Cisco Network Admission Control and Microsoft Network Access Protection

Configuration and Troubleshooting Guide

Version 1.0

Introduction

The purpose of this guide is to provide the details necessary for configuring and testing the Cisco® Network Admission Control (NAC) and Microsoft Network Access Protection (NAP) integration solution (referred to here as NAC-NAP). This guide provide configuration details for all components of the NAC-NAP solution, including the Microsoft Vista client, Cisco Secure Access Control Server (ACS) for Windows, Cisco network access devices (NADs), Microsoft Network Policy Server (NPS), and required components.

Cisco Network Admission Control and Microsoft Network Access Protection Integration Overview

The Cisco NAC and Microsoft NAP solutions together provide the capability to gather identity and posture information from an endpoint, determine the security policy compliance of the endpoint, provide remediation services, and enforce network access policies based on the compliance of the endpoint.

With the integration of these two solutions, an administrator can verify the health status of a Microsoft Vista client, provide remediation capabilities, and provide dynamic policy enforcement on the network infrastructure.

The NAC-NAP solution components include Cisco Secure Access Control System (ACS) version 4.2, Cisco 802.1X-capable Catalyst Switches, Microsoft Network Policy Server (NPS), and Microsoft NAP-enabled Vista operating system. The Cisco NAC Appliance does not support NAP at this time and is not part of the solution.

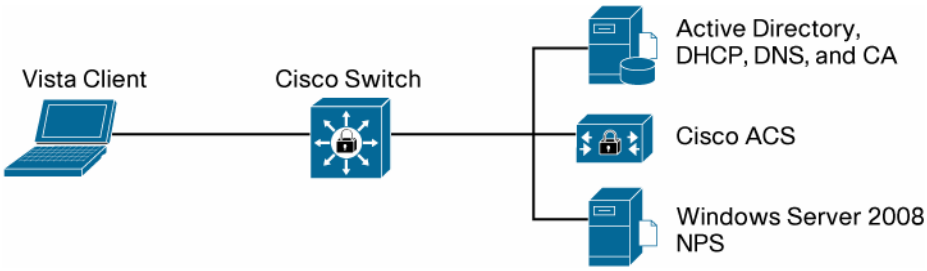
- For additional information about the Cisco NAC solution, see http://www.cisco.com/go/nac.
- For additional information about the Microsoft NAP solution, see http://www.microsoft.com/nap.

Topology

The initial deployment examples include the following components for NAC-NAP (Figure 1): Microsoft Windows 2003 Server running Cisco Secure ACS, Microsoft Active Directory, certificate authority (CA), Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), a Cisco switch, a Microsoft Vista client, and Microsoft Windows Server 2008 running Microsoft NPS, Host Credential Authorization Protocol (HCAP), and Microsoft Internet Information Server (IIS). This setup includes support for IEEE 802.1x assessment methods and HCAP integration between Cisco Secure ACS and Microsoft NPS. Note that when the HCAP server is installed on Windows Server 2008, the Microsoft NPS and IIS components are also installed.

This topology also includes support for IEEE 802.1x (NAC Layer 2 IEEE 802.1x) network connection methods. Cisco Secure ACS acts as the Cisco network policy server. The Microsoft NPS acts as the posture validation server. The Microsoft NPS and the Cisco Secure ACS communicate posture data through HCAP.

Figure 1. Basic Topology for NAC-NAP Interoperability Architecture

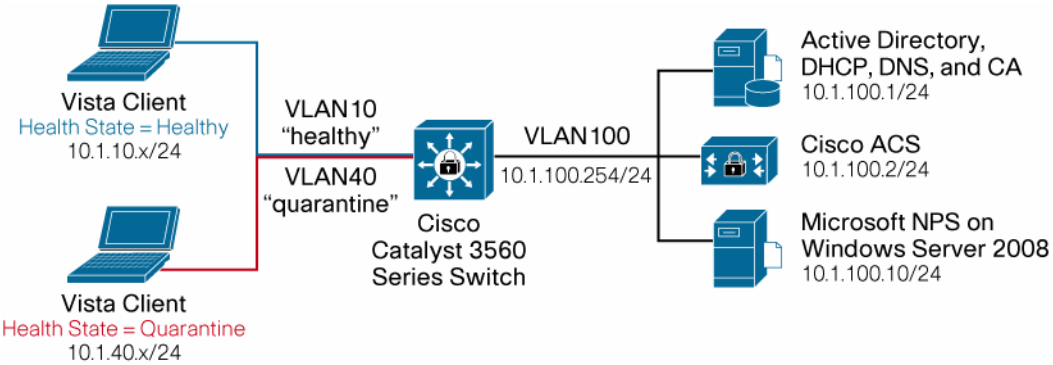


Configuration Scenarios

IEEE 802.1x Method

The IEEE 802.1x deployment scenario uses IEEE 802.1x with Extensible Authentication Protocol–Flexible Authentication via Secure Tunneling (EAP-FAST) as the assessment method and provides policy enforcement through dynamic VLAN assignment on the switch. Initially, two VLANs will be configured on the switch for support with IEEE 802.1x: a healthy VLAN and a quarantine VLAN (Figure 2).

Figure 2. IEEE 802.1x Method Setup



After the client is connected to the switch port, IEEE 802.1x authentication will occur when a link is detected and before the IP address is assigned to the client. After the initial IEEE 802.1x authentication between the client and the switch, the client will authenticate to Cisco Secure ACS using the EAP-FAST protocol. Cisco Secure ACS will be configured to receive the Windows health information using EAP-FAST and will send this to the Microsoft NPS over the HCAP protocol.

The initial policy to determine client health will be evaluation of whether Microsoft Windows Firewall is enabled on the Vista client. If Microsoft NPS determines that the firewall is enabled, a posture state of healthy is reported to the Cisco Secure ACS over HCAP. Because the host is deemed to be compliant, or "healthy," the healthy policy will be assigned to the client. With this policy, the client will dynamically be placed in the healthy VLAN and granted full network access. If Microsoft NPS determines that the firewall is disabled, two options are available. The host can be quarantined indefinitely, until the firewall is manually reenabled and the client health state changes to healthy; or the firewall can be enabled automatically through Microsoft NPS remediation, and the client status will change from quarantine to healthy automatically.

NAC-NAP Network Hardware Requirements

Supported Cisco Catalyst Switch Platforms

Table 1 lists the Cisco Catalyst® switch platforms that NAC-NAP supports.

Table 1. Switch Platforms Supported by NAC-NAP

Platform (Supervisor)	OS Type	OS Version
Cisco Catalyst 6500 Series Supervisor Engines 32 and 720	Cisco IOS® Software	Cisco IOS Software 12.2 (33) SXH or later
Cisco Catalyst 6500 Series Supervisor Engines 2, 32, and 720	Cisco Catalyst OS	Cisco Catalyst OS 8.6 (1) or later
Cisco Catalyst 4500 Series Supervisor Engine II-Plus, II-Plus-TS, II-Plus-10GE, IV, V, and V-10GE	Cisco IOS® Software	Cisco IOS Software 12.2 (37) SG or later
Cisco Catalyst 4900 Series Switches	Cisco IOS® Software	Cisco IOS Software 12.2 (35) SE or later
Cisco Catalyst 3570 and 3560 Series Switches	Cisco IOS® Software	Cisco IOS Software 12.2 (35) SE or later
Cisco Catalyst 2960 Series Switches	Cisco IOS® Software	Cisco IOS Software 12.2 (35) SE or later

For more information, please refer to following release note http://www.cisco.com/en/US/netsol/ns812/networking_solutions_sub_solution_home.html.

NAC-NAP Client Requirements

Table 2 lists the requirements for NAC-NAP clients.

Table 2. Client Requirements

Platform	Version	Cisco Requirement	Comments
Windows	Vista (Business, Enterprise, Ultimate)		Service Pack 1 is a prerequisite for the NAC-NAP interoperability architecture. Service Pack 1 adds critical enhancement to supplicants, and those features are required for NAC-NAP interoperation.
		Cisco EAP-FAST Module	For the NAC-NAP interoperability architecture, Windows Vista must have the Cisco EAP-FAST software module installed.

Note: Cisco Trust Agent is not required for clients with the Microsoft Vista OS.

NAC-NAP Server Requirements

The minimum number of computers need for this testing is three. The recommended machine configurations are summarized in Table 3. The addition of more machines can make testing and debugging easier.

Table 3. Server Requirements

Server Type	OS	Function
Domain controller	Windows Server 2003 or 2008	The domain controller provides Microsoft Active Directory policy, DHCP server, DNS server, and root CA.
Microsoft NPS	Windows Server 2008	Microsoft NPS is the policy configuration point for NAP health validation.
Cisco Secure ACS 4.2	Cisco Secure ACS installed on a domain member server running on Microsoft Windows 2000 Server, Windows Server 2003, Windows Server 2008, or Cisco Secure ACS Solution Engine Version 4.2	Cisco Secure ACS is the central policy configuration point for NAC-NAP integration. Cisco Secure ACS will provide secure connection to clients and proxy health information to Microsoft NPS.

Admission Control Predeployment Checklist

This checklist provides a guide to the components, technologies, and organizational efforts required for a successful NAC-NAP deployment.

Security Policy Creation and Maintenance

- What are your current security policies for each of these domains?
- Who (and what) is responsible for policy creation? Policy enforcement?
- What is the quorum for making changes?
- Will network access authorizations be based on identity or posture, or both?
- What is your policy on unmanaged and nonstandard machines on your network (labs, guests, consultants, extranets, kiosks, etc.)?
- How will you handle acquisitions that may have a different network infrastructure and policy?

Public Key Infrastructure

- Have you already deployed an enterprise public key infrastructure (PKI)? Windows 2000 Server or later, a CA vendor, or other?
- If not, will you install and manage one or purchase individual certificates from a CA vendor?
- Do you understand the long-term support, migration, and scaling requirements of self-signed certificates?

Directory Services

- Do you or will you require identity for network authorization?
- Have you already deployed directory services: Microsoft Active Directory, LDAP, or other?
- Will your existing installation scale to support the added queries or are more servers needed?

Network Access Devices

- A NAD acts as a policy-enforcement point for the authorized network access privileges that are granted to a host. Does your existing hardware support the desired NAC functions? Do you need to upgrade?
- Is a new Cisco IOS Software or Cisco Catalyst OS license required for the security (crypto) images?
- Do these NADs have enough memory for the larger Cisco IOS Software security images? Do you need a memory upgrade?
- Can these NADs run the NAC-supported versions of Cisco IOS Software and Cisco Catalyst OS or is another NAD required?

Hosts and Other Network-Attached Devices

- Do you already use IEEE 802.1x supplicants from Microsoft, Cisco, or some other vendor on a platform other than Windows Vista?
- Will an IEEE 802.1x upgrade require a supplicant purchase, OS upgrade, or hardware upgrade (printers, etc)?
- Do you need wired or wireless IEEE 802.1x supplicant functions? (The Cisco free supplicant is wired only.)

- Which authentication types are required? (The NAC-NAP Version 1 solution supports only EAP-FAST with EAP–Transport Layer Security [EAP-TLS], EAP–Generic Token Card [EAP-GTC], and EAP–Microsoft Challenge-Handshake Authentication Protocol Version 2 [EAP-MSCHAPv2] inner authorization methods.)

Nonresponsive Hosts

- Do you have nonresponsive hosts (NRHs)? Generally, an NRH is a host that does not have an IEEE 802.1x supplicant or NAP agent running to perform posture validation.
- Have you identified all of the NRH device types in your network:
  - No IEEE 802.1x supplicant (unsupported or hardened OS)
  - NAP agent disabled or not supported (unsupported OS or network boots)
  - Otherwise unmanaged or uncontrolled devices (guests, labs, etc.)
- What is your authorization strategy for NRHs?
- Do you need to upgrade to IEEE 802.1x capabilities in your hardware or OS?
- Will you use whitelisting in Cisco Secure ACS (MAC authentication bypass [MAP] and MAC or IP wildcards)?
- Do you know the administrative and management costs of a MAP, host registration, and guest system?

Cisco Secure ACS

- Do you already use Cisco Secure ACS? Will you need to upgrade or purchase it?
- How many Cisco Secure ACSs will you need to scale the deployment based on your organization size, availability requirements, revalidation frequency, and policy size?
- How will you replicate the Cisco Secure ACS database and configuration changes: manually, periodically, scheduled, or instantly?
- Will any load-balancing hardware or software be necessary to handle a high volume of concurrent authorizations?

Third-Party Software Integration

- What existing desktop security software do you want to integrate with NAC-NAP?
- What new client software do you want to deploy because of NAC-NAP?
- Do you have the required version for NAC integration? Or is an upgrade, new purchase, or replacement required?

Patch Management

- What update, patch, or remediation software do you currently use, if any?
- Does this update software integrate with NAC-NAP?
- Will you have a remediation website for communicating the posture status to unhealthy or nonresponsive hosts?
- Will you distribute software to employees and guests from this site? How will you handle licensing?

Monitoring, Reporting, and Troubleshooting

- What is your existing monitoring and reporting framework?
- Will NAC logs and events integrate? Or is something additional needed?
- Do you have sufficient long-term storage space for all of these new logs and events?

Communications

- Have you communicated the solution to the organization for the various stages: awareness (need and benefits), readiness (what and when), and adoption (monitoring and enforcement)?
- How will you communicate: email, internal news, remediation website, support desk, etc.?

Support Desk

- Have you set up staff training for the new technology and processes?
- How will the support staff troubleshoot support calls related to NAC-NAP?
- What application development is required to resolve NAC-related issues?
- Have you reviewed the troubleshooting steps (list of required logs for opening cases, etc.)?

Configuration for NAC-NAP Integration

The following sections provide the details necessary for configuring all the Cisco NAC and Microsoft NAP solution components in the scenarios described here.

The following servers and other hardware are required and will need to be installed and configured for the NAC-NAP interoperability solution:

- Cisco Secure ACS 4.2 for Windows (Microsoft Windows Server 2008, Windows Server 2003, or Windows 2000 Server)
- Microsoft Windows Server 2008 (HCAP server including Microsoft NPS and IIS)
- Microsoft Windows Vista (Service Pack 1 is required)
- NAC-compatible Cisco Catalyst switch (such as the Cisco Catalyst 3750 Series Switch)

In addition, the network device will need to be configured to support the NAC-NAP solution. In the lab, a switch will be used for to implement IEEE 802.1x for wired connections.

Cisco Secure ACS Base Configuration

The NAC-NAP configuration will begin with the Cisco Secure ACS to establish the base functions to develop policies for the solution. After installing Cisco Secure ACS, use the following steps to create the Cisco Secure ACS configuration for NAC-NAP.

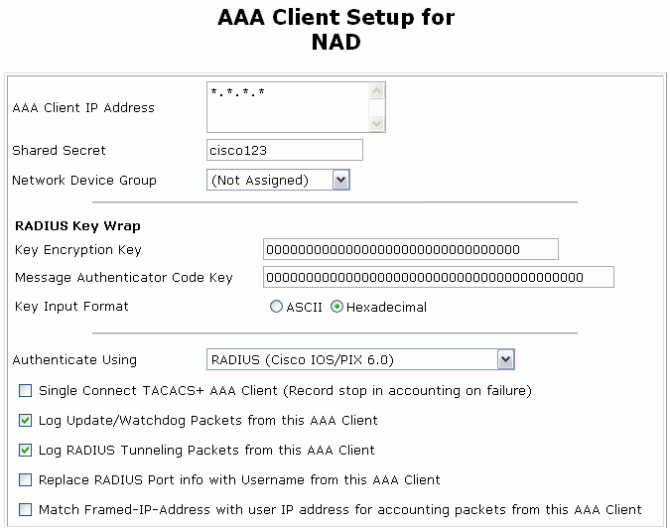
Network Configuration

Task 1: Configure AAA Clients

On the Network Configuration page, you can add and configure authentication, authorization, and accounting (AAA) clients (network access devices, such as switches and wireless access points) and remote AAA servers.

Step 1. On the **Network Configuration** screen, click the hyperlink under **Network Device Group**. Click **(Not Assigned)** and move to the **(Not Assigned) AAA Client screen**.

Step 2. Configure the AAA clients by clicking the **Add Entry** button. You can define all NADs as a single AAA client using IP address wildcards. **Shared Secret** is an identical key string that you define for a switch RADIUS configuration. For Authenticate Using, be sure to select **RADIUS (Cisco IOS/PIX 6.0)**. The following screenshot shows a sample configuration.



Step 3. Click **Submit + Apply** to save the changes.

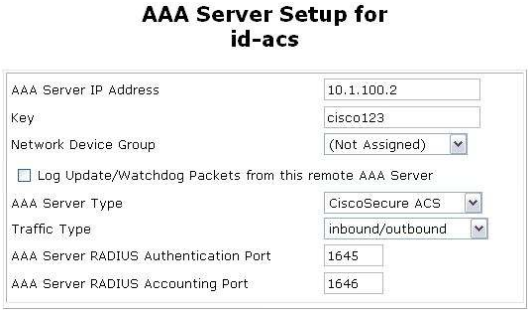
Note: AAA client definitions with wildcards cannot overlap with other AAA client definitions, regardless of the authentication types. When adding more AAA clients with a different authentication type, avoid using wildcards and specify the AAA client IP address as needed.

Task 2: Configure AAA Servers

The AAA server information is populated with the hostname and IP address of the device on which Cisco Secure ACS is installed. In this configuration guide, the server name **id-acs** and IP address **10.1.100.2** are configured. If the server has been assigned a different name, it will be displayed as the AAA server name with current active IP address.

Note: Your AAA server is automatically populated during the installation of Cisco Secure ACS, using the hostname assigned to the host operating system.

Step 1. Configure the **Key** setting for the AAA server as shown in the following screenshot. Choose **Network Configuration > Network Device Group > (Not Assigned)** and click the AAA server name hyperlink **id-acs**. This shared secret key is used by the remote AAA server and Cisco Secure ACS to encrypt the data. The key must be configured identically in the remote AAA server and the local Cisco Secure ACS, including case sensitivity.



Note: You can optionally assign the Cisco Secure ACS to a previously configured network device group (NDG). When adding a Cisco Secure ACS to a network device group, make sure that shared secret for NDG matches the Cisco Secure ACS's shared secret.

Interface Configuration

In the Interface Configuration section, you can configure options such as the RADIUS attribute dictionary, NDG, replication, and the HCAP interface for communication with Microsoft NPS running on Windows Server 2008. The items configured in the Interface Configuration section, such as RADIUS attributes, must be enabled here to be available in other parts of the Cisco Secure ACS configuration.

Task 1: Configure RADIUS Attributes

You configure the RADIUS attributes in the Interface Configuration section. Note that the RADIUS Cisco IOS/PIX6.0 menu appears only after you add the AAA client with the RADIUS Cisco IOS/PIX6.0 authentication type on the Network Configuration screen.

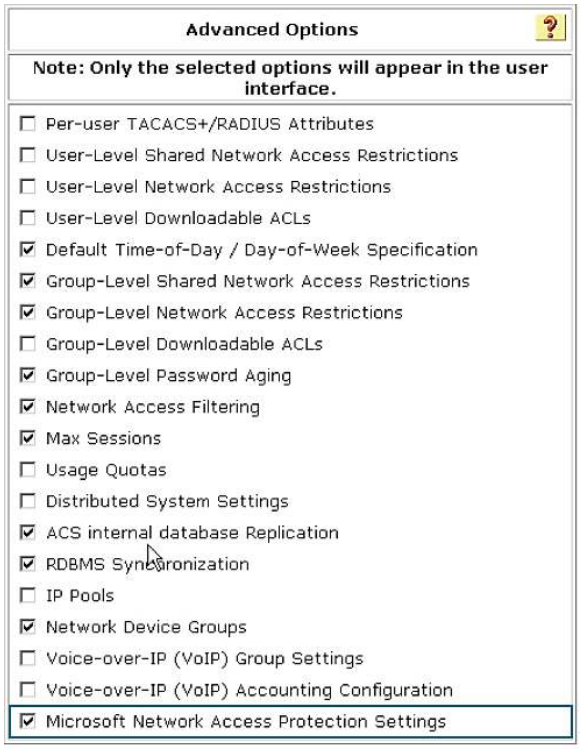
Step 1. Choose **Interface Configuration** from the main menu, choose **RADIUS (IETF)**, and select the attributes shown in the screenshot. Then choose **RADIUS Cisco IOS/PIX6.0** and select the attribute shown in the screenshot. Only the attributes checked are necessary for NAC. All other attributes should by unchecked to save time in later configuration steps.

	Options
RADIUS (IETF)	☑ [027] Session-Timeout
	☑ [029] Termination-Action
	☑ [064] Tunnel-Type
	☑ [065] Tunnel-Medium-Type
	☑ [081] Tunnel-Private-Group-ID
RADIUS (Cisco IOS/PIX6.0)	☑ [026/009/001] cisco-av-pair

Note: Attributes 64, 65, and 81 are necessary only for VLAN assignments. Attributes 27 and 29 are used for IEEE 802.1X reauthentication.

Step 2. Choose **Interface Configuration > Advanced Options** and enable the attributes shown here.

Advanced Options
☑ Default Time-of-Day / Day-of-Week Specification
☑ Group-Level Shared Network Access Restrictions
☑ Group-Level Network Access Restrictions
☑ Group-Level Password Aging
☑ Network Access Filtering
☑ Max Sessions
☑ ACS internal database Replication
☑ RDBMS Synchronization
☑ Network Device Groups
☑ Microsoft Network Access Protection Settings



Note: **Microsoft Network Access Protection Settings** needs to be checked in this section to enable the HCAPv2 interface so you can configure the Microsoft NPS address.

System Configuration

Task 1: Set Up Cisco Secure ACS Certificate and Root CA Certificate

Configure Cisco Secure ACS with a server certificate for establishing client trust when challenging the client for its credentials. For authenticated in-band PAC provisioning for EAP-FAST, the client must have a certificate that matches the one installed in Cisco Secure ACS.

Note: Using a production PKI and certificates signed by a production CA or registration authority is highly recommended for the most scalable NAC deployments. This part of NAC implementation has been significantly compressed and abbreviated; you will need to use an existing PKI (internal or outsourced) to securely identify the Cisco Secure ACS infrastructure to endpoint devices.

The following steps show how to request the Cisco Secure ACS certificate from a locally configured Microsoft root CA server and install it on Cisco Secure ACS as the server certificate. If the CA server is not available in the testing environment, Cisco Secure ACS can generate a self-signed certificate. Please proceed to Step 14 if you want to use a self-signed server certificate generated on Cisco Secure ACS. Step 14 shows how to create and install a self-signed certificate.

Step 1. Choose **System Configuration > ACS Certificate Setup > Generate Certificate Signing Request**. Fill out the required field as shown here and click the **Submit** button.

Examples of field values for the certificate signing request (CSR) are shown here.

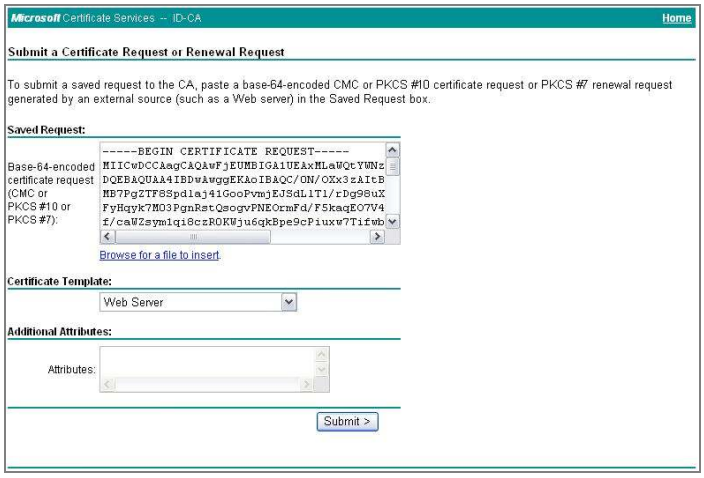
Generate Certificate Signing Request	
Certificate subject	cn=your_acs_ name
Private key file	C:\%your_cert_dir%your_private_key_name
Private key password	your_private_key_password
Retype private key password	your_private_key_password
Key length	2048 bits
Digest to sign with	SHA1

After you submit your request, your CSR is displayed in the right frame of your browser console.

Step 2. Now send the CSR to the Microsoft CA server. Copy your CSR to a temporary text file. Then access your CA server using Microsoft Internet Explorer (IE). The local Microsoft CA server can be accessed through the following URL: http://your_ca_server/certsrv/

Step 3. Click **Request a certificate > advanced certificate request > Submit a certificate request by using a base-64-3ncoded CMS or PKCS #10, or submit a renewal request by using a base-64-encoded PKCS #7 file**.

Step 4. Paste your copied CSR from the Cisco Secure ACS web console to the **Saved Request** text box. For **Certificate Template**, choose **Web Server**; then click **Submit**.



Step 5. Select **DER encoded** to download your Distinguished Encoding Rules (DER) encoded certificate to your certificate directory on Cisco Secure ACS (or you may need to download the certificate to your Cisco Secure ACS Solution Engine server). Name the downloaded certificate to distinguish it from the root CA server of this Microsoft CA server. Alternatively, you may want to save the CA certificate in both **DER** and **Base 64** encoding methods and then save them both with appropriate names.

Step 6. (Optional) When you are accessing the CA web enrollment console, we recommend that you download the CA server root certificate and save it along with the Cisco Secure ACS certificate for future use. To download the CA root certificate, access your CA server with IE and click **Download a CA certificate, certificate chain, or CRL** under **Select a task** section of **Welcome** page.

Step 7. Make sure you choose the current CA server and then click **Download certificate**.

Step 8. Now you have a root CA certificate, Cisco Secure ACS certificate, and associated private key saved on your Cisco Secure ACS. You have to install those certificates and the private key on Cisco Secure ACS. First install the root CA certificate on Cisco Secure ACS. Choose **System Configuration > ACS Certificate Setup > ACS Certification Authority Setup**. Specify the location of the CA certificate and click the **Submit** button.

Step 9. After you add the new CA certificate, restart Cisco Secure ACS. Choose **System Configuration > Service Control** and click **Restart**.

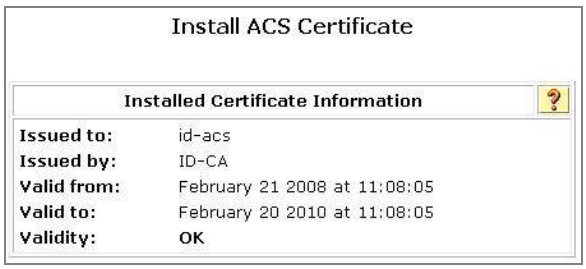
Step 10. After installing the CA certificate, you should add it to the certificate trust list (CTL) as a trusted authority. To do this, select the **Edit Certificate Trust List** link from the **ACS Certificate Setup** screen, locate the name of your CA in the list, and check the box next to it and click **Submit** to save the changes.

Edit the Certificate Trust List (CTL)
☑ ID-CA

Step 11. Changing the CTL requires a Cisco Secure ACS restart; **choose System Configuration > Service Control** and click the **Restart** button.

Step 12. Choose **Install Certificate**. Specify the location of the Cisco Secure ACS certificate and click the **Submit** button.

Install New Certificate	
Read certificate from file	
Certificate file:	c:\certs\id-acs.cer
Private key file:	c:\certs\id-acs.pvk
Private key password:	cisco123



Step 13. After a successful installation of the Cisco Secure ACS certificate, you must restart Cisco Secure ACS. Choose **System Configuration** from the main menu, select **Service Control**, and click the **Restart** button. This completes the Cisco Secure ACS certificate installation process.

Step 14. (Optional) Choose **System Configuration > ACS Certificate Setup > Generate Certificate Signing Request**. Fill out the required fields as shown here and click the **Submit** button.

Note: Self-signed server certificates generated on Cisco Secure ACS should be used for lab testing purposes only. This certificate is valid for one year only, and the administrator is advised to not deploy a self-signed certificate for any production use.

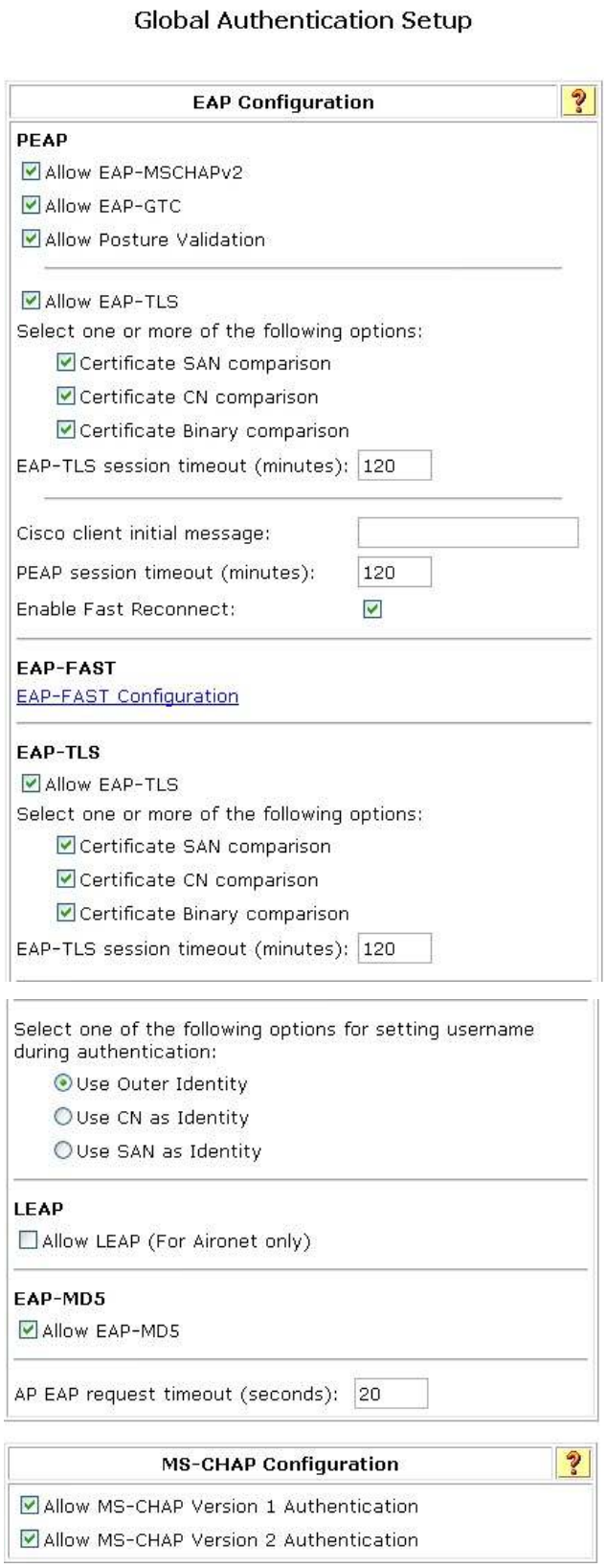
Task 2: Set Up Global Authentication

Cisco Secure ACS supports many protocols for securely transferring credentials from the host to the Cisco Secure ACS for authentication and authorization. You must tell Cisco Secure ACS which protocols are allowed and what the default settings are for each protocol.

Note: Unless you have a limited deployment environment or specific security concerns, we highly recommend that you enable all protocols globally. You will have an opportunity to limit the actual protocol options later when you create the network access profiles for NAC, but if they are not enabled here, they will not be available in the network access profiles.

Step 1. Choose System Configuration > Global Authentication Setup.

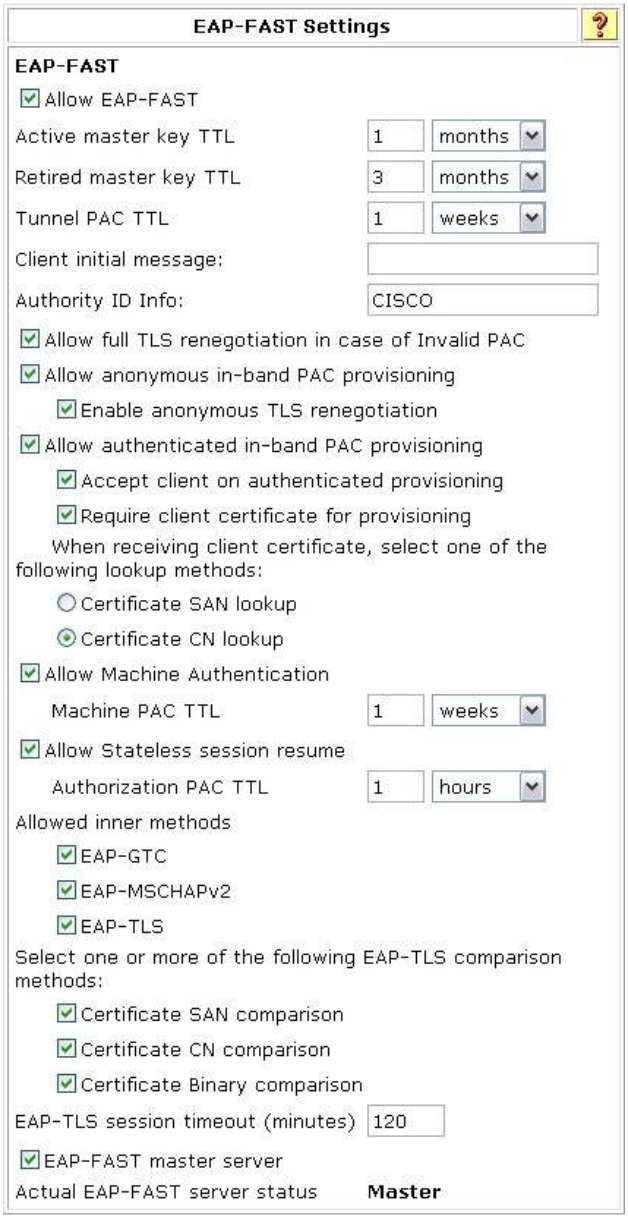
Step 2. Select the global authentication parameters shown here to make them available for the network access profile authentication configuration. Note that Protected EAP (PEAP) and its inner authentication methods are also selected. PEAP is not required for NAC-NAP integration. Those methods can be disabled in the network access profile.



Step 3. Click **Submit + Restart** to save these changes.

Step 4. Choose **EAP-FAST Configuration** to open the **EAP-FAST Configuration** page. Select the parameters shown here

EAP-FAST Configuration



Step 5. Click **Submit + Restart** to save these changes.

Task 3: Configure Attributes for Logging

In this task, you will turn on the Cisco Secure ACS logs needed for monitoring and troubleshooting. Cisco Secure ACS logs provides records of access requests from clients and hints about why authentication failed if something goes wrong. You should always turn on the appropriate log options when initially configuring Cisco Secure ACS.

Note: To log any attribute values from hosts other than NAC attribute values, you must first import the attribute definitions into Cisco Secure ACS and then select them for logging.

Step 1. To specify which log files are enabled and which event attributes are recorded within them, choose **System Configuration > Logging**.

The recommended log files and their logged attributes for NAC are shown here. Make sure logging for **CSV Failed Attempts, CSV Passed Authentications, and CSV RADIUS Accounting** are all turned on.

CSV Failed Attempts	CSV Passed Authentications	CSV RADIUS Accounting
Logged Attributes • Message-Type • User-Name • Caller-ID • Authen-Failure-Code • NAS-Port • NAS-IP-Address • AAA Server • Network Device Group • Access Device • PEAP/EAP-FAST-Clear-Name • EAP Type • EAP Type Name • Network Access Profile Name • Shared RAC • Downloadable ACL • System-Posture-Token • Application-Posture-Token • Reason	**Logged Attributes** • Message-Type • User-Name • Caller-ID • NAS-Port • NAS-IP-Address • AAA Server • Filter Information • Network Device Group • Access Device • PEAP/EAP-FAST-Clear-Name • EAP Type • EAP Type Name • Network Access Profile Name • Outbound Class • Shared RAC • Downloadable ACL • System-Posture-Token • Application-Posture-Token • Reason	**Logged Attributes** • User-Name • Group-Name • Calling-Station-Id • Acct-Status-Type • Acct-Session-Id • Acct-Session-Time • Acct-Input-Octets • Acct-Output-Octets • Acct-Input-Packets • Acct-Output-Packets • Framed-IP-Address • NAS-Port • NAS-IP-Address • Class • Termination-Action • Called-Station-Id • Acct-Delay-Time • Acct-Authentic • Acct-Terminate-Cause • Event-Timestamp • NAS-Port-Type • NAS-Port-Id • AAA Server • ExtDB Info • Network Access Profile Name • cisco-av-pair • Access Device

Administration Control Configuration

Task 1: Add Remote Administrator Access

To remotely administer your Cisco Secure ACS from a web browser, you must enable this feature by choosing **Administration Control** from the main menu. By adding one or more accounts, you can log in to your Cisco Secure ACS with HTTP.

Step 1. Choose **Add Administrator** and in the **Administration Control** section add the information shown here.

Add Administrator	
Administrator Name:	administrator
Password:	cisco123
Administrator Privilege:	Grant All

Shared Profile Components Configuration

Shared profile components are configurations that can be reused across many different network access profiles for filtering within Cisco Secure ACS or for network authorization within RADIUS. These need to be defined before you configure the network access profiles.

Note: Network access profiles are introduced in Cisco Secure ACS 4.0. They enable you to create and map individual authentication, posture validation, and authorization components depending on the access method being used.

Among the most useful shared profile components are the RADIUS authorization components (RACs).

Task 1: Configure RADIUS Authorization Components

RACs are sets of RADIUS attributes that are applied to NADs during network authorization. After you group a set of RADIUS attributes in a RAC, you can make the RAC available when configuring network access profiles and use it as an enforcement command for the NAD, sent in the RADIUS Access Accept packet.

Step 1. To configure RACs, choose **Shared Profile Components > RADIUS Authorization Components** and click the **Add** button for each new RAC you want to create. Each RAC can contain one or more vendor RADIUS attributes, including Cisco IOS/PIX 6.0 and IETF.

Note: The session timeout value used for NAC deployments can significantly affect Cisco Secure ACS performance. We strongly recommended that you adjust the timeout value for the scale of your network and the Cisco Secure ACS transaction capacity.

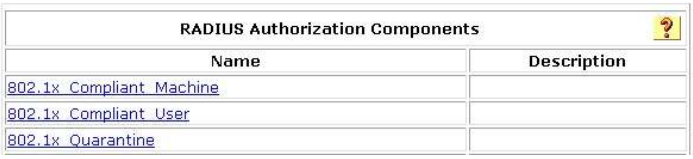
Step 2. Specify RAC entries, attribute assignments, and values. Create these RAC configurations for a IEEE 802.1x scenario (NAC Layer 2 IEEE 802.1x).

Attribute	Vendor	Use Case	Definition
Session Timeout (27)	IETF	IEEE 802.1x	Reauthentication timer value in second
Termination Action (29)	IETF	IEEE 802.1x	RADIUS-Request (1) means that posture revalidation takes place without any session termination. If this value is set to Default (0) or not sent, the session is terminated upon revalidation timer expiration.
Tunnel-Type	IETF	IEEE 802.1x	Tunnel-Type (802) defined in RFC 3580
Tunnel-Medium-Type	IETF	IEEE 802.1x	Tunnel-Medium-Type (VLAN) defined in RFC 3580
Tunnel-Private-Group-ID	IETF	IEEE 802.1x	Tunnel-Private-Group-ID defined in RFC 3580. This attribute is used to tell the NAD which local VLAN the switch should assign to a port to which a user is connected. Cisco NADs accept both strings (VLAN name) and integers (VLAN ID) in this attribute. This attribute needs to be sent along with attributes 64 and 65.

RAC Name	Vendor	Assigned Attributes	Value
802.1x_Compliant_User	IETF	Session-Timeout (27)	3600
	IETF	Termination-Action (29)	RADIUS-Request
	IETF	Tunnel-Type (64)	VLAN
	IETF	Tunnel-Medium-Type (65)	802
	IETF	Tunnel-Private-Group-ID (81)	healthy
802.1x_Compliant_Machine	IETF	Session-Timeout (27)	3600
	IETF	Termination-Action (29)	RADIUS-Request
	IETF	Tunnel-Type (64)	VLAN
	IETF	Tunnel-Medium-Type (65)	802
	IETF	Tunnel-Private-Group-ID (81)	asset
802.1x_Quarantine	IETF	Session-Timeout (27)	60
	IETF	Termination-Action (29)	RADIUS-Request

RAC Name	Vendor	Assigned Attributes	Value
	IETF	Tunnel-Type (64)	VLAN
	IETF	Tunnel-Medium-Type (65)	802
	IETF	Tunnel-Private-Group-ID (81)	quarantine

Step 3. For the IEEE 802.1x scenario, you should have three RACs total. Now the Cisco Secure ACS service needs to compile those RACs. Choose **System Configuration > Service Control > Restart** to compile the RACs.



Group Setup Configuration

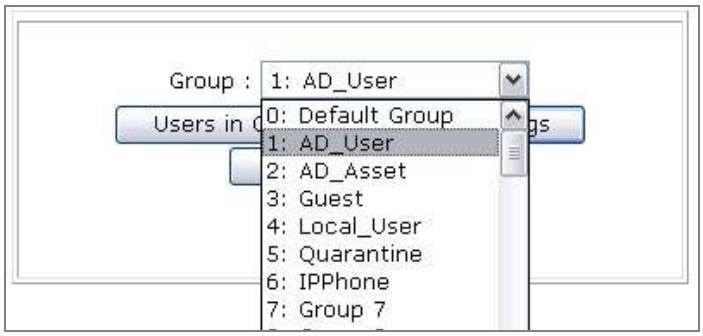
Cisco Secure ACS can enforce policy for users by applying authorization rules (dynamic VLAN assignment) per group. You can configure these groups locally on the Cisco Secure ACS; however, they can be mapped to a set of groups in an external database, such as Active Directory. For instance, if **user1** belongs to the Active Directory Domain user group, this user can be assigned to VLAN 10 if authentication succeeds. If **user2** belongs to the Cisco Secure ACS local database, this user can be assigned to VLAN 30 in the same way. There is also a way to assign policy per user; however, this method does not scale in a large enterprise environment.

Task 1: Set Up User Groups

This documentation uses an Active Directory environment as the user authentication database; therefore, in this test you will create three Cisco Secure ACS local groups, with two of them mapped to Active Directory user groups.

Step 1. By default, Cisco Secure ACS already has 500 user groups. You will start by renaming four of these groups. Choose **Group Setup** from the main Cisco Secure ACS menu. From the Group pull-down menu, choose **1: Group 1** and click **Rename Group**. Type **AD_User** and click **Submit**. Repeat those steps for each of the other groups using the group names shown here.

Group Number	Group Name
1: Group 1	AD_User
2: Group 2	AD_Asset
4: Group 4	Local_User
5: Group 5	Quarantine



Task 2: Set Up Users

Although the user is authenticated against Active Directory, a user account can be created locally on Cisco Secure ACS.

Step 1. Choose **User Setup**, for **User**, enter **Vista**, and click the **Add/Edit** button. Under **User Setup** for **User: vista (New User)**, enter **cisco123** as the user's password.

Step 2. In the **Group to which the user is assigned** drop-down menu, assign the user to the **Local_User** group. Scroll to the bottom and click the **Submit** button.

Note: The individual RADIUS attributes will be configured and applied in the Network Access Profile section and do not need to be configured for each individual group.

External User Database Configuration

For Cisco Secure ACS to authenticate the user and device against Active Directory, Cisco Secure ACS needs to be running on a domain member server. Active Directory in the Windows domain can be configured in the external user database. In this section, you will set up three items: you will configure unknown-user policy, map the Cisco Secure ACS local group to the Active Directory security group, and set up Windows database options in detail.

Task 1: Configure Unknown-User Policy

In this task, unknown-user policy is configured to find the correct database when a user is not found in the Cisco Secure ACS local database.

Step 1. Choose **External User Database > Unknown User Policy**.

Step 2. Click **Check the following external user database**.

Step 3. Use the arrow button to move **Windows Database** from the **External Databases** box to the **Selected Database** and then click **Submit**.

Task 2: Map Database Groups

In this task, Cisco Secure ACS local groups are mapped to Active Directory user groups on in a domain.

Step 1. Choose **External User Database > Database Group Mappings**.

Step 2. Under **Unknown User Group Mappings**, click **Windows Database**.

Step 3. Click **New configuration** to select your domain. In this task, use domain name ID, so in the **Detected Domains** list, select **ID** (or your domain) and click **Submit**.

Step 4. Click **ID** and start Cisco Secure ACS local group and NT group mappings. Click **Add mapping** and under **NT Groups** select **Domain User** and then click **Add to selected**. In the **ACS group** list, select **AD_User** and click **Submit**.

Step 5. Repeat these steps with the entries shown here to map the NT groups to Cisco Secure ACS local groups.

NT Groups	Cisco Secure ACS Groups
Domain Computers	AD_Asset

Note: Domain computer accounts are used to authenticate devices using IEEE 802.1x against Active Directory.

Task 3: Configure External User Database

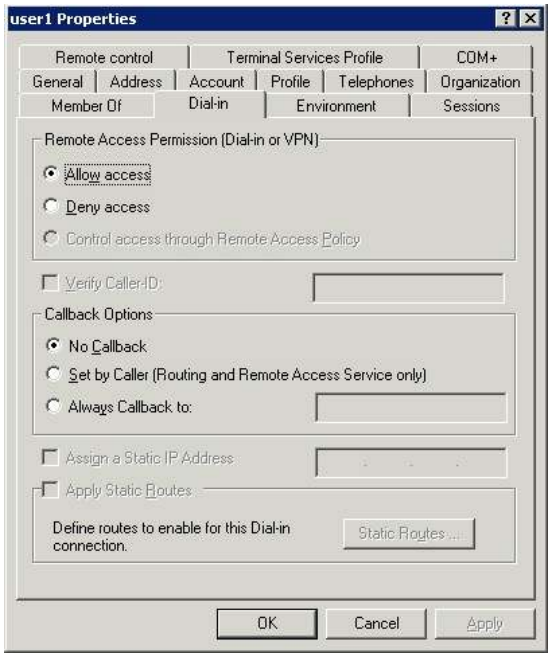
In this task, more detailed options for the specific user database are configured.

Step 1. Choose **External User Database > Database Configuration > Windows Database** and click the **Configure** button to configure more detailed options for the Windows Active Directory database.

Step 2. Under **Windows User Database Configuration**, **unselect Verify that "Grant dialin permission to user" setting has been enabled from within the Windows User Manager for users configured for Windows User Database authentication**.

With this option disabled, Cisco Secure ACS will not check the **Allow access** remote access permission in the Active Directory user account properties. The following screenshot shows the user account properties on the Active Directory Users and Computers management console.

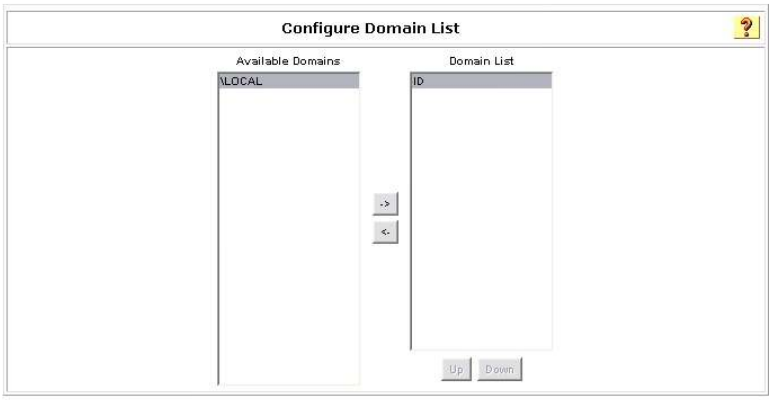
Note: This feature is disabled here for testing purpose only. You should revisit and evaluate this setting when deploying Cisco Secure ACS to a production network.



Step 3. Select **Use the next sequential External Database in the Selected Databases list in case of an "External DB user invalid or bad password" error**.

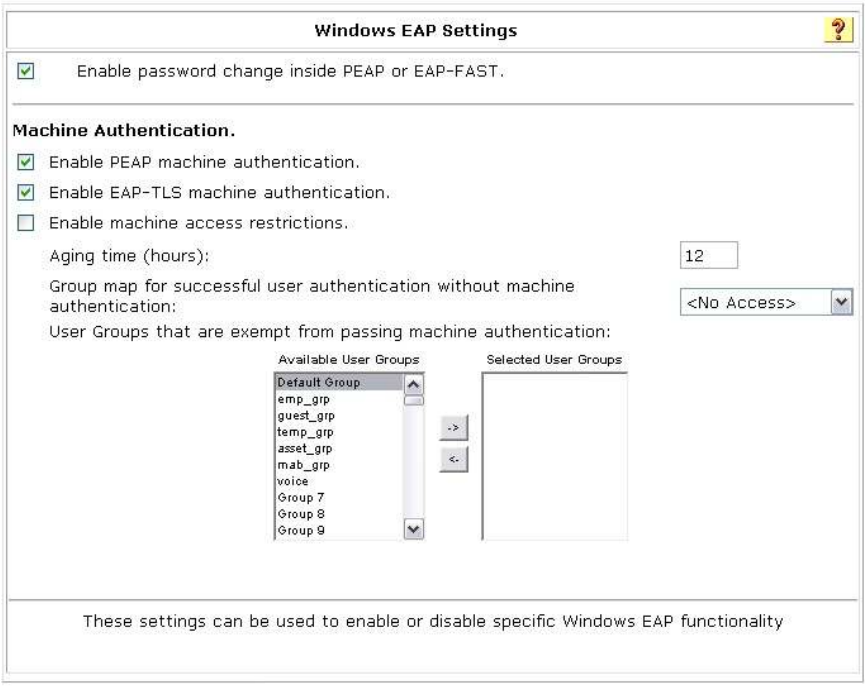
Step 4. Under **Configure Domain List**, use the arrow button to move your domain name, in this case, the domain name **ID**, from the **Available Domains** list to **Domain List**.

Note: If you are in a single domain, this operation is optional.

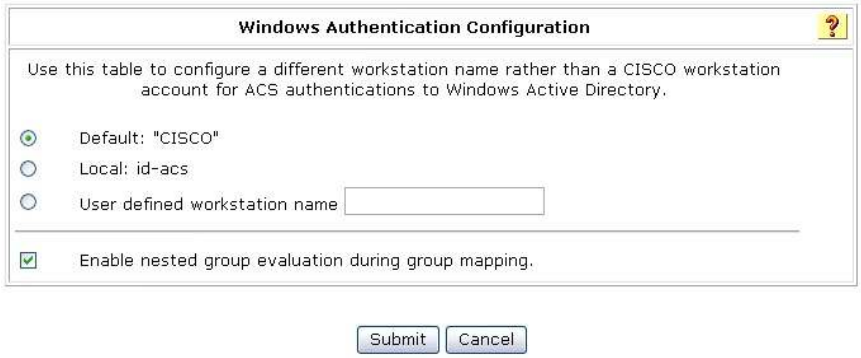


Step 5. Under **MS-CHAP Settings**, select both **MS-CHAP version 1** and **MS-CHAP version 2**.

Step 6. Under **Windows EAP Settings**, select **Enable password change inside PEAP or EAP-FAST**.



Step 7. Under **Windows Authentication Configuration**, select **Default: "CISCO"** as the workstation name and select **Enable nested group evaluation during group mapping**.



Posture Validation Configuration

Microsoft NPS provides posture validation and basic remediation services for the NAC-NAP solution. All statement of health (SoH) information from the client will be received by Cisco Secure ACS and forwarded to Microsoft NPS over HCAP for compliance checking. The result of the compliance check in Microsoft NPS will be sent back to Cisco Secure ACS over HCAP, and a NAC policy will be assigned based on the result.

Task 1: Set Up Cisco Secure ACS External Posture Validation

External posture server validation will be configured to forward Microsoft Vista client statement of health information from Cisco Secure ACS to Microsoft NPS for posture validation.

Step 1. Choose **Posture Validation > External Posture Validation Setup**.

Step 2. Under **External Posture AAA Servers**, click **Add Server**.

Note: Be sure to select External Posture AAA Servers, not External Posture Servers. External Posture Servers allows you to configure posture servers, which are HCAPv1 capable. External Posture AAA Servers provides an interface to the Microsoft NPS which is HCAPv2 compliant.

Step 3. In the Name field, add the hostname of the Microsoft NPS. In this example, the name for the Microsoft NPS is **ID-NPS**.

Step 4. Select **Primary Server Configuration**.

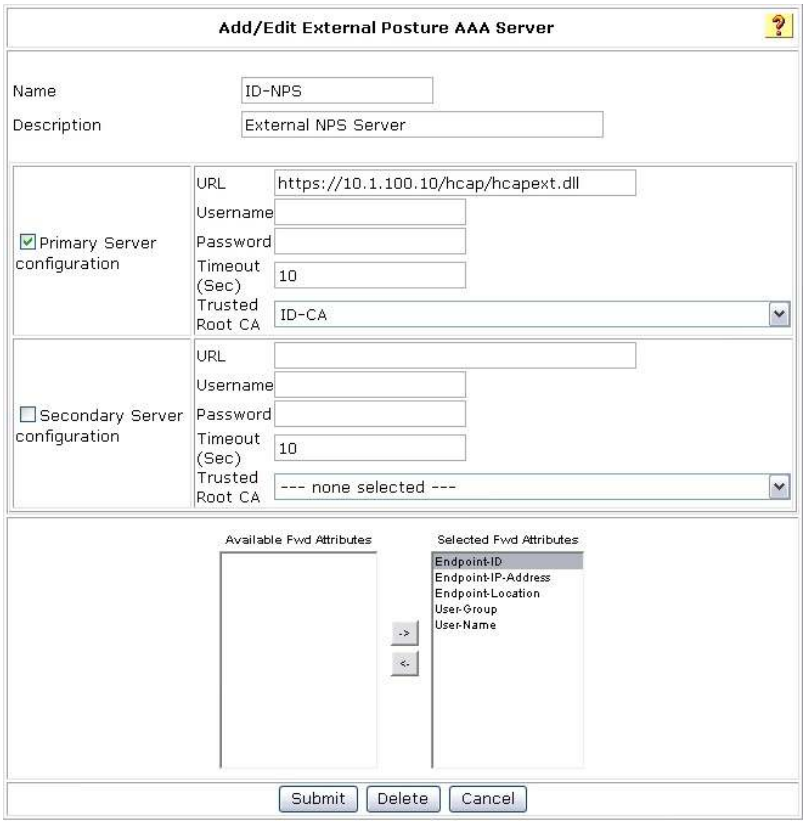
Step 5. Enter the URL (https://x.x.x.x/hcap/hcapext.dll) that will be used for communication between Cisco Secure ACS and the Microsoft NPS. In this example, the URL has been configured as the following: https://10.1.100.10/hcap/hcapext.dll

Step 6. Do not configure any username or password. The username and password are optional and should be used if these credentials are required by the IIS server.

Step 7. The default **Timeout (Sec)** value of **10** can be used. This value sets the interval between primary server failure and failover to the secondary server.

Step 8. To enable encrypted communication between Cisco Secure ACS and Microsoft NPS, an HTTPS connection can be established using a server certificate. Select the trusted root CA used for both Cisco Secure ACS and Microsoft NPS. In this example, the **Trusted Root CA** value is **ID-CA**. In the test environment, Secure Sockets Layer (SSL) communication can be turned off by changing the URL as described in Step 5 to http://x.x.x.x/hcap/hcapext.dll (the “s” is removed from https://).

Step 9. Select all the attributes in the **Available Fwd Attributes** box and use the arrow button to move them to **the Selected Fwd Attributes** box. The attributes include Endpoint-ID, Endpoint-IP-Address, Endpoint-Location, User-Group, and User-Name.



The following table shows the available attributes used in NAC-NAP IA and their definitions.

Attributes	Definition
Endpoint-ID	End host MAC address
Endpoint-IP-Address	End host IP address if available
Endpoint-Location	Flag to differentiate policy on Microsoft NPS; Location-Group can be configured in the network access profile on Cisco Secure ACS when configuring posture
User-Group	Cisco Secure ACS local group name that specifies the group to which the user is assigned
User-Name	Authenticated username

Completion of Common Cisco Secure ACS Configuration for IEEE 802.1x Scenario

Initial Cisco Secure ACS configuration for IEEE 802.1x is now complete. Additional configuration, including posture validation setup for IEEE 802.1x network access profiles, is discussed in the following sections.

Task 1: Complete the Configuration

Before proceeding to the next configuration discussion, change the logging level on Cisco Secure ACS and restart Cisco Secure ACS service.

Step 1. Choose **System Configuration > Service Configuration**. Under **Services Log File Configuration**, change the level of detail to **Full**. Click the **Restart** button to restart all Cisco Secure ACS services.

Windows Server 2008 Configuration

In this document ID-NPS runs on Windows Server 2008 and hosts Microsoft NPS and the HCAP server, which provides client health validation for Cisco Secure ACS.

Note: In this document, Active Directory is running on Windows Server 2003. The CA service runs on the same server. Because some of the operations in this document require certificates for Windows Vista or Windows Server 2008 through web enrollment, we have applied the following hotfix on Windows Server 2003: http://support.microsoft.com/kb/922706

Task 1: Obtain a Computer Certificate for SSL

To provide SSL authentication for HCAP, the server running Microsoft NPS uses a computer certificate that is stored in its local computer certificate store. Microsoft Certificate Manager will be used to obtain a computer certificate. Do not perform this procedure if your server already has a certificate for SSL encryption.

Note: To request an SSL certificate using the following procedure, the server must be joined to a domain with an available enterprise CA.

Step 1. Choose **Start > Run**, and in the **Open** field enter **mmc**. This operation opens a window called **Console1**.

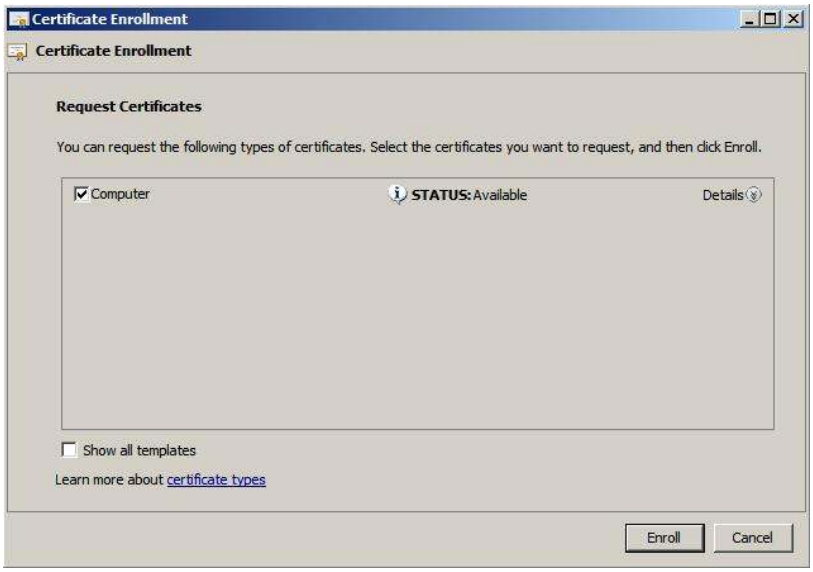
Step 2. From the **File** menu, choose **Add/Remove Snap-in**.

Step 3. In **the Add or Remove Snap-ins** dialog box, click **Certificates**, click **Add**, select **Computer account**, click **Next**, and then click **Finish**. Then click OK to close the dialog box.

Step 4. In the left pane, double-click **Certificate**, right-click **Personal**, point to **All Tasks**, and then choose **Request New Certificate**.

Step 5. The **Certificate Enrollment** dialog box, opens. Click **Next**.

Step 6. Select the **Computer** check box as shown here and then click **Enroll**.



Step 7. Verify that **Succeeded** is displayed to indicate the status of certificate installation and then click **Finish**.

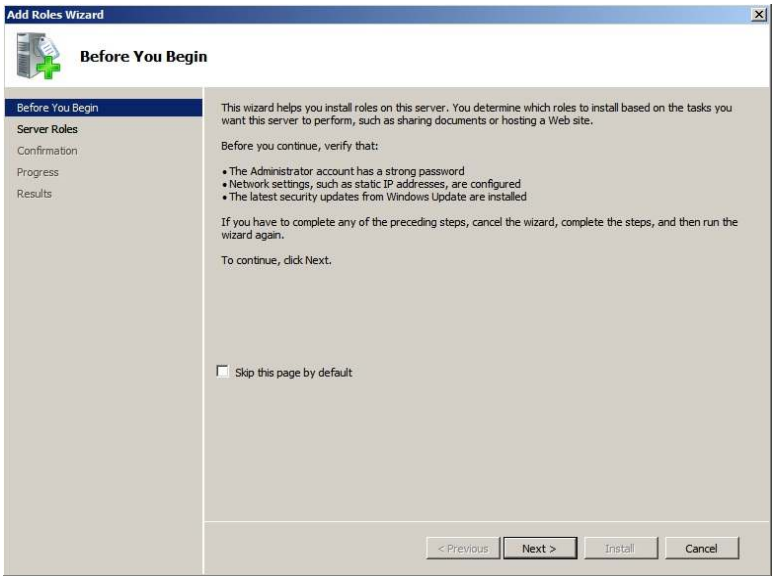
Step 8. Close the **Console1** window.

Note: Your server may have more than one certificate in the local certificate store. Before choosing an SSL certificate, you can view the properties of these certificate by clicking a certificate in the list, then clicking **Properties**, and then clicking the **Detail** tab. A certificate used for SSL authentication must have a **Subject** field value that corresponds to the fully qualified domain name of the HCAP server (for example, **ID-NPS.id.local**), and an **Enhanced Key Usage** (EKU) field value of **Server Authentication**. The certificate must also be sent from a root CA that is trusted by the client computer. The computer certificate provisioned in this procedure meets these requirements.

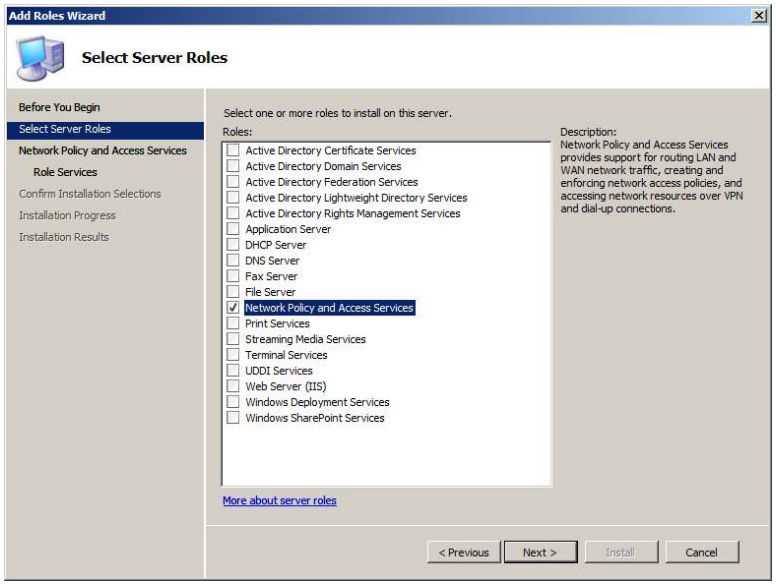
Task 2: Run the Role Management Tool to Install the HCAP Server

This Role Management Tool (RMT) also installs the Microsoft NPS and IIS components. The screenshots in this section show the RMT installation of the HCAP server.

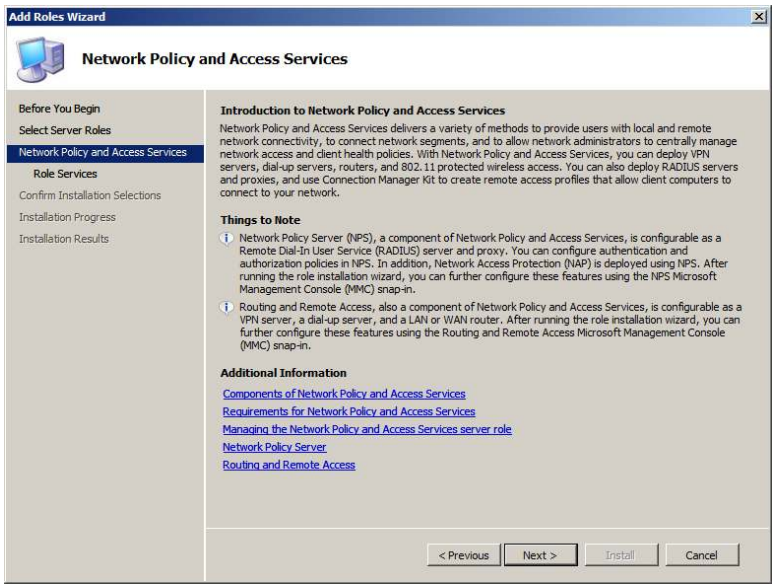
Step 1. To activate the RMT wizard, click **Add Roles** in the server manager user interface. The following screenshot shows the wizard's introductory page. Click **Next** to see the roles that can be installed on the server.



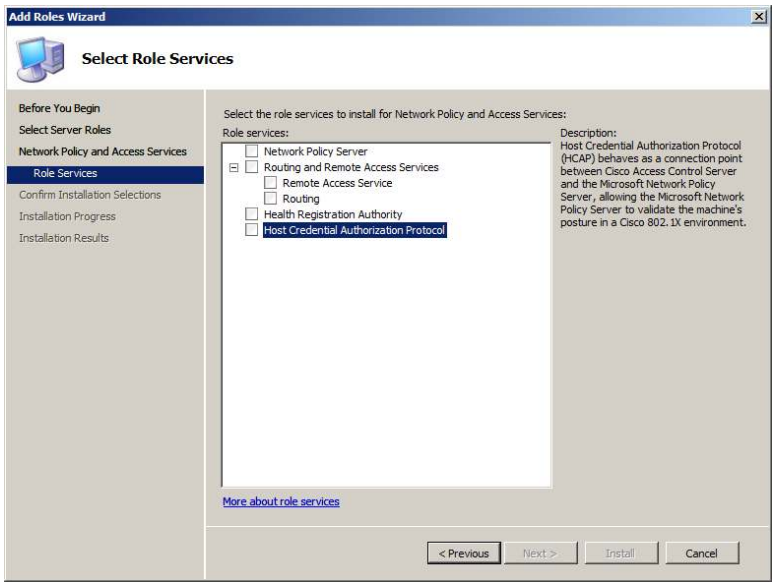
Step 2. The following screenshot shows the roles that can be selected on the server. Select the **Network Policy and Access Services** role and click **Next**.



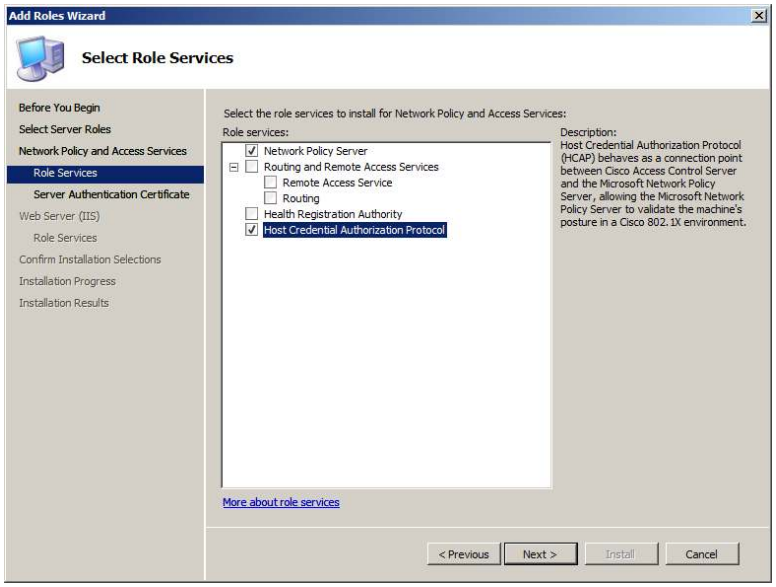
Step 3. The following screenshot shows the introductory page for the **Network Policy and Access Services** role. Click **Next**.



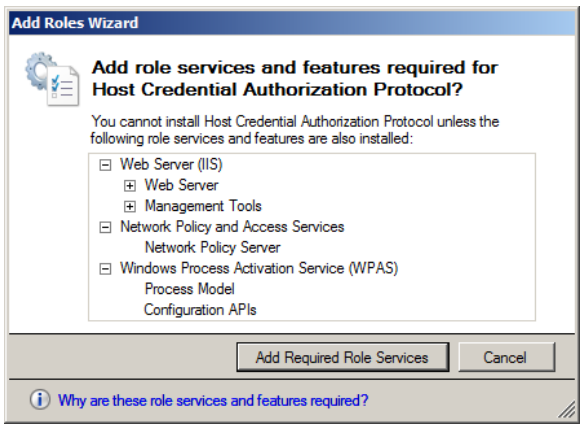
Step 4. Select **Host Credential Authorization Protocol** to install the HCAP server.



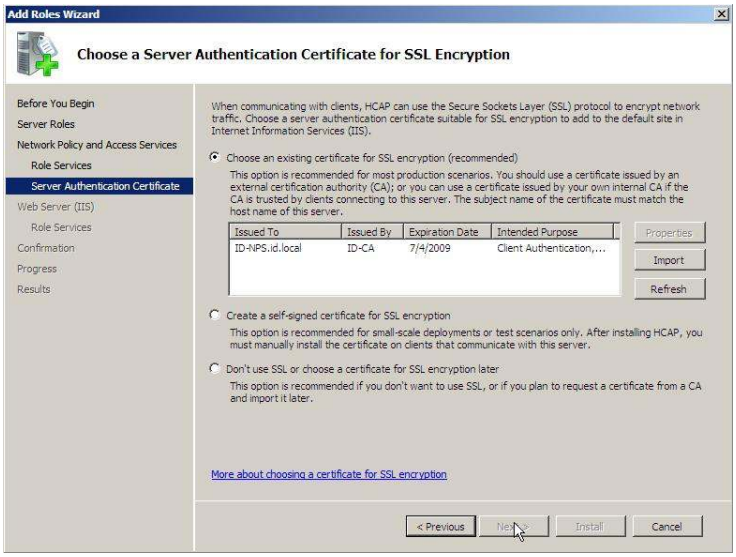
Step 5. Selecting **Host Credential Authorization Protocol** automatically selects Microsoft NPS.



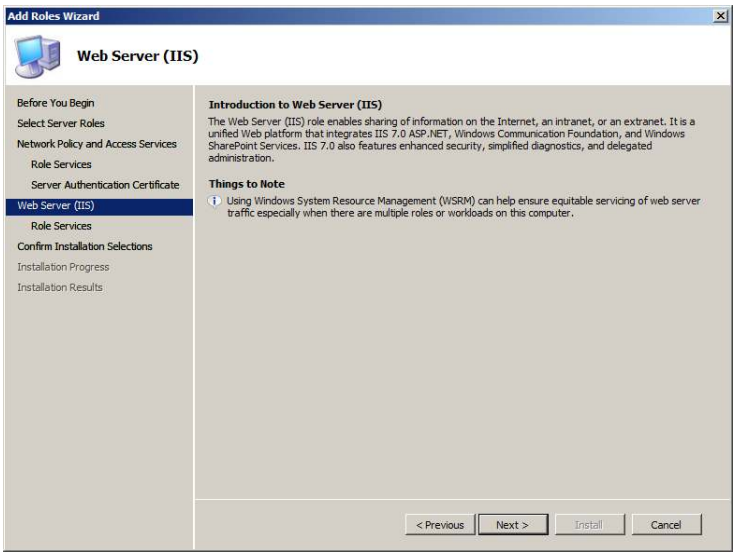
Step 6. Installation of HCAP requires dependent role services and features that will be installed automatically for the administrator. The following screenshot shows the dialog box listing all the dependent role services and features required for the HCAP server. Click **Add Required Role Services**.



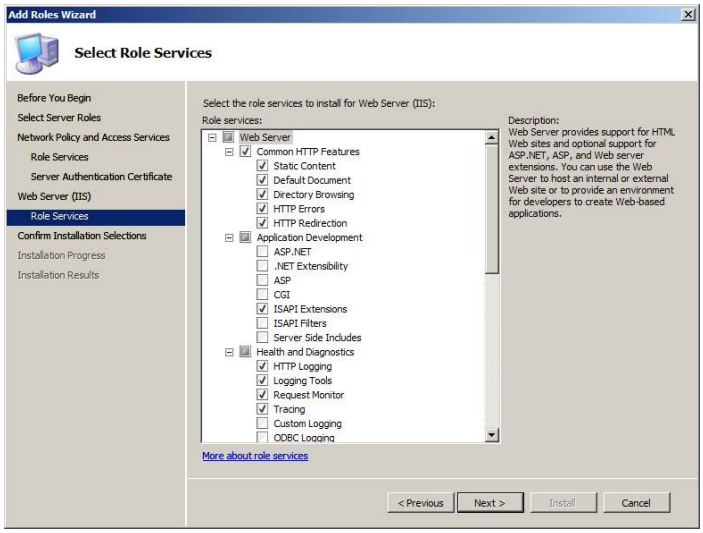
Step 7. The following screenshot shows the **Server Authentication Certificate** page, which allows the administrator to use an existing certificate. Select **ID-NPS.id.local** from the existing certificate list and click **Next**.



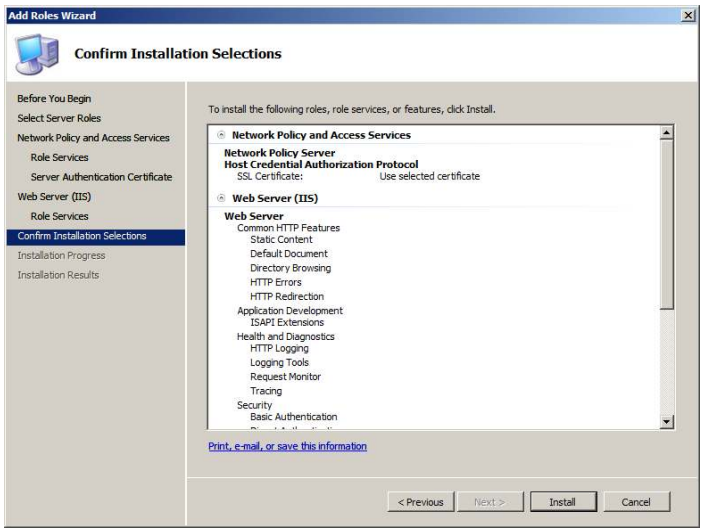
Step 8. Click **Next** on the Web Server (IIS) screen to get to the **Select Role Services** page.



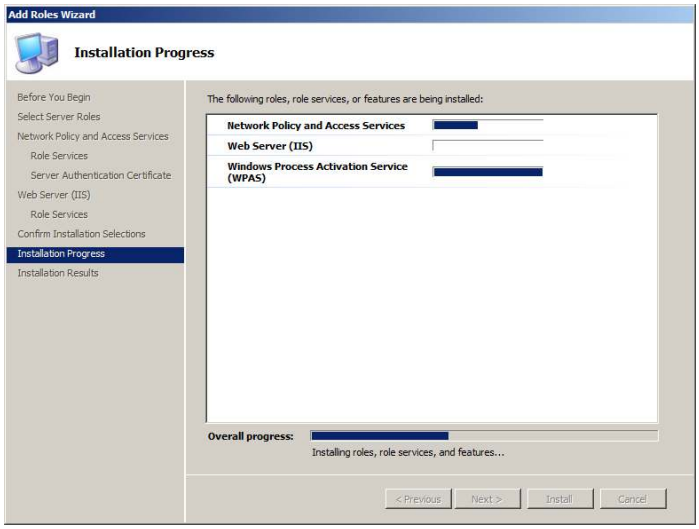
Step 9. The following screenshot shows the role services that are being installed on the server. Click **Next**.



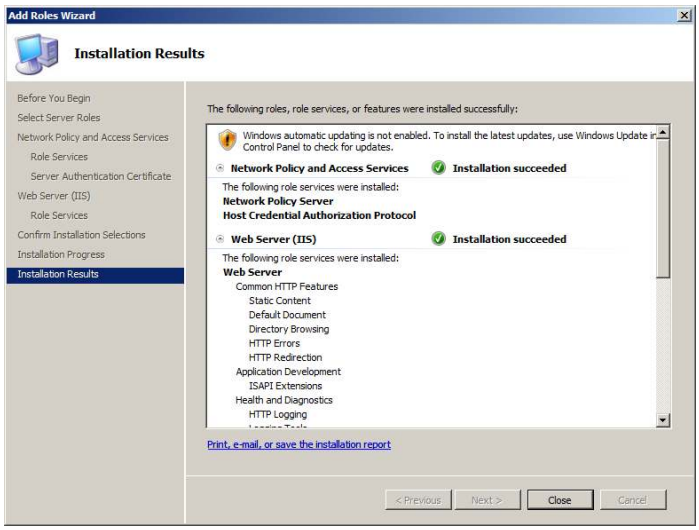
Step 10. The following screenshot shows the confirmation page before installation begins. Click **Install** to start the installation.



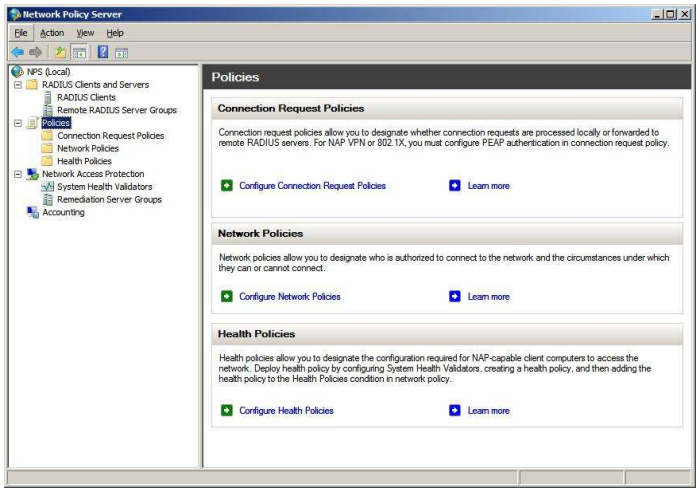
Step 11. The following screenshot shows the installation progress.



Step 12. The following screenshot shows that the installation has succeeded and that the HCAP server and its dependent components are installed.



Step 13. Open the Microsoft NPS Management Console, choose **Start > Run**, and in the **Open** field enter **nps.msc**. Then click **OK**. The following screenshot shows NPS Management Console.



Network Policy Server Configuration

The Microsoft NPS service on Microsoft NPS needs to be configured for the test lab. There are four configuration steps:

- Configure connection request policy (CRP)
- Configure system health validators (SHVs)
- Configure health policies
- Configure network policies

All configuration steps are performed using the Microsoft NPS Microsoft Management Console.

Task 1: Configure Connection Request Policy

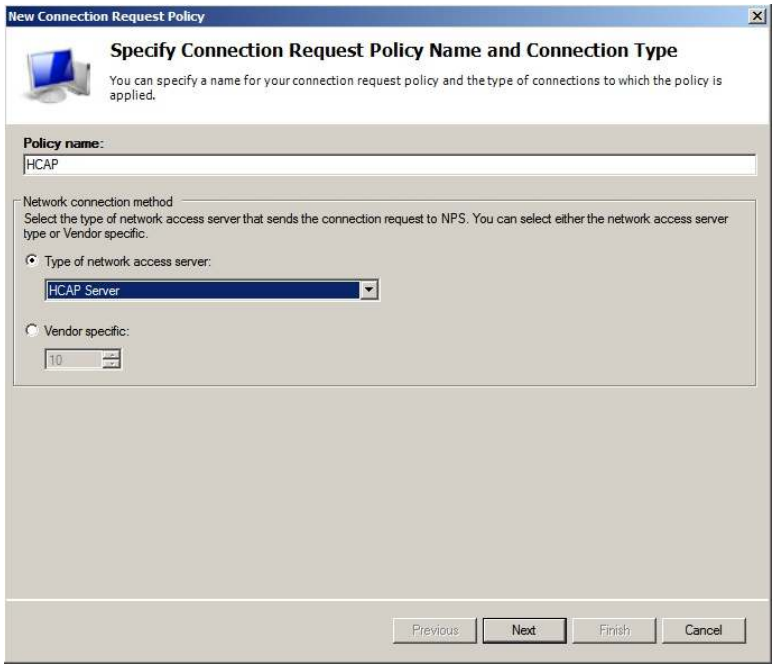
Client authentication methods are evaluated in CRP for this test lab.

Step 1. Double-click **Connection Request Processing** and then click **Connection Request Policies**.

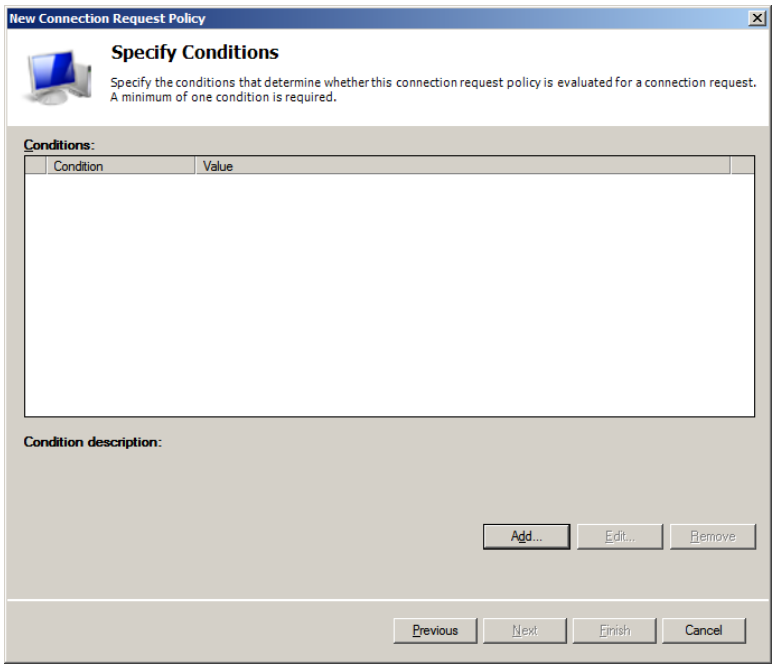
Step 2. In the middle pane, under **Name**, right-click **Use Windows authentication for all users** and then click **Delete**. When a dialog box appears asking you to confirm the deletion, click **OK**. You will create a new connection request policy.

Step 3. Right-click **Connection Request Policies**, point to **New**, and then choose **Custom**.

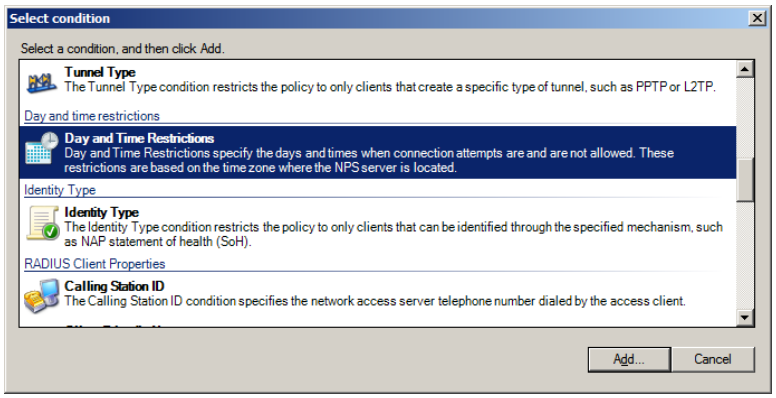
Step 4. In the **New Connection Request Policy Properties** box, on the **Overview** tab, for **Policy name**, type **HACP**. From the **Type of network access server** pull-down menu, choose **HCAP Server**. Your screen should look like the following screenshot. Click **Next**.



Step 5. In the **New Connection Request Policy Properties** box, click **Add** to add the conditions for the CRP to match.

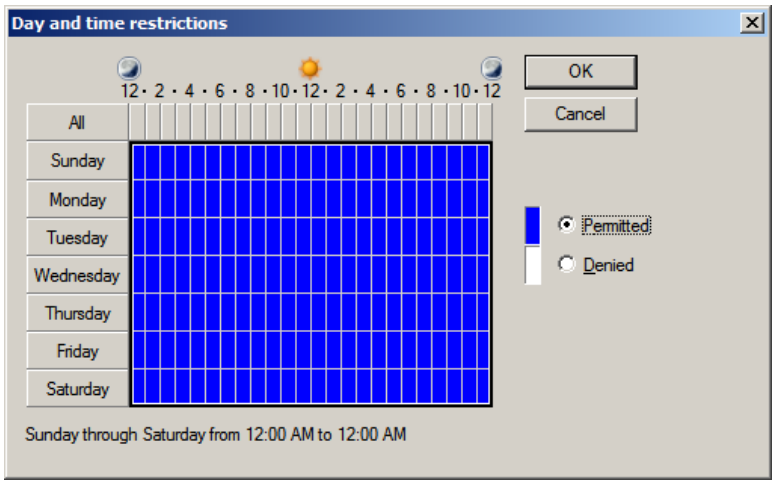


Step 6. In the **Select Conditions** dialog box that opens, you can select the conditions for the CRP. For this task, select the **Day and Time Restriction** condition to permit connections.

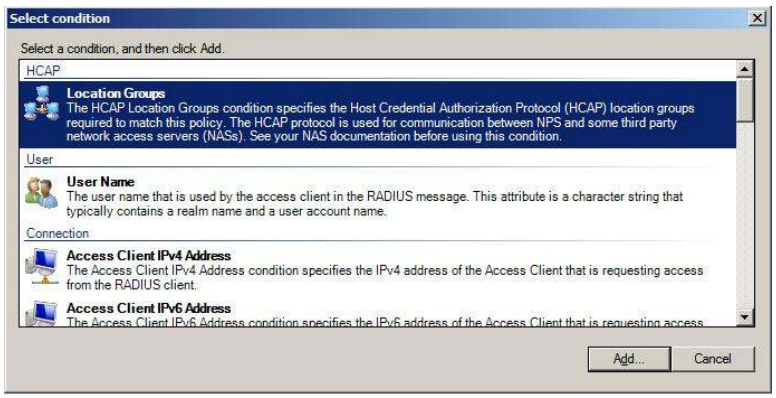


Step 7. The **Day and time restrictions** dialog box that opens permits all requests from the Cisco Secure ACS. Select a range as shown in the screenshot, click **Permitted**, and click **OK**.

Note: This is an example, and administrators can use whatever conditions apply to their specific deployments.

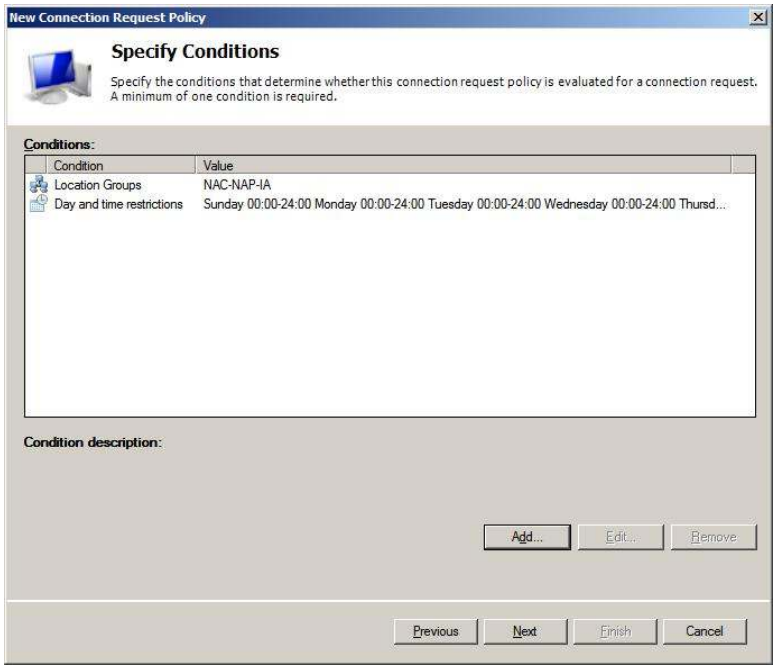


Step 8. Click the **Add** button again and this time choose **HCAP Location Groups**; then click **Add**.

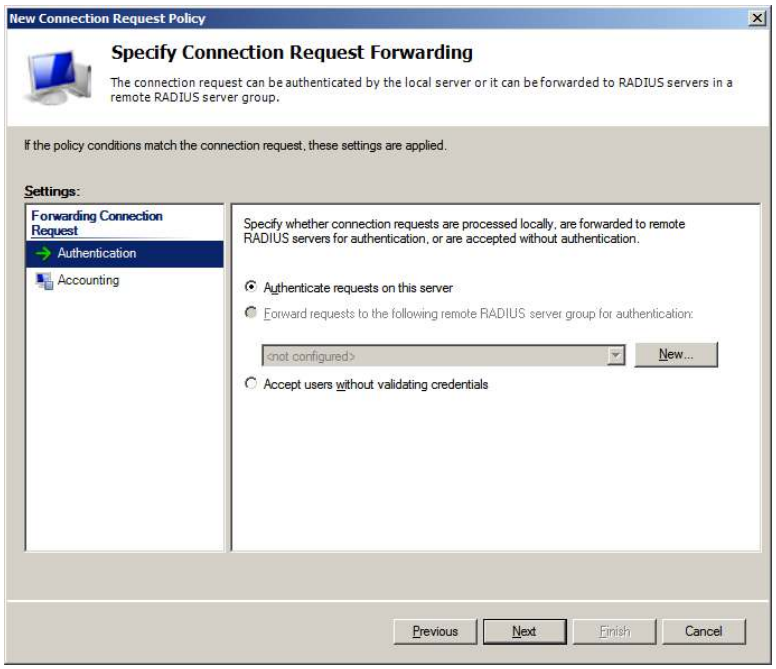


Step 9. In the **Location Groups** window, type the HCAP location group name: for example, **NAC-NAP-IA**. Microsoft NPS can use the HCAP location group name to identify HCAP requests by the specific Cisco Secure ACS. The same string is configured in the Posture section of the network access profile in the Cisco Secure ACS configuration.

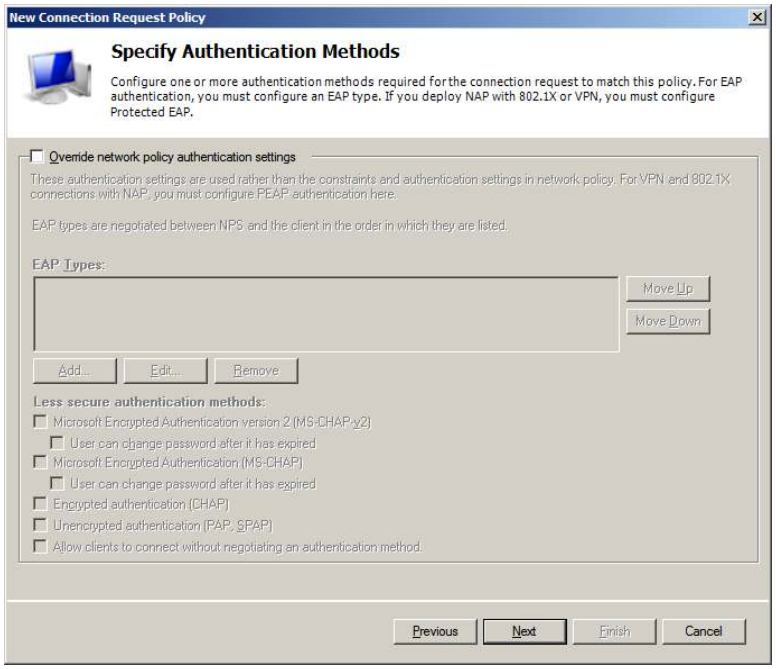
Step 10. This task set up two conditions. Make sure you have the two entries for **Conditions** and then click **Next**.



Step 11. Select **Authenticate requests on this server** as shown here.



Step 12. Ensure that **Override network policy authentication settings** is not checked. The authentication settings should be set up in the network policies.



Step 13. On the **Configure Settings** page, click **Next**. Click **Finish** to complete the configuration of the CRP.

Task 2: Configure System Health Validators

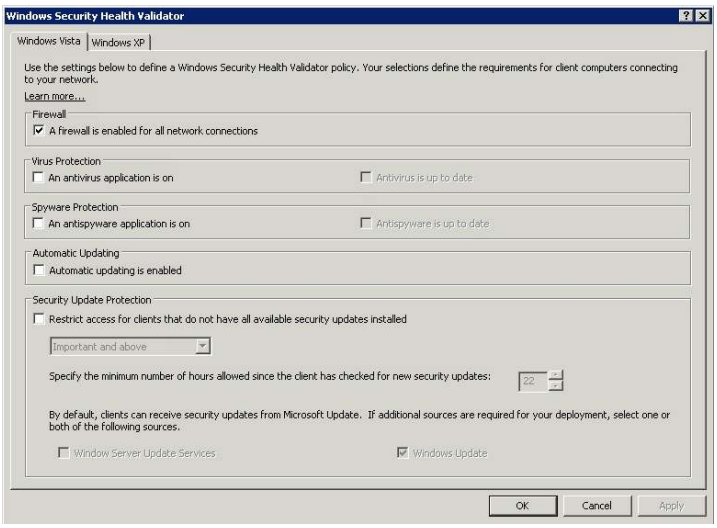
Network health requirements are defined by SHVs. For the test lab, the Windows Security Health Validator will require only that Windows Firewall is enabled.

Step 1. Double-click **Network Access Protection** and then click **System Health Validators**.

Step 2. In the middle pane, under **Name**, double-click **Windows Security Health Validator**.

Step 3. In the **Windows Security Health Validator Properties** dialog box, click **Configure**.

Step 4. Clear all check boxes except **A firewall is enabled for all network connections**, as shown in the following screenshot.



Step 5. Click **OK** to close the **Windows Security Health Validator** dialog box and then click **OK** to close the **Windows Security Health Validator Properties** dialog box.

Task 3: Configure Health Policies

Health policies classify the client health status. The test lab defines a compliant and noncompliant health state.

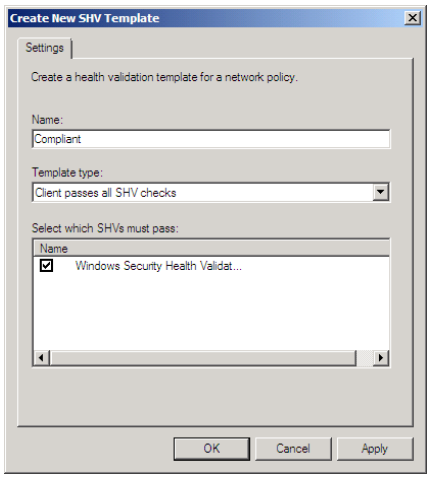
Step 1. Double-click **Network Access Protection**.

Step 2. Right-click **System Health Validator Templates** and then click **New**.

Step 3. In the **Create New SHV Template** dialog box, under **Name**, type **Compliant**.

Step 4. Under **Template type**, verify that **Client passes all SHV checks** is selected.

Step 5. Under **Select which SHVs must pass**, select the **Windows Security Health Validator** check box, as shown in the following screenshot.



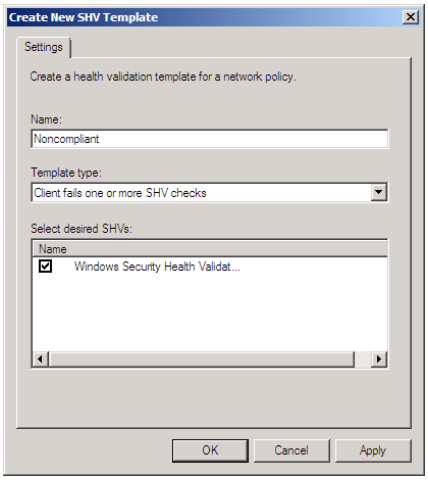
Step 6. Click **OK**.

Step 7. Right-click **System Health Validator Templates** and then click **New**.

Step 8. In the **Create New SHV Template** dialog box, under **Name**, type **Noncompliant**.

Step 9. Under **Template Type**, choose **Client fails one or more SHV checks**.

Step 10. Under **Select desired SHVs**, select the **Windows Security Health Validator** check box, as shown in the following screenshot.



Step 11. Click **OK**.

Task 4: Configure Network Policies

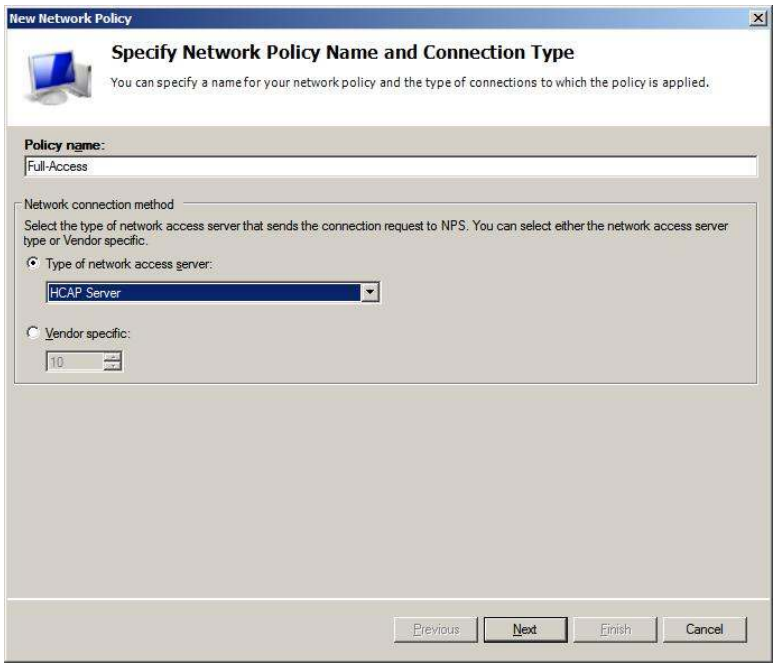
Network policies evaluate information contained in client authorization requests and grant network access based on the results. Network policy determines whether a client complies with health policy and returns the appropriate posture token to Cisco Secure ACS using HCAP. If the client is determined to be noncompliant with health policy, then a quarantine state is sent to Cisco Secure ACS, which can optionally be updated to a compliant state.

Step 1. Click **Network Policies**.

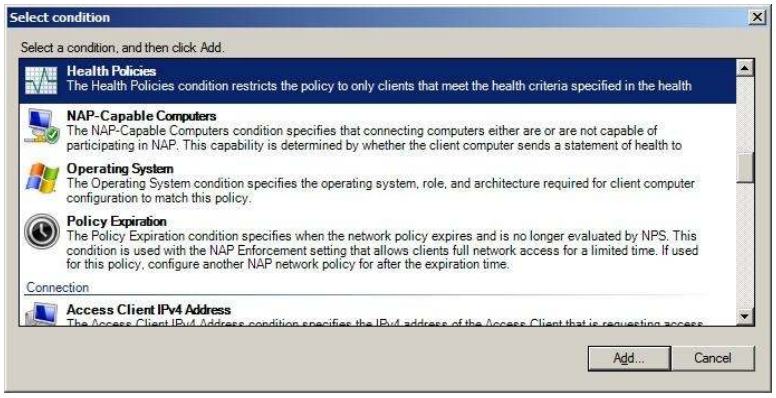
Step 2. Delete the two default policies under **Name** by right-clicking the policies and then choosing **Delete**. Click **OK** to confirm each deletion.

Step 3. Right-click **Network Policies**, point to **New**, and choose **New Network Policy**.

Step 4. In the **New Network Policy window**, under **Policy name**, name the new network policy; in this example, type **Full-Access**. **Select Type of network access server** and choose **HCAP Server** from the pull-down menu. Then click **Next**.



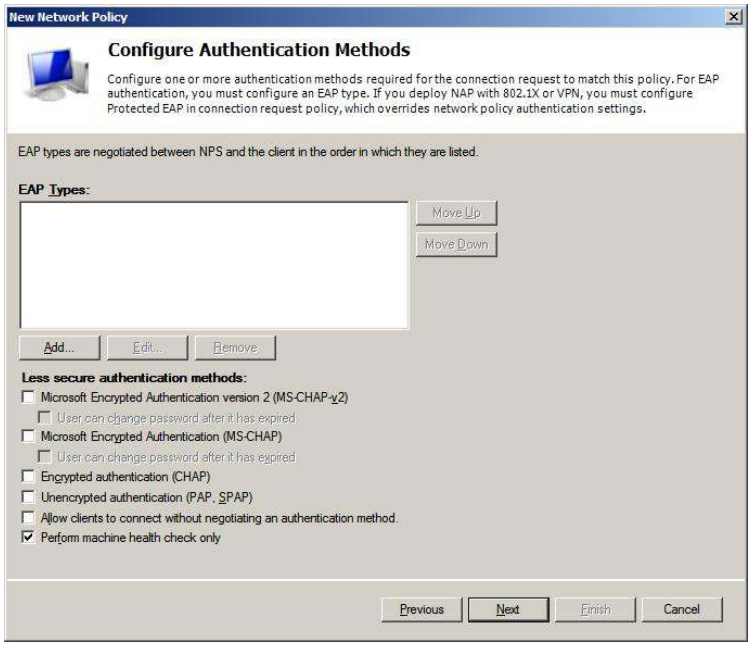
Step 5. In the **Specify Condition** window, click the **Add** button and choose **Health Policies**.



Step 6. From the **Health Policies** pull-down menu, choose **Compliant**, which was created in the previous task (Task 3). Click **OK** to go back to the **Select Condition** page and click **Next**.

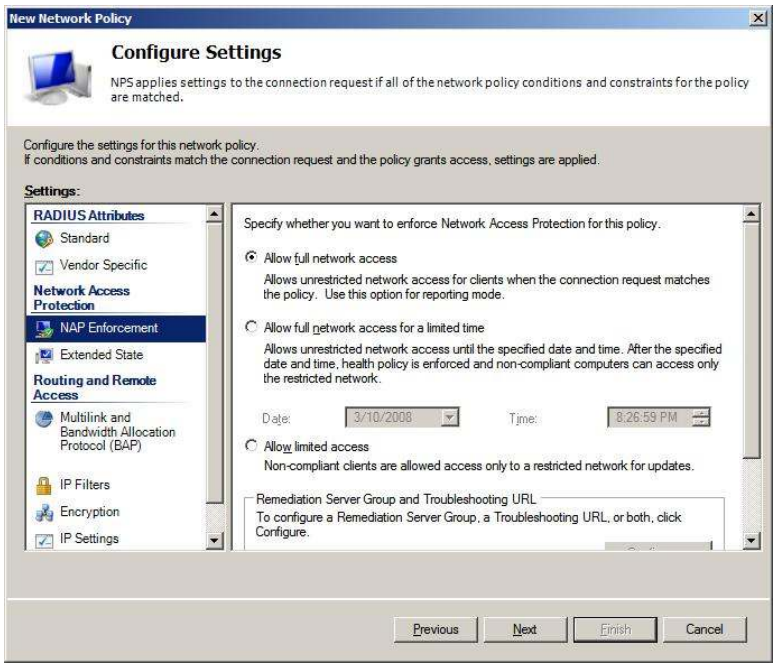
Step 7. In the **Specify Access Permission** window, choose **Access granted** and click **Next**.

Step 8. In the **Configure Authentication Methods** window, deselect everything and select **Perform machine health check only**. Note that Microsoft NPS is used as the HCAP server, not the authentication server. Microsoft NPS is only performing a health check.



Step 9. In the **Configure Constraints** window, click **Next** and leave all options unchanged.

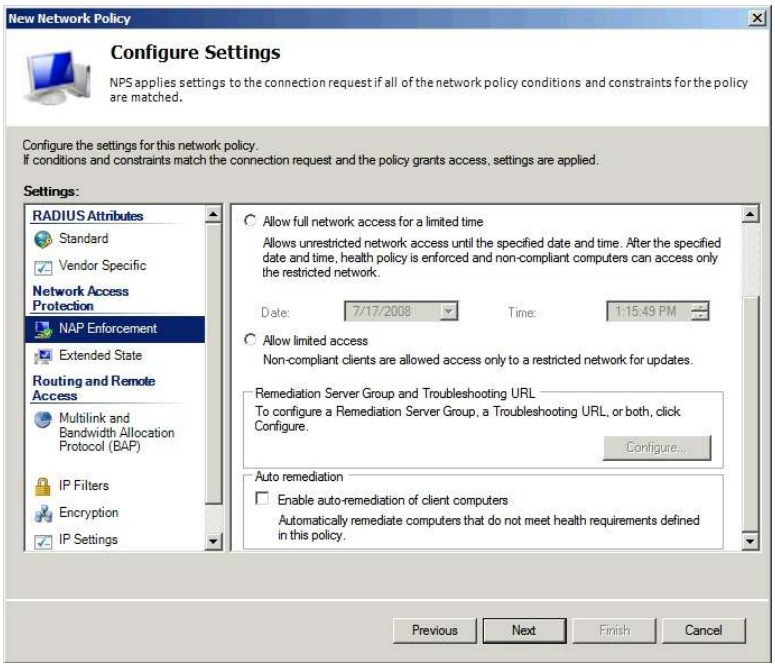
Step 10. In the **Configure Settings** window, first remove all predefined Standard RADIUS attributes (**Framed-Protocol** and **Service-Type**). Microsoft NPS communicates to Cisco Secure ACS using the HCAP protocol; therefore, no RADIUS attributes are involved. Then click **NAP Enforcement** in the settings list on the left side of the window. In **NAP Enforcement** settings pane that appears on the right, select **Allow full network access** and leave everything else deselected.



Step 11. Click **Next** and then click **Finish** to complete the Full-Access network policy.

Step 12. Repeat Steps 1 through 9 for a network policy named **Restricted-Access**. In the **Specify Condition** window, select **Health Policies** and then choose **Noncompliant**, which was created in the previous task (Task 3).

Step 13. In the **Configure Settings** window for a network policy named Restricted-Access, remove all predefined standard RADIUS attributes (**Framed-Protocol** and **Service-Type**). In the **NAP Enforcement** settings pane, select **Allow limited access**, and in the **Auto remediation** section, deselect **Enable auto-remediation of client computers**. Be sure to deselect the autoremediation in this section; otherwise, the NAP system changes the computer state (firewall state) immediately after IEEE 802.1x connection, and checking the switch port state (healthy or changed to quarantine VLAN) is difficult.



Step 14. After configuring the **Configure Settings** window options, click **Next** and then click **Finish** to complete network policy configuration. This completes the Microsoft NPS setup.

Windows Vista Client Configuration

NAC-NAP interoperability architecture requires a client computer running Windows Vista. The Windows Vista configuration consists of three steps:

- Enable Network Access Protection Agent and Wired Autoconfiguration Service
- Enable EAP enforcement client and Windows Security Center
- Install and configure the Cisco EAP-FAST Module

Task 1: Enable Network Access Protection Agent and Wired AutoConfig Service

The Network Access Protection Agent and Wired AutoConfig Services are the two main services that need to be enabled for NAP using IEEE 802.1x technologies. By default, these services are turned off and need to be manually turned on. Also, the service type needs to be set to Automatic so that these services are enabled on the next reboot of Windows Vista. Follow these steps to enable both NAP Agent and Wired AutoConfig services.

Step 1. Choose **Start > All Programs > Accessories**, right-click **Command Prompt**, and choose **Run as Administrator**.

Step 2. Type **services.msc** and press the **Enter** key. This operation opens a Services window.

Step 3. In the list of services, right-click **Network Access Protection** Agent and choose **Properties**.

Step 4. For **Startup type**, choose **Automatic**.

Step 5. Under **Service status**, click **Start**, wait for the service to start, and then click **OK**.

Step 6. In the list of services, right-click **Wired AutoConfig** and choose **Properties**.

Step 7. For **Startup type**, choose **Automatic**.

Step 8. Under **Services status**, click **Start**, wait for the service to start, and then click **OK**.

Step 9. Close the services window.

Task 2: Enable EAP Quarantine Enforcement Client and Windows Security Center

In addition to NAP Agent and Wired AutoConfig, EAP Quarantine Enforcement Client and Windows Security Center need to be enabled. The following steps show how to enable these essential clients.

Step 1. Choose **Start > All Programs, Accessories**, right-click **Command Prompt**, and choose **Run as Administrator**.]

Step 2. Type **mmc** and press the **Enter** key. This operation opens a window called Console1.

Step 3. From the **File** menu, choose **Add/Remove Snap-in**.

Step 4. Select **NAP Client Configuration** and then click **Add**.

Step 5. In the **NAP Client Configuration** dialog box, click **OK** to accept the default selection **Local computer (the computer on which this console is running)**.

Step 6. Select **Group Policy Object Editor** and then click **Add**.

Step 7. Click **Finish** to accept the default **Group Policy Object** selection **Local Computer**.

Step 8. In the **Add or Remove Snap-ins** dialog box, click **OK**.

Step 9. In the left pane of the Console1 window, double-click **NAP Client Configuration (Local Computer)** and then click **Enforcement Clients**.

Step 10. In the middle pane, right-click **EAP Quarantine Enforcement Client** and then click **Enable**.

Step 11. In the left pane, double-click **Local Computer Policy**, double-click **Computer Configuration**, double-click **Administrative Templates**, double-click Windows Components, and then click **Security Center**.

Step 12. In the middle pane, double-click Turn on **Security Center (Domain PCs only)**.

Step 13. Select **Enabled** and then click **OK**.

Step 14. Close the **Console1** window.

Step 15. Click **No** when prompted to save the console settings.

Note: Enable the NAP agent service on Vista. At the command prompt, enter the following command: net start napagent.

Note: Enable the NAP quarantine enforcement client (QEC) on Vista. At the command prompt, enter the following command: netsh nap cli set enforcement ID = 79623 ADMIN = "ENABLE".

Task 3: Install and Configure the Cisco EAP-FAST Module

These are the steps required to install and enable the Cisco EAP-FAST Module (IEEE 802.1x) on the Vista client.

Step 1. First, obtain EAP-FAST Module through Microsoft Windows Update. The EAP-FAST files will be installed in C:\program files\Cisco Systems\Cisco EAP-FAST Module.

Step 2. Choose **Start > All Programs, Accessories**, right-click **Command Prompt**, and choose **Run as Administrator**.

Step 3. Next to **Open**, type **control netconnections** and then click **OK**.

Step 4. Right-click **Local Area Connection** on the **Network Connections** screen and select **properties**.

Step 5. Select the **Authentication** tab.

Note: This tab becomes available only when Wired AutoConfig service is started. If you do not see the Authentication tab, check the service status.

Step 6. Select the **Enable IEEE 802.1x authentication** check box.

Step 7. Under **Choose a network authentication method**, select **Cisco EAP-FAST**.

Step 8. On the **Connection** tab, select **Use anonymous outer identity** and use the default identity of **anonymous**.

Step 9. Select **the Use Protected Access Credential** option and select **Allow automatic PAC provisioning**. A protected access credential (PAC) authority will not be available at this point. You will first need to provision a PAC during the initial client authentication,

Step 10. Select **Validate Server Certificate** and select the appropriate CA from the **Trusted Root CA** drop-down list. If your trusted root CA is not in the list, select the **Validate Server Certificate** check box and deselect the **Do not prompt user to authorize new servers or trusted certification authorities** check box. The next time the user is authenticated successfully, the trusted root CA certificate will be provisioned, with a prompt to verify the provisioned certificate.

Step 11. On the **User Credentials** tab, the default setting **Use Windows user name and password** should be selected. If you are testing with a username and password that differs from the one used in the Windows logon, choose **Prompt automatically for username and password**.

Step 12. Select the **Authentication** tab. For **Authentication method**, select **EAP-MSCHAPv2**. Also select the **Allow fast reconnect** and **Enable posture validation** options.

Configuration of IEEE 802.1x on the Cisco IOS Software Switch

In this section, you will configure the components to enable the base functions of IEEE 802.1x on a switch running Cisco IOS Software.

Task 1: Configure AAA on the NAD

Follow these steps to enable AAA for NAC Layer 2 802.1x on a Cisco IOS Software switch for NAC.

Step 1. Enable AAA on the switch service using the **aaa new-model** global configuration command.

```
Cat3560(config)#aaa new model
```

Step 2. Configure the switch to use RADIUS for IEEE 802.1x authentication using the **aaa authentication dot1x default group radius** command.

```
Cat3560(config)#aaa authentication dot1x default group radius
```

Step 3. Configure the switch to run authorization for all network-related service requests using the **aaa authorization network default group radius** command.

```
Cat3560(config)#aaa authorization network default group radius
```

Step 4. Configure the switch to use RADIUS for IEEE 802.1x accounting using **the aaa accounting dot1x default start-stop group radius** command.

```
Cat3560(config)#aaa accounting dot1x default start-stop group radius
```

Step 5. Verify that the VLANs and VLAN interfaces listed here have been preconfigured on the switch for NAC L2 802.1x.

VLAN Name	VLAN	Subnets
healthy	10	10.1.10.x/24
guest	20	10.1.20.x/24
quarantine	40	10.1.40/x/24
asset	50	10.1.50.x/24
voice	99	10.1.99.x/24

```
vlan 10
 name healthy
!
vlan 20
 name guest
!
```

```
vlan 40
 name quarantine
!
vlan 50
 name asset
!
vlan 99
 name voice
!
interface Vlan10
 description healthy VLAN
 ip address 10.1.10.254 255.255.255.0
 ip helper-address 10.1.200.1
!
interface Vlan20
 description guest VLAN
 ip address 10.1.20.254 255.255.255.0
 ip helper-address 10.1.200.1
!
interface Vlan40
 description quarantine VLAN
 ip address 10.1.40.254 255.255.255.0
 ip helper-address 10.1.200.1
!
interface Vlan50
 description asset VLAN
 ip address 10.1.50.254 255.255.255.0
 ip helper-address 10.1.200.1
!
interface Vlan99
 description voice VLAN
 ip address 10.1.99.254 255.255.255.0
 ip helper-address 10.1.200.1
```

Step 6. Enable IEEE 802.1x using the dot1x system-auth-control global configuration command.

```
Cat3560(config)#dot1x system-auth-control
```

Step 7. Enable IEEE 802.1x on Fast Ethernet 1/1.

```
Cat3560(config-if)#dot1x port-control auto
Cat3560(config-if)#dot1x pae authenticator
Cat3560(config-if)#dot1x timeout reauth-period server
Cat3560(config-if)#dot1x reauthentication
Cat3560(config-if)#spanning-tree portfast
```

Network Access Profile Configuration for NAC L2 802.1x

In the following section, you will configure a network access profile (authentication, posture validation, and authorization) to support NAC L2 802.1x. Cisco Secure ACS supports two methods of configuring network access profiles.

- Add an empty profile and configure all the necessary information.
- Use the template profiles to customize the network access profile desired with the base information included in the template.

Cisco Secure ACE provides eight predefined network access profile templates:

- NAC L3 IP
- NAC L2 IP
- NAC L2 802.1x
- Microsoft IEEE 802.1x
- Wireless (NAC L2 802.1x)
- Agentless Host for L2 (802.1x fallback)
- Agentless Host for L3
- Agentless Host for L2 and L3

Task 1: Create the NAC L2 802.1x Profile from the Template

In this section of the lab, you use the NAC L2 802.1x network access profile template to create a base profile; you then make the necessary changes to customize this template.

Step 1. Choose **Network Access Profiles** from the main menu and select **Add Template Profile**.

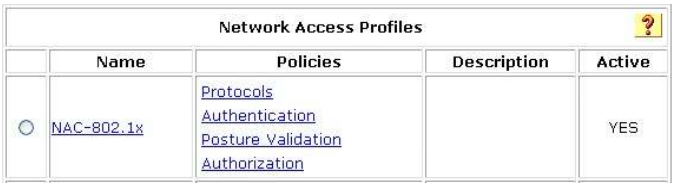
Step 2. Create a Network Access Profile for IEEE 802.1x by selecting the **NAC L2 802.1x** template from the **Template** drop-down menu. Select **Active** to enable the profile.

Step 3. Click **Submit**.

Task 2: Configure the Profile

Now you can configure the NAC-802.1x network access profile.

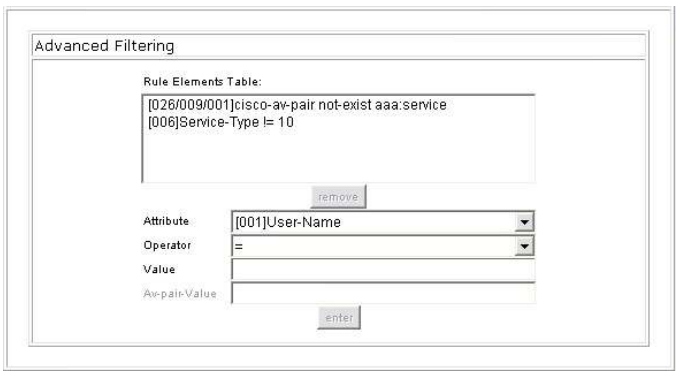
Step 1. On the **Network Access Profiles** screen, select the **NAC-802.1x** link for the new IEEE 802.1x profile.



Step 2. Verify that the profile includes the following elements in **Rule Elements Table** under **Advanced Filtering**:

```
[026/009/001]cisco-av-pair not-exist aaa:service
[006]Service-Type !=10
```

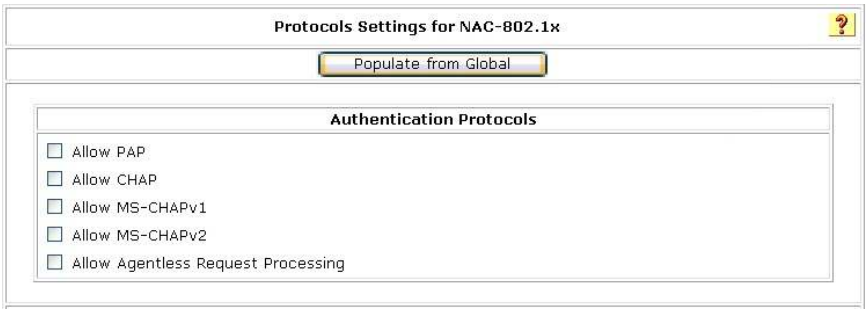
These elements should be automatically populated when the profile is created from the template.

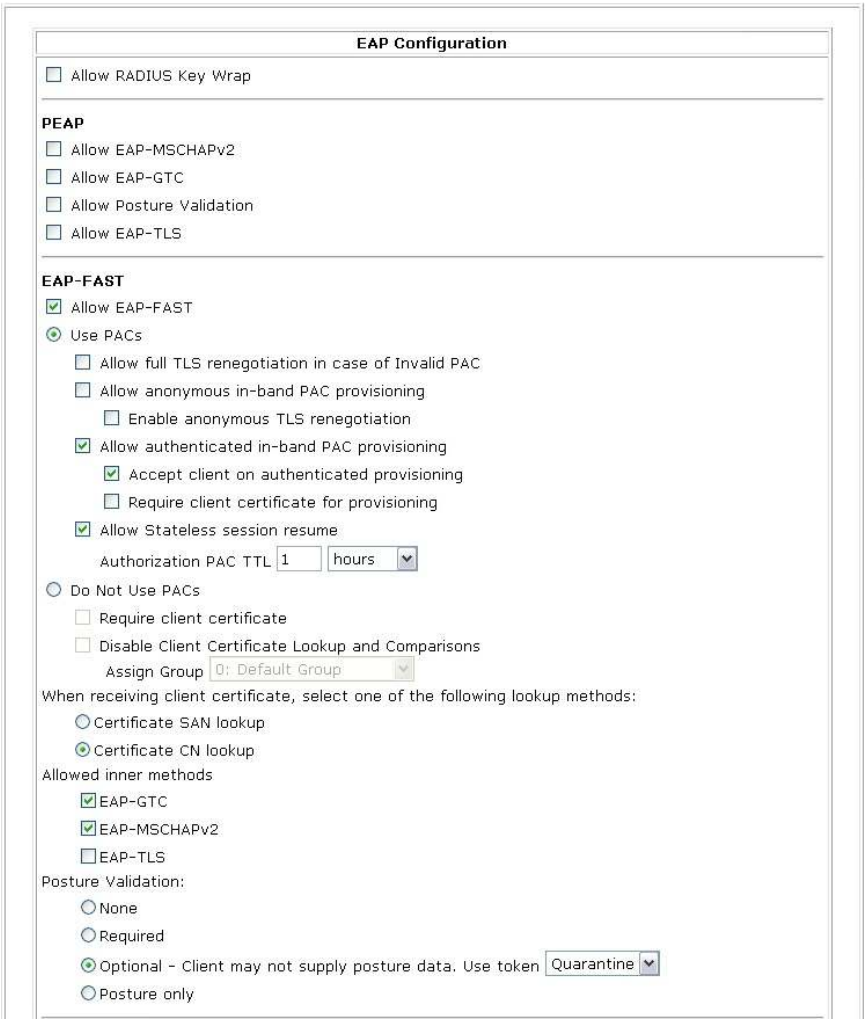


Step 3. On the **Network Access Profiles** screen, select the **Protocols** link for the new IEEE 802.1x profile.

Step 4. Notice that a portion of the EAP-FAST configuration is already selected as part of the base template. Leave the default EAP-FAST configuration as is except under **Posture Validation**, select **Optional** and choose **Quarantine** as the token from the drop-down list.

Note: This setting is very important; if a Vista client requests access and can provide only a user or machine identity credential and cannot provide SoH information (for instance, the NAP agent is not running), then this setting can still give the user access to the quarantine VLAN, instead of rejecting network access entirely.

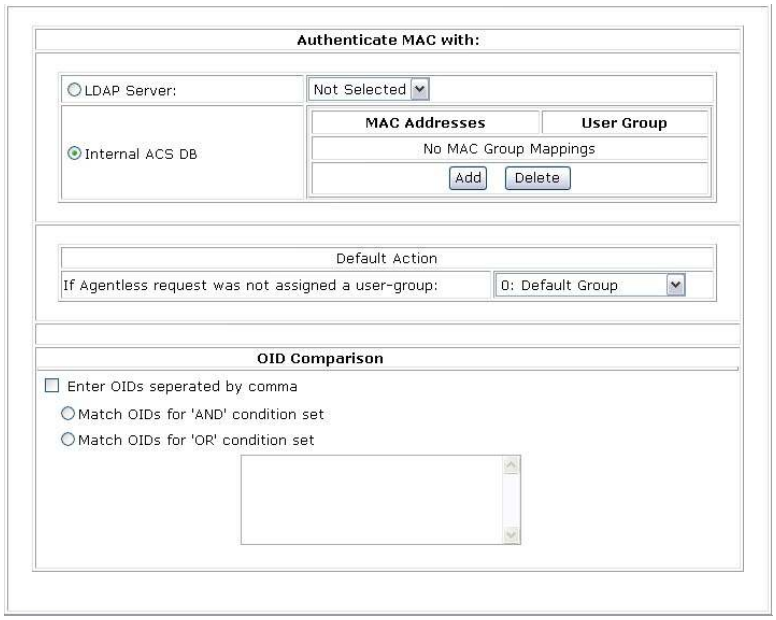




Step 5. Click **Submit**.

Step 6. Select the **Authentication** link from the Network Access Profile screen for the profile you created.

Step 7. Under **Credential Validation Databases**, use the arrow buttons to move **Windows Database** from **Available Databases** to **Selected Databases**. You are going to authenticate the user and machine using the IEEE 802.1x protocol against Microsoft Active Directory.



Step 8. Click **Submit** to apply change.

Step 9. On the **Network Access Profile** screen, select the **Posture Validation** link for the profile you created.

Step 10. Under **Posture Validation Rule**, click **NAC-SAMPLE-POSTURE-RULE** link and click **Delete**. This rule is automatically generated when a NAC-802.1x profile is created using the template, and you are not going to use this rule in this task.

Step 11. Click the **Add Rule** button for the **Statement of Health Posture Validation Rule**.

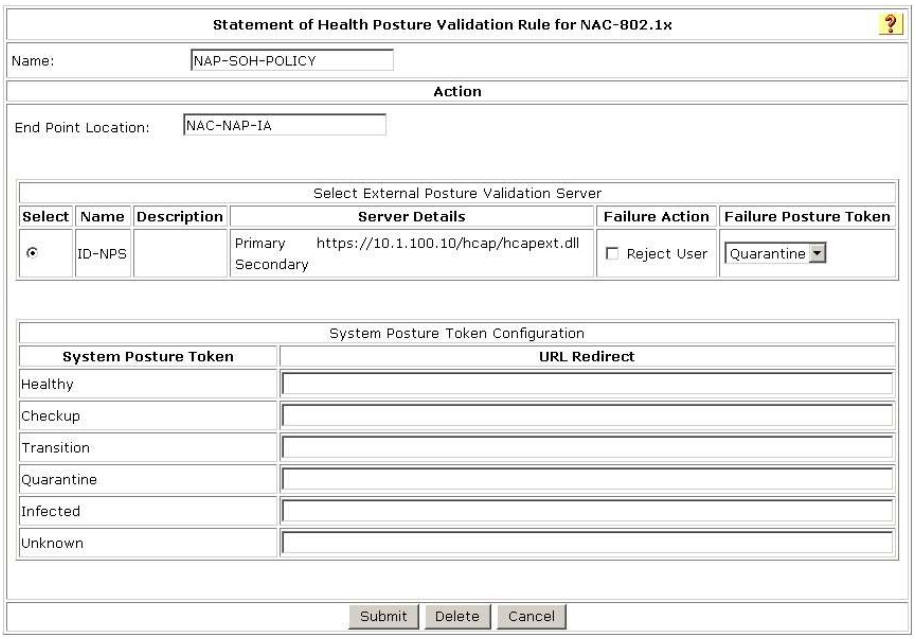
Step 12. In the **Name** field, type the name of the policy. In this example, the name is **ID-NPS**.

Step 13. In the Action section, enter a name for **End Point Location**. In this example, the name is **NAC-NAP-IA**. Remember that this value needs to be match the HCAP location ID that was configured in the Microsoft NPS connection request policies. Please refer to Network Policy Server Configuration, Task 1 Step 9 section to make sure the same Location Group string is used in the NPS configuration.

Step 14. Select **External Posture Validation Server**. In this example, the name is the name of our Microsoft **NPS ID-NPS**.

Step 15. Select the **Reject User** box. The **Failure Posture Token** should be dimmed.

Remember that the **Reject User** option for **Failure Action** can be turned off when the selected Microsoft NPS becomes available if Cisco Secure ACS can still send at least a posture token (in this case, a quarantine token) back to the NAD. For testing purposes, you will disable this feature and fail authentication when Microsoft NPS is not available.



Step 16. For **System Posture Token Configuration**, type your remediation URL under **URL Redirect**. Upon quarantine, user HTTP traffic is redirected to this URL for further user notification purposes.

Step 17. Click the **Submit** button.

Note: We recommend the use of Failure Posture Token instead of Reject User in Failure Action. If the client responds with an empty SoH, meaning that no posture information is available on Vista, the system returns the configured token instead of rejecting the access request. It is highly likely that clients will not send SoH if the NAP agent is not configured properly or if dot3svc starts before NAP service.

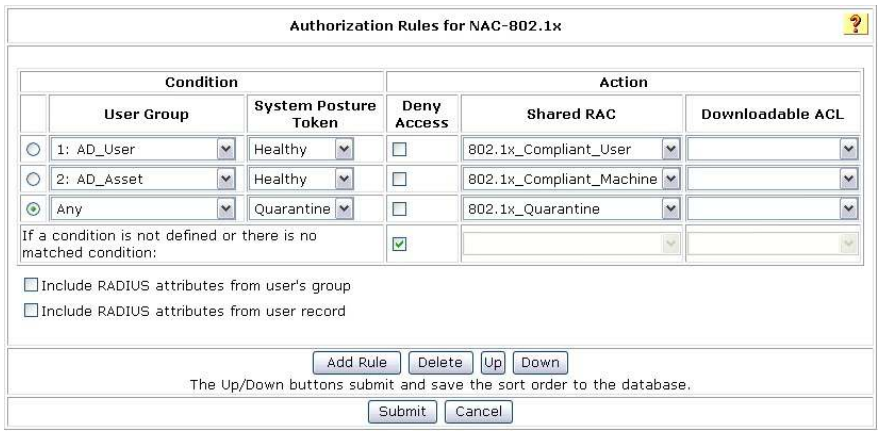
Task 3: Configure Authorization section of the NAC-802.1x Profile

In the Authorization section of the profile, you can configure conditional authorization rules for the profile. For instance, you can configure authorization rule such as if the authentication request is for a user belongs to group A, and also if the health condition is healthy then apply the healthy authorization rule, otherwise go to next line for more restricted authorization rule. Following steps show how to build the conditional authorization rules for NAC-802.1x profile.

Step 1. Select the **Authorization** link for the NAC-802.1x profile.

Step 2. Enable authorization as shown in following screenshot. This configuration specifies the following conditions:

- If the user is successfully authenticated against Active Directory, and if the user's Active Directory group is mapped to Cisco Secure ACS local group **AD_User**, and if SoH evaluation by Microsoft NPS returns the **Healthy** token, then send authorization rule **802.1x_Compliant_User**.
- If a device is successfully authenticated against Active Directory, and if the device's Active Directory group is mapped to Cisco Secure ACS local group **AD_Machine**, and if SoH evaluation by Microsoft NPS returns the Healthy token, then send authorization rule **802.1x_Compliant_Machine**.
- If a user or device is authenticated successfully against Active Directory but SoH evaluation by Microsoft NPS returns the Quarantine token, then send authorization rule 802.1x_Quarantine.
- If none of these conditions match, then reject authentication.



Step 3. Click **Submit**.

Task 6: Test Basic Client Authentication to Cisco Secure ACS

In this task, basic authentication between the client and Cisco Secure ACS will be performed. This will verify basic user authentication is occurring prior to validating posture information from the client to Microsoft NPS.

Step 1. On the Windows Vista client, choose **Start > All Programs > Accessories**, right-click **Command Prompt**, and choose **Run as Administrator**. In the Command Prompt console, type **control netconnections** to display the **Network Connections** window.

Step 2. In the **Network Connections** window, right-click **Local Area Connection** and select **properties**. If the user access control (UAC) asks permission to continue, click **Continue** and type your local administrator credential if necessary.

Step 3. Click the **Authentication** tab. (If this tab is not available, you need to enable the Wired AutoConfig supplicant service.)

Step 4. Verify that **Cisco: EAP-FAST** is selected as the network authentication method and then click the **Settings** button.

Step 5. Click the **Authentication** tab for EAP-FAST Properties.

Step 6. Uncheck **Enable Posture Validation**.

Note: Cisco Secure ACS is configured to accept access from a client that cannot provide any SoH information but return the quarantine token. If authentication succeeds with a valid user ID and password, the client PC should be assigned to the quarantine VLAN, in this case VLAN 40, and DHCP IP address scope 10.1.40.x/24 should be assigned to it.

Step 7. After successful authentication is confirmed, return EAP-FAST configuration to the original setting; that is, enable **Posture Validation** on the **Authentication** tab.

Basic authentication for EAP-FAST is complete.

Testing the NAC IEEE 802.1x Function

This section helps you verify that IEEE 802.1x (NAC L2 802.1x) is configured and functioning properly. Authentication will occur between the client and Cisco Secure ACS over EAP-FAST. The health information from the Vista client will be gathered by Cisco Secure ACS and forwarded to Microsoft NPS over HCAP for verification and compliance checking. On the basis of these results, a posture token and accompanying policy will be downloaded to the switch from Cisco Secure ACS and assigned to the client session. With IEEE 802.1x, a specific VLAN quarantine client is assigned to the port as an enforcement mechanism. (See Figure 2 at the beginning of this guide.)

To be considered healthy and to be placed in the healthy role, the Vista client must correctly return the required SoH information to Cisco Secure ACS and Microsoft NPS. The system health requirements specified in Microsoft NPS must be met for the client to be passed an application posture token of “healthy.” In the example topology, Fast Ethernet port 0/1 is configured for IEEE 802.1x (NAC L2 802.1x).

Task 1: Test Scenario 1

In test scenario 1, shown here, user authentication is performed as well as posture validation for the client.

Test Scenario 1	
Scenario	User authentication and posture validation
Description	Perform user authentication and posture validation for the client using IEEE 802.1x
Authentication context	User
VLAN settings	• Port VLAN: VLAN 1 (default) • User VLAN: VLAN 10 (VLAN name = healthy)

Step 1. On the Windows Vista Client, choose **Start > All Program > Accessories > Command Prompt**. At the **Command Prompt** console, type control **netconnections**.

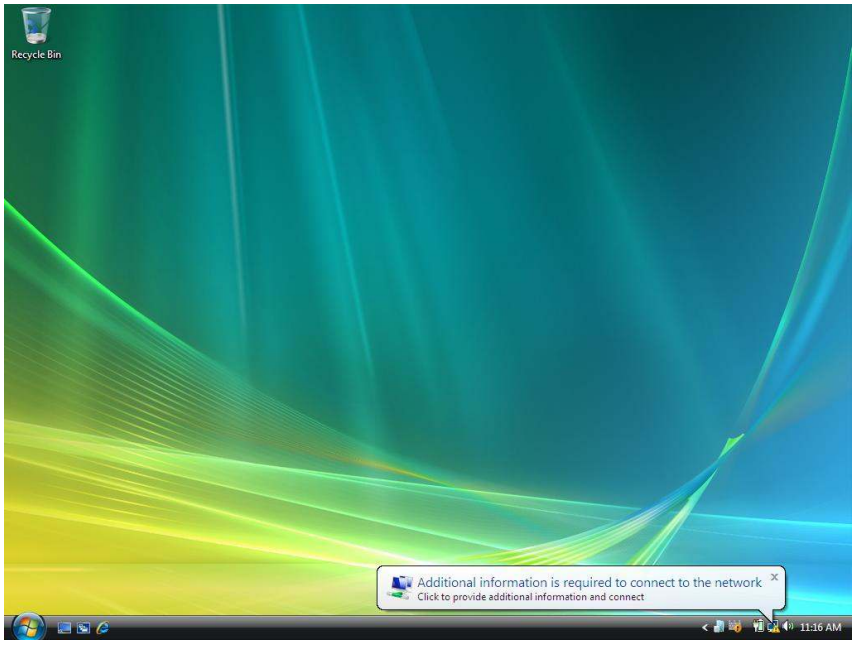
Step 2. In the **Network Connections** window that opens, right-click **Local Area Connection** and select **properties**. If the UAC asks permission to continue, click **Continue** and type your local administrator credential, if necessary.

Step 3. Select the **Authentication** tab. (If this tab is not available, you need to enable the Wired AutoConfig supplicant service.)

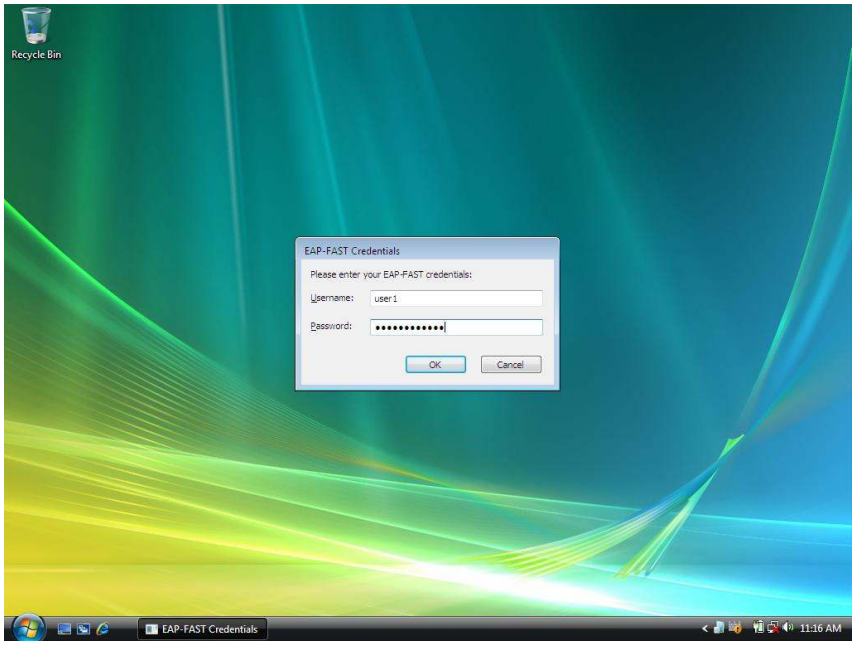
Step 4. Verify that **Cisco: EAP-FAST** is selected as the network authentication method and then click the **Settings** button.

Step 5. On the **User Credentials** tab, select **Prompt automatically for username and password**.

Step 6. Connect the client to the switch port Fast Ethernet 0/1. Alternatively, enter the shut and then the **no shut** command in the interface. On the client, you should see a credential request from the supplicant similar to the one in the following screenshot.



Step 7. Click the notification icon, and you will be prompted to enter user credentials.



Step 8. Enter the user credentials for authentication. In this example, the username is **user1**, and the password is **cisco123**.

Step 9. View the Cisco Secure ACS **Passed Authentication** log to verify successful client authentication and policy assignment.

ge-	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	Downloadable ACL	System-Posture-Token	Application-Posture-Token	Reason	EAP Type	EAP Type Name	PE
OK	ID\user1	AD_User	00-0D-60-FC-9C-38	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	..	Healthy	..	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	ar

Step 10. On the switch, enter the show dot1x interface FastEthernet 0/1 details command to verify the current status of the client.

```
Cat3560#show dot1x interface FastEthernet 0/1 details

Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0

Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 000d.60fc.9c38
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE

Port Status               = AUTHORIZED
ReAuthPeriod              = 3600
ReAuthAction              = Reauthenticate
TimeToNextReauth          = 3593
Authentication Method     = Dot1x
Posture                   = Healthy
Authorized By             = Authentication Server
Vlan Policy               = 10
```

Step 11. Enter the show vlan command to verify that the switch port has been placed in the correct VLAN.

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------
1    default                          active    Fa0/7
10   healthy                          active    Fa0/1, Fa0/2
20   guest                            active
30   contractor                       active
40   quarantine                       active
50   asset                            active
99   voice                            active    Fa0/1, Fa0/2
```

Task 2: Test Scenario 2

In test scenario 2, shown here, user authentication is performed as well as posture validation for the client, but this time you will disable Windows Firewall to verify that the basic quarantine and remediation functions are working.

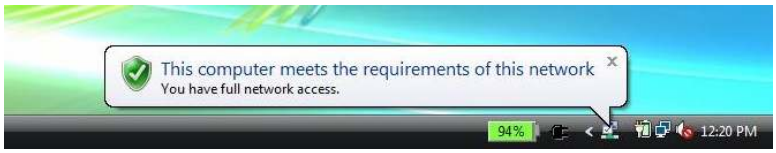
Test Scenario 2	
Scenario	User authentication and noncompliant posture validation
Description	Perform user authentication and posture validation for the client using IEEE 802.1x when Windows Firewall is disabled
Authentication context	User
VLAN settings	• Port VLAN: VLAN1 (default) • User VLAN: VLAN 10 (VLAN name = healthy) • Quarantine VLAN: VLAN 50 (VLAN name = quarantine)

Step 1. Choose **Start > All Programs > Accessories**, right-click **Command Prompt**, and choose **Run as administrator**. Type your administrative credential at the UAC prompt and click **Continue**.

Step 2. Type **netsh firewall set opmode disable** to disable Windows Firewall. As soon as the command above is issued, the NAP agent is notified that the health state has changed, and it will initiate an EAPoL-Start 802.1x control packet to trigger IEEE 802.1x reauthentication with new health information. As a result of reauthentication, the client is now considered noncompliant; therefore, it is placed in the quarantine VLAN, and the user is notified that the computer does not meet the requirements of the network policy, as shown here.

Step 3. Click this balloon message. Another window appears detailing why the computer does not meet the requirements of the network policy.

Step 4. In this test, Microsoft NPS is configured to perform autoremediation when Windows Firewall is disabled. As a result, when Microsoft NPS detects that the client Windows Firewall is disabled, it tries to reenable the firewall as a remediation process. You will see this process right after you disable Windows Firewall. When the firewall is forcefully enabled as a remediation process, the user will be notified that the remediation process is complete in a balloon message as shown here.



Step 5. Click this balloon message. Another window appears detailing the remediation process, as shown here.

Step 6. View the Cisco Secure ACS **Passed Authentication** log. You can now see that the client was quarantined once and then placed back in the healthy VLAN immediately after Microsoft NPS performed the remediation process.

	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	System-Posture-Token	Reason	EAP Type	EAP Type Name	PEAP/EAP-FAST-Clear-Name
2008	12:47:41	Authen OK	ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	Healthy	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	anonymous
2008	12:47:40	Authen OK	ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Quarantine	Quarantine	Posture State=2 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	anonymous

Step 7. Notice in Reason field of the Cisco Secure ACS Passed Authentication log that the Posture State value changed from 2 to 1. **Posture State=2** means that the SoH information sent from the client PC did not meet the policy requirements configured on Microsoft NPS. **Posture State=1** means that the client passed all health checks on Microsoft NPS.

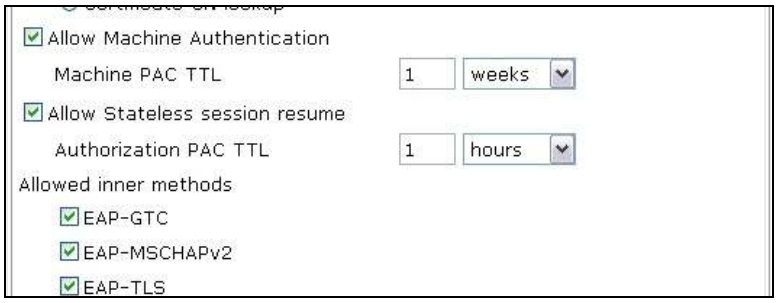
Task 3: Test Scenario 3

In test scenario 3, shown here, both computer and user authentication is performed as well as posture validation for the client. By default, the IEEE 802.1x supplicant on the Vista client will attempt both machine and user authentication.

Test Scenario 3	
Name	Computer and user authentication IEEE 802.1x and posture validation
Description	Perform computer and user authentication and posture validation for the client
Authentication context	machineOrUser (default)
VLAN settings	• Port VLAN: VLAN1 (default) • Computer VLAN: VLAN50 (VLAN name = asset) • User VLAN: VLAN 10 (VLAN name = healthy)

Step 1. Verify that machine authentication is enabled in Cisco Secure ACS by navigating on the Cisco Secure ACS web console to **System Configuration > Global Authentication Setup > EAP-FAST Configuration**.

Step 2. In the EAP-FAST settings, verify that **Allow Machine Authentication** is enabled.



Step 3. Verify that your Vista supplicant configuration is set to perform both machine and user authentication by entering the following command at the command prompt in Vista:

```
netsh lan show profile
```

```
Profile on interface Local Area Connection
======================================================================
Applied: User Profile

    Profile Version        : 1
    Type                   : Wired LAN
    AutoConfig Version     : 1
    802.1x                 : Enabled
    802.1x                 : Not Enforced
    EAP type               : Cisco: EAP-FAST
    802.1X auth credential : Machine or user credential
    Cache user information : No
```

Step 4. Reboot your Windows Vista machine and wait for the CTRL + ALT + DELETE message to appears.

Step 5. On the switch, enter the **show dot1x interface FastEthernet 0/1 details** command to verify the current status of the client.

```
Cat3560#show dot1x int FastEthernet 0/1 details

Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0

Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 000d.60fc.9c38
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE

Port Status               = AUTHORIZED
```

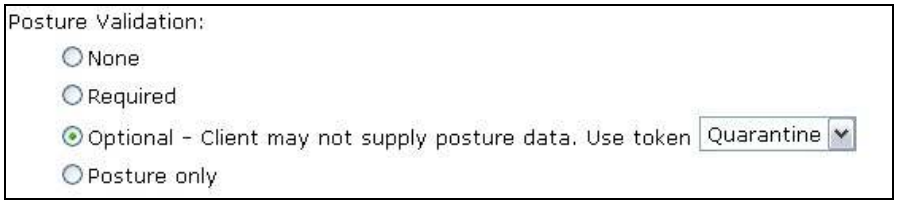
```
ReAuthPeriod              = 60
ReAuthAction              = Reauthenticate
TimeToNextReauth          = 50
Authentication Method     = Dot1x
Posture                   = Quarantine
Authorized By             = Authentication Server
Vlan Policy               = 40
```

Step 6. Enter the **show vlan** command to verify that the switch port has been placed in the correct VLAN.

```
Cat3560#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- ---------------------
1    default                          active    Fa0/7
10   healthy                          active    Fa0/2
20   guest                            active
30   contractor                       active
40   quarantine                       active    Fa0/1
50   asset                            active
99   voice                            active    Fa0/1, Fa0/2
```

Step 7. Notice that although machine authentication succeeds, the Vista client is placed in quarantine VLAN 40. This behavior occurs because the Windows Vista supplicant service starts much earlier than the NAP agent. When authentication requests SoH information, the NAP agent is not available, and therefore no SoH information is sent to Cisco Secure ACS. Cisco Secure ACS performs authentication first against Active Directory; however, because there is no SoH information, it uses the Posture Optional method and immediately assigns the Quarantine token.



This behavior is why the NAD receives the quarantine VLAN for machine authentication. As soon as the NAP agent starts, it reevaluates the system and tries to reauthenticate the device. The following are the results of the **show dot1x interface FastEthernet0/1 detail** command after the NAP agent starts upon successful machine authentication, and also after the successful user authentication.

```
Dot1x Info for FastEthernet0/1
----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0

Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 000d.60fc.9c38
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE

Port Status               = AUTHORIZED
ReAuthPeriod              = 3600
ReAuthAction              = Reauthenticate
TimeToNextReauth          = 3472
Authentication Method     = Dot1x
Posture                   = Healthy
Authorized By             = Authentication Server
Vlan Policy               = 50
```

```
Dot1x Info for FastEthernet0/1
----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0
```

```
Dot1x Authenticator Client List
-------------------------------
Domain                      = DATA
Supplicant                  = 000d.60fc.9c38
    Auth SM State           = AUTHENTICATED
    Auth BEND SM State      = IDLE

Port Status                 = AUTHORIZED
ReAuthPeriod                = 3600
ReAuthAction                = Reauthenticate
TimeToNextReauth            = 3139
Authentication Method       = Dot1x
Posture                     = Healthy
Authorized By               = Authentication Server
Vlan Policy                 = 10
```

Here is the Cisco Secure ACS log showing the flow of those authentications by device and user.

User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	Downloadable ACL	System-Posture-Token	Application-Posture-Token	Reason
ID\user1	AD_User	00-0D-60-FC-9C-38	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	..	Healthy	..	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS
host/vista01.id.local	AD_Asset	00-0D-60-FC-9C-38	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_Machine	..	Healthy	..	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS
host/vista01.id.local	AD_Asset	00-0D-60-FC-9C-38	50001	10.1.100.254	NAC-802.1x	802.1x_Quarantine	..	Quarantine	..	Posture State=2 Extended State=0 returned by: Evaluated by policy: ID-NPS

Task 4: Test Scenario 4

In test scenario 4, shown here, Fast Ethernet port 0/1 is configured to perform NAC Layer 2 IEEE 802.1x (EAP-FAST) authentication. By default, the IEEE 802.1x supplicant on the client will attempt both machine and user authentication. The supplicant configuration on the Vista client will need to be modified to perform only machine authentication.

Test Scenario 4	
Name	Computer authentication IEEE 802.1x and posture validation
Description	Perform machine authentication and posture validation
Authentication context	Machine
VLAN settings	• Port VLAN: VLAN1 (default) • Computer VLAN: VLAN 50 (VLAN name = asset)

Step 1. The profile can be edited using a text editor or an Extensible Markup Language (XML) editor. To export the default configuration profile, use following command:

```
netsh lan export profile folder=”path_to_xml_file”
interface=”interface_name”
```

Example: **netsh lan export profile folder="c:\profiles" interface="LAN"**

Use the following command to reimport the configuration profile after editing is completed:

```
netsh lan add profile filename="path_to_xml_file"
interface="interface_name"
```

Example: **netsh lan add profile filename="c:\profiles\LAN.xml" interface="LAN"**

Step 2. On the Windows Vista Client, choose **Start > All Program > Accessories > Command Prompt**. In the command prompt console, type **netsh** to enter **netsh** command mode.

Step 3. Type **lan** and **show profile**. Verify that the output from the previous task shows the values shown here.

```
Profile on interface Local Area Connection
===================================================================
Applied: User Profile
    Profile Version        : 1
    Type                   : Wired LAN
    AutoConfig Version     : 1
    802.1x                 : Enabled
    802.1x                 : Not Enforced
    EAP type               : Cisco: EAP-FAST
    802.1X auth credential : Machine or user credential
    Cache user information : No
```

Step 4. Enter the command shown here to export the profile (for this operation, the wired interface name is **Local Area Connection**; if the name of your interface is different, change the name here accordingly). After you export the profile, exit the **netsh** command line by typing **bye** and then start editing the XML profile with Notepad or some other text editor.

```
netsh lan>export profile folder=. interface="Local*"
Interface: Local Area Connection
Profile File Name: .\Local Area Connection.xml
1 profile(s) were exported successfully.
netsh lan>bye
C:\Users\user1.ID>notepad "Local Area Connection.xml"
```

Step 5. When editing the Local Area Connection.xml file, add **<authMode>machine</authMode>** immediately before the **<EAPConfig>** element in this XML file as shown here.

```
--- Skipped ---
<OneX xmlns="http://www.microsoft.com/networking/OneX/v1">
<cacheUserData>false</cacheUserData>
<authMode>machine</authMode>
<EAPConfig>
--- Skipped ---
```

Step 6. After editing the XML file, save the change and close the text editor. Go back to the command prompt console and enter **netsh lan** mode.

Step 7. Type the following command to add the edited profile to the interface:

```
netsh lan>add profile filename="Local Area Connection.xml"
interface="Local*"
```

The profile was added successfully on the interface Local Area Connection.

Step 8. Verify your change in **authMode** so that only machine authentication is enabled.

```
netsh lan>show profile
Profile on interface Local Area Connection
=======================================================================
Applied: User Profile
    Profile Version        : 1
    Type                   : Wired LAN
    AutoConfig Version     : 1
    802.1x                 : Enabled
    802.1x                 : Not Enforced
    EAP type               : Cisco: EAP-FAST
    802.1X auth credential : Machine credential
    Cache user information : No
```

Step 9. Reboot your Windows Vista machine and wait for the CTRL + ALT + DELETE message to appear.

Step 10. On the switch, enter the **show dot1x interface FastEthernet 0/1** details command to verify the current status of the client.

```
Cat3560#show dot1x int FastEthernet 0/1 details
Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
```

```
SuppTimeout                = 30
ReAuthPeriod               = (From Authentication Server)
ReAuthMax                  = 2
MaxReq                     = 2
TxPeriod                   = 30
RateLimitPeriod            = 0
Dot1x Authenticator Client List
-------------------------------
Domain                     = DATA
Supplicant                 = 000d.60fc.9c38
    Auth SM State          = AUTHENTICATED
    Auth BEND SM State     = IDLE
Port Status                = AUTHORIZED
ReAuthPeriod               = 60
ReAuthAction               = Reauthenticate
TimeToNextReauth           = 50
Authentication Method      = Dot1x
Posture                    = Quarantine
Authorized By              = Authentication Server
Vlan Policy                = 40
```

Step 11. Enter the **show vlan** command to verify that the switch port has been placed in the correct VLAN.

```
Cat3560#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------
-
1    default                          active    Fa0/7
10   healthy                          active    Fa0/2
20   guest                            active
30   contractor                       active
40   quarantine                       active    Fa0/1
50   asset                            active
99   voice                            active    Fa0/1, Fa0/2
```

Step 12. Notice that although machine authentication succeeds, the Vista client is placed in quarantine VLAN 40. This behavior occurs because the Windows Vista supplicant service starts much earlier than the NAP agent. When authentication requests SoH information, the NAP agent is not available, and therefore no SoH information is sent to Cisco Secure ACS. Cisco Secure ACS performs authentication first against Active Directory; however, because there is no SoH information, it uses the Posture Optional method and immediately assigns the Quarantine token. This behavior is why the NAD receives the quarantine VLAN for machine authentication. As soon as the NAP agent starts, it reevaluates the system and tries to reauthenticate the machine. Here are the results of the **show dot1x interface FastEthernet0/1 detail** command after the NAP agent starts.

Note: This is the setting for machine authentication only. Therefore, IEEE 802.1x authentication is not triggered upon Windows user logon.

```
Dot1x Info for FastEthernet0/1
----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0
Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 000d.60fc.9c38
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE
Port Status               = AUTHORIZED
ReAuthPeriod              = 3600
ReAuthAction              = Reauthenticate
TimeToNextReauth          = 3472
Authentication Method     = Dot1x
Posture                   = Healthy
Authorized By             = Authentication Server
Vlan Policy               = 50
```

Tuning the Windows Vista Supplicant Function

The Single Sign On feature is added to the Windows Vista supplicant on both the wireless interface (introduced in the release version of Vista) and wired interface (supported on Service Pack 1 [SP1]). With this feature, supplicant behavior can be optimized to run more synchronously with the Microsoft Windows startup process, making IEEE 802.1x deployment much easier than before.

Two types of authentication are introduced with the Single Sign On feature: PreLogon and PostLogon. With PreLogon, Single Sign On (IEEE 802.1x user authentication using the Windows domain credential) is performed before the user logs on. With this authentication method, Windows can make sure that network authentication establishes a network connection with the user credential before initiating user domain logon.

With the PostLogon authentication method, Single Sign On (IEEE 802.1x user authentication) is performed immediately after the user logs on. This type of authentication is preferred for authentication with a user certificate, since the user certificate is typically stored in a specific user account, which requires user logon to access.

For information about the options you can use to tune Single Sign On elements, see http://msdn2.microsoft.com/en-us/library/ms706527.aspx. These elements can be configured by editing the XML profile, adding **singleSignOn** elements and subelements.

The following is a sample profile, with **singleSignOn** set to **preLogon** mode.

```
  <?xml version="1.0" ?>
- <LANProfile
xmlns="http://www.microsoft.com/networking/LAN/profile/v1">
- <MSM>
- <security>
  <OneXEnforced>false</OneXEnforced>
  <OneXEnabled>true</OneXEnabled>
- <OneX xmlns="http://www.microsoft.com/networking/OneX/v1">
  <cacheUserData>false</cacheUserData>
  <supplicantMode>compliant</supplicantMode>
  <authMode>machine</authMode>
- <singleSignOn>
  <type>preLogon</type>
  <maxDelay>10</maxDelay>
  <allowAdditionalDialogs>true</allowAdditionalDialogs>
  <maxDelayWithAdditionalDialogs>10</maxDelayWithAddtionalDialogs>
  <userBasedVirtualLan>true</userBasedVirtualLan>
  </singleSignOn>
- <EAPConfig>
------- omitted ---------
  </EAPConfig>
  </OneX>
  </security>
  </MSM>
  </LANProfile>
```

These elements can also be configured with group policy on Windows Server 2003 or 2008. The next task describes a feature that allows the administrator to configure supplicant behavior as well as EAPHost options remotely on Windows Server 2003 or 2008 using group policy. The task focuses on deployment options for the Cisco EAP-FAST Module.

Task 1: Configure Supplicant with Group Policy

Many elements and options of supplicant as well as EAPHost components (including the Cisco EAP-FAST Module) can be remotely configured and provisioned using Windows Server 2003 or 2008. This documentation assumes that Active Directory is running on Windows Server 2003. By default, Windows Server 2003 domain policy does not contain the schema needed to configure the Windows Vista supplicant and EAPHost. You need to follow the steps presented here to make those configuration options available on Windows Server 2003.

Step 1. On a server running Windows Server 2003, copy the **adprep** directory, located in **<yourDVDdrive>:\sources\adprep** on the Windows Server 2008 DVD, to a temporary directory on your local system. (You can create a temporary directory named **temp** on your C drive on a server running Windows Server 2003 and copy **adprep** to the directory.)

Step 2. On Windows Server 2003, launch the command prompt (choose **Start > All Programs > Accessories > Command Prompt**) and open the **adprep** directory you just copied from Windows Server 2008 DVD (**cd c:\temp\adprep**).

Step 3. The **adprep** directory contains a program called **adprep.exe**. You will use this program to extend your Active Directory schema. Note that this command will be applied to your Active Directory schema, so use this command with caution. We highly recommended that you test this upgrade in your testing environment first. At the command prompt, enter the following command:

```
C:\temp\adprep\adprep.exe /forestprep
```

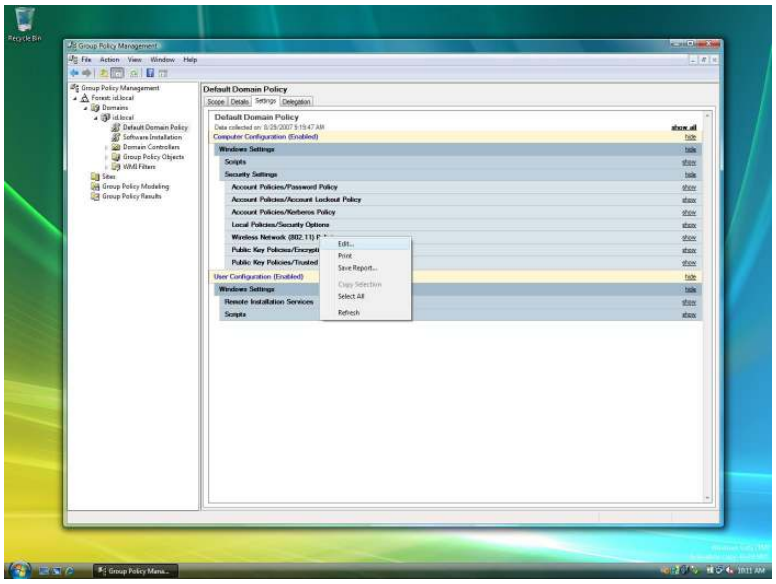
Step 4. At the command prompt, you will be asked to confirm the command and change. Confirm the command by typing C and pressing the **Enter** key.

Step 5. On the Windows Vista SP1 client where the Cisco EAP-FAST Module is installed, you need to install another program called Group Policy Management Console (GPMC), so you can make changes to Active Directory group policy. By default, GPMC is not installed on Windows Vista SP1. From Windows Vista SP1, GPMC is included in a package called Remote Server Administrator Tool (RSAP), which can be found as **KB941314** at the Microsoft website. You have to install RSAP first and enable GPMC as a Windows component. Download the RSAP installer to the desktop. Click **Windows6.0-KB941314-x86** installer and follow the instructions to complete RSAP installation.

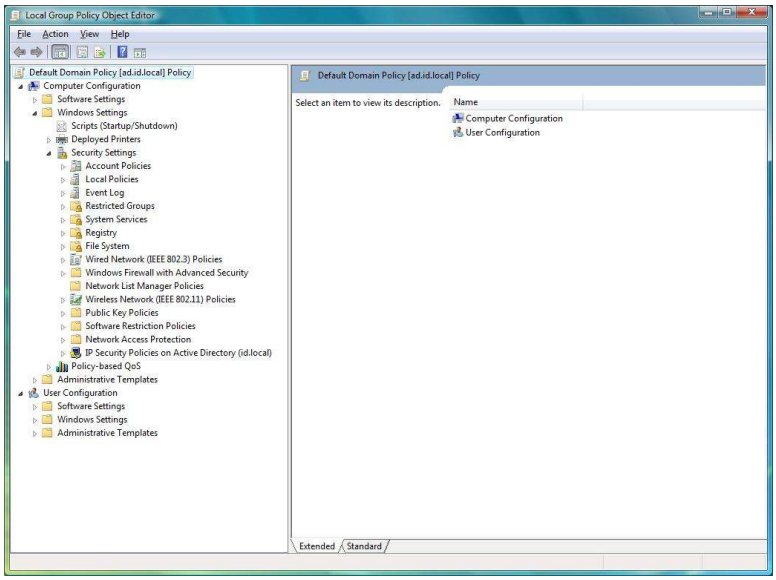
Step 6. After installing RSAP, choose **Start > Control Panel > Programs > Programs and Features** and select **Turn Windows features on or off**. Then choose **Remote Server Administration Tools > Feature Administration Tools** and **select Group Policy Management Tools**. Click **OK** to enable GPMC.]

Step 7. With GPMC installed, you can browse Group Policy on your Active Directory domain from Windows Vista SP1. Start GPMC by choosing **Start > All Programs > Accessories > Run** and typing **gpmc.msc**. On the **User Account Control** screen, click **Continue** to display the **Group Policy Management** screen. (This example assumes that you are running this program from an account with administrative privileges.)

Step 8. As shown in the following screenshot, browse to your domain and select **Default Domain Policy**. On the right pane of the screen, select the **Settings** tab and right-**click Computer Configuration (Enabled)**. In the context menu, choose Edit.



The Local Group Policy Editor screen will appear. Although the default domain policy is used to configure group policy in this document, we recommend that you configure a separate GPO that can be applied to only NAC-NAP computers.



Step 9. In the **Local Group Policy Editor** window, choose **Computer Configuration > Windows Settings > Security Settings** to display the **Wireless / Wired Interface Policies** pane.

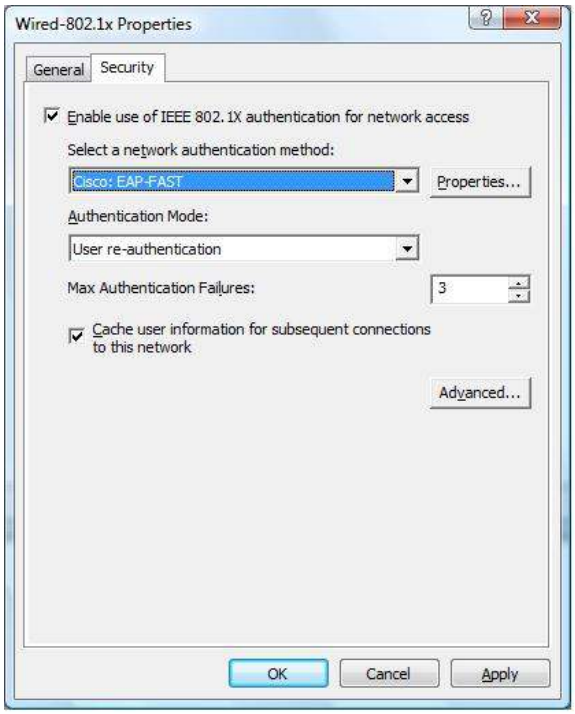
Note: This documentation discusses only wired interface policy and its EAP-FAST configuration.

Step 10. Right-**click Wired Network (IEEE 802.3) Policies** in the policy tree and choose **Create a New Windows Vista Policy** from the context menu

Step 11. On the **General** tab, in the **Policy Name** field, type **Wired-802.1x.**

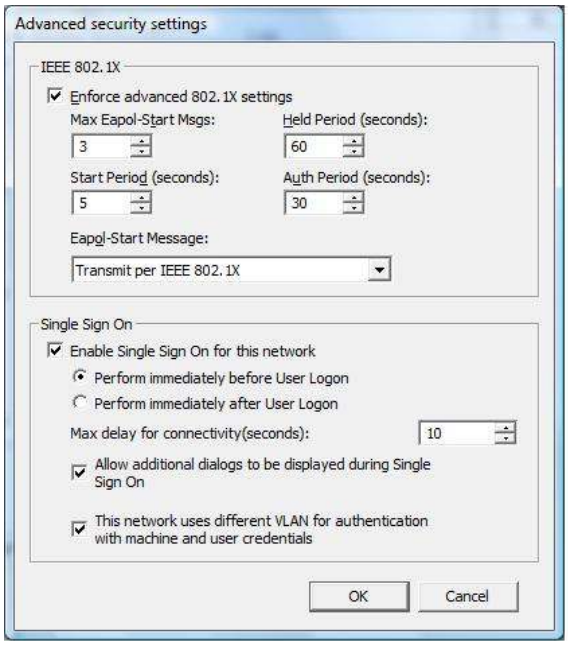
Step 12. On the **Security** tab, verify that Enable **use of IEEE 802.1x authentication for network access** is selected. From the **Select a network authentication method** pull-down menu, choose **Cisco: EAP-FAST**. Change the value for **Max Authentication Failures** to **3**. For **Authentication Mode**, choose **User re-authentication** from the pull-down menu. This selection will enable both user and machine authentication (equivalent to the **<authMode>userOrMachine</authMode>** element in an XML-based profile).

Note: Max Authentication Failure is set to 1 by default. This setting prevents a user from reentering his or her credentials when invalid credentials are provided at the initial prompt.



Step 13. If you click the **Properties** button on the **Security** tab, the **EAP-FAST Configuration** screen will appear. You can configure EAP-FAST settings centrally using this group policy configuration tool. For EAP-FAST settings, follow the steps described in the “Windows Vista Client Configuration” section earlier in this document.

Step 14. If you click **Advanced** button on the **Security** tab, you’ll see the available configuration options for the supplicant. Configure the supplicant as in the following screenshot.



Step 15. As described earlier, **Single Sign On** can be configured in detail, using group policy. Use the preceding screenshot to configure your group policy setup.

Step 16. After you finish your configuration, exit the **GPMC** tool.

Step 17. After you finish configuring group policy, you can provision your configuration to the local Windows Vista machine. To do this, run the **gpupdate** tool to reflect your policy change on the domain to your local system.

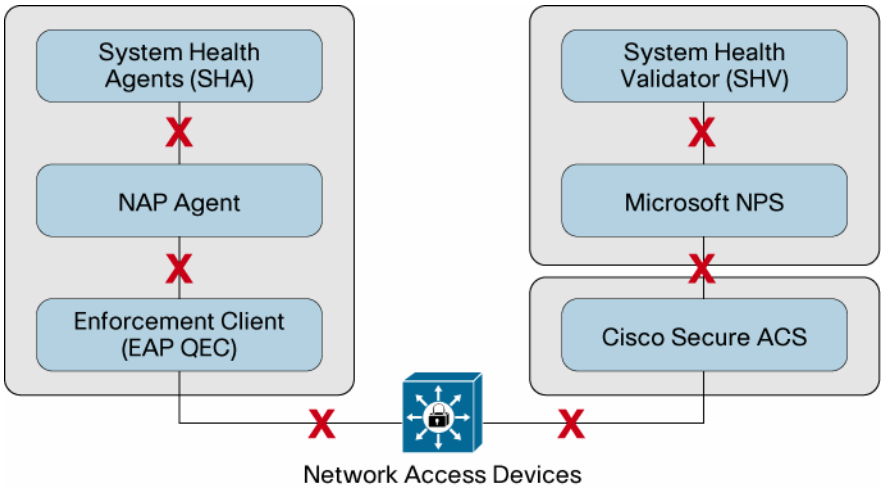
Troubleshooting the NAC-NAP Solution

This section provides information about how to troubleshoot the Cisco NAC and Microsoft NAP solution. The section discusses the steps for troubleshooting problems with the client software, network hardware, and server applications. Troubleshooting guidance is provided for both the EAP over User Datagram Protocol (UDP) and the IEEE 802.1x deployment scenarios. Detailed configuration information for each of these scenarios is provided in the previous section of this document.

NAC-NAP Troubleshooting Overview

To facilitate troubleshooting, you should understand where possible failure points exist in the architecture. Figure 3 shows the possible failure points in the NAC-NAP solution architecture and the process for debugging them.

Figure 3. Possible Failure Points in the NAC-NAP Architecture



Because the NAC-NAP solution is an integration of technologies from both Cisco and Microsoft, the architecture includes many components, and failure points can exist in a component itself or in communication between components.

As shown in Figure 3, the architecture has four major components: the client computer, the network access devices (NADs), Cisco Secure ACS, and Microsoft NPS. The first component is the client software running on the Windows Vista operating system. This client software (or agent) communicates with a NAD, in this case a Cisco switch or wireless access point. The NAD forwards an authentication and access request to the policy server; Cisco Secure Access Control Server (ACS) is the policy server, which becomes a broker of both identity and posture information. Behind the Cisco Secure ACS is another policy server, the Microsoft Network Policy Server (NPS), where all the access policies are determined. This document discusses how to troubleshoot each of these components in the access method using IEEE 802.1x.

When troubleshooting the NAC-NAP solution, you should first understand how successful authentication and posture validation looks like in the log. As you have seen in the IEEE 802.1x testing section, after client user or machine credentials are authenticated successfully and SoH values are validated as compliant, the log of the successful session appears in the Cisco Secure ACS Passed Authentication log. From the Cisco Secure ACS web console, choose **Reports and Activity > Passed Authentications** on the left and click the **Passed Authentication active.csv** link. As in the following screenshot, you may see a log of a quarantined user. This user was not rejected, but was granted limited access to the network. It is very important to remember that both healthy and quarantined users and machines are listed in Passed Authentication log when authentication and posture validation succeed. When authentication is performed but you do not see any log associated with the authentication session, you need to start troubleshooting NAC-NAP.

User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	System-Posture-Token	Reason
ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	Healthy	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS
ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Quarantine	Quarantine	Posture State=2 Extended State=0 returned by: Evaluated by policy: ID-NPS

When you troubleshoot the NAC-NAP interoperability architecture, the Cisco Secure ACS log is a good place to start. Although the Cisco Secure ACS log does not always tell you the exact issue that is causing the authentication failure, it at least gives you some hints as to where the problem may be. This section looks at two categories of authentication failure: problems for which the Cisco Secure ACS log does not show any record of the authentication session, and problems for which the Cisco Secure ACS log shows a record of the authentication session.

Failure with No Authentication Record in Cisco Secure ACS Log

In some cases, a user may be connected to an IEEE 802.1x–enabled port but there is no Cisco Secure ACS log associated with authentication. A common cause of such a situation is an error in the authenticator (NAD) configuration. Following is a checklist of procedures to follow when there is no authentication record:

- Make sure that required AAA commands are configured properly. Required AAA commands are listed in the “IEEE 802.1x Network Access Device Configuration” section of this guide. If AAA commands are not properly configured, there will be no RADIUS communication between the authenticator and the authentication server, and hence there will be no record in the Cisco Secure ACS log.
- Make sure on the switch or access point that RADIUS servers are configured with the correct addresses and port numbers. If the switch or access point (authenticators) is not sending the authentication request packet to the correct RADIUS server (Cisco Secure ACS), then there will be no record in the Cisco Secure ACS log. If the IP address and port numbers of the RADIUS server are correct but the RADIUS shared key is incorrectly configured, there will be a record in the Cisco Secure ACS Failed Attempt log with the authentication failure code “Invalid message authenticator in EAP request.”
- If you have multiple Cisco Secure ACSs in an authenticator configuration, check them all for the log. There is a chance that the log is recorded on another Cisco Secure ACS when multiple Cisco Secure ACSs are running behind a server load-balancing mechanism.

Another common error is that the IEEE 802.1x supplicant is not installed or enabled on the connecting interface. Check the output of the show command on the authenticator. In this document, the IEEE 802.1x supplicant is connected on the port Fast Ethernet 0/1. Enter show dot1x interface FastEthernet 0/1 detail to see whether any other factor is causing the problem. If

there is a client but no IEEE 802.1x supplicant running or connected, output similar to the following screenshot will be displayed.

```
Cat3560#show dot1x int fa0/1 d
Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0
Guest-Vlan                = 20
Dot1x Authenticator Client List Empty
Domain                    = DATA
Port Status               = UNAUTHORIZED
```

If any other fail open IEEE 802.1x feature such as a IEEE 802.1x guest VLAN is configured on the port, then the output will be similar to the next screenshot. Guest VLAN is a feature of Cisco IOS Software for the Cisco Catalyst platform of switches; with it, any user without an IEEE 802.1x supplicant can be placed in a locally predefined VLAN (in the following output, the guest VLAN is defined as VLAN 20) so that user has at least restricted network access. The guest VLAN feature is implemented when the switch sends an EAP request and identity packet to the supplicant (sending request ReAuthMax_count with interval TxPeriod) but does receive a response from the supplicant. By default, after 90 seconds, if the supplicant does not respond, the switch assumes that there is no supplicant on the IEEE 802.1x port and assigns a predefined VLAN to this port. No RADIUS communication is involved in the guest VLAN process; therefore, no log is associated with this authentication, even though the user is granted guest VLAN access.

```
Cat3560#show dot1x int fa0/1 d
Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = SINGLE_HOST
ReAuthentication          = Enabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0
Guest-Vlan                = 20
Dot1x Authenticator Client List Empty
Domain                    = DATA
Port Status               = AUTHORIZED
Authorized By             = Guest-Vlan
Operational HostMode      = MULTI_HOST
Vlan Policy               = 20
```

Failure with Authentication Record in Cisco Secure ACS Log

In many situations Cisco Secure ACS provides information about authentication failures. Although the authentication failure code (AFC; description of possible cause of authentication failure) does not indicate exactly where the problem is, the AFC makes troubleshooting much easier and helps you narrow down the root cause of the problem so that you can resolve it. This section examines possible points of failure in each component based on the Cisco Secure ACS Failed Attempt log output.

Troubleshooting Client Software

This section examines situations in which software components running on the Windows Vista client fail. When the NAP-related agent fails to respond to the request by Cisco Secure ACS, failure information will be reported in the Failed Attempt log on Cisco Secure ACS. The main NAP-related software running on Windows Vista consists of the supplicant, system health agents, NAP agent, and enforcement client.

When EAP-FAST Posture Validation Is Not Enabled

By default, the Cisco EAP-FAST Module does have posture validation enabled. When Cisco Secure ACS requests SoH information and the supplicant is not enabled to send SoH information, authentication fails. Check the EAP-FAST settings to make sure that **Enable Posture Validation** on the **Authentication** tab is selected.

AFC	Reason
Posture Validation Failure (general)	Supplicant is unable to send SoH information. General posture validation failure occurs when Cisco Secure ACS receives empty SoH. Note that the same AFC can be recorded for other reasons, such as when NAP agent is not enabled and when EAP QEC is not running.

When NAP Agent Is Not Enabled

By default, the NAP agent service is turned off. When Cisco Secure ACS requests SoH information and the NAP agent is not running, authentication fails.

AFC	Reason
Posture Validation Failure (general)	NAP agent is not running. General posture validation failure occurs when Cisco Secure ACS receives empty SoH. Note that the same AFC can be recorded for other reasons, such as when the Enable Posture Validation setting for the Cisco EAP-FAST Module is not enabled and when EAP QEC is not running.

Enter the command shown here at the command prompt to verify that the NAP agent is running. If it is running, following output is displayed.

```
C:\Windows\system32>sc query napagent
SERVICE_NAME: napagent
        TYPE               : 20  WIN32_SHARE_PROCESS
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
```

If the NAP agent is not running, the **netsh nap client show state** command at command prompt also returns the message “The “Network Access Protection Agent” service is not running.” Enter the commands shown here at the command prompt to enable the NAP agent.

```
C:\Windows\system32>sc config napagent start= auto
C:\Windows\system32>net start napagent
```

When EAP Enforcement Client Is Not Enabled

By default, EAP QEC is turned off. When Cisco Secure ACS requests SoH information and EAP QEC is not running, authentication fails.

AFC	Reason
Posture Validation Failure (general)	EAP QEC is unable to send SoH information. General posture validation failure occurs when Cisco Secure ACS receives empty SoH. Note that the same AFC can be recorded for other reasons, such as when NAP agent is not enabled and when the Enable Posture Validation setting for the Cisco EAP-FAST Module configuration is not enabled .

Enter the command shown here at the command prompt to verify that EAP QEC is running. If it is running, the following output is displayed.

```
C:\Windows\system32>netsh nap client show state

---SKIPPED---

Enforcement client state:
---------------------------------------------------
Id                      = 79617
Name                    = DHCP Quarantine Enforcement Client
Description             = Provides DHCP based enforcement for NAP
Version                 = 1.0
Vendor name             = Microsoft Corporation
Registration date       =
Initialized             = Yes

Id                      = 79618
Name                    = Remote Access Quarantine Enforcement Client
Description             = Provides the quarantine enforcement for RAS
Client
Version                 = 1.0
Vendor name             = Microsoft Corporation
Registration date       =
Initialized             = Yes

Id                      = 79619
Name                    = IPSec Relying Party
Description             = Provides IPSec based enforcement for
Network Access Pro
tection
Version                 = 1.0
Vendor name             = Microsoft Corporation
Registration date       =
Initialized             = No

Id                      = 79621
Name                    = TS Gateway Quarantine Enforcement Client
```

```
Description            = Provides TS Gateway enforcement for NAP
Version                = 1.0
Vendor name            = Microsoft Corporation
Registration date      =
Initialized            = Yes

Id                     = 79623
Name                   = EAP Quarantine Enforcement Client
Description            = Provides EAP based enforcement for NAP
Version                = 1.0
Vendor name            = Microsoft Corporation
Registration date      =
Initialized            = Yes

---SKIPPED---
```

Enter the commands shown here at the command prompt to enable the NAP agent.

```
C:\Windows\system32>netsh nap client set enforcement ID = 79623
ADMIN = “ENABLE”
```

When System Health Agent Is Not Running

When for any reason the System Health Agent (SHA) is not running, the NAP agent will not send SoH information regarding this specific SHA. In this case, authentication does not fail. Instead, the user is granted limited network access until the health state becomes compliant.

AFC	Reason
None	Authentication does not fail. The information is recorded in the Cisco Secure ACS Passed Authentication log.

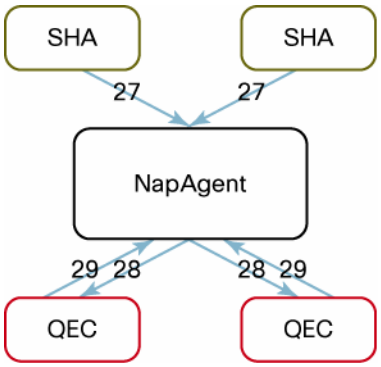
Enter the command shown here at the command prompt to identity the SHA that is unable to obtain health information.

```
netsh nap client >show state
System health agent (SHA) state:
---------------------------------------------------
Id                     = 79744
Name                   = Windows Security Health Agent
--- skipped ---
Registration date      =
Initialized            = Yes
Failure category       = None
Remediation state      = Could not update
Remediation percentage = 0
```

```
Fixup Message          = (3237937215) - The Windows Security Health
Agent failed to update the security state of this computer.
Compliance results     = (0xC0FF0001) - A system health component is
not enabled.
                         (0x00000000) -
                         (0x00000000) -
                         (0x00000000) -
                         (0x00000000) -
                         (0x00000000) -
                         (0x00000000) -
                         (0x00000000) -
Remediation results    = (0xC0FF0023) - Windows could not enable the
Windows Firewall. An administrator must start it manually.
---SKIPPED---
```

A number of client events also provide information about failures. Figure 4 shows the information events logged on the client when the NAP transaction crosses the component boundaries.

Figure 4. NAP Transaction and Event Log IDs



Event ID	Description
27	Indicates that an SoH was received from the SHA
28	Indicates that the SoH was received by the quarantine enforcement client indicated in the event
29	Indicates the SoH response from the server; also contains the client health state
18	Indicates a NAP health state change

All events that relate to communication between the NAP agent and SHA are documented at the following Microsoft website:
http://technet2.microsoft.com/WindowsServer2008/en/library/e85ebe50-e515-4121-84c8-fcebf8d778d31033.mspx

All events that relate to communication between the NAP agent and the enforcement client are documented at the following Microsoft website:
http://technet2.microsoft.com/WindowsServer2008/en/library/77685aa1-083d-45dd-89b4-a8cb67cc58fc1033.mspx

When troubleshooting, the most reliable source of information is a log from the particular components. You need to know how to enable logging on a component and where the log is written.

All NAP logs on the Windows Vista client can be viewed through Event Viewer. Following are the steps to view logs.

1. Choose **Start > All Programs > Administrative Tools** and launch **Event Viewer**.
2. Under **Event Viewer (Local)** on the left side of the screen, navigate to **Applications and Services Logs > Microsoft > Windows > Network Access Protection**, right-click **Operational**, and choose **Filter Current Logs**.
3. On the **Filter** tab, from the **Event sources** pull-down menu, choose **Network Access Protection.**
4. In the **Include/Excludes Event IDs** section, type **6-10, 12, 28, 29 to filter events to those related to NAP** in the text box and click **OK**.

When Supplicant Fails

As discussed previously, if the supplicant fails to respond to the authentication request, there will be no report in the Cisco Secure ACS Failed Attempt log, since there will be no IEEE 802.1x communication if the supplicant does not exist. Enter the commands shown here at the command prompt to verify that the supplicant service is started and running.

Enter this command to verify the state of EAPHost service:

```
C:\Windows\system32>sc query eaphost
SERVICE_NAME: eaphost
        TYPE               : 20  WIN32_SHARE_PROCESS
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
```

Enter this command to verify the state of IEEE 802.1x supplicant service for the wired interface:

```
C:\Windows\system32>sc query dot3svc
SERVICE_NAME: dot3svc
        TYPE               : 20  WIN32_SHARE_PROCESS
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
```

Enter this command to verify the state of IEEE 802.1x supplicant service for the wireless interface:

```
C:\Windows\system32>sc query wlansvc
SERVICE_NAME: wlansvc
        TYPE               : 20  WIN32_SHARE_PROCESS
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE,
ACCEPTS_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
```

Note: Wired AutoConfig service is disabled by default and must be manually started. The commands shown here enable the supplicant and configure service so that it starts automatically when the client PC is booted.

```
C:\Windows\system32>sc config dot3svc start= auto
C:\Windows\system32>sc config wlansvc start= auto
C:\Windows\system32>net start dot3svc
C:\Windows\system32>net start wlansvc
```

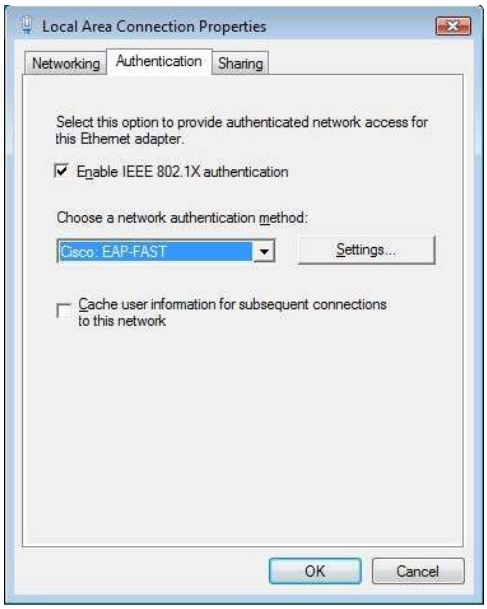
When EAP-FAST Module Is Not Installed

The Cisco EAP-FAST Module provides additional an EAP method for Windows Vista. EAP-FAST is the only EAP method that is supported by the NAC-NAP integration architecture. The Cisco EAP-FAST Module is not shipped with Windows Vista; instead, it is provisioned through Windows Update. If the EAP-FAST is not installed on the Vista client and the Vista client tries to connect to a NAC-NAP enabled network, the AFC shown here is reported to the Cisco Secure ACS Failed Attempt log.

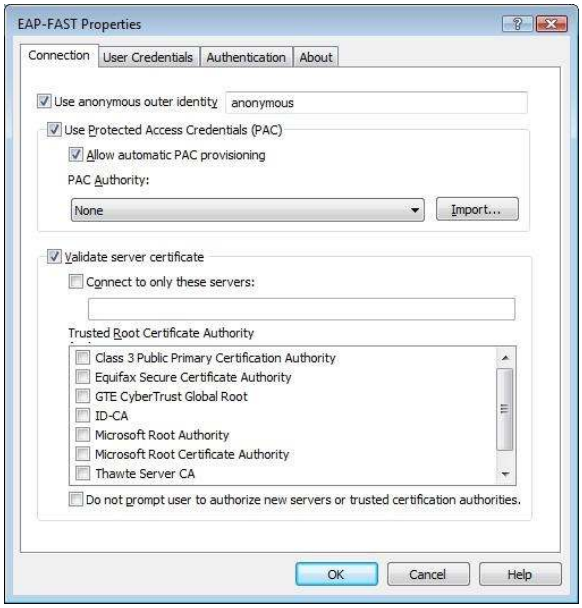
AFC	Reason
EAP_PEAP Type not configured	The Cisco EAP-FAST Module is not installed; therefore, the supplicant cannot negotiate the EAP type suggested by Cisco Secure ACS because no other EAP method is enabled on Cisco Secure ACS to accept the requested access. When the supplicant is enabled on Windows Vista, Microsoft: Protected EAP (PEAP) is enabled by default.

To view the EAP-FAST settings for IEEE 802.1x, enter **control netconnections** at the command prompt; then open **Network Connections**, right-click **Local Area Connection**, and choose **properties** from context menu.

In the **Local Area Connection Properties** window, look for **Cisco: EAP-FAST** on the Choose a **network authentication method** drop-down box on the **Authentication** tab; if you see it, the EAP-FAST module is successfully installed. If you do not see the **Authentication** tab in the **Local Area Connection Properties** window, go back to Task 1 in the section “Configuring the Windows Vista Client” and configure and start Wired AutoConfig service.



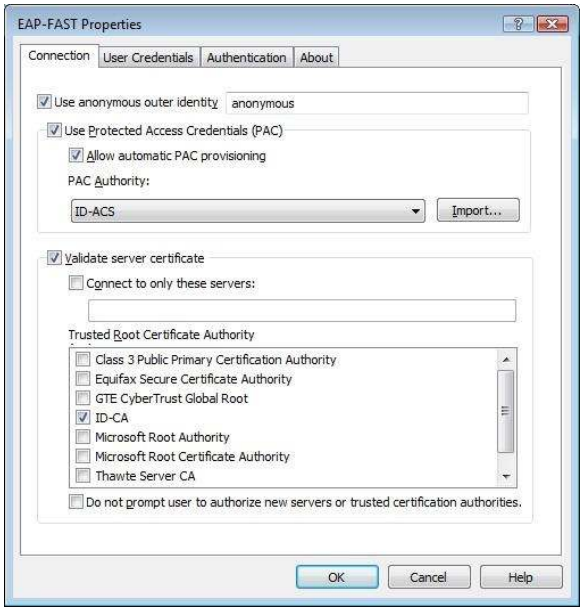
On the **Authentication** tab, choose **Cisco: EAP-FAST** from the **Choose a network authentication method** drop-down menu and click the **Settings** button. The **EAP-FAST Properties** window appears.



EAP-FAST will attempt to download a protected access credential (PAC) to the client during the initial client authentication attempt. Prior to this initial client attempt, you will notice that no PAC is available for selection in the **PAC Authority** pull-down menu.

If the initial authentication is successful, a PAC will be provisioned to the client. The user will be notified in the balloon message that additional information is required to connect to the network.

If user clicks this balloon message, another message box appears asking the user if he or she wants to accept the PAC from the PAC authority. If the user clicks yes, then the PAC will be saved, and your EAP-FAST Properties window will now show the PAC authority name and the trusted root CA server.



View the Cisco Secure ACS report to verify successful client authentication and policy assignment. In the example shown here, the client was successfully authenticated, assigned a PAC, and assigned a policy of “Healthy” based on the client status.

User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	Downloadable ACL	System-Posture-Token	Application-Posture-Token	Reason	EAP Type	EAP Type Name	PEAP FA Cle Na
user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	..	Healthy	..	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	anony

Troubleshooting IEEE 802.1x Authenticator

IEEE 802.1x provides client authentication to the network devices. The IEEE 802.1x method relies on EAP-FAST as the transport protocol. When troubleshooting a problem with IEEE 802.1x, information can be gathered from the Vista client, the network device, Cisco Secure ACS, and Microsoft NPS.

The IEEE 802.1x method can carry user identification and SoH information between the client and the network devices and servers in a single transaction. After the client is authenticated, the client health state is determined and a network access policy is assigned on the network device. In the case of IEEE 802.1x, this policy is enforced on the NAD through the use of dynamic VLANs, which are assigned through RADIUS attributes from Cisco Secure ACS to the switch.

IEEE 802.1x Logging and Debugging on a Switch

The IEEE 802.1x log and debugging information on the switch provides a lot of useful information for troubleshooting and verifying IEEE 802.1x sessions and status. You should enable the RADIUS IEEE 802.1x Accounting features to log IEEE 802.1x information.

You can view the IEEE 802.1x settings for an interface along with the current IEEE 802.1x state information for the interface by entering the show dot1x interface x/x/x details command.

```
Cat3560#show dot1x int fa0/1 d
Dot1x Info for FastEthernet0/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = MULTI_HOST
ReAuthentication          = Disabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = (From Authentication Server)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0
Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 0016.41ae.8b1b
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE
Port Status               = AUTHORIZED
Authentication Method     = Dot1x
Posture                   = Healthy
Authorized By             = Authentication Server
Vlan Policy               = 10
```

In the output in the preceding screenshot, you can see that the client connected to interface 0/1 has been authenticated and authorized on the port with a posture of healthy. The VLAN that has been assigned is 10, the healthy VLAN.

By entering the **show vlan** command, you can see that interface FastEthernet 0/1 has been placed in VLAN 10.

```
Cat3560#show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------
-----------
1    default                          active    Fa0/2, Fa0/3, Fa0/4,
Gi0/1
10   healthy                          active    Fa0/1, Fa0/5, Fa0/6
20   contractor                       active
30   guest                            active
40   quarantine                       active
50   asset                            active
99   voice                            active
```

Other useful IEEE 802.1x Cisco IOS Software commands include the following:

```
debug dot1x {all | errors | events | feature | packets | registry |
state-machine}
no debug dot1x {all | errors | events | feature | packets | registry
| state-machine}
```

Options	Description
all	Display all IEEE 802.1x authentication debug messages
errors	Display IEEE 802.1x errors debug messages
events	Display IEEE 802.1x event debug messages
feature	Display IEEE 802.1x feature debug messages
packets	Display IEEE 802.1x packet debug messages
registry	Display IEEE 802.1x registry invocation debug messages
state-machine	Display debug messages for state-machine-related events

When troubleshooting the RADIUS protocol, the following debug command are useful:

```
debug radius {accounting | authentication | brief | elog | failover
| retransmit | verbose | <cr>}
no debug radius {accounting | authentication | brief | elog |
failover | retransmit | verbose | <cr>}
```

Options	Description
accounting	Display RADIUS accounting packet debug message only
authentication	Display RADIUS authentication packet debug message only
brief	Display RADIUS I/O transaction only
elog	Display RADIUS event logging

Options	Description
failover	Display debug message on packets sent upon RADIUS failover
retransmit	Display debug message on retransmission of RADIUS packet
verbose	Display all debug messages including those for nonessential RADIUS debugging

Authorization Failures on Authenticator (Switch)

One common problem that can be difficult to troubleshoot is authorization failure. IEEE 802.1x authorization occurs when the switch or access point receives the last RADIUS packet, called access-accept. Usually the RADIUS access-accept packet contains all the RADIUS attributes that are necessary to enforce authorization on the client PC. RADIUS attributes used for authorization can be the VLAN ID and name and the reauthentication timer value. Authorization failure occurs when the RADIUS server sends authorization to an authenticator (switch or access point) and the authenticator does not understand or is unable to apply enforcement on the port.

The two most common authorization failures result from lack of authorization command and authorization mismatch.

When Authorization Command Is Not Configured

If the command aaa authorization network default group radius is not configured, all the authorization criteria carried by the RADIUS attributes will fail. Common RADIUS attributes that will be ignored are:

- Session-Timeout (27)
- Termination-Action (29)
- Tunnel-Type (64)
- Tunnel-Medium-Type (65)
- Tunnel-Private-Group-ID (81)

If the switch port is configured with IEEE 802.1x and also configured to receive VLAN (through attributes 64, 65, and 81) and the reauthentication timer (through attributes 27 and 29), the port will be assigned to VLAN 0, and no reauthentication timer will be assigned to the port: that is, reauthentication will never happen on this port. The following log shows VLAN assignment failure.

```
Feb 27 15:55:16.659: dot1x-ev:dot1x_sendRespToServer: Response sent
to the server from 000d.60fc.9c38
Feb 27 15:55:16.668: dot1x-ev:dot1x_vlan_assign_authc_success called
on interface FastEthernet0/1
Feb 27 15:55:16.676: dot1x-ev:dot1x_vlan_assign_authc_success:
Successfully assigned VLAN 0 to interface FastEthernet0/1
Feb 27 15:55:16.676: dot1x-ev:dot1x_switch_supplicant_add: Adding
000d.60fc.9c38 on FastEthernet0/1 in vlan 1, domain is DATA
Feb 27 15:55:16.676: dot1x-ev:dot1x_switch_addr_add: Added MAC
000d.60fc.9c38 to vlan 1 on interface FastEthernet0/1
```

Following is the output of the **show dot1x int fa0/1 detail** command when authorization failure occurs. Notice that **ReAuthPeriod** is now set to 0, and **TimeToNextReauth** is also **0**. VLAN assignment fails, and VLAN policy becomes inapplicable. Also note that authentication succeeds, and the port status is **AUTHORIZED** even if authorization fails.

```
ID-3560#show dot1x int fa0/1 d
-- skipped --
Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 000d.60fc.9c38
    Auth SM State         = AUTHENTICATED
    Auth BEND SM State    = IDLE
Port Status               = AUTHORIZED
ReAuthPeriod              = 0
ReAuthAction              = Terminate
TimeToNextReauth          = 0
Authentication Method     = Dot1x
Authorized By             = Authentication Server
Vlan Policy               = N/A
```

This type of authorization failure can be easily found by checking the authenticator configuration in detail. However, this problem is difficult to troubleshoot from the Cisco Secure ACS log, because the AAA server sends an access-accept packet to its RADIUS client (NAD) but never receives acknowledgment back from the RADIUS client. That is, after the RADIUS access-accept packet is sent to the NAD, successful authentication is logged on Cisco Secure ACS, and the network administrator is usually confused as to why the client cannot get on to the network.

When Authorization Mismatch Occurs

Authorization mismatch occurs when the RADIUS attribute sent from the AAA server cannot be matched to the value on the NAD. A common scenario of authorization mismatch is VLAN mismatch upon authorization. For instance, if RADIUS is configured to send the VLAN name HEALTHY, and if a VLAN named Healthy_VLAN exists but not a VLAN named HEALTHY, then authorization fails because there is no matched VLAN on the local switch. As a result, the port becomes unauthorized and is closed. Again this authorization failure will never be reported back to Cisco Secure ACS. The Cisco Secure ACS log shows a successful authentication session. Currently only Cisco Catalyst 3000 Series Switches with Cisco IOS Software Release 12.2(44)SE or later will generate a syslog message noting this authorization failure. Other platforms do not send syslog messages; therefore, you must turn on debugging on the switch for troubleshooting. Following is the syslog message generated on the Cisco Catalyst 3000 Series with Cisco IOS Software.

```
Feb 27 16:39:40.839: %LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/1, changed state to up

Feb 27 16:39:41.477: %DOT1X_SWITCH-5-ERR_RADIUS_VLAN_NOT_FOUND:
Attempt to assign non-existent VLAN wrong_vlan to dot1x port
FastEthernet0/1

Feb 27 16:39:41.930: %LINK-3-UPDOWN: Interface FastEthernet0/1,
changed state to up
```

Failure in Communication with RADIUS Server

The common failures on the authenticator are related to the RADIUS protocol communication between the authenticator (NAD) and the authentication server (Cisco Secure ACS). A common problem occurs when an invalid RADIUS shared secret is used on either the NAD or Cisco Secure ACS. The error code shown here is reported in the Cisco Secure ACS Failed Attempt log.

AFC	Reason
Invalid message authenticator in EAP request	Message authenticator (attribute 80) is a hashed checksum of the access-request packet using a shared secret as the key. Invalid message authenticator usually means that the shared secret configured on either NAD or Cisco Secure ACS is invalid or does not match on both. Check or r-configure the shared secret on both NAD and Cisco Secure ACS to resolve the problem.

Troubleshooting with Cisco Secure ACS Passed Authentication Log

When a client establishes a secure EAP-FAST connection to Cisco Secure ACS and properly authenticates, an entry is created in the Passed Authentication log. The log entry enables you to view basic client information such as the username, IP address or MAC address (caller-id), posture token that is assigned, reason description, network access profile assigned, RAC, and additional information.

The following screenshot shows an example of the Cisco Secure ACS Passed Authentication log for a Vista client. In this case, the client has authenticated and matched the IEEE 802.1x network access profile and has been assigned a healthy posture token and accompanying policy.

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	System-Posture-Token	Reason	EAP Type	EAP Type Name	PEAP/EAP-FAST-Clear-Name
03/17/2008	09:40:15	Authen OK	ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	Healthy	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	anonymous

It is possible for a Passed Authentication log entry to be created for a client assigned to a quarantine state. When the client has authenticated, a log entry is placed in the Passed Authentication report, but the posture token assigned is a quarantine token. Remember that just because a client is authenticated does not mean that it should be assigned a healthy policy. In the following screenshot, the Vista client has authenticated but is assigned a quarantine token. If you look at the Microsoft NPS policy, it states that the Windows Firewall must be enabled for the client to be assigned a healthy policy. In this case, the firewall was disabled on the client, and as a result the client was assigned a quarantine policy.

Date	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	System-Posture-Token	Reason	EAP Type	EAP Type Name	PEAP/EAP-FAST-Clear-Name
03/17/2008	09:40:15	Authen OK	ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Compliant_User	Healthy	Posture State=1 Extended State=0 returned by: Evaluated by policy: ID-NPS	43	EAP-FAST	anonymous

Depending on the configuration options selected in the external posture validation policy created in the network access profile, a client may also fail authentication when the external posture validation server (Microsoft NPS) is unavailable, as shown here.

Date ↓	Time	Message-Type	User-Name	Group-Name	Caller-ID	Network Access Profile Name	Authen-Failure-Code	NAS-Port	NAS-IP-Address	PEAP/EAP-FAST-Clear-Name	ExtDB Info	Reason	EAP Type	EAP Type Name	Access Device
03/17/2008	10:28:19	Authen failed	anonymous	Default Group	00-1C-25-14-79-E2	NAC-802.1x	Posture Validation Failure on External Policy	50001	10.1.100.254	..	..	..	43	EAP-FAST	NAD

If the Microsoft NPS and the Cisco Secure ACS lose communication, you can select the option to assign the client a default posture token, which can either grant full or limited network access while the server communication is unavailable, as shown here.

Date ↓	Time	Message-Type	User-Name	Group-Name	Caller-ID	NAS-Port	NAS-IP-Address	Network Access Profile Name	Shared RAC	System-Posture-Token	Reason	EAP Type	EAP Type Name	PEAP/EAP-FAST-Clear-Name
03/17/2008	10:39:16	Authen OK	ID\user1	AD_User	00-1C-25-14-79-E2	50001	10.1.100.254	NAC-802.1x	802.1x_Quarantine	Quarantine	Statement of Health rule failed with server= ID-NPS return a defualt token.	43	EAP-FAST	anonymous

The Cisco Secure ACS **Reports and Activities** menu brings you to a page where you can find the available log messages. These logs are useful for viewing both passed authentications and failed attempts from the Cisco Secure ACS web console. Detailed debug logs are available in the directories listed here.

AFC	Reason
Authentication Logs	C:\Program Files\CiscoSecure ACS v4.2\CSAuth\Logs\AUTH.log
RADIUS Logs	C:\Program Files\CiscoSecure ACS v4.2\CSRadius\Logs\RDS.log
CSV Files	C:\Program Files\CiscoSecure ACS v4.2\Logs\

All the logs that are required for troubleshooting and support can be dumped into a CAB archive file and saved in the following directory: **C:\Program Files\CiscoSecure ACSv4.2\Utils\Support\Package.Cab**.

Choose **System Configuration > Support** and select **Collect Log Files, Collect User Database**, and **Collect Previous Days Logs** and enter the number of days for which you need to collect the logs. Then click **Run Support Now** to create the Package.cab archive log file.

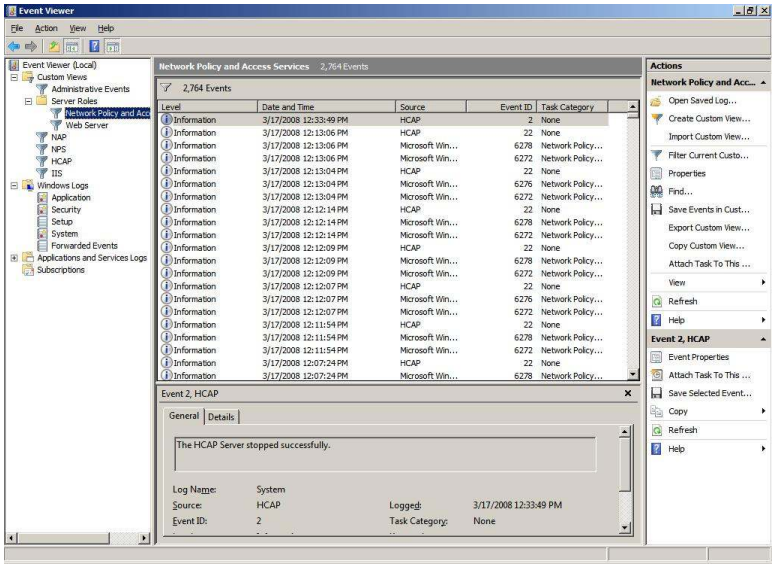
When creating the Package.Cab file using this support tool, be aware that all Cisco Secure ACS services are stopped. Be cautious when exporting log files on Cisco Secure ACS.

Troubleshooting Microsoft Network Policy Server

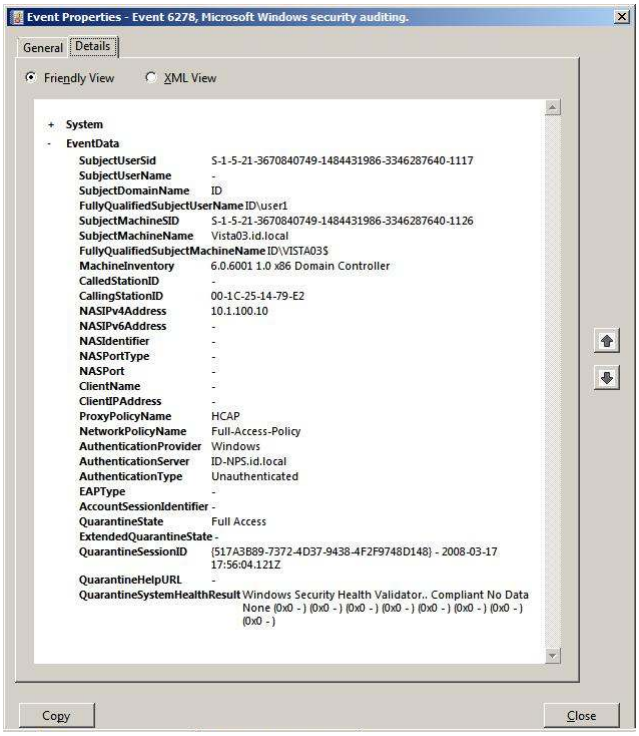
The NAC-NAP IEEE 802.1x session will fail if Microsoft NPS is misconfigured. Event logs are useful for gathering information about and troubleshooting a failure on Microsoft NPS.

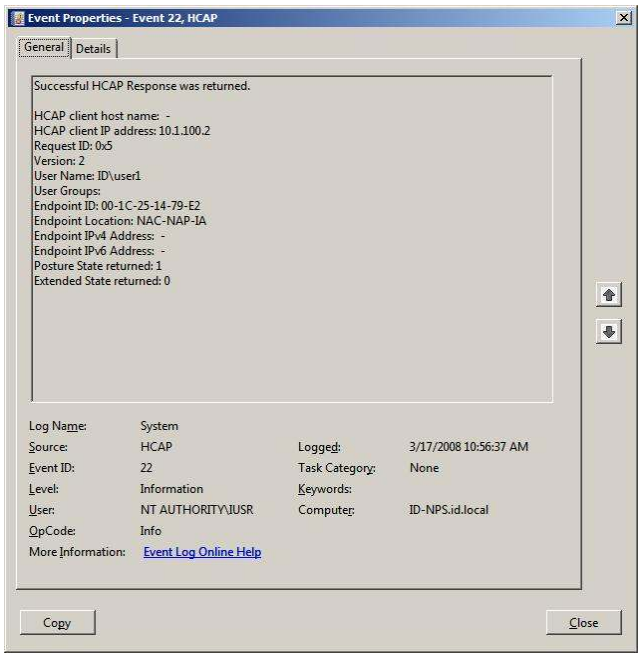
Event Logs

The event viewer on Microsoft NPS is used to view logs related to Microsoft NPS events. On Microsoft NPS, choose **Event Viewer (Local) > Custom View > Server Roles > Network Policy and Access Services**. This custom view will include events for HCAP, Microsoft NPS, and access auditing. This custom view is created automatically when the Microsoft NPS role is installed.

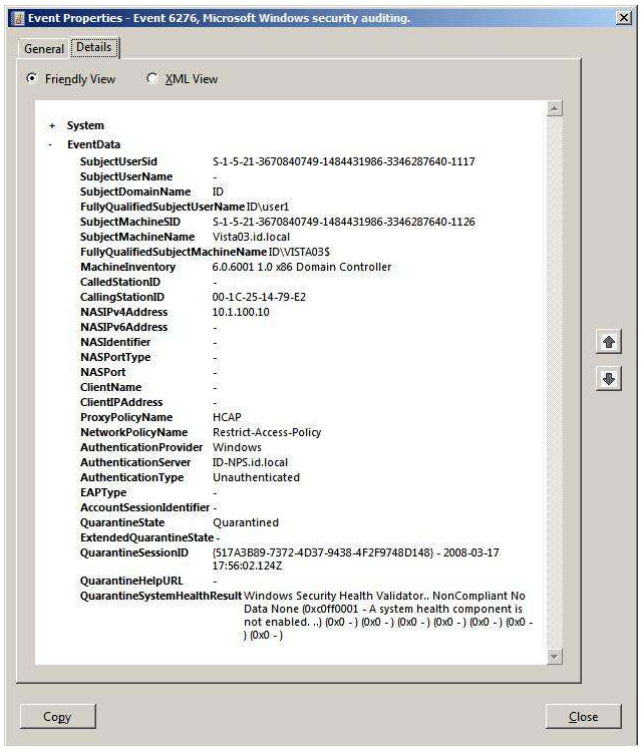


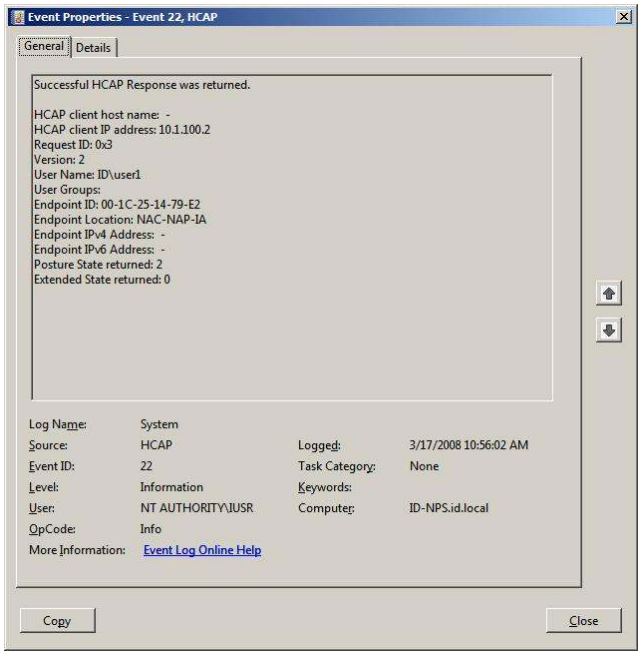
The example in the following screenshot shows an entry in the log for the Vista client that was authenticated successfully and granted full network access (healthy token). An HCAP log is also generated containing information about the values that are returned to Cisco Secure ACS.





In the next example, a log entry for the same Vista client has been created. Because Windows Firewall was disabled, the client was assigned a restricted access policy (quarantine token) until the firewall is reenabled.





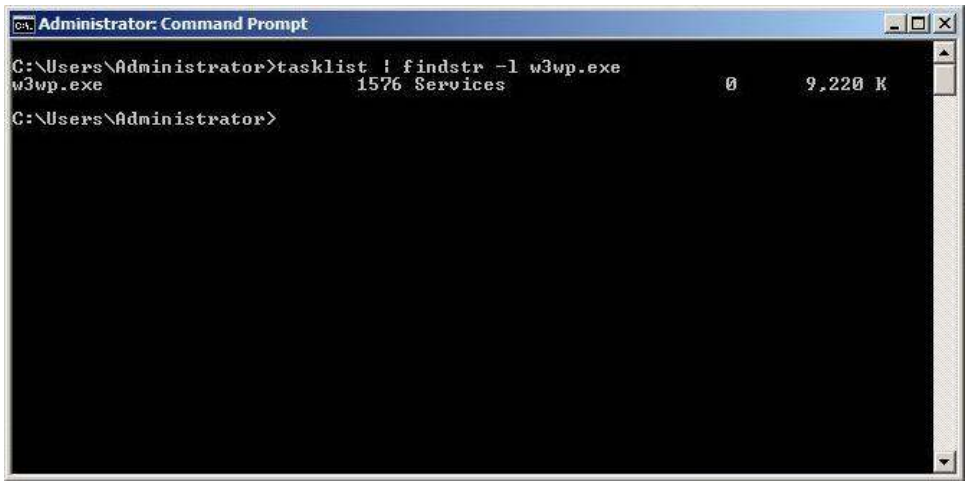
The critical event IDs are 6278 (healthy) and 6276 (quarantined). With those event IDs, you can identify the health state as well as find detailed information about the client. More information is available at the following URL:
http://technet2.microsoft.com/windowsserver2008/en/library/3bfa69a6-26a3-4796-a50b-168f7f5e48731033.mspx?mfr=true

Verification That HCAP Is Running on Microsoft NPS

When a client tries to authenticate, w3wp.exe will be listed in the task list. You can verify the current state of this service by entering the following command at the command prompt:

```
tasklist | findstr –l w3wp.exe
```

If this commend does not return any value, repeat it right after authentication occurs and you will get a result similar to the screenshot shown here.



Troubleshooting NAP

For NAP-related components, both logging and tracing information is available for use in troubleshooting. Tracing information will typically be collected only if you contact Microsoft for support. This section describes how to find the logs for the NAP components.

Event Logs

NAP logging is enabled by default, and events are stored in the following log:

Event Viewer\Applications and Services logs\Microsoft\Windows\Network Access Protection\Operational

Tracing

NAP tracing files can be created and forwarded to the Microsoft development team to diagnose problems. To enable tracing, do the following:

1. Open a command prompt in an elevated mode.
2. If the directory **%systemroot%\tracing\nap** does not exist, create it with the command **mkdir %systemroot%\tracing\nap**.
3. At the command prompt, enter **logman start qagentrt -p {b0278a28-76f1-4e15-b1df-14b209a12613} 0xFFFFFFFF 9 -o %systemroot%\tracing\nap\qagentrt.etl –ets**.
4. Run the scenario to capture the trace.
5. To stop tracing, at the command prompt **enter logman stop qagentrt –ets**.
6. Copy **%systemroot%\tracing\nap\qagentrt.etl** to another folder so that it can be sent to Microsoft.

Troubleshooting Microsoft Network Policy Server

Accounting Logs

Accounting log files are enabled by default. The location of the Microsoft NPS accounting logs is **%windir%\system32\logfiles**. Microsoft NPS accounting can be managed from the accounting node in the Microsoft NPS snap-in.

Event Logs

Event logging for Microsoft NPS is enabled by default, and events are visible in the system log. You can send the event log with any other information when a problem occurs.

Tracing

Microsoft NPS tracing files do not require symbol files to read and can be used for troubleshooting. Tracing files are located in **the %windir%\tracing** folder and are called **ias*.log**. To enable tracing, do the following:

1. At the command prompt in an elevated mode, run **netsh ras set tracing * enable**. This command will start tracing.
2. Restart Microsoft NPS.
3. At the command prompt, enter **net stop ias**.
4. At the command prompt, enter **net start ias**.
5. Reproduce the problem. This will generate a trace file of the problem.
6. Copy **%windir%\tracing\IAS*.log** to another folder so that it can be sent to Microsoft.
7. At the command prompt, enter **netsh ras set tracing * disable**.

8. Restart Microsoft NPS.
9. At the command prompt, enter **net stop ias**.
10. At the command prompt, enter **net start ias**.

Troubleshooting HCAP Server

Event Logs

Event logging for HCAP server is enabled by default, and events are visible in the system log. You can send the event log with any other information when a problem occurs.

Tracing

HCAP server tracing files can be created and forwarded to the Microsoft development team to diagnose problems. Tracing files are located in the **%systemroot%\tracing\hcapext** folder and are called **hcapext.etl**. To enable tracing, do the following:

1. At the elevated command prompt, enter **logman start hcapext -p {af000c3b-46c7-4166-89ab-de51df2701ee} 0xFFFFFFFF 9 -o %systemroot%\tracing\hcapext\hcapext.etl –ets**.
2. Reproduce the problem. This will generate the trace file of the problem.
3. Copy **%systemroot%\tracing\hcapext\hcapext.etl** to another folder so that it can be sent to Microsoft.
4. To stop tracing, at the command prompt enter **logman stop hcapext –ets**.

Troubleshooting Wireless AutoConfig Service

Event Logs

Wireless AutoConfig event logging is enabled by default, and events are stored in the following logs:

Event Viewer\Applications and Services logs\Microsoft\Windows\WLAN-Autoconfig\Operational

Tracing

WLAN AutoConfig tracing files do not require symbol files to read and can be used for troubleshooting. Tracing files are located in the **C:\Windows\tracing\wireless** folder. To enable tracing, do the following:

1. From an elevated command prompt, enter **netsh WLAN set tracing yes**. This will start tracing.
2. Reproduce your problem.
3. To disable tracing, at the command prompt enter **netsh WLAN set tracing no**. After executing this command, wait for control to return to the command window (postprocessing converts the files into readable text).
4. Copy the entire **C:\Windows\tracing\wireless** folder, including all subdirectories, to another folder so that it can be sent to Microsoft.

Troubleshooting Wired AutoConfig Service

Event Logs

Wired AutoConfig event logging is enabled by default, and events are stored in the following logs:

Event Viewer\Applications and Services logs\Microsoft\Windows\Wired-Autoconfig\Operational

Tracing

Wired AutoConfig tracing files do not require symbol files to read and can be used for troubleshooting. Tracing files are located in the **C:\Windows\tracing\wired** folder. To enable tracing, do the following:

1. From an elevated command prompt, enter **Netsh LAN set tracing yes**. This will start tracing.
2. Reproduce your problem.
3. To disable tracing, at the command prompt enter **netsh LAN set tracing no**. After executing this command, wait for control to return to the command window (postprocessing converts the files into readable text).
4. Copy the entire **C:\Windows\tracing\wired** folder, including subdirectories, to another folder so that it can be sent to Microsoft.

Troubleshooting Cisco EAP-FAST Module

Tracing

Follow these steps to configure and start logging when gathering logs for the Cisco EAP-FAST Module:

1. Choose **Start > All Programs > Accessories**.
2. Right-click **Command Prompt** and choose **Run as Administrator**.
3. At the prompt, enter the following command to configure and start logging: **wevtutil.exe si Cisco-EAP-FAST/Debug /e:true Network Policy Server**.
4. Reproduce the problem with the Cisco EAP-FAST Module.
5. At the prompt, enter the following command to stop the logging: **wevtutil.exe sl Cisco-EAP-FAST/Debug /e:false**.
6. Browse to **C:\Windows\System32\Winevt\Logs** and you can find the log file **Cisco\EAP-FAST%4Debug.etl**.

Note: After the .etl file is obtained, you can view this log with Event Viewer. After logging is turned off, all the internal buffers for logs are flushed. Also, you must stop logging before you can analyze the .etl file. If you must shut down the device on which logging was running before logging finishes, logging resumes after you reboot. If logging is started either automatically or manually, however, the logs are cleared.

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