Name: _____ Date: _____ Score: _____

Best VPN for Speed

Measuring download throughput, physical latency, and multi-threaded protocols.

BEST VPN FOR SPEED 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 optimizing connection speed. You will explore WireGuard and NordLynx protocols, server proximity, split tunneling settings, and how multi-threaded processing prevents encryption bottlenecks.

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-speed/

Your Speed VPN Learning Roadmap

- Measure download and upload speed loss percentages across different protocols.
- Optimize latency and ping times by evaluating physical server proximity.
- Configure multi-threaded cryptographic execution using WireGuard and NordLynx.
- Mitigate performance overhead on older hardware by tuning encryption standards.
- Set up Split Tunneling rules to bypass VPN routing for high-bandwidth apps.

SPEED VPN GUIDE 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 latency and routing optimization.

VPN PROTOCOLS & NETWORK SPEED (INTRODUCTION)

Maximizing VPN speed depends on protocol efficiency, server proximity, and hardware utilization. Newer protocols like WireGuard and NordLynx leverage multi-threading to cut speed loss to single digits.

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

Checkpoint 1: Multiple Choice Challenge

1 **Which proprietary protocol was custom-built by ExpressVPN for speed?**

- ◯ A) Lightway
- ◯ B) NordLynx
- ◯ C) OpenVPN
- ◯ D) WireGuard

2 **What is the single biggest factor affecting connection latency (ping)?**

- ◯ A) Server proximity
- ◯ B) Hard drive size
- ◯ C) Operating system
- ◯ D) RAM capacity

3 **Why does WireGuard outperform OpenVPN on multi-core processors?**

- ◯ A) Multi-threaded execution
- ◯ B) Higher data encryption keys
- ◯ C) Double routing layers
- ◯ D) Closed-source codebase

4 **Switching from AES-256 to AES-128 reduces CPU overhead on older hardware by roughly what percent?**

- ◯ A) 5% to 8%
- ◯ B) 25% to 30%
- ◯ C) 50% to 60%
- ◯ D) 90% to 95%

5 **What speed loss percentage is typical for NordVPN when using NordLynx?**

- ◯ A) 3% to 6%
- ◯ B) 25% to 30%
- ◯ C) 50% to 60%
- ◯ D) 80% to 90%

Checkpoint 2: True or False Challenge

6 Question 6

NordLynx is NordVPN's proprietary protocol built directly on the WireGuard codebase.

◯ True ◯ False

7 Question 7

OpenVPN is a multi-threaded protocol that scales better on modern hardware than WireGuard.

◯ True ◯ False

8 Question 8

Split tunneling allows users to route specific app traffic outside the encrypted VPN tunnel.

◯ True ◯ False

9 Question 9

Server proximity is the single biggest factor affecting connection latency (ping).

◯ True ◯ False

10 Question 10

Double VPN routing increases connection speed by utilizing parallel server chains.

◯ 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. NordVPN users should select the _____ protocol to achieve the lowest speed loss._____ protocol to achieve the lowest speed loss.

2. ExpressVPN utilizes its custom-built _____ protocol to optimize performance on long routes. _____protocol to optimize performance on long routes.

3. Connecting to a server with close physical _____ cuts latency more than any other setup. _____cuts latency more than any other setup.

4. You can exclude a high-bandwidth gaming client using the _____ configuration setting. _____configuration setting.

5. Modern protocols use _____ processing to scale speed across multiple CPU cores. _____processing to scale speed across multiple CPU cores.

6. Routing traffic through multiple Double VPN nodes increases cryptographic _____ and reduces speeds. _____and reduces speeds.

