IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF ALASKA

UNITED STATES OF AMERICA **v.** **PARAS JHA**	**Docket Nos. 3:17-CR-00163-01** **3:17-CR-00164-01** **HON. TIMOTHY M. BURGESS**

SENTENCING MEMORANDUM ON BEHALF OF PARAS JHA

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INTRODUCTION

Like millions of other children, Paras Jha was given a computer and an Internet connection when he was only a pre-teen. Singularly gifted in coding, Paras was permitted to explore his talents with few limitations. As he got older, he spent more and more time at his computer. Grades, friends, and any outside activities fell to the wayside. There were daily arguments with his parents, mostly over his lackluster academics. Although Paras was obviously extremely intelligent, he was struggling at school and at home. At college he struggled even more, ultimately dropping out in his sophomore year. Nevertheless, his parents persuaded themselves that despite Paras' excessive computer use and increasing isolation, academic failure and interpersonal struggles, he had a bright future; that future lay in his coding prowess. Unbeknownst to them this bright young man embarked on a dangerous path, one that eventually led to the creation of a powerful botnet and criminal charges in two jurisdictions for violating the Computer Fraud and Abuse Act.

The consequences of Paras' decisions to engage in cyber criminality are undeniably serious; he faces incarceration, restitution, and the far-reaching consequences of a felony conviction, all at the young age of 22. Three facts mitigate his culpability and should weigh heavily in the sentence this Court fashions. First, Paras was only 18 when he began experimenting with denial of service ("DDoS") attacks. Second, Paras had undiagnosed ADHD, a neurobiological disorder which impacts executive function and decision making with often severe outcomes in academic performance, interpersonal relationships, mental health, and long-term outcomes in practically every facet of adult life. While his youth and the consequences of his undiagnosed ADHD do not excuse Paras' criminal behavior, they may appropriately be considered as mitigating circumstances, and thus are important

considerations when determining an appropriate sentence. Third, Paras' extraordinary cooperation with the government and his post-offense rehabilitation warrant a substantial departure from the advisory guidelines. Paras' acceptance of responsibility, his extraordinary cooperation with the Government, and his post-offense rehabilitation are affirmations that this young man has matured into a tempered, productive, law-abiding citizen with great promise in the cyber security field. For all of these reasons, it is respectfully submitted that a sentence of probation is sufficient but not greater than necessary to serve the purposes of 18 U.S.C. § 3553(a).

I. Background

Paras Jha, now just 22 years old, was a very immature 18-year-old college student when he engaged in the conduct to which he has pled and now faces sentencing. Paras, along with his codefendants Josiah White and Dalton Norman, created a powerful program known as the Mirai botnet. The botnet allowed the user to marshal unsecured Internet-of-Things devices ("IoT"), turning them into a collective army that executed denial of service attacks.

A DDoS attack is a temporary event in which a person floods a server, computer system, or network with traffic in order to overwhelm the system, making it difficult or impossible for legitimate users to access or use. Paras' first foray into DDoS attacks was very limited. His exposure began through his participation in a popular online game: Minecraft. Distributed denial of service attacks were ubiquitous in the Minecraft universe.[1]

[1] Minecraft is well-known to many parents, gamers, and computer aficionados. It is a creation/survival game where players create their own worlds and build shelters to protect themselves from the game's night phase, when creatures spawn and attack. The possibilities for creative play are limitless and the game's popularity unprecedented. Because of the immense popularity of the game, it also spawned businesses. Renting server space out to groups of players became a lucrative source of income, with the larger server companies renting servers in locations around the world with thousands of virtual servers online at any given time.

The attacks, typically initiated by one Minecraft player against another, would overwhelm a targeted computer's internet connection, flooding it with traffic generated by multiple devices controlled by the botnet operator.[2] DDoS was a popular tool in the hands of a wide-range of participants, from unschooled pre-teens downloading step-by-step instructions from YouTube to shut down a rival player, to businesses that catered to these so called "script kiddies,"[3] offering low cost DDoS services to anyone willing to pay for the privilege of ruining someone's afternoon of gaming. Paras was no exception and frequently fell victim to these kinds of attacks.

Paras started hosting his own Minecraft server in high school. He became interested in the mechanics of denial of service when his own server was attacked; he started exploring hack forums for information on how to combat – as well as to build – such tools. This marked his entry into the world of computer deviancy. His parents, who encouraged his computer coding and believed his computer skills would lead to a career in cyber security, were completely unaware of the inherent dangers of Paras' singular skills coupled with the immaturity of youth. Perversely, as Paras was learning how to protect his server from DDoS attacks, he began using such attacks for his own gain. At first, he used the tool to attack competing Minecraft servers, frustrating players' ability to play on rival host servers. Later, Paras used these attacks to generate interest in obtaining DDoS mitigation

[2] As one of the FBI agents investigating this case observed in the Wired magazine article that profiled the trio of young men and the Mirai botnet, DDoS attacks were so prevalent in Minecraft that he would be more surprised if there wasn't a connection to Minecraft in a denial of service attack he was investigation.

[3] Programmers and so-called white hackers referred to Minecraft players who unleashed DDoS attacks to knock players offline a particular server as script kiddies, immature kids (or adults) who either used hacking techniques without knowing or learning how they functioned, by downloading one of the numerous hacking toolkits one can find virtually everywhere on the internet, including step by step videos on YouTube.

protection, a service offered by Protraf, the online business he created. As DDoS attacks were rampant in the Minecraft community, the need and demand for Minecraft DDoS-mitigation servers to protect host servers were fairly lucrative.

