



# Digital Camouflage Using VPN

How To Use VPN As Your Cloak Of Invisibility  
When Accessing The Internet



Virtual Technology  
Conference  
Saturday, 11/04/17  
@ 1 PM ET

Conference Description  
& Registration Links go to  
[apcug2.org/category/virtual-tech-conference](http://apcug2.org/category/virtual-tech-conference)




Another tech presentation  
from  
**Joe Melfi**

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## Introduction



**VPN is only one part  
of your full security  
and privacy practice!**

**How do we keep the curious and the devious from seeing our data and activity while using the Internet?** We all have critical information like passwords and account logins that we don't want to be known, some info we consider private, or we simply don't want anything to be seen by others because it's nobody's business. **It's our data, our conversations, and only those we grant permission should see that data.** You may have heard that your web surfing and emails could be vulnerable to snooping. It may be easier than most people know, especially when using public Wi-Fi! **We'll discuss the best way to make your data unreadable and untraceable - by implementing VPN.**

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## Agenda / Main Topics

- Focus on VPN to achieve data integrity and privacy
- How it works
- Types available
- Apps and software
- Devices and hardware
- Free versus pay options
- Caveats and compromises (nothing is perfect)



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## Related Topics (brief introduction only)

- Your Full Security Scheme
- AAA Security
- Encryption
- Protocols (SSL, IPSec, etc.)
- Cyphers and Hash algorithms
- Certificates and Certificate Authorities (CA)
- Public and Private Keys



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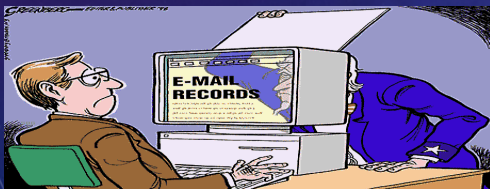
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## Who should be using VPN?

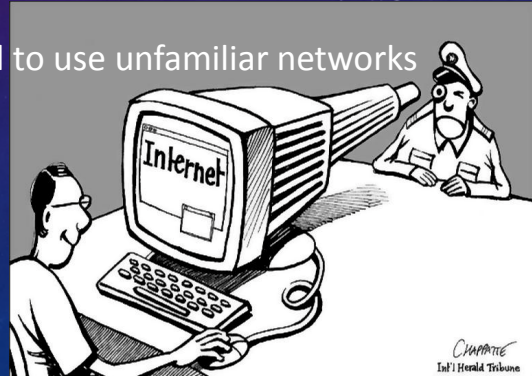


- Anyone using computers, smartphones, and Internet connected devices in public... Free/Paid Wi-Fi at coffee shops, restaurants, libraries, hotels, convention centers, etc.
- Mobile users and travelers that may need to use unfamiliar networks
- Home users, for security and privacy
- EVERYONE!



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## Mitigate Security Concerns



- Viruses, Worms, Malware, Phishing, Spam, Ransomware, Keyloggers  
→ Use Antivirus Solutions and Password Managers
- Cookies, Beacons, Trackers, Analytics, Scripts  
→ Use Privacy Protection, Secure Browsers, Ad Blockers, Script Blockers
- Attacks from outside your computer  
→ Use Firewall Solutions
- Hiding your Internet data from snooping and maintaining data integrity  
→ **Use Encrypted VPN Tunneling**

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## The Internet Is A Public Network



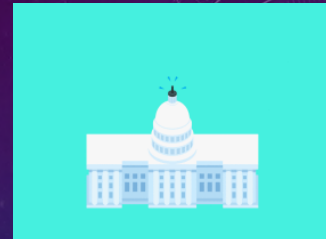
- Once data leaves your home or work network and enters the Internet, it passes through a Public network and routes through numerous nodes where it can become vulnerable to various security hazards
- Who monitors and governs and protects data on the Internet?
  - It is a Public network – very little protection, except your own safeguards
  - Your ISP provides *some* protection, but they also have complete access to every byte of your data as well as a financial interest to gain from your data and activity – they are a huge portion of the privacy problem
- Public Wi-Fi is probably the biggest risk, and one you can improve
- You may take precautions – but your friends/family could make you vulnerable if they allow their data/activities to be unprotected