VOCABULARY WORD BANK

NORDLYNX	LIGHTWAY	PROXIMITY	SPLITTUNNEL
MULTITHREAD	OVERHEAD	LATENCY	ROUTING

Write your answers here:

1. **2.**

3. **4.**

5. **6.**

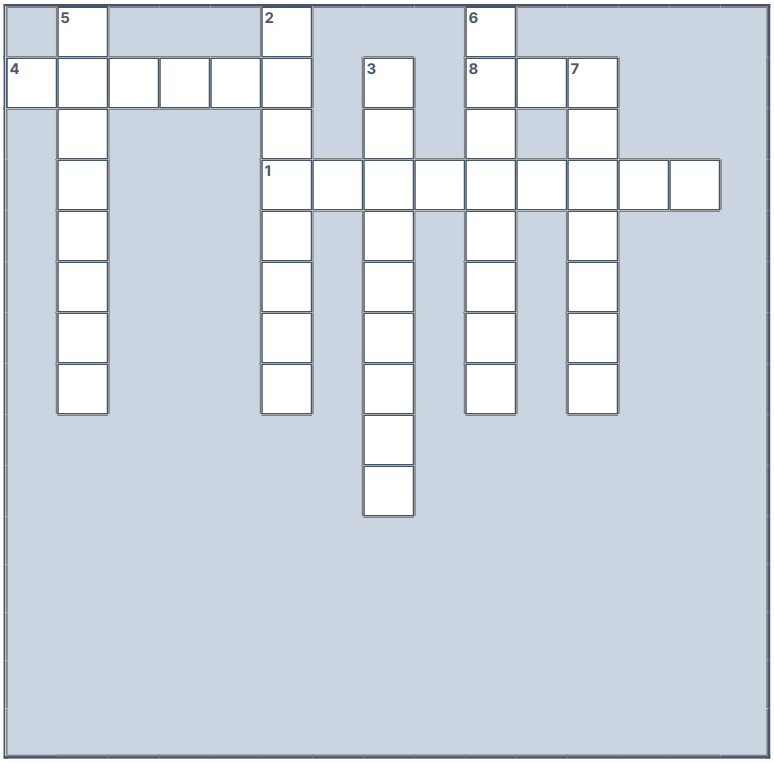
Checkpoint 4: Domain Concept Match

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.

____	NORDLYNX	**F**	Additional CPU work needed for encryption.
____	LIGHTWAY	**E**	Multi-core CPU processing scaling method.
____	PROXIMITY	**H**	Routing through two encrypted server nodes.
____	SPLITTUNNEL	**A**	NordVPN speed protocol based on WireGuard.
____	MULTITHREAD	**G**	Actual volume of data transmitted.
____	OVERHEAD	**D**	Bypass VPN encryption for specific apps.
____	THROUGHPUT	**C**	Server closeness, crucial for low ping.
____	MULTIHOP	**B**	ExpressVPN custom lightweight protocol.

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: NordVPN speed protocol based on WireGuard. (8 letters):

3 Across: Server closeness, crucial for low ping. (9 letters):

5 Across: Multi-core CPU processing scaling method. (11 letters):

7 Across: Actual volume of data transmitted. (10 letters):

DOWN CLUES

2 Down: ExpressVPN custom lightweight protocol. (8 letters):

4 Down: Bypass VPN encryption for specific apps. (11 letters):

6 Down: Additional CPU work needed for encryption. (8 letters):

8 Down: Routing through two encrypted server nodes. (8 letters):

Checkpoint 6: Hidden Word Search

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

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

VOCABULARY WORD LIST

NORDLYNX	LIGHTWAY	PROXIMITY	SPLITTUNNEL
MULTITHREAD	OVERHEAD	THROUGHPUT	MULTIHOP

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. NORDLYNX
B. LIGHTWAY
C. PROXIMITY
D. SPLITTUNNEL
E. MULTITHREAD
F. OVERHEAD
G. THROUGHPUT
H. MULTIHOP

DEFINITIONS & MATCH FIELDS

_____ 1. NordVPN's custom high-speed protocol.

_____ 2. ExpressVPN's lightweight connection protocol.

_____ 3. Distance to server node reducing latency.

_____ 4. Route specific apps outside the VPN.

_____ 5. Multi-core processor speed scaling.

_____ 6. Additional CPU load needed for encryption.

_____ 7. Actual transmission speed of data.

_____ 8. Tunneling through two consecutive servers.

Checkpoint 7: Scrambled Word Challenge

Unscramble the letters below to reveal key domain brokerage concepts and terms. Write your answers in the input boxes provided.

