

# Configure SS7 for ENUM Number Portability

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## OPERATING INSTRUCTIONS

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# 1 Introduction

This document is a guideline that provides an example of configuring the Signaling System #7 (SS7) stack layers for IPWorks ENUM Number Portability (NP). The SS7 configuration in this document is based on IPWorks 2+2 deployment:

2+2 deployment: 2 x SCs (SC-1 and SC-2) and 2 x PLs (PL-3 and PL-4) in the IPWorks system. The configuration example of ENUM running on PL-3 and PL-4 is provided in this document.

**Note:** Two options to configure SS7 when IPWorks is already scaled out:

- If the IPWorks capacity is permitted, perform scale-in operation first to be 2+2 deployment, then configure SS7.
- Contact IPWorks support.

**Note:** The operations in this document use the following method to identify the PLs in 2+2 deployment: PL-X and PL-Y correspond to PL-3 and PL-4.

## 1.1 Target Groups

This document is intended for the installation personnel.

## 1.2 Related Information

Trademark information, typographic conventions, and definition and explanation of abbreviations and terminology can be found in the following documents:

- *Trademark Information*
- *Typographic Conventions*
- *Glossary of Terms and Acronyms*





## 2 Prerequisites

This section describes the prerequisites required for the configuration.

### 2.1 Documents

Before using this document to perform the SS7 configuration, the users are required to read the following documents:

- *Signaling Manager User Guide*

### 2.2 Users

The installation personnel are required to have prior knowledge about:

- Intermediate UNIX and Linux skills
- SS7 knowledge

### 2.3 Tool

The stack can be configured by using the GUI tool:

- Signaling Manager: It is a Java tool delivered with the TE stack.

**Note:** Ensure that the target host supports GUI mode.

### 2.4 Condition

- Ensure that the SS7 CAF is installed and running normally.

```
# cmw-status -v su | grep -i ss7 -A 4
```

```
safSu=SC-2,safSg=2N,safApp=ERIC-ss7caf.mgmt
  AdminState=UNLOCKED(1)
  OperState=ENABLED(1)
  PresenceState=INSTANTIATED(3)
  ReadinessState=IN-SERVICE(2)
--
safSu=SC-1,safSg=2N,safApp=ERIC-ss7caf.mgmt
  AdminState=UNLOCKED(1)
  OperState=ENABLED(1)
  PresenceState=INSTANTIATED(3)
  ReadinessState=IN-SERVICE(2)
```



```
--
safSu=PL-4,safSg=NWA,safApp=ERIC-ss7caf.core
AdminState=UNLOCKED(1)
OperState=ENABLED(1)
PresenceState=INSTANTIATED(3)
ReadinessState=IN-SERVICE(2)
--
safSu=PL-4,safSg=2N,safApp=ERIC-ss7caf.netwcontrol
AdminState=UNLOCKED(1)
OperState=ENABLED(1)
PresenceState=INSTANTIATED(3)
ReadinessState=IN-SERVICE(2)
--
safSu=PL-3,safSg=NWA,safApp=ERIC-ss7caf.core
AdminState=UNLOCKED(1)
OperState=ENABLED(1)
PresenceState=INSTANTIATED(3)
ReadinessState=IN-SERVICE(2)
--
safSu=PL-3,safSg=2N,safApp=ERIC-ss7caf.netwcontrol
AdminState=UNLOCKED(1)
OperState=ENABLED(1)
PresenceState=INSTANTIATED(3)
ReadinessState=IN-SERVICE(2)
```

For how to check IPWorks software information, refer to *View Software Information*.

## 2.5 Configuring Signaling Manager

To configure the tool Signaling Manager, do the following:

1. Log on to the SC-1.

```
# ssh root@<SC-1 IP address>
```

2. Find the path to PSO storage where SS7 configuration and log files are stored:

```
# cat /usr/share/psd/storage-paths/config
```

```
# <path to config PSO storage>
```

```
# cat /usr/share/psd/storage-paths/no-backup
```

```
# <path to no-backup PSO storage>
```

3. Create links to the path where SS7 configuration and log files are stored.





```
# ln -s <path to config PSO storage>/ss7caf-ana90137/etc
/opt/sign/etc
```

```
# ln -s <path to no-backup PSO storage>/ss7caf-ana90137/log
/opt/sign/log
```

**Note:** If the path `/opt/sign/etc` or `/opt/sign/log` already exists, remove it.

4. Create the folder for template files if the path `/opt/sign/cnf_template` doesn't exist.

```
mkdir -p /opt/sign/cnf_template
```

