Phishing Activity Trends Report

4th Quarter 2016

APWG

Unifying the

Global Response

To Cybercrime

October – December 2016

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Phishing Report Scope

The *APWG Phishing Activity Trends Report* analyzes phishing attacks reported to the APWG by its member companies, its Global Research Partners, through the organization's website at http://www.apwg.org, and by e-mail submissions to reportphishing@antiphishing.org. APWG also measures the evolution, proliferation, and propagation of crimeware by drawing from the research of our member companies.

Phishing Defined

Phishing is a criminal mechanism employing both *social engineering* and *technical subterfuge* to steal consumers' personal identity data and financial account credentials. Social engineering schemes use spoofed e-mails purporting to be from legitimate businesses and agencies, designed to lead consumers to counterfeit websites that trick recipients into divulging financial data such as usernames and passwords. Technical subterfuge schemes plant crimeware onto PCs to steal credentials directly, often using systems to intercept consumers online account user names and passwords -- and to corrupt local navigational infrastructures to misdirect consumers to counterfeit websites (or authentic websites through phisher-controlled proxies used to monitor and intercept consumers' keystrokes).

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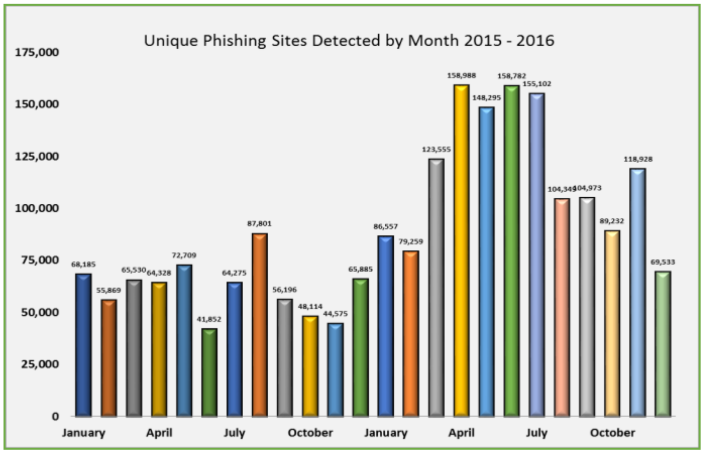
Phishing Attack Campaigns in 2016 Shatter All Previous Years' Records



The APWG recorded more phishing in 2016 than in any year since it began monitoring in 2004. [p. 5]

Other 4th Quarter 2016 Phishing Trends Highlights

- The total number of phishing attacks in 2016 was 1,220,523, a 65% increase over 2015. [p. 5]
- In the fourth quarter of 2004, the APWG saw 1,609 phishing attacks per month. In the fourth quarter of 2016, APWG saw an average of 92,564 phishing attacks per month, an increase of 5,753% over 12 years. [p. 5]
- Fraudsters in Brazil are using both traditional phishing and social media to defraud Internet users. They are also using technical tricks to make it harder for responders to stop theses scams. [pp. 10-11]
- Phishers concentrated on fewer targets during the holiday season, and hit fewer lower-yielding or experimental targets. [p. 7]
- Phishers didn't need to choose domain names that help fool victims. [pp. 8-9]
- The country that is most plagued by malware is China, where 47.09% of machines are infected, followed by Turkey (42.88%) and Taiwan (38.98%). [p. 13]

Methodology and Instrumented Data Sets

The APWG continues to refine its tracking and reporting methodology and to incorporate new data sources into our reports. APWG tracks and reports the number of unique phishing reports (email campaigns) it receives, in addition to the number of unique phishing sites found. An e-mail campaign is a unique e-mail sent out to multiple users, directing them to a specific phishing web site (multiple campaigns may point to the same web site). APWG counts unique phishing report e-mails as those found in a given month that have the same subject line in the e-mail.

