IBM i
7.3

Networking
TCP/IP setup

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 61.

This edition applies to IBM i 7.3 (product number 5770-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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Contents

TCP/IP setup

This topic provides you with tools and procedures for configuring TCP/IP on the IBM® i operating system.

For example, you can use this information to create a line description, a TCP/IP interface, and a route. Find out how to customize your TCP/IP configuration, and learn about various TCP/IP techniques that enable you to direct the data that flows in and out of your network.

Before you use this information to configure TCP/IP, ensure that you have installed all the necessary hardware components. After you complete the initial tasks for configuring TCP/IP, you are ready to expand the capabilities of your system with TCP/IP applications, protocols, and services to meet your unique needs.

Related information
Networking: TCP/IP applications, protocols, and services
Networking: TCP/IP troubleshooting

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Internet Protocol version 6

The Internet Protocol version 6 (IPv6) plays a key role in the future of the Internet. This topic describes IPv6 and explains how it is being implemented in the IBM i operating system.

IPv6 overview

You will find information about why Internet Protocol version 6 (IPv6) is replacing Internet Protocol version 4 (IPv4) as the Internet standard, and how you can use it to your advantage.

IPv6 is the next evolution in Internet Protocol. Most of the Internet uses IPv4, and this protocol has been reliable and resilient for over 20 years. However, IPv4 has limitations that might cause problems as the Internet expands. IPv6 is the updated version of IPv4 and is gradually replacing IPv4 as the Internet standard.

Extensive IP addressing capability

In particular, there is a growing shortage of IPv4 addresses, which are needed for all new devices added to the Internet. The key to IPv6 enhancement is the expansion of the IP address space from 32 bits to 128 bits, enabling virtually unlimited, unique IP addresses. The new IPv6 address text format is:

```
xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx
```

where each x is a hexadecimal digit representing 4 bits.

The expanded addressing capability of IPv6 provides a solution to the address depletion problem. As more people use mobile computers, such as mobile telephones and handheld computers, the increasing demands of wireless users contribute to the depletion of IPv4 addresses. The expanded IP address capability of IPv6 provides enough IP addresses for the growing number of wireless devices.

Simpler IP configuration

IPv6 provides new functions that simplify the tasks of configuring and managing the addresses on the network. Configuring and maintaining networks is a labor-intensive activity. IPv6 reduces some of the workload by automating several of the network administrator's tasks. The IPv6 autoconfiguration feature, for example, automatically configures interface addresses and default routes for you. In stateless autoconfiguration, IPv6 takes the Media Access Control (MAC) address of the machine and a network prefix provided by a local router and combines these two addresses to create a new, unique IPv6 address. This feature eliminates the need for a Dynamic Host Configuration Protocol (DHCP) server.

Site renumbering

If you use IPv6, you do not have to renumber your device addresses when you change to a different Internet service provider (ISP). Site renumbering is an important architectural element of IPv6, and is largely automatic. The lower half of your IPv6 address remains unchanged, because this is traditionally the MAC address of your Ethernet adapter. A new IPv6 prefix is assigned to you by the ISP, and this new prefix can be distributed to all of the end hosts by updating the IPv6 routers in the network and allowing IPv6 stateless autoconfiguration to recognize the new prefix.

Related concepts

Available IPv6 functions
IBM is implementing IPv6 onIBM i gradually. IPv6 functions are transparent to existing TCP/IP applications and coexist with IPv4 functions.

Configuring IPv6
You can use these instructions to configure your system for IPv6 functions.

Related reference

Comparison of IPv4 and IPv6
You might wonder how IPv6 differs from IPv4. You can use this table to quickly look up different concepts, IP functions, and the use of IP addresses in Internet protocols between IPv4 and IPv6.

IPv6 concepts

Before you implement IPv6 on your system, you need to understand the basic IPv6 concepts, such as IPv6 address formats, IPv6 address types, and neighbor discovery.
Related concepts
Scenario: Creating an IPv6 local area network

This scenario helps you understand situations in which you use IPv6 for your business. It describes the prerequisites for setting up an IPv6 local area network (LAN), and demonstrates the configuration steps for IPv6 stateless address autoconfiguration using the character-based interface.

IPv6 address formats

The size and format of the IPv6 address expand addressing capability.

The IPv6 address size is 128 bits. The preferred IPv6 address representation is: x:x:x:x:x:x:x:x, where each x is the hexadecimal values of the eight 16-bit pieces of the address. IPv6 addresses range from 0000:0000:0000:0000:0000:0000:0000:0000 to ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff.

In addition to this preferred format, IPv6 addresses might be specified in two other shortened formats:

Omit leading zeros
Specify IPv6 addresses by omitting leading zeros. For example, IPv6 address 1050:0000:0000:0000:0005:0600:300c:326b can be written as 1050:0:0:0:5:600:300c:326b.

Double colon
Specify IPv6 addresses by using double colons (::) in place of a series of zeros. For example, IPv6 address ff06:0:0:0:0:0:0:c3 can be written as ff06::c3. Double colons can be used only once in an IP address.

An alternative format for IPv6 addresses combines the colon and dotted notation, so the IPv4 address can be embedded in the IPv6 address. Hexadecimal values are specified for the left-most 96 bits, and decimal values are specified for the right-most 32 bits indicating the embedded IPv4 address. This format ensures compatibility between IPv6 nodes and IPv4 nodes when you are working in a mixed network environment.

IPv4-mapped IPv6 address uses this alternative format. This type of address is used to represent IPv4 nodes as IPv6 addresses. It allows IPv6 applications to communicate directly with IPv4 applications. For example, 0:0:0:0:0:ffff:192.1.56.10 and ::ffff:192.1.56.10/96 (shortened format).

All of these formats are valid IPv6 address formats. You can specify these IPv6 address formats in IBM Navigator for i except for the IPv4-mapped IPv6 address.

IPv6 address types

This information shows the categories of different IPv6 address types, and explains the uses for each of them.

IPv6 addresses are categorized into these basic types:

Unicast address
The unicast address specifies a single interface. A packet sent to a unicast address destination travels from one host to the destination host.

The two regular types of unicast addresses include:

Link-local address
Link-local addresses are designed for use on a single local link (local network). Link-local addresses are automatically configured on all interfaces. The prefix used for a link-local address is fe80::/10. Routers do not forward packets with a destination or source address containing a link-local address.

Global address
Global addresses are designed for use on any network. The prefix used for a global address begins with binary 001.

There are two special unicast addresses defined:

Unspecified address
The unspecified address is 0:0:0:0:0:0:0:0. You can abbreviate the address with two colons (::). The unspecified address indicates the absence of an address, and it can never be assigned

to a host. It can be used by an IPv6 host that does not yet have an address assigned to it. For example, when the host sends a packet to discover if an address is used by another node, the host uses the unspecified address as its source address.

Loopback address

The loopback address is `0:0:0:0:0:0:0:1`. You can abbreviate the address as `::1`. The loopback address is used by a node to send a packet to itself.

Anycast address

An anycast address specifies a set of interfaces, possibly at different locations, that all share a single address. A packet sent to an anycast address goes only to the nearest member of the anycast group. IBM i can send to anycast addresses, but cannot be a member of an anycast group.

Multicast address

The multicast address specifies a set of interfaces, possibly at multiple locations. The prefix used for a multicast address is `ff`. If a packet is sent to a multicast address, one copy of the packet is delivered to each member of the group. The IBM i operating system currently provides basic support for multicast addressing.

Neighbor discovery

Neighbor discovery allows hosts and routers to communicate with one another.

Neighbor discovery functions are used by IPv6 nodes (hosts or routers) to discover the presence of other IPv6 nodes, to determine the link-layer addresses of nodes, to find routers that are capable of forwarding IPv6 packets, and to maintain a cache of active IPv6 neighbors.

Note: The IBM i TCP/IP stack does not support neighbor discovery as a router.

IPv6 nodes use these five Internet Control Message Protocol version 6 (ICMPv6) messages to communicate with other nodes:

Router solicitation

Hosts send these messages to request routers to generate router advertisements. A host sends an initial router solicitation when the host first becomes available on the network.

Router advertisement

Routers send these messages either periodically or in response to a router solicitation. The information provided by router advertisements is used by hosts to automatically create global interfaces, and associated routes. Router advertisements also contain other configuration information used by a host such as maximum transmission unit and hop limit.

Neighbor solicitation

Nodes send these messages to determine the link-layer address of a neighbor, or to verify that a neighbor is still reachable.

Neighbor advertisement

Nodes send these messages in response to a neighbor solicitation or as an unsolicited message to announce an address change.

Redirect

Routers use these messages to inform hosts of a better first hop for a destination.

For more information about neighbor discovery and router discovery, see RFC 2461 .

Stateless address autoconfiguration

Stateless address autoconfiguration automates some of the network administrator's tasks.

Stateless address autoconfiguration is the process that IPv6 nodes (hosts or routers) use to automatically configure IPv6 addresses for interfaces. The node builds various IPv6 addresses by combining an address prefix with either an identifier derived from the MAC address of the node or a user-specified interface identifier. The prefixes include the link-local prefix (`fe80::/10`) and prefixes of length 64 advertised by local IPv6 routers (if any exist).

The node performs duplicate address detection to verify the uniqueness of the address before assigning it to an interface. The node sends out a neighbor solicitation query to the new address and waits for a response. If the node does not receive a response, then the address is assumed to be unique. If the node receives a response in the form of a neighbor advertisement, the address is already in use. If a node determines that its tentative IPv6 address is not unique, then autoconfiguration stops and manual configuration of the interface is required.

Related tasks
Configuring IPv6 address autoconfiguration
You can take advantage of the IPv6 stateless and DHCPv6 address autoconfiguration function to configure IPv6 automatically.

Address autoconfiguration with DHCPv6

DHCP for IPv6 provides stateful address autoconfiguration for IPv6 nodes.

Stateful address autoconfiguration with DHCPv6 is another process that IPv6 nodes (hosts or routers) can use to automatically configure dynamic IPv6 addresses for interfaces. The node obtains an IPv6 address by sending a DHCPv6 request. After a DHCP server on the network receives the DHCPv6 request from the client, it can assign an IPv6 address to the client. In addition to providing network administrators greater control of addresses used by nodes, DHCPv6 can also provide additional configuration information including DNS settings.

Related tasks
Configuring IPv6 address autoconfiguration
You can take advantage of the IPv6 stateless and DHCPv6 address autoconfiguration function to configure IPv6 automatically.
Related information
Configuring the DHCP server to use ISC's DHCP 4

Comparison of IPv4 and IPv6

You might wonder how IPv6 differs from IPv4. You can use this table to quickly look up different concepts, IP functions, and the use of IP addresses in Internet protocols between IPv4 and IPv6.

You can select an attribute from this list to link to the comparison in the table.

- Address
- Address allocation
- Address lifetime
- Address mask
- Address prefix
- Address Resolution Protocol (ARP)
- Address scope
- Address types
- ARPING
- Communications trace
- Configuration
- Domain Name System (DNS)
- Dynamic Host Configuration Protocol (DHCP)
- File Transfer Protocol (FTP)
- Fragments
- Host table
- IBM Navigator for i support

- Interface
- Internet control message protocol (ICMP)
- Internet group management protocol (IGMP)
- IP header
- IP header options
- IP header protocol byte
- IP header Type of Service byte
- LAN connection
- Layer Two Tunnel Protocol (L2TP)
- Loopback address
- Maximum transmission unit (MTU)
- NDPING
- Netstat
- Network address translation (NAT)
- Network table
- Node info query
- Open Shortest Path First (OSPF)
- Packet filtering
- Packet forwarding
- PING
- Point-to-Point Protocol (PPP)
- Port restrictions
- Ports
- Private and public addresses
- Protocol table
- Quality of service (QoS)
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- Route
- Routing Information Protocol (RIP)
- Services table
- Simple Network Management Protocol (SNMP)
- Sockets API
- Source address selection
- Starting and stopping
- Telnet
- Trace route
- Transport layers
- Unspecified address
- Virtual private network (VPN)

Description	IPv4	IPv6
Address	32 bits long (4 bytes). Address is composed of a network and a host portion, which depend on address class. Various address classes are defined: A, B, C, D, or E depending on initial few bits. The total number of IPv4 addresses is 4 294 967 296. The text form of the IPv4 address is nnn.nnn.nnn.nnn, where 0<=*nnn*<=255, and each *n* is a decimal digit. Leading zeros can be omitted. Maximum number of print characters is 15, not counting a mask.	128 bits long (16 bytes). Basic architecture is 64 bits for the network number and 64 bits for the host number. Often, the host portion of an IPv6 address (or part of it) will be derived from a MAC address or other interface identifier. Depending on the subnet prefix, IPv6 has a more complicated architecture than IPv4. The number of IPv6 addresses is 10^{28} (79 228 162 514 264 337 593 543 950 336) times larger than the number of IPv4 addresses. The text form of the IPv6 address is xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx, where each x is a hexadecimal digit, representing 4 bits. Leading zeros can be omitted. The double colon (::) can be used once in the text form of an address to designate any number of 0 bits. For example, ::ffff:10.120.78.40 is an IPv4-mapped IPv6 address.
Address allocation	Originally, addresses were allocated by network class. As address space is depleted, smaller allocations using Classless Inter-Domain Routing (CIDR) are made. Allocation has not been balanced among institutions and nations.	Allocation is in the earliest stages. The Internet Engineering Task Force (IETF) and Internet Architecture Board (IAB) have recommended that essentially every organization, home, or entity be allocated a /48 subnet prefix length. This will leave 16 bits for the organization to do subnetting. The address space is large enough to give every person in the world their own /48 subnet prefix length.
Address lifetime	Generally, this is not an applicable concept for IPv4 addresses, except for addresses assigned using DHCP.	IPv6 addresses have two lifetimes: preferred and valid, with the preferred lifetime always <= valid. After the preferred lifetime expires, the address is not to be used as a source IP address for new connections if an equally good preferred address is available. After the valid lifetime expires, the address is not used (recognized) as a valid destination IP address for incoming packets or used as a source IP address. Some IPv6 addresses have, by definition, infinite preferred and valid lifetimes; for example link-local (see address scope).

Description	IPv4	IPv6
Address mask	Used to designate network from host portion.	Not used (see address prefix).
Address prefix	Sometimes used to designate network from host portion. Sometimes written as /nn suffix on presentation form of address.	Used to designate the subnet prefix of an address. Written as /nnn (up to 3 decimal digits, 0 <= nnn <= 128) suffix after the print form. An example is fe80::982:2a5c/10, where the first 10 bits comprise the subnet prefix.
Address Resolution Protocol (ARP)	ARP is used by IPv4 to find a physical address, such as the MAC or link address, associated with an IPv4 address.	IPv6 embeds these functions within IP itself as part of the algorithms for stateless autoconfiguration and neighbor discovery using Internet Control Message Protocol version 6 (ICMPv6). Hence, there is no such thing as ARP6.
Address scope	For unicast addresses, this concept does not apply. There are designated private address ranges and loopback. Outside of that, addresses are assumed to be global.	In IPv6, address scope is part of the architecture. Unicast addresses have two defined scopes, including link-local and global; and multicast addresses have 14 scopes. Default address selection for both source and destination takes scope into account. A scope zone is an instance of a scope in a particular network. As a consequence, IPv6 addresses sometimes must be entered or associated with a zone ID. The syntax is %zid where zid is a number (typically small) or a name. The zone ID is written after the address and before the prefix. For example, 2ba::1:2:14e:9a9b:c%3/48.
Address types	IPv4 addresses are categorized into three basic types: unicast address, multicast address, and broadcast address.	IPv6 addresses are categorized into three basic types: unicast address, multicast address, and anycast address. See IPv6 address types for descriptions.
ARPING	ARPING is a TCP/IP tool to test reachability of systems on the local LAN.	Similar support for IPv6 is available with the NDPING tool.
Communications trace	Communications trace is a tool to collect a detailed trace of TCP/IP (and other) packets that enter and leave the system.	Same support for IPv6.

