TrustSec Phased Deployment Configuration Guide

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TrustSec Phased Deployment Configuration Guide

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This document is designed to help focus and streamline Cisco TrustSec deployments. It includes the following sections:

Phased Deployment Overview

This section includes the following topics:

Cisco TrustSec Overview

Cisco Trusted Security (TrustSec) is an integrated solution comprising several Cisco products that offer authentication, access control, and user policies to secure network connectivity and resources. Cisco TrustSec facilitates greater security and cost-effective management of changes throughout your organization.

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Having a secure TrustSec framework in place helps enterprises better manage employee mobility, reduce network access expenses, and boost overall productivity while lowering operating costs.

The Cisco TrustSec solution provides the following benefits:

- Improves business capability without compromising security—Policies are associated with users and not physical ports, which not only gives your users more mobility but also simplifies administration for IT staff. Policy enforcement and dynamic provisioning ease management functions and deliver greater scalability.
- Provides greater flexibility and mobility—Creating user or group profiles with policies that define trust relationships between users and network resources helps easily authenticate, authorize, and account for all wired and wireless network users.
- Increases efficiency and manage costs—Delivering secure network access to partners and vendors though centralized policy-based administration decreases the time, complexity, and effort associated with port security techniques at the media access control level.
- Increases visibility and enforces policy compliance—Tracking users and accounting for user activities help safeguard your network.

Cisco IOS Software Identity Enhancements

This section describes Cisco IOS Software features that accommodate the deployment scenarios described in this guide. It includes the following topics:

IEEE 802.1X with Multiauth

Multiple authentication allows more than one host to authenticate on an IEEE 802.1X-enabled switch port. With multiauth, each host must authenticate individually before it can gain access to the network resources.

Note When multiauth is enabled, your dynamic authorization options change. Because an Ethernet port can be assigned to only one VLAN, you cannot have each authenticated session on a different VLAN. Therefore, Cisco recommends that you consider using downloadable access control lists (dACLs) as your authorization method. This is discussed later in this document.

Flexible Authentication Sequencing

Flexible authentication sequencing provides a flexible timeout and fallback mechanism among IEEE 802.1X, MAC authentication bypass (MAB), and web authentication methods. It also allows switch administrators to control the sequence of the authentication methods. This simplifies the Cisco TrustSec configuration by providing a single-set of configuration commands to handle different types of endpoints

connecting to the switch ports. In addition, flexible authentication sequencing allows users to configure any authentication method on a standalone basis; that is, MAB can be configured without requiring IEEE 802.1X configuration.

IEEE 802.1X with Open Access

This feature allows users to have limited network access, such as the Intel Preboot eXecution Environment (PXE) boot server, before IEEE 802.1X authentication. The limited access is optionally controlled by an access control list (ACL) or a virtual LAN (VLAN) that is defined by the switch administrator and applied on the switch port.

IEEE 802.1X and MAB with Downloadable ACLs

This feature allows per-user ACLs to be downloaded from the Cisco Access Control Server (ACS) as policy enforcement after authentication using IEEE 802.1X, MAB, or web authentication.

IEEE 802.1X and MAB with Downloadable VLAN

This feature allows per-port VLAN to be downloaded from the Cisco ACS as policy enforcement after authentication using IEEE 802.1X and MAB.

Multidomain Authentication

This feature allows an IP phone, either Cisco or non-Cisco, and a PC to authenticate on the same switch port while it places them on appropriate voice and data VLANs.

For a full list of the new Cisco IOS Software enhancements and additional information, see the following URLs:

- http://www.cisco.com/en/US/prod/collateral/iosswrel/ps8802/ps6970/ps6017/ps9673/product_bulletin_c25-503086.html#wp9000607
- http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/configuration/guide/dot1x.html#wp1107452

Cisco Discovery Protocol Enhancement for Second Port Disconnect

Cisco Discovery Protocol (CDP) is enhanced to add a new type-length-value (TLV) for the IP phone to inform the switch in the event of the PC disconnecting from the IP phone. Upon receiving this notification, the switch can clear the authenticated session security record for the PC. This enables end users to move behind phones without validating security policies, and thus eliminating error disabling of ports.

Cisco Secure Access Control System 5.x

Cisco Secure Access Control System 5.x (ACS 5.x) is the Cisco policy management system for supporting comprehensive, identity-based access control and security. Cisco ACS 5.x is focused on enhanced support for 802.1X. The following are the key enhancements for Cisco ACS 5.x:

- Rules-based attribute-driven policy model
- Lightweight web GUI
- Centralized reporting, monitoring, and troubleshooting
- Linux-based system architecture
- Improved integration with identity and policy databases
- Available as physical appliance and virtual appliance for VMware

Phased Implementation Strategy

The depth and breadth of Cisco TrustSec accommodates a large number of use cases and deployment scenarios. This section describes the following two aspects of the use cases discussed in this guide:

- Authentication and Authorization Modes, page 6
- Endpoint/User—Use Cases, page 7

Authentication and Authorization Modes

Cisco recommends a phased deployment model that can allow for limited impact on network access while gradually introducing authentication and authorization on the wired network. The phases are as follows:

- Monitor mode
- Low impact mode
- High security mode

Monitor Mode

Monitor mode allows for the deployment of the TrustSec authentication methods IEEE 802.1X, MAB, and/or web authentication (WebAuth) without any effect to user or endpoint access to the network. Monitor mode is basically like placing a security camera at the door to monitor and record port access behavior.

With AAA RADIUS accounting enabled, you can log authentication attempts and gain visibility into who and what is connecting to your network with an audit trail. You can discover the following:

- Which endpoints such as PCs, printers, cameras, and so on, are connecting to your network
- Where these endpoints connected
- Whether they are 802.1X capable or not
- Whether they have valid credentials
- In the event of failed MAB attempts, whether the endpoints have known, valid MAC addresses

Monitor mode is enabled using 802.1X with the open access and multiauth mode Cisco IOS Software features enabled, as follows:

```
sw(config-if)#authentication open
sw(config-if)#authentication host-mode multi-auth
```

The open access feature transforms the normal behavior of blocking traffic on an 802.1X-enabled port until authentication and authorization are successfully performed. The default behavior of 802.1X is still to block all traffic accept Extensible Authentication Protocol over LAN (EAPoL). However, the open access feature allows the customer/administrator the option of providing unrestricted access to all traffic, even though authentication (802.1X, MAB, and/or WebAuth) is enabled.

All of this is accomplished with no impact to end users or network-attached hosts.

Low Impact Mode (also known as Selective Access Mode)

In this mode, you are able to incrementally increase the security by adding an ingress ACL to the 802.1X-enabled switchport that is configured in open mode. This ACL provides the ability to maintain whatever basic connectivity is required for unauthenticated hosts while selectively providing differentiated access for authenticated users.

An example of how this may be used is providing a host attached to a default port the ability to use Dynamic Host Configuration Protocol (DHCP), Domain Name System (DNS), and perhaps get to the Internet; all while blocking access to internal resources. When a device connected to that switchport authenticates, a dACL is applied to permit all traffic.

High Security Mode

Another option for 802.1X-enabled switch ports is the strict use of the traditional closed mode in conjunction with the use of dynamic VLAN assignment for differentiated access. This is the default behavior of an 802.1X-enabled switch port.

This guide demonstrates how to configure these three identity-enabled modes, allowing you to determine which mode works best for your environment.

Endpoint/User—Use Cases

Most if not all customer environments have a mix of host and users types. These typically fall into the following four primary categories:

- Managed Hosts/Assets
- Managed Users
- Unmanaged Host/Assets
- Unmanaged Users

Managed Hosts/Assets

The host device/asset is managed by the IT department and belongs to one of the following two classes for the purpose of TrustSec:

- 802.1X capable—The device has a supplicant and can authenticate using 802.1X.
- Non-802.1X capable—The device does not have the ability to authenticate using 802.1X; that is, there is no supplicant.

Because the devices are managed, the IT department has knowledge of the device and in most cases can install and configure the prerequisite 802.1X supplicant software if it is available.

Note This guide uses Active Directory and the Cisco ACS internal database as the identity management (IdM) systems for managed hosts.

Managed Users

The end user has some affiliation with the company, either as an employee or subcontractor, and has been provisioned with an identity (username/password, digital certificate, and so on) in the identity IdM system of the company; typically, Microsoft Active Directory or Lightweight Directory Access Protocol (LDAP). The Cisco TrustSec Policy Management Server (ACS) integrates with common IdM systems to allow seamless authentication of user credentials.

Note This guide uses Active Directory as the IdM system for managed user identities.

Unmanaged Host/Assets

Endpoints that belong to short-term guests or business partners such as consultants, contractors, and customers. Because of legal or liability concerns, most IT departments cannot or are reluctant to install client software such as 802.1X supplicants on these unmanaged host PCs.

Unmanaged Users

Users that are considered short-term guests or business partners such as consultants, contractors, and customers, which are not or will not be provisioned into the traditional company IdM systems.

The key is to be able to accommodate all of the above endpoint/user use cases with a single switch port configuration. This can be accomplished with Cisco IOS Software enhancements; specifically, flexible authentication (FlexAuth) and flexible authentication sequencing. FlexAuth is used in conjunction with a policy or procedure to register the PC MAC addresses of guests and contractors.

Predeployment LAN Requirements

This section includes the following topics:

Assumptions and Prerequisites

The following network services should be installed, configured, and ready for use:

- Microsoft Active Directory (AD)
- Certificate Authority (CA); this document assumes Microsoft CA
- DHCP
- DNS

For this configuration guide, the following have been preconfigured:

- AD domain *demo.local*
- AD users and passwords, as listed in Table 1
- Switch VLANs and DHCP scopes, as listed in Table 2.

Table 1 AD Users and Passwords

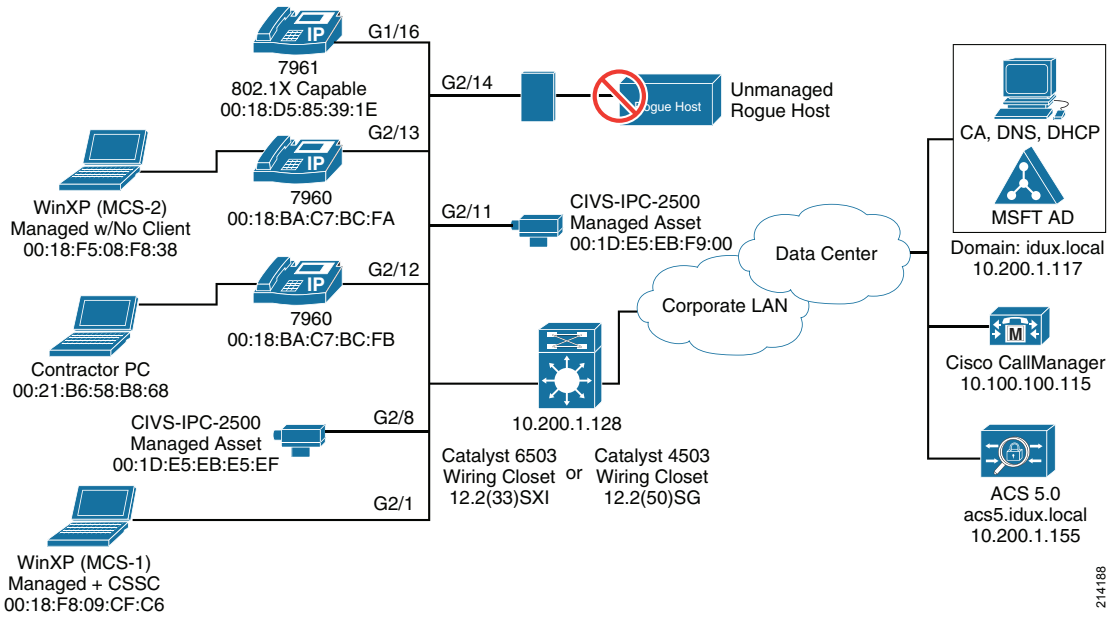
Username	Example Passwords	Record Your Passwords Here
Administrator	aPa$$word0	
User1	uPa$$word1	
User2	uPa$$word2	

Table 2 Switch VLANs and Scopes

VLAN NAME	VLAN ID	IP	Description
Monitor Mode			
DATA	210	10.200.10.x/24	All non-Voice
VOICE	211	10.200.11.x/24	Voice Only
High Security Mode (used later)			
MACHINES	212	10.200.12.x/24	Managed Host/Assets
GUEST	213	10.200.13.x/24	Non-802.1X responsive Host
CONTRACTOR	214	10.200.14.x/24	Reserved for Contractors
AUTHFAIL	215	10.200.15.x/24	Failed 802.1X attempts

Figure 1 shows a diagram of the TrustSec components used in the Cisco testing lab.

Figure 1 TrustSec Lab Components



Pre-TrustSec Switchport Interface Configuration

The following is a typical switchport configuration before TrustSec implementation:

```
Interface GigabitEthernet 2/1
  switchport access vlan 210
  switchport voice vlan 211
  switchport mode access
  spanning-tree portfast
  spanning-tree bpduguard enable
  ip verify source vlan dhcp-snooping
  etc.
end

! Comments:
! Your configuration may vary. The main thing to note is that we are only using a DATA
! and VOICE VLAN initially and no TrustSec features are enabled.
```

The following global switch configuration needs to be applied to the switch to enable DHCP Snooping on the port:

```
ip dhcp snooping vlan 210-215 <- your vlans may vary
no ip dhcp snooping information option
ip dhcp snooping
```

Verify that all hosts, except contractors and rogue APs, are online and working:

```
Cat6K#show cdp neighbors

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
                  D - Remote, C - CVTA, M - Two-port Mac Relay

Device ID        Local Intrfce     Holdtme    Capability  Platform      Port ID
SEP001BD585391E   Fas 2/16          161             H P M      IP Phone     Port 1
SEP0018BAC7BCEE  Fas 2/12          175             H P        IP Phone     Port 1
SEP0018BAC7BCFA  Fas 2/13          167             H P        IP Phone     Port 1
6506-1.identity.com     Fas2/48      151              R S I     WS-C6506  Gig1/43
001DE5EBE5EF         Fas 2/8          136                H         CIVS-IPC-    eth0
001DE5EBF900          Fas 2/11       131                H         CIVS-IPC-    eth0


Cat6k#show ip dhcp snooping binding

MacAddress              IpAddress          Lease(sec)  Type                 VLAN
Interface
------------------    ---------------       ----------      -------------          ----
--------------------
00:1B:D5:85:39:1E    10.200.11.202    613050      dhcp-snooping   211   FastEthernet2/16
00:18:F8:08:F8:38     10.200.10.203    450645      dhcp-snooping   210   FastEthernet2/13
00:18:F8:09:CF:C6    10.200.10.201    358850      dhcp-snooping   210   FastEthernet2/1
00:18:BA:C7:BC:FA   10.200.11.201    687677      dhcp-snooping   211   FastEthernet2/13
00:18:BA:C7:BC:EE   10.200.11.203    687690      dhcp-snooping   211   FastEthernet2/12
00:1D:E5:EB:F9:00    10.200.10.206    687692      dhcp-snooping   210   FastEthernet2/11
00:1D:E5:EB:F9:00    10.200.10.206    687692      dhcp-snooping   210   FastEthernet2/11
00:1D:E5:EB:E5:EF   10.200.10.204    687693      dhcp-snooping   210   FastEthernet2/8
00:21:86:58:DB:6B    10.200.10.205    444919      dhcp-snooping   210   FastEthernet2/12

Total number of bindings: 8
```

Verifying Network Infrastructure Before TrustSec is Deployed

Verify the following before deploying TrustSec:

- DNS and DHCP are working
- Client machines have joined the AD domain
- The access switch can ping the Cisco ACS
- The Cisco ACS can ping the AD domain controller
- IP phones are working; check for dial tone
- All VLANs are configured and routable on the network
- Devices such as IP cameras and printers are working; for example, browse to the IP camera http://10.200.10.206

Note Do *not* enable TrustSec features such as 802.1X on the switch until you have configured your AAA server, switch-to-AAA/RADIUS configurations, and so on.

Implementing Monitor Mode

This section describes the global configuration necessary to implement monitor mode. This section includes the following topics:

Monitor Mode Overview

This section describes how to enable TrustSec authentication on the access switch ports and configure the infrastructure to support authentication and accounting. Monitor mode does not disrupt any network services for attached hosts, but enables you to account for and monitor network access attempts from the hosts connecting to your network.

Note that configuration of 802.1X supplicants, or clients, is not a concern here because monitor mode does not enforce authentication. However, if there are hosts with 802.1X enabled, you are able to detect them via the RADIUS accounting logs.

Installing Digital Certificates

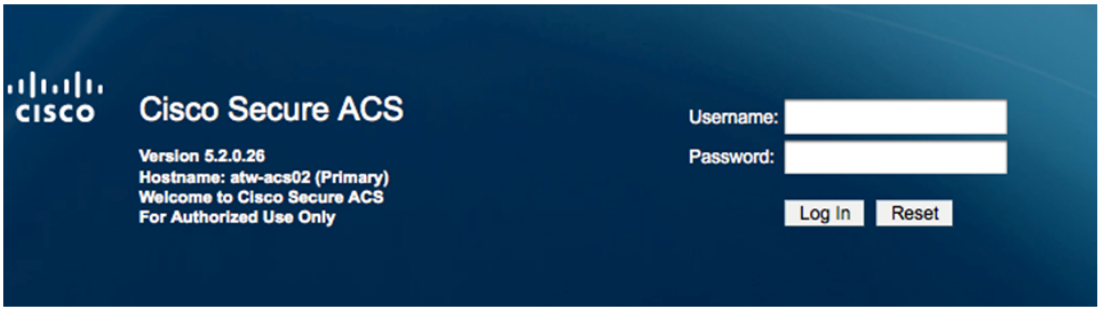
To install digital certificates, complete the following steps.

Procedure

Step 1 Login to your newly installed Cisco Secure ACS 5.X (see Figure 2).

Unless otherwise configured, use the default username and password: *acsadmin/default*.

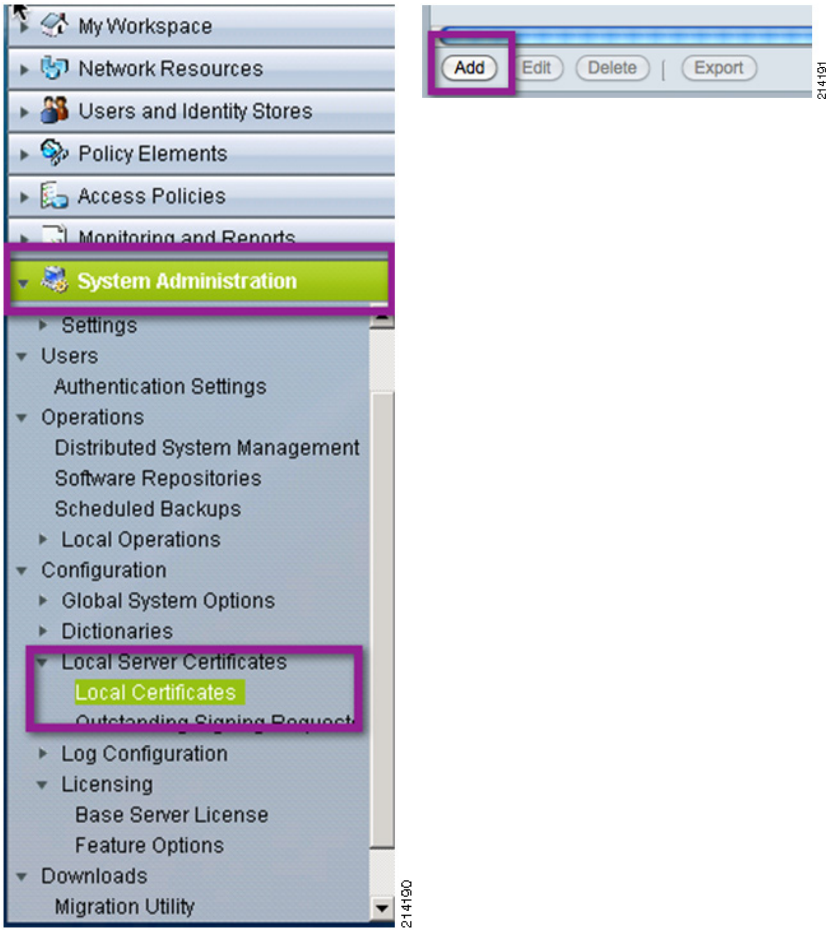
Figure 2 Cisco Secure ACS Login



Step 2 To create a digital certificate for ACS from your lab, trusted public, or enterprise certificate authority, go to the Cisco Secure ACS **System Administration > Configuration > Local Server Certificates > Local Certificates**, and select **Add** (see Figure 3).

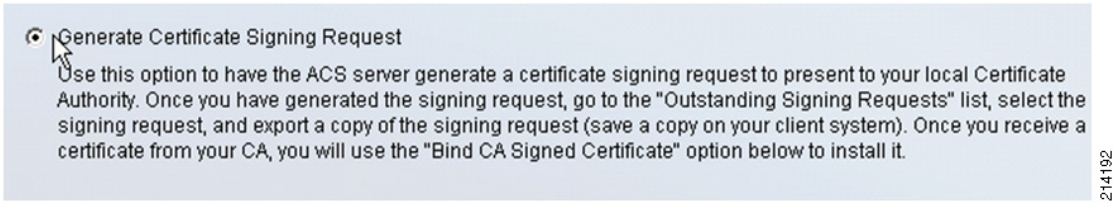
Tip **Best Practice Recommendation**—Do not use self-signed certificates. Creating a digital certificate for ACS that is signed by a trusted third-party or enterprise CA is highly recommended. It is the foundation of trust for most browser-based (SSL) and EAP-based (RADIUS) protocols.

Figure 3 Creating a Digital Certificate



Step 3 Check the Generate Certificate Signing Request and click **Next** (see Figure 4).

Figure 4 Selecting Generate Certificate Signing Request



Step 4 In the Generate Certificate Signing Request screen (see Figure 5), do the following:

a. In the Certificate Subject text box, enter the fully qualified domain name of your ACS 5.0 server: **cn=acs5.demo.local**.

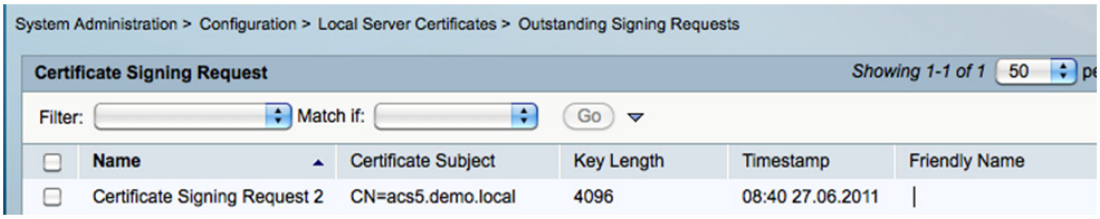
b. In the Key Length text field, select **4096**

c. Click **Finish**.

Figure 5 Generate Certificate Signing Request

Step 5 To access the Certificate Signing Request (CSR), go to **System Administration > Configuration > Local Server Certificates > Outstanding Signing Requests** (see Figure 6).

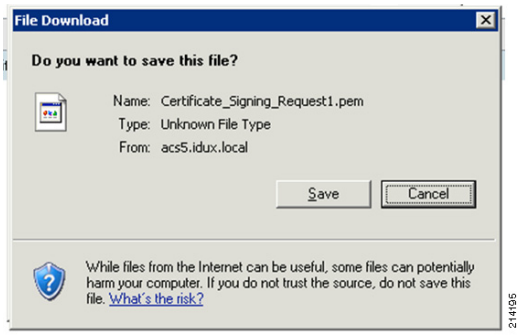
Figure 6 Certificate Signing Request



Step 6 Select the CSR you created, click **Export** and then click **Save** (see Figure 7).

You will need to access this CSR from the CA in a later step.

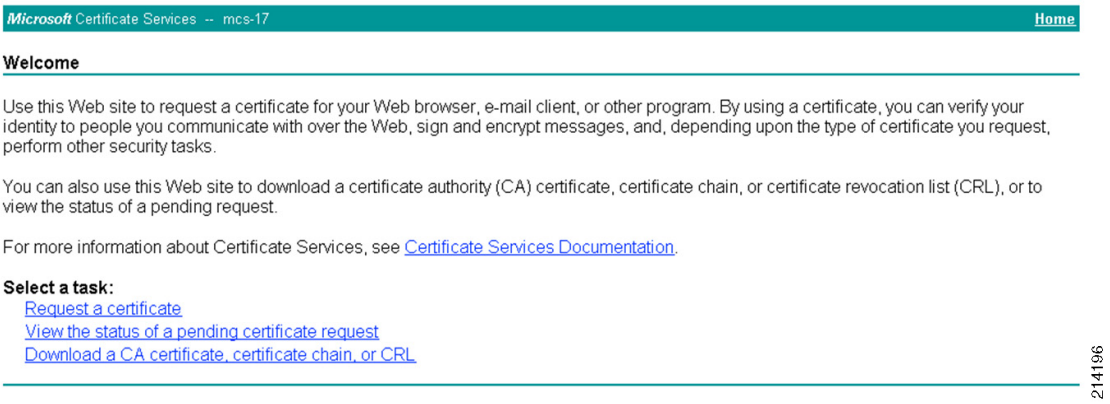
Figure 7 Saving the Certificate Signing Request



Step 7 Open your enterprise or pilot/demo root CA server: **http://ad.demo.local/certsrv**.

The Welcome screen appears, as shown in Figure 8.

Figure 8 Microsoft Certificate Services—Welcome Screen



Step 8 Select **Request a Certificate**.

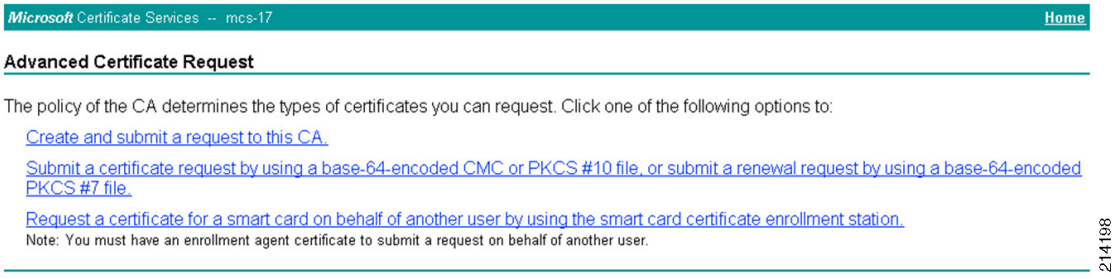
The Request a Certificate screen appears, as shown in Figure 9.

Figure 9 Request a Certificate Screen

Step 9 Select **advanced certificate request**.

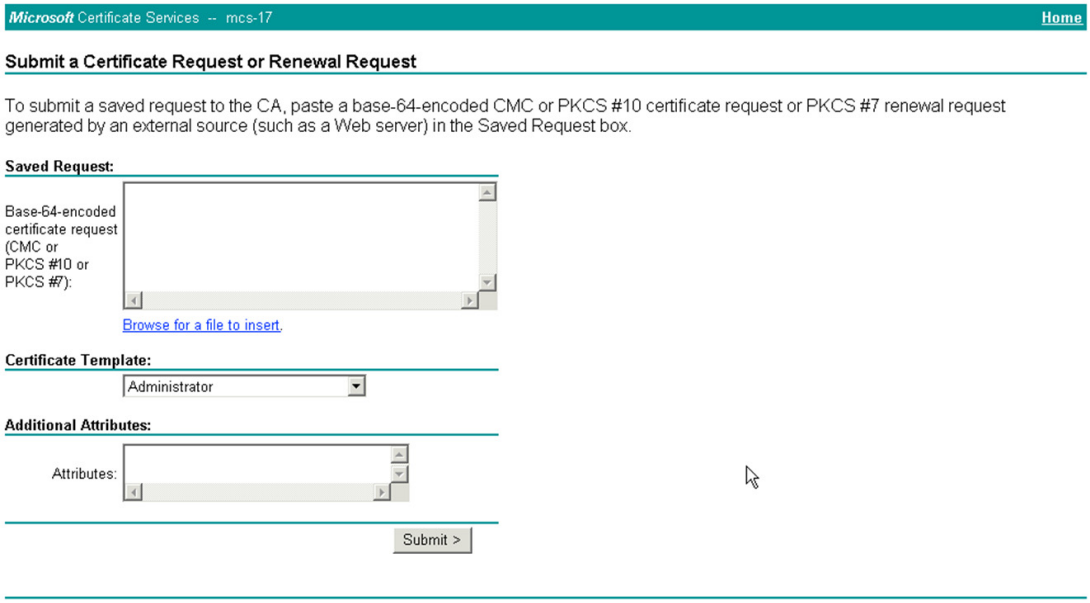
The Advanced Certificate Request screen appears, as shown in Figure 10.

Figure 10 Advanced Certificate Request Screen



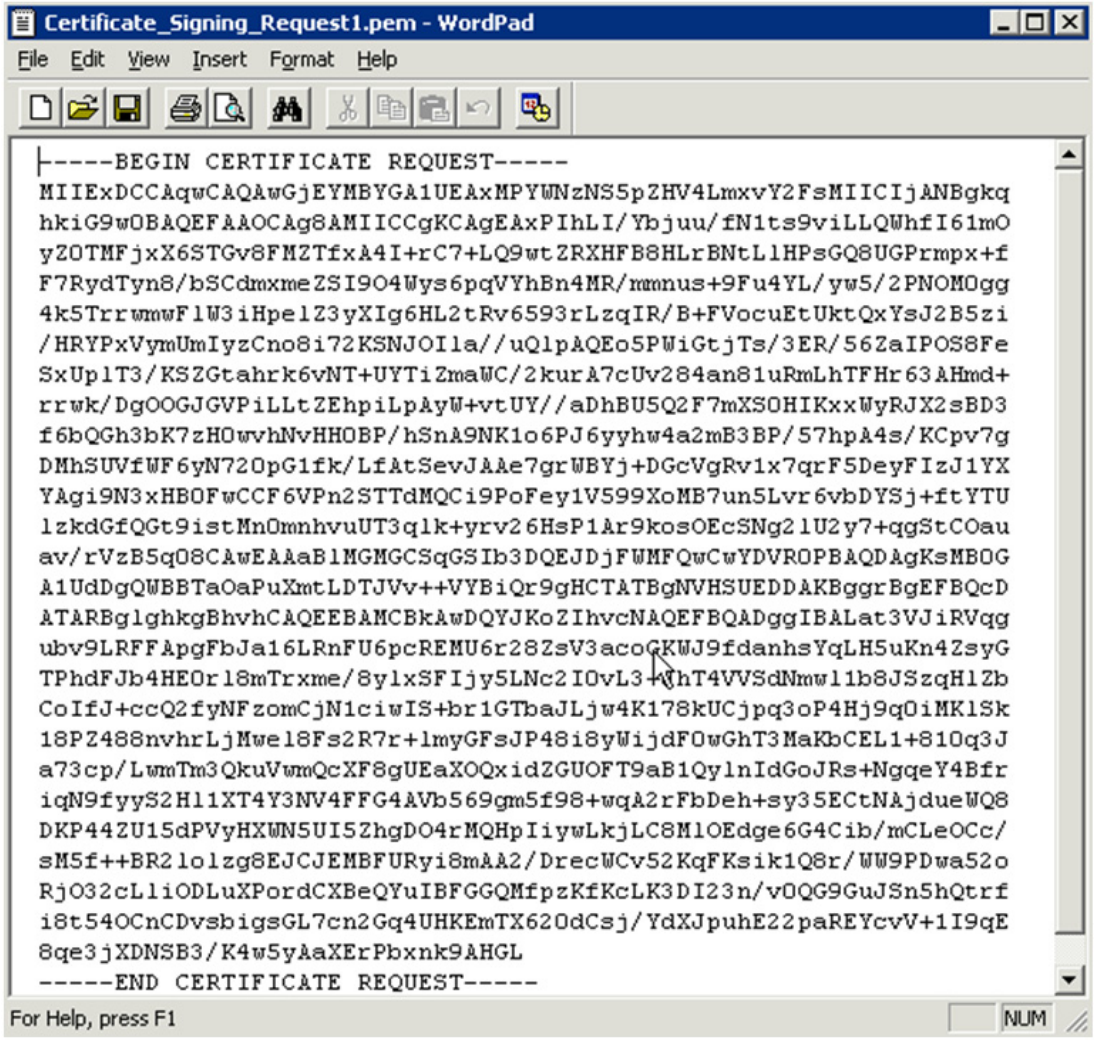
Submit a certificate request by using a base-64-encoded CMC or PKCS#10 file, or submit a renewal request by using a base-64-encoded PKCS#7 file (see Figure 11).

Figure 11 Submitting a Certificate Request



Step 10 Open the CSR you created from ACS in the previous step in a text editor (see Figure 12).

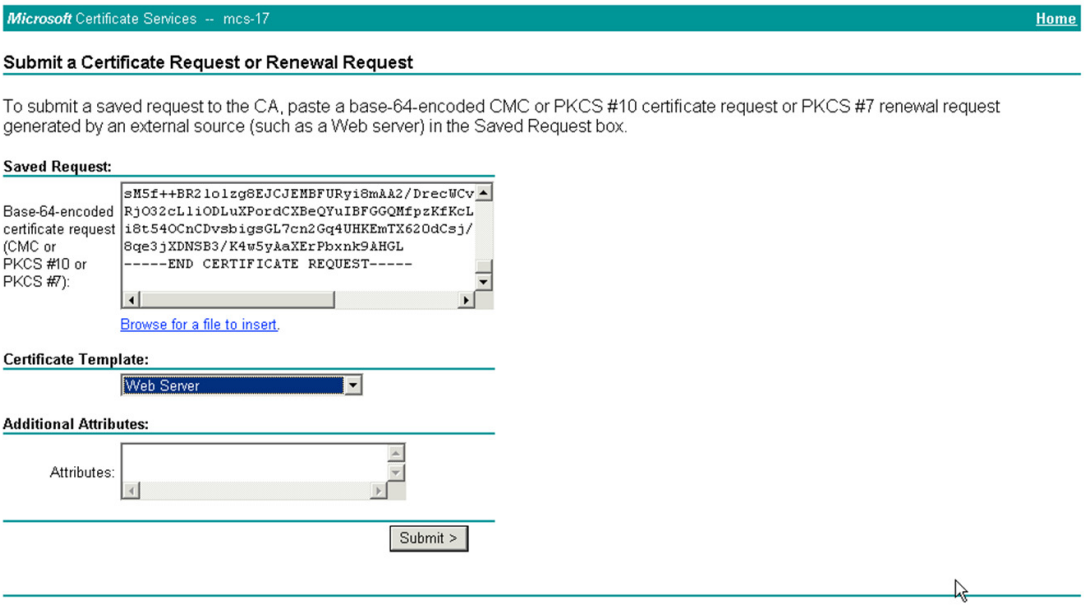
Figure 12 CSR Opened in a Text Editor



Step 11 Ensure that word wrap is not enabled and select all of the text.

Step 12 Paste the selected text into the CA window and click **Submit** (see Figure 13).

Figure 13 Submitting a Certificate Request (2)



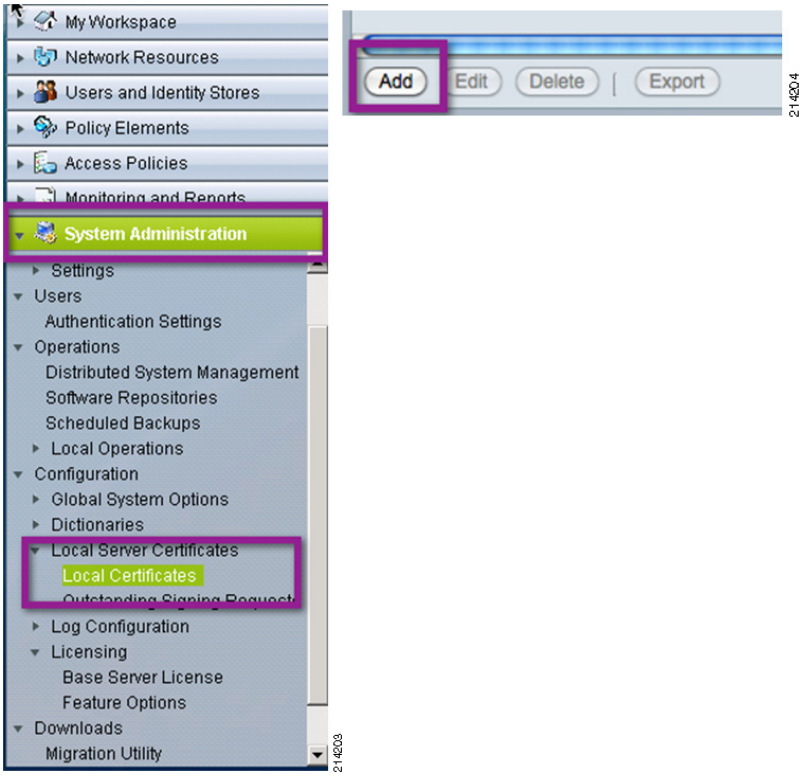
Step 13 Download your certificate on your local computer in DER format for importing into ACS; for example, **ca-cert-DER.cer** (see Figure 14).

Make a note of the filename and directory in which you saved it.

Figure 14 Certificate Issued

Step 14 To install the new certificate in the Cisco ACS 5.0 interface, go to **System Administration > Configuration > Local Server Certificates > Local Certificates** and select **Add** (see Figure 15).

Figure 15 Adding a New Certificate

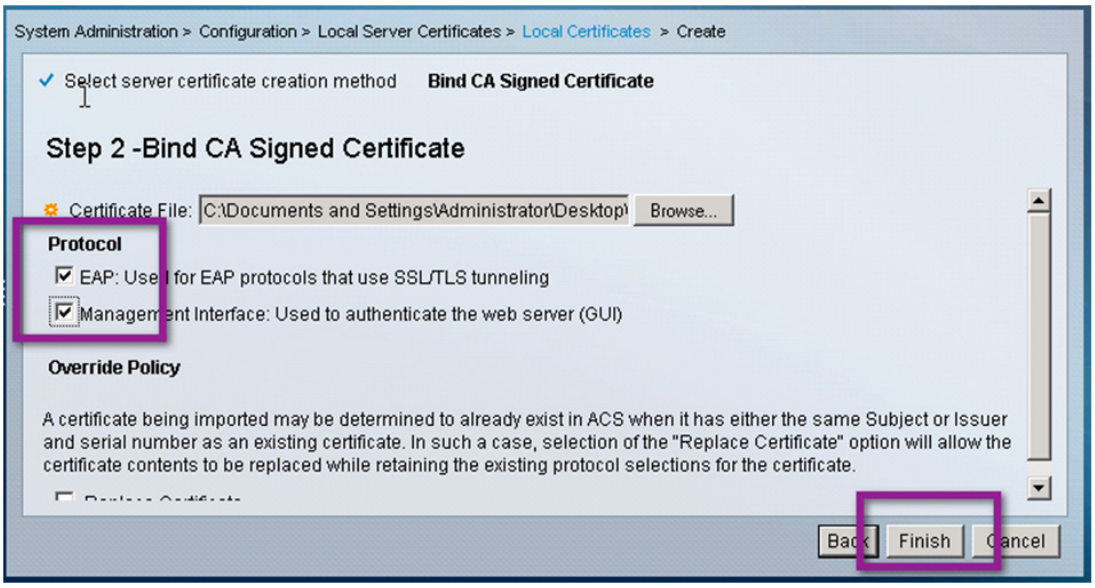


Step 15 Select the **Bind CA Signed Certificate** option and click **Next** (see Figure 16.)

Figure 16 Bind CA Signed Certificate Screen

Step 16 Browse, locate, and select the file you created earlier, and make sure to check both the **EAP** and **Management Interface** checkboxes (see Figure 17).

