

# 3 Years in China: A Tale of Building a REAL Full Speed Anti-Censorship Router

Hack In The Box 2023 Amsterdam

twitter: @onlyxwings





#### Any Chinese Friend in the room ?



# EV Express/PN



## About kaijern @onlyxwings



#### **Qiling Framework**

Cross platform and multi architecture advanced binary emulation framework

- https://qiling.io
- > Lead Developer
- > Founder



#### **Badge Maker**

Electronic fan boy, making toys from hacker to hacker

- > Reversing Binary
- Reversing IoT Devices
- > Part Time CtF player

#### **Badge Designer for Hacking Conferences**





#### **Qiling Framework**

- Cross platform and cross architecture binary instrumentation framework
- Emulate and instrument ARM, ARM64, MIPS, X86 and X8664
- Emulate and instrument Linux, MacOS, Windows and FreeBSD
- High-level Python API access to register, CPU and memory
- > 4000+ Github star, more than 100,000+ pypi download, 70+ contributors worldwide



#### Some Recent Talk (Partial)

- > 2018, HITB, Beijing/Dubai
- > 2018, beVX, Hong Kong
- > 2019, DEFCON USA
- > 2019, Zeronights, St Petersburg
- > 2020, Nullcon, GOA
- > 2020, Blackhat USA, Asia, Europe
- > 2021, Blackhat USA, Asia
- > 2022, Blackhat EU. Blackhat MEA

# How It All Started

#### **Entering China and stuck for 3 years**

出入境记录凭证 Statement of Travel Records 姓名: LAU KAI JERN 证件号码: Document Nun 出入境类型: Departure/Arrival入境/Arrival 出入境日期: 2020/01/28 Date 出入境口岸: 广州白云 Port HINA IMMIGRATION INSPECTIO



# What is the WALL

#### Facebook, year 2009

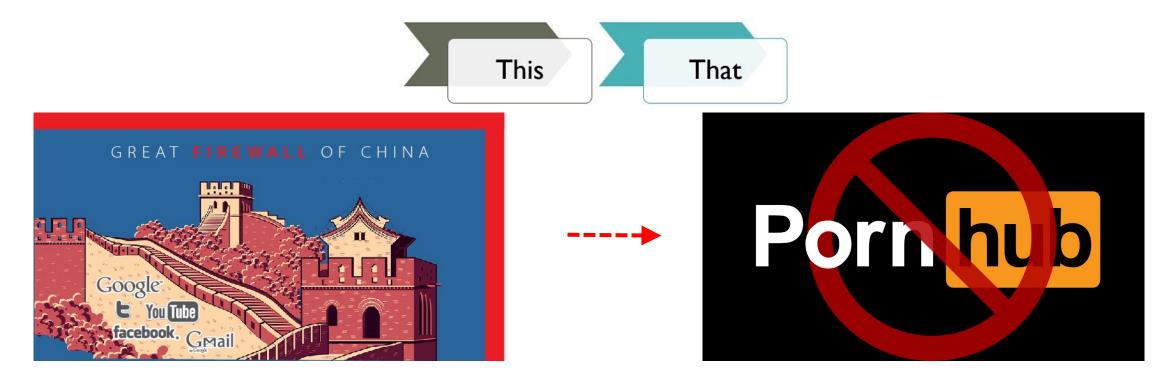
#### China [edit]

Main article: Internet censorship in China See also: Great Firewall of China

In China, Facebook was blocked following the July 2009 Ürümqi riots because protestors with the East Turkestan independence movement were using Facebook as part of their communications network to organize attacks across the city; Facebook refused to release the protestor identities and information to the Chinese government.<sup>[14]</sup> Some Chinese users also believed that Facebook would not succeed in China after Google China's problems in 2013.<sup>[15]</sup> Renren (formerly *Xiaonei*) has many features similar to Facebook, and complies with PRC Government regulations regarding content filtering.

As of 20 August 2013, there have been reports of Facebook being partially unblocked in China.<sup>[16]</sup> However, according to the "Blocked in China" website, Facebook is still blocked as of 7 December 2019.<sup>[17]</sup> Facebook is not blocked in Hong Kong and Macau, which are special administrative regions operating under different systems. Facebook is currently working on a censorship project for China, where a third party would be allowed to regulate Facebook and control popular stories that come around. This would be a huge attempt by Facebook to get back into China.<sup>[18]</sup>

On 6 July 2020, Facebook announced that the company would stop reviewing requests for Hong Kong users' data while evaluating the newly imposed Hong Kong national security law by the Chinese government.<sup>[19]</sup>

