THE 2018 HACKER REPORT

hackerone

hack'er

/'ha–ker/

noun

one who enjoys the intellectual challenge of creatively overcoming limitations

Executive Summary

We are in the age of the hacker. Hackers are lauded as heroes, discussed daily in the media, villainized at times, and portrayed by Hollywood - anything but ignored.

At HackerOne, we agree with Keren Elazari: hackers are the immune system of the internet. Just like we need the Elon Musks to create technology, we need the Kerens and the Mudges to research and report where these technological innovations are flawed.

The internet gets safer every time a vulnerability is found and fixed. The HackerOne community of security researchers are doing their part day in and day out to do just that: hunt the issues and responsibly report the risks to organizations so they can be remediated safely before being exploited by criminals. The community is strong and it is growing: we've seen a 10-fold increase in registered users in just 2 years.

With 1,698 respondents, The 2018 Hacker Report is the largest documented survey ever conducted of the ethical hacking community.

As you read through the report, you will see the curious, tenacious, communal and charitable nature of the hacker community.

One in four hackers have donated bounty money to charity, many hackers share knowledge freely with other hackers and security researchers, and they have helped the U.S. Department of Defense resolve almost 3,000 vulnerabilities - without receiving a cash bounty. They report security vulnerabilities because it's the right thing to do.

Hacking is being taught for college credit in top tier universities like UC Berkeley, Tufts, and Carnegie Mellon. Hackers around the world are earning more money through bug hunting than ever before. Bounties are a great equalizer with opportunity for all. Some hackers are earning over 16x what they would make as a full time software engineer in their home country.

While we have achieved much, there is much work to still be done. Most companies (94% of the Forbes Global 2000 to be exact) do not have a published vulnerability disclosure policy. As a result, nearly 1 in 4 hackers have not reported a vulnerability that they found because the company didn't have a channel to disclose it. Read the "Companies are Becoming More Open to Receiving Vulnerabilities" section for more on this challenge and the progress that's been made to date.

Consider this report a dossier on the vital members of our modern digital society, hackers. Gain insights on the hacker mindset, see statistics and growth metrics of where they are from, what vulnerabilities they find and even get to know some of the individuals involved in the incredible bug bounty community.

166K+
TOTAL REGISTERED HACKERS

72K+
TOTAL VALID VULNERABILITIES SUBMITTED

$23.5M+
TOTAL BOUNTIES PAID

**As of December 2017*

Key Findings

- **Bug bounties can be life changing for some hackers.** The top hackers based in India earn 16x the median salary of a software engineer. And on average, top earning researchers make 2.7 times the median salary of a software engineer in their home country.

- **Nearly 1 in 4 hackers have not reported a vulnerability that they found because the company didn't have a channel to disclose it.**

- **Money remains a top reason for why bug bounty hackers hack, but it's fallen from first to fourth place compared to 2016.** Above all, hackers are motivated by the opportunity to learn tips and techniques, with "to be challenged" and "to have fun" tied for second.

- **India (23%) and the United States (20%) are the top two countries represented** by the HackerOne hacker community, followed by Russia (6%), Pakistan (4%) and United Kingdom (4%).

- Nearly **58% of them are self-taught** hackers. Despite 50% of hackers having studied computer science at an undergraduate or graduate level, and 26.4% studied computer science in high school or before, **less than 5% have learned hacking skills in a classroom.**

- While **37% of hackers say they hack as a hobby** in their spare time, about 12% of hackers on HackerOne make $20,000 or more annually from bug bounties, **over 3% of which are making more than $100,000 per year,** 1.1% are making over $350,000 annually. A quarter of hackers rely on bounties for at least 50% of their annual income, and **13.7% say their bounties earned represents 90-100% of their annual income.**

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Geography

HackerOne's community of hackers includes representatives from practically every country and territory on the planet. India, the United States, Russia, Pakistan and the United Kingdom round out the top five countries represented, with 43% based in India and the United States combined. The fact that hackers hail from nearly every longitude and latitude, provides a true meaning to "hack the planet". With the online nature of hacker-powered security programs it is easy for hackers to find new and potentially lucrative opportunities from anywhere. A company in the United States or the United Kingdom can seamlessly work directly with leading hackers in India and Russia to find their most critical vulnerabilities fast.

Geographic Representation of Where Hackers are Located in the World

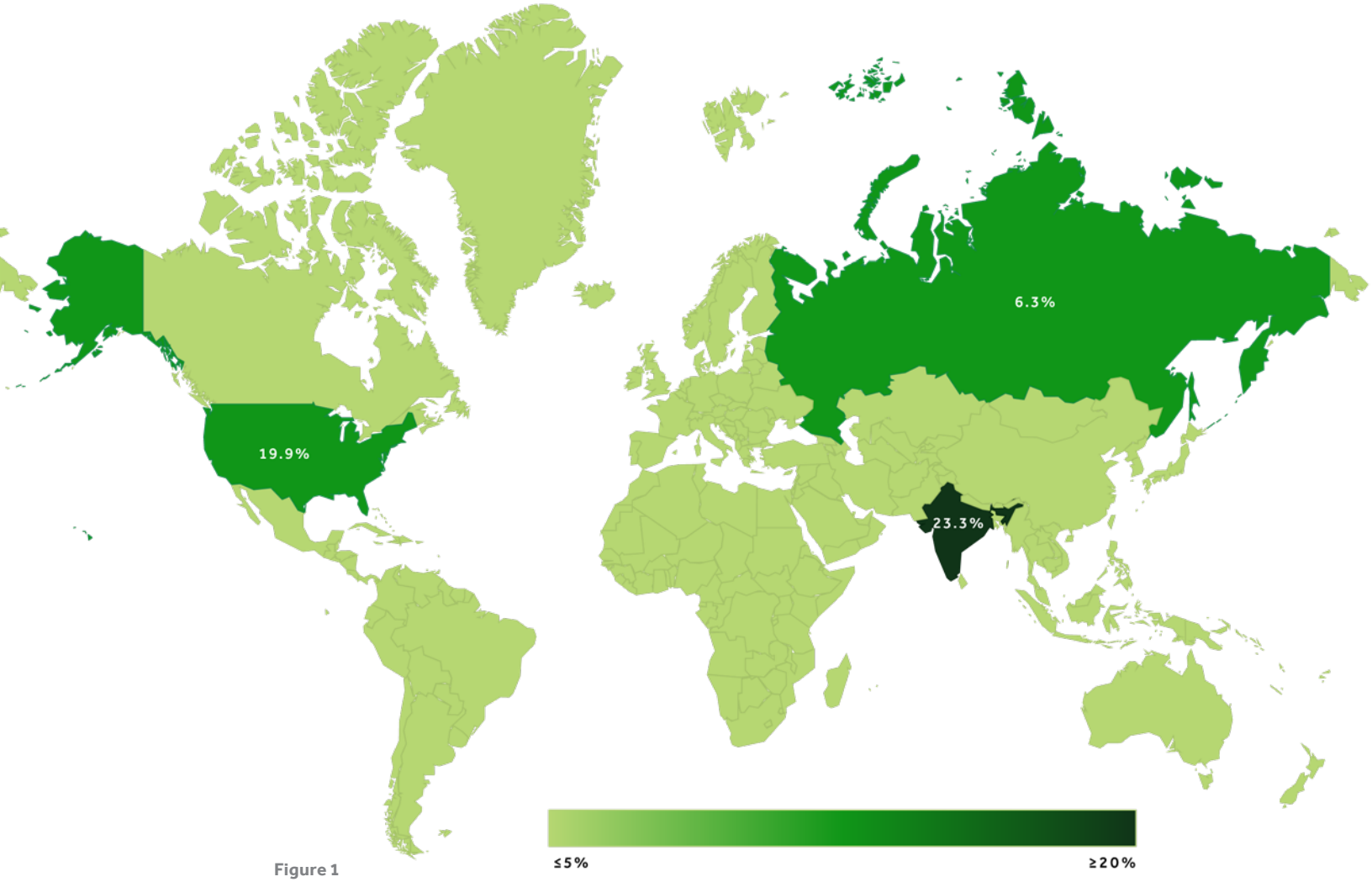


Figure 1

THE INTERNATIONAL FLOW OF BUG BOUNTY CASH

When we published the Hacker Powered Security Report in May 2017, we shared that hackers located in India had received over $1.8M in bounties. It was apparent that while India-based hackers earned millions, companies with headquarters in India are paying only a fraction of that. The chart below represents the collective outflow and inflow of bug bounty cash on the HackerOne platform all time.