Description	IPv4	IPv6
Configuration	You must configure a newly installed system before it can communicate with other systems; that is, IP addresses and routes must be assigned.	Configuration is optional, depending on functions required. IPv6 can be used with any Ethernet adapter and can be run over the loopback interface. IPv6 interfaces are self-configuring using IPv6 stateless autoconfiguration. You can also manually configure the IPv6 interface. So, the system will be able to communicate with other IPv6 systems that are local and remote, depending on the type of network and whether an IPv6 router exists.
Domain Name System (DNS)	Applications accept host names and then use DNS to get an IP address, using socket API `gethostbyname()`. Applications also accept IP addresses and then use DNS to get host names using `gethostbyaddr()`. For IPv4, the domain for reverse lookups is `in-addr.arpa`.	Same support for IPv6. Support for IPv6 exists using AAAA (quad A) record type and reverse lookup (IP-to-name). An application may elect to accept IPv6 addresses from DNS (or not) and then use IPv6 to communicate (or not). The socket API `gethostbyname()` only supports IPv4. For IPv6, a new `getaddrinfo()` API is used to obtain (at application choice) IPv6 only, or IPv4 and IPv6 addresses. For IPv6, the domain used for reverse lookups is `ip6.arpa`, and if they are not found then ip6.int is used. (See API getnameinfo()—Get Name Information for Socket Address for details.)
Dynamic Host Configuration Protocol (DHCP)	DHCP is used to dynamically obtain an IP address and other configuration information. IBM i supports a DHCP server for IPv4.	The IBM i implementation of DHCP does not support IPv6. However, ISC DHCP server implementation can be used.
File Transfer Protocol (FTP)	FTP allows you to send and receive files across networks.	Same support for IPv6.
Fragments	When a packet is too big for the next link over which it is to travel, it can be fragmented by the sender (host or router).	For IPv6, fragmentation can only occur at the source node, and reassembly is only done at the destination node. The fragmentation extension header is used.
Host table	A configurable table that associates an Internet address with a host name (for example, `127.0.0.1` for loopback). This table is used by the sockets name resolver, either before a DNS lookup or after a DNS lookup fails (determined by host name search priority).	Same support for IPv6.
IBM Navigator for i support	IBM Navigator for i provides a complete configuration solution for TCP/IP.	Same support for IPv6.

Description	IPv4	IPv6
Interface	The conceptual or logical entity used by TCP/IP to send and receive packets and always closely associated with an IPv4 address, if not named with an IPv4 address. Sometimes referred to as a logical interface. IPv4 interfaces can be started and stopped independently of each other and independently of TCP/IP using the STRTCPIFC and ENDTCPIFC commands and using IBM Navigator for i.	Same support for IPv6.
Internet Control Message Protocol (ICMP)	Used by IPv4 to communicate network information.	Used similarly by IPv6; however, Internet Control Message Protocol version 6 (ICMPv6) provides some new attributes. Basic error types remain, such as destination unreachable, echo request and reply. New types and codes are added to support neighbor discovery and related functions.
Internet Group Management Protocol (IGMP)	IGMP is used by IPv4 routers to find hosts that want traffic for a particular multicast group, and used by IPv4 hosts to inform IPv4 routers of existing multicast group listeners (on the host).	IGMP is replaced by MLD (multicast listener discovery) protocol for IPv6. MLD does essentially what IGMP does for IPv4, but uses ICMPv6 by adding a few MLD-specific ICMPv6 type values.
IP header	Variable length of 20-60 bytes, depending on IP options present.	Fixed length of 40 bytes. There are no IP header options. Generally, the IPv6 header is simpler than the IPv4 header.
IP header options	Various options might accompany an IP header (before any transport header).	The IPv6 header has no options. Instead, IPv6 adds additional (optional) extension headers. The extension headers are AH and ESP (unchanged from IPv4), hop-by-hop, routing, fragment, and destination. Currently, IPv6 supports some extension headers.
IP header protocol byte	The protocol code of the transport layer or packet payload (for example, ICMP).	The type of header immediately following the IPv6 header. Uses the same values as the IPv4 protocol field. But the architectural effect is to allow a currently defined range of next headers, and is easily extended. The next header will be a transport header, an extension header, or ICMPv6.
IP header Type of Service byte	Used by QoS and differentiated services to designate a traffic class.	Uses different codes to designate an IPv6 traffic class. Currently, IPv6 does not support TOS.

Description	IPv4	IPv6
LAN connection	LAN connection is used by an IP interface to get to the physical network. Many types exist; for example, Ethernet. Sometimes it is referred to as the physical interface, link, or line.	IPv6 can be used with any Ethernet adapters and is also supported over virtual Ethernet between logical partitions.
Layer Two Tunnel Protocol (L2TP)	L2TP can be thought of as virtual PPP, and works over any supported line type.	Same support for IPv6.
Loopback address	A loopback address is an interface with an address of 127.*.*.* (typically 127.0.0.1) that can only be used by a node to send packets to itself. The physical interface (line description) is named *LOOPBACK.	The concept is the same as in IPv4. The single loopback address is 0000:0000:0000:0000:0000:0000:0000:0001 or ::1 (shortened version). The virtual physical interface is named *LOOPBACK.
Maximum transmission unit (MTU)	Maximum transmission unit of a link is the maximum number of bytes that a particular link type, such as Ethernet or modem, supports. For IPv4, 576 is the typical minimum.	IPv6 has a lower boundary limit on MTU of 1280 bytes. That is, IPv6 does not fragment packets below this limit. To send IPv6 over a link with an MTU of less than 1280 bytes, the link-layer must transparently fragment and defragment the IPv6 packets.
NDPING	Similar support for IPv4 is available with the ARPING tool.	NDPING is a TCP/IP tool to test reachability of neighboring systems on IPv6 interfaces.
Netstat	Netstat is a tool to look at the status of TCP/IP connections, interfaces, or routes. Available using IBM Navigator for i and the character-based interface.	Same support for IPv6.
Network address translation (NAT)	Basic firewall functions integrated into TCP/IP, configured using IBM Navigator for i.	Currently, NAT does not support IPv6. More generally, IPv6 does not require NAT. The expanded address space of IPv6 eliminates the address shortage problem and enables easier renumbering.
Network table	On IBM Navigator for i, a configurable table that associates a network name with an IP address without mask. For example, host Network 14 and IP address 1.2.3.4.	Currently, no changes are made to this table for IPv6.
Node info query	Does not exist.	A simple and convenient network tool that should work like ping, except with content: an IPv6 node may query another IPv6 node for the target's DNS name, IPv6 unicast address, or IPv4 address. Currently, not supported.

Description	IPv4	IPv6
Open Shortest Path First (OSPF)	OSPF is a router protocol used within larger autonomous system networks in preference to RIP.	Same support for IPv6.
Packet filtering	Packet filtering is the basic firewall functions integrated into TCP/IP. It is configured by using IBM Navigator for i.	Packet filtering does not support IPv6.
Packet forwarding	The IBM i TCP/IP stack can be configured to forward IP packets that it receives for nonlocal IP addresses. Typically, the inbound interface and outbound interface are connected to different LANs.	Packet forwarding has limited support for IPv6. The IBM i TCP/IP stack does not support neighbor discovery as a router.
PING	PING is a basic TCP/IP tool to test reachability. Available using IBM Navigator for i and the character-based interface.	Same support for IPv6.
Point-to-Point Protocol (PPP)	PPP supports dialup interfaces over various modem and line types.	Same support for IPv6.
Port restrictions	IBM Navigator for i allows a customer to configure a selected port number or port-number ranges for TCP or User Datagram Protocol (UDP) so that they are only available for a specific profile.	Port restrictions for IPv6 are identical to those available in IPv4.
Ports	TCP and UDP have separate port spaces, each identified by port numbers in the range 1-65535.	For IPv6, ports work the same as IPv4. Because these are in a new address family, there are now four separate port spaces. For example, there are two TCP port 80 spaces to which an application can bind, one in AF_INET and one in AF_INET6.

Description	IPv4	IPv6
Private and public addresses	All IPv4 addresses are public, except for three address ranges that have been designated as private by IETF RFC 1918: `10.*.*.*` `(10/8)`, `172.16.0.0` through `172.31.255.255` `(172.16/12)`, and `192.168.*.*` `(192.168/16)`. Private address domains are commonly used within organizations. Private addresses cannot be routed across the Internet.	IPv6 has an analogous concept, but with important differences. Addresses are public or temporary, previously termed anonymous. See RFC 3041. Unlike IPv4 private addresses, temporary addresses can be globally routed. The motivation is also different; IPv6 temporary addresses are meant to shield the identity of a client when it initiates communication (a privacy concern). Temporary addresses have a limited lifetime, and do not contain an interface identifier that is a link (MAC) address. They are generally indistinguishable from public addresses. IPv6 has the notion of limited address scope using its designed scope designations (see address scope).
Protocol table	In IBM Navigator for i, the protocol table is a configurable table that associates a protocol name with its assigned protocol number; for example, UDP, 17. The system is shipped with a small number of entries: IP, TCP, UDP, ICMP.	The table can be used with IPv6 without change.
Quality of service (QoS)	Quality of service allows you to request packet priority and bandwidth for TCP/IP applications.	Same support for IPv6.
Renumbering	Renumbering is done by manual reconfiguration, with the possible exception of DHCP. Generally, for a site or organization, renumbering is a difficult and troublesome process to avoid if possible.	Renumbering is an important architectural element of IPv6, and is largely automatic, especially within the /48 prefix.
Route	Logically, a mapping of a set of IP addresses (might contain only one) to a physical interface and a single next-hop IP address. IP packets whose destination address is defined as part of the set are forwarded to the next hop using the line. IPv4 routes are associated with an IPv4 interface, hence, an IPv4 address. The default route is *DFTROUTE.	Conceptually, similar to IPv4. One important difference: IPv6 routes are associated (bound) to a physical interface (a link, such as ETH03) rather than an interface. One reason that a route is associated with a physical interface is because source address selection functions differently for IPv6 than for IPv4. See Source address selection.

Description	IPv4	IPv6
Routing Information Protocol (RIP)	RIP is a routing protocol supported by the routed daemon.	Currently, RIP does not support IPv6.
Services table	On IBM i, a configurable table that associates a service name with a port and protocol; for example, service name FTP, port 21, TCP, and User Datagram Protocol (UDP). A large number of well-known services are listed in the services table. Many applications use this table to determine which port to use.	No changes are made to this table for IPv6.
Simple Network Management Protocol (SNMP)	SNMP is a protocol for system management.	Same support for IPv6.
Sockets API	These APIs are the way applications use TCP/IP. Applications that do not need IPv6 are not affected by sockets changes to support IPv6.	IPv6 enhances sockets so that applications can now use IPv6, using a new address family: AF_INET6. The enhancements have been designed so that existing IPv4 applications are completely unaffected by IPv6 and API changes. Applications that want to support concurrent IPv4 and IPv6 traffic, or IPv6-only traffic, are easily accommodated using IPv4-mapped IPv6 addresses of the form `::ffff:a.b.c.d`, where `a.b.c.d` is the IPv4 address of the client. The new APIs also include support for converting IPv6 addresses from text to binary and from binary to text. See Using AF_INET6 address family for more information about sockets enhancements for IPv6.
Source address selection	An application may designate a source IP (typically, using sockets `bind()`). If it binds to INADDR_ANY, a source IP is chosen based on the route.	As with IPv4, an application can designate a source IPv6 address using `bind()`. Similarly to IPv4, it can let the system choose an IPv6 source address by using in6addr_any. But because IPv6 lines have many IPv6 addresses, the internal method of choosing a source IP is different.

Description	IPv4	IPv6
Starting and stopping	Use the STRTCP or ENDTCP command to start or end IPv4. IPv4 is always started when you run the STRTCP command to start TCP/IP.	Use the STRIP6 parameter of the STRTCP or ENDTCP command to start or end IPv6. IPv6 might not be started when TCP/IP is started. IPv6 can be started independently at a later time. Any IPv6 interfaces are automatically started if the AUTOSTART parameter is set to *YES (the default). IPv6 cannot be used or configured without IPv4. The IPv6 loopback interface, ::1, is automatically defined and activated when IPv6 is started.
Telnet	Telnet allows you to log on and use a remote computer as though you were connected to it directly.	Same support for IPv6.
Trace route	Trace route is a basic TCP/IP tool to do path determination. Available using IBM Navigator for i and the character-based interface.	Same support for IPv6.
Transport layers	TCP, UDP, RAW.	The same transports exist in IPv6.
Unspecified address	Apparently, not defined, as such. Socket programming uses 0.0.0.0 as INADDR_ANY.	Defined as ::/128 (128 0 bits). It is used as the source IP in some neighbor discovery packets, and various other contexts, like sockets. Socket programming uses ::/128 as in6addr_any.
Virtual private network (VPN)	Virtual private network (using IPsec) allows you to extend a secure, private network over an existing public network.	Same support for IPv6. See Virtual private network for details.

Related concepts

IPv6 overview

You will find information about why Internet Protocol version 6 (IPv6) is replacing Internet Protocol version 4 (IPv4) as the Internet standard, and how you can use it to your advantage.

Available IPv6 functions

IBM is implementing IPv6 onIBM i gradually. IPv6 functions are transparent to existing TCP/IP applications and coexist with IPv4 functions.

These are the main IBM i features that are affected by IPv6:

Configuration

- By default, IPv6 is started when you start TCP/IP. If you do not want to start IPv6 when TCP/IP starts, you can set the STRIP6 parameter on the Start TCP/IP (STRTCP) command to *NO. You can then start IPv6 at a later time by specifying STRIP6 (*YES) on a second STRTCP command.

- If you configure IPv6, you are sending IPv6 packets over an IPv6 network. See "Scenario: Creating an IPv6 local area network" on page 16 for a scenario that describes a situation in which you configure IPv6 on your network.

- You can configure virtual IPv6 interfaces, and perform an IPv6 stateless address autoconfiguration. For more information about these features, see "Configuring IPv6" on page 26.
- You can now use the character-based interface in addition to IBM Navigator for i to configure and customize TCP/IP.

Sockets

Develop and test sockets applications using IPv6 application programming interfaces (APIs) and tools. IPv6 enhances sockets so that applications can use IPv6 using a new address family, which is AF_INET6. These enhancements do not affect existing IPv4 applications. You can create applications that use concurrent IPv4 and IPv6 traffic or IPv6-only traffic.

Domain Name System (DNS)

DNS supports AAAA addresses and a new domain IP6.ARPA for reverse lookups (IP-to-name). An application might elect to accept IPv6 addresses from DNS (or not) and then use IPv6 to communicate (or not).

Troubleshooting TCP/IP

Use standard troubleshooting tools such as PING, netstat, trace route and communications trace for IPv6 networks. These tools now support the IPv6 address format. See TCP/IP troubleshooting to solve problems for both IPv4 and IPv6 networks.

Related concepts

IPv6 overview

You will find information about why Internet Protocol version 6 (IPv6) is replacing Internet Protocol version 4 (IPv4) as the Internet standard, and how you can use it to your advantage.

Scenario: Creating an IPv6 local area network

This scenario helps you understand situations in which you use IPv6 for your business. It describes the prerequisites for setting up an IPv6 local area network (LAN), and demonstrates the configuration steps for IPv6 stateless address autoconfiguration using the character-based interface.

Note: In the scenario, the IP addresses x:x:x:x:x:x:x:x represent link-local IP addresses.

Situation

Your business is expected to experience a significant growth in due course. This typically affects the accounting department that is currently using an IPv4 network. Because the use of IPv6 expands the capability of IP addresses, and IPv6 will eventually replace IPv4 as the Internet standard, it is of great importance to implement IPv6 for your company's financial operations. You have already purchased a new client/server-based accounting application that uses IPv6 for connectivity.

Objectives

After you configure your system for IPv6, the accounting department of your company will be able to start using the accounting application over an IPv6 network.

Details

As required by your business, the accounting application installed on System A needs to connect to another instance of the application located on the remote System B. This enables the clients to run the applications, share and transfer data stored in both systems. The following figure shows the network setup in this scenario. Two IBM i systems and two client workstations are connected to the site Ethernet LAN using an Ethernet adapter.

Accounting Department
IPv6 network
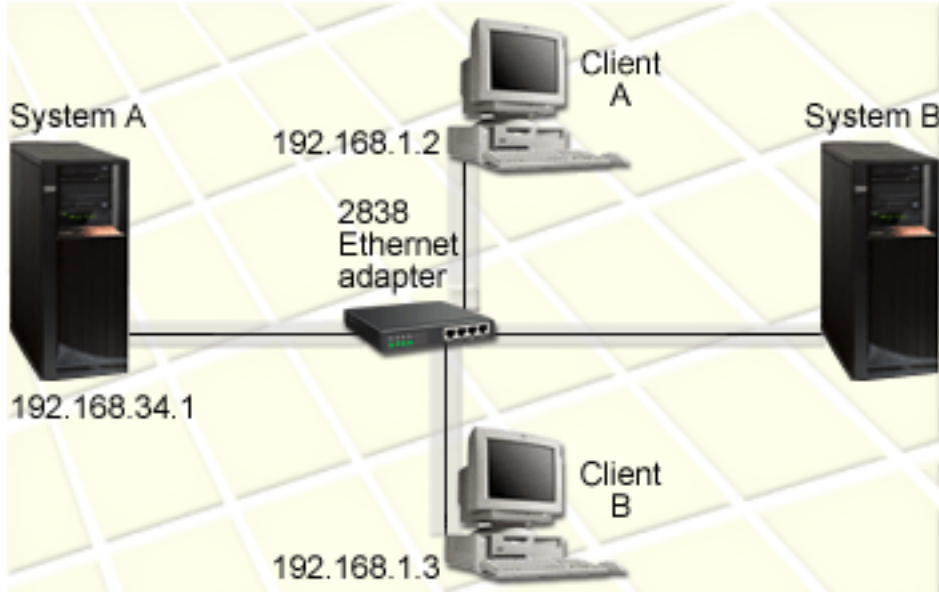
- Both System A and System B products run on IBM i 5.4 or later.
- System A currently has the IPv4 address 192.168.34.1.
- System A is required to have a connection to the System B, which is located remotely.
- Two client workstations are to be connected to the IPv6 LAN:
  - Client A currently has the IPv4 address 192.168.1.2.
  - Client B currently has the IPv4 address 192.168.1.3.