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## Don't Count On Congress or FCC



- Where Is Net Neutrality?
- Why has Congress just allowed ISPs to snoop and sell our data?
- Who is actively prosecuting abusive spammers and telemarketers?
- It's too easy to commit cybercrime – seems too little is being done to mitigate or prosecute – therefore, insufficient deterrent
- Our data is our business and should not be for sale, or more correctly, it should not be snooped, tracked, taken, or sold – period
- Opt-in should default to NO; Opt-out should default to YES
- **Permissions to steal our data should NOT be a requirement of service**

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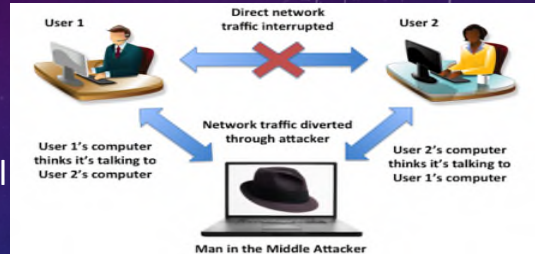
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# Packet Sniffing, Man In The Middle, Fakes

- Tools are easily obtained, thanks to Open Source and the Internet
- Wireshark packet sniffer is very powerful
- Man In The Middle attacks
  - “Bad Actors” set up dummy/decoy Wi-Fi relay stations in coffee shops and hotels, users think they are attaching to a legitimate free Wi-Fi Hot Spot
  - Network (SSID) names like “Free Wi-Fi” lure unsuspecting users
- Fakes and other used as click-bait
  - Fake websites, fake advertising, fake coupons, fake giveaways, fake news, cute puppies/kittens, jokes, porn, advertising written to look like news articles



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# Packet Analyzer (Sniffer)

No.	Time	Source	Destination	Protocol	Info
8	5.568823	127.0.0.1	127.0.0.1	HTTP	GET /webservice/clienttools/comms.php/webservice/clienttools/comms.php?srv&f=syste
10	9.556861	127.0.0.1	127.0.0.1	HTTP	HTTP/1.1 200 OK (text/html)
12	10.625226	127.0.0.1	127.0.0.1	HTTP	GET /webservice/clienttools/comms.php/webservice/clienttools/comms.php/webservice,
14	11.724392	127.0.0.1	127.0.0.1	HTTP	HTTP/1.1 200 OK (text/html)
16	13.719489	127.0.0.1	127.0.0.1	HTTP	GET /clienttools/ExplorerCP/index.php?app=air60.8126535733634084 HTTP/1.1
18	13.739599	127.0.0.1	127.0.0.1	HTTP	HTTP/1.1 200 OK (text/html)
20	14.470359	127.0.0.1	127.0.0.1	HTTP	GET /clienttools/ExplorerCP/javascrpts.php?app=air&nticache=00fa3587779eaab9d4e
250	17.245885	127.0.0.1	127.0.0.1	HTTP	GET /webservice/clienttools/comms.php?srv&f=kt.get_all_explorer_policies&msgAuth=

```

{"response": "pong", "loginLocation": "\\index.html", "versionok": true, "fullName": "", "serverVersions": ["0.1", "0.2", "0.9", "0.9.1", "0.9.2"]}
    
```

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## Reflect On Current & Historical Vulnerabilities

- Windows, MacOS, Linux, Android, iOS - it doesn't matter
- No computer or smartphone – your identity and personal info = \$\$\$
- Data breaches – Equifax, Experian, Yahoo, Adobe, Ameritrade, Anthem, AOL, Apple, AT&T, Blizzard Entertainment, CardSystems, Citigroup, Dropbox, eBay, Dun & Bradstreet, Facebook, Gmail, IRS
  - [https://en.wikipedia.org/wiki/List\\_of\\_data\\_breaches](https://en.wikipedia.org/wiki/List_of_data_breaches)
- WPA2 vulnerability – Wi-Fi security method (fixes in-process)
- SSL vulnerability – Web Browser encryption (fixed/upgraded)
- BlueBorne Bluetooth connection vulnerability (fixes in-process)

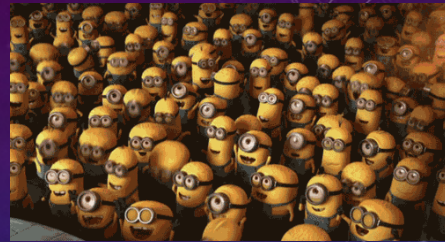
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## Help us! What Can We Do?