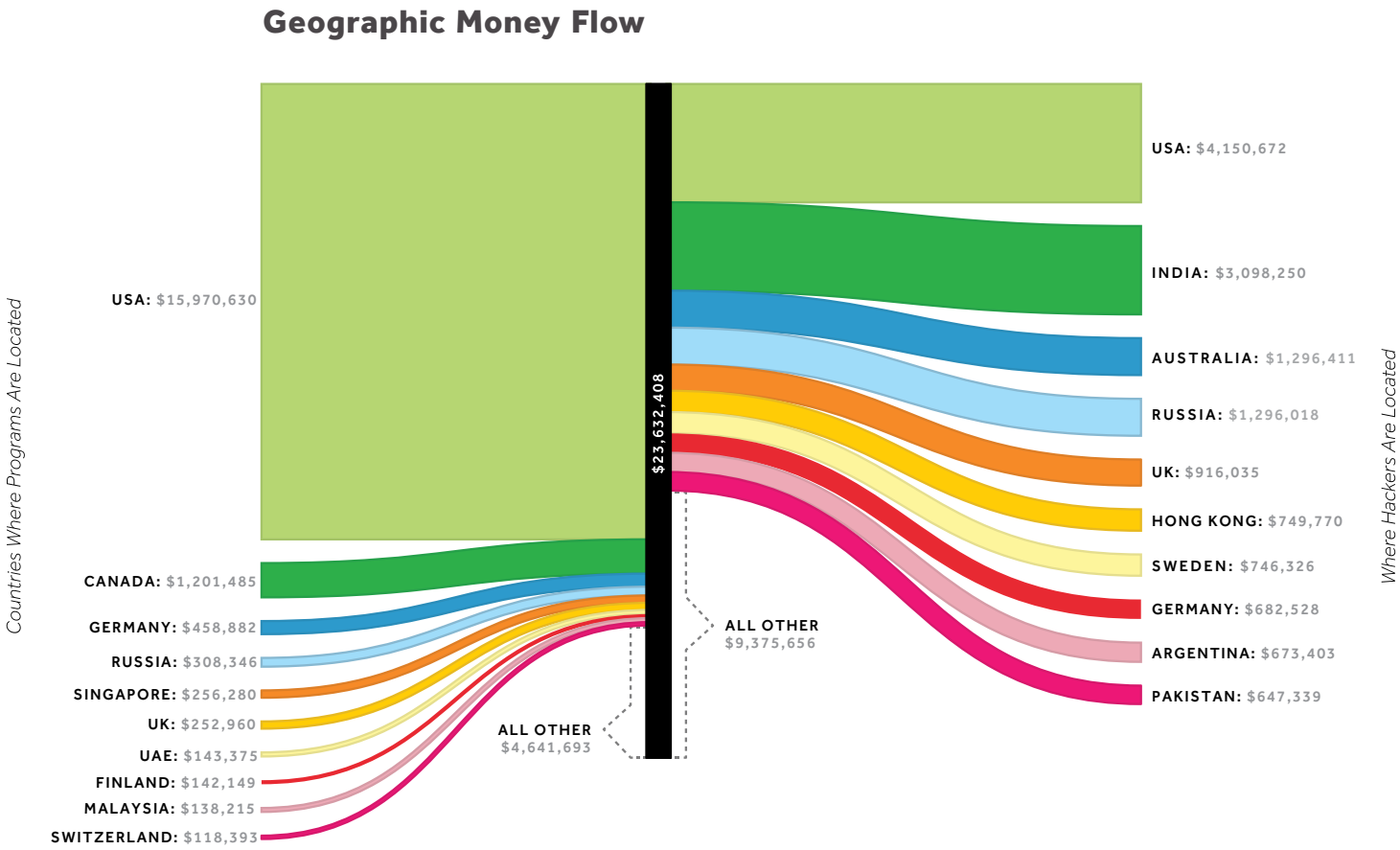
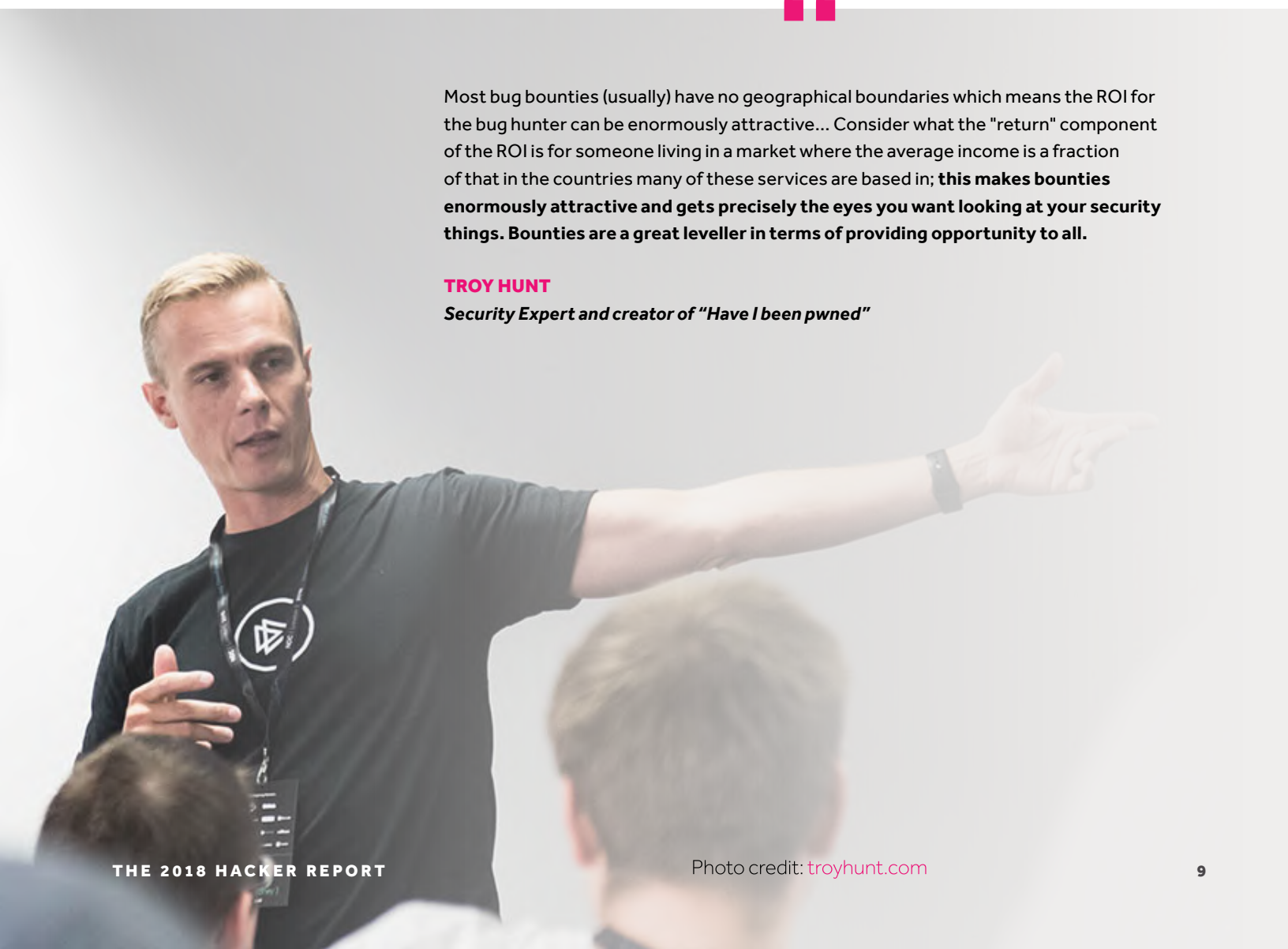


Figure 2: *Visualization of the Bounties by Geography showing on the left where the companies paying bounties are located and on the right where hackers receiving bounties are located. Special credit to Allen Householder for inspiring this graph.*

THE ECONOMICS OF BUG HUNTERS

Bug bounties can be life-changing. We compared competitive salaries for an equivalent job to the bug bounty earnings of top performers in each country. Out of 40 countries we pulled economic salary data on, the average multiplier of the top performers in each of those regions was 2.7x. This means on average, top earning researchers make 2.7 times the median salary of a software engineer in their home country. Which country had the highest multiplier for 2017? India with a multiplier of 16x the median salary of a local software engineer. This means hunting bugs is potentially 16x more lucrative than an alternative job as a software engineer. Now that's incentive to hack and hack a lot.



> Most bug bounties (usually) have no geographical boundaries which means the ROI for the bug hunter can be enormously attractive... Consider what the "return" component of the ROI is for someone living in a market where the average income is a fraction of that in the countries many of these services are based in; **this makes bounties enormously attractive and gets precisely the eyes you want looking at your security things. Bounties are a great leveller in terms of providing opportunity to all.**
>
> **TROY HUNT**
> ***Security Expert and creator of "Have I been pwned"***

Photo credit: troyhunt.com

BUG BOUNTIES VS. SALARY

	MULTIPLIER
India	16
Argentina	15.6
Egypt	8.1
Hong Kong	7.6
Philippines	5.4
Latvia	5.2
Pakistan	4.3
Morocco	3.7
China	3.7
Belgium	2.7
Australia	2.7
Poland	2.6
Canada	2.5
United States of America	2.4
Sweden	2.2
Bangladesh	1.8
Germany	1.8
Italy	1.7
Netherlands	1.7
Israel	1.6
Croatia	1.5
Czech Republic	1.5
Spain	1.5
Romania	1.2
Saudi Arabia	1.2

Figure 3: *Median annual wage of a "software engineer" was derived from PayScale for each region. The multiplier was found by dividing the upper range of bounty earners on HackerOne for the region by the median annual wage of a software engineer for the related region.*

HACKER SPOTLIGHT

SANDEEP

Advice to beginners...

“

Since bug bounty is booming nowadays, competition between hackers is increasing. So, have some patience when you are first starting, and keep improving your recon skills. You have Internet, you have all the resources- keep reading from others' blogs and disclosed practical reports on HackerOne. Patience and better reporting is the KEY.

Photo credit: Adam Bacchus

Demographics

Youthful, curious, gifted professionals. Over 90% of hackers are under the age of 35, 58% are self-taught and 44% are IT professionals. Education remains a major emphasis of the community and efforts at HackerOne. Students can learn hacking for college credit at UC Berkeley, hacker's regularly share their knowledge and help others. Hacking is a continuous learning endeavor and there's a strong appetite for knowledge.

