Interconnecting Your Axia Network's Cisco 2960 Switch with an Office Network

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Introduction

Often, users wish to allow access to an Axia IP-Audio Network from an office business network for configuration and maintenance purposes. This document describes a simple network integration solution based on the Cisco 2690 Ethernet switch recommended for small Axia networks.

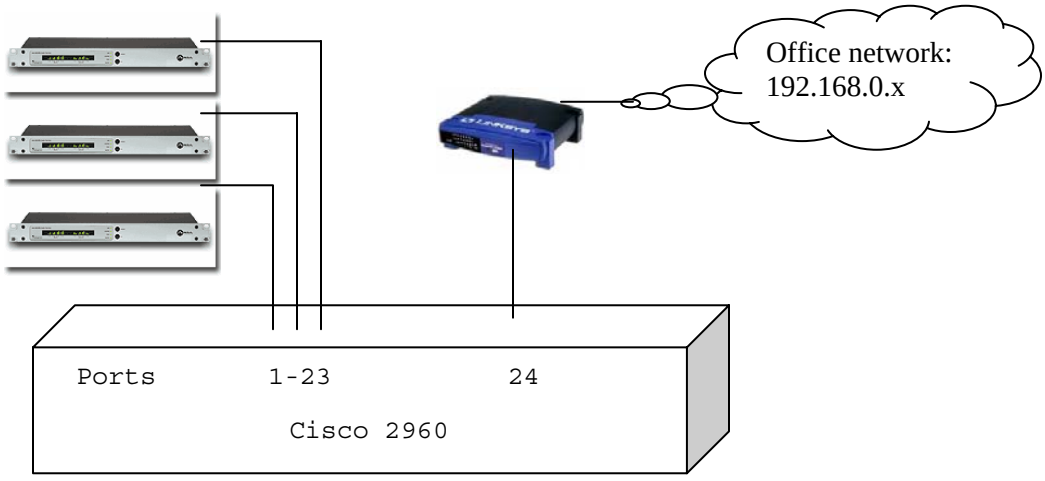
It is also possible to use this bridge to provide access to the office business network from the Axia network. It is, however, recommended that Axia devices and office workstations reside on different virtual LANs (VLANs) and to keep those devices dedicated for their needed tasks.

Note that the configuration shown in this document will not allow office PC's access to Axia audio channels; this functionality requires that your entire office network support quality of service (QoS) features, and also to be configured to for multicast filtering. It is beyond the scope of this document for this setting up this capability.

Example network configuration

This example shows how to configure remote access from an office network to an Axia network.

Network	IP addresses	Network Mask
Office	192.168.0.0 – 192.168.0.255	255.255.255.0
Axia	192.168.2.0 – 192.168.2.255	255.255.255.0



Because the Cisco 2960 currently does not have the feature “IP Routing” we will need to use an external device for this routing. In this example we are using a simple Linksys Router/Gateway for cable or DSL (model used for this example is a BEFSR11 though other makes and models should be similar in setup). The other option could be the business network switch itself (discussed later in this document).

The instructions below illustrate how to configure the Linksys Router and attach it between the two networks for cross network access. Since the office and Axia devices are on different VLANs and network segments, the office network should not interfere with the Axia network.

Configuring the Cisco 2960 switch

For the initial configuration of the switch, you can use HyperTerminal with a serial port connection to the switch using the console cable. Typical default serial port settings are 9600 baud / 8 bit / no parity / no flow control. Documentation for configuring the Cisco 2960 for use with the Axia gear can be found at this link:

http://www.axiaaudio.com/manuals/files/Axia_Cisco2960_config.pdf

Please refer to your Cisco switch manual for additional information about the command line interface.

Axia devices are connected to any of the switch ports that are properly configured per the documentation noted above. One can use any of the similar configured ports on the switch to connect to the Linksys (or other) Router. There are no other special port or VLAN requirements.

