Assignment - 1

1Q) Compare band board, leased lines, and fibes for remote access

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Media comparison for Remote Access Infrastructure.

Feature.	Broadband	Leased Lines.	Fiber optics
Type	Shared Internet acess	Dedicated point to point	medium of data transmission
Speed	Moderate to high.	consists symmetri-cal	Extream high
Symmetry	A Symmetric	Symmetric	Symmetrical.
Dedicated Band width	No	Yes	Depends
latency	Higher and variable	Low and Stable	very Low
Reliabillity	moderate	High	Very high
security	Lowes	High	High.
Cost	Low to Moderate	High	Moderate to High.
Scalabillity	Limited by local ISP	High Scalabile	High Scalable.
Installation Time	Quick	Long	-fast in urban areas

* Firewalls and NAT Traversal :-

- VPN protocols must work well firewalls and NAT to maintain same less connections
- Some protocols are more firewalls - friendly and traverse.

Example :-

softethes VPN users HTTPS tunneling to bypass firewalls and web proxies effectvely

* Cross - Platform Compatabillity :-

A good VPN protocols support various OS and device types

Example :-

L2TP/IPsec and open VPN

Protocol	security	speed	stabillity	Best use case
open VPN	very high	Medium	High	General security remote access
Wire Gaurd	High	very high	Medium	High-performance needs modern device
IKEv2 /IPsec	High	High	very high	Mobile users, Stable connects
SSTP	High	Medium	High	Windows - Specific environments
softether	High	High	High	Fire wall - bypass versatile networks

* Encryption and Data Integrity:

- Vpn protocols encrypt the data in transit, making it unreading to un authorized users
- They also provide Integrity cheaks and ensure data hasn't been tampered with.

Example :-
Open VPN user SSL / TLS For key exchange and AFK's for encryption, ensure strong confidence.

* Authentication :-

- vpn protocols ensure that only users and devices can allow the network.
- They support different authentication methods

Example :-
IKEV2 / IPSec supports EAP authentication, which can be integrated with MFA

* Performance and Reliabillity :-

Protocols impact speed limit, latency and how connections handle interruption.
Some protocols are better of moble users due to faster reconnection.

Example :-
Wire Guard is known too high performance and low overhead

Assignment-①

2Q) Discuss the role of VPN protocols in secure remote access

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In Case of Remote Work with ROVESTVPN

* **Broad band :-**
  - Best for Home based remote working using VPN to connect to corporate network.
  - Limitation performs drops during peak hours
  - VPN use works with VPN but many experiance.

* **Leased Lines :-**
  - Best for Both broadband and leased line delivery, idea for band width - Intensive.
  - context Most effective when used in leased lines
  - VPN use Excellent for site to site vpn tunnel

* **Fibers for High :-**
  - Best for Both board band and leased line delivery; Idea for band width - Intensive tasks
  - context Most effective when used in leased lines (or) business - class broad band
  - VPN use provides fast, stable, and secure tunnel for remote access

Assignment-①

3Q) Evaluate latency and jitter in various transmission media.

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Transmission Media and there performance.

Transmission Media	Avg Latency	jitter	Evalution for remote work
Fiber optic	1-10 min	very low	Excellent : Low latency and jitter, ideal for VPN
cable.	10-30 min	Low - medium	Good : Stable enough for mast remote work needs
DSL	20-50 min	Medium	High latency and jitter not ideal for real-time
4G	30-70 min	Medium - High	Decent speen, but jitter fluctuates basted on network load and signal
5G	10-20 ms	Low	Low latency, good for mobile workers, but coverge.
Wifi	1-8 ms	Low-Medium	Low latency good for mobile when signal is Strong
Satellite	600-800 ms	very high.	Poor : High latency / VPN's, VOIP

1. Fiber Optics :-

- Support high speed VPN's tunnels, Low-buffer video calls and real time collabration tools.
- Excellent for both office branches and remote home offices with fiber availibillity

2. 5G/4G :-

- 5G offer near-fiber performance but may suffer from signal instabillity
- 4G lite has acceptable speed but higher jitter.
- Good for moblie employees

3. Wifi :-

- Depends on wired background
- Latency is low
- Ensure strong wifi signals

4. DSL & cable :-

- Still common in residential.
- Acceptable for most VPN activities

5. Satellite. :-

- Geo: Long distance to geostationary orbit level
- Leo : Low latency but not yet consistant reliable
- Use when only no terrestrial options are availible

Implementation Tips

1. secondary ISP connections :-

- A seperation internet connection from a different internet service provider
- Avoid single point of failure in case of one ISP goes down
- Example :-
  If the primary links is fiber boardband from Airtel , BSNL on the backup

2. 4G/5G data :-

- A moble broadband dongle router with sim card
- useful if wired connections are unavalible
- Example : Jio (or) Airtel 5G hotspot devices

3. Satellite Internet :-

- Internet via satellite
- useful in remote (or) rural areas
- Limitations higher Latency and Cost

Why Backup Links are Important

- Prevent down time from ISP outages (or) physical link failures
- Maintain uninterrupted access to coporate resources
- Ensure secure, redundant VPN connections for remote users
- Support failures mechanisms for seamless switches

Recommended backup Links for Remote opperations

Primary Links	Recommended Backup Links	Rotaonale
Fiber optics	- cable broad band - 4G/5G	Different physical reduces single point of failure cellure.
cable Broad Band	- DSL - 4G/5G	DSL as a wired backup and cellular for wireless
DSL	- 4G/5G cellular - satellite	cellular is faster and more flexible
4G/5G	- carrier cellular Networks - satellite	satellite backup if terre -strial fails
satellite	- 4G/5G - wired DSL	Satellite is usually slow latency heavy.

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42) Recommended backup links for remote operation

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