Grace mukeni

9:00 TO 11:00 M0RNIG

ASSIGNMENT

DIFFERENCE OF IP ADDRESS

|  |  |
| --- | --- |
| IPV4 | IPV6 |
| DHCP or a manual configuration | Supports out configuration |
| Numeric data decimal notation | Alphanumeric hexadecimal notation |
| Address must be reused and masked | Every device has a unique address |
| Is a 32bit string of digits composed of four numbers each between 0 and 255 and separated by periods | Is a 128-bit hexadecimal string |
| It was deployed in 1981 | It was deployed in 1998 |
| Takes more time | Takes less time |
|  |  |

TYPES OF NETWORK PORT

1. Port 20 and 21: file transfer and protocols (FTP)
2. Port 22: secure shell (SSH)
3. Port 25: simple mail transfer protocol (SMTP)
4. Port 53: domain name system (DNS)
5. Port 80: hypertext transfer protocol (HTTP)

WELL KNOWN PORT

TCP/IP port assigned number authority IANA 1024 to 49151 for convenience of the internet community.

Below is an example:

| Well-Known TCP/UDP Ports 0 to 1023 | | | |
| --- | --- | --- | --- |
| **Port #** | **Protocol** | **Description** | **Status** |
| 0 | TCP, UDP | Reserved; do not use (but is a permissible source port value if the sending process does not expect messages in response) | Official |
| 1 | TCP, UDP | TCPMUX | Official |
| 5 | TCP, UDP | RJE (Remote Job Entry) | Official |
| 7 | TCP, UDP | ECHO protocol | Official |
| 9 | TCP, UDP | DISCARD protocol | Official |
| 11 | TCP, UDP | SYSTAT protocol | Official |
| 13 | TCP, UDP | DAYTIME protocol | Official |
| 17 | TCP, UDP | QOTD (Quote of the Day) protocol | Official |

**LIST OF WELL-KNOWN PORTS**

Port numbers range from 0 to 65535, but only port numbers 0 to 1023 are reserved for privileged services and designated as well-known ports. The following list of *well-known port numbers* specifies the port used by the server process as its contact port.

|  |  |
| --- | --- |
| Port Number — | Description |
| 1 | [TCP](https://www.webopedia.com/definitions/tcp/) Port Service Multiplexer (TCPMUX) |
| 5 | Remote Job Entry (RJE) |
| 7 | ECHO |
| 18 | Message Send Protocol (MSP) |
| 20 | [FTP](https://www.webopedia.com/definitions/ftp/) — Data |
| 21 | FTP — Control |
| 22 | [SSH](https://www.webopedia.com/definitions/ssh/) Remote Login Protocol |
| 23 | [Telnet](https://www.webopedia.com/definitions/telnet/) |
| 25 | [Simple Mail Transfer Protocol](https://www.webopedia.com/definitions/smtp/) (SMTP) |
| 29 | MSG ICP |
| 37 | Time |
| 42 | Host Name Server (Nameserv) |
| 43 | WhoIs |
| 49 | Login Host Protocol (Login) |
| 53 | [Domain Name System](https://www.webopedia.com/definitions/dns/) (DNS) |
| 69 | [Trivial File Transfer Protocol](https://www.webopedia.com/definitions/tftp/) (TFTP) |
| 70 | [Gopher](https://www.webopedia.com/definitions/gopher/) Services |
| 79 | [Finger](https://www.webopedia.com/definitions/finger/) |
| 80 | [HTTP](https://www.webopedia.com/definitions/http/) |
| 103 | [X.400](https://www.webopedia.com/definitions/x-400/) Standard |
| 108 | SNA Gateway Access Server |
| 109 | POP2 |
| se110 | [POP3](https://www.webopedia.com/definitions/pop/) |
| 115 | Simple File Transfer Protocol (SFTP) |
| 118 | SQL Services |
| 119 | Newsgroup ([NNTP](https://www.webopedia.com/definitions/nntp/)) |
| 137 | [NetBIOS](https://www.webopedia.com/definitions/netbios/) Name Service |
| 139 | NetBIOS Datagram Service |
| 143 | Interim Mail Access Protocol (IMAP) |
| 150 | NetBIOS Session Service |
| 156 | [SQL Server](https://www.webopedia.com/definitions/sql-server/) |
| 161 | [SNMP](https://www.webopedia.com/definitions/snmp/) |
| 179 | [Border Gateway Protocol](https://www.webopedia.com/definitions/bgp/) (BGP) |
| 190 | Gateway Access Control Protocol (GACP) |
| 194 | [Internet Relay Chat](https://www.webopedia.com/definitions/irc/) (IRC) |
| 197 | Directory Location Service (DLS) |
| 389 | [Lightweight Directory Access Protocol](https://www.webopedia.com/definitions/ldap/) (LDAP) |
| 396 | Novell Netware over IP |
| 443 | [HTTPS](https://www.webopedia.com/definitions/ssl/) |
| 444 | Simple Network Paging Protocol (SNPP) |
| 445 | Microsoft-DS |
| 458 | Apple [QuickTime](https://www.webopedia.com/definitions/quicktime/) |
| 546 | [DHCP](https://www.webopedia.com/definitions/dhcp/) Client |

