IPv4 Subnet Cheat Sheet

| **CIDR** | **Subnet Mask** | **Total IPs** | **Usable IPs** |
| --- | --- | --- | --- |
| **/32** | **255.255.255.255** | **1** | **1** |
| **/31** | **255.255.255.254** | **2** | **2\*** |
| **/30** | **255.255.255.252** | **4** | **2** |
| **/29** | **255.255.255.248** | **8** | **6** |
| **/28** | **255.255.255.240** | **16** | **14** |
| **/27** | **255.255.255.224** | **32** | **30** |
| **/26** | **255.255.255.192** | **64** | **62** |
| **/25** | **255.255.255.128** | **128** | **126** |
| **/24** | **255.255.255.0** | **256** | **254** |
| **/23** | **255.255.254.0** | **512** | **510** |
| **/22** | **255.255.252.0** | **1024** | **1022** |
| **/21** | **255.255.248.0** | **2048** | **2046** |
| **/20** | **255.255.240.0** | **4096** | **4094** |
| **/19** | **255.255.224.0** | **8192** | **8190** |
| **/18** | **255.255.192.0** | **16,384** | **16,382** |
| **/17** | **255.255.128.0** | **32,768** | **32,766** |
| **/16** | **255.255.0.0** | **65,536** | **65,534** |
| **/15** | **255.254.0.0** | **131,072** | **131,070** |
| **/14** | **255.252.0.0** | **262,144** | **262,142** |
| **/13** | **255.248.0.0** | **524,288** | **524,286** |
| **/12** | **255.240.0.0** | **1,048,576** | **1,048,574** |
| **/11** | **255.224.0.0** | **2,097,152** | **2,097,150** |
| **/10** | **255.192.0.0** | **4,194,304** | **4,194,302** |
| **/9** | **255.128.0.0** | **8,388,608** | **8,388,606** |
| **/8** | **255.0.0.0** | **16,777,216** | **16,777,214** |
| **/7** | **254.0.0.0** | **33,554,432** | **33,554,430** |
| **/6** | **252.0.0.0** | **67,108,864** | **67,108,862** |
| **/5** | **248.0.0.0** | **134,217,728** | **134,217,726** |
| **/4** | **240.0.0.0** | **268,435,456** | **268,435,454** |
| **/3** | **224.0.0.0** | **536,870,912** | **536,870,910** |
| **/2** | **192.0.0.0** | **1,073,741,824** | **1,073,741,822** |
| **/1** | **128.0.0.0** | **2,147,483,648** | **2,147,483,646** |

Private IP ranges

|  |  |  |  |
| --- | --- | --- | --- |
| **Class** | **Size** | **Subnet Mask** | **Range of IPs** |
| **Class A** | **10.0.0.0/8** | **255.0.0.0** | **10.0.0.0 – 10.255.255.255** |
| **Class B** | **172.16.0.0/12** | **255.240.0.0** | **172.16.0.0 – 172.31.255.255** |
| **Class C** | **192.168.0.0/16** | **255.255.0.0** | **192.168.0.0 – 192.168.255.255** |

Formulas

Number of subnets = **2n** where n is the number of borrowed bits.

number of hosts = **2(32-n)** where n is the number of subnet mask value

and unusable host is **2(32-n) - 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **OSI Model** | **TCP/UDP** | **PDU** | **Address Type** | **Protocol EX.** |
| Application | Application | Data |  | HTTP, FTP, DNS, IMAP, SMTP |
| Presentation |
| Session |
| Transport | Transport | Segment | Port | TCP, UDP |
| Network | Network | Packet | IP | IP, IPv6, ICMP |
| Data-Link | Network Access | Frame | MAC | Ethernet, CDP |
| Physical | Bit | 10BASE-T |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Decimal  Value | **0** | **128** | **192** | **224** | **240** | **248** | **252** | **254** | **255** |
| No. of Bits set to 1 | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subnet | **1** | **2** | **4** | **8** | **16** | **32** | **64** | **128** | **256** |
| Host | **256** | **128** | **64** | **32** | **16** | **8** | **4** | **2** | **1** |
| S.mask | **/24** | **/25** | **/26** | **/27** | **/28** | **/29** | **/30** | **/31** | **/32** |

Full forms

**MPLS** = Multiprotocol Label Switching

**LSR** = Label Switch Router

**LER** = Label Edge Router

**LDP** = Label Distribution Protocol

**LSP** = Label Switched Path

**FEC** = Forwarding Equivalence Class

**RSVP-TE** = Resource Reservation Protocol-Traffic Engineering

**VPN** = Virtual Private Network

**VPLS** = Virtual Private LAN Service

**L2VPN** = Layer 2 Virtual Private Network

**L3VPN** = Layer 3 Virtual Private Network

**PE** = Provider Edge

**P** = Provider

**CE** = Customer Edge

**TE** = Traffic Engineering

**QoS** = Quality of Service

**BGP** = Border Gateway Protocol

**IGP** = Interior Gateway Protocol

**OSPF** = Open Shortest Path First

**IS-IS** = Intermediate System to Intermediate System

**BFD** = Bidirectional Forwarding Detection

**FRR** = Fast Reroute

**PWE3** = Pseudo-wire Emulation Edge to Edge

**TTL** = Time to Live

**ECMP** = Equal-Cost Multi-Path

MPLS labels consist of the following four parts:

1. Label value: 20 bits.

2. Experimental: 3 bits.

3. Bottom of stack: 1 bit.

4. Time to live: 8 bits.

**Steps Of An MPLS Network Traffic Pathway**

Here is an example of how a packet travels through an MPLS network:

1. A packet enters the network through an LER.
2. The packet is assigned to a forwarding equivalence class (FEC). The FEC assignment depends on the type of data and the destination. FECs are used to identify packets with similar or identical characteristics.
3. The LER -- or ingress node -- applies a label to the packet and pushes it inside an LSP. The LER decides on which LSP the packet takes until it reaches its destination address.
4. The packet moves through the network across LSRs.
5. When an LSR receives a packet, it carries out the Push, Swap and Pop actions.
6. In the final step, the LSR -- or egress router -- removes the labels and then forwards the original IP packet toward its destination.