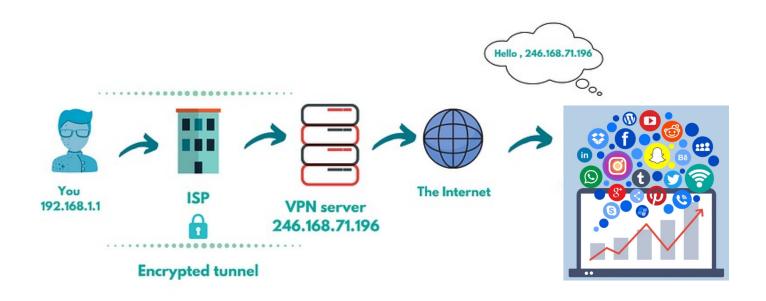


# Not Only for Users

#### Website and Domains



Website and domain need to be verified by Local Authority

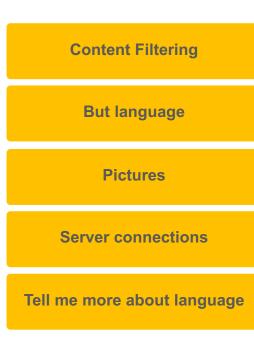


Self Hosted VPN is illegal

But ...

#### **Domain, Website and Content**

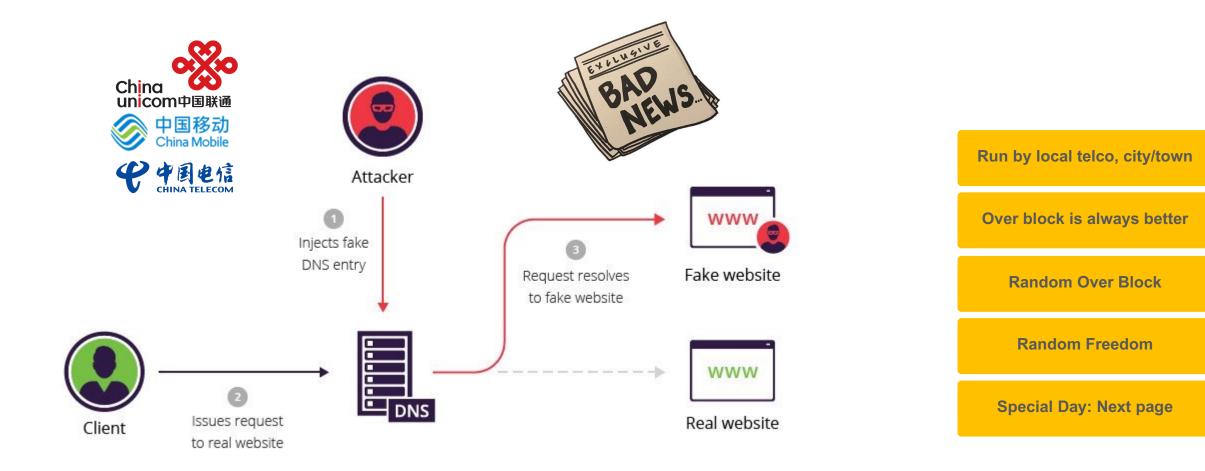




Full human review, of coz they will tell you AI

## Great Firewall ++

## **Targeted Area DNS pollution**







## How To Get Connected

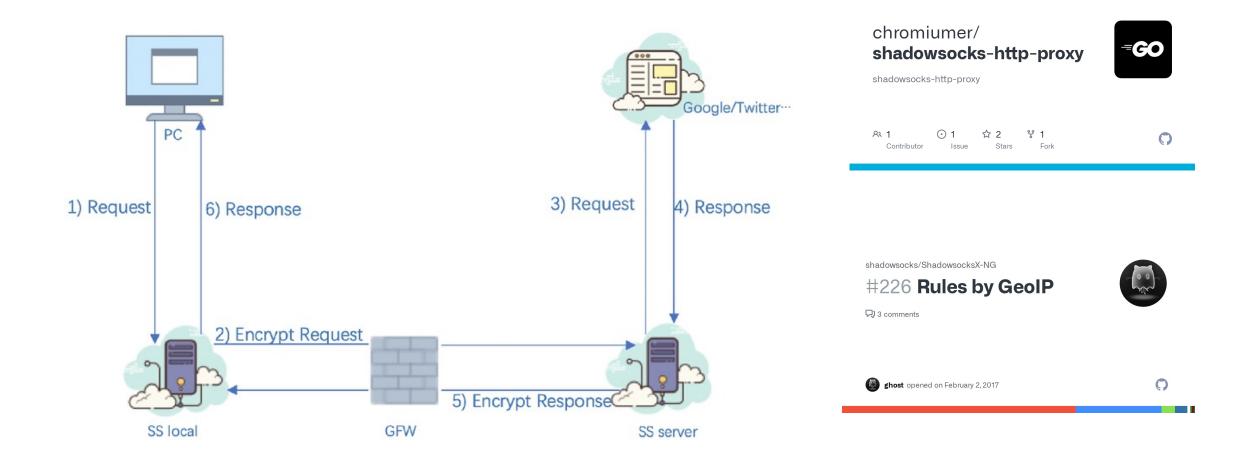
VPN



It started with VPN, but local APP is an Issue

# A New Hope

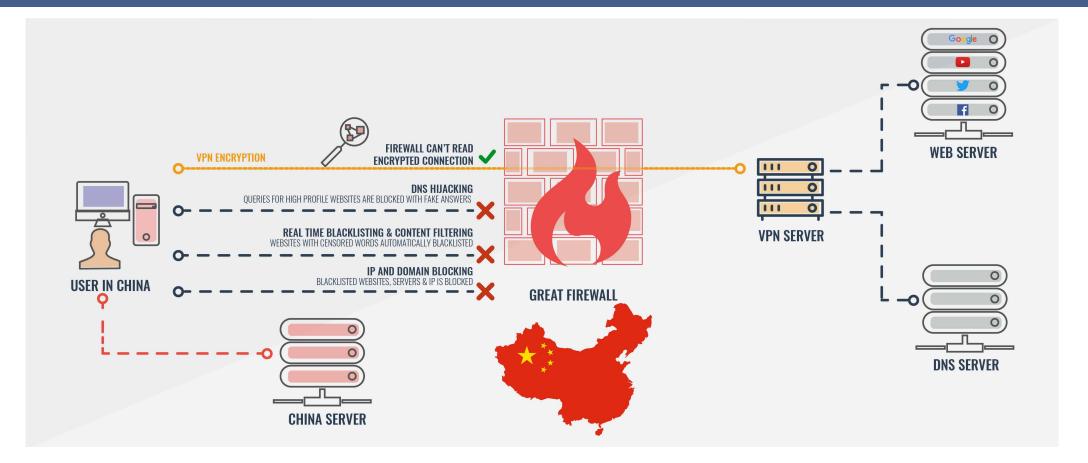