Paras' deviancy inevitably escalated. When challenged by a player in the Netherlands to create a more powerful DDoS tool, Paras set to work collaborating with his codefendants (White and Norman were online friends who lived in different states) to create the Mirai botnet. The botnet was novel; the conspirators' exploited a previously undisclosed vulnerability in IoT devices. As a result, Paras and his codefendants were free and uninhibited in their ability to harness these devices as "zombies" in the botnet's coordinated attacks. Although the coding was not particularly complex, the results were significant.

The PSR and the government sentencing submission detail the series of schemes and harassment effected by the use of the Mirai botnet. The defendants targeted rival DDoS mitigation providers, web hosts, Minecraft servers, and Krebs on Security – a blog that focuses on cyber-crime that had published speculation that Paras was the creator of the botnet. Later, Paras and his codefendants evolved their business model, renting use of the botnet to others for a fee.

After law enforcement attention focused on Mirai and Paras, the botnet code was released on a hack forum, and the codefendants worked on creating another botnet. This botnet was separate from the Mirai botnet and was used to participate in "click-fraud" activities. Paras continued to be on the FBI's radar, however, because of his DDoS of Rutgers University his freshman and sophomore years. Eventually, the cyber trail led to

Paras as the individual behind those attacks, then to the instant prosecution in both jurisdictions.

II. The Plea Agreement and Guidelines Calculation

Pursuant to a plea agreement, Paras pled to two Informations, each charging a conspiracy to violate 18 U.S.C. § 1030(a)(5)(A). Probation has grouped the offenses pursuant to U.S.S.G. §3D1.1 and §3D1.2, with a combined offense level applicable for all groups pursuant to §3D1.4. Accordingly, the base offense level is 6, with two points added for §2B1.1(b)(2) (ten or more victims); and two points for §2B1.1(b)(10), sophisticated means. There is no agreement as to loss. The PSR details that in 3:17-CR-0163-TMB, the gain was approximately 100 Bitcoin with a value of over $180,000.[4] In case 3:17-CR-00164-TMB, Probation calculated a total estimated loss of $307,000 for the DDoS attacks on HostUs, Hypixel, Psychz Networks and Akamai, for a total increase of 12 levels. There is also a four-level automatic increase pursuant to U.S.S.G. § 2B1.1(b)(18)(A)(iii) because the offense was a violation of 18 U.S.C. § 1030(a)(5)(A). The resulting total offense level is 26, a four-fold increase from the fraud guidelines' base offense level of six. With a three-level reduction for acceptance of responsibility the total adjusted offense level is a 23 with a guideline range of 46-57 months. As the government correctly notes on page 7 of its submission, the four-level enhancement for a violation of 1030(a)(5)(A) is inapplicable pursuant to § 2B1.1(b)(18)(A)(ii). Thus, the correct total offense level is 19 yielding an advisory range of 30-37 months.

In examining these calculations, it is important to note that the guidelines range is supposed to represent a "rough approximation" of the appropriate sentence when it is the

[4] Paras agreed to, and has, forfeited 13 Bitcoin as proceeds of the criminal activity.

product of empirical data and national experience, guided by professional staff with appropriate expertise. *See Rita v. United States*, 551 U.S. 338, 350 (2007). When the Guidelines are not the product of the Commission's exercise of its institutional role, such as when a guideline is not based on any identified empirical approach and instead guided by Congressional directive, the Court is not presented with a typical case, where the resulting guideline range represents a "rough approximation." *Kimbrough v. United States*, 552 U.S. 85, 109 (2007). In such a case, the Court can determine that a sentence produced by such a guideline yields a sentence "greater than necessary" to achieve the purposes of 18 U.S.C. §3553(a), even in a so called mine run case, and vary. *Id*.

For policy reasons, the Commission did not employ its characteristic empirical approach when formulating Guidelines for fraud. United States Sentencing Commission, *Fifteen Years of Guidelines Sentencing* (Nov. 2004), Executive Summary at vii, 15, 56. Indeed, the Commission has never explained why it is appropriate to accord the weight it does to the amount of loss in the fraud guidelines, nor has it explained the rationale for any of its identified specific offense characteristics. *United States v. Adelson*, 441 F. Supp. 2d, 506, 510 (S.D.N.Y. 2006) (further citation omitted). Additionally, the specific offense characteristic enhancements and §2B1.1's broad definition of "loss" for CFAA cases were also developed pursuant to Congressional directive, not the Sentencing Commission's exercise of its institutional expertise, or its use of empirical evidence and sentencing data.[5]

[5] In fact, in the 1996 Report to the Congress: Adequacy of Federal Sentencing Guidelines Penalties for Computer Fraud and Vandalism Offense", the Sentencing Commission concluded that none of the offenders convicted of violating §1030(a) (4) or (5) had thus far been convicted with a subsequent federal crime. 21 of the 40 defendants sentenced under the fraud guideline obtained some term of imprisonment, so that roughly 47.5% of the universe of offenders sentenced to date drew sentences of probation. *Id*. The data assembled by the commission as illustrated in Tables attached to the Report suggested that sentencing judges were generally satisfied that guidelines sentences for computer crime defendants were "realistically constructed to mirror the seriousness of these offense." At that time the mean sentencing range for computer crime cases was 0-6, with no upward departures, and 86% of sentencing was within guideline range. The mean prison sentence

As such, as in *Kimbrough*, the Court may conclude that the sentencing range produced by the fraud guidelines falls short of a "rough approximation" of a reasonable sentence under §3553(a) because it is not backed by empirical data or the Commission's expertise.

III. Downward Departure for Substantial Assistance to the United States Pursuant to Section 5K1.1

The Government has filed a motion for a downward departure based on Paras' extraordinary cooperation. We submit that the nature, extent, success and breadth of Paras' cooperation warrants a downward departure to a non-custodial sentence.