5. Configure `cp.manager.address` in the Signaling Manager configuration file `signmgr.cnf`.

```
# vi /opt/sign/etc/signmgr.cnf
```

Configure `cp.manager.address`:

```
cp.manager.address=ss7cafcpmaddress:6669
```

6. Start the Signaling Manager on the SC-1.

```
# /opt/sign/EABss7050/bin/signmgui -own.cnf
/opt/sign/etc/signmgr.cnf &
```

**Note:**

- If the JAVA cannot be found, use the command `export JAVA_HOME=/opt/sign/EABss7069/jre`
- If no X11 DISPLAY variable was set, try to log out the SC-1, and then log on again by using the `-X` option:

```
# ssh -X root@<SC-1 IP Address>
```

## 2.6 Configuring ERH SS7

To configure the ERH SS7, do the following:

1. Log on to the ECLI on an active SC.

```
# ssh <username>@<active SC IP address> -t -s cli
```

2. Configure the *ErhSs7* MO.



```
>configure

(config)> dn ManagedElement=<Node Name>,IpworksFunction=1,IpworksDnsRoot=1,I
pworksEnumRoot=1,EnumServer=1,Erh=1,ErhSs7=1

(config-ErhSs7=1)>cpManager=ss7cafcpmaddress:6669

(config-ErhSs7=1)>numOfBindBES=10

(config-ErhSs7=1)>numOfErh=10

(config-ErhSs7=1)>Log=1,level=LOG_LEVEL_INFO

(config-ErhSs7=1)>commit
```

### 3. Verify the changes.

Example:

```
(config-ErhSs7=1)>show -v
ErhSs7=1
ainQualityOfService=3 <default>
cpInstanceId="PL-3:1|PL-4:2" <default> <obsolete>
cpManager="ss7cafcpmaddress:6669" <default>
cpManagerPeerHost="127.0.0.1:6669" <default> <obsolete>
enableCustomizedDigTable=false <default>
enableHA=true <default> <obsolete>
erhSs7Id="1"
formatFlag=false <default>
inapApplicationContextType=CS1 <default>
inapDigitTable="0x0=0,0x1=1,0x2=2,0x3=3,0x4=4,0x5=5,0x6=6,0x7=7,0x8=8,0x9=9,0xA= ,0xB=b,0xC=c,0xD=d,0xE=e,0xF=f" <default>
inapFilterRNOFDestRoutingAddr=false <default>
InterrogationType=BASIC <default>
logFileName="ipwerh.log" <default>
mapDigitTable="0x0=0,0x1=1,0x2=2,0x3=3,0x4=4,0x5=5,0x6=6,0x7=7,0x8=8,0x9=9,0xA=*,0xB=#,0xC=,0xD=,0xE=,0xF=" <default>
MAPMessage=MAP_ATI <default>
mcc3bitMNCPAIR="302-656|374-130|374-140|714-020" <default>
mccWith3bitMNC="310|311|316|334|338|342|344|346|348|365|376|708|722|732|750" <default>
MSRNMode=NOFURTHERHANDLING <default>
numOfBindBES=10 <default>
numOfErh=10 <default>
remoteSSN=0 <default>
returnWholeMSRN=RNONLY <default>
RNLength=[] <empty>
Log=1
```

### 4. Exit the ECLI session.

### 5. Log on to a PL board, and restart the ENUM server.

```
#ssh <username>@<PL IP Address>

#ipw-ctr stop enum <PL hostname>

#ipw-ctr start enum <PL hostname>
```



## 3 Procedure

This section provides an example of configuring ENUM Number Portability.

### 3.1 Presupposition Value

The section lists the presupposition value that is used as an example for the configuration.

- Standard: ITU Network
- SS7 Scenario: HD
- SS7 Configuration: SIGTRAN
- Signaling Protocol: Choose one of the following protocols:
  - INAP
  - MAP
  - AIN
- Use “national format”
- Local Host
  - Local Host name: PL-X
  - Local Host SS7 eVIP Traffic IP Address: 10.170.57.95
- Partner Host
  - Partner Host Name: PL-Y
  - Partner Host SS7 eVIP Traffic IP Address: 10.170.57.95

For more information about the eVIP Traffic IP address (<VIP\_SS7\_IP1>), refer to the section *Exported IP Addresses* in document *IPWorks Network Connectivity Overview*.