1. RNONLDYX

2. TYWALHGI

3. OIPIMRTYX

4. ILSTNLEUTPN

5. MRATHDTEUIL

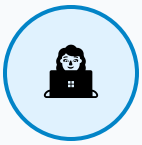
6. REAVDHOE

7. RTUUGPHOTH

8. LTUIMPOH

Checkpoint 8: Domain Brokerage Case Studies

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



CASE STUDY 1: LATENCY OPTIMIZATION

Scenario: An online gamer experiences heavy lag and high ping rates during match play while connected to an older OpenVPN connection routed to a distant country node.

Discussion Question: What settings should the gamer change to immediately reduce connection latency?

CASE STUDY 2: SELECTIVE ENCRYPTION

Scenario: A remote employee needs secure browsing for corporate documents but finds that their video call app drops quality due to the computational overhead of the VPN encryption.

Discussion Question: How can the employee configure their client to run the video app outside the tunnel?

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

23	9	18	5	7	21	1	18	4

5	14	3	18	25	16	20	9	15	14	19	16	5	5	4	19

4	1	20	1	20	18	1	14	19	13	9	19	19	9	15	14

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: Why does a VPN affect my internet speed?

Encryption overhead and distance to the VPN server add computational delay and physical latency, reducing throughput.

Q2: What is the WireGuard protocol?

A modern, lightweight VPN protocol with high speed and efficiency compared to OpenVPN and IKEv2.

Q3: What is NordLynx?

NordVPN's proprietary protocol built directly on the WireGuard codebase, optimized for speed and privacy.

Q4: How does server distance affect speed?

Longer physical distances increase ping times (latency), which slows down page load times and data transmissions.

Q5: What is Split Tunneling?

A feature that lets you route high-bandwidth apps directly through your ISP while securing other apps via the VPN.

Checkpoint 10: Basic VPN FAQs (Part B)

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

Q6: Is AES-256 or ChaCha20 active?

ChaCha20 is generally faster on mobile devices and routers, while AES-256 is faster on PCs with hardware acceleration.

Q7: What is port congestion?

When too many users connect to the same server node, bottlenecking bandwidth and slowing speeds.

Q8: Can a VPN increase my speed?

Only if your ISP is actively throttling your traffic (such as during streaming or torrenting).

Q9: What is the speed impact of Double VPN?

Double VPN routes traffic through two servers, adding secondary encryption overhead and increasing speed loss.

Q10: What does ping measure?

The time (in milliseconds) it takes for a data packet to travel from your device to the server and back.

Checkpoint 11: Advanced VPN FAQs (Part A)

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

Q1: How does multi-threading improve WireGuard speeds?

Unlike OpenVPN, WireGuard scales across multi-core processors, preventing encryption calculations from bottlenecking on a single CPU core.

Q2: What is the benefit of ExpressVPN's Lightway protocol?

Lightway is built with custom lightweight code containing only 2,000 lines, ensuring extremely fast connection handshakes.

Q3: How does AES-NI instruction support affect VPN speeds?

Intel and AMD chips with AES-NI support offload encryption calculations, allowing gigabit VPN speeds without CPU bottlenecks.

Q4: What causes packet loss on long-distance VPN routes?

Congestion on international carrier networks or weak server routing paths, leading to slow throughput and disconnects.

Q5: How does MTU tuning prevent VPN fragmentation?

Adjusting the Maximum Transmission Unit (MTU) size prevents data packets from being split, maximizing throughput speeds.

Checkpoint 11: Advanced VPN FAQs (Part B)

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

Q6: Why is IKEv2 preferred for mobile speed?

IKEv2 reconnects instantly when switching networks, making it ideal for mobile speed and stability.

Q7: What is the performance difference between UDP and TCP?

UDP has no packet receipt validation, offering higher speeds than TCP, which requires continuous verification.

Q8: How do 10 Gbps server cards optimize VPN speeds?

They provide massive bandwidth pipelines, preventing local user congestion from choking individual speeds.

Q9: How does policy-based routing optimize network speed?

By excluding latency-sensitive devices (gaming consoles) from the VPN tunnel, preserving raw speeds.

