

Virtual Private Networks

What are they?



Disclaimer

- All material presented is not representative of my employer or any other party
- All thoughts, ideas, and opinions are my own unless otherwise stated



Overview

- Bio
- What is a VPN
- How to choose a commercial VPN
- How to deploy your own VPN
- Summary
- Questions

Who am I?

- Jacen Kohler
- Education:
 - UNT alumni, BS in Computer Engineering
 - SrDesign Capstone: NASA IPv6 DHCP in Space
- Career:
 - Goldman Sachs: Summer Intern & FTE Cyber Security Analyst
 - Big4 Consulting: Sr Cyber Security Consultant
 - Critical Mfg: Vulnerability Management Program Lead
- Community:
 - BSides DFW
 - Dallas Hackers Association
 - SouthWest CCDC Red Team Lead

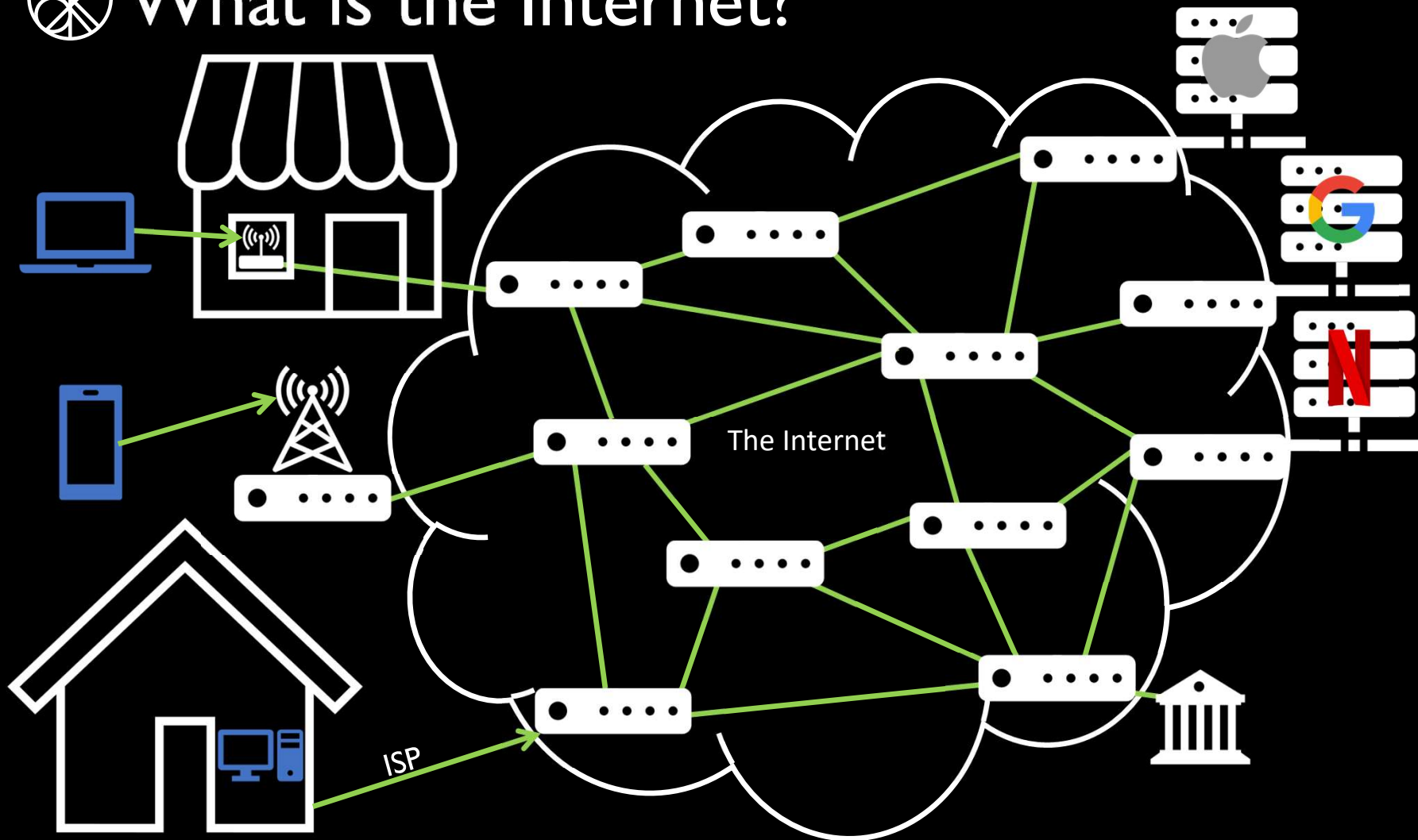
What is a VPN

- Virtual Private Network
 - “virtual point-to-point connection through the use of tunneling protocols over existing networks” – Wikipedia
 - “Allows you to access the public internet via a secure and private network connection.” – Microsoft
 - A way to access devices and networks from another network or location
 - How does a VPN work?

How Does the Internet Work?

- What is the internet?
- Open Systems Interconnection model (OSI model)
- Postal example

⊗ What is the Internet?



How Does the Internet Work?

- Open Systems Interconnection model (OSI model)
 1. Physical: start and end nodes are known/detectable for a given step
 2. Data Link: start and end nodes are known/detectable for a given step
 3. Network: source and destination IP addresses are known for entire trip
 4. Transport: source and destination ports are known for entire trip
 5. Session: used for creating a single communication “conversation”
 6. Presentation: protocol conversion and data compression
 7. Application: contains content, often encrypted via HTTPS

Layer		Protocol data unit (PDU)	Function ^[27]
Host layers	7 Application	Data	High-level protocols such as for resource sharing or remote file access, e.g. HTTP.
	6 Presentation		Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
	5 Session		Managing communication sessions, i.e., continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
	4 Transport	Segment, Datagram	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing
Media layers	3 Network	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2 Data link	Frame	Transmission of data frames between two nodes connected by a physical layer
	1 Physical	Bit, Symbol	Transmission and reception of raw bit streams over a physical medium

Postal Mail Example

- Open Systems Interconnection model (OSI model)
 1. Physical: Road between two USPS facilities
 2. Data Link: Address of two USPS facilities
 3. Network: Addresses for source and destination of mail
 4. Transport: Unit number for source and destination of mail
 5. Session: Similar to the stamp in that it is single use for this piece of mail
 6. Presentation: The envelope itself, can be nested in other envelopes
 7. Application: Actual contents of envelope or parcel