- Remote Host
  - Remote Host Name: *linux-yt49*
  - Remote SP IP Address: 10.0.50.18
- Local SSN:
  - For MAP: 8



- For INAP: 7
- Local SPC: 200
- Remote SSN: 6
- Remote SPC: 100
- GT Translation Type: 123

## 3.2 Starting from Template Configuration File

To start from the configuration template, do the following:

1. Log on to SC-1, and copy the template files from PL-X to SC-1.

```
# ssh root@<SC-1 IP address>

# scp root@PL-X:/opt/ipworks/enum/others/Ss7caf_hd_inap
.cim /opt/sign/cnf_template/

# scp root@PL-X:/opt/ipworks/enum/others/Ss7caf_hd_map.
cim /opt/sign/cnf_template/

# scp root@PL-X:/opt/ipworks/enum/others/Ss7caf_hd_ain.
cim /opt/sign/cnf_template/
```

2. After the main Signaling Manager window pops up, select **File > New** from the menu bar.
3. Choose a .cim file in the **Template** tab.
  - If the signaling protocol is INAP, choose /opt/sign/cnf\_template/Ss7caf\_hd\_inap.cim.
  - If the signaling protocol is MAP, choose /opt/sign/cnf\_template/Ss7caf\_hd\_map.cim.
  - If the signaling protocol is AIN, choose /opt/sign/cnf\_template/Ss7caf\_hd\_ain.cim.
4. Select **Tools > Expert Mode** and **Tools > Configuration Mode > Initial**.

**Note:** **Expert Mode** enables all properties to be visible in the Signaling Manager.

## 3.3 Configuring INAP (Only for INAP)

**Note:** Follow the step if the signaling protocol is INAP; otherwise, skip the step.

Set the value of INAP according to the following table:



*Table 1 Configure INAP*

Navigation Pane	Operation Pane Properties	Value
INAP > INAP > INAP Subsystems > INAP Subsystem:7	Tcap Subsystem	TCAP Subsystem:7

## 3.4 Configuring ETSI MAP (Only for MAP)

**Note:** Follow the step if the signaling protocol is MAP; otherwise, skip the step.

Set the value of ETSI MAP according to the following table:

*Table 2 Configure ETSI MAP*

Navigation Pane	Operation Pane	Value
ETSI MAP > ETSIMAP > ETSIMAP Subsystems > ETSIMAP Subsystem:8	Tcap Subsystem	TCAP Subsystem:8
ETSI MAP > ETSIMAP	ML Timer	600

## 3.5 Configuring System Components

Set the value of system components according to the following table:

Before configuring system components, ensure that the Expert Mode is activated from Tools menu.

*Table 3 Configure System Components*

Navigation Pane	Operation Pane Properties	Value
System Components > System Components	CP Manager Address	ss7cafcpmaddress:6669
System Components > System Components > CP > CP	EVIP	On
System Components > System Components > CP > CP	If Alias	On
System Components > System Components > CP > CP	Msg Conn Time Wait	25
System Components > System Components > ECM > ECM	Connection Time Wait	25
System Components > System Components > ECM > ECM > Process Classes > SCTP FEP	Command	/opt/sign/EABss7052/bin/fe_sctp -e 255 -u 161 -a 1 -o 5 -w 5
System Components > System Components > ECM > ECM > Process Classes > GEN RP	Command	/opt/sign/EABss7053/bin/be -b 3 -u 161 -a 5 -o 1 -d 0 -w 5
System Components > System Components > ECM > ECM > Process Classes > NMP	Command	/opt/sign/EABss7053/bin/be -b 2 -e 255 -u 161 -a 1 -w 5



Navigation Pane	Operation Pane Properties	Value
System Components > System Components > ECM > ECM > Process Classes > OAMP	Command	/opt/sign/EABss7049/bin/oam -m -c /opt/sign/etc/oam.cnf -w 5
System Components > System Components > ECM > ECM > Process Classes > LOGD	Command	/opt/sign/EABss7049/bin/logd
System Components > System Components > ECM > ECM > Process Classes > SAFOAM	Command	/opt/sign/EABss7038/bin/cm-agent --mode=ntf-agent

## 3.6 Configuring TCAP (Only for INAP and MAP)

**Note:** Follow the step if the signaling protocol is INAP or MAP; otherwise, skip the step.

Set the value of TCAP according to the following table:

*Table 4 Configure TCAP (Only for INAP)*

Navigation Pane	Operation Pane Properties	Value
TCAP > TCAP > TCAP Subsystems > TCAP Subsystem:7	Subsystem Number	7
	Sccp Sap	SSN:7

*Table 5 Configure TCAP (Only for MAP)*

Navigation Pane	Operation Pane Properties	Value
TCAP > TCAP > TCAP Subsystems > TCAP Subsystem:8	Subsystem Number	8
	Sccp Sap	SSN:8

## 3.7 Configuring TCAP ANSI (Only for AIN)

**Note:** Follow the step if the signaling protocol is AIN; otherwise, skip the step.

Set the value of TCAP ANSI according to the following table:

*Table 6 Configure TCAP ANSI*

Navigation Pane	Operation Pane Properties	Value
TCAP ANSI > TCAP ANSI > TCAP ANSI Subsystems > TCAP ANSI Subsystem:7	Subsystem Number	7
	Sccp Sap	SSN:7

## 3.8 Configuring Sign Networks

Set the value of Sign Networks according to the following table:



Table 7 Configure Sign Networks

Navigation Pane	Operation Pane Properties	Value
Sign Networks > Network #1 > SCCP SAPs > Network #1, SSN:8	Subsystem Number	8
Sign Networks > Network #1 > Remote Sign Points > NetworkID: 1, RemoteSPC: 100	Remote SPC	100
Sign Networks > Network #1 > Local Sign Points > NodeID:0, LocalSPC: 200	Local SPC	200
Sign Networks > Network #1 > Local Sign Points > Local SPC: 200 > SCCP Sign Point > SCCP > Local SAPs > LocalSPC: 200, SSN 8	Subsystem Number	8
	Sccp Sap	NetworkID # 1, SSN: 8
Sign Networks > Network #1 > Local Sign Points > Local SPC: 200 > SCCP Sign Point > SCCP > Remote SAPs > RemoteSPC: 100, SSN 6	Remote SPC	100
	Subsystem Number	6
	Remote Sign Point	NetworkID: 1, RemoteSPC: 100
Sign Networks > Network #1 > Local Sign Points > Local SPC: 200 > SCCP Sign Point > SCCP > Entitysets > Prim:RemoteSPC: 100 SSN: 6	Primary Sap	RemoteSPC: 100, SSN: 6
Sign Networks > Network #1 > Local Sign Points > Local SPC: 200 > SCCP Sign Point > SCCP > GT Translators > 2,123,*-->Prim:RemoteSPC: 100, SSN: 6	Translation Type <sup>(1)</sup>	123
	Numbering Plan	Not Used <sup>(2)</sup>
	Nature of Address	Not Used <sup>(3)</sup>
	Number Series <sup>(4)</sup>	*
	Primary Termination Indicator	Change to 'Route On SSN'.
	Entityset	Prim:RemoteSPC: 100 SSN: 6

(1) The value must be the same as the **Translation Type Value** specified when uses create MAPData through ipwcli. It is related to provisioning, and users can refer to **ITU-T Rec. Q.713**.

(2) If the users assign the attribute **Nature of to Address** as **International number** for SCCP layer in SS7, must select **E163 / E164 (ISDN)** from the **Numbering Plan** list.

(3) If the users only want to apply the "international format" for SCCP layer in SS7, must select **International number** from the **Nature of Address** list.

(4) Set the Number Series, Primary Termination Indicator, and Entityset by referring to **Reconfiguring SS7 Network, Creating and Defining GT Routing**

## 3.9 Configuring SCTPs

Set the value of Sctp according to the following table:

Table 8 Configure SCTPs

Navigation Pane	Operation Pane Properties	Value
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #1	Port Number	2905



Navigation Pane	Operation Pane Properties	Value
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #1	Used By M3	No
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #1	Sctp End Point Profile	Sctp End Point Profile #0
SCTPs > Sctp FE > Sctp End Points > FE : IP Address Table #1 > Sctp Local Address	Address	10.170.57.95
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #2	Port Number	2906
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #2	Used By M3	No
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #2	Sctp End Point Profile	Sctp End Point Profile #0
SCTPs > Sctp FE > Sctp End Points > FE : Local Address Table #2 > SctpLocal Address	Address	10.170.57.95

## 3.10 Configuring M3UA IETF

Set the value of the M3UA IETF according to the following table:

*Table 9 Configure M3UA IETF*

Navigation Pane	Operation Pane Properties	Value
M3UA IETF > M3UA	Distributed End Point Support	On
M3UA IETF > M3UA > Local ASes > LocalAS#1 LocalSPC:200	Local Sign Point	NodeID: 0, LocalSPC: 200
M3UA IETF > M3UA > Local ASes > LocalAS#1 LocalSPC:200 > Local Routing Key > RK#1 NA:0 > Groupings > Grouping OPC:200 > Destination SPCs > RemoteSPC:100 in RoutingKeyID:1	Remote Sign Point	NetworkID: 1, RemoteSPC: 100
M3UA IETF > M3UA > Local SPs > LocalSP#1 TYPE:	Sctp End Point	FE: Local Address Table #1
M3UA IETF > M3UA > Local SPs > LocalSP#2 TYPE:	Sctp End Point	FE: Local Address Table #2
M3UA IETF > M3UA > Remote SPs > RemoteSP#1 Type:IPSP serves RemoteAS#40001 > Remote SP Address	Address	10.0.50.18
M3UA IETF > M3UA > Remote SPs > RemoteSP#2 Type:IPSP serves RemoteAS#40001 > Remote SP Address	Address	10.0.50.18
M3UA IETF > M3UA > Remote SPs > RemoteSP#1 Type:IPSP serves RemoteAS#40001	Primary Local Ip Address	10.170.57.95
	Primary Remote Ip Address	10.0.50.18
M3UA IETF > M3UA > Remote SPs > RemoteSP#2 Type:IPSP serves RemoteAS#40001	Primary Local Ip Address	10.170.57.95
	Primary Remote Ip Address	10.0.50.18





## 3.11 Validating and Restarting SS7 Stack

To validate and restart the SS7 stack, do the following:

1. Validate the configuration by choosing **Edit > Validate**.
2. If there are validation errors, click **Results** to view error description and go to the respective configuration.
3. Select **Process View...** in the **Tools** menu, then click the **Configure** button in the process view dialog box and choose **Initial Configuration**.
4. Generate the configuration files on the GEP machine in Signaling Manager.

Select **Tools>Process View...>Configure**

5. Restart the SS7 Stack according to different deployment scenarios.

```
SC-X: # amf-adm restart safSu=SC-1,safSg=2N,safApp=ERIC
      -ss7caf.mgmt
```

```
SC-X: # amf-adm restart safSu=SC-2,safSg=2N,safApp=ERIC
      -ss7caf.mgmt
```

```
SC-X: # amf-adm restart safSu=PL-3,safSg=2N,safApp=ERIC
      -ss7caf.netwcontrol
```

```
SC-X: # amf-adm restart safSu=PL-3,safSg=NWA,safApp=E
      RIC-ss7caf.core
```

```
SC-X: # amf-adm restart safSu=PL-4,safSg=2N,safApp=ERIC
      -ss7caf.netwcontrol
```

```
SC-X: # amf-adm restart safSu=PL-4,safSg=NWA,safApp=E
      RIC-ss7caf.core
```

6. Select **File > Connect** and make sure that the status is **Active** in the status bar.
7. Select **Process View...** in the **Tools** menu, then click the **Restart stack** button in the process view dialog box. Ensure that all stack processes are running.
8. Save the configuration file as another name by selecting **File> Save As**.
  - If the signaling protocol is INAP, save as `ss7hd_inap.cim`.
  - If the signaling protocol is MAP, save as `ss7hd_map.cim`.
  - If the signaling protocol is AIN, save as `ss7hd_ain.cim`.
9. Close the Signaling Manager.



**Note:** The configuration of SS7 stack on the remote machine might be different for different vendors. Therefore, the detailed procedure is out of scope of this document.

## 3.12 Verifying Stack Configuration

Before verifying stack configuration, make sure that the presupposition values in Section 3.1 on page 7 are configured correctly, and all stack processes in remote machine are running.

To verify whether the stack configuration is correct, do the following:

**Note:** Perform the steps on both the **local** and **remote** machines.

1. Start Signaling Manager.

```
# /opt/sign/EABss7050/bin/signmgui -own.conf\  
/opt/sign/etc/signmgr.cnf &
```

2. Select **M3UA IETF > M3UA > Local ASes > LocalAS#1 LocalSPC:200** from the navigation pane.

Click the **Actions** tab in the operation pane, choose **M3IETF-Local AS Status**, and click **Send**.

3. Select **M3UA IETF > M3UA > Remote ASes > RemoteAS#40001 