The District of New Jersey and the District of Alaska reached an agreement early on that Paras' cooperation would be coordinated and run by Special Agent Elliott Peterson in Alaska and credited towards his sentencings in both Districts, whether combined or separate. Agent Peterson, who is recognized as one of the FBI's top investigators for cybercrime, has described Paras' cooperation not only as substantial, but extraordinary in its scope, breadth, results, and amount of time expended. Paras and Agent Peterson have communicated almost daily over the past year. Paras has devoted hundreds of hours assisting the FBI and other agencies, both here and abroad. Paras has completely changed over the past year from an immature young man with little appreciation for the consequences of his actions, to a responsible, law-abiding citizen and dedicated cooperator who has helped thwart massive cyberattacks on several companies and done everything and more asked of him by the government.

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was 13.1 months, and the median, 9.0. The 1995 Manual provided for a base offense level of 6 with a 14-level enhancement for an offense with more than 5 million and less than 10 million; there were no enhancements specific to CFAA offenses. Thus, there was no data at that point that indicated any serious adjustment to the guideline offense levels, or ultimate sentencing factors, was necessary though of course such changes were made with increases both to the loss table, as well as specific offense characteristics enhancements and the expansion of the loss definition for CFAA offenses.

The government has provided the Court with a summary of the more significant matters Paras has assisted the FBI, other law enforcement agencies, and private sector companies with over the past year. During these investigations, Paras worked tirelessly to uncover identities, information, methods and timing of attacks, and other information that lead to the identity and location of individuals later charged with computer crimes. His cooperation has been more than substantial, it has been outstanding. We wholeheartedly agree with the government's motion for an 85% reduction in the sentence, combined with continued education, and community service that includes continuing cooperation with the FBI. (Govt. Sentencing Memorandum at pg. 7). A sentence of probation in Zone A is sufficient but not greater than necessary sentence given all of the facts and mitigating circumstances in this particular case..

IV. The Sentencing Factors Under 18 U.S.C. § 3553

A. Defendant's Good Character and Personal History: 18 U.S.C. § 3553(a)(1)

As researchers and law enforcement have begun to understand, cyber–deviance often begins in adolescence, and the rates of young people engaging cyber-crime is steadily increasing. (Exhibit A, NCA Intelligence Assessment, "Pathways into Cyber Crime," p. 2). Young offenders often start by participating in gaming cheat websites and "modding" (game modification) forums, where they are first exposed to off-the-shelf hacking tools to improve their game or frustrate competitors. (*Id.* at p. 9). Financial gain is often not the immediate priority; rather, a sense of accomplishment and a need to prove one's self by completing challenges motivates many. (*Id.*) As summarized in "A Sociology of Hackers," the most common motivation for cyber deviance is a compulsive attraction to hacking,

intellectual curiosity, strong feelings of control or power, and the satisfaction derived from feeling that one is part of a group." (*Id*. at 17, citing Chiesa, R. and Ducci, S, and Chiappi, S. (2008) "Profiling Hackers: The Science of Profiling as Applied to the World of Hacking").

Paras clearly fits the "hacker" profile in these white papers and research studies. In his personal history, the Court can find all the markers of a young man who was at risk to engage in cyber deviancy. As evidenced by the letters submitted by family members and friends, the neuropsychological evaluation report prepared by Dr. Joshua Cohen, and Paras' letter to this Court, Paras' path to cyber-criminality was clearly charted in his struggles as an emerging adult.

1. Childhood and Undiagnosed ADHD

Paras, now just 22 years old, is the older of two children born to Anand and Vijaya Jha. Paras was a quiet, intelligent little boy who was kind, polite, and respectful, but somehow different from other kids. He was always a child of endless questions and inquisitiveness; his natural intelligence manifested itself as an intensity other children lacked. (Exhibit B, Letter of Suhasinee Madge) ("*When the other [children] were running around aimlessly, he would build a complicated Lego structure with full concentration and patience. As he grew up so did his imagination and intelligence.*); (Exhibit C, Letter of Sunita Walavalkar) ("*He was and is curious about everything…asking about things he sees around. If he doesn't get satisfactory answers, he would continue his questions next day and try to gather more*.) When close family friends were building their new home, Paras was fascinated by the mechanics of electrical wiring and plumbing, meticulously mapping out the house, including all of its wiring and pipes. (Exhibit D, Letter of Shilpa and Praveen

Hendre) ("*One thing about Paras always amazed me is his curiosity. He wanted to know how things worked…His curiosity continued to grow as he grew and he would ask questions to his parents and others all the time.*"). Everyone, especially his parents, expected Paras to do great things in school, in college, and in life. (Exhibit E, Letter of Vijaya Jha; Exhibit F, Letter of Anand Jha).

Perhaps it was the outsized expectations that Paras' parents had for his future that blinded them to the troubling signs that he was struggling, first with developmental milestones, later with making friends and doing well in school, and finally with living independently at college. In retrospect, Paras' mother acknowledges that she did not grasp the significance of his failure to make developmental strides in parity with his peers, when he was late to crawl, walk or talk, and later, experienced difficulty tying his shoes, catching a ball, or buttoning clothes. (Exhibit E, Letter of Vijaya Jha). As he grew older, Paras had difficulty with paying attention at school, observing schedules and rules, and turning in homework on time. From a young age he seemed to have trouble making friends, preferring solitary play to the group activities and sports of his peers. (*Id.*). ("*Paras since the beginning was a quiet and happy by himself, lonely child. I used to wonder why he doesn't mix with other kids his age or why he doesn't go out like other kids do.*); (Exhibit F, Letter of Anand Jha). Relatives and family friends also noticed that he seemed to be an introvert, with few friends and a reclusive nature. (Exhibit G, Letter of Sahil Jha) ("*Because of his disciplined nature other kids would sometimes bully him and I believe this may have caused him not to make many friends and he would be just by himself, with his books and cartoon shows"*).

