Configure ACLs on Wireless LAN Controller Example

Contents

Introduction

This document describes how to configure the access control lists (ACLs) on Wireless LAN Controllers (WLAN) to filter traffic through the WLAN.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- How to configure the WLC and Lightweight Access Point (LAP) for basic operation
- Basic knowledge of Lightweight Access Point Protocol (LWAPP) and wireless security methods

Components Used

The information in this document is based on these software and hardware versions:

- Cisco 2000 Series WLC that runs firmware 4.0
- Cisco 1000 Series LAP
- Cisco 802.11a/b/g Wireless client adapter that runs firmware 2.6
- Cisco Aironet Desktop Utility (ADU) version 2.6

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is

live, ensure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

ACLs on WLCs

ACLs on the WLC are meant to restrict or permit wireless clients to services on its WLAN.

Before WLC firmware version 4.0, ACLs are bypassed on the Management Interface, so you cannot affect traffic destined to the WLC you can only prevent wireless clients from the management of the controller with the **Management Via Wireless** option. Therefore, ACLs can only be applied to dynamic interfaces. In WLC firmware version 4.0, there are CPU ACLs which can filter traffic destined for the Management Interface. See the Configure CPU ACLs section for more information.

You can define up to 64 ACLs, each with up to 64 rules (or filters). Each rule has parameters that affect its action. When a packet matches all of the parameters for a rule, the action set for that rule is applied to the packet. You can configure ACLs through either the GUI or the CLI.

These are some of the rules you need to understand before you configure an ACL on the WLC:

- If the source*and*destination are **any** , the direction in which this ACL is applied can be **any** .
- If either the source*or*destination are **not any** , then the direction of the filter must be specified, and an inverse statement in the opposite direction must be created.
- The WLC notion of inbound versus outbound is nonintuitive. It is from the perspective of the WLC facing towards the wireless client, rather than from the perspective of the client. So, inbound direction means a packet that comes into the WLC from the wireless client and outbound direction means a packet that exits from the WLC towards the wireless client.
- There is an implicit deny at the end of the ACL.

Considerations When ACLs are Configured in WLCs

ALCs in WLCs work differently than in routers. These are a few things to remember when you configure ACLs in WLCs:

- The most common mistake is to select IP when you intend to deny or allow IP packets. Because you select what is inside the IP packet, you deny or allow IP-in-IP packets.
- Controller ACLs cannot block WLC virtual IP address, and hence DHCP packets for wireless clients.
- Controller ACLs cannot block multicast traffic received from wired networks that is destined to wireless clients. Controller ACLs are processed for multicast traffic initiated from wireless clients, destined to wired networks or other wireless clients on the same controller.
- Unlike a router, the ACL controls traffic in both directions when applied to an interface, but it does not perform stateful firewalling. If you forget to open a hole in the ACL for return traffic, this causes a problem.
- Controller ACLs only block IP packets. You cannot block Layer 2 ACLs or Layer 3 packets

that are not IP.
- Controller ACLs do not use inverse masks like the routers. Here, 255 means match that octet of the IP address exactly.
- ACLs on the controller are done in software and impact forwarding performance.

Note: If you apply an ACL to an interface or a WLAN, wireless throughput is degraded and can lead to potential loss of packets. In order to improve throughput, remove the ACL from the interface or WLAN and move the ACL to a neighboring wired device.

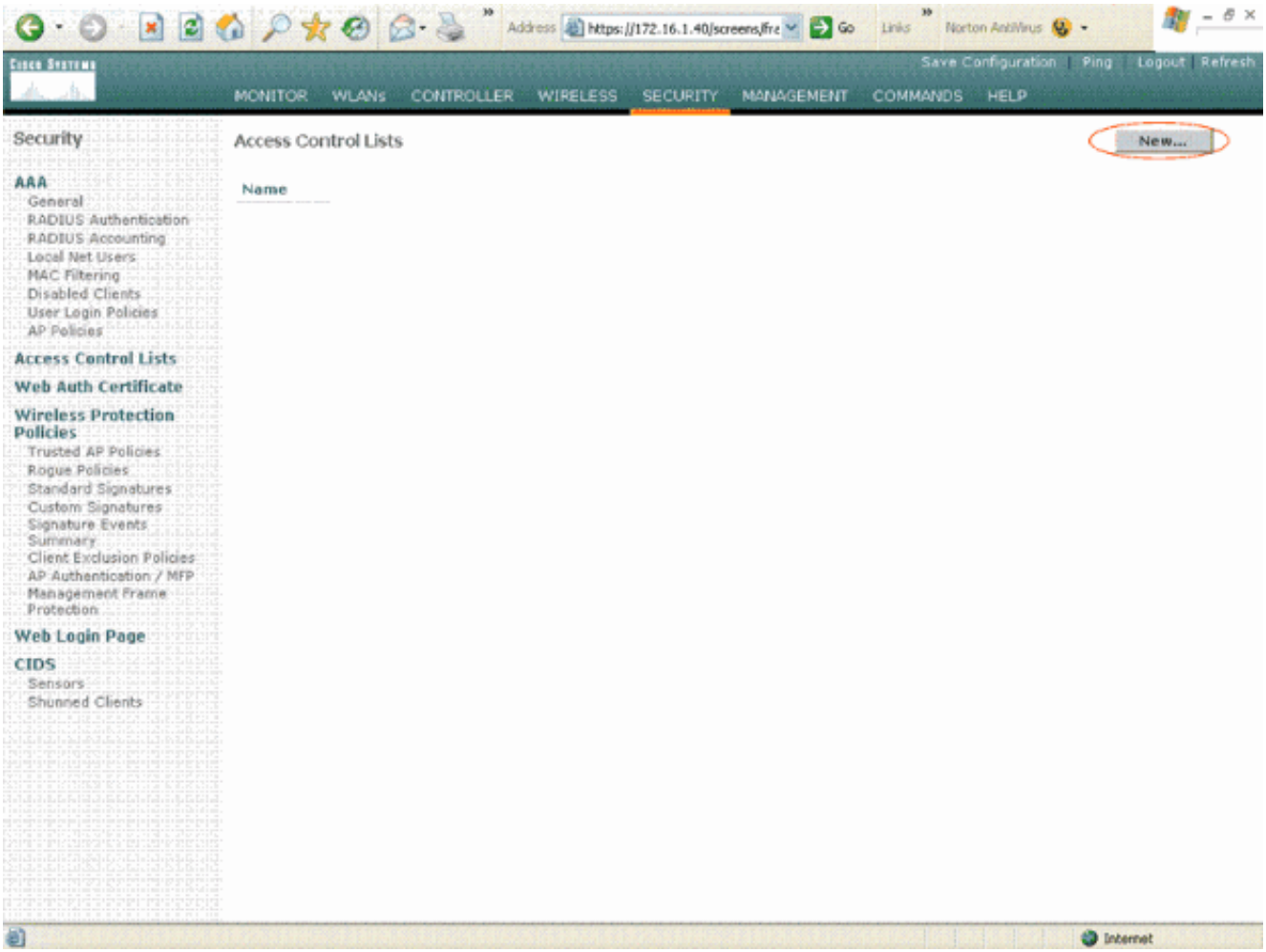
Configure ACL on WLCs

This section describes how to configure an ACL on the WLC. The objective is to configure an ACL that allows guest clients to access these services:

- Dynamic Host Configuration Protocol (DHCP) between the wireless clients and DHCP server
- Internet Control Message Protocol (ICMP) between all devices in the network
- Domain Name System (DNS) between the wireless clients and the DNS server
- Telnet to a specific subnet

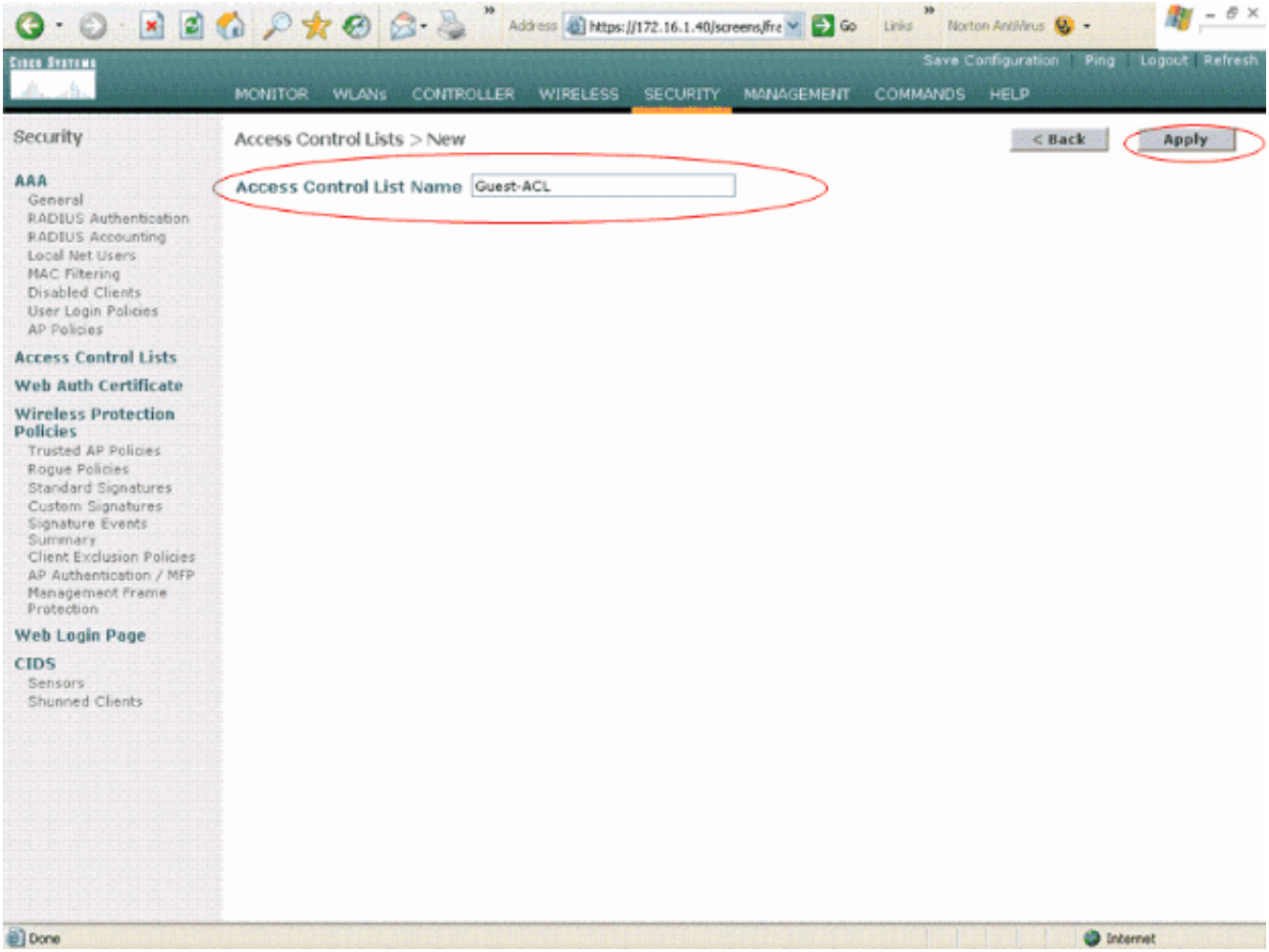
All other services must be blocked for the wireless clients. Complete these steps in order to create the ACL with the WLC GUI:

1. Go to the WLC GUI and choose **Security > Access Control Lists**.The Access Control Lists page appears. This page lists the ACLs that are configured on the WLC. It also enables you to edit or remove any of the ACLs. In order to create a new ACL, click **New**
.



