

Name: _____

Date: _____

Score: _____

Best VPN for Raspberry Pi

Deploying lightweight VPN clients and ARM binaries on Raspberry Pi boards.

RASPBERRY PI VPN SETUPS LEARNING OVERVIEW

LEARNER

STUDENT STATUS

Network Defender Track

SECURE

CONNECTION STATUS

Shielding data packets

100%

LEAK DEFENSE

DNS & IPv6 leak protection

Welcome! This activity packet guides you through Raspberry Pi VPN configurations. You will explore ARM binary packaging, CPU constraints, lightweight WireGuard setups, and headless CLI routers.

WORKSHEET CHECKPOINTS

- ☐ **Part 1-4:** Master VPN and network security configurations.
- ☐ **Part 5-7:** Solve crossword & word search puzzles.
- ☐ **Part 8-9:** Solve case studies & cipher challenge.
- ☐ **Part 10:** Review basic & advanced FAQ pages.
- ☐ **Part 11:** Explore 10 interesting real-world facts.

Open the VPN.com Best VPNs Guide

URL: <https://www.vpn.com/vpn/best-vpn-for-linux-raspberry-pi/>

Your Raspberry Pi VPN Learning Roadmap

- Configure secure VPN connections using command-line interface utilities.
- Build firewall rules to prevent unencrypted public traffic leaks.
- Diagnose DNS resolution conflicts and enforce secure nameservers.

RASPBERRY PI VPN SETUPS INSTRUCTIONS

Answer the multiple choice and true/false questions, complete the fill-in-the-blank sentences using the word bank, match definitions, and solve the crossword and word search puzzles. Apply your knowledge to ARM architecture, low-power resources, and command-line options.

ARM PROCESSOR COMPATIBILITY & CPU CRYPTOGRAPHIC OVERHEAD (INTRODUCTION)

Setting up VPN clients on Raspberry Pi single board computers requires downloading binaries compiled specifically for ARM, choosing lightweight protocols like WireGuard to save CPU cycles, and routing traffic on headless nodes.

READ EACH CHECKPOINT CAREFULLY AND SELECT OR WRITE THE CORRECT RESPONSE.

Checkpoint 1: Multiple Choice Challenge

1 What processor architecture is used by Raspberry Pi, requiring compatible VPN binaries?

- ☐ A. x86_64
- ☐ B. ARM
- ☐ C. RISC-V
- ☐ D. MIPS

2 What is the approximate speed of NordLynx on a Raspberry Pi 4?

- ☐ A. 10-15 Mbps
- ☐ B. 80-100 Mbps
- ☐ C. 300-400 Mbps
- ☐ D. 730 Mbps

3 What is the approximate speed of OpenVPN on a Raspberry Pi 1?

- ☐ A. 10-15 Mbps
- ☐ B. 80-100 Mbps
- ☐ C. 50-60 Mbps
- ☐ D. 1-2 Mbps

4 Which VPN client provides a lightweight, native CLI client optimized for Raspberry Pi ARM boards?

- ☐ A. NordVPN
- ☐ B. Surfshark
- ☐ C. Mullvad
- ☐ D. Windscribe

5 Which protocol uses fewer CPU cycles on constrained Pi hardware?

- ☐ A. OpenVPN
- ☐ B. WireGuard
- ☐ C. PPTP
- ☐ D. L2TP

Checkpoint 2: True or False Challenge

6 Question 6

Raspberry Pi OS is based on Debian.

☐

True

☐

False

7 Question 7

ExpressVPN provides a full desktop GUI client for Raspberry Pi OS.

☐

True

☐

False

8 Question 8

NordLynx builds directly on the WireGuard protocol.

☐

True

☐

False

9 Question 9

A Raspberry Pi 1 has enough CPU power to route 500 Mbps of OpenVPN traffic.

☐

True

☐

False

10 Question 10

Mullvad charges a flat rate of €5/month with no long-term contracts.

☐

True

☐

False

Checkpoint 3: Key Term Insertion

Read each sentence below and fill in the blank with the correct term from the Word Bank.

1. Pi users must ensure they download VPN packages compiled as _____.
2. Constrained single board computers require applications that are _____.
3. Manual tunnels are established in the terminal using the default _____.
4. Connection credentials and certificates are referenced inside the _____.
5. System DNS nameservers are registered and queried inside the _____.
6. A secure killswitch is built by adding rules to drop traffic in _____.