Thousands get compromised every day  
don't be one of them!...



- Keep your OS and applications up to date to incorporate all the latest security updates
- Use security software: antivirus/antimalware, anti-spam, Firewall, Privacy Protection, Secure Browser, Password Manager, schedule deep scans
- Be aware and use common sense ALL DAY, EVERY DAY!
  - Don't do things that you know will increase your risk
- Use VPN!

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## How Can VPN Help?



- Normal Internet traffic – everybody’s data is mixed together in segments called “packets”, each **packet** is identified using **header** information used by protocols to determine what data goes where, followed by the **payload** – your data (unencrypted by default)
- VPN creates what is referred to as a **virtual private tunnel** – although your data may be mixed with all other packets, it makes your packets behave as though they are independent, as if they run through their own tunnel – really a logical/virtual separation, not a physical separation
- Tunnel data is encrypted, forming a virtual private tunnel
- This emulates what companies once paid high costs to obtain from the phone company – private/leased lines

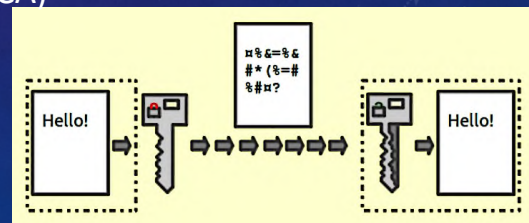
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## Elements of VPN and Secure Communication

- AAA Security (concept for complete **user** security)
- Cryptography (techniques for secure communications)
- Encryption (encoding), Ciphers and Hash algorithms
- Security Protocols (SSL, IPSec, etc.)
- Certificates and Certificate Authorities (CA)
- Public Keys (shared) and Private Keys (kept private), Internet Key Exchange (IKE) protocol



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## AAA Security

An example of a current standard to implement AAA: Remote Authentication Dial-In User Service (RADIUS). RADIUS servers are used in Enterprise environments

- Authentication, authorization, and accounting (AAA) is a term for a framework for intelligently controlling access to computer resources, enforcing policies, auditing usage, and providing the information necessary to bill for services.
- Authentication
  - Authenticate a user's identity using criteria and credentials
- Authorization
  - User inherits specific privileges, enforced by using policies
- Accounting
  - Measure and log access to resources for control, billing, analysis

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## Encryption and Decryption

(simplified)

Dave wants to send a message to Alice

Data is obscured by encryption using a public key (from server certificate issued by CA)



Original data is protected from snooping.

Received data is same as sent – cannot be altered.

Data unobscured by decryption using server private key

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## Security Protocols – SSL, TLS, 3DES, AES

- Transport Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL), both frequently referred to as "SSL", are cryptographic protocols
- Triple DES (3DES), officially the Triple Data Encryption Algorithm (TDEA or Triple DEA), is a symmetric-key block cipher, which applies the Data Encryption Standard (DES) cipher algorithm three times to each data block
- The Advanced Encryption Standard (AES) is a specification for the encryption of electronic data that supersedes the Data Encryption Standard (DES)

### Internet protocol suite

#### Application layer

BGP · DHCP · DNS · FTP · HTTP · IMAP · LDAP · MGCP · MQTT · NNTP · NTP · POP · ONC/RPC · RTP · RTSP · RIP · SIP · SMTP · SNMP · SSH · Telnet · TLS/SSL · XMPP · *more...*

