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1 Standalone Program SAProuter

SAProuter is a standalone program that protects your SAP network against unauthorized access.

SAProuter is a proxy in a network connection between SAP systems, or between SAP systems and external networks. SAProuter acts as an extra firewall to the existing firewall (port filter). It is usually installed directly on the firewall host.

The SAProuter port serves as a gateway, through which connections to your firewall-protected system can be opened. You can specify the connections you want to allow in a route permission table.

Caution

Note that installing SAProuter without the use of a firewall does not protect your network against access from external networks. You must ensure that all incoming SAP connections can be made secure by SAProuter.

Related Information

- Uses and Functions of SAProuter [page 5]
- SAProuter Installation [page 10]
- SAProuter Configuration and Administration - Overview [page 17]
- SAProuter Options - Reference [page 47]
- Identifying and Correcting Errors [page 51]
2 Uses and Functions of SAProuter

With SAProuter you can control and log incoming connections to an SAP system. This is useful for support connections from SAP to your SAP system, which SAP employees use to access your system if there are problems.

You can also set up indirect connections between programs that cannot be accessed directly due to the network configuration. This can occur if there are address conflicts when using non-registered IP addresses and if there are firewall restrictions.

SAProuter can be used to improve network security. Connections and data can be protected by a password from unauthorized external access. With the route permission table you can specify that connections only from selected SAProuters are permitted. With the SNC layer encrypted connections from a known partner can be permitted.

You can increase performance and stability by reducing the workload of an SAP system within a local area network (LAN) when communicating with a wide area network (WAN).

Supported Scenarios

- SAP GUI communication through the SAProuter (to the message server and/or SAP dispatcher)
- RFC communication between systems or between RFC client and Gateway
- Support connections from SAP to customers. For support purposes SAP enables the transfer of other protocols through special, proprietary precautions, but these are not appropriate for production operation and are not released.

Unsupported Scenarios

- Communication between server components with HTTP-based protocols through the SAProuter (e.g. Web service calls through HTTP)
- Communication from a user interface such as the browser or the Business Client through SAProuter to an application server (e.g. Web Dynpro or BSP-based applications)
- Binary protocols (e.g. terminal server, X-server) between communication partners

Related Information

NI Network Interface [page 6]
SAP Protocol [page 7]
Route Connections [page 7]
SAProuter Installation [page 10]
SAProuter Configuration and Administration - Overview [page 17]
SAProuter Options - Reference [page 47]
2.1 NI Network Interface

The NI protocol (Network Interface) is used by SAProuter, all SAP programs, and development kits for CPI-C and remote function call (RFC).

In the OSI 7 layer model, the NI layer forms the upper part of the transport layer. The NI protocol uses TCP or UDP. The protocol is also known as the SAP protocol.

The test program niping, which tests the NI functions, belongs to the NI layer. A predefined number of data packages is sent from the client to the server, is returned by the server, and read again by the client. In addition, average transfer times and detailed information (depending on the trace level) about the data transfer are displayed. The test program niping can be used to test network connections with or without SAProuter.

Related Information

SAP Protocol [page 7]
2.1.1 SAP Protocol

The SAP Protocol is the protocol used by SAP programs that communicate using the NI interface. This is an enhanced version of the TCP/IP protocol, which has been extended by one field and some options for error information.

The initial letter **s** can be used in the route permission table to permit the SAP protocol only. The line is interpreted in the usual way, but only SAP programs (SAP GUI, SAP application server) are allowed to communicate with each other.

The NI network interface provides the SAP protocol as the default for communication, although it can also use the TCP/IP protocol with external programs (for example, `telnet` or `lpd`) that do not "speak" SAP protocol.

Related Information

- Uses and Functions of SAProuter [page 5]
- NI Network Interface [page 6]
- Route Strings [page 17]
- Creating a Route Permission Table [page 20]

2.2 Route Connections

A route connection is the connection between two hosts across a network. The route is the sequence of intermediate stations used to set up the connection. Connections between SAP systems can be set up with or without SAProuter.

Route Connections Without SAProuter

If a connection is to be set up between an SAP work station and a customer work station, a port has to be opened. The more connections required to external hosts, the more ports (and therefore "holes") have to be opened in the firewall.

The following information is required for connections without SAProuter:

- **IP address of the host**, or the **logical name of the host** on which the server process is running. The target host must therefore have a **unique IP address**.
- **Port number** or the **logical name** of the port used by the process. The server process must use an exclusive port number on its host. Also, this port number must be known to the client.
When the NI network interface is used, the host address and port number can be passed as logical names (for example, host saposs, service sapdp00) or address strings (for example, a host IP address in the form www.xxx.yyy.zzz, port 3200).

The following graphic shows a network connection from an SAP system to a customer system operating without SAProuter. This example assumes that both the SAP LAN (local area network) as well as the customer LAN are protected against unwanted access by firewalls.

### Route Connections With SAProuter

SAProuter only allows a network to be accessed from fixed points. The number of access points (ports) is therefore reduced, since fewer direct lines are required for connections. Each port is guarded by an SAProuter whose route permission table determines the routes that can be used and the necessary passwords for gaining access.

The concatenation of SAProuter enables two points with identical IP addresses to be connected. SAProuter cannot only be used to connect one host with a particular service, but also several hosts and services with each other. The route information is provided in the form of a route string. The passwords required for access are also specified in the route string.
The following graphic shows a network connection with SAProuter:

![Network Connection Diagram]

**Related Information**

*Uses and Functions of SAProuter [page 5]*
*SAProuter Configuration and Administration - Overview [page 17]*
3 SAProuter Installation

Prerequisites

i Note
First read the hardware requirements for SAProuter.

Procedure

1. Download: We recommend you always install the latest SAProuter. You can find the latest SAProuter on SAP Service Marketplace http://service.sap.com.
   a) Choose the Software Downloads tab.
   b) In the left column choose SAP Software Download Center Support Packages and Patches A-Z Index S SAPROUTER SAPROUTER 7.20.

2. Installation: The installation of SAProuter depends on the operating system used:
   ○ Installing SAProuter on Windows [page 13]
   ○ Installing SAProuter on Unix [page 12]
   ○ Installing SAProuter on IBM i [page 14]

Related Information

Hardware Requirements for SAProuter [page 10]
Testing Basic Functions of the SAProuter [page 14]

3.1 Hardware Requirements for SAProuter

SAProuter Architecture and Requirement Profile

Since the work of SAProuter (also with SNC) is mainly I/O-based (input/output), you do not require any especially powerful CPU.

The workload handled by the SAProuter is determined by the number of open connections.

If over 800 connections have to be maintained, we recommend that you start new SAProuter processes with Option -Y <n>. This distributes the load across several processes and reduces the risk of any problem occurring (if a problem does occur, it never affects all the open connections.) The following rule of thumb applies to a large number of connections: 1 SAProuter per 500 connections.
Alternatively to option -Y you can also set a script that monitors the SAProuter process and restarts the SAProuter (soft shutdown with Option -p, then restart), as soon as a certain number of connections is exceeded, or when the message
"Maximum number of clients reached" is written for the first time.

Since the SAProuter process is running in one thread (single threaded) and is often busy with I/O calls or with host name resolutions, a computer with one CPU manages well with several SAProuter processes running in parallel.

Recommended Hardware

For an SAProuter with 3000 parallel connections between SAP GUIs and application servers, transferring an average volume of data, a small number of file downloads and uploads (approximately 8kB data transfer in both directions per connection and per 10 seconds), we recommend:

- Quick network adapter (very important)
- 2 hyper-threading (HTT) CPUs with 2GHz tact frequency
- 512 MB RAM
- 50 MB free space on the hard drive for SAProuter and configuration
- Hard drive space for log files

Background

For 3000 users we estimate six SAProuter processes (set Option -C <clients> to 1000).

Each of these processes requires 4.5 MB of memory, and 9% of a two-way HTT 3 GHz CPU, if you assume one third of the CPU workload is for the users and two thirds for the system. The six SAProuter processes together require approximately 30 MB and 55% of the CPU.

Sometimes it takes a few seconds to determine the host name from the IP address (reverse lookup), and during this time the process is blocked. The cause is usually an error in the DNS configuration. Users will notice these delays particularly if the workload on the SAProuter is large. Use Option -D, to prevent this happening.

Recommended Start Options

Start the SAProuter as follows:

- **Windows/Unix:** saprouter -r -K <SNC name> -Y 0 -C 1000 -D -G <log file> -J 2000000
- **IBMi:** saprouter '-r -K <SNC name> -Y 0 -C 1000 -D -G <log file> -J 2000000'

For information about operating SAProuter on Windows see SAP Note 734095.

Related Information

- *Installing SAProuter on Unix* [page 12]
- *Installing SAProuter on Windows* [page 13]
- *Installing SAProuter on IBM i* [page 14]
- *Testing Basic Functions of the SAProuter* [page 14]
3.2 Installing SAProuter on Unix

Context

SAProuter is installed as a daemon on UNIX.

Procedure

1. Create subdirectory `saprouter` in directory `/usr/sap/`.
2. Download the latest version of the SAProuter from SAP Service Marketplace. More information: SAProuter Installation [page 10]
3. Copy programs `saprouter` and `niping` to the newly created directory `/usr/sap/saprouter`. SAProuter and program `niping` are in package `saprouter*.SAR`.
   If you cannot copy the programs from SAP Service Marketplace, you can copy a version (may be obsolete) from your directory `/usr/sap/<SID>/SYS/exe/run`.
4. This step is optional:
   - If you want to start the SAProuter on the same computer used for an SAP instance, insert the following lines into file `/usr/sap/<SID>/SYS/exe/run/startsap`:
     ```
     #
     # Start saprouter
     #
     SRDIR=/usr/sap/saprouter
     if [ -f $SRDIR/saprouter ]; then
     echo "Starting saprouter Daemon" | tee -a $LOGFILE
     echo "--------------------------------" | tee -a $LOGFILE
     $SRDIR/saprouter -r -R $SRDIR/saprouttab | tee -a $LOGFILE &
     fi
     ```
   
<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert the lines before the commands to start the SAP instance. Normally the SAProuter runs on a different computer. If this is so, this step is omitted and you start SAProuter as usual.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
5. Maintain the Route Permission Table in directory `/usr/sap/saprouter`. Use SAProuter option `-R` to keep the route permission table in another directory or under a name other than `saprouttab` (see Option -R <routtab>).
3.3 Installing SAProuter on Windows

Context

SAProuter is installed as a service on Windows.

Note

There may be a problem if some of the Microsoft DLLs have not been replaced. You can find which ones you need in SAP Note 684106.

Procedure

1. Create subdirectory saprouter in directory <disk drive>:\usr\sap.
2. Download the latest version of the SAProuter from SAP Service Marketplace. More information: SAProuter Installation
3. Copy the executables saprouter.exe and niping.exe into newly created directory <disk drive>:\usr\sap. SAProuter and program niping are in package saprouter*.SAR. Read the README file in this package.
   If you cannot copy the programs from SAP Service Marketplace, you can copy a version (may be obsolete) from your directory <disk drive>:\usr\sap\<SID>\SYS\exe\run.
4. If SAProuter has already been entered as a service with srvany.exe, remove the definition of the service from the Registry and restart the host.
5. Define the service using the following syntax: `sc.exe create <service> binPath ="<Path to service EXE file> some parameters" type = own start = auto`
   More information: 618053
6. Define the general attributes of the service: In Control Panel Services set the startup type to "automatic" and enter a user. SAProuter should not run under the SystemAccount.
7. To avoid the error message "The description for Event ID (0)" in the Windows NT event log, you must enter the following in the registry: Under HKEY_LOCAL_MACHINE SYSTEM CurrentControlSet Services Event Log Application create the key saprouter and define the following values for it:
   These settings are not required for running SAProuter. They are used to display error messages in detail in the event log.
8. Maintain the *Route Permission Table* in directory `system32`.
   Use SAProuter option `-R` to keep the route permission table in another directory or under a name other than `saprouttab` (see *Option -R <routtab>*).

**Related Information**

*Hardware Requirements for SAProuter* [page 10]
*Testing Basic Functions of the SAProuter* [page 14]

### 3.4 Installing SAProuter on IBM i

The following SAP Note describes how to install SAProuter on IBM i: [1818735](#)

**Related Information**

*Hardware Requirements for SAProuter* [page 10]
*Testing Basic Functions of the SAProuter* [page 14]

### 3.5 Testing Basic Functions of the SAProuter

**Context**

Before using SAProuter, you should test whether there are any network problems.

The following table shows the test scenario when using `niping`:

SAProuter runs in window 1, the server in window 2, and the client in window 3.

<table>
<thead>
<tr>
<th>Window 2 (host2)</th>
<th>Window 1 (host1)</th>
<th>Window 3 (host3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without SAProuter</td>
<td><code>niping -s</code></td>
<td><code>niping -c -H host2</code></td>
</tr>
<tr>
<td>With SAProuter</td>
<td><code>niping -s</code></td>
<td><code>saprout -r</code></td>
</tr>
</tbody>
</table>
Table 2: Testing on IBM i Systems

<table>
<thead>
<tr>
<th></th>
<th>Window 2 (host2)</th>
<th>Window 1 (host1)</th>
<th>Window 3 (host3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without SAProuter</td>
<td><code>call niping '-s'</code></td>
<td><code>call niping '-c' </code>-H 'host2'`</td>
<td></td>
</tr>
<tr>
<td>With SAProuter</td>
<td><code>call niping '-s'</code></td>
<td><code>saprouter '-r'</code></td>
<td><code>call niping '-c' </code>-H '/H/host1/H/host2'`</td>
</tr>
</tbody>
</table>

Procedure

1. Install SAProuter and program niping
   
   SAProuter Installation [page 10]
2. Open three windows (shells) on one or more hosts.
3. Start SAProuter in window 1 (on host1 with option `-r`).
   
   Starting and Stopping SAProuter: Option `-r` and `-s` [page 29]
4. In window 2 (host2) start test program niping to simulate a test server (see table above).
5. In window 3 (host3) start test program niping without the SAProuter to simulate a client (see table above). This command tests the connection without the SAProuter, that is directly between host2 and host3.
6. In window 3 start test program niping again with the SAProuter (see table above). This command tests the connection with SAProuter. A host name is interpreted as a route (over one or more SAProuters to the server) if `/H/` is added as a prefix to the host name. More information: Route Connections [page 7]
7. Optional step: Enter the command niping `-t` (IBM i: `call niping '-t'`) to perform a self-test for the local host. To get an idea of the options provided by niping, enter niping without any parameters. SAP Note 500235 \( \text{\textcopyright} \) contains comprehensive documentation about the niping tool.

Results

- In steps 3 and 4, data packages are sent to the server, and the server sends the data packages back.
- In step 7 a list of function names, parameters, and return codes is displayed. If the self-test is successful, the following message appears:
  
  *** SELFTEST O.K. ***

Related Information

Hardware Requirements for SAProuter [page 10]
Installing SAProuter on Unix [page 12]
Installing SAProuter on Windows [page 13]
Installing SAProuter on IBM i [page 14]
4 SAProuter Configuration and Administration - Overview

- **Route Strings** [page 17]
- **Creating a Route Permission Table** [page 20]
  - Specifying the File for the Route Permission Table: Option `-R <routtab>` [page 21]
  - Setting Up SNC Connections: Option `-K` [page 21]
  - Re-Read Route Permission Table: Option `-n` [page 22]
  - Route Permission Table [page 23]
  - Example of a Route Permission Table [page 26]
  - Example of a Route Permission Table with SNC [page 27]
- **Starting and Stopping SAProuter: Option `-r` and `-s`** [page 29]
  - Triggering Soft Shutdown: Option `-p` [page 30]
- **Configuring and Administrating SAProuter** [page 30]
  - Changing the SAProuter Port: Option `-S` [page 31]
  - Specifying Ports for Outgoing Connections: Option `-M` [page 31]
  - Specifying Network Interface for Outgoing Connections: Option `-I` [page 32]
  - Changing the Maximum Number of Clients: Option `-C` [page 32]
  - Specifying Host Name and Password: Option `-H` [page 33]
  - Starting an Additional SAProuter with Maximum Number of Clients: Option `-Y` [page 34]
  - Setting Up a Standard Error Message for Clients: Option `-Z` [page 35]
  - Not Resolving IP Addresses from Incoming Connections: Option `-D` [page 36]
  - Activating IPv6: Option `-6` [page 36]
  - Closing the Connection: Option `-c` [page 37]
  - Displaying Connection Information: Option `-l` and `-L` [page 37]
- **Activating SAProuter Logging: Option `-G`** [page 38]
  - Restricting the Size of the Log File: Option `-J` [page 39]
  - Preventing Overwriting of Trace and Log Files: Option `-E` [page 40]
  - Evaluating the Log File of SAProuter [page 40]
- **SAProuter Trace File** [page 42]
  - Specifying the Trace File: Option `-T` [page 43]
  - Changing the Trace Level when SAProuter is Started: Option `-V` [page 43]
  - Changing the Trace Level in a Productive System: Option `-t (toggle trace)` [page 44]
  - Writing Detailed Information to the Trace File: Option `-d (dump buffers)` [page 46]
  - Emptying the Internal Buffer: Option `-f (flush buffers)` [page 46]

## 4.1 Route Strings

A route string describes the stations of a connection required between two hosts through one or more SAProuters. Each of these SAProuters checks its route permission table to see whether the connection between its predecessor and successor is allowed, and if it is, sets the connection up.
A route string has the syntax:

\[(/H/host/S/service/W/pass)*\]

A route string contains a substring for each SAProuter and for the target server. Each substring contains the information required by SAProuter to set up a connection in the route: the host name, the port name, and the password, if one was given.

A route string can contain any number of “Substrings”.

A SAProuter always checks only the previous host name or the previous IP address and the next substring (\(/H/\ldots/S/\ldots/W/\ldots/) for host name or IP address, service and password. The last substring does not contain a password, since there is no successor in the route.

If the /S/ section is missing, the default port number of the SAProuter is used. If the /W/ section is missing, a password is not used.

Table 3: Syntax of substrings

<table>
<thead>
<tr>
<th>/H/</th>
<th>indicates the host name</th>
</tr>
</thead>
<tbody>
<tr>
<td>/S/</td>
<td>specifies the service (port). This information is optional. The default value is 3299.</td>
</tr>
<tr>
<td>/W/</td>
<td>indicates the password for the connection between the predecessor and successor on the route. This information is optional. The default is “” (no password).</td>
</tr>
</tbody>
</table>

**Caution**

- Note that the host name must be at least two characters long.
- H, S, and W must be uppercase!
- In earlier Releases (<4.0A), the password entry was made one substring later and with the letter /P/.
  
  New: /H/saprouter/W/pass/H/targetserver
  
  Old: /H/saprouter/H/targetserver/P/pass
  
  (Here pass is the password which is checked by the SAProuter on host saprouter to set up or prohibit the connection from the source host to the target host.)
  
  Due to downward compatibility, the old password entry form is still possible.

Route strings are best illustrated by an example.
Example

The graphic above shows an example of a connection between SAP and a customer system.

In this example, an SAP service employee working on sappc wants to log on to a customer application server yourapp, which provides the service sapsrv. The SAP service employee logs on to the SAP system, and through the SAProuter on sap_rout and the customer’s SAProuter your_rout sets up a connection between sappc and yourapp. your_rout requires the pass_to_app password for connections with yourapp.

The associated route string looks like:

/\H/sap_rout/\H/your_rout/\W/pass_to_app/\H/yourapp/\S/sapsrv

This route string is interpreted by the SAProuters involved in the route as follows:

<table>
<thead>
<tr>
<th>Substring</th>
<th>Host/address</th>
<th>Service/port</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>/\H/sap_rout</td>
<td>/\S/&lt;default&gt;</td>
<td>&lt;no password&gt;</td>
</tr>
<tr>
<td>2</td>
<td>/\H/your_rout</td>
<td>/\S/&lt;default&gt;</td>
<td>/\W/pass_to_app</td>
</tr>
<tr>
<td>3</td>
<td>/\H/yourapp</td>
<td>/\S/sapsrv</td>
<td></td>
</tr>
</tbody>
</table>

The connection from sappc to the application server is set up in the following steps:

1. **sappc (front end):**
   - Sets up the connection to SAProuter sap_rout according to substring 1 and relays the route information.

2. **sap_rout (SAProuter on SAP side):**
   - Uses the route permission table to check whether route sappc zu your_rout 3299 is allowed, sets up the connection to the customer SAProuter on host your_rout, and passes substring 2 and 3.

3. **your_rout (SAProuter on customer side):**
   - Checks whether route sap_rout to yourapp, sapsrv is permitted. Password pass_to_app is also checked. SAProuter then sets up the connection to the application server.
4.2 Creating a Route Permission Table

Context

You can create a route permission table with a standard text editor.
You must create a separate route permission table for each SAProuter in your network.
If no specific route permission table has been assigned to the SAProuter, ./saprouttab is used on UNIX and IBM i. On Windows, file saprouttab is searched for in the working directory of SAProuter \usr\sap\saprouter. If this file is not available, SAProuter terminates with an appropriate message.

Procedure

1. Create the file in the relevant directory.
2. Fill the table with standard entries in the following standard form: P/S/D <source host> <destination host> <destination server <password>, or with corresponding SNC entries for SNC connections (see route permission table).

Example

Then you call SAProuter online help to display an example of a route permission table. To do this, enter saprouter in the command line.

Related Information

SAProuter Configuration and Administration - Overview [page 17]
Specifying the File for the Route Permission Table: Option -R <routtab> [page 21]
Setting Up SNC Connections: Option -K [page 21]
Re-Read Route Permission Table: Option -n [page 22]
Route Permission Table [page 23]
4.2.1 Specifying the File for the Route Permission Table: Option -R <routtab>

Start SAProuter with option -R to specify the file containing the route permission table:

- Windows/Unix: saprouter -R <path>
- IBMi: saprouter '-R <path>'

**Note**
If you do not specify a path, SAProuter searches for the file in the following path:

- UNIX/IBM i: ./sапрouttab
- Windows: <lwk>:/usr/sap/saprouter/sапрouttab

**Caution**
- The route permission table is essential for SAProuter. If it is not found, SAProuter terminates with an appropriate message.
- If you want to permit all connections, you must specify the following single-line route permission table:

  P * * *

Related Information

- Creating a Route Permission Table [page 20]
- SAProuter Configuration and Administration - Overview [page 17]
- Setting Up SNC Connections: Option -K [page 21]
- Re-Read Route Permission Table: Option -n [page 22]
- Route Permission Table [page 23]
- Example of a Route Permission Table [page 26]
- Example of a Route Permission Table with SNC [page 27]

4.2.2 Setting Up SNC Connections: Option -K

**Prerequisites**

You are using at least version 30 of SAProuter, and have configured SNC using the relevant guide.
Context

SNC is used to make network connections using the Internet, in particular WAN connections, secure. It provides reliable authentication as well as encryption of the data to be transferred.

SAProuter allows SNC connections to be set up. The route permission table can be used to specify precisely whether SNC connections are to be allowed, and if so, which ones.

Procedure

1. Enter a **KT** entry (key target) in the route permission table of the source host. This causes the connection to the target host to use the SNC layer.

2. Enter a **KP** entry in the route permission table of the source host and the target host, which allows the connection.

3. Start both SAProuters with option -K:
   - Windows/Unix: `-K <SNCname>`
   - IBM i: `-K <SNCname>`

   The names ensure the authenticity of the host.

Related Information

- [SAProuter Configuration and Administration - Overview](#) [page 17]
- [Creating a Route Permission Table](#) [page 20]
- [Specifying the File for the Route Permission Table: Option -R <routtab>](#) [page 21]
- [Re-Read Route Permission Table: Option -n](#) [page 22]
- [Route Permission Table](#) [page 23]
- [Example of a Route Permission Table](#) [page 26]
- [Example of a Route Permission Table with SNC](#) [page 27]

4.2.3 Re-Read Route Permission Table: Option -n

With option -n (IBM i: `saprouter -n`) you can report changes in the route permission table to the active SAProuter. This is how the table named with `Option -R <routtab>` (default saprouttab) is re-read. You can use this function if, for example, you want to enter other restrictions in the route permission table without having to stop and restart SAProuter.

⚠️ **Caution**

The new route permission table does not affect existing connections. Even if the existing connection is not allowed according to the new table, it remains in place.
4.2.4  Route Permission Table

The route permission table contains the host names and port numbers of the predecessor and successor points on the route (from the SAProuter's point of view), as well as the passwords required to set up the connection (corresponds to a substring).

It is used to specify which connections are allowed and which prohibited by SAProuter. It also specifies whether SNC connections are set up and if so, which ones.

Syntax of Entries in a Route Permission Table

- **Standard entries** in a route permission table have the following syntax:
  
P/S/D  <source-host> <dest-host> <dest-serv> <password>

- **SNC entries for incoming connections** have the following syntax:
  
KT  <SNCname src-host> <src-host> <src-serv>

- **SNC entries for outgoing connections** have the following syntax:
  
KT  <SNCname dest-host> <dest-host> <dest-serv>

- **KD**, **KP** and **KS** entries have the following syntax:
  
KD/P/S  <SNCname source-host> <dest-host> <dest-serv> <Kennwort>
Row Starts of the Route Permission Table

The beginning of the line can be as follows:

<table>
<thead>
<tr>
<th>Entry</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>P (Permit)</td>
<td>Triggers the SAProuter to open the connection. <strong>P</strong> (permit) entries can contain a password. SAProuter checks whether this password corresponds to that sent by the client.</td>
</tr>
<tr>
<td></td>
<td>Directly after the <strong>P</strong>, you can specify the maximum number of SAProuters permitted before and after this SAProuter on the route for the connection to be allowed: <strong>Pv, n</strong>.</td>
</tr>
<tr>
<td></td>
<td><strong>v</strong> is the maximum number of preceding SAProuters on this route, and <strong>n</strong> is the maximum number of following SAProuters.</td>
</tr>
<tr>
<td>S (Secure)</td>
<td>Only permits connections with the NI protocol. Connections with other protocols, for example TCP, are not permitted.</td>
</tr>
<tr>
<td></td>
<td>With <strong>Sv, n</strong> you can determine the number of preceding and succeeding SAProuters on the route, the same as you can with <strong>P</strong>.</td>
</tr>
<tr>
<td>D (Deny)</td>
<td>Prevents the connection from being set up.</td>
</tr>
<tr>
<td>KT (Key Target)</td>
<td>This defines which connections should be SNC connections. This can be defined for both incoming and outgoing connections (from the point of view of this SAProuter).</td>
</tr>
<tr>
<td>K&lt;D/P/S&gt;</td>
<td>The (encrypted) SNC connection is set up if the route string contains the correct <code>&lt;password&gt;</code>.</td>
</tr>
<tr>
<td>#</td>
<td>With <code>#</code> you can insert comment lines.</td>
</tr>
</tbody>
</table>

**Note**

SNC entries always start with the letter **K** (key).

**Caution**

- So that SNC connections are possible, the appropriate SAProuters must have been started with option `-K`, and the route permission table must contain the appropriate **KT** entry.
- **Security Note:**
For security reasons SAP recommends that you do not use wildcards (\*) for the target host (\texttt{<dest-host>}) and the target port (\texttt{<dest-serv>}) in P and S lines in the route permission table. If the table contains these lines, the SAProuter issues a warning message:

\texttt{WARNING: wildcard character used in route target}

## Specifying Outbound Hosts, Target Hosts, and Target Host Port

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\texttt{&lt;source-host&gt;}</td>
<td>This element describes the host from where the connection comes (from the viewpoint of the SAProuter). Here you can specify a host name, an IP address, or an IP subnetwork. \texttt{&lt;source-host&gt;} can be a SAProuter.</td>
</tr>
<tr>
<td>\texttt{&lt;dest-host&gt;}</td>
<td>With the \texttt{&lt;dest-host&gt;} element you can specify the host to which the connection is to go (from the viewpoint of the SAProuter). Here you can specify a host name, an IP address, or an IP subnetwork. \texttt{&lt;dest-host&gt;} can be a SAProuter.</td>
</tr>
<tr>
<td>\texttt{&lt;dest-serv&gt;}</td>
<td>With the \texttt{&lt;dest-serv&gt;} element you can specify the port of the target host. Here you can also specify port ranges by separating the two ports that enclose the port range with a point. If \texttt{&lt;dest-serv&gt;} has value 3200.3298, this means connections to the target server on all ports between 3200 and 3298.</td>
</tr>
</tbody>
</table>

**Note**

If a \texttt{<source-host>} client wants to set up a connection to \texttt{<dest-host> <dest-serv>} through a SAProuter, SAProuter checks its route permission before the connection is set up. If the password and route that SAProuter has received correspond to the entries in the route permission table, SAProuter sets up the connection. In this is not the case, SAProuter does not set up the connection, and issues the message "route permission denied".

## Evaluation of the Route Permission Table

The following rules apply when the SAProuter evaluates the route permission table.
**First Match:**
The lines in the route permission table are evaluated from top to bottom. The first entry in the route permission table for which the source address, target address, and target port match determines whether a connection is permitted or denied.

**No Match**
If there is no matching entry in the table for a route, the connection is denied. It behaves as though the last line were a `D * * *`.

---

**Note**
If the SAProuter is the last SAProuter on the route (for example, the front end), and the service is not an SAP service (not an SAP protocol), a wildcard (`*`) cannot be used with the service. The connection is only permitted if the non-SAP service is explicitly specified. If the example given above contained a `*` instead of `telnet`, and the SAProuter was the last one on the route, the telnet connection would not be set up.

---

**Related Information**

*SAProuter Configuration and Administration - Overview* [page 17]
*Creating a Route Permission Table* [page 20]
*Creating the File for the Route Permission Table: Option -R <routtab>* [page 21]
*Setting Up SNC Connections: Option -K* [page 21]
*Re-Read Route Permission Table: Option -n* [page 22]
*Example of a Route Permission Table* [page 26]
*Example of a Route Permission Table with SNC* [page 27]

---

### 4.2.5 Example of a Route Permission Table

**Example**
A route permission table could look like this:

<table>
<thead>
<tr>
<th></th>
<th>host1</th>
<th>host2</th>
<th>serviceX</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>host1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>host2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>*</td>
<td>*</td>
<td>3200.3298</td>
</tr>
<tr>
<td>P</td>
<td>155.56.<em>.</em></td>
<td>155.56.<em>.</em></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>155.57.1011xxxx .*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>host4</td>
<td>host5</td>
<td>*</td>
</tr>
</tbody>
</table>

PASS
### Explanation of the Rows (from top to bottom):

- Do not allow routes from `host1` to `host2`, service `serviceX`
- Do not allow routes starting from `host3`
- Allow all routes to server processes that use a service in area 3200 to 3298
- Allow all routes within subnetwork 155.56.0.0/16
- Allow all routes starting from subnetwork 155.57.1011xxxx (the last byte is written as a binary number; each x stands for 0 or 1).
- Allow all routes from `host4` to `host5` if password `pass` is correct
- All routes from `host6`, but only SAP protocol
- Native protocol routes (TCP/IP) from `host7` to `host8` for the non-SAP service `telnet` on `telnet`
- All connections to non-SAP routers (no more SAP routers allowed on this route) if password `gui` is correct

### Related Information

- SAProuter Configuration and Administration - Overview [page 17]
- Creating a Route Permission Table [page 20]
- Specifying the File for the Route Permission Table: Option `-R <routtab>` [page 21]
- Setting Up SNC Connections: Option `-K` [page 21]
- Re-Read Route Permission Table: Option `-n` [page 22]
- Route Permission Table [page 23]
- Example of a Route Permission Table with SNC [page 27]

### 4.2.6 Example of a Route Permission Table with SNC

```
P   *   *   *   pass
KT S:SR@host4 host4 3333
```
<table>
<thead>
<tr>
<th>KT</th>
<th>S:SR@host4</th>
<th>host9</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD</td>
<td>S:SR@host4</td>
<td>host9</td>
<td>*</td>
</tr>
<tr>
<td>KP</td>
<td>S:SR@host4</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>KS</td>
<td>*</td>
<td>host10</td>
<td>4444</td>
</tr>
<tr>
<td>KP</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

**Explanation of the Rows (from top to bottom):**

- Allow all connections if password `pass` is specified correctly.
- Connections from this SAProuter to `host4` (SNC name `S:SR@host4`), service `3333` should be SNC connections.
- Connections from `host9` (SNC name `s:SR@host9`) to this SAProuter should be SNC connections.
- A SNC connection from `SR@host4` to `host9` through this SAProuter should not be set up.
- A SNC connection from `S:SR@host4` through this SAProuter (any target host) is allowed if the password `pass2` is correct (unless the connection is to `host9`, since this is not allowed according to the previous entry - the first entry which "matches" is decisive).
- All SAP to SAP connections (NI protocols) to `host10`, service `4444`, which come in as SNC connections are passed on as non-SNC connections to `host10` (no SNC host).
- All SNC connections (for which the previous entries are not suitable) are allowed.

**Related Information**

*SAProuter Configuration and Administration - Overview* [page 17]
*Creating a Route Permission Table* [page 20]
*Specifying the File for the Route Permission Table: Option -R <routtab>* [page 21]
*Setting Up SNC Connections: Option -K* [page 21]
*Re-Read Route Permission Table: Option -n* [page 22]
*Route Permission Table* [page 23]
*Example of a Route Permission Table* [page 26]
4.3 Starting and Stopping SAProuter: Option -r and -s

Note

- Before using SAProuter, you should test its basic functions.
- Enter `saprouter` in the input field to display a full list of SAProuter parameters.
- You can start SAProuter automatically when booting the system. Under UNIX, for example, you change your `/etc/rc` file.
- If you want to run a high number of connections (more than 1000) through SAProuter, start the SAProuter using option `-r -Y <n>`, and set the maximum number of clients to 2000 using option `-C <clients>`:

### Starting SAProuter

Start SAProuter with option `-r`:

- **Windows/Unix:** `saprouter -r`
- **IBM i:** `saprouter '-r'` (if possible in batch mode)

This command starts SAProuter with no further parameters. The connections allowed are contained in the `saprouttab`.

Note

If you enter `start saprouter -r` in the input field, SAProuter opens in a new window. You can continue to work in your first window, and for instance, stop SAProuter here.

### Stop SAProuter

You stop SAProuter with option `-s`:

- **Windows/Unix:** `saprouter -s`
- **IBM i:** `saprouter '-s'` (if possible in batch mode)

This command stops SAProuter.

Note

If SAProuter is not running on the default service 3299, you have to specify the service with option `-S <service>`.
4.3.1 Triggering Soft Shutdown: Option -p

You can shut down SAProuter softly. With a soft shutdown SAProuter continues to run on another port. Administration functions can be done here, but SAProuter does not accept any more logon requests. SAProuter terminates automatically when no more clients are connected. The advantage of a soft shutdown is that the port on which SAProuter was running (default 3299) is now free. This is useful if you want to start a new SAProuter without closing existing connections, or if more connections are required than one SAProuter alone can handle (max. 1018).

To trigger a soft shutdown of SAProuter, enter the following command in the input field:

- **Windows/ UNIX:** saprouter -p
- **IBM:** saprouter -p

**Note**

- Alternatively, you can start SAProuter with option saprouter -r -Y <n> (IBM: saprouter -r -Y <n>). You moves the existing SAProuter automatically to another port and a new SAProuter is started. The new SAProuter then accepts incoming connections on this port.
- The default port on which SAProuter continue to run port 65000. If this port is already assigned or if a port range was already defined for the SAProuter with option -M, a different port is selected.

4.4 Configuring and Administrating SAProuter

- **Changing the SAProuter Port: Option -S** [page 31]
- **Specifying Ports for Outgoing Connections: Option -M** [page 31]
- **Specifying Network Interface for Outgoing Connections: Option -I** [page 32]
- **Changing the Maximum Number of Clients: Option -C** [page 32]
- **Specifying Host Name and Password: Option -H** [page 33]
- **Starting an Additional SAProuter with Maximum Number of Clients: Option -Y** [page 34]
- **Setting Up a Standard Error Message for Clients: Option -Z** [page 35]
- **Not Resolving IP Addresses from Incoming Connections: Option -D** [page 36]
- **Activating IPv6: Option -6** [page 36]
- **Closing the Connection: Option -c** [page 37]
- **Displaying Connection Information: Option -l and -L** [page 37]
4.4.1 Changing the SAProuter Port: Option -S

Start SAProuter with the following option to start SAProuter on another port (default 3299):

- **Windows/UNIX:** `saprouter -r -S <port>`
- **IBM:** `saprouter '-r -S <Port>'`

**Note**

SAProuter is started on the local host on the port (service) specified. If you want to administer this SAProuter, the port (service) must be specified.

Related Information

- [Configuring and Administrating SAProuter](page 30)
- [Specifying Ports for Outgoing Connections: Option -M](page 31)

4.4.2 Specifying Ports for Outgoing Connections: Option -M

Start SAProuter with the following option to specify an area of ports for outbound connections:

- **Windows/UNIX:** `saprouter -r -M <min>.<max>`
- **IBM:** `saprouter '-r -M <min>.<max>'`

**Example**

`saprouter -r -M 1.1023` only allows outgoing connections from ports 1 to 1023 (reserved for root under UNIX).

Related Information

- [Configuring and Administrating SAProuter](page 30)
4.4.3 Specifying Network Interface for Outgoing Connections: Option -I

If a computer has multiple network interfaces, you can specify which interface is used to establish external connections. This can be useful for instance for firewalls between two networks. For instance, you can specify that the connection is opened only in specific networks. The specified address must be a local interface.

Start SAProuter with the following option to specify a network interface:

- **Windows/UNIX**: `saprouter -r -I <address>
- **IBM**: `saprouter -r -I <address>`

**Related Information**

*Configuring and Administrating SAProuter* [page 30]

4.4.4 Changing the Maximum Number of Clients: Option -C

You can set the maximum number of clients. The default setting is 800, the maximum value is 2039. Two clients correspond to one connection. This means there are a maximum of 400 connections in the default setting. The maximum number of connections is 1019.

If you want more connections than the maximum (1019), you can "move" SAProuter to another port with option -p and start a new SAProuter on this port.

Start SAProuter with the following option to set the number of clients:

- **UNIX/Windows**: `saprouter -r -C <number of clients>
- **IBM**: `saprouter -r -C <Number of Clients>`

**Example**

If you want to run 1000 connections with your SAProuter, start SAProuter as follows:

**UNIX/Windows**: `saprouter -r -C 2000
IBM`: `saprouter -r -C 2000`

**Note**

The limitations set here only apply if smaller values for the number of connections have not been set in the operating system. Therefore you must take the operating system parameters into consideration. As of SAProuter version 37 significant higher values are possible, up to 16000 (with the exception of IBM i). But make sure that only one thread process is involved. For this reason having more than about 1000/1500 clients is not at all practical. With many connections you can work better with option -Y <n>, which distributes the connections across several processes.
### 4.4.5 Specifying Host Name and Password: Option -H

With this option you can specify the host name and password. The option can be specified when the SAProuter is started, or sent to a running SAProuter.

#### At Startup:

Start SAProuter with the following option to specify a host name:

- **Windows/ UNIX:** `saprouter -r -H <hostname>`
- **IBM i:** `saprouter -r -H <host name>'

**Note**
- This causes SAProuter to "listen" to the IP address of host `<hostname>`. If nothing else is defined with option `-S`, SAProuter uses the default port 3299. If SAProuter is started without option `-H`, it listens to all the IP addresses belonging to this host. `<hostname>` can also be an IP address.
- If you started SAProuter with option `-H <host name>`, of course you also have to define the host name for administration. For example, if you want to use a new route permission table, you must enter `saprouter -n -H <host name>` (IBM i: `saprouter -n -H <host name>'`).

#### When SAProuter is Running:

You can use this option in a running SAProuter to get SAProuter information from a remote host. A password may be required, which is then entered with option `-P <password>` (IBM i: Option `-P <password>'`). SAProuter then checks its route permission table to determine whether the route is allowed with this password, and if it is, it displays the information.

**Example**

Host *myhost* has two IP addresses: `a1` and `a2`.

Call `saprouter -r` (IBM i: `saprouter -r') causes SAProuter to listen to `a1/3299` and `a2/3299`. The call to `saprouter -r -H a2` (IBM i: `saprouter -r -H a2`) causes SAProuter to listen only to `a2/3299`.

**Example**

SAProuter is running on host *sr*, port 3299 (default). You would like to display the SAProuter information (list of all SAProuter clients, for example) from the host *myhost*. 
Enter command `saprouter -l -H host_sr -P pass` (IBM: `saprouter '-l -H host_sr -P pass '`). SAProuter checks whether its route permission table contains the entry `P myhost host_sr 3299 pass` Do_Destroy. If it does, the SAProuter information is displayed on your host `myhost`.

Integration

If the SAProuter is running on a port other than the default port 3299, you can specify this in the command line with `option -S <service>`.

Related Information

*Configuring and Administrating SAProuter* [page 30]

4.4.6 Starting an Additional SAProuter with Maximum Number of Clients: Option -Y

You can trigger SAProuter to automatically start a new SAProuter when the client table is full. This allows you to circumvent the limit of 1000 clients.

Start SAProuter with the following option to get SAProuter to start a new SAProuter when the maximum number of clients is reached:

- **Windows/UNIX:** `saprouter -r -Y <n>`
- **IBM:** `saprouter '-r -Y <n>'`

**Note**
The number `n` specifies the maximum number of times a new SAProuter can be started.

<table>
<thead>
<tr>
<th>Value of n</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A new SAProuter is started every time the client table becomes full.</td>
</tr>
<tr>
<td>1</td>
<td>SAProuter never starts automatically.</td>
</tr>
<tr>
<td><code>n &gt; 1</code></td>
<td>SAProuter is started a maximum of <code>n</code> times when the client table becomes full. You can use this value to control the amount of SAProuter restarts.</td>
</tr>
</tbody>
</table>
Note
With option -I / -L you can display information about the active SAProuter. Here you can also see whether this SAProuter has been started, and if so from which SAProuter process.

Related Information

Configuring and Administering SAProuter [page 30]

4.4.7 Setting Up a Standard Error Message for Clients: Option -Z

With this option you can specify that any errors occurring while opening the connection are not reported in detail to the client. The same error text is then always returned to the caller regardless of the error (connection could not be opened, route is not permitted, host name could not be resolved, and so on).

The client receives the following error text that the connection could not be established:

```
**********************************************************************
SAProuter * ERROR route could not be established * TIME Tue Sep 5 15:38:57 2006 *
RELEASE 0 * COMPONENT NI (network interface) * RC -92
**********************************************************************
```

Start SAProuter with the following option to activate this error information:

- **Windows/ UNIX**: saprouter -r -Z
- **IBM i**: saprouter '-r -Z'

Note
For this option you must be using at least SAProuter version 38.0.

Related Information

Configuring and Administering SAProuter [page 30]
4.4.8  Not Resolving IP Addresses from Incoming Connections: Option -D

Start SAProuter with the following option to stop IP addresses from incoming connections being resolved in SAProuter.

- Windows/Unix: `saprouter -r -D`
- IBM i: `saprouter '-r -D'

**Note**

This can result in better performance for SAProuters in which connections from many different clients are set up. If this option is used, only the IP addresses are visible in the log (client-side).

**Related Information**

*Configuring and Administrating SAProuter* [page 30]

4.4.9  Activating IPv6: Option -6

Start SAProuter with the following option to activate IPv6:

- Windows/Unix: `saprouter -r -6`
- IBM i: `saprouter '-r -6'

**Note**

The SAProuter can then open and manage both IPv4 and IPv6 connections. For this option you must be using at least SAProuter version 38.0.

**Related Information**

*Configuring and Administrating SAProuter* [page 30]
4.4.10  Closing the Connection: Option -c

Context

With option -c you can close a connection. Each internal connection has a number that runs through an SAProuter.

Note

With option -l / -L you can display the connection numbers.

Procedure

1. Enter option -l/-L in the input field to display the number of the connection that you want to close.
   - Windows/Unix: saprouter -l or saprouter -L
   - IBM: saprouter '-l'
2. Enter option -c in the input field to close the connection:
   - Windows/Unix: saprouter -c <connection number>
   - IBM: saprouter '-c <connection number>'

Example

The saprouter -c 2 command (IBM i: Command saprouter '-c 2') closes the connection with the (internal) number 2.

Related Information

Configuring and Administrating SAProuter [page 30]

4.4.11  Displaying Connection Information: Option -l and -L

Enter option -l in the input field to display route information.

- Windows/Unix: saprouter -l
- IBM: saprouter '-l'

Note

If you use option saprouter -L (IBM i: saprouter '-L') instead, more detailed information will be displayed.
The following information is displayed:

- A table with the connection number, client, partner, and service for each existing connection. Connections for which the connection trace is activated are marked with an asterisk (*).
- The total number of clients, the working directory in which SAProuter is running, and the path of the route permission table.
- The PID and the port of the 'Vaters' if SAProuter was started by another SAProuter process.

**Note**
- If you want to display the SAProuter information from a remote host, use option -H <host name> [-P <password>].
- If you are running several SAProuter processes, and you want to display the route details of a SAProuter other than the last one started, use option -S <service> and specify the port.

**Example**

If you specify `saprouter -l`, the output may look like:

```plaintext
Wed Apr 11 09:01:57 2007 SAP Network Interface Router, Version 38.0
Wed Apr 11 09:01:58 2007 peer SAProuter with NI version 38 ...
... send info-request to running SAProuter ... SAP Network Interface Router running on port 3299 (PID = 1576962)
Started on: Wed Apr 13 09:00:10 2005
ID CLIENT | PARTNER service
--------------------------------+------------------------------------
7 localhost | (no partner) 6 10.18.203.8 | 10.17.74.118 3227 4 *10.18.203.8 | 10.17.74.118 3227 2 10.18.203.8 | 10.17.74.118 3227 Total no. of clients: 7
Working directory : /net/usr.scratch/d039768/mm/rs6000_64 Routtab : ./saprouttab
```

### 4.5 Activating SAProuter Logging: Option -G

**Context**

You can log connections and actions running through the SAProuter in a log file. You can use this log file, for example, to get an overview of the functions and workload of the SAProuter. With option -G you can activate logging when the SAProuter is started.

**Note**

With option -J you can specify the size of the log file in bytes.

**Procedure**

1. Start the SAProuter with option -G. Enter the name of the log file after the -G.

   Windows/Unix: `saprouter -r -G <LogFileName.txt>`
2. Optional: You can restrict the size of the log file with option -J <size in bytes>. With option -V you specify the trace level.

Windows/Unix: saprouter -r -G <LogFileName.txt> -J<size in bytes>
IBM: saprouter '-r -G <LogFileName.txt> -J<size in bytes>'

Related Information

SAProuter Configuration and Administration - Overview [page 17]
Restricting the Size of the Log File: Option -J [page 39]
Preventing Overwriting of Trace and Log Files: Option -E [page 40]
Evaluating the Log File of SAProuter [page 40]

4.5.1 Restricting the Size of the Log File: Option -J

If you start SAProuter with option -G, you can restrict the size of the log file with option -J <size in bytes>. If you do not use this option, the log file can become as large as is necessary:

- Windows/Unix: saprouter -r -G <LogFileName.txt> -J<size in bytes>
- IBM: saprouter '-r -G <LogFile.txt> -J<size in Bytes>'

Note

If you use this option, once the log file reaches the defined size, it is renamed to <log file name>_a_<start date>_<start time>-<end date>_<end time>. The created files are archived.

Related Information

SAProuter Configuration and Administration - Overview [page 17]
Activating SAProuter Logging: Option -G [page 38]
Preventing Overwriting of Trace and Log Files: Option -E [page 40]
Evaluating the Log File of SAProuter [page 40]
4.5.2 Preventing Overwriting of Trace and Log Files: Option -E

Start SAProuter with this option to prevent old trace files and log files from being overwritten when SAProuter is restarted.

- Windows/UNIX: `saprouter -r -E`
- IBM: `saprouter '-r -E'`

Related Information

- SAProuter Configuration and Administration - Overview [page 17]
- Activating SAProuter Logging: Option -G [page 38]
- Restricting the Size of the Log File: Option -J [page 39]
- Evaluating the Log File of SAProuter [page 40]

4.5.3 Evaluating the Log File of SAProuter

The log file is structured line by line. Each line contains the following information:

- **Date and Time** (week day, month, day, time, year)
- **Action**:
  - INIT LOGFILE (start of log file)
  - READ ROUTTAB (read route permission table)
  - CONNECT FROM/TO (open connection from/to). The IP address and port always refer to the connection’s counter page (peer).
  - DISCONNECT (close connection)
  - PERM DENIED (connection not permitted in accordance with route permission table)
- **Handle Pair**: `<C|S>n/m`. The letter indicates whether the action was initialized by the client (C) or by the server (S). The two numbers are internal NI handle numbers: The first number means the connection with the handle to the client, and the second number means the connection with the handle to the server. A log with a handle pair C1/- means that no server-side connection between a pair exists yet.

**Example**

Assume that logging was activated and the following actions were executed through the SAProuter. The SAProuter stands between the physical hosts ldp007 with the IP address 10.21.72.60 and binmain (IP address 10.21.82.77).

1. Connection is opened between host ldp007 (10.21.72.60) and host binmain (10.21.82.77) with port sapmsBIN, which is closed by the client again.
2. Administrator calls up local SAProuter to display the list of connections ( `saprouter -l`).
3. Connection is established between host ldp007 (10.21.72.60) and the same host ldp007 with port 3298, which is closed by the server again.
4. Attempt to open connection from host ldp007 (10.21.72.60) to the same host with telnet port 23 is rejected by the SAProuter.

The route permission table in this example allows connections from any host to host 10.21.82.77 with port sapmsBIN, as well as to host 10.21.72.60 with port 3298:

```
P * 10.21.82.77 sapmsBIN
P * 10.21.72.60 3298
```

After these actions have been executed, the log file would look like:

```
(3) Wed Dec 7 13:14:05 2005 CONNECT FROM C1/- host 10.21.72.60/1245 (ldp007.wdf.sap.corp)
(4) Wed Dec 7 13:14:05 2005 CONNECT TO S1/2 host 10.21.82.77/sapmsBIN (binmain)
(5) Wed Dec 7 13:14:05 2005 DISCONNECT C1/2 host 10.21.72.60/1245 (ldp007.wdf.sap.corp)
(6) Wed Dec 7 13:14:13 2005 CONNECT FROM C2/- host 127.0.0.1/44997 (local host)
(7) Wed Dec 7 13:14:13 2005 SEND INFO TO C2/-
(8) Wed Dec 7 13:14:13 2005 DISCONNECT C2/- host 127.0.0.1/44997 (local host)
(9) Wed Dec 7 13:14:23 2005 CONNECT FROM C2/- host 10.21.72.60/1276 (ldp007.wdf.sap.corp)
(10) Wed Dec 7 13:14:23 2005 CONNECT TO S2/1 host 10.21.72.60/3298 (ldp007)
(11) Wed Dec 7 13:14:24 2005 DISCONNECT S2/1 host 10.21.72.60/3298 (ldp007)
```

**Note**

The line numbers are not displayed, but are added here to help with the description.

The lines mean the following:

<table>
<thead>
<tr>
<th>Line(s)</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1), (2)</td>
<td>The first two lines are always at the start of the log file. The first line marks the start, the second means that the route permission table has been read in successfully.</td>
</tr>
<tr>
<td>Line(s)</td>
<td>Meaning</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>(3), (4)</td>
<td>The client (host 10.21.72.60, port 1245) connects to the SAProuter and through this host it can connect to host 10.21.82.77, port sapmsBIN, since this connection is permitted according to the route permission table.</td>
</tr>
<tr>
<td>(5)</td>
<td>The connection between host 10.21.72.60, port 1245 and host 110.21.82.77, port sapmsBIN is closed by the client.</td>
</tr>
<tr>
<td>(6)</td>
<td>On the local host (IP address 127.0.0.1, port 44997) the connection list display is called up (saprouter -l). The connection is opened with the SAProuter.</td>
</tr>
<tr>
<td>(7)</td>
<td>The SAProuter sends the client the requested connection information.</td>
</tr>
<tr>
<td>(8)</td>
<td>The connection is closed again. As it is not a client/server connection via the SAProuter, the connection is closed by the SAProuter.</td>
</tr>
<tr>
<td>(9), (10)</td>
<td>Client host 10.21.72.60, port 1276 wants to connect to server 10.21.72.60, port 3298 via the SAProuter, which is permitted according to the route permission table. The SAProuter opens the connection.</td>
</tr>
<tr>
<td>(11)</td>
<td>The connection is closed again (from the server).</td>
</tr>
<tr>
<td>(12), (13)</td>
<td>Client host 10.21.72.60, port 1352 wants to connect to server 10.21.72.60, port 23 (telnet) via the SAProuter, which is not permitted according to the route permission table. The SAProuter returns message, &quot;permission denied&quot;.</td>
</tr>
<tr>
<td>(14)</td>
<td>The connection is closed by the SAProuter. (With unpermitted connections and in error situations the SAProuter closes the connections.)</td>
</tr>
</tbody>
</table>

### 4.6 SAProuter Trace File

A trace file is used to search for errors. If an error occurs, the function in which it occurred or why a connection failed is logged in the trace file.

A trace file is always written. If you do not specify a different file, the dev_rout trace file is used. It can be found in the working directory of the SAProuter.

---

**Note**
- With option -V you can specify the trace level when SAProuter is started.
- With option -T you can specify a trace file.
- With option -t you can change the trace level when the SAProuter is active.
- With option -d you can write detailed information to the trace file.
Related Information

SAProuter Configuration and Administration - Overview [page 17]
Specifying the Trace File: Option -T [page 43]
Changing the Trace Level when SAProuter is Started: Option -V [page 43]
Changing the Trace Level in a Productive System: Option -t (toggle trace) [page 44]

Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]
Emptying the Internal Buffer: Option -f (flush buffers) [page 46]

4.6.1 Specifying the Trace File: Option -T

A trace file is always written. If you do not use this option, the dev_rout trace file is used. It can be found in the working directory of the SAProuter.

Start SAProuter with the following option to use your own trace file:

- UNIX/Windows: saprouter -r -T <trace file>
- IBM: saprouter '-r -T <trace file>'

Related Information

SAProuter Configuration and Administration - Overview [page 17]
SAProuter Trace File [page 42]
Changing the Trace Level when SAProuter is Started: Option -V [page 43]
Changing the Trace Level in a Productive System: Option -t (toggle trace) [page 44]

Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]
Emptying the Internal Buffer: Option -f (flush buffers) [page 46]

4.6.2 Changing the Trace Level when SAProuter is Started: Option -V

Start SAProuter with the following option to change the trace level:

- UNIX/Windows: saprouter -r -V <trace level>
- IBM: saprouter '-r -V <Trace Level>'

Note: Possible values are 1, 2, and 3. The default value is 1.
Related Information

SAProuter Configuration and Administration - Overview [page 17]
SAProuter Trace File [page 42]
Specifying the Trace File: Option -T [page 43]
Changing the Trace Level in a Productive System: Option -t (toggle trace) [page 44]

Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]
Emptying the Internal Buffer: Option -f (flush buffers) [page 46]

4.6.3 Changing the Trace Level in a Productive System: Option -t (toggle trace)

Context

You can use option -t to change the trace level of an active SAProuter. Possible values are 1, 2, or 3.

You can also activate the trace for single connections. For these connections the information is written with trace level 2. The connection is traced using an enhanced syntax of option -t.

You have the following options:

<table>
<thead>
<tr>
<th>Command</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>saprouter -t &quot;on &lt;id&gt;&quot;</td>
<td>This command activates the trace for this (existing) connection. &lt;id&gt; is the number of the connection. You can see this number when you display the connection information (option saprouter -l).</td>
</tr>
<tr>
<td>saprouter -t &quot;off &lt;id&gt;&quot;</td>
<td>Deactivates the trace for connection with number &lt;id&gt;.</td>
</tr>
<tr>
<td>saprouter -t &quot;on &lt;IPaddress&gt;&quot;</td>
<td>Activates the trace for all new connections coming from the IP address &lt;IPaddress&gt;. You use this option if the connection is not yet open and you are looking for information to set up the connection.</td>
</tr>
<tr>
<td>saprouter -t &quot;off &lt;IPaddress&gt;&quot;</td>
<td>Deactivates the trace for all new connections coming from the IP address &lt;IPaddress&gt;.</td>
</tr>
<tr>
<td>saprouter -t &quot;on &lt;subnet&gt;&quot;</td>
<td>&lt;subnet&gt; specifies a set of IP addresses. The command activates the trace for all new connections coming from this subnetwork.</td>
</tr>
<tr>
<td>saprouter -t &quot;off &lt;subnet&gt;&quot;</td>
<td>Deactivates the trace for all new connections coming from this subnetwork.</td>
</tr>
</tbody>
</table>
Note

Connections for which the connection trace is activated are marked in the connection overview with an asterisk (*). You can display the connection overview with option -l. You can find the trace information in the trace file dev_rout.

Procedure

1. To change the trace level in a productive system, enter option -t in the input field:
   - Windows/Unix: saprouter -t<Trace-Level>
   - IBM: saprouter '-t<Trace-Level>'

2. Optional: To activate the trace for single connections, enter option -t in the input field:
   - Windows/Unix: saprouter -t<command>
   - IBM: saprouter ' -t<command>'

Example

You activate the trace for connection number 4 by sending the command saprouter -t "on 4" to the active SAProuter.

Then you call saprouter -l (IBM: saprouter ' -l') to display the connections. You get the following output:

```
SAP Network Interface Router running on port 3299 (PID = 1576962) Started on: Wed Apr 13 09:00:10 2005 ID CLIENT | PARTNER service ------------------------------ +------------------------------- 7 localhost | (no partner) 6 10.18.203.8 | 10.17.74.118 3227 4 *10.18.203.8 | 10.17.74.118 3227 2 10.18.203.8 | 10.17.74.118 3227 Total no. of clients: 7 Working directory : /usr/sap/PRD/work Routtab : ./saprouttab
```

The asterisk (*) is the trace for connection 4.

Related Information

- SAProuter Configuration and Administration - Overview [page 17]
- SAProuter Trace File [page 42]
- Specifying the Trace File: Option -T [page 43]
- Changing the Trace Level when SAProuter is Started: Option -V [page 43]
- Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]
- Emptying the Internal Buffer: Option -f (flush buffers) [page 46]
4.6.4 Writing Detailed Information to the Trace File: Option -d (dump buffers)

Enter option -d in the input field to write detailed information on the host names involved in the connection and their IP addresses to the trace file (default dev_rout, or the name specified with option -T<trace file>). The trace file is not overwritten, the information is appended at the end.

- Windows/Unix: saprouter -d
- IBM: `saprouter '-d'

Related Information

SAProuter Configuration and Administration - Overview [page 17]
SAProuter Trace File [page 42]
Specifying the Trace File: Option -T [page 43]
Changing the Trace Level when SAProuter is Started: Option -V [page 43]
Changing the Trace Level in a Productive System: Option -t (toggle trace) [page 44]

Emptying the Internal Buffer: Option -f (flush buffers) [page 46]

4.6.5 Emptying the Internal Buffer: Option -f (flush buffers)

Enter option -f in the input field to empty the internal buffer. The internal buffer is written to the trace file with option -d.

- Windows/Unix: saprouter -f
- IBM: `saprouter '-f'

Related Information

SAProuter Configuration and Administration - Overview [page 17]
SAProuter Trace File [page 42]
Specifying the Trace File: Option -T [page 43]
Changing the Trace Level when SAProuter is Started: Option -V [page 43]
Changing the Trace Level in a Productive System: Option -t (toggle trace) [page 44]

Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]
SAProuter provides a number of optional functions. They are represented by a letter that is specified when SAProuter is started, or is sent to an active SAProuter. You can combine most of the options with each other by specifying an administration option and any number of other options.

If an invalid combination of SAProuter options is specified, SAProuter behaves as if only `saprouter` was specified and displays the online help.

Use the following syntax to specify options:

**Syntax UNIX/Windows:** `saprouter -<option>`

**Syntax IBM i:** `saprouter '<option>'`

---

**Note**

In the default configuration SAProuter does not permit any routes to itself. The "loopback" from SAProuter to itself can be permitted explicitly with option `-X`. This option can affect the security of your system because potential attackers could reconfigure SAProuter. Therefore, for security reasons SAP recommends you do not use this option. More information: [1853140](#)

---

### Administration Options

Administration options for SAProuter are sent to an active SAProuter, with the exception of the start option `-r`.

<table>
<thead>
<tr>
<th>Option</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| `-r`   | Start SAProuter  
Starting and Stopping SAProuter: Option `-r` and `-s` [page 29] |
| `-s`   | Stop SAProuter  
Starting and Stopping SAProuter: Option `-r` and `-s` [page 29] |
<p>| <code>-n</code>   | Re-Read Route Permission Table: Option <code>-n</code> [page 22] |
| <code>-t</code>   | Changing the Trace Level in a Productive System: Option <code>-t</code> (toggle trace) [page 44] |
| <code>-c</code>   | Closing the Connection: Option <code>-c</code> [page 37] |
| <code>-l</code> / <code>-L</code> | Displaying Connection Information: Option <code>-l</code> and <code>-L</code> [page 37] |</p>
<table>
<thead>
<tr>
<th>Option</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-d</td>
<td>Writing Detailed Information to the Trace File: Option -d (dump buffers) [page 46]</td>
</tr>
<tr>
<td>-f</td>
<td>Emptying the Internal Buffer: Option -f (flush buffers) [page 46]</td>
</tr>
<tr>
<td>-p</td>
<td>Triggering Soft Shutdown: Option -p [page 30]</td>
</tr>
</tbody>
</table>

### Additional Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Meaning</th>
<th>Default Value</th>
</tr>
</thead>
</table>
| -R     | Specifying the File for the Route Permission Table: Option -R <routtab> [page 21] | UNIX and IBM: ./saprouttab  
Windows: <lwk>:\usr\sap \saprouter\saprouttab |
<p>| -K     | Setting Up SNC Connections: Option -K [page 21] | - |
| -G     | Activating SAProuter Logging: Option -G [page 38] | No log file |
| -J     | Restricting the Size of the Log File: Option -J [page 39] | No size restriction |
| -T     | Specifying the Trace File: Option -T [page 43] | dev_rout in the directory of the SAProuter |
| -V     | Changing the Trace Level when SAProuter is Started: Option -V [page 43] | 1 |
| -E     | Preventing Overwriting of Trace and Log Files: Option -E [page 40] | - (Trace and log files are overwritten when the SAProuter is restarted) |
| -S     | Changing the SAProuter Port: Option -S [page 31] | 3299 |
| -C     | Changing the Maximum Number of Clients: Option -C [page 32] | 800 |
| -D     | Not Resolving IP Addresses from Incoming Connections: Option -D [page 36] | - |</p>
<table>
<thead>
<tr>
<th>Option</th>
<th>Meaning</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>Activating IPv6: Option -6 [page 36]</td>
<td>-</td>
</tr>
<tr>
<td>-Z</td>
<td>Setting Up a Standard Error Message for Clients: Option -Z [page 35]</td>
<td>-</td>
</tr>
<tr>
<td>-I</td>
<td>Specifying Network Interface for Outgoing Connections: Option -I [page 32]</td>
<td>-</td>
</tr>
<tr>
<td>-Y</td>
<td>Starting an Additional SAProuter with Maximum Number of Clients: Option -Y [page 34]</td>
<td>SAProuter is not automatically re-started (case n=1)</td>
</tr>
<tr>
<td>-H</td>
<td>Specifying Host Name and Password: Option -H [page 33]</td>
<td>-</td>
</tr>
<tr>
<td>-M</td>
<td>Specifying Ports for Outgoing Connections: Option -M [page 31]</td>
<td>-</td>
</tr>
</tbody>
</table>

**Expert Options**

⚠️ Caution

Use these options only after consulting SAP, or only if you are very experienced in this area.

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>-B &lt;buffer size&gt;</td>
<td>Maximum queue length per client</td>
<td>1 NI package</td>
</tr>
<tr>
<td>-Q &lt;queue size&gt;</td>
<td>Maximum heap memory for NI package</td>
<td>20,000,000 bytes</td>
</tr>
<tr>
<td>-W &lt;wait time L&gt;</td>
<td>Timeout for blocking network calls (if there is an error)</td>
<td>5000 msec</td>
</tr>
</tbody>
</table>

**Related Information**

- Standalone Program SAProuter [page 4]
- Uses and Functions of SAProuter [page 5]
- SAProuter Installation [page 10]
- SAProuter Configuration and Administration - Overview [page 17]
Identifying and Correcting Errors [page 51]
6 Identifying and Correcting Errors

If an error occurs while a SAProuter is in operation, an error message is displayed by the SAProuter client. The error message helps you to locate the cause of the error and find a solution.

Provided you have activated logging, if an error occurs you can find more information about error handling in the log file.

You should also search the SAP notes to find solutions to errors (component BC-CST-NI).

6.1 SAP Notes for SAProuter

Use

We recommend you always refer to the relevant SAP Notes if you experience problems with SAProuter. You will find these on the SAP Service Marketplace.

Note

You can also search for SAP Notes under component BC-CST-NI to find current corrections in the SAProuter environment.

<table>
<thead>
<tr>
<th>Note Number</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>0029684</td>
<td>STFK: Route Permission Denied</td>
</tr>
<tr>
<td>0062636</td>
<td>saprouter terminates on ending UNIX session</td>
</tr>
<tr>
<td>0063342</td>
<td>List: NI error codes</td>
</tr>
<tr>
<td>0164937</td>
<td>NiPBind: service 'sap????' in use</td>
</tr>
<tr>
<td>0104576</td>
<td>Package filter between ITS and R/3</td>
</tr>
<tr>
<td>0042692</td>
<td>Test tool for RFC connections: sapinfo</td>
</tr>
<tr>
<td>0066168</td>
<td>Required documents when analyzing RFC problems</td>
</tr>
<tr>
<td>0025917</td>
<td>Changes to /etc/hosts are not accepted</td>
</tr>
<tr>
<td>0147021</td>
<td>&quot;Address already in use&quot; due to TCP state</td>
</tr>
<tr>
<td>0037211</td>
<td>ftp not via SAProuter : &quot;connection refused&quot;</td>
</tr>
</tbody>
</table>
6.2 SAProuter Error Messages

A SAProuter error message typically consists of eight or more lines.

The first two lines tell you:

- The host on which the SAProuter is running
- The application area the error belongs to

If there is no LOCATION entry, the error message refers to a local program.

The information after the blank line is particularly relevant for internal errors. If you cannot fix the error and want to set up a connection with SAP, the detailed information may be helpful.

The most frequent error messages are:

- **Route permission denied**: The connection is not permitted and will not be opened by SAProuter.
- **Maximum number of clients reached**: SAProuter cannot open the connection because it has already opened the maximum number of connections.

### Example

**Lines in an Error Message**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SapRouter on myhost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR</td>
<td>partner not reached</td>
</tr>
<tr>
<td>RELEASE</td>
<td>710</td>
</tr>
<tr>
<td>COMPONENT</td>
<td>NI (network interface)</td>
</tr>
<tr>
<td>VERSION</td>
<td>39.2</td>
</tr>
</tbody>
</table>
In this example, SAProuter cannot set up the connection to its partner. We recommend you check the connection again.

Related Information

Standalone Program SAProuter [page 4]
Identifying and Correcting Errors [page 51]
Fixing Error: "Route permission denied" [page 53]
Fixing Error: "Maximum number of clients reached" [page 54]

6.2.1 Fixing Error: "Route permission denied"

Context

The error "route permission denied" occurs when SAProuter does not allow a connection because of the entries in the route permission table.

Procedure

1. Check the route permission table of SAProuter.
   Bear in mind that the first entry in the route permission table for which the source address, target address, and target port match, is decisive.
2. Change the route permission table, if required.
   With option `saprouter -l` or `saprouter -L` (IBM: `saprouter -l` or `saprouter -L`) you can display the directory containing the active SAProuter and route permission table.
3. You can import a modified route permission table with option `saprouter -n` (IBM: `saprouter -n`).

Related Information

Identifying and Correcting Errors [page 51]
SAProuter Error Messages [page 52]
6.2.2 Fixing Error: "Maximum number of clients reached"

Context

The error "maximum number of clients reached" occurs when SAProuter cannot accept any further clients because the maximum number has been reached (default 800). However, SAProuter continues running with all other clients.

Procedure

1. Perform a soft shutdown of SAProuter with option saprouter -p (IBM: saprouter '-p').
   Following a soft shutdown, SAProuter continues to run on a different port.

2. Optional: Restart SAProuter on the old port with option saprouter -C <number of clients> (IBM: saprouter '-C <number of clients>' and enter a higher number of clients.

3. Optional: You can automate the procedure from step 2 by starting SAProuter with option saprouter -Y (IBM: saprouter '-Y').
   In this case, a new SAProuter is started every time the client table becomes full.

Related Information

Identifying and Correcting Errors [page 51]
SAProuter Error Messages [page 52]
Fixing Error: "Route permission denied" [page 53]

6.3 Connection Setup Errors

The following errors can occur during the connection setup:

- The connection is refused due to the entries in the route permission table (route permission denied).
  Fixing Error: "Route permission denied" [page 53]
- SAProuter cannot accept any further client (maximum number of clients reached)
  Fixing Error: "Maximum number of clients reached" [page 54]
- Connect fails because the server is not running (connection refused)
- TCP/IP connect takes too long (could not establish connection within <Timeout -W>)
- Route setup takes too long (no route completion within <Timeout -W>)
- No route permission for the connection (route permission denied)
- Error on the subsequent host (partner not reached/route permission denied)
Connect fails because the server is not running (connection refused)

The log file contains the following entries:

Thu Jun 14 13:18:22 2007 CONNECT FROM C9/- host 10.66.66.90/35169 (host2.company.corp)
Thu Jun 14 13:18:22 2007 CONNECT TO S9/17 host 10.66.66.91/3299 (host1)
Thu Jun 14 13:18:22 2007 DISCONNECT S9/17 host 10.66.66.91/3299 (host1)

The client issues the error message below:

*********************************************************************** * LOCATION SAProuter 39.1 (SP3) on 'ld8060' * ERROR partner '10.66.66.91:3299' not reached * * TIME Thu Jun 14 13:18:22 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -92 * MODULE nixxi.cpp * LINE 3068 * DETAIL NiPConnect2: 10.66.66.91:3299 * SYSTEM CALL connect * ERRNO 111 * ERRNO TEXT Connection refused * COUNTER 4 ***********************************************************************

Explanation:

On the server side there is no program running that listens to IP address 10.66.66.91 and port 3299 (LISTEN).

Solution approach:

- Check that the host name/IP address and server name/port number are correct.
- Check that the SAProuter and the system or corresponding program on the server is running and is using the correct port (OS command `netstat -an`).

TCP/IP connect takes too long (longer than the timeout -W value)

The log file contains the following entries:

Thu Jun 14 13:22:01 2007 CONNECT FROM C10/- host 10.66.66.90/41060 (host2.company.corp)
Thu Jun 14 13:22:01 2007 CONNECT TO S10/18 host 1.1.1.1/3299 (1.1.1.1)
Thu Jun 14 13:22:06 2007 CONNECT ERR S10/18 could not establish connection within 5s
Thu Jun 14 13:22:06 2007 DISCONNECT S10/18 host 1.1.1.1/3299 (1.1.1.1)

The client issues the error message below:

*********************************************************************** * LOCATION SAProuter 39.1 (SP3) on 'ld8060' * ERROR connection to 1.1.1.1:3299 timed out * * TIME Thu Jun 14 13:22:06 2007 * RELEASE 710 * COMPONENT NI (network interface) *
Explanation:
In this example, the TCP/IP connection from the SAProuter to the next node (the next SAProuter, a system, or another network component) could not be established within a specified timeout period.

Solution approach:
This error can occur if the server host is down or the IP address of the host cannot be reached.

It can also be due to the network failing to establish the TCP/IP connection within 5 seconds (the timeout value defined in option -W).

You may be able to solve this problem by using a greater value for option -W.

Route setup takes too long

The log file contains the following entries:

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thu Jun 14 13:34:19 2007</td>
<td>CONNECT FROM C15/- host 10.66.66.90/41070 (host2.company.corp)</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14 13:34:19 2007</td>
<td>CONNECT TO S15/23 host 10.21.72.60/3299 (host3)</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14 13:34:24 2007</td>
<td>CONNECT ERR S15/23 no route completion within 5s; check SAProuter on 'host3'</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14 13:34:24 2007</td>
<td>DISCONNECT S15/23 host 10.21.72.60/3299 (host3)</td>
<td></td>
</tr>
</tbody>
</table>

The client issues the error message below:

```
***********************************************************************
LOCATION SAProuter 39.1 (SP3) on 'ld8060' * ERROR connection to host3:3299 timed out *
TIME Thu Jun 14 13:34:24 2007 * RELEASE 710 * COMPONENT NI (network interface) *
VERSION 39 * RC -5 * MODULE nirout.cpp * LINE 6537 * DETAIL RTPENDLIST::timeoutPend: no route completion within 5s * (ROUTED) * COUNTER 17
***********************************************************************
```

Explanation:
The SAProuter is able to connect to the next host using TCP/IP, but the next host takes too long to establish the route to the destination. It receives no NI_PONG (confirmation that the route has been established) within the -W timeout period.

Solution approach:
- Find out why the subsequent SAProuter was unable to establish the connection within 5 seconds (in this example). It might be due to slow name resolution, for example. The log and trace files should provide further information on this.
In the case of connections using multiple SAP routers in a WAN environment, increase option -W. If multiple SAP routers are involved in setting up a connection and the network response times are relatively high, the default value of 5 seconds is not sufficient to enable the connection to the target system to be established.

**No route permission for the connection**

The log file contains the following entries:

```plaintext
Thu Jun 14 14:18:20 2007 CONNECT FROM C10/- host 10.66.66.90/63669 (host2.company.corp)
Thu Jun 14 14:18:20 2007 PERM DENIED C10/- host 10.66.66.90 (host2.company.corp) to host1/3254
Thu Jun 14 14:18:20 2007 DISCONNECT C10/- host 10.66.66.90/63669 (host2.company.corp)
```

The client issues the error message below.

```plaintext
************************************************************************
* LOCATION SAProuter 39.1 (SP3) on 'ld8060' *
* ERROR ld8060: route permission denied (host2.company.corp to * host1, 3254) *
* TIME Thu Jun 14 14:18:20 2007 *
* RELEASE 710 *
* COMPONENT NI (network interface) *
* VERSION 39 *
* RC -94 *
* COUNTER 5 *
************************************************************************
```

**Explanation:**

The SAP router rejects the connection because the route permission table does not allow it.

**Solution approach:**

Check the route permission table.

**Error on the subsequent host**

This error does not occur on the local SAP router. Instead, it occurs on a subsequent host. Messages of the following type appear in the log of the local SAP router:

```plaintext
Thu Jun 14 14:42:53 2007 CONNECT FROM C10/- host 10.66.66.90/30005 (host2.company.corp)
Thu Jun 14 14:42:53 2007 CONNECT TO S10/18 host 10.21.72.60/3299 (host3)
Thu Jun 14 14:42:54 2007 CONNECT ERR S10/18 NIEROUT_INTERN on 'SAProuter 37.15 on hs0126'
Thu Jun 14 14:42:54 2007 DISCONNECT S10/18 host 10.21.72.60/3299 (host3)
```

or
Thu Jun 14 14:40:28 2007 CONNECT FROM C9/- host 10.66.66.90/24016 (host2.company.corp)
Thu Jun 14 14:40:28 2007 CONNECT TO S9/17 host 10.21.72.60/3299 (host3), *** NATIVE ROUTING ***
Thu Jun 14 14:40:28 2007 CONNECT ERR S9/17 NIEROUT_PERM_DENIED on 'SAProuter 39.0 on 'host3'', *** NATIVE ROUTING ***
Thu Jun 14 14:40:28 2007 DISCONNECT S9/17 host 10.21.72.60/3299 (host3), *** NATIVE ROUTING ***

The client issues the error message below:

************************************************************************ LOCATION
SAProuter 37.15 on hs0126 * ERROR partner not reached (host 10.66.66.91, service 3298) * * TIME Thu Jun 14 14:42:54 2007 * RELEASE 640 * COMPONENT NI (network interface) * VERSION 37 * RC -93 * MODULE nixxi.cpp * LINE 8724 * DETAIL
NiPConnect2 * SYSTEM CALL SiPeekPendConn * ERRNO 239 * ERRNO TEXT Connection refused * COUNTER 5
************************************************************************

or

************************************************************************ LOCATION
SAProuter 39.0 on 'host3' * ERROR host3: route permission denied (host2.company.corp to * host1, 3253) * * TIME Thu Jun 14 14:40:28 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -93 * COUNTER 3
************************************************************************

Solution approach:

Check the log and trace files on the SAProuter where the error occurred if the information already provided is not sufficient. The SAProuter error message that is normally displayed on the client contains information on the error. The LOCATION line tells you the location of the error.

Related Information

Standalone Program SAProuter [page 4]
Identifying and Correcting Errors [page 51]

6.4 Connection Terminations

Connection terminations can be triggered from both the client side and the server side.
Connection Terminations from the Server Side

The following entries appear in the log file when a connection termination is triggered from the server side (if the local SAProuter is the client):

Thu Jun 14 16:08:47 2007 CONNECT FROM C18/- host 10.66.66.90/24761 (host2.company.corp)
Thu Jun 14 16:08:47 2007 CONNECT TO S18/10 host 10.21.83.41/3299 (host2)
Thu Jun 14 16:08:47 2007 ESTABLISHED S18/10
Thu Jun 14 16:08:58 2007 DISCONNECT S18/10 host 10.21.83.41/3299 (host2)

or

Thu Jun 14 16:09:50 2007 CONNECT FROM C19/- host 10.66.66.90/24847 (host2.company.corp)
Thu Jun 14 16:09:50 2007 CONNECT TO S19/11 host 10.21.72.60/3298 (ldp007)
Thu Jun 14 16:09:50 2007 ESTABLISHED S19/11
Thu Jun 14 16:10:02 2007 DISCONNECT S19/11 host 10.21.72.60/3298 (ldp007) RST

The client issues the error message below:

********************************************************************** LOCATION SAProuter 39.0 on 'host2' * ERROR connection to partner '10.21.72.60:3298' broken * TIME Thu Jun 14 16:08:58 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -95 * MODULE nixxi.cpp * LINE 4660 * DETAIL NiIRead: P=10.21.72.60:3298; L=?? * SYSTEM CALL recv * ERRNO 232 * ERRNO TEXT Connection reset by peer * COUNTER 17
**********************************************************************

or

********************************************************************** LOCATION SAProuter 39.1 (SP3) on 'host1' * ERROR connection to partner '10.21.72.60:3298' broken * TIME Thu Jun 14 16:10:02 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -95 * MODULE nixxi.cpp * LINE 4660 * DETAIL NiIRead: P=10.21.72.60:3298; L=10.66.66.90:24848 * SYSTEM CALL recv * ERRNO 104 * ERRNO TEXT Connection reset by peer * COUNTER 10
**********************************************************************
Connection Terminations from the Client Side

The following entries appear in the log file when a connection termination is triggered from the client side (if the local SAProuter is the server):

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Event</th>
<th>Host</th>
<th>IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thu Jun 14</td>
<td>16:13</td>
<td>CONNECT FROM</td>
<td>C20/- host</td>
<td>10.66.66.90/24849</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>host2.company.corp</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14</td>
<td>16:13</td>
<td>CONNECT TO</td>
<td>S20/12 host</td>
<td>10.21.83.41/3299</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>host2</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14</td>
<td>16:13</td>
<td>ESTABLISHED</td>
<td>S20/12</td>
<td></td>
</tr>
<tr>
<td>Thu Jun 14</td>
<td>16:13</td>
<td>DISCONNECT</td>
<td>C20/12 host</td>
<td>10.66.66.90/24849</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>host2.company.corp</td>
<td>RST</td>
</tr>
</tbody>
</table>

There is no error message with errInfo because the error is on the client side.

Explanation/solution:

The **DISCONNECT** entry in the log file tells you the side where the connection termination was triggered. You can use this information to find the node/program that first closed the connection. The trace file for this program contains more information on the cause of the connection termination.

In some cases, the connection between the two programs can be terminated without either side triggering the termination. For example, this is the case if two SAProuters with a direct TCP/IP connection both record that the other side triggered the connection termination. This means that an active network component between the two programs terminated the TCP/IP connection. The network component concerned is often a firewall or a router with an idle timeout. If this occurs, check the network.

The **DISCONNECT** log entry also tells you whether or not the connection was closed in a TCP/IP-compliant manner. **RST** at the end of the line indicates a retransmit timeout. This means that the other side or an active network component between the two sides of the TCP/IP connection ended the connection incorrectly. This can be caused by the program crashing, the connection being closed too early at application level, or a firewall.

Related Information

*Standalone Program SAProuter* [page 4]
*Identifying and Correcting Errors* [page 51]
6.5 Other Errors

The following errors occur only rarely:

- The SAProuter receives incorrect data. This can happen if the route is too short or if the system overlooks the fact that the connection is to a SAProuter rather than a backend connection.
- The SAProuter receives the route information too late (TCP/IP connection setup was successful).
- The SAProuter is the client and it receives an incorrect response from the server.
- The SAProuter is the server and it receives the data from the client too early.
- SNC not active for a forwards connection
- SNC not active for a backwards connection

Incorrect data sent to the SAProuter

The log file contains the following entries:

```
Thu Jun 14 09:55:36 2007 CONNECT FROM C10/- host 10.66.66.90/34506 (host1.company.corp)
Thu Jun 14 09:55:36 2007 INVAL DATA C10/- route expected
Thu Jun 14 09:55:36 2007 DISCONNECT C10/- host 10.66.66.90/34506 (host1.company.corp)
```

The client issues the error message below:

```
*********************************************************************** * LOCATION
SAProuter 39.1 (SP3) on 'host1' * ERROR internal error * * TIME Thu Jun 14 09:55:36
2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -93 *
MODULE nirout.cpp * LINE 2664 * DETAIL NiRClientHandle: route expected * COUNTER 4
***********************************************************************
```

Explanation:

The client program sends incorrect data to the SAProuter. This is usually the case if the client assumes that it is already communicating with the target system but the connection was actually established to an SAProuter that has to wait for a route first.

Solution approach:

Check the parameters for the connection setup on the client.
Route sent too late

The log file contains the following entries:

```plaintext
Thu Jun 14 12:27:27 2007 CONNECT FROM C11/- host 10.66.66.90/35087 (host1.company.corp)
Thu Jun 14 12:27:32 2007 CONNECT ERR C11/- no route received within 5s
Thu Jun 14 12:27:32 2007 DISCONNECT C11/- host 10.66.66.90/35087 (host1.company.corp)
```

The client issues the error message below:

```
***********************************************************************
* LOCATION SAProuter 39.1 (SP3) on 'host1' * ERROR connection timed out * TIME Thu Jun 14 12:27:32 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -5 * MODULE nirout.cpp * LINE 6519 * DETAIL RTPENDLIST::timeoutPend: no route received within 5s * (CONNECTED) * COUNTER 5
***********************************************************************
```

Explanation/solution:

The connection setup (connect) was successful but the client sends the route to the SAProuter too late, or the client assumes that it is already connected to the server and is waiting for data, or the timeout -W is exceeded.

This error can occur if the client does not send the route quickly enough after the TCP/IP connect to the SAProuter. This might be caused by the client hanging temporarily.

Incorrect response from the server

The log file contains the following entries:

```plaintext
Thu Jun 14 13:59:43 2007 CONNECT FROM C9/- host 10.66.66.90/46915 (host1.company.corp)
Thu Jun 14 13:59:43 2007 CONNECT TO S9/17 host 10.66.66.91/3253 (host2)
Thu Jun 14 13:59:43 2007 DISCONNECT S9/17 host 10.66.66.91/3253 (host2)
```

The client issues the error message below:

```
***********************************************************************
* LOCATION SAProuter 39.1 (SP3) on 'host1' * ERROR internal error * TIME Thu Jun 14 13:59:43 2007 * RELEASE 710 * COMPONENT NI (network interface) * VERSION 39 * RC -93 * MODULE nirout.cpp * LINE 2694 * DETAIL NiRClientHandle: invalid data from server 'host2' during route completion * COUNTER 3
***********************************************************************
```
Explanation:
If a server-side program other than a SAProuter responds, or if the back end responds, the SAProuter cannot use the response. It needs another SAProuter as the server.

Solution approach:
Check the parameters for the connection setup on the client.

Data received too early from the client

If the SAProuter, as the server, receives data from the client before the route is established, the following entries appear in the log file:

```
Thu Jun 14 14:15:00 2007 CONNECT FROM C10/- host 10.66.66.90/52640 (host1.company.corp)
Thu Jun 14 14:15:00 2007 CONNECT TO S10/18 host 10.66.66.91/3253 (host2)
Thu Jun 14 14:15:00 2007 CONNECT ERR C10/18 invalid data form client during route completion
Thu Jun 14 14:15:00 2007 DISCONNECT C10/18 host 10.66.66.90/52640 (host1.company.corp)
```

The client issues the error message below:

```
***********************************************************************
* LOCATION SAProuter 39.1 (SP3) on 'host1' * ERROR internal error *
* TIME Thu Jun 14 14:15:00 2007 * RELEASE 710 * COMPONENT NI (network interface) *
* VERSION 39 * RC -93 * MODULE nirout.cpp * LINE 2688 * DETAIL NiRClientHandle: invalid data from client *
* 'host1.company.corp' during route completion * COUNTER 5
***********************************************************************
```

Explanation:
The client program is behaving incorrectly.

Solution approach:
Check for a more recent version of the client program.
Data received too early from the server

The log file contains the following entries:

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thu Jun 14 13:59:43</td>
<td>CONNECT FROM C9/- host 10.66.66.90/46915 (host1.company.corp)</td>
</tr>
<tr>
<td>Thu Jun 14 13:59:43</td>
<td>CONNECT TO S9/17 host 10.66.66.91/3253 (host2)</td>
</tr>
<tr>
<td>Thu Jun 14 13:59:43</td>
<td>CONNECT ERR S9/17 invalid data from server during route completion</td>
</tr>
<tr>
<td>Thu Jun 14 13:59:43</td>
<td>DISCONNECT S9/17 host 10.66.66.91/3253 (host2)</td>
</tr>
</tbody>
</table>

The client issues the error message below:

```
***********************************************************************
LOCATION SAProuter 39.1 (SP3) on 'host1' * ERROR internal error *
TIME Thu Jun 14 13:59:43 2007 * RELEASE 710 * COMPONENT NI (network interface) *
VERSION 39 * RC -93 * MODULE nirout.cpp * LINE 2694 * DETAIL NiRClientHandle: invalid data from server
'host2' during * route completion * COUNTER 3
***********************************************************************
```

Solution approach:

Check the version of the SAProuter on the server side and update the program if necessary.

SNC not active for a forwards connection

The log file contains the following entries:

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>CONNECT FROM C18/- host 10.66.66.90/30891 (host1.company.corp)</td>
</tr>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>CONNECT TO S18/10 host 10.18.211.3/3299 (10.18.211.3) (p:CN=D039768, O=SAP-AG, C=DE)</td>
</tr>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>CONNECT ERR S18/10 forwarding route failed NIESNC_FAILURE</td>
</tr>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>DISCONNECT C18/10 host 10.66.66.90/30891 (host1.company.corp)</td>
</tr>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>CONNECT FROM C9/- host 10.18.211.3/1168 (host3.wdf.sap.corp)</td>
</tr>
<tr>
<td>Thu Jun 14 17:16:40</td>
<td>DISCONNECT C9/- host 10.18.211.3/1168 (host3.wdf.sap.corp)</td>
</tr>
</tbody>
</table>

SAProuter Error Message on Client Side:
Explanation:
The SAProuter on the server side has not activated SNC.

Solution approach:
Restart the SAProuter on the server side with the option `-K mysncname`.

SNC not active for a backwards connection

The log file contains the following entries:

```plaintext
Thu Jun 14 17:08:19 2007 CONNECT FROM C9/- host 10.66.66.90/30883 (host1.company.corp)
Thu Jun 14 17:08:19 2007 CONNECT TO S9/17 host 10.18.211.3/3299 (10.18.211.3)
Thu Jun 14 17:08:19 2007 CONNECT ERR S9/17 NIESNC_FAILURE on 'SAProuter 39.1 (SP3) on host3'
Thu Jun 14 17:08:19 2007 DISCONNECT S9/17 host 10.18.211.3/3299 (10.18.211.3)
```

```plaintext
Thu Jun 14 17:08:19 2007 CONNECT FROM C12/- host 10.18.211.3/1119 (host3.wdf.sap.corp)
Thu Jun 14 17:08:19 2007 CONNECT TO S12/20 host 10.66.66.91/3253 (host2)
Thu Jun 14 17:08:19 2007 CONNECT ERR C12/20 NIECONN_BROKEN on 'SAProuter 39.1 (SP3) on host3'
Thu Jun 14 17:08:19 2007 DISCONNECT C12/20 host 10.18.211.3/1119 (host3.wdf.sap.corp)
```

SAProuter Error Message on Client Side:

```plaintext
*********************************************************************** * LOCATION
SAProuter 39.1 (SP3) on 'host3' * ERROR SNC processing failed: * SNC not enabled *
* TIME Thu Jun 14 17:08:19 2007 * RELEASE 710 * COMPONENT NI (network interface) *
VERSION 39 * RC -104 * MODULE nisnc.c * LINE 566 * DETAIL NiSncOpcode: NISNC_REQ *
COUNTER 4 ***********************************************************************

Explanation:
The SAProuter on the client side has not activated SNC.
Solution approach:
Restart the SAProuter on the client side with the option -K mysncname.

Related Information

Standalone Program SAProuter [page 4]
Identifying and Correcting Errors [page 51]

6.6 Successful Connection Setup and Data Transfer - An Example

When the connection is set up and data transferred without any errors, you can see the following entries in the log file:

Operation Without SNC

Thu Jun 14 16:08:04 2007 CONNECT FROM C9/- host 10.66.66.90/19114 (host1.company.corp)
Thu Jun 14 16:08:04 2007 CONNECT TO S9/17 host 10.21.83.41/3299 (host2)
Thu Jun 14 16:08:06 2007 ESTABLISHED S9/17
Thu Jun 14 16:21:06 2007 DISCONNECT C9/17 host 10.66.66.90/19114 (host1.company.corp)
Thu Jun 14 14:28:40 2007 CONNECT FROM C19/- host 10.66.66.90/12127 (host1.company.corp)
Thu Jun 14 14:28:40 2007 CONNECT TO S19/11 host 10.21.72.60/3299 (host3), *** NATIVE ROUTING ***
Thu Jun 14 14:28:41 2007 ESTABLISHED S19/11, *** NATIVE ROUTING ***
Thu Jun 14 14:58:43 2007 DISCONNECT S19/11 host 10.21.72.60/3299 (host3), *** NATIVE ROUTING ***

Operation with SNC

When using SNC for data communication between two SAProuters there are two different mechanisms for setting up the connection.
SNC Forwards Setup

With this mechanism, client-side SAProuter initiates the SNC connection/encryption. The SAProuter on the client-side has an entry of the type KT in the router permission table for the server-side SAProuter and therefore establishes the SNC connection. The SNC name is written to the ‘CONNECT TO’ log when the connection to the server-side SAProuter is established. The ‘ESTABLISHED’ log displays the recipient side of the SNC communication once the connection has been set up successfully.

Client Side

Thu Jun 14 17:13:22 2007 CONNECT FROM C9/- host 10.66.66.90/30888 (host1.company.corp)
Thu Jun 14 17:13:25 2007 CONNECT TO S9/17 host 10.18.211.3/3299 (10.18.211.3) (p:CN=D039768, O=SAP-AG, C=DE)
Thu Jun 14 17:19:12 2007 DISCONNECT C9/17 host 10.66.66.90/30888 (host1.company.corp)

Server Side

Thu Jun 14 17:13:22 2007 CONNECT FROM C9/- host 10.18.211.3/1150 (host2)
Thu Jun 14 17:13:25 2007 CONNECT TO S9/17 host 10.66.66.91/3253 (binmain)
Thu Jun 14 17:13:25 2007 ESTABLISHED S9/17 (SNC/-)
Thu Jun 14 17:19:12 2007 DISCONNECT C9/17 host 10.66.66.90/30888 (host1.company.corp)

SNC Backwards Setup

The server-side SAProuter can also initiate SNC. This is what happens if the incoming connection from the client-side SAProuter does not use SNC (see above) but the server-side SAProuter requires it due to the relevant entries in the route permission table. In this scenario, the SNC handshake is triggered by the server-side SAProuter later on. This means that there is no SNC name in the ‘CONNECT TO’ entry in the log on the client side.

Client Side

Thu Jun 14 16:55:21 2007 CONNECT FROM C9/- host 10.18.211.3/1065 (host2)
Thu Jun 14 16:55:21 2007 CONNECT TO S9/17 host 10.18.211.3/3299 (10.18.211.3)
Thu Jun 14 16:56:42 2007 DISCONNECT S9/17 host 10.18.211.3/3299 (10.18.211.3)

Server Side
Thu Jun 14 16:55:21 2007 CONNECT FROM C9/- host 10.18.211.3/1066 (host2)
Thu Jun 14 16:55:21 2007 ESTABLISHED S9/17 (SNC/-)
Thu Jun 14 16:56:42 2007 DISCONNECT S9/17 host 10.66.66.91/3253 (host4.company.corp)

Related Information

Standalone Program SAProuter [page 4]
Identifying and Correcting Errors [page 51]
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