Configuration of a Gateway on Cisco 2960 switch

It may be desirable to have management access to the Cisco switch as well as the Axia gear. To configure the gateway after configuration of all other switch parameters, enter the following instructions to configure the switch (remember you must be in privileged mode for configuration of the switch):

```
Cisco2960Sw# config t
Cisco2960Sw<config># ip default-gateway 192.168.2.254
Cisco2960Sw<config># end
Cisco2960Sw# copy run start
Destination filename [startup-config]?  <Press Enter>
Building configuration...
[OK]
Cisco2960Sw#
```

To verify the configuration:

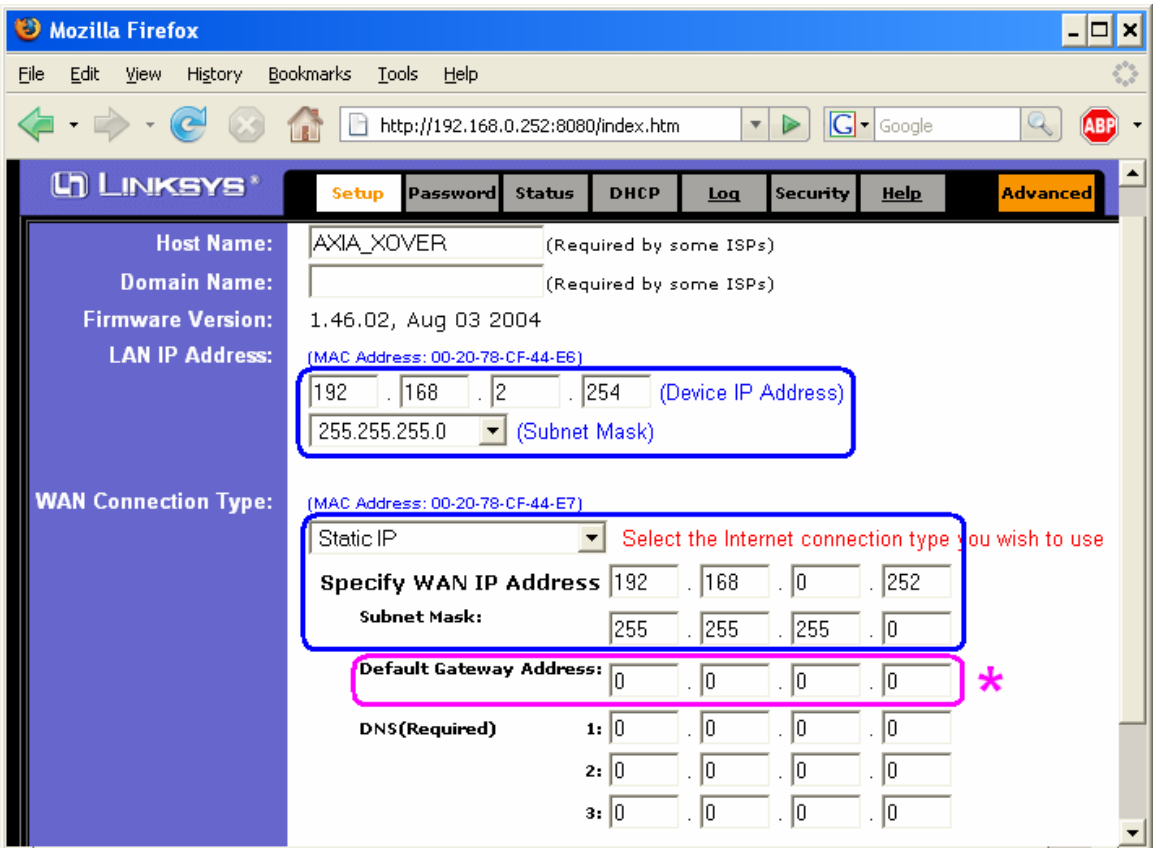
```
Cisco2960Sw# show start
```

Look in the last few lines of the configuration for this line:

```
Ip default-gateway 192.168.2.254
```

