

Comparison Between Private and Public IP, IPv4 and IPv6, TCP and UDP

1. Private IP vs. Public IP

Feature	Private IP	Public IP
Definition	Used within a private network, not routable on the internet.	Assigned by ISPs and used to access the internet.
Scope	Local networks (e.g., home, office)	Global, used across the internet
Address Range	Reserved ranges: 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 IANA and ISPs
Security	More secure, as they are not directly exposed to the internet	Requires security measures like firewalls and NAT
Cost	Free (self-assigned)	Paid (ISP assigned)

2. IPv4 vs. IPv6

Feature	IPv4	IPv6
Address Size	32-bit	128-bit
Address Format	Dotted decimal (e.g., 192.168.1.1)	Hexadecimal (e.g., 2001:0db8:85a3::8a2e:0370:7334)
Address Space	~4.3 billion addresses	3.4×10^{38} addresses
Security	Security not built-in; requires additional measures like IPSec	Built-in security features (IPSec mandatory)
Speed	Slower due to NAT usage	Faster due to direct addressing
Compatibility	Supported by all devices	Requires updated hardware and software

3. TCP vs. UDP

Feature	TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
Connection Type	Connection-oriented	Connectionless
Reliability	Reliable, ensures data delivery	Unreliable, no guarantee of delivery
Speed	Slower due to error checking and retransmission	Faster due to minimal overhead
Use Cases	Web browsing, email, file transfers (e.g., HTTP, FTP, SMTP)	Streaming, gaming, VoIP (e.g., DNS, VoIP, video streaming)
Overhead	Higher due to error checking and acknowledgments	Lower, minimal error checking