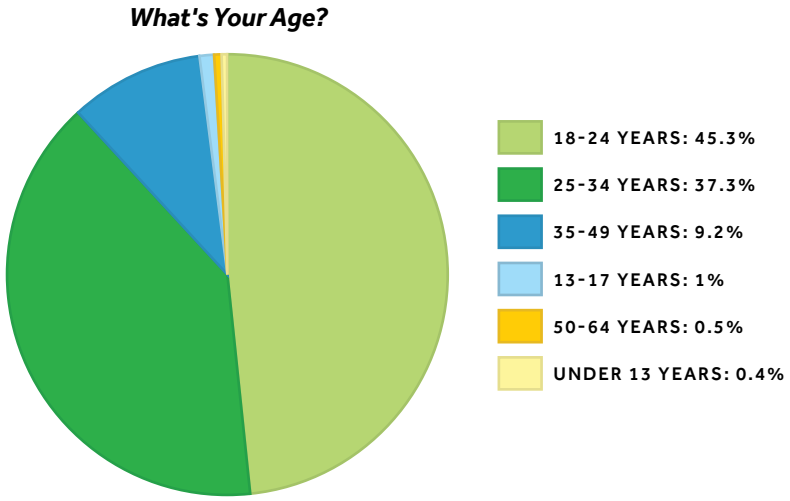


Figure 4

Over 90% of bug bounty hackers on HackerOne are under the age of 35, with over 50% under 25 and just under 8% under the age of 18. The majority (45.3%) of hackers are between 18 and 24 years old, closely followed by 37.3% of hackers who are between 25 and 35 years old.

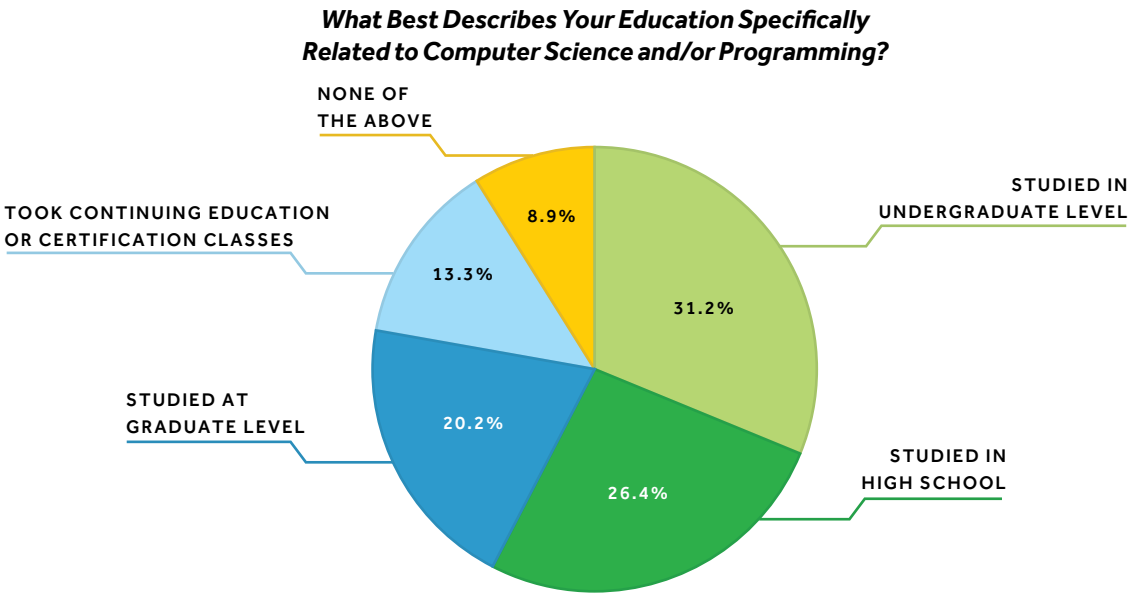


Figure 5

The vast majority of hackers, 58%, are self-taught and 67% learned tips and tricks through online resources, blogs and books or through their community (other hackers, friends, colleagues, etc.).

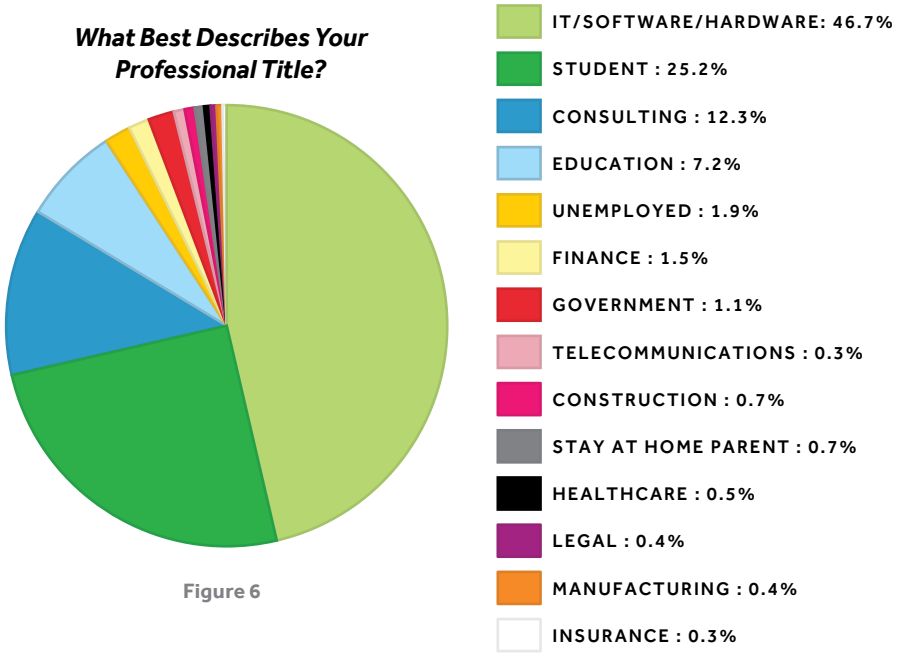


Figure 6

Hackers by night, students and tech employees by day. Almost half, 46.7%, of hackers work fulltime in the areas of information technology (IT), software or hardware development. Over 44% of those working in an IT profession specifically focus on security or security research, and 33% on software development. Just over 25% of hackers on HackerOne are students and 13% say they hack full time or 40+ hours per week.

HOURS PER WEEK SPENT HACKING

Over 66% of hackers spend 20 hours or less per week hacking, with 44% spending 10 hours or less per week. More than 20% of hackers spend over 30 hours per week.

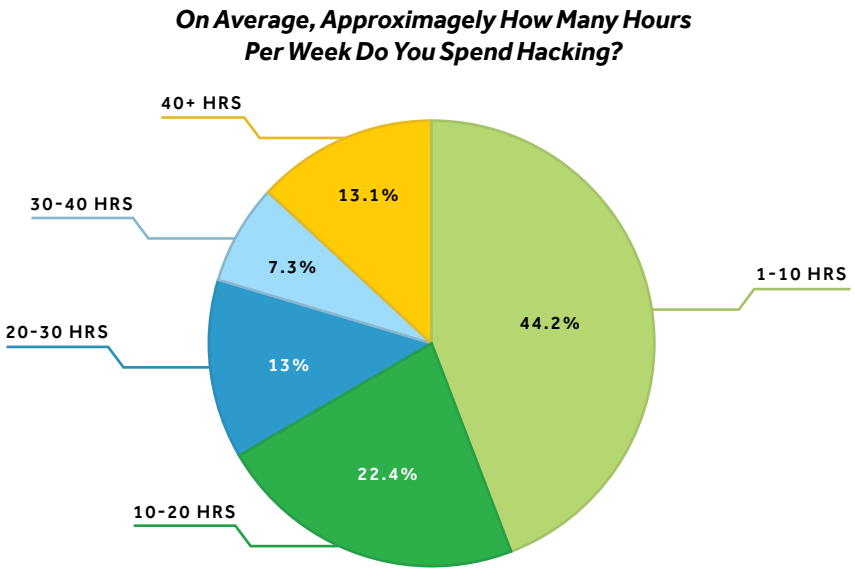


Figure 7

Trends in Hacker Education

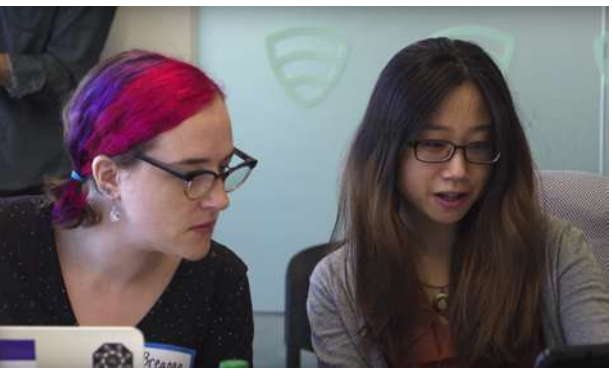
Empowering our community is one of our core values. Hackers are naturally curious and we aim to satisfy that curiosity through hacker education.

Hacking for College Credit

We were proud to partner with UC Berkeley on training students to hunt for vulnerabilities and build more secure software. Read the CNN article for the details about this collaborative effort, a first for a university to offer collegiate credit for a hacker-centric educational offering.

Creativity of Thought Comes from Diversity

In June 2017, Lookout and HackerOne teamed up to produce a security education event bringing together female engineers for a workshop on hacking and cyber security. The vast majority of hackers on the HackerOne platform, are male. Creativity of thought comes from diversity, and we aim to empower and educate all those interested in hacking. The day included bounty challenges, educational workshops, hands-on hacking, and a raffle for a free trip to DEF CON 25 in Las Vegas.



Learning From the Best

HackerOne has given out over 10,000 copies of Peter Yaworski's "Web Hacking 101" book. To this day, new hackers on the platform are eligible for their free copy. In addition, we facilitate in-person workshops for students and community groups and even our online hacker community in combination with our live-hacking events. One such effort was our webinar live-stream with Frans Rosen from the rooftop pool deck of the W Hotel in Las Vegas: How to Win Over Security Teams and Gain Influence as a Hacker. Also, hacktivity is the front page of our community showcasing select activity regarding vulnerabilities (if disclosed), hackers, programs, and bounty awards. Disclosed hacktivity reports are a wonderful way for hackers to learn. See a recent synopsis of the top 20 reports.

HACKER SPOTLIGHT

NICOLE

"I've always had somewhat of a mindset for security, even before I knew anything about computer science - growing up, my brain was constantly racing to figure out systems in order to find loopholes and workarounds that I could slip through.