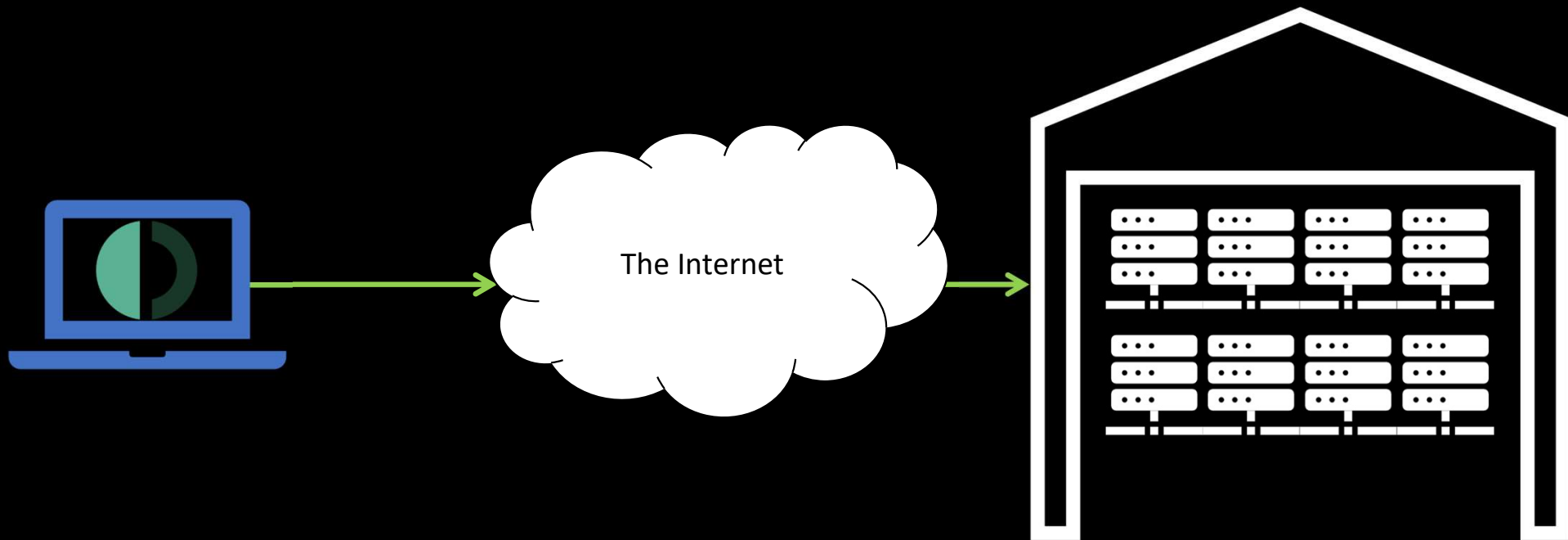




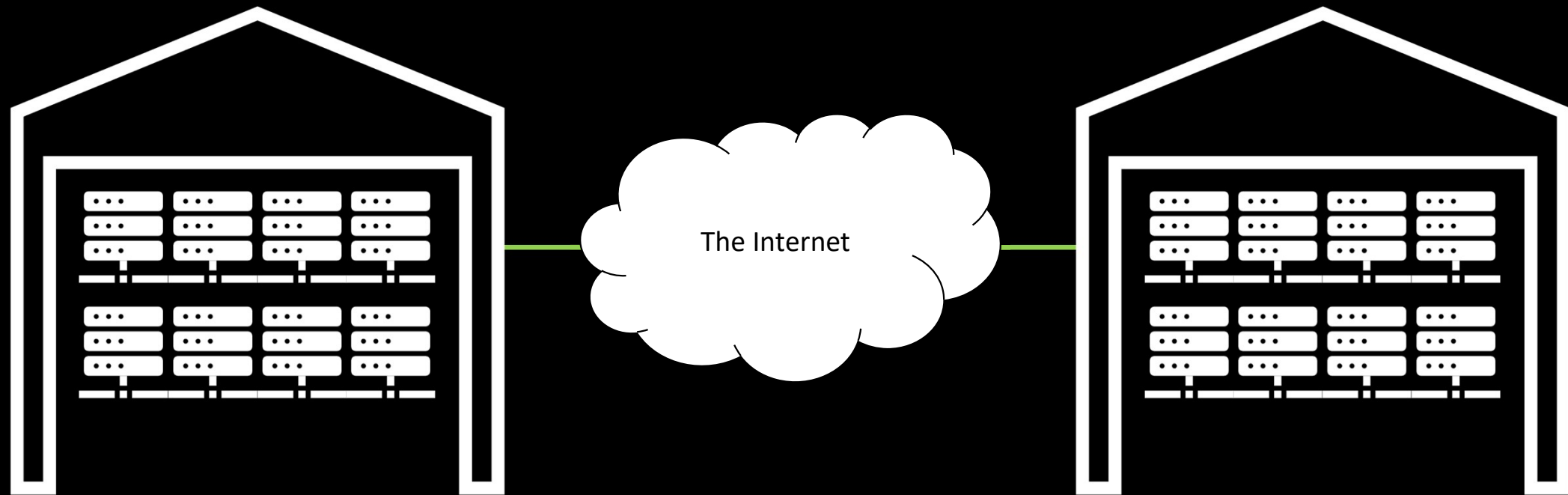
Types of VPNs

- Remote Access
- Site to Site
- Extranet
- TOR

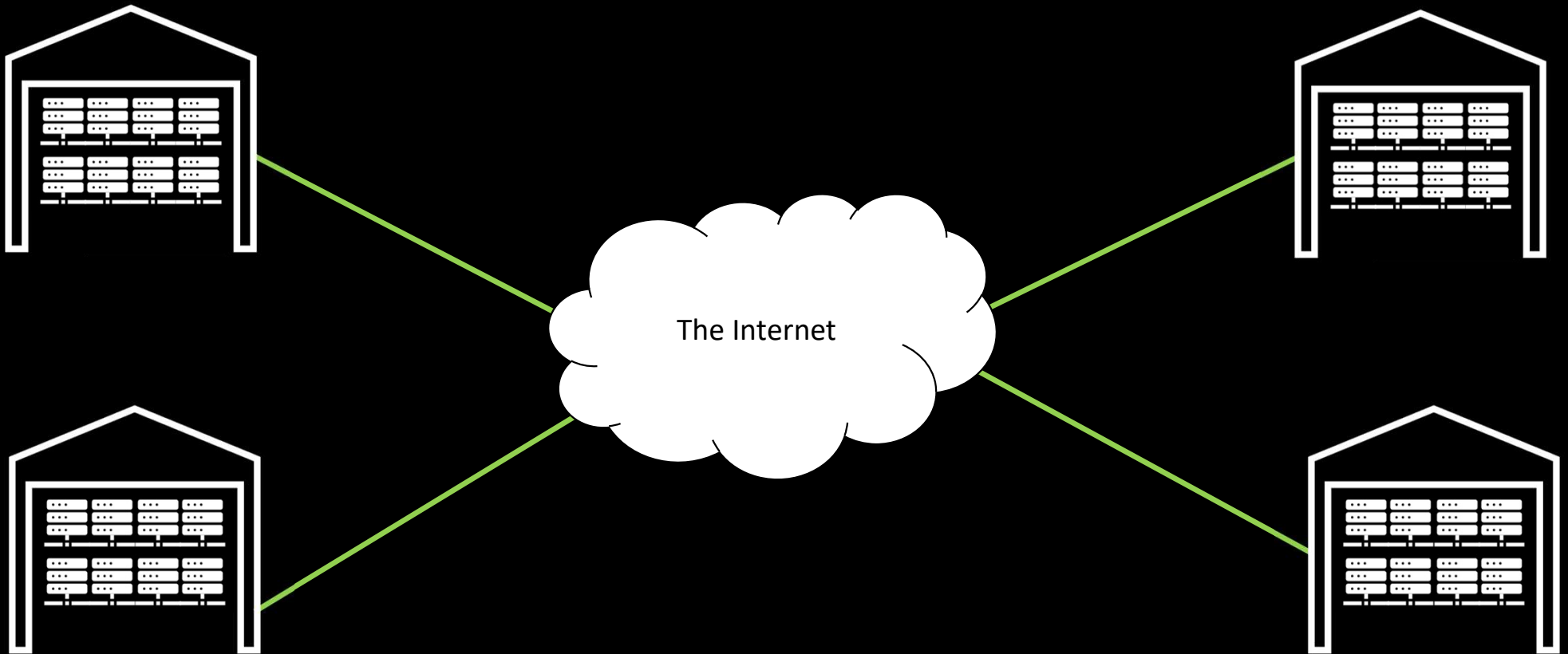
Remote Access

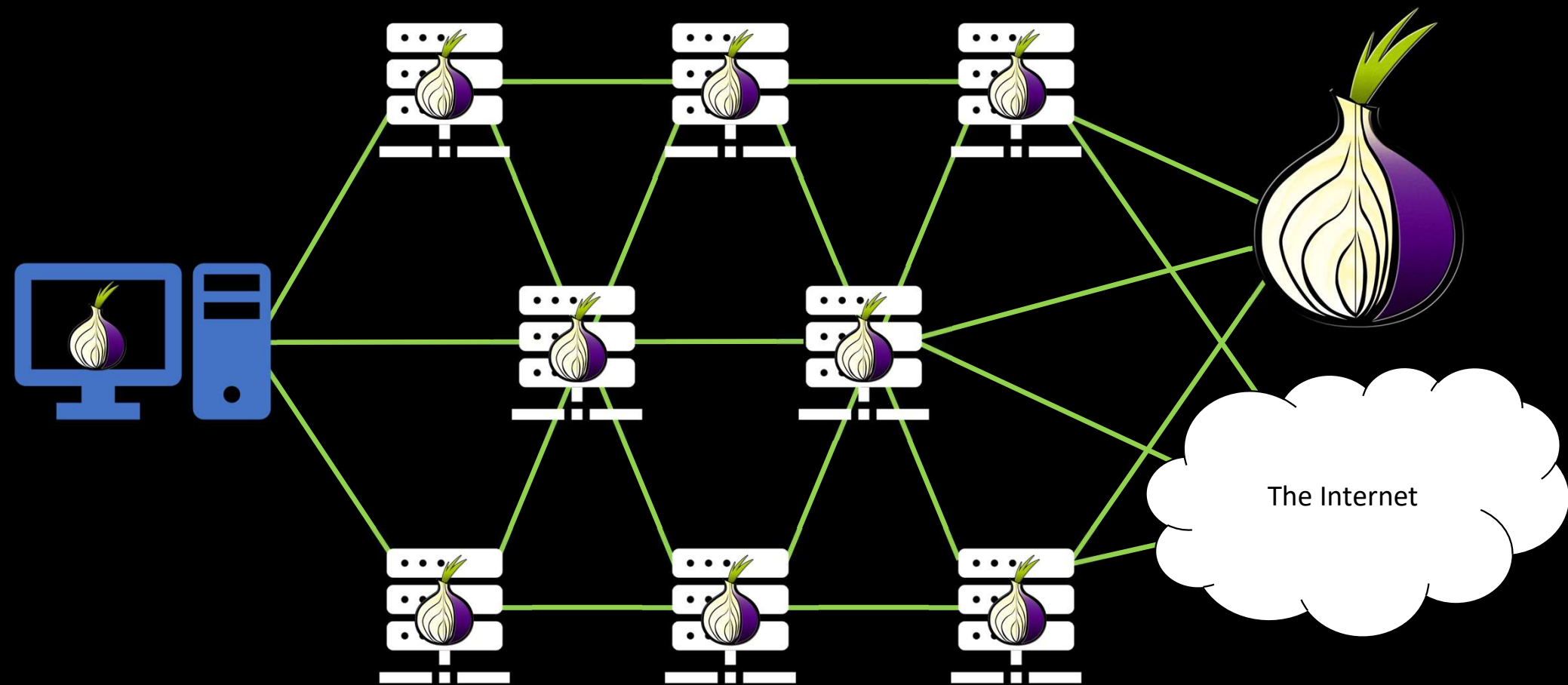


Remote Access



Extranet





What a VPN is not?

- What a VPN MIGHT be
 - Encrypted
 - Hides destination from those who can intercept traffic
- What a VPN is not?
 - SSL/TLS
 - Encrypted (potentially)



Threat Modeling

- Questions to ask yourself:
 - Why are you interested in a VPN?
 - Hide you location
 - Protect your identity
 - What are you attempting to protect yourself from?
 - Advertisers and marketers
 - Internet Service Providers (ISP) snooping
 - Who are you wanting to prevent from seeing your traffic destination?
 - ISP
 - Destination website/services
 - What other ways can these entities collect information about you?
 - Overly broad app permissions on phones
 - User submitted information



What to look for in a commercial VPN

- What jurisdiction (geography) are they located in?
 - Five Eyes: US, UK, Canada, New Zealand, Australia
 - Nine Eyes: Five Eyes, Denmark, France, the Netherlands, and Norway.
 - Fourteen Eyes: Nine Eyes, Germany, Belgium, Italy, Sweden, and Spain.
- Have they been audited?
- Do they log your traffic?
- What is their payment method?

