IP Addresses

Every organisation that wishes to send and receive e-mail, or gain access to the Internet, needs a globally unique address, known as an IP address. These addresses are numeric and uniquely identify one network interface on a computer. Each address is written as four fields, separated by dots, and each field can be a number ranging from 0 to 255, e.g. 193.63.117.225.

The address is divided into two sections: the network number and the host (computer) number. The network number will be the same for all computers on the same network. Each network interface on each computer on the same network must, however, have a unique host number.

Classless IP Addresses

The method of allocating address space according to need is known as CIDR. Further information about this strategy may be found in RFC 1519, *Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy* [1].

All information sent across the Internet is encapsulated into IP datagrams. At present IPv4 is used: see RIPE-405 [2], the RIPE document for IPv4 Address Allocation and Assignment Policies.

Since RIPE NCC documents are frequently updated, the status of this document can be checked at http://www.ripe.net/ripe/docs/titletoc.html [3].

IPv6 (Internet Protocol version 6)

IPv6 is the new version of IP, the common protocol underpinning all Internet communications. It is expected ultimately to supersede the current version, IPv4, in order to accommodate the rapid growth of the Internet. The transition from IPv4 to IPv6 will take some years, but in the meantime the two protocols can and will coexist and operate together in various ways.

Janet has been experimenting with IPv6 services for a number of years and has deployed dual-stack services on the JANET core which have been stable since their introduction in 2003. Steps are now being taken to introduce IPv6 into the JANET SLA.

The full Janet IPv6 Policy statement can be found at http://www.ja.net/products-services/janet-futures/ipv6 [4]

Applying for IP Addresses

IP Addresses are provided for use with a Primary or Sponsored Connection, but not for use with a Proxy Connection (see Section 2. Connecting to Janet [5] for information about the different types of connection).

- If you are connecting to JANET, to obtain an initial assignment of JANET addresses simply complete the relevant section within the JCUR or the Sponsored Licence Application Form.
- If you have an existing Primary JANET connection and need further address space to facilitate additional network services, send an initial email to ipaddress@ja.net [6] – you will then be provided with login credentials for the web-based request form.

The JANET LIR Team administers all IP address allocation requests, assessing the requirements of the customer against the appropriate policies before assigning any address space.

Internet Registeries

ICANN [7], based in the USA, controls the global allocation of IP address space. This body has allocated blocks of IP addresses to five Regional Internet Registries, one of which is RIPE NCC [8]. JANET and other networks in Europe may apply to RIPE NCC for IP address space.

The Janet Registry

Janet is a Local Internet Registry and has authority from RIPE NCC to assign IP address space to its customers. These assignments are made under the classless system. Under the current guidelines, each organisation needs to demonstrate that it will use at least 25% of the address space applied for immediately and 50% in the first year. Additional address space can be obtained if the requirements of an organisation change and they can demonstrate a physical need for more addresses. There is no charge for this service.

Assignment of IP Address Space

Janet customers in the process of connecting to the network apply for IP addresses using the web-based JCUR. FE and specialist colleges and PCDL centres may enlist the help of their JISC RSC [9] in completing the form.

Existing customers who wish to request additional address space should contact the JANET Service Desk for advice.

FE and specialist colleges and PCDL centres should consult their JISC RSC before applying for additional IP addresses.

Organisations wishing to use IPv6 address space for either experimental or production traffic can also contact the Janet Service Desk for login details for the web-based request form. The current policy allows a /48 prefix to be assigned per organisation without requiring any justification. Organisations that request a prefix greater than a /48 will need to provide suitable justification to illustrate their intended use of the address space. All IPv6 address space for the Janet network is assigned from within the 2001:0630::/32 prefix.

Returning IP Addresses

IP addresses assigned by JANET belong to the network, not the customer and cannot be routed across a network run by another ISP. The addresses must therefore be returned to JANET if an organisation decides to leave the network or has redundant address space. Organisations with a Primary Connection that enter into sponsoring arrangements with third party organisations must not use part of their address space for the sponsored site. Address space for this purpose will be assigned separately. All enquiries about returning address space should be addressed to Janet Service Desk.