#### The era of Shadowsocks/SSR



Cat and mouse game

# Evolution

## Xray [ Shadowsocks/SSR/Trojan/Vmess/Vless ]



Compilation of different protocol

Clash

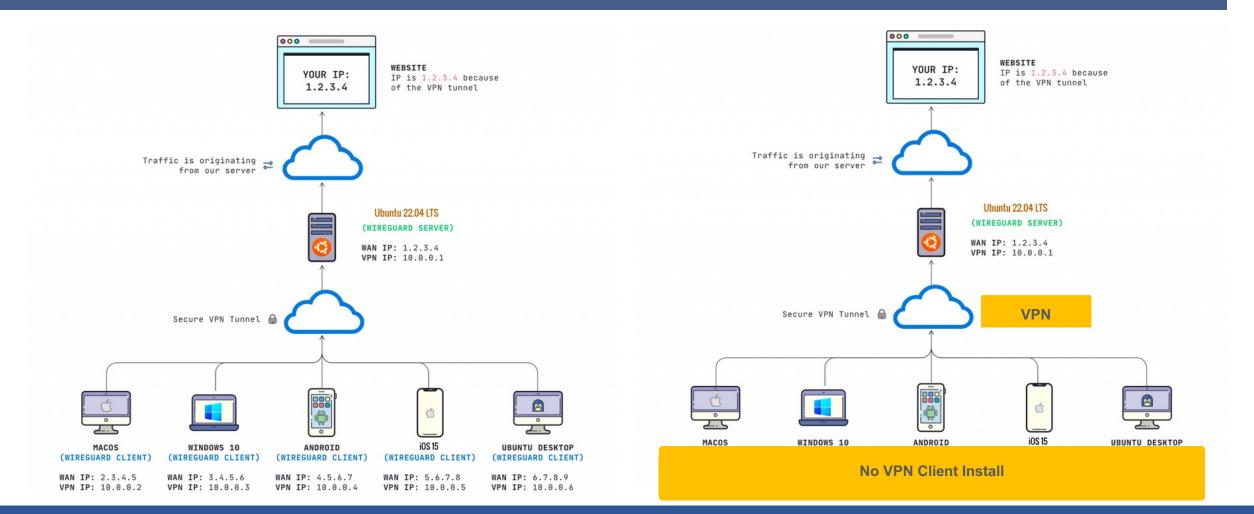
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ShadowSocksR Plus+										
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策略组		
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Global TV	Selector	
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连接

## How to Build Tunnel

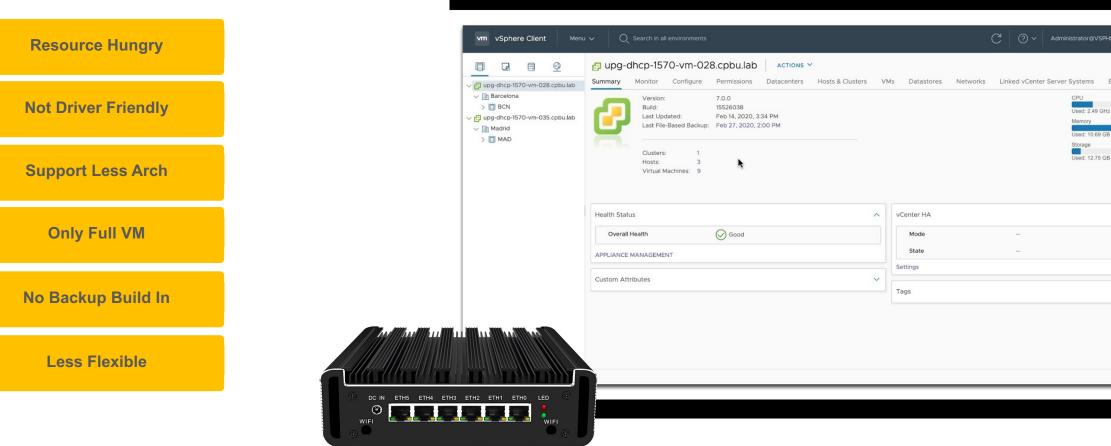
#### **Deployment: Client/Server Vs Gateway**



