## Introduction to TCP and UDP

TCP and UDP are two standard protocols that work with the [Internet Protocol (IP)](https://www.baeldung.com/cs/popular-network-protocols). Both TCP and UDP protocols are used in the transport layer of the [OSI model](https://www.baeldung.com/cs/osi-model).

**What is TCP?**

Transmission Control Protocol (TCP) is connection-oriented, meaning once a connection has been established, data can be transmitted in two directions. TCP has built-in systems to check for errors and to guarantee data will be delivered in the order it was sent, making it the perfect protocol for transferring information like still images, data files, and web pages.

But while TCP is instinctively reliable, its feedback mechanisms also result in a larger overhead, translating to greater use of the available bandwidth on your network.

**What is UDP?**

User Datagram Protocol (UDP) is a simpler, connectionless Internet protocol wherein error-checking and recovery services are not required. With UDP, there is no overhead for opening a connection, maintaining a connection, or terminating a connection; data is continuously sent to the recipient, whether or not they receive it.

Although UDP isn’t ideal for sending an email, viewing a webpage, or downloading a file, it is largely preferred for real-time communications like broadcast or multitask network transmission.

**What is the Difference Between TCP and UDP?**

TCP is a connection-oriented protocol, whereas UDP is a connectionless protocol. A key difference between TCP and UDP is speed, as TCP is comparatively slower than UDP. Overall, UDP is a much faster, simpler, and efficient protocol, however, retransmission of lost data packets is only possible with TCP.

Another notable discrepancy with TCP vs UDP is that TCP provides an ordered delivery of data from user to server (and vice versa), whereas UDP is not dedicated to end-to-end communications, nor does it check the readiness of the receiver (requiring fewer overheads and taking up less space).

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| **Feature** | **TCP** | **UDP** |
| **Connection status** | Requires an established connection to transmit data (connection should be closed once transmission is complete) | Connectionless protocol with no requirements for opening, maintaining, or terminating a connection |
| **Data sequencing** | Able to sequence | Unable to sequence |
| **Guaranteed delivery** | Can guarantee delivery of data to the destination router | Cannot guarantee delivery of data to the destination |
| **Retransmission of data** | Retransmission of lost packets is possible | No retransmission of lost packets |
| **Error checking** | Extensive error checking and acknowledgment of data | Basic error checking mechanism using checksums |
| **Method of transfer** | Data is read as a byte stream; messages are transmitted to segment boundaries | UDP packets with defined boundaries; sent individually and checked for integrity on arrival |
| **Speed** | Slower than UDP | Faster than TCP |
| **Broadcasting** | Does not support Broadcasting | Does support Broadcasting |
| **Optimal use** | Used by HTTPS, HTTP, SMTP, POP, FTP, etc | Video conferencing, streaming, DNS, VoIP, etc |

