# Assignment

## unit-1

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Scenario :- A metro network uses real-time communication between stations.

Questions :-

a) Identify a topology for real-time communication:

Recommended Topology :- Mesh Topology.

Reasons :- Mesh topology provides multiple communication paths between stations.

Benefits :-

High reliability and fault tolerance.

* Low latency due to multiple routing paths.

* supports real time exchange, even during node/link failure.

b) Recommend wireless standards with minimal delay.

Recommended standards :-

1. LTE-R (Long-Team Evolution - Railway) :-

* Designed specifically for railways.

* Low latency (<50ms), high reliability.

* supports voice, video, and train control signals.

2. Wi-fi 6 (802.11ax) :-

* suitable for station-level high-speed communication.

* Low latency and higher throughput in dense environments.

3. 5G NR (New Radio):-

Ultra-reliable low latency communication (URLLC)

* Ideal for automation and real-time control.

c) suggest redundant physical links:-

Redundancy options:

* fiber optic Rings: Use ring topology for fiber optic cabling to ensure if one link fails, communication reroutes.

* Dual communication links:- Deploy two independent links (e.g, LTE-R + fiber) between key nodes.

* Trackside Radio units:- Have overlapping coverage zones for wireless units to ensure handover without packet loss.

d) compare public and private communication infrastructure :-

| Feature | Public Infrastructure | Private Infrastructure |
|---|---|---|
| ownership | Telecom provider | Metro authority |
| control | Limited | full control. |
| cost | Lower initial cost | Higher upfront investment. |
| security | shared networks, Less secure. | Dedicated, secure. |
| customiza -tion | Limited | Highly customizable. |
| Reliability | subject to public usage | Designed for mission critical applications. |