

2.Latency Optimization

Why UDP is preferred over TCP in low-latency systems:

- **UDP is connectionless**, meaning there's no need for a handshake (like TCP's 3-way handshake), reducing startup delay.
- **Low overhead**: No acknowledgment packets or retransmission mechanisms.
- **Fast delivery**: Data is sent immediately without waiting for confirmation.
- **Ideal for real-time systems** like market data feeds, gaming, or VoIP, where **speed is more important than reliability**.

Trade-offs Between TCP and UDP:

Feature	TCP	UDP
Reliability	Reliable (ensures delivery, in order)	Unreliable (no guarantee of delivery)
Latency	Higher due to connection setup & ACKs	Lower due to connectionless nature
Ordering	Guarantees in-order delivery	No ordering guarantees
Error Check	Has error recovery & retransmission	Has basic checksum, but no retransmission
Use Case	File transfers, web browsing	Live streaming, market data, DNS, VoIP

Conclusion:

In low-latency systems where occasional packet loss is acceptable, **UDP is preferred** due to its speed. If reliability and ordering are critical, **TCP** is used despite higher latency.