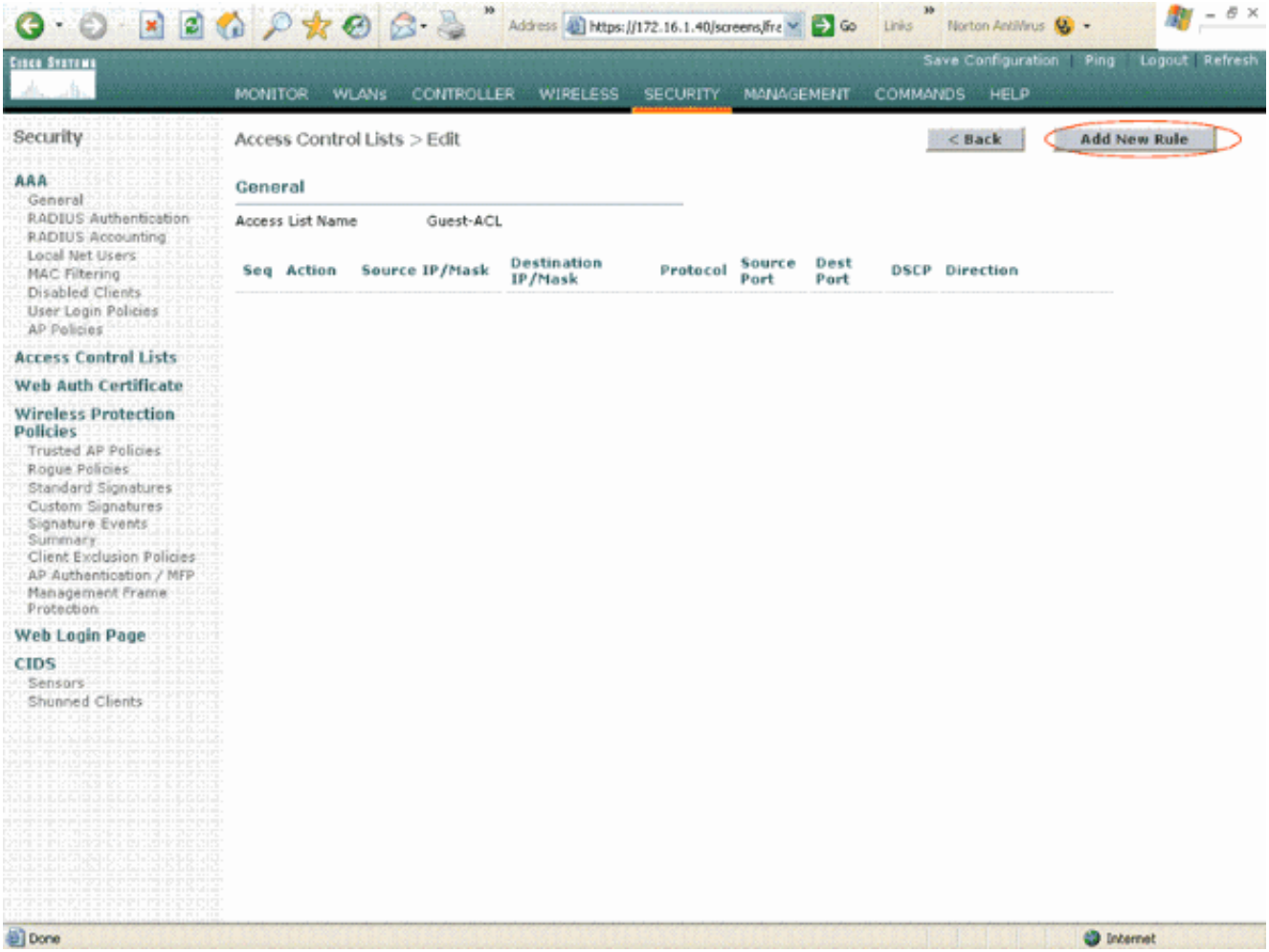
Access Control Lists

2. Enter the name of the ACL and click **Apply**.You can enter up to 32 alphanumeric characters. In this example, the name of the ACL is **Guest-ACL** . Once the ACL is created, click **Edit** to create rules for the
ACL.



Enter the Name of the ACL

3. When the Access Control Lists > Edit page appears, click **Add New Rule**.The Access Control Lists > Rules > New page
appears.



Add New ACL Rules

4. Configure rules that allow a guest user these services:DHCP between the wireless clients and DHCP serverICMP between all devices in the networkDNS between the wireless clients and the DNS serverTelnet to a specific subnet

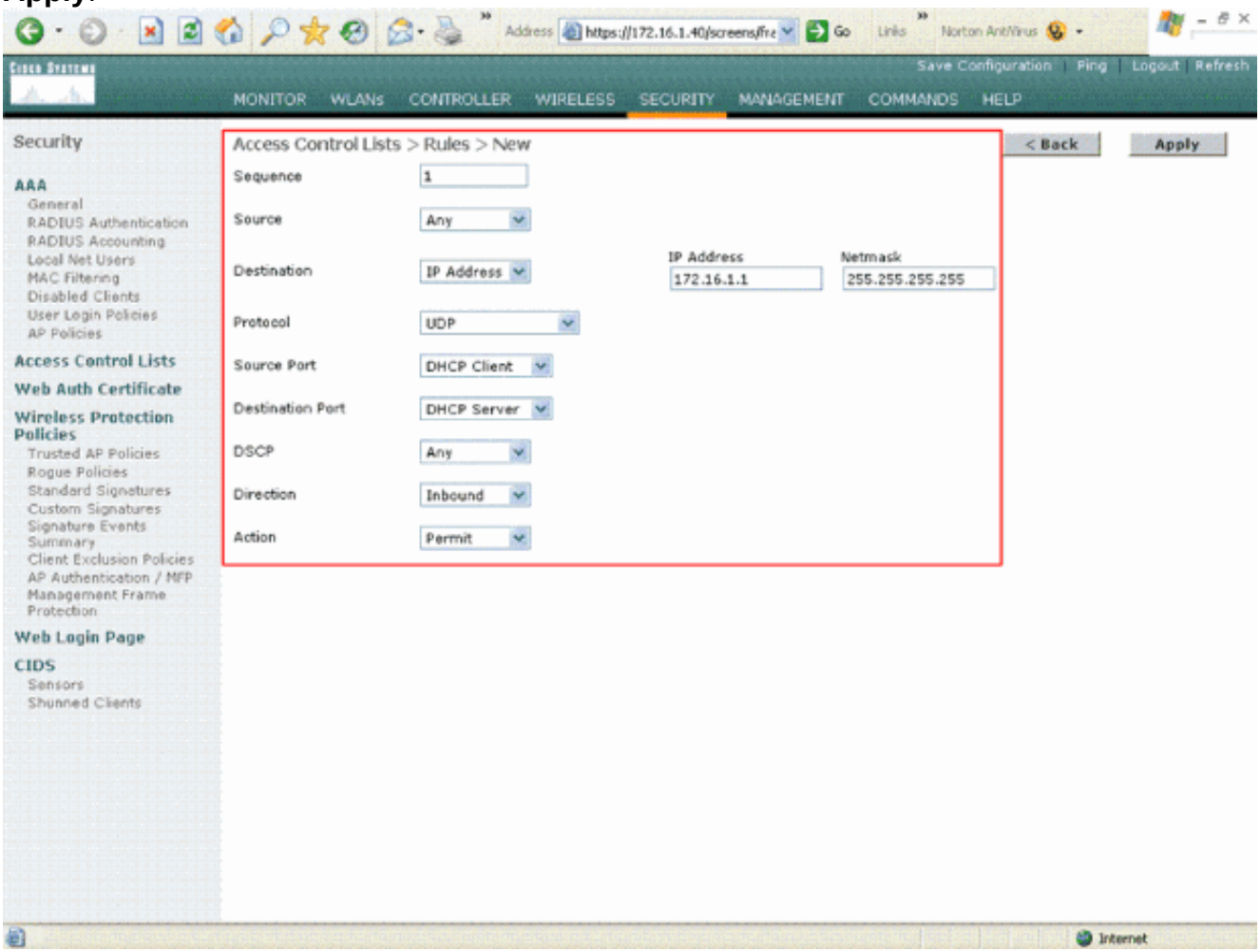
Configure Rules that Allow Guest User Services

This section shows an example for how to configure the rules for these services:

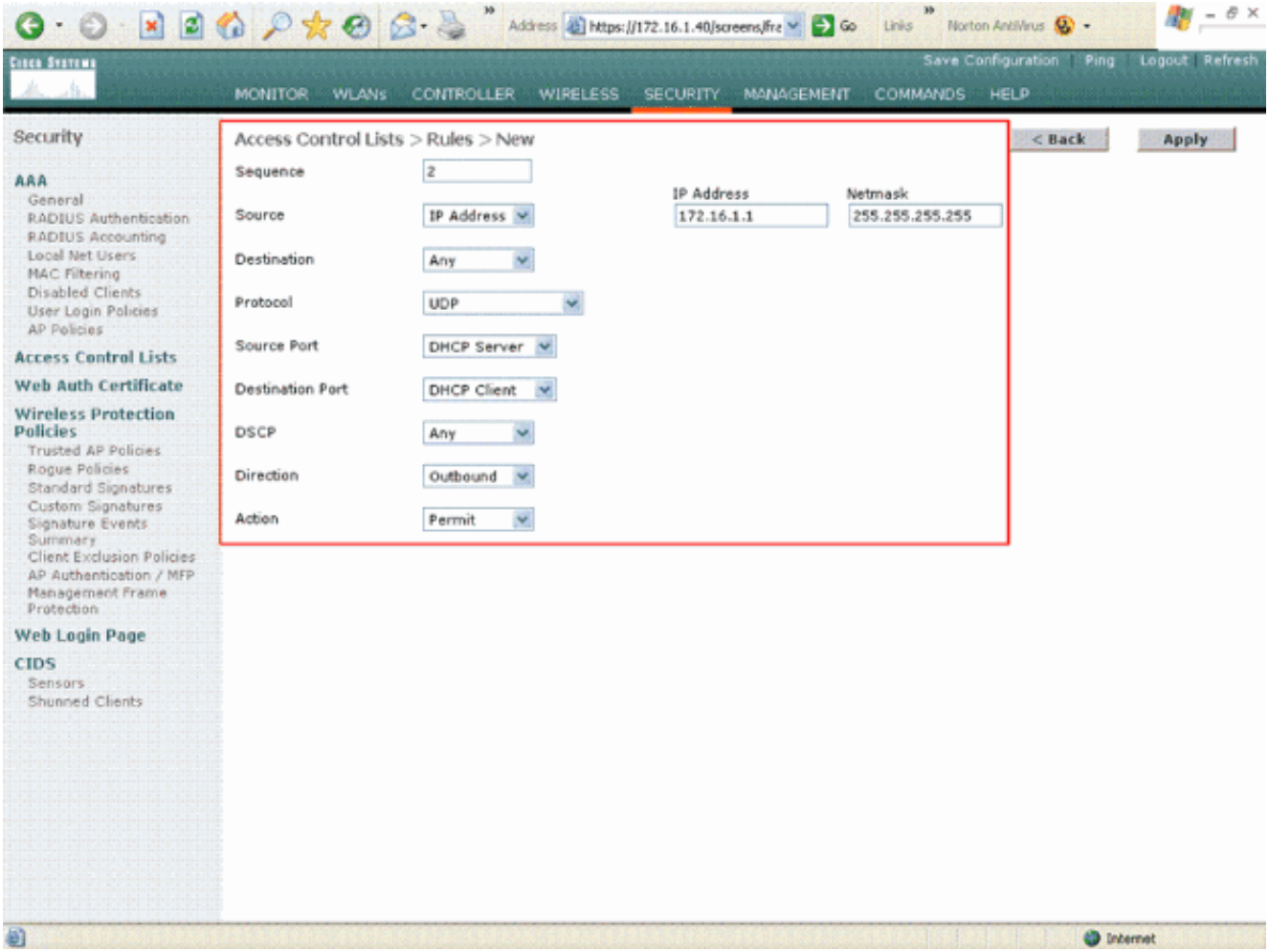
- DHCP between the wireless clients and DHCP server
- ICMP between all devices in the network
- DNS between the wireless clients and the DNS server
- Telnet to a specific subnet

1. In order to define the rule for DHCP service, select the source and destination IP ranges.This example uses **any** for the source which means that any wireless client is allowed access to the DHCP server. In this example, the server 172.16.1.1 acts as the DHCP and DNS server. So, the destination IP address is 172.16.1.1/255.255.255.255 (with a host mask).Because DHCP is a UDP based protocol, select **UDP** from the Protocol drop-down field. If you chose TCP or UDP in the previous step, two additional parameters appear: Source Port and Destination Port. Specify the Source and Destination port details. For this rule, the Source Port is **DHCP Client** and the Destination Port is **DHCP Server** .Choose the Direction in which the ACL is to be applied. Because this rule is from the client to the server, this example uses **Inbound**. From the Action drop-down box, choose **Permit** to cause this ACL to allow DHCP packets from the wireless client to the DHCP server. The default value is

Deny. Click
Apply.

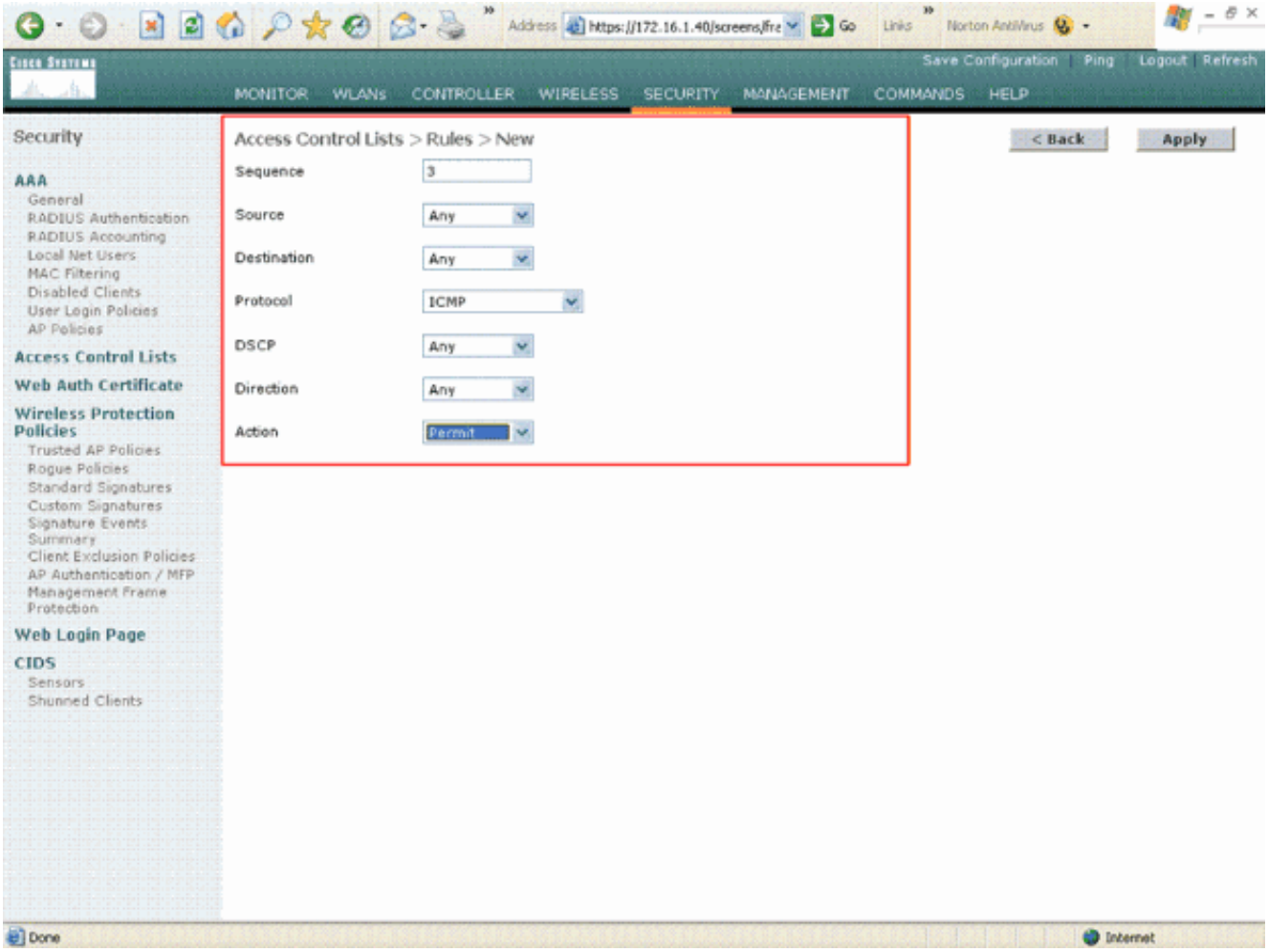


Choose Permit to Cause ACL to Allow DHCP Packets If either the source or destination are not **any** , then an inverse statement in the opposite direction must be created. Here is an example.