Experience & Signal

While many hackers are young, nearly 29% have been hacking for 6 years or more, of which over 10% of them have been hacking since at least 2006 (11 years or more). Age is of little importance to the value of a reporter. Signal, which calculates the percentage of a hacker's reports that are valid, may be the most important metric to track and it is a major focus for HackerOne, in fact HackerOne has the highest published signal to noise ratio, and it's only getting better.

Approximately How Many Years Have You Been Hacking?

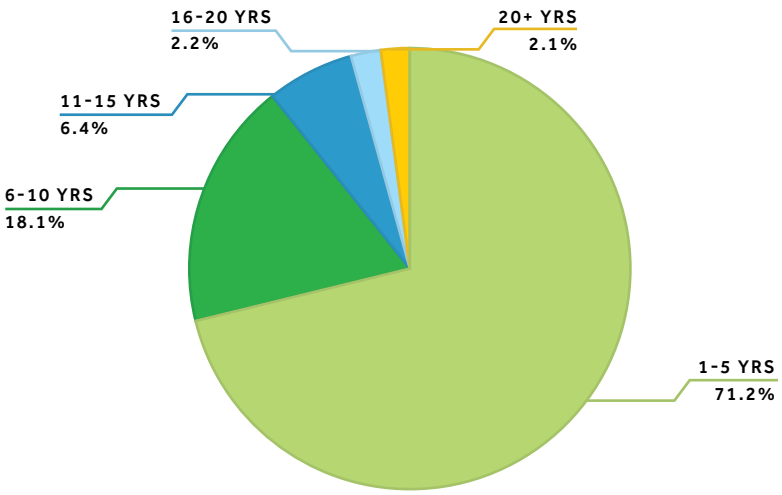


Figure 8

Tracking What Matters: Hacker Signal

HackerOne has an industry best "signal to noise ratio" (SNR). In the Hacker Powered Security Report, we displayed the SNR for the past several years, showing a steady year-over-year improvement. While we are proud to be #1, we're always aiming for better: We've embarked on an ambitious product development effort to eliminate noise for all programs. In beta testing, we've seen impressive improvements in signal. Stay tuned for more—2018 is going to be the biggest year yet.

Signal to Noise Ratio Table Definitions

CLEAR SIGNAL	NOMINAL SIGNAL	NOISE
Vulnerability reports closed as "resolved." This means the issue was a valid security bug that was validated by the vulnerability response team.	These reports are closed and marked "informative" or duplicates of resolved issues. While not contributing to clear signal, many of these reports were technically accurate based on the best information available to the researcher.	These reports are closed as "Not Applicable," "Spam" or duplicates of these types. This represents the noise in the signal to noise ratio.

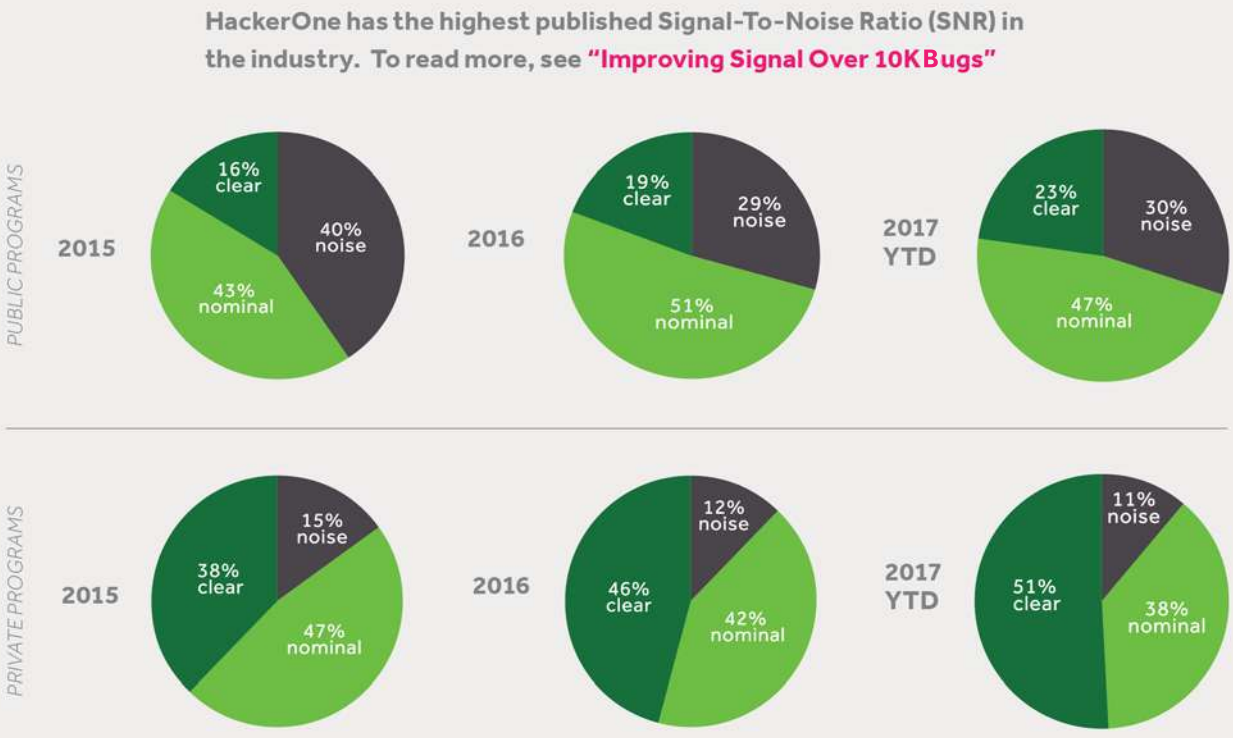
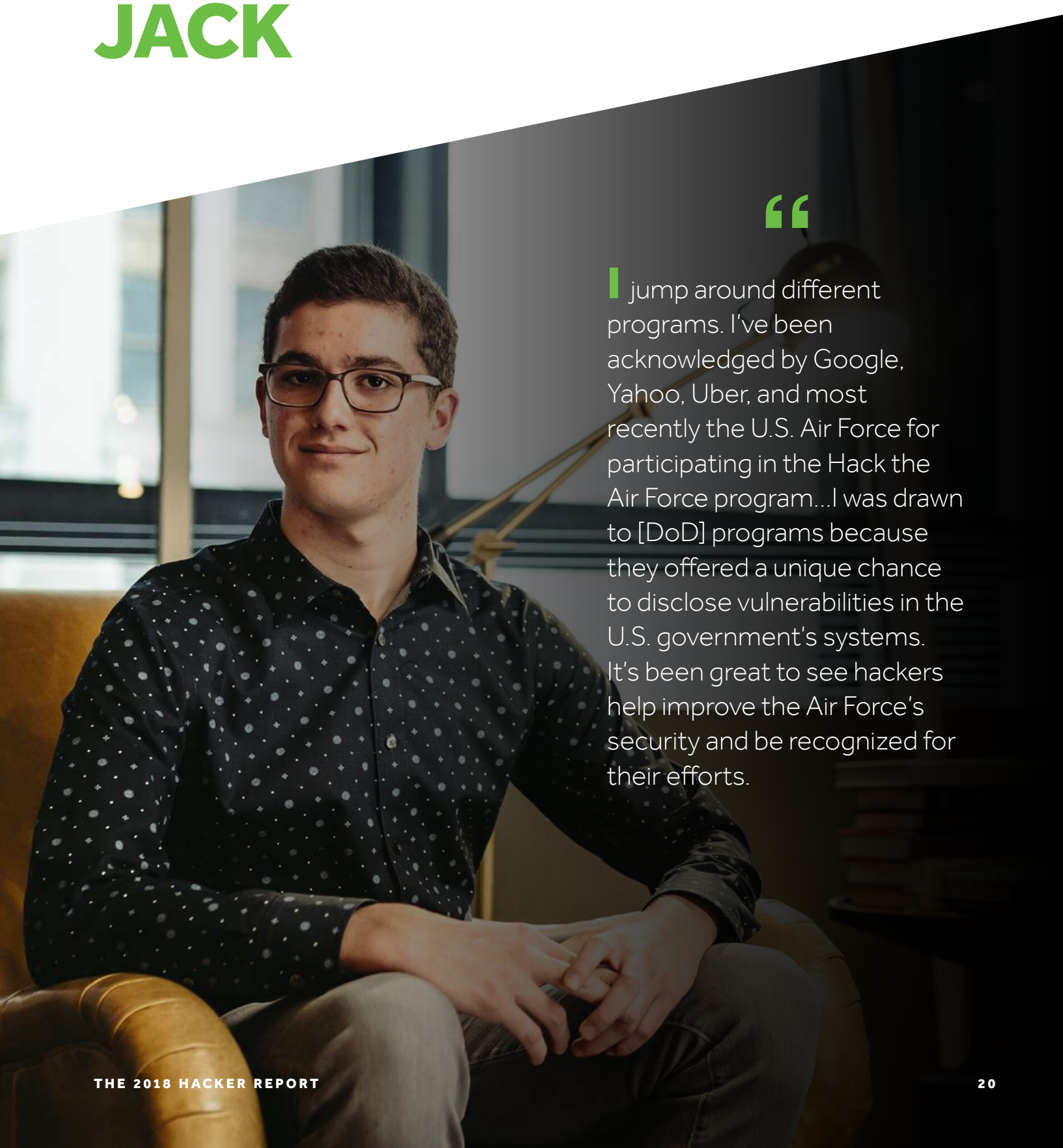