Depends on your requirement

# Journey to Start Building a Home Router

#### Version 1



Self Hosted VPN is illegal

Extensions

Free: 10.68 GHz

Free: 13.3 GB

Capacity: 13.17 GHz

Capacity: 23.99 GB

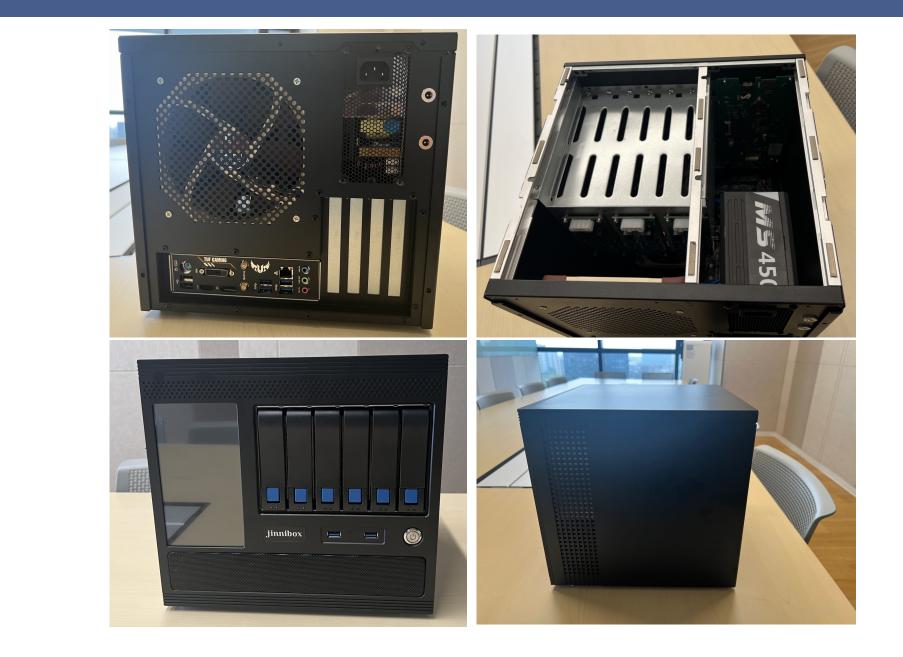
Capacity: 142.99 GB

Free: 130.24 GB

V

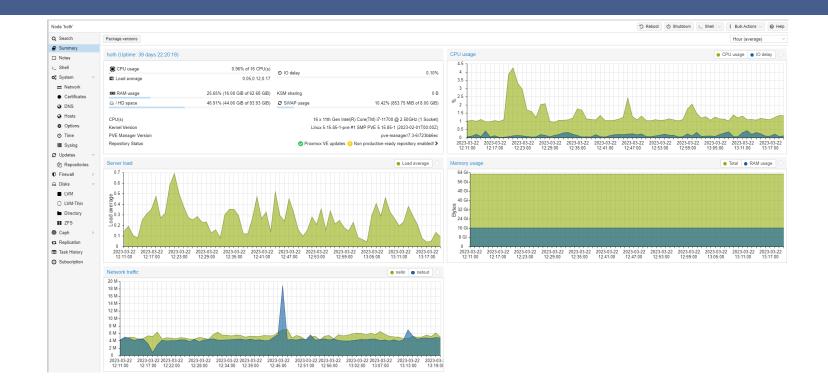
But ...

