

# INTERNET CONNECTION SPEED WITH VPN ROUTER

Using router to provide Internet connection with VPN to whole home or whole office is handy and easy. It save a lot of effort on setup and no need to setup VPN of every devices individually.

However, Internet connection speed with VPN may be a question mark to some persons.

So, what is the speed and is it reasonable to use?

Here are some examples for your reference.

Have fun!



# SPEED TEST

## OF INTERNET CONNECTION WITH VPN ROUTER

Speed test is related to several key factors which includes

1. testing computer used for speed test
2. network traffic condition
3. testing server speed
4. VPN server speed
5. browser speed
6. router performance

These are key factors besides of various other minor factors which will affect the test result.

See following slides for examples.

**Note:** All tests are not represent definite result due to un-controllable variation of test conditions and just act as examples for reference only.

# SPEED TEST EXAMPLE 1

Testing computer – Intel core i5-3470 @3.2 GHz and 16G RAM

1. Internet plan – 150M download and 15M upload
2. Test time – Sunday
3. Test speed
  - without VPN – ping 7 mS, download 52.45 Mbps, upload 15.32 Mbps
  - with VPN - ping 14 mS, download 36.89 Mbps, upload 14.66 Mbps
4. Browser – Firefox
5. Router – iMAC with Ubuntu 18.04 acts as router with VPN
  - Modem acts as normal modem router

## **Note:**

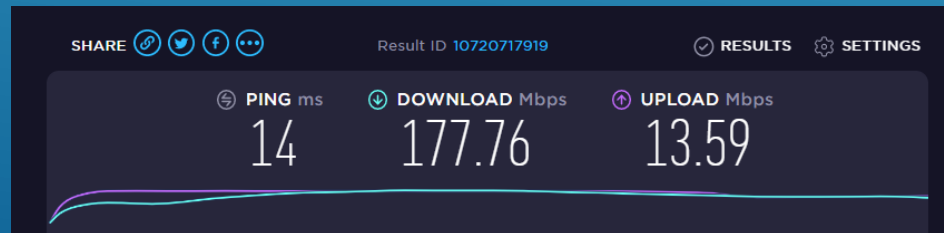
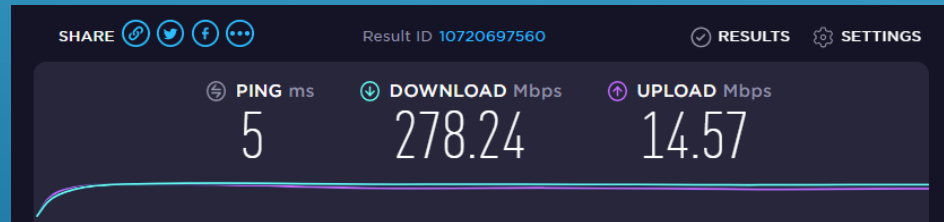
iMAC core 2 computer is pretty old as 2010 product with Intel CPU and has no support of many software already.

However, Ubuntu version 16.04 still can be installed and upgraded to version 18.04. It works under Ubuntu very well so far. Also works as router pretty good too and easy to manage. You also can install and activate other functions like firewall etc., but that are not included in this topic

# SPEED TEST EXAMPLE 2

Testing computer – Intel core i5-3470 @3.2 GHz and 16G RAM

1. Internet plan – 150M download and 15M upload
2. Test time – Sunday
3. Test speed
  - without VPN – ping 5 mS, download 278.24 Mbps, upload 14.57 Mbps
  - with VPN - ping 14 mS, download 177.76 Mbps, upload 13.59 Mbps
4. Browser – Opera GX
5. Router –Aspire E1 431-4626 with Ubuntu 20.04 with VPN setup  
Modem acts as normal modem router



# SPEED TEST EXAMPLE 3

## ASUS RT-AC68U

WITH OFFICIAL FIRMWARE 3.0.0.4.386\_40558-GC48F410

### Case 1 :

Testing computer – Intel core i5-3470 @3.2 GHz and 16G RAM

1. Internet plan – 150M download and 15M upload
2. Test time – Sunday
3. Test speed
  - without VPN – ping 11 mS, download 301.09 Mbps, upload 16.42 Mbps
  - with VPN - ping 18 mS, download 27.84 Mbps, upload 14.99 Mbps
4. Browser – Opera GX
5. Router – ASUS RT-AC68U act as router with VPN (1599.07 MIPs CPU speed)  
Modem acts as normal modem router

# SPEED TEST EXAMPLE 3

## ASUS RT-AC68U

WITH OFFICIAL FIRMWARE 3.0.0.4.386\_40558-GC48F410

### Case 2 :

Testing computer – Intel core i5-3470 @3.2 GHz and 16G RAM

1. Internet plan – 150M download and 15M upload
2. Test time – Sunday
3. Test speed
  - without VPN – ping 10 mS, download 298.99 Mbps, upload 16.25 Mbps
  - with VPN - ping 12 mS, download 33.86 Mbps, upload 14.75 Mbps
4. Browser – Opera GX
5. Router – ASUS RT-AC68U act as router with VPN (1998.84 MIPs CPU speed)  
Modem acts as normal modem router