**Common TCP/IP Protocols and Ports**

|  |  |  |  |
| --- | --- | --- | --- |
| **Protocol** | **TCP/UDP** | **Port Number** | **Description** |
| File Transfer Protocol (FTP)  (RFC 959) | TCP | 20/21 | FTP is one of the most commonly used file transfer protocols on the Internet and within private networks. An FTP server can easily be set up with little networking knowledge and provides the ability to easily relocate files from one system to another. FTP control is handled on TCP port 21 and its data transfer can use TCP port 20 as well as dynamic ports depending on the specific configuration. |
| Secure Shell (SSH)  (RFC 4250-4256) | TCP | 22 | SSH is the primary method used to manage network devices securely at the command level. It is typically used as a secure alternative to Telnet which does not support secure connections. |
| Telnet  (RFC 854) | TCP | 23 | Telnet is the primary method used to manage network devices at the command level. Unlike SSH which provides a secure connection, Telnet does not, it simply provides a basic unsecured connection. Many lower level network devices support Telnet and not SSH as it required some additional processing. Caution should be used when connecting to a device using Telnet over a public network as the login credentials will be transmitted in the clear. |
| Simple Mail Transfer Protocol (SMTP)  (RFC 5321) | TCP | 25 | SMTP is used for two primary functions, it is used to transfer mail (email) from source to destination between mail servers and it is used by end users to send email to a mail system. |
| Domain Name System (DNS)  (RFC 1034-1035) | TCP/UDP | 53 | The DNS is used widely on the public internet and on private networks to translate domain names into IP addresses, typically for network routing. DNS is hieratical with main root servers that contain databases that list the managers of high level Top Level Domains (TLD) (such as .com). These different TLD managers then contain information for the second level domains that are typically used by individual users (for example, cisco.com). A DNS server can also be set up within a private network to private naming services between the hosts of the internal network without being part of the global system. |
| Dynamic Host Configuration Protocol (DHCP)  (RFC 2131) | UDP | 67/68 | DHCP is used on networks that do not use static IP address assignment (almost all of them). A DHCP server can be set up by an administrator or engineer with a poll of addresses that are available for assignment. When a client device is turned on it can request an IP address from the local DHCP server, if there is an available address in the pool it can be assigned to the device. This assignment is not permanent and expires at a configurable interval; if an address renewal is not requested and the lease expires the address will be put back into the poll for assignment. |
| Trivial File Transfer Protocol (TFTP)  (RFC 1350) | UDP | 69 | TFTP offers a method of file transfer without the session establishment requirements that FTP uses. Because TFTP uses UDP instead of TCP it has no way of ensuring the file has been properly transferred, the end device must be able to check the file to ensure proper transfer. TFTP is typically used by devices to upgrade software and firmware; this includes Cisco and other network vendors’ equipment. |
| Hypertext Transfer Protocol (HTTP)  (RFC 2616) | TCP | 80 | HTTP is one of the most commonly used protocols on most networks. HTTP is the main protocol that is used by web browsers and is thus used by any client that uses files located on these servers. |
| Post Office Protocol (POP) version 3  (RFC 1939) | TCP | 110 | POP version 3 is one of the two main protocols used to retrieve mail from a server. POP was designed to be very simple by allowing a client to retrieve the complete contents of a server mailbox and then deleting the contents from the server. |
| Network Time Protocol (NTP)  (RFC 5905) | UDP | 123 | One of the most overlooked protocols is NTP. NTP is used to synchronize the devices on the Internet. Even most modern operating systems support NTP as a basis for keeping an accurate clock. The use of NTP is vital on networking systems as it provides an ability to easily interrelate troubles from one device to another as the clocks are precisely accurate. |
| NetBIOS  (RFC 1001-1002) | TCP/UDP | 137/138/139 | NetBIOS itself is not a protocol but is typically used in combination with IP with the NetBIOS over TCP/IP (NBT) protocol. NBT has long been the central protocol used to interconnect Microsoft Windows machines. |
| Internet Message Access Protocol (IMAP)  (RFC 3501) | TCP | 143 | IMAP version3 is the second of the main protocols used to retrieve mail from a server. While POP has wider support, IMAP supports a wider array of remote mailbox operations which can be helpful to users. |
| Simple Network Management Protocol (SNMP)  (RFC 1901-1908, 3411-3418) | TCP/UDP | 161/162 | SNMP is used by network administrators as a method of network management. SNMP has a number of different abilities including the ability to monitor, configure and control network devices. SNMP traps can also be configured on network devices to notify a central server when specific actions are occurring. Typically, these are configured to be used when an alerting condition is happening. In this situation, the device will send a trap to network management stating that an event has occurred and that the device should be looked at further for a source to the event. |
| Border Gateway Protocol (BGP)  (RFC 4271) | TCP | 179 | BGP version 4 is widely used on the public internet and by Internet Service Providers (ISP) to maintain very large routing tables and traffic processing. BGP is one of the few protocols that have been designed to deal with the astronomically large routing tables that must exist on the public Internet. |
| Lightweight Directory Access Protocol (LDAP)  (RFC 4510) | TCP/UDP | 389 | LDAP provides a mechanism of accessing and maintaining distributed directory information. LDAP is based on the ITU-T X.500 standard but has been simplified and altered to work over TCP/IP networks. |
| Hypertext Transfer Protocol over SSL/TLS (HTTPS)  (RFC 2818) | TCP | 443 | HTTPS is used in conjunction with HTTP to provide the same services but doing it using a secure connection which is provided by either SSL or TLS. |
| Lightweight Directory Access Protocol over TLS/SSL (LDAPS)  (RFC 4513) | TCP/UDP | 636 | Just like HTTPS, LDAPS provides the same function as LDAP but over a secure connection which is provided by either SSL or TLS. |
| FTP over TLS/SSL  (RFC 4217) | TCP | 989/990 | Again, just like the previous two entries, FTP over TLS/SSL uses the FTP protocol which is then secured using either SSL or |