## Version 2



Customized Board Customized CPU GPU 10GB NIC 6 HDD Bay USB 3 + Type C

#### Proxmox



	7.3-6 Search									
Server View ~	Datacenter									
	Q Search									
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	Groups	🖵 qemu	109 (anaxes-debian-mips)				-			
	Pools	storage 🗧	backup_system (hoth)	20.2 %			-			
	Roles	storage 🛢	images (hoth)	46.9 %			-			
	Realms	storage 🛢	local (hoth)	46.9 %			-			
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ver View ~	Virtual Machine 100 (	(hapes) on node 'hoth' No Tage	SP
Datacenter         ▶ hoth <ul> <li>10 (batuu)</li> <li>200 (drall)</li> <li>201 (daiyu)</li> <li>202 (yavin)</li> <li>203 (agamar)</li> <li>299 (debian-tmp)</li> <li>100 (hapes)</li> <li>101 (cralt)</li> <li>106 (anoat-MacOS12)</li> <li>107 (corellia-debian-aarch64)</li> <li>108 (bogano-debian-amfh)</li> <li>109 (anaxes-debian-mips)</li> <li>□ hackup_system (hoth)</li> <li>□ images (hoth)</li> <li>□ local (hoth)</li> <li>□ local-twn (hoth)</li> </ul>	Summary Console Hardware Cloud-Init Options Task History Monitor Backup Replication Snapshots Firewall Permissions	Add        Remove       Edit         Add        Remove       Edit         Image: Add        Remove       Edit         Image: Add        Remove       Edit         Image: Remove       Edit       Edit         Image: Remove       Remove       Edit         Image: Remove       Remove       Edit         Image: Remove       Remove       Edit         Image: Remove       Remove       Remove         Image: Remove       Remove       Remo	Disk Action         Revert           1.00 GiB         1 (1 sockets, 1 cores)           Default (SeaBIOS)         Default (440fx)           VirtIO SCSI         Iocal-lvm.vm-100-disk-0,size=8G           virtIo=16:FF:F5:EB:51:69,bridge=vmbr0         Iocal-lvm.vm-100-disk-1,efltype=4m,pre-enrolled-keys=1,size=4M           0000:04:00.0         0000:05:00.0

#### **OpenWRT aka xwingsWRT**

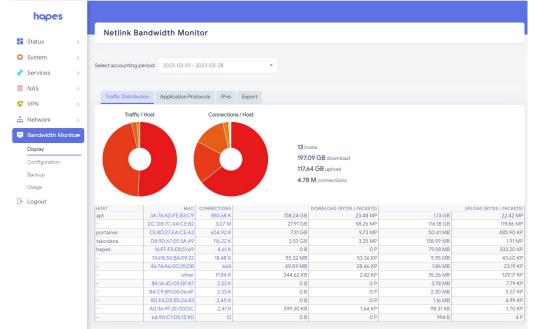
No EFI environment detected. early console in extract\_kernel input\_data: 0x0000000023ad3a8 input\_len: 0x0000000004eb72c output: 0x000000001000000 output\_len: 0x00000000185f8d0 kernel\_total\_size: 0x000000001626000 needed\_size: 0x000000001a00000 trampoline\_32bit: 0x00000000009d000

Decompressing Linux... Parsing ELF... done. Booting the kernel. Please press Enter to activate this console.

