# Virtual Private Networks (VPNs) and Tor

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# What is Vpn ?

- *VPN stands for "Virtual Private Network" and describes the opportunity to establish a protected network connection when using public networks.*
- **Most important, VPN services establish secure and encrypted connections to provide greater privacy**

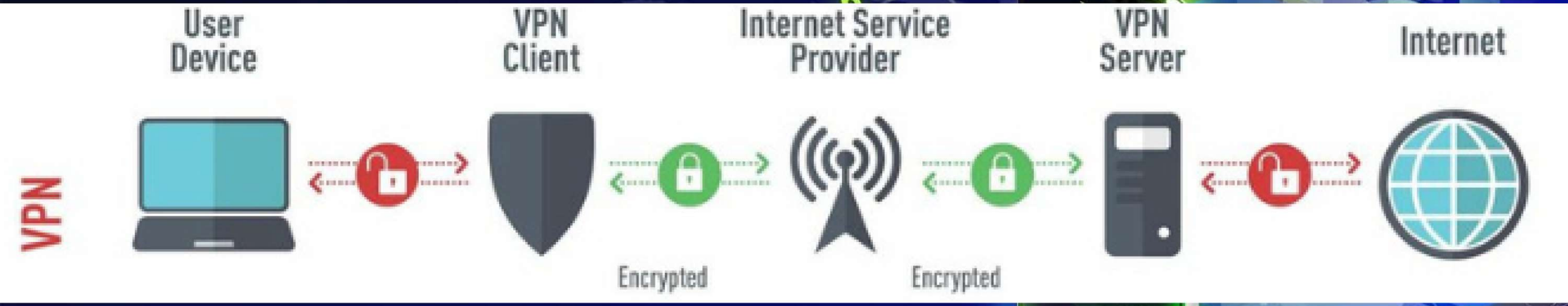
# Why should we use VPN?

- Safety and Security
- Breaking geo-restriction
- Subsidized shopping and traveling
- Online Privacy

# What does VPN hide?

- IP address
- Location
- Device
- Browsing History

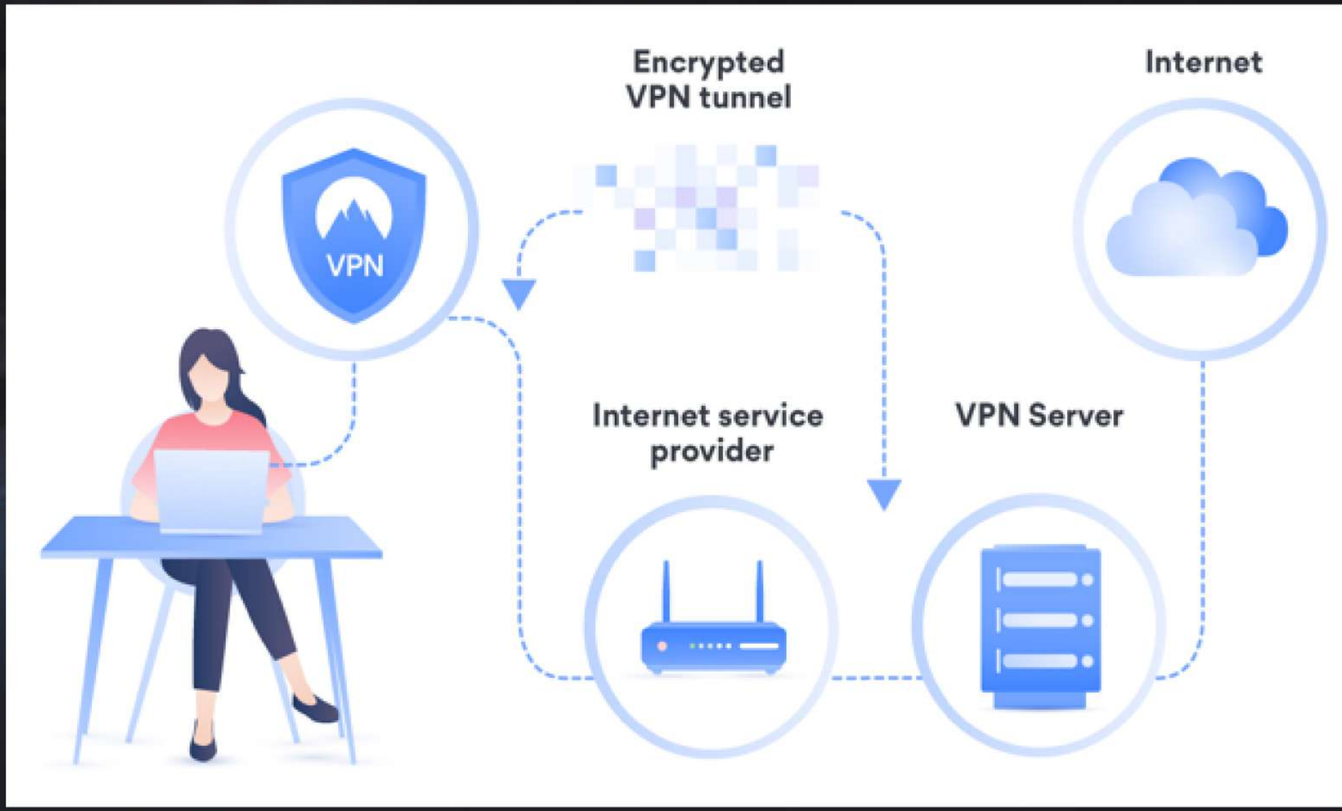
# How Does VPN Work?



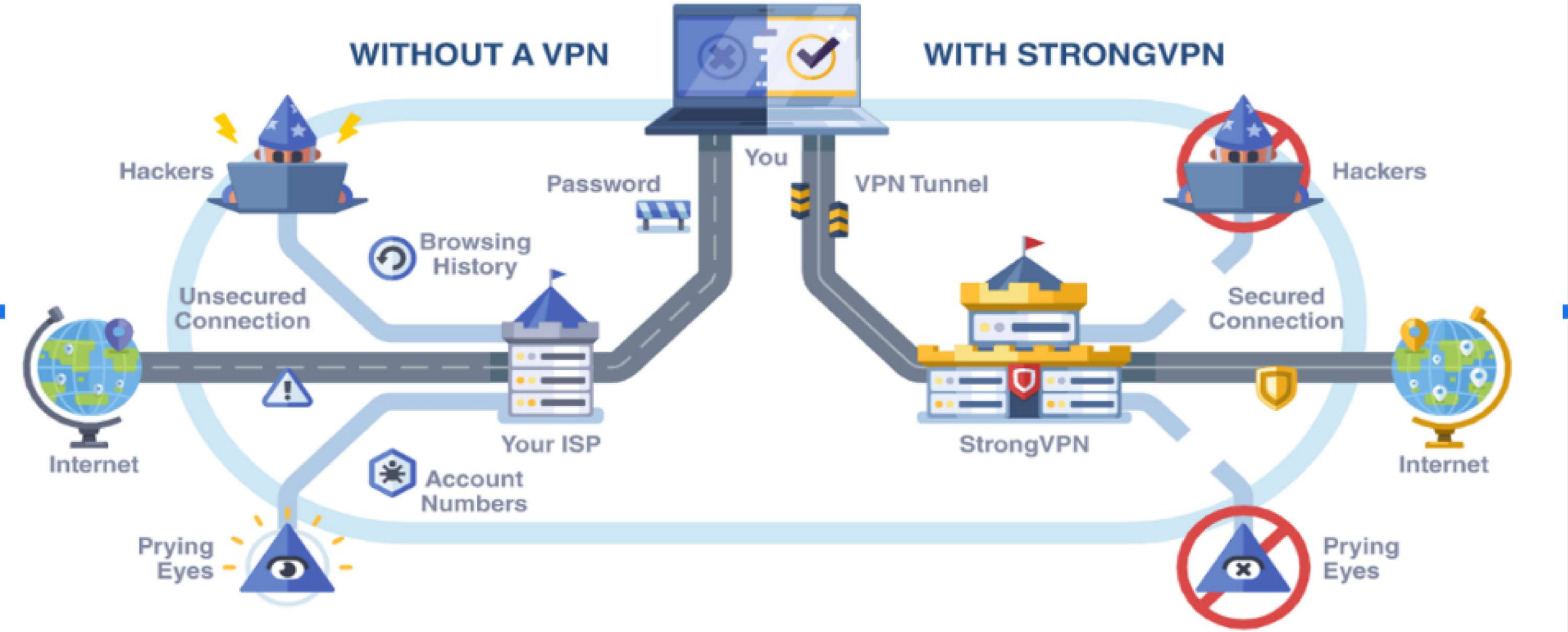
# What is a VPN tunnel?

A VPN tunnel is an encrypted link between your computer or mobile device and an outside network.

This tunnel opens up at one point ( VPN client) and weaves its way through the internet before emerging at another point (the VPN server)



# With or Without VPN



# VPN Protocols

## Internet Protocol Security (IPSec)

IPSec secures Internet Protocol communication by verifying the session and encrypts each data packet during the connection.

## Point–to–Point Tunneling Protocol (PPTP)

PPTP generates a tunnel and confines the data packet.
Point-to-Point Protocol (PPP) is used to encrypt the data between the connection. .

## Secure Shell (SSH)

SSH generates the VPN tunnel through which the data transfer occurs and also ensures that the tunnel is encrypted.

# VPN Protocols

## Secure Socket Layer (SSL) and Transport Layer Security (TLS)

SSL and TLS generate a VPN connection where the web browser acts as the client and user access is prohibited to specific applications instead of entire network

## Open VPN

OpenVPN is an open source protocol that allows developers access to its underlying code. It uses a traditional security protocol based on SSL and TLS protocol.

## Layer 2 Tunneling Protocol (L2TP)

L2TP generates a tunnel between two L2TP connection points and IPSec protocol encrypts the data and maintains secure communication between the tunnel

## PAST

In 1996, a Microsoft employee started developing the Peer to Peer Tunnelling protocol (PPTP).

In 1999, the specification was published.

## PRESENT

VPN technology was originally developed only by big companies and organizations for their own goals.

The evolution of internet helped VPN market to grow larger and larger that the average online users are using VPN to protect their privacy.

## FUTURE

VPNs will become more and more common in the next years.
Even the users from less-developed countries will be able to use VPN whenever they browse the web.

# Disadvantages

- Out of 196 countries, 30 have banned VPNs
- It is difficult for consumers to check the quality of encryption
- VPN is not entirely free you have to pay to use it.
- Using the wrong VPN can put privacy in danger
- Mostly VPN down the Internet speed.
- Connection break or software problem

# Alternatives of VPN

- SD-WAN (Software Define wide area network)
- SASE (Secure access service edge)
- Smart DNS
- ZTNA(Zero Trust Network access)
- TOR

# What is Tor ?

The Tor Browser is a web browser that allows you to browse the internet anonymously. It uses the Tor network to hide your IP address and encrypt your internet traffic.

# Why Tor?

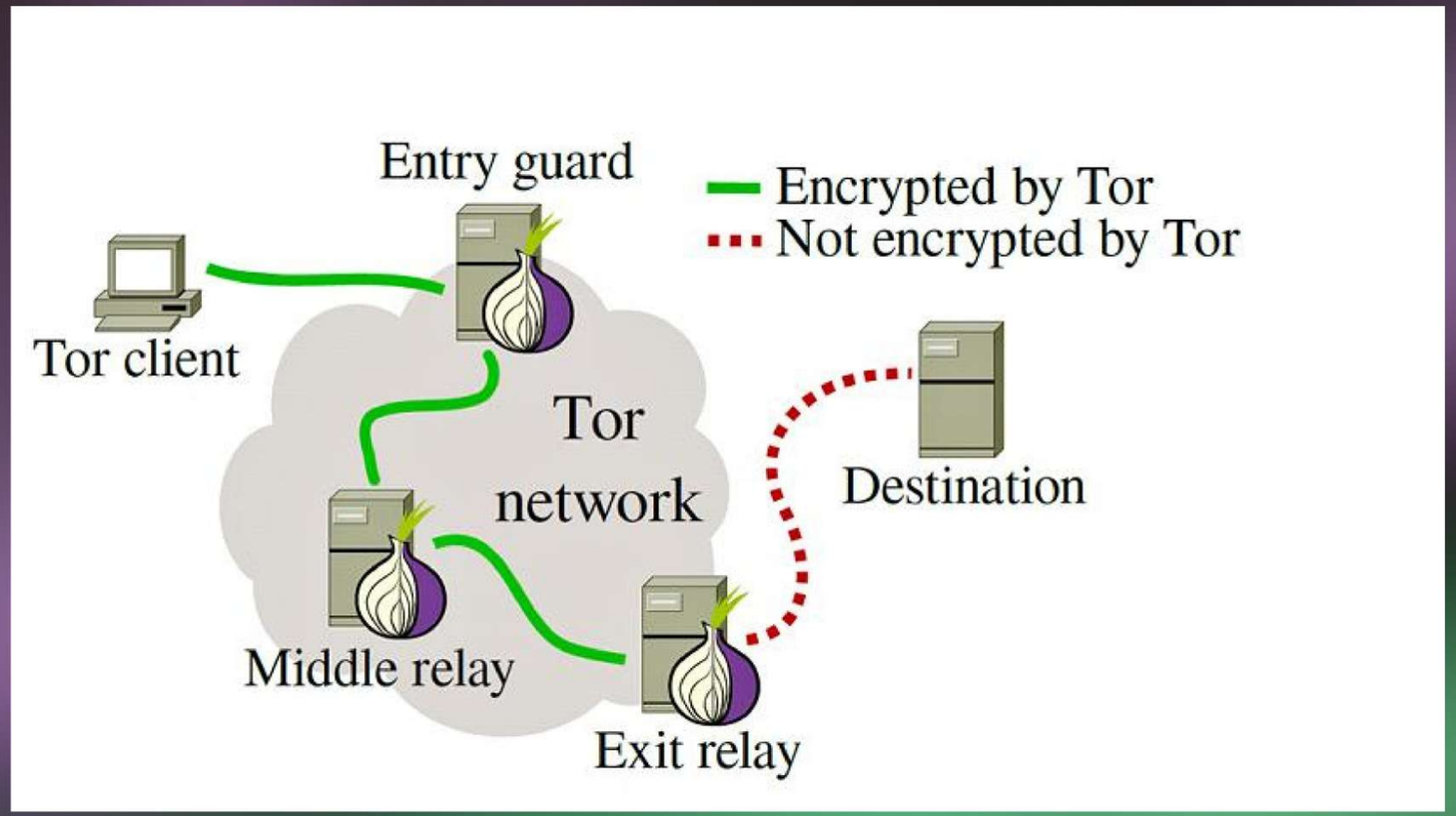
- BLOCK TRACKERS
- Defend against surveillance
- Freely Browse
- Multilevel Encryption