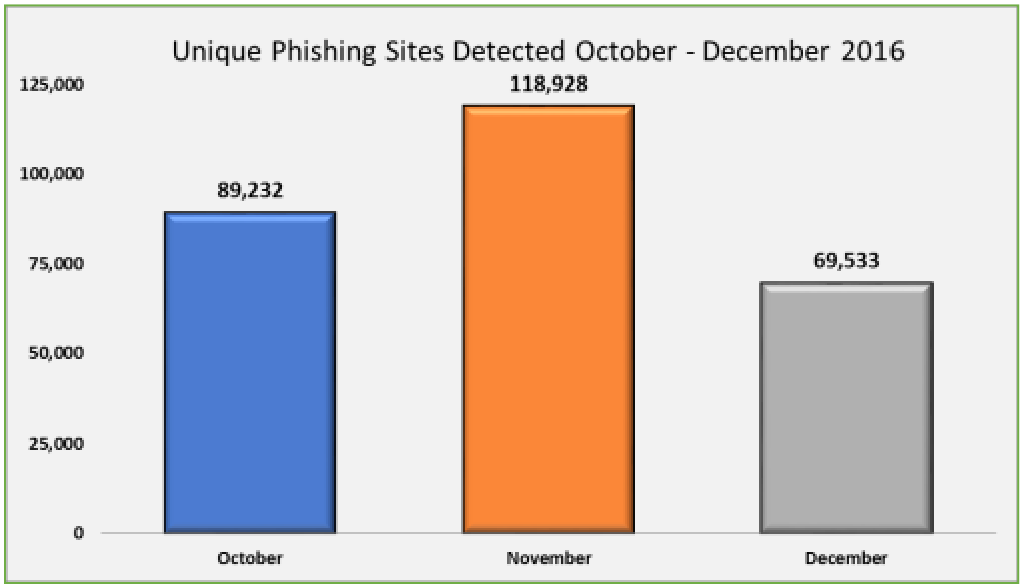
The APWG also tracks the number of unique phishing websites. This is now determined by the unique base URLs of the phishing sites. (A single phishing site may be advertised as thousands of customized URLS, all leading to basically the same attack destination.) APWG additionally tracks crimeware instances (unique software applications as determined by MD5 hash of the crimeware sample), as well as unique sites that are distributing crimeware (typically via browser drive-by exploits). The *APWG Phishing Activity Trends Report* also includes statistics on rogue anti-virus software, desktop infection rates, and related topics.

Statistical Highlights for 4th Quarter 2016

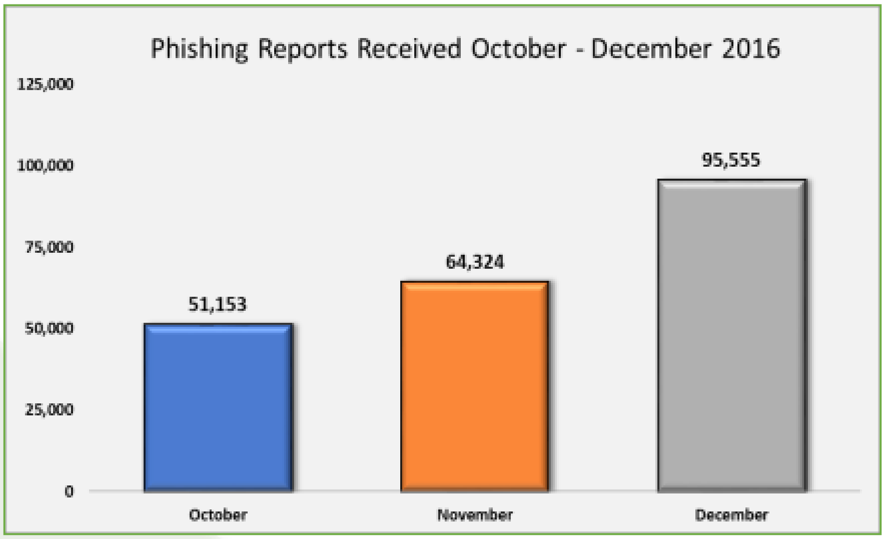
	October	November	December
Number of unique phishing websites detected	89,232	118,928	69,533
Number of unique phishing e-mail reports (campaigns) received by APWG from consumers	51,153	64,324	95,555
Number of brands targeted by phishing campaigns	357	332	264