When Paras was in the third grade, a perceptive teacher recommended to Mrs. Jha that Paras be evaluated for ADHD. In retrospect, there were signs early on that Paras might have this neurobiological disorder: Paras' academic struggles, in spite of his intelligence; his ability to intensely focus only on activities in which he was interested; and his difficulty navigating social relationships. ADHD is an impairment of executive function, which refers to a wide range of central control processes in the brain that activate and manage other brain functions that prioritize, integrate and regulate other cognitive and behavioral functions. *See* https://www.cdc.gov/ncbddd/adhd/facts.html; http://www.help4adhd.org/Understanding-ADHD/About-ADHD.aspx. Impaired functions may range from working memory and recall to control of one's emotions to complex problem solving. Children with ADHD struggle with chronic symptoms of inattention, distractibility, hyperactivity and impulsivity. *Id*. They also rarely develop the self-esteem that other children and adolescents derive through succeeding at school and pleasing adults, complicating their lives as teenagers and adults.

In spite of the recommendation, Mrs. Jha resisted believing that Paras might have a disability. (Exhibit E, Letter of Vijaya Jha). She maintained that in their family everyone was educated and accomplished, disregarding the fact that all three of her husband's demonstrably intelligent uncles dropped out of college. (*Id*.). Paras' mother wanted to believe that she would have the "quickest, fastest, and most intelligent son." *Id.* Acknowledging even the possibility that he had a developmental disability would undermine this dream. (*Id.)* She admits that she filled out the parental questionnaire required to make the diagnosis with a distinct bias. (*Id.*) Because the diagnosis of ADHD is made solely through questionnaires filled out by the teacher and parents, her decision to

answer questions in this manner precluded a doctor from diagnosing Paras when he was in grammar school. Without the diagnosis, Paras did not receive behavioral therapy or medication, nor did he receive an Individualized Education Plan, which would have provided him with specific academic supports and accommodations to assist him in school.

Children denied these interventions experience greater difficulties as their academic workload and the complexity of tasks increase in middle and high school. [6] They also suffer from self-esteem issues and difficulties with social relationships. Untreated ADHD adversely impacts individuals across a broad spectrum, with such individuals experiencing higher substance abuse rates, higher rates of mental health disorders in adulthood, higher mortality and suicide rates, higher rates of criminality, adverse academic achievement and performance, and financial and occupational difficulties.[7] As they grow older, children with ADHD, especially those who are untreated, face significant difficulties in school, family life, and social relationships.[8]

This was certainly true of Paras. As he got older, Paras struggled more and more at school. Because he was so obviously bright, both his parents and his teachers attributed his mediocre grades and failure to complete homework to laziness or a lack of responsibility. Spurred by his mother's ambitions, Paras applied for admission to a "magnet" public STEM high school that admitted the highest scoring student from each town in the district.

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[6] L. Eugene Arnold, et al, "Long-Term Outcomes of ADHD: Academic Achievement and Performance", J.Atten. Disord., 2015 Jan 12 (achievement test and performance outcomes worse in individuals with untreated ADHD).

[7] Hamed, Alaa et. al., "Why the Diagnosis of Attention Deficity Hyperactivity Disorder Matters", Front. Psychiatry, 26 November 2015, at https://www.frontiersin.org/articles/10.3389/fpsyt.2015.00168/full

[8] It may be that the plethora of symptoms and adverse outcomes in academic performance, substance abuse rates, and employment contributes to the higher incidence of criminal activity in adults who exhibited ADHD symptoms between the ages of 5-12 compared to adults without ADHD. *See* Fletcher, J. Wolfe, B. "Long Term Consequences of ADHD on Criminal Activities", J. Ment. Health Policy Economics 2009.

He got in, but struggled. His parents were frequently called into school by teachers and counselors to discuss his behavior, his lack of attention, and his failure to turn in homework. (Exhibit F, Letter of Anand Jha). As a result, there were many arguments with Paras as his bewildered parents pressed him to try harder. (Exhibit E, Letter of Vijaya Jha; Exhibit F, Letter of Anand Jha).

Paras' relationship with his mother suffered in particular, as she was the one who took on the role of academic assistant, tasked with keeping him on schedule, ensuring his homework was completed, and making sure he got up in time in the morning and went to bed on time in the evening.

> *This period in our life…threw us miles away from each other in our minds. I was keen on him getting high grades and get into one of the top colleges, so we always had a lot of verbal heated discussions. I did say many disappointing verbal sentences towards him thinking that this will help him pursue his studies aggressively. We didn't realize that Paras was suffering from ADHD symptoms and was not able to concentrate on his exams and studies. He started to rebel in everything and my husband had to intervene for peace between us*." (Exhibit E).

During these tumultuous years, Paras became even more obsessed with his computer and online friends, leading to a kind of self-imposed isolation. (Exhibit F, Letter of Anand Jha). ("*With all these in-house arguments going on, his interaction with us and his school friends reduced and he would spend most of his time in his room with his online friends[;][h]e didn't go out to movies or gatherings with his friends as we saw other teenagers his age doing*."); (Exhibit H, Letter of Avinash Dhuri; Exhibit G, Letter of Sahil Jha). Anand, a software programmer, introduced his son to computers and encouraged Paras' coding when he was very young. By age 12 Paras had mastered C+, one of several computer "languages" he eventually learned, and his coding skills rapidly exceeded what Anand could teach him. Everyone in the family and within the Jha's circle of friends knew

of Paras' aptitude with computers and believed, at the time, that it would be his path to success. (Exhibit I, Letter of Nimesh Singh; Exhibit J, Letter of Anita Jha; Exhibit K, Letter of Vikram and Madhumita Rao). Mrs. Jha, however, was troubled by the amount of time Paras devoted to his computer. (Exhibit E, Letter of Vijaya Jha).