#### Transport layer

TCP · UDP · DCCP · SCTP · RSVP · *more...*

#### Internet layer

IP (IPv4 · IPv6) · ICMP · ICMPv6 · ECN · IGMP · OSPF · IPsec · *more...*

#### Link layer

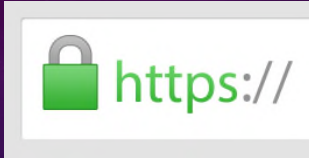
ARP · NDP · Tunnels (L2TP) · PPP · MAC (Ethernet · DSL · ISDN · FDDI) · *more...*

V · T · E

## Security Protocols – PPTP, SSTP, L2TP, IPsec, OpenVPN

- PPTP is a very basic VPN protocol based on PPP. The PPTP specification does not actually describe encryption or authentication features and relies on the PPP protocol being tunneled to implement security functionality - recommended to replace with L2TP
- Secure Socket Tunneling Protocol (SSTP) is a proprietary protocol that was designed by Microsoft as a replacement for the insecure PPTP protocol
- Layer 2 Tunneling Protocol (L2TP) does not provide any encryption or confidentiality by itself – rather, it relies on an encryption protocol that it passes within the tunnel to provide privacy
- IPsec is a network protocol suite that authenticates and encrypts the packets of data sent over a network representing an end-to-end security scheme
- OpenVPN is an advanced open source VPN solution backed by 'OpenVPN technologies' and which is now the de-facto standard in the open source networking space. Uses the proven SSL/TLS encryption protocol.

## HTTPS, SSL , Secure/Encrypted websites



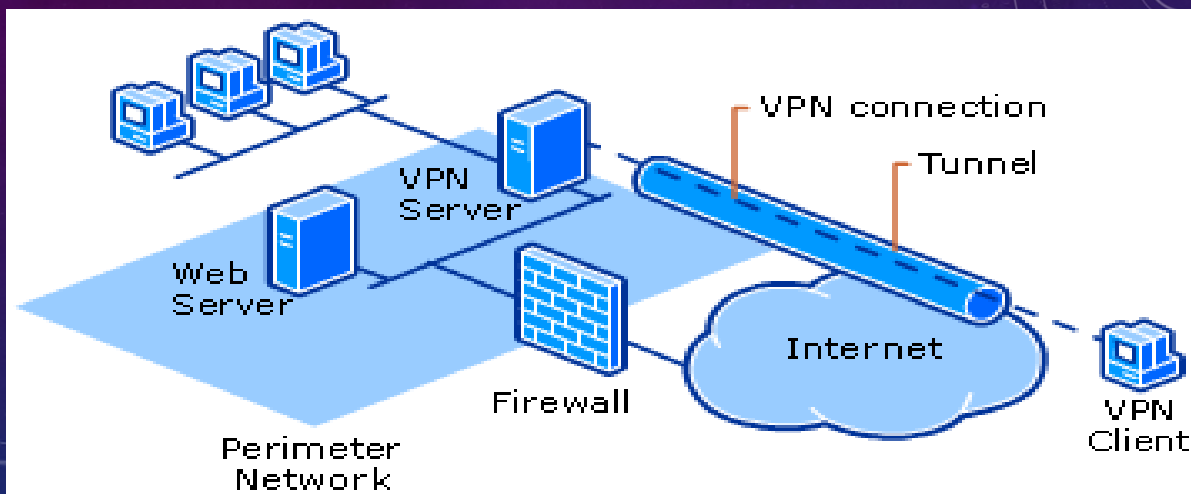
- Most websites use HTTP, but HTTPS is used by banks and online shopping, and more
- More and more websites are shifting to HTTPS
  - Google now advocates that HTTPS should be used everywhere on the web
- The “S” indicates Secured by SSL, which today is actually upgraded to TLS
- HTTPS certificates that are certified also validate that they are genuine, unless the site doesn’t certify or they expire

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## Case 1 - Corporate VPN for Teleworker – Remote Client-to-HQ Server