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| **PROTOCOLS (SERVICE NAMES)** | **PORTS NUMBERS** | **TRANSPORT PROTOCOLS** | **MEANINGS** |
| **1.**File Transfer Protocol (FTP) | 20 and 21 | TCP | It is a protocol that carries data guarantees that data will be delivered properly. |
| **2.**Secure Shell (SSH) | 22 | TCP and UDP | It is a cryptographic network protocol used to secure data communication. |
| **3.**Telnet | 23 | TCP | It is the used for remote management protocol for managing network devices. |
| **4.**Simple Mail Transfer Protocol (SMTP) | 25 | TCP | It is a communication protocol which is used to transmit email messages over the internet to the destination server. |
| **5.**Domian Name System (DNS) | 53 | TCP and UDP | It is used in the performance of one simple task of converting IP address  To domain names that everyone can easily understand. |
| **6.**Trivial File Transfer Protocol (TFTP) | 69 | UDP | TFTP is typically used by devices to upgrade software and firmware and that include cisco. |
| **7.**Hyper Text Transfer Protocol (HTTP) | 80 | TCP | It is a kind of protocol used to define how data is transmitted and formatted and also used by www as a channel for communication. |
| **8.**Dynamic Host Configuration Protocol (DHCP) | 67 and 68 | UDP | It is a kind of service used in the client and server model. |
| **9.**Post Office Protocol 3 (POP3) | 110 | TCP | It is a protocol used by e-mail client to retrieve e-mail from the servers. |
| **10.**Network News Transport Protocol (NNTP) | 119 | TCP | nntp is an application protocol used for transporting USENET news articles between news servers and the end user client. |
| **11.**Network Time Protocol (NTP) | 123 | UDP | It is the synchronization of time between network devices in the network. |
| **12.**NetBIOS | 135 and 139 | TCP and UDP | NetBIOS itself is not a protocol but is typically used in combination with IP with the NetBIOS over TCP/IP protocol. |
| **13.**Simple Network Management Protocol (SNMP) | 161 and 162 | TCP and UDP | It has the ability to monitor, configure and control network devices. |
| **14.**Lightweight Directory Access Protocol | 389 | TCP and UDP | LDAP provides a mechanism of accessing and maintaining distributed directory information. |
| **15.**Transport Layer Security (TLS) | 443 | TCP | It is a protocol of a secured socket layer that uses asymmetric keys to transfer data over a network. |
| **16.**Real-Time Transport Protocol. (RTP) | 1023 TO 65535 | UDP | It is used for delivering audio and video data over an IP network. |
| **17.**Hyper Text Transfer Protocol Secure. (HTTPS) | 443 | TCP | It renders authentication and encryption that provides secure communication with the use of secure socket layer. |
| **18.**Internet Message Access Protocol. (IMAP4) | 143 | TCP and UDP | It is an application layer protocol and an internet standards for e-mail retrieval. |
| **19.**Address Resolution Protocol (ARP) | 3389 | TCP | It is used to resolve the network layer address into the link address. |
| **20.**Border Gateway Protocol (BGP) | 179 | TCP | It is used to maintain very large routing tables and traffic processing. |
| **21.**Internet Relay Chat (IRC) | 194 | UDP | It is an application layer protocol that facilitate communication in the form of text. |
| **22.**Session Initiation Protocol. (SLP) |  | TCP and UDP | It is used to establish, modify, and terminate multimedia communication session such as VoIP. |
| **23.**Session Description Protocol.(SDP) |  | TCP | It describes the content of multimedia communication. |
| **24.**Remote Desktop Protocol. (RDP) | 3389 | TCP | It provides a user with a graphical interface to connect to another computer over a network connection. |
| **25.**Server Message Block (SMB) |  | TCP | It is an application layer protocol that helps in accessing network resources, such as shared files and printers. |
| **26.**Secure File Transfer Protocol (SFTP) | 22 | TCP and UDP | It uses the SSH protocol to access and transfer file over the network. |
| **27.**Internet Group Management Protocol (IGMP) | 2 | TCP | It is a communication protocol used by hosts and adjacent routers on IPv4 network to establish multicast group membership. |
| **28.**Route Access Protocol (RAP) | 38 | TCP |  |
| **29**.Resource Location Protocol (RLP) | 39 | TCP | It is used for determining the location of higher level service from host on a network. |
| **30.**Host Name Server Protocol (HNSP) | 42 | TCP |  |
| **31**.Internet Control Messages Protocol (ICMP) | 1 | PING | It is used by a ping utility to check the reachability the device in a network. |