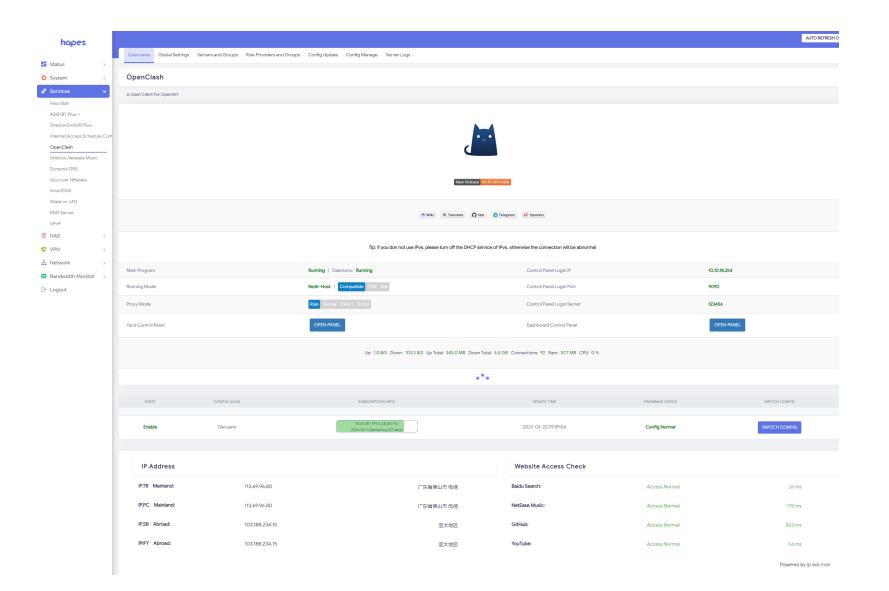
```
BusyBox v1.36.0 (2023-03-26 14:18:00 UTC) built-in shell (ash)
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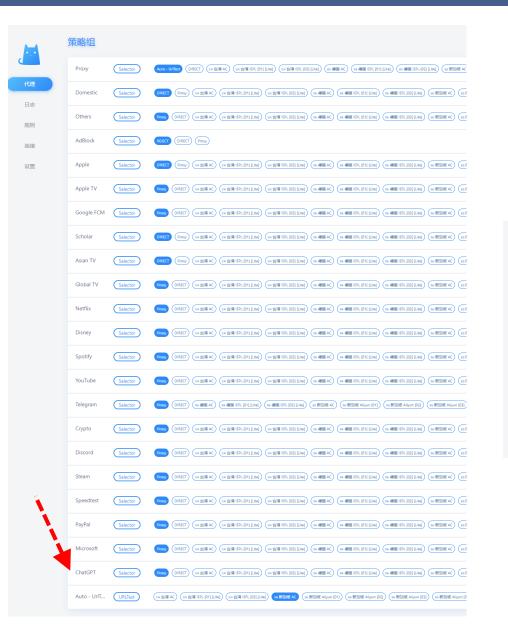
opes				
		Status		
v	- 1	System		
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Log		Model		QEMU Standard PC (J440FX + PIIX, 1996) - Common KVM processor : 1 Core 2 Thread (CpuMark : 30334.449151 Scores)
.og ies		CPU Info		2496.000 MHz
e Graphs		Firmware Version		OpenWrt R23.2.14 / LuCI Master (git-23.050.56566-a8351ec)
ard Status		Kernel Version		6.1.12
	>	Local Time		Wed Mar 22 13:19:06 2023
es	>	Uptime		1d 21h 23m 38s
	>	Load Average		0.00, 0.00, 0.00
	>	CPU usage (%)		20 %
ork	>	Crousige (%)		20 76
idth Monitor	>	Memory		
t		Total Available		767 MB / 987 MB (77%)
		Buffered		4 MB / 987 MB (0%)
		Interfaces		
			eth0	eth1
			(A)	
			half-duplex	2500Mb/s full-duplex



## OpenClash



#### Web Categorization



代理													
<mark>Shadowsocks</mark> sg 新加坡 AC		<mark>Shadowsocks</mark> нк 香港 AC [02]		<mark>Shadowsocks</mark> нк 香港 IEPL [10] [Premium]		<mark>Trojan</mark> нк 香港 Aliyun [04]		<mark>Shadowsocks</mark> нк 香港 IEPL [08] [Premium]		<mark>Shadowsocks</mark> нк 香港 IEPL [03] [Std]		<mark>Shadowsocks</mark> нк 香港 IEPL [07] [Std]	
39ms	UDP	45ms	UDP	45ms	UDP	46ms	UDP	46ms	UDP	49ms	UDP	50ms	UDP
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60ms	UDP	61ms	UDP	62ms	UDP	67ms	UDP	68ms	UDP	69ms	UDP	69ms	UDP
<b>Trojan</b> sg 新加坡 Aliyun [03]		<mark>Trojan</mark> sc 新加坡 Aliyun [04]		<b>Trojan</b> JP 日本 BBTEC		<mark>Trojan</mark> нк 香港 Aliyun [02]		<mark>Trojan</mark> нк 香港 Aliyun [01]		<mark>Trojan</mark> JP 日本 IEPL [01] [Lite]		<mark>Trojan</mark> JP 日本 IEPL [02] [Lite]	
