Comparison: Private vs Public IP, IPv4 vs IPv6, TCP vs UDP

1. Private IP vs Public IP

Feature	Private IP	Public IP
Definition	Used within private networks.	Used for internet access.
Range	10.0.0.0 - 10.255.255.255 / 172.16.0.0 - 172.31.255.255 / 192.168.0.0 - 192.168.255.255	Assigned by ISP, globally unique.
Usage	Internal communication within a network.	Internet communication.
Security	More secure as it's not directly accessible.	Less secure as it's publicly available.
Cost	Free, no registration needed.	Requires payment to ISP.

2. IPv4 vs IPv6

Feature	IPv4	IPv6
Address Length	32-bit	128-bit
Total Addresses	4.3 billion	Massive (2^128 addresses)
Format	192.168.1.1	2001:0db8:85a3::8a2e:0370:7334
Performance	Slower due to NAT	Faster with sufficient addresses
Security	Relies on external protocols	IPsec built-in for security

3. TCP vs UDP

Feature	TCP	UDP
Connection Type	Reliable, connection-oriented	Unreliable, connectionless
Speed	Slower due to acknowledgments	Faster, no acknowledgments
Usage	Web browsing, email, file transfer	VoIP, video streaming, gaming
Error Handling	Retransmits lost packets	No retransmission of lost packets