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| **32**.Remote Directory Access Protocol (RDAS) |  | TCP | It is used retrieves information about domain names from a central registry. |
| **33**.Lightweight Presentation Protocol (LPP) |  | TCP and UDP | It is describe an approach for providing stream lined support of  OSI application services on top of TCP/IP –based network for some constrained environment. |
| **34.**Remote Procedure Call Protocol (RPC) |  | TCP and UDP | It is a protocol for requesting a service from a program location in a remote computer through a network. |
| **35.**Network Address Translation (NAT) | 3022 | TCP and UDP | It is the method by which IP addresses are mapped from one group to another, transparent to end users. |
| **36.**Microsoft Active Directory Protocol (MADP) | 445 | TCP | it is used by Microsoft server operating systems for client/server access and file and printer sharing. |
| **37**.Calender Access Protocol (CAP) | 1026 | TCP | It is used by Novell GroupWise for its calendar access protocol and also used by windows task scheduler. |
| **38.** Layer Two Tunneling Protocol.(L2TP) | 1701 | TCP | It is used to connect two private business network together over an internet connection to create a virtual network. |
| **39**.Point To Point Tunneling Protocol (PPTP) | 1732 | TCP | A tunneling and encryption standard is used to connect two private business network together over an internet connection to create a virtual network. |
| **40**.Remote Procedure Call (RPC) | 135 | TCP | It holds information regarding which ports and IP addresses the services are currently running . |

