



TECHNICAL NOTE

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REFERENCE DOCUMENT

# IPv6 in Axis Video Products

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### Document history

Revision	Date	Description
0.01	January 31, 2006	Initial version.
0.02	May 29, 2006	Added notes about IPv6 addresses and rephrased a bunch of stuff.

# 1 IPv6 in general

IPv6 (Internet Protocol version 6) was initially designed by the IETF to replace the current IP version 4 (IPv4). The most likely scenario now is that IPv4 will remain even after IPv6 enters the arena.

One of the main reasons for the introduction of IPv6 is the growing shortage of IPv4 addresses. Additionally, IPv6 also adds improvements in areas such as routing and network auto-configuration.

Some general information about IPv6 addresses and configuration is provided in the following sections. For further information please see the links in section 3.

## 1.1 The IPv6 address

The IPv6 address is written in hexadecimal form, and consists of eight double-bytes separated by colons. To make the address representation as short as possible, a number of consecutive zeros may be abbreviated to a double colon, which is allowed once in any single IPv6 address.

Instead of using a subnet mask as in IPv4, IPv6 simply uses a network prefix length. The prefix length is appended to the address.

Example: fe80::250:daff:fe4d:7592/64

The prefix length specifies how many bits of the address will be considered part of the prefix. In the example above, the first 64 bits specify the network address, while the final 64 bits specify the host address.

IPv6 addresses can be assigned in different ways:

- A link-local IPv6 address is automatically configured.
- A DHCPv6 server can be used to assign IPv6 addresses.
- Router advertisements can be used to assign auto-configured addresses.

### 1.1.1 Auto-configured link-local address

A device that supports IPv6 will get an auto-configured link-local address that starts with fe80. The remainder of the address is usually built on a so-called EUI64 address.

The EUI64 address is constructed by taking the Ethernet MAC address of the network interface, and filling it with two specific bytes (fffe) in the middle, to get a 64-bit address (see the example address in the previous section.)

### 1.1.2 Auto-configuration using router advertisements

In an IPv6 network, network devices may be auto-configured by listening to advertisements sent by routers in the network. These advertisements will then define how the network devices should be configured in order to be able to be routable.

A routable IPv6 address can be derived by using the information in the router advertisements. This auto-configured address is derived using the EUI64 address, together with the address of the router and the network prefix.

The router advertisements may instruct the network device to use DHCPv6, and if so, at which level (see section 1.1.3).

### 1.1.3 Configuration using DHCPv6

Just as an IPv4 network may use a DHCP server to assign IP configuration, an IPv6 network may use a DHCPv6 server. DHCPv6 can be used at different levels:

- In **stateless** mode the DHCPv6 server will designate the network servers to use, e.g. DNS servers and NTP servers, but it will not assign IPv6 addresses for network devices. This must be done using some other method.
- In **stateful** mode the DHCPv6 server will also assign IPv6 addresses to the network devices, as well as assigning the network servers as in stateless mode.

### 1.1.4 Accessing IPv6 devices

Most programs accept host names and will automatically look up the IPv6 address. This is the preferred way of passing addresses to programs. If the name maps to an IPv4 address, IPv4 will be used. If the name maps to an IPv6 address, IPv6 will be used. If there are both IPv4 and IPv6 mappings, the operating system will decide which to try first.

To pass IPv6 literal addresses to a program, there are a few points to consider. When passing an URL, brackets must be used. For example:

Example of URL:

```
http://[2001:5c0:84d9:2:240:8cff:fe6b:3cb9]/view/index.shtml
```

Example of URL with embedded user credentials and service port number:

```
http://root:pass@[2001:5c0:84d9:2:240:8cff:fe6b:3cb9]:80/view/index.shtml
```

When accessing devices by their link-local addresses, an interface must be specified. This is because the link-local prefix fe80::/10 has multi-path routes, i.e., one route per interface. The routing system has no way of knowing which interface the device you are trying to contact is located on.

Example of Link-Local URL:

```
http://[fe80::2:240:8cff:fe6b:3cb9%eth0]/view/index.shtml
```

Example of Link-Local URL with embedded user credentials and service port number:

```
http://root:pass@[fe80::2:240:8cff:fe6b:3cb9%eth0]:80/view/index.shtml
```

Most programs (e.g FTP, Telnet, etc) will accept the IPv6 address in its literal form:

```
telnet 2001:5c0:84d9:2:240:8cff:fe6b:3cb9
telnet fe80::2:240:8cff:fe6b:3cb9%eth0
telnet fe80::2:240:8cff:fe6b:3cb9%4
```

```
ftp 2001:5c0:84d9:2:240:8cff:fe6b:3cb9
ftp fe80::2:240:8cff:fe6b:3cb9%eth0
ftp fe80::2:240:8cff:fe6b:3cb9%4
```