143ms	UDP	163ms	UDP	192ms	UDP	216ms	UDP	225ms	UDP	242ms	UDP	251ms	UDP

## **Update Chinese IP for Local Route**

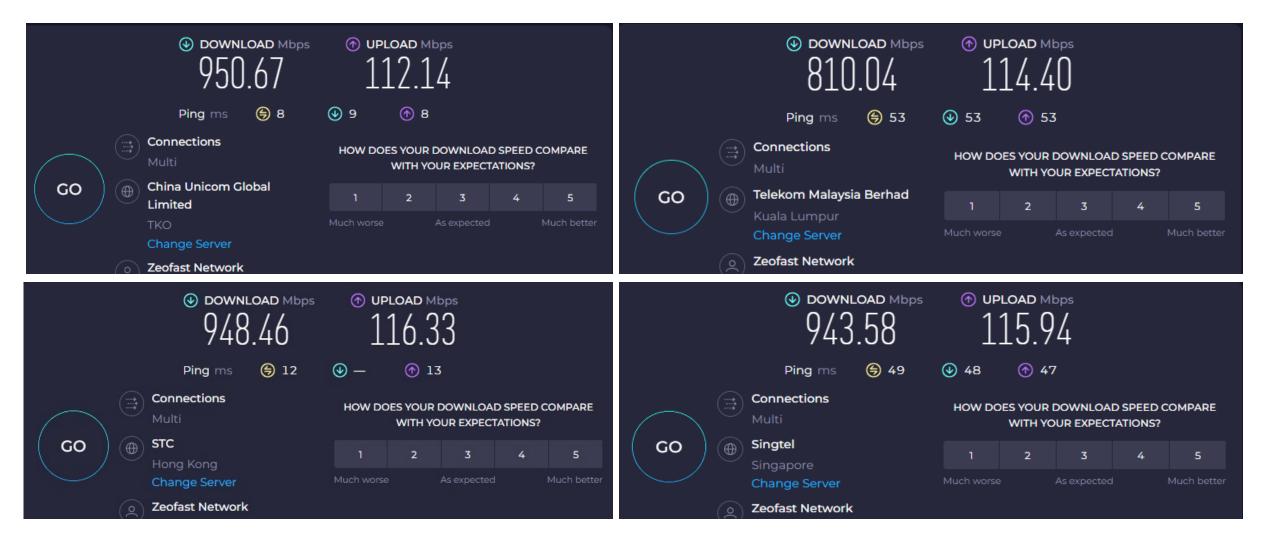
Overviews Global Settings Servers and Groups Rule Providers and Groups Config Update Config Manage Server Logs Current Config File: Dier.yaml 🕶

SWITCH CONFIG

#### Global Settings(Will Modify The Config File Or Subscribe According To The Settings On This Page)

Note: It is not recomr Note: Turning on secu Note: Some software Note: Game proxy plu Note: The default pro	nended to enable IPv6 ure DNS in the browser will modify the device ease use nodes except	and related service will cause abnorm HOSTS, which will Vmess BT, PT download, et	es for routing. Most d al shunting, please b cause abnormal shu tc., please use redir r	int, please pay attention to mode as much as possible	n problems reported s ocheck		it				
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		Auto Update	<ul> <li>Auto Update Chr</li> </ul>	nroute Lists							
	Update Tim	ne (Every Week)	Every Monday		•						
	Update ti	ime (every day)	3:00		•						
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			Custom Chnrout	te Lists URL, Click Button B	elow To Refresh After	Edit					
	Custom Chnro	oute6 Lists URL	Clang-CN-IPV6(	Default)	<b>*</b>						
			O Custom Chnrout	teó Lists URL, Click Button	Below To Refresh Afte	r Edit					
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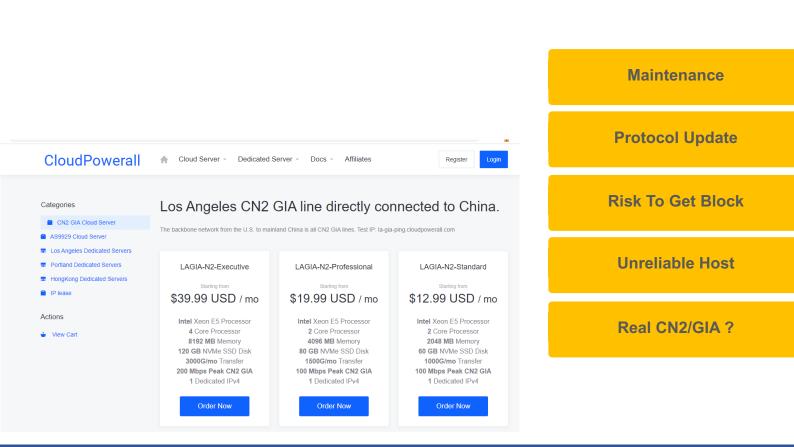
#### **Speed Test**



## Remote Server

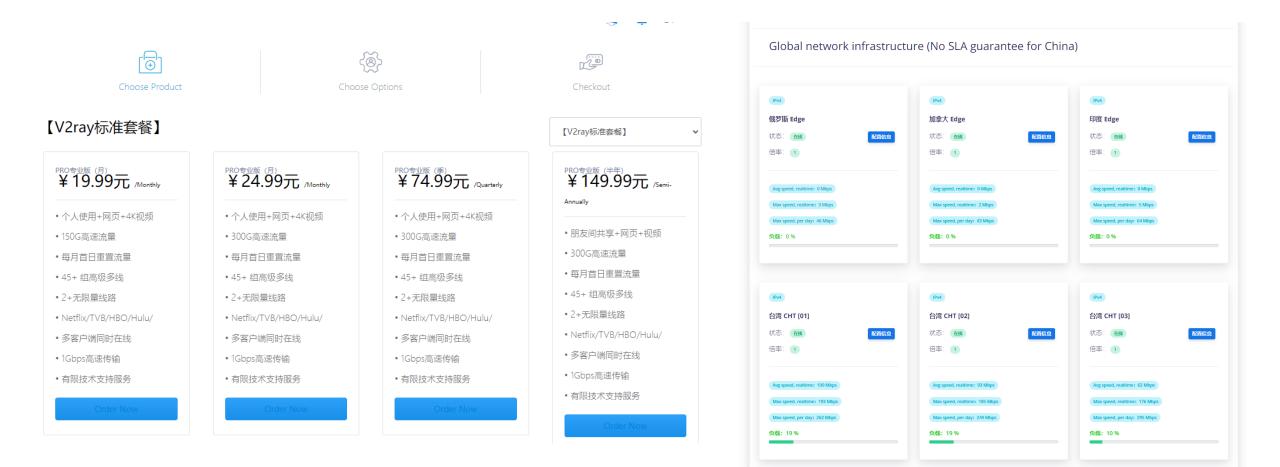
#### **Building Your Own**





Slow Messy and Unreliable