# interesting facts about Tor

- Tor Browser is based on Firefox and offers various privacy-enhancing features.
- The Tor network has over 7,000 relays and over 2 million users globally, making it one of the world's largest anonymity networks.
- The Tor Project is a non-profit organisation
- The Tor Browser is available for Windows, macOS, Linux, and Android devices.
- Tor Hidden Services, often known as. onion sites are websites that are only accessible via the Tor network.

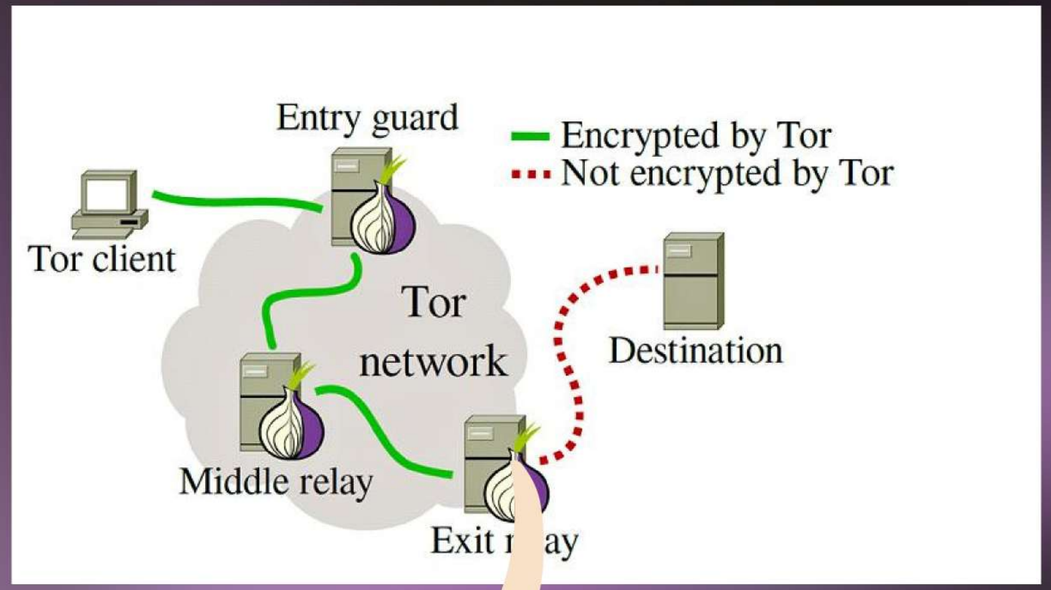
# How does Tor Browser Work?

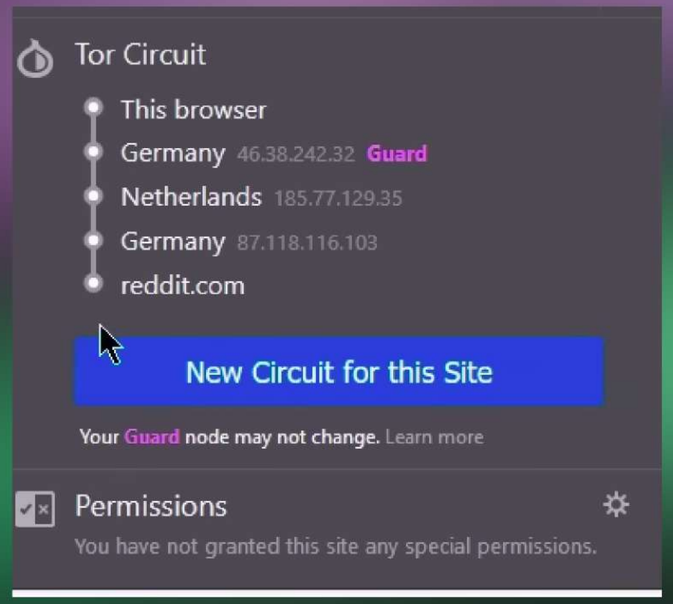
# TOR BROWSER




**Tor browser, providing anonymity and privacy by encrypting and bouncing your traffic through three randomly selected relays.**

# TOR BROWSER




*In this example-*

**Entry Guard - Germany**

**Middle Relay - Netherlands**

**Exit Relay - Germany**

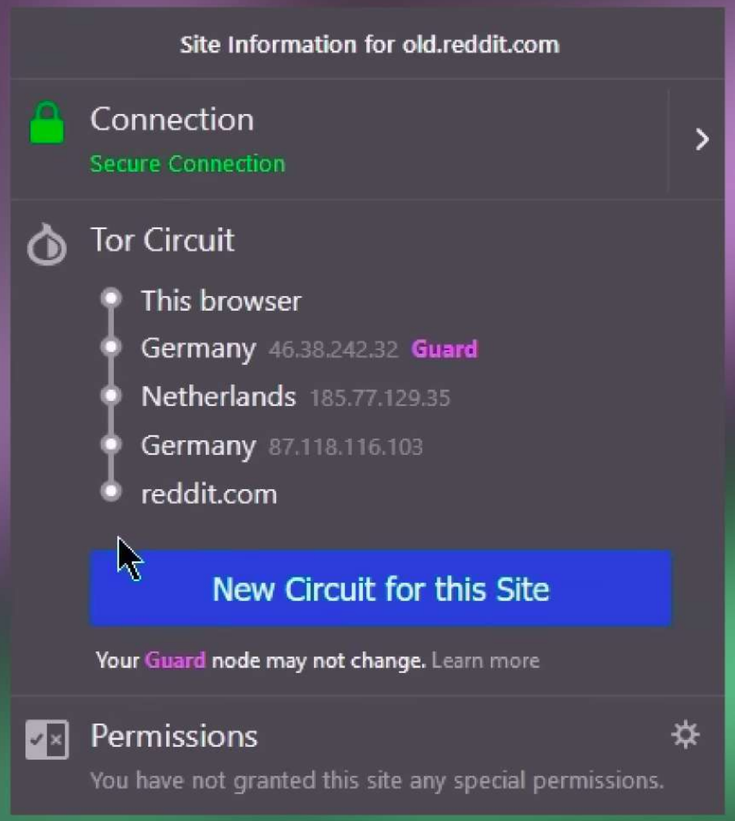
**There can be many combination between these three replays**

TOR BROWSER

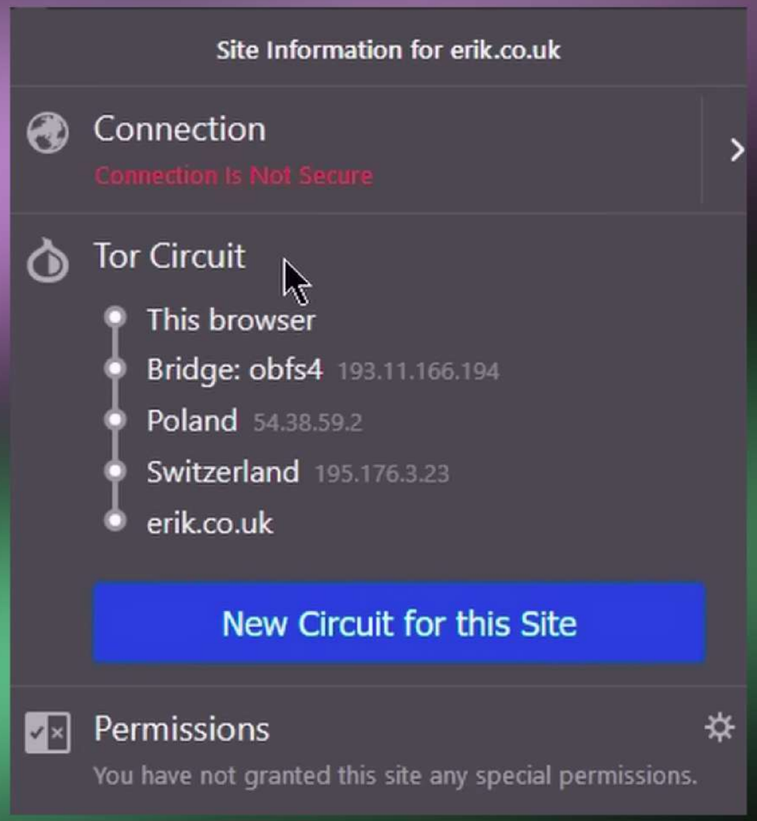
# How to Check Connection secure Or Not?