VOCABULARY WORD BANK

ARMBINARIES
RESOLVCONFIG

LOWRESOURCE
IPTABLESKILL

OPENVPNCLI
TUNNELDEVICE

CONFIGFILE
LIGHTWEIGHT

Write your answers here:

- | | | | |
|----|----------------------|----|----------------------|
| 1. | <input type="text"/> | 2. | <input type="text"/> |
| 3. | <input type="text"/> | 4. | <input type="text"/> |
| 5. | <input type="text"/> | 6. | <input type="text"/> |

Checkpoint 4: VPN & Network Concept Match

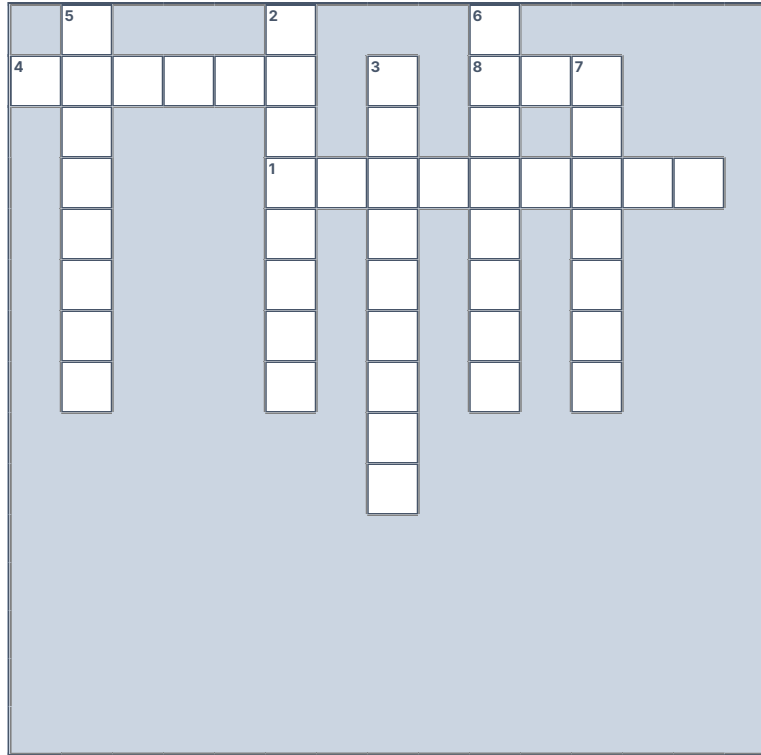
DEFINITION MATCHING

Match each vocabulary term on the left with its correct definition on the right by writing the corresponding letter (A-H) in the fillable input box.

	ARMBINARIES	G	Virtual network adapter card routing local traffic into the tunnel.
	LOWRESOURCE	H	Lightweight networking protocols (like WireGuard) with low CPU overhead.
	OPENVPNCLI	B	Software optimized to consume minimal RAM and CPU cycles.
	CONFIGFILE	A	Machine binaries compiled specifically for ARM processors.
	RESOLVCONFIG	C	Command-line tool used to run OpenVPN tunnels from the shell.
	IPTABLESKILL	D	Text configuration profiles containing connection parameters.
	TUNNELDEVICE	F	Netfilter firewall commands preventing unencrypted packet egress.
	LIGHTWEIGHT	E	System configuration file (resolv.conf) defining active nameservers.

Checkpoint 5: Crossword Puzzle

Solve the crossword puzzle by typing letters into the active white boxes. The numbers correspond to the clues below.



ACROSS

1. Process of wrapping data packets inside other packets (9)
4. Remote server that routes traffic and hides your IP (6)
8. Internet Service Provider, logs traffic unless encrypted (3)

DOWN

2. Rules determining how data is sent and encrypted (8)
3. Rate of data transfer across a path (9)
5. Blocking site access based on location (8)
6. Security system that monitors and blocks traffic (8)
7. State of being free from tracking or surveillance (7)

Checkpoint 5 Alternative: Accessible Crossword Clues

Screen-reader and keyboard users can type the crossword answers directly in the text fields below.

