Special Use Network Blocks

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Certain blocks of internet addresses are reserved for special uses, as given in the table below. All other addresses may be assigned to internet users. This document refers only to IPv4 (Internet Protocol version 4) networks. All address blocks are given in CIDR (Classless Inter-Domain Routing, pronounced “cider”) notation. Classes A-E are obsolete. Classful notation is now depreciated.

Block	Remarks
0.0.0.0/8	Reserved, “this” network. Address 0.0.0.0 is this host in this network.
10.0.0.0/8	Private networks.
127.0.0.0/8	Reserved, loopback. Normally, only the “localhost” address, 127.0.0.1, is used.
169.254.0.0/16	Reserved, link local. Hosts auto-configure, without DHCP. Private networks.
172.16.0.0/12	Private networks.
192.0.2.0/24	Reserved, test net. Such as example.com or example.net .
192.168.0.0/16	Private networks.
198.18.0.0/15	Reserved, benchmark testing.
224.0.0.0/4	Reserved, multicast.
240.0.0.0/4	Reserved, experimental. However, 255.255.255.255 is limited broadcast.

Only routable packets should occur on the general internet. Packets on the general internet, with a source or destination in any of the special use address blocks (given above), are known as “Martians”, because they come from no known earthly source. Bogons are Martians plus all packets with IP addresses which are unassigned by IANA (Internet Assigned Numbers Authority) [1]. Bogons should never occur, and should be dropped [2]. Their appearance is usually an indication that some piece of network equipment is malfunctioning.

Note that private networks use some of these addresses, so packets on those networks might be
(a) routable, in public internet address blocks assigned by IANA,
(b) in the defined private network (for example, in 192.168.1.0/24),
(c) in the “this” network block, loopback or limited broadcast,
(d) in bogon space, that is, everywhere else not covered by (a), (b) and (c).

Private address space is defined in RFC 1918. In addition, RFC 3330 [3] mentions other special use blocks with reserved addresses. Private networks can be easily connected to the internet through the use of NAT (Network Address Translation), a most useful technique. NAT can be provided by a low-cost broadband router or similar. It would be possible to use any unassigned (that is, reserved by IANA) address block for a private network, but bear in mind that IANA may at any time decide to assign a formerly unassigned (and not special use) address block to a RIR (Regional Internet Registry). That block then becomes routable.

All packets sent to the limited broadcast address (255.255.255.255) are broadcast packets, which must never be allowed outside the subnet of the source. Routers filter out broadcast packets, layer-2 switches do not. Broadcast packets get used in DHCP (Dynamic Host Configuration Protocol).

Nearly all switches are layer 2 switches, particularly lower cost switches. Such switches only handle Ethernet frames, which are in layer 2 (Data Link) of the OSI (Open Systems Interconnection) network model. Those switches do not know anything about the higher layers. All octets pertaining to higher layers are inside Ethernet frames and are treated purely as data, to be sent from one switch hardware port to another, without any interpretation. Because it is a hardware device, a switch also conforms to various layer 1 (Physical) standards. A switch automatically learns which of its ports have what MAC (Media Access Control, namely hardware) addresses connected, so it can send frames to the correct port. It does not broadcast all frames to all ports, as a hub does. Hubs are now

mostly obsolete. Switches are generally simple and cheap, with no internal settings needing network administration.

Routers appear physically similar to switches, but do understand layers 3 (Network) and 4 (Transport). They are more complicated and powerful internally, compared to switches. Routers can do NAT (Network Address Translation), filtering of packets, implementing of protocols (such as PPPoE, Point-to-Point Protocol over Ethernet), implementing firewalls and many other complex networking tasks. Routers are usually administered by having a web server built into them, then the network administrator uses a web browser to access a small website inside the router. Routers can be complex and expensive.

A switch sits entirely inside a subnet. A router is the thing which separates different subnets from each other. A router also separates a subnet from the general internet, thus being a “gateway”. Switches are designed to be transparent, each switch port does not have its own MAC address, or IP address. Router ports have their own MAC addresses and IP addresses. A router might have a switch or switches built into it, but never vice versa.

References

[1] http://www.iana.org/numbers.html

[2] http://www.cymru.com/Bogons/

[3] http://www.faqs.org/rfcs/rfc3330.html