# TOR BROWSER

## How to Check Connection secure Or Not?




**Secure**

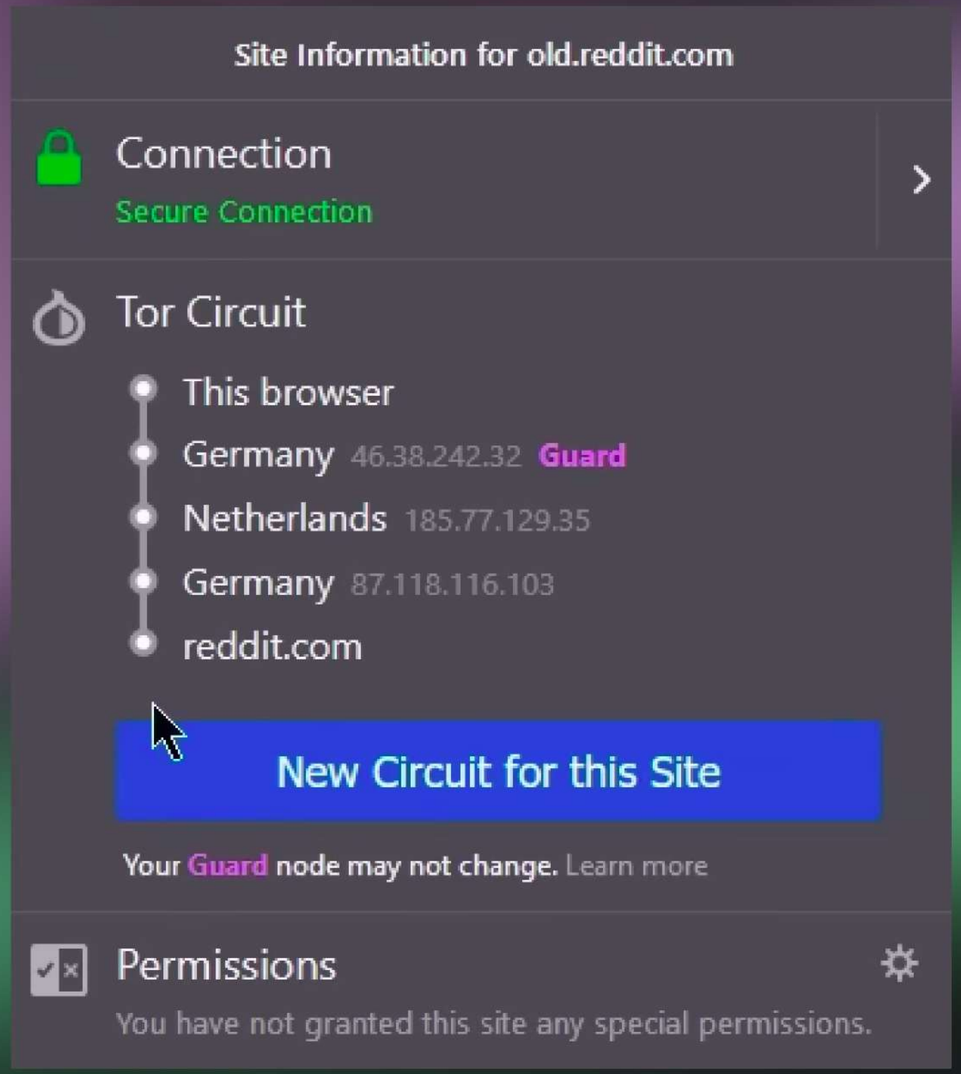



**Not Secure**

The Client knows about all the Tor nodes in the circuit

The Tor circuit changes every 10 minutes

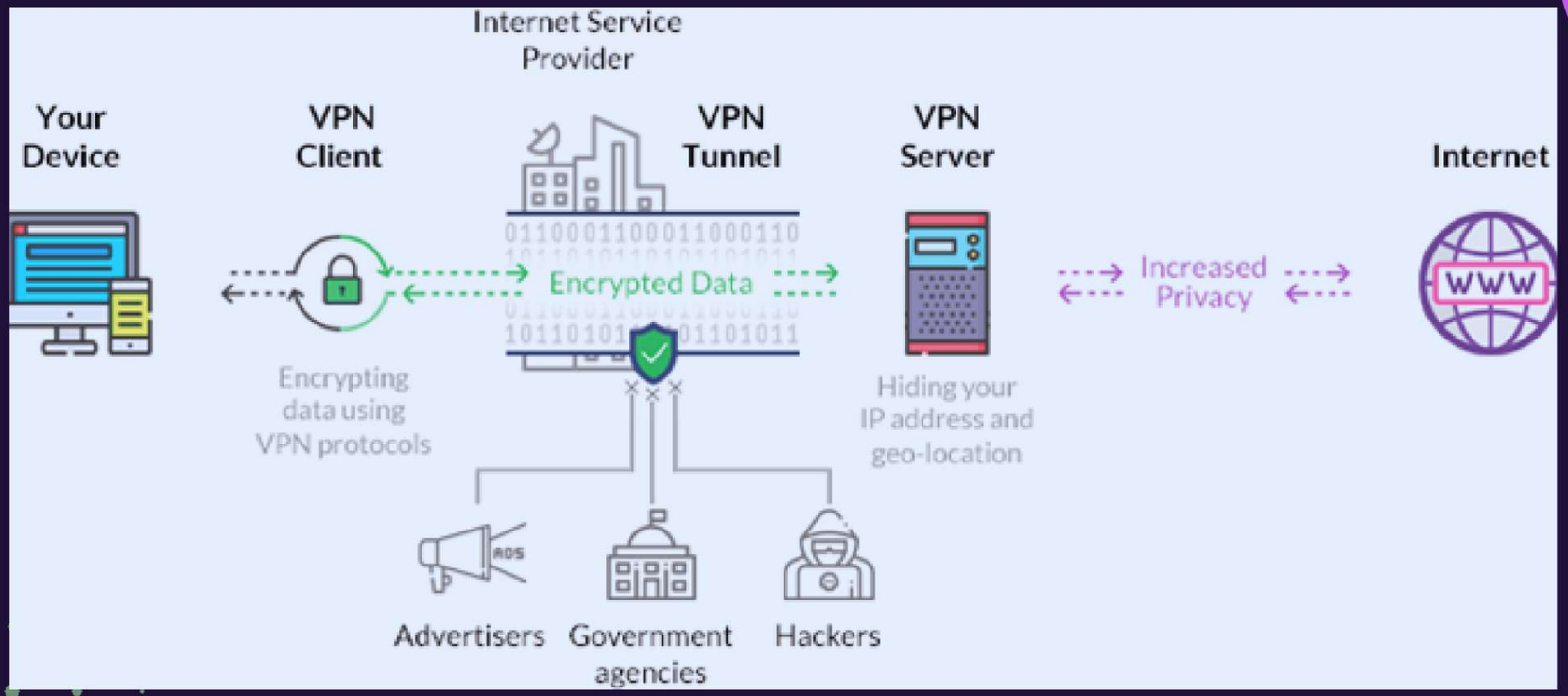
# TOR BROWSER


Site Information for old.reddit.com
Connection
Secure Connection
Tor Circuit
This browser
Germany 46.38.242.32 Guard
Netherlands 185.77.129.35
Germany 87.118.116.103
reddit.com
New Circuit for this Site
Your Guard node may not change. Learn more
Permissions
You have not granted this site any special permissions.

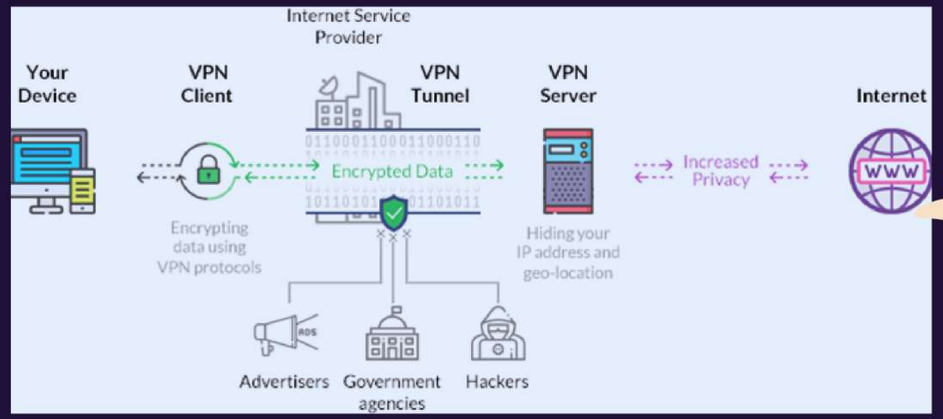
# More facts

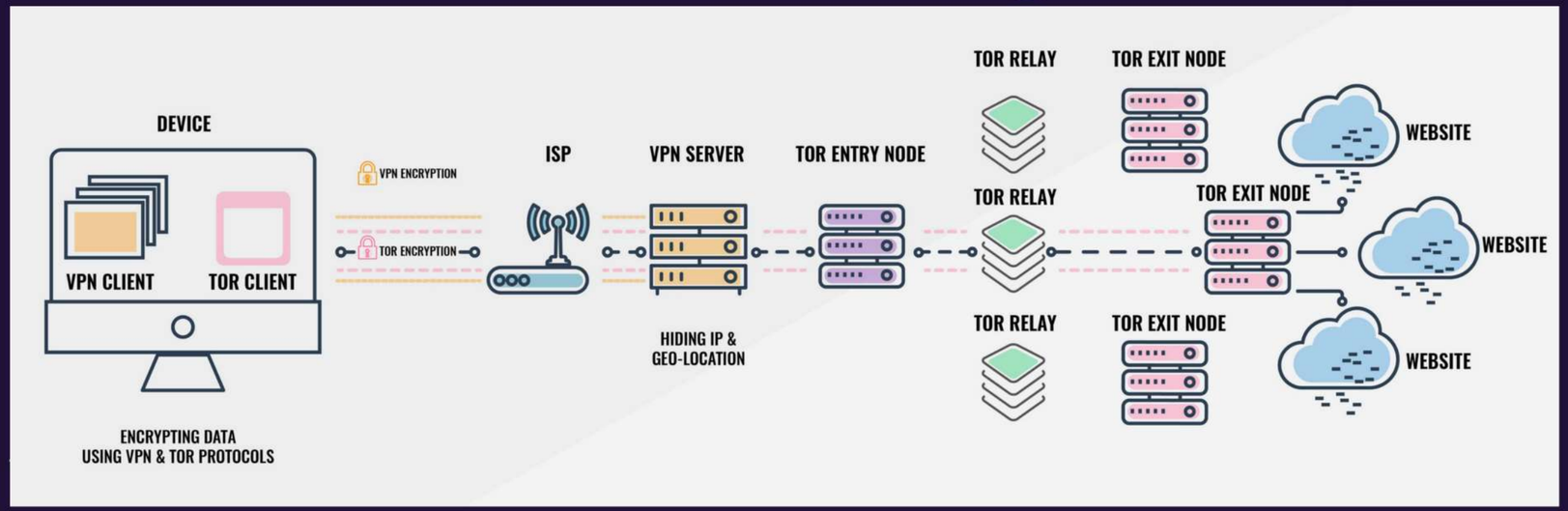
- Tor messages are called cells and each cell is always 512 bytes long
- Each "cell" that is sent contains the Circuit ID
- The Circuit ID can be used to know the previous and next nodes
- Tor directory is where all the Tor metadata resides

# HOW VPN WORKS?



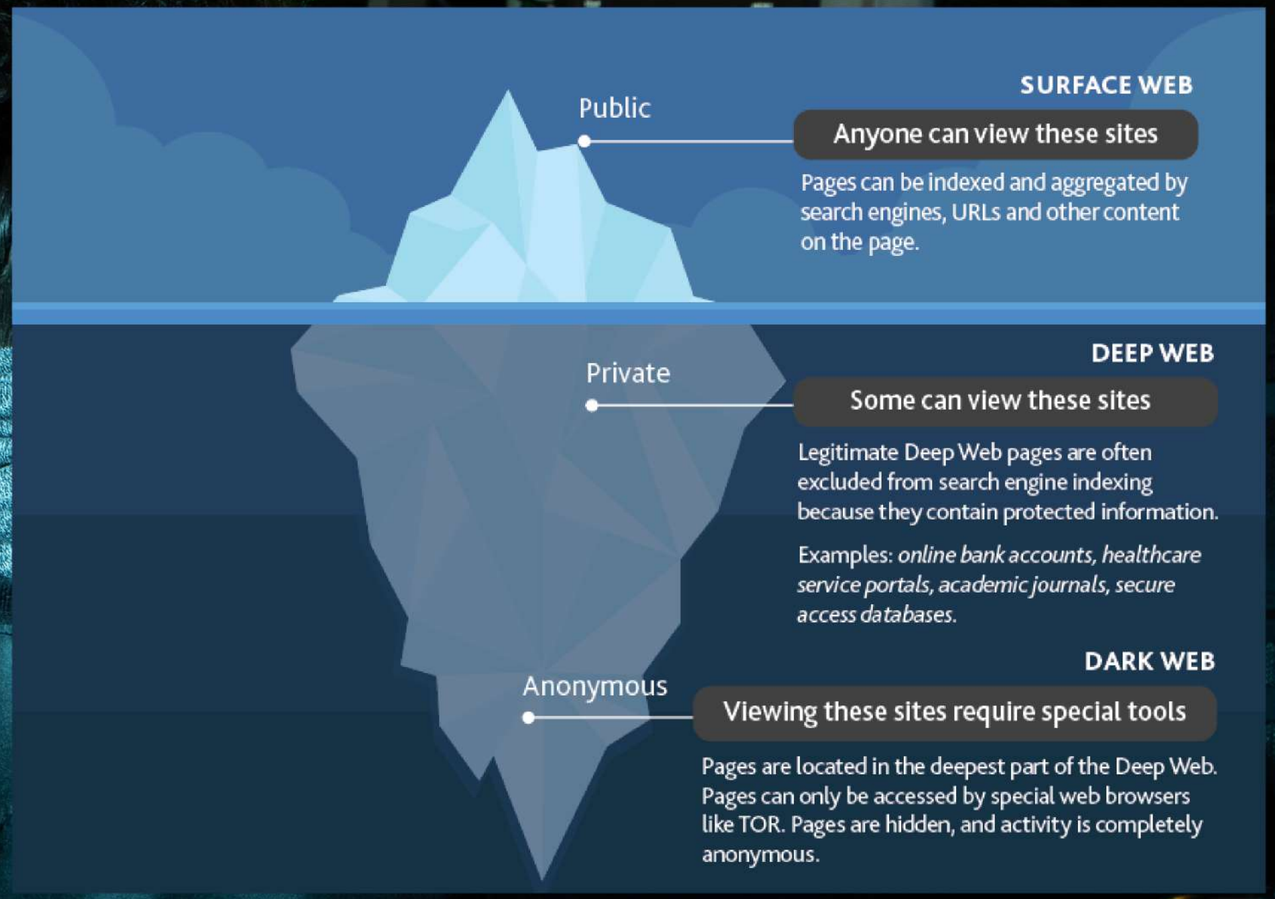
# HOW VPN + TOR WORKS?



# Dark Side of "Tor Browser"

- Tor's anonymity makes it an attractive & powerful tool for attackers and criminals
- Tor provides access to the dark web
- Tor's hidden capabilities can assist users in masking their identities and hosting certain websites and messengers that can only be viewed by Tor users.



# Weakness of Tor

- **Slow internet speed:** Because the Tor network relies on a network of relays to transport traffic, it can result in slower internet connections.
- **weakness in exit nodes:** All traffic exiting the Tor network must go through an exit node, which might be a weak point in the system.
- **Limited security:** Tor only protects internet traffic that is routed through the network. Other sorts of attacks, such as malware, phishing, or social engineering, are not protected.
- **Reliance on user behavior :** To guarantee anonymity, Tor relies on user behavior. Users must avoid using recognizable usernames or revealing personal information that could be used to identify them, for example.