Phishing E-mail Reports and Phishing Site Trends – 4th Quarter 2016

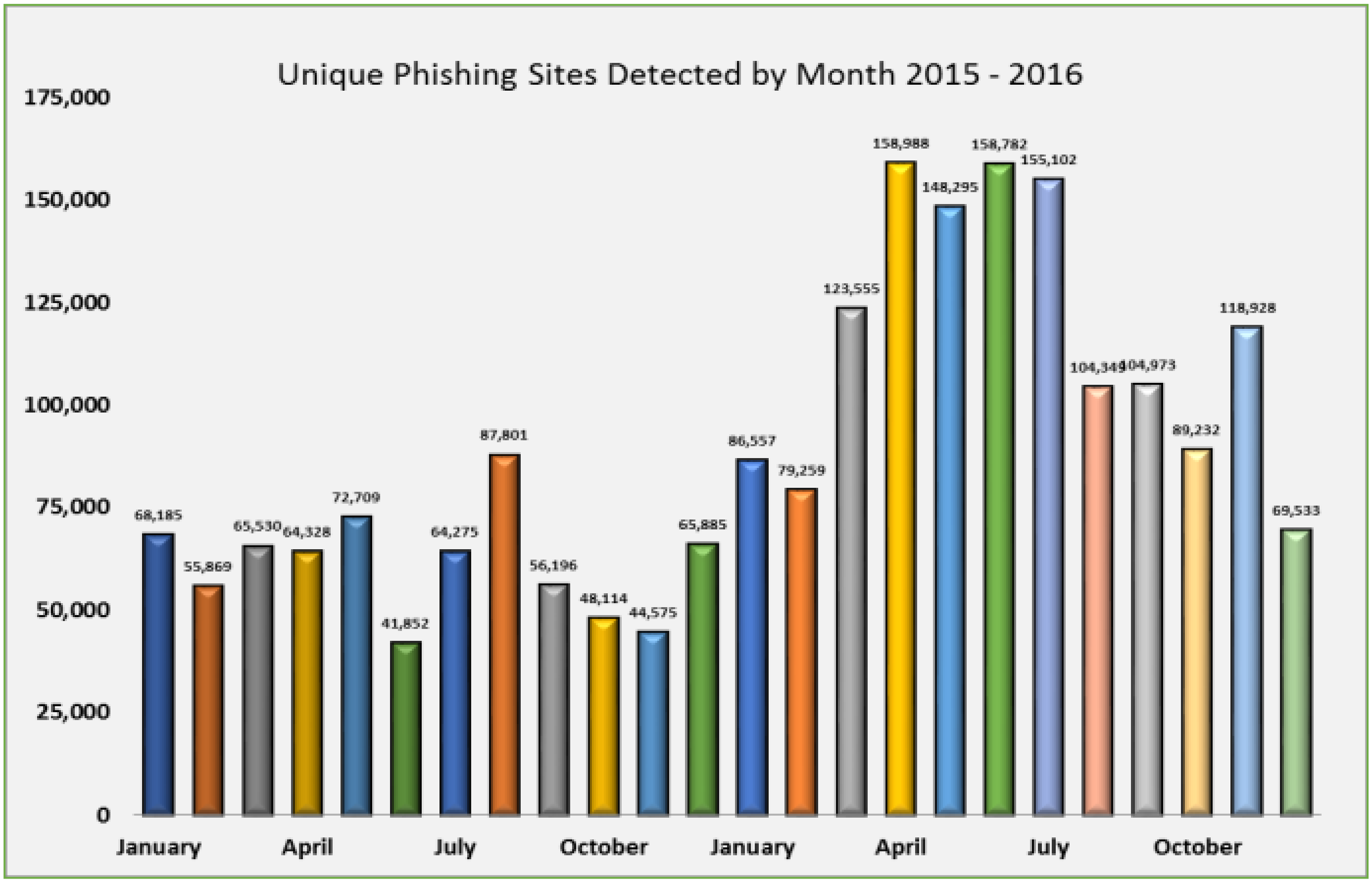
The total number of phishing sites detected in Q4 was 277,693. According to Stefanie Ellis, Anti-Fraud Product Marketing Manager at MarkMonitor, “Phishing attack volumes in the second half of 2016 were roughly equivalent with the second half of 2015, versus the incredibly high volumes detected during the first 6 months of 2016.”