Configuring the router to pass data between the Axia network and the Business network

Since the Cisco switch does not have IP Routing capability we will use an external device to do the routing. For this example we are using a popular Linksys Cable/DSL router/gateway, model BEFSR11. The device offers web based access for configuration. Accessing the unit we have the main setup page of the router:

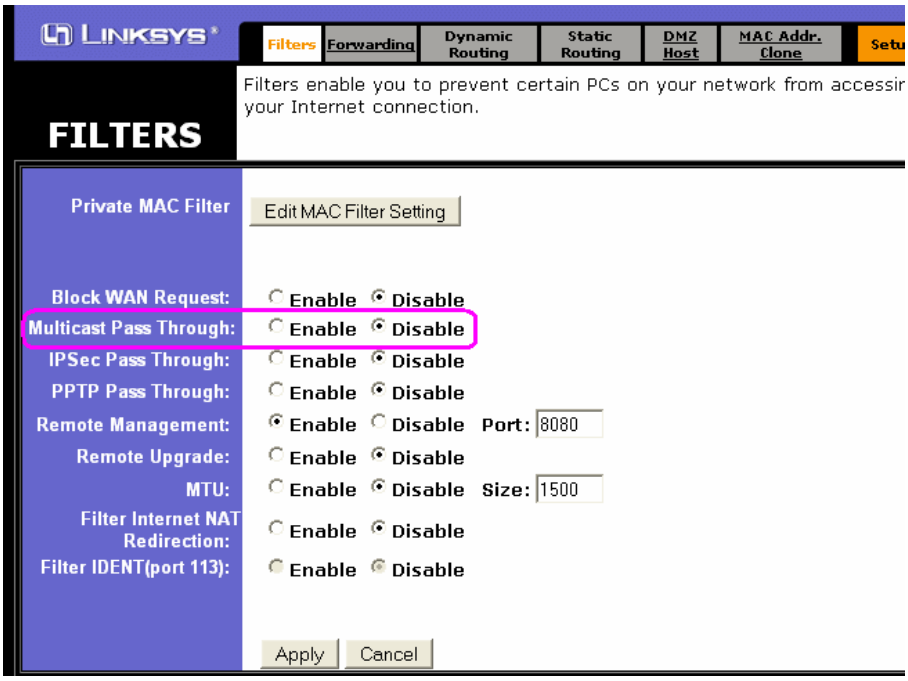


On the LAN side the IP address is programmed with a static address to be on the AXIA network. For the WAN side the IP address is programmed with a static address to be on the Business network. Subnet is set according to the requirements of the network.
* The gateway is optional here.

Other basic settings within the router are:

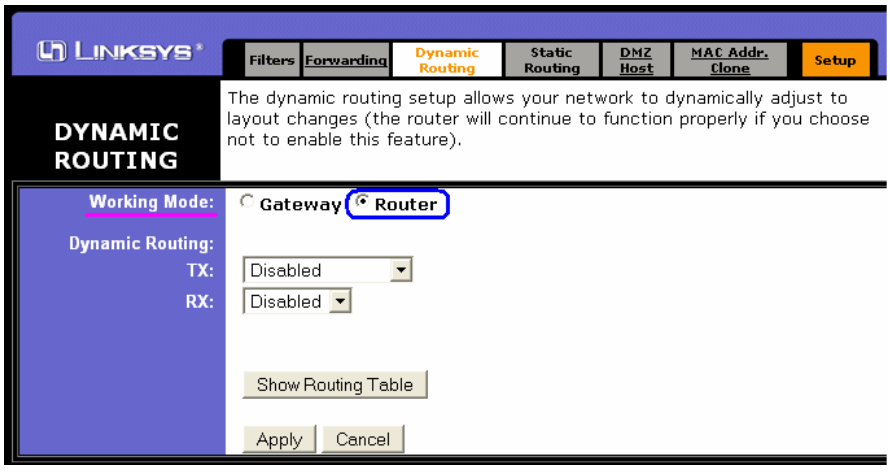
DHCP is DISABLED
AOL Parental Controls are DISABLED

Within the ADVANCE/FILTERS configuration:



Ensure that the Multicast Pass Through is DISABLED. All other options can be at their defaults. If you wish to access the router's configuration from both sides of the network ENABLE the Remote Management option.