Prerequisites and assumptions

This scenario assumes that the following hardware prerequisites have been met in this network environment:

- All cabling and hardware setup has been completed for the network.
- The Ethernet adapter (2838 in this scenario) has been configured.

To create an IPv6 LAN, the following software components must be installed on System A or System B:

- IBM Navigator for i

Configuration

You must complete the following tasks before you start to configure IPv6 for your system:

- You must have TCP/IP configured using an IPv4 address.
- You must have had an Ethernet line description configured when you configured TCP/IP for the first time.

Related concepts
IPv6 concepts
Before you implement IPv6 on your system, you need to understand the basic IPv6 concepts, such as IPv6 address formats, IPv6 address types, and neighbor discovery.

Related tasks
Configuring TCP/IP for the first time

If you are setting up a new system, you need to establish a connection to the network and you must configure TCP/IP using IPv4 for the first time.

Starting the IPv6 stack

You must first turn on the IPv6 stack using the character-based interface. IPv6 services are not available until you start the IPv6.

Verify the IPv6 stack is started

Typically, the IPv6 stack was started when you configured TCP/IP for the first time.

To verify whether the IPv6 stack has been started, complete the following steps:

1. On the command line, type NETSTAT and press Enter to access the Work with TCP/IP Network Status menu.
2. Specify Option 10 (Display TCP/IP stack status) and press Enter.
3. At the *IPv6 stack status* prompt, ensure the value is Active.

Starting the IPv6 stack

If the status of the IPv6 stack is not Active, your IPv6 has not been started.

To start the IPv6 stack, complete the following steps:

1. On the command line, type STRTCP (Start TCP/IP command) and press F4 (Prompt) to see a list of additional parameters.
2. At the *Start IPv6* prompt, specify *YES and then press Enter.

Note: You do not need to end TCP/IP in order to start IPv6 at a later time.

Configuring IPv6 stateless address autoconfiguration

There are several ways to configure IPv6 for your system. This topic shows how to configure IPv6 stateless address autoconfiguration using the character-based interface.

Because the IPv6 stateless address autoconfiguration creates new IPv6 interfaces automatically for a given line description, you must configure an existing Ethernet line description. In this example, the line description name used is Eth08.

To configure IPv6 stateless address autoconfiguration using the character-based interface, follow these steps:

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify *IP6SAC.
3. At the *Line description* prompt, specify Eth08 and press Enter to see a list of optional parameters.
4. Specify the values or keep the default values for some of the optional parameters according to the following table.

Table 1. Input values for an IPv6 stateless address autoconfiguration

Parameter names	Input values
Maximum transmission unit	*LIND
Interface ID	*LIND
DAD maximum transmits	2
Privacy extensions	*YES
Text 'description'	ETHLINE IPv6 SAC interface

5. Ensure that all the values are specified correctly and press Enter.

You have configured an IPv6 stateless address autoconfiguration successfully.

Starting IPv6 interface

After you configured the IPv6 stateless address autoconfiguration, you must start the IPv6 interface so that it can be used over the network.

To start an IPv6 stateless address autoconfiguration using the character-based interface, follow these steps:

1. On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.
2. At the *Internet address* prompt, type *IP6SAC and press Enter.
3. At the *Line description* prompt, specify Eth08 and press Enter.

You have successfully started the IPv6 stateless address autoconfiguration and a link-local IPv6 address has been assigned to your system.

Note: One or more global IPv6 addresses can be assigned depending on the local routers advertised prefixes.

IPv6 troubleshooting

If you have IPv6 configured on IBM i, you can use several of the same troubleshooting tools as you do for IPv4.

For example, tools such as trace route and PING accept both the IPv4 and IPv6 address formats, so you can use them to test connections and routes for both types of networks. In addition, you can use the communications trace function to trace data on both IPv4 and IPv6 communications lines.

See TCP/IP troubleshooting for a general troubleshooting guide that provides techniques for solving problems related to IPv4 and IPv6.

Related information

Communications trace

Planning TCP/IP setup

Before you start to install and configure your system, take a few moments to plan the operation. This topic helps you prepare for the installation and configuration of TCP/IP on IBM i.

The planning guidelines in this topic pertain to basic TCP/IP setup using IPv4. If you intend to configure IPv6, see Configuring IPv6 for setup requirements and configuration instructions.

Gathering TCP/IP configuration information

You must gather and record basic configuration information that is required to set up TCP/IP.

The following table lists the required information for TCP/IP configuration. Print this page and record the configuration information about your system and the TCP/IP network to which you are connecting. You must refer to this information later when you configure TCP/IP.

Table 2. Required information for TCP/IP configuration

Required information	For your system	Example
Type of communication adapter installed in your system (see the instructions following this table)		Ethernet
Resource name		CMN01

Table 2. Required information for TCP/IP configuration (continued)		
Required information	**For your system**	**Example**
IP address for your system		`199.5.83.158`
Subnet mask for your system		`255.255.255.0`
Gateway address		`199.5.83.129`
Host name and domain name for your system		`sys400.xyz.company.com`
IP address for domain name server		`199.4.191.76`

Use the following instructions to help you determine the values in the preceding table:

- To determine your communications adapter information and resource name (the first two rows in the table), follow these steps:

  1. On the command line, type GO HARDWARE and press Enter to access the Hardware Resources menu.
  2. Select Option 1 (Work with communication resources) and then press Enter. Your communication resources are listed by resource name. Follow the display instructions if you want to work with your resources or view more details.

- If you are unfamiliar with any of the rest of those terms, see the IBM Redbooks publication IBM i5/OS IP Networks: Dynamic for information about basic installation and configuration procedures.

Related tasks

Installing TCP/IP
Base TCP/IP support is included with the IBM i operating system and allows you to connect the system to a network.

TCP/IP security considerations

When planning your TCP/IP configuration for a IBM i, consider your security needs.

These strategies can help limit your TCP/IP exposure:

- **Start only those TCP/IP applications that you need.**

  Each TCP/IP application has its own unique security exposures. Do not depend on a router to reject requests for a particular application. As a secondary defense, set the autostart values of applications that are not required to NO.

- **Limit the hours during which TCP/IP applications run.**

  Limit your exposure by reducing the hours that your servers are running. If possible, stop TCP/IP servers such as FTP and Telnet during off-hours.

- **Control who can start and change your TCP/IP applications.**

  By default, *IOSYSCFG authority is required to change TCP/IP configuration settings. A user without *IOSYSCFG authority needs *ALLOBJ authority or explicit authority to the TCP/IP start commands. Giving special authorities to users represents a security exposure. Evaluate the need for any special authorities for each user and keep special authorities to a minimum. Keep track of which users have special authorities and periodically review their requirement for the authority. This also limits the possibility of server access during off-hours.

- **Control your TCP/IP routing:**

  - Disallow IP forwarding so that hackers cannot use your Web server to attack other trusted systems.
  - Define only one route on your public Web server: the default route to your Internet Service Provider.
  - Do not configure host names and IP addresses of internal secure systems in your Web server's TCP/IP host table. Only put the name of other public servers that you need to reach in this table.

- **Control TCP/IP servers designed for remote, interactive signon.**

  Applications such as FTP and Telnet are more vulnerable to outside attack. For details on how to control your exposure, read the topic on controlling interactive signon in System values: Signon overview.

Related information

IBM i and Internet security
Planning TCP/IP security
Setting up TCP/IP security

Installing TCP/IP

Base TCP/IP support is included with the IBM i operating system and allows you to connect the system to a network.

If you want to use any TCP/IP applications, such as Telnet, File Transfer Protocol (FTP), and Simple Mail Transfer Protocol (SMTP), you also need to install IBM TCP/IP Connectivity Utilities for i. TCP/IP Utilities is a separately installable licensed program.

To install TCP/IP Utilities on your system, follow these steps:

1. Insert your installation media for TCP/IP into your system.

   a) If your installation media is a CD-ROM, insert it into your optical device.

   b) If your installation media is a tape, insert it into your tape drive.

2. On the command line, type GO LICPGM and press Enter to access the Work with Licensed Programs menu.

3. Select Option 11 (Install licensed programs) and press Enter to see a list of licensed programs and their optional features.

4. Type 1 (Install) in the Option column next to 5770-TC1 (IBM TCP/IP Connectivity Utilities for i), and then press Enter.

5. On the Confirm Install of Licensed Programs display, press Enter to continue.

6. On the Install Options display, fill in the following choices and then press Enter to submit.

Table 3. Choices for Install Options display

Install Options	Descriptions
Installation device	Type QOPT if installing from a CD-ROM device. Type TAP01 if installing from a tape drive.
Objects to install	You can specify this option to determine whether you want to install programs, language objects, or both.
Nonaccepted agreement	This option applies only if the software agreement has not been previously accepted. Specify 2 to be prompted to accept or decline the software agreement.
Automatic IPL	This option determines whether the system performs an automatic IPL when the installation process has completed successfully.

   After you successfully installed IBM TCP/IP Connectivity Utilities for i, either the Work with Licensed Programs menu or the Sign On display is shown.

7. Select Option 50 (Display log for messages) to verify that you have installed IBM TCP/IP Connectivity Utilities for i successfully.

   If an error occurs, you will see the following message at the bottom of the Work with Licensed Programs display:

   ```
   Work with licensed program function not complete.
   ```

Should a problem occur, try to reinstall IBM TCP/IP Connectivity Utilities for i.

Note: Other licensed programs that you might want to install include:

- IBM HTTP Server for i (5770-DG1): This program provides Web server support.
- Some TCP/IP applications require installation of additional licensed programs. To find out which programs you need, review the setup instructions for the specific application you want.

Related reference
Gathering TCP/IP configuration information
You must gather and record basic configuration information that is required to set up TCP/IP.

Configuring TCP/IP

You might be configuring TCP/IP for the first time, or you might be performing an additional configuration for IPv6. This topic provides instruction on how to configure TCP/IP in different situations.

Before you use this information to configure TCP/IP, ensure that you have installed all the necessary hardware components.

Configuring TCP/IP for the first time

If you are setting up a new system, you need to establish a connection to the network and you must configure TCP/IP using IPv4 for the first time.

You must use the character-based interface to configure TCP/IP for the first time. For example, if you want to use IBM Navigator for i from a PC that requires basic TCP/IP configuration before IBM Navigator for i runs, you must first use the character-based interface to perform the basic configurations.

When you configure your system using the character-based interface, you need to frequently access the Configure TCP/IP menu to select configuration tasks. Before you start to configure your system, take a few moments and follow these instructions to review the menu.

1. On the command line, type GO TCPADM and press Enter to access the TCP/IP Administration menu.
2. Specify Option 1 (Configure TCP/IP) and press Enter to access the Configure TCP/IP menu (CFGTCP).

Note: To perform the configuration steps discussed in this section, you must have *IOSYSCFG special authority in your user profile.

Related concepts
Scenario: Creating an IPv6 local area network
This scenario helps you understand situations in which you use IPv6 for your business. It describes the prerequisites for setting up an IPv6 local area network (LAN), and demonstrates the configuration steps for IPv6 stateless address autoconfiguration using the character-based interface.

Customizing TCP/IP
IBM Navigator for i and the character-based interface also provide you with many options that you can use to customize your TCP/IP configuration.

Related reference
Planning IPv6 configuration
You must have TCP/IP configured on the system before you can configure IPv6. Listed here are the hardware and software requirements and the prerequisites for configuring IBM i for IPv6.

Related information
User profiles
*IOSYSCFG special authority
Ethernet Link Aggregation

Step 1: Configuring a line description (Ethernet)

You must create an Ethernet line description as the communication object for TCP/IP.

To configure a line description for an Ethernet line, follow these steps:

1. On the command line, type CRTLINETH (Create Line Description command) and press F4 (Prompt) to access the Create Line Desc (Ethernet) menu.
2. At the *Line description* prompt, specify a line name (use any name).
3. At the *Resource name* prompt, specify the resource name.
4. Press Enter several times to see a list of additional parameters.
5. Specify values for any additional parameters that you want to change, and then press Enter to submit.

Step 2: Turning on IP datagram forwarding

If you want the IP packets to be forwarded among different subnets, you need to turn on IP datagram forwarding.

To turn on IP datagram forwarding, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 3 (Change TCP/IP attributes), and then press Enter.
3. At the *IP datagram forwarding* prompt, type *YES and then press Enter.

Step 3: Configuring an interface

You must configure an IPv4 interface by assigning an IPv4 address for your network adapter.

To configure a TCP/IP interface, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Specify Option 1 (Work with TCP/IP interfaces), and then press Enter.
3. In the Work with TCP/IP Interfaces menu, specify 1 (Add) for the *Opt* prompt and press Enter to access the Add TCP/IP Interface menu.
4. At the *Internet address* prompt, specify a valid IPv4 address that you want to represent your system.
5. At the *Line description* prompt, specify the line name that you defined in Step 1.
6. At the *Subnet mask* prompt, specify a valid IPv4 address for the subnet mask and press Enter.
7. To start the interface, type 9 (Start) on the Work with TCP/IP Interface menu for the interface you configured, and then press Enter.

Step 4: Configuring a default route

To reach remote networks for your system, use this information to configure a default route.

Because your network can consist of many interconnected networks, you must define at least one route for your system to communicate with a remote system on another network. You must also add routing entries to enable TCP/IP clients that are attempting to reach your system from a remote network to function correctly.

You need to plan to have the routing table defined so that there is always an entry for at least one default route (*DFTROUTE). If there is no match on any other entry in the routing table, data is sent to the IP router specified by the first available default route entry.

To configure a default route, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 2 (Work with TCP/IP Routes) and press Enter.

3. Select 1 (Add) for the *Opt* prompt and press Enter to access the Add TCP/IP Route (ADDTCPRTE) menu.
4. Type *DFTROUTE for the *Route destination* prompt and *NONE for the *Subnet mask* prompt.
5. At the *Next hop* prompt, specify the IP address of the gateway on the route, and then press Enter.

Step 5: Defining TCP/IP domain

After specifying the routing entries, you need to define the local domain and host names to allow communication within the network, and then use a DNS server to associate the IP addresses with the host names.

The local domain and host name is the primary name associated with your system. They are required when you set up other network applications, such as e-mail.

If you want to use easily remembered names rather than IP addresses, you must use either a DNS server, or a host table, or both to resolve IP addresses. You must configure the host name search priority to tell the system which method you prefer to use.

To define TCP/IP domain, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 12 (Change TCP/IP domain information), and then press Enter.
3. At the *Host name* prompt, specify the name you defined for your local host name.
4. At the *Domain name* prompt, specify the names you defined for your local domain name.
5. At the *Host name search priority* prompt, set the value in one of the following ways:

    - Set the value to *LOCAL (recommended). This determines that the system searches the host names in a host table first.

    - Set the value to *REMOTE. This determines that the system automatically searches the host names in a DNS server first. The system queries each DNS server until it gets an answer.

    Note: If the host name search priority is set to *LOCAL, you must define a host table entry for your system. See Step 6: Defining a host table for details.

6. At the *Domain name server* prompt, specify the IP address that represents your DNS server, and then press Enter.

After defining the TCP/IP domain information, you can use either the character-based interface or IBM Navigator for i to change the configurations.

Related tasks
Changing TCP/IP domain
You can customize the local domain and host names, add or remove DNS servers, change the host name search priority, and so on.

Related information
Domain Name System

Step 6: Defining a host table

You might want to use a host table other than a DNS server to resolve your IP addresses. You can ignore this step if you only use a DNS server.

Like a DNS server, a host table is used to associate IP addresses with host names so that you can use easily remembered names for your system. The host table supports both IPv4 and IPv6 addresses.

To define a host table using the character based interface, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 10 (Work with TCP/IP Host Table Entries), and then press Enter.
3. Specify 1 (Add) for the *Opt* prompt and press Enter to access the Add TCP/IP Host Table Entry menu.

4. At the *Internet address* prompt, specify the IP address you defined in Step 3.
5. At the *Host name* prompt, specify the associated fully qualified local host name, and then press Enter. Specify a plus sign (+) by the *+ for more values* prompt to make space available for more than one host name, if necessary.

   Note: You can specify up to 65 host names for a single host table entry (IP address).
6. Repeat steps 1 through 5 for each of the other hosts on the network to which you want to communicate with by name, and add an entry for each.

After defining a host table, you can use either the character-based interface or IBM Navigator for i to change the configurations.