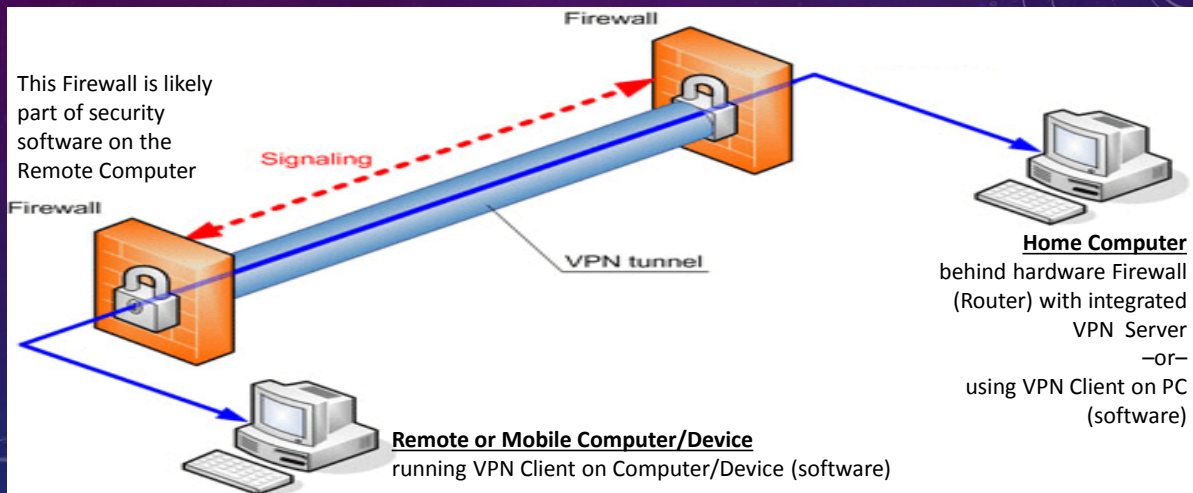
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## Case 2 – Personal VPN for Personal Cloud – Mobile Client-to-Home Server



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## Case 3 – Turnkey VPN Services From 3<sup>rd</sup> Party



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## How Can A Turnkey VPN Solution Help?

- Data Privacy - scrambled/secure/hidden
- Data Integrity – data cannot be changed
- Security – authentication
- Anonymity – hides your real external IP address
- Bypass Geo-blockades / Geo-fencing – user selects exit server location
- Bypass censorship
- Enable blocked applications in certain countries like Skype, Facebook
- Bypass access restrictions to some geo-based content
  - No longer works with Netflix

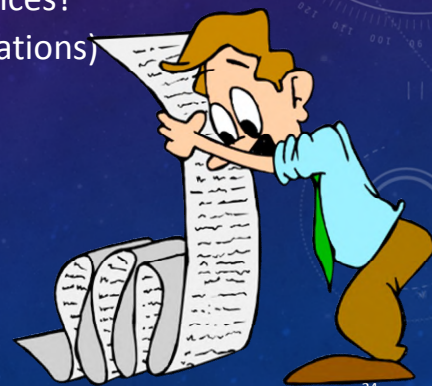
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## What To Look For In A VPN Solution

- Affordability for as many devices as you own
- Should experience little speed/performance compromise; is there throttling, bandwidth limiting, restricted services?
- Multiple global exit nodes (remote server locations)
- No Logs – no traffic records, no traces
- Kill switch – stop all traffic if not encrypted
- Flexibility and ease of use
- Optional: Ad Blocking (speed up browsing)
- Payment methods should also be private



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## VPN Providers – Who Can You Trust?

- Your data passes through their servers – how do you know it is not being violated?
- Many unknown companies/names offer these services – are you compromising for free/cheap VPN solutions?
- Well-known security software companies offer these solutions – may cost more but may be more trustworthy
- Mobile apps have already shown to violate every privacy rule – be careful which you choose
- Research reputations carefully before installing

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## Available Products & Services

Many available. Complex and costly to test. Which are best? – difficult to say. See review websites and do your due diligence. Below solutions get frequent mentions and high ratings:

Check this website: [Best VPN Services](#)

- ExpressVPN (\$8.32/mo)
- Private Internet Access (PIA) (\$3.33/mo)
- NordVPN (\$5/75/mo)
- PureVPN (\$2.95/mo)
- TunnelBear (free)

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# Available Products & Services

- Also, check website: [The Best VPN Services of 2017](#)

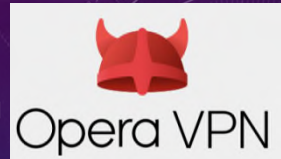
Name	IPVanish VPN	NordVPN	PureVPN	Private Internet Access VPN	KeepSolid VPN Unlimited	TunnelBear VPN	TorGuard VPN	Golden Frog VyprVPN	AnchorFree Hotspot Shield Elite	Hide My Ass VPN
Lowest Price	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT	SEE IT
Editor Rating	●●●●○	●●●●●	●●●●○	●●●●●	●●●●●	●●●●○	●●●●○	●●●●○	●●●●○	●●●●○
Best For	General Users	General Users	Speed Demons	Power Users	Frequent Travelers	First-Time Users	BitTorrent Users	General Users	Nervous Shoppers	Security Novices
Supported Client Software	Android, ChromeOS, iOS, Linux, macOS, Windows	Android, iOS, macOS, Windows	Android, Chrome, iOS, Linux, macOS, Windows	Android, Chrome, iOS, Linux, macOS, Windows	Android, Chrome, Firefox, iOS, Linux, macOS, Windows	Android, Chrome, iOS, macOS, Opera, Windows	Android, iOS, Linux, macOS, Windows	Android, iOS, macOS, Windows	Android, Chrome, Firefox, iOS, macOS, Windows	Android, iOS, macOS, Windows

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# Example – Opera VPN Service On Win



VPN

Normally, your browser connects directly to the website and its approximate location. With VPN, your apparent location changes to the location of the VPN server.

Enable VPN [Learn more](#)

Block ads and surf the web up to three times faster [Learn more](#)

Manage exceptions...

Optimal location

- Optimal location
- Canada
- United States
- Germany
- Netherlands
- Singapore

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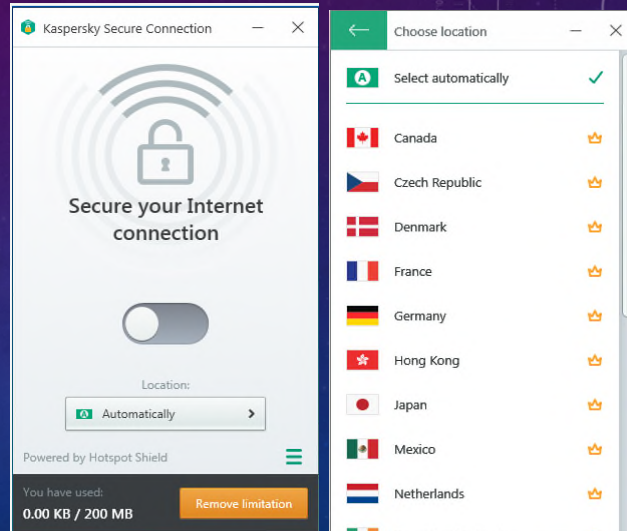
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VPN is a free service, and the amount of data you are allowed to transfer is unlimited.



## Example – Kaspersky VPN Service on Win

- Included with Kaspersky Total Security, or downloadable – free 200MB/day
- Upgrade/pay for unlimited usage
  - \$4.99/mo 5-devices, 1 user
  - \$29.99/yr 5-devices, 1-user (\$2.50/mo)



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## Example – Avast VPN Service On Win

- Free 7-day trial. Pay after trial...
- PC, Mac, 1 device: \$59.99/year (\$4.99/month)
- Android, iPhone/iPad, 1 device: \$19.99/year (\$1.67/month)
- Up to 5 devices: \$79.99/year (\$6.67/month)



**Avast SecureLine VPN**

Protect all your online activities from prying eyes. A single click launches a VPN and hides your IP address, allowing you to enjoy true privacy.