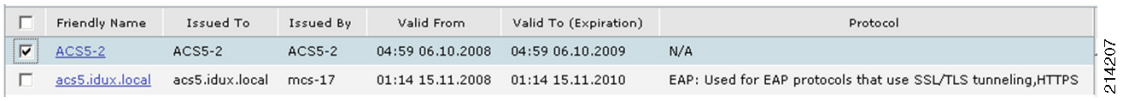
Figure 17 Step 2 - Bind CA Signed Certificate Screen



Step 17 Click **Finish**.

You should now see the new digital certificate successfully installed (see Figure 18), and you may delete the old self-signed certificate.

Figure 18 New Digital Certificate Installed



This completes the ACS certificate enrollment section.

Adding a Certificate Authority

To add a certificate authority, complete the following steps.

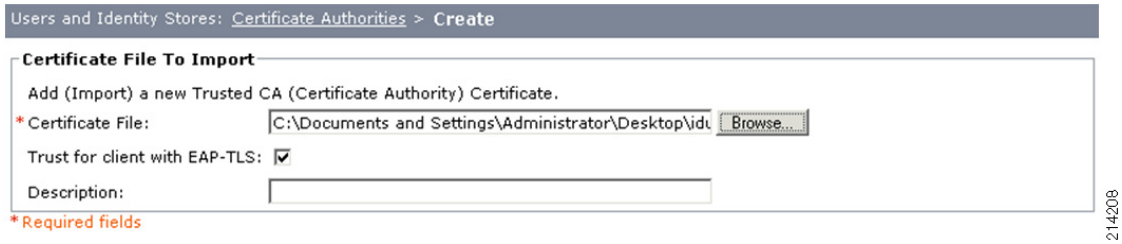
Procedure

Step 1 Go to **User and Identity Stores > External Identity Stores > Certificate Authorities** and click **Add**.

Step 2 In the Certificate File to Import screen, click **Browse** and select the .cer file of the root CA created previously.

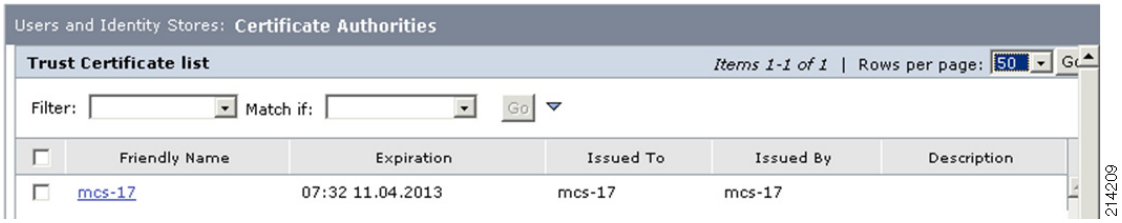
Step 3 Click **Open** and ensure that the **Trust for Client with EAP-TLS** checkbox is checked (see Figure 19).

Figure 19 Adding a Certificate Authority



Step 4 Click **Submit** and the new CA will be displayed in the Trust Certifcate List (Figure 20).

Figure 20 Trust Certificate List



Configuring Network Access Devices

To create an RADIUS entry for your access switch, complete the following steps.

Procedure

Step 1 Go to **Network Resources > Network Devices and AAA Clients.**

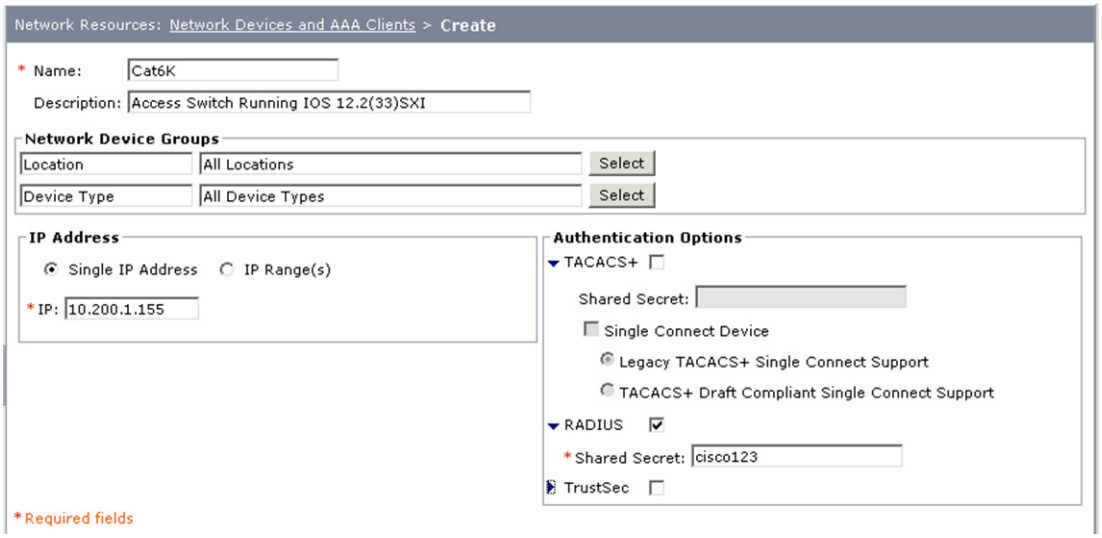
Step 2 Create an entry for RADIUS for your access switch (see Figure 21) by doing the following:

a. Provide a name and IP address that corresponds to your access switch.

b. Check the RADIUS box.

c. Provide a shared secret; this exercise uses *cisco123*.

Figure 21 Creating a RADIUS Entry for the Access Switch



Connecting to the Active Directory Domain

To connect to the Active Directory domain, complete the following steps.

Procedure

Step 1 Go to Users and **Identity Stores > External Identity Stores > Active Directory**, and do the following:

a. Enter the appropriate domain name; for example, **demo.local**.

b. Provide a username and password that allow you to connect to the domain; for example, **administrator/***yourpassword*.

Step 2 Click on the **Test Connection** button to validate joining the domain.

- If you get an error similar to the one shown in Figure 22, your clocks are not synchronized. In this case, go to the "Setting the Clock for the New Cisco ACS 5.x Appliance" section on page 23.

Figure 22 Connection Failed Message

- If you were successful, select **Save Changes** and move to the "Creating Identity Groups and Identity Store Sequences" section on page 25.

Note Clock synchronization is extremely important to Active Directory operations. Always use NTP where possible.

Setting the Clock for the New Cisco ACS 5.x Appliance

To set the clock on a new Cisco ACS 5.x appliance, complete the following steps.

Procedure

Step 1 Access the command-line interface on the ACS appliance and enter the administratively defined login credentials; for example, **admin/password** (see Figure 23).

Note You configured the password in the setup process of the ACS appliance.

Figure 23 Login Screen

Step 2 Determine the correct value for your timezone by typing the following command at the base prompt (not in global configuration mode) to display the available options.

```
ACS5-2/admin# show timezone
```

Step 3 Access global configuration mode by typing **conf t**.

Step 4 Type the clock timezone value (for example, **US/Pacific**) and press the **Enter** key.

Step 5 Use the following command to set your timezone:

```
ACS5-2/admin(config)# clock timezone <YOURTIMEZONE>
```

Step 6 At the Do you want to restart now? prompt, type **y**.

Step 7 Do one of the following:

a. To set the NTP server, from global configuration mode use the **ntp server <*server*>** command, as in the following example:

```
ACS5-2/admin(config)# ntp server time.cisco.com
```

b. To set the time, use the **clock set <***month day time year***>** command, as in the following example:

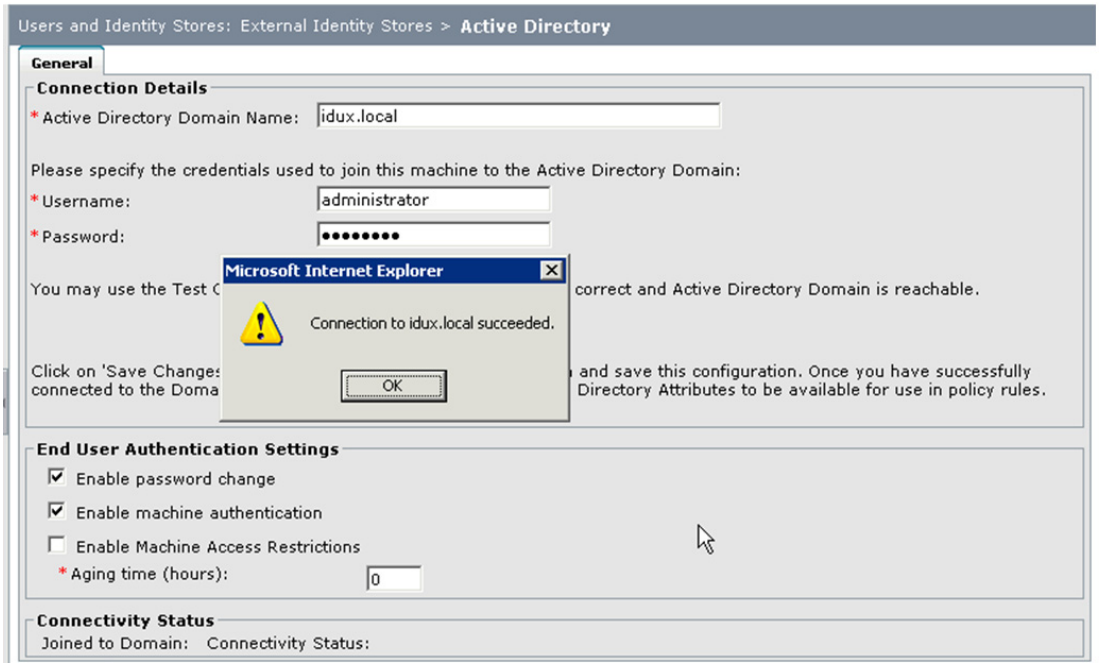
```
ACS5-2/admin# clock set Jun 24 14:27:00 2011
```

Your ACS appliance should now have the same timezone, time, and date as your Active Directory domain controller.

Step 8 Go back into the Cisco ACS web interface and finish your Active Directory setup.

If you had to adjust the timezone, date, and time, go back to the previous step and set up your Active Directory as an external identity store. When you are complete, you should now be able to establish a connection with the active directory, as shown in Figure 24.

Figure 24 Successful Connection to the Active Directory



Creating Identity Groups and Identity Store Sequences

This section includes the following topics:

Creating Identity Groups

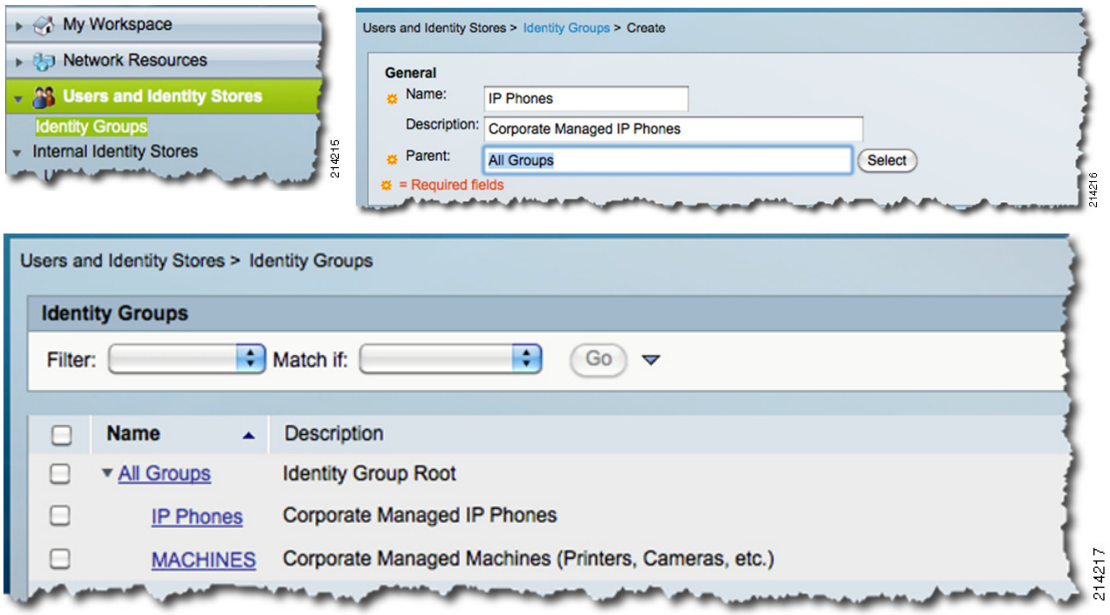
To create identity groups, complete the following steps.

Procedure

Step 1 Go to **Users and Identity Stores > Identity Groups** and select **Create**.

Step 2 Type in the name and description information and click **Submit** (see Figure 25).

Figure 25 Creating Identity Groups



Step 3 Repeat for the next group.

Note It is not necessary to create any internal identity stores as a host for MAB in monitor mode. These are added in the next phase. which is low impact mode.

Creating Identity Store Sequences

The identity store sequence allows you to add multiple identity stores to an access service. It attempts each identity store in the sequence, which is extremely flexible. This allows having users such as IP phones, temporary users, admin users, and so on, to be internally defined in ACS without having to add them to the corporate Active Directory or other external LDAP database.

To create identity store sequences, complete the follow steps.

Procedure

Step 1 Go to **User and Identity Stores > Identity Store Sequences** and select **Create**.

Step 2 In the window shown in Figure 26, do the following:

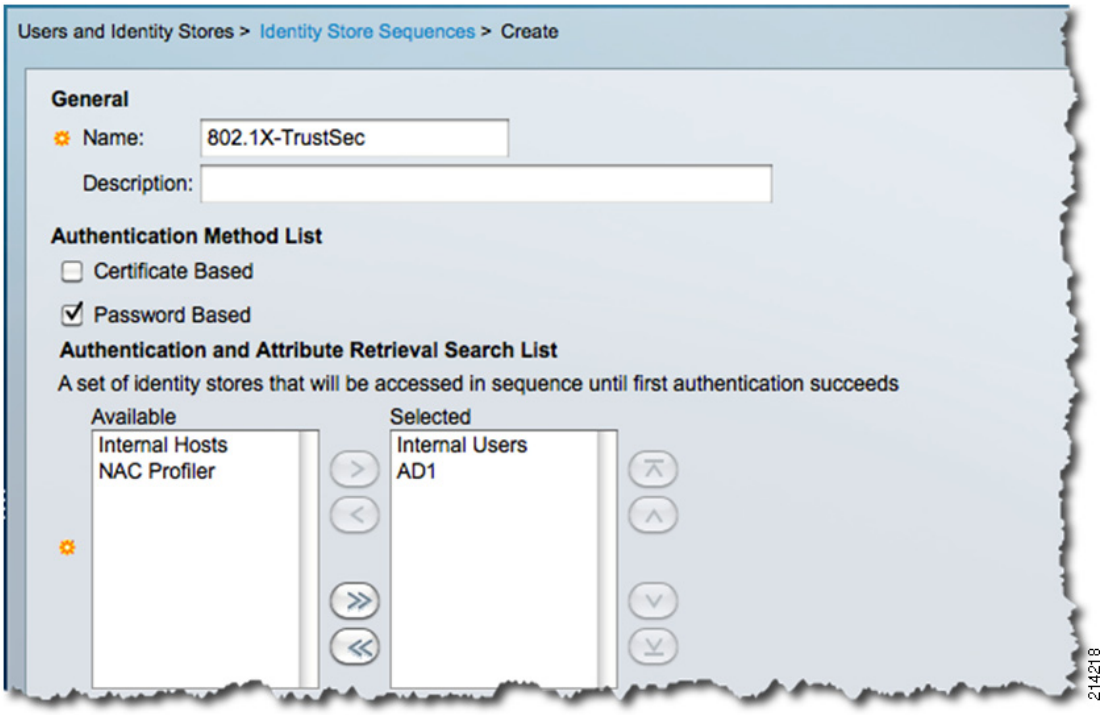
a. Type the name **802.1X-TrustSec**.

b. Type a description and select **Internal Users** and **AD1**.

c. Click **Submit**.

This is used later in the 802.1X access service.

Figure 26 Creating Identity Store Sequences



Using Policy Elements

This section describes the configuration of policy elements. It includes the following topics:

Note You do not need to create any authorization profiles for monitor mode because the port allows *all* traffic to flow, regardless of whether the endpoint successfully authenticates or not. You are only monitoring in this mode.

Creating Access Policies

For this guide, two new access services are created: one for 802.1X, and one for MAC Authentication Bypass (MAB).

Complete the following steps.

Procedure

Step 1 Go to **Access Policies > Access Services** and select **Create**.

Step 2 In the window shown in Figure 27, do the following:

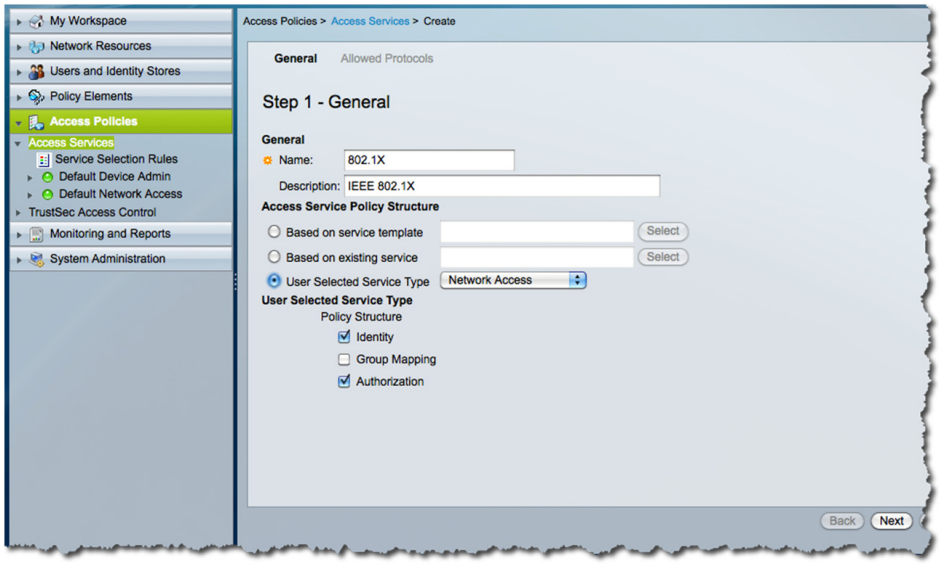
a. For the Name, type **802.1X**.

b. For the Description, type **IEEE 802.1X**.

c. Select **User Selected Policy Structure**.

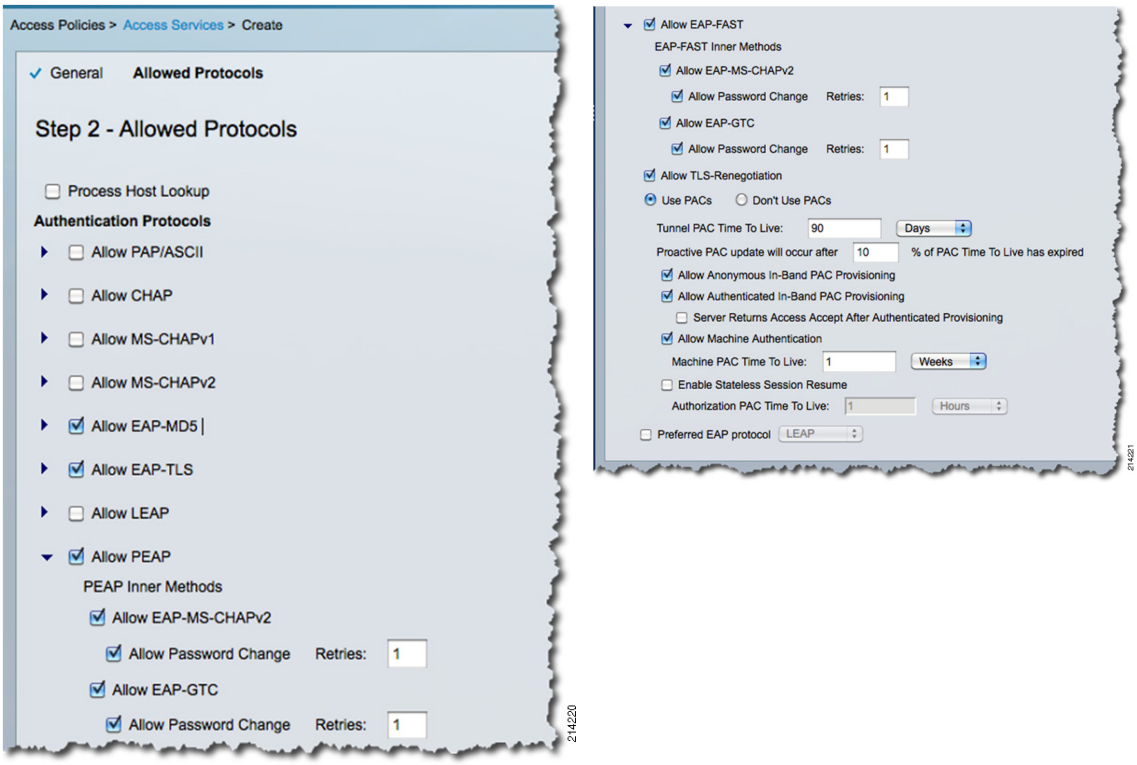
d. Click **Next**.

Figure 27 Creating Access Services—Step 1



Step 3 Select all of the check boxes shown in Figure 28 and click **Finish**.

Figure 28 Creating Access Services—Step 2



Note Decline any messages requesting you create matching Service Selection Rules. This is done in a later step.

Step 4 Select **Access Policies > Access Services** again.

Repeat the process above to create a new access service for MAB. The MAB service allows you to recognize network access requests, glean the MAC addresses, and record them in the AAA accounting logs. This helps you monitor and determine what devices, via their MAC addresses, are connecting to the network and where.

Step 5 Select **Create**.

Step 6 In the window shown in Figure 29, do the following:

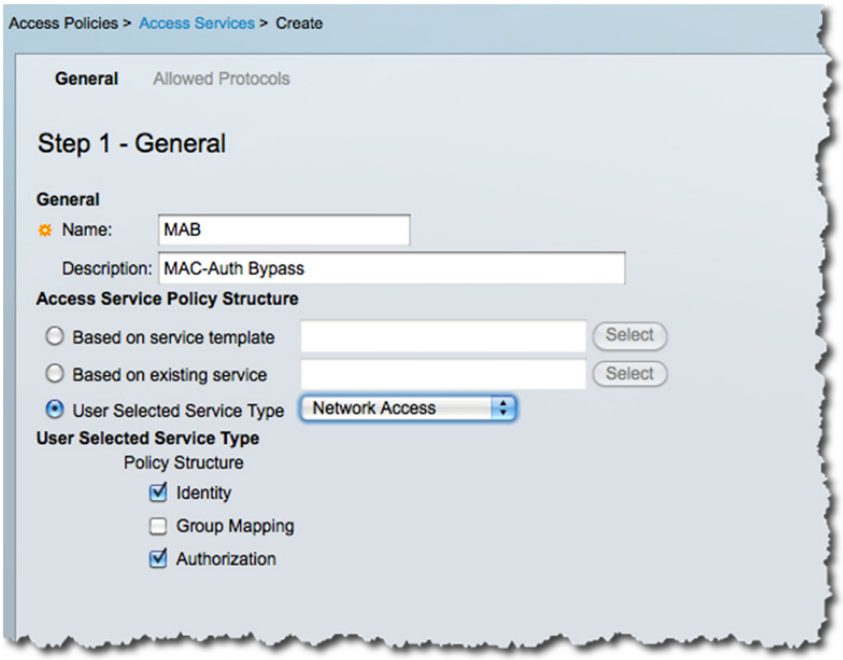
a. For the name, type **MAB**.

b. For the description, type **MAC-Auth Bypass**.

c. Select **User Selected Service Type**.

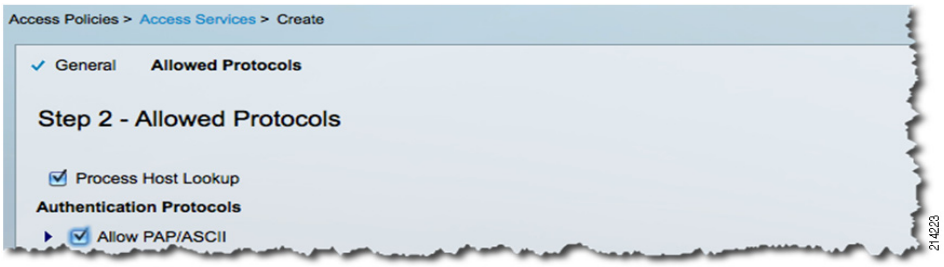
d. Accept the defaults and click **Next**.

Figure 29 Creating an Access Service for MAB—Step 1



Step 7 For MAB, select only **Process Host Lookup** and **Allow PAP/ASCII** (see Figure 30).

Figure 30 Creating an Access Service for MAB—Step 2



Step 8 Click **Finish**.

Note Decline any messages requesting you create matching Service Selection Rules. This is done in a later step.

Defining Identity Sources and Authorization Profiles

After creating the 802.1X and MAB Access Services, define their respective identity sources and authorization profiles by completing the following steps.

Procedure

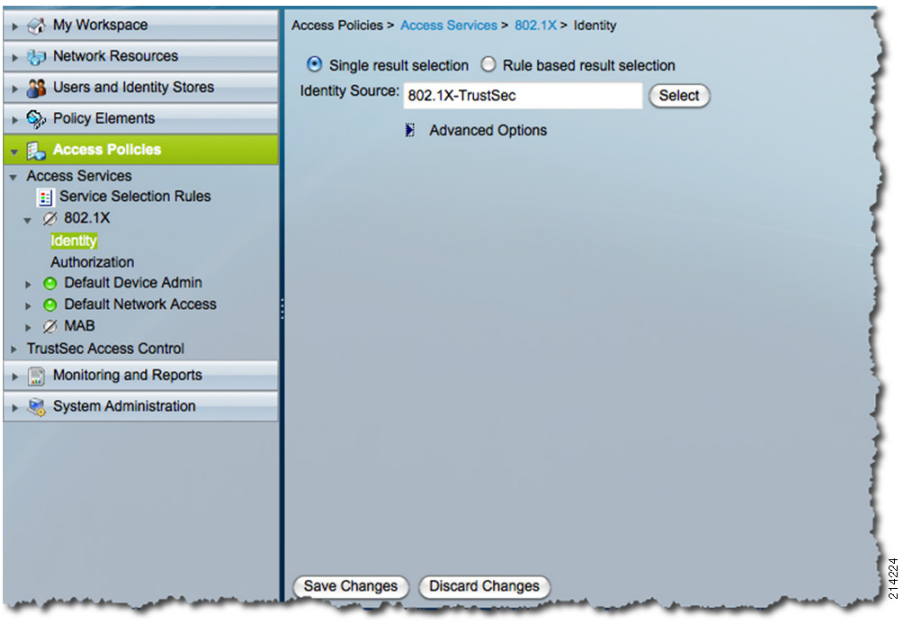
Step 1 From within **Access Policies > Access Services**, select the previously created **802.1X** access service.

Step 2 Use the drop-down arrow to select **Identity** to set up the Identity Source.

Step 3 For 802.1X, specify **802.1X-TrustSec** (see Figure 31).

This is the Identity Store Sequence you created previously, which contains both Active Directory and the internal database.

Figure 31 Setting up the Identity Source

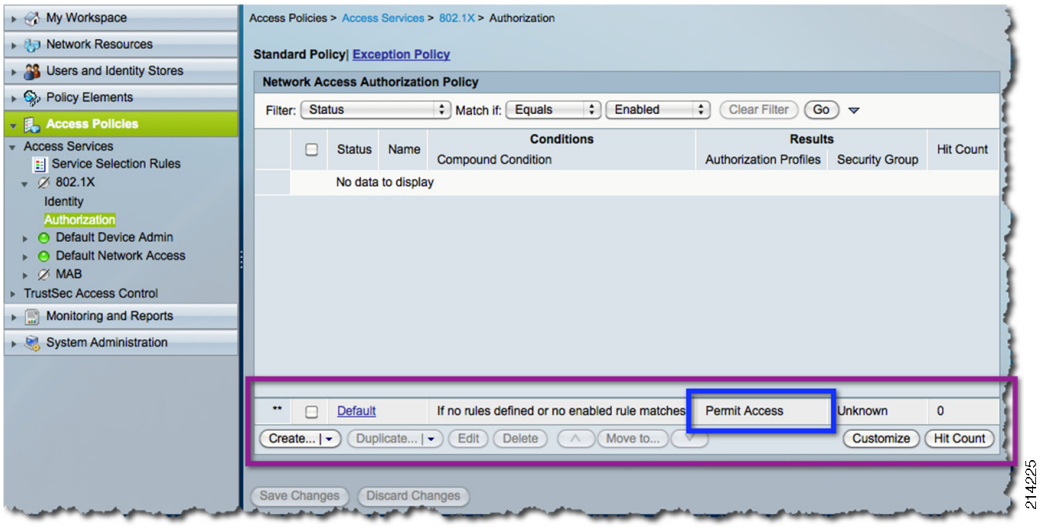


Step 4 Accept the defaults and click **Save Changes**.

Step 5 Select **Authorization** under the 802.1X Access Service.

Step 6 In the window shown in Figure 32, for Monitor Mode, accept the Default Policy Rule for both 802.1X and MAB Access Services, which is **Permit Access**.

Figure 32 Authorization



Creating Service Selection Rules

In this section, you create two service selection rules: one for 802.1X and a second for MAB. Service selection is a means for Cisco ACS to identify an access service request and associate it with the proper administratively defined access service such as 802.1X, MAB, TACACS+, and so on. This allows for the specialized handling of different types of service requests, as listed in Table 3.

Table 3 Service Selection Rules

Service Selection Rule Name	Compound Expression				Result Service
	Dictionary	Attribute	Operator	Value	
Match-802.1X	RADIUS-IETF	Service-Type	Match	Framed	802.1X
Match-MAB	RADIUS-IETF	Service-Type	Match	Call-Check	MAB

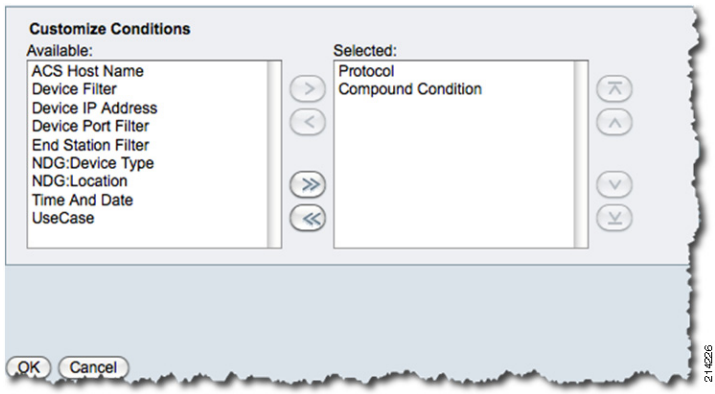
Complete the following steps.

Procedure

Step 1 Go to **Access Policies > Service Selection Rules**.

Step 2 Select the **Customize** button from the lower right corner and make sure **Compound Condition** is selected (see Figure 33).

Figure 33 Customize Conditions Screen



Step 3 Click **OK**.

Step 4 Select **Create.**

Step 5 In the windows shown in Figure 34, do the following:

a. For the Name, type **Match-802.1X**.

b. Select the **Protocol** checkbox.

c. Select **RADIUS**.

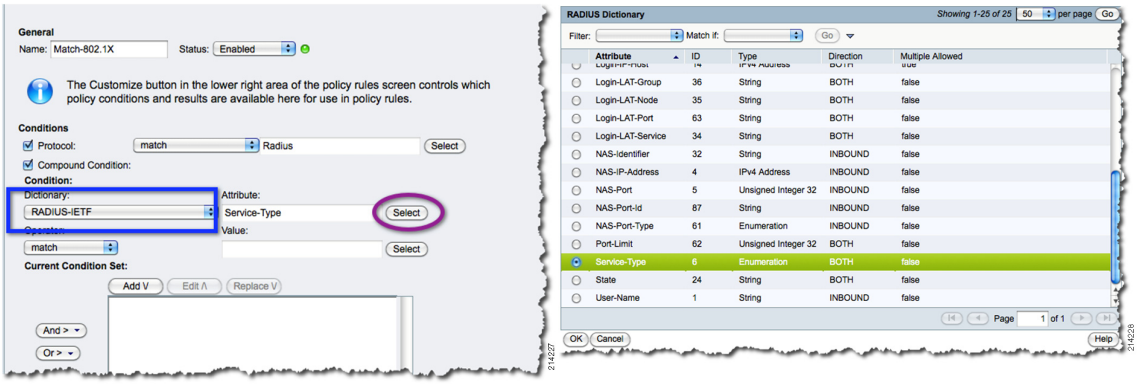
d. Select the **Compound Conditions** checkbox.

e. Select **RADIUS-IETF** from the dictionary drop-down box.

f. Click the **Select** button to select **Service-Type** for the Attribute.

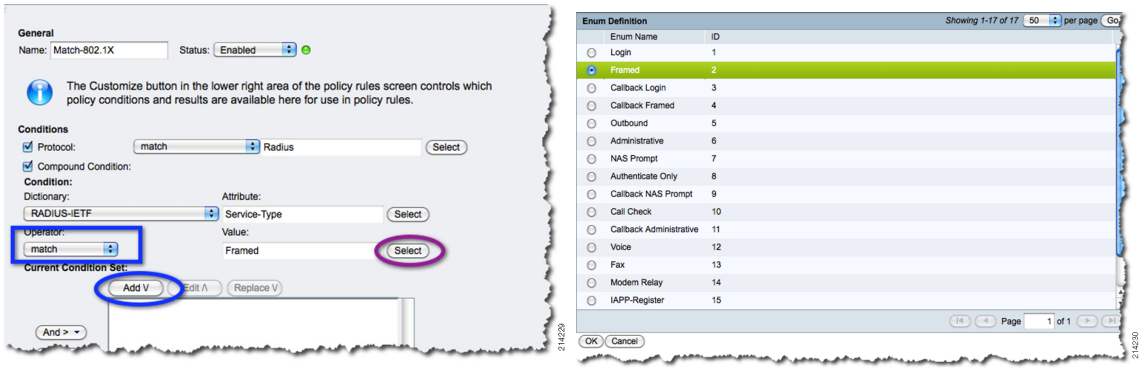
g. Click **OK**.

Figure 34 Creating the Service Selection Rule (1)



Step 6 From the Operator drop-down menu, Select **match** and Select Framed for the value (see Figure 35).

Figure 35 Creating the Service Selection Rule (2)



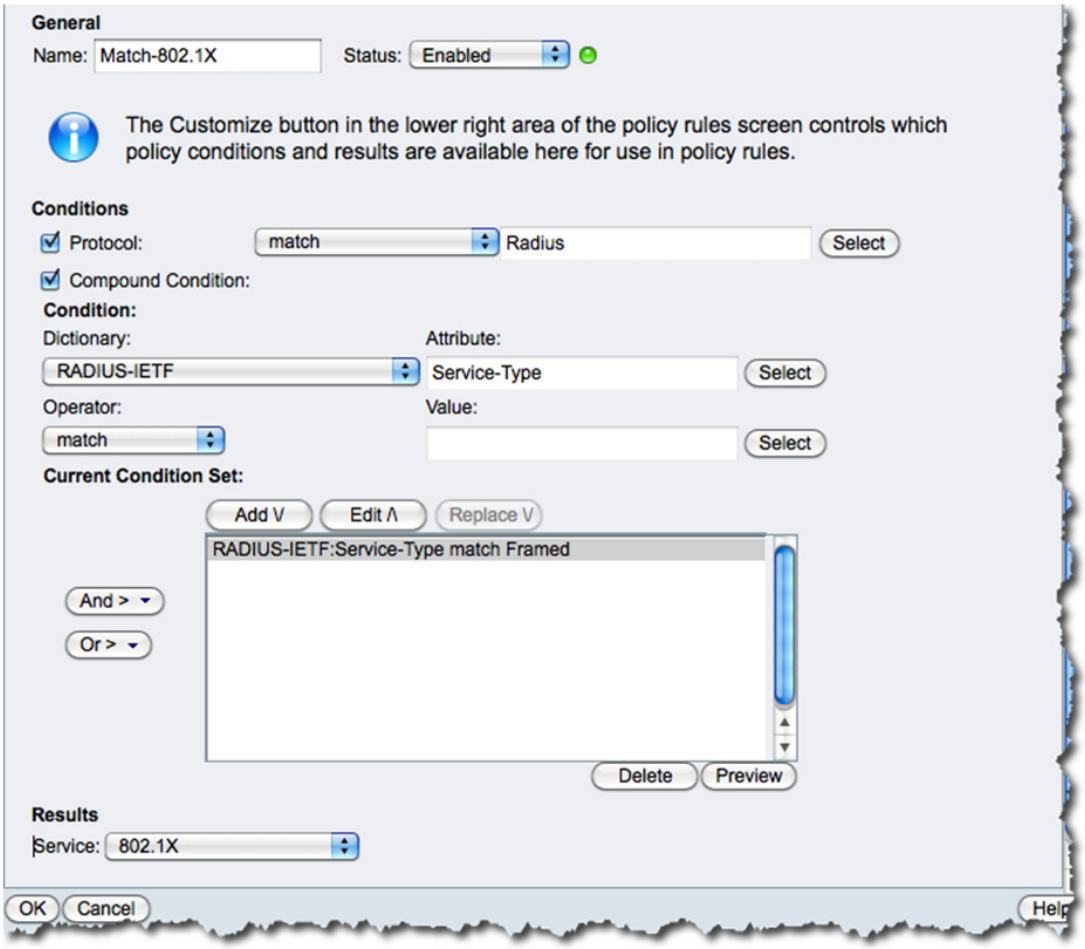
Step 7 In the window shown in Figure 36, do the following:

a. Select **Add V**.

b. In the Service drop-down menu under Results, select **802.1X**.

c. Click **OK**.

Figure 36 Creating the Service Selection Rule (3)



You now see the newly created service selection rule *Match-802.1X*.

Step 8 Select **Save Changes** to save the changes.

Step 9 To create the MAB service selection rule, select **Create**.

Step 10 In the window shown in Figure 37, do the following:

a. Give this rule the name of **Match-MAB**.

b. Select the **RADIUS** protocol.

c. In the Compound Condition section, select **RADIUS-IETF** from the Dictionary drop-down menu.

d. Click the **Select** button to select **Service-Type** for the Attribute value.

e. Click **OK**.

f. Select **match** from the Operator drop-down menu.