Related tasks

Customizing host table entries
You can add, edit, or remove host table entries. The host table supports both IPv4 and IPv6 addresses.

Step 7: Starting TCP/IP

You must start TCP/IP to make TCP/IP services ready to use.

To start TCP/IP, follow these steps.

1. On the command line, type STRTCP (Start TCP/IP command) and press F4 (Prompt) to access the Start TCP/IP menu.
2. Specify *YES for the additional devices that you want to start optionally; otherwise, specify *NO.
3. Press Enter to start TCP/IP.

The Start TCP/IP (**STRTCP**) command initializes and activates TCP/IP processing, starts the TCP/IP interfaces, and starts the server jobs. Only TCP/IP interfaces and servers with AUTOSTART *YES are started with the **STRTCP** command.

You can use either IBM Navigator for i or the character-based interface to change the configuration when you need to change the networking settings.

Related concepts

Configuring IPv6
You can use these instructions to configure your system for IPv6 functions.

Customizing TCP/IP
IBM Navigator for i and the character-based interface also provide you with many options that you can use to customize your TCP/IP configuration.

Step 8: Testing TCP/IP connection

Use this procedure to test TCP/IP connections after you finish TCP/IP configurations for the first time.

After you have successfully installed the IBM TCP/IP Connectivity Utilities for i licensed program and configured TCP/IP for your system, you need to test whether your TCP/IP connection works well.

Testing TCP/IP using the command prompts

To test your TCP/IP connection to the network, follow these steps:

1. Verify that TCP/IP communication is configured and started on each of the workstations. Use the documentation provided by your workstation vendor.
2. From a workstation, open a command prompt and type `ping` followed by the IP address of the interface you have configured.

   For example, if the IP address is 192.168.34.1, type:

   ```
   ping 192.168.34.1
   ```

You might receive a message that confirms that the packet has been sent to your system. This verifies that the workstation can access the system. If the connection to the network fails, see TCP/IP troubleshooting for more information.

Testing TCP/IP using IBM Navigator for i

Alternatively, you can use the IBM Navigator for i to test your TCP/IP connection:

- From the IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks** > **TCP/IP Configuration** and click **Work with Ping**.
- Follow the steps in the Ping panel to complete testing the TCP/IP connection.

Configuring IPv4 DHCP clients

IPv4 clients using Dynamic Host Configuration automatically obtain IPv4 addresses.

IPv4 DHCP client support provides the capability to automatically acquire an IPv4 address for an interface. It is accomplished by configuring an IPv4 DHCP client interface on a line description. The IPv4 DHCP client interacts with a IPv4 DHCP server to obtain a dynamic IPv4 address. The capability to define, modify, and manage an IPv4 DHCP client interface is like IPv6 Stateless Address Configuration (SAC). Traditional Command Language (CL) commands: ADDTCPIFC, STRTCPIFC, ENDTCPIFC, RMVTCPIFC, and CHGTCPIFC are used to create and manage the IPv4 DHCP client interfaces.

Related concepts
Customizing IPv4 interfaces
You might want to add IPv4 interfaces for your system, or change, remove, start, or stop existing IPv4 interfaces. You can find detailed instructions on how to perform these tasks.

Configuring IPv6

You can use these instructions to configure your system for IPv6 functions.

You are ready to take advantage of the next-generation Internet by using IPv6 on your network. You can configure IPv6 on an existing line by using the IPv6 stateless address autoconfiguration function, or by manually configuring IPv6 interfaces.

Related concepts
IPv6 overview
You will find information about why Internet Protocol version 6 (IPv6) is replacing Internet Protocol version 4 (IPv4) as the Internet standard, and how you can use it to your advantage.

Related tasks
Step 7: Starting TCP/IP
You must start TCP/IP to make TCP/IP services ready to use.

Planning IPv6 configuration

You must have TCP/IP configured on the system before you can configure IPv6. Listed here are the hardware and software requirements and the prerequisites for configuring IBM i for IPv6.

Hardware and software requirements

To configure IPv6 on an Ethernet line, your system must meet the following requirements:

- IBM i 5.4, or later
- IBM Navigator for i
- IPv6-capable router, if you want to send IPv6 traffic beyond the immediate LAN

Configuration prerequisites

You must have the following items configured before you can configure IPv6:

- You must have TCP/IP configured by using IPv4. See Configuring TCP/IP for the first time for details.
- You must have IPv6 started. Complete the following steps to verify whether the IPv6 stack has been started:

    1. On the command line, type NETSTAT and press Enter to access the Work with TCP/IP Network Status menu.
    2. Specify Option 10 (Display TCP/IP stack status) and press Enter.
    3. At the *IPv6 stack status* prompt, ensure the value is Active.
    4. If the value of IPv6 stack status is not Active, complete the following steps to start IPv6:

        a. On the command line, type STRTCP (Start TCP/IP command) and press F4 (Prompt) to access the Start TCP/IP menu.
        b. At the *Start IPv6* prompt, type *YES, and then press Enter.

    Note: You do not need to end TCP/IP in order to start IPv6 at a later time.

Related tasks

Configuring TCP/IP for the first time
If you are setting up a new system, you need to establish a connection to the network and you must configure TCP/IP using IPv4 for the first time.

Configuring IPv6 address autoconfiguration

You can take advantage of the IPv6 stateless and DHCPv6 address autoconfiguration function to configure IPv6 automatically.

The IPv6 address autoconfiguration automatically creates new IPv6 interfaces for a given line description, and assigns IPv6 addresses for the interfaces. You can configure a line description to perform IPv6 address autoconfiguration using either a wizard in IBM Navigator for i, or the character-based interface.

Configuring IPv6 address autoconfiguration using IBM Navigator for i

To configure IPv6 address autoconfiguration using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** and click **Lines**.
2. Click the context menu for one of the lines in the right pane, and select **IPv6 Stateless Address Autoconfiguration** > **Configure**.
3. Follow the steps in the New IPv6 Interface wizard to complete the autoconfiguration.
4. To start the IPv6 interface created by the autoconfiguration, right-click the line you just configured and select **IPv6 Stateless Address Autoconfiguration** > **Start**.

    Note: To ensure that the IPv6 is started automatically when you start TCP/IP, select **Start when TCP/IP is started** in the Configure Line for IPv6 display.

If the status changes to Active, you have configured and started the IPv6 address autoconfiguration successfully.

Configuring IPv6 address autoconfiguration using the character-based interface

To *configure* IPv6 address autoconfiguration using the character-based interface, follow these steps:

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, type *IP6SAC.
3. At the *Line description* prompt, specify a line name (use any name), and press Enter to see a list of optional parameters.
4. Specify any of the optional parameters, and then press Enter.

To *start* the IPv6 stateless address autoconfiguration, follow these steps:

1. On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.
2. At the *Internet address* prompt, type *IP6SAC, and press Enter.
3. At the *Line description* prompt, specify the line name that you defined in the preceding configuration steps, and then press Enter.

You have successfully configured and started the IPv6 address autoconfiguration.

Note: DHCPv6 is used to assign IPv6 addresses automatically after configuring and starting **IPv6 Stateless Address Autoconfiguration** when the IPv6 router on the network advertises the availability of DHCPv6 for address configuration.

Related concepts

Stateless address autoconfiguration
Stateless address autoconfiguration automates some of the network administrator's tasks.

Address autoconfiguration with DHCPv6
DHCP for IPv6 provides stateful address autoconfiguration for IPv6 nodes.

Related tasks

Starting a specific TCP/IP interface
You must start a specific IPv4 or IPv6 interface whichever is needed for your sockets-enabled application.

Related information

*IOSYSCFG special authority

Manually creating an IPv6 interface

You can configure IPv6 by manually creating a local area network IPv6 interface, or a virtual IPv6 interface. You can use either IBM Navigator for i, or the character-based interface to perform the configuration.

Creating an IPv6 interface using IBM Navigator for i

To create an IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Interfaces**, and complete one of the following steps:
   - To create an IPv6 interface for the local area network, select **New Interface** > **Local Area Network**.
   - To create a virtual IPv6 interface, select **New Interface** > **Virtual IP**.
3. Follow the steps in the New IPv6 Interface wizard to create the new IPv6 interface. The new interface will appear in the right window after you finish the configuration.

   Note: The **New Interface** menu item is enabled only if you have *IOSYSCFG special authority.
4. To start the interface, right-click the new IPv6 interface in the right pane, and then select **Start**.

   You can also select the **Start when TCP/IP is started** check box in the New IPv6 Interface wizard to ensure that it starts automatically the next time that you start TCP/IP.

Configuring an IPv6 interface using the character-based interface

To create a normal IPv6 interface by using the character-based interface, follow these steps:

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv6 address.
3. At the *Line description* prompt, specify a line name (use any name) and press Enter to see a list of optional parameters.
4. Specify any of the other optional parameters that you want, and then press Enter.

To create a virtual IPv6 interface using the character-based interface, follow these steps:

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv6 address.
3. At the *Line description* prompt, type *VIRTUALIP and press Enter to see a list of optional parameters.
4. At the *Preferred line descriptions* prompt, complete one of the following steps:

   - If you do not want to specify any preferred line descriptions at this moment, keep the default value as *NONE.
   - Type a plus sign (+) by the *+ for more values* prompt and press Enter. Then, in the Specify More Values for Parameter PREFLIND menu, specify line descriptions (use any name) one by one, and then press Enter.

   Note: You can specify up to 10 line descriptions in order of preference. Each line description must be used by at least one IPv6 interface.
5. Ensure that you specify all the other optional parameters correctly, and then press Enter.

To start the IPv6 interface you created, follow these steps:

1. On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.
2. At the *Internet address* prompt, specify the IPv6 address you defined, and then press Enter.

You have successfully created and started an IPv6 interface.

Related information

*IOSYSCFG special authority

Configuring TCP/IP when the operating system is in restricted state

If you need to configure TCP/IP while the operating system is in restricted state, perform the steps outlined in this topic. You can use both IPv4 and IPv6 addresses for your system.

As a network administrator, you might encounter some situations that you must prevent users from changing any configuration. This requires that your operating system must be in restricted state. To configure TCP/IP in restricted state, you must first start TCP/IP using special parameters, and then start a specific IPv4 or IPv6 interface to allow access to the system.

The following restrictions apply when the operating system is running in restricted state:

- You can only start interfaces that are not attached to a network server description (NWSD) or a network interface description (NWID).
- You cannot start TCP/IP servers (the STRTCPSVR command), because they require active subsystems.

Complete the following tasks to configure TCP/IP while your operating system is in restricted state:

Starting TCP/IP using special parameters

Before you can configure IPv4 or IPv6 interfaces in restricted state, you must use special parameters to start TCP/IP.

Complete the following steps to start TCP/IP while your operating system is in restricted state:

1. On the command line, type STRTCP (Start TCP/IP command) and press F4 (Prompt) to access the Start TCP/IP menu.
2. Specify *NO for the Start application servers, Start TCP/IP interfaces, and Start point-to-point profiles parameters.
3. Specify *YES for the Start IPv6 parameter, whereby you will be able to configure IPv6 interfaces in restricted state.

4. Press Enter to submit the configuration.

Note: The above commands start TCP/IP, but do not start TCP/IP application servers or IP interfaces.

Starting a specific TCP/IP interface

You must start a specific IPv4 or IPv6 interface whichever is needed for your sockets-enabled application.

After you start TCP/IP in restricted state, you can manually configure IPv4 and IPv6 interfaces, or perform an IPv6 stateless address autoconfiguration in a normal way. Alternatively, you can use existing IPv4 or IPv6 interfaces that you have configured before.

Complete the following steps to start a specific IPv4 or IPv6 interface:

1. Verify that the interface you want to start either specifies a virtual IP address, or uses a line description of *ELAN, *TRLAN, or *DDI.

   a) On the command line, type CFGTCP (Configure TCP/IP command) and then press F4 (Prompt) to access the Configure TCP/IP menu.

   b) Specify Option 1 (Work with TCP/IP interfaces) and then press Enter.

   c) Verify the Line Description and the Line Type columns:

      • For the IPv4 interface that you want to start, verify that the Line Description column is *VIRTUALIP, or that the Line Type column is *ELAN, *TRLAN, or *DDI.

      • For the IPv6 interface that you want to start, verify that the Line Description column is *VIRTUALIP, or that the Line Type column is *ELAN.

2. Verify that the interface you want to start is not attached to an NWID or NWSD.

   a) On the command line, type DSPLIND (Display Line Description command) and press F4 (Prompt) to access the Display Line Description menu.

   b) At the *Line description* prompt, specify the line name of the interface and then press Enter.

   c) On the Display Line Description menu, verify that the Resource name is neither *NWID nor *NWSD.

   If the interface is attached to an NWID or NWSD, it is recommended that you select a different interface.

3. Start the interface.

   a) On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.

   b) At the *Internet address* prompt, type the IPv4 or IPv6 address of the interface, and then press Enter.

      Note: Verify that the *AUTOSTART is not specified for *Internet address*.

Related tasks

Adding IPv4 interfaces
You can use either IBM Navigator for i or the character-based interface to create IPv4 interfaces for your system, including local area network interfaces, wide area network interfaces, and virtual IPv4 interfaces.

Adding IPv6 interfaces
You can use either IBM Navigator for i or the character-based interface to create IPv6 interfaces for your system, including local area network interface and virtual IPv6 interfaces.

Configuring IPv6 address autoconfiguration
You can take advantage of the IPv6 stateless and DHCPv6 address autoconfiguration function to configure IPv6 automatically.

Verifying the interface

Finally, you must verify that the interface you started is active.

To verify the interface, you need to ping the specific interface for your application.

From a workstation, open a command prompt and type `ping` followed by the IP address of the interface you have configured.

Only a few TCP/IP-related utilities can operate in restricted state. However, Ping and Netstat can be used.
Related information

Ping

Netstat

Saving and Restoring TCP/IP configuration information

After the systems IP Interfaces are configured and verified, it is a good idea to generate a backup of the TCP/IP configuration. The Retrieve TCP/IP Information (**RTVTCPINF**) command gathers key TCP/IP configuration information from the default system locations and places it in the library that is specified for the Library (**LIB**) parameter.

The gathered TCP/IP configuration information can be used by the Update TCP/IP Information (**UPDTCPINF**) command to reset or restore the TCP/IP configuration on a system. Back up the TCP/IP configuration any time a supported TCP/IP application is configured or before any major changes to TCP/IP or a supported TCP/IP application is made. The backup provides a working configuration to go back to in case of any problem.

Related information

Ping

Netstat

RTVTCPINF

UPDTCPINF

IPCONFIG command

IPCONFIG is a System Service Tools (SST) Advanced Analysis command that allows viewing or altering IP configuration settings not available through the standard TCP/IP configuration menus.

To use the IP configuration IBM-supplied command support, follow these steps:

1. Access System Service Tools by using the CL command Start System Service Tools (**STRSST**).
2. Select **Start a service tool**.
3. Select **Display/Alter/Dump**.
4. Select **Display/Alter storage**.
5. Select **Licensed Internal Code (LIC) data**.
6. Select **Advanced analysis**. (You must page down to see this option.)
7. Page down until you find the IPCONFIG option. Then, place a 1 (Select) next to the option and press Enter. You are now on the `Specify Advanced Analysis Options` window. The command shows as IPCONFIG.
8. Enter '-h' without the quotation marks and press Enter to display the available options.

Customizing TCP/IP

IBM Navigator for i and the character-based interface also provide you with many options that you can use to customize your TCP/IP configuration.

After you have configured TCP/IP, you might decide to customize your configuration. As your network grows, you might need to change properties, add interfaces, or add routes to your system. To use IPv6 applications, you need to configure IPv6 for the system. This section provides a starting point for you to manage your TCP/IP configuration. You can use either the wizards in IBM Navigator for i or the character-based interface to accomplish the tasks.

Related tasks

Configuring TCP/IP for the first time

If you are setting up a new system, you need to establish a connection to the network and you must configure TCP/IP using IPv4 for the first time.

Step 7: Starting TCP/IP
You must start TCP/IP to make TCP/IP services ready to use.

Changing TCP/IP general settings

You can view and change your TCP/IP general settings using either IBM Navigator for i or the character-based interface.

For instance, you can change properties for host or domain names, name server, host table entries, system attributes, port restrictions, servers, or client connections. You can change general properties or properties that are specific to IPv4 or IPv6, such as transports.

Changing TCP/IP domain

You can customize the local domain and host names, add or remove DNS servers, change the host name search priority, and so on.

You can use either IBM Navigator for i or the character-based interface to view and change host domain information.

Changing TCP/IP domain using IBM Navigator for i

To change the host domain information by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks** > **TCP/IP Configuration**.
2. Click **TCP/IP Configuration Properties** to open the panel.
3. From the **Host Domain Information** tab, follow the instructions to customize the host domain information.