Although Mrs. Jha blamed Paras' excessive computer use for some of his academic problems, the truth was that Paras' obsessive interest in coding and programming was simply another symptom of his ADHD. Because computers interested him and gaming and coding provided immediate gratification and pleasure, Paras was able to focus singularly on his programming and gaming to the exclusion of almost every other interest. (Exhibit L, Neuropsychological Report of Dr. Joshua Cohen pp, 16-17). (Exhibit H, Letter of Avinash Dhuri) (*When Paras was in school he had to be pushed to study, yet when it came to learning computer languages, he was the one jumping to his keyboard*).

While Paras seemed to always disappoint his parents with his academic achievement, his coding abilities were a source of pride for Anand, who encouraged Paras' obsessive use of the computer and brushed aside Vijaya's concerns. (Exhibit F, Letter of Anand Jha; Exhibit L, Neuropsychological Evaluation by Dr. Joshua Cohen, p. 7-8). For Paras, the computer and his coding were more than just a future career path; it was a means for recognition and affirmation, and a way to bond with others. Online, he would post his coding efforts, excel at gaming, and offer help to others to solve problems or refine their own code. There was instant recognition, and a sense of brotherhood online with fellow coders and gamers. Computers and his coding skills were a vehicle for forming the social relationships that escaped Paras in the real world. Online, Paras found a "tribe" of peers who shared his interests and skills in forums and chat rooms dedicated to coding and

programming. There were no geographical boundaries, as the multitude of gaming and coding forums and chat rooms allowed Paras to "meet" and converse with others who shared his singular interest in computers and coding in disparate parts of the world and across time zones. In stark contrast, Paras had few friends in school or in his neighborhood.

Family friends noticed that Paras had become more withdrawn and isolated, and seemed to eschew friendships, schoolwork and other activities, for the computer. (Exhibit B, Letter of Suhasinee Madge) *("[S]lowly, [Paras'] interest seemed to narrow down towards computers, at the expense of other things…towards the latter part of his high school, he simply did not care about other subjects and was totally devoted to computer science.*"); (Exhibit G, Letter of Sahil Jha)*("He did not have many good friends and kept himself busy with his books and computers…We often had to drag him out of his desk to have a conversation or play family games.");* (Exhibit J, Letter of Anita Jha) ([*H]e seemed to have interest only in computers and wasn't a person who talked a lot*"); (Exhibit K, Letter of Vikram and Madhumita Rao) (*We had recognized Paras' ability to grasp complex programming concepts since early years, this was also his downfall, perhaps because of youth, emotional immaturity…In his high school and early college years, Paras also had difficult making friends because of his obsession with computers and his inability to focus and devote time to other aspects of his life*.).

Paras' gaming on various Minecraft servers and his endeavors to run his own server provided his first exposure to the extremely prevalent and indiscriminate use of denial of service attacks, now well-documented in the press and well-known in the industry. With the rise in popularity of Minecraft, individual hosted servers allowed multiple users to play multiplayer games. Hosting these servers, frequented by pre-teens and adults alike, became

a lucrative business model as players paid to play: both to rent "space" in Minecraft and to purchase in-game tools. As documented in the Wired magazine article that explored the Minecraft-Mirai connection, server hosts running a popular Minecraft server could make $100,000 a month, a fact which generated an expansion of the DDoS industry. (Exhibit M). Disgruntled players, angry at the destruction of their creations or seeking personal retribution, could launch a DDoS attack using simple instructions found on YouTube. Such DDoS attacks became so common that entire businesses were built on selling low cost DDoS tools to accommodate less talented youngsters who were unable to code sufficiently to create their own.

More sophisticated users understood that launching a denial of service attack on a popular Minecraft server could make money. Individuals hosting servers could drive players to their servers by thwarting the ability to play on a rival server with a barrage of denial of service attacks. Unable to play on one server, players would move their game (and their money) to another server. As a result of these indiscriminate attacks, DDoS-mitigation services grew in popularity, providing an enticing opportunity. This activity was rife in adolescent gaming circles. As FBI Agent Doug Klein explained, "We see so many attacks on Minecraft I'd be more surprised sometimes if I didn't see a Minecraft connection in a DDoS case." (Exhibit M, Wired Magazine). As he pointed out, "[t]he vast majority of these Minecraft servers are being run by kids…you don't necessarily have the astute business judgment in the "executives" running these servers." *Id*. Within that closed universe, DDoS'ing was so ubiquitous that the fact that it was technically illegal was seemingly irrelevant. With a 13-year-old able to buy a simple DDoS tool for $15 on hundreds of sites advertising such products, and DDoS attacks a constant and almost

routine occurrence, there is a distinct risk that such behavior can not only proliferate but gain a kind of acceptance online.

Paras' own server was hit with DDoS attacks. To try to defend against them, Paras tried to understand their composition, attempting to reverse engineer the attacks. Paras easily found individuals online who were engaging in such attacks and discussed the various methods. Fascinated, Paras began experimenting with DDoS programming himself. The lure of being able to wield the tool, both defensively and offensively, was compelling, particularly because the attacks were so common and so easy to initiate. With his embrace of denial of service attacks in the Minecraft landscape, Paras was on the pathway from cyber deviance to cybercrime.