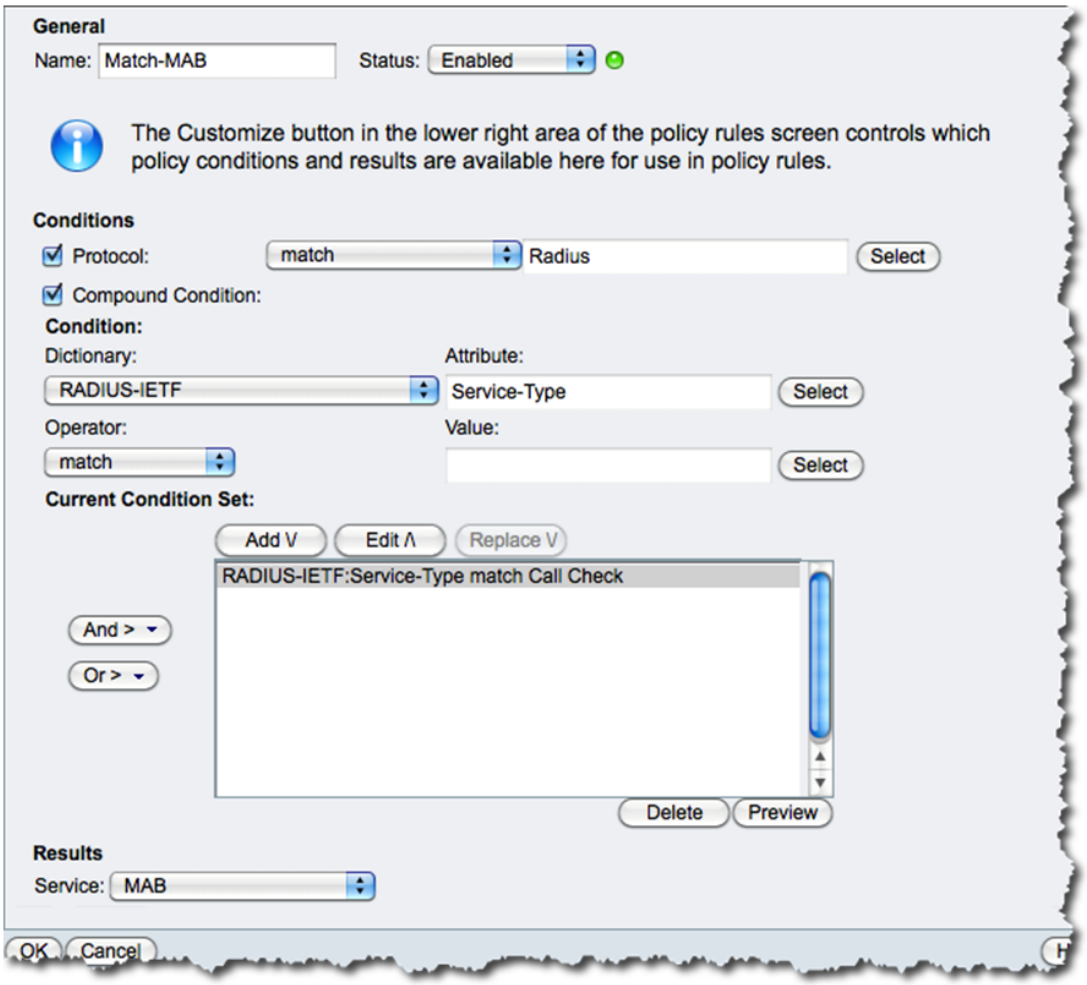
g. For the value, click the **Select** button and select **Call-Check** and then **OK**.

h. Select **Add V**.

i. From the Service drop-down menu in the Results section, select **MAB**.

j. Click **OK** and then **Save Changes**.

Figure 37 Creating the MAB Service Selection Rule



Configuring the Access Switch

This section describes the configuration of the access switch. It includes the following topics:

- Configuring Global Identity Settings, page 34
- Configuring Monitor Mode on the Switch Port, page 35

Configuring Global Identity Settings

Configure the global identity commands on the switch to enable TrustSec by using the following commands as a guide:

- AAA settings:

```
! Enable AAA
aaa new-model
```

```
! Create an 802.1X port-based authentication method list
aaa authentication dot1x default group radius

! Required for VLAN/dACL assignment
aaa authorization network default group radius

! Enables 802.1X Accounting and MAB
aaa accounting dot1x default start-stop group radius
```

- RADIUS settings:

```
! Define the Radius Server and establish the ports to use.
! The test keyword will proactively check that the RADIUS server (ACS 5) is still
responding.

radius-server host [ACS_Server_IP_Address] auth-port 1645 acct-port 1646 test username
test-radius


! Define the Shared-Secret to be used between ACS & the Switch.
! This must match what was entered in ACS.

radius-server key [user-defined-shared-key]

! ensure your RADIUS traffic is always sourced from the ip address entered in the
RADIUS server.
ip radius source-interface [interface_name]

! create the user in Global Config for the RADIUS server Test.
username test-radius password 0 cisco123
```

- Globally enable 802.1X authentication:

```
dot1x system-auth-control
```

There are additional features to consider before going into production, such as Inaccessible Authentication Bypass, also known as Critical Auth. For instructions on Inaccessible Authentication Bypass, as well as other identity features, see the following URL: http://www.cisco.com/en/US/docs/switches/lan/catalyst6500/ios/12.2SX/configuration/guide/dot1x.html#wp1054805

Configuring Monitor Mode on the Switch Port

To configure monitor mode on the switch, add the following TrustSec settings to the access ports:

```
! Enter the range of interfaces to apply the port configuration to
interface range g2/1-16

! Enable pre-authentication open access (non-restricted)
 authentication open

! Enable port-based Authentication on the Interface
 authentication port-control auto

! Enable 802.1X Authentication on the Interface
 dot1x pae authenticator

! Enable MAC-Auth Bypass on the Interface
 mab

! Enable multiauth Mode
 authentication host-mode multi-auth
```

```
! multiauth Allows a single IP phone and one or more data clients to independently
authenticate
! on an authorized port.  Each host, or MAC Address, is authenticated individually.
```

Note This is not an extensive list of the identity feature set, but just those necessary for the enabling of monitor mode for the purposes of this guide.

Verifying Monitor Mode

Now that you have enabled the global settings in Cisco ACS and on the switch, as well as the port-specific configuration to enable TrustSec monitor mode, run the validation steps described in this section to verify proper operation.

This section includes the following topics:

Verifying Access Switch-to-Cisco ACS Server Communication

Access the switch console and ping the IP address of your Cisco ACS server.

Note This is an optional step because you should have already validated communications during the Cisco ACS configuration steps earlier.

Verifying Authenticator-to-Authentication Server Communication

This validation exercise verifies that the switch is sending RADIUS messages for those hosts attempting to authenticate to those ports where you have enabled monitor mode. The easiest way to verify this is to check the accounting logs on the Cisco ACS server. Because you are in monitor mode, you should see failed authentication attempts from hosts.

Complete the following steps.

Procedure

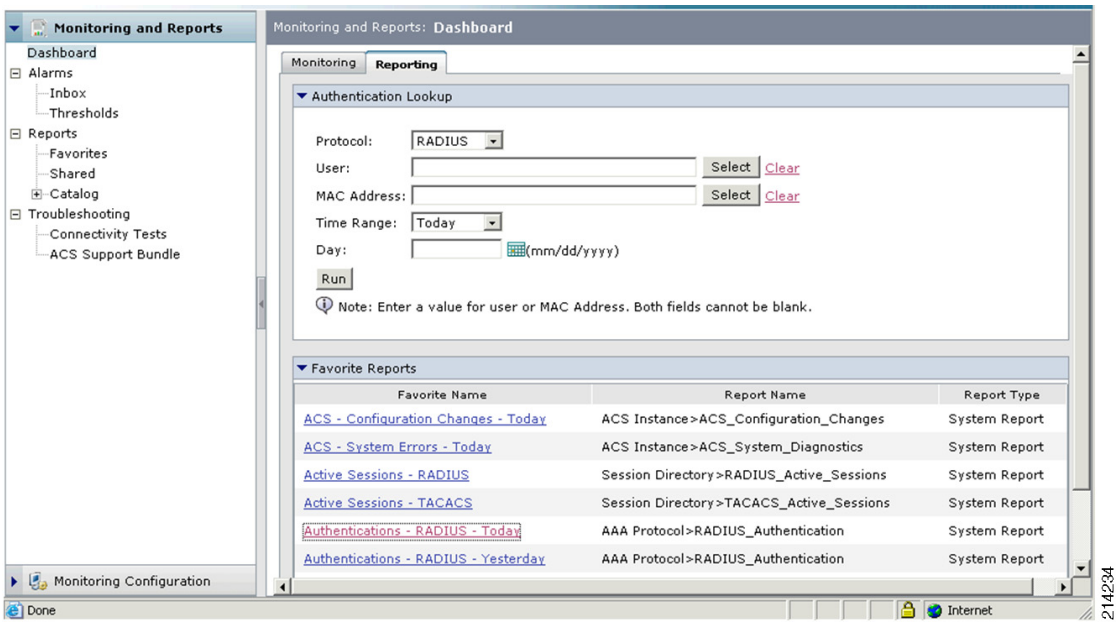
Step 1 From within the Cisco ACS web interface, select **Monitoring and Reports** (see Figure 38).

Figure 38 Monitoring and Reports Screen

Step 2 Select **Launch Monitoring & Report Viewer**.

Depending on your browser behavior settings, either a new browser window or tab within the existing browser window is launched (see Figure 39).

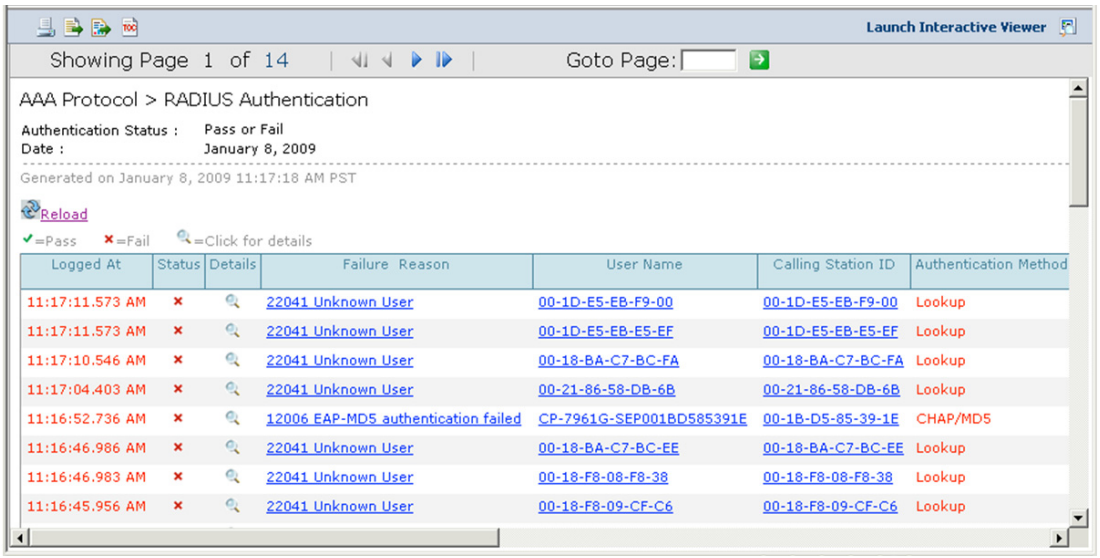
Figure 39 Monitoring and Reports Dashboard



Step 3 From within the Monitoring and Report view screen, select **Authentications – RADIUS – Today** from the Favorite Reports section.

You should see failed authentication attempts, as shown in Figure 40. However, remember that because you are in monitor mode and using the Open Access Cisco IOS Software feature, those hosts still have full network access.

Figure 40 Failed Authentication Attempts



Verifying that the Cisco ACS Server Can Communicate with the AD Domain Controller

Access a command-line prompt on the ACS server and ping the IP address of your Microsoft AD Controller.

Note This is an optional step because you should have already validated communications during the Cisco ACS configuration steps earlier.

Verifying Host Network Connectivity and Network Services

Now that you have enabled 802.1X and MAB in Open Mode, once again verify that the hosts connected to these ports still have network access as they did before enabling these TrustSec features.

Complete the following steps.

Procedure

Step 1 Access the switch console perform the following:

```
conf t
 int range f2/1-16 (or the range of ports you configured)
  shut
  no shut
end
```

Notice the console messages on your terminal showing 802.1X and MAB authentication attempts and failures as shown in Figure 41. This is normal output. Depending on the authentication order commands, the switch ports first attempt 802.1X and then MAB, because these are the two TrustSec features you enabled.

Figure 41 Console Message Output

```
*Jan  8 11:53:43.383: %AUTHMGR-5-START: Starting 'dot1x' for client (0018.f809.cfc6) on Interface Fa2/1
id-4503-2#
*Jan  8 11:53:47.547: %AUTHMGR-5-START: Starting 'dot1x' for client (0018.bac7.bcee) on Interface Fa2/12
*Jan  8 11:53:48.323: %AUTHMGR-5-START: Starting 'dot1x' for client (0021.8658.db6b) on Interface Fa2/12
id-4503-2#
*Jan  8 11:53:48.647: %AUTHMGR-5-START: Starting 'dot1x' for client (0018.f808.f838) on Interface Fa2/13
id-4503-2#
*Jan  8 11:53:54.751: %AUTHMGR-5-START: Starting 'dot1x' for client (0018.bac7.bcfa) on Interface Fa2/13
id-4503-2#
*Jan  8 11:53:58.831: %AUTHMGR-5-START: Starting 'dot1x' for client (001b.d585.391e) on Interface Fa2/16
id-4503-2#
*Jan  8 11:54:12.859: %AUTHMGR-5-START: Starting 'dot1x' for client (001d.e5eb.f900) on Interface Fa2/11
*Jan  8 11:54:13.239: %AUTHMGR-5-START: Starting 'dot1x' for client (001d.e5eb.e5ef) on Interface Fa2/8
id-4503-2#
*Jan  8 11:54:31.603: %AUTHMGR-5-START: Starting 'dot1x' for client (001b.d585.391e) on Interface Fa2/16
*Jan  8 11:54:31.619: %DOT1X-5-FAIL: Authentication failed for client (001b.d585.391e) on Interface Fa2/16
id-4503-2#
*Jan  8 11:54:31.619: %AUTHMGR-7-RESULT: Authentication result 'fail' from 'dot1x' for client (001b.d585.391e) on Interface Fa2/16
id-4503-2#
*Jan  8 11:55:00.615: %DOT1X-5-FAIL: Authentication failed for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.615: %AUTHMGR-7-RESULT: Authentication result 'no-response' from 'dot1x' for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.615: %AUTHMGR-7-FAILOVER: Failing over from 'dot1x' for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.615: %AUTHMGR-5-START: Starting 'mab' for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.623: %MAB-5-FAIL: Authentication failed for client (0018.f809.cfc6) on Interface Fa2/1
id-4503-2#
*Jan  8 11:55:00.623: %AUTHMGR-7-RESULT: Authentication result 'fail' from 'mab' for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.627: %AUTHMGR-7-FAILOVER: Failing over from 'mab' for client (0018.f809.cfc6) on Interface Fa2/1
*Jan  8 11:55:00.627: %AUTHMGR-7-NOMOREMETHODS: Exhausted all authentication methods for client (0018.f809.cfc6) on Interface Fa2/1
id-4503-2#
```

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However, because you have enabled *open mode*, connectivity should not be affected at all. To verify this, perform the following steps.

Step 2 To check the port authentication status on the switch for a given port, type the **show authentication session** command for a specific interface from your console connection to the switch.

For example, **show auth session int f2/1**. You should notice an output similar to the one shown in Figure 42, indicating that the host failed authentication where the status shows *Authz Failed*. You should also notice that the port attempted 802.1X and then failed over to MAB, both indicating they failed over.

Figure 42 Sample Status Output

```
id-4503-2>en
Password:
id-4503-2#show auth session int f2/1
            Interface:  FastEthernet2/1
          MAC Address:  0018.f809.cfc6
           IP Address:  10.200.10.201
               Status:  Authz Failed
               Domain:  DATA
      Oper host mode:  multi-auth
    Oper control dir:  both
     Session timeout:  N/A
        Idle timeout:  N/A
   Common Session ID:  0AC801800000000000000990C
     Acct Session ID:  0x00000002
              Handle:  0x1A000000

Runnable methods list:
       Method   State
       dot1x    Failed over
       mab      Failed over

id-4503-2#
```

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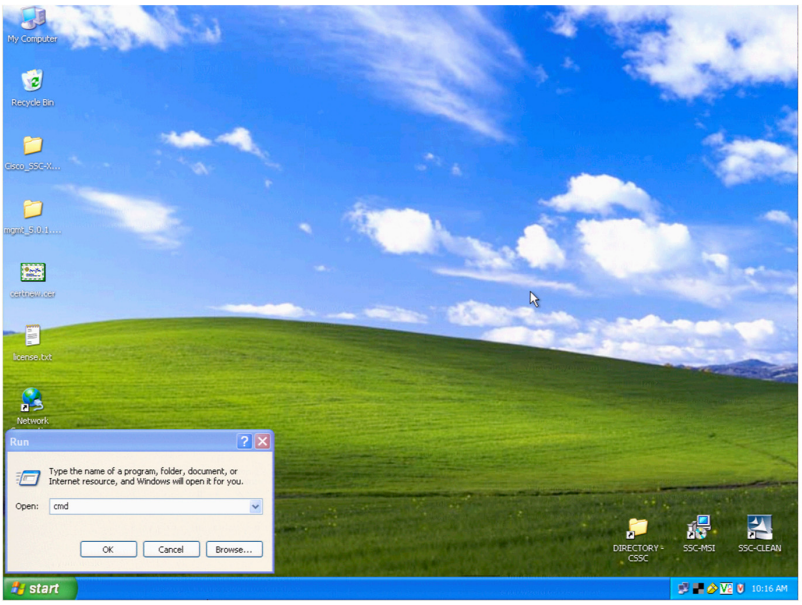
Step 3 To verify that there has been no disruption of network services for the hosts attached to this monitor mode-enabled switch/network, verify that DNS/DHCP is working using the **ipconfig** and **ping** commands on one of the PCs.

Step 4 From one of the PCs connected to the port for which you just verified the failed authentication from the previous exercise, access the command line dialogue.

For example, got to **Start > Run > CMD** and click **OK** (see Figure 43).

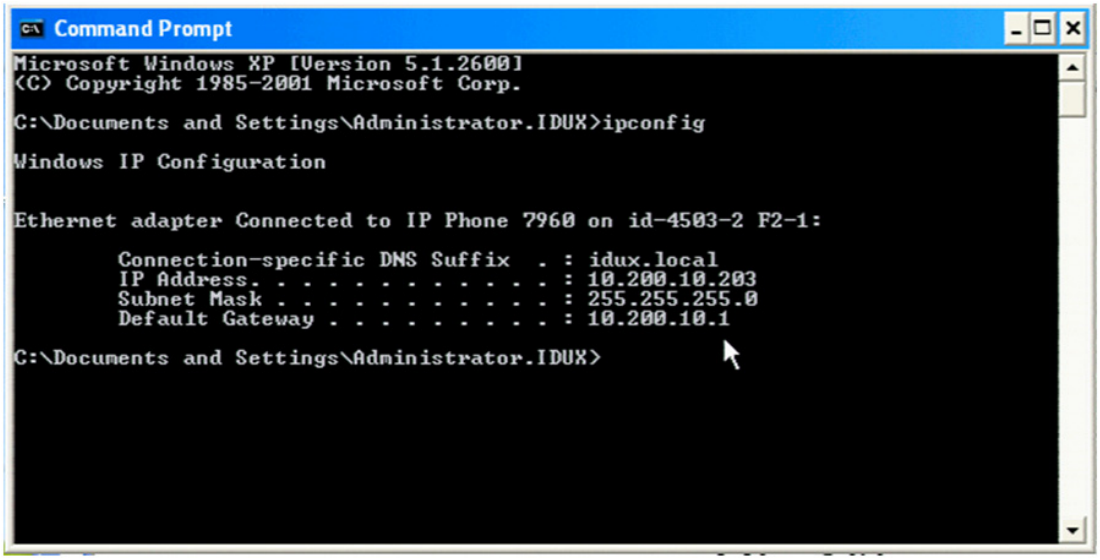
Figure 43 Accessing the Command Prompt



Step 5 From the command prompt, type **ipconfig**.

Your output should be similar to that shown in Figure 44. Notice the host has an IP address.

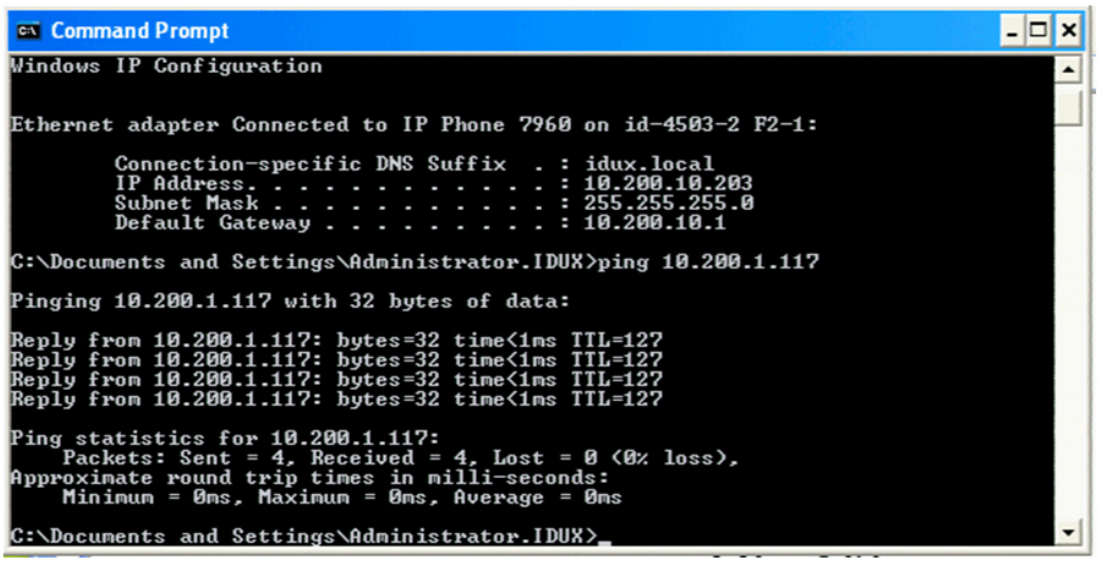
Figure 44 Sample ipconfig Output



Step 6 Verify network connectivity by typing **ping *<ip address>*.**

For example, type **ping 10.200.1.117** for the Microsoft AD Server, or use the IP address you assigned your AD server. Your output should be similar to that shown in Figure 45.

Figure 45 Verifying Network Connectivity



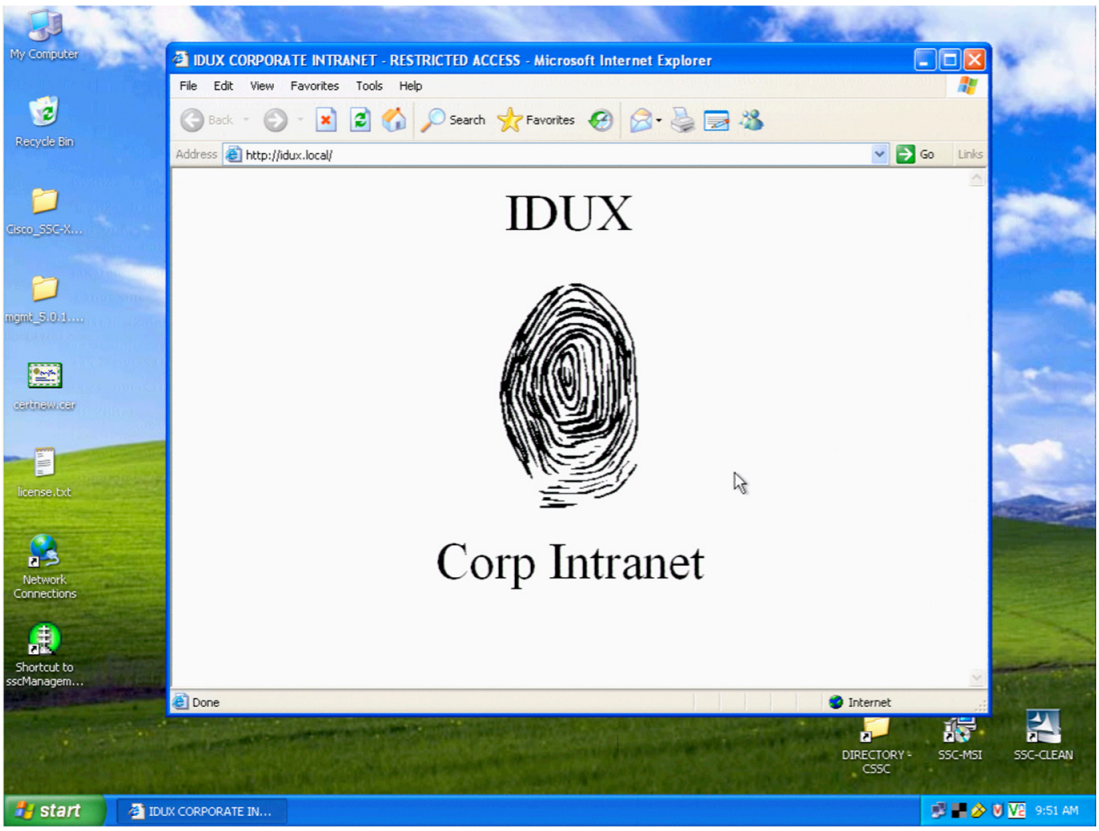
Step 7 Verify that the client PC can still join the AD domain by logging out and logging back into the Windows PC domain (see Figure 46).

Figure 46 Logging into Windows PC Domain

Step 8 Using the Windows Internet Explorer, verify that you can access the web server hosted on your network (see Figure 47).

This example uses a default page on the Windows AD Server.

Figure 47 Accessing the Web Server



Verifying that IP Phones are Working

Check to see that the IP phones have obtained IP addresses and verify that they have a dial tone, indicating they have associated with the Cisco Call Manager.

Verifying that Devices such as IP Cameras Work

To verify that your IP cameras work, complete the following steps.

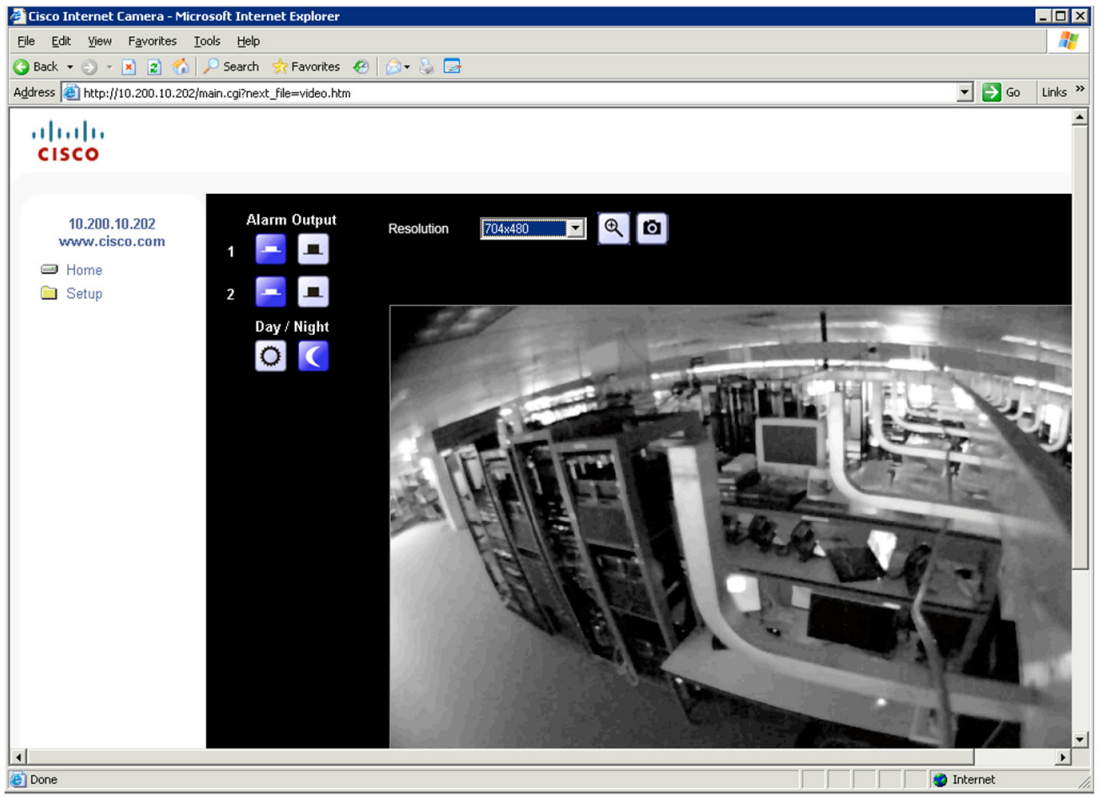
Procedure

Step 1 Using Internet Explorer, browse to the IP address of one of your Cisco MediaNet IP Video Cameras; for example, **http://10.200.10.202**.

Step 2 When prompted for login credentials, enter **admin** for the username and **Cisco123** for the password.

After you have authenticated, you see whatever your camera is viewing (see Figure 48). You may need to adjust the focus ring to focus the video.

Figure 48 Accessing the IP Camera



Implementing Low Impact Mode

This section includes the following topics:

Low Impact Mode Overview

Low impact mode enables you to incrementally increase the security level by configuring an ingress port ACL on the Open Access TrustSec-enabled port. This provides basic connectivity for guests, contractors, and unauthenticated hosts while selectively limiting access to introduce a higher level of access security.

Additionally, differentiated access can be accommodated based on successful authentication and authorization by combining downloadable ACLs (dACLs) with the Cisco TrustSec-enabled port, which uses 802.1X, MAB, and/or WebAuth.

Combined with dACLs for successfully authenticated users and hosts, you can create profiles to grant or deny access to network resources based on need and your security policies, as shown in Table 4. This enables differentiated services while still maintaining secure network connectivity for legacy hosts.

Table 4 Profiles

Low Impact or Selective Access Mode			
Profile Name	**Description**	**VLAN**	**dACL**
Phone-Authz	Policy to map IP phones to voice VLAN	VOICE	CorpAssetACL
Managed-Asset-Authz	Policy to be applied to managed assets	n/a	CorpAssetACL
MediaNet-Authz	Policy for Cisco MediaNet endpoints	n/a	CorpAssetACL
CorpUser-Authz	Policy for valid AD authenticated Users	n/a	CorpUserACL
Contractor-Authz	Policy for short-term contractors	n/a	ContractorACL

Configuring Cisco ACS

This section includes the following topics:

Configuring Active Directory Groups

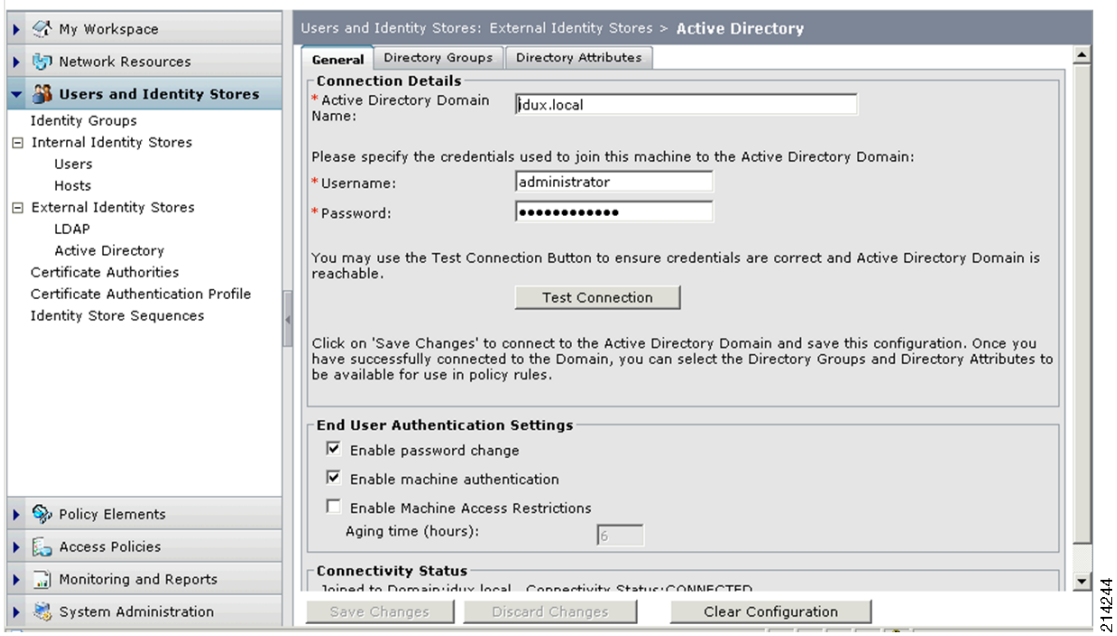
Before configuring policies, you need to select some Active Directory groups so they are available for subsequent steps.

Complete the following steps.

Procedure

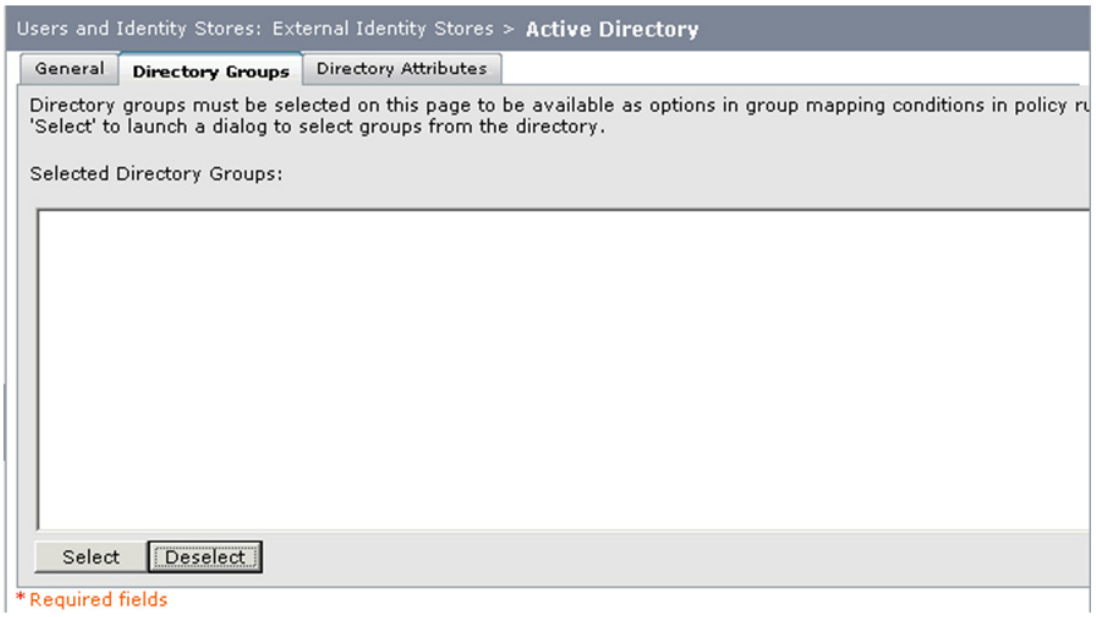
Step 1 Go to **Users and Identity Store > External Identity Stores > Active Directory** (see Figure 49).

Figure 49 Active Directory



Step 2 Select the **Directory Groups** tab (see Figure 50).

Figure 50 Active Directory—Directory Groups

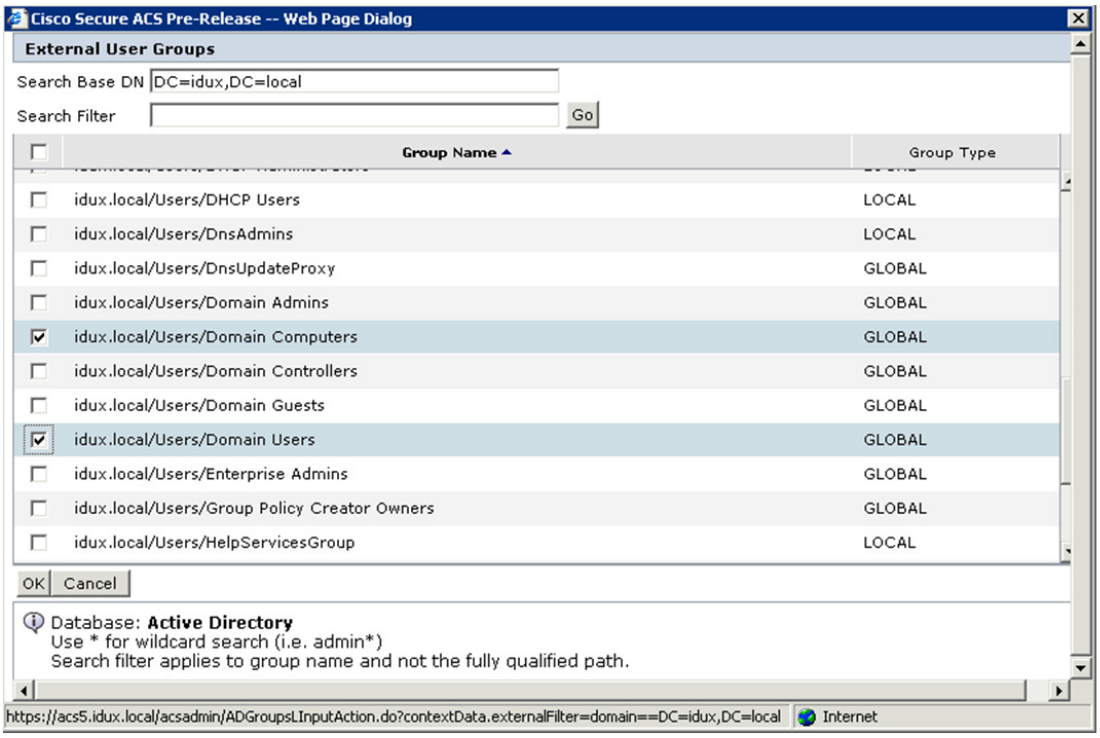


Step 3 In this window, do the following:

a. Click **Select.**

b. Scroll down and select **/Users/Domain Computers** and **/Users/Domain Users** (see Figure 51).

Figure 51 Selecting Group Names

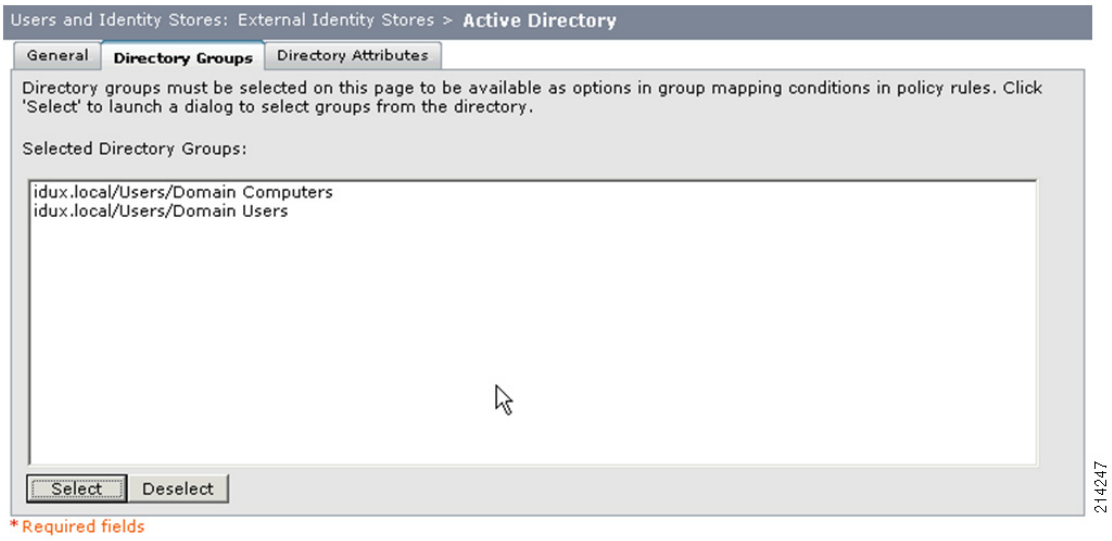


Note Your domain name will most likely be different than demo.local; for example, *yourcompany.com*.

c. Click **OK**.

The window shown in Figure 52 appears, showing the Directory Groups you selected.

Figure 52 Selected Directory Groups



Step 4 Click **Save Changes**.

Configuring ACS Policy Elements

This section describes how to create and/or modify the three ACS policy components listed in Table 5, which are linked together for the authorization policies.

Table 5 Three ACS Policy Components

ACS Component Type	Section within the ACS GUI	Comments
Downloadable ACLs (dACL)	Policy Elements > Authorizations and Permission > Named Permission Objects	Named ACLs that can be associated with different authorization profiles
Authorization profiles	Access Policies > Access Services > Named Access Service	Named profiles that allow you to provide different permission or policies to different groups
Authorization profiles	Policy Elements > Authorizations and Permission > Network Access	These authorization profiles are created within the access service; for example, 802.1X, MAB, and so on

This is an extensible approach that allows you to differentiate various types of request per access service, and to create and apply different policy based on groups.