Changing TCP/IP domain using the character-based interface

To change the host domain information by using the character-based interface, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 12 (Change TCP/IP domain information) and press Enter.
3. On the Change TCP/IP Domain menu, change host name, domain name, and DNS server, and specify domain search list and host name search priority as needed.
4. Press Enter.

Related tasks
Step 5: Defining TCP/IP domain
After specifying the routing entries, you need to define the local domain and host names to allow communication within the network, and then use a DNS server to associate the IP addresses with the host names.

Customizing host table entries

You can add, edit, or remove host table entries. The host table supports both IPv4 and IPv6 addresses.

You can use either IBM Navigator for i or the character-based interface to view and customize host table entries.

Customizing host table entries using IBM Navigator for i

To customize the host table entries by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks** > **TCP/IP Configuration**.
2. Click **Manage Host Table** to open the Host Table window.

The Host Table window shows the host names of each entry (both IPv4 and IPv6 addresses). Each host table entry can contain up to 65 host names.

3. Use the Host Table window to add, edit, or remove host table entries.

Customizing host table entries using the character-based interface

To customize the host table entries by using the character-based interface, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 10 (Work with TCP/IP Host Table Entries), and then press Enter.
3. Perform any of the following tasks to customize the host table:
   - To add a host table entry, type 1 (Add) for the *Opt* prompt at the first line, and then press Enter.
   - To change a host name, type 2 (Change) next to the line you want to change, and then press Enter.
   - To remove a host table entry, type 4 (Remove) next to the line you want to remove, and then press Enter.
   - To rename a host table entry, type 7 (Rename) next to the line you want to rename, and then press Enter.
4. After you finish all the changes, press Enter.

The Merge TCP/IP Host Table (**MRGTCPHT**) command is used to merge host names, IP addresses, and text comment entries from a physical file member or integrated file system object into the local host table. For more information about **MRGTCPHT**, see Merge TCP/IP Host Table (**MRGTCPHT**).

Related tasks
Step 6: Defining a host table
You might want to use a host table other than a DNS server to resolve your IP addresses. You can ignore this step if you only use a DNS server.

Changing TCP/IP (IPv4 and IPv6) attributes

You can view and change your TCP/IP attributes by using IBM Navigator for i.

To view and change the TCP/IP attributes using IBM Navigator for i, complete the following these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks** > **TCP/IP Configuration**.
2. Click **TCP/IP Attributes** to open the panel.
3. Select one of these tabs to change the properties:
   - Select the **IPv4** tab to change IPv4 specific attributes.
   - Select the **IPv6** tab to change IPv6 common attributes.

Changing other TCP/IP attributes

You can perform additional configurations for TCP/IP, such as changing the attributes for User Datagram Protocol (UDP) and Address Resolution Protocol (ARP) that are associated with TCP/IP, and so on.

You can use either IBM Navigator for i or the character-based interface to change or perform any additional configurations for TCP/IP.

Changing other TCP/IP attributes using IBM Navigator for i

You can access the TCP/IP attributes pages in IBM Navigator for i in the following ways:

- To access the TCP/IP Configuration Properties window, follow these steps:
  1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks**.
  2. Click **TCP/IP Configuration Properties** to open the TCP/IP Configuration Properties window.
  3. Select the **Port Restrictions**, **Servers to Start**, or **SOCKS** tabs and follow the instructions to change the settings.

- To access the TCP/IP Attributes window, follow these steps:
  1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks**.
  2. Click **TCP/IP Attributes** to open the TCP/IP Attributes window.
  3. Select the **General** or **Transports** tab and follow the instructions to change the settings.

Changing other TCP/IP attributes using the character-based interface

To access the Change TCP/IP Attributes display using the character-based interface, follow these steps:

1. On the command line, type CFGTCP (Configure TCP/IP command) and press Enter to access the Configure TCP/IP menu.
2. Select Option 3 (Change TCP/IP Attributes), and then press Enter.
3. Change the settings that you want, and press Enter.

Customizing IPv4 interfaces

You might want to add IPv4 interfaces for your system, or change, remove, start, or stop existing IPv4 interfaces. You can find detailed instructions on how to perform these tasks.

By using IBM Navigator for i or the character-based interface, you can perform any of the following tasks to customize your IPv4 interfaces.

Related concepts
Configuring IPv4 DHCP clients
IPv4 clients using Dynamic Host Configuration automatically obtain IPv4 addresses.

Adding IPv4 interfaces

You can use either IBM Navigator for i or the character-based interface to create IPv4 interfaces for your system, including local area network interfaces, wide area network interfaces, and virtual IPv4 interfaces.

Creating an IPv4 interface using IBM Navigator for i

To create an IPv4 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4** and click **IPv4 Interfaces**.
2. Click the **Actions** menu and complete one of the following steps:
   - To create a local area network interface, select **New Interface** > **Local Area Network**.
   - To create a wide area network interface, select **New Interface** > **Wide Area Network**.
   - To create a virtual interface, select **New Interface** > **Virtual IP**.
3. Follow the steps in the New IPv4 Interface wizard to create the IPv4 interface. After you finish the configuration, the new interface is displayed in the right pane.

   Note: The New Interface menu item is enabled only if you have *IOSYSCFG special authority.

Creating an IPv4 interface using the character-based interface

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

To create a normal IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv4 address.
3. At the *Line description* prompt, specify a line name (use any name) and press Enter to see a list of optional parameters.
4. Specify any of the other optional parameters that you want, and then press Enter.

To create a virtual IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv4 address.
3. At the *Line description* prompt, type *VIRTUALIP and press Enter to see a list of optional parameters.
4. At the *Preferred interfaces* prompt, complete one of the following steps:
   - If you do not want to specify any preferred interfaces at this time, keep the default value *NONE.
   - Type a plus sign (+) by the *+ for more values* prompt and press Enter. Then, in the Specify More Values for Parameter PREFIFC menu, specify valid IPv4 addresses that represent preferred IPv4 interfaces one by one, and then press Enter.

   Note: You can specify up to 10 IPv4 interfaces in order of preference. Each interface must be a normal IPv4 interface.
5. Ensure that you specify all the other optional parameters correctly, and then press Enter to submit.

To create an IPv4 DHCP interface by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify *IP4DHCP.
3. At the *Line description* prompt, specify a line name (use any name) and press Enter to see a list of optional parameters.
4. Specify any of the other optional parameters that you want, and then press Enter.

Related tasks
Starting a specific TCP/IP interface
You must start a specific IPv4 or IPv6 interface whichever is needed for your sockets-enabled application.

Related information
*IOSYSCFG special authority

Starting IPv4 interfaces

You can start IPv4 interfaces that were not started automatically when you created them, or that have been ended previously. You can use either IBM Navigator for i or the character-based interface to perform the tasks.

Starting an IPv4 interface using IBM Navigator for i

To start an IPv4 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Interfaces** to see a list of IPv4 interfaces displayed in the right pane.
3. Right-click the IPv4 interface that you want to start, and select **Start**.

   If the status of the interface becomes Active, you have started the IPv4 interface successfully.

Starting an IPv4 interface using the character-based interface

To start an IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.
2. At the *Internet address* prompt, complete one of the following steps:
   - To start a single IPv4 interface, specify a valid IPv4 address and press Enter.
   - To enable all interfaces to be started automatically when you create or change them, type *AUTOSTART and press Enter.
   - To start an IPv4 DHCP client interface, specify the value *IP4DHCP for the *Internet address* prompt. Specify the corresponding line description name for the *Line description* prompt and press Enter.

Changing IPv4 interfaces

You can change the properties of the existing IPv4 interfaces using either IBM Navigator for i or the character-based interface.

Changing an IPv4 interface using IBM Navigator for i

To change an existing IPv4 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Interfaces** to see a list of IPv4 interfaces displayed in the right pane.
3. Right-click the IPv4 interface that you want to change, and select **Properties**.
4. In the IPv4 properties window, specify the values of the properties that you want to change.

   You can change some properties of an IPv4 interface when it is in active status.

Changing an IPv4 interface using the character-based interface

Note: To run the CHGTCPIFC command, you must have *IOSYSCFG special authority.

To change an existing IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type CHGTCPIFC (Change TCP/IP Interface command) and press F4 (Prompt) to access the Change TCP/IP Interface menu.
2. At the *Internet address* prompt, specify the IPv4 address of the interface that you want to change, and press Enter to see a list of optional parameters.

   Note: For DHCP client interfaces, only the interface with the IP address *IP4DHCP can be changed. Interfaces automatically created by the DHCP client support cannot be changed.
3. Specify any of the optional parameters that you want to change, and keep the default value *SAME for any parameters that you are not changing.
4. Ensure that you specify all the parameters correctly, and then press Enter.

Related information

*IOSYSCFG special authority

Ending IPv4 interfaces

You might need to end IPv4 interfaces that you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Ending an IPv4 interface using IBM Navigator for i

To end an existing IPv4 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Interfaces** to see a list of IPv4 interfaces displayed in the right pane.
3. Right-click the IPv4 interface that you want to end, and select **Stop**.

   If the status of the interface becomes Inactive, you have ended the IPv4 interface successfully.

Ending an IPv4 interface using the character-based interface

To end an existing IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type ENDTCPIFC (End TCP/IP Interface command) and press F4 (Prompt) to access the End TCP/IP Interface menu.
2. At the *Internet address* prompt, specify the IPv4 address of the interface that you want to end, and press Enter.

   Note: To end interfaces created by DHCP, specify the value *IP4DHCP for the *Internet Address* prompt. Specify the corresponding line description name for the *line description* prompt.

Removing IPv4 interfaces

You might need to remove IPv4 interfaces that you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Prerequisites:

You must end an IPv4 interface before you remove it. This means the status of the IPv4 interface that you are about to remove must be inactive. See "Ending IPv4 interfaces" on page 36 for how to end an IPv4 interface.

Removing an IPv4 interface using IBM Navigator for i

To remove an existing IPv4 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Interfaces** to see a list of IPv4 interfaces displayed in the right pane.
3. Right-click the IPv4 interface that you want to remove, and select **Delete**.
4. In the Confirm Delete window, click **Yes**.

Removing an IPv4 interface using the character-based interface

Note: To run the RMVTCPIFC command, you must have *IOSYSCFG special authority.

To remove an existing IPv4 interface by using the character-based interface, follow these steps:

1. On the command line, type RMVTCPIFC (Remove TCP/IP Interface command) and press F4 (Prompt) to access the Remove TCP/IP Interface menu.
2. At the *Internet address* prompt, specify the IPv4 address of the interface that you want to remove, and press Enter.

   Note: To remove an IPv4 DHCP client interface, specify the value *IP4DHCP for the *Internet address* prompt. Specify the corresponding line description name for the *Line description* prompt.

Related information
*IOSYSCFG special authority

Customizing IPv6 interfaces

You might want to add IPv6 interfaces for your system, or change, remove, start, or stop existing IPv6 interfaces. You can find detailed instructions on how to perform these tasks.

You can customize your IPv6 interfaces using either IBM Navigator for i or the character-based interface.

Adding IPv6 interfaces

You can use either IBM Navigator for i or the character-based interface to create IPv6 interfaces for your system, including local area network interface and virtual IPv6 interfaces.

Creating an IPv6 interface using IBM Navigator for i

To create a new IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6** and click IPv6 Interfaces.
2. Click the **Actions** menu and complete one of the following steps:

   - To create a local area network interface, select **New Interface** > **Local Area Network**.
   - To create a virtual interface, select **New Interface** > **Virtual IP**.

3. Follow the steps in the New IPv6 Interface wizard to create the IPv6 interface. After you finish the configuration, the interface is displayed in the right pane.

   Note: The New Interface menu item is enabled only if you have *IOSYSCFG special authority.

Creating an IPv6 interface using the character-based interface

Note: To run the ADDTCPIFC command, you must have *IOSYSCFG special authority.

To create a normal IPv6 interface by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv6 address.
3. At the *Line description* prompt, specify a line name (use any name), and press Enter to see a list of optional parameters.
4. Specify any of the other optional parameters, and then press Enter.

To create a virtual IPv6 interface using the character-based interface, follow these steps:

1. On the command line, type ADDTCPIFC (Add TCP/IP Interface command) and press F4 (Prompt) to access the Add TCP/IP Interface menu.
2. At the *Internet address* prompt, specify a valid IPv6 address.
3. At the *Line description* prompt, type *VIRTUALIP and press Enter to see a list of optional parameters.
4. At the *Preferred line descriptions* prompt, complete one of the following steps:

    - If you do not want to specify any preferred line descriptions at this moment, keep the default value *NONE.
    - Type a plus sign (+) by the *+ for more values* prompt and press Enter. Then, in the Specify More Values for Parameter PREFLIND menu, specify line descriptions (use any name) one by one, and then press Enter.

    Note: You can specify up to 10 line descriptions in order of preference. Each line description must be used by at least one IPv6 interface.

5. Ensure that you specify all the other optional parameters correctly, and then press Enter.

Related tasks
Starting a specific TCP/IP interface
You must start a specific IPv4 or IPv6 interface whichever is needed for your sockets-enabled application.

Related information
*IOSYSCFG special authority

Starting IPv6 interfaces

You can start IPv6 interfaces that were not started automatically when you created them, or that have been ended previously. You can use either IBM Navigator for i or the character-based interface to perform the tasks.

Starting an IPv6 interface using IBM Navigator for i

To start an IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Interfaces** to see a list of IPv6 interfaces displayed in the right pane.
3. Perform either of the following two steps to start the interface:

    - For normal IPv6 interfaces, right-click the one that you want to start and select **Start**.
    - For interfaces created by IPv6 stateless address autoconfigurations, right-click the one that you want to start, and select **Start stateless address autoconfiguration**.

    If the status of the interface becomes Active, you have started the IPv6 interface successfully.

Starting an IPv6 interface using the character-based interface

To start an IPv6 interface by using the character-based interface, follow these steps:

1. On the command line, type STRTCPIFC (Start TCP/IP Interface command) and press F4 (Prompt) to access the Start TCP/IP Interface menu.

2. At the *Internet address* prompt, complete one of the following steps:
   - To start a normal IPv6 interface, specify a valid IPv6 address and press Enter.
   - To start an interface created by an IPv6 stateless address autoconfiguration, complete these steps:
     a. Type *IP6SAC and press Enter.
     b. At the *Line description* prompt, specify the line name for the IPv6 stateless address autoconfiguration, and then press Enter.
   - To enable all interfaces to be started automatically when you create or change them, type *AUTOSTART and press Enter.

Changing IPv6 interfaces

You can change the properties of the existing IPv6 interfaces using either IBM Navigator for i or the character-based interface.

Changing an IPv6 interface using IBM Navigator for i

To change an existing IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Interfaces** to see a list of the IPv6 interfaces.
3. Right-click the IPv6 interface that you want to change, and select **Properties** to show the IPv6 Interface Properties window.
4. In the IPv6 Interface Properties window, specify the values of the properties that you want to change.

   Notes:
   - You can change some properties of an IPv6 interface when it is in active status.
   - If you are changing a virtual IPv6 interface, you might want to select the **Options** tab to change the preferred line descriptions.

Changing an IPv6 interface using the character-based interface

Note: To run the CHGTCPIFC command, you must have *IOSYSCFG special authority.

To change an existing IPv6 interface by using the character-based interface, follow these steps:

1. On the command line, type CHGTCPIFC (Change TCP/IP Interface command) and press F4 (Prompt) to access the Change TCP/IP Interface menu.
2. At the *Internet address* prompt, complete one of the following steps:
   - To change a normal IPv6 interface, specify the IPv6 address of the interface that you want to change.
   - To change an interface created by an IPv6 stateless address autoconfiguration, type *IP6SAC.
3. At the *Line description* prompt, specify the line name of the interface, and then press Enter to see a list of optional parameters.
4. Specify any of the optional parameters that you want to change, and keep the default value *SAME for any parameters that you are not changing.
5. Ensure that you specify all the parameters correctly, and then press Enter.

Related information
[*IOSYSCFG special authority](#)

Ending IPv6 interfaces

You might need to end IPv6 interfaces that you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Ending an IPv6 interface using IBM Navigator for i

To end an existing IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Interfaces** to see a list of IPv6 interfaces displayed in the right pane.
3. Perform one of the following steps to end the interface:
   - For normal IPv6 interfaces, right-click the one that you want to end, and select **Stop**.
   - For interfaces created by IPv6 stateless address autoconfigurations, right-click the one that you want to end, and select **Stop stateless address autoconfiguration**.

Ending an IPv6 interface using the character-based interface

To end an existing IPv6 interface by using the character-based interface, follow these steps:

1. On the command line, type ENDTCPIFC (End TCP/IP Interface command) and press F4 (Prompt), to access the End TCP/IP Interface menu.
2. At the *Internet address* prompt, complete one of the following steps:
   - To end a normal IPv6 interface, specify the IPv6 address of the interface that you want to end, and press Enter.
   - To end an interface created by an IPv6 stateless address autoconfiguration, type *IP6SAC and specify the line name of the interface at the *Line description* prompt, and then press Enter.