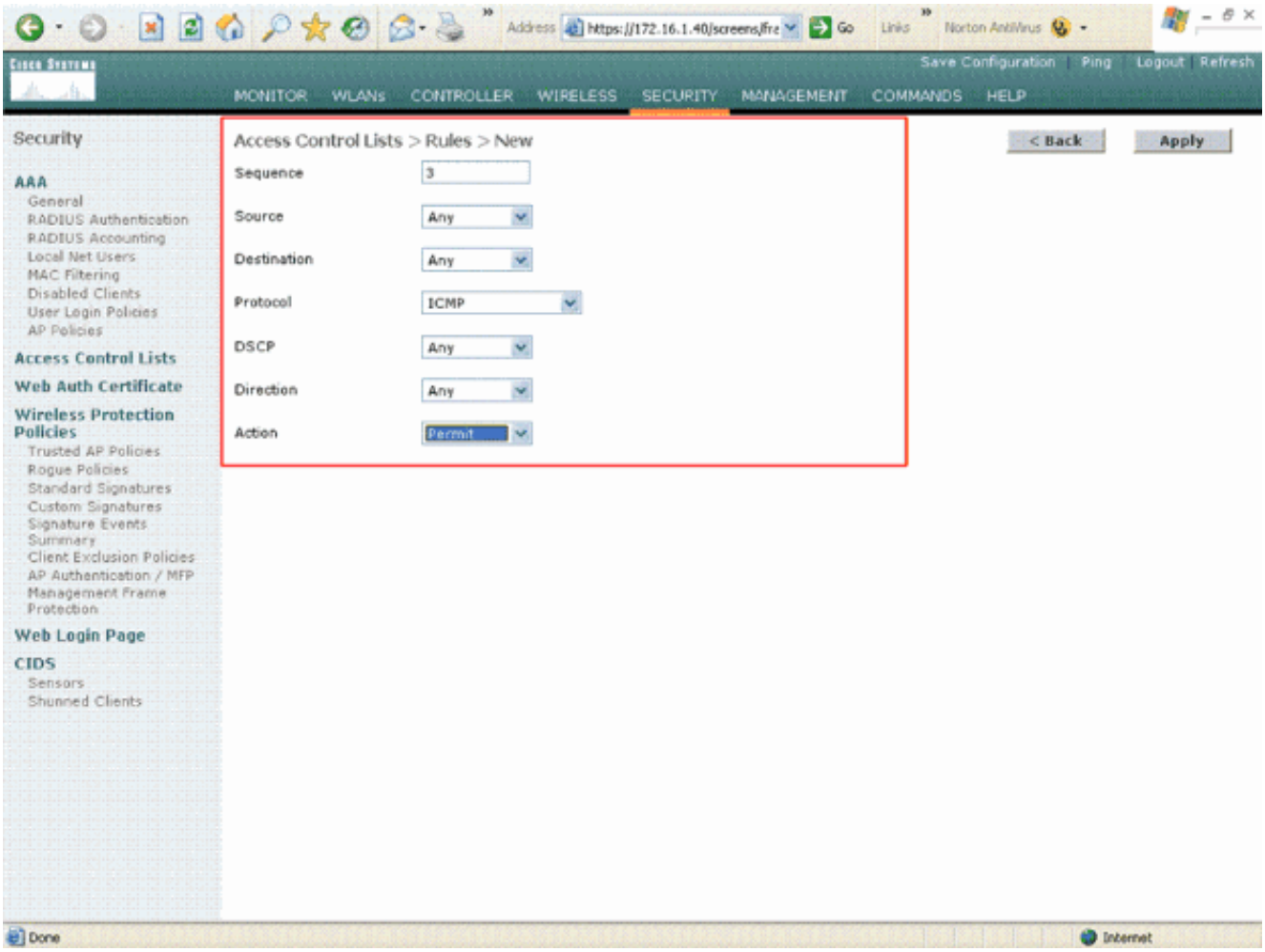
Source or Destination set to Any

2. In order to define a rule that allows ICMP packets between all devices, select **any** for the Source and Destination fields. This is the default value.Choose **ICMP** from the Protocol drop-down field. Because this example uses **any** for the Source and Destination fields, you do not have to specify the direction. It can be left at its default value of **any** . Also, the inverse statement in the opposite direction is not required.From the Action drop-down menu, choose **Permit** in order to cause this ACL to allow DHCP packets from the DHCP server to the wireless client. Click
Apply.