Paras' undiagnosed ADHD compounded the age-related deficiencies of his executive function. His ADHD made him particularly vulnerable to unacceptable risk taking, impulsivity, and lack of insight into the reasons for and consequences of his behavior. As Dr. Cohen opines in his report, ADHD alone does not explain (or excuse) Paras' behavior, but it certainly contributed significantly to it. (Exhibit L, Report of Dr. Joshua Cohen, p. 16). Undiagnosed for years with no explanation for his seeming inability to perform academically despite being highly intelligent, Paras had a deep sense of inadequacy, frustration, and a corresponding isolation that was alleviated only when he was on a computer. (*Id.*). In computers Paras "found a domain in which he felt a sense of efficacy", where he finally saw enthusiasm and pride from his father and received constant praise from his online friends. (*Id.*). From his online peers –many of whom were engaged in cyber deviant behavior themselves– he gained respect and admiration, particularly for

his risk-taking behavior in developing malicious code and launching denial of service attacks. (*Id.*). He found the praise intoxicating.

Test results from Dr. Cohen's neuropsychological evaluation confirm that Paras frequently responded impulsively without foresight. *Id*. Additionally, there is little that seems to excite him or from which he gains a sense of competence outside of computers. *Id*. Paras' ability to devote sustained attention to coding, which was a constant and immediate rewarding endeavor, was not accompanied by forethought; Paras' act of coding was premeditated, but the future impact on himself and others was not considered. *Id*. at 17.

2. Youthful Offender

Although both parents believed that things would change for Paras when he finally entered Rutgers to begin his B.S. in computer science, the executive function issues that plagued him in grade and high school followed him to college, and unsurprisingly unraveled his first year. Without his mother's attention to his scheduling, sleep habits, and homework, Paras found himself completely unmoored. He could not keep track of his class schedule, homework, or exams. He was unable to do well academically, which made him feel frustrated, hopeless, and deeply ashamed. He was acutely isolated. He had no real friends and had no social interactions with other students with the exception of his roommate. He did not go to parties, hated the football games that seemed to dominate Rutgers campus life, and failed to make any significant emotional relationships. He was depressed and alone, but avoided going home or talking to his parents about his feelings because they were so upset and disappointed with his academic performance at college.

Instead, he spent almost all of his time on the computer, interacting with online friends, gaming, and coding, sometimes into the early morning hours.

As his academic life deteriorated, Paras became more enmeshed in his online world. In his freshman and sophomore years at Rutgers, Paras launched four denial of service attacks, not to steal data or acquire financial profit, but for purely personal, juvenile reasons. He reveled in the uproar caused by the first attack, which he launched to delay upper-classmen registration for an advanced computer science class he wanted to take. The second attack was launched to delay his calculus exam. The last two attacks were motivated in part by the publicity and outrage. Although they were undoubtedly negative, they elevated Paras' sense of self and accomplishment. He held no ill will toward his fellow students and demonstrated an absence of concern for the disruptions of his peers' exams or classwork, and for the trouble visited upon the school. Paras simply did not think about the consequences at all. After his initial attacks made him a "celebrity," he fed on the attention, sense of power, and control. Meanwhile, the rest of his life crumbled.

Paras did so poorly in school that he was put on academic probation. Feeling more isolated and defeated than ever before, he dropped his sophomore year. With his father's encouragement he shifted his focus, developing Protraf, a DDoS mitigation firm. Anand was unaware that in Paras' effort to develop mitigation tools, he was creating distributed denial of service tools, and later wielding them to encourage targeted companies to engage the services of his firm. When he was later challenged to create a tool for denial of service attacks, Paras began developing code for a more powerful DDoS tool (the Mirai botnet) with his online compatriots, White and Norman. Eventually, the trio found ways to monetize the botnet, which proved extremely powerful and effective at launching short,

but incapacitating DDoS attacks. The group rented out the botnet to others. Anand, meanwhile, was completely unaware of the dangerous escalation of Paras' behavior.

It is not entirely surprising that Paras' cyber deviance morphed into cyber-crime, or that his prior personal motivations for utilizing denial of service attacks would evolve into a financial model. This pathway is common for many adolescents; there is very little difference between the abilities of illegal hackers and those individuals using their abilities legally in the cyber security industry. The difference for hackers who found themselves using their skills for good in the industry is that those professionally working had, at some point, a parent, guardian, or teacher intervene and put them on a proper, law-abiding path.[9]

In a trilogy of cases, the Supreme Court recognized that juveniles are constitutionally different from adults for purposes of sentencing because they have both diminished culpability and greater prospects for rehabilitation. *See Roper v. Simmons*, 541 U.S. 1040 (2004); *Graham v. Florida*, 560 U.S. 48, 68 (2010); *Miller v. Alabama*, 567 U.S. 460 (2012). Citing scientific studies showing that adolescents' brain development made them more prone to impulsivity, more vulnerable to adverse environmental factors, and less likely to have fully formed characters, the Supreme Court in *Roper* specifically found that, as a class, adolescents were less responsible than adults, and thus legally less culpable. 543 U.S. at 569.

The Supreme Court's use of a chronological age of 18 for purposes of creating a bright line for categorical prohibitions on the death penalty or life imprisonment does not

[9] See http://telegraph.co.uk/news2017/07/25/teenage-hackers-sent-rehab-put-skills-good -use-fight-against/, an article discussing the development of cyber-crime rehabilitation and education programs for young offenders in the UK based on research that looked at the abilities of illegal hackers and those of individuals in the cyber security industry and concluded that those in cybersecurity were very similar to the illegal hacker group, "but at some point a parent, guardian or teacher had intervened to put them on a law-abiding path."

mean that the characteristics of adolescence – such as immaturity, impulsivity, and lack of fully developed character – are irrelevant for sentencing purposes when the offender is an emerging adult. In *Roper*, the Supreme Court observed that "[t]he qualities that distinguish juveniles from adults do not disappear when an individual turns 18." 543 U.S. at 574. While 18 may be the "point where society the draws the line for many purposes between childhood and adulthood," scientific research confirms that full adulthood is not biologically achieved until much later than 18, and current research suggests that significant behavioral and cognitive development occurs beyond the age of 18. *Id.*; *see also*, Scott, Elizabeth S., & Laurence D. Steinberg, *Rethinking Juvenile Justice*. Cambridge, Mass: Harvard University Press, 236, 2008; Emily Buss, What the Law Should (and Should Not) Learn from Child Development Research, 38 Hofstra L. Rev. 13, 39 (2009) ("Much of the developmental research suggests that the qualities highlighted by the Court [in *Rogers v. Simmons*], described together as psycho-social immaturity, continue to apply to individuals into their twenties, even mid-twenties or beyond.").