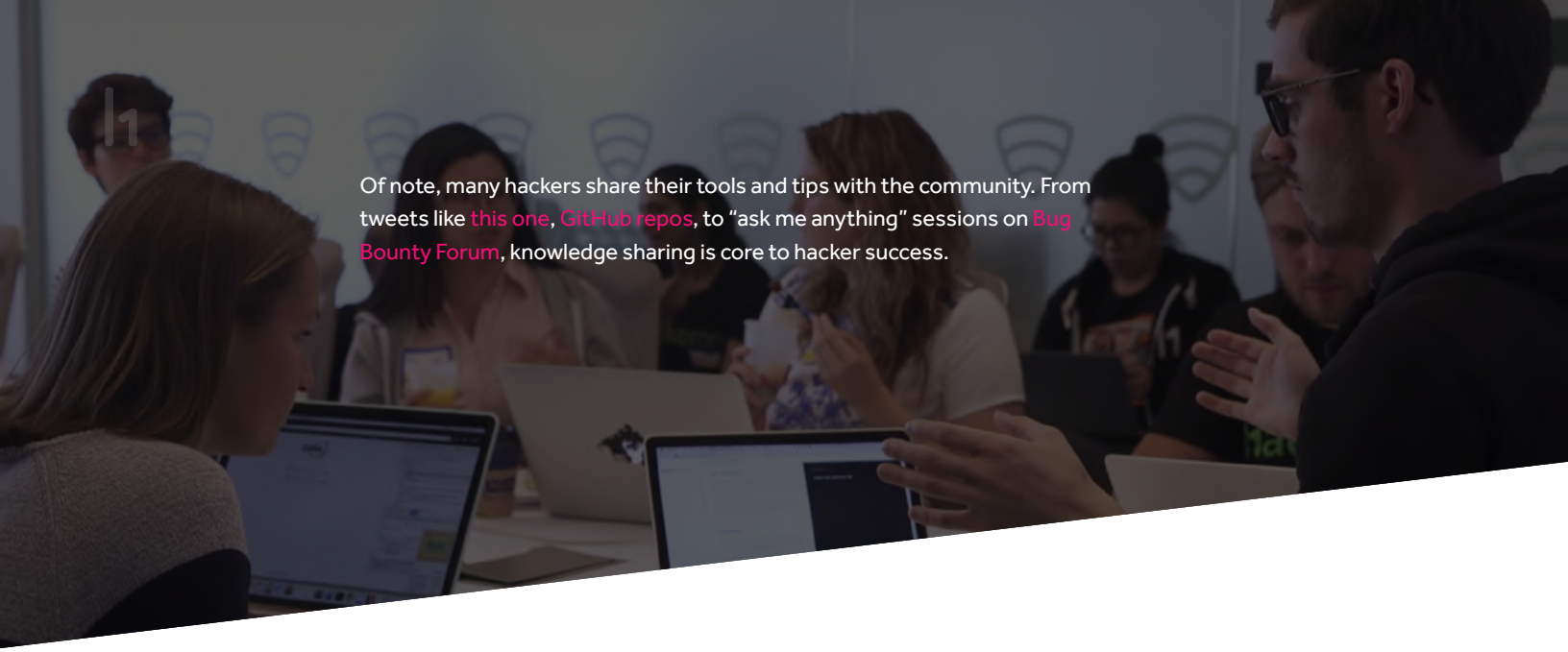
Figure 9: *As of May 2017*

HACKER SPOTLIGHT

JACK



"I jump around different programs. I've been acknowledged by Google, Yahoo, Uber, and most recently the U.S. Air Force for participating in the Hack the Air Force program...I was drawn to [DoD] programs because they offered a unique chance to disclose vulnerabilities in the U.S. government's systems. It's been great to see hackers help improve the Air Force's security and be recognized for their efforts.



Of note, many hackers share their tools and tips with the community. From tweets like this one, GitHub repos, to "ask me anything" sessions on Bug Bounty Forum, knowledge sharing is core to hacker success.

Targets & Tools

How do hackers decide which programs to hack? What are their tools of choice? What attack surfaces do they prefer? Read on to find out.

FAVORITE TOOLS

Nearly 30% of hackers on HackerOne use Burp Suite to help them hunt for bugs, and over 15% of hackers build their own tools. Other top tools used for bug hunting include web proxies and scanners (12.6%), network vulnerability scanners (11.8%), fuzzers (9.9%), debuggers (9.7%), WebInspect (5.4%), Fiddler (5.3%) and Chip Whisperer (0.8%).

What Software or Tools of the Trade Help You Most When You're Hacking?

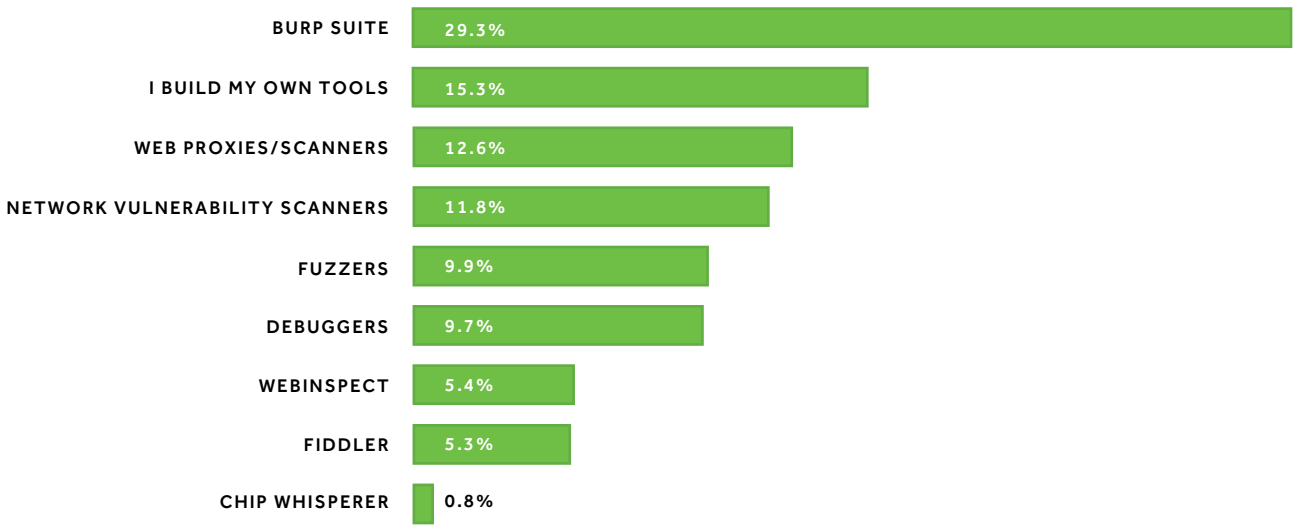


Figure 10

Burp Suite is the premier offensive hacking solution published by Portswigger. In June 2017, we announced a partnership with Portswigger to offer new and aspiring hackers a free 90-day license for Burp Suite Professional. Dafydd Studdard, Portswigger founder and author of the Web Application Hacker's Handbook said, "**We couldn't be more excited to announce this partnership and look forward to seeing what amazing things will be done. We're all about making the internet safer and empowering researchers, and this is one big way we're going about that.**" Read more in our announcement blog.

hackerone BURP SUITE

HACKERS LOVE RESEARCHING WEBSITES, APIs & TECHNOLOGY THAT HOLDS THEIR OWN DATA

Hackers love webapps. Over 70% of surveyed hackers said their favorite types of product or platform to hack is websites, followed by APIs (7.5%), technology that has their data (5%), Android apps (4.2%), operating systems (3.1%) and IoT (2.6%).

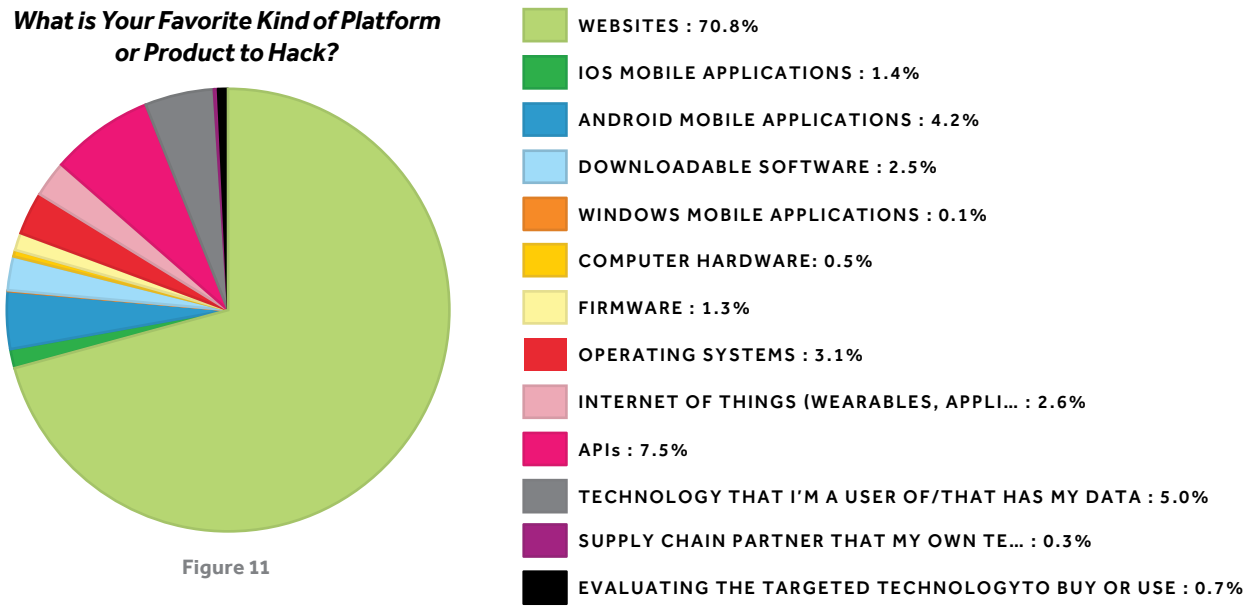


Figure 11

Google Play

53% of worldwide internet traffic is mobile according to Statista, putting mobile hacking into the spotlight. IoT is a major risk emphasis according to the authors of the CERT Guide to Coordinated Vulnerability Disclosure. In the past year, **HackerOne has partnered with Google Play on mobile hacking efforts, and Microsoft Research, Qualcomm, Intel, Nintendo and more for IoT device hacking programs.**

HACKER SPOTLIGHT

JAMES

> I absolutely love working on Burp Suite precisely because so many people use it. Just seeing when I have an idea for a scanning technique and I put it in the scanner and then a couple of months later I'll see publicly disclosed reports on HackerOne that were clearly found by Burp and that's the best feeling. Knowing that I can take a class of bug that's largely overlooked and just stomp on it is awesome.