In the DYNAMIC ROUTING change the Working Mode to ROUTER.



All port forwarding is off.
There are no Static Routes to enable on this device.
There is no DMZ host to configure.

Configuring the business network gateway to allow Axia network access

Network systems use gateways to access devices from outside their local networks. If these devices live on a separate network (ie a different LAN or VLAN) there must be a route configured for each network, and this route must be added to the gateway or router. Those devices use either specific command-line commands or a web-based user interface to set these options. Please refer to your gateway device's user manual for more detailed information.

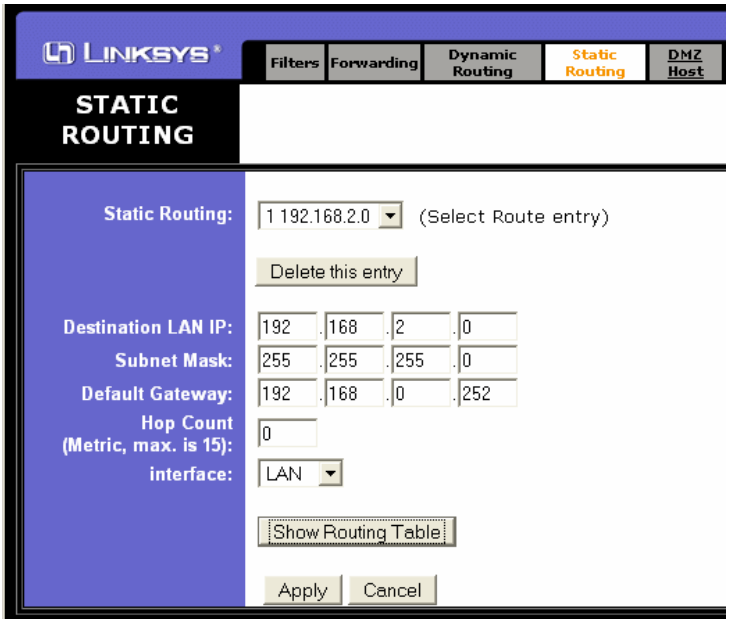
Configuring a route requires three parameters: destination network, the network mask and gateway. In our example, the destination network is 192.168.2.0 mask 255.255.255.0

The gateway is the address assigned to the IP router device from office network range: ex. 192.168.0.252

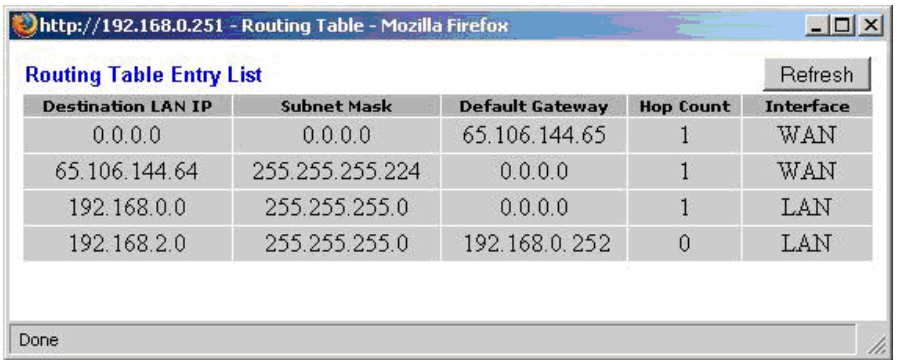
The route configuration command will be like below, or similar:

```
route add 192.168.2.0 mask 255.255.255.0 192.168.0.252
```

Ex. #1: A popular LinkSys router used for gateway access to the Internet. It provides a web-based user interface for configuration. This is NOT the same device as the router used between the Cisco 2960 switch and the office business switch. The screenshot below shows a static route configuration for the 192.168.2.x network access.