ACROSS CLUES

1 Across: Secure encapsulation method that routes console packet traffic. (9) (9 letters):

4 Across: Remote gaming host node that you connect to for lobbies. (6) (6 letters):

8 Across: Broadband service provider whose throttling policies you bypass. (3) (3 letters):

DOWN CLUES

2 Down: Handshake rules (such as OpenVPN) running on a compatible router. (8) (8 letters):

3 Down: Data capacity limits monitored on your home router during play. (9) (9 letters):

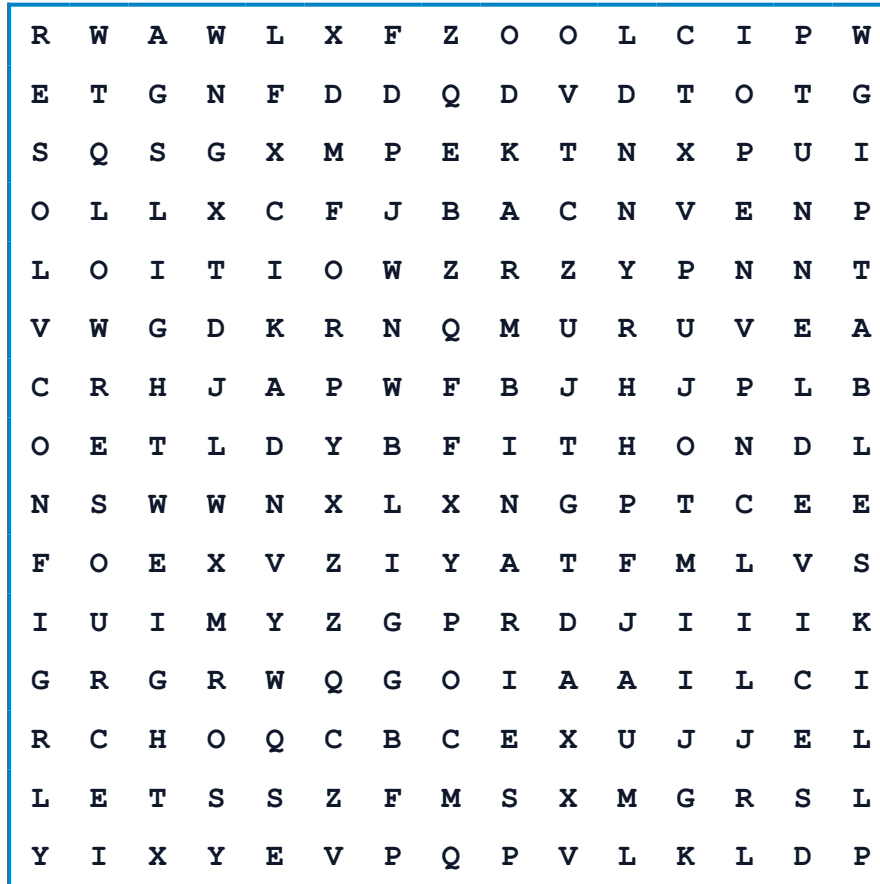
5 Down: Regional restriction that prevents accessing specific marketplace items. (8) (8 letters):

6 Down: Network shield that can block game ports and cause strict NAT. (8) (8 letters):

7 Down: Freedom from DDoS threats and online packet tracking while online. (7) (7 letters):

Checkpoint 6: Hidden Word Search

Find the 8 key vocabulary terms hidden in the grid below. Words can be horizontal, vertical, or diagonal.



VOCABULARY WORD LIST

ARMBINARIES
RESOLVCONFIG

LOWRESOURCE
IPTABLESKILL

OPENVPNCLI
TUNNELDEVICE

CONFIGFILE
LIGHTWEIGHT

Checkpoint 6 Alternative: Accessible Vocabulary Matching

Match each of the 8 vocabulary terms from the Word Search to its correct definition by writing the letter (A-H) in the blank space.

VOCABULARY TERMS

- A. ARMBINARIES
- B. LOWRESOURCE
- C. OPENVPNCLI
- D. CONFIGFILE
- E. RESOLVCONFIG
- F. IPTABLESKILL
- G. TUNNELDEVICE
- H. LIGHTWEIGHT

DEFINITIONS & MATCH FIELDS

- 1. Machine binaries compiled specifically for ARM processors.
- 2. Software optimized to consume minimal RAM and CPU cycles.
- 3. Command-line tool used to run OpenVPN tunnels from the shell.
- 4. Text configuration profiles containing connection parameters.
- 5. System configuration file
- 6. Netfilter firewall commands preventing unencrypted packet egress.
- 7. Virtual network adapter card routing local traffic into the tunnel.
- 8. Lightweight networking protocols

Checkpoint 7: Scrambled Word Challenge

Unscramble the letters below to reveal key Virtual Private Network (VPN) concepts and terms. Write your answers in the input boxes provided.