## Just Buy It



#### Maintenance Free

## **Everything Else**

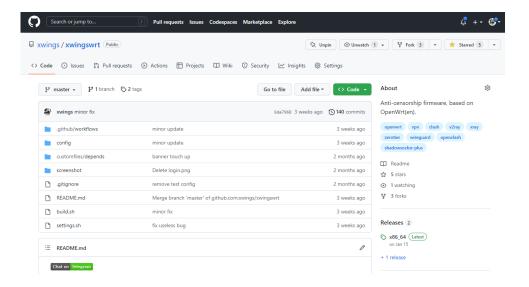
- > About Qiling Framework
  - https://qiling.io
  - https://github.com/qilingframework/qiling
  - https://docs.qiling.io
  - http://t.me/qilingframework



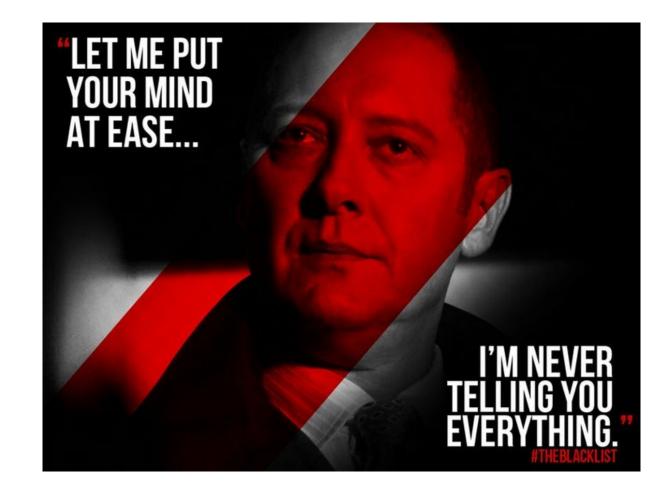
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🕤 Issues 🔢 🛛 🕅	Pull requests (14) Q Discussions () Actions () Pro	ects 🖽 Wiki 🔘 Security 🗠 Insights 🛞 Settings	
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xwings Merge pull reque	st #1299 from qilingframework/dev 🚃 🗸 st	A True Instrumentable Binary Emulat Framework	ion
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gitignore	update gitignore to ignore temp test file	2 years ago 🎄 GPL-2.0 license	
	readd rootfs	lant ywar 🛱 3.9k stars	
COPYING	import	4 years ago ¥ 638 forks	
CREDITS.md	Update CREDITS.md	8 months ago	
) ChangeLog	Update changelog to version 1.4.5	3 months ago Releases 22	
Dockerfile	Compile pelle from source	last year S Warsion 1.4.5 (Latest)	
README.md	update blackhat 2022	4 months ago on Dec 31, 2022	
3 1000	Update TODO	2 years ago + 21 releases	
] qitool	issue fix	5 months ago	
) altuipy	issue fix	5 months ago Packages	
) setup.py	ready for 1.4.5	2 months ago No packages published Publish your fint package	
README.md		Used by 22	
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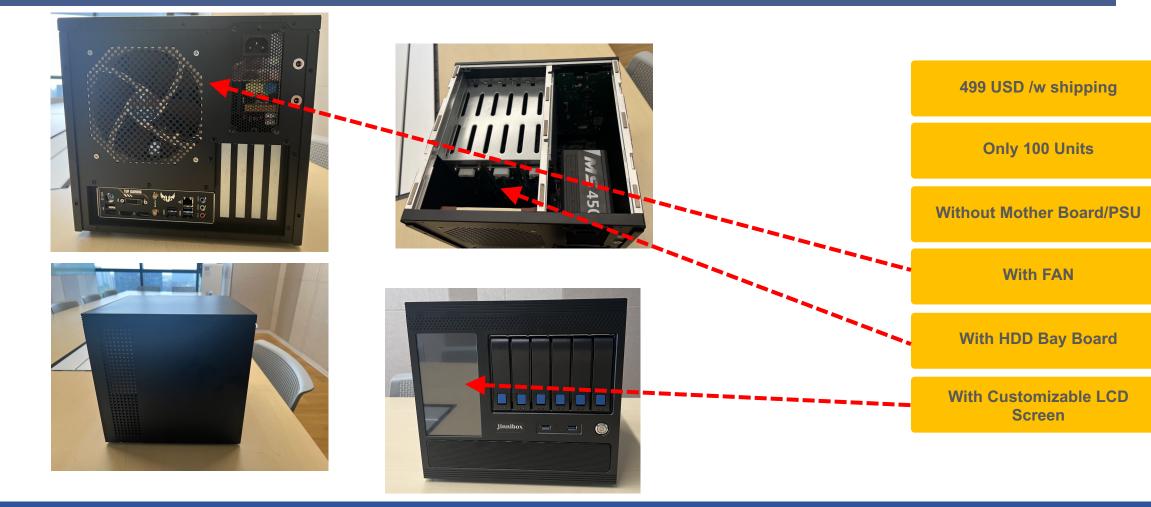
- > About xwingswrt
  - https://github.com/xwings/xwingswrt
  - https://docs.qiling.io
  - > @onlyxwings



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# Questions

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