The three dACLs listed in Table 6 will be used in the authorization profiles.

Note These are only sample ACLs. Consult with the InfoSec or Security staff of your organization to determine what is appropriate for your requirements.

Table 6 dACLs

Named dACL	ACE Permissions
CorpAssetACL	`permit icmp any any log` `permit ip any any`
CorpUserACL	`permit icmp any any log` `permit ip any any`

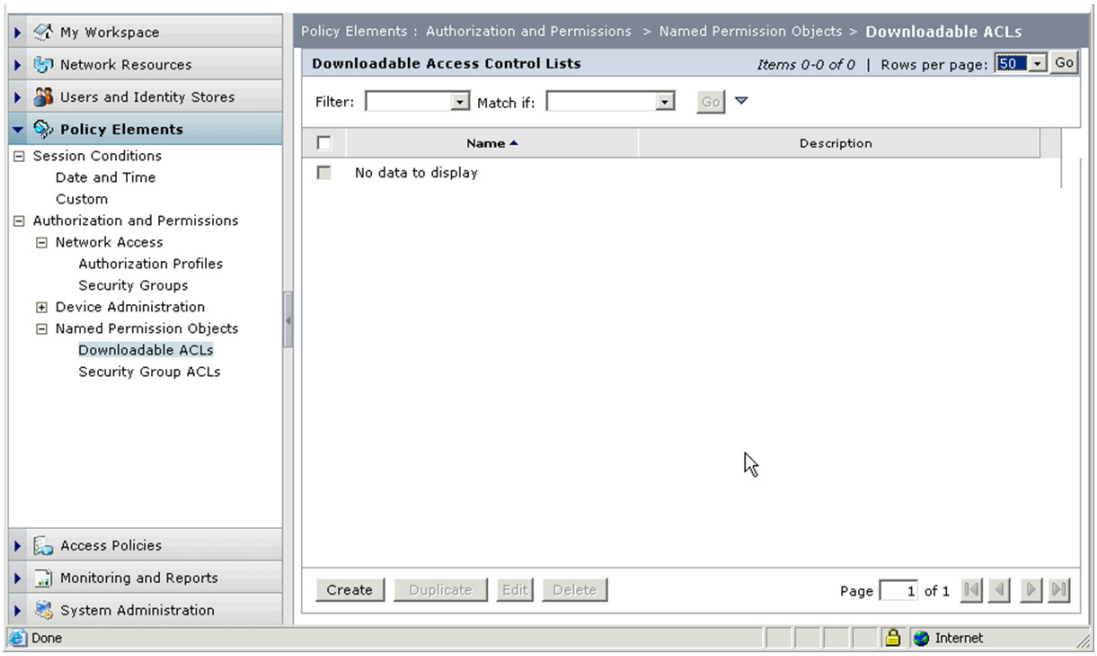
ContractorACL	`remark Allow DHCP`
	`  permit udp any eq bootpc any eq bootps`
	`remark Allow DNS`
	`  permit udp any any eq domain`
	`remark Allow access to internet`
	`  permit tcp any any eq www`
	`  permit tcp any any eq 443`
	`remark Allow IPSEC VPN`
	`  permit udp any any eq 62515`
	`  permit udp any any eq isakmp`
	`  permit udp any any eq 10000`
	`  permit udp any any eq 4500`
	`  permit esp any any`
	`  permit ah any any`

Complete the following steps.

Procedure

Step 1 To create the *CorpAssetACL* dACL, select **Policy Elements > Authorization and Permissions > Named Permission Objects > Downloadable ACLs** from the ACS web interface (see Figure 53).

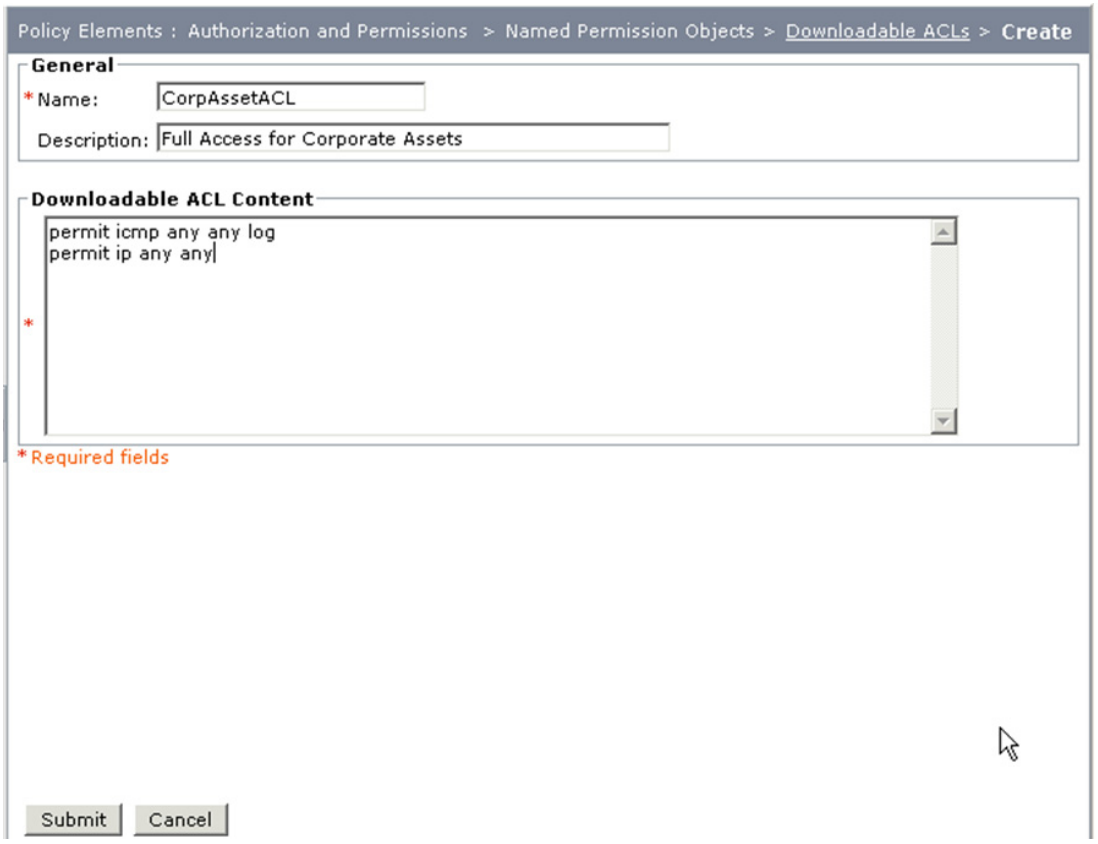
Figure 53 Downloadable Access Control Lists



Step 2 Select **Create**.

Step 3 In the window shown in Figure 54, enter the name, description, and the ACL permissions from Table 6 for the *CorpAssetACL* dACL.

Figure 54 Creating a dACL

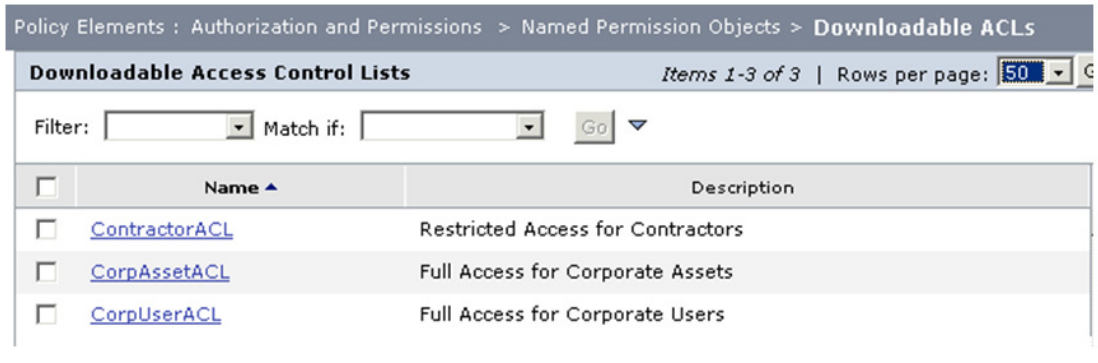


Step 4 Click **Submit**.

Step 5 Repeat the above steps to enter the *CorpUserACL* and *ContractorACL* dACLs.

After you have created all three dACLs, you should see the information shown in Figure 55 under the Downloadable ACLs section.

Figure 55 Three dACLs



Configuring Authorization Profiles

For low impact mode, create the five authorization profiles listed in Table 7. These profiles will be associated with identity groups and access services.

Table 7 Five Authorization Profiles

Profile Name	Description	VLAN	dACL
Phone-Authz	Policy to map IP phones to Voice VLAN	n/a	CorpAssetACL
Managed-Asset-Authz	Policy to be applied to Managed Assets	n/a	CorpAssetACL
MediaNet-Authz	Policy for Cisco MediaNet Endpoints	n/a	CorpAssetACL
CorpUser-Authz	Policy for Valid AD Authenticated Users	n/a	CorpUserACL
Contractor-Authz	Policy for short term contractors	n/a	ContractorACL

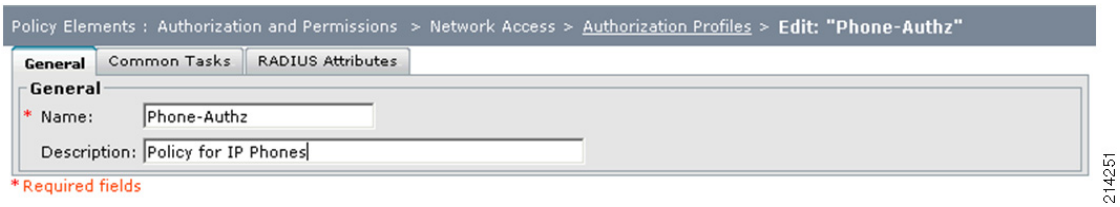
To create the five authorization profiles, complete the following steps.

Procedure

Step 1 Go to **Policy Elements > Authorizations and Permissions > Network Access > Authorization Profiles** and select **Create**.

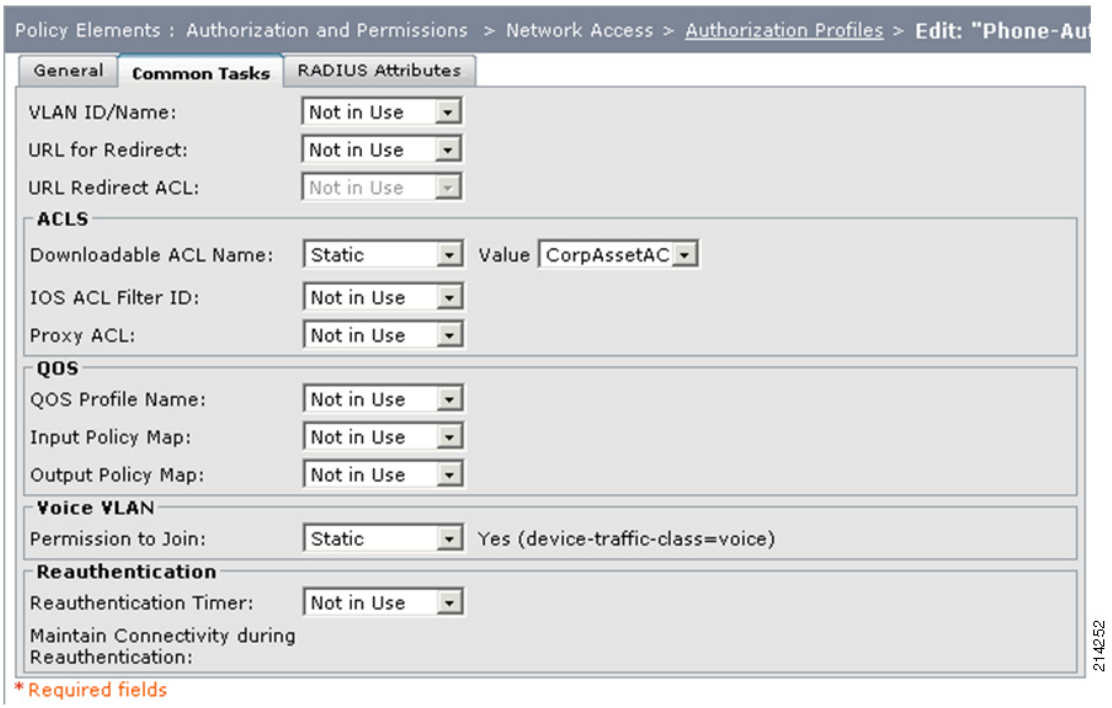
Step 2 In the screen shown in Figure 56, type **Phone-Authz** in the Name field and enter an appropriate description.

Figure 56 Authorization Profiles—General Tab



Step 3 Select the **Common Tasks** tab (see Figure 57).

Figure 57 Authorization Profiles—Common Tasks Tab



Step 4 Do the following:

a. For Downloadable ACL Name, select **Static**.

b. From the Value drop-down menu, select **CorpAssetACL**.

c. In the Voice VLAN section, select **Static** from the Permission to Join drop-down menu.

Step 5 Click the **RADIUS Attributes** tab.

Step 6 In the RADIUS Attributes tab, accept the defaults and click **Submit**.

Step 7 Create the *Managed-Asset-Authz* authorization profile by performing the above steps, using the information shown in Figure 58 and Figure 59.

Figure 58 Authorization Profiles—General Tab

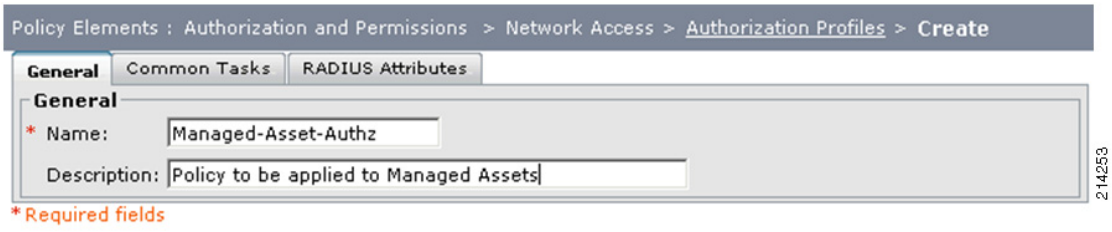
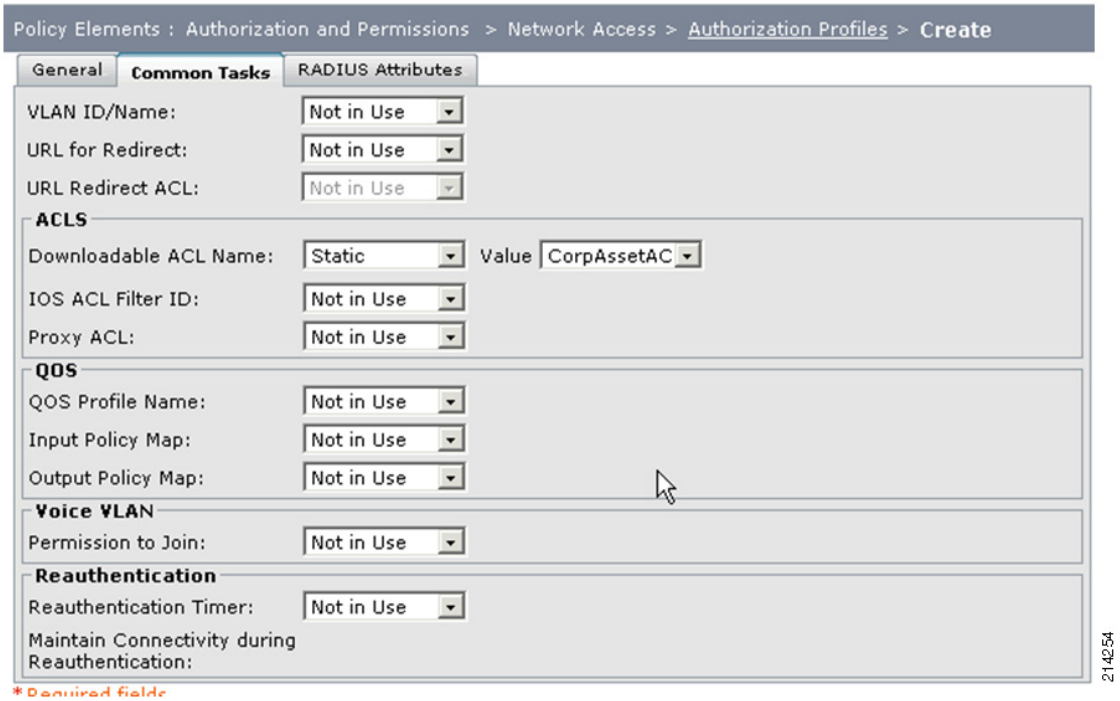


Figure 59 Authorization Profiles—Common Tab



Step 8 Repeat the above steps to create the *MediaNet-Authz* profile.

Step 9 Repeat the above steps to create the *CorpUser-Authz* profile, using the information shown in Figure 60 and Figure 61.

In the Value drop-down menu in the ACLS section, select **CorpUserACL**.

Figure 60 Authorization Profiles—General Tab

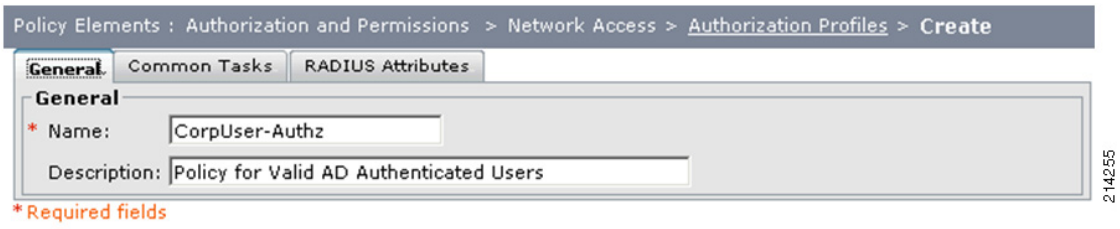
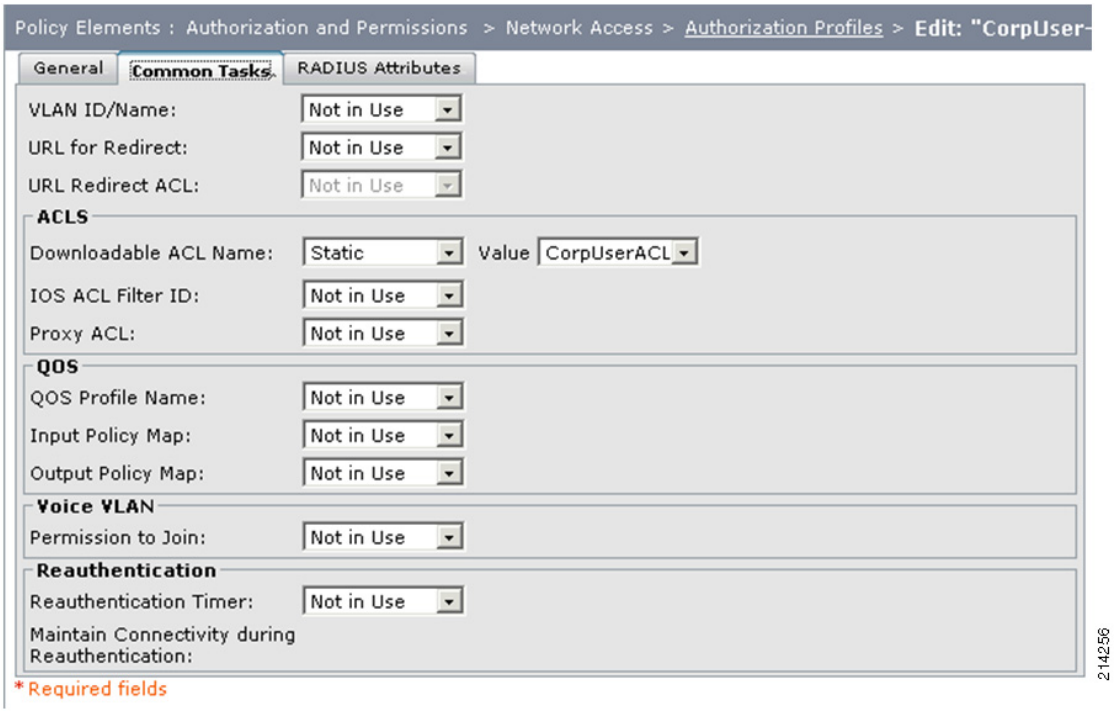


Figure 61 Authorization Profiles—Common Tasks Tab



Step 10 Repeat the above steps to create the *Contractor Authz* profile, using the information shown in Figure 62 and Figure 63.

In the Value drop-down menu in the ACLS section, select **ContractorACL**.

Figure 62 Authorization Profiles—General Tab

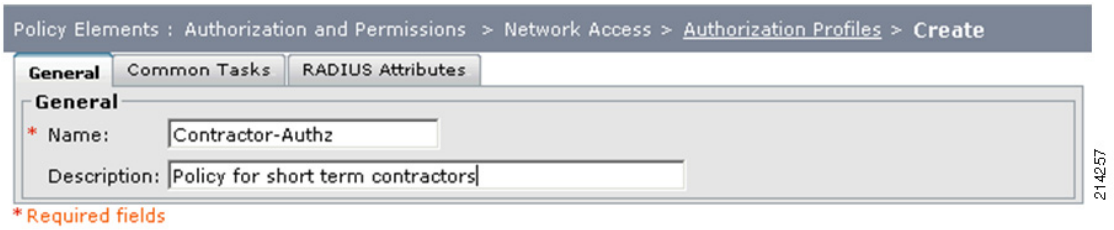
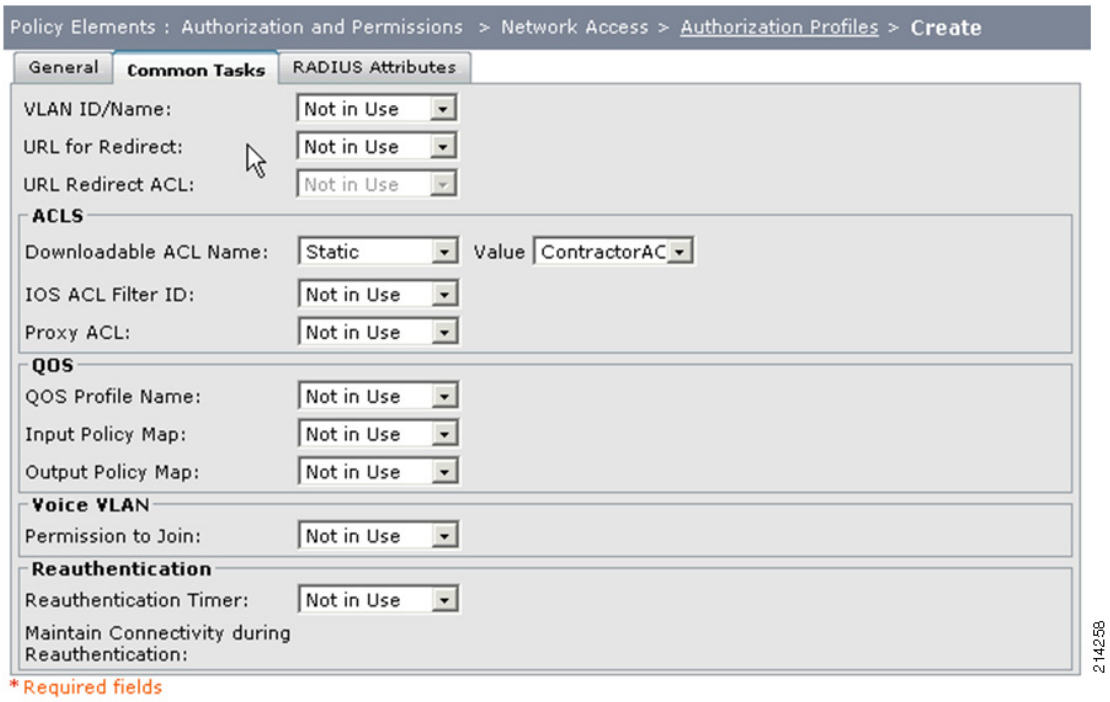
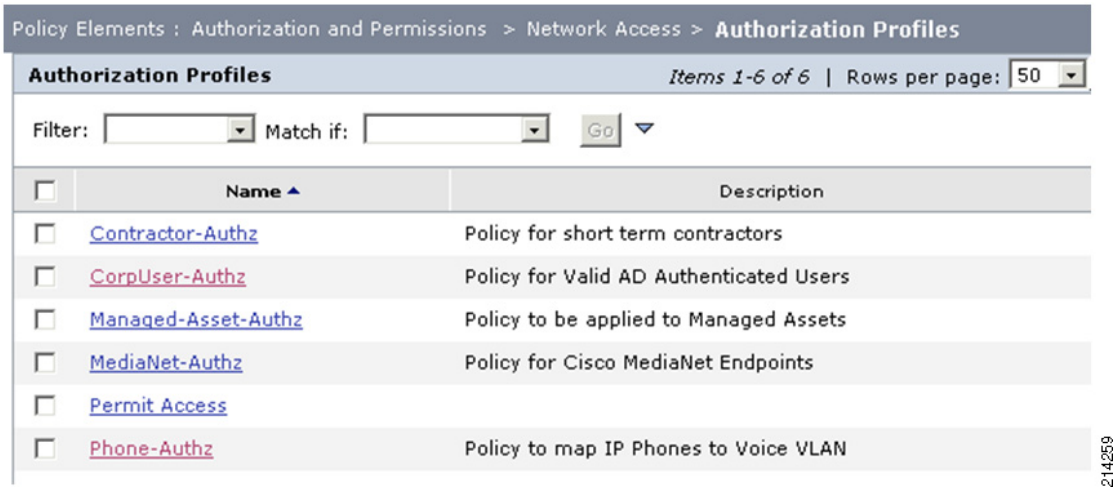


Figure 63 Authorization Profiles—Common Tasks Tab



Step 11 After you have created all the sample profiles, you should see the information shown in Figure 64 in your Authorization Profiles section.

Figure 64 Authorization Profiles



Configuring Access Policies

This section includes the following topics:

Configuring User and Identity Stores

Table 8 lists the identity groups used in this section.

Table 8 Identity Groups

Group	Description	Comment
IP phones	Corporate managed IP phones	Added previously in monitor mode
MACHINES	Corporate managed machines such as printers, cameras, and so on	Added previously in monitor mode
Contractor	Contractors	New group to be added

Adding a Contractor Identity Group

To create the *Contractor* identity group, complete the following steps.

Procedure

Step 1 Go to **Users and Identity Stores > Identity Groups** and select **Create**.

Step 2 Type in the group and description information listed for the Contractor identity group in Table 8.

Step 3 Click **Submit**.

Creating Internal Identity Stores—Host for MAB

Next you will create entries for managed host devices and assign them to identity groups. These entries are used to provide authentication and authorization using MAB.

The information listed in Table 9 is provided as an example.

Table 9 Identity Group Information

MAC Address	Description	Identity Group
00-18-BA-C7-BC-EE	Cisco 7960 IP Phone (non-802.1X capable)	IP Phone
00-18-BA-C7-BC-FA	Cisco 7960 IP Phone (non-802.1X capable)	IP Phone
00-1D-E5-EB-E5-EF	Cisco IP Video Camera	MACHINE
00-1D-E5-EB-F9-00	Cisco IP Video Camera	MACHINE
00-21-86-58-DB-6B	Contractor PC (Non-managed host)	Contractor

Note The Cisco 7961 Phone used in the example described in this guide is 802.1X-capable. Therefore, you do not need to enter it in the host database. It is added in the Users database in the next section.

Use Table 10 to record your own MAC addresses to accommodate the use cases described in this guide.

Table 10 MAC Address Reference List

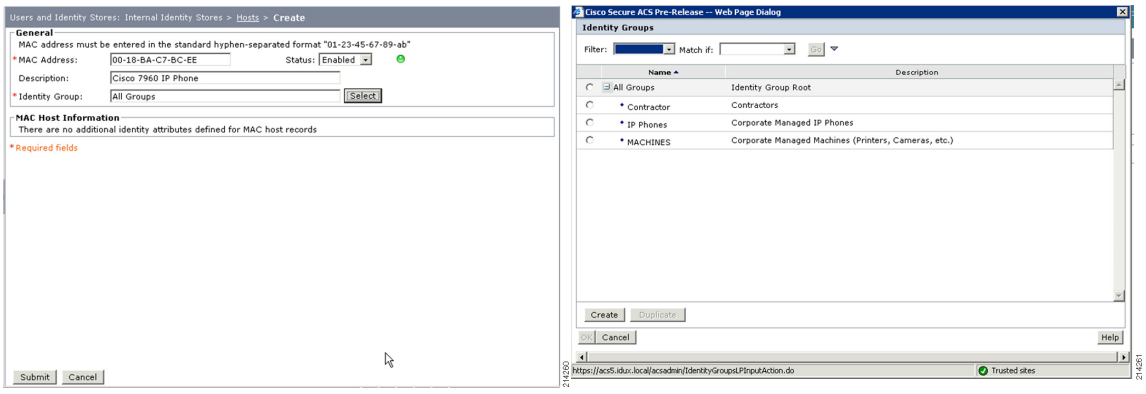
MAC Address	Description	Identity Group
	Cisco IP Phone	IP Phone
	Cisco IP Phone	IP Phone
	Cisco IP Camera (or other non-dot1x host)	MACHINE
	Cisco IP Camera (or other non-dot1x host)	MACHINE
	Contractor PC	CONTRACTOR

To create entries for managed host devices and assign them to identity groups, complete the following steps.

Procedure

Step 1 Go to **User and Identity Stores > Internal Identity Stores > Hosts** (see Figure 65).

Figure 65 Users and Identity Stores—Hosts



Step 2 In the Identity Groups screen, select **Create.**

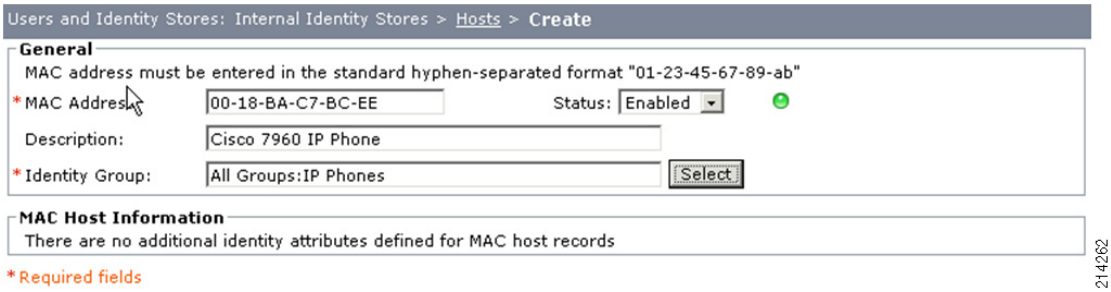
Step 3 In the screen shown in Figure 66, do the following:

a. Type the MAC address and description, using the information from Table 9.

b. Click the **Select** button for Identity Group selection and select the appropriate group.

c. Click **OK**, then click **Submit**.

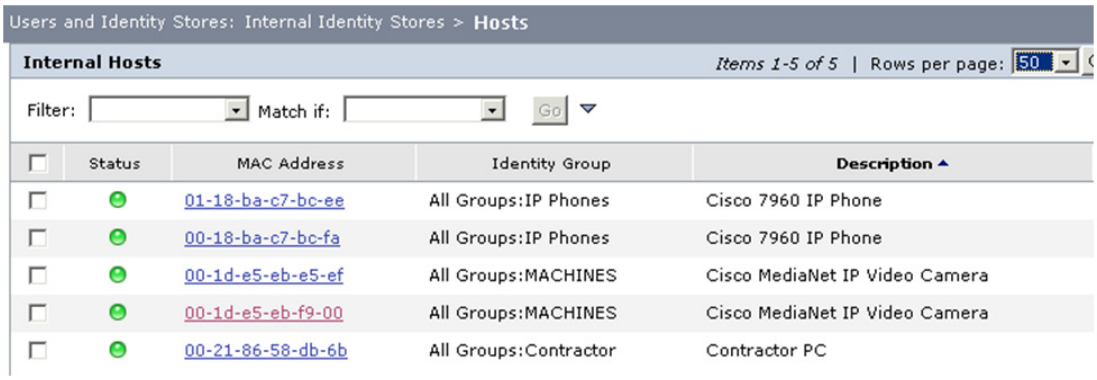
Figure 66 Users and Identity Stores—Create



Step 4 Repeat the above steps to enter the other MAC addresses listed in Table 9.

After you have entered all the MAC addresses for your pilot, your host database should look like the screen shown in Figure 67.

Figure 67 Internal Hosts



Note Cisco offers products that can automate the process of building a database of profiled MAC addresses. The installation and configuration of those products are covered in another document. Additionally, if you already have a database of known valid MAC addresses from an asset management system, those may be imported into the internal database of ACS. Consult the ACS User Guide for more information. For more information on Cisco ACS 5.0, see the following URL: http://www.cisco.com/en/US/docs/net_mgmt/cisco_secure_access_control_system/5.0/user/guide/ACS_user_guide.html

Configuring Internal Identity Stores—Users for 802.1X

Next you will create entries for managed host devices and assign them to identity groups. These are used to provide authentication and authorization, using 802.1X for identities that are not maintained in your external identity management (IdM) system.

Note This internal database can be used to create accounts for 802.1X-capable phones, administration, bootstrapping, troubleshooting, and other uses without having to add a user into your official IdM system; for example, Microsoft AD. Where possible, the use of existing identity repositories such as AD is recommended as a best practice. However, certain use cases may require the use of the internal database within ACS. Follow the security policies of your company in this matter.

The information shown in Table 11 is provided as an example.

Table 11 Managed Host Device Information

Host ID	Description	MD5 Password	Identity Group
CP-7961G-SEP001BD585391E	Cisco 7961G 802.1X-capable IP Phone	password	IP Phones

Use Table 12 to record your own MAC addresses to accommodate the use cases described in this guide.

Table 12 Managed Host Reference List

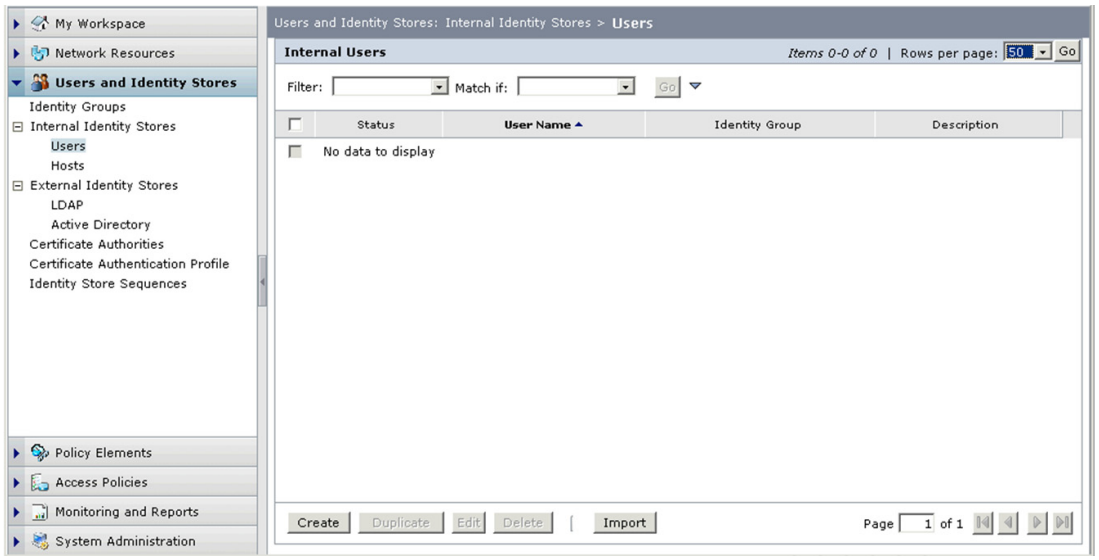
Host ID	Description	MD5 Password	Identity Group

To create entries for managed host devices and assign them to identity groups, complete the following steps.

Procedure

Step 1 Go to **User and Identity Stores > Internal Identity Stores > Users** (see Figure 68)**.**

Figure 68 Internal Users



Step 2 Select **Create.**

Step 3 In the screen shown in Figure 69, do the following:

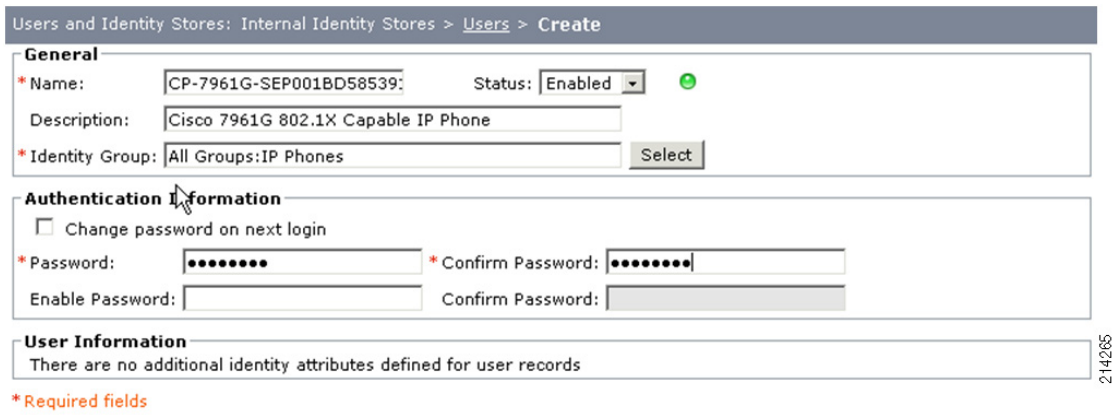
a. Type the UserID for example, **CP-7961G-SEP001BD585391E**

b. Type an appropriate description; for example, **Cisco 7961G 802.1X Capable IP Phone**.

c. Type a password; for example, **pa$$Word4**.

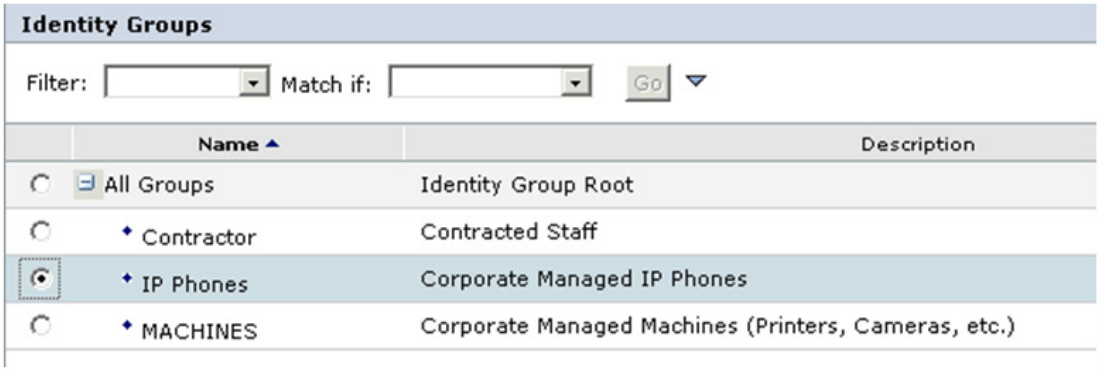
This password must match the one you configured on your host. In this case, *pa$$Word4* is used for the password on the Cisco 7961G IP Phone.

Figure 69 Creating an Entry



Step 4 For Identity Group, click **Select** and select the appropriate group; for example, **All Groups:IP Phones** (see Figure 70). Then click **OK.**

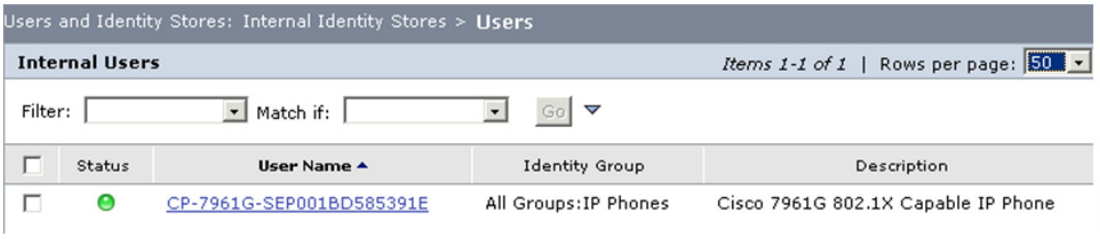
Figure 70 Identity Groups



Step 5 Click **Submit**.

You should now see your entry in the Internal Users database, as shown in Figure 71.

Figure 71 Internal Users Database



Adding Authorization Rules for 802.1X Service

For low impact mode, you will now add new authorization rules to allow for differentiated services between the various groups or classes of users and hosts.

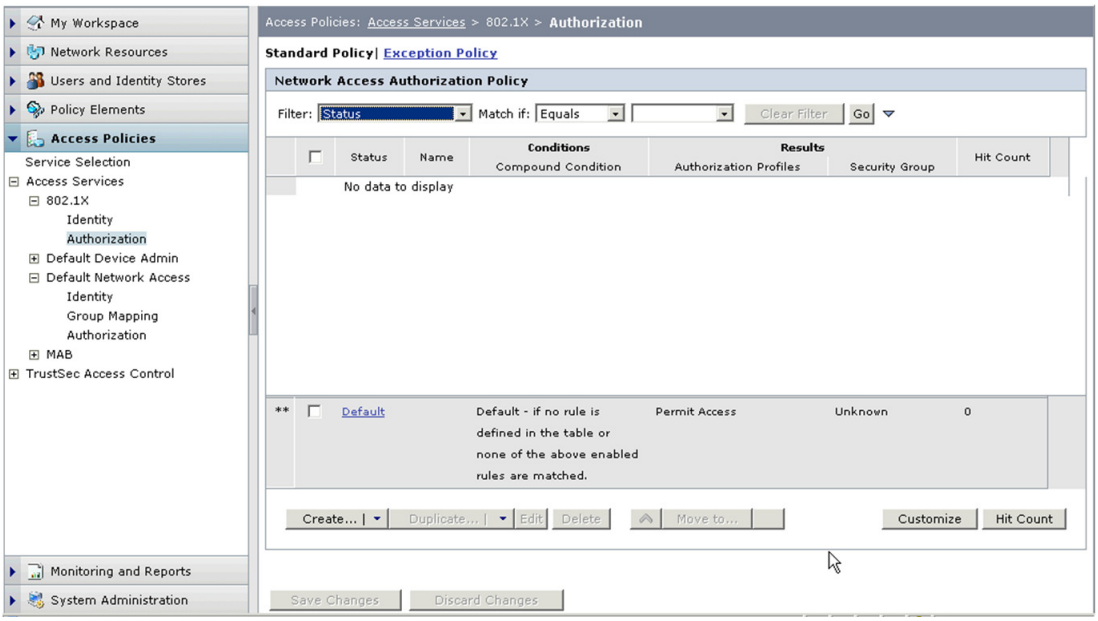
Adding an 802.1X-Capable Phones Authorization Rule

Complete the following steps.

Procedure

Step 1 Go to **Access Policies > Access Services > 802.1X > Authorization** (see Figure 72).

Figure 72 Network Access Authorization Policy



Step 2 To set up an authorization policy for 802.1X-capable IP phones, click **Create**.

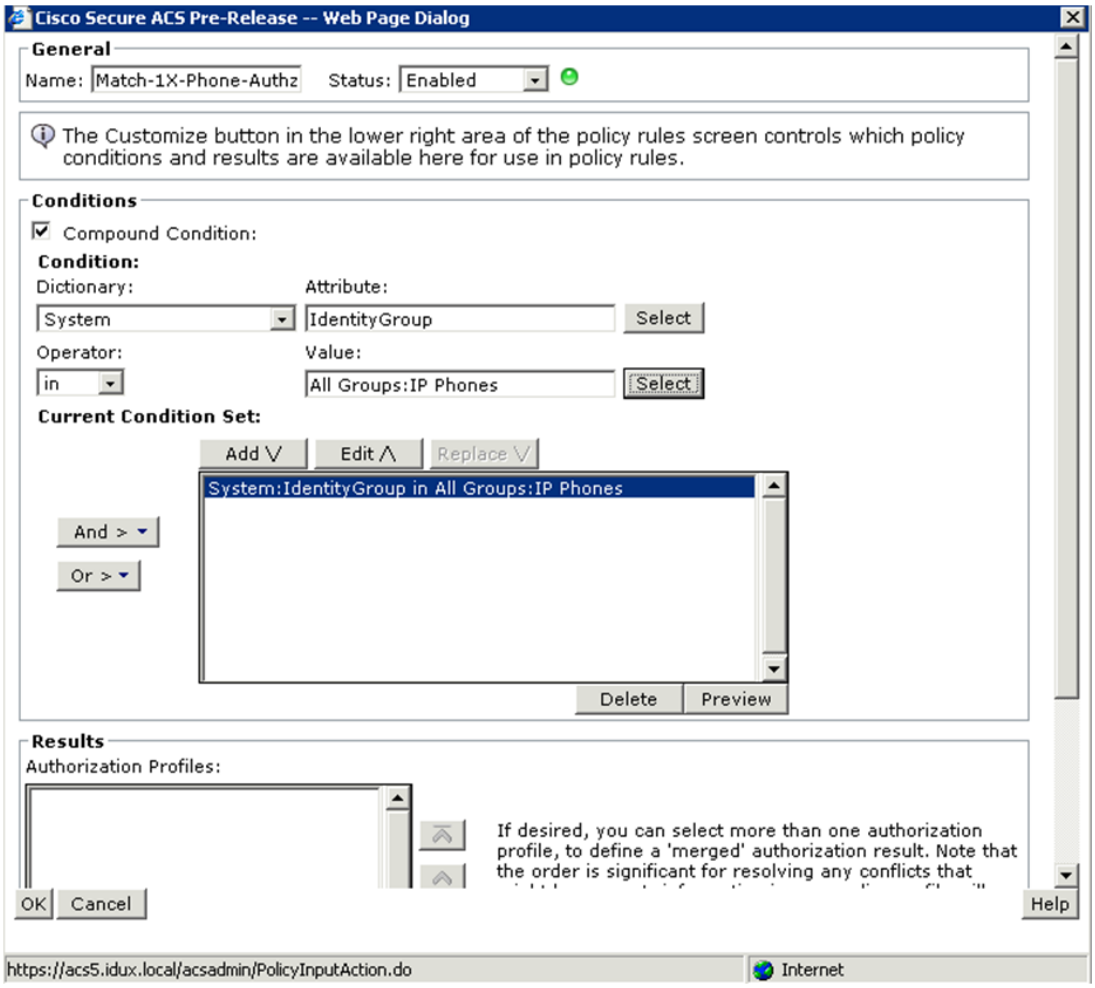
Step 3 In the screen shown in Figure 73, do the following:

a. For the Name, enter a new name; for example, **Match-1X-Phone-Authz**.

b. Select the **Compound Condition** checkbox.

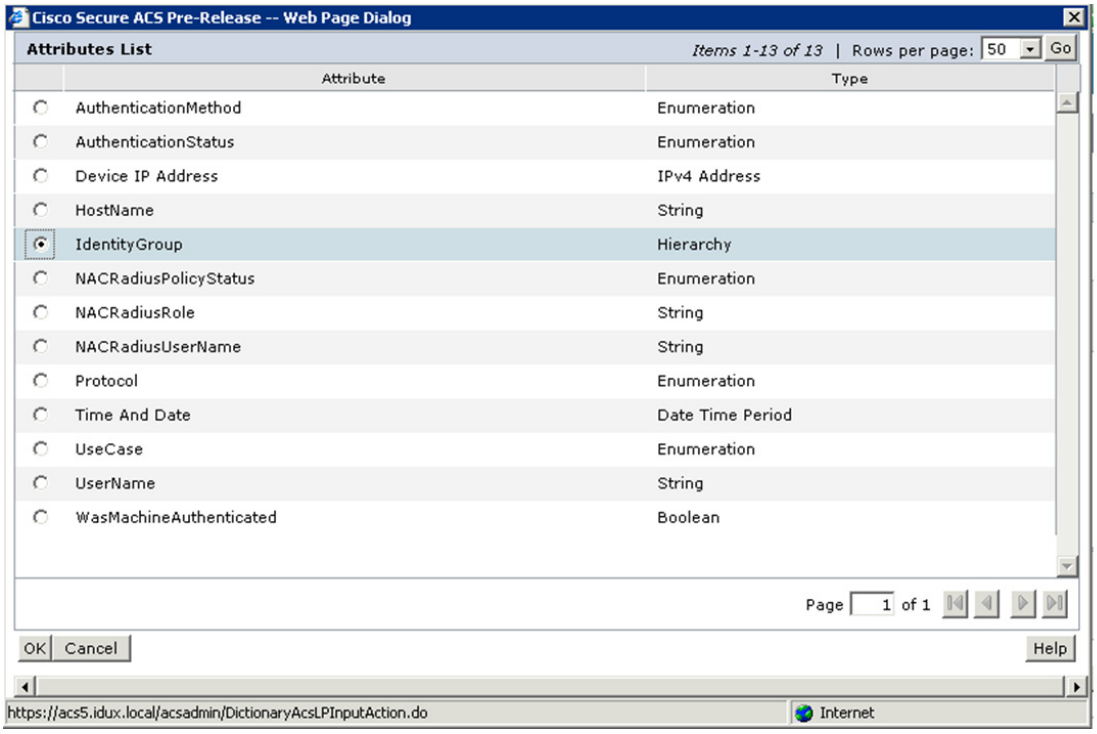
c. From the Dictionary drop-down menu, select **System**.

Figure 73 Creating an Authorization Policy



d. For Attribute, click **Select** and select **IdentityGroup** (see Figure 74).

Figure 74 Attribute List

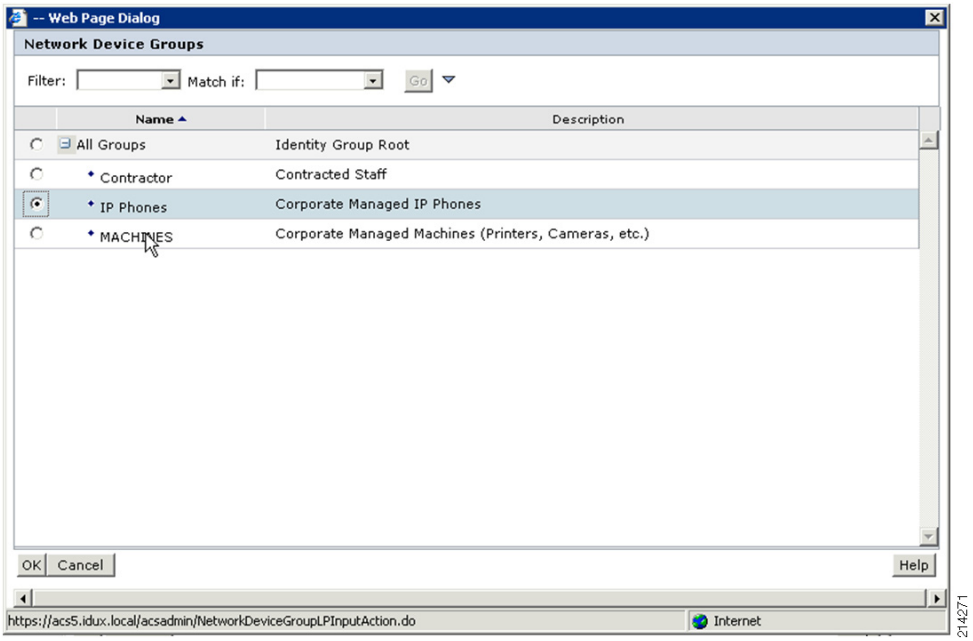


e. Click **OK**.

f. In the Operator drop-down menu, make sure that **In** is selected.

g. Click **Select** to select **IP Phones** from the Network Device Groups list (see Figure 75).

Figure 75 Network Device Groups

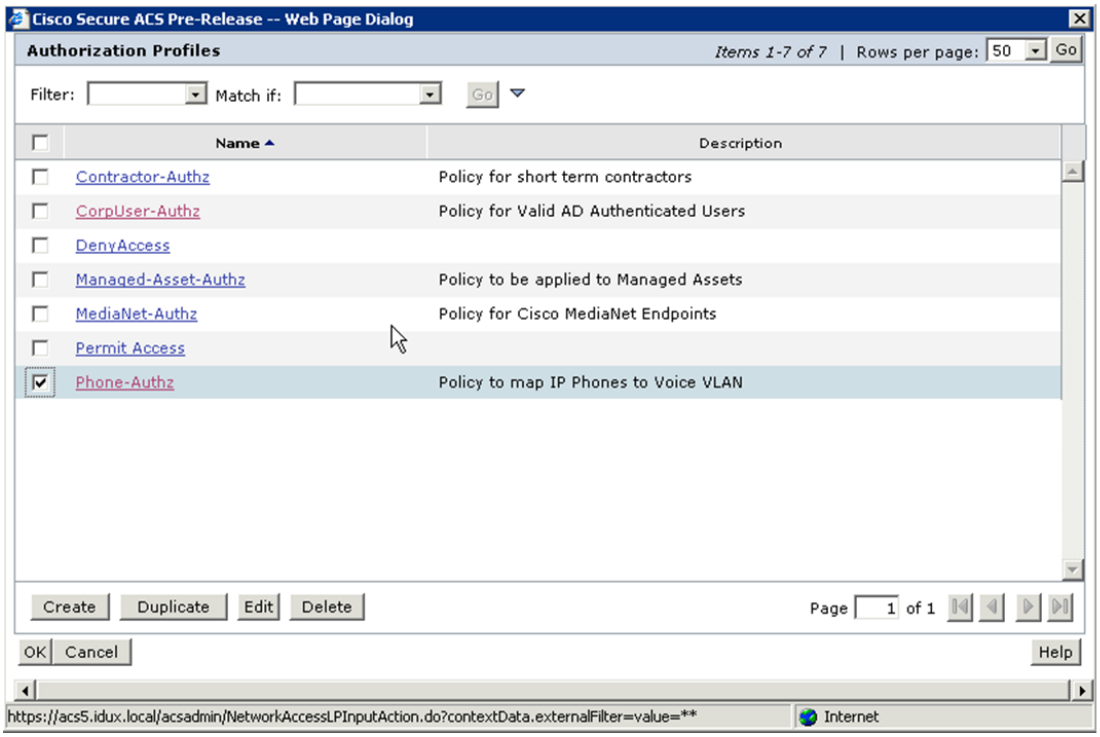


Step 4 Select **Add**.

Step 5 In the Results/Authorization Profiles section, click **Select.**

Step 6 Select the previously created **Phone-Authz** profile (see Figure 76).

Figure 76 Authorization Profiles List



Step 7 Click **OK** and then click **OK** again.

Click **Save Changes**.

Adding 802.1X-CorpUserRule

Complete the following steps.

Procedure

Step 1 In the screen shown in Figure 72, click **Create**.

Step 2 In the screen shown in Figure 77, do the following:

a. For the Name, enter a new name; for example, **802.1X-CorpUserRule**.

b. Select the **Compound Condition** checkbox.

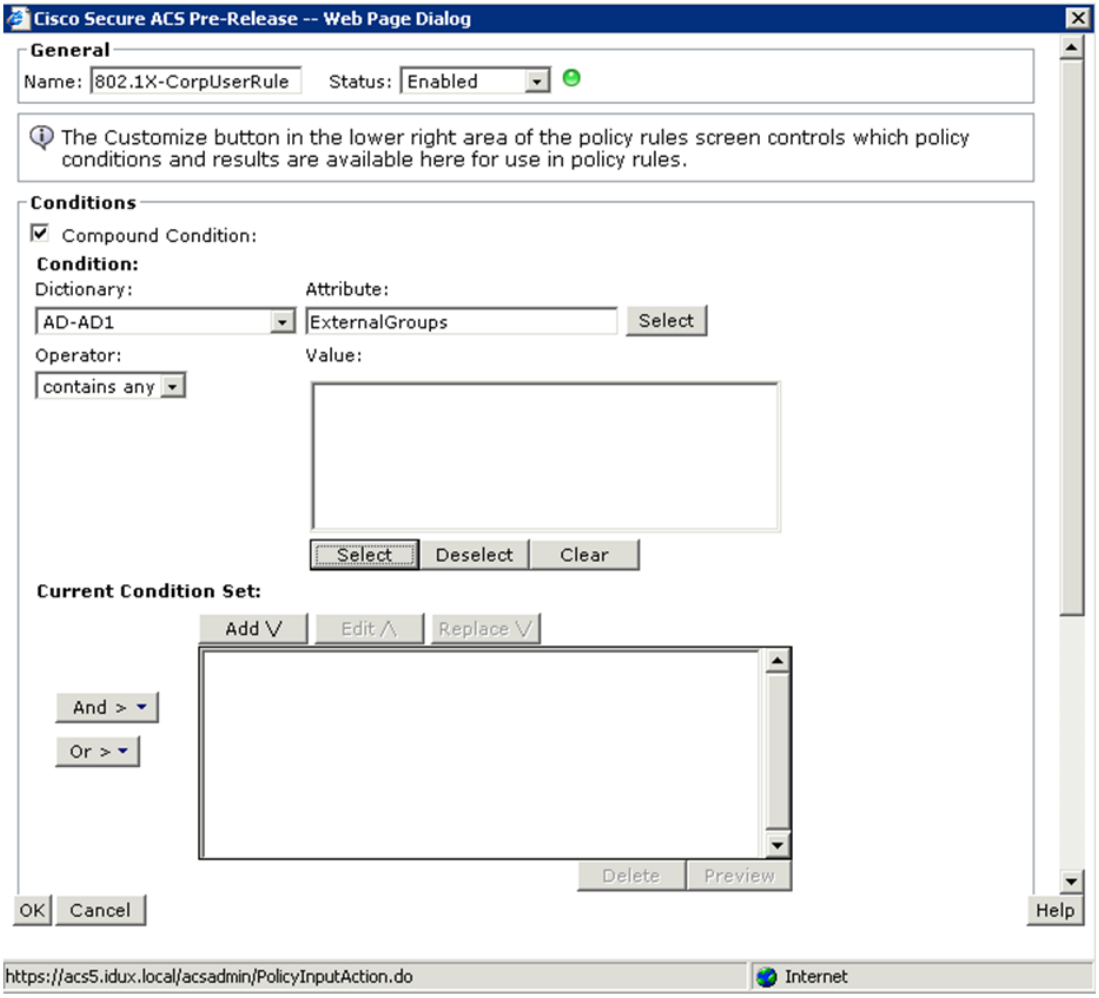
c. From the **Dictionary** drop-down menu, select **AD-AD1.**

d. From the attribute list, press **Select** to select **ExternalGroups**.

e. Click **OK**.

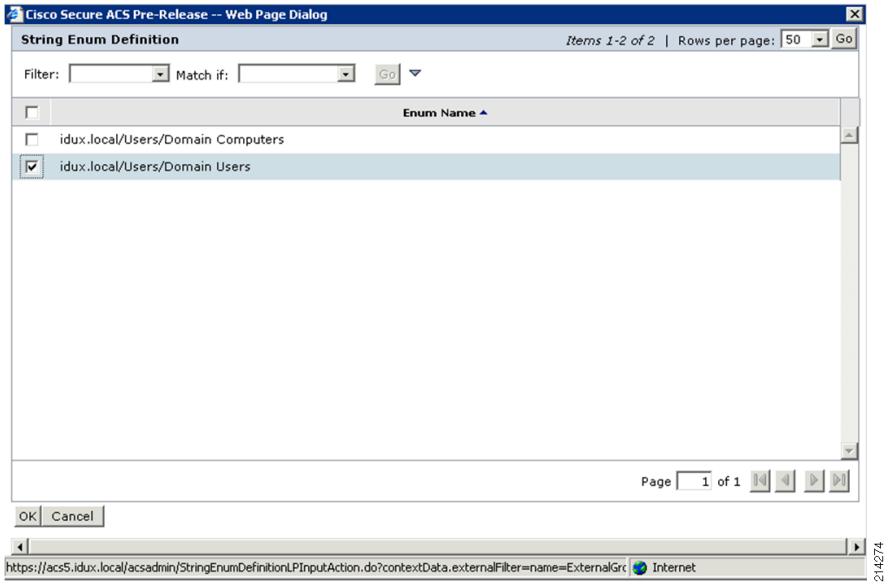
f. In the **Operator** drop-down menu, make sure that **contains any** is selected.

Figure 77 Creating an Authorization Policy



Step 3 Click **Select** and select **/Users/Domain Users** from the Network Device Groups screen (see Figure 78).

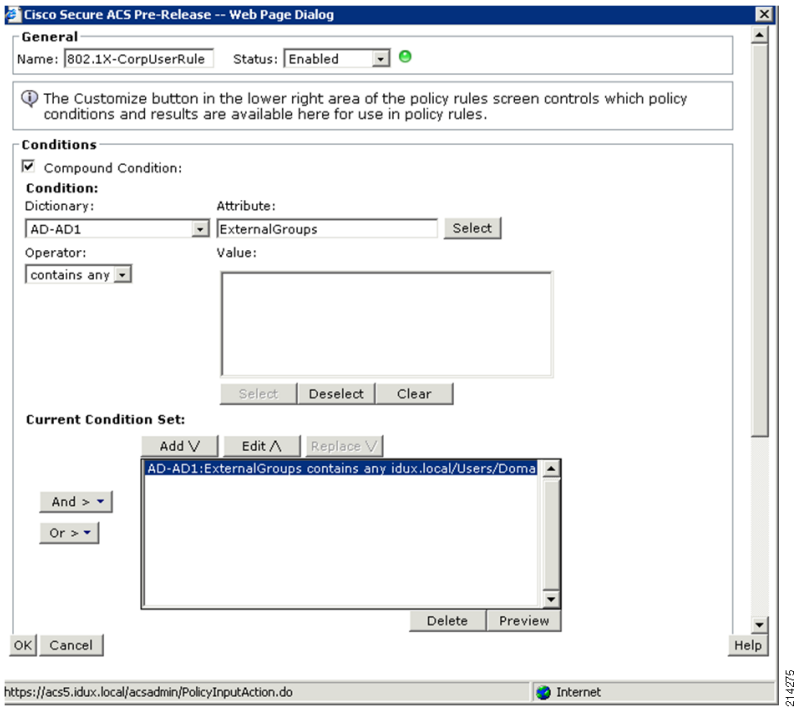
Figure 78 Network Device Groups



Step 4 Click **OK**.

Step 5 Click **Add V** (see Figure 79).

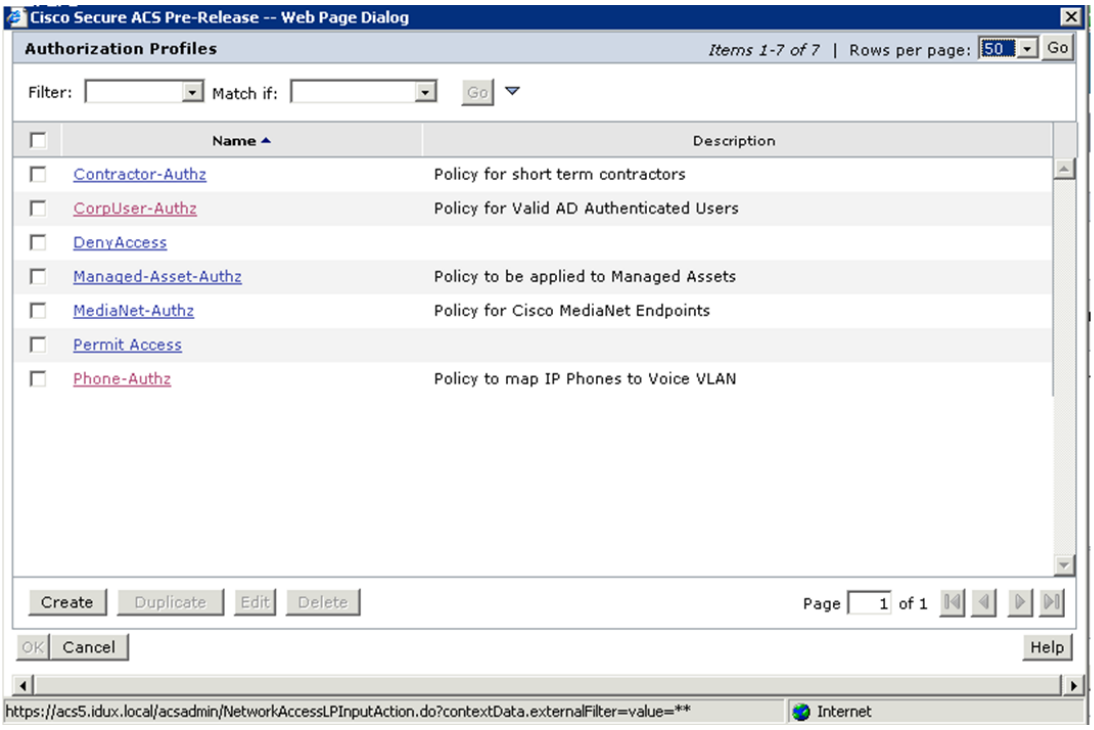
Figure 79 Clicking Add V



Step 6 Scroll down to the Results/Authorization Profiles section and click **Select.**

Step 7 Select the previously created **CorpUser-Authz** profile (see Figure 80).

Figure 80 Authorization Profiles List



Step 8 Click **OK** and then **OK** again.

Step 9 Click **Save Changes**.

Now you should see both the *Match-1X-Phone-Authz* and the *802.1X-CorpUserRules* as authorizations for 802.1X (see Figure 81).

Figure 81 Network Access Authorization Policy

For now, this is all you will create for 802.1X in low impact mode. If your organization has more types of wired 802.1X devices, you may want to try adding more.

As demonstrated in the previous exercises, you used the previously created dACLs and authorization profiles in creating these specific authorization rules for 802.1X. Next, you will do a similar configuration of authorization rules for MAB.

Adding Authorization Rules for MAB Service

MAB IP Phones Rule

In this section you will set up an identity source and authorization rule to match IP phones in the MAB access service. This ensures that the MAB authenticated phones are put into the voice VLAN for proper access. All successfully authenticated non-802.1X phones obtain the Phone-Authz profile, which allows full access to the voice VLAN with no ACL restrictions; that is, **permit ip any any**.

Complete the following steps.

Procedure

Step 1 From the MAB Access Service section, select **Identity** (see the left-hand side of Figure 82).

Step 2 Press **Select.**

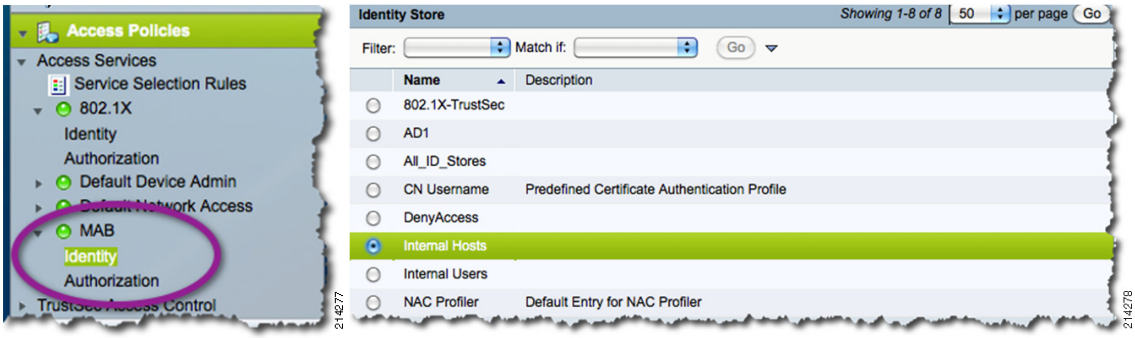
Step 3 In the screen shown in the right-hand side of Figure 82, do the following:

a. Select **Internal Hosts**.

b. Click **OK**.

c. Click **Submit**.

Figure 82 Selecting Internal Hosts



Step 4 From the MAB Access Service section, select **Authorization** and click **Create**.

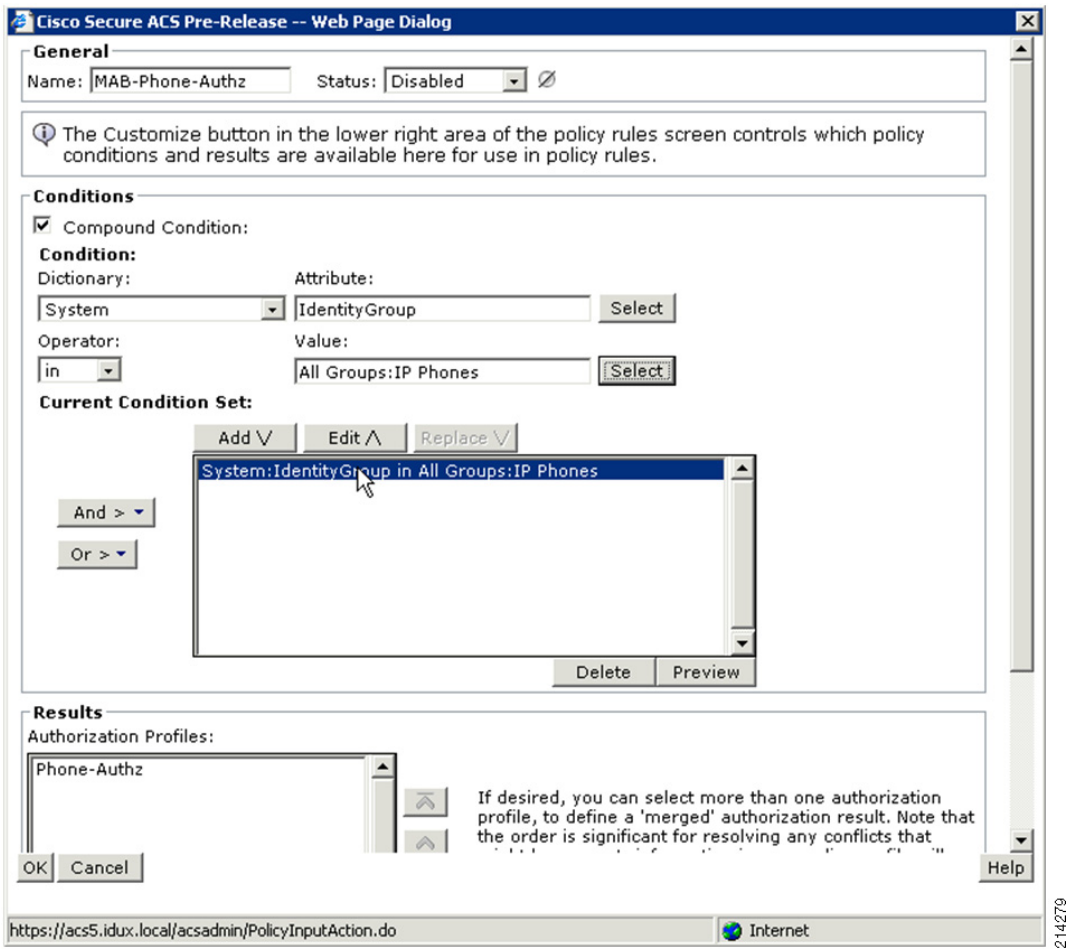
Step 5 In the screen shown in Figure 83, do the following:

a. For the name, enter an appropriate name; for example, **MAB-Phone-Authz**.

b. Check the **Compound Condition** checkbox.

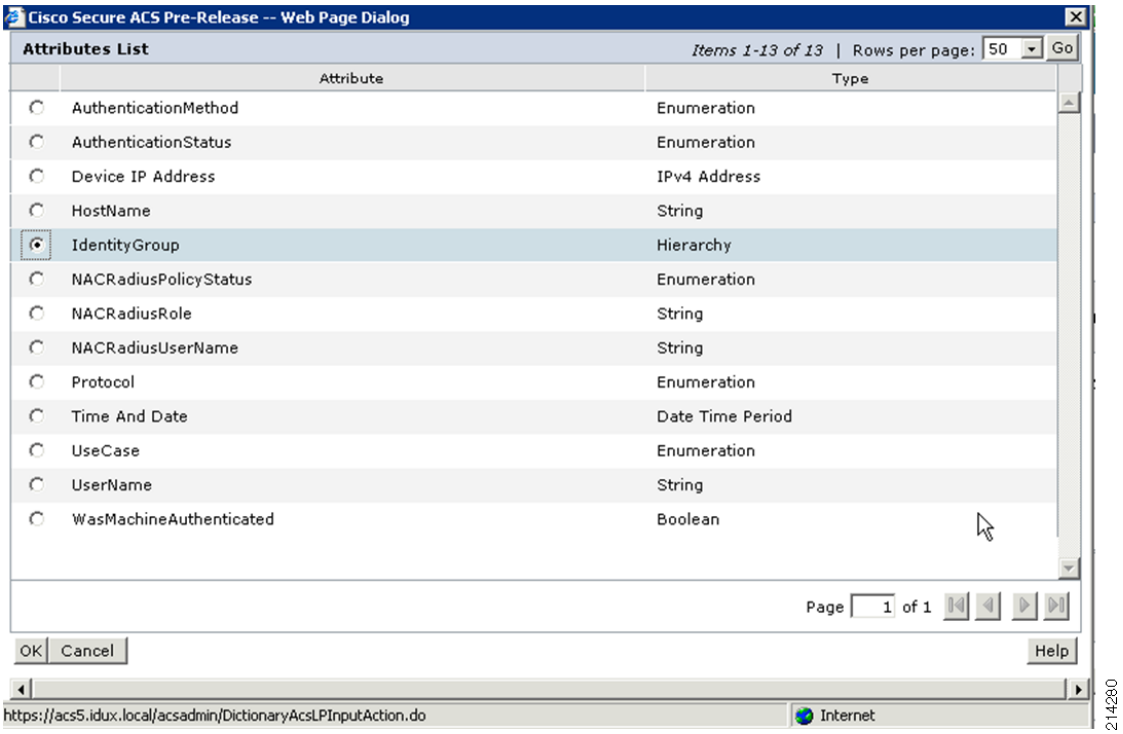
c. From the Dictionary drop-down menu, select **System** and then click **Select**.

Figure 83 Creating an Authorization Policy



Step 6 From the Attribute List (see Figure 84), select **Identity Group** and click **OK**.

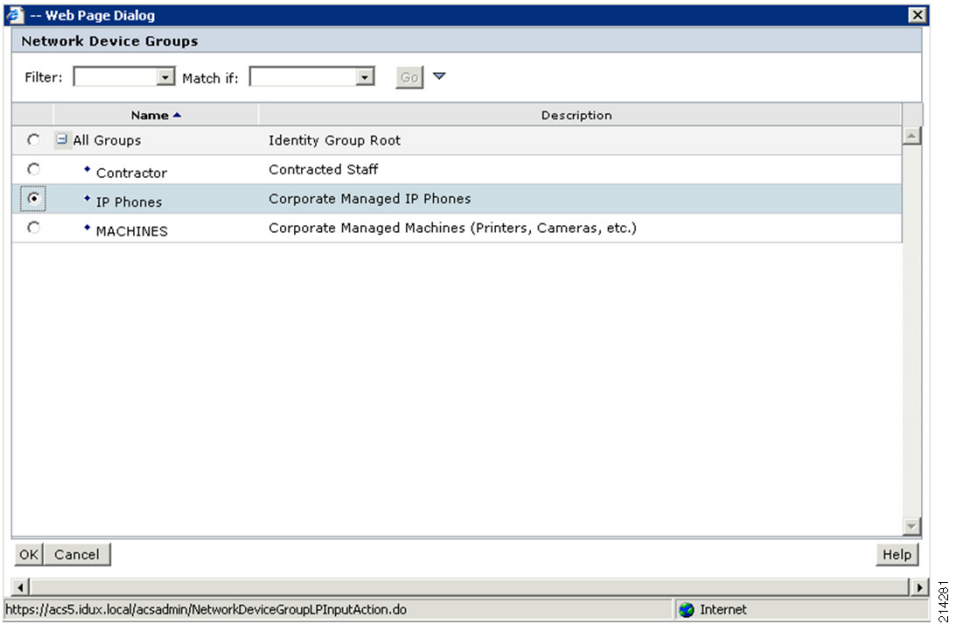
Figure 84 Attributes List



Step 7 In the Operator drop-down menu, make sure that **In** is selected and click **Select.**

Step 8 From the Network Device Groups list, select **IP Phones** (see Figure 85).

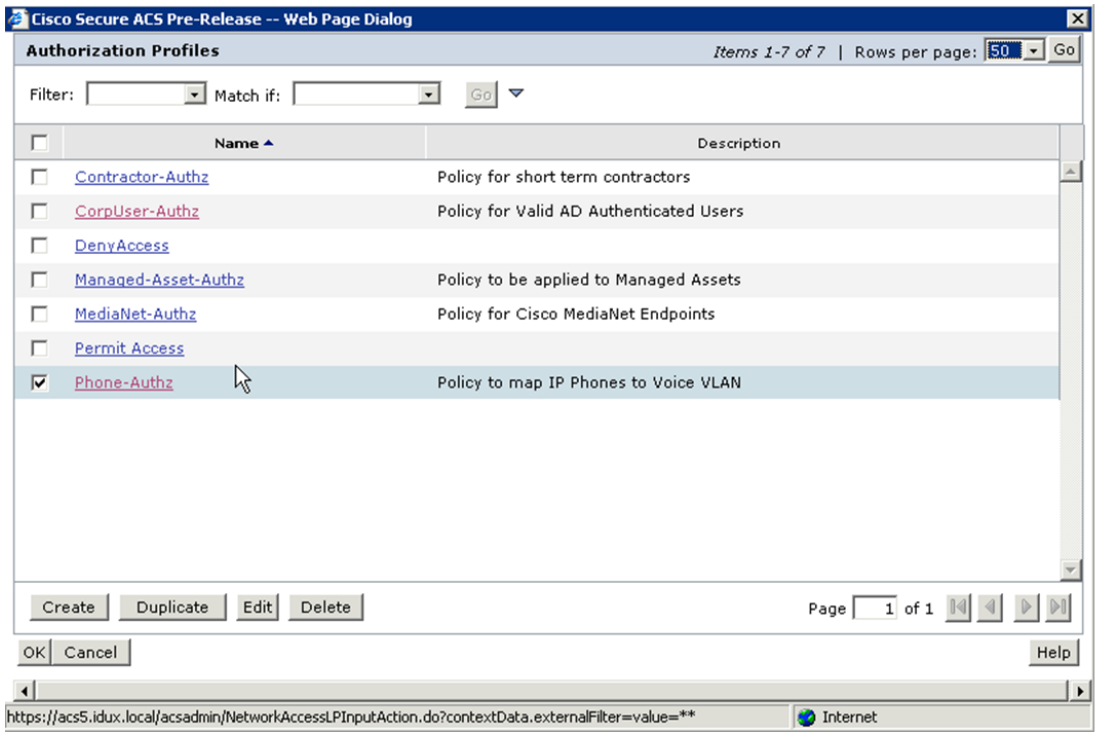
Figure 85 Network Device Groups



Step 9 Click **Add**.

Step 10 In the Results/Authorization Profiles section, click **Select** and select the previously created **Phone-Authz** profile (see Figure 86).

Figure 86 Authorization Profiles List



Step 11 Click **OK** and then click **OK** again.

Step 12 Click **Save Changes**.

Adding a MAB Contractor Rule

To add a MAB contractor rule, complete the following steps.

Procedure

Step 1 From the MAB Access Service section, select **Authorization** and click **Create**.

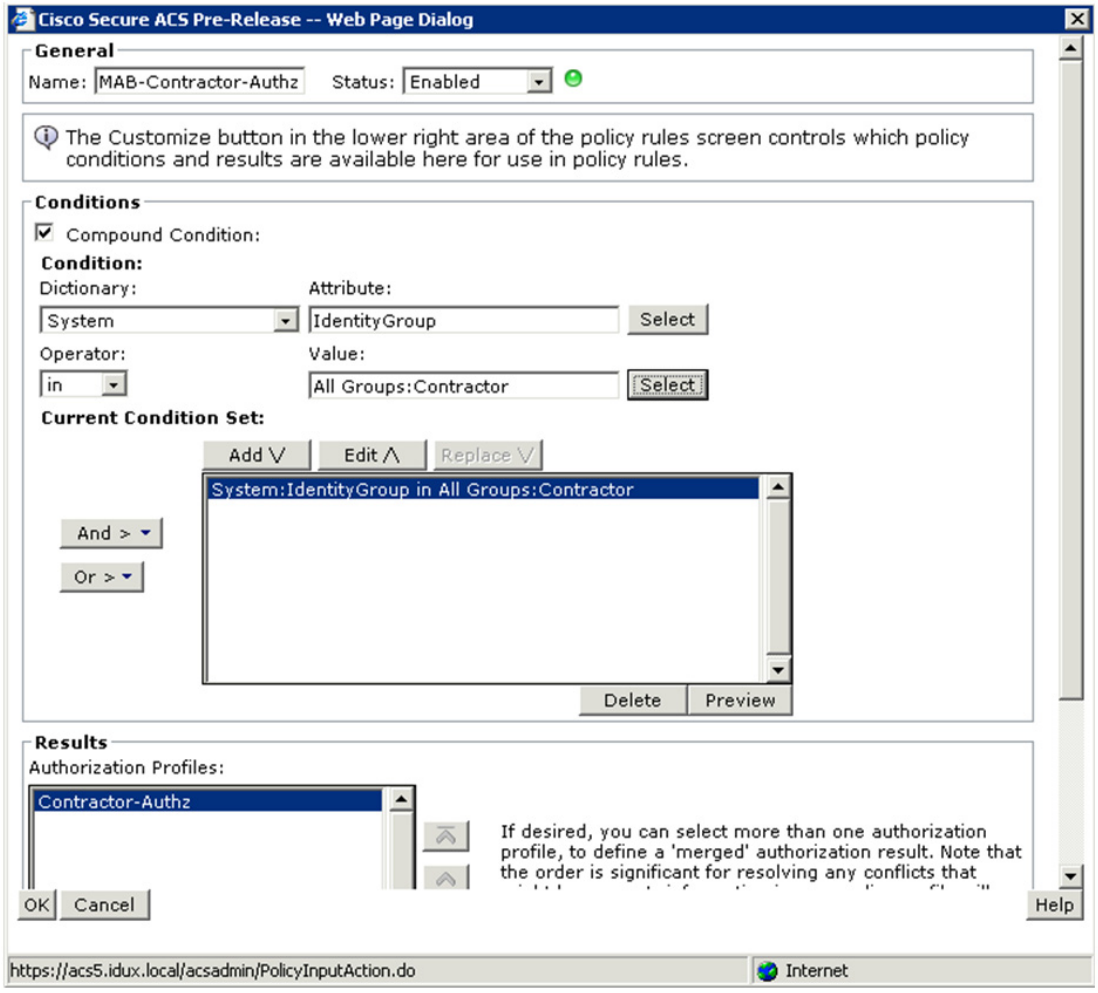
Step 2 In the window shown in Figure 87, do the following:

a. For the Name, enter an appropriate name; for example, **MAB-Contractor-Authz**.

b. Select **Compound Condition**

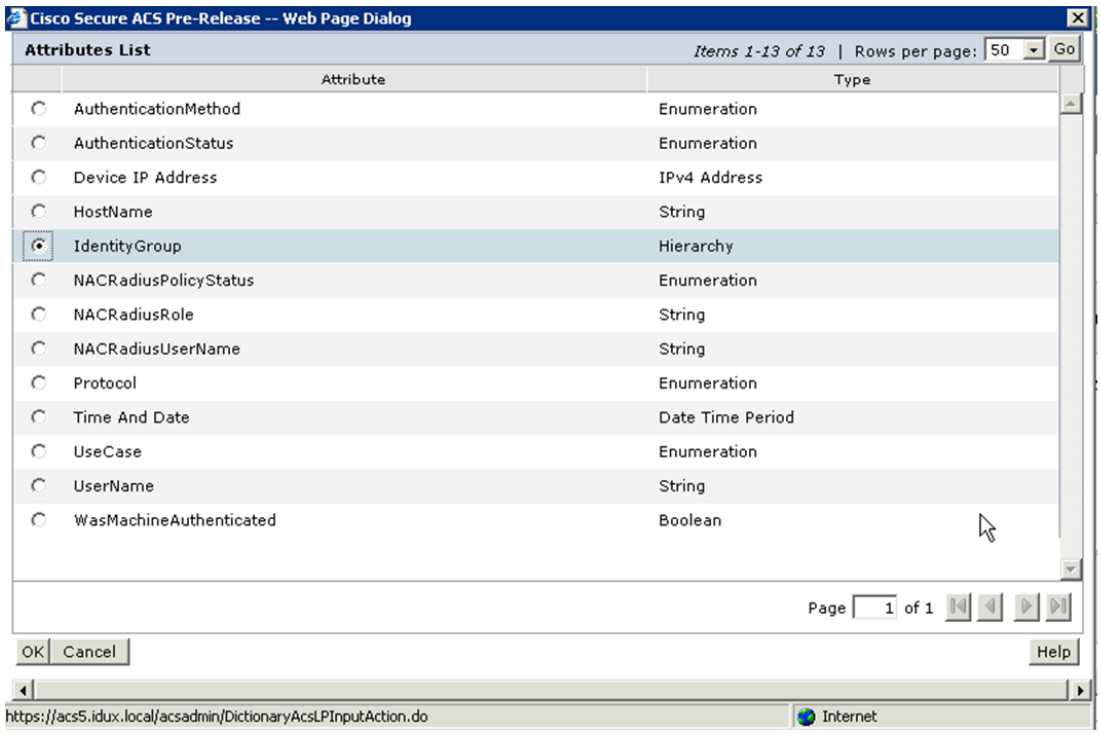
c. From the Dictionary drop-down menu, select **System** and then press the **Select** button.

Figure 87 Creating an Authorization Policy



Step 3 From the Attribute List (see Figure 88), select **Identity Group** and then click **OK**.

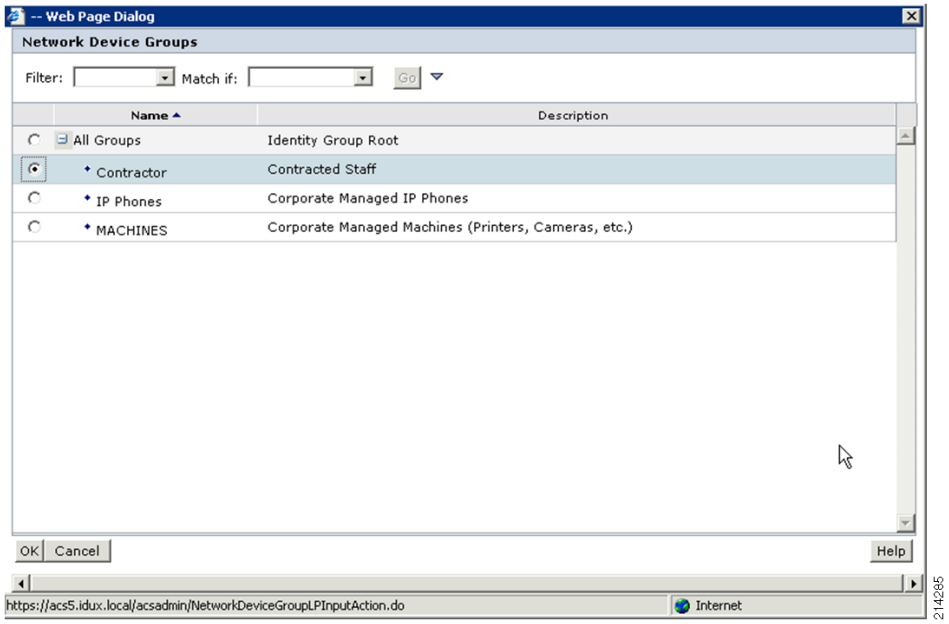
Figure 88 Attribute List



Step 4 In the Operator drop-down menu, *m*ake sure **In** is selected.

Step 5 From the Network Device Groups list (see Figure 89), click **Select** to select **Contractor**.

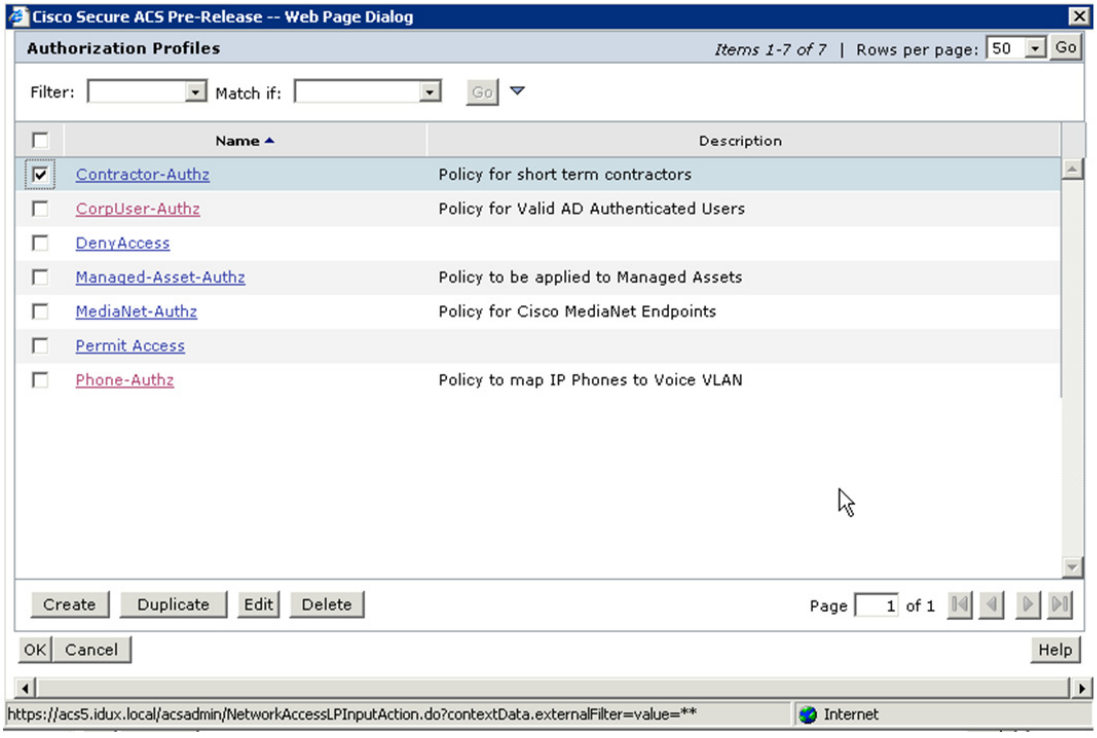
Figure 89 Network Device Groups



Step 6 Click **Add**.

Step 7 In the Results/Authorization Profiles section, click **Select** and select the previously created **Contractor-Authz** profile (see Figure 90).

Figure 90 Authorization Profiles List



Step 8 Click **OK** and then click **OK** again.

Step 9 Click **Save Changes**.

Adding a MAB MediaNet Rule

To add a MAB MediaNet rule, complete the following steps.

Procedure

Step 1 From the MAB Access Service section, select **Authorization** and click **Create**.

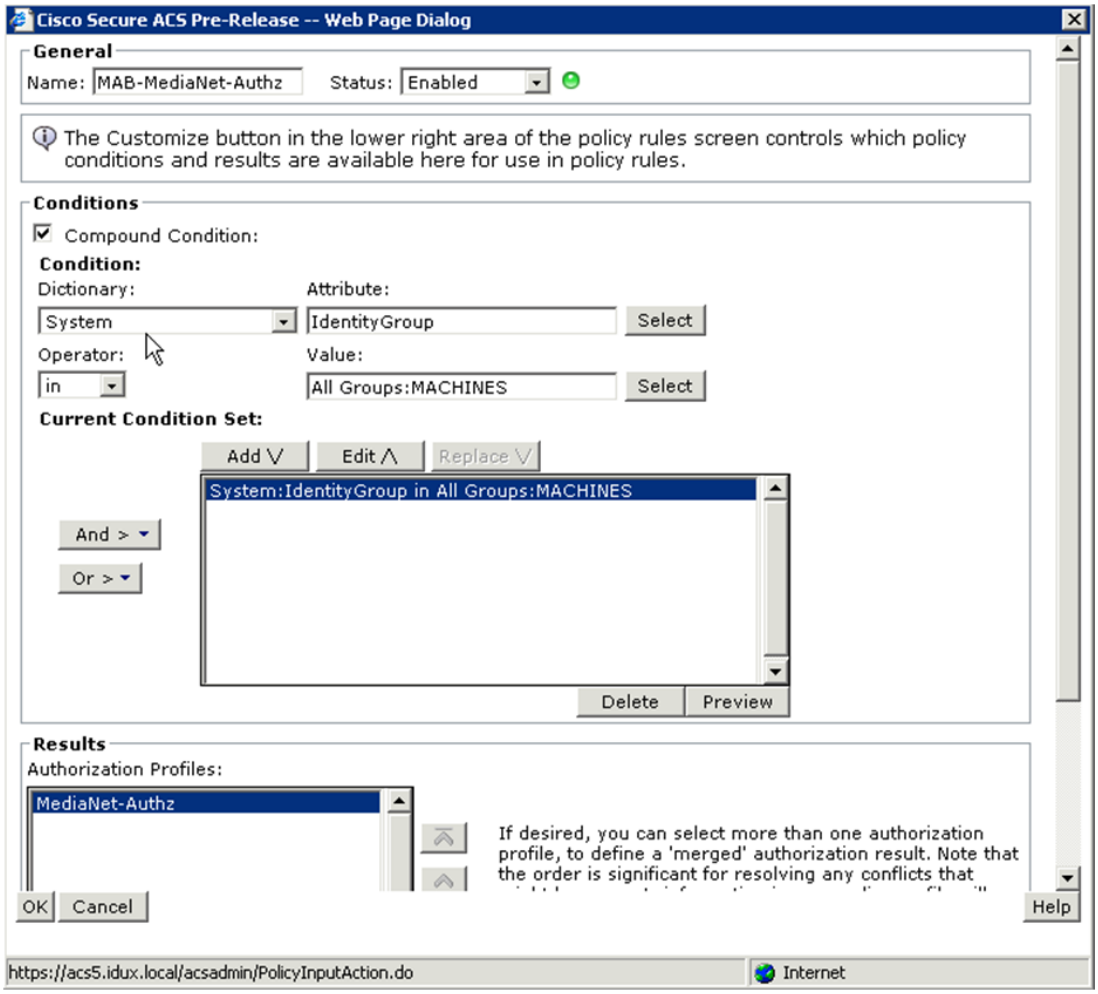
Step 2 In the window shown in Figure 91, do the following:

a. For the Name, enter an appropriate name; for example, **MAB-MediaNet-Authz**.

b. Select **Compound Condition.**

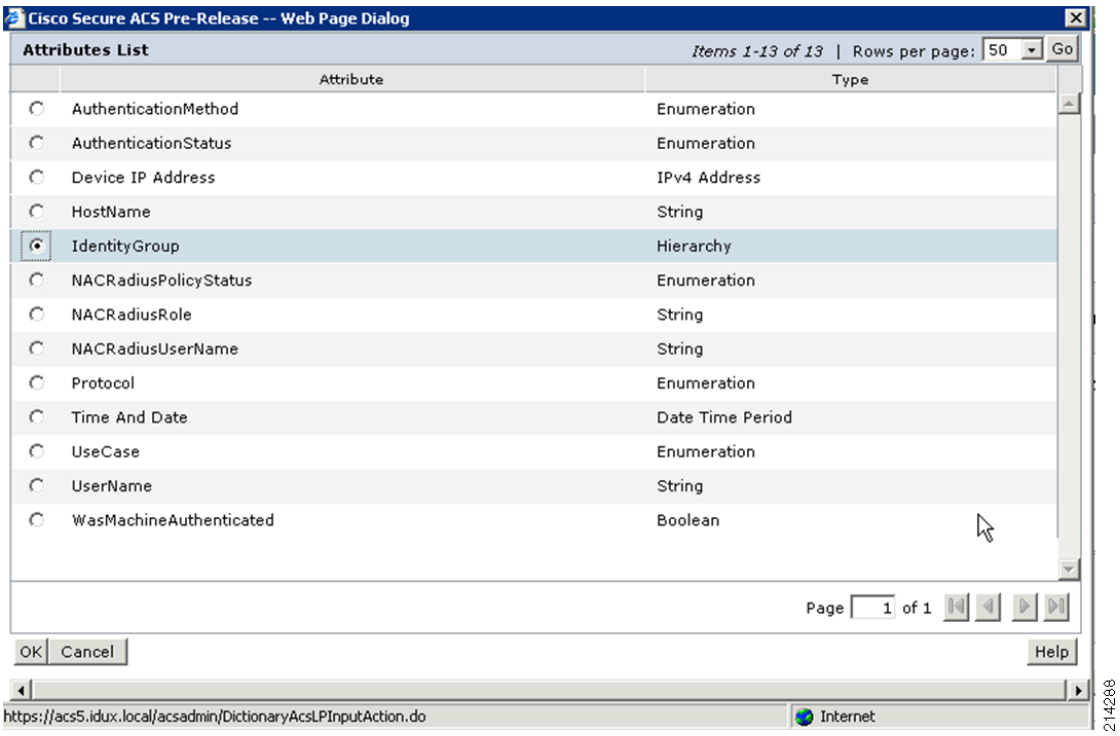
c. From the Dictionary drop-down menu, select **System** and then press the **Select** button.

Figure 91 Creating an Authorization Policy



d. From the Attribute List (see Figure 92) select **Identity Group** and click **OK**.

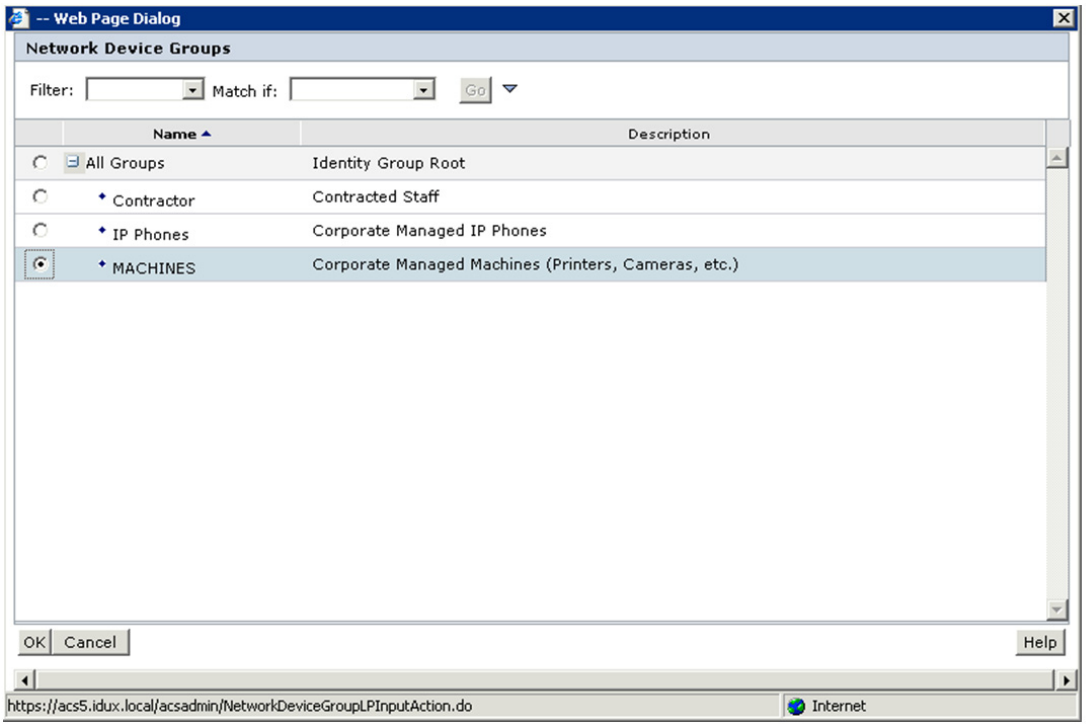
Figure 92 Attribute List



Step 3 In the Operator drop-down menu, make sure **In** is selected and click **Select.**

Step 4 From the Network Device Groups list (see Figure 93), select **MACHINES**.

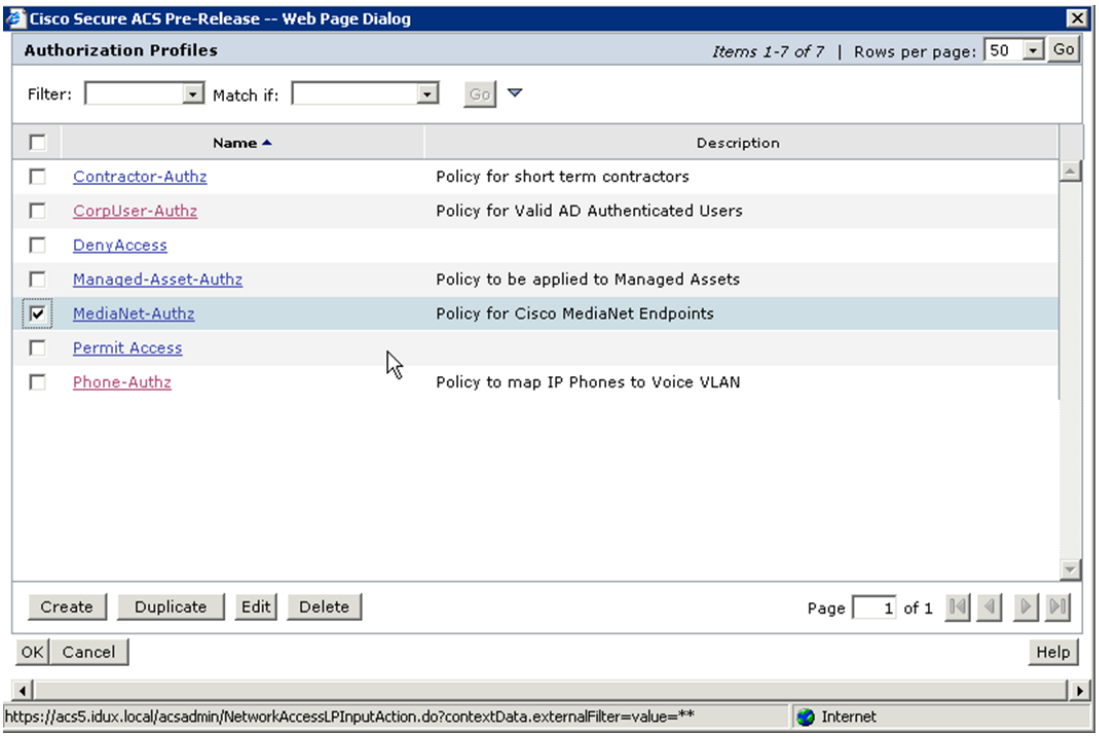
Figure 93 Network Device Groups



Step 5 Click **Add**.

Step 6 In the Results/Authorization Profiles section, click **Select** button and select the previously created **MediaNet-Authz** profile (see Figure 94).

Figure 94 Authorization Profiles List



Step 7 Click **OK** and then click **OK** again.

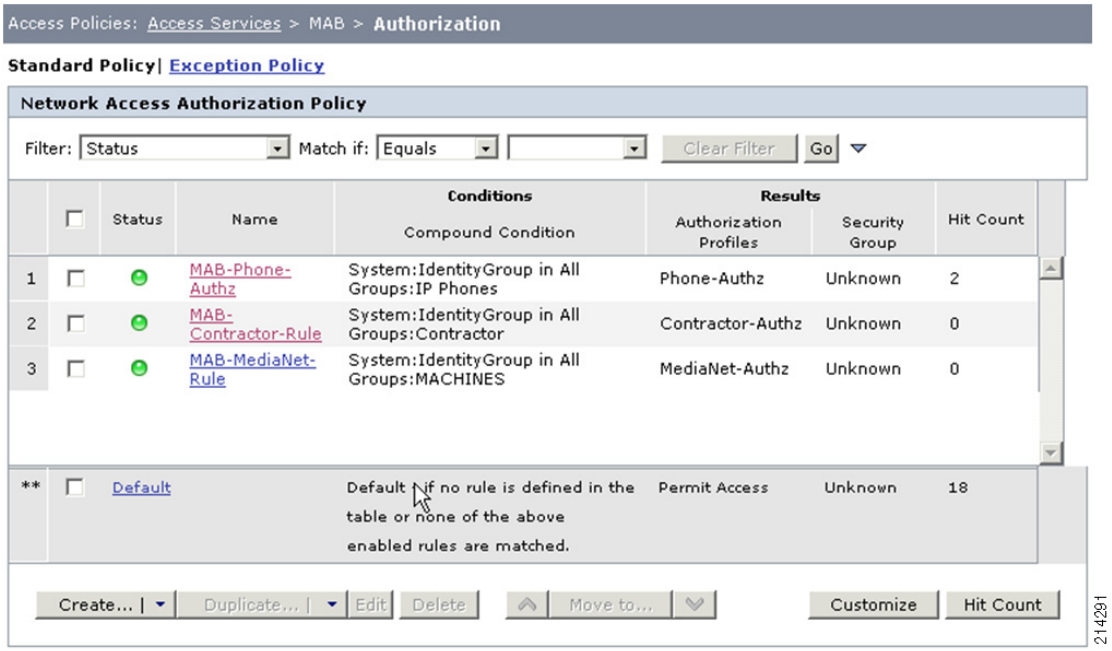
Step 8 Click **Save Changes**.

You should have now three authorization rules for MAB, as shown in Figure 95:

- MAB-Phone-Authz
- MAB-Contractor-Authz
- MAB-MediaNet-Authz

These apply differentiated authorization policy per group type.

Figure 95 MAB Authorization Policies



Configuring the Switch

This section includes the following topics:

Global Switch Default ACLs

Apply the following pre-authentication ACL to be applied to the TrustSec-enabled ports:

```
ip access-list extended PRE-AUTH
 remark Allow DHCP
  permit udp any eq bootpc any eq bootps
 remark Allow DNS
  permit udp any any eq domain
 remark Allow Websense
  permit tcp any any eq 15871
 remark Deny access to HO
  deny ip any 10.0.0.0 0.255.255.255
  deny ip any 192.168.0.0 0.0.255.255
  deny ip any 172.16.0.0 0.15.255.255
 remark Allow access to internet
  permit tcp any any eq www
  permit tcp any any eq 443
```

To enable dACLs, you must first configure your access switch to allow communications using the *cisco-av-pair* attribute with the value *aaa:event=acl-download*. To enable this functionality, enter the following command in the global configuration of the switch. Failure to add this command results in failed authentication/authorization requests.

```
conf t
 radius-server vsa send
 end
```

Switch Port Configuration

Access your switch console and add **ip access-group PRE-AUTH** to the TrustSec-enabled ports you have configured for this exercise:

```
interface range fa2/1-16
  shut
  switchport access vlan 210
  switchport voice vlan 211
  switchport mode access
  ip access-group PRE-AUTH in
  authentication host-mode multi-domain
  authentication open
  authentication port-control auto
  mab
  dot1x pae authenticator
  ip verify source vlan dhcp-snooping
  no shut
```

You are adding only one new line to the configuration (**ip access-group PRE-AUTH in**) and modifying the host-mode from *multiauth* to *multidomain*, which restricts one host in the voice VLAN and one host in the data VLAN. You can use the above configuration as a reference to the other configuration items that should be enabled on the low impact identity-enabled ports.

Configuring the Endpoint Host

For the purposes of this TrustSec phased deployment demonstration, the 802.1X client configuration is limited to Windows XP, the Cisco Secure Services Client (SSC), and PEAP as the authentication protocol.

Before installing Cisco SSC on your Windows XP PC, make sure you do not have any other 802.1X supplicant installed or configured. If you do, remove the supplicant and reboot before starting the next procedure.

To configure the endpoint host, complete the following steps.

Procedure

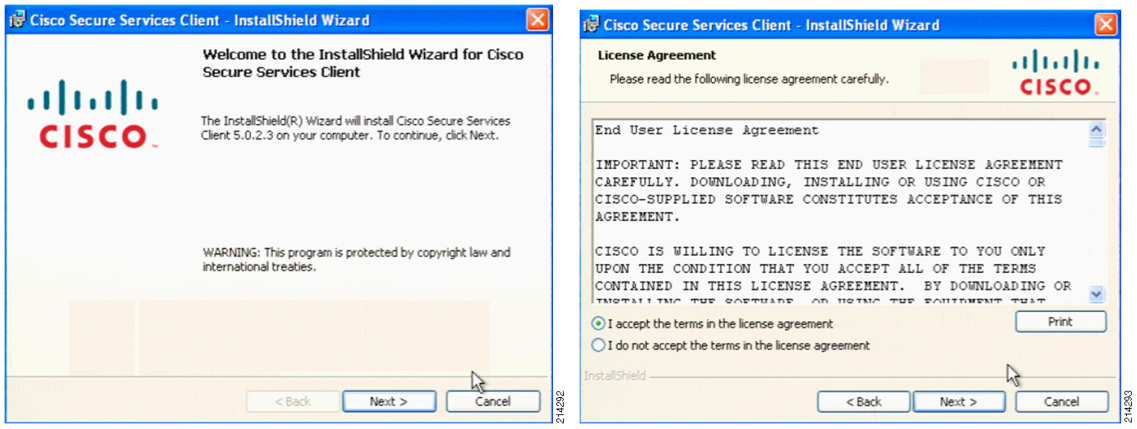
Step 1 Download the latest version of Cisco's SSC (v5.1.1 or later) from http://tools.cisco.com/support/downloads/ to your desktop on the Windows XP machine.

You need both of the following installation applications:

- Cisco_SSC-XP2K_5.1.1.3.zip—Required to install the supplicant on the host PC.
- Cisco_SSCMgmtUtil_5.1.1.4.zip—Required on by the Administrator to create profiles.

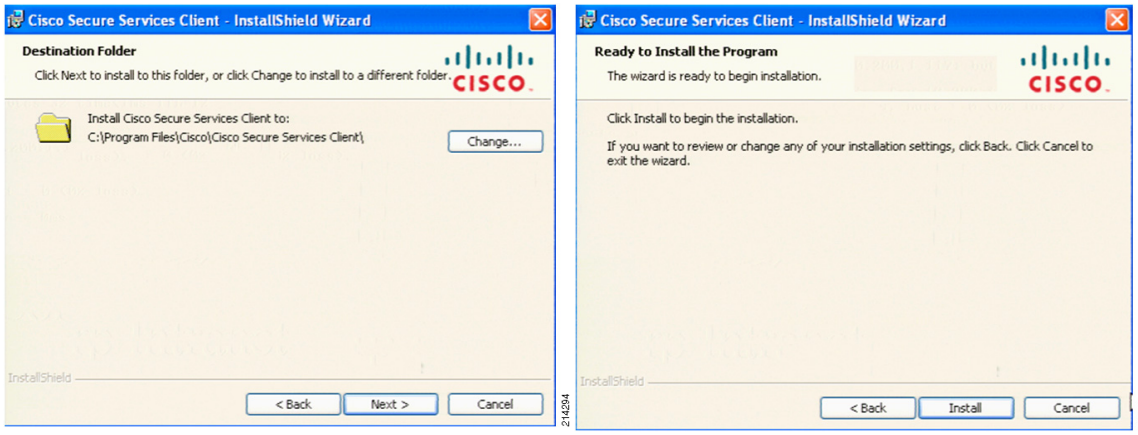
Step 2 Unzip the archive, and run the Cisco SSC Installer (see Figure 96).

Figure 96 Cisco SSC Installer



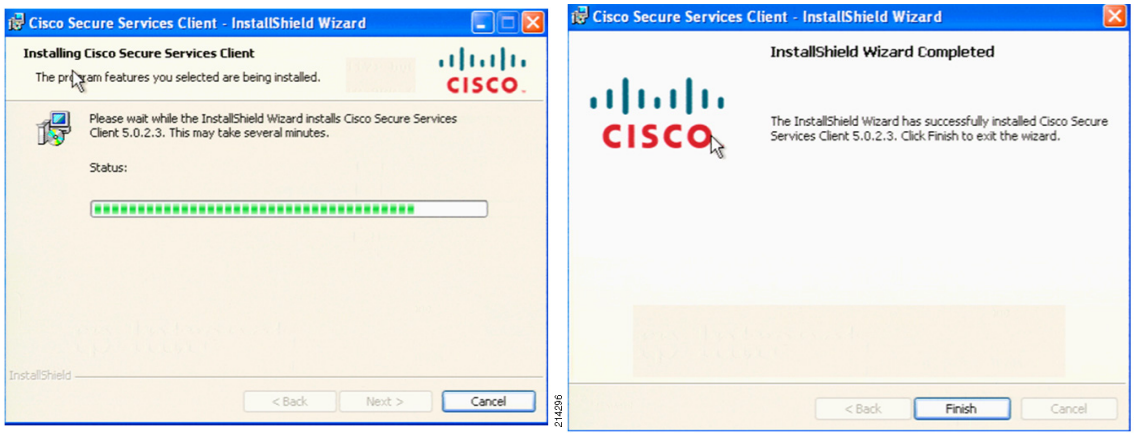
Step 3 Accept the terms and default installation directory (see Figure 97) and click **Install**.

Figure 97 Installation Directory



The two screens shown in Figure 98 show the installation progress

Figure 98 Installation Progress

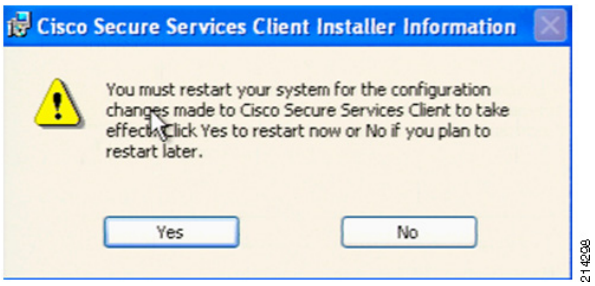


Step 4 When the installation is complete, click **Finish**.

Step 5 Select **Yes** to reboot.

You are required to reboot.

Figure 99 Reboot Screen

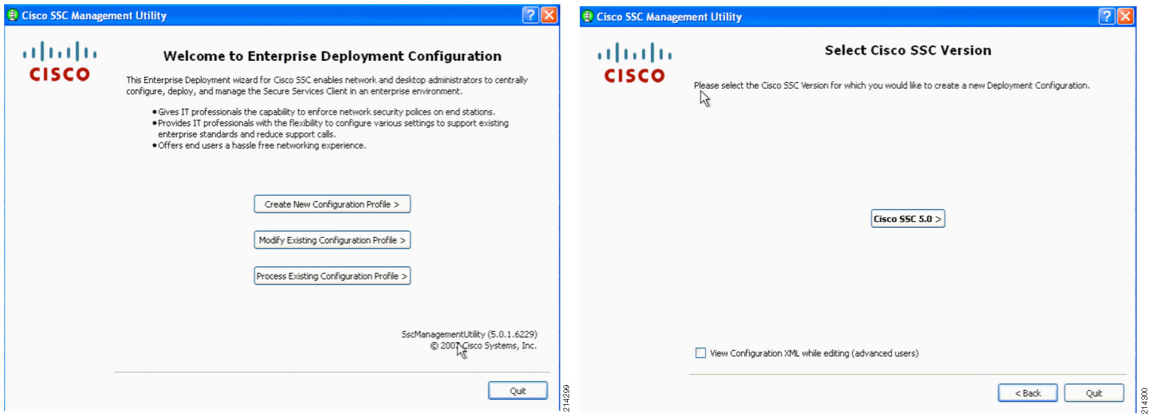


Step 6 When the Windows XP PC has rebooted, log back in as the Administrator.

Step 7 To configure the client for network access, run the *sscManagementUtility.exe* file.

Step 8 Click **Create New Configuration Profile >** and select **Cisco SSC 5.0 >** (see Figure 100).

Figure 100 Welcome and Select Cisco SSC Version Screens



Step 9 In the Client Policy screen (see Figure 101), do the following:

a. Paste in your license key.

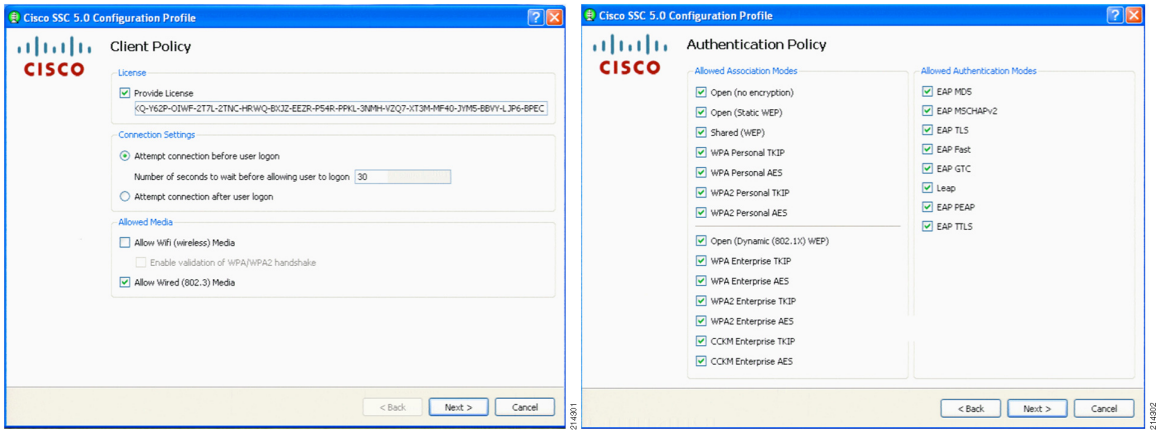
b. Select the **Attempt connection before user logon** radial button.

c. Check the **Allow Wired (802.3) Media** checkbox.

d. Click **Next**.

Step 10 In the Authentication Policy screen (see Figure 101) select all of the Association and Authentication modes and click **Next**.

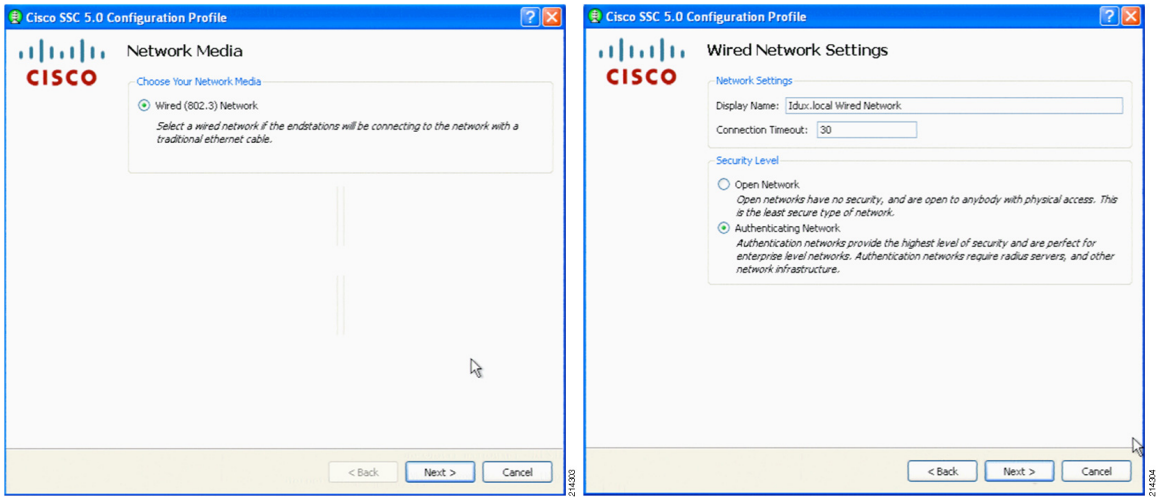
Figure 101 Client Policy and Authentication Policy Screens



Step 11 To create a network profile for each network to which you connect, click **Add Network**.

Step 12 In the Network Media screen (see Figure 102), accept the default and click **Next**.

Figure 102 Network Media and Wired Network Settings Screens



Step 13 In the Wired Network Settings screen (see Figure 102), do the following:

a. Enter a name for this network; for example, **Demo.local Wired Network**.

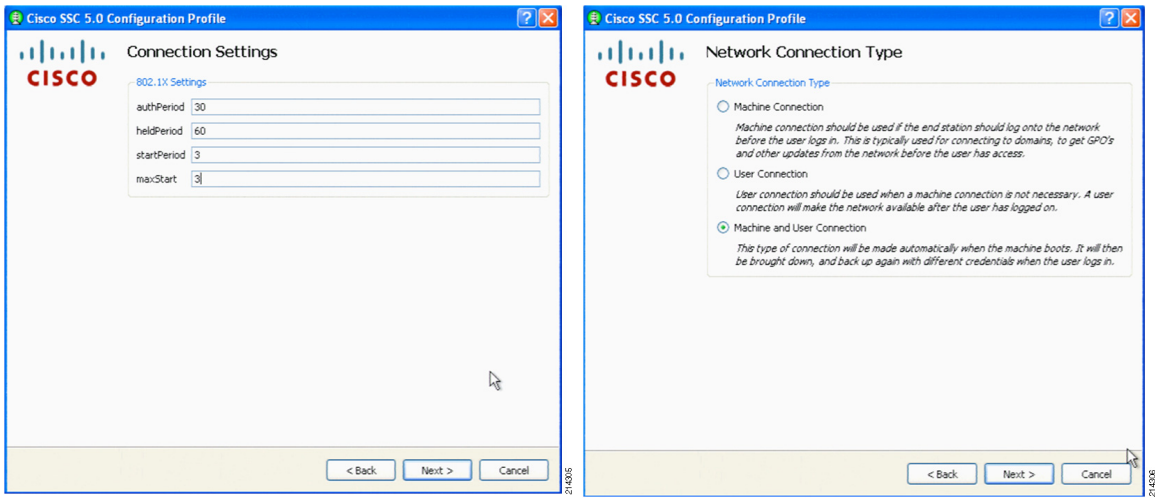
b. Change the Connection Timeout to **30**.

c. Select **Authenticating Network**.

d. Click **Next.**

Step 14 In the Connection Settings screen (see Figure 103), set the **Connection Settings** as shown and click **Next**.

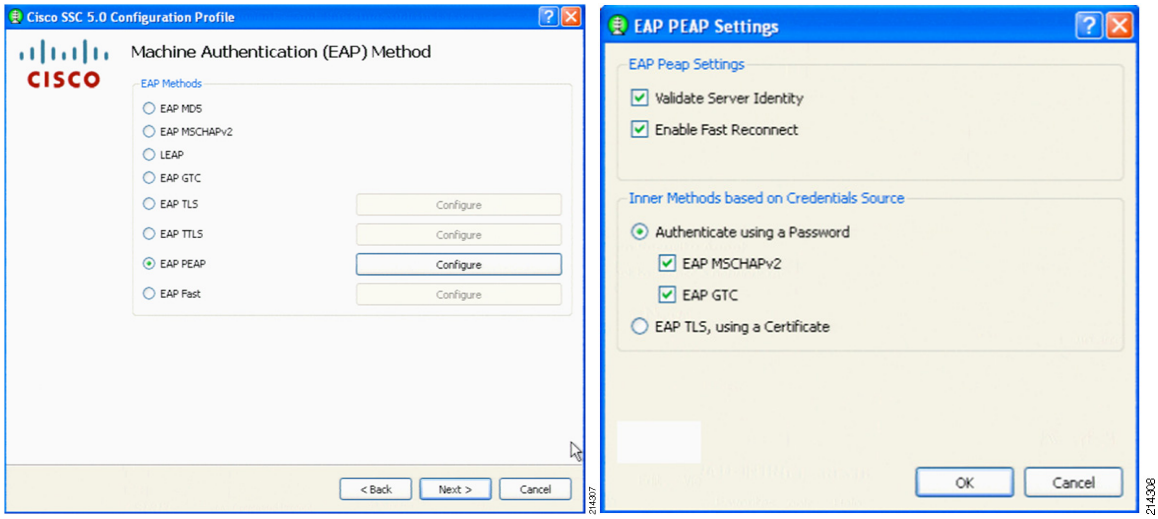
Figure 103 Connection Settings and Network Connection Type Screens



Step 15 In the Network Connection Type screen (see Figure 103), select **Machine and User Connection** and click **Next**.

Step 16 In the Machine Authentication (EAP) Method screen (see Figure 104), select **EAP PEAP** and click the **Configure** button.

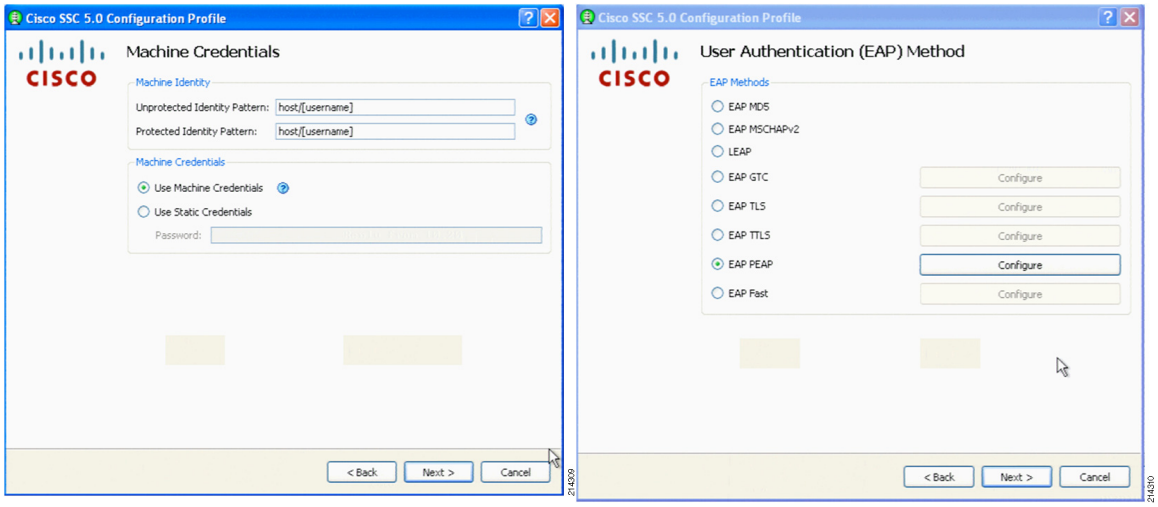
Figure 104 Machine Authentication (EAP) Method and EAP PEAP Settings Screens



Step 17 In the EAP PEAP Settings screen (see Figure 104), for the EAP PEAP setting, check the boxes as shown, click **OK**, and click **Next**.

Step 18 In the Machine Credentials screen (see Figure 105), select **Use Machine Credentials** radial box and click **Next**.

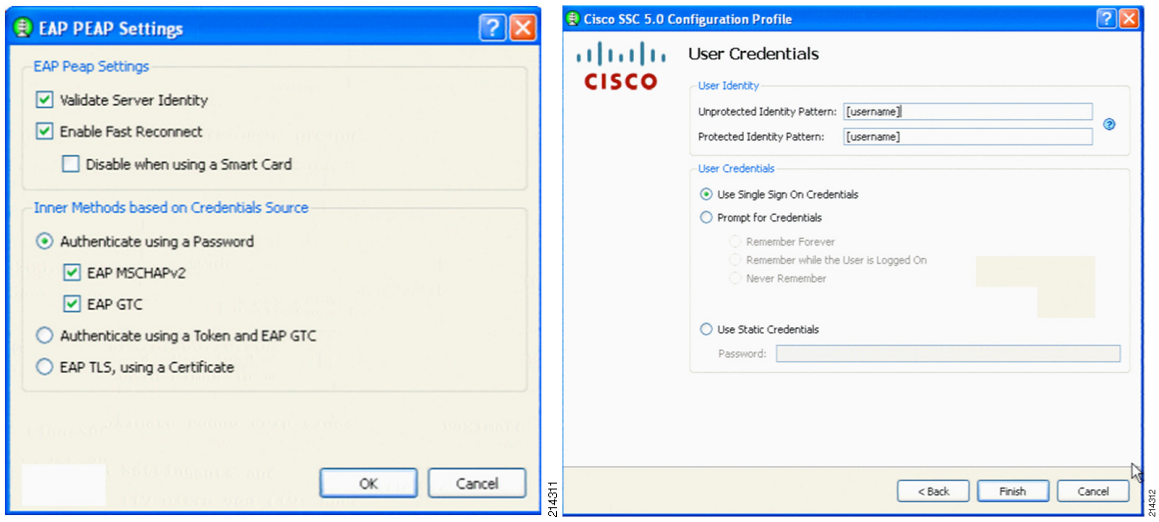
Figure 105 Machine Credentials and User Authentication (EAP) Method Screens



Step 19 In the User Authentication (EAP) Method screen (see Figure 105), select the **EAP PEAP** radio box and then click **Configure**.

Step 20 Select the check boxes and radio buttons as shown in Figure 106 for the EAP PEAP settings, click **OK,** and then click **Next**.

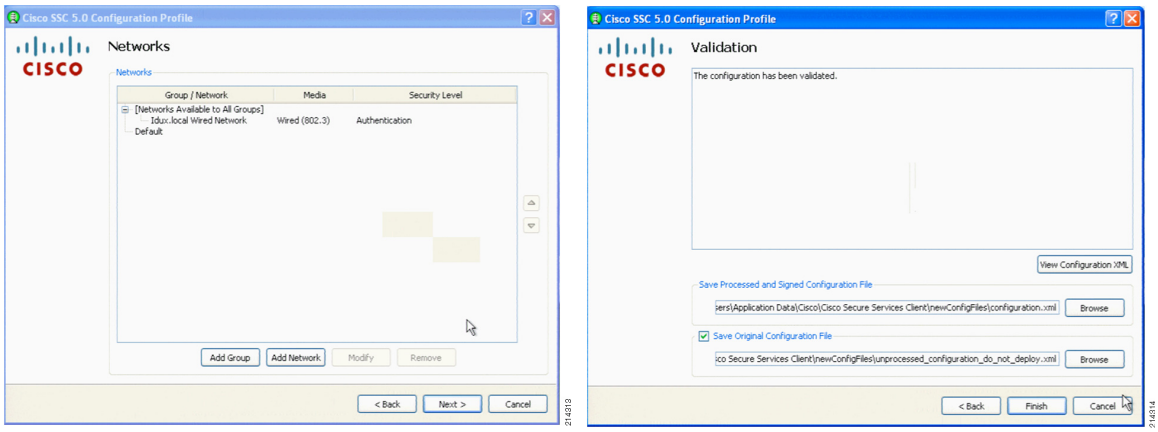
Figure 106 EAP PEAP Settings and User Credentials Screens



Step 21 In the User Credentials screen (see Figure 106), accept **Use Single Sign On Credentials** and click **Finish**.

Step 22 Click **Next** to validate the configuration (see Figure 107).

Figure 107 Networks and Validation Screens



Step 23 Click **Finish** and you are finished with this PC.

Repeat the SCC and Management Utility configuration for other PCs that you are using in this demonstration.

Note There is a way to create an administrative install MSI file with preconfigured settings for a mass deployment. For more information, see the Cisco SSC documentation at the following URL: http://www.cisco.com/en/US/products/ps7034/index.html.

Verifying Low Impact Mode

This section includes the following topics:

Note Global AAA/RADIUS configuration verification should not be necessary because this was validated in the previous sections.

Verifying Host Network Connectivity and Network Services

A quick way to gain insight into the IP addresses associated with the ports and MAC addresses is to run the **show ip dhcp snooping binding** Cisco IOS Software CLI switch command (see Figure 108).

Figure 108 show ip dhcp snooping binding Output

```
id-4503-2#show ip dhcp snooping binding
MacAddress          IpAddress        Lease(sec)  Type           VLAN  Interface
------------------  ---------------  ----------  -------------  ----  --------------------
00:18:F8:08:F8:38   10.200.10.203    685617      dhcp-snooping  210   FastEthernet2/13
00:18:F8:09:CF:C6   10.200.10.201    685558      dhcp-snooping  210   FastEthernet2/1
00:18:BA:C7:BC:FA   10.200.11.201    691176      dhcp-snooping  211   FastEthernet2/13
00:18:BA:C7:BC:EE   10.200.11.203    691134      dhcp-snooping  211   FastEthernet2/12
00:1D:E5:EB:F9:00   10.200.10.200    685586      dhcp-snooping  210   FastEthernet2/11
00:1B:D5:85:39:1E   10.200.11.202    691116      dhcp-snooping  211   FastEthernet2/16
00:1D:E5:EB:E5:EF   10.200.10.202    685583      dhcp-snooping  210   FastEthernet2/8
00:21:86:58:DB:6B   10.200.10.205    685620      dhcp-snooping  210   FastEthernet2/12
Total number of bindings: 8
```

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Comparing this with the original lab diagram shown in Figure 1, you can see that all of the devices are connected and have an IP address. You also see which VLAN they are in and their MAC addresses. The only exception is the rogue AP on port f2/14.

Another useful IOS **show** command is **show authentication sessions**. This displays the state of all TrustSec-enabled switch ports on that switch. Figure 109 and Figure 110 show port-specific derivatives of this command.

Figure 109 show authenticated sessions Output

```
id-4503-2#show authentication sessions

Interface  MAC Address     Method   Domain   Status         Session ID
Fa2/8      (unknown)       dot1x    UNKNOWN  Running        0AC8018000009D3890DCEED8
Fa2/11     (unknown)       dot1x    UNKNOWN  Running        0AC8018000009D3990DCF2C0
Fa2/1      0018.f809.cfc6  dot1x    DATA     Authz Success  0AC8018000009D3190DC8948
Fa2/16     001b.d585.391e  dot1x    UNKNOWN  Running        0AC8018000009D3590DC9124
Fa2/13     0018.bac7.bcfa  dot1x    UNKNOWN  Running        0AC8018000009D3790DC9510
Fa2/12     0018.bac7.bcee  dot1x    UNKNOWN  Running        0AC8018000009D3690DC9510
Fa2/14     0006.2504.c295  dot1x    UNKNOWN  Running        0AC8018000009D3390DC8D40
Fa2/12     0021.8658.db6b  dot1x    UNKNOWN  Running        0AC8018000009D3A90DD020C
Fa2/13     0018.f808.f838  dot1x    UNKNOWN  Running        0AC8018000009D3B90DD0598
```

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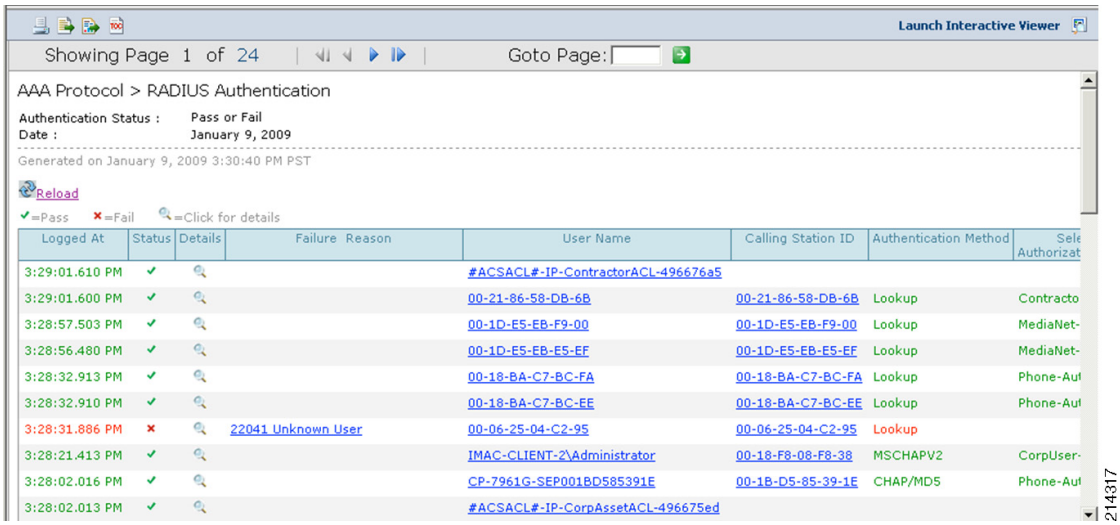
Figure 110 show cdp neighbors Output

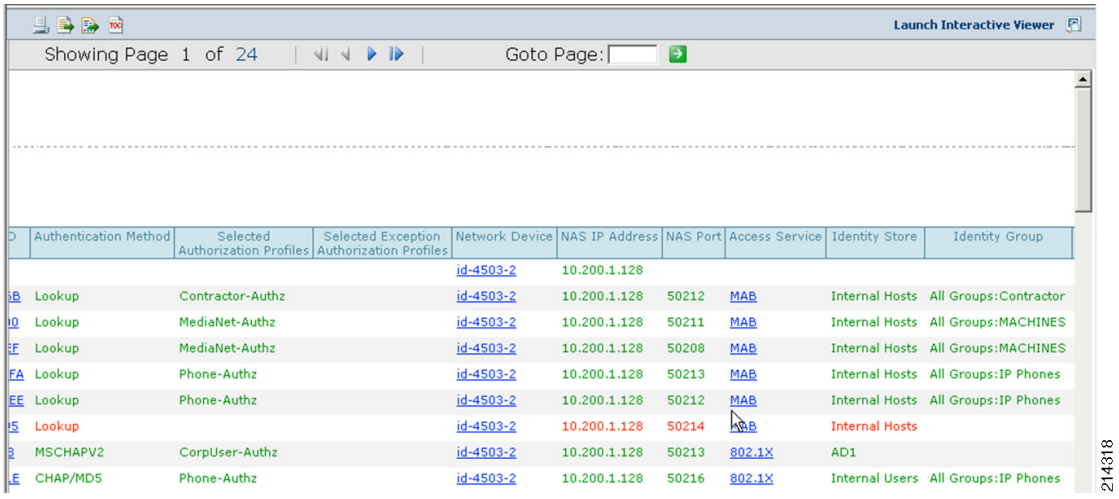
Another quick summary view is to look at the Authentication and Authorization logs within ACS Reporting and Monitoring (see Figure 111).

Figure 111 Authentication and Authorization Logs (1)



The screenshot in Figure 112 is the same list of hosts, which has been scrolled to the right to show the rest of the data available.

Figure 112 Authentication and Authorization Logs (2)



As shown, all of the administratively allowed devices have successfully authenticated and received the authorization policy as prescribed. Note that the host with the MAC address 00-06-25-04-C2-95 failed authentication. By having this log, we know that someone has plugged in a rogue device on switch id-4503-2 on port 50214 (i.e, F2/14). Per policy in Low Impact mode, this device is allowed to gain an IP address and access limited resources per the PRE-AUTH ACL. However, this allows you to also send someone out to determine what the device is and whether it should be on your network.

Verifying 802.1X-Capable Managed Assets

802.1X Cisco IP Phone

This simple verification step verifies that the phone has an IP address and has connected to the Call Manager. One easy test is to pick up the phone and see whether it has dial tone. If it does, chances are everything is working just fine.

For further verification look at the switch port status, as shown in Figure 113.

Figure 113 Switch Port Status

```
id-4503-2>en
Password:
id-4503-2#show authen session interface f2/16
           Interface:  FastEthernet2/16
         MAC Address:  001b.d585.391e
          IP Address:  10.200.11.202
           User-Name:  CP-7961G-SEP001BD585391E
              Status:  Authz Success
              Domain:  VOICE
      Oper host mode:  multi-auth
    Oper control dir:  both
       Authorized By:  Authentication Server
     Session timeout:  3600s (local), Remaining: 1154s
      Timeout action:  Reauthenticate
        Idle timeout:  N/A
   Common Session ID:  0AC801800009D30907E4128
     Acct Session ID:  0x00009D3E
              Handle:  0x9A000D6F

Runnable methods list:
      Method   State
      dot1x    Authc Success
      mab      Not run
```

214319

Figure 113 shows that the phone successfully authenticated via 802.1X and was placed in the VOICE VLAN.

Windows XP and Cisco SSC 802.1X Supplicant/Client

Complete the following steps.

Procedure

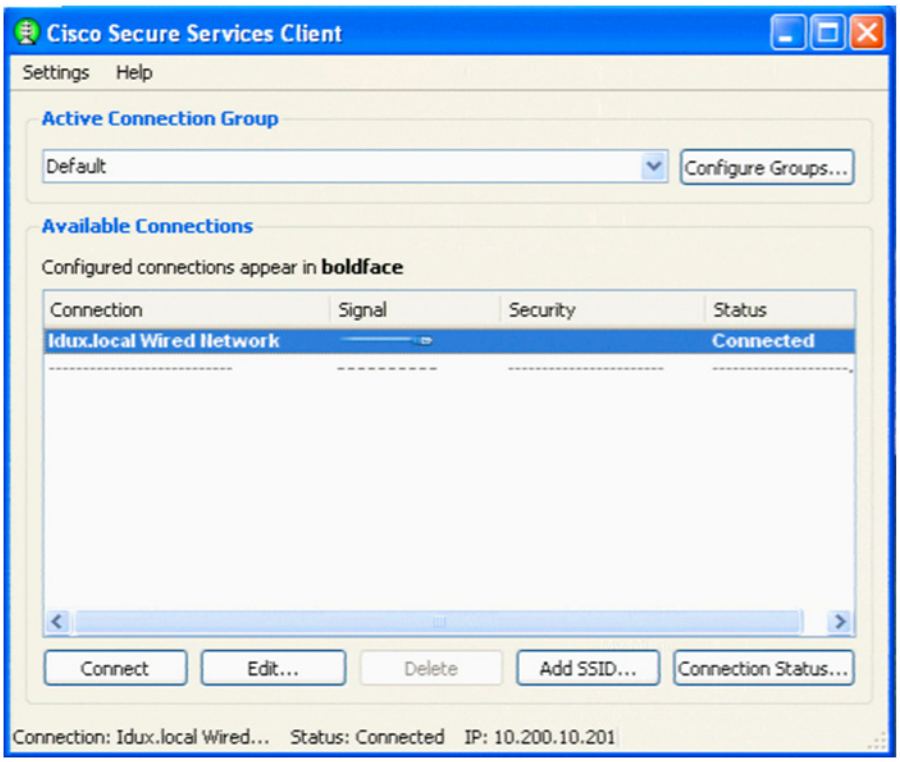
Step 1 From the Windows XP interface, double-click the SSC icon (that is, the round green icon) in the tray bar (see Figure 114).

Figure 114 SSC Icon in the Tray Bar

214320

This loads the SSC dialog window, showing the status of your connection (see Figure 115).

Figure 115 Connection Status



Step 2 For further verification, look at the switch port status (see Figure 116).

Figure 116 Switch Port Status

```
id-4503-2#show authentication sessions interface f2/1
           Interface:  FastEthernet2/1
         MAC Address:  0018.f809.cfc6
          IP Address:  10.200.10.201
           User-Name:  administrator
              Status:  Authz Success
              Domain:  DATA
     Oper host mode:  multi-auth
   Oper control dir:  both
      Authorized By:  Authentication Server
        Vlan Policy:  N/A
     Session timeout:  3600s (local), Remaining: 2270s
      Timeout action:  Reauthenticate
        Idle timeout:  N/A
   Common Session ID:  0AC801800009D25907D4E68
     Acct Session ID:  0x00009D33
              Handle:  0x7A000D64

Runnable methods list:
      Method   State
      dot1x    Authc Success
      mab      Not run
```

214322

Verifying Non-802.1X-Capable Managed Assets

Cisco IP Phone (no 802.1X Supplicant)

Verify that the phone has dial tone and check the authentication status of the switch port. Two non-802.1X phones are on ports F2/12 and F2/13. You can also determine where they are connected by using the following Cisco IOS Software CLI commands:

- show cdp neighbors
- show ip dhcp snooping binding
- show authentication session

You can also check the AAA logs from ACS.

Figure 117 shows the output for **show authentication sessions interface f2/12** & **f2/13**.

Figure 117 show authentication sessions interface f2/12 & f2/13 Output

```
id-4503-2#show authentication sessions interface f2/12
            Interface:  FastEthernet2/12
          MAC Address:  0018.bac7.bcee
           IP Address:  10.200.11.203
            User-Name:  00-18-BA-C7-BC-EE
               Status:  Authz Success
               Domain:  VOICE
      Oper host mode:  multi-auth
    Oper control dir:  both
       Authorized By:  Authentication Server
      Session timeout:  N/A
         Idle timeout:  N/A
    Common Session ID:  0AC801800009D3690DC9510
     Acct Session ID:  0x00009D47
              Handle:  0x0A000D75

Runnable methods list:
       Method   State
       dot1x    Failed over
       mab      Authc Success

----------------------------------------
            Interface:  FastEthernet2/12
          MAC Address:  0021.8658.db6b

           IP Address:  10.200.10.205
            User-Name:  00-21-86-58-DB-6B
               Status:  Authz Success
               Domain:  DATA
      Oper host mode:  multi-auth
    Oper control dir:  both
       Authorized By:  Authentication Server
         Vlan Policy:  N/A
      Session timeout:  N/A
         Idle timeout:  N/A
    Common Session ID:  0AC801800009D3A90DD020C
     Acct Session ID:  0x00009D4B
              Handle:  0x31000D79

Runnable methods list:
       Method   State
       dot1x    Failed over
       mab      Authc Success
```

214323

```
id-4503-2#show authentication sessions interface f2/13
            Interface:  FastEthernet2/13
          MAC Address:  0018.bac7.bcfa
           IP Address:  10.200.11.201
            User-Name:  00-18-BA-C7-BC-FA
               Status:  Authz Success
               Domain:  VOICE
      Oper host mode:  multi-auth
    Oper control dir:  both
       Authorized By:  Authentication Server
      Session timeout:  N/A
         Idle timeout:  N/A
    Common Session ID:  0AC801800009D3790DC9510
     Acct Session ID:  0x00009D48
              Handle:  0x2B000D76

Runnable methods list:
       Method   State
       dot1x    Failed over
       mab      Authc Success

----------------------------------------
            Interface:  FastEthernet2/13
          MAC Address:  0018.f808.f838

           IP Address:  10.200.10.203
            User-Name:  IMAC-CLIENT-2\Administrator
               Status:  Authz Success
               Domain:  DATA
      Oper host mode:  multi-auth
    Oper control dir:  both
       Authorized By:  Authentication Server
         Vlan Policy:  N/A
      Session timeout:  N/A
         Idle timeout:  N/A
    Common Session ID:  0AC801800009D3B90DD0598
     Acct Session ID:  0x00009D4C
              Handle:  0x3A000D7A

Runnable methods list:
       Method   State
       dot1x    Authc Success
       mab      Not run
```

214324

As shown in the output from these Cisco IOS show commands, two devices are authenticated on each port: a phone and a PC. The phones are placed in the VOICE VLAN and the PCs in the DATA VLAN.

For port F2/12, the phone and the PC are both authenticated via MAB. On port F2/13, the phone is authenticated via MAB and the PC is authenticated via 802.1X. Both ports have the same configuration. This is the power of FlexAuth combined with multiauth.

You can also repeat the validation steps performed in the "Verifying Monitor Mode" section on page 36 for a complete validation.

Implementing High Security Mode

This section includes the following topics:

High Security Mode Overview

Low impact mode may fulfill initial access security requirements for many organizations. For those that need stricter access controls may choose to deploy high security mode.

High security mode returns to the traditional closed mode of 802.1X, in conjunction with dynamic VLAN assignment for differentiated access. Although high security mode represents a more traditional deployment model, the new Cisco IOS FlexAuth feature set can be used to create a flexible, adaptable deployment.

FlexAuth allows you to configure secondary authentication methods to 802.1X, such as MAB and/or Web Authentication for guest access. Additionally, FlexAuth allows you to re-order the sequence of authentication. For example, you can try MAB before 802.1X.

Because you are moving from monitor or low impact mode, the base infrastructure configuration is already in place. Here you need to modify only the authorization profiles and switch port configurations.

Modifying Authorization Profiles

For high security mode, you are going to modify the five existing authorization profiles. The authorization is changed from dACLs to VLANs.

Table 13 lists the authorization profiles for all three modes.

Table 13 Authorization Profiles

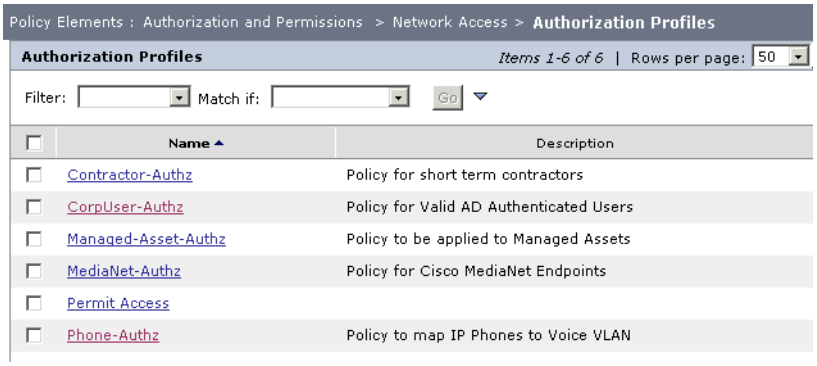
Profile Name	Description	VLAN	dACL
Monitor Mode			
No Authorization Profile Required	n/a	n/a	n/a
Low Impact or Selective Access Mode			
Phone-Authz	Policy to map IP phones to Voice VLAN	n/a	CorpAssetACL
Managed-Asset-Authz	Policy to be applied to managed assets	n/a	CorpAssetACL
MediaNet-Authz	Policy for Cisco MediaNet endpoints	n/a	CorpAssetACL

Table 13 Authorization Profiles

CorpUser-Authz	Policy for valid AD authenticated users	n/a	CorpUserACL
Contractor-Authz	Policy for short-term contractors	n/a	ContractorACL
High Security Mode			
Phone-Authz	Policy to map IP phones to Voice VLAN	N/A	n/a
Managed-Asset-Authz	Policy to be applied to managed assets	MACHINE	n/a
MediaNet-Authz	Policy for Cisco MediaNet endpoints	MEDIANET	n/a
CorpUser-Authz	Policy for valid AD authenticated users	DATA	n/a
Contractor-Authz	Policy for short-term contractors	CONTRACTOR	n/a

To modify existing authorization profiles, first access the ACS web interface and go to **Policy Elements > Authorization and Permissions > Network Access > Authorization Profiles** (see Figure 118).

Figure 118 Authorization Profiles Screen

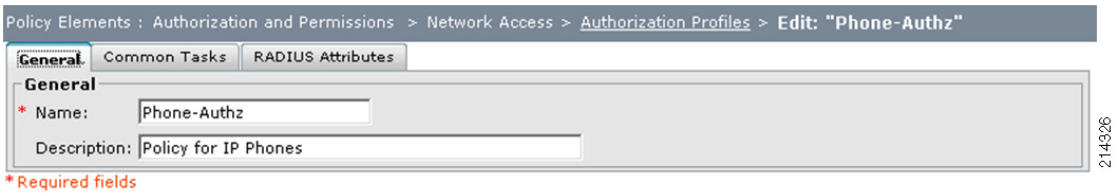


From here, modify the existing profiles by completing the following steps.

Modifying the Phone-Authz Profile

Step 1 Select the **Phone-Authz** profile (see Figure 119).

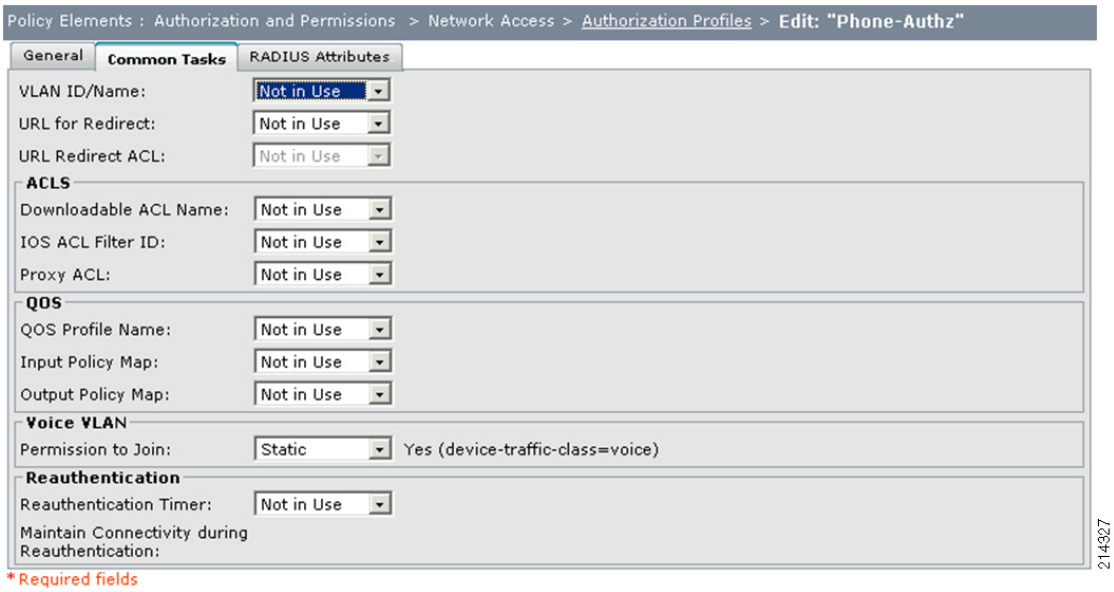
Figure 119 Modifying the Phone-Authz Profile



Step 2 Select the **Common Tasks** tab.

Step 3 Under the ACLS section, from the Downloadable ACL Name drop-down menu, change **static** to **Not in Use** (see Figure 120).

Figure 120 Authorization Profiles—Common Tasks Tab



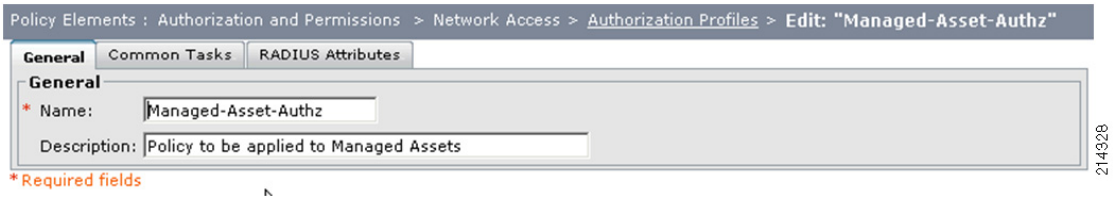
Step 4 Click **Submit** to finish.

Repeat these steps for the rest of the Authz profiles created, using Table 13 to map the appropriate VLANs to these profiles.

Modifying the Managed-Asset-Authz Profile

Step 1 Select the **Managed-Asset-Authz** profile (see Figure 121).

Figure 121 Modifying Managed-Asset-Authz Profile



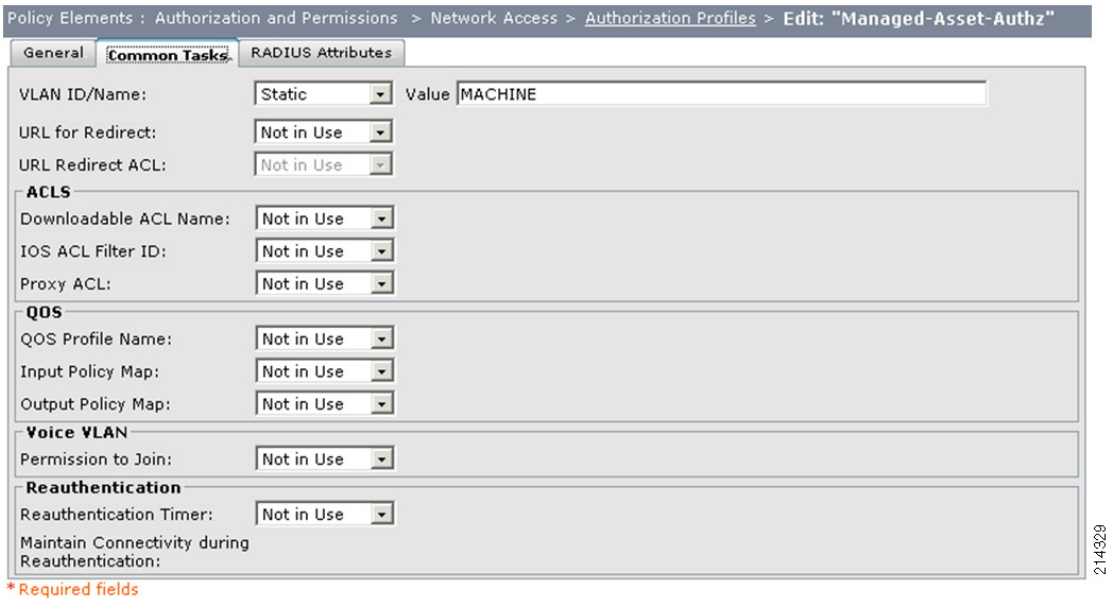
Step 2 Select the **Common Tasks** tab (see Figure 122) and do the following:

a. For the VLAN ID/Name drop-down option, select **static**.

b. In the Value input field, type **MACHINE**.

c. Under the ACLS section, from the Downloadable ACL Name drop-down menu, change **static** to **Not in Use**.

Figure 122 Authorization Profiles—Common Tasks Tab

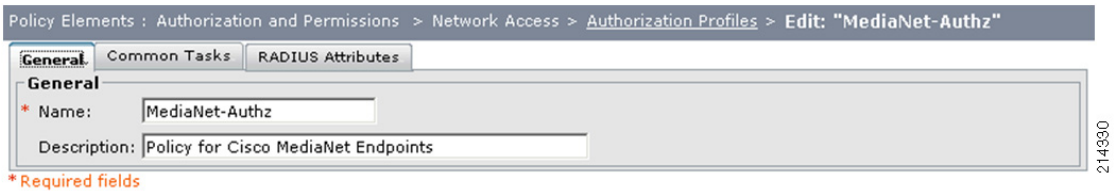


Step 3 Click **Submit**.

Modifying the MediaNet-Authz Profile

Step 1 Select the **MediaNet-Authz** profile (see Figure 123).

Figure 123 Modifying the MediaNet-Authz Profile



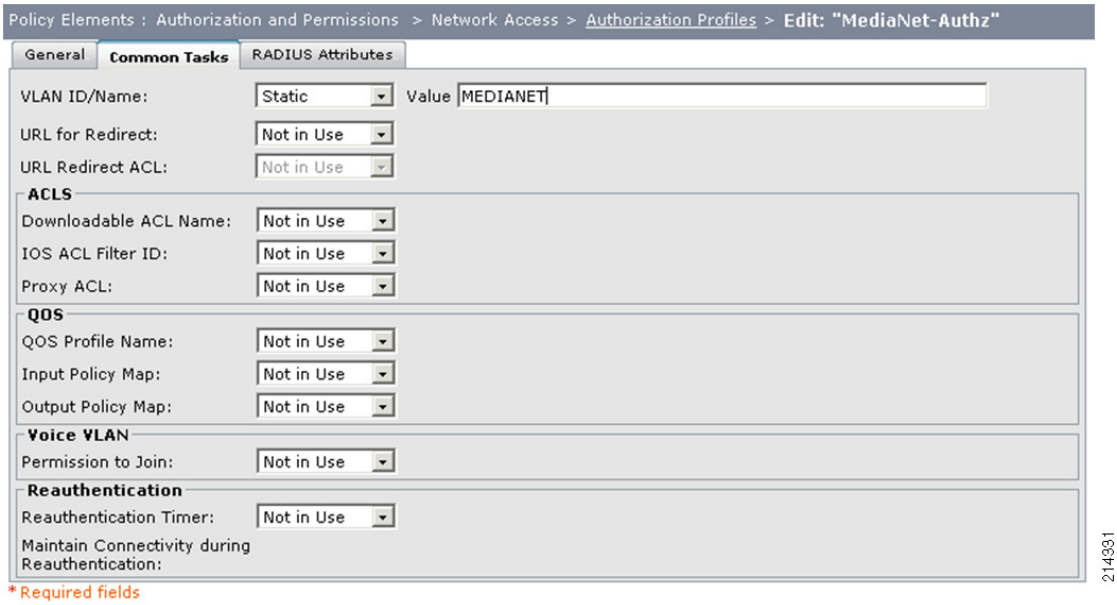
Step 2 Select the **Common Tasks** tab (see Figure 124) and do the following:

a. For the VLAN ID/Name drop-down option, select **static**.

b. In the Value input field, type **MEDIANET**.

c. Under the ACLS section, from the Downloadable ACL Name drop-down menu, change **static** to **Not in Use**.

Figure 124 Authorization Profiles—Common Tasks Tab

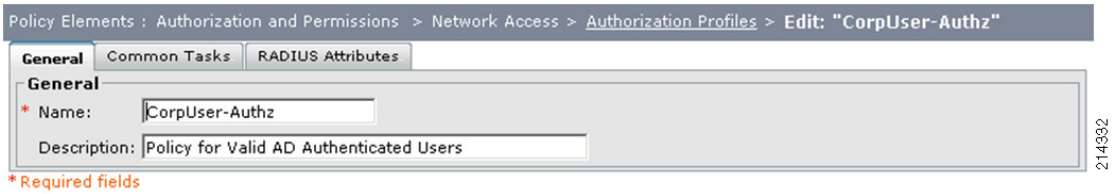


Step 3 Click **Submit**.

Modifying the CorpUser-Authz Profile

Step 1 Select the **CorpUser-Authz** profile (see Figure 125).

Figure 125 Modifying the CorpUser-Authz Profile



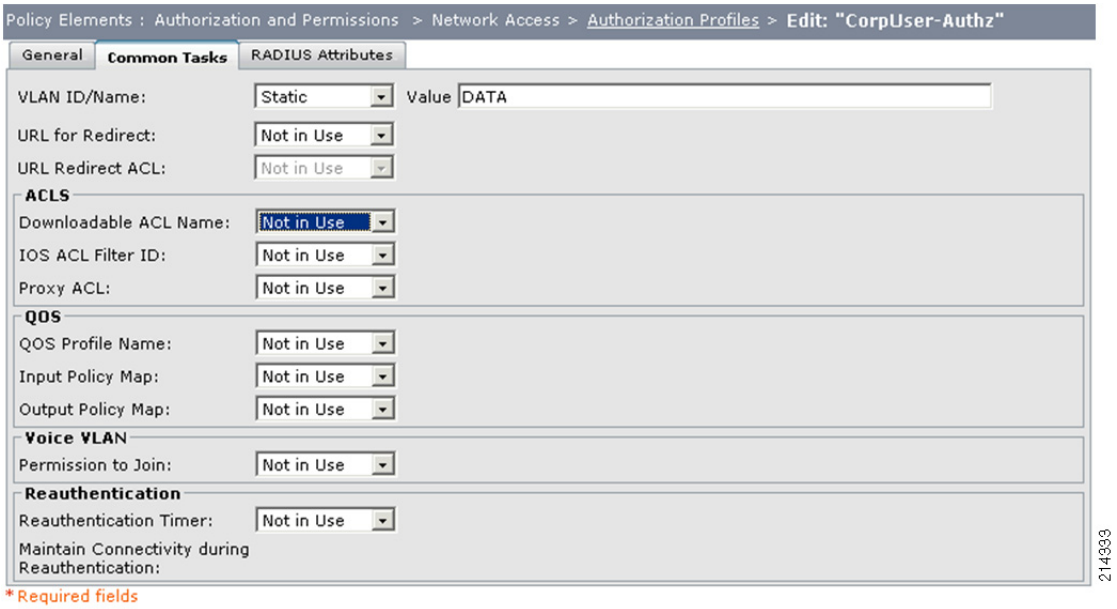
Step 2 Select the **Common Tasks** tab (see Figure 126) and do the following:

a. For the VLAN ID/Name drop-down option, select **static**.

b. In the Value input field, type **DATA**.

c. Under the ACLS section, from the Downloadable ACL Name drop-down menu, change **static** to **Not in Use**.

Figure 126 Authorization Profiles—Common Tasks Tab

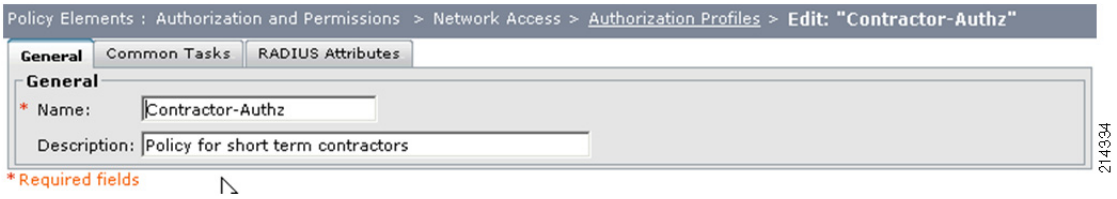


Step 3 Click **Submit**.

Modifying the Contractor Authorization Profile

Step 1 Select the **Contractor-Authz** profile (see Figure 127).

Figure 127 Modifying the Contractor-Authz Profile



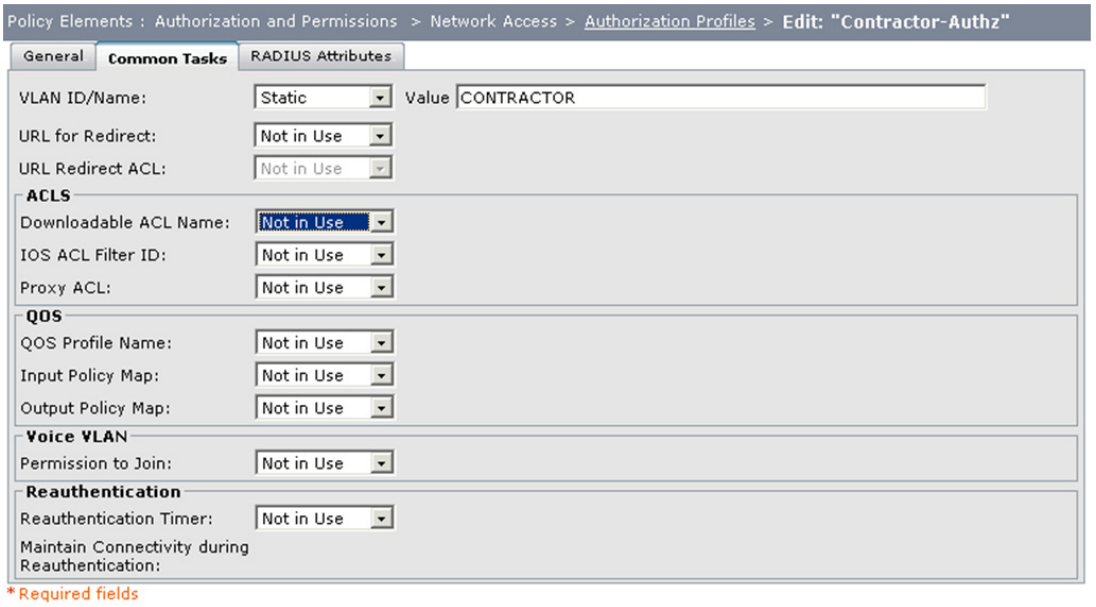
Select the **Common Tasks** tab (see Figure 128) and do the following:

a. For the VLAN ID/Name drop-down option, select **static**.

b. In the Value input field, type **CONTRACTOR**.

c. Under the ACLS section, from the Downloadable ACL Name drop-down menu, change **static** to **Not in Use**.

Figure 128 Authorization Profiles—Common Tasks Tab



Step 2 Click **Submit**.

Verifying Global Switch VLAN Definition

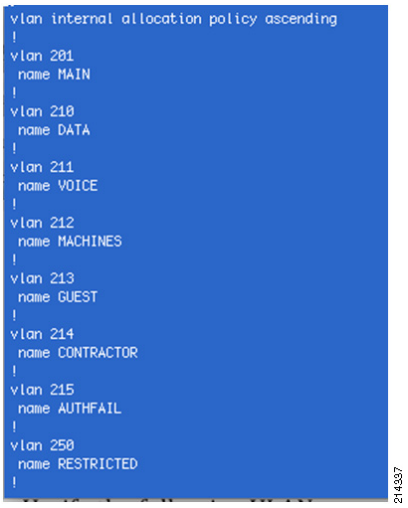
Verify that the VLANs listed in Table 14 are enabled on the TrustSec-enabled switch.

Table 14 VLANs

VLAN NAME	VLAN ID	IP	Description
Monitor Mode			
DATA	210	10.200.10.x/24	All non-Voice
VOICE	211	10.200.11.x/24	Voice Only
High Security Mode (Above plus those listed below)			
MACHINES	212	10.200.12.x/24	Managed Host/Assets
GUEST	213	10.200.13.x/24	Non-802.1X responsive Host
CONTRACTOR	214	10.200.14.x/24	Reserved for Contractors
AUTHFAIL	215	10.200.15.x/24	Failed 802.1X attempts

Figure 129 shows the output for the **show run | begin vlan internal** command.

Figure 129 show run | begin vlan internal Output



Configuring the Switch Port

Access your switch console and remove **ip access-group PRE-AUTH in** and **authentication open** on all of the TrustSec-enabled ports you have configured in the previous monitor and low impact modes:

```
interface range fa2/1-16
  shut
  switchport access vlan 210
  switchport voice vlan 211
  switchport mode access

  ip access-group PRE-AUTH in <- Remove this entry
  no ip access group PRE-AUTH in
  authentication open <- Remove this entry
  no authentication open

  authentication host-mode multi-domain
  authentication port-control auto
  mab
  dot1x pae authenticator
  ip verify source vlan dhcp-snooping
  no shut
```

When complete, make sure you bounce the affected interfaces by using the **shut** and then the **no shut** commands.

Verifying High Security Mode

This section includes the following topics:

Note Global AAA/RADIUS configuration verification should not be necessary because this was validated in the previous sections.

Verifying Host Network Connectivity and Network Services

The **show authentication sessions** Cisco IOS command is useful to display the state of all TrustSec-enabled switch ports on that switch. Figure 130 shows a port-specific derivative of this command.

Figure 130 show authenticated sessions Output

```
id-4503-2#show authentication sessions

Interface  MAC Address     Method   Domain   Status         Session ID
Fa2/8      (unknown)       dot1x    UNKNOWN  Running        0AC8018000009D3890DCEED8
Fa2/11     (unknown)       dot1x    UNKNOWN  Running        0AC8018000009D3990DCF2C0
Fa2/1      0018.f809.cfc6  dot1x    DATA     Authz Success  0AC8018000009D3190DC8948
Fa2/16     001b.d585.391e  dot1x    UNKNOWN  Running        0AC8018000009D3590DC9124
Fa2/13     0018.bac7.bcfa  dot1x    UNKNOWN  Running        0AC8018000009D3790DC9510
Fa2/12     0018.bac7.bcee  dot1x    UNKNOWN  Running        0AC8018000009D3690DC9510
Fa2/14     0006.2504.c295  dot1x    UNKNOWN  Running        0AC8018000009D3390DC8D40
Fa2/12     0021.8658.db6b  dot1x    UNKNOWN  Running        0AC8018000009D3A90DD020C
Fa2/13     0018.f808.f838  dot1x    UNKNOWN  Running        0AC8018000009D3B90DD0598
```

214338

You can also see the authentication status for a specific port; for example, **show authentication session int f2/1** (see Figure 131).

Figure 131 show authentication session int f2/1 Output

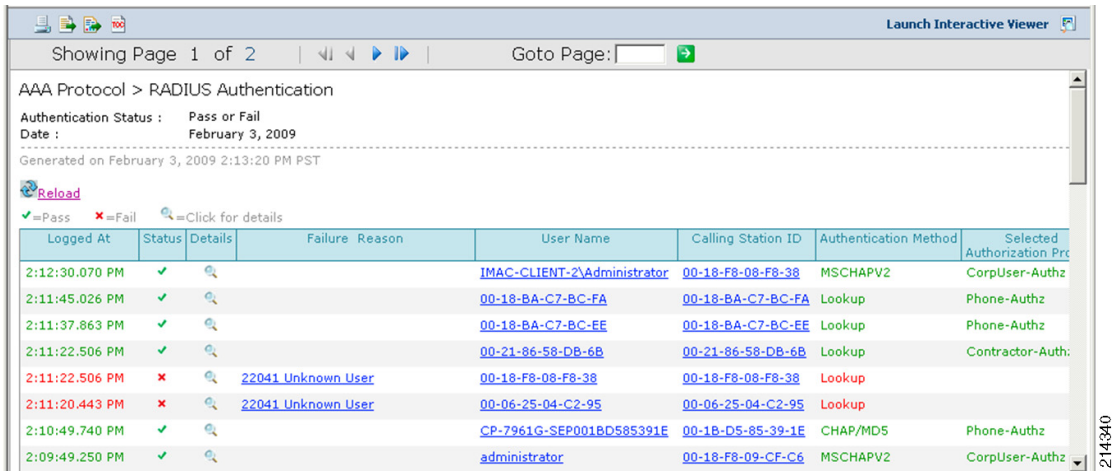
```
id-4503-2#show authentication sessions interface f2/1
           Interface:  FastEthernet2/1
         MAC Address:  0018.f809.cfc6
          IP Address:  10.200.10.201
           User-Name:  administrator
              Status:  Authz Success
              Domain:  DATA
     Oper host mode:  multi-domain
   Oper control dir:  both
      Authorized By:  Authentication Server
       Vlan Policy:  210
     Session timeout:  3600s (local), Remaining: 3233s
      Timeout action:  Reauthenticate
        Idle timeout:  N/A
   Common Session ID:  0AC80180000000002403D4FD7C
     Acct Session ID:  0x0000002B
              Handle:  0x53000024

Runnable methods list:
      Method   State
      dot1x    Authc Success
      mab      Not run
```

214339

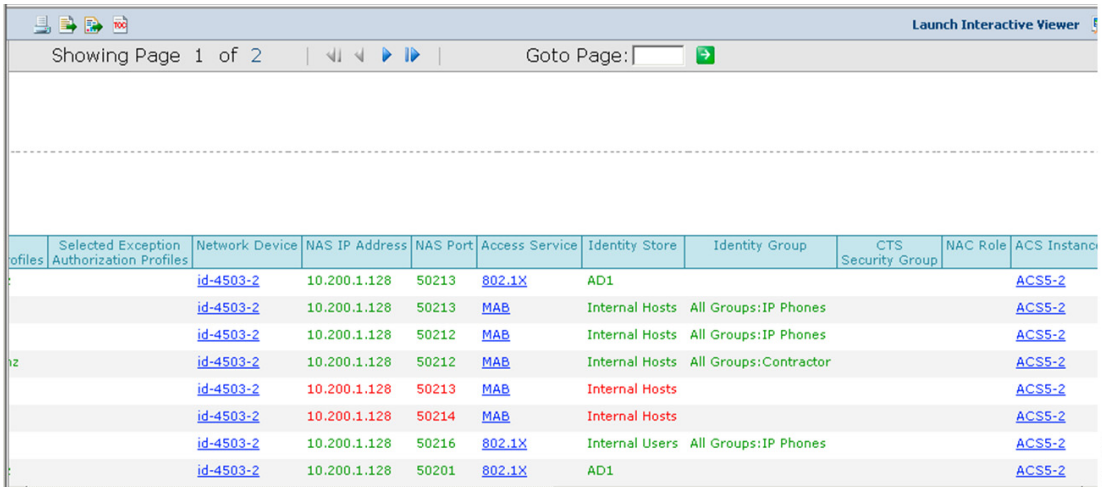
For another quick summary view, look at the Authentication and Authorization logs within ACS Reporting and Monitoring (see Figure 132).

Figure 132 Authentication and Authorization Logs (1)



The screenshot shown in Figure 133 is the same list of hosts, which has been scrolled to the right to show the rest of the data available.

Figure 133 Authentication and Authorization Logs (2)



As shown, all the administratively allowed devices have successfully authenticated and received the authorization policy as prescribed. Note that the host with the MAC address 00-06-25-04-C2-95 failed authentication. By having this log, you know that someone has plugged in a rogue device on switch id-4503-2 on port 50214 (that is, F2/14). Per policy in high security mode, this device is not allowed to gain access to the network.

Verifying 802.1X-Capable Managed Assets

802.1X Cisco IP Phone

In this simple verification step, verify that the phone has an IP address and has connected to the Call Manager. One easy test is to pick up the phone and see whether it has dial tone. If it does, chances are everything is working just fine.

For further verification, you can look at the switch port status (see Figure 134).

Figure 134 Switch Port Status

```
id-4503-2#show auth session int f2/16
           Interface:  FastEthernet2/16
         MAC Address:  001b.d585.391e
          IP Address:  10.200.11.202
           User-Name:  CP-7961G-SEP001BD585391E
              Status:  Authz Success
              Domain:  VOICE
      Oper host mode:  multi-domain
    Oper control dir:  both
       Authorized By:  Authentication Server
        Vlan Policy:  211
     Session timeout:  3600s (local), Remaining: 2191s
      Timeout action:  Reauthenticate
        Idle timeout:  N/A
   Common Session ID:  0AC801800000002E03D5F924
     Acct Session ID:  0x00000035
              Handle:  0x4400002E

Runnable methods list:
      Method   State
      dot1x    Authc Success
      mab      Not run
```

214342

As shown, the phone successfully authenticated via 802.1X, was placed in the VOICE VLAN, and the host mode is multidomain.

Windows XP and Cisco SSC 802.1X Supplicant/Client

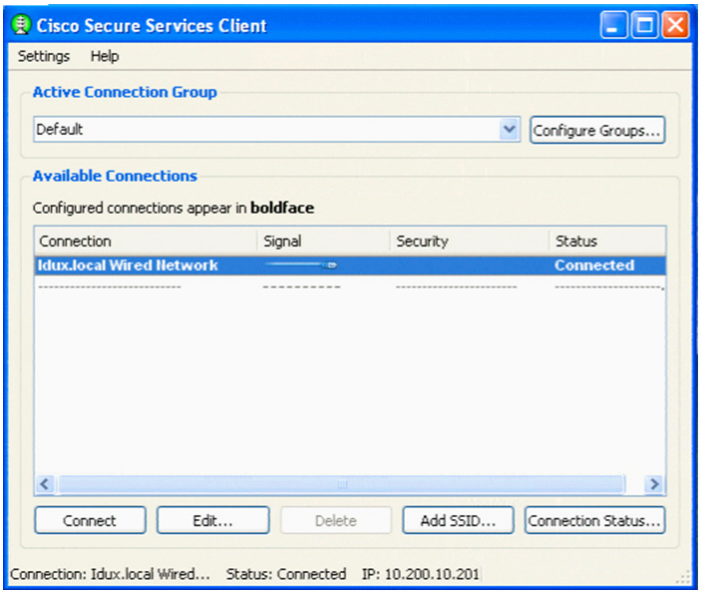
Step 1 From the Windows XP interface, double-click the SSC icon in the tray bar.

Figure 135 Cisco SSC Icon in the Tray Bar

214343

This loads the SSC dialog window showing the status of your connection (see Figure 136).

Figure 136 Connection Status



Step 2 For further verification, look at the switch port status (see Figure 137).

Figure 137 Switch Port Status

```
id-4503-2#show auth session int f2/1
           Interface:  FastEthernet2/1
         MAC Address:  0018.f809.cfc6
          IP Address:  10.200.10.201
           User-Name:  administrator
              Status:  Authz Success
              Domain:  DATA
      Oper host mode:  multi-domain
    Oper control dir:  both
       Authorized By:  Authentication Server
        Vlan Policy:  210
     Session timeout:  3600s (local), Remaining: 2043s
      Timeout action:  Reauthenticate
         Idle timeout:  N/A
    Common Session ID:  0AC801800000002403D4FD7C
      Acct Session ID:  0x0000002B
              Handle:  0x53000024

Runnable methods list:
       Method   State
       dot1x    Authc Success
       mab      Not run
```

214345

Verifying Non-802.1X-Capable Managed Assets

Cisco IP Phone (no 802.1X Supplicant)

Verify dial tone and look at the authentication status of the switch port. From before, two non-802.1X-capable phones are on ports F2/12 and F2/13. You can also determine where they are connected from the following Cisco IOS commands:

- show cdp neighbors
- show ip dhcp snooping binding

- show authentication session

You can also check the AAA logs from ACS.

Figure 138 shows the output for the **show authentication sessions interface f2/12** & **f2/13** command.

Figure 138 show authentication sessions interface f2/12 and f2/13 Output

```
id-4503-2#show auth session int f2/12
           Interface:  FastEthernet2/12
         MAC Address:  0018.bac7.bcee
          IP Address:  10.200.11.203
           User-Name:  00-18-BA-C7-BC-EE
              Status:  Authz Success
              Domain:  VOICE
     Oper host mode:  multi-domain
   Oper control dir:  both
      Authorized By:  Authentication Server
        Vlan Policy:  211
     Session timeout:  N/A
        Idle timeout:  N/A
   Common Session ID:  0AC801800000002A03D54584
     Acct Session ID:  0x00000031
              Handle:  0xCB00002A

Runnable methods list:
      Method   State
      dot1x    Failed over
      mab      Authc Success

----------------------------------------
           Interface:  FastEthernet2/12

         MAC Address:  0021.8658.db6b
          IP Address:  10.200.10.205
           User-Name:  00-21-86-58-DB-6B
              Status:  Authz Success
              Domain:  DATA
     Oper host mode:  multi-domain
   Oper control dir:  both
      Authorized By:  Authentication Server
        Vlan Policy:  214
     Session timeout:  N/A
        Idle timeout:  N/A
   Common Session ID:  0AC801800000002803D50548
     Acct Session ID:  0x0000002F
              Handle:  0x19000028

Runnable methods list:
      Method   State
      dot1x    Failed over
      mab      Authc Success
```

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```
id-4503-2#show auth session int f2/13
           Interface:  FastEthernet2/13
         MAC Address:  0018.bac7.bcfa
          IP Address:  10.200.11.201
           User-Name:  00-18-BA-C7-BC-FA
              Status:  Authz Success
              Domain:  VOICE
     Oper host mode:  multi-domain
   Oper control dir:  both
      Authorized By:  Authentication Server
        Vlan Policy:  211
     Session timeout:  N/A
        Idle timeout:  N/A
   Common Session ID:  0AC801800000002B03D561A8
     Acct Session ID:  0x00000032
              Handle:  0x3A00002B

Runnable methods list:
      Method   State
      dot1x    Failed over
      mab      Authc Success

----------------------------------------
           Interface:  FastEthernet2/13

         MAC Address:  0018.f808.f838
          IP Address:  10.200.10.203
           User-Name:  IMAC-CLIENT-2\Administrator
              Status:  Authz Success
              Domain:  DATA
     Oper host mode:  multi-domain
   Oper control dir:  both
      Authorized By:  Authentication Server
        Vlan Policy:  210
     Session timeout:  N/A
        Idle timeout:  N/A
   Common Session ID:  0AC801800000002903D50554
     Acct Session ID:  0x00000030
              Handle:  0x30000029

Runnable methods list:
      Method   State
      dot1x    Authc Success
      mab      Failed over
```

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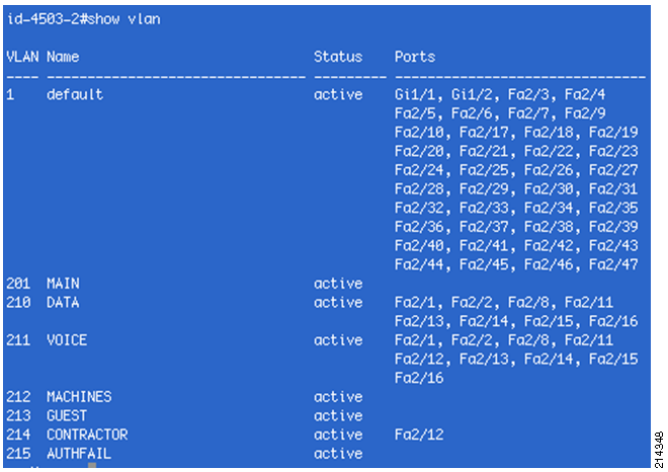
As shown from the output of these Cisco IOS **show** commands, two devices are authenticated on each port: a phone and a PC. The phones are placed in the VOICE domain and the PCs in the DATA domain.

For port F2/12, the phone and the PC are both authenticated via MAB. On port F2/13, the phone is authenticated via MAB and the PC is authenticated via 802.1X. Both ports have the same configuration. This is the power of FlexAuth and multiauth.

Furthermore, using the **show vlan** command, you can see that interface f2/12 is in both the VOICE and CONTRACTOR VLANs (see Figure 139).

Figure 139 show vlan Output



The phone that is in the VOICE domain has been placed in the VOICE VLAN and the PC that is in the DATA domain is in the CONTRACTOR VLAN.

You can also repeat the validation steps performed in the "Verifying Monitor Mode" section on page 36 for a complete validation.

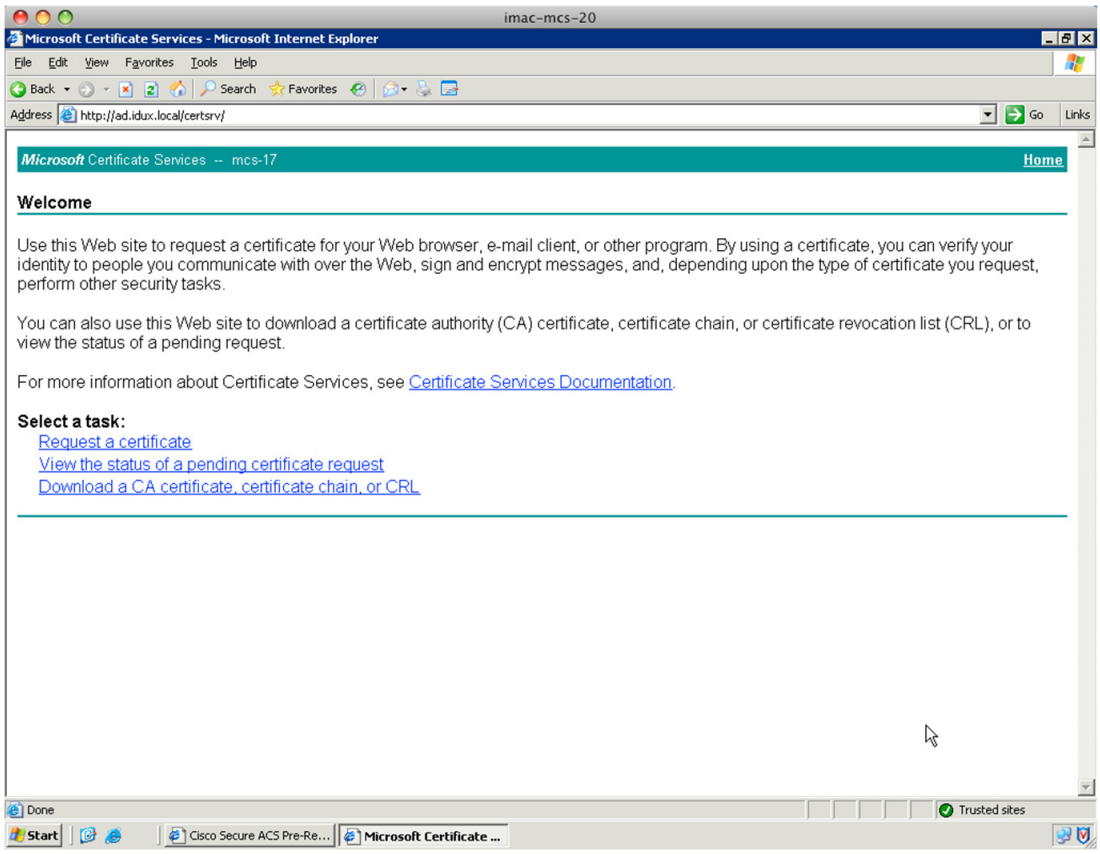
Creating a Certificate for a Windows XP Browser

To create a certificate for your Windows XP browser, complete the following steps.

Procedure

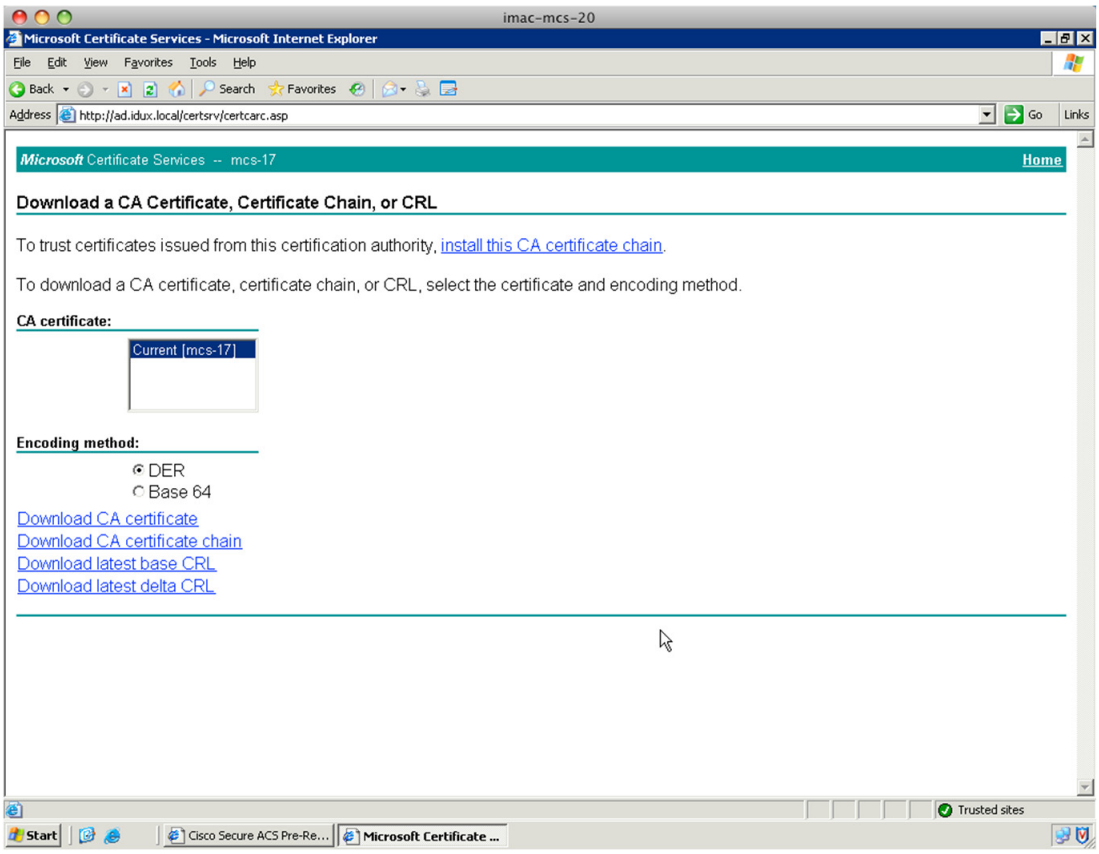
Step 3 Access your CA via your browser; for example, **http://demo.local/certsrv/** (see Figure 140).

Figure 140 Microsoft Certificate Services Screen



Step 4 Select **Download a CA Certificate**, **Certificate Chain**, or **CRL** (see Figure 141).

Figure 141 Selecting a Certificate to Download



Step 5 Download a CA Certificate (see Figure 142, Figure 143, Figure 144, Figure 145, and Figure 146).

Note ACS supports only the DER certificate format. Save the certificate (*demo-local-ca-cert.cer*) for installation into your browser or applications.

Figure 142 Opening the Certificate

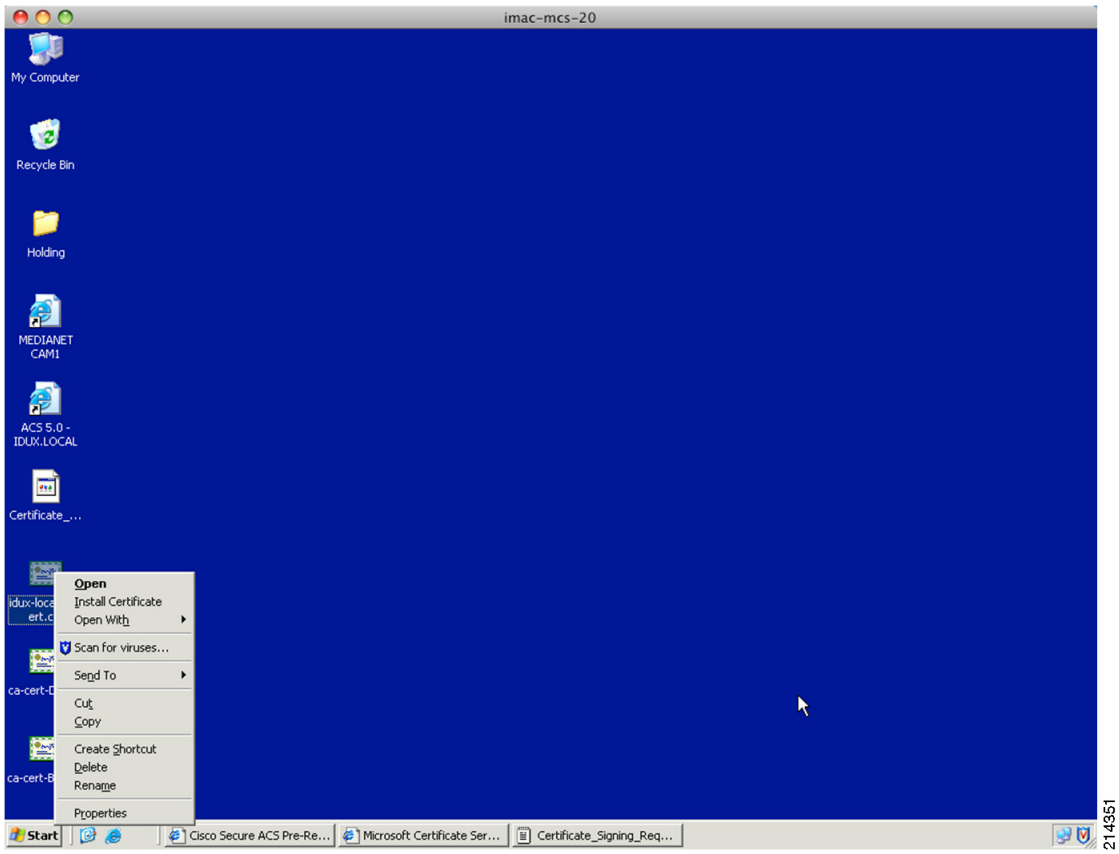


Figure 143 Certificate Import Wizard and Select Certificate Store Screens

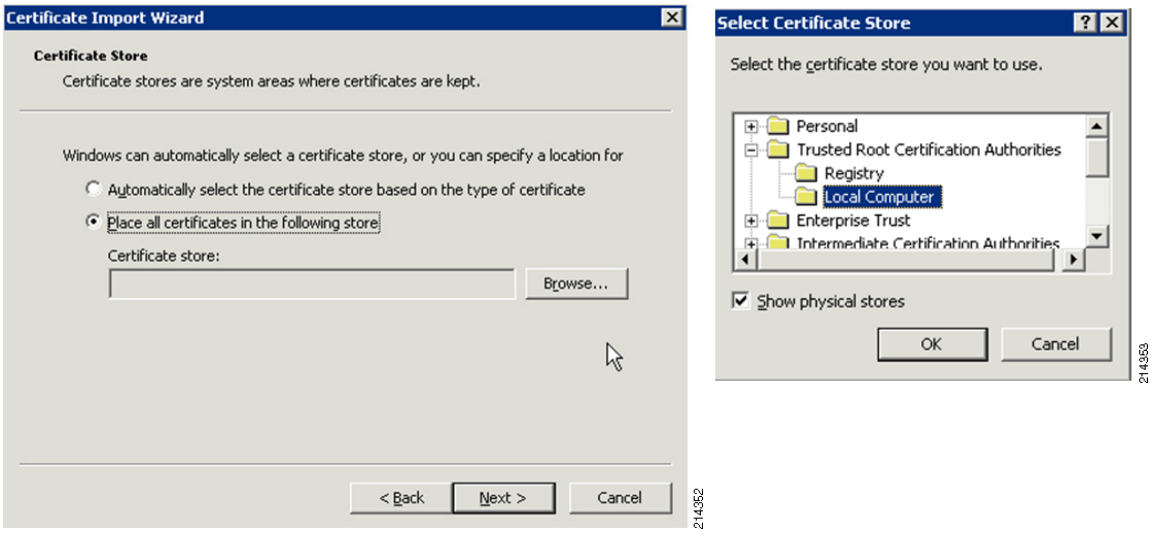
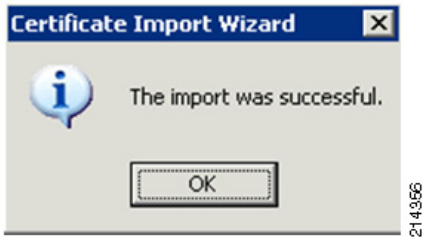


Figure 144 Completing the Certificate Import Wizard Screen

Figure 145 Warning Message

Figure 146 Success Message



References

TrustSec 1.99 Documents

- Wired 802.1X Deployment Guide—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/Dot1X_Deployment/Dot1x_Dep_Guide.html
- IP Telephony for 802.1X Design Guide—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/IP_Tele/IP_Telephony_DIG.html
- MAC Authentication Bypass Deployment Guide—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/MAB/MAB_Dep_Guide.html
- TrustSec Phased Deployment Configuration Guide—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/Phased_Deploy/Phased_Dep_Guide.html
- Local WebAuth Deployment Guide—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/WebAuth/WebAuth_Dep_Guide.html
- Scenario-Based TrustSec Deployments Application Note—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/Scenario_based_AppNote/Scenario_based_AN.html
- TrustSec 1.99 Deployment Note: FlexAuth Order, Priority, and Failed Authentication—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/FlexAuthNote/flexauth-note.html
- TrustSec Planning and Deployment Checklist—
http://www.cisco.com/en/US/docs/solutions/Enterprise/Security/TrustSec_1.99/TrustSec_Checklist/trustsec-199_checklist.html

Related Documents

- Configuring WebAuth on the Cisco Catalyst 3750 Series Switches—
http://www.cisco.com/en/US/partner/docs/switches/lan/catalyst3750/software/release/12.2_55_se/configuration/guide/sw8021x.html
- Configuring WebAuth on the Cisco Catalyst 4500 Series Switches—
http://www.cisco.com/en/US/partner/docs/switches/lan/catalyst4500/12.2/53SG/configuration/webauth.html
- Configuring WebAuth on the Cisco Catalyst 6500 Series Switches—
http://www.cisco.com/en/US/partner/docs/switches/lan/catalyst6500/ios/12.2SX/configuration/guide/webauth.html
- Cisco IOS Firewall authentication proxy—
http://www.cisco.com/en/US/products/sw/secursw/ps1018/products_tech_note09186a0080094eb0.shtml

- WebAuth with Cisco Wireless LAN Controllers—
http://www.cisco.com/en/US/partner/tech/tk722/tk809/technologies_configuration_example09186a008076f974.shtml#external-process