Reverse Delegations

Janet are responsible for reverse delegations within the JANET IP address space, as allocated by the RIPE NCC. Therefore, Janet will undertake delegations within the following zones:

60.193.in-addr.arpa	80.194.in-addr.arpa
61.193.in-addr.arpa	81.194.in-addr.arpa
62.193.in-addr.arpa	82.194.in-addr.arpa
63.193.in-addr.arpa	83.194.in-addr.arpa
66.194.in-addr.arpa	87.81.in-addr.arpa
194.195.in-addr.arpa	219.212.in-addr.arpa
195.195.in-addr.arpa	0.3.6.0.1.0.0.2.ip6.arpa

Reverse zones for newly assigned IP ranges will be automatically delegated in the DNS as part of the IP assignment process. Alternatively, requests for the delegation or modification of a reverse domain should be submitted to naming@ja.net [10] using the form available at http://www.ja.net/forms/reverse-delegation-service-application-form/28 [11]
Completed examples may be found at https://community.ja.net/library/janet-services-documentation/example-re... [12]

All sites may contact the Janet Service Desk for advice and assistance when dealing with reverse delegation problems. FE and specialist colleges may also receive assistance from their JISC RSC with this process.

Hardware Addresses

Computers have a unique hardware address that is allocated to the network interface when the machine is manufactured. When a computer is connected to a LAN, the Address Resolution Protocol provides a mapping of IP addresses to the hardware or MAC address. This allows each computer on that network to recall the address of every other machine connected to the same LAN. The benefit of this system is that it reduces traffic on the LAN, because there is no need to query the address of another machine every time

correspondence is exchanged. A computer will usually retain the same MAC address if it is moved to another network, although it may change if the hardware is upgraded or altered.

IP Subnet Addressing

The subnetting of IP addresses can help to make better use of IP address space, for example on expansion of a network. It also allows IP addresses on networks to be divided into multiple smaller networks or subnets. The addresses for the subnets are derived from the main network address by applying a subnet mask, and as such belong to that organisation. Effective use of subnets may remove the need to obtain additional address space. Subnets also provide some advantages over one large network:

- smaller networks are easier to manage and troubleshoot
- network traffic overall is reduced
- network security can be applied more easily at the interconnections between the subnets.

Further information about subnetting is provided in Appendix 8.

Private IP Addresses and Network Address Translation

The use of private addressing and NAT permits even fairly large organisations to make the best use of a small block of addresses allocated from the globally unique IP address space, and assists in conserving this limited Internet resource.

RFC 1918, *Address Allocation for Private Internets* [13], sets out the rules for using a set of reserved numbers (private addresses) for hosts on a local network. IANA has guaranteed that these addresses will never be used publicly on the Internet.

Since privately addressed nodes on a network do not have a presence on the Internet, there has to be a method by which these addresses are translated to globally routable numbers. This translation service is provided by NAT, which allows packets to be sent and received from outside the local network. Queries about private addressing and NAT may be sent to the Janet Service Desk. FE and specialist colleges may contact their JISC RSC for assistance on the use of private address space.

Links
[1] http://www.ietf.org/rfc/rfc1519.txt
[2] http://www.ripe.net/ripe/docs/ipv4-policies.html
[3] http://www.ripe.net/ripe/docs/titletoc.html
[4] http://www.ja.net/products-services/janet-futures/ipv6
[5] https://community.ja.net/library/janet-services-documentation/connecting-janet
[6] mailto:ipaddress@ja.net
[7] http://www.icann.org/
[8] http://www.ripe.net/
[9] http://www.jisc.ac.uk/whatwedo/services/as_rsc/rsc_home/rscs_contact.aspx
[10] mailto:naming@ja.net
[11] http://www.ja.net/forms/reverse-delegation-service-application-form/28
[12] https://community.ja.net/library/janet-services-documentation/example-reverse-delegation-forms

[13] http://www.ietf.org/rfc/rfc1918.txt