The number of unique phishing reports submitted to APWG during Q4 was 211,032. The number of unique phishing reports submitted to APWG saw a continual rise during the three-month period, peaking at 95,555 in December. Some of these reports duplicate each other.



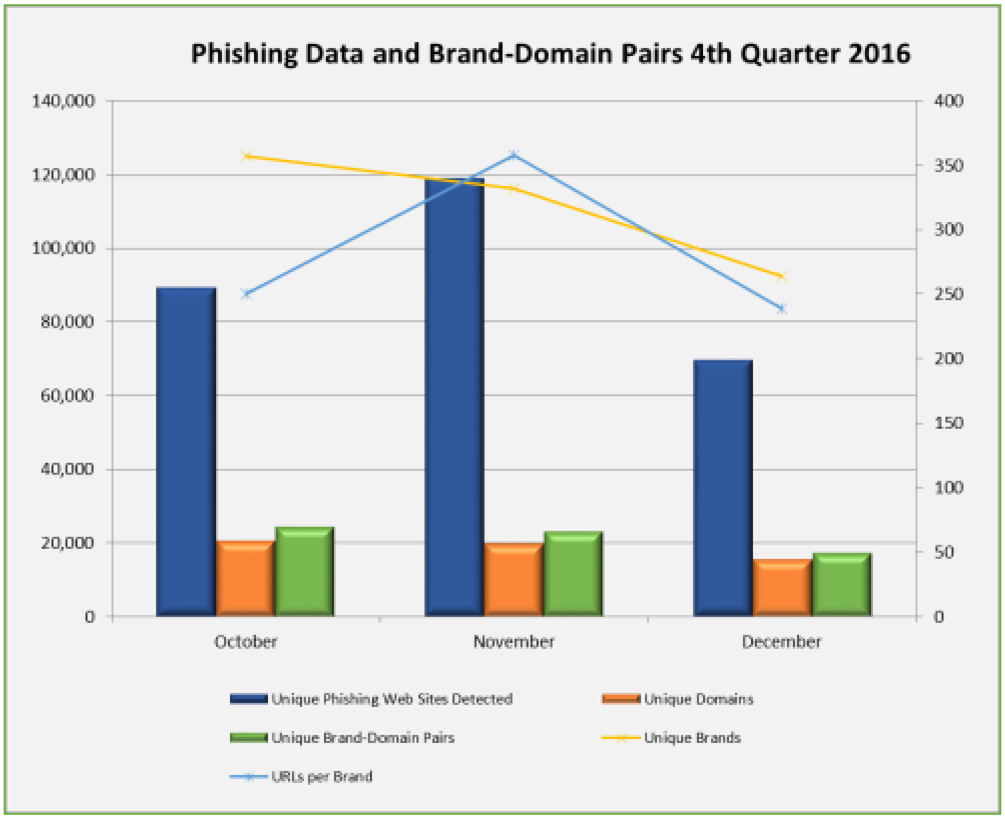
To place 2016 in context, below are consolidated phishing attack statistics for 2015 and 2016. The phishing activity in early 2016 was the highest ever recorded by the APWG since it began monitoring in 2004. Phishing activity in the fourth quarter of 2016 was higher than any period in 2015. The total number of phishing attacks in 2016 was 1,220,523. This was a 65 percent increase over 2015.



In the fourth quarter of 2004, the APWG saw 1,609 phishing attacks per month. In the fourth quarter of 2016, APWG saw an average of 92,564 phishing attacks per month, an increase of 5,753% over 12 years.