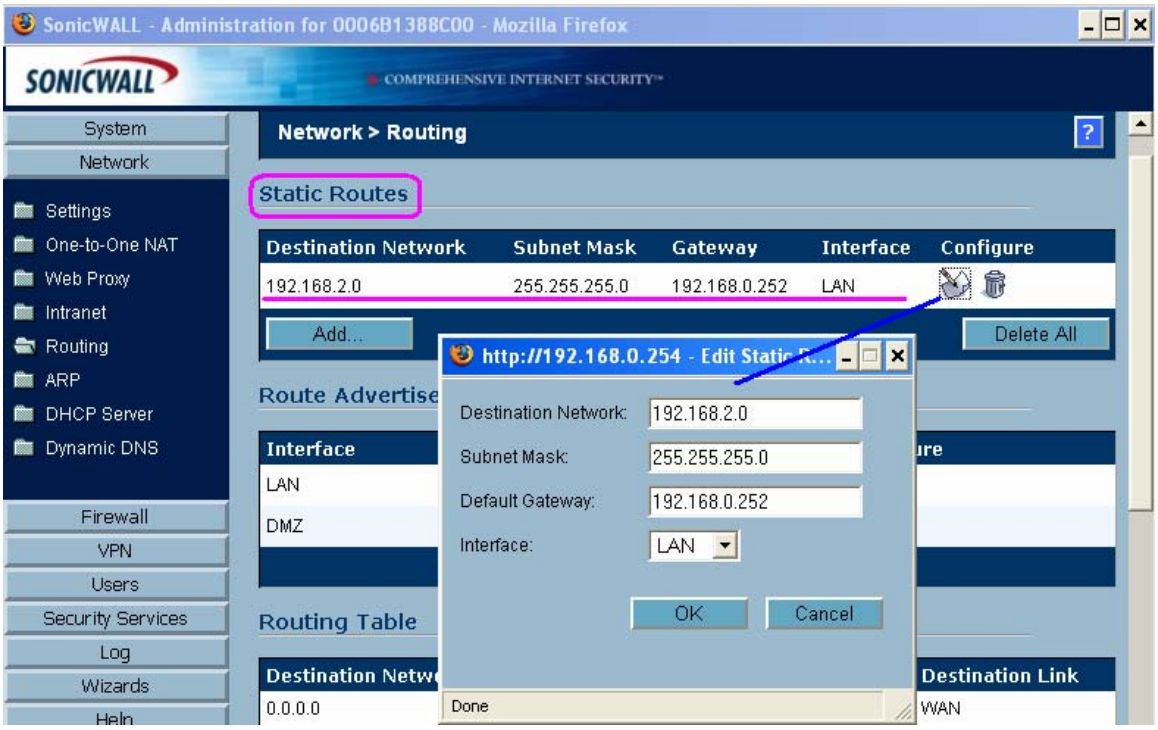


Static route configuration on Linksys: 192.168.2.x network.



Routing table.

Ex. #2. Another popular Gateway/Router device used by businesses for internet access and firewall security is the SonicWall appliance. Again a static route must be added to the device in order to route the proper requests to the stand alone router device.



Static route configuration on SonicWall Appliance: 192.168.2.x network.

To verify routing configuration, use `ping` and `tracert` tools. First, make sure that you have access to the first gateway, then to the second one, and eventually to a device in the other network. In case of a problem, make sure that gateway IP addresses are configured properly in both your PC and Axia devices.