1. RMBINARIESA

5. ESOLVCONFIGR

2. OWRESOURCEL

6. PTABLESKILLI

3. PENVPNCLIO

7. UNNELDEVICET

4. ONFIGFILEC

8. IGHTEIGHTL

Checkpoint 8: VPN & Network Case Studies

Apply the concepts you have learned to solve the real-world scenarios below.



CASE STUDY 1: HIGH CPU OVERHEAD ON PI 3

Scenario: A user running an OpenVPN tunnel on a Raspberry Pi 3 finds that CPU utilization spikes to 95% during large file downloads.

Discussion Question: How do you lower the resource usage?



CASE STUDY 2: DNS LEAKS ON RASPBERRY PI OS

Scenario: A headless Pi DNS server (Pi-hole) is routing queries through the local ISP instead of the VPN connection.

Discussion Question: How do you enforce VPN DNS routing?

Final Challenge: Decrypting the Cipher

A network engineer secures routing channels and client tunnels. Use the Letter-to-Number key below to decrypt the message by writing the matching letters in the blank spaces.

LETTER-TO-NUMBER ENCRYPTION KEY

A=1	B=2	C=3	D=4	E=5	F=6	G=7	H=8	I=9	J=10	K=11	L=12	M=13
N=14	O=15	P=16	Q=17	R=18	S=19	T=20	U=21	V=22	W=23	X=24	Y=25	Z=26

1	18	13	8	1	18	4	23	1	18	5	18	21	14	19
12	9	7	8	20	23	5	9	7	8	20	22	16	14	
3	12	9	5	14	20	19	15	6	20	23	1	18	5	

Decoded cybersecurity message:

TIP: EACH NUMBER REPRESENTS THE POSITION OF THAT LETTER IN THE ALPHABET (E.G. 1 = A, 2 = B, 26 = Z).

Checkpoint 10: Basic VPN FAQs (Part A)

Review the most common questions and answers regarding Virtual Private Networks (VPNs) and tunneling.

Q1: What is Raspberry Pi?

A series of small, single-board computers developed by the Raspberry Pi Foundation for educational and utility projects.

Q2: How do I install a VPN on Raspberry Pi?

Install the lightweight CLI app of your provider, or run manual OpenVPN/WireGuard tunnels via the terminal.

Q3: Does Raspberry Pi support GUI VPNs?

Most providers do not offer GUI apps for ARM Linux, so connections are controlled via CLI or NetworkManager.

Q4: What is the CPU architecture of Raspberry Pi?

Raspberry Pi boards run on ARM architecture, requiring specifically compiled ARM binary packages.

Q5: Why does OpenVPN consume high CPU on Pi?

OpenVPN operates in user space and relies heavily on software-based cryptographic processing, which stresses the Pi CPU.

Checkpoint 10: Basic VPN FAQs (Part B)

Review the most common questions and answers regarding Virtual Private Networks (VPNs) and tunneling.

Q6: Is WireGuard supported on Raspberry Pi OS?

Yes, WireGuard is supported natively in modern Raspberry Pi OS releases running 5.10+ kernels.

Q7: How do I check system temperature during VPN load?

Execute 'vcgencmd measure_temp' in the terminal to verify the Pi CPU temperature.

Q8: Can I use a Pi as a VPN router?

Yes, by configuring packet forwarding and NAT routing between the ethernet port and the tun0 interface.

Q9: How do I check active network adapters on Pi?

Run the 'ifconfig' or 'ip addr' command in the terminal to display adapters like eth0, wlan0, and tun0.

Q10: What is Raspberry Pi OS?

The official Debian-based operating system optimized for Raspberry Pi single-board computers.

Checkpoint 11: Advanced VPN FAQs (Part A)

Explore advanced technical aspects of VPN tunneling protocols, mobile client integrations, and enterprise deployment.