Brand-Domain Pairs Measurement – 4th Quarter 2016

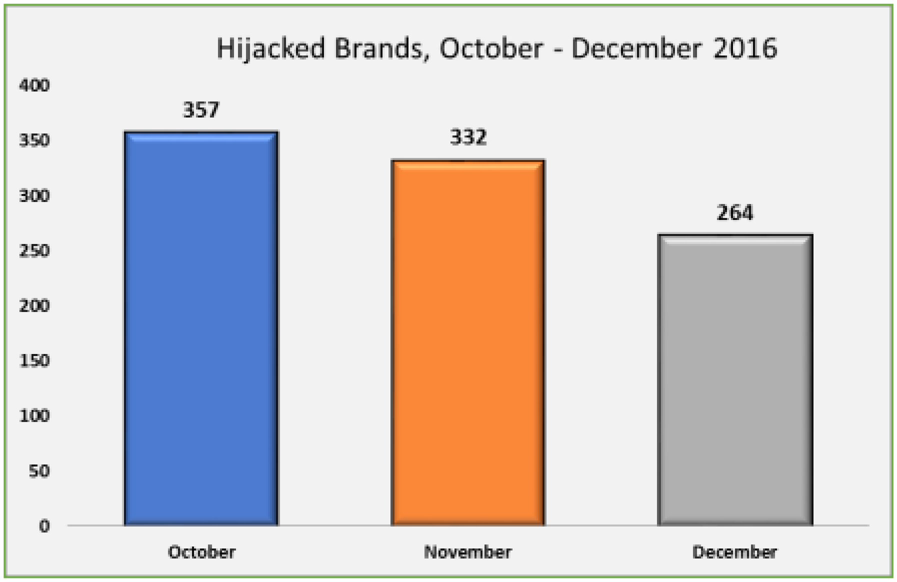
The following chart combines statistics based on brands phished, unique domains, unique domain/brand pairs, and unique URLs. Brand/domain pairs count the unique instances of a domain being used to target a specific brand. (*Example*: if several URLs are targeting a brand – but are hosted on the same domain – this brand/domain pair would be counted as one instead of several.) *Forensic utility* of this metric: If the number of unique URLs is greater than the number of brand/domain pairs, it indicates many URLs are being hosted on the same domain to target the same brand. Knowing how many URLs occur with each domain indicates the approximate number of attacking domains a brand-holding victim needs to locate and neutralize. Since phishing-prevention technologies (like browser and e-mail blocking) require the full URL in order to prevent over-blocking, it is useful to understand the general number of unique URLs that occur per domain.



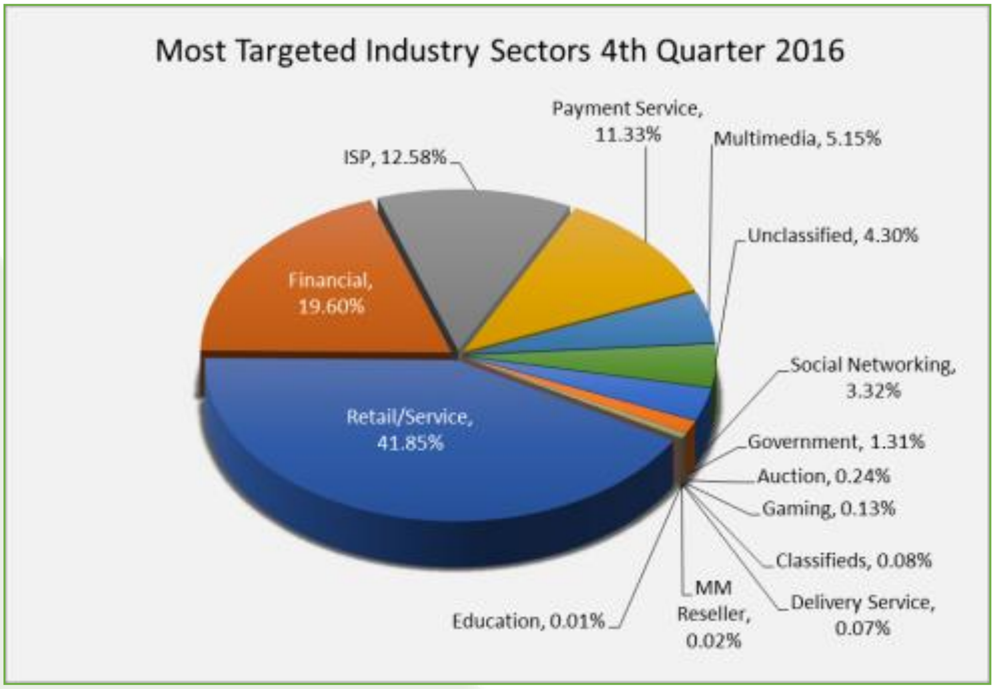
	October	November	December
Number of Unique Phishing Web Sites Detected	89,232	118,928	69,533
Unique Domains	20,773	19,814	15,673
Unique Brand-Domain Pairs	24,397	23,219	17,494
Unique Brands	357	332	264
URLs Per Brand	250	358	239