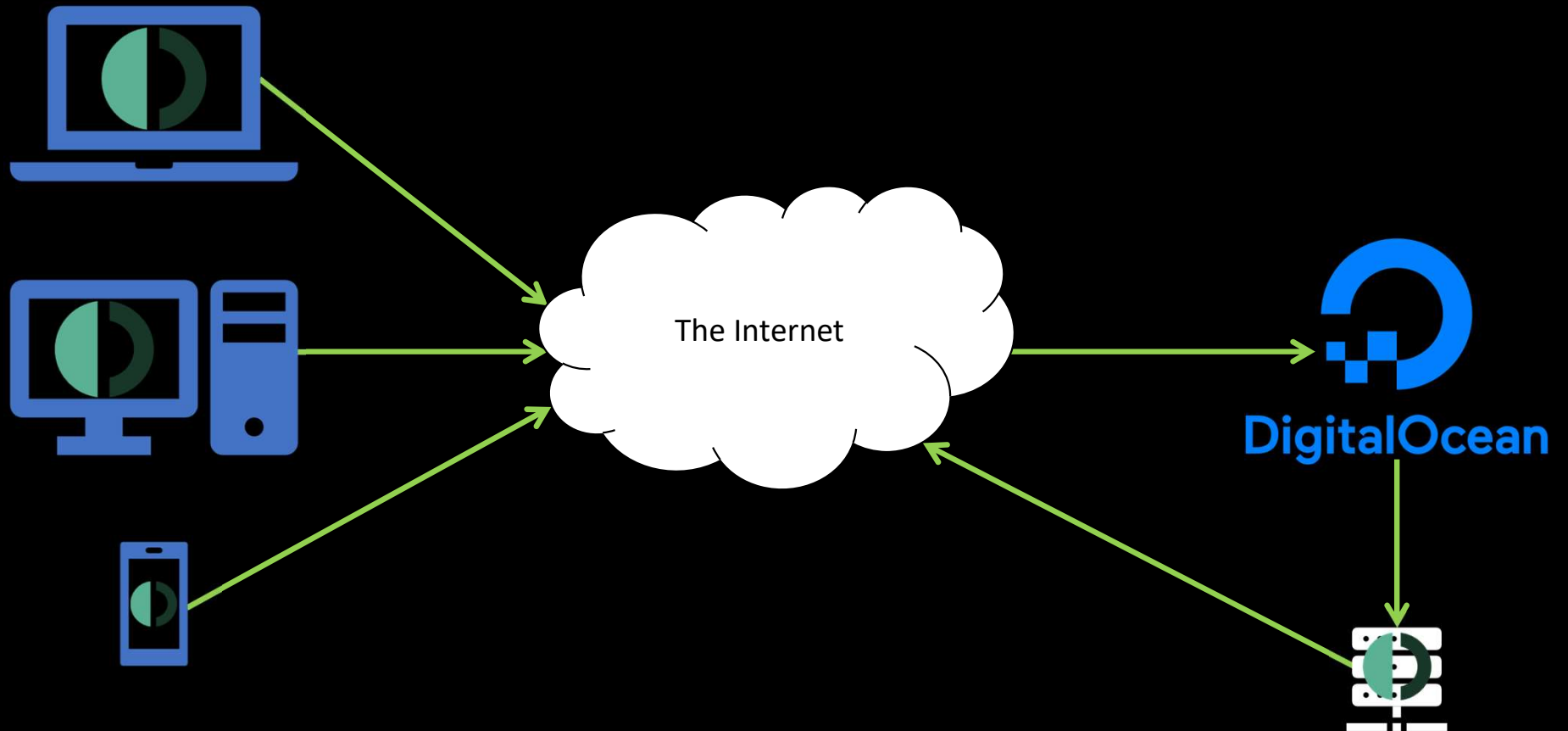
How to deploy your own VPN

- Deploy Outline to a Digital Ocean Droplet
- Deploy OpenVPN to a home router

How to deploy Outline to a Droplet

- What is Outline?
 - Simple VPN using shadowsocks
 - Part of Google's incubator Jigsaw
 - Uses technology to address geopolitical issues
 - Independently audited most recently in 2022-Dec
 - Open source
- What is Digital Ocean?
 - Cloud service provider
 - Historically friendly to hosting VPNs
- What does this method achieve?
 - Makes your traffic appear to originate from the cloud service provider
 - Does not make you invisible

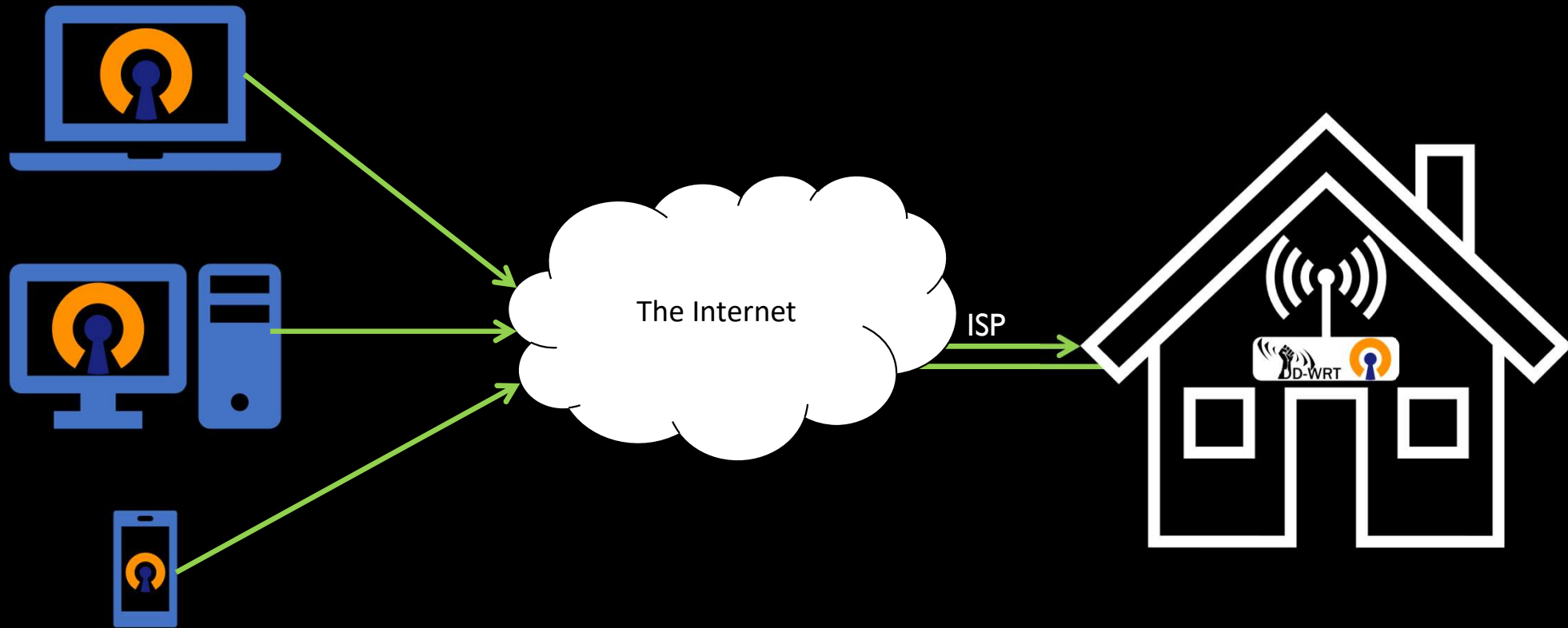
⊗ What We are Building



How to deploy OpenVPN to a Router

- What is OpenVPN?
 - Open Source VPN software using OpenSSL
- Does it need to be a router?
 - Could be a server
 - Still requires router configuration
- What does this method achieve?
 - Allows you to access devices in your home network
 - Printers
 - File servers
 - Smart Home devices

🚫 What We are Building





Summary

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Questions

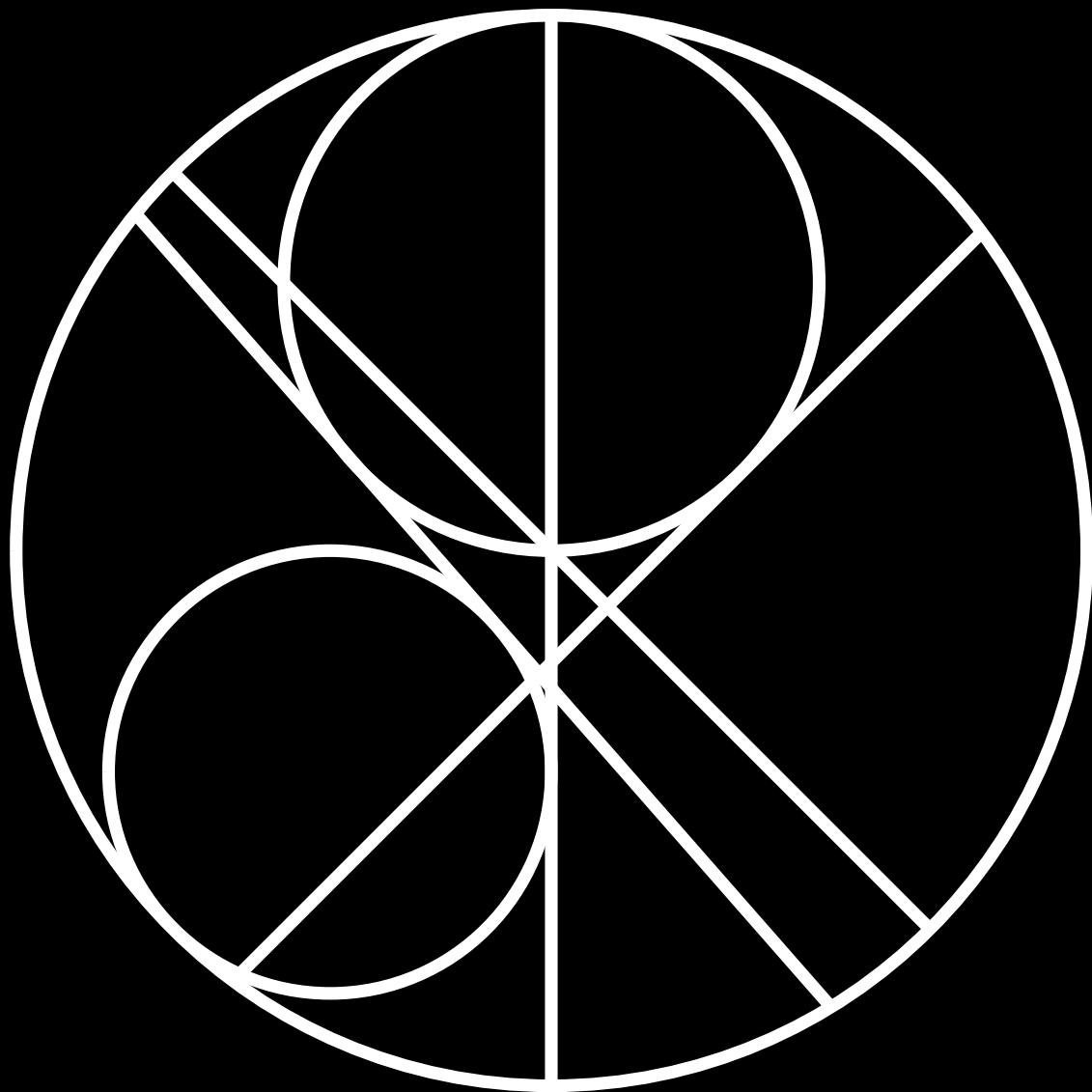
JacenRKohler.net

 [LinkedIn.com/in/JacenRKohler](https://www.linkedin.com/in/JacenRKohler)

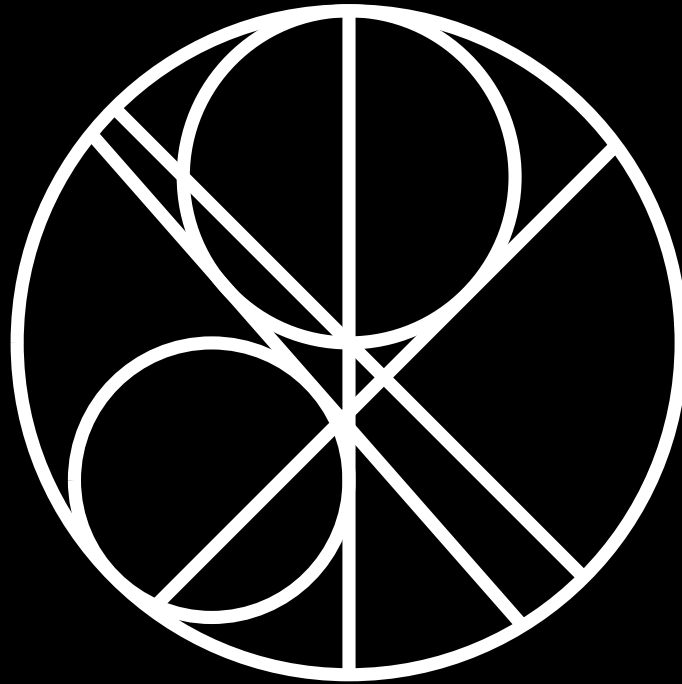
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 [GitHub.com/JacenRKohler/Presentations](https://github.com/JacenRKohler/Presentations)



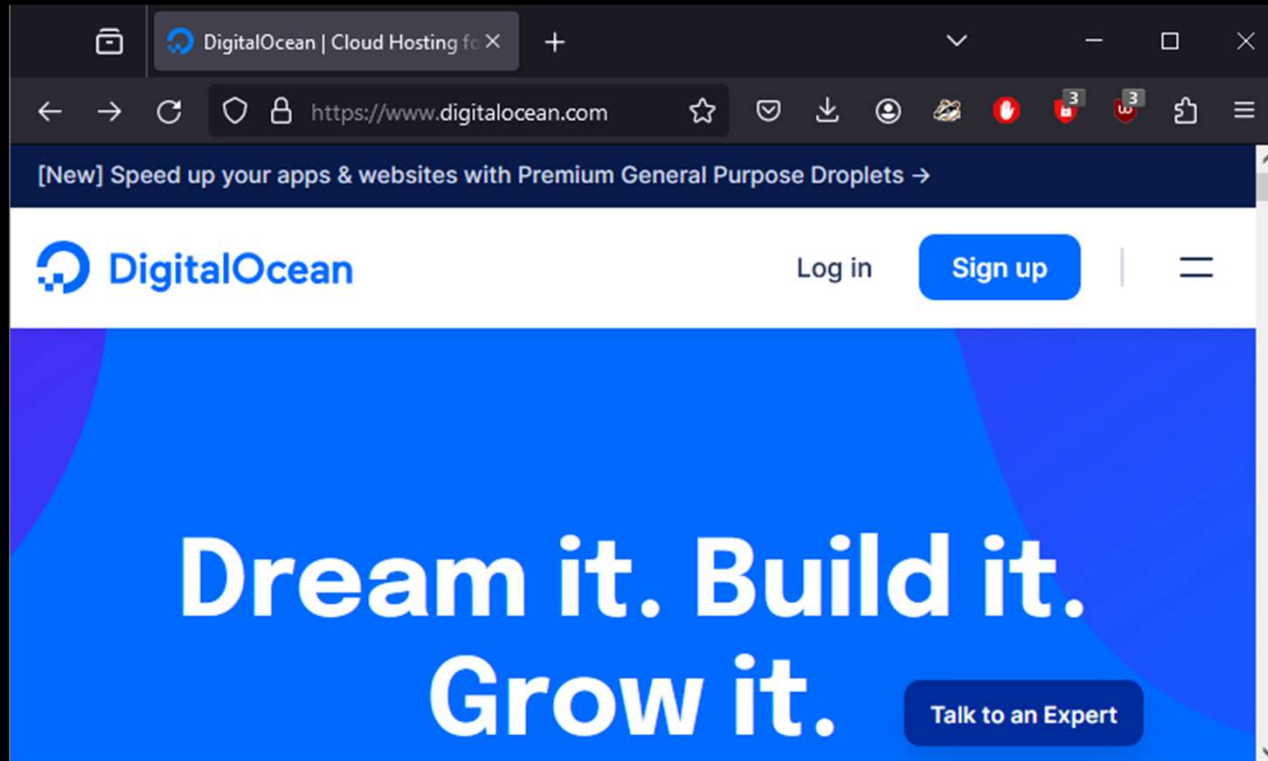




Backup Slides

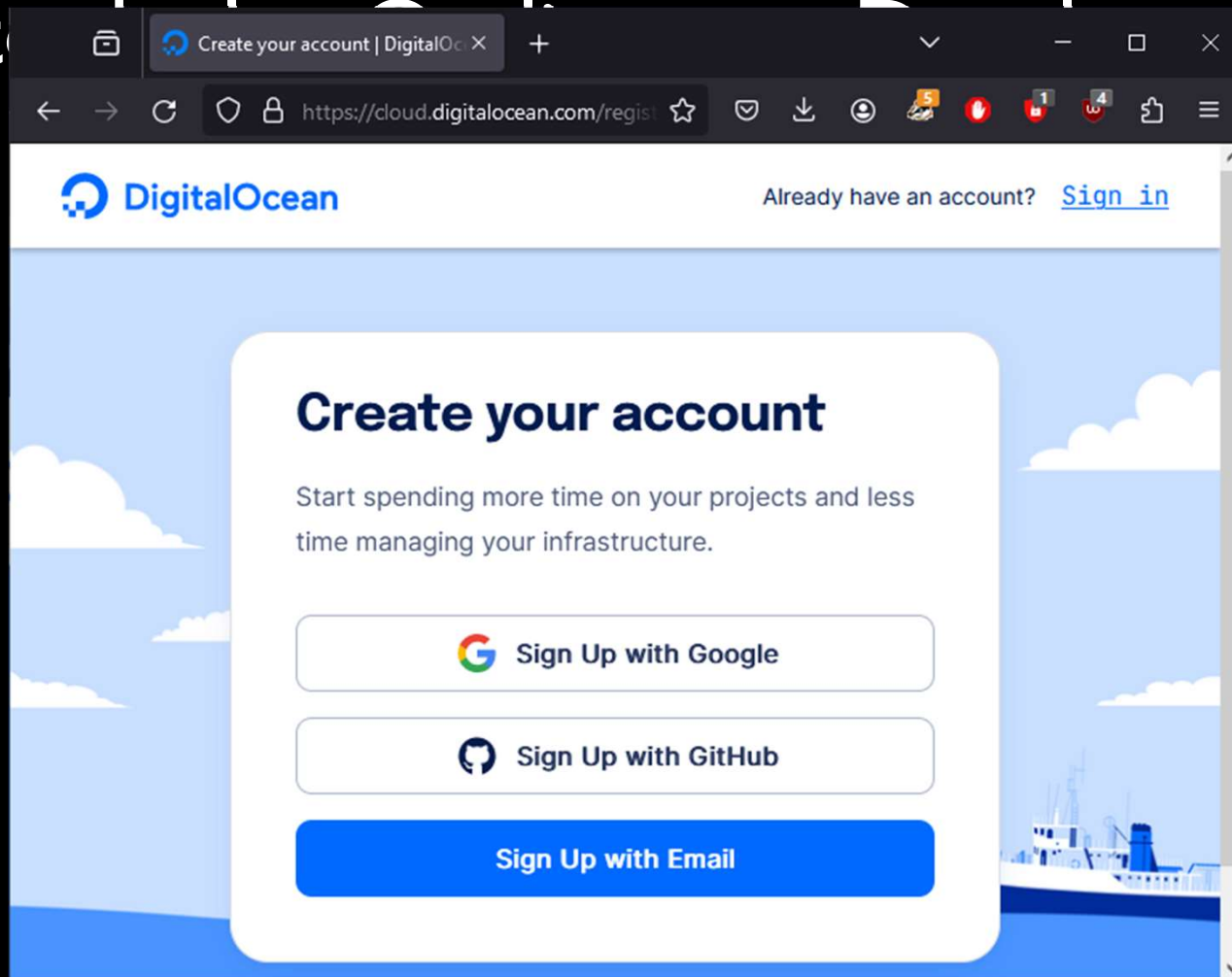
Just In Case

How to deploy Outline to a Droplet

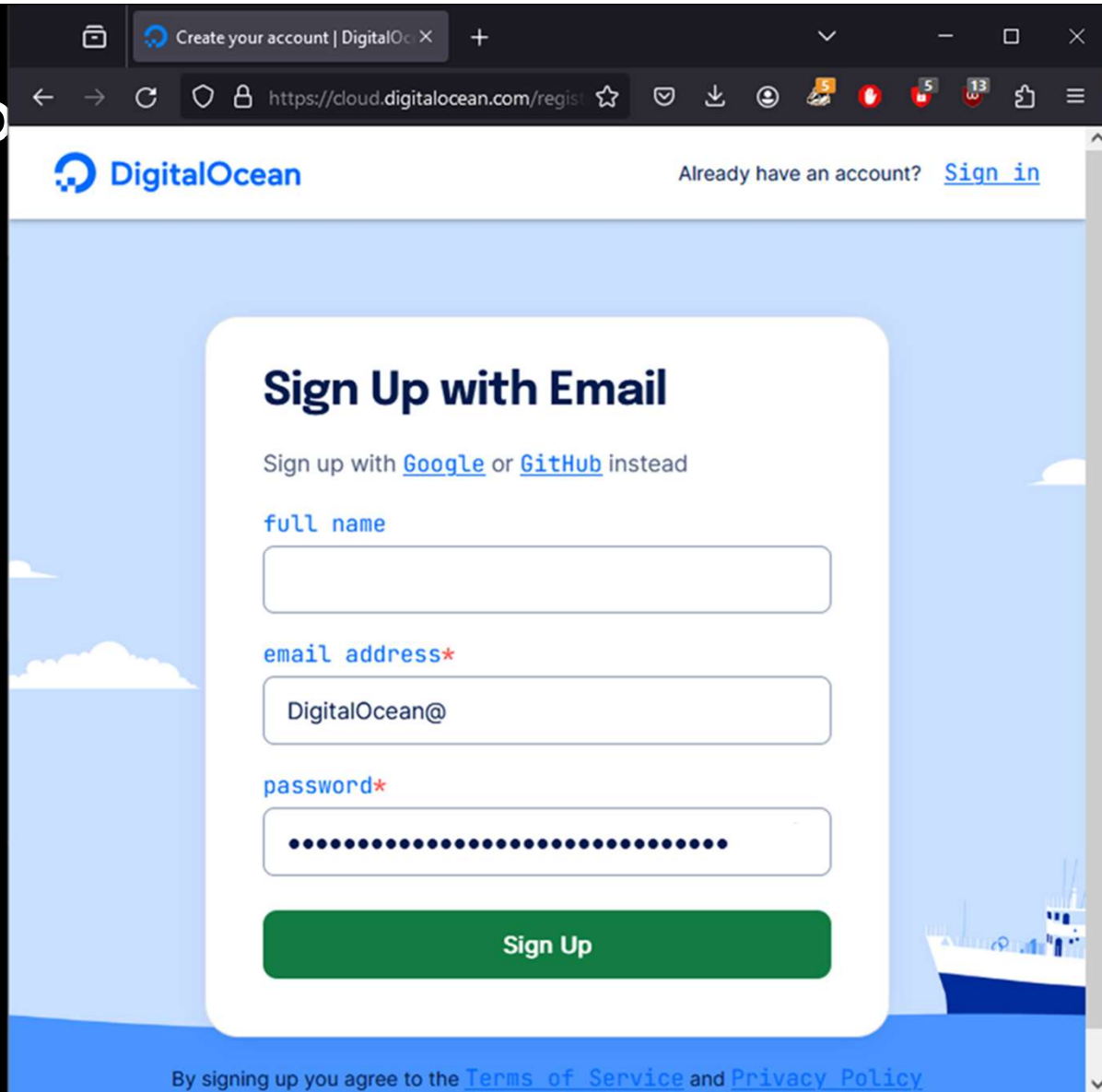




How to




How to



The image shows a web browser window displaying the DigitalOcean registration page. The browser's address bar shows the URL `https://cloud.digitalocean.com/register`. The page header includes the DigitalOcean logo and a link to 'Sign in' for existing users. The main content area is titled 'Sign Up with Email' and offers an alternative to sign up with Google or GitHub. It contains three input fields: 'full name', 'email address*' (with 'DigitalOcean@' entered), and 'password*'. A green 'Sign Up' button is positioned below the password field. At the bottom, a footer states that signing up implies agreement to the 'Terms of Service' and 'Privacy Policy'.

Create your account | DigitalOc X

← → ↻ 🔒 https://cloud.digitalocean.com/register ☆

 **DigitalOcean** Already have an account? [Sign in](#)

Sign Up with Email

Sign up with [Google](#) or [GitHub](#) instead

full name

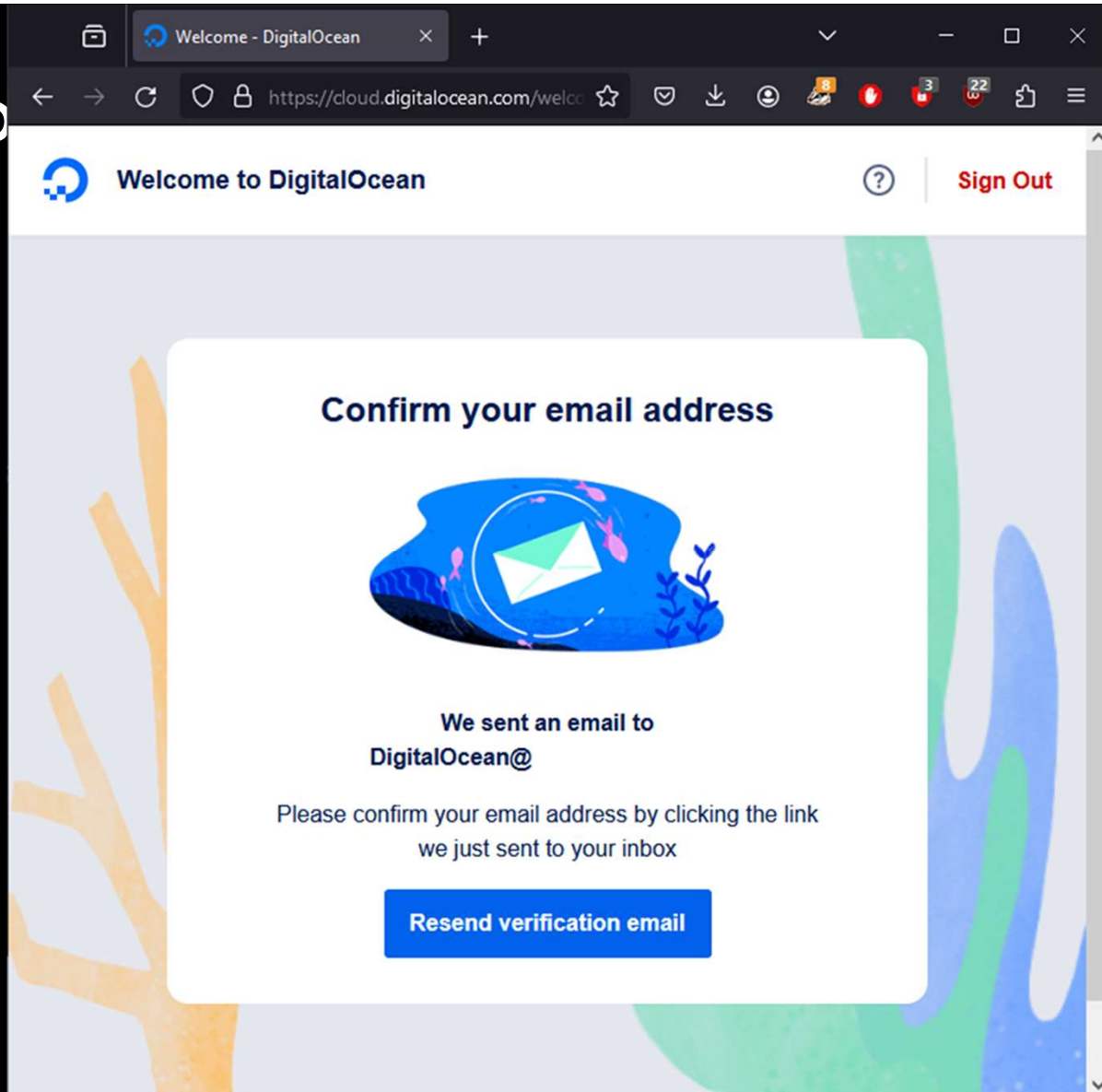
email address*

password*

Sign Up

By signing up you agree to the [Terms of Service](#) and [Privacy Policy](#)

How to





Welcome - DigitalOcean

https://cloud.digitalocean.com/welcome?i=6d8

Welcome to DigitalOcean

Sign Out

Receive Resources And Support That Meet Your Unique Needs

Every customer is different. To help us better support your unique cloud journey with product and business-specific resources, we'd love to hear more about you.

What do you plan to build on DigitalOcean?

Other

What is your role or business type?

Other

What is your monthly spend on cloud infrastructure across cloud platforms? (Provide an estimate)

\$0 - \$50

How many employees work at your company?

2-9

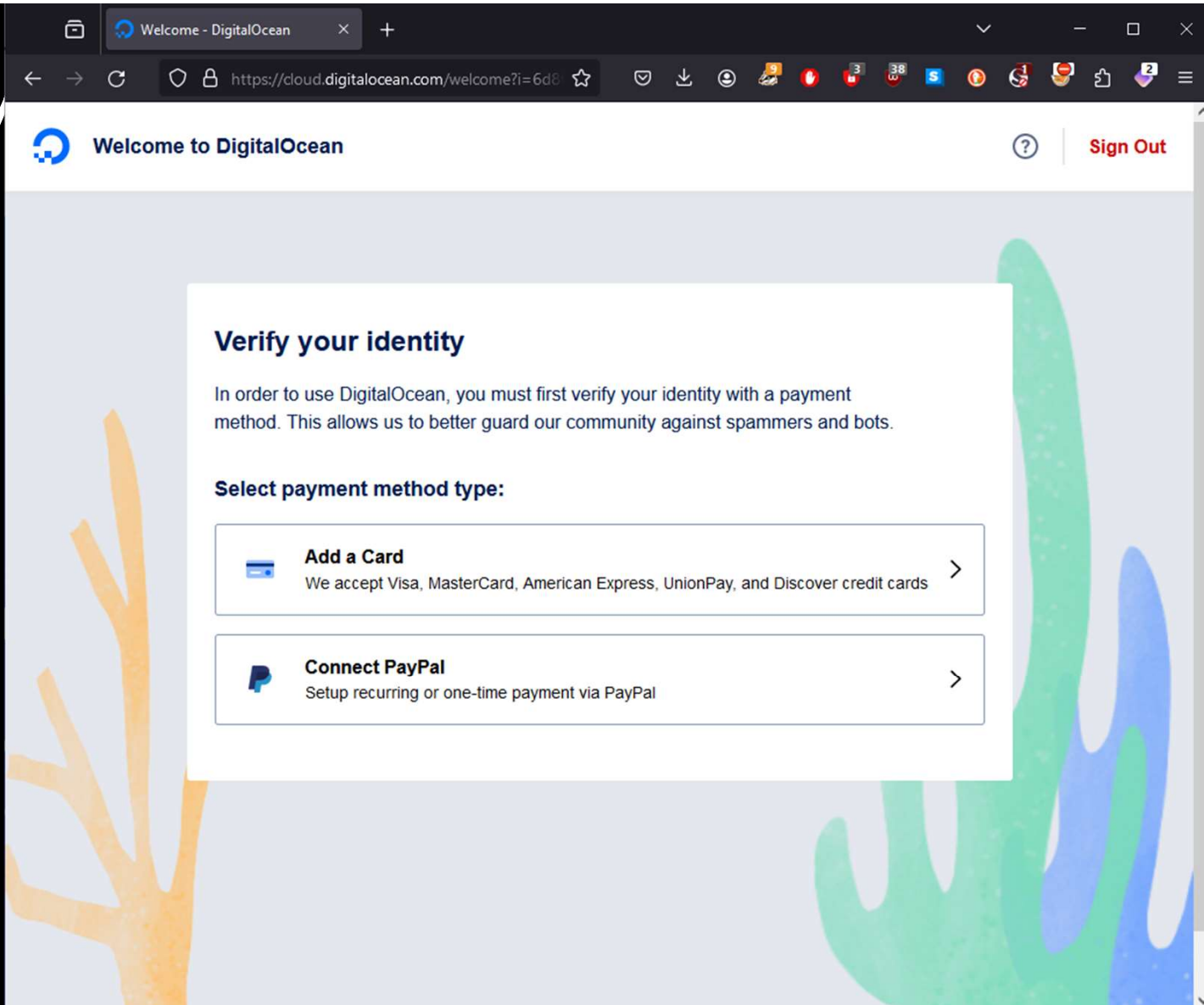
How do you prefer to manage cloud resources?

I'm not sure

Submit



How



How to

Welcome - DigitalOcean

https://cloud.digitalocean.com/welcome?i=6d0

Add Card

Cancel

Card Details

Cardholder name*

We won't charge your card. You may see a temporary pre-authorization charge to verify the card, which will be reversed within a week.

Billing Address

Please provide the billing address associated with the credit card you've provided above.

Country

Address Line 1*

Address Line 2

City*

State / Province / Region*

▼

Zip / Postal Code*

Save payment method

Why do I have to add a payment method?

In order to keep DigitalOcean a safe and sustainable platform, we require new members to verify their identity with a payment method.

[Learn more about billing](#)

How to

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