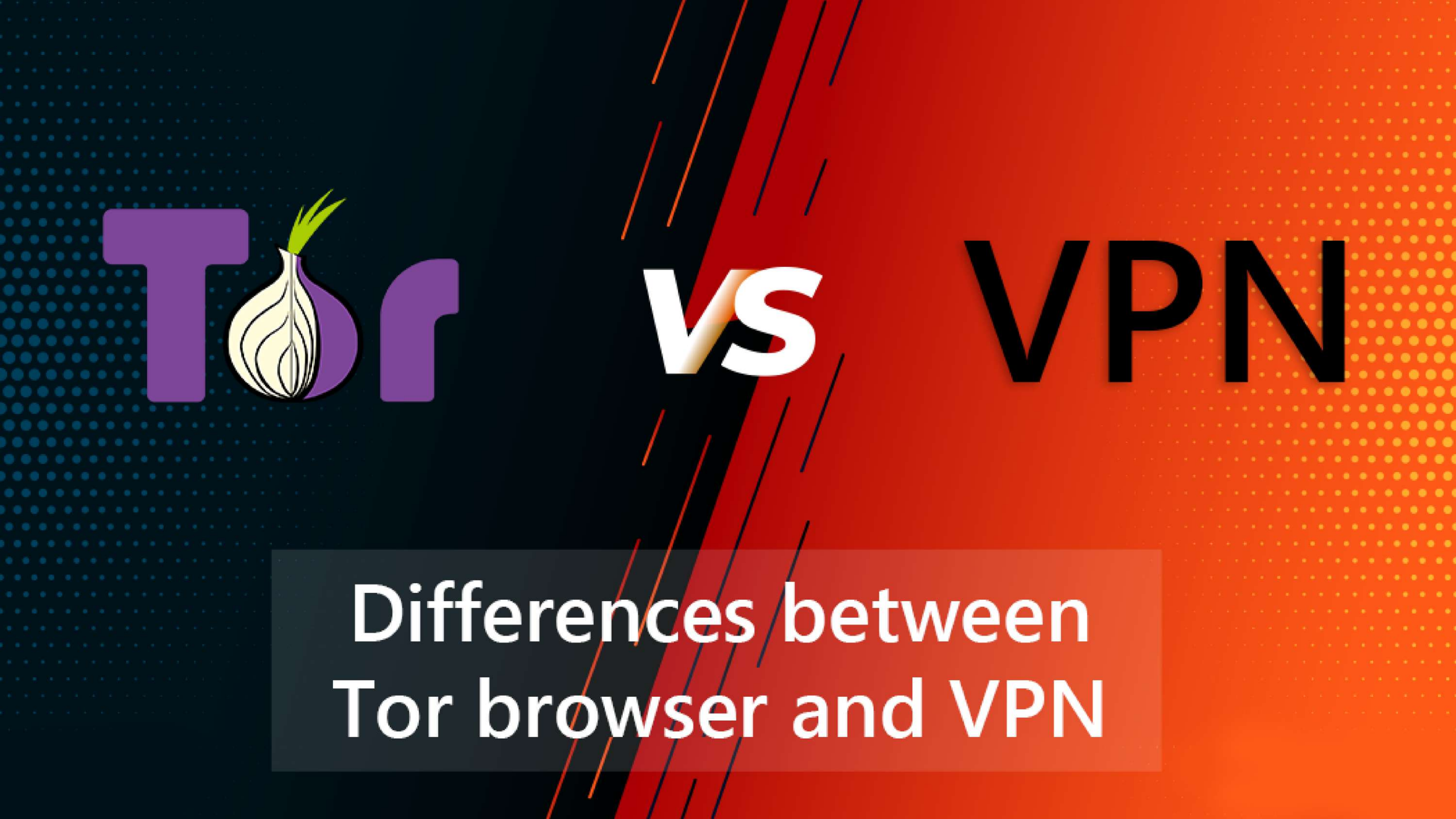
# History of Tor

Tor was invented in the mid-1990s by workers of the United States Naval Research Laboratory.

The alpha version of Tor, first known as The Onion Routing project, was released on September 20, 2002.

# Tor alternatives?

- **I2P:** This encrypts and hide your internet data in the Invisible Internet Project (I2P).
- **Freenet:** Freenet is a peer-to-peer network that allows users to share files and communicate in an anonymous manner.
- **Proxy servers:** Proxy servers can be used to hide your online activities by masking your IP address.


Tor
VS
VPN
Differences between
Tor browser and VPN

- Anonymously accessing the Web
- Untraceable Communication
- Accessing the Dark Web

- Unblocking region locked content
- Securing Public WiFi
- Preventing ISP throttling

# Tor vs. VPN

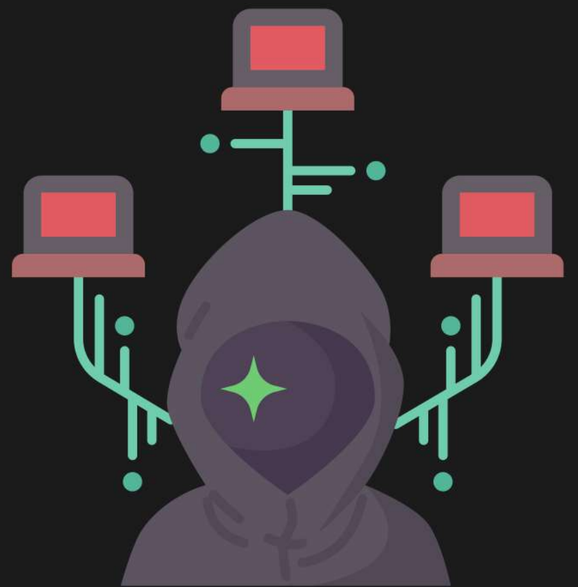
## Tor

- **Decentralized** network of servers run by volunteers
- Internet traffic is routed through **three random nodes**
- Only **internet traffic within the Tor browser** will be protected

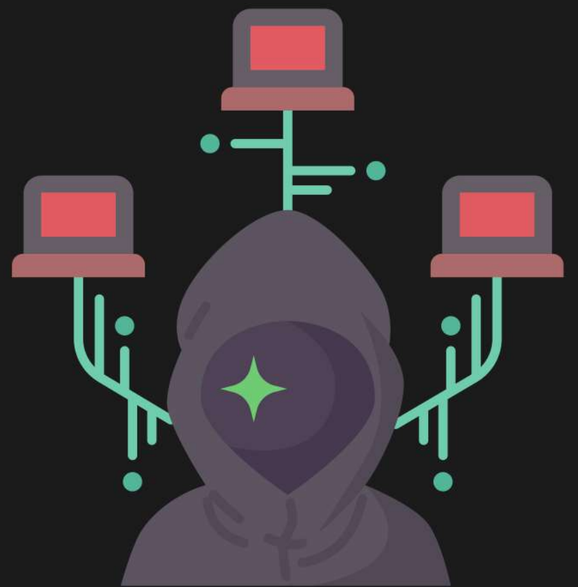
## VPN

- **Centralized** group of servers run by VPN provider
- Internet traffic is routed through a **single VPN server**
- Once configured, **all of your internet traffic** will be protected

# DEMO



# Checking hotel booking prices from different locations.



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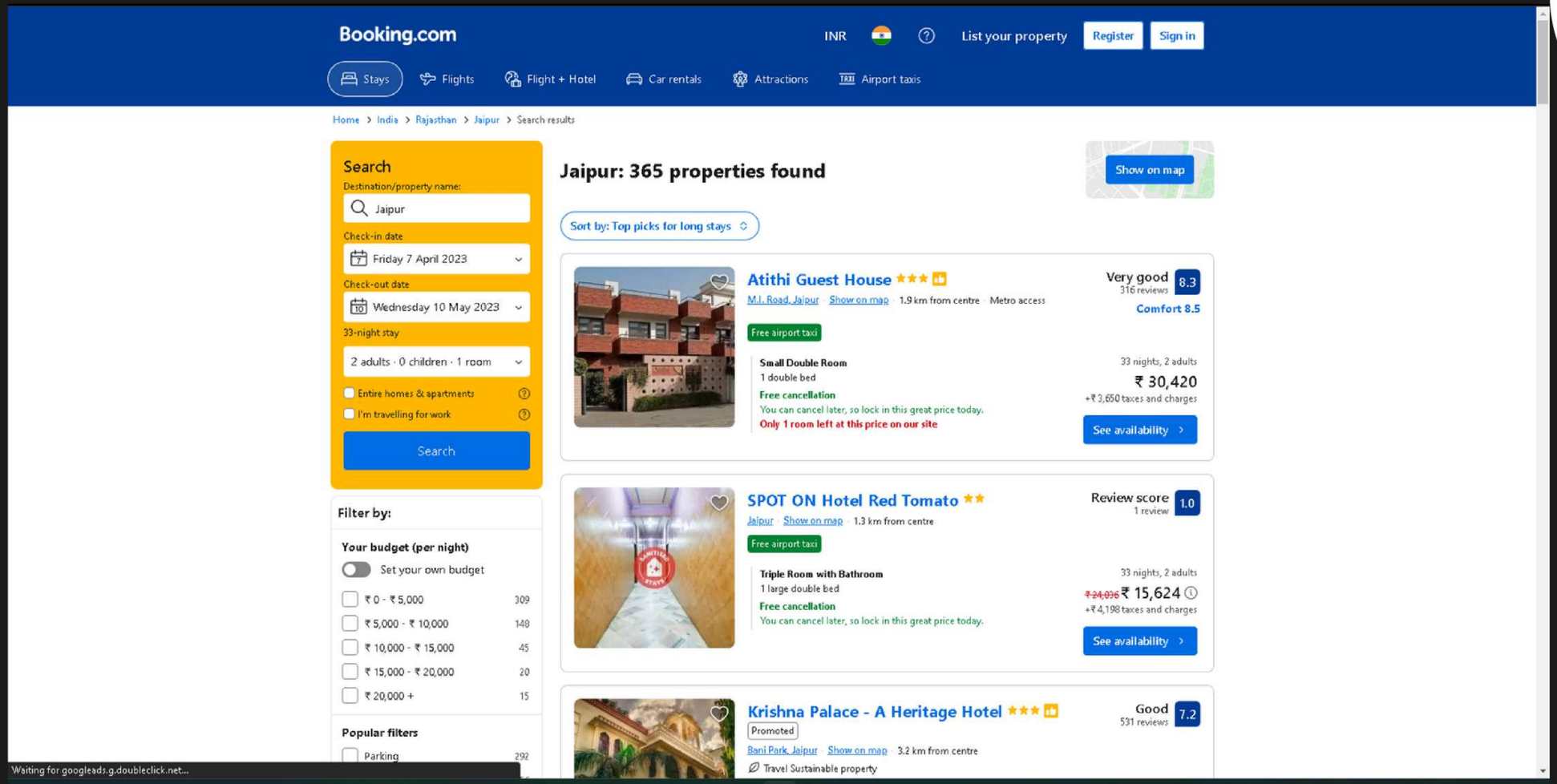
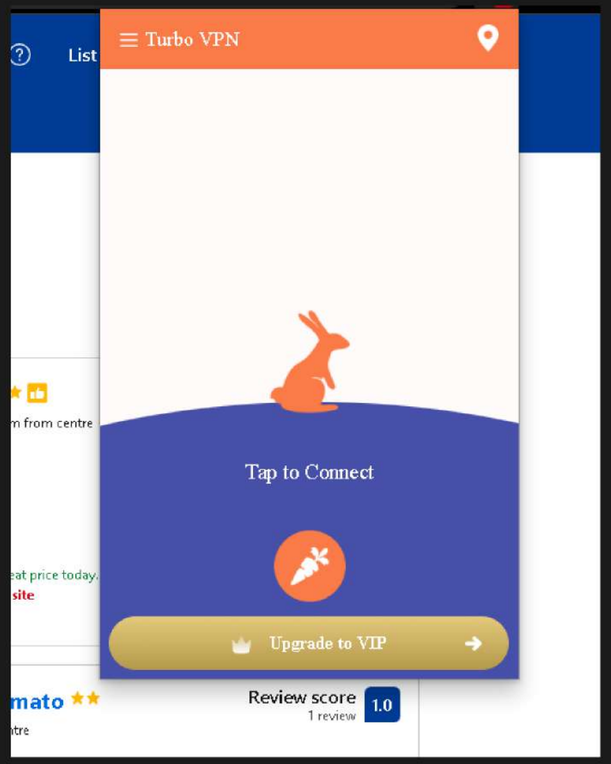
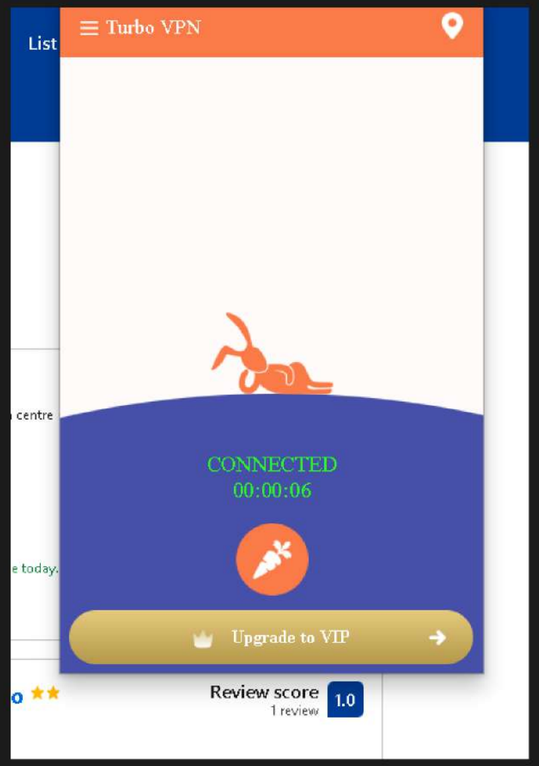