Brands and Industries Targeted by Phishing Attacks – 4th Quarter 2016

The number of brands targeted was relatively steady at just over 400 per month through the first three quarters of 2016. But the number of brands targeted by phishers dropped notably in Q4, down to just 264 unique brands during December. This indicates that phishers concentrated on fewer targets during the holiday season, and hit fewer lower-yielding or experimental targets.



MarkMonitor found that companies in the Retail and Financial services sectors remained the top targets:



Use of Domain Names for Phishing – 4th Quarter 2016

New to this report are insights from APWG member company RiskIQ, a digital threat management firm providing discovery, intelligence and mitigation of threats associated with an organization's digital presence. RiskIQ's analysts examined the thousands of phishing attack URLs that were submitted to the APWG's data clearinghouse in 4Q2016. This reveals where phishers obtained domain names and how the phishers conducting their attacks.

These were the top-10 TLDs where phishing attacks occurred in 4Q2016:

Phishing Domains by TLD, 4Q2016

October		November		December	
.com	6,317	.com	6,757	.com	6,579
.net	596	.net	604	.net	523
.org	570	.org	577	.tk	484
com.br	430	com.br	426	.org	432
.ru	349	.info	350	.info	398
IP addresses	218	.ru	349	com.br	315
.info	216	.tk	345	.top	310
com.ve	200	.ga	314	.ga	302
co.uk	189	.ml	227	.cf	300
.online	168	IP addresses	226	.ml	298
other TLDs	4,359	other TLDs	4,652	other TLDs	4,843
TOTAL	**13,612**		**14,827**		**14,784**

Some of these domains were compromised – the phishers broke into their web servers to plant phishing URLs on existing web sites. Other domains were likely registered by phishers specifically to support new phishing sites, but analysis of how many sites fell into which category were not available for this report.

.COM is the largest TLD by far, and contains the most web sites of any TLD, so it expected that .COM will top the above lists. Domains in .TK, .GA, .ML, and .CF TLDs are offered for free. Most to all of the domains used for phishing in those TLDs were probably malicious registrations, made by phishers for the purpose of phishing. The .TOP and .ONLINE TLDs are young, and contain relatively few unique websites; more research will be needed to understand why these TLDs appear to be attracting relatively larger volumes of reported phishing sites. Further research is also needed to understand why .BR domains get compromised more often than other ccTLDs that are larger by zone size.

To gain insight into how phishers use domain names, RiskIQ then analyzed how many domains used for phishing contained either the name of the target brand or a confusingly similar variation, using sophisticated algorithms checking for visual and binary similarities as well as computing sequences, permutations and typographical errors. This tells us whether or not phishers tried to fool Internet users by registering domain names that are confusing—for example *pay5al.com*, *pay.pal.com*, or *paypal.sign-in.online*, which look like legitimate site Paypal.com.

The analysis revealed that very few phishers registered domain names that were confusingly similar to the brands they were phishing. A larger number (but still a small percentage) placed brand names (or misspellings thereof) in subdomains:

	October	November	December
% of second-level domains that were confusingly similar to the relevant brand	4%	4%	3%
% of Fully Qualified Domain Names (including subdomains) confusingly similar to the targeted brand	11%	14%	16%

"A relatively low percentage of phishing websites targeting a brand attempt to spoof that brand in the domain name—whether at the second-level or in the fully-qualified domain name," says Jonathan Matkowsky, VP for intellectual property & brand security at RiskIQ. This is evidence that phishers do not need to use deceptive domains names to fool Internet users into visiting their sites. Instead, users are often fooled by hyperlinks (which must be hovered over to even see the destination domain), URL shorteners, which mask the destination domain, or brand names inserted elsewhere in the URL.