Some programs may take the interface identifier in a non-standard way. An example of this is the ping6 tool usually distributed with linux. It expects to be run like this:

```
ping6 -I eth1 fe80::2:240:8cff:fe6b:3cb9
```

On Windows XP you can see the identifier of each adapter by running 'ipconfig' and finding the IPv6 link-local address of that interface. It may look something like this:

Windows IP Configuration

Ethernet adapter Local Area Connection:

```
Connection-specific DNS Suffix . : testnetwork.com
IP Address. . . . . : 192.168.2.22
Subnet Mask . . . . . : 255.255.255.0
IP Address. . . . . : fe80::204:75ff:fec2:3a79%4
Default Gateway . . . . . : 192.168.2.1
                                fe80::213:20ff:fe11:d2ee%4
```

Running ping6 on Windows XP:

```
ping6 fe80::2:240:8cff:fe6b:3cb9%4
```

## 2 Using the Axis embedded web interface

The IP configuration of the Axis video product is usually made from the **Basic TCP/IP Settings** (see section 2.1) and **Advanced TCP/IP Settings** pages in the embedded web interface.

In addition to this, you can list the parameters directly in the Plain Config page in the Advanced System Options menu. From here you can customize the IPv6 configuration, by changing parameters that are not available from the Basic TCP/IP Settings page (see section 2.2).

### 2.1 The Basic TCP/IP Settings page

On the Basic TCP/IP Settings page, it is possible to enable or disable the use of IPv4 and/or IPv6.

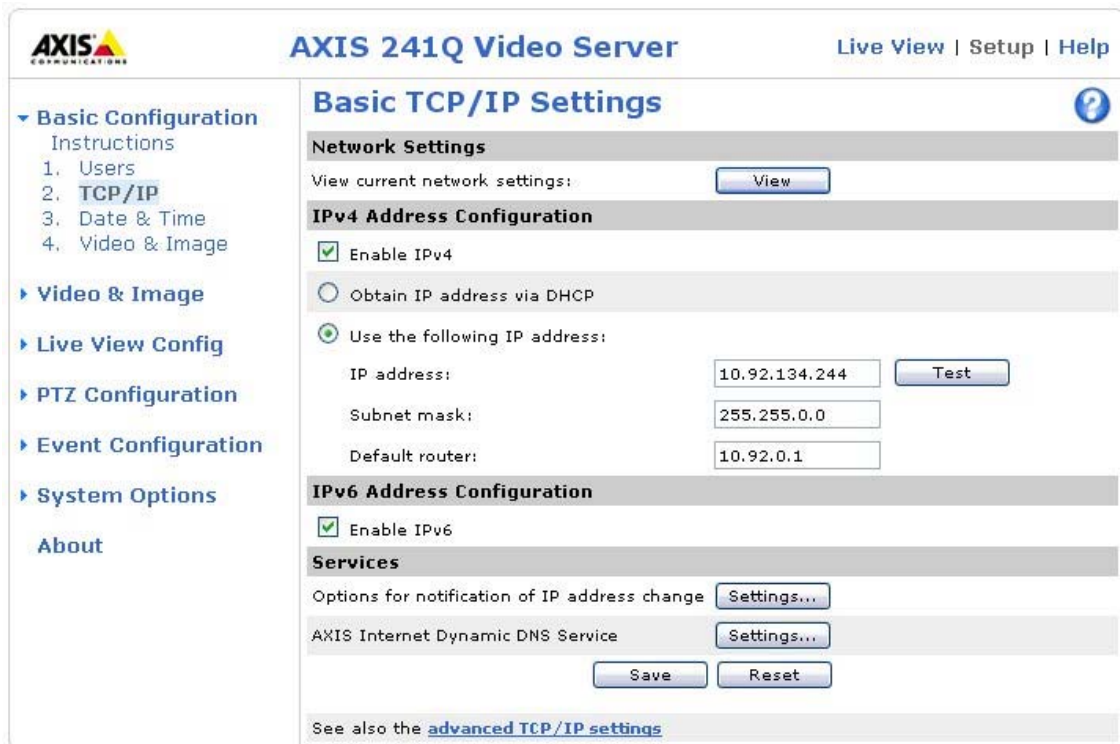


Figure 1: The Basic TCP/IP Settings page

The user is prohibited from disabling both IPv4 and IPv6, since this will render the Axis video device inaccessible. It is however, still possible to disable both IPv4 and IPv6 from the Plain Config page. If this happens, the Axis video device will override the configuration and start IPv4 according to the IPv4 configuration.

#### 2.1.1 Enable or disable IPv4

Use of IPv4 is enabled by default.