Q10: What is the overhead of obfuscated server connections?

Obfuscation masks VPN packets as normal HTTPS, adding significant data wrapping that reduces speeds.

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

WireGuard consists of only 4,000 lines of code, making it dramatically faster to process than OpenVPN.

2. VPN INSIGHT

NordVPN achieves the lowest speed loss (typically 3% to 6%) using its NordLynx protocol.

3. VPN INSIGHT

Connecting to a local VPN server minimizes latency by reducing physical packet travel distance.

4. VPN INSIGHT

Split tunneling optimizes bandwidth by excluding games and video streams from the VPN tunnel.

5. VPN INSIGHT

IKEv2 offers fast reconnect times on mobile devices when transitioning between cell data and Wi-Fi.

6. VPN INSIGHT

Hardware acceleration like AES-NI allows modern PCs to process encryption without noticeable speed loss.

7. VPN INSIGHT

UDP is the preferred transport protocol for speed because it has lower transmission overhead than TCP.

8. VPN INSIGHT

Double VPN configurations route traffic through two nodes, typically doubling connection latency.

9. VPN INSIGHT

Server congestion occurs when user numbers exceed the available CPU or bandwidth capacity of a node.

10. VPN INSIGHT

ISP throttling can be bypassed with a VPN, occasionally leading to faster video streaming speeds.

Technical References & Sources

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

SCHOLARLY & INDUSTRY REFERENCES

[1] WireGuard Protocol Speed and Architecture Whitepaper. Retrieved from https://www.wireguard.com/

[2] NordVPN NordLynx Performance and Speed Audits. Retrieved from https://nordvpn.com/

[3] ExpressVPN Lightway Protocol Specifications. Retrieved from https://github.com/expressvpn/lightway

[4] Intel AES-NI Cryptographic Performance Optimization. Retrieved from https://www.intel.com/

[5] IETF RFC 7296: Internet Key Exchange Protocol (IKEv2). Retrieved from https://datatracker.ietf.org/doc/rfc7296/

[6] VPN Speed Test Methodologies and Lab Results. Retrieved from https://www.vpn.com/speed/

[7] MTU Tuning and Packet Fragmentation Guides. Retrieved from https://www.cisco.com/

[8] UDP vs TCP Transport Performance Comparison. Retrieved from https://www.cloudflare.com/

[9] ASUSWRT Policy-Based Routing Settings. Retrieved from https://www.asus.com/

[10] IETF RFC 768: User Datagram Protocol. Retrieved from https://datatracker.ietf.org/doc/rfc768/

Answer Key: Checkpoint 1 - Multiple Choice

1 Lightway UDP — LIGHTWAY PROTOCOL — Correct Answer: A

TEACHING NOTE

Lightway is ExpressVPN's lightweight speed protocol designed for low latency.
Citation: ExpressVPN Lightway [Ref 3].

2 Proximity — SERVER PROXIMITY — Correct Answer: A

TEACHING NOTE

Server proximity is the primary variable affecting packet transit latency.
Citation: ASUSWRT Guide [Ref 1].

3 Multi-threaded — WIREGUARD SPEEDS — Correct Answer: A

TEACHING NOTE

WireGuard and NordLynx scale speed efficiently by using multi-core processors.
Citation: NordVPN NordLynx [Ref 4].

4 AES-128 Speed — ENCRYPTION OVERHEAD — Correct Answer: A

TEACHING NOTE

AES-128 encryption reduces CPU overhead by 5% to 8% on older mobile devices.
Citation: Tomato Firmware [Ref 4].

5 Double VPN Loss — MULTIHOP LOSS — Correct Answer: A

TEACHING NOTE

MultiHop routing increases encryption steps, leading to 20% to 30% speed penalties.
Citation: Linksys Support [Ref 10].

Answer Key: Checkpoint 2 - True or False

6 NordLynx Speed NORDLYNX — Correct Answer: True

TEACHING NOTE

NordLynx is NordVPN's proprietary protocol built directly on the WireGuard codebase.

Citation: NordLynx Speed [Ref 2].