Removing IPv6 interfaces

You might need to remove IPv6 interfaces that you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Prerequisites:

You must end an IPv6 interface before you remove it. This means the status of the IPv6 interface that you are about to remove must be inactive. See "Ending IPv6 interfaces" on page 39 for how to end an IPv6 interface.

Removing an IPv6 interface using IBM Navigator for i

To remove an existing IPv6 interface by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Interfaces** to see a list of IPv6 interfaces displayed in the right pane.
3. Perform one of the following steps to remove the interface:
   - For normal IPv6 interfaces, right-click the one that you want to remove, and select **Delete**.
   - For interfaces created by IPv6 stateless address autoconfigurations, right-click the one that you want to end, and select **Remove stateless address autoconfiguration**.
4. In the Confirm Delete window, click **Yes**.

Removing an IPv6 interface using the character-based interface

Note: To run the RMVTCPIFC command, you must have *IOSYSCFG special authority.

To remove an existing IPv6 interface by using the character-based interface, follow these steps:

1. On the command line, type RMVTCPIFC (Remove TCP/IP Interface command) and press F4 (Prompt) to access the Remove TCP/IP Interface menu.
2. At the *Internet address* prompt, complete one of the following steps:
   - To remove a normal IPv6 interface, specify the IPv6 address of the interface that you want to remove, and press Enter.
   - To remove an interface created by an IPv6 stateless address autoconfiguration, type *IP6SAC and specify the line name of the interface at the *Line description* prompt, and then press Enter.

Related information
*IOSYSCFG special authority

Customizing IPv4 routes

You might want to add IPv4 routes for your system, or change or remove existing IPv4 routes. You can find detailed instructions on how to perform these tasks.

You can customize your IPv4 routes using either IBM Navigator for i or the character-based interface.

Adding IPv4 routes

You can create new IPv4 routes for your system either by following the wizard in IBM Navigator for i or by using the character-based interface.

Any changes that you make to the routing information take effect immediately.

Creating a new IPv4 route using IBM Navigator for i

To create a new IPv4 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4** and click the IPv4 Routes.
2. Click the **Actions** menu, and click **New Route**.
3. Follow the steps in the New IPv4 Route wizard to configure a new IPv4 route.

Creating a new IPv4 route using the character-based interface

To create a new IPv4 route by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPRTE (Add TCP/IP Route command) and press F4 (Prompt), to access the Add TCP/IP Route menu.

   Note: To run the ADDTCPRTE command, you must have *IOSYSCFG special authority.

2. At the *Route destination* prompt, complete one of the following steps:

   - To create a default IPv4 route, type *DFTROUTE and press Enter.

     Note: To configure a default IPv4 route, you must specify *NONE for the Subnet mask parameter.

   - To create a normal IPv4 route, specify the IPv4 address of the route destination and press Enter.

   A list of optional parameters is then displayed.

3. At the *Next hop* prompt, specify the IPv4 address of the gateway on the route.
4. Specify any of the other optional parameters that you want, and then press Enter.

Related information

[*IOSYSCFG special authority](#)

Changing IPv4 routes

You can change the properties of the existing IPv4 routes by using either IBM Navigator for i or the character-based interface.

Changing an IPv4 route using IBM Navigator for i

To change the properties of an existing IPv4 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Routes** to see a list of the IPv4 routes.
3. Right-click the IPv4 route that you want to change, and select **Properties**.
4. In the IPv4 route window, specify the values of IPv4 route properties that you want to change.

Changing an IPv4 route using the character-based interface

To change the properties of an existing IPv4 route by using the character-based interface, follow these steps:

1. On the command line, type CHGTCPRTE (Change TCP/IP Route command) and press F4 (Prompt) to access the Change TCP/IP Route menu.

   Note: To run the CHGTCPRTE command, you must have *IOSYSCFG special authority.

2. At the *Route destination* prompt, complete one of the following steps:

   - To change a default IPv4 route, type *DFTROUTE and press Enter.

     Note: To configure a default IPv4 route, you must specify *NONE for the Subnet mask parameter.

   - To change a normal IPv4 route, specify the IPv4 address of the route destination that you want to change, and then press Enter.

   A list of optional parameters is then displayed.

3. At the *Next hop* prompt, specify the IPv4 address of the gateway on the route.

4. Specify any of the other optional parameters that you want to change, and keep the default value as *SAME for any parameters that you are not changing.

5. Ensure that you specify all the parameters correctly, and then press Enter.

Related information
*IOSYSCFG special authority

Removing IPv4 routes

You might need to delete IPv4 routes you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Removing an IPv4 route using IBM Navigator for i

To delete an existing IPv4 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Click **IPv4 Routes** to see a list of the IPv4 routes.
3. Right-click the IPv4 route that you want to remove, and select **Delete**.
4. In the Confirm Delete window, press Yes.

Removing an IPv4 route using the character-based interface

To delete an existing IPv4 route by using the character-based interface, follow these steps:

1. On the command line, type RMVTCPRTE (Remove TCP/IP Route command) and press F4 (Prompt), to access the Remove TCP/IP Route menu.

   Note: To run the RMVTCPRTE command, you must have *IOSYSCFG special authority.

2. At the *Route destination* prompt, complete one of the following steps:

   - To delete a default IPv4 route, type *DFTROUTE and press Enter.
   - To delete a normal IPv4 route, specify the IPv4 address of the route destination and press Enter.

   A list of optional parameters is then displayed.

3. At the *Next hop* prompt, specify the IPv4 address of the gateway on the route.

4. Specify any of the other optional parameters that helps identify the IPv4 route that you want to delete, and then press Enter.

Related information
*IOSYSCFG special authority

Customizing IPv6 routes

You might want to add IPv6 routes for your system, or change or remove existing IPv6 routes. You can find detailed instructions on how to perform these tasks.

By using either IBM Navigator for i or the character-based interface, you can perform any one of the following tasks to customize your IPv6 routes.

Adding IPv6 routes

You can create IPv6 routes for your system either by following the wizard in IBM Navigator for i or by using the character-based interface. You can configure only one IPv6 default route.

Any changes that you make to the routing information take effect immediately.

Creating an IPv6 route using IBM Navigator for i

To create an IPv6 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6** and click **IPv6 Routes**.
2. Click the **Actions** menu and click **New Route**.
3. Follow the steps in the New IPv6 Route wizard to create an IPv6 route.

Creating an IPv6 route using the character-based interface

Note: To run the ADDTCPRTE command, you must have *IOSYSCFG special authority.

To create an IPv6 route by using the character-based interface, follow these steps:

1. On the command line, type ADDTCPRTE (Add TCP/IP Route command) and press F4 (Prompt) to access the Add TCP/IP Route menu.
2. At the *Route destination* prompt, specify the IPv6 address of the route destination, and press Enter to see a list of optional parameters.
3. At the *Next hop* prompt, specify the IPv6 address of the gateway on the route.
4. At the *Binding line description* prompt, specify the line name that this route will be bound to.
5. Specify any of the other optional parameters that you want, and then press Enter.

To create a new default IPv6 route using the character-based interface, follow these steps:

1. On the command line, type ADDTCPRTE (Add TCP/IP Route command) and press F4 (Prompt) to access the Add TCP/IP Route menu.
2. At the *Route destination* prompt, type *DFT6ROUTE and press Enter to see a list of optional parameters.
3. At the *Next hop* prompt, specify the IPv6 address of the gateway on the route.
4. At the *Address prefix length* prompt, type *NONE (this corresponds to a value of 0).
5. At the *Binding line description* prompt, specify the line name that this route will be bound to.
6. Specify any of the other optional parameters that you want, and then press Enter.

Related information
*IOSYSCFG special authority

Changing IPv6 routes

You can change the properties of the existing IPv6 routes using either IBM Navigator for i or the character-based interface.

Changing an IPv6 route using IBM Navigator for i

To change an the properties of an existing IPv6 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.

2. Click **IPv6 Routes** to see a list of the IPv6 routes.
3. Right-click the IPv6 route that you want to change, and select **Properties**.
4. In the IPv6 Route Properties window, specify the IPv6 property values that you want.

Changing an IPv6 route using the character-based interface

To change the properties of an existing IPv6 route by using the character-based interface, follow these steps:

1. On the command line, type CHGTCPRTE (Change TCP/IP Route command) and press F4 (Prompt) to access the Change TCP/IP Route menu.

   Note: To run the CHGTCPRTE command, you must have *IOSYSCFG special authority.

2. At the *Route destination* prompt, complete one of the following steps:

   - To change a default IPv6 route, type *DFT6ROUTE and press Enter.

     Note: To configure a default IPv6 route, you must specify *NONE for the Address prefix length parameter.

   - To change a normal IPv6 route, specify the IPv6 address of the route destination that you want to change, and then press Enter.

   A list of optional parameters is then displayed.

3. Specify any of the other optional parameters that you want to change, and keep the default value *SAME for any parameters that you are not changing.
4. Ensure that you specify all the parameters correctly, and then press Enter.

Related information
*IOSYSCFG special authority

Removing IPv6 routes

You might need to delete IPv6 routes you have configured. You can use either IBM Navigator for i or the character-based interface to complete the task.

Removing an IPv6 route using IBM Navigator for i

To delete an existing IPv6 route by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv6**.
2. Click **IPv6 Routes** to see a list of the IPv6 routes.
3. Right-click the IPv6 route that you want to remove, and select **Delete**.
4. In the Confirm Delete window, press Yes.

Removing an IPv6 route using the character-based interface

To delete an existing IPv6 route by using the character-based interface, follow these steps:

1. On the command line, type RMVTCPRTE (Remove TCP/IP Route command) and press F4 (Prompt) to access the Remove TCP/IP Route menu.

   Note: To run the RMVTCPRTE command, you must have *IOSYSCFG special authority.

2. At the *Route destination* prompt, complete one of the following steps:

   - To delete a default IPv6 route, type *DFT6ROUTE and press Enter.
   - To delete a normal IPv6 route, specify the IPv6 address of the route destination and press Enter.

   A list of optional parameters is then displayed.

3. At the *Next hop* prompt, specify the IPv6 address of the gateway on the route.
4. At the *Binding line description* prompt, specify the line name that this route is bound to.
5. Specify any of the other optional parameters that helps identify the IPv6 route that you want to delete, and then press Enter.

Related information

Ending TCP/IP connections

You might want to end your TCP/IP connection in some situations. This topic provides you with procedures to end an IPv4 or IPv6 TCP connection.

To end an IPv4 or IPv6 TCP connection using the character-based interface, follow these steps:

1. On the command line, type ENDTCPCNN (End TCP/IP Connection command) and press F4 (Prompt) to access the End TCP/IP Connection menu.
2. At the *Protocol* prompt, specify *TCP.
3. At the *Local internet address* and *Local port* prompts, specify a valid IPv4 or IPv6 address and the port number of your local Internet, and then press Enter.
4. At the *Remote internet address* and *Remote port* prompts, specify a valid IPv4 or IPv6 address and the port number of the remote Internet, and then press Enter.

You have ended your TCP/IP connection.

TCP/IP techniques to connect virtual Ethernet to external LANs

Different TCP/IP techniques can be used to connect the virtual Ethernet network to an external LAN. You can use virtual Ethernet as an alternative to using a network card for interpartition communication.

If you are using a virtual Ethernet network for interpartition communication, you might need to enable your partitions to communicate with a physical, external LAN. You need to enable the TCP/IP traffic to flow between the virtual Ethernet network and the external LAN. The following figure shows a logical flow of the IP packets.
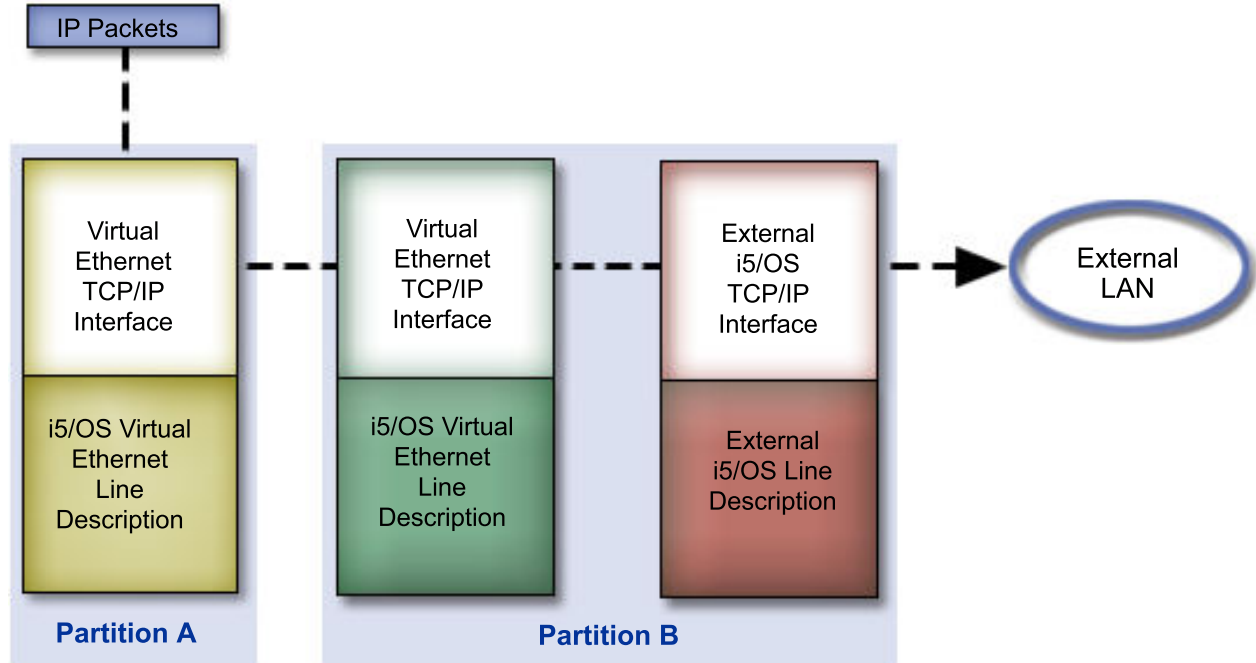
IP traffic initiated by partition A goes from its own virtual Ethernet interface to the virtual Ethernet interface on partition B. By implementing TCP/IP techniques used to connect virtual Ethernet to external LANs, you can enable the IP packets to continue on to the external interface and toward their destination.

There are three methods for connecting the virtual Ethernet and external LAN. Each method has nuances that make it more feasible based on your knowledge of TCP/IP and your environment. Choose from one of the following methods:

- Proxy Address Resolution Protocol (ARP) method
- Network address translation (NAT) method
- TCP/IP routing method

Proxy Address Resolution Protocol method

This proxy Address Resolution Protocol (ARP) method uses transparent subnetting to associate a partition's virtual interface with an external interface.

The proxy ARP function is built into the TCP/IP stack. It is suggested that you use this method if you have the necessary IP addresses.

Note: IPv6 is not supported by the ARP method.

You might want to learn more information about transparent subnetting:

- IBM i5/OS IP Networks: Dynamic

  This IBM Redbooks publication demonstrates how to design an IP network that is self-configuring, fault-tolerant, secure, and efficient in its operation on IBM i.

- TCP/IP routing and workload balancing

  This topic collection provides techniques and instructions for routing and workload balancing.

If you choose to use the proxy ARP method, you must have a firm understanding of subnetting and TCP/IP. You need to obtain a contiguous block of IP addresses that are routable by your network. You subnet this block of IP addresses. In this example, a contiguous block of four IP addresses (10.1.1.72 through 10.1.1.75) is used. Because it is a block of four IP addresses, the subnet mask for these addresses is 255.255.255.252. You assign one to each of the virtual TCP/IP interfaces on your partitions as shown in this figure.
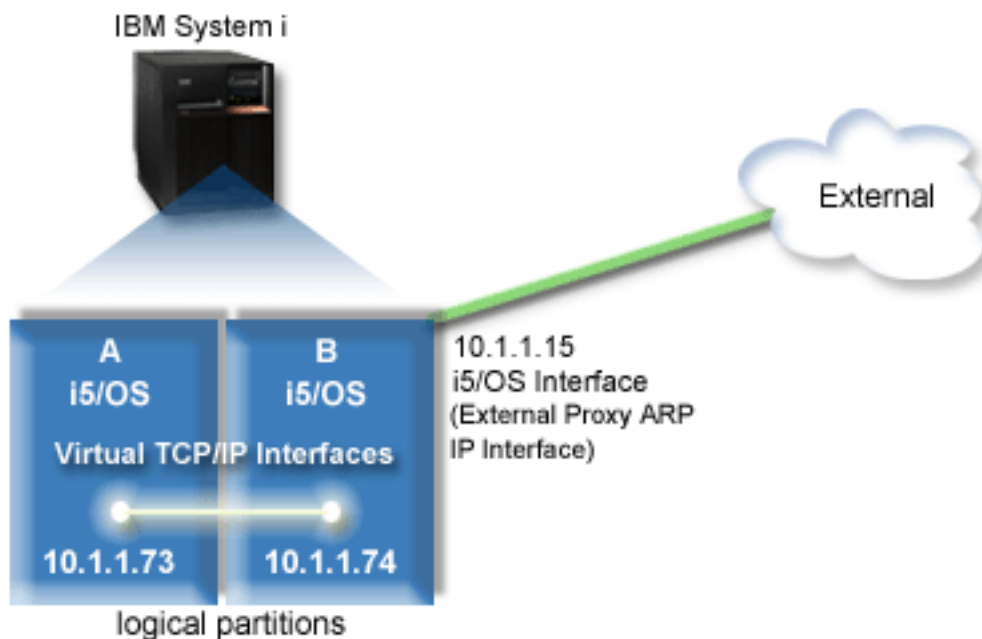
In this example, TCP/IP traffic from partition A runs across the virtual Ethernet to the 10.1.1.74 interface on partition B. Because 10.1.1.74 is associated with the external proxy ARP interface 10.1.1.15, the packets continue out of the virtual Ethernet using the proxy ARP interface.