[DOWNLOAD FOR PC](#)  
Free 7-day trial

[BUY LICENSE](#)

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# Example – Personal VPN Service On Android



- PIA (\$6.95/mo); or (\$39.95/yr - \$3.33/mo)
- PureVPN (Free)
  - Play Store 4.1/14k, 1Mil
- TunnelBear (Free)
  - Play Store 4.4/100k, 5Mil
- Turbo VPN (Free)
  - Play Store 4.7/432k, 10Mil
- Many more

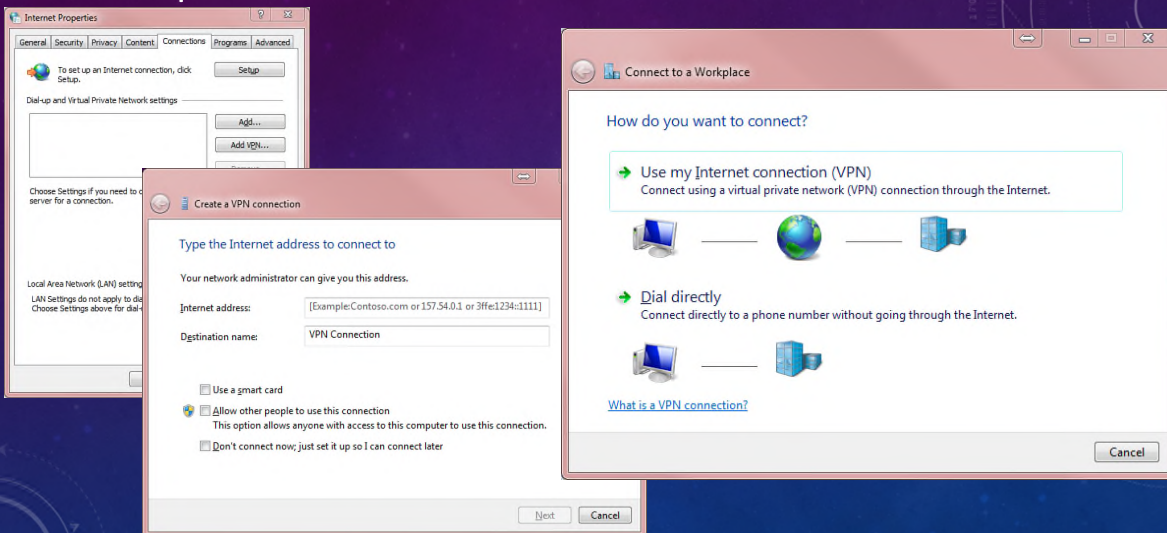


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# Example – Windows Built-in VPN



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## Is Everything Encrypted, and Is All My Data Hidden From Everyone?

It depends (sorry for that answer) – consider these...

- Your ISP sees Destination and Source IP address which are still visible (cannot encrypt) and may reveal your communication to a VPN service
- Cookies and Web Beacons can reveal your activity or leave trails
  - Manage carefully (private browser windows; delete cache/cookies; CCleaner)
- Ads and banners can slow browsing, and may leave cookies
- Web analytics might also collect data
- Social Networks are notorious for clever data collection schemes
- Encryption is only between two endpoints, not private beyond that
  - Some applications continue beyond the other endpoint – example: Email

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## Summary – VPN Benefits



- Protects privacy of sensitive data using bank-grade encryption
- Scrambled/encrypted data is worthless to snoopers, hackers and ISPs
- Data integrity
- Access your home data while away without worries
- Browse anonymously, don't leave traces
- Bypass geo blockades, censorship filters, and covert monitoring
- Bypass geo-blocking restrictions; access media and services as though you are located somewhere else that satisfies geo-requirements

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## Conclusion

- Should you be using VPN? **YES!**
  - **YES!** Anytime away from home or using public Wi-Fi
  - **YES!** Whenever you wish to protect your privacy, protect your data, or bypass geo-blocks
- VPN services are readily available at fair prices
- Free VPN services have their drawbacks and concerns, but may fill your needs
- Should you be in control of your data, your activity, your privacy?
  - **ABSOLUTELY!!!**



I know what you did last summer ... and what you are doing right now

That's a stupid password !

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## Questions Are Free, Answers \$1 (Just Kidding)

### Digital Camouflage With VPN

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