Motivation

Bug hunters only hunt for cash, right? Wrong. The financial incentive is without question important, however, there's more to it than the almighty dollar. Curiosity is an enduring quality across the hacker community. Strong hacker involvement for high profile vulnerability disclosure programs (such as the Department of Defense) are examples of the genuine desire by hackers to help the internet become more secure.

MONEY IS NOT NUMBER ONE MOTIVATOR

Money remains a top reason for why bug bounty hackers hack, but it's fallen from first place to fourth place compared to 2016. Above all, hackers are motivated by the opportunity to learn tips and techniques, with "to be challenged" and "to have fun" tied for second. Other top reasons for hacking include career advancement, the opportunity to protect and defend and to do good in the world. Overall, they want to improve and build upon their skill sets, have fun and contribute to a safer internet in the process.

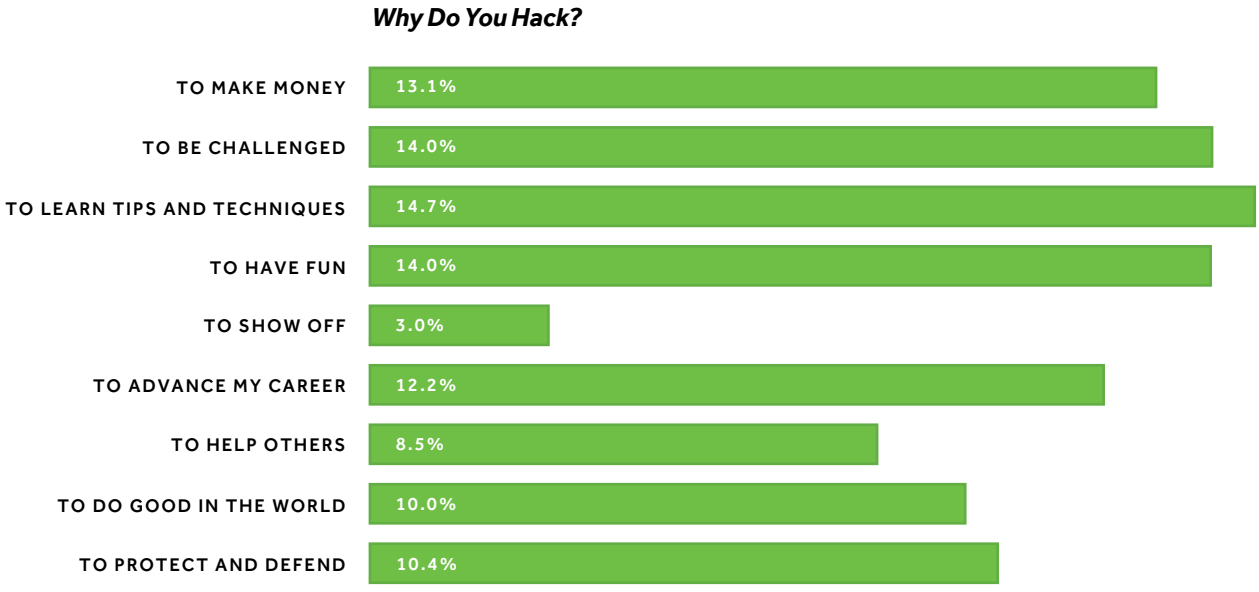
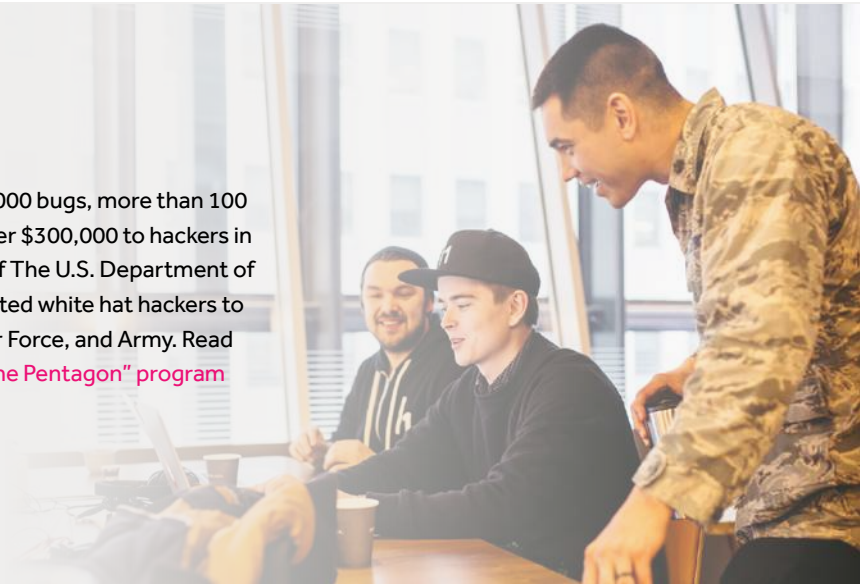


Figure 12

The Pentagon opened up to hackers and fixed over 3,000 bugs, more than 100 of which were high or critical severity, and paid out over $300,000 to hackers in the process. Led by Defense Digital Service division of The U.S. Department of Defense (DoD), the U.S. Federal Government, has invited white hat hackers to find security flaws in systems run by the Pentagon, Air Force, and Army. Read the Wired story of the immensely successful "Hack The Pentagon" program and HackerOne's ongoing work with the DoD.



BOUNTY LEVELS AND OPPORTUNITY TO LEARN IS MOST IMPORTANT TO HACKERS

Incentives drive hacker attention. Whether that's incentive to earn money or learn / hone their skills. Over 23% of hackers said they choose companies to hack based on the bounties they offer. More than 20% said they choose companies to hack based on the opportunity to learn. Other top incentives include the fact that it's a brand they like (13%), the security team's responsiveness (10.7%) and recognition (9.7%).

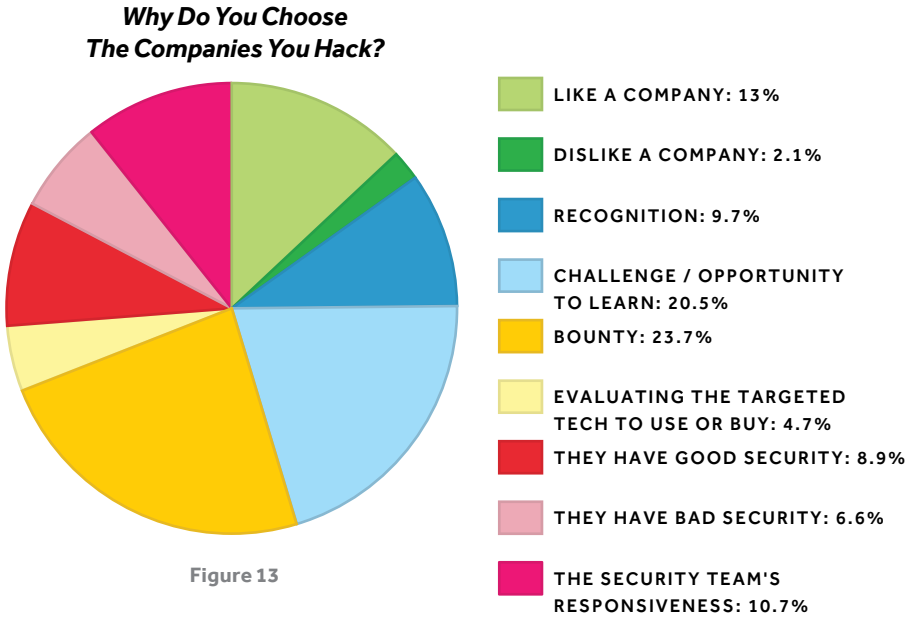


Figure 13

HACKERS ARE LOOKING FOR THEIR FAVORITE ATTACK VECTOR: CROSS-SITE SCRIPTING (XSS)

When asked about their favorite attack vector, technique or method, over 28% of hackers surveyed said their prefer searching for XSS vulnerabilities, followed by SQL injection (23.1%), fuzzing (5.5%) and brute force (4.5%), among others.

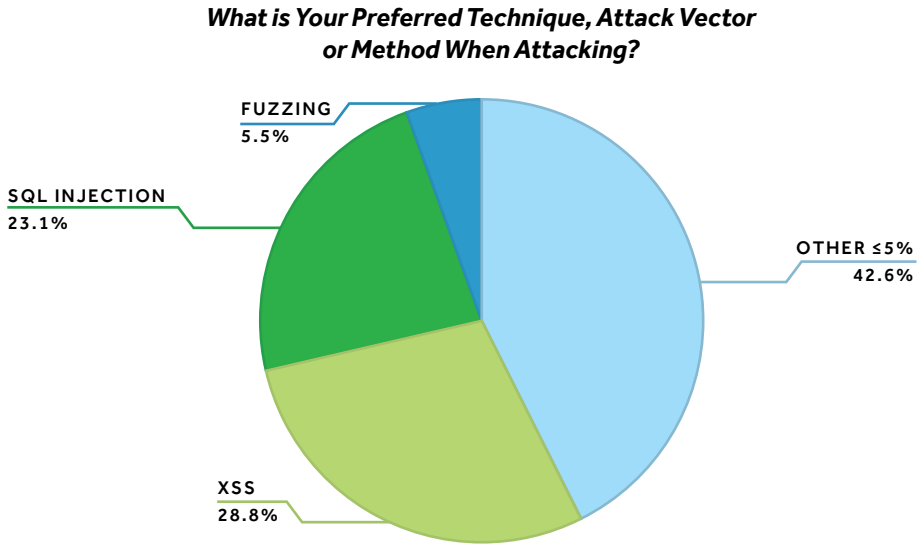


Figure 14

The OWASP team recently released the 2017 revised and updated version of the ten most critical web application security risks. We created a flashcard reference guide to download, print, and share for easy learning!

How Hackers Spend Their Bounties

HackerOne has paid out over $23 million in bounties in five years with a goal of $100 million by the end of 2020. In Figure 3, we presented the economic impact, but what are the personal stories of how hackers have spent their bounty dollars? At our live-hacking in Las Vegas, H1-702, we talked to some of our hackers about how they spend their bounty earnings. Here are a few of their responses:

IBRAM MARZOUK

One of the things that I did with my bounty money was helping my parents buy a house when I first came to the U.S., so that's probably the biggest thing I've done with bounty money.

DAVID DWORKEN

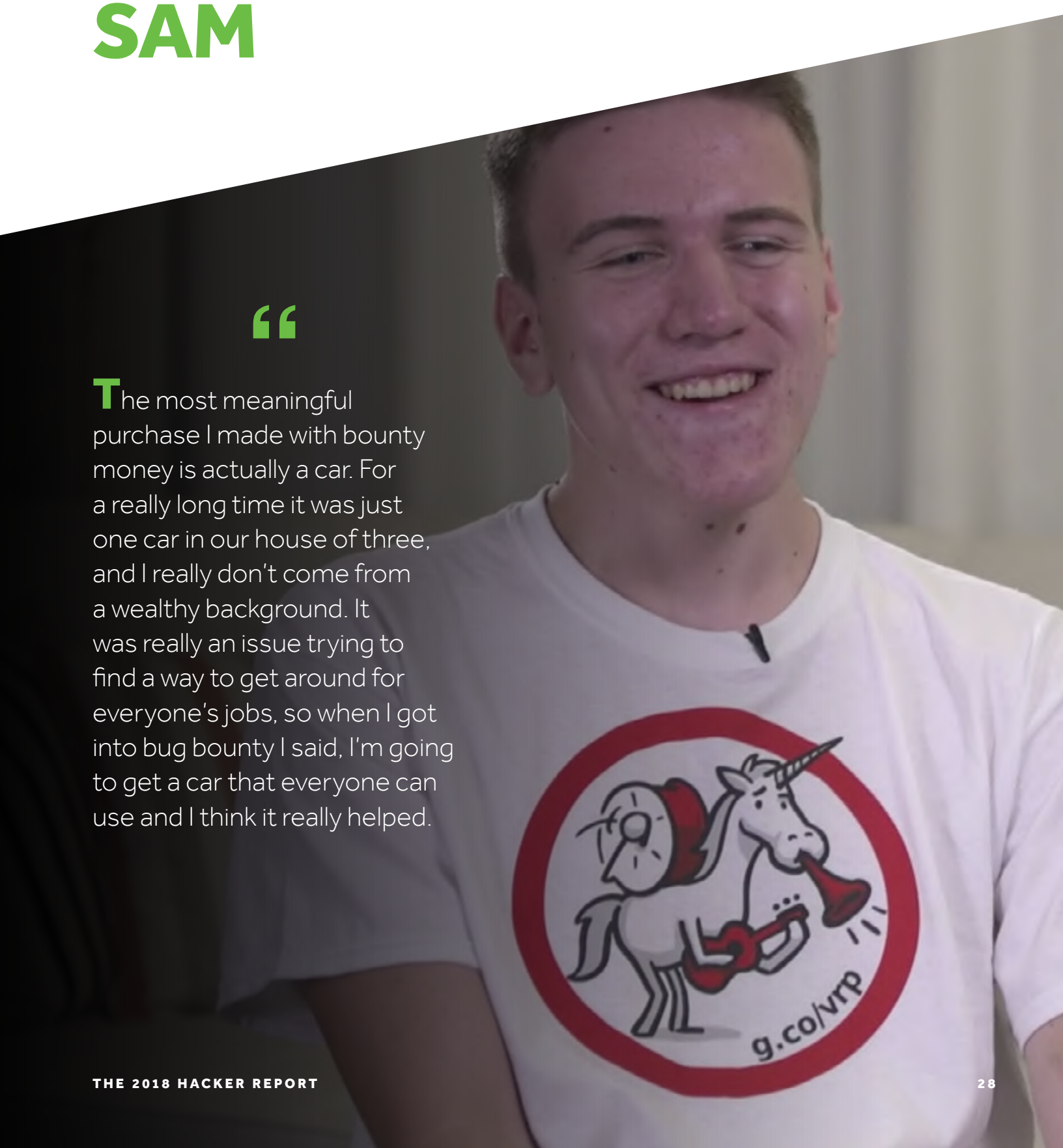
The most meaningful result of a bounty for me was actually one from Starterbox where there was some, out of miscommunication where they thought something was a bug and it ended up not being a bug. So then I talked to them we actually just decided to donate the bounty that they had already awarded to the EFF.

FRANS ROSÉN

A lot of my money goes to actually goes into hiring people. I have a venture firm financing companies through bug bounties...I give the opportunity to people to get work and create a family and stuff.

HACKER SPOTLIGHT

SAM



“

The most meaningful purchase I made with bounty money is actually a car. For a really long time it was just one car in our house of three, and I really don't come from a wealthy background. It was really an issue trying to find a way to get around for everyone's jobs, so when I got into bug bounty I said, I'm going to get a car that everyone can use and I think it really helped.

A True Community: Working Together & Giving Back

We have a hashtag and a saying "**#TogetherWeHitHarder**"—meaning, our impact is infinitely greater when a community rallies around a common cause. Hackers are making the internet safer, together.

HACKERS FREQUENTLY WORK ALONE BUT LIKE LEARNING FROM OTHERS

While about a third of hackers (30.6%) prefer working alone, 31.3% of hackers like to read other hackers' blogs and publicly disclosed vulnerability results to learn from them. Thirteen percent of hackers sometimes work with their peers, 9% regularly work with other hackers, 8.7% of hackers serve as mentors or mentees to other hackers and 7.1% have filed at least one bug report with other hackers as part of a team.

How Do You Typically Work With Other Members of the Hacker Community?

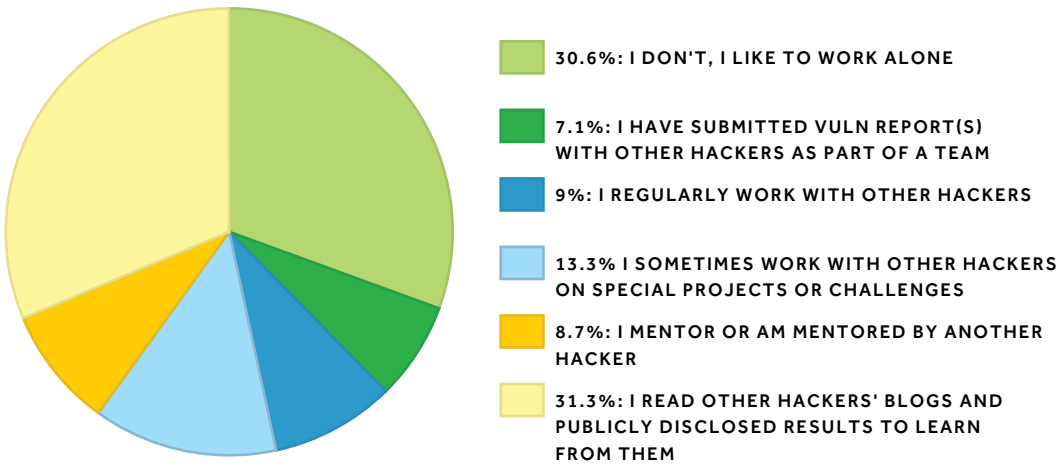


Figure 15

Hackers donating bounties to charity. Over 24% of hackers on HackerOne have donated bounty money to charity organizations like EFF, Red Cross, Doctors Without Borders, Save the Children and local animal shelters. Companies like Qualcomm, Google, and Facebook have "bounty match" promotions, matching any bounties earned that hackers in turn donate to a cause.

Bringing the Community Together for Global Live-Hacking Events

Meeting and interacting online is how a majority of our community interacts with each other. But there's no replacing the chance to have a face-to-face meeting, sharing a meal and a high five. And it's not just hackers, HackerOne believes in the value of connecting hackers directly with security teams. In 2017, we hosted four live-hacking events: San Francisco, Amsterdam, Las Vegas, and New York City. We partner with our customers to fly out some of the top members of our community from all over the world to participate in live-hacking events. These events bring together some of the best talent with eager security teams to uncover vulnerabilities, boost payouts and harden attack surfaces, all while building personal relationships that last a lifetime.

Bringing the Community Together for Global Live-Hacking Events

H1-415 | SAN FRANSISCO | FEB



H1-3120 | AMSTERDAM | MAY



shopify airbnb

H1-702 | LAS VEGAS | JULY



H1-212 | NEW YORK CITY | DEC



UBER

ZENEFITS

HACKER SPOTLIGHT

FRANS

> Personally I hack because I really love to build stuff and I also love to break stuff...the best way to know how to build stuff is to know how you can break it.

Companies are Becoming More Open to Receiving Vulnerabilities

For companies that do not have a vulnerability disclosure policy (VDP) in place, which is a published process and channel that publicly states how a vulnerability can be safely reported and provides "safe harbor" language for the hacker, the most common (and legally safest path) for a white hat hacker with knowledge of a vulnerability is non-disclosure - because there's no way to disclose it. In fact, nearly 1 in 4 hackers have not reported a vulnerability that they found because the company didn't have a channel to disclose it. This doesn't mean they don't try and responsibly report it - they are forced to go through other channels (i.e. social media, emailing personnel in the company, etc.) but are frequently ignored or misunderstood.