To configure a virtual Ethernet to use the proxy ARP connection method, complete these configuration tasks.

Step 1: Enabling virtual Ethernet

To associate the virtual interface with an external interface, you must first enable logical partitions to participate in a virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870, and 890. If you are setting up virtual Ethernet on models other than 8*xx*, see Virtual Ethernet for i5/OS logical partitions in the IBM Systems Hardware Information Center for the instructions.

To enable virtual Ethernet, follow these steps:

1. On the command line on the primary partition (partition A), type STRSST (Start Service Tools command) and press Enter.
2. Type your service tools user ID and password.
3. From the System Service Tools (SST) window, select Option 5 (Work with System Partitions).
4. From the Work with System Partitions window, select Option 3 (Work with Partition Configuration).
5. Press F10 (Work with Virtual Ethernet).
6. Type 1 in the appropriate column for partition A and partition B to enable the partitions to communicate with one another over virtual Ethernet.
7. Exit System Service Tools (SST) to return to the command line.

Step 2: Creating Ethernet line descriptions

You need to perform this step in one of two ways depending on the model you are using. Select the appropriate procedure for your particular model.

Creating Ethernet line descriptions on models 8xx
Use these steps to create an Ethernet line description on models 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870 and 890.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. On the command line on partition A, type `WRKHDWRSC *CMN` and press Enter.
2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

    The Ethernet port identified as 268C is the virtual Ethernet resource. There is one port for each virtual Ethernet that is connected to the logical partition.
3. From the Display Resource Detail window, scroll down to find the port address. The port address corresponds to the virtual Ethernet you selected during the configuration of the logical partition.
4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet port, and then press Enter.
5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.
    a) At the *Line description* prompt, type VETH0.

    The name VETH0, although arbitrary, corresponds to the numbered column on the Virtual Ethernet page in which you enabled the logical partitions to communicate. If you use the same names for the line descriptions and their associated virtual Ethernet, you can easily keep track of your virtual Ethernet configurations.

    b) At the *Line speed* prompt, type 1G.
    c) At the *Duplex* prompt, type *FULL, and then press Enter.
    d) At the *Maximum frame size* prompt, type 8996 and press Enter.

    By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

    You will see a message stating that the line description has been created.

6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.

7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

   Although the names of the line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Creating Ethernet line descriptions on models other than 8xx

Use these steps to create an Ethernet line description on models other than 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 515, 520, 525, 550, 570, 595 and so on.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. On the command line on partition A, type `WRKHDWRSC *CMN` and press Enter.

2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

   The Ethernet ports identified as 268C are the virtual Ethernet resources. There is one for each virtual Ethernet adapter. Each port identified as 268C has an associated location code that is created when you create the virtual Ethernet adapter using the HMC (Step 1).

3. From the Display Resource Detail window, scroll down to find the 268C resource that is associated to the specific location code created for this virtual Ethernet.

4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet resource, and then press Enter.

5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.

   a) At the *Line description* prompt, type VETH0.

      If you use the same names for the line descriptions and their associated virtual Ethernet, such as VETH0, you can easily keep track of your virtual Ethernet configurations.

   b) At the *Line speed* prompt, type 1G.

   c) At the *Duplex* prompt, type *FULL, and then press Enter.

   d) At the *Maximum frame size* prompt, type 8996 and press Enter.

      By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

      You will see a message stating that the line description has been created.

6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.

7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

   Although the names of the line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Step 3: Turning on IP datagram forwarding

Turn on IP datagram forwarding so that the packets can be forwarded among different subnets.

To turn on IP datagram forwarding, follow these steps:

1. On the command line on partition B, type CHGTCPA (Change TCP/IP Attributes command) and press F4 (Prompt) to access the Change TCP/IP Attributes menu.

2. At the *IP datagram forwarding* prompt, type *YES and press Enter.

Step 4: Creating the interface to enable proxy ARP

You need to create an external interface to enable proxy ARP.

To create the TCP/IP interface to enable proxy ARP, complete these steps:

1. Obtain a contiguous block of IP addresses that are routable by your network.

   Because you have two partitions in this virtual Ethernet, you need a block of four addresses. The fourth segment of the first IP address in the block must be divisible by four. The first and last IP addresses of this block are the subnet and broadcast IP addresses are unusable. The second and third IP address can be used for the TCP/IP interfaces for the virtual Ethernet on partition A and partition B. For this procedure, the IP address block is `10.1.1.72` through `10.1.1.75` with a subnet mask of `255.255.255.252`.

   You also need a single IP address for your external TCP/IP address. This IP address does not have to belong to your block of contiguous addresses, but it must be within the same original subnet mask of `255.255.255.0`. In this procedure, the external IP address is `10.1.1.15`.

2. Create an IBM i TCP/IP interface for partition B. This interface is known as the external, proxy ARP IP interface. To create the interface, follow these steps:

   a) On the command line on partition B, type CFGTCP (Configure TCP/IP command), and then press Enter to see the Configure TCP/IP window.

   b) Select Option 1 (Work with TCP/IP Interfaces), and then press Enter.

   c) Select Option 1 (Add), and then press Enter to see the Add TCP/IP Interface (ADDTCPIFC) window.

   d) At the *Internet address* prompt, type `10.1.1.15`.

   e) At the *Line description* prompt, type the name of your line description, such as ETHLINE.

   f) At the *Subnet mask* prompt, type `255.255.255.0`.

3. Start the interface. On the Work with TCP/IP Interfaces window, select Option 9 (Start) by the interface.

Step 5: Creating virtual TCP/IP interfaces

You need to specify the virtual TCP/IP interfaces on both partition A and partition B.

To create the virtual interface on partition A, follow these steps:

1. On the command line on partition A, type CFGTCP (Configure TCP/IP command), and then press Enter to see the Configure TCP/IP window.
2. Select Option 1 (Work with TCP/IP Interfaces), and then press Enter.
3. Select Option 1 (Add), and then press Enter to see the Add TCP/IP Interface (ADDTCPIFC) window.
4. At the *Internet address* prompt, type `10.1.1.73`.
5. For the *Line description* prompt, type the name of your line description, such as VETH0.
6. At the *Subnet mask* prompt, type `255.255.255.252`.
7. On the Work with TCP/IP Interfaces window, type 9 (Start) by the interface to start it.

To create the virtual interface on partition B, repeat the above steps on the command line on partition B. In step 4, type `10.1.1.74` for the *Internet address* prompt.

Step 6: Creating a preferred interface list

You can now create a preferred interface list to control which adapters and IP addresses are the preferred interface for virtual Ethernet proxy Address Resolution Protocol (ARP) agent selection.

Creating a preferred interface list using IBM Navigator for i

To create a preferred interface list by using IBM Navigator for i, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **TCP/IP Configuration** > **IPv4**.
2. Select **IPv4 Interfaces** to see a list of interfaces displayed in the right pane.

3. In the interfaces list, right-click the virtual Ethernet interface for which you want to create the preferred interface list, and then click **Properties**.

4. Click the **Advanced** tab, and complete the following steps:

   a) Select the **Preferred interfaces** option in the **ARP Proxy** drop-down list.

   b) Select the interface addresses from the Available interfaces list, and click **Add**.

   You can also remove an interface from the Preferred interface list in the right pane by clicking **Remove**, or move an interface up and down in the list to change the order by clicking **Move up** and **Move down**.

   c) Click **OK** to save the preferred interface list that you have created.

Creating a preferred interface list using the character-based interface

To create a preferred interface list by using the character-based interface, follow these steps:

1. On the command line, type CHGTCPIFC (Change TCP/IP Interface command) and press F4 (Prompt) to access the Change TCP/IP Interface menu.

2. At the *Internet address* prompt, specify the virtual Ethernet IPv4 interface for which you want to create the preferred interface list, and then press Enter to see a list of optional parameters.

3. At the *Preferred interfaces* prompt, type a plus sign (+) by *+ for more values*, and then press Enter.

4. Specify up to 10 preferred IPv4 interfaces in order of preference. The first interface is the most preferred.

5. Press Enter twice.

Notes:

1. Only 10 interfaces are supported for the preferred interface list.

2. The interface for which you want to create the preferred interface list must be inactive for the list to be configured. Interfaces listed in the preferred interface list do not need to be inactive at the time the list is configured.

Step 7: Creating the default route

Creating the default route enables the packet to exit the virtual Ethernet network.

To create the default route, follow these steps:

1. On the command line on partition A, type CFGTCP (Configure TCP/IP command) and press Enter.

2. Select Option 2 (Work with TCP/IP Routes), and then press Enter.

3. Select Option 1 (Add), and then press Enter.

4. At the *Route destination* prompt, type *DFTROUTE.

5. At the *Subnet mask* prompt, type *NONE.

6. At the *Next hop* prompt, type 10.1.1.74.

   Packets from partition A travel over the virtual Ethernet to the 10.1.1.74 interface using this default route. Because 10.1.1.74 is associated with the external proxy ARP interface 10.1.1.15, the packets continue out of the virtual Ethernet using the proxy ARP interface.

Step 8: Verifying network communications

You can now verify your network communications.

To verify your network communications, use the ping command:

• From partition A, **ping** the virtual Ethernet interface 10.1.1.74 and an external host.

• From an external IBM i host, **ping** the virtual Ethernet interfaces 10.1.1.73 and 10.1.1.74.

Related information

Ping

Network address translation method

You can use IBM i packet filtering to route traffic between a partition and the outside network.

Network address translation (NAT) can route traffic between your virtual Ethernet network and the external network. This particular form of NAT is called static NAT, and it will allow both inbound and outbound IP traffic to and from the virtual Ethernet network. Other forms of NAT like masquerade NAT also work if your virtual Ethernet network does not need to receive traffic initiated by external clients. Like the TCP/IP routing and proxy ARP methods, you can take advantage of your existing IBM i network connection. Because you will be using IP packet rules, you must use IBM Navigator for i to create and apply your rules.

Note: IPv6 is not supported by the NAT method.

The following figure is an example of using NAT to connect your virtual Ethernet network to an external network. The $10.1.1.x$ network represents an external network while the $192.168.1.x$ network represents the virtual Ethernet network.
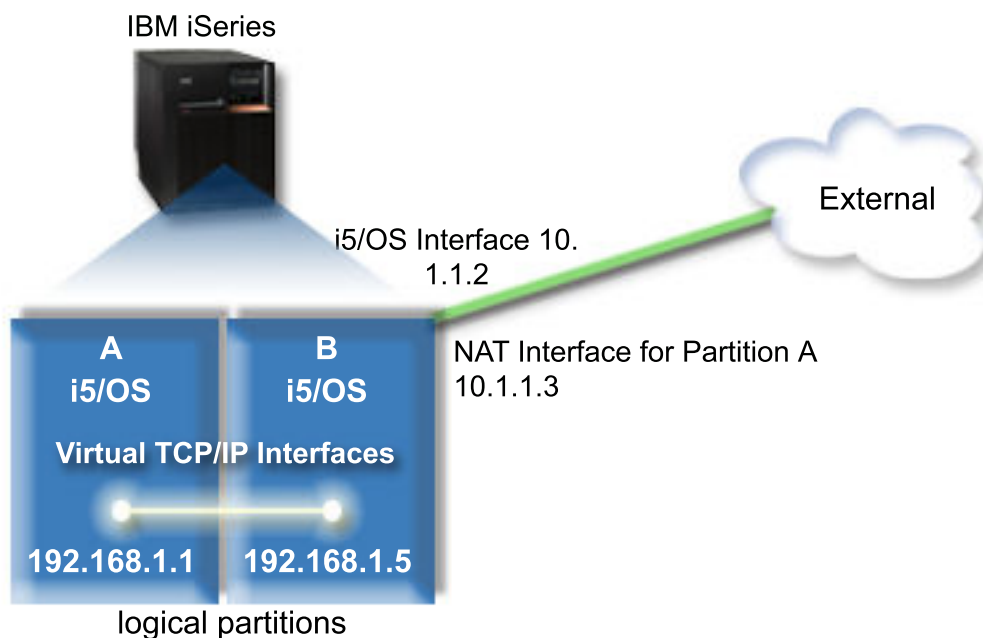
In this example, any existing TCP/IP traffic for the system runs over the $10.1.1.2$ interface. A new interface, 10.1.1.3, is created for communicating between the 10.1.1.x network and the 192.168.1.x network. Because this is a static map scenario, the inbound traffic gets translated from the $10.1.1.3$ interface to the $192.168.1.5$ interface. The outbound traffic gets translated from the $192.168.1.5$ interface to the external $10.1.1.3$ interface. Partition A and partition B use their virtual interfaces $192.168.1.1$ and $192.168.1.5$ to communicate with one another.

To make static NAT work, you need to first set up your IBM i and TCP/IP communications. Then you will create and apply some IP Packet rules. To configure virtual Ethernet to use the NAT method, complete these configuration tasks:

Step 1: Enabling virtual Ethernet

To associate the virtual interface with an external interface, you must first enable logical partitions to participate in a virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870, and 890. If you are setting up virtual Ethernet on models other than 8*xx*, see Virtual Ethernet for i5/OS logical partitions in the IBM Systems Hardware Information Center for the instructions.

To enable virtual Ethernet, follow these steps:

1. On the command line on the primary partition (partition A), type STRSST (Start Service Tools command) and press Enter.
2. Type your service tools user ID and password.
3. From the System Service Tools (SST) window, select Option 5 (Work with System Partitions).
4. From the Work with System Partitions window, select Option 3 (Work with partition configuration).
5. Press F10 (Work with Virtual Ethernet).
6. Type 1 in the appropriate column for partition A and partition B to enable the partitions to communicate with one another over virtual Ethernet.
7. Exit System Service Tools (SST) to return to the command line.

Step 2: Creating Ethernet line descriptions

You need to perform this step in one of two ways depending on the model you are using. Select the appropriate procedure for your particular model.

Creating Ethernet line descriptions on models 8xx

Use these steps to create an Ethernet line description on models 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870 and 890.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. On the command line on partition A, type `WRKHDWRSC *CMN` and press Enter.
2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

   The Ethernet port identified as 268C is the virtual Ethernet resource. There is one for each virtual Ethernet that is connected to the logical partition.
3. From the Display Resource Detail window, scroll down to find the port address. The port address corresponds to the virtual Ethernet that you selected during the configuration of the logical partition.
4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet port, and press Enter.
5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.

   a) At the *Line description* prompt, type VETH0.

      The name VETH0, although arbitrary, corresponds to the numbered column on the Virtual Ethernet page in which you enabled the logical partitions to communicate. If you use the same names for the line descriptions and their associated virtual Ethernet, you can easily keep track of your virtual Ethernet configurations.

   b) At the *Line speed* prompt, type 1G.

   c) At the *Duplex* prompt, type *FULL, and then press Enter.

   d) At the *Maximum frame size* prompt, type 8996 and press Enter.

      By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

      You will see a message stating that the line description has been created.
6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.
7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

   Although the names of the line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Creating Ethernet line descriptions on models other than 8xx

Use these steps to create an Ethernet line description on models other than 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 515, 520, 525, 550, 570, 595 and so on.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. At the command line on partition A, type `WRKHDWRSC *CMN` and press Enter.
2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

   The Ethernet ports identified as 268C are the virtual Ethernet resources. There is one for each virtual Ethernet adapter. Each port identified as 268C has an associated location code that is created when you create the virtual Ethernet adapter using the HMC (Step 1).
3. From the Display Resource Detail window, scroll down to find the 268C resource that is associated to the specific location code created for this virtual Ethernet.
4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet resource, and then press Enter.
5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.

   a) At the *Line description* prompt, type VETH0.

      If you use the same names for the line descriptions and their associated virtual Ethernet, such as VETH0, you can easily keep track of your virtual Ethernet configurations.

   b) At the *Line speed* prompt, type 1G.

   c) At the *Duplex* prompt, type *FULL, and then press Enter.

   d) At the *Maximum frame size* prompt, type 8996 and press Enter.