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| **List of Well Known Ports** | | | | |
| **Port** | **TCP** | **UDP** | **Name** | **Description** |
| 1 | ✔ | ✔ | tcpmux | TCP port multiplexer |
| 5 | ✔ | ✔ | rje | Remote job entry |
| 7 | ✔ | ✔ | echo | Echo service |
| 9 | ✔ | ✔ | discard | Zero service for test purposes |
| 11 | ✔ | ✔ | systat | System information |
| 13 | ✔ | ✔ | daytime | Time and date |
| 17 | ✔ | ✔ | qotd | Sends quote of the day |
| 18 | ✔ | ✔ | msp | Sends text messages |
| 19 | ✔ | ✔ | chargen | Sends an infinite character string |
| 20 | ✔ |  | ftp-data | FTP data transfer |
| 21 | ✔ | ✔ | ftp | FTP connection |
| 22 | ✔ | ✔ | ssh | Secure Shell Service |
| 23 | ✔ |  | telnet | Telnet service |
| 25 | ✔ |  | smtp | Simple Mail Transfer Protocol |
| 37 | ✔ | ✔ | time | Machine-readable time protocol |
| 39 | ✔ | ✔ | rlp | Resource location protocol |
| 42 | ✔ | ✔ | nameserver | Name service |
| 43 | ✔ |  | nicname | WHOIS directory service |
| 49 | ✔ | ✔ | tacacs | Terminal access controller access control system |
| 50 | ✔ | ✔ | re-mail-ck | Remote mail checking |
| 53 | ✔ | ✔ | domain | DNS name resolver |
| 67 |  | ✔ | bootps | Bootstrap protocol services |
| 68 |  | ✔ | bootpc | Bootstrap client |
| 69 |  | ✔ | tftp | Trivial file transfer protocol |
| 70 | ✔ |  | gopher | Document search |
| 71 | ✔ |  | genius | Genius protocol |
| 79 | ✔ |  | finger | Delivers user contact information |
| 80 | ✔ |  | http | Hypertext transfer protocol |
| 81 | ✔ |  |  | Torpark: Onion routing (unofficial) |
| 82 |  | ✔ |  | Torpark: Control (unofficial) |
| 88 | ✔ | ✔ | kerberos | Network authentication system |
| 101 | ✔ |  | hostname | NIC host name |
| 102 | ✔ |  | Iso-tsap | ISO TSAP protocol |
| 105 | ✔ | ✔ | csnet-ns | Mailbox mail server |
| 107 | ✔ |  | rtelnet | Remote telnet |
| 109 | ✔ |  | pop2 | Post office protocol v2 for e-mail communication |
| 110 | ✔ |  | pop3 | Post office protocol v3 for e-mail communication |
| 111 | ✔ | ✔ | sunrpc | RPC protocol for NFS |
| 113 |  | ✔ | auth | Authentication service |
| 115 | ✔ |  | sftp | Simple file transfer protocol |
| 117 | ✔ |  | uucp-path | File transfer between Unix systems |
| 119 | ✔ |  | nntp | Transfer of messages in news groups |
| 123 |  | ✔ | ntp | Time synchronization service |
| 137 | ✔ | ✔ | netbios-ns | NETBIOS name service |
| 138 | ✔ | ✔ | netbios-dgm | NETBIOS datagram service |
| 139 | ✔ | ✔ | netbios-ssn | NETBIOS session service |
| 143 | ✔ | ✔ | imap | Internet message access protocol for e-mail communication |
| 161 |  | ✔ | snmp | Simple network management protocol |
| 162 | ✔ | ✔ | snmptrap | Simple network management protocol trap |
| 177 | ✔ | ✔ | xdmcp | X display manager |
| 179 | ✔ |  | bgp | Border gateway protocol |
| 194 | ✔ | ✔ | irc | Internet relay chat |
| 199 | ✔ | ✔ | smux | SNMP UNIX multiplexer |
| 201 | ✔ | ✔ | at-rtmp | AppleTalk routing |
| 209 | ✔ | ✔ | qmtp | Quick mail transfer protocol |
| 210 | ✔ | ✔ | z39.50 | Bibliographic information system |
| 213 | ✔ | ✔ | ipx | Internetwork packet exchange |
| 220 | ✔ | ✔ | imap3 | IMAP v3 for e-mail communication |
| 369 | ✔ | ✔ | rpc2portmap | Coda file system port mapper |
| 370 | ✔ | ✔ | codaauth2 | Coda file system authentication service |
| 389 | ✔ | ✔ | ldap | Lightweight directory access protocol |
| 427 | ✔ | ✔ | svrloc | Service location protocol |
| 443 | ✔ |  | https | HTTPS (HTTP over SSL/TLS) |
| 444 | ✔ | ✔ | snpp | Simple network paging protocol |
| 445 | ✔ |  | microsoft-ds | SMB over TCP/IP |
| 464 | ✔ | ✔ | kpasswd | Kerberos password change |
| 500 |  | ✔ | isakmp | Security protocol |
| 512 | ✔ |  | exec | Remote process execution |
| 512 |  | ✔ | comsat/biff | Mail client and server |
| 513 | ✔ |  | login | Login to remote computer |
| 513 |  | ✔ | who | Whod user logging daemon |
| 514 | ✔ |  | shell | Remote shell |
| 514 |  | ✔ | syslog | Unix system logging service |
| 515 | ✔ |  | printer | Line printer daemon print services |
| 517 |  | ✔ | talk | Talk remote calling |
| 518 |  | ✔ | ntalk | Network talk |
| 520 | ✔ |  | efs | Extended file name server |
| 520 |  | ✔ | router | Routing information protocol |
| 521 |  | ✔ | ripng | Routing information protocol for IPv6 |
| 525 |  | ✔ | timed | Time server |
| 530 | ✔ | ✔ | courier | Courier remote procedure call |
| 531 | ✔ | ✔ | conference | Chat over AIM and IRC |
| 532 | ✔ |  | netnews | Netnews newsgroup service |
| 533 |  | ✔ | netwall | Emergency broadcasts |
| 540 | ✔ |  | uucp | Unix-to-Unix copy protocol |
| 543 | ✔ |  | klogin | Kerberos v5 remote login |
| 544 | ✔ |  | kshell | Kerberos v5 remote shell |
| 546 | ✔ | ✔ | dhcpv6-client | DHCP v6 client |
| 547 | ✔ | ✔ | dhcpv6-server | DHCP v6 server |
| 548 | ✔ |  | afpovertcp | Apple filing protocol over TCP |
| 554 | ✔ | ✔ | rtsp | Real time streaming protocol |
| 556 | ✔ |  | remotefs | Remote file system |
| 563 | ✔ | ✔ | nntps | NNTP over SSL/TLS |
| 587 | ✔ |  | submission | Message submission agent |
| 631 | ✔ | ✔ | ipp | Internet printing protocol |
| 631 | ✔ | ✔ |  | Common Unix printing system (unofficial) |
| 636 | ✔ | ✔ | ldaps | LDAP over SSL/TLS |
| 674 | ✔ |  | acap | Application configuration access protocol |
| 694 | ✔ | ✔ | ha-cluster | Heartbeat service |
| 749 | ✔ | ✔ | kerberos-adm | Kerberos v5 administration |
| 750 |  | ✔ | kerberos-iv | Kerberos v4 services |
| 873 | ✔ |  | rsync | rsync file transfer services |
| 992 | ✔ | ✔ | telnets | Telnet over SSL/TLS |
| 993 | ✔ |  | imaps | IMAP over SSL/TLS |
| 995 | ✔ |  | pop3s | POP3 over SSL/TLS |