

# Configuring SS7 Signaling Network, SCCP, M3

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## OPERATING INSTRUCTION

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# 1 Overview

## 1.1 Description

This operating instruction describes, using an example, how to configure the SS7 stack layers SCCP and M3 . Nowadays M3 is obsolete and substituted by M3 IETF. If M3 IETF needs to be configured, see description in Configuring SS7 Signaling Network, M3 IETF. The SCCP and M3 configurations are described in this document for the following:

- A single node, see Figure 1

**Note:**

- This operating instruction is based on a configuration where MTP-L2 uses two Narrowband FEs.
- To make sure that there are always links running during node upgrade or similar, it is recommended to always split links between FEs, so called redundant links, according to Figure 1.

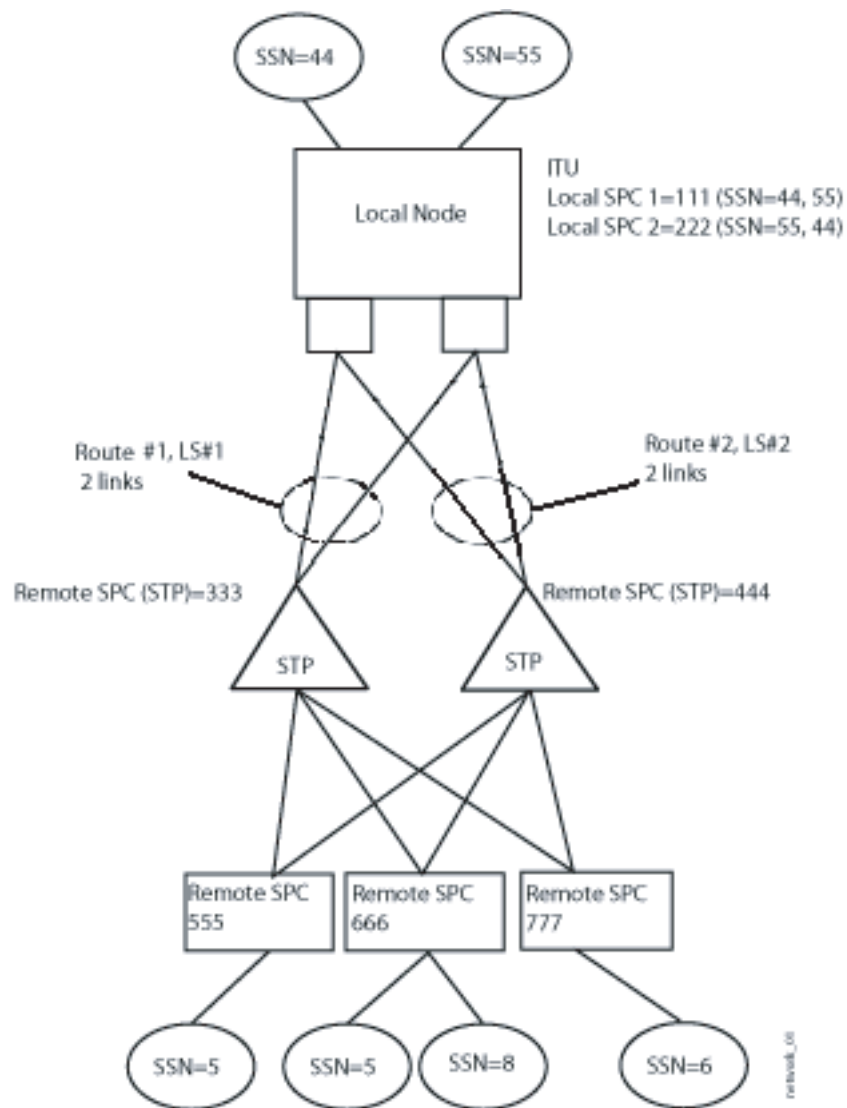


Figure 1 Network Configuration Example

## 1.2 Prerequisites

### 1.2.1 Documents

For configuration parameter information, see SCTP and M3 Information Models.

### 1.2.2 Tools

Not applicable.



### 1.2.3

#### Conditions

The first condition below (Configuring SS7, MTP-L2 IF ISR - NB,HSL or Configuring SS7, MTP-L2 IF ADAX- NB,HSL) should be met to be able to perform the Example configuration in this text. The example is shown in Figure 1. The other two conditions below are not described in the example, but can also be used as a base for network configurations.

- Configuration of FE's has been performed, according to Configuring SS7, MTP-L2 IF ISR - NB, HSL or Configuring SS7, MTP-L2 IF ADAX - NB, HSL.
- Configuration of FE's has been performed, according to Configuring SS7, SCTP.
- Configuration of FE's has been performed, according to Configuring SS7, FE HSSL ATM.







## 2 Procedure

**Note:** To view all elements that are shown in the figures you may need to turn on the **Expert Mode** under the **Tools** menu, but it is recommended to have it turned off.

### 2.1 Creating Local Sign Point

1. Expand **Signaling System** and the underlying structure to view the configuration.
2. Select **Sign Networks** and press the **Insert** key. An instance of a Local Signaling Point, named **Network #1** for the first network will be added. The number after # is the **Network ID** property taken from the Local Signaling Point instance added to the Sign Network instance.
3. Expand **Network #1** to view the default configured relations.