Phishing and Identity Theft Techniques in Brazil – 4th Quarter 2016

New to this report are insights from APWG member company Axur. Axur is located in Brazil and concentrates on protecting companies and their users in Brazil from Internet-based threats. Axur especially monitors attacks against banks, technology firms, airlines, and online marketplaces located in the country. Axur's data illustrates how criminals are perpetrating identity theft in South America's largest economy, and shows how these incidents are both local and international problems.

In 4Q2016 Axur observed more than 2,000 fraud occurrences that targeted Brazilian companies and individuals. Most of these appeared on social media, mobile apps, and traditional phishing sites:

Type	Description	Oct 2016	Nov 2016	Dec 2016	Total
Phishing	Phishing sites	150	87	67	**304**
Paid Search Phishing	Paid ads with phishing, on Google and Bing	0	0	2	**2**
Malware	Malware distribution URLs	20	41	38	**99**
Malware C&C	Malware command-and-control servers	25	8	5	**38**
Pharming	Rogue DNS	20	9	6	**35**
Malicious proxy servers		10	10	15	**35**
Redirect	Redirection URLs used in scams, phishing, etc.	28	27	42	**97**
Social Media Scams	Scams on social media platforms (Facebook, instagram, LinkedIn, Youtube, blogs, etc.)	274	345	333	**952**
Scam Web sites	Scams on other websites	170	60	56	**286**
Mobile App Scam	Apps with unauthorized brand use in official stores	81	78	159	**318**
Total		**778**	**665**	**723**	**2,166**

"Criminals are re-inventing themselves all the time," said Fabio Ramos, CEO of Axur. "We've seen a decrease in the numbers of regular phishing attacks, and an increase in other methods of fraud, such as malware fake services advertised through social media platforms. We believe that now, more than ever before, efforts should be aimed at reaching out and monitoring several different channels where the frauds can take place."

Although those 2,166 incidents targeted companies and consumers in Brazil, very few of them were hosted in Brazil, as identified by ASN:

Country of hosting, Q42016	Total
United States	1,006
Ireland	724
Brazil	106
France	35
Canada	32
Argentina	28
Portugal	23
Germany	22
China	19
Czech Republic	17
Other	154
Total	2,166

It is not surprising to see a concentration in the United States -- a significant portion of the world's web servers are located in the United States, and phishing web sites are often placed on compromised web servers. The incidents in Ireland were scams on Facebook, and Facebook has an Irish corporation where it manages IP space.

In addition, some of the fraud sites that Axur found had "IP filters." This is a technique where the fraudsters don't allow people on IP addresses outside of Brazil to see the fraud sites – only people *inside* of Brazil can see the fraud sites. The goal is to make it more difficult for response teams at hosting provider outside of Brazil to view the active fraud, so they cannot confirm the problems and then eliminate them. Sometimes the fraudsters also block the IPs of the target company (a bank, for instance), so the company's security team will see the fraud as being down, unless they access it from an IP that doesn't belong to the company. This IP filtering technique was used in 29 percent of phishing attacks, and on occasion malware attacks and attacks using redirection techniques, but not for other types:

Type of incident, 4Q2016	No IP filter	IP filtered	Total	% per type
Phishing	216	88	304	**29%**
Paid Search Phishing	2		2	**0%**
Malware	87	12	99	**12%**
Malware C&C	38		38	**0%**
Pharming	35		35	**0%**
Malicious Proxy Server	35		35	**0%**
Redirect	80	17	97	**18%**
Social Media Scams	952		952	**0%**
Scam Web sites	286		286	**0%**
Mobile App scam	318		318	**0%**
Total	**2,049**	**117**	**2,166**	**5%**

Axur's data illustrates that even when the victims are in a very specific region, criminals use Internet infrastructure around the globe in order to carry out their attacks. This cross-border crime can only be disrupted by timely cooperation between the private entities that can detect and shut down the problems: hosting providers, victim companies, security response companies, and domain registries and registrars.