Indeed, brain systems implicated in self-regulation and behavior control in particular may not fully mature until early adulthood. *Graham v. Florida*, *supra*, 560 U.S. at 68, *citing* Brief for The American Medical Association, et. Al., as Amici Curiae Supporting Neither Party 16-24(No. 08-7412, 2009 WL 2237127 at *16). Recent research and neuroimaging confirm that "[t]he parts of the brain that govern impulse, judgment and other characteristics may not reach complete maturity until an individual reaches age 21 or 22." United States Department of Justice, Office of Juvenile and Delinquency Prevention Annual Report (2005), at www.ncjrs.gov/pdffiles1/ojjdp/212757.pdf. Researchers believe that the executive part of the brain important for controlling reason, planning, organization,

and impulse control does not fully mature until the early 20s, with at least one study indicating that the region of the brain inhibiting risky behavior in young men is not fully formed until age 25. Jan N. Giedd, "Structural Magnetic Resonance Imaging of the Adolescent Brain," 1-21 Annals N.Y. Acad. Science 105-109 (June 2004). Because this part of the brain, the prefrontal cortex, is responsible for impulsivity, judgment, planning for the future, and foresight, its underdevelopment in emerging adults must be of consequence when weighing criminal consequences, as these are the very characteristics that make one morally culpable.

Paras' progression to more serious criminal computer activity fits a profile identified in a joint report/discussion paper prepared by the National Cyber Crime Unit, a part of the National Crime Agency in the UK, and CREST, a not-for-profit accreditation and certification body representing the technical information security industry. (Exhibit A).[10] The NCCU's investigations suggested that many of the young people targeted by the NCCU campaign are male gaming enthusiasts. (*Id*.). The investigation concluded that there was often a clear progression individuals took towards illegal activity, starting with a growing interest in coding, then modification of computer games and entry into online coding clubs and forums where they are exposed to the possibilities of using their skills for hacking. (*Id*.). Unsurprisingly, the NCCU's research suggests that individuals at risk of becoming involved in illegal online activity can be as young as 12 and are distinguished by a deep interest in technology often sparked by gaming, much like Paras. (*Id.*) They are likely to spend a large and ever-increasing proportion of their lives online, and are often

[10] The UK government has made a significant effort to isolate causes and address early intervention due to the growing number of young people involved in serious cybercrime, funding studies, initiatives and a prevention program. The discussion paper looked at young people's pathways into cyber-crime, identified characteristics of at risk youths, and suggested ways of deterring such conduct through intervention.

academically gifted in technology. (*Id.*). Moreover, in workshops exploring why individuals with these skills and interests become involved in criminal activity, participants suggested that some of the young people involved may find hacking appealing in part because it offers a way of acquiring power, or creating a sense of "belonging" through membership in hacking forums and other online communities. (*Id*.). The desire to "prove oneself" within these communities was cited as a significant factor that could lead to more serious illegal activities. (*Id.*). Financial gain is often only a secondary motivation; sometimes the main motive for doing something illegal is that it presents an interesting challenge. (*Id*.).[11] Because much of hacking is goal-oriented, and driven by the challenge, individuals cross the line into illegal activity without thinking or being concerned about whether getting the information or solving the challenge crosses the line into illegality. (*Id*.).

The parallels to Paras' background, personal history, and the circumstances of his offense are striking. Of course, neither Paras' age, nor his ADHD are limitlessly mitigating. Not every young gamer crosses the line and neither age nor his neurodevelopmental disorder is an excuse for his conduct. At a certain point, Paras' criminal cyber activity was motivated by financial gain, as his eventual monetization of the Mirai botnet and the click fraud scheme demonstrate. Paras has accepted full responsibility and acknowledged that he alone is responsible for his criminal conduct and the malicious use of his coding skills for profit. However, Paras' immaturity and his ADHD, in combination with his personal history and the circumstances of his offenses, do provide insight into Paras' motivation and mitigate his culpability. He is just one example of the growing need for law enforcement,

[11] One participant summarized the motivations of a hacker, "if you have a problem to solve, enough time to solve it, and someone to prove wrong that will give you a hacker." (*Id*.)

parents, and educators to identify and intervene when young people's online activity begins to cross the line between legal and illegal behavior, before that behavior evolves into criminal conduct.

In this case, a prison term is not necessary for specific or general deterrence. Overwhelmingly, individuals convicted of computer offenses under 18 U.S.C. § 1030 are first offenders categorized under Criminal History Category one: in 2007, the rate was 78%. USSC, *Increased Penalties for Cyber Security Offenses* (May 2003), at 3. Those in CH I have the lowest rate of recidivism across all criminal history categories. USSC, *Measuring Recidivism: The Criminal History Computation of the Federal Sentencing Guidelines*, Ex. 2 (May 2004). Tellingly, most defendants convicted of CFAA crimes have some college education (like Paras) or a college degree, which also corresponds with a low recidivism rate: 13.8% for some college education, 7.1% for a college degree. *Id*. at 12 and Ex.10.

3. 42 School

Paras' post-conduct behavior is also a powerful indicator of his potential for rehabilitation as a productive law-abiding member of society. *Pepper v. United States*, 562 U.S. 476, 491-92 (2011) (post-offense rehabilitation is a critical factor in the imposition of sentence because it tends to reveal a defendant's likelihood of future criminal conduct). Paras is enrolled in 42 School, an extremely competitive, intensive, and challenging computer coding and engineering program.