Q1: How do I configure a routing killswitch via iptables on Pi?

Allow outbound on the physical adapter only to the VPN server IP, and block all other non-vpn traffic on local interfaces.

Q2: How do I deploy Pi-hole alongside a VPN?

Configure Pi-hole to listen on all local interfaces and route its upstream DNS requests through the VPN interface IP.

Q3: How do I fix connection issues after Pi reboot?

Enable autostart on systemd for the VPN daemon or add client connection commands inside `/etc/rc.local`.

Q4: How do I measure throughput on headless Pi?

Install `speedtest-cli` via `apt`, and run it while specifying the network interface to use for testing.

Q5: What are NordVPN's speed lab metrics for Pi?

NordVPN averages 80-100 Mbps using NordLynx (WireGuard) on a Pi 4, and 10-15 Mbps on older Pi models.

Checkpoint 11: Advanced VPN FAQs (Part B)

Explore advanced technical aspects of VPN tunneling protocols, mobile client integrations, and enterprise deployment.

Q6: How do I install dependencies manually on Pi?

Run 'sudo apt-get update' followed by 'sudo apt-get install openvpn wireguard resolvconf' to install base packages.

Q7: Can I connect to Mullvad on Pi?

Yes, Mullvad provides an ARM client CLI binary or manual WireGuard configurations for Raspberry Pi OS.

Q8: How do I secure credential text files on Pi?

Execute 'chmod 600 credentials.txt' to restrict read permissions to the file owner.

Q9: Does Raspberry Pi support hardware encryption acceleration?

Pi 4 and newer boards support cryptography extensions, whereas older models must rely on software-based ciphers.

Q10: How do I configure NetworkManager via Raspberry Pi GUI?

Add the NetworkManager tray plug-in to the taskbar and import OpenVPN or WireGuard configurations graphically.

Part 11: 10 Real-World VPN Facts & Insights

Review real-world facts regarding VPN encryption speeds, protocol audits, mobile connectivity, and enterprise remote work.

1. VPN INSIGHT

Raspberry Pi computers utilize ARM processors, which require specifically compiled software binaries.

2. VPN INSIGHT

Onconstrained Pi hardware, WireGuard delivers up to 100 Mbps throughput compared to OpenVPN's 15 Mbps limit.

3. VPN INSIGHT

NordVPN provides an official Linux CLI application with full ARM package compatibility.

4. VPN INSIGHT

ExpressVPN provides ARM binary packages, supporting Lightway and OpenVPN protocols via CLI.

5. VPN INSIGHT

Mullvad VPN charges €5 flat per month and supports anonymous registration via 16-digit codes.

6. VPN INSIGHT

Firewall killswitches on Pi are configured using iptables rules to drop all unencrypted outgoing data packets.

7. VPN INSIGHT

systemd resolver daemons prevent DNS queries from leaking to local public ISP routers.

8. VPN INSIGHT

A headless Raspberry Pi is typically managed remotely via SSH terminal connections.

9. VPN INSIGHT

WireGuard is integrated directly into the system kernel, reducing thermal load during file transfers.

10. VPN INSIGHT

The standard openvpn utility allows users to connect manually using standard plain text files.

Technical References & Sources

The study guide and interactive puzzles are compiled from global technical standards, specifications, and regulatory frameworks.

SCHOLARLY & INDUSTRY REFERENCES

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- [2] Raspberry Pi Documentation. (2026). Network Configuration and Security. Retrieved from <https://www.raspberrypi.com/documentation/computers/configuration.html>
- [3] Debian Wiki. (2026). WireGuard on Debian-based Systems. Retrieved from <https://wiki.debian.org/Wireguard>
- [4] IETF RFC 7296: Internet Key Exchange Protocol. Retrieved from <https://datatracker.ietf.org/doc/rfc7296/>
- [5] WireGuard Protocol and Tooling Manual. Retrieved from <https://www.wireguard.com/>
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- [8] OpenVPN Community CLI Reference Guide. Retrieved from <https://openvpn.net/community-resources/>
- [9] IETF RFC 768: User Datagram Protocol. Retrieved from <https://datatracker.ietf.org/doc/rfc768/>
- [10] IETF RFC 793: Transmission Control Protocol. Retrieved from <https://datatracker.ietf.org/doc/rfc793/>

Answer Key: Checkpoint 1 - Multiple Choice

1 ARM Architecture

ARM BINARIES

Correct Answer: B

TEACHING NOTE

Raspberry Pi runs on ARM hardware, requiring specifically compiled ARM binary packages.

