

IP Address and Subnetting Guide



NETWORK ADDRESS RANGES BY CLASS

IP network addresses are issued as follows:

CLASS	RANGE	DEFAULT MASK
Class A	1-127	255.0.0.0
Class B	128-191	255.255.0.0
Class C	192-223	255.255.255.0

MAXIMUM NUMBER OF HOSTS BY CLASS

The maximum number of hosts is achieved by using the default subnet mask for each class (i.e. by having only one subnet).

CLASS	NO. OF ADDRESSES	
Class A	2 ²⁴	16,777,216
Class B	2 ¹⁶	65,536
Class C	2 ⁸	256

BINARY CALCULATIONS

DECIMAL	BINARY	
2 ⁰	1	00000001
2 ¹	2	00000010
2 ²	4	00000100
2 ³	8	00001000
2 ⁴	16	00010000
2 ⁵	32	00100000
2 ⁶	64	01000000
2 ⁷	128	10000000

SUBNET MASKS - BINARY REPRESENTATIONS

DECIMAL	HEX	BINARY
.128	80	10000000
.192	C0	11000000
.224	E0	11100000
.240	F0	11110000
.248	F8	11111000
.252	FC	11111100
.254	FE	11111110
.255	FF	11111111

NO. OF BITS SUBNET MASK NO. OF SUBNETS NO. OF HOSTS PER SUBNET

CLASS B

NO. OF BITS	SUBNET MASK	NO. OF SUBNETS	NO. OF HOSTS PER SUBNET
1	255.255.128.0	2	32766
2	255.255.192.0	4	16382
3	255.255.224.0	8	8190
4	255.255.240.0	16	4094
5	255.255.248.0	32	2046
6	255.255.252.0	64	1022
7	255.255.254.0	128	510
8	255.255.255.0	256	254
9	255.255.255.128	512	126
10	255.255.255.192	1024	62
11	255.255.255.224	2048	30
12	255.255.255.240	4096	14
13	255.255.255.248	8192	6
14	255.255.255.252	16384	2

CLASS C

NO. OF BITS	SUBNET MASK	NO. OF SUBNETS	NO. OF HOSTS PER SUBNET
1	255.255.255.128	2	126
2	255.255.255.192	4	62
3	255.255.255.224	8	30
4	255.255.255.240	16	14
5	255.255.255.248	32	6
6	255.255.255.252	64	2

IP ADDRESS RANGES FOR CLASS C SUBNETS

SUBNET MASK	SUBNET NO.	SUBNET ADDRESS	ADDRESS RANGE	B'CAST	SUBNET MASK	SUBNET NO.	SUBNET ADDRESS	ADDRESS RANGE	B'CAST
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Number of bits for Class C networks — 24 bit mask = 255.255.255.0, 32 bit mask = 255.255.255.255.

USABLE SUBNETS AND ADDRESSES

The top and bottom host numbers of any subnet may not be used. The bottom number is the subnet address and the top number is the broadcast address for the subnet.

128 (25 bits)	0 1	0 128	1-126 129-254	127 255	252 (30 bits)	0 1	0 4	1-2 5-6	3 7
192 (26 bits)	0 1 2 3	0 64 128 192	1-62 65-126 129-190 193-254	63 127 191 255		2 3 4 5 6 7	8 12 16 20 24 28	9-10 13-14 17-18 21-22 25-26 29-30	11 15 19 23 27 31
224 (27 bits)	0 1 2 3 4 5 6 7	0 32 64 96 128 160 192 224	1-30 33-62 65-94 97-126 129-158 161-190 193-222 225-254	31 63 95 127 159 191 223 255		8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120 124 128 132 136 140 144 148 152 156 160 164 168 172 176 180 184 188 192 196 200 204 208 212 216 220 224 228 232 236 240 244 248 252	33-34 37-38 41-42 45-46 49-50 53-54 57-58 61-62 65-66 69-70 73-74 77-78 81-82 85-86 89-90 93-94 97-98 101-102 105-106 109-110 113-114 117-118 121-122 125-126 129-130 133-134 137-138 141-142 145-146 149-150 153-154 157-158 161-162 165-166 169-170 173-174 177-178 181-182 185-186 189-190 193-194 197-198 201-202 205-206 209-210 213-214 217-218 221-222 225-226 229-230 233-234 237-238 241-242 245-246 249-250 253-254	35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99 103 107 111 115 119 123 127 131 135 139 143 147 151 155 159 163 167 171 175 179 183 187 191 195 199 203 207 211 215 219 223 227 231 235 239 243 247 251 255
240 (28 bits)	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0 16 32 48 64 80 96 112 128 144 160 176 192 208 224 240	1-14 17-30 33-46 49-62 65-78 81-94 97-110 113-126 129-142 145-158 161-174 177-190 193-206 209-222 225-238 241-254	15 31 47 63 79 95 111 127 143 159 175 191 207 223 239 255		32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63	125-126 129-130 133-134 137-138 141-142 145-146 149-150 153-154 157-158 161-162 165-166 169-170 173-174 177-178 181-182 185-186 189-190 193-194 197-198 201-202 205-206 209-210 213-214 217-218 221-222 225-226 229-230 233-234 237-238 241-242 245-246 249-250 253-254	127 131 135 139 143 147 151 155 159 163 167 171 175 179 183 187 191 195 199 203 207 211 215 219 223 227 231 235 239 243 247 251 255	
248 (29 bits)	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	0 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152 160 168 176 184 192 200 208 216 224 232 240 248	1-6 9-14 17-22 25-30 33-38 41-46 49-54 57-62 65-70 73-78 81-86 89-94 97-102 105-110 113-118 121-126 129-134 137-142 145-150 153-158 161-166 169-174 177-182 185-190 193-198 201-206 209-214 217-222 225-230 233-238 241-246 249-254	7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127 135 143 151 159 167 175 183 191 199 207 215 223 231 239 247 255					