In February 2018, Paras received permission to move from his parents' home in New Jersey to northern California to attend 42 School. Paras had previously attended a 4-week course offered from October 22 to November 18, 2017. After attaining one of the

program's highest scores, Paras was invited to attend the school and take part in their full program.

42 School was started by Xavier Niel, a French billionaire, entrepreneur, and philanthropist, who runs France's largest telecommunications provider. Niels funds a tuition-free school that seeks to fill job shortages in the tech industry. The educational principles he and his team have developed are utilized not only in the schools he established in France and Silicon Valley, but also in the educational facilities he established in South Africa, Romania, Ukraine, and Belgium. 42 is recognized as a highly valued member and feeder for future employees at the best-known companies in Silicon Valley and throughout the tech corridor. Any code developed by the student becomes their intellectual property and may be used by them to advance their learning and future careers.

Before his ADHD treatment protocol, the demands of a program like 42 would have presented insurmountable time management and executive function issues for Paras, as evidenced by his prior experience in high school and college. Now, older and a year into his ADHD treatment, Paras is exceling at 42 despite the demands. Not only has he distinguished himself with his aptitude and ability to complete complex projects at an unparalleled pace, Paras has also volunteered hundreds of hours of time helping the school resolve issues in their authentication system, fixing flaws in the software that runs 42's website, and identifying discrepancies in the software run on every computer in the institution. (Exhibit N). Paras also mentors his fellow students by providing individual assistance with homework assignments or technical computer issues, study groups, and running a Reverse Engineering Club to assist students with difficult to master concepts.

(*See* Exhibit O, Letter of Jin Zheng). Just as importantly, Paras has never strayed from a law-abiding use of his computer skills and education while at 42.

4. Current Part-Time Job

In addition to the substantial time devoted to the 42 School and work with the FBI, Paras' dedication to transforming himself is further demonstrated by yet another aspect of his new life: his part-time job. In July of 2018, Paras obtained a part-time job working for a fast-growing cyber security company in the Bay Area.[12] There, he uses the skills he once used for cyber deviancy to test and explore devices in a lab environment, helping to rectify vulnerabilities in commonly used hardware (such as personal laptops), rather than exploiting them. Once Paras uncovers vulnerabilities, the company discloses his findings to affected vendors and gives them the ability to fix insecurities before others have the ability to take advantage – a sharp contrast to his past behavior. Although his time working for the company has been brief, Paras has proven himself integral in their expansion and development, to the benefit of not just the organization, but Paras himself. The fact that the company is fully aware of the charges in Alaska and New Jersey and still trusts Paras to work on discovering these vulnerabilities speaks volumes.

V. §3553(a)(2)(A)-(C) – The Need for the Sentence Imposed to Reflect the Seriousness of the Offense, Provide Deterrence, Protection of the Public and to Provide Defendant with Educational or Vocational Training

A prison term would substantially derail the advances Paras has made. Research indicates that incarceration, whether imposing it at all or increasing the time served, has either no significant correlation to recidivism and may in fact increase the likelihood of recidivism. *See e.g.*, Lin Song & Roxanne Lieb, *Recidivism: The Effect of Incarceration*

[12] We have redacted the name of the company for privacy reasons.

and Length of Time Served 4-6, Wash. St. Inst. for Pub Policy (Sept. 1993) (at http://wsipp.wa.gov/ReportFile/1152/Wsipp_Recidivism-The-Effect-of-Incarceration-and-Length-of-Time-Served_Full-Report.pdf.)

VII. CONCLUSION

Paras cannot erase the past, nor can he avoid the consequences of his actions. Those consequences are severe, even without incarceration. He is now a convicted felon. He faces substantial restitution that will impact his livelihood and career prospects for decades to come. His criminal conduct and participation in creating the Mirai botnet has made him infamous, and he will have to live with that reputation and its effects on his future career, personal relationships, and family for years to come. Paras has painfully realized how devastating his arrest has been to his parents, family, and friends deluged with the cascade of news articles, magazine profiles, and online discussion of his crime. Fear for her son and pain over his public infamy have sent his mother into a spiral of despair. She has essentially retreated into herself and closeted herself at home. Paras feels responsible for the brain tumor his mother recently had removed, which doctors claimed can be the result of unnatural stress. (Exhibit N).

The government's recommendation of 5 years' probation, community service including continued cooperation with the FBI, and continued education is a fair and reasonable sentence given all the above-detailed mitigating factors. Such a sentence reflects Paras' youth at the time of the offense, and his capacity for rehabilitation. We respectfully would ask that the Court not impose a curfew, or a period of community or home confinement, however, as it would impact Paras' ability to fulfill the time and work demands of 42 as well as his new part-time job.

42 is project based. The "school" does not have traditional classes on a set schedule, nor specific school hours. Instead, students work in teams on specific work projects that often stretch into early morning hours and extend into the weekend. Paras also has a part-time job to which he commits whatever free hours he might have. Community or home confinement will thus be difficult to manage because Paras does not have a traditional academic schedule or set hours during which he is expected at school. As a result he would have to update probation on a daily basis as to his schedule, which constantly changes, and which is not confined to weekdays and a certain time period. In lieu of such confinement the Court might instead require Paras to participate in a prevention program that educates young people, educators, and parents on the dangers of online activity and productive uses of their coding skills.

Paras' history, youth, post-offense rehabilitation, capacity for change, substantial assistance and the significance of his future contributions to society all weigh strongly in favor of the recommended departure to Zone A with 5 years' probation.

Respectfully submitted,

s/ *Robert G. Stahl*

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