Vulnerability Disclosure Policy (VDP): an organization's formalized method for receiving vulnerability submissions from the outside world. This often takes the form of a "security@" email address. The practice is defined in ISO standard 29147. Unlike a bug bounty program, a VDP does not offer hackers financial incentives for their findings, but they are still incredibly effective. Organizations like the U.S. Department of Defense have received and resolved nearly 3,000 security vulnerabilities from their VDP alone. You can read about best practices for vulnerability disclosure and more in our guide; 5 Critical Components of a VDP.

One silver lining, however, is that companies are becoming more open to receiving vulnerabilities than they were before. We asked our hackers what their recent experiences have been like. A combined 72% noted companies are more open and 34% noted companies as far more open.

In Your Opinion, Over the Last Year, What Best Describes Companies' Reactions to Receiving Vulnerability Reports From Security Researchers?

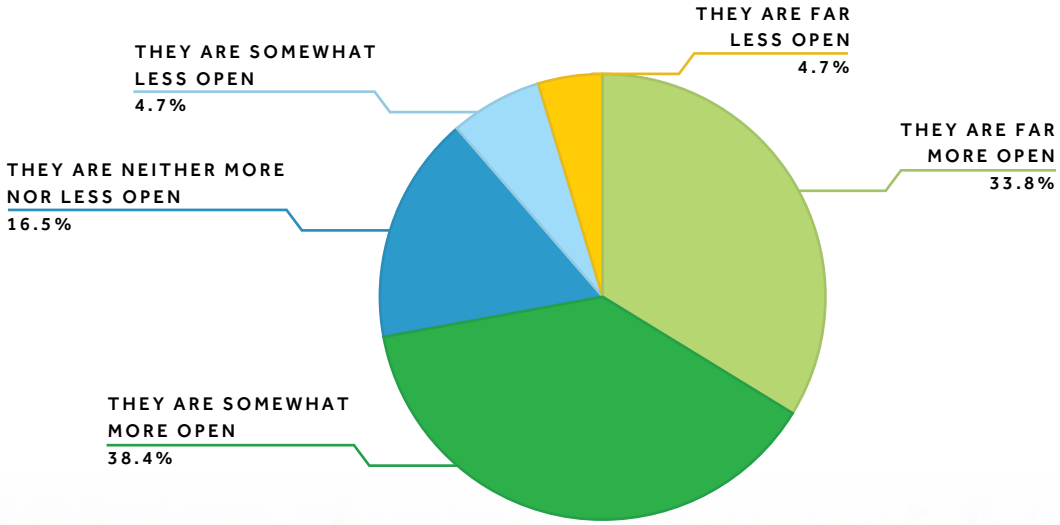


Figure 16

The Department of Defense has fixed over 3,000 vulnerabilities in the past 18 months - that's over 167 vulnerabilities a month, or approximately 6 submitted each day. Read the Wired recap of "Hack the Pentagon" and the DoD's ongoing vulnerability disclosure policy published on HackerOne.

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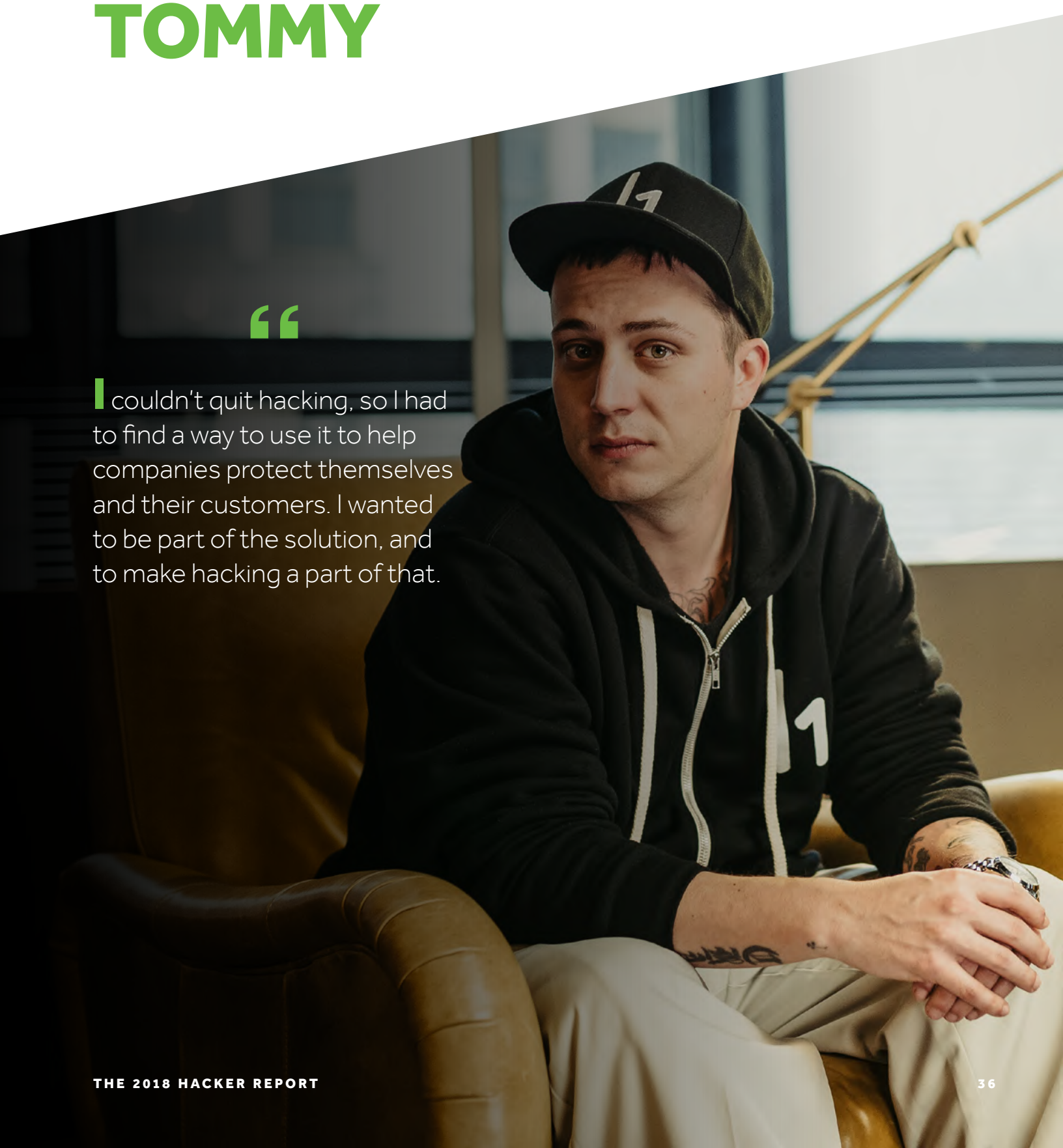
TOMMY



> I couldn't quit hacking, so I had to find a way to use it to help companies protect themselves and their customers. I wanted to be part of the solution, and to make hacking a part of that.

Conclusion

Some of the most critical vulnerabilities in the Internet's history have been discovered and resolved thanks to the efforts of hackers fueled by curiosity and altruism. Acalvio Technologies Chief Security Architect Chris Roberts puts it this way, "Hackers unfortunately are [often] portrayed as the bad guys, whereas I would argue that for the last 20 or 30 years, we're actually the good guys. Our job is to help you understand risk, and how you actually mitigate it."

And the HackerOne community - the largest such community of white hat hackers in the world - continues to do just that: test and retest, explain and explore the security vulnerabilities that exist in organizations big and small. From the hottest new Silicon Valley startups, to the world's largest companies and marketplaces such as Google Play, Starbucks, General Motors, and even the U.S. Department of Defense.

HackerOne's mission is to empower the world to make the internet more secure. We've made great strides, yet much work remains. The invaluable trends of vulnerability disclosure policies receiving regulatory and industry support (see our list of 16 quotes in the Voices of Vulnerability Disclosure) are one big example of how the tide is shifting. Creating safe harbor language in your vulnerability disclosure policy for ethical hackers who are trying to help will result in your company being more secure, your customers data staying out of the wrong hands, and an army of security advocates in your corner.

HackerOne is investing in the hacker community so it will continue to grow and thrive and working closely with security teams across the globe to help them achieve their goals. Together we hit harder.

HACKER SPOTLIGHT

BRETT

> At the end of the day, we're all in this together. We're trying to find stuff and fix issues. We're trying to help protect the world. That's what it comes down to. And I like to be a part of that.

METHODOLOGY

In December 2017, HackerOne surveyed over 1,700 hackers from over 195 countries and territories. These individuals have all successfully reported one or more valid security vulnerability on HackerOne, as indicated by the organization that received the vulnerability report. Additional findings were collected from the HackerOne platform using HackerOne's proprietary data based on over 900 collective bug bounty and vulnerability disclosure programs.

ABOUT HACKERONE

HackerOne is the #1 hacker-powered security platform, helping organizations receive and resolve critical vulnerabilities before they can be exploited. More than 1,000 organizations, including the U.S. Department of Defense, U.S. General Service Administration, General Motors, Twitter, GitHub, Nintendo, Panasonic Avionics, Qualcomm, Square, Starbucks, Dropbox and the CERT Coordination Center trust HackerOne to find critical software vulnerabilities. HackerOne customers have resolved over 57,000 vulnerabilities and awarded over $23M in bug bounties. HackerOne is headquartered in San Francisco with offices in London and the Netherlands.

MAKE THE INTERNET SAFER

WWW.HACKERONE.COM / SALES@HACKERONE.COM / +1 (415) 891-0777

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