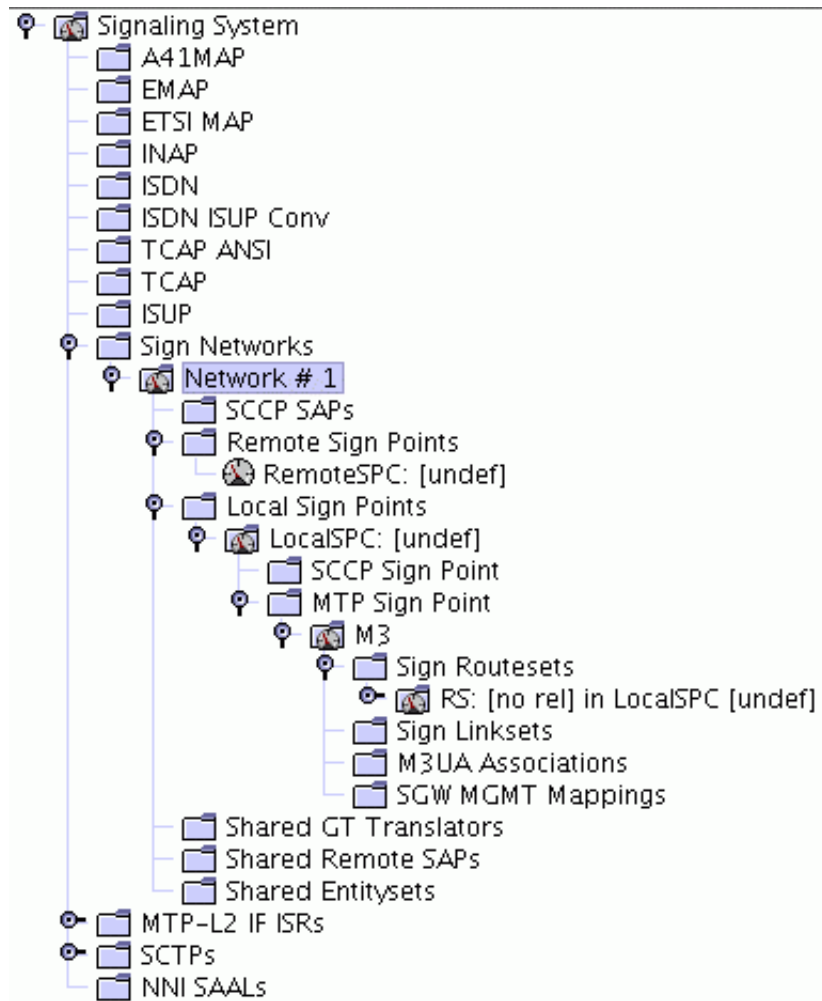


Figure 2 Sign Network Instance, Called Network #1, After Expansion

**Note:** The SCCP configuration is in the **SCCP Sign Point** and the M3 configuration is in the **M3** element which is added automatically by default in the **MTP Sign Point** element when an instance of **Sign Network** is added.

4. Set the properties shown in the following table to specify the Local Signaling Point:



Table 1 Local Signaling Point related Properties

Property Location	Property Name	Comments
Network #1	Network Indicator	<p>In the Example select <b>NI0</b>. Otherwise the possible values are:</p> <p><b>NI0</b>: International network</p> <p><b>NI1</b>: Spare (International use only)</p> <p><b>NI2</b>: National network</p> <p><b>NI3</b>: Reserved for national use</p>
Local SPC: [undef]	Local SPC	<p>In the Example set the value to: 111.</p> <p>The name of the <b>Local SPC: [undef]</b> in the navigation pane will be updated with the set value, for instance <b>Local SPC: 111</b> , if the set value is <b>111</b></p>
M3	Node Behaviour	<p>In the Example select: <b>SS7 End-Point</b>.</p> <p>If IP is also used in your configuration, you must select other options specified for IP End-Point or a combination of SS7 and IP End-Point.</p>

## 2.2 Configure SCCP SAPs

A Local SSN is defined as a **Subsystem Number** in an **SCCP SAPs** instance.

1. Add an element on **SCCP SAPs**. **SSN: [undef]** is added.
2. Select the added **SSN: [undef]** instance and edit its **Subsystem Number** property. The Subsystem Number 44 is used in the example. The **SSN: [undef]** will be updated with the set Subsystem Number value.
3. In the Example there is also a second SCCP SAP. Add a second SCCP SAP and set its Subsystem Number to 55, see figure below.

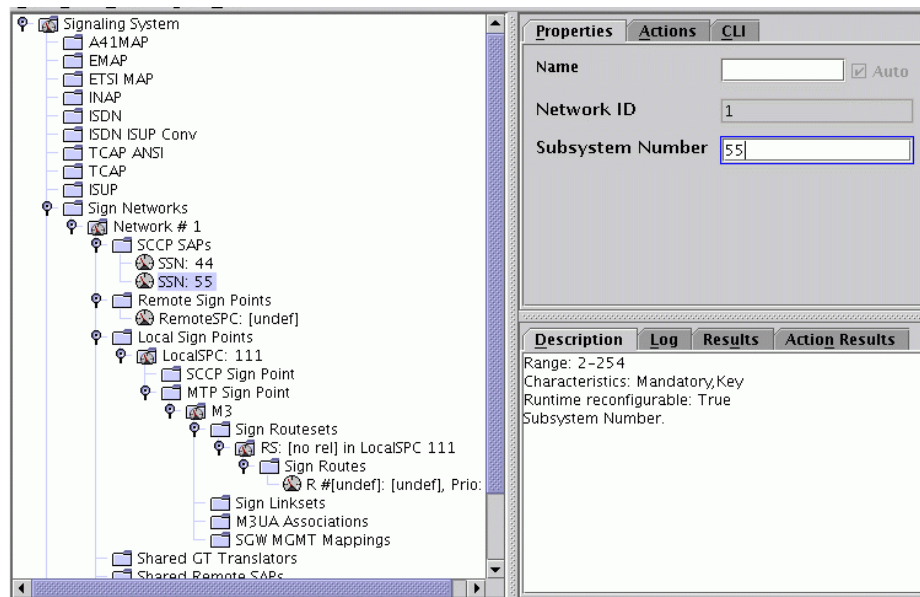


Figure 3 SCCP SAP Instances for the Example Are Added

## 2.3 Configure Remote Sign Points

A **RemoteSPC: [undef]** instance in **Remote Sign Points** was added by default when Step 2 was performed.

1. Select the added **RemoteSPC: [undef]** instance and edit its **Remote SPC** property. Element's name will be updated with the set Remote SPC value.
2. To add more Remote SPC instances, add an element on the recently defined Remote Sign Point. In the Example configuration add Remote SPC instances according to the figure below.

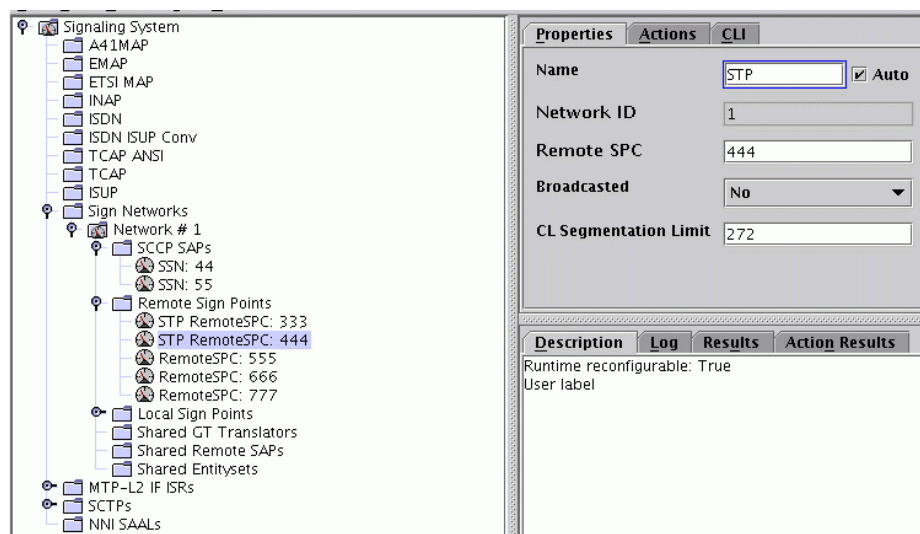


Figure 4 Remote SPC Instances for the Example Are Added



**Note:** In order to differentiate between an STP and an End Point, “STP” can be entered in the **Name** field. This will make your configuration easier to read.

## 2.4 Configure SCCP: Local SAP

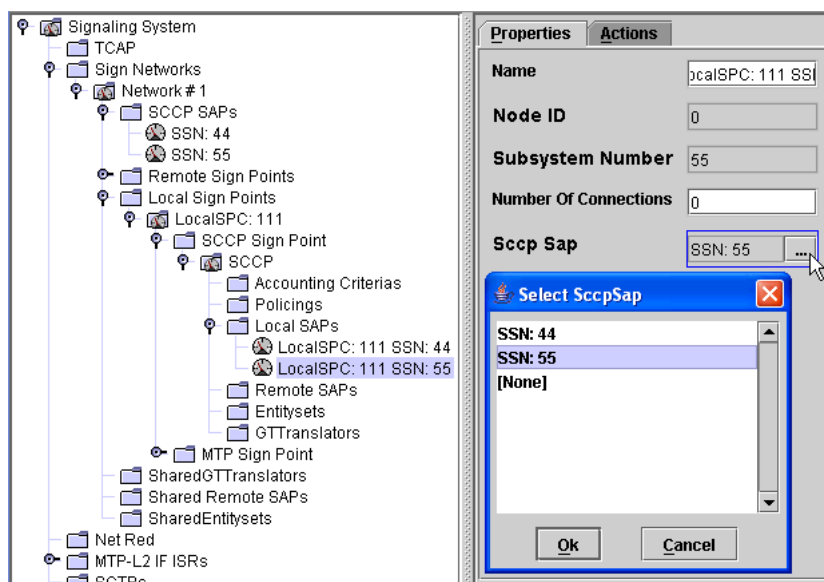
To add Local SAPs:

1. Add an element on **SCCP Sign Point**. An **SCCP** element is added. In the **SCCP** element set the **Timer Reconnect** property to for example 5000.

In the Example the **SCCP Sign Point** group-element is located under the **LocalSPC:111** that was defined in an earlier step.

In the example there are no TCAP elements added at this stage, therefore there will be a validation error in the **SCCP** element for the **Node Used by TCAP** property. This property can be set to **No** to create a valid configuration without TCAP, but that is outside the scope of the example.

2. Add an element on **Local SAPs** in **SCCP**. In the Example a **LocalSPC: 111 SSN: [undef]** element is added.
3. Select the added **LocalSPC: 111 SSN: [undef]** instance, and assign the **SccpSap** reference.



**Figure 5** Select SCCP SAPs Which Are Created in “Configure Local SSN” Step

The Local SAP **Subsystem Number** property and its name will be updated with the set SSN value.

**Note:** Steps in this section must be repeated for each required Local SAP for your configuration. In the Example in this document, two Local SAPs (SSN=44 and SSN=55) are needed for each Local SPC.

## 2.5 Configure M3: Sign Linksets and Links

The steps in this section are valid when the **Node Behaviour** defined in Step 4 is using SS7.

### 2.5.1 Sign Linksets

1. Add an element on **Sign Linksets** for the **M3** of a **Local Sign Points** instance, for example **Local SPC: 111**. An instance of Sign Linkset, initially called **LS # 1 --> Adjacent RemoteSPC: [no rel]** is added.

**Note:** As is visible in the name of the added **LS # 1 --> Adjacent RemoteSPC: [no rel]** the Adjacent RemoteSPC relation is not set by default.

2. Select the added Link set instance, for example **LS # 1 --> Adjacent RemoteSPC: [no rel]**, and assign the **Adjacent SPC** reference.

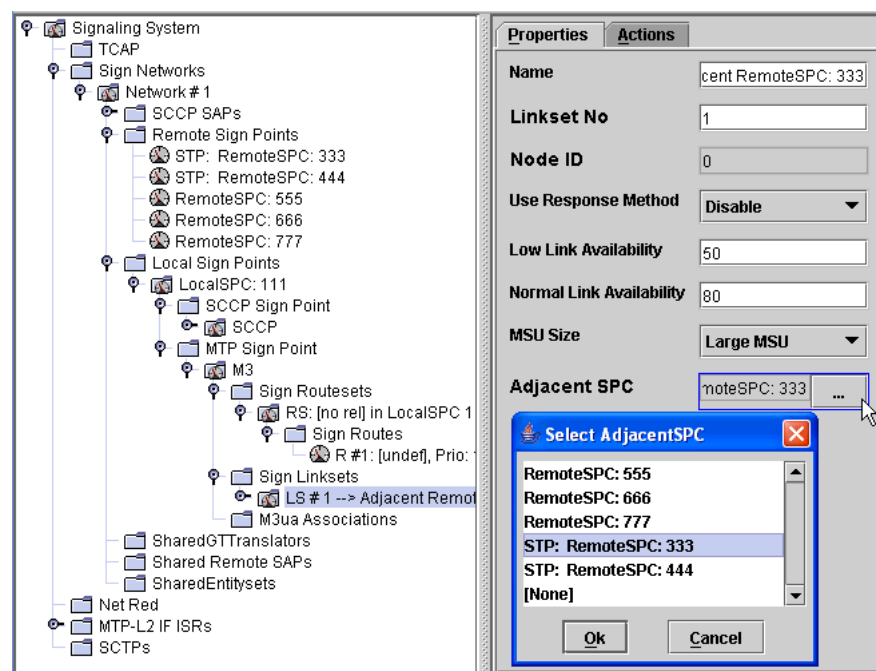


Figure 6 Select AdjacentSPC Instances

### 2.5.2 Sign Links of a Linkset

The first Link called **[no rel]SLC: 0** was already added by default when a Linkset was added. In order to make more links, perform Step 4 in this section.



**Note:** As it is visible in the name of the added **[no rel]SLC: 0**, the **L2Link** relation which is a reference to a physical timeslot of a trunk on an MTP-L2 IF ISR or ADAX, is not set initially. When this reference is set the name of the link will be updated, for instance as **FE 0: ISR Link PCMA:0, SLC: 0**

3. Select **[no rel]SLC: 0** and assign the **L2Link** reference.

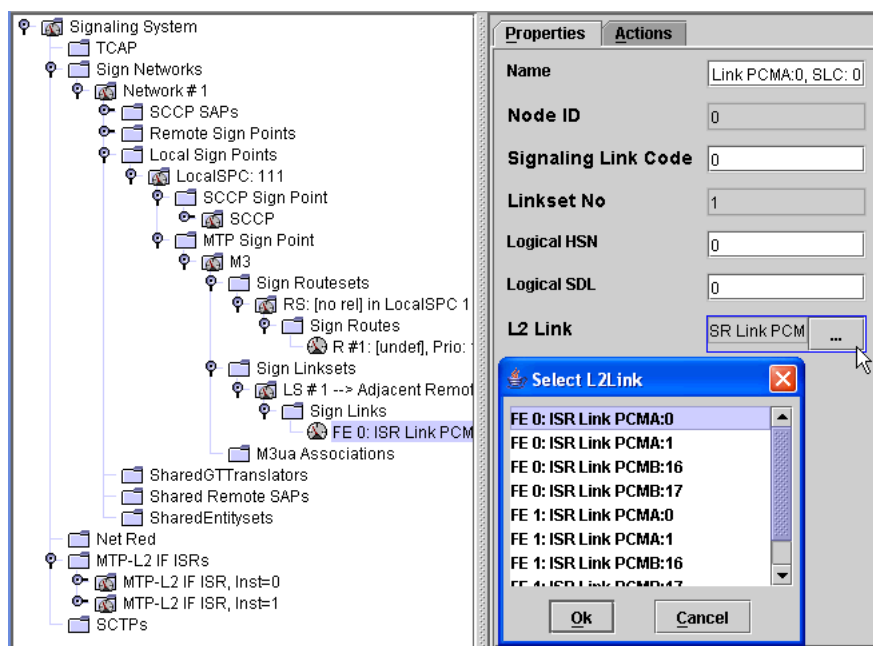


Figure 7 Select L2Link Instances

**Note:** The **M3–Link Normal Activation** action must be performed when links are added during the reconfiguration mode, in order to activate the added links.

4. To add more links, press the **Insert** button while the previous link is selected. The SLC and L2Link are both automatically increased to the next available value, but may need to be updated.

### 2.5.3 Example Linksets and Links

To follow the example create the Linksets and Links according to the below figure:

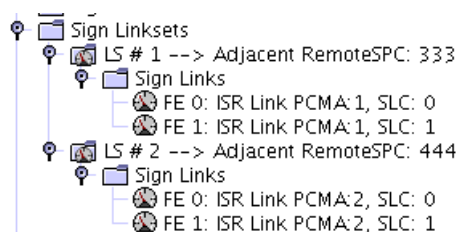


Figure 8 Example Linksets and Links

## 2.6 Configure M3: Sign Routesets and Routes

### 2.6.1 Sign Routeset

A Routeset is already added by default when the **M3** is added, it is called for instance **RS: [no rel] in LocalSPC 111** if M3 is added for **LocalSPC: 111**.

**Note:** As is visible in the name of the added **RS: [no rel] in LocalSPC 111**, the **Remote Sign Point** relation is not set by default. When this reference is set the name of the Routeset will be updated, for instance **RS: 333 in LocalSPC 111**, if “RemoteSPC: 333” is assigned as Remote Sign Point reference.

1. Select the added Routeset, for instance **RS: [no rel] in LocalSPC 111**, and assign the **Remote Sign Point** reference.

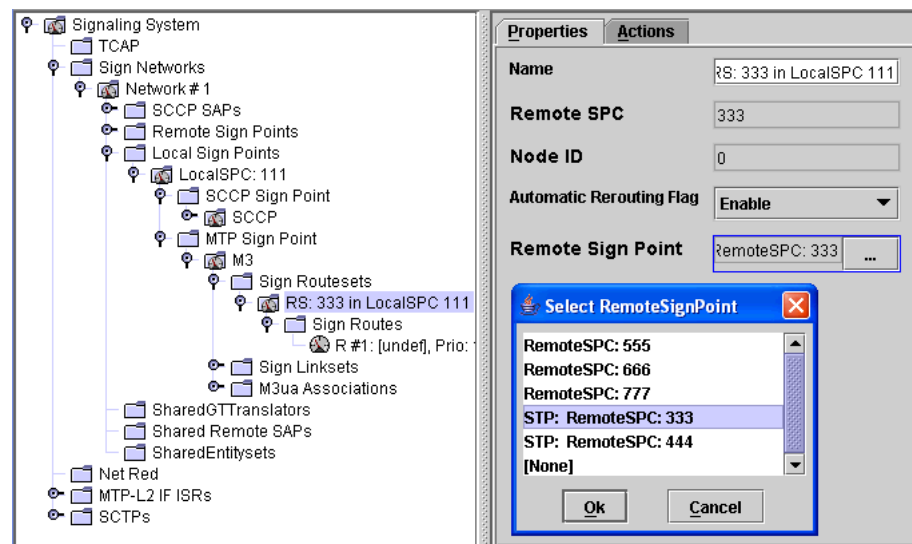


Figure 9 Select Remote Sign Point Instance in the List of Instances

### 2.6.2 Sign Routes of a Routeset

The first Route, called **R #1: [undef], Prio: 1** is already added for the added Routeset by default, when the **M3** is added. In order to make more routes, perform Step 2.

**Note:** Visible in the name of the added **R #1: [undef], Prio: 1** is the **Carrier** relation which is a reference to a **Sign Linkset** or an **M3ua Association** instance, depending on how **Node Behaviour** is set in Step 4. If uses M3 IETF, for details how to configure it, see Configuring SS7 Signaling Network, M3 IETF. When this reference is set, the name of the route will be updated, for instance as **Route #1,LS # 1 to RS 333, Prio: 1**

1. Select **R #1: [undef], Prio: 1** and assign the **Carrier** reference.



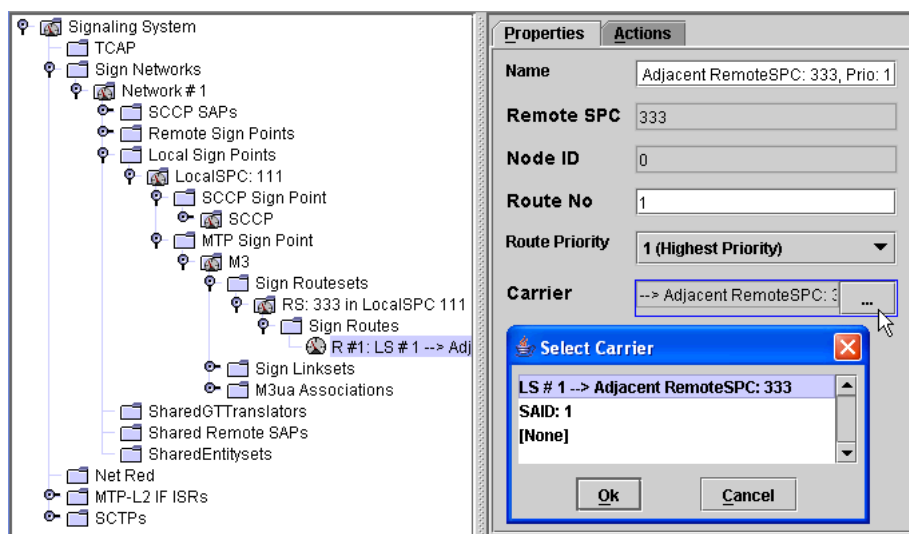


Figure 10 Selected Carrier Instances from the List of Instances

2. To add more routes, press the **Insert** button while the previous route is selected. Then repeat Step 1 for the new route. Adjust the **Route Priority** unless loadsharing is desired.

### 2.6.3 Example Routesets and Routes

Add the routes and routesets according to the below figure to complete the Example for **LocalSPC:111**, see also Figure 1.

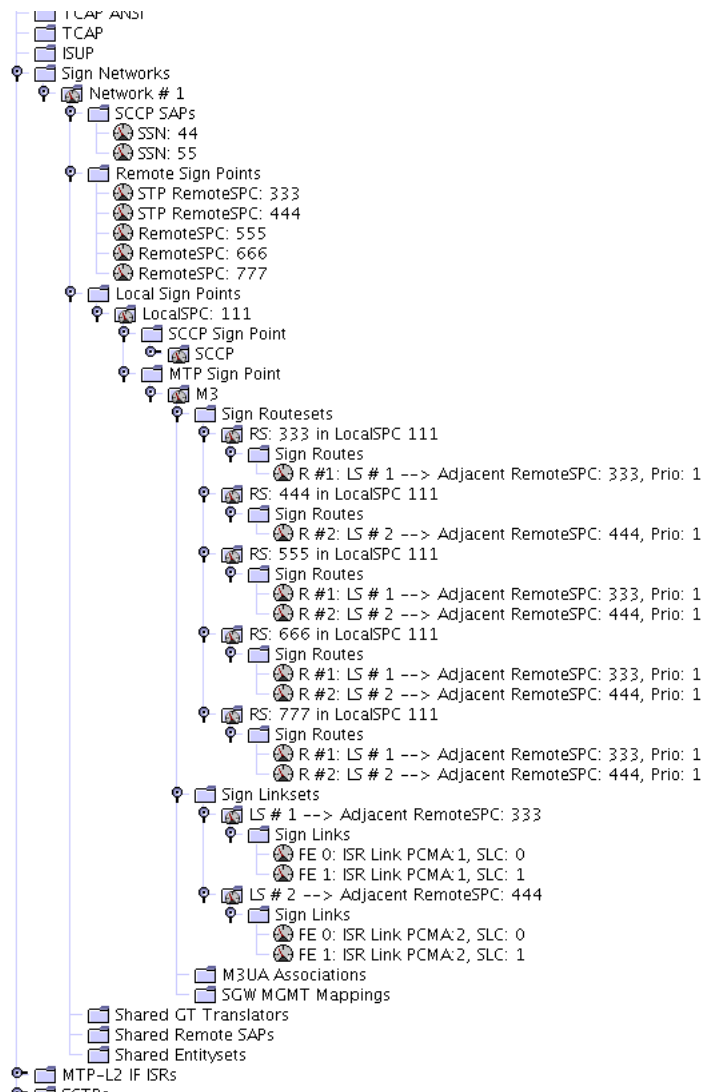


Figure 11 Example Routes and Routesets for LocalSPC:111

## 2.7 Configure SCCP: GT Translators

If the GT Translation needs to be configured, use steps explained in the GT OPI: Reconfiguring SS7 Network, Creating and Defining GT Routing.

## 2.8 Configure M3: M3UA Associations

**Note:** This section is not part of the Example configuration using the two MTP-L2 IF ISR FEs, so the steps below can be skipped. This section requires an SCTP FE which needs to be created according to the SCTP OPI: **Configuring SS7, SCTP**. If M3 IETF is used, for details how to configure it, see Configuring SS7 Signaling Network, M3 IETF.



M3UA Associations are used when the **Node Behaviour** defined in Step 4 is using IP. The following steps must be taken to configure an M3UA Association:

1. Add an element on **M3UA Associations** for the **M3** of a **Local Sign Points** instance, for instance **Local SPC: 111**. An instance of M3UA Association, initially called **SAID: 1** is added. The first instance uses 1 as the value of the SAID property.
2. Select the added **SAID: 1** and assign the **Adjacent SPC** which is an instance of the Remote Sign Point created in Section 2.3 on page 8.
3. Assign the **SCTP End Point** which have been created according to the instruction in the SCTP OPI.

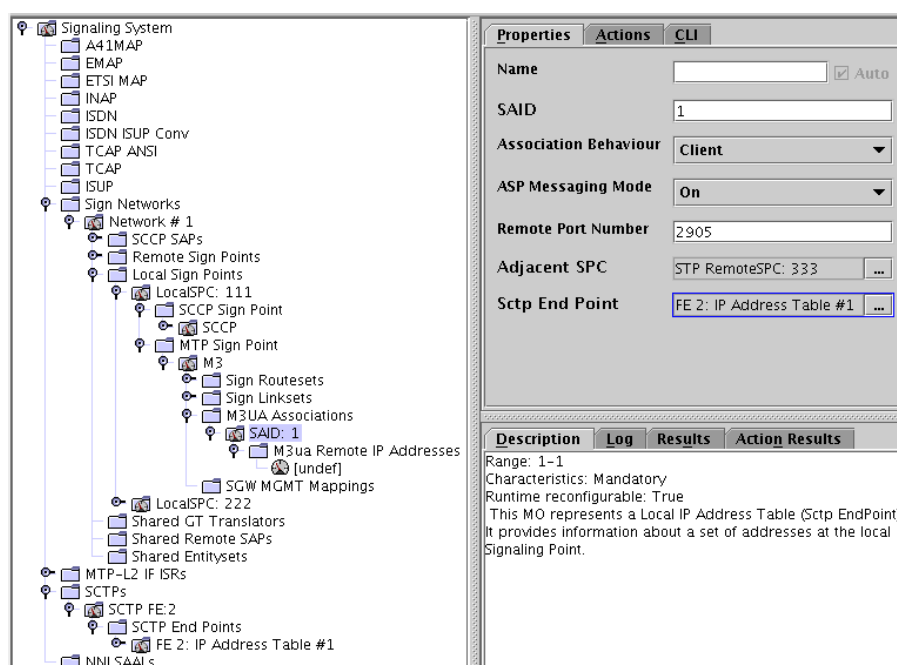


Figure 12 Configuring an Instance of the M3ua Association

4. One instance of **M3ua Remote IP Addresses**, called **[undef]** was added when **SAID: 1** was created. Its name will be updated when its Address property is set to a valid IP address, for instance 150.168.200.181.

More instances of M3ua Remote IP Addresses can be added if SCTP multi-homing functionality is going to be used.

**Note:** An SCTP endpoint is considered multi-homed if there are more than one transport address that can be used as a destination address to reach that endpoint. SCTP selects one of the multiple destination addresses of a multi-homed peer endpoint and one of the multiple source addresses of a multi-homed local endpoint as the primary path. By default, an endpoint always transmits to the primary path. If retransmission is timed out, local or remote address is rotated and new path is tried.

5. Add a route and create a reference to **SAID:1**. The **Route Priority** must be changed from the default to create a valid configuration.

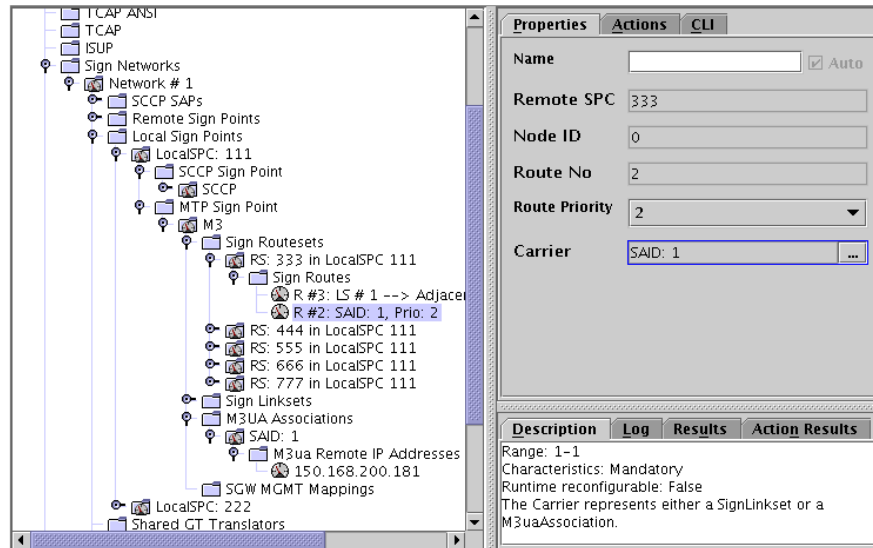


Figure 13 Add route for the M3UA Association

## 2.9 Verifying Local Signaling Point Configuration

In order to validate, select **Validate** from the **Edit** menu. The result will be displayed in the Results tab of the Information pane.

If the configuration is not valid the incorrect properties will be listed in different lines. When a line is selected, Signaling Manager will prompt to the location to edit the property with the proper values to make the configuration valid.

If you have performed the steps in the Example configuration there might be some properties that are invalid because they do not have any default value. In that case you can set a value according to the description of the property. Repeat until the configuration is valid.

## 2.10 Example Configuration

The below figure shows how to complete the Example configuration, see also Figure 1. If you have followed the steps in the previous sections you can complete the configuration by creating the **LocalSPC:222** from a copy of the **LocalSPC:111**:

1. Copy **LocalSPC:111** by using the right mouse button on **LocalSPC:111** and choose **Add** in the pop-up menu.
2. Change the **Local SPC** property from 111 to 222 in the copy. The LocalSPC:222 will increase the FE number automatically to use the **MTP-L2 IF ISR FE:1**.

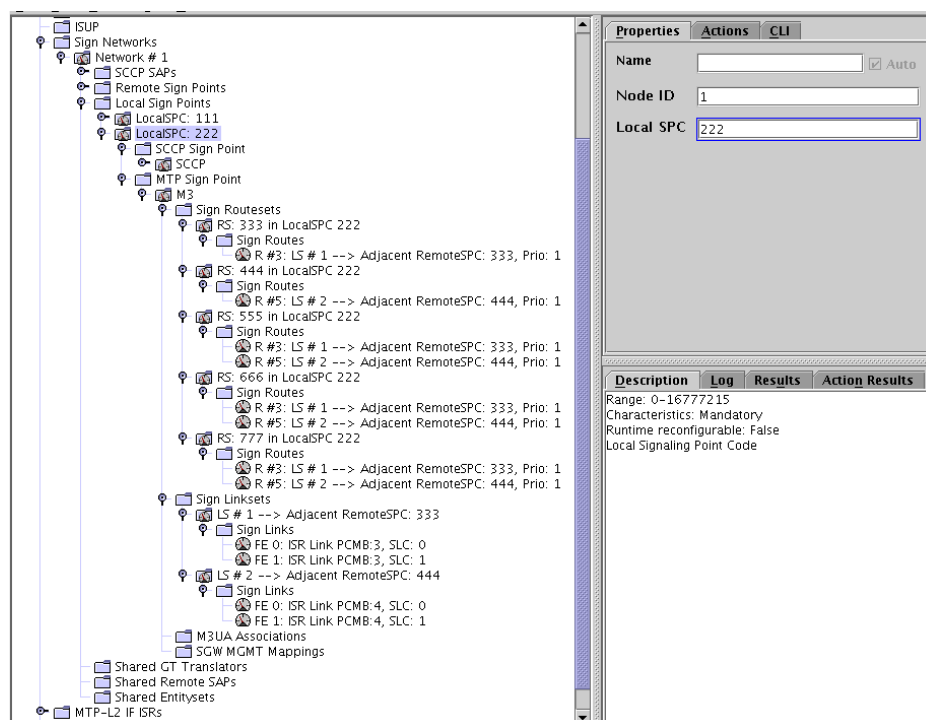


Figure 14 Example Configuration completed





## 3 Recommended SS7 Parameters

If M3 IETF needs to be configured, see description in Configuring SS7 Signaling Network, M3 IETF. For configuration parameter information, see Configuration File Description SCCP ITU / Chinese / ETSI / ANSI and Configuration File Description SS7 MTP-L3 & M3UA IETF.

### 3.1 SCCP Property Sheet

The recommended values in Table 2 are valid for ITU, ANSI, China, and TTC.

Table 2 SCCP Properties

Property Name	Recommended Value	Comments
<b>MSB of Address Indicator used</b>	<b>No</b>	Set to <b>No</b> by default. If the message is for international network. Set to <b>Yes</b> for national network message. To change this property expert mode must be used.
<b>Outgoing SMI Value</b>	<b>Affected Subsystem multiplicity unknown (When SCCP ITU/ China or ETSI is used)</b>  <b>Affected Subsystem is solitary (When SCCP ANSI is used)</b>	The Subsystem Multiplicity Indicator (SMI) is always passed through for incoming messages. This SCCP can however be configured to insert a specific SMI value in outgoing messages. Expert property, should be set correctly by default.
<b>Controls When To Send SSP</b>	<b>Send SSP when receiving MTP_TRANSFER_ind and user is unbound.</b>	Controls when to send SSP messages or not.  Options:  Send SSP when user unbinds.  Do not send SSP when receiving MTP_TRANSFER_ind and user is unbound.  Send SSP when receiving MTP_TRANSFER_ind and user is unbound. Expert property, should set correctly by default.



Table 2 SCCP Properties

<b>Send SSA Always</b>	<b>Yes</b>	<p>Controls whether to send SSA messages or not.</p> <p>No: Do not send SSA when user binds, wait until MM_ORDER_req (Send SSA) is received.</p> <p>Yes: Send SSA always.</p>
<b>Send SST Immediately</b>	<b>Yes</b>	<p>Controls when to send SST.</p> <p>Recommended for a stand-alone system: <b>Yes</b>. Recommended for a Geographical Network Redundancy System (NetRed): <b>No</b>.</p> <p>No: Wait for T(stat) timer to expire after MTP_RESUME before sending SST.</p> <p>Yes: Send SST immediately after MTP_RESUME_ind reception then start T(stat) timer.</p> <p>Expert property, should set correctly by default.</p>
<b>Controls When To Send SST</b>	<b>Send SST Always</b>	<p>Controls whether to send SST messages or not.</p> <p>Recommended for a stand-alone system: <b>Send SST Always</b>. Recommended for a Geographical Network Redundancy System (NetRed): <b>Do Not Send SST when MTP_RESUME_int is received</b>.</p> <p>Options:</p> <p>Send SST always.</p> <p>Do not send SST when MTP_RESUME_ind is received (all remote SSNs are considered allowed).</p> <p>Do not initiate SST messages.</p> <p>Expert property, should set correctly by default.</p>





## 3.2 Local SAP Instance

Table 3 Local SCCP SAP Parameters

Property Name	Recommended Value	Comments
<b>Number Of Connections</b>	<b>0</b>	Max number of simultaneous connections on this subsystem. Zero shall be used for connectionless SCCP.  Set to 0 by default.
<b>S1 (Add OPC to Calling Party Address)</b>	<b>No</b>	Expert property set to No by default. When the SCCP receives an incoming message (UDT, UDTS) and there is a Calling Party Address present where the routing indicator indicates "route on SSN" but without an SPC present, the SCCP modifies the Calling Party Address for the corresponding user primitive. The OPC in the routing label is added to the Calling Party Address in the correct place. The SPC indicator is set to indicate the presence of the SPC and the length indicator is adjusted.  Options: <ul style="list-style-type: none"> <li>• <b>No:</b> Do not add OPC to Calling Party Address.</li> <li>• <b>Yes:</b> Add OPC to Calling Party Address.</li> </ul>
<b>S2 (Remove SPC from Calling Party Address)</b>	<b>No</b>	Expert property set to No by default. When the SCCP receives a user primitive (N_UNITDATA_req) where the Called Party Address contains an SPC and the routing indicator indicates "route on SSN" the SCCP does not transmit the SPC in the Called Party Address of the corresponding SCCP peer-to-peer message. The SPC indicator is set accordingly.  Options: <ul style="list-style-type: none"> <li>• <b>No:</b> Do not remove the SPC from the Calling Party Address if present.</li> <li>• <b>Yes:</b> Remove the SPC from the Calling Party Address if present.</li> </ul>



Table 3 Local SCCP SAP Parameters

Property Name	Recommended Value	Comments
<b>S3 (Calling Party Address Control)</b>	<b>Transparent</b>	<p>Expert property set to Transparent by default. There are configuration options on a per local SSN basis to control the Calling Party Address for outgoing messages. These are only valid for messages sent to the network as the result of the reception of a primitive from the user. Messages generated by SCCP itself will not be affected.</p> <p>Options:</p> <ul style="list-style-type: none"><li>• <b>Transparent:</b> The Calling Party Address is transmitted transparently.</li><li>• <b>SPC and SSN:</b> “SPC present”, “SSN present” and “Route on SSN”. The SPC is the local SPC (the first in the list in the configuration file if there are several) and the SSN is the SSN of the user (taken from msgHead of the received primitive).</li><li>• <b>SSN only:</b> “SSN present” and “Route on SSN”. The SSN is the SSN of the user (taken from msgHead of the received primitive)</li></ul>
<b>S4 (Add OPC and DPC to User Part)</b>	<b>No</b>	<p>Expert property set to No by default. When the SCCP receives an incoming message, SCCP modifies the Calling Party Address, if present, for the corresponding user primitive. The OPC in the routing label is added to the Calling Party Address just BEFORE the address indicator. The length indicator of the Calling Party Address is adjusted. When the SCCP receives an incoming message, SCCP modifies the Called Party Address, if present, for the corresponding user primitive. The DPC in the routing label is added to the Called Party Address just before the address indicator. The length indicator of the Called Party Address is adjusted.</p>



Table 3 Local SCCP SAP Parameters

Property Name	Recommended Value	Comments
<b>S4 (Add OPC and DPC to User Part)</b>	Continued description.	<p>When the SCCP receives a user primitive (N_UNITDATA_req) the Called and Calling Party Addresses are presumed to contain “extra” SPCs as described above. The SPCs are not present in the peer-to-peer message. When the SCCP receives a user primitive where the Called Party Address does not contain an SPC and the routing indicator indicates “Route on SSN” the “extra ”SPC is used as DPC in the routing label. If there is an SPC in the address (in addition to the “extra”) this SPC is used as DPC in the routing label if the routing indicator indicates “Route on SSN”. For outgoing messages, if a GTT has been performed successfully, the resulting SPC is used in the routing label.</p> <p>Options:</p> <ul style="list-style-type: none"> <li>• <b>No:</b> Do not add OPC and DPC to user interface.</li> <li>• <b>Yes:</b> Add OPC and DPC to user interface.</li> </ul>
<b>SSN</b>	See Comments.	<p>Sub System Number, indicates what type of services that runs on the chosen OPC. Range: <b>2-254</b>.</p> <p>Do not add a LocalSap if the node is a STP. No SSN will then be added to the chosen OPC.</p> <p>The following numbers are normally used.</p> <ul style="list-style-type: none"> <li>• 3: ISUP</li> <li>• 4: OMAP</li> <li>• 5: MAP</li> <li>• 6: HLR</li> <li>• 7: VLR</li> <li>• 8: MSC</li> <li>• 9: EIR</li> <li>• 10: AUC</li> <li>• 11: SMS</li> <li>• 254: BSSAP</li> </ul>





# Glossary

**SCCP**

Signaling Connection Control Part

**IETF**

Internet Engineering Task Force

**MTP-L2**

Message Transfer Part - Layer 2

**M3**

MTP Layer 3

**M3-IETF**

SS7 MTPL3 & M3UA-IETF

**M3UA**

MTPL3 User Adaptation layer

**MTP**

Message Transfer Part

**SS7**

Signaling System Number 7

**FE**

Front End





## Reference List

- [1] *Configuring SS7 Signaling Network, M3 IETF*, 11/1543-CNA 403 0874/1
- [2] *Configuring SS7, MTP-L2 IF ISR - NB, HSL*, 2/1543-CNA 403 0874/1
- [3] *Configuring SS7, SCTP*, 1/1543-CNA 403 0874/1
- [4] *Configuring SS7, FE HSSL ATM*, 6/1543-CNA 403 0874/1
- [5] *Configuring SS7, MTP-L2 IF ADAX - NB, HSL*, 8/1543-CNA 403 0874/1
- [6] *Reconfiguring SS7 Network, Creating and Defining GT Routing*, 5/1543-CNA 403 0874/1
- [7] *Configuration File Description SCCP ITU / Chinese / ETSI / ANSI*, 19073-CAA 901 437 Uen/1
- [8] *SCTP*, 12/15517-CAA9011470 Uen/1
- [9] *Configuration File Description SS7 MTP-L3 & M3UA IETF*, 19073-CAA 901 1817 Uen/1