Example

Here's an example output of the route trace though a 192.168.0.251 business gateway to the 192.168.0.252 Axia switch and to the destination device 192.168.2.163:

```
C:\>tracert 192.168.2.163
Tracing route to 192.168.2.163 over a maximum of 30 hops

  1   <10 ms   <10 ms   <10 ms  GW251.telos-systems.com
                                 [192.168.0.251]
  2     1 ms     1 ms     1 ms  192.168.0.252
  3     1 ms     1 ms     1 ms  192.168.2.163

Trace complete.
```

Alternative #1: Configuring individual clients residing in a business network to access an Axia network

Clients in business network know how to access other clients from the same network using the default local network route. To reach the Axia network, there must be a route defined.
One option is to configure routes in the business network to access 192.168.2.x manually on the Workstation directly:

On Windows systems, type this command:

```
C:\>route add 192.168.2.0 mask 255.255.255.0 192.168.0.252
```

And then verify:

```
C:\>route print
===========================================================================
Interface List
0x1 ........................... MS TCP Loopback interface
0x2 ...00 60 08 3f fa 8e ...... 3Com 3C90x Ethernet Adapter (Microsoft's Packet
Scheduler)
===========================================================================
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0    192.168.0.251   192.168.0.150       1
        127.0.0.0        255.0.0.0        127.0.0.1       127.0.0.1       1
      192.168.0.0    255.255.255.0    192.168.0.150   192.168.0.150       1
    192.168.0.150  255.255.255.255        127.0.0.1       127.0.0.1       1
    192.168.0.255  255.255.255.255    192.168.0.150   192.168.0.150       1
      192.168.2.0    255.255.255.0    192.168.0.252   192.168.0.150       1
        224.0.0.0        224.0.0.0    192.168.0.150   192.168.0.150       1
  255.255.255.255  255.255.255.255    192.168.0.150   192.168.0.150       1
Default Gateway:     192.168.0.251
===========================================================================
Persistent Routes:
  None
```

Configuration on Linux system:

```
route add -net 192.168.2.0 netmask 255.255.255.0 gw 192.168.0.252
```

And then check the routes:

```
c3p0:/home/user# route
Kernel IP routing table
Destination  Gateway         Genmask       Flags Metric Ref Use Iface
192.168.2.0  192.168.0.252   255.255.255.0 UG    0      0     0 eth0
localnet     *               255.255.255.0 U     0      0     0 eth0
default      GW254.telos-sys 0.0.0.0     UG    0      0     0 eth0
```

And finally, ping device on the Axia network:

```
c3p0:/home/user# ping 192.168.2.10
PING 192.168.2.10 (192.168.2.10): 56 data bytes
64 bytes from 192.168.2.10: icmp_seq=0 ttl=64 time=1.0 ms
```

Alternative #2: Configuring the Business switch for gateway access to a different VLAN (for advanced IT users).

The alternative to using a stand alone router device between the two networks is to use the business switch's routing capability IF it supports this option. For this to properly work the IT professional must have an excellent understanding of his business switch programming options AS WELL AS an excellent understanding of the IGMP Querier function. It is this feature on the Cisco Switch that is required to properly route the Axia audio data. Improper configuration on the office business switch can disrupt this feature and cause flooding of the Cisco switch as well as flooding of the business switch.

The Cisco switch must remain the Master IGMP Querier to properly route and distribute the Axia audio data packets. Should the Cisco 2960 switch become "aware" of the business switch it may drop its rank of Master querier to a slave and think the business switch is the Master querier. Proper port configuration is essential to prevent the link from looking like an Edge switch to Core switch trunk link as it must block all multicast traffic from the Axia network.

It is beyond the scope of this document to provide further details on this type of configuration as there are too many different models of switches to contend with. If you do not have the expertise for this type of configuration it is recommended to use the stand alone router device as described previously in this document.

For more assistance:

If you questions about this document and basic switch setup, contact Axia Support at support@axiaaudio.com . For more detailed support questions regarding configuration of your NON-Axia network devices please contact the manufacturers' technical support departments.