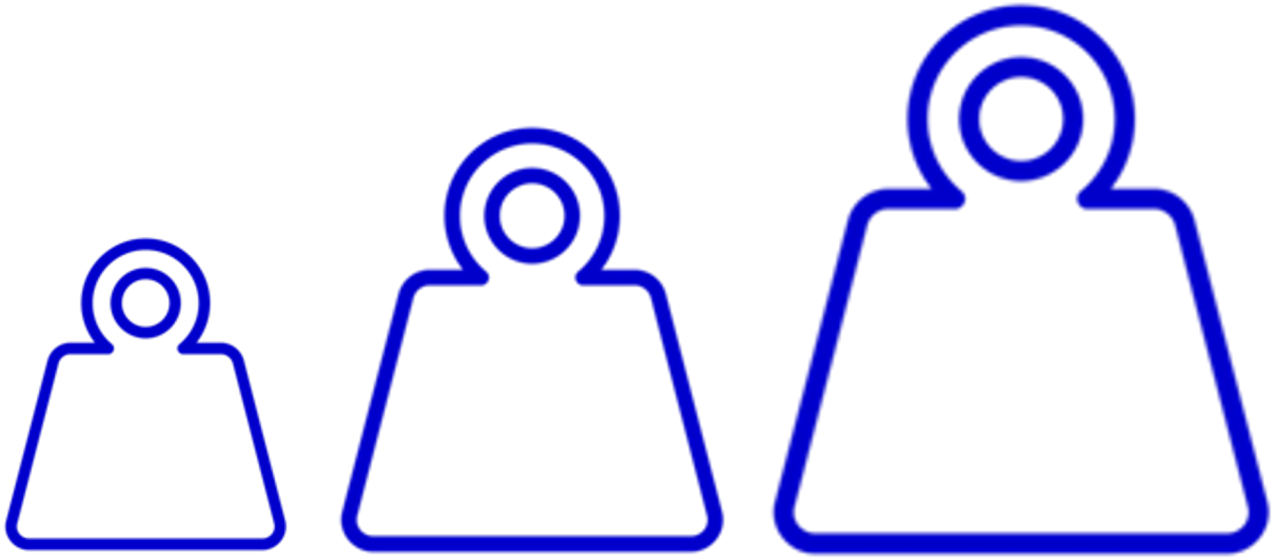
Comparing Phishing with Their Targets

Nearly **30%** of the targets have at least one phishing page that **matches** their fingerprinting functions, and **65%** of the phishers invoke **additional functions**.

Who are the Heavy Fingerprinters?

We computed a **signature** based on the list of **fingerprinting functions** used and their interactions. Through a manual analysis of some such cases, we discovered clusters that suggest **specific attacker groups** with distinct modes of operations.

Who are the Heavy Fingerprinters?



We were able to extract **32** unique **signatures** impersonating more than one target brand, matching up to **15 targets** from **7** different **categories**.

Thank you

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