# In India

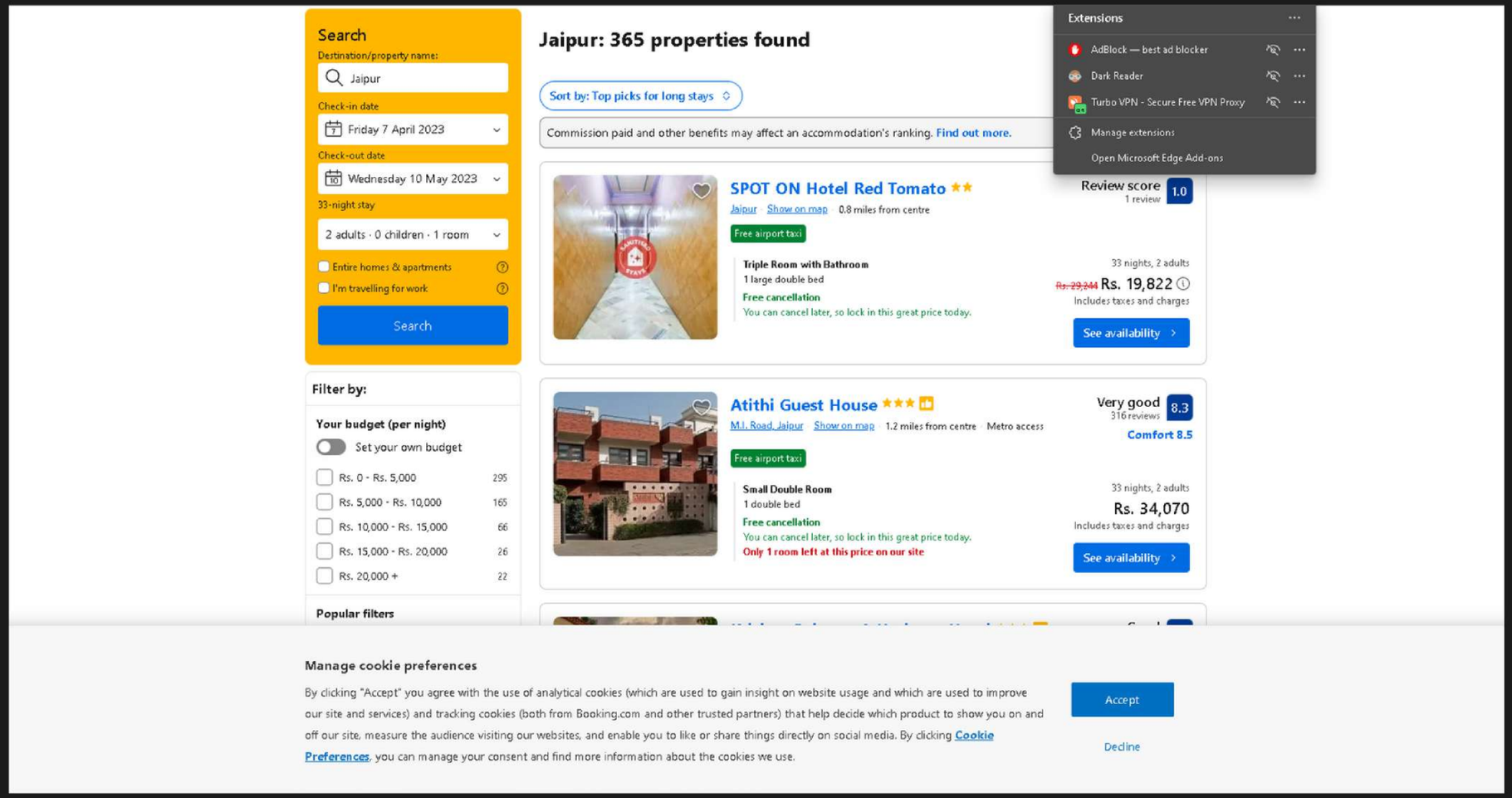
Checking hotel booking prices from different locations.




# So, Let's Turn On the VPN And Connect to UK

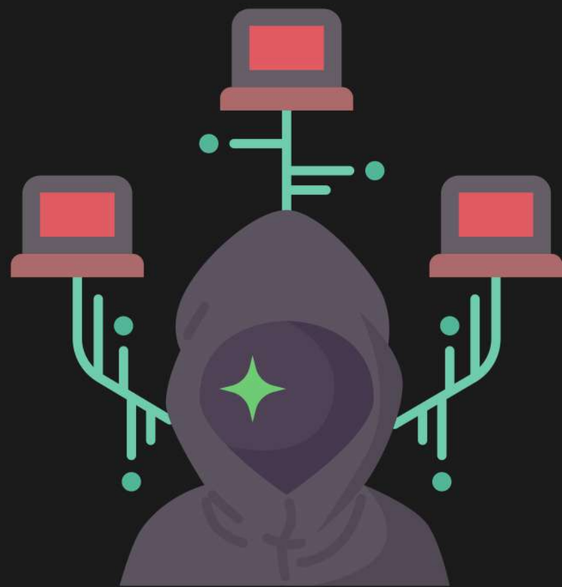
# Checking hotel booking prices from different locations.




## With VPN (UK)

## So, Now we can see the prices are higher for foreigners

# Checking IP address after connecting to VPN.



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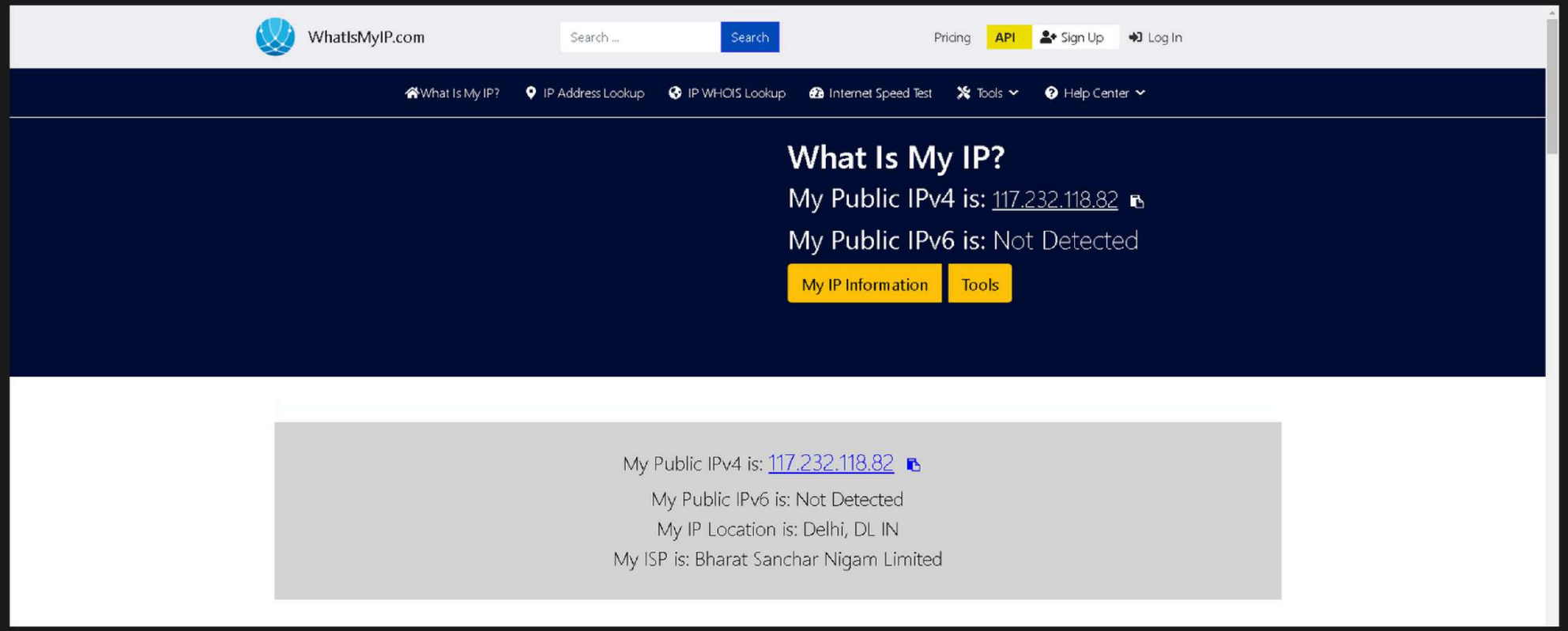
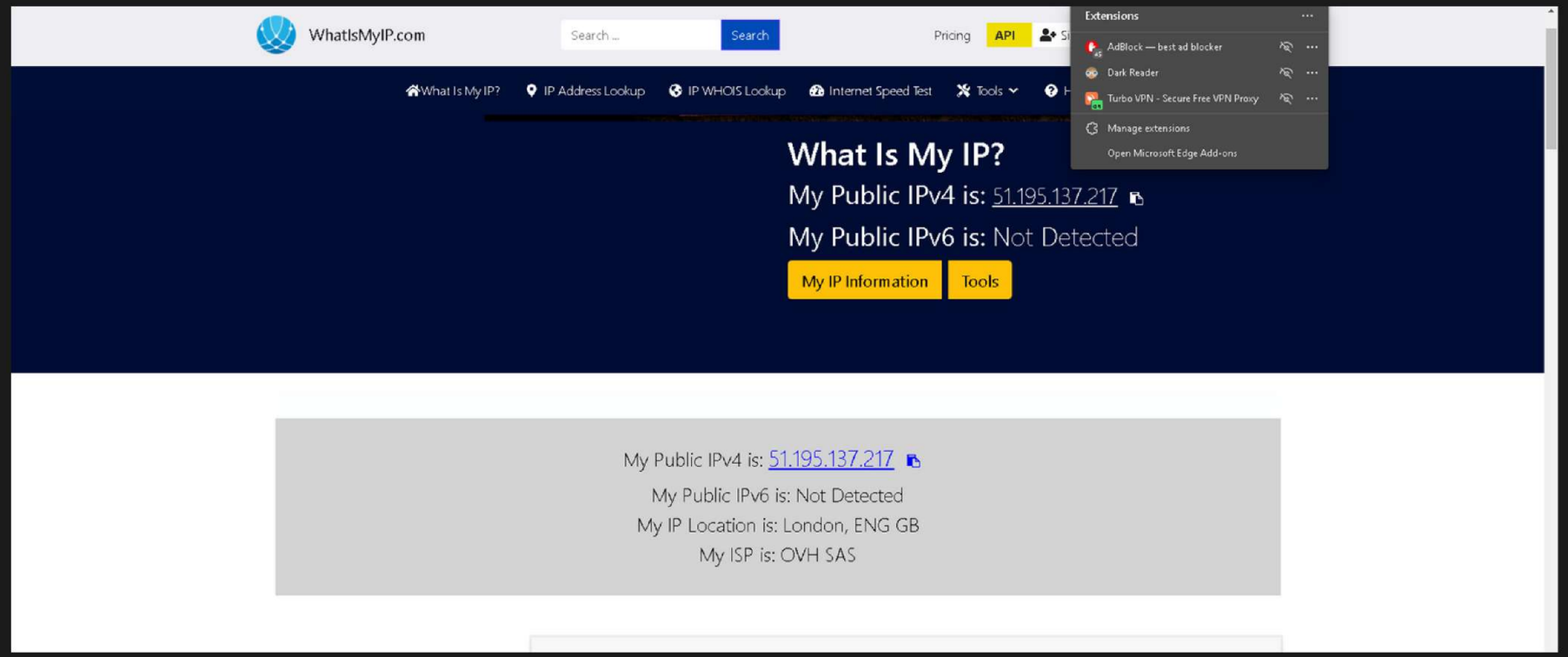


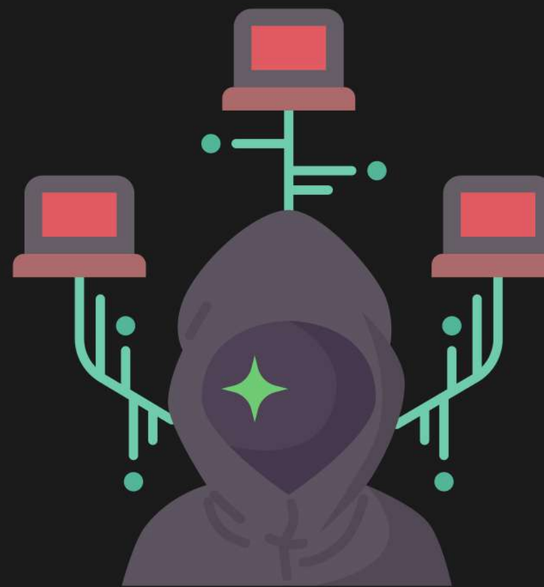

**Without VPN.**

# Checking IP address after connecting to VPN.

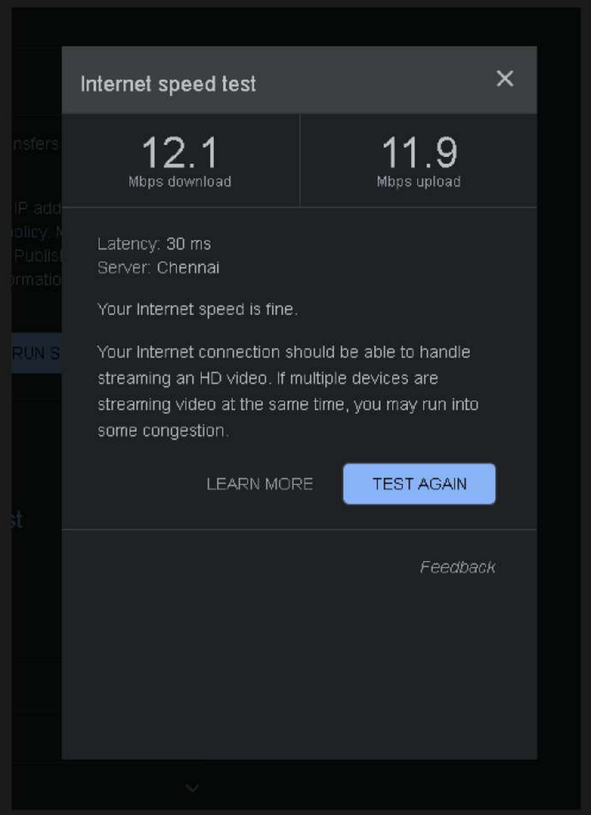



## With VPN

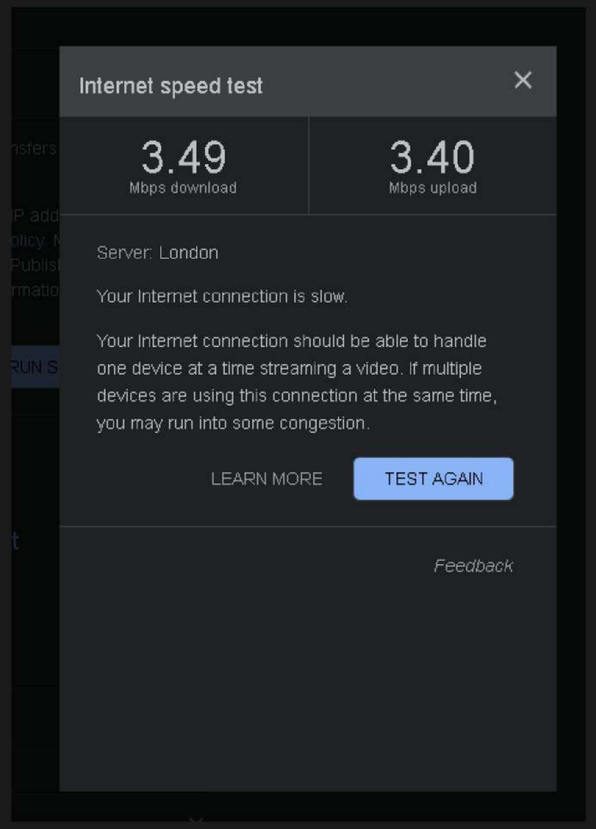
# Witnessing decrease in internet speed after connecting to VPN.



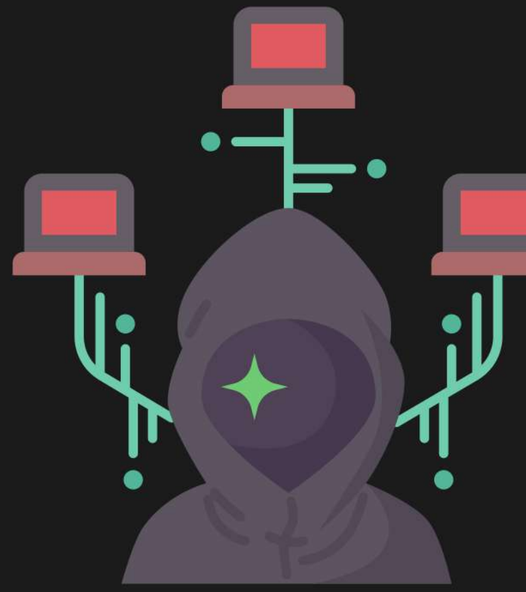
# Witnessing decrease in internet speed after connecting to VPN.




## Without VPN



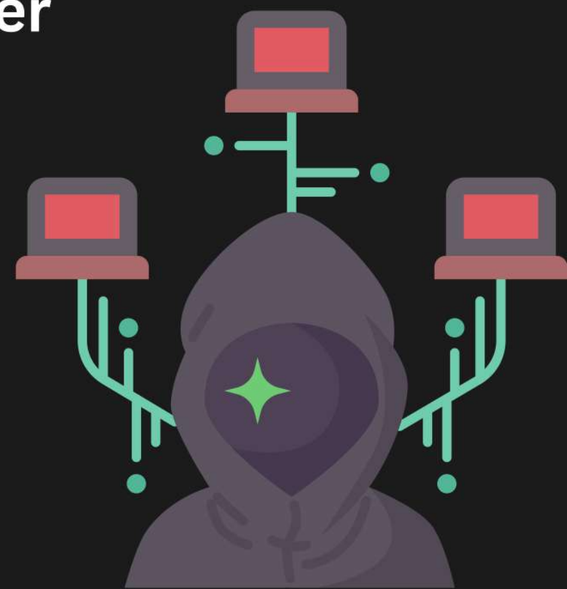

## With VPN



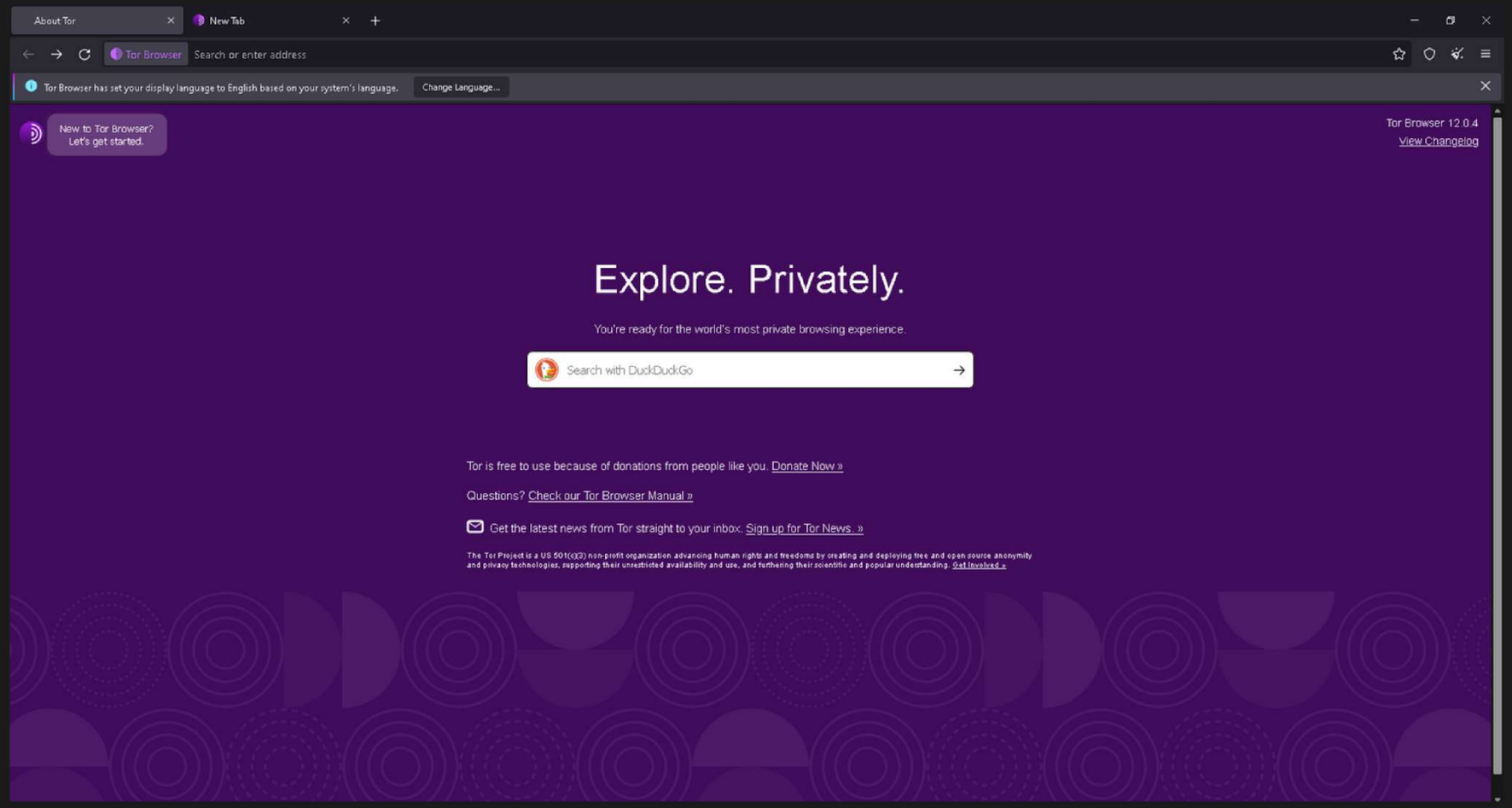
# Some More

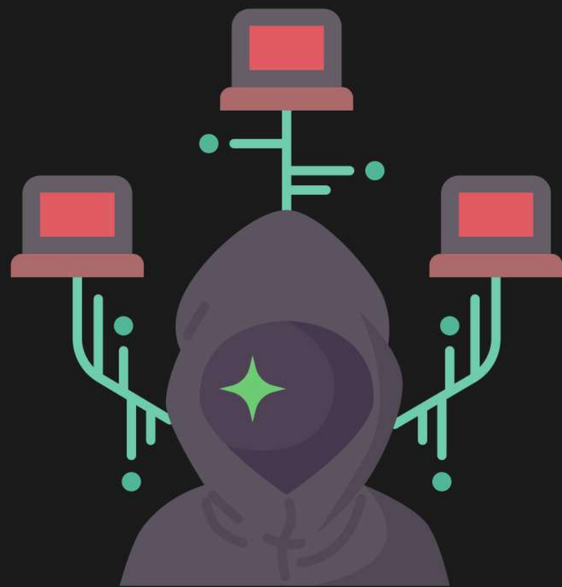
You can also buy paid games at a lower price
Using a VPN as in Some Countries
The games are cheaper as compared to our country

Saving money on online shopping - Some online retailers may offer different prices based on your location. By using a VPN, you can change your virtual location and potentially find better deals on products and services.