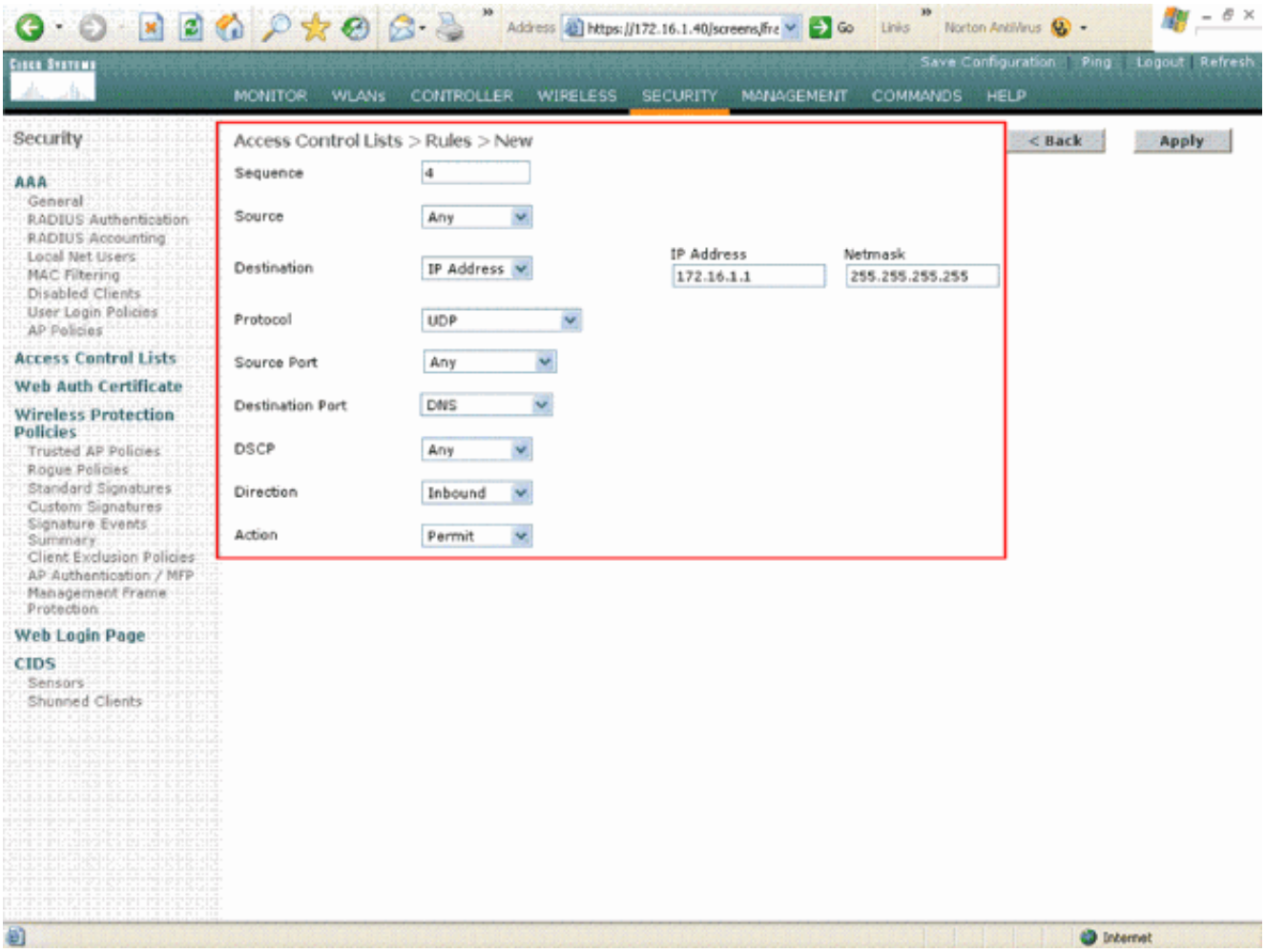


Permit to Cause ACL to Allow DHCP Packets from DHCP Server to Wireless Client

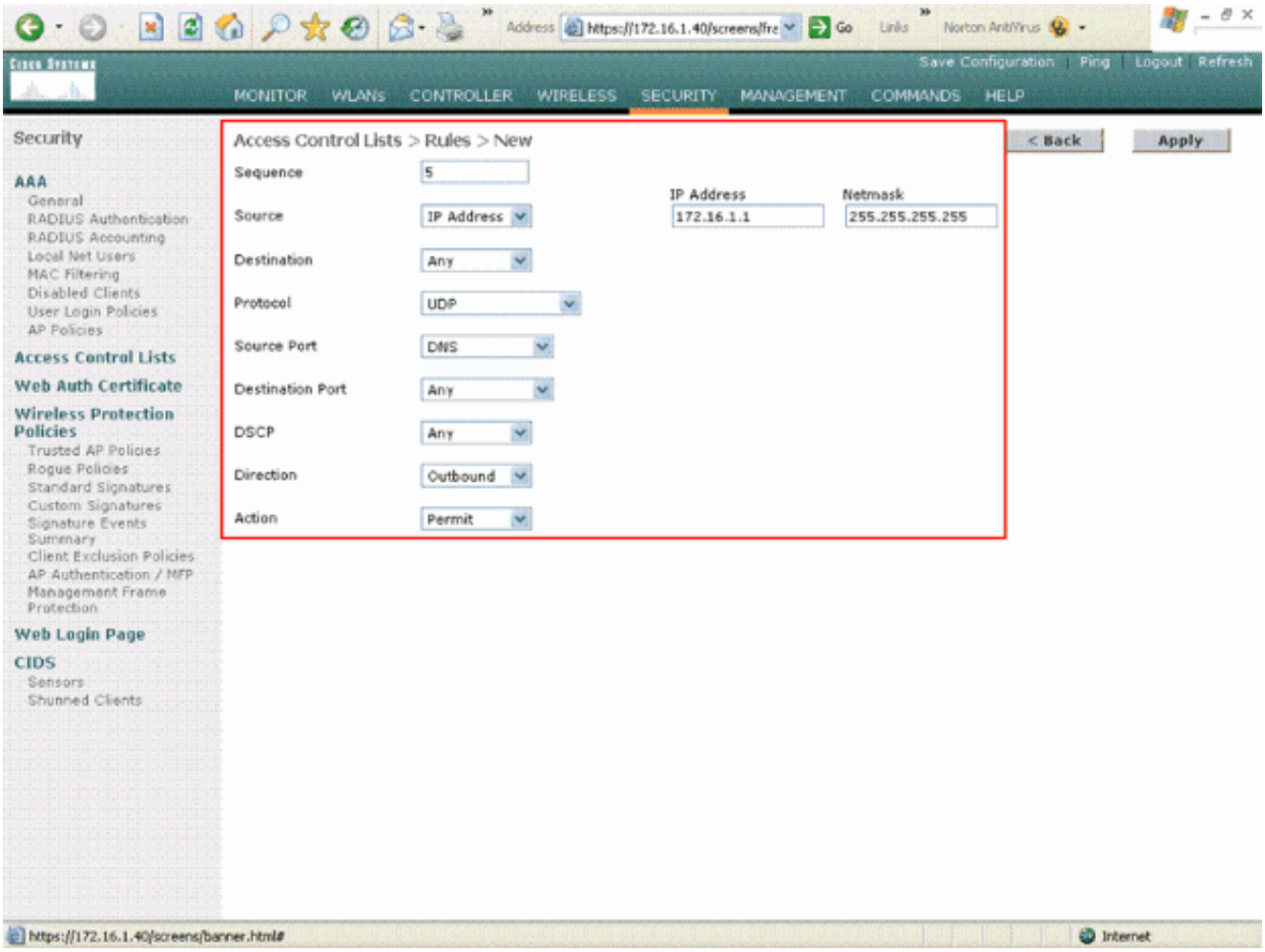
3. Similarly, create rules that allow DNS server access to all wireless clients and Telnet server access for the wireless client to a specific subnet. Here are the examples.



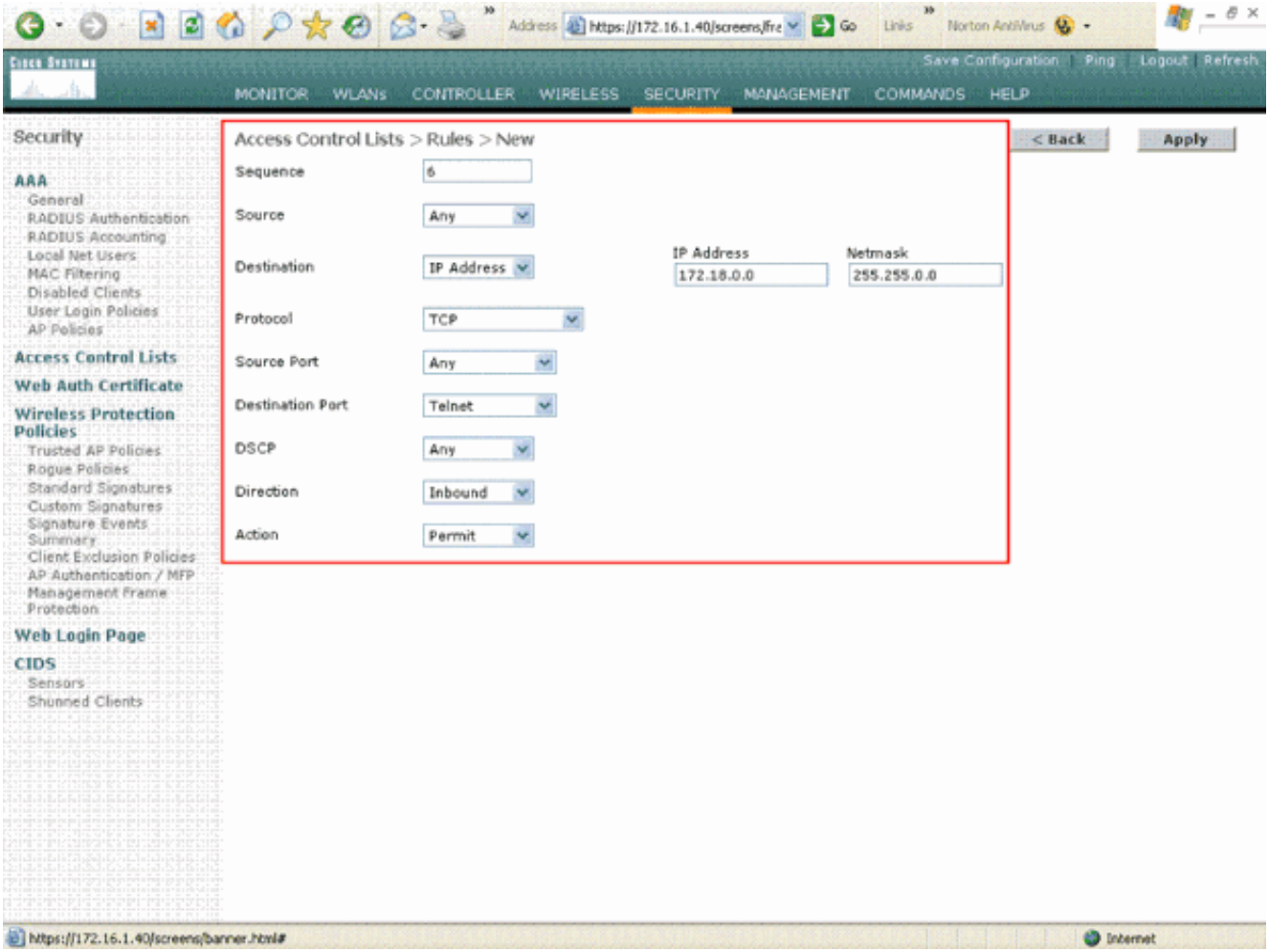
Create Rules that Allow DNS Server Access to all Wireless Clients



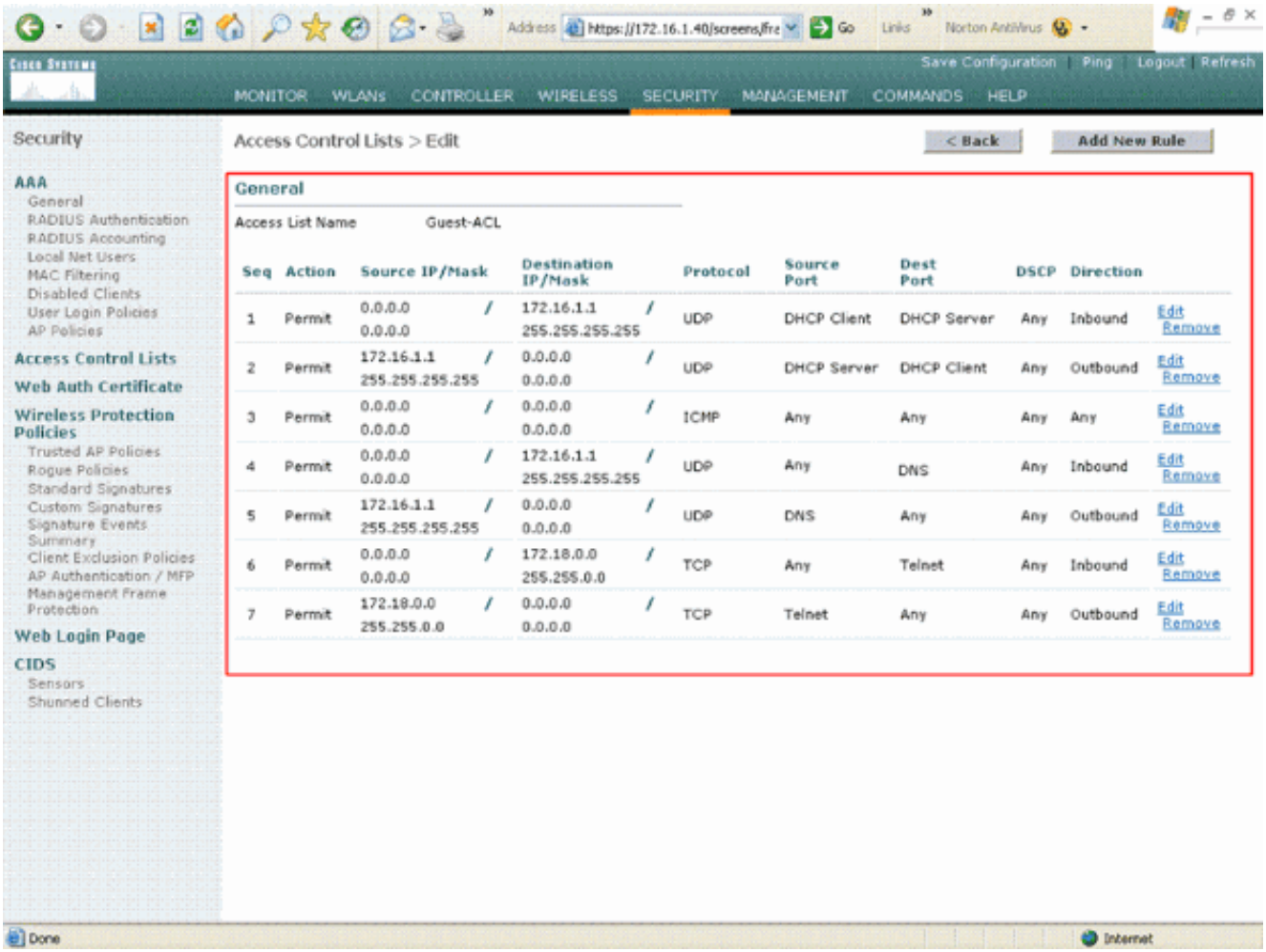
Create Rules that Allow Telnet Server Access for the Wireless Client to a Subnet Define this rule in order to allow access for the wireless client to the Telnet service.



Allow Access for the Wireless Client to the Telnet Service

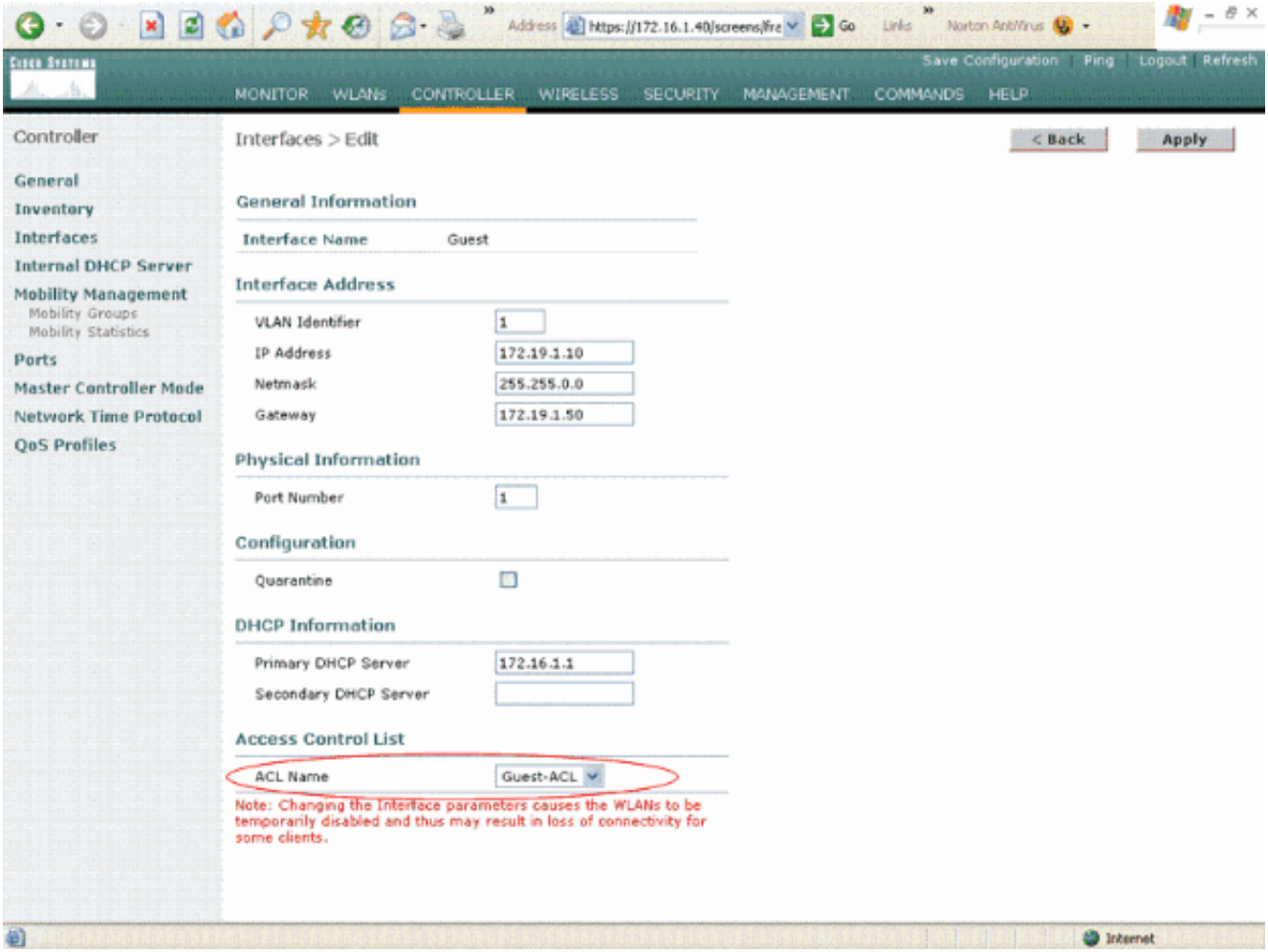


Another Example of Wireless Client Access to the Telnet Service The **ACL > Edit** page lists all the rules that are defined for the
ACL.



Edit Page Lists all Rules Defined For The ACL

4. Once the ACL is created, it needs to be applied to a dynamic interface. In order to apply the ACL, choose **Controller > Interfaces** and edit the interface to which you want to apply the ACL.
5. In the **Interfaces > Edit** page for the dynamic interface, choose the appropriate ACL from the Access Control Lists drop-down menu. Here is an example.



Choose the Appropriate ACL from the Access Control List Menu

Once this is done, the ACL permits and denies traffic (based on the configured rules) on the WLAN which uses this dynamic interface. Interface-ACL can only be applied to H-Reap APs in Connected mode but not in Standalone mode.

> **Note**: This document assumes that WLANs and dynamic interfaces are configured. Refer to Configure VLANs on Wireless LAN Controllers or information on how to create dynamic interfaces on WLCs.

Configure CPU ACLs

Previously, ACLs on WLCs did not have an option to filter LWAPP/CAPWAP data traffic, LWAPP/CAPWAP control traffic, and mobility traffic destined to the Management and AP Manager interfaces. In order to address this issue and filter LWAPP and mobility traffic, CPU ACLs were introduced with WLC firmware release 4.0.

The configuration of CPU ACLs involves two steps:

1. Configure rules for the CPU ACL.
2. Apply the CPU ACL on the WLC.

The rules for the CPU ACL must be configured in a similar way to the other ACLs.

Verify

Cisco recommends that you test your ACL configurations with a wireless client in order to ensure that you have configured them correctly. If they fail to operate correctly, verify the ACLs on the ACL web page and verify that your ACL changes were applied to the controller interface.

You can also use these **show** commands in order to verify your configuration:

- **show acl summary** —In order to display the ACLs that are configured on the controller, use the **show acl summary** command.Here is an example:

```
(Cisco Controller) >show acl summary

ACL Name                         Applied
-------------------------------- -------
Guest-ACL                        Yes
```

- **show acl detailedACL_Name** —Displays detailed information on the configured ACLs.Here is an example:

```
(Cisco Controller) >show acl detailed Guest-ACL

                  Source                        Destination               Source Port
Dest Port
I  Dir       IP Address/Netmask             IP Address/Netmask        Prot    Range
Range    DSCP Action
-- --- ------------------------------ ------------------------------ ---- ----------- ----
------- ---- ------
 1  In         0.0.0.0/0.0.0.0             172.16.1.1/255.255.255.255   17    68-68
67-67     Any Permit
 2 Out      172.16.1.1/255.255.255.255         0.0.0.0/0.0.0.0           17    67-67
68-68     Any Permit
 3 Any         0.0.0.0/0.0.0.0                0.0.0.0/0.0.0.0            1     0-65535
0-65535  Any Permit
 4  In         0.0.0.0/0.0.0.0             172.16.1.1/255.255.255.255   17     0-65535
53-53     Any Permit
 5 Out      172.16.1.1/255.255.255.255         0.0.0.0/0.0.0.0           17    53-53
0-65535  Any Permit
 6  In         0.0.0.0/0.0.0.0             172.18.0.0/255.255.0.0             60-65535
23-23     Any Permit
 7 Out      172.18.0.0/255.255.0.0             0.0.0.0/0.0.0.0            6    23-23
0-65535  Any Permit
```

- **show acl cpu** —In order to display the ACLs configured on the CPU, use the **show acl cpu** command.Here is an example:

```
(Cisco Controller) >show acl cpu

CPU Acl Name.............................. CPU-ACL
Wireless Traffic.......................... Enabled
Wired Traffic............................. Enabled
```

Troubleshoot

Controller software release 4.2.x or later enables you to configure ACL counters. ACL counters can help determine which ACLs were applied to packets transmitted through the controller. This feature is useful when you troubleshoot your system.

ACL counters are available on these controllers:

- 4400 Series
- Cisco WiSM

- Catalyst 3750G Integrated Wireless LAN Controller Switch

In order to enable this feature, complete these steps:

1. Choose **Security > Access Control Lists > Access Control Lists** in order to open the Access Control Lists page.This page lists all of the ACLs that have been configured for this controller.
2. In order to see if packets hit any of the ACLs configured on your controller, check the **Enable Counters** check box and click **Apply** . Otherwise, leave the check box unchecked. This is the default value.
3. If you want to clear the counters for an ACL, hover your cursor over the blue drop-down arrow for that ACL and choose **Clear Counters** .

Related Information

- **Cisco Wireless LAN Controller Configuration Guide, Release 6.0**
- **Configure VLANs on Wireless LAN Controllers**
- **Troubleshoot a Lightweight AP that Fails to Join a WLC**
- **Cisco Technical Support & Downloads**