

# An Empirical Analysis of VPN Ecosystem of China

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## 1 Introduction

In countries where VPNs are legal, people can easily get stable and secure VPN providers according to public information. But in China, advocating or selling commercial VPN is illegal, related search results are hidden in search engines in China including baidu.com or bing.com.

Nearly all famous VPN providers' websites are also censored in China. The only way to know which VPNs are viewable in China and where to download them is by street talk or recommended by friends. Therefore, many small, unsafe softwares are downloaded and installed on millions of computers or mobile phones in China. There are already many incidents about VPN usage world-wide. Some research analyse the whole ecosystem of the world, some research analyzes the GFW of China. But as far as I know, no research analyzes the ecosystem of the unregulated VPN market in China.

Therefore, we plan to do an empirical analysis of unmonitored VPN providers which are not famous but widely adopted by Chinese people. Are the VPNs stable, diverse, and secure as they claimed?

## 2 Related Work

There are some papers analyzing how popular VPNs work, Mohammad Taha Khan etc.[1] created a measurement system to test various infrastructural and privacy aspects of VPNs, and found that many VPNs do leak user traffic. They also find that a non-trivial fraction of VPN providers transparently proxy traffic, and many misrepresent the physical location of their vantage points: 5–30% of the vantage points, associated with 10% of the providers they study, appear to be hosted on servers located in countries other than those advertised to users. Reethika Ramesh and researchers at University of Michigan created an analysis software called VPNalyzer which automates the measurement process, and makes it easy for users and researchers to investigate VPNs.[2]

### 3 Methodology

I plan to take a survey to get popular VPNs used by Chinese people, and use a similar measurement system adopted by related papers to get the experimental results about how these VPNs behave. The main steps are as below.

1. Take a small survey to see what are the popular VPNs in China, maybe the majority would be very different from world-famous VPNs.
2. Install the chosen VPNs (about a dozen) on real computers or virtual machines (both macOS and Windows, even with Android and iOS if possible).
3. Build honeysites to test content manipulation.
4. As far as I know, some API of the old papers already expire and some websites are completely banned in China like google.com so they can't be used to test link status, so I need to change to new APIs or new libraries to achieve the same goal.
5. Analyze the data and draw tables and graphs about the VPNs' security and stability

### 4 Challenges and how to address them

Firstly, we have to find enough samples to test, which require a small survey and some paid VPN need to be bought to use.

The measurement methodology adopted by other researchers is already very sophisticated, can I create new measurement methods to test the VPNs, if not, can I dig more information from the data collected?

Some APIs, libraries, and tools expired, I need to find new solution for even the same measurement.

### References

- [1] Mohammad Taha Khan, Joe DeBlasio, Geoffrey M Voelker, Alex C Snoeren, Chris Kanich, and Narseo Vallina-Rodriguez. An empirical analysis of the commercial vpn ecosystem. In *Proceedings of the Internet Measurement Conference 2018*, pages 443–456, 2018.
- [2] Reethika Ramesh, Leonid Evdokimov, Diwen Xue, and Roya Ensafi. Vp-analyzer: systematic investigation of the vpn ecosystem. In *Network and Distributed System Security*, volume 10, 2022.