      By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

      You will see a message stating that the line description has been created.
6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.
7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

   Although the names of the your line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Step 3: Turning on IP datagram forwarding

Turn on IP datagram forwarding so that the packets can be forwarded among different subnets.

To turn on IP datagram forwarding, follow these steps:

1. On the command line on partition A, type CHGTCPA (Change TCP/IP Attributes command) and press F4 (Prompt) to access the Change TCP/IP Attributes menu.
2. At the *IP datagram forwarding* prompt, type *YES and press Enter.

Step 4: Creating the interfaces

To allow traffic between your virtual Ethernet network and the external network, you need to create several TCP/IP interfaces for your system.

To create the TCP/IP interfaces, complete these steps:

1. Create and start a TCP/IP interface on partition B for general communication to and from the system:

   a) On the command line on partition B, type CFGTCP (Configure TCP/IP command), and then press Enter to see the Configure TCP/IP window.

b) Select Option 1 (Work with TCP/IP Interfaces), and then press Enter.

c) Select Option 1 (Add), and then press Enter to see the Add TCP/IP Interface (ADDTCPIFC) window.

d) At the *Internet address* prompt, type 10.1.1.2.

e) At the *Line description* prompt, type ETHLINE.

f) At the *Subnet mask* prompt, type 255.255.255.0.

g) Start the interface. On the Work with TCP/IP Interfaces window, select Option 9 (Start) by the interface.

2. On partition B, create and start another TCP/IP interface that connects to the external network. You must use the same line description as your existing external TCP/IP interface.

   Repeat the above steps to create the interface. Specify 10.1.1.3 for the *Internet address* prompt and use the same values for the other prompts. This interface eventually performs the address translation for your partition.

3. Create and start the TCP/IP interface on partition A for the virtual Ethernet:

   a) On the command line on partition A, type CFGTCP (Configure TCP/IP command), and press Enter to see the Configure TCP/IP window.

   b) Select Option 1 (Work with TCP/IP Interfaces), and then press Enter.

   c) Select Option 1 (Add), and press Enter to see the Add TCP/IP Interface (ADDTCPIFC) window.

   d) At the *Internet address* prompt, type 192.168.1.1.

   e) At the *Line description* prompt, type VETH0.

   f) At the *Subnet mask* prompt, type 255.255.255.0.

   g) Start the interface. On the Work with TCP/IP Interfaces window, select Option 9 (Start) by the interface.

4. Create and start the TCP/IP interface on partition B for the virtual Ethernet:

   On partition B, repeat the above steps to create the interface. Specify 192.168.1.5 for the *Internet address* prompt and use the same values for the other prompts.

Step 5: Creating packet rules

Use the Address Translation wizard in IBM Navigator for i to create the packet rules that map the private address on partition A to the public address on partition B.

To create the packet rules, follow these steps:

1. In IBM Navigator for i, expand **IBM i Management** > **Network** > **All Tasks** > **IP Policies** > **Packet Rules** and click **Open Rules Editor**.

2. Click **OK** on the **Welcome** page and the **Getting Started** page if shown.

3. From the **Wizards** menu, select **Address Translation**.

4. Follow the wizard's instructions to create the packet rules.

   - Select **Map address translation**.
   - Enter the private IP address 192.168.1.1.
   - Enter the public IP address 10.1.1.3.
   - Select the line on which the interfaces are configured, such as ETHLINE.

5. Select **Activate Rules** from the **File** menu.

Step 6: Verifying network communications

You can now verify your network communications.

To verify your network communications, use the **ping** command:

- From partition A, **ping** the virtual Ethernet interface 192.168.1.5 and an external host.

- From an external IBM i host, **ping** each of the virtual Ethernet interfaces `192.168.1.1` and `192.168.1.5`.

Related information

Ping

TCP/IP routing method

Standard TCP/IP routing is used to route traffic to the virtual Ethernet network in the same way you define routing to any other LAN. This requires that you update routing information throughout your network.

You can also route traffic to your partitions through IBM i with various routing techniques. This solution is not difficult to configure on the system but, depending on the topology of your network, it might not be practical to implement. The TCP/IP routing method supports both IPv4 and IPv6. The following figure shows an IPv4 network:
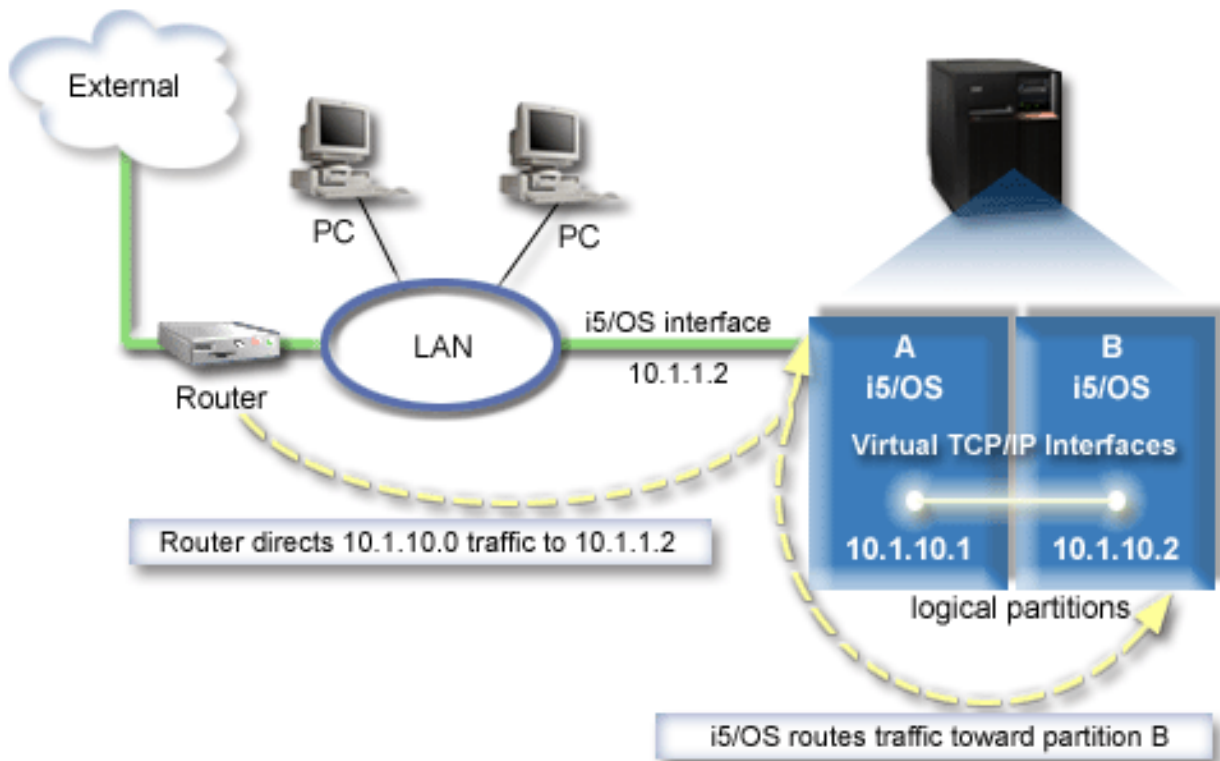
The existing TCP/IP interface (`10.1.1.2`) connects to the LAN. The LAN is connected to remote networks with a router. The virtual TCP/IP interface on partition B is addressed as `10.1.10.2` and the virtual TCP/IP interface on partition A as `10.1.10.1`. In IBM i, if you turn on IP datagram forwarding, IBM i will route the IP packets to and from partition B. When you define your TCP/IP connection for partition B, the router address must be `10.1.10.1`.

The difficulty of this type of routing is getting the IP packets to the system. In this scenario, you can define a route on the router so that it passes packets destined to the `10.1.10.0` network to the `10.1.1.2` interface. That works for remote network clients. It also works for the local LAN clients (clients connected to the same LAN as the IBM i platform) if they recognize that same router as their next hop. If they do not, then each client must have a route that directs `10.1.10.0` traffic to the IBM i `10.1.1.2` interface; therein starts the impracticability of this method. If you have many LAN clients, then you must define many routes.

To configure virtual Ethernet to use the TCP/IP routing method, use the following instructions:

Step 1: Enabling virtual Ethernet

To associate the virtual interface with an external interface, you must first enable logical partitions to participate in a virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870, and 890. If you are setting up virtual Ethernet on models other than 8*xx*, see Virtual Ethernet for i5/OS logical partitions in the IBM Systems Hardware Information Center for the instructions.

To enable virtual Ethernet, follow these steps:

1. On the command line on the primary partition (partition A), type STRSST (Start Service Tools command) and press Enter.
2. Type your service tools user ID and password.
3. From the System Service Tools (SST) window, select Option 5 (Work with System Partitions).
4. From the Work with System Partitions window, select Option 3 (Work with partition configuration).
5. Press F10 (Work with Virtual Ethernet).
6. Type 1 in the appropriate column for partition A and partition B to enable the partitions to communicate with one another over virtual Ethernet.
7. Exit System Service Tools (SST) to return to the command line.

Step 2: Creating Ethernet line descriptions

You need to perform this step in one of two ways depending on the system model you are using. Select the appropriate procedure for your particular model.

Creating Ethernet line descriptions on models 8xx
Use these steps to create an Ethernet line description on models 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 800, 810, 825, 870 and 890.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. On the command line on partition A, type WRKHDWRSC *CMN and press Enter.
2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

   The Ethernet port identified as 268C is the virtual Ethernet resource. There is one for each virtual Ethernet that is connected to the logical partition.
3. From the Display Resource Detail window, scroll down to find the port address. The port address corresponds to the virtual Ethernet you selected during the configuration of the logical partition.
4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet port, and then press Enter.
5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.
   a) At the *Line description* prompt, type VETH0.

      The name VETH0, although arbitrary, corresponds to the numbered column on the Virtual Ethernet page in which you enabled the logical partitions to communicate. If you use the same names for the line descriptions and their associated virtual Ethernet, you can easily keep track of your virtual Ethernet configurations.
   b) At the *Line speed* prompt, type 1G.
   c) At the *Duplex* prompt, type *FULL, and then press Enter.
   d) At the *Maximum frame size* prompt, type 8996 and press Enter.

      By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

      You will see a message stating that the line description has been created.

6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.

7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

Although the names of the line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Creating Ethernet line descriptions on models other than 8xx

Use these steps to create an Ethernet line description on models other than 8*xx* so that the system can use virtual Ethernet.

This configuration procedure applies to models 515, 520, 525, 550, 570, 595 and so on.

To configure new Ethernet line descriptions to support virtual Ethernet, follow these steps:

1. On the command line on partition A, type `WRKHDWRSC *CMN` and press Enter.

2. From the Work with Communication Resources window, select Option 7 (Display resource detail) next to the appropriate virtual Ethernet port.

   The Ethernet ports identified as 268C are the virtual Ethernet resources. There is one for each virtual Ethernet adapter. Each port identified as 268C has an associated location code that is created when you create the virtual Ethernet adapter using the HMC (Step 1).

3. From the Display Resource Detail window, scroll down to find the 268C resource that is associated to the specific location code created for this virtual Ethernet.

4. From the Work with Communication Resources window, select Option 5 (Work with configuration descriptions) next to the appropriate virtual Ethernet resource, and then press Enter.

5. From the Work with Configuration Descriptions window, select Option 1 (Create), and then press Enter to see the Create Line Description Ethernet (CRTLINETH) window.

   a) At the *Line description* prompt, type VETH0.

      If you use the same names for the line descriptions and their associated virtual Ethernet, such as VETH0, you can easily keep track of your virtual Ethernet configurations.

   b) At the *Line speed* prompt, type 1G.

   c) At the *Duplex* prompt, type *FULL and press Enter.

   d) At the *Maximum frame size* prompt, type 8996 and press Enter.

      By changing the frame size to 8996, the transfer of data across the virtual Ethernet is improved.

      You will see a message stating that the line description has been created.

6. Vary on the line description. Type `WRKCFGSTS *LIN`, and then select Option 1 (Vary on) for VETH0.

7. Repeat steps 1 through 6, but perform the steps from the command line on partition B to create an Ethernet line description for partition B.

   Although the names of the line descriptions are arbitrary, it is helpful to use the same names for all of the line descriptions associated with the virtual Ethernet. In this scenario, all the line descriptions are named VETH0.

Step 3: Turning on IP datagram forwarding

Turn on IP datagram forwarding so that the packets can be forwarded among different subnets.

To turn on IP datagram forwarding, follow these steps:

1. On the command line on partition A, type CHGTCPA (Change TCP/IP Attributes command) and then press F4 (Prompt) to access the Change TCP/IP Attributes menu.

2. At the *IP datagram forwarding* prompt, type *YES and press Enter.

Step 4: Creating the interfaces

To allow traffic between your virtual Ethernet network and the external network, you need to create several TCP/IP interfaces for your system.

To create the TCP/IP interfaces, complete these steps:

1. Create an IBM i TCP/IP interface on partition A. To create the interface, follow these steps:

    a) On the command line on partition A, type CFGTCP (Configure TCP/IP command), and then press Enter to see the Configure TCP/IP window.

    b) Select Option 1 (Work with TCP/IP Interfaces), and then press Enter.

    c) Select Option 1 (Add), and then press Enter to see the Add TCP/IP Interface (ADDTCPIFC) window.

    d) At the *Internet address* prompt, type 10.1.1.2.

    e) At the *Line description* prompt, type the name of your line description, such as ETHLINE.

    f) At the *Subnet mask* prompt, type 255.255.255.0.

2. Start the interface. On the Work with TCP/IP Interfaces window, select Option 9 (Start) by the interface.

3. Repeat steps 2 and 3 to create and start the TCP/IP interfaces on partition A and partition B.

    These interfaces are used for the virtual Ethernet. Use IP addresses 10.1.10.1 and 10.1.10.2 for these interfaces and the subnet mask 255.255.255.0.

Advantages of using virtual Ethernet

Virtual Ethernet provides efficient communication between logical partitions, and benefits for establishing an economical network. You can take advantage of virtual Ethernet on the IBM i operating system.

Virtual Ethernet enables you to establish high-speed communication between logical partitions without purchasing additional hardware. For each of the 16 ports enabled, the system creates a virtual Ethernet communications port, such as CMN*xx* with a resource type of 268C. Logical partitions assigned to the same local area network (LAN) then become available to communicate through that link. A physical system allows you to configure up to 16 different virtual local area networks. Virtual Ethernet provides the same function as using a 1 Gb Ethernet adapter. Ethernet 10 Mbps and 100 Mbps local area networks are not supported with virtual Ethernet.

Virtual Ethernet is an economical networking solution that provides substantial benefits:

- Economical: Potentially no extra networking hardware is required. You can add partitions to the system and communicate with an external LAN without installing extra physical LAN cards. If the current system has limited available card slots in which to install additional LAN cards, then using the virtual Ethernet offers the capability to operate LAN-attached partitions without the requirement to upgrade the system.

- Flexible: It is possible to configure a maximum of 16 distinctive connections enabling the configuration of selective communication paths between partitions. For added flexibility, the configuration model allows logical partitions to implement both a virtual Ethernet and physical LAN connection. This is a desirable feature when using the Linux® partition to host a firewall application.

- Fast: The virtual Ethernet emulates a 1 GB Ethernet connection and provides a fast and convenient communication method between partitions. This enhances the opportunity to integrate separate applications that run on different logical partitions.

- Versatile: Regardless of whether your partitions are running on IBM i or Linux, they can all be connected to the same virtual Ethernet.

- Reduced congestion: By using the virtual Ethernet for interpartition communication, communication traffic is reduced on the external LAN. In the case of Ethernet, which is a collision-based standard, this will certainly help prevent a degradation of service for other LAN users.

Related information for TCP/IP setup

Product manuals, IBM Redbooks publications, Web sites, and other information center topic collections contain information that relates to the TCP/IP setup topic collection. You can view or print any of the PDF files.

IBM Redbooks

- TCP/IP Tutorial and Technical Overview (about 7.5 MB)

- IBM i5/OS IP Networks: Dynamic (about 14.8 MB)

Web sites

- The Internet Engineering Task Force (IETF) (http://www.ietf.org/)

  Learn about the group of individuals that develops Internet protocol, including IPv6.

- IPv6 Forum (www.ipv6forum.com)

  Find news and events that communicate the latest IPv6 developments.

Other information

- TCP/IP applications, protocols, and services: This topic collection contains information about TCP/IP applications and services beyond the scope of configuration.
- TCP/IP troubleshooting: This topic collection contains information that helps you solve problems related to TCP/IP connections or traffic for both IPv4 and IPv6.
- Planning and setting up system security: This topic collection contains information about planning and setting up security for IBM i products.

Related reference
PDF file for TCP/IP setup
You can view and print a PDF file of this information.

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