When IPv4 is disabled no IPv4 configuration will be made on the device. The device will then only be accessible via IPv6.

Note that when IPv4 is disabled, a link-local IPv4 address will not be assigned, even if the use of a link-local IPv4 address is enabled on the Advanced TCP/IP Settings page.

#### 2.1.2 Enable or disable IPv6

Use of IPv6 is disabled by default.

When IPv6 is enabled, the Axis video device will assign a link-local IPv6 address. By default, the device will also listen to router advertisements and assign IPv6 addresses accordingly.

It is possible to change the IPv6 configuration behaviour using the plain configuration interface found in the Advanced System Options menu. For further descriptions of the advanced IPv6 settings, see section 2.2.

## 2.2 IPv6 settings using the Plain Config page

The IPv6 configuration is by default set to accept router advertisements and to use DHCPv6 according to the router advertisements. In different environments it may be necessary to change the IPv6 configuration.

To do this, go to the Plain Config page in the Advanced System Options menu and select the Network parameter group. The IPv6 configuration options are described in the following sections.

### 2.2.1 IPv6 settings

By altering the parameters in the Network.IPv6 parameter group, the behaviour of the IPv6 configuration is changed. The group consists of five parameters:

- The **IPv6 Enabled** parameter (Network.IPv6.Enabled) is used to enable or disable IPv6 network configuration.
- The **Accept router advertisements** parameter (Network.IPv6.AcceptRA) is used to enable or disable acceptance of router advertisements. If this parameter is set to **yes**, the Axis video device will listen to router advertisements on the network and perform IPv6 configuration according to them.
- The **DHCPv6** parameter (Network.IPv6.DHCPv6) is used to configure the DHCPv6 client. There are four levels of usage:
  - **auto** – The use of DHCPv6 is determined by the router advertisements.
  - **stateless** – DHCPv6 is used to set DNS servers and NTP servers etc, but not to set IPv6 addresses.
  - **stateful** – DHCPv6 is used to set IPv6 addresses as well as DNS servers etc.
  - **off** – DHCPv6 is disabled.
- The **IP Address** parameter (Network.IPv6.IPAddress) is used to manually set an IPv6 address. This address will be used in parallel with other IPv6 addresses that may be set by DHCPv6 or by router advertisements.  
If a specific prefix length is requested the prefix length is defined last in the address, like this: “2001:5c0:84d9:2::1:3b/128”. If no prefix length is defined, the default length 64 will be used.
- The **Default router** parameter (Network.IPv6.DefaultRouter) is used to manually set an IPv6 default router. This address will be set in parallel with other IPv6 addresses that may be set by DHCPv6 or by router advertisements.

<b>Network IPv6:</b>	
IPv6 Enabled:	<input checked="" type="checkbox"/>
Accept router advertisements:	<input checked="" type="checkbox"/>
DHCPv6:	auto <input type="button" value="v"/>
IP address:	<input type="text"/>
Default router:	<input type="text"/>

**Figure 2: Plain config view of the IPv6 parameters in the Network group.**

### **2.2.2 Efficient IPv6 configuration**

The IPv6 addresses currently in use are read from the *IP addresses* parameter in the Network.<interface>.IPv6 group, where <interface> is the name of the interface (e.g. eth0). This parameter lists all IPv6 addresses, separated by space characters.

The IPv6 default router is found in the *Default router* parameter in the Network.Routing.IPv6 group.



## 2.3 The Advanced TCP/IP Settings page

The Advanced TCP/IP Settings page appears differently, depending on the protocols enabled on the Basic TCP/IP Settings page.

DNS servers and NTP servers may be configured with either IPv4 or IPv6 addresses.

Some settings are only available for IPv4:

- Obtain host name via DHCP is only available for IPv4.
- NAT Traversal (port mapping) settings use IPv4 only.
- Enable/disable link-local address only enables/disables the IPv4 link-local address.

The screenshot shows the 'Advanced TCP/IP Settings' page for an 'AXIS 241Q Video Server'. The page is divided into several sections:

- DNS Configuration:**
  - Obtain DNS server address via DHCP (with a 'View' button)
  - Use the following DNS server address:
    - Domain name:  (use ; to separate names)
    - Primary DNS server:
    - Secondary DNS server:
- NTP Configuration:**
  - Obtain NTP server address via DHCP (with a 'View' button)
  - Use the following NTP server address:
    - Network address:  (host name or IP address)
- Host Name Configuration:**
  - Use the host name:
  - Enable dynamic DNS updates
  - Register DNS name:  (Axisproduct.example.com)
  - TTL:
- HTTP:**
  - HTTP port:
- HTTPS:**
  - HTTPS port:
- RTSP:**
  - RTSP port:
- Network Traffic:**
  - Connection type:  (dropdown)
  - Maximum bandwidth:
    - Unlimited
    - Limited to  Mbit/s (dropdown)

At the bottom of the form are 'Save' and 'Reset' buttons.