# SPEED TEST EXAMPLE 3

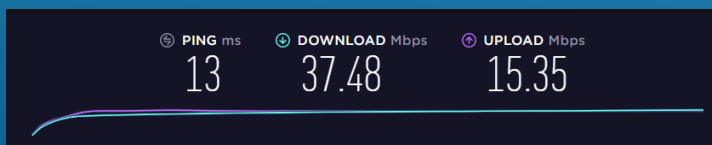
## ASUS RT-AC68U

WITH OFFICIAL FIRMWARE 3.0.0.4.386\_40558-GC48F410

### Case 3 :

Testing computer – Intel core i5-3470 @3.2 GHz and 16G RAM

1. Internet plan – 150M download and 15M upload
2. Test time – Sunday
3. Test speed
  - without VPN – ping 11 mS, download 299.26 Mbps, upload 15.52 Mbps
  - with VPN - ping 13 mS, download 37.48 Mbps, upload 15.35 Mbps
4. Browser – Opera GX
5. Router – ASUS RT-AC68U act as router with VPN (2398.61 MIPs CPU speed)  
Modem acts as normal modem router



# IS RT-AC68U A BOTTLE NECK?

RT-AC68U is a high performance wireless router with pretty high network speed capability although is not the very top model. Since router need to perform VPN encryption and decryption calculation at real time, thus calculation speed is a key factor of VPN speed.

To verify and confirm ASUS RT-AC68U and other routers' VPN speed, a test with VPN software on PC is used to test speed again to identify the bottle neck

## Case with PC VPN software:

1. RT-AC68U act as router with VPN deactivated
2. Same condition as previous tests with same core i5 PC
3. Test speed
  - without VPN – ping 11 mS, download 301.09 Mbps, upload 16.42 Mbps
  - with VPN - ping 12 mS, download 131.05 Mbps, upload 15.06 Mbps

## Comments:

1. Case with PC VPN software is tested right after previous 3 RT-AC68U speed tests
2. Seems the calculation speed of the PC with core i5 is about 130 Mbps max. under this case and limited the Internet connection speed, and seems the VPN server may not be limiter. The tested routers' VPN speed are about true and proved the routers are bottle neck.
3. Boost up the ARM processor speed help a little bit and give about 37 Mbps which is not bad for normal use already.



# USE UBUNTU AS ROUTER

Any old PC sit on the shelf of no use can be installed with Ubuntu or other Linux operating systems and to be used as normal PC or router.

There are lot of information of doing this on Internet and easily to be found just by browse and search.

Please feel free to do some browsing and search.

# BOOST UP ASUS RT-AC68U

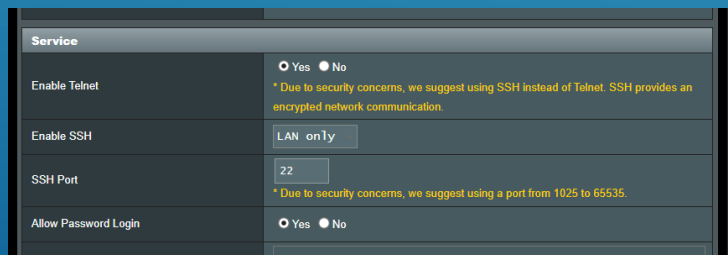
## Boost up RT-AC68U speed:

RT-AC68U performance can be boosted up by boost up CPU and RAM speed.

Here is the procedure I did and these procedures was provided by original provider(s) on WEB and is credited to original owner(s).

1. Login to your RT-AC68U router
2. Go to Administration – System page
3. Set “Enable Telnet” to “Yes”
4. Set “Enable SSH” to “LAN only”
5. Set “SSH Port” to any unused port like “2048” etc. or just leave it as is “22”
6. Set “Allow Password Login” to “Yes”
7. Now you can login to RT-AC-68U by Telnet. You can use any Telnet software like “Putty” etc. for the purpose.

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# BOOST UP ASUS RT-AC68U<sub>CONT.</sub>

## Login to RT-AC68U via Telnet:

1. Type in follow into Telnet screen then hit return to confirm  
nvram set asuscfeclkfreq=1200,800 && nvram set asuscfecommit=1
2. Wait for step 1 finished
3. Type in follow into Telnet screen then hit return to confirm  
nvram set clkfreq=1200,800 && nvram commit && reboot
4. Wait for RT-AC68U reboot finished and login again
5. Type in follow into Telnet screen then hit return to confirm  
cat /proc/cpuinfo && nvram get clkfreq && cat /proc/dmu/temperature

The screen will show details of the system,  
CPU is 2398.61 MIPS, CPU frequency is 1200 MHz and RAM is 800 MHz

```
Processor      : ARMv7 Processor rev 0 (v7l)
processor      : 0
BogoMIPS      : 2398.61

processor      : 1
BogoMIPS      : 2398.61

Features      : swp half thumb fastmult edsp
CPU implementer : 0x41
CPU architecture: 7
CPU variant   : 0x3
CPU part      : 0xc09
CPU revision  : 0

Hardware      : Northstar Prototype
Revision      : 0000
Serial        : 0000000000000000
1200,800
CPU temperature : 82.5C
```

# BOOST UP ASUS RT-AC68U<sub>CONT.</sub>

You can change the frequency of CPU and RAM to any value you want just by replace “*Frequency*” in code as:

```
nvrn set asuscfeclkfreq=“Frequency, Frequency” && nvrn set asuscfecommit=1  
nvrn set clkfreq=“Frequency, Frequency” && nvrn commit && reboot
```

RT-AC68U original working frequency is 800 and 666 MHz as of I know.

I did changed to different frequency to try

1. CPU/RAM – 800/666 MHz
2. CPU/RAM – 1000/666 MHz
3. CPU/RAM – 1200/666 MHz
4. CPU/RAM – 1200/800 MHz
5. CPU/RAM – 1400/800 MHz

So far, 1200/800 worked for many days and is working fine but 1400/800 also works with feeling of some unstable and cannot provide confidence of stable operation and performance.

As you see in the screen shot, The CPU temperature is at 82°C @ 1200/800 MHZ

This also worked for many days with no problem at all. Seems that ARM core processor can handle that kind of temperature with no problem.

However, Adding fan to cool down the CPU may be a good idea, thus I put fans on as experiment.

# BOOST UP ASUS RT-AC68U<sub>CONT.</sub>

Installing fans to RT-AC68U

Additional fans definite can cool down the ARM processor temperature.

I added two fans to the back cover of RT-AC-68U to cool down the unit and got 61°C CPU temperature.  
A huge 21°C difference.

```
Processor      : ARMv7 Processor rev 0 (v7l)
processor      : 0
BogoMIPS      : 2398.61

processor      : 1
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Features       : swp half thumb fastmult edsp
CPU implementer : 0x41
CPU architecture: 7
CPU variant    : 0x3
CPU part       : 0xc09
CPU revision   : 0

Hardware       : Northstar Prototype
Revision      : 0000
Serial        : 0000000000000000
1200,800
CPU temperature : 61°C
```

# BOOST UP ASUS RT-AC68U<sub>CONT.</sub>

**Further boost up RT-AC68U Internet connection speed with VPN:**

Is it possible to further boost up RT-AC68U VPN performance?

The answer is “YES”

*By Replacing the firmware ASUSWRT-MERLIN plus boost up the ARM processor speed can further increase the Internet connection speed to about 50 – 80 Mbps as tested (tested at about 80 Mbps max. at best time and condition.) I believe the VPN code of ASUSWRT-MERLIN firmware is lighter and faster and thus has better speed performance.*

Use ASUSWRT-MERLIN firmware is well published on web and is easy to install.

You can browse <https://www.asuswrt-merlin.net> and will find the firmware and installation instruction as well as many information in the community.

# BOOST UP ASUS RT-AC68U<sub>CONT.</sub>

Install fans on back cover of RT-AC68U:



Please note two fans are at “Push & Pull” condition, it means that one fan blow air into the router and the other fan suck out air from the router to form more powerful air circulation.. Both fans are glued to the back cover by hot melt glue and performed very good. Both fans are in different sizes and purely because I have fans on hand with different sizes by chance.



# INTERNET CONNECTION SPEED WITH VPN ROUTER

## Conclusion:

VPN is relied on encryption and decryption calculation of processor/CPU. Thus calculation capability of router is a key factor affecting VPN speed.

ASUS RT-AC68U is using dual core ARM core processor running at 800/666 MHz clock, however, the calculation capability is not good enough to support faster calculation. However, improvement can be made to boost up the performance and I believe speed with or without boost is still good enough for normal use.

iMAC computer with Ubuntu 18.04 as router is not ideal also because the CPU is old and do not have enough calculation power, however, I believe speed is still reasonable to support normal use.

ACER Aspire E1 431-4626 with Ubuntu 20.04 with VPN setup works much better than iMAC and RT-AC68U.

As test examples shown, better calculation capability of router will give better Internet connection speed with VPN. There are high end routers in the market and selling at hundreds dollars each and definitely will perform good. For business, high end router can be purchased for the purpose. However, it may be too expensive for personal purpose. Thus convert old computers to work as router may be a good idea and will perform good also.

All tests are example and for reference only and do not mean true performance of any of particular products. Different results may happen according to various situation



# INTERNET CONNECTION SPEED WITH VPN ROUTER - UPDATE

## Update on speed with VPN :

ACER Aspire E1 431-4626 with Ubuntu 20.04 with VPN setup

- \* Test time – weekday mid-night
- \* VPN server location – Toronto, Canada
- \* Test destination location – Toronto, Canada
- \* Test website – Fido
- \* Internet plan – 150 Mbps download, 15 Mbps upload
- \* Test computer - Intel core i5-3470 @3.2 GHz and 16G RAM