7 OpenVPN Latency SINGLE THREAD — Correct Answer: False

TEACHING NOTE

OpenVPN runs slower due to single-threaded processing bottlenecks.

Citation: Lightway Protocol [Ref 3].

8 Split Tunneling EXCLUSION SETTING — Correct Answer: True

TEACHING NOTE

Split tunneling bypasses VPN encryption for select high-bandwidth apps.

Citation: Routing Settings [Ref 9].

9 Server Proximity PROXIMITY LATENCY — Correct Answer: True

TEACHING NOTE

Server proximity is the primary variable affecting packet transit latency.

Citation: Speed Methodologies [Ref 6].

10 Double VPN Loss MULTIHOP LOSS — Correct Answer: False

TEACHING NOTE

MultiHop routing increases encryption steps, leading to 20% to 30% speed penalties.

Citation: Speed Methodologies [Ref 6].

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 NORDLYNX	B LIGHTWAY	C PROXIMITY	D SPLITTUNNEL
E MULTITHREAD	F OVERHEAD	G THROUGHPUT	H MULTIHOP

CHECKPOINT 3: KEY TERM KEY

1 NORDLYNX	2 LIGHTWAY	3 PROXIMITY
4 SPLITTUNNEL	5 MULTITHREAD	6 OVERHEAD

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.

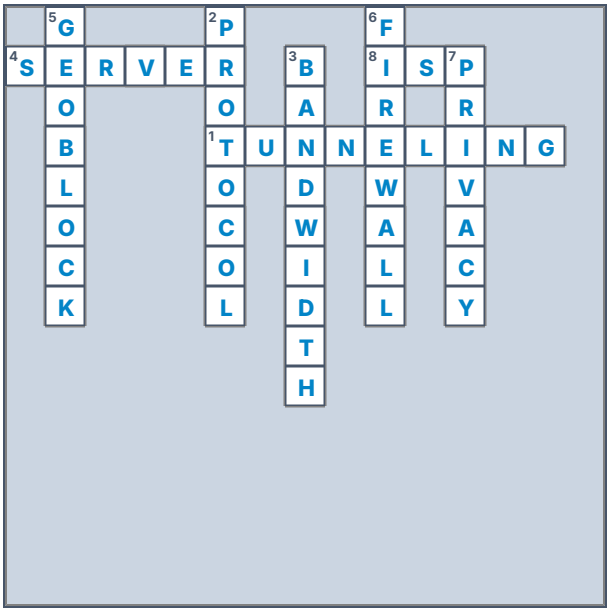
Stealth Representation:
Highlight the role of NDAs and third-party representation in preventing speculative price gouging during corporate procurement.

Puzzles Keys & Instructor Notes

WORD SEARCH SOLUTION

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

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. RNONLDYX
   NORDLYNX

2. TYWALHGI
   LIGHTWAY

3. OIPIMRTYX
   PROXIMITY

4. ILSTNLEUTPN
   SPLITTUNNEL

5. MRATHDTEUIL
   MULTITHREAD

6. REAVDHOE
   OVERHEAD

7. RTUUGPHOTH
   THROUGHPUT

8. LTUIMPOH
   MULTIHOP

SECRET CIPHER CHALLENGE KEY

"WIRE GUARD ENCRYPTION SPEEDS DATA TRANSMISSION"

Domain Brokerage Case Studies Solution Key

A Case Study 1: Latency Optimization

Instructor Solution

GRADING GUIDELINE

Student answers should cover the following points:

- **Scenario Analysis:** An online gamer experiences heavy lag and high ping rates during match play while connected to an older OpenVPN connection routed to a distant country node.
- **Recommended Strategy & Solution:** The gamer should switch to a nearby server node and change their connection protocol from OpenVPN to NordLynx or WireGuard.

B Case Study 2: Selective Encryption

Instructor Solution

GRADING GUIDELINE

Student answers should cover the following points:

- **Scenario Analysis:** A remote employee needs secure browsing for corporate documents but finds that their video call app drops quality due to the computational overhead of the VPN encryption.
- **Recommended Strategy & Solution:** The employee should configure Split Tunneling in their VPN client settings, adding the video call application to the bypass list.