Figure 3: The Advanced TCP/IP Setting page with IPv6 only enabled.

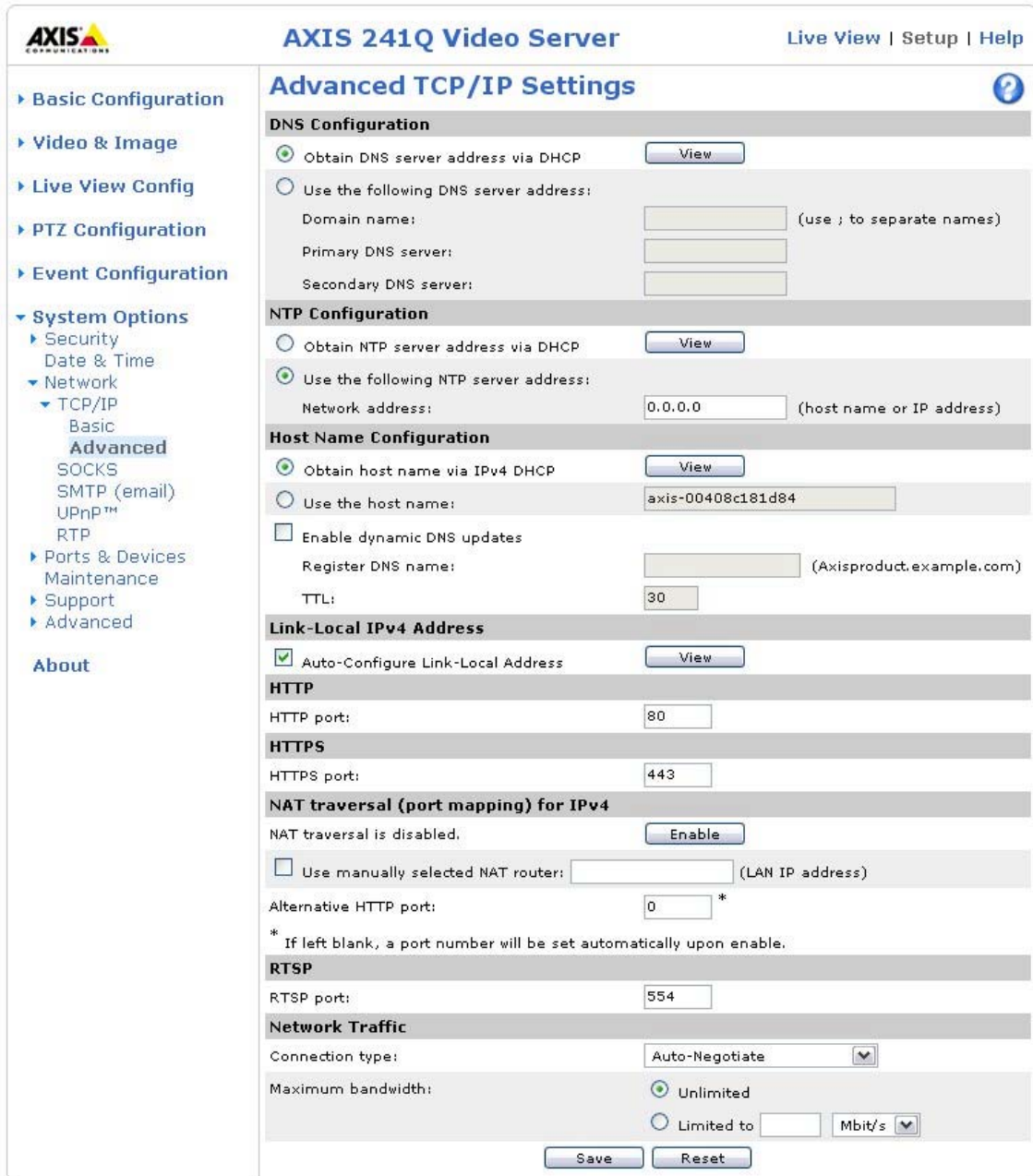


Figure 4: The Advanced TCP/IP Setting page with both IPv4 and IPv6 enabled.

### 3 Useful links

RFC 2460 - IPv6 Specification: <http://www.faqs.org/rfcs/rfc2460.html>

## 4 Abbreviations

DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol for IPv6
DNS	Domain Name System
IETF	The Internet Engineering Task Force, <a href="http://www.ietf.org/">http://www.ietf.org/</a> .
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
NAT	Network Address Translation
NTP	Network Time Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol