Chapter 9

Locating Subscriber Information with the NIC

This chapter describes the network information collector (NIC) that the SRC software uses to locate subscriber information for an application and discusses strategies for implementing a NIC configuration. The chapter includes information about the NIC sample data provided with the SRC software; reviewing this data will help you plan a NIC configuration for your network. Topics include:

Locating Subscriber Management Information

For services to be activated for a subscriber session, applications such as the SRC Volume-Tracking Application (SRC-VTA), Dynamic Service Activator, Enterprise Manager Portal, or a residential portal need to locate the SAE that manages the subscriber. An application such as the Threat Mitigation Application Portal needs to locate the SAE that manages interfaces through which traffic destined for a specified IP address enters the network.

The NIC is the component that locates which SAE manages a subscriber or an interface. The NIC uses information that identifies the subscriber or the interface to identify the managing SAE. A NIC is similar to a Domain Name System (DNS) in that a NIC processes resolution requests. Rather than translating hostnames to IP addresses and vice versa, the NIC resolves an identifier for a subscriber or an interface to a reference for the managing SAE.

The components that participate in this resolution are a NIC host and a NIC proxy, also called a NIC locator for particular applications. A NIC host processes resolution requests. A NIC proxy requests data resolution for an application. A NIC proxy is so-named because it requests information on behalf of an application. A NIC proxy and a NIC host communicate with each other through Common Object Request Broker Architecture (CORBA); NIC manages the CORBA interactions for you.

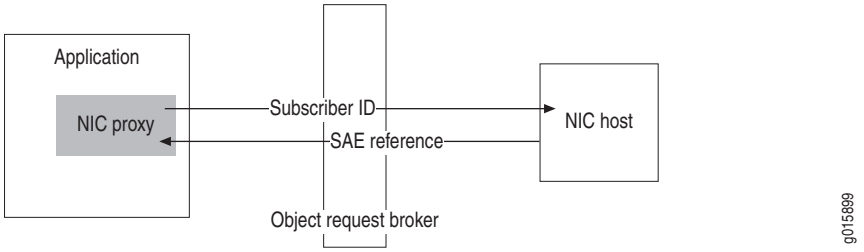
NIC can operate in a client/server mode or in a local host mode. In the client/server mode, a NIC host and NIC proxies can reside on different systems. In local host mode, a NIC host and NIC proxies reside in the same process on a machine.

NIC Client/Server Mode

In client/server mode, a NIC host is the server. A NIC proxy, which comprises libraries within an application that interacts with a NIC host, is the client.

Figure 7 shows a NIC proxy running within an application and a NIC host running on a different machine. Both communicate through CORBA, with the NIC proxy providing an identifier for a subscriber and the NIC host returning a reference to the SAE that manages the subscriber.

Figure 7: Communication Between a NIC Proxy and a NIC Host in Client/Server Mode



NIC Local Host Mode

In local host mode, a Java application can include the libraries for a NIC host as well as NIC proxies. With this configuration, the NIC host and the NIC proxies communicate with each other within the same application. Because both components run within the same application, the application and the NIC host start and stop at the same time.

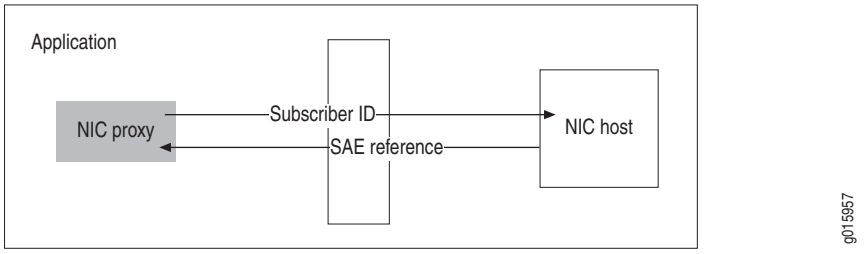
If an application uses a local NIC host, all NIC proxies for the application typically communicate with the local NIC host, but some of the NIC proxies can be configured to communicate with a NIC host that runs on another system.

When you use NIC in local host mode:

- You cannot use C-Web to monitor or troubleshoot the local NIC host
- The NIC host runs all the resolvers and agents for the host on the local machine.
- Other NIC hosts cannot communicate with agents and resolvers that run in a local NIC host.

Figure 8 shows a NIC proxy and a NIC host running within an application.

Figure 8: Communication Between a NIC Host and a NIC Proxy in Local Host Mode



Mapping Subscribers to a Managing SAE

A NIC collects information about the state of the network and can provide mapping from a specified type of network data, known as a *key*, to another type of network data, known as a *value*. Applications can use a NIC proxy to submit a key to a NIC host. The NIC host obtains a corresponding value from other components within NIC and returns it through the NIC proxy to the application. A typical use of a NIC is for a residential portal application to submit a subscriber's IP address and for the NIC to return the interoperable object reference (IOR) of the SAE managing that subscriber.

NIC Proxies and NIC Locators

Typically, an application supports one NIC proxy for each type of data request. A NIC proxy caches resolution results for a period of time so that it can resolve future requests without consulting the NIC host, thereby decreasing traffic between the NIC proxy and the NIC host. Applications that use NIC proxies communicate with the proxy to delete any invalid cache entries. Caching lets you optimize resolution performance for your network configuration and system resources.

You configure a NIC proxy when you configure that application. SRC applications such as the SRC-VTA and Dynamic Service Activator contain NIC proxies. If you are writing an external application that will interact with a NIC, you must include NIC proxies in the application.

A NIC locator provides the same functionality as a NIC proxy; however, it runs as part of the NIC host. A NIC locator uses the NIC access interface module, a simple CORBA interface, to enable non-Java applications to interact with NIC. A NIC locator does not cache information.

For information about the NIC access interface module, see the API documentation in the SRC software distribution in the folder *SDK/doc/idl/nic* or on the Juniper Networks Web site at

http://www.juniper.net/techpubs/software/management/sdx/api-index.html

For more information about NIC proxies and NIC locators, see *Chapter 16, Developing Applications That Use NIC*.

NIC Hosts

NIC hosts collect and store SRC information, and respond to requests from NIC proxies. The components in a NIC host that manage this process are:

- NIC agents—Collect data from SRC components, publish data, and make data available to NIC resolvers
- NIC resolvers—Process resolution requests

NIC Agents

NIC agents collect information about the state of the network from many data sources on the network. Table 10 describes the types of agents supplied with NIC.

Table 10: Types of NIC Agents

Type of Agent	Type of Information the Agent Makes Available
Consolidator agent	Summary information received from other agents.
Directory agent	Specified directory entries and changes to directory entries.
Properties agent	Information from a specified list of property file. Typically, you do not configure properties agents.
SAE plug-in agent	Subscriber information and interface information for SAE-managed subscribers and interfaces.
XML agent	Information from a specified XML document. Typically, you do not configure XML agents.

NIC Resolvers

NIC resolvers manage information to resolve requests by:

- Receiving and storing information about the state of the network from components within NIC and other NIC resolvers
- Requesting information from NIC agents and other NIC resolvers
- Receiving requests from the NIC proxies or other NIC resolvers
- Processing requests and sending responses to the requesters

High Availability for NIC

You can configure high availability for NIC when you use client/server mode with the NIC host and the NIC proxies running on different machines. NIC supports several mechanisms to maintain high availability. We recommend that you use NIC replication to keep a NIC configuration highly available. NIC replication uses groups of NIC hosts that share the same configuration for NIC resolutions to respond to resolution requests.

When you use NIC in local host mode, you do not need to configure redundancy for a NIC host, because the NIC host runs within the application.

High Availability in Existing NIC Configurations

If you have a previous NIC configuration, you may be using:

- NIC host redundancy, in which a set of NIC hosts provide redundancy

  The SRC CLI does not support NIC host redundancy.

- Redundancy for SAE plug-in agents, in which a set of SAE plug-in agents provide redundancy

  If you have an SAE plug-in agent that uses agent redundancy, enable state synchronization for the agent and use NIC replication. In SRC Release 1.0.0, configuration for SAE plug-in agent redundancy is discontinued.

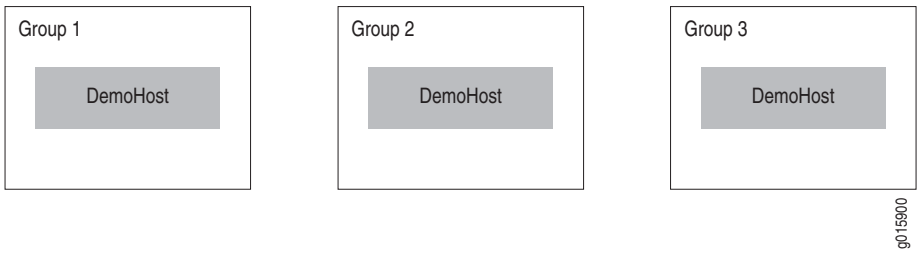
NIC Replication

NIC replication uses the concept of a group to identify a NIC host that has a particular configuration. A group contains one or more NIC hosts; each NIC host in a group is unique; for example, each NIC host could reside on a different system. A NIC proxy contacts specified groups that contain hosts with the same configuration to locate a managing SAE.

For example, a group might include the host DemoHost, but not two instances of DemoHost. Typically, each NIC host in a group is located in the same point of presence (POP). However, a machine can support only one NIC host. The SRC software stores groups in the directory in *ou = dynamicConfiguration, ou = Configuration, o = Management, o = umc*.

For example, Figure 9 shows three NIC groups with each group containing a NIC host that has the same configuration.

Figure 9: NIC Groups



Groups let you:

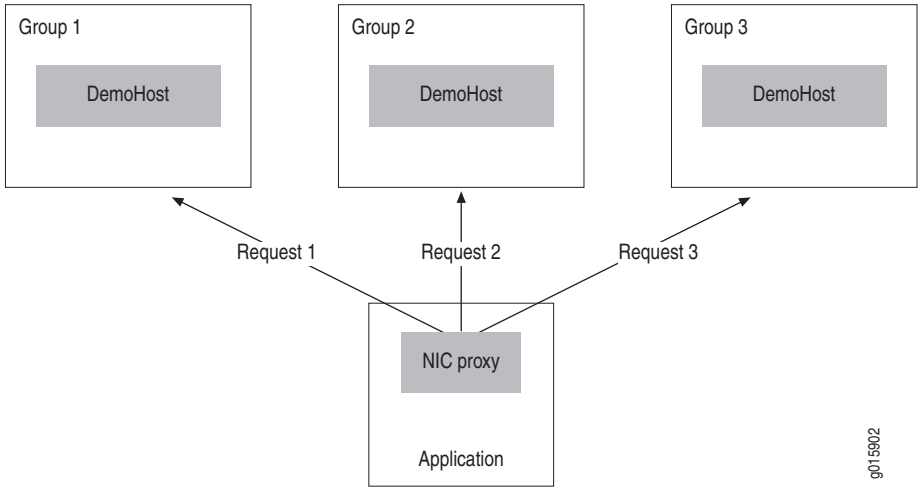
- Distribute network and processing load between two or more groups
- Provide failover protection if one group becomes unavailable

With NIC replication, a NIC proxy can contact multiple NIC hosts that are assigned to different groups. When a NIC proxy is configured to contact more than one group, the NIC configuration on a NIC host in each group should be equivalent—the NIC hosts should use the same configuration scenarios.

A NIC proxy selects a group by using the method specified in the configuration for the proxy; for example, the NIC proxy can randomly choose a group from a list. The NIC proxy then sends resolution requests to the corresponding host in that group. If a NIC proxy submits high numbers of resolution requests to the NIC host, you can configure the NIC proxy to randomly pick a NIC host or to pick a NIC host in a cyclic order to decrease the probability that one NIC host manages all the resolution requests.

Figure 10 shows resolution requests sent by means of a round-robin selection.

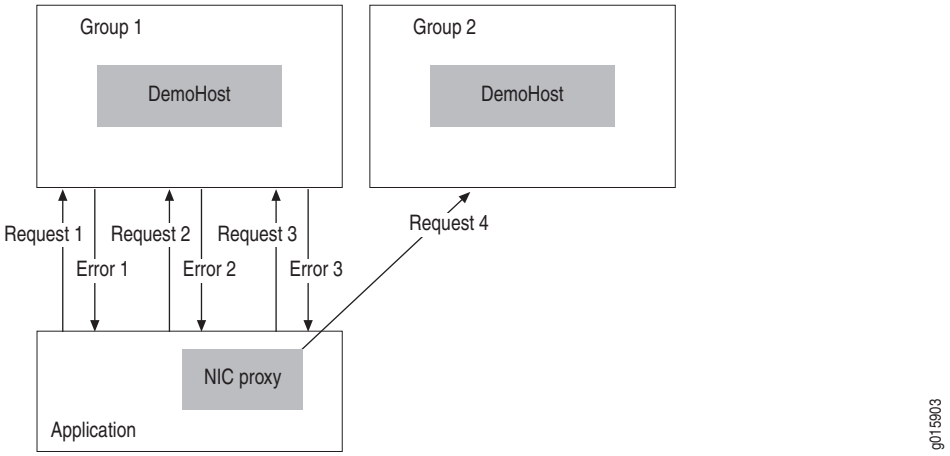
Figure 10: NIC Group Selection by Round-Robin



If the NIC host fails to respond to a specified number of resolution requests, the NIC proxy stops sending resolution requests to the unavailable NIC host and sends the resolution requests to another NIC host. The NIC proxy continues to poll the unavailable NIC host to determine its availability. When the NIC host becomes available, the NIC proxy can again send resolution requests to that host.

Figure 11 shows a NIC proxy that sends a resolution request to Group 1, receives an error message, then sends two more resolution requests before sending a request to Group 2 rather than Group 1. When Group 1 is available again, the NIC proxy will send the request to Group 1.

Figure 11: NIC Resolution Request



You configure NIC replication for hosts, then configure NIC proxies to use replication.

Although you can distribute agents and resolvers among different hosts, as shown in the configuration for the NIC hosts OnePopBO and OnePopH1 in the sample data, we recommend that you use the DemoHost configuration, which centralizes the configuration for agents and resolvers.

Planning a NIC Implementation

The SRC software provides standard NIC configuration scenarios that you can modify to meet the requirements for your environment. Which scenarios you choose depends on the applications you use.

If the resolution scenarios do not provide the type of resolution needed, we recommend that you consult Juniper Professional Services.

If you want to customize configuration of the scenarios provided for a NIC running on a Solaris platform, see *Chapter 18, Customizing a NIC Configuration*.

To plan your NIC implementation:

1. Review the NIC configuration scenarios, and select the scenario that best fits the requirements for your application. In most cases, one of the basic configuration scenarios provides the type of resolution needed.

   See *NIC Configuration Scenarios* on page 154.

2. Determine the number of NIC proxies that you will need to access NIC hosts, and estimate the amount of traffic between the NIC proxies and the NIC hosts. If you expect heavy traffic between NIC proxies and NIC hosts, configure a number of NIC hosts to share the traffic load and processing.

3. Determine which NIC hosts to assign to a group to provide NIC replication; choose names for these groups.

4. If you have not done so already, determine which systems are to run NIC hosts.

NIC Configuration Scenarios

Table 11 lists the NIC configuration scenarios provided in the SRC software.

Table 11: NIC Configuration Scenarios

Configuration Scenario	Name of NIC Configuration Scenario to Use	Type of Resolution	Notes
Basic Configuration Scenarios			
For JUNOSe local configuration for PPP and DHCP subscribers. **Sample use:** DSL providers for residential customers.	OnePop	Subscriber IP address to the SAE IOR	Simplest configuration. IP pools configured locally on each virtual router (VR) with IP addresses from a static pool of IP addresses configured on the virtual router.
For subscribers who have an accounting ID. Can be used for multiple subscribers who use the same accounting ID, in which case NIC returns all SAE IORs for mapped subscribers. **Sample use:** Support for the volume-tracking application.	OnePopAcctId	Accounting ID of a subscriber to the SAE IOR and the IP address of a subscriber to accounting ID	A subscriber's accounting ID can be specified at subscriber login from the SAE subscriber classification script. As a result, the accounting ID encapsulates other attributes of the subscriber session processed by the subscriber classification script. The OnePopAcctId configuration scenario can resolve the encapsulated attributes. For example, customers can assign a subscriber username (login id without domain name) to an accounting ID with the following subscriber classification. [<-retailerDn->?accountingUserId=<-userName->?sub?(uniqueID=<-userName->)]
For subscribers who have assigned IP addresses (assigned external to the SAE). **Sample use:** In a PacketCable Multimedia Specification (PCMM) environment when the SAE acts as both a policy server and application manager.	OnePopDynamicIp	Subscriber IP address to the SAE IOR	

Table 11: NIC Configuration Scenarios (continued)

Configuration Scenario	Name of NIC Configuration Scenario to Use	Type of Resolution	Notes
For resolution of a subscriber login name to an SAE IOR, and of a subscriber IP address to a subscriber login name. **Sample use:** Support for tracking subscriber bandwidth usage or for using a billing model. You can use the SRC-VTA with this scenario.	OnePopLogin	Subscriber login name to the SAE IOR and subscriber IP address to login name	Uses two resolvers. Use a separate NIC proxy for each resolution.
For subscribers who connect through a cable modem termination system (CMTS) device. **Sample use:** In a PCMM environment in which the policy server is separate from the application server. This scenario can be used when the configuration includes Juniper Policy Server or another policy server, and the SAE is an application manager.	OnePopPcmm	Subscriber IP address to the SAE IOR	
For use with applications that use the SAE programming interfaces and that identify subscribers by the primary username. **Sample uses:** ■ Aggregate services ■ Dynamic service activator application	OnePopPrimaryUser	Primary username of a subscriber to the SAE IOR	Similar to *OnePopLogin.xml*.

For a router configuration in which VRs share IP pools.
Sample use:
■ Services for enterprise subscribers.
■ Support for two different proxies:
  ■ Subscriber DN to the SAE IOR
  ■ Subscriber IP address to the SAE IOR
	OnePopDnSharedIp	Subscriber distinguished name (DN) or subscriber IP address to the SAE IOR	Includes resolution available in *OnPopSharedIp.xml* and adds resolution from a subscriber DN.

Table 11: NIC Configuration Scenarios (continued)

Configuration Scenario	Name of NIC Configuration Scenario to Use	Type of Resolution	Notes
For a router configuration in which pools can be shared among routers. Pools can be assigned by RADIUS or by a DHCP server. **Sample use:** Support for DHCP and PPP connections for residential subscribers.	OnePopSharedIp	Subscriber IP address to the SAE IOR	
For scenarios in which subscribers have an assigned IP address and these IP addresses can be associated with interfaces on JUNOS routing platforms. **Sample use:** ■ Threat Mitigation Application Portal	OnePopStaticRouteIp	Assigned subscriber IP address to the SAE IOR	Static route information for routers resides in an XML document in the directory under the router object.
For enterprise customers.	OnePopAllRealms	Subscriber IP address or subscriber DN to the SAE IOR	The scenario combines the OnePop and OnePopSharedIp scenarios and adds resolution from a subscriber DN.
Advanced Configuration Scenario			
For two POPs that share a back office. **Sample use:** Support for a deployment that has a back office that connects to NIC hosts at other sites.	MultiPop	Subscriber IP address to the SAE IOR	You can deploy this scenario in an environment that has a number of POPs; for example, a configuration in which there are two POPS with NIC proxy communication to a back office, which in turn communicates with the POP hosts. The POP hosts each support parallel hosts and agents and manage resolutions in the same way. You can add POPs by copying the configuration for one POP and modifying the configuration to suit your environment.

NIC Agents Used in the NIC Configuration Scenarios

When you configure a NIC configuration scenario, you use the basic configuration for each NIC agent in the scenario, but modify properties such as directory properties to make the agent configuration compatible with your SRC configuration. The NIC configuration scenario that you use determines which agents appear in your configuration.

Table 12 lists all agents that are available in the various configuration scenarios.

Table 12: NIC Agents

Agent Name	Type of Agent	Type of Information
AcctIdIp	SAE plug-in	Mappings of accounting IDs of a subscribers to the SAE IOR and subscriber IP addresses to accounting ID(s)
DnVr	SAE plug-in	Mappings of enterprise access DNs to VRs
Enterprise	Directory	List of enterprise names
IpAcctId	SAE plug-in	Mappings of subscriber IP addresses to accounting IDs
IpLoginName	SAE plug-in	Mappings of IP addresses to login names
IpVr	SAE plug-in	Mappings of IP addresses to VRs
LoginNameVr	SAE plug-in	Mappings of login names to VRs
PoolVr	Directory	Mappings of IP pools to VRs
UserNameVr	SAE plug-in	Mappings of subscriber IP addresses to accounting IDs
VrSaeId	Directory	Reads information about virtual routers and the mappings between virtual routers and SAEs

Table 13 shows the types of agents that each configuration scenario uses.

Table 13: Agents in Configuration Scenarios

NIC Configuration Scenario	Directory Agents	SAE Plug-In Agents
OnePop	PoolVr, VrSaeId	
OnePopAcctId	PoolVr, VrSaeId	AcctIdIp, IpAcctId
OnePopDnSharedIp	PoolVr, VrSaeId, Enterprise	DnVr
OnePopDynamicIp	PoolVr, VrSaeId	
OnePopLogin	Pool, VrSaeId	IpLoginName, LoginNameVr
OnePopPcmm	PoolVr, VrSaeId	
OnePopSharedIp	PoolVr, VrSaeId	IpVr
MultiPop	PoolVr, VrSaeId, site-specific versions of PoolVr and VrSaeId	IpVr
OnePopAllRealms	PoolVr, VrSaeId, Enterprise	IpVr
OnePopPrimaryUser	VrSaeId	UserNameVr
OnePopStaticRouteIp	VrSaeId, PoolInterface	

NOTE: If you use a configuration scenario that includes an SAE plug-in agent, make sure that your network has a CORBA naming server that includes the names of the servers that host the SAE plug-in agents. The SRC software distribution includes a CORBA naming server in the omniORB package.

Router Initialization Scripts with NIC Configuration Scenarios

The NIC resolutions map VRs to SAEs. For these resolutions, use a router initialization script that associates each VR with the SAE that manages it. Which router initialization script you use depends on whether the SAE obtains IP pools from JUNOSe VRs:

- **poolPublisher** router initialization script—Use when the SAE obtains local IP pools locally from JUNOSe VRs.
- **iorPublisher** router initialization script—Use when the router is one of the following:
  - JUNOSe routers that do not supply IP addresses from local pools
  - JUNOS routing platforms
  - CMTS devices

  These devices do not supply IP addresses from local pools in your network.

Table 14 lists which type of initialization script should be used with the various NIC configuration scenarios.

Table 14: Type of Router Initialization Script to Use for NIC Configuration Scenarios

poolPublisher	iorPublisher	poolPublisher or iorPublisher
One Pop	OnePopDnSharedIp	OnePopAcctId
	OnePopPcmm	OnePopAllReams
	OnePopPrimaryUser	OnePopDynamicIp
	OnePopSharedIp	OnePopLogin
	OnePopStaticRouteIp	MultiPop

NOTE: If you modify information about IP pools on a VR after the COPS connection is established, the SAE does not automatically register the changes, and you must update the directory.

For more information about router initialization scripts for JUNOSe routers, including how to update the directory, see *Chapter 5, Using JUNOSe Routers in the SRC Network with the SRC CLI*.

For more information about router initialization scripts for JUNOS routing platforms, see *Chapter 7, Using JUNOS Routing Platforms in the SRC Network with the SRC CLI*.