Crimeware and Malware– 4th Quarter 2016

The APWG's Crimeware statistics categorize crimeware as code designed with the intent of collecting information on the end-user in order to steal the user's credentials. Unlike most generic keyloggers, phishing-based keyloggers have tracking components, which attempt to monitor specific actions (and specific organizations, such as financial institutions, retailers, and e-commerce merchants) in order to target specific information. The most common types of information are access to financial-based websites, e-commerce sites, and web-based mail sites.

APWG member PandaLabs found an average of 190,000 new malware samples per day in 4Q2016. This is the lowest figure for 2016. The following data show the proportion of malware created in Q4 2016 by type:

New Malware Strains in Q4	% of malware samples
Trojans	70.03%
Virus	11.61%
Worms	9.93%
Adware / Spyware	2.05%
PUPs	6.38%

Malware Infections by Type	% of malware samples
Trojans	74.99%
Virus	1.55%
Worms	1.50%
Adware / Spyware	0.51%
PUPs	21.45%

According to Luis Corrons, PandaLabs Technical Director and *Trends Report* contributing analyst, the world's most-infected country was China, where 47.09% of machines are infected, followed by Turkey (42.88%) and Taiwan (38.98%). Scandinavian countries have the lowest infection rates, and Sweden was lowest of all with just a 20.03% infection rate.

Ranking	Country	Infection Rate
1	China	47.09%
2	Turkey	42.88%
3	Taiwan	38.98%
4	Guatemala	38.56%
5	Ecuador	36.54%
6	Russia	36.02%
7	Peru	35.75%
8	Mexico	35.13%
9	Venezuela	34.77%
10	Brazil	33.13%

Ranking	Country	Infection ratio
36	United Kingdom	24.54%
37	Germany	23.66%
38	Belgium	23.32%
39	Switcherland	22.69%
40	Netherlands	22.43%
41	Japan	21.79%
42	Denmark	21.54%
43	Finland	20.78%
44	Norway	20.51%
45	Sweden	20.03%

APWG Phishing Activity Trends Report Contributors

Axur works to identify and fight the threats in the cyberspace that interfere with the interests of companies, governments ,and individuals.

iThreat provides risk data, intelligence tools, and analysis to help its clients protect their intellectual & Internet properties.

MarkMonitor, a global leader in enterprise brand protection, offers comprehensive solutions and services that safeguard brands, reputation and revenue from online risks.

Panda Security's mission is to keep our customers' information and IT assets safe from security threats, providing the most effective protection with minimum resource consumption.

RiskIQ is a digital threat management company enabling organizations to discover, understand and mitigate known, unknown, & malicious exposures across all digital channels.

The *APWG Phishing Activity Trends Report* is published by the APWG. For further information about the APWG, please contact APWG Deputy Secretary General Foy Shiver at +1.404.434.7282 or foy@apwg.org. For media inquiries related to the content of this report, please contact APWG Secretary General Peter Cassidy at +1.617.669.1123; Stefanie Ellis at Stefanie.ellis@markmonitor.com; Luis Corrons of Panda at lcorrons@pandasoftware.es; Fabricio Pessôa of Axur, at +55.51.30122987, fabricio.pessoa@axur.com; or Kari Walker for RiskIQ at +1.703.928.9996, Kari@KariWalkerPR.com, +1.703.928.9996.

About the APWG

Founded in 2003, the Anti-Phishing Working Group (APWG) is a not-for-profit industry association focused on eliminating the identity theft and frauds that result from the growing problem of phishing, crimeware, and e-mail spoofing. Membership is open to qualified financial institutions, retailers, ISPs, solutions providers, the law enforcement community, government agencies, multi-lateral treaty organizations, and NGOs. There are more than 2,000 enterprises worldwide participating in the APWG.

APWG maintains it public website, <http://www.antiphishing.org>; the website of the STOP. THINK. CONNECT. Messaging Convention <http://www.stopthinkconnect.org> and the APWG's research website <http://www.ecrimeresearch.org>. These are resources about the problem of phishing and Internet frauds– and resources for countering these threats. The APWG, a 501(c)6 tax-exempted corporation, was founded by Tumbleweed Communications, financial services institutions and e-commerce providers. APWG's first meeting was in November 2003 in San Francisco and was incorporated in 2004 as an independent corporation controlled by its board of directors, its executives and its steering committee.

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