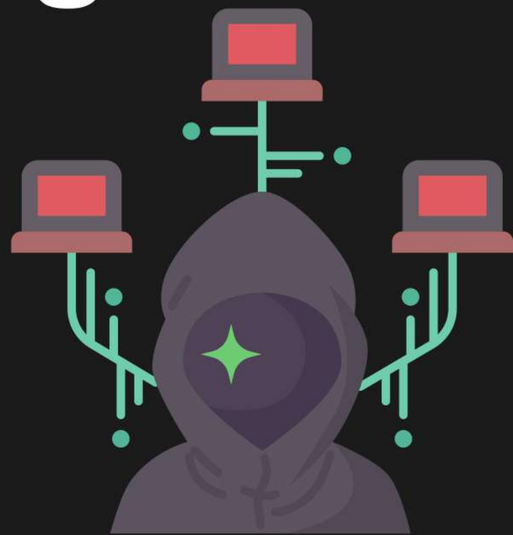


# Tor Browser

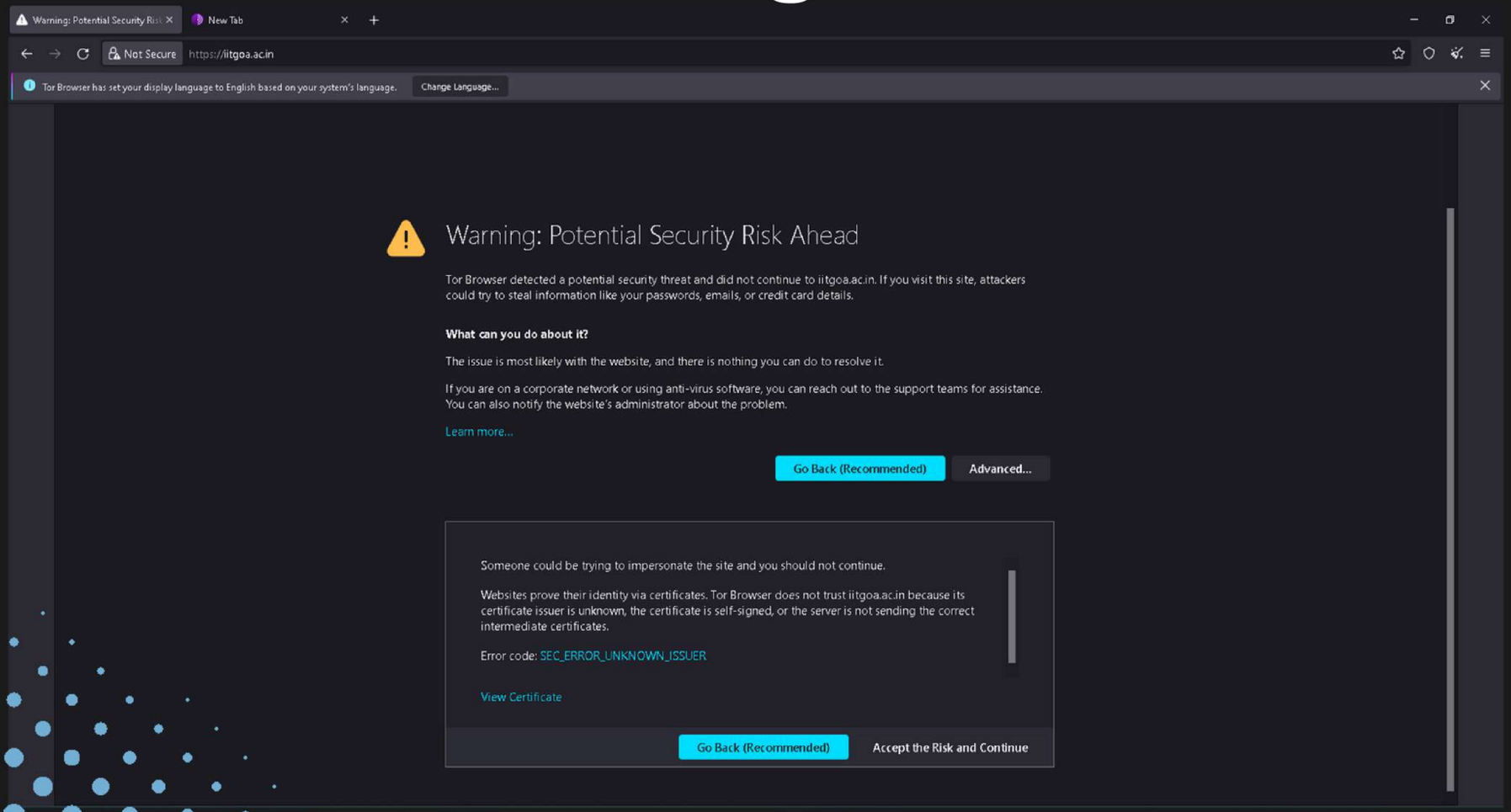

About Tor
New Tab
Tor Browser
Search or enter address
Tor Browser has set your display language to English based on your system's language.
Change Language...
New to Tor Browser?
Let's get started.
Tor Browser 12.0.4
View Changelog
Explore. Privately.
You're ready for the world's most private browsing experience.
Search with DuckDuckGo
Tor is free to use because of donations from people like you. Donate Now »
Questions? Check our Tor Browser Manual »
Get the latest news from Tor straight to your inbox. Sign up for Tor News. »
The Tor Project is a US 501(c)(3) non-profit organization advancing human rights and freedoms by creating and deploying free and open source anonymity and privacy technologies, supporting their unrestricted availability and use, and furthering their scientific and popular understanding. Get Involved »

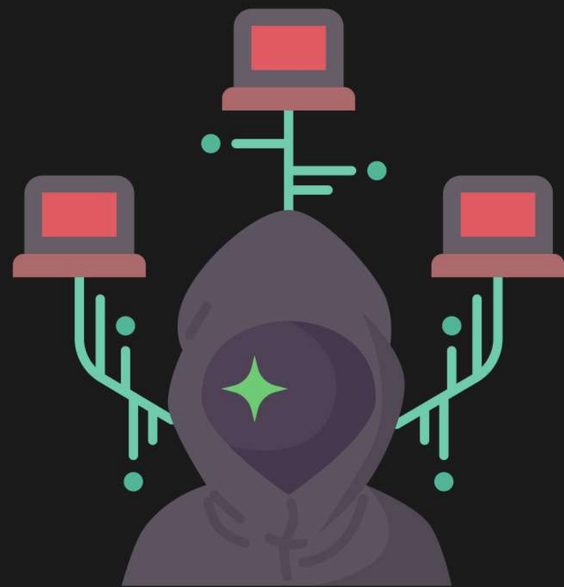


When we use the tor browser to get more information, we saw a something strange thing about our College Website.

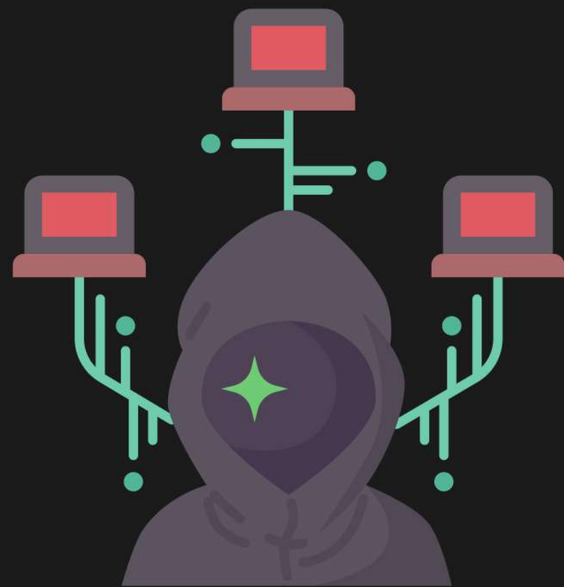


# Our college website is not secure, according to Tor.

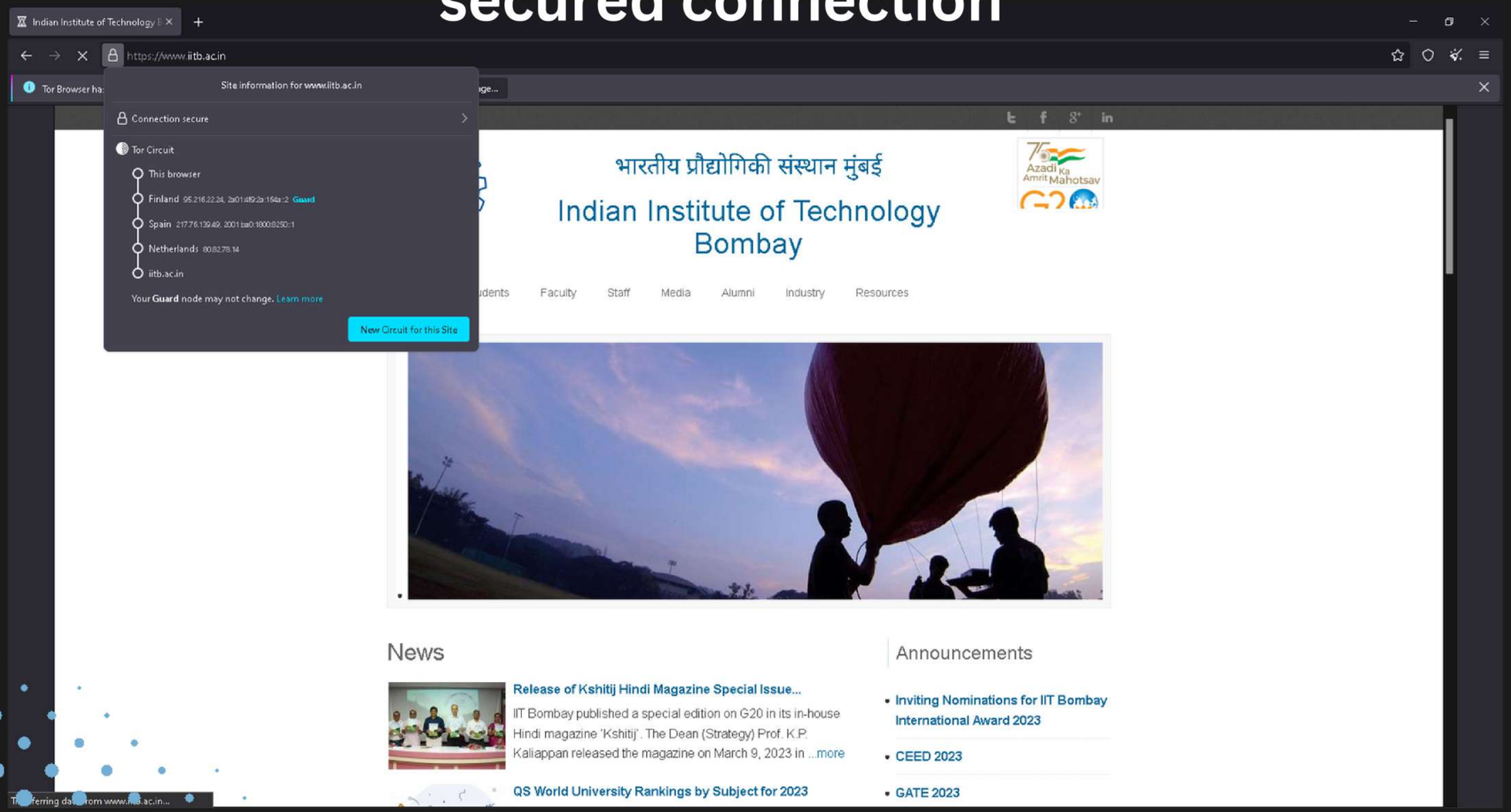


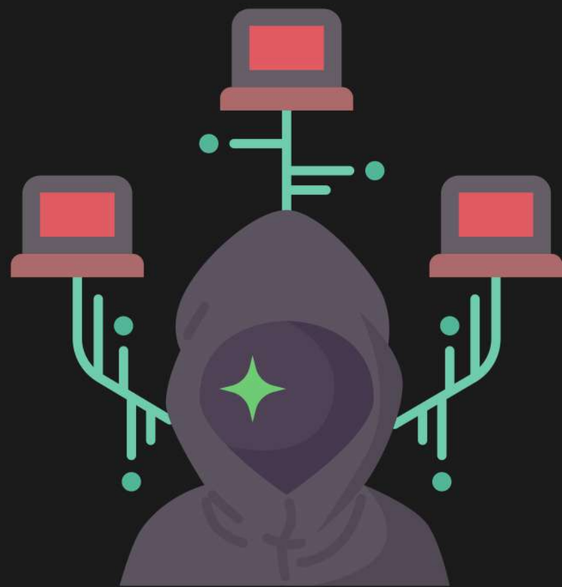



When this happens, we check the websites of other colleges.

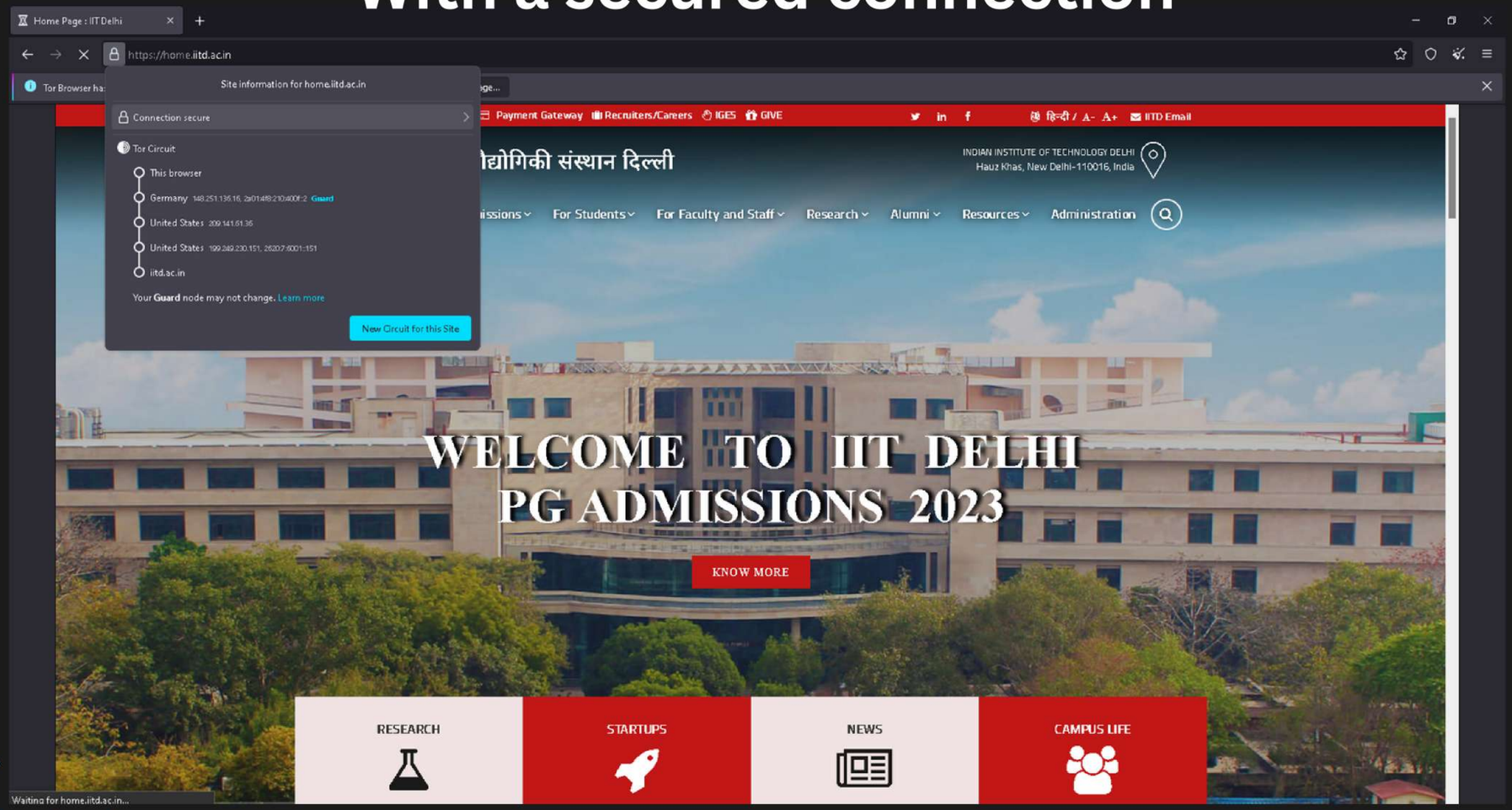


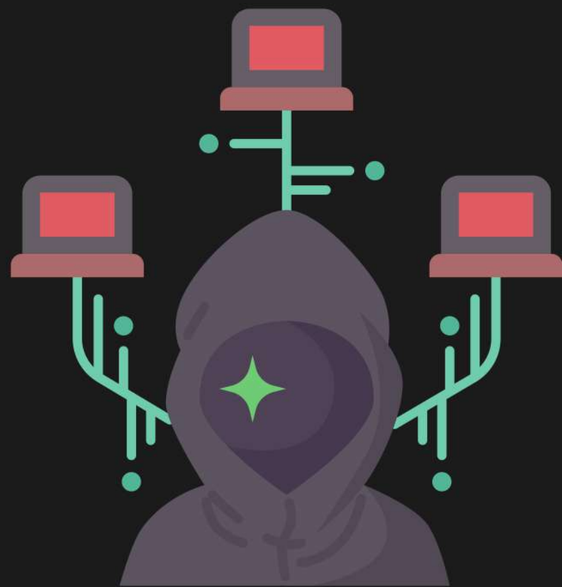
# But, We were able To access IIT Bombay website from the tor browser and it is showing a secured connection



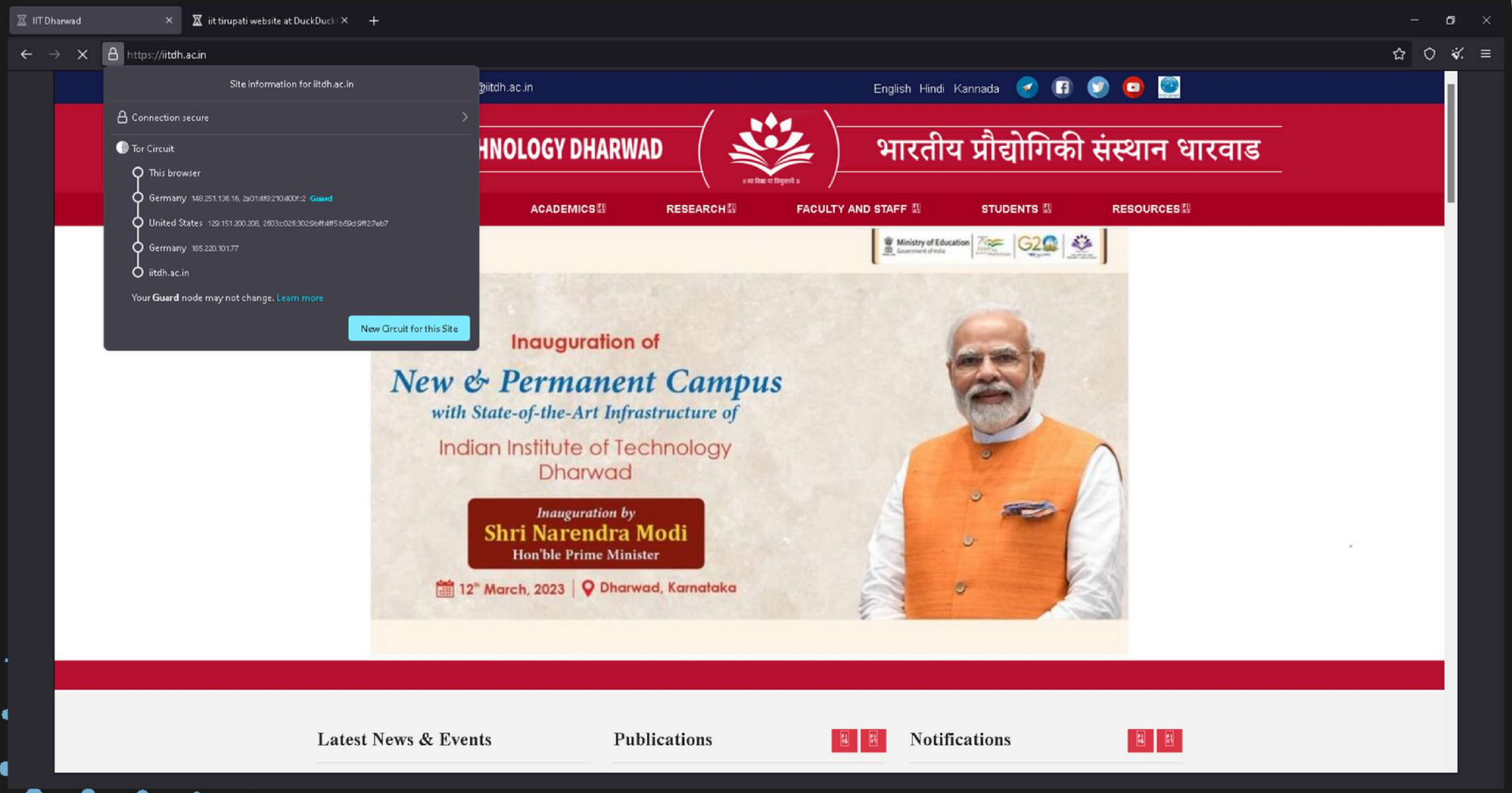



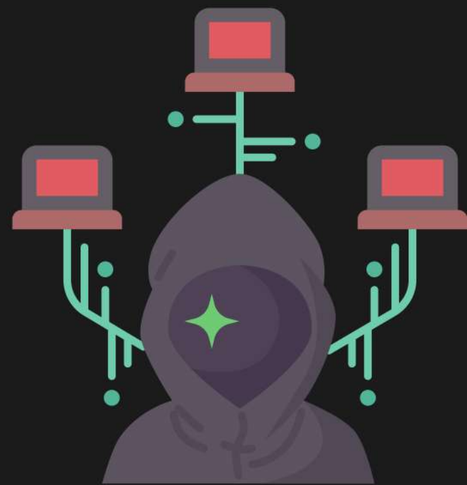
# Same We were able To access IIT Delhi website With a secured connection



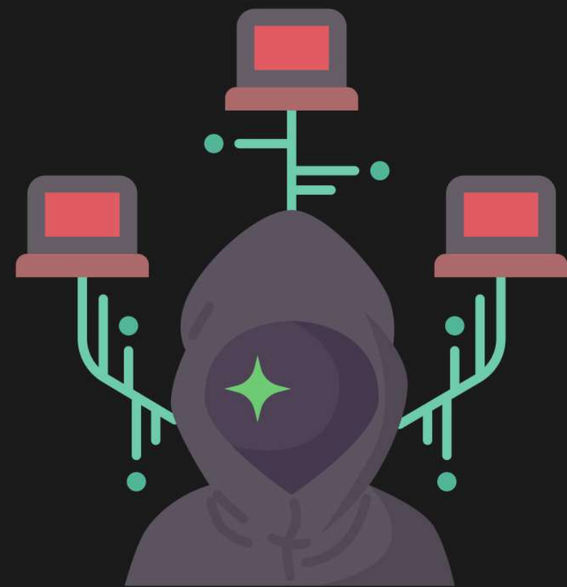
# We are also able To access the IIT Dharwad website(Third-gen)



## So, the question is why does this happen with our website? why it's showing Not Secure...

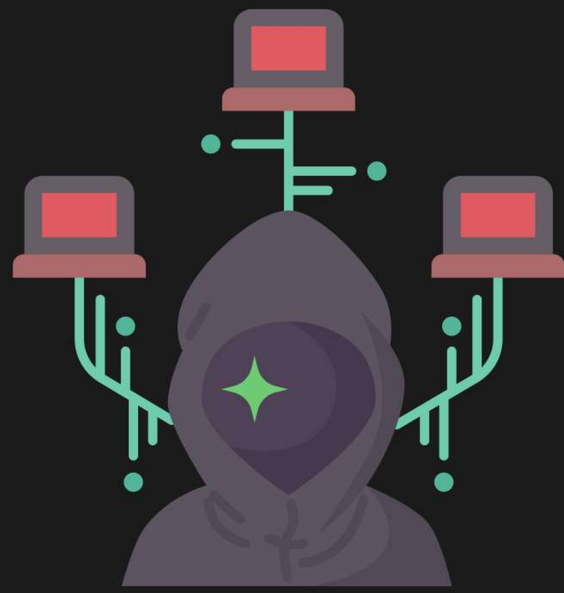
It's Showing Connection Not Secure, which means the connection between the browser and the website is not encrypted with HTTPS.



## Now again a new question happens because Our College website uses HTTPS Then Why is this Showing Not Secure?

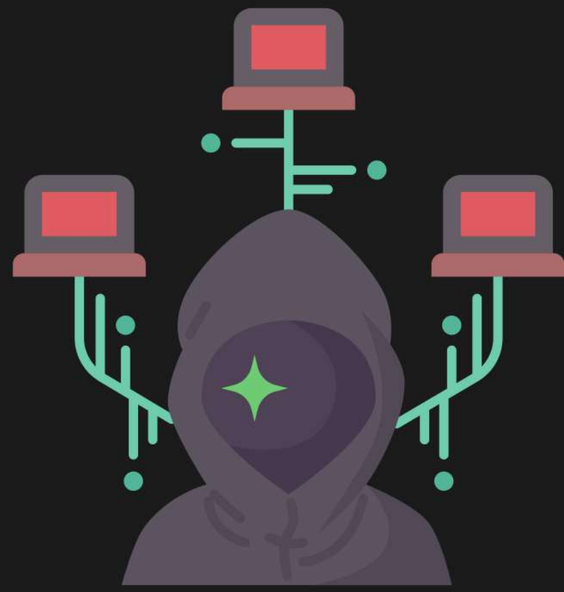
it can happen because the SSL/TLS certificate installed on the server is either invalid or not trusted by your browser.

SSL(Secure Sockets Layer)
TLS(Transport Layer Security)



## How can be Fix this?

Contact the website administrator and report the SSL error. The website administrator can check if the SSL/TLS certificate is valid and trusted.



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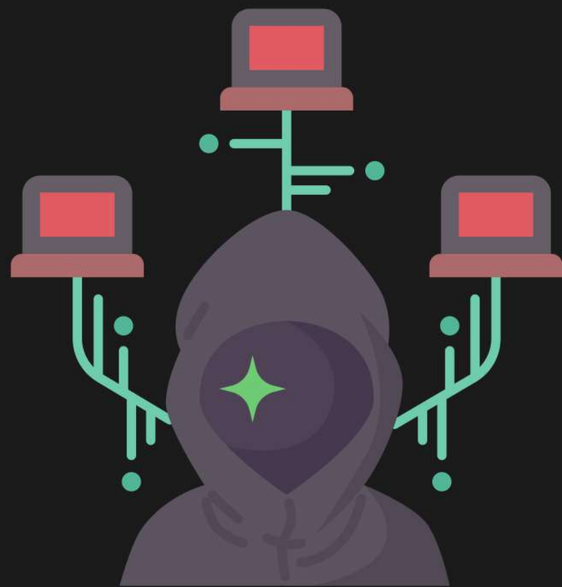

# thank you!