Piyush Kumar Sharma

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Research Interests

Building secure systems and contributing in the broad area of networks, systems, and security.

Education

- **Indraprastha Institute of Information Technology (IIIT)** — Delhi, India
  PhD in Computer Science — *2016 - present*
  - CGPA: 10/10
- **Indraprastha Institute of Information Technology (IIIT)** — Delhi, India
  M.Tech in Computer Science — *2016 - 2018*
  - CGPA: 9.6/10
- **Ambedkar Institute of Technology, GGSIPU** — Delhi, India
  B. Tech, Electronics & Communication — *2012 - 2016*
  - Percentage: 83.5/100

Research Projects

- **SiegeBreaker: Deployable Decoy Routing using Software Defined Networks**
  PETS 2020
  - Decoy routing is a new approach that utilizes routers as proxies to serve censored content.
  - The research aimed at building a deployable decoy routing system using Software Defined Networks. Key design decisions:
    - Seperation of Concerns: Dividing the task of Decoy Routing among different specialized modules.
    - Covert signalling mechanism: Identifying DR request by analyzing small fraction of traffic.
    - Using hardware routers (SDN switches)
    - Implementing flow and congestion control: To ensure reliability and good performance.
  - By virtue of our robust design, we succeeded in achieving:
    1.) Performance comparable to direct TCP downloads.
    2.) Privacy for clients who do not want their traffic to be inspected.
- **Achieving Untraceable Anonymous VoIP Calls Over the Internet**
  PETS 2020
  - No existing functional anonymous voice calling system.
  - Existing anonymity systems like Tor are deemed unsuitable for real-time applications like VoIP. However, no detailed study done yet.
  - Thus, studied Tor, by conducting an extensive and comprehensive study for shedding light on the feasibility of conducting VoIP calls over its network.
  - Conducted 0.5 million voice calls for a duration of 12 months using two setups.
    - The comprehensive study involved varying: 0.5 million Tor circuits (6650 Tor relays), Caller/Callee location across 7 countries, caller and(or) callee anonymity, Tor circuit lengths, VoIP codecs. Call duration, 3rd party applications such as Telegram and Skype, etc.
  - In contrast to prior belief, the study reveals that Tor currently provides a natural ecosystem for conducting VoIP calls.

Publications

1. **Piyush Kumar Sharma**, Devashish Gosain, Himanshu Sagar, Chaitanya Kumar, Aneesh Dogra, Vinayak Naik, H.B. Acharya, Sambuddho Chakravarty. "**SiegeBreaker: An SDN Based Practical Decoy Routing System**", Accepted for publication in Proceedings of Privacy Enhancing Technologies (**PETS**) 2020 (A top-tier venue in Privacy).
2. **Piyush Kumar Sharma**, Shashwat Chaudhary, Nikhil Hassija, Mukulika Maity, Sambuddho Chakravarty. "**The Road Not Taken: Re-thinking The Feasibility of Anonymous Voice Calling Over Tor**", Accepted for publication in Proceedings of Privacy Enhancing Technologies (**PETS**) 2020.
3. Tarun Kumar Yadav*, Akshat Sinha*, Devashish Gosain*, **Piyush Kumar Sharma**, Sambuddho Chakravarty. "**Where The Light Gets In: Analyzing Web Censorship Mechanisms in India.**", Accepted for publication in ACM Internet Measurement Conference (**IMC**), 2018. (*Shared First Author).
4. **Piyush Kumar Sharma**, Chaitanya Kumar, Aneesh Dogra, Vinayak Naik, H.B. Acharya and Sambuddho Chakravarty. "**SiegeBreaker: An SDN Based Practical Decoy Routing System**", Accepted as a poster in Annual Computer Security Applications Conference (**ACSAC**), 2017.

Professional Experience

- **Pentester Academy** Pune, India
  R & D Intern *Three months*
  - My main work included research and development in VoIP and telephony technologies (SIP, RTP, RTCP, etc.). Built custom Wireshark plugins (packet dissectors) in Lua to display various VoIP characteristics. Additionally, I also built some Wireshark plugins for characterizing and displaying details of network protocols such as DHCP, ARP, etc.
  - I also worked on TLS and PKI certificates and wrote automated scripts in Python to retrieve important information such as identifying self-signed certificates, retrieving chain of trust of Certifying Authorities (CAs), etc.
  - As a side work, I also developed plugins to detect Tor traffic in Wireshark itself.
- **CODEC Networks** Delhi, India
  Information Security Intern *12 months*
  - Enforced network-wide security policies for different organizations using a centralized network security solution product: McAfee epo. The policies enforced included rules for Solidcore (Application Security), Drive Encryption, Removable Devices management, and DLP(Data Leakage Prevention).
  - Implemented a next-generation firewall: UNTANGLE UTM on the network scenario provided by the organization. Worked on CISCO ASA Firewall and enforced security policies on a production network.
  - Being actively involved as an instructor, I delivered corporate training for the organization including CEH, ECSA, CND, *etc.*.

Skills

- *Programming Languages:* C, C++, Python, Lua
- *Web Technologies:* HTML, CSS
- *Operating System:* Windows, Linux
- *Emulators/Simulators:* Mininet, DeterLab
- *Hardware:* Arduino, Raspberry pi, Intel Galileo, Zodiac-fx, HP3500yl SDN switch, Cisco networking devices
- *Certification:* EC-Council Certified Network Defender(CND)