

GoHop: Personal VPN to Defend from Censorship

Yuzhi Wang*, Ping Ji†, Borui Ye‡, Pengjun Wang*, Rong Luo*, Huazhong Yang*

**Department of Electronic Engineering, Tsinghua University, China*

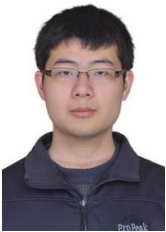
†NEMO Research Lab, City University of New York, USA

‡School of Computer Science, Beijing University of Posts and Telecommunications, China

yz-wang12@mails.tsinghua.edu.cn

Abstract— Internet censorship threatens people's online privacy, and in recent years, new technologies such as high-speed Deep Packet Inspection (DPI) and statistical traffic analysis methods had been applied in country scale censorship and surveillance projects. Traditional encryption protocols cannot hide statistical flow properties and new censoring systems can easily detect and block them “in the dark”. Recent work showed that traffic morphing and protocol obfuscation are effective ways to defend from statistical traffic analysis. In this paper, we proposed a novel traffic obfuscation protocol, where client and server communicate on random port. We implemented our idea as an open-source VPN tool named GoHop, and developed several obfuscation method including pre-shared key encryption, traffic shaping and random port communication. Experiments has shown that GoHop can successfully bypass internet censoring systems, and can provide high-bandwidth network throughput.

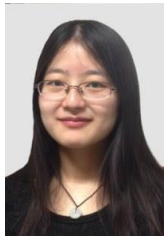
Keyword—VPN, privacy protection, random port, traffic morphing, protocol obfuscation, censorship circumvention



Yuzhi Wang received his B.S. degree in 2012 from School of Telecommunication Engineering in Xidian University, Xi'an, China, and he is currently a Ph.D. student in Department of Electronic Engineering in Tsinghua University, Beijing, China, under the supervision of Prof. Huazhong Yang. Mr. Wang's research mainly focuses on Wireless Sensor Networks, Internet of Things and Network Security.



Ping Ji received the B.A. degree in computer science and technology from Tsinghua University, Beijing, China, in 1998, and the Ph.D. degree in computer science from the University of Massachusetts, Amherst, in 2003. Since 2003, she has been a faculty member of the Master's Program in Forensics Computing at the Mathematics and Computer Science Department, John Jay College of Criminal Justice, New York, NY, and a faculty member of the Ph.D. program in Computer Science of the Graduate Center, City University of New York (CUNY), Flushing, NY. Her research interests include protocol design, performance analysis, and signaling for advanced networks services, network security, wireless and sensor networks, and network measurements and performance modeling.



Borui Ye is currently an undergraduate student in School of Computer Science, Beijing University of Posts and Telecommunications, Beijing, China. Ms. Ye's research interests include Artificial Intelligence, Machine Learning and Network Security.



Pengjun Wang received the B.S. and Ph.D. degrees from the NICS Group, Department of Electronic Engineering, Tsinghua University, Beijing, China in 2006 and 2011, respectively. Currently, he is an Assistant Research Scientist in Department of Electronic Engineering in Tsinghua University. His recent research mainly focuses on Wireless Sensor Networks and Structural Health Monitoring.



Rong Luo(M'05) received the double B.S. degree in engineering physics and electronic engineering and the Ph.D. degree from Tsinghua University, Beijing, China, in 1992 and 1997, respectively. Currently, she is an Associate Professor with the Department of Electronic Engineering, Tsinghua University. Her current research work is mainly on SoC design technology, VLSI design, Wireless Sensor Networks and Data Mining.



Huazhong Yang(M'97-SM'00) received the B.S. degree in microelectronics and the M.S. and Ph.D. degrees in circuits and systems from Tsinghua University, Beijing, China, in 1989, 1993 and 1998, respectively. Since 1993, he has been with the Department of Electronic Engineering, Tsinghua University, where he has been a Full Professor since 1998. His research interests include CMOS radio-frequency integrated circuits, VLSI system structure for digital communications and media processing, low-voltage and low-power ICs, and computer-aided design methodologies for system integration, wireless sensor networks and structural health monitoring.