[**TCP vs UDP**](https://ipwithease.com/tcp-vs-udp/)

| **PORT NUMBER** | **TRANSPORT PROTOCOL** | **SERVICE NAME** | **RFC** |
| --- | --- | --- | --- |
| 20, 21 | TCP | File Transfer Protocol (FTP) | RFC 959 |
| 22 | TCP and UDP | Secure Shell (SSH) | RFC 4250-4256 |
| 23 | TCP | Telnet | RFC 854 |
| 25 | TCP | Simple Mail Transfer Protocol (SMTP) | RFC 5321 |
| 53 | TCP and UDP | Domain Name Server (DNS) | RFC 1034-1035 |
| 67, 68 | UDP | Dynamic Host Configuration Protocol (DHCP) | RFC 2131 |
| 69 | UDP | Trivial File Transfer Protocol (TFTP) | RFC 1350 |
| 80 | TCP | HyperText Transfer Protocol (HTTP) | RFC 2616 |
| 110 | TCP | Post Office Protocol (POP3) | RFC 1939 |
| 119 | TCP | Network News Transport Protocol (NNTP) | RFC 8977 |
| 123 | UDP | Network Time Protocol (NTP) | RFC 5905 |
| 135-139 | TCP and UDP | NetBIOS | RFC 1001-1002 |
| 143 | TCP and UDP | Internet Message Access Protocol (IMAP4) | RFC 3501 |
| 161, 162 | TCP and UDP | Simple Network Management Protocol (SNMP) | RFC 1901-1908, 3411-3418 |
| 179 | TCP | Border Gateway Protocol (BGP) | RFC 4271 |
| 389 | TCP and UDP | Lightweight Directory Access Protocol | RFC 4510 |
| 443 | TCP and UDP | HTTP with Secure Sockets Layer (SSL) | RFC 2818 |
| 500 | UDP | Internet Security Association and Key Management Protocol (ISAKMP) / Internet Key Exchange (IKE) | RFC 2408 - 2409 |
| 636 | TCP and UDP | Lightweight Directory Access Protocol over TLS/SSL (LDAPS | RFC 4513 |
| 989/990 | TCP | FTP over TLS/SSL | RFC 4217 |

DIFFERECE BETWEEN SERVER AND PROXY

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| --- | --- | --- |
| **S.No.** | **FORWARD PROXY** | **REVERSE PROXY** |
| 1 | Forward proxy connection initiates from inside secured zone and destined to outside unsecured global network. | Reverse proxy connection comes from outside global network and destined to inside secured network. |
| 2 | Forward proxy are not used for Application Delivery. | Reverse proxy are built for Application Delivery. |
| 3 | Forward proxy are good for content filtering, nat’ing, Email Security etc. | Reverse Proxy are used for Load Balancing (TCP Multiplexing), Content Switching, Authentication and application firewall. |
| 4 | Forward proxy restrict the internal user from accessing the user filtered/restricted site. | Reverse proxy restrict the outside user/client to have direct access to internal/private networks. |

DATA AND CAPSULATION

Difference Between Data Abstraction and Encapsulation

Definition

Data Abstraction is an OOP concept that hides the implementation details and shows only the functionality to the user. Encapsulation is an OOP concept that binds or wraps the data and methods together into a single unit.

Main Usage

Data Abstraction hides the implementation details to reduce the code complexity while encapsulation hides data for the purpose of data protection. This is the main difference between data abstraction and encapsulation with regards to the usage of the two.

Method of Achieving

OOP languages use abstract classes and interfaces to achieve Data Abstraction. In contrast, OOP languages can achieve Encapsulation by making the data members private and accessing them through public methods.

Conclusion

Data abstraction and encapsulation are two concepts in OOP (Object Oriented Programming). The difference between data abstraction and encapsulation is that the data abstraction hides implementation details to reduce code complexity while the encapsulation hides details for data protection.