Citation: Raspberry Pi OS [Ref 1].

2 NordLynx Speed

80-100 MBPS

Correct Answer: B

TEACHING NOTE

NordLynx (WireGuard) averages 80-100 Mbps throughput on a Pi 4, conserving CPU cycles.

Citation: NordVPN Pi Lab [Ref 5].

3 OpenVPN Speed

10-15 MBPS

Correct Answer: A

TEACHING NOTE

OpenVPN on older Pi 1 models runs at roughly 10-15 Mbps due to software cryptographic load.

Citation: Pi OpenVPN Speed [Ref 5].

4 ARM CLI Client

NORDVPN CLI

Correct Answer: A

TEACHING NOTE

NordVPN provides an official Linux CLI application with full ARM package compatibility.

Citation: NordVPN CLI Pi [Ref 3].

5 WireGuard Protocol

WIREGUARD CPU

Correct Answer: B

TEACHING NOTE

WireGuard is integrated into the kernel, running with significantly lower CPU overhead than OpenVPN.

Citation: WireGuard CPU [Ref 5].

Answer Key: Checkpoint 2 - True or False

6 Debian
Base

RASPBERRY PI OS

Correct Answer: True

TEACHING NOTE

Raspberry Pi OS is based on Debian and inherits its package system.

Citation: Raspberry Pi OS [Ref 1].

7 CLI Client
Only

EXPRESSVPN CLI

Correct Answer: False

TEACHING NOTE

ExpressVPN operates via command-line interface on ARM boards without a desktop GUI.

Citation: ExpressVPN Speed [Ref 4].

8 NordLynx
WireGuard

NORDLYNX

Correct Answer: True

TEACHING NOTE

NordLynx builds on the WireGuard protocol to deliver fast encryption on Pi devices.

Citation: NordVPN Pi [Ref 3].

9 Pi 1
Throughput

CPU THROTTLING

Correct Answer: False

TEACHING NOTE

Pi 1 single-core ARM processors cannot route 500 Mbps of encrypted OpenVPN traffic.

Citation: Pi OpenVPN Speed [Ref 5].

10 Flat €5
Rate

MULLVAD

Correct Answer: True

TEACHING NOTE

Mullvad charges a flat rate of €5/month with no contracts or term commitments.

Citation: Mullvad Pricing [Ref 5].

Vocabulary Keys & Grading Rubric

Instructor Grading Rubric: Award 1 point for each correct matching (8 points total) and context term (6 points total).

CHECKPOINT 4: CONCEPT MATCH KEY

A ARMBINARIES

B LOWRESOURCE

C OPENVPNCLI

D CONFIGFILE

E RESOLVCONFIG

F IPTABLESKILL

G TUNNELDEVICE

H LIGHTWEIGHT

CHECKPOINT 3: KEY TERM KEY

1 ARMBINARIES

2 LOWRESOURCE

3 OPENVPNCLI

4 CONFIGFILE

5 RESOLVCONFIG

6 IPTABLESKILL

DISCUSSION NOTES FOR INSTRUCTORS

Valuation Accuracy:

Verify that students understand how domain length, extension (.com, .ai), and commercial search volume drive appraisal pricing.

Escrow Security:

Emphasize that funds are held in licensed third-party holding accounts prior to domain WHOIS transfer verification.

Stealth Representation:

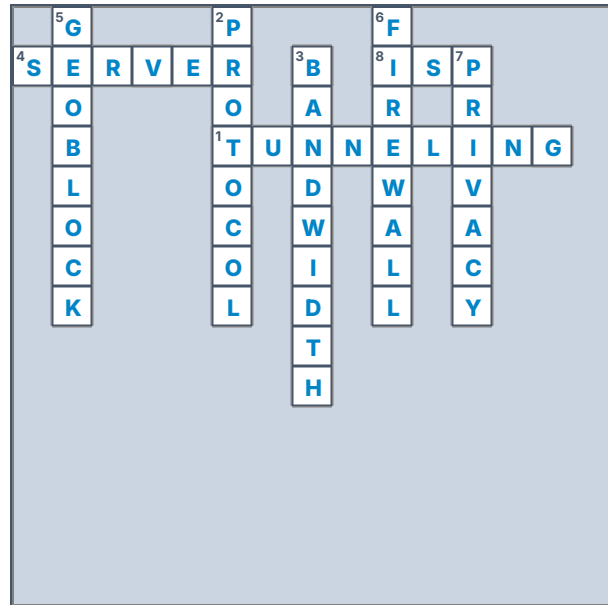
Highlight the role of NDAs and third-party representation in preventing speculative price gouging during corporate procurement.

Puzzles Keys & Instructor Notes

WORD SEARCH SOLUTION

R	W	A	W	L	X	F	Z	O	O	L	C	I	P	W
E	T	G	N	F	D	D	Q	D	V	D	T	O	T	G
S	Q	S	G	X	M	P	E	K	T	N	X	P	U	I
O	L	L	X	C	F	J	B	A	C	N	V	E	N	P
L	O	I	T	I	O	W	Z	R	Z	Y	P	N	N	T
V	W	G	D	K	R	N	Q	M	U	R	U	V	E	A
C	R	H	J	A	P	W	F	B	J	H	J	P	L	B
O	E	T	L	D	Y	B	F	I	T	H	O	N	D	L
N	S	W	W	N	X	L	X	N	G	P	T	C	E	E
F	O	E	X	V	Z	I	Y	A	T	F	M	L	V	S
I	U	I	M	Y	Z	G	P	R	D	J	I	I	I	K
G	R	G	R	W	Q	G	O	I	A	A	I	L	C	I
R	C	H	O	Q	C	B	C	E	X	U	J	J	E	L
L	E	T	S	S	Z	F	M	S	X	M	G	R	S	L
Y	I	X	Y	E	V	P	Q	P	V	L	K	L	D	P

CROSSWORD SOLUTION



INSTRUCTOR GUIDE FOR CROSSWORD SOLUTIONS

ACROSS CLUES

- 1 Across:** TUNNELING Process of wrapping data packets. (3, 5)
- 4 Across:** SERVER Remote computer routing traffic. (1, 0)
- 8 Across:** ISP Internet Service Provider. (1, 9)

DOWN CLUES

- 2 Down:** PROTOCOL Rules determining data transmission. (0, 5)
- 3 Down:** BANDWIDTH Rate of data transfer. (1, 7)
- 5 Down:** GEOBLOCK Location website restriction. (0, 1)
- 6 Down:** FIREWALL Security monitor barrier. (0, 9)
- 7 Down:** PRIVACY State of freedom from tracking. (1, 11)

Scrambled Words & Cipher Solution Key

Grading key for the vocabulary word unscramble activity and Secret Cipher Challenge.

WORD UNSCRAMBLE KEY

1. RMBINARIESA

ARMBINARIES

5. ESOLVCONFIGR

RESOLVCONFIG

2. OWRESOURCEL

LOWRESOURCE

6. PTABLESKILLI

IPTABLESKILL

3. PENVPNCLIO

OPENVPNCLI

7. UNNELDEVICET

TUNNELDEVICE

4. ONFIGFILEC

CONFIGFILE

8. IGHTEIGHTL

LIGHTWEIGHT

SECRET CIPHER CHALLENGE KEY

"ARM HARDWARE RUNS LIGHTWEIGHT VPN CLIENT SOFTWARE"

VPN & Network Case Studies Solution Key

A Case Study 1: High CPU Overhead on Pi

[Instructor Solution](#)

GRADING GUIDELINE

Student answers should cover the following points:

- **Scenario Analysis:** A user running an OpenVPN tunnel on a Raspberry Pi 3 finds that CPU utilization spikes to 95% during large file downloads.
- **Recommended Strategy & Solution:** Switch the VPN protocol to WireGuard (or NordLynx) to utilize kernel-level encryption which uses fewer CPU cycles.

B Case Study 2: DNS Leaks on Raspberry Pi C

[Instructor Solution](#)

GRADING GUIDELINE

Student answers should cover the following points:

- **Scenario Analysis:** A headless Pi DNS server (Pi-hole) is routing queries through the local ISP instead of the VPN connection.
- **Recommended Strategy & Solution:** Configure systemd-resolved on the Pi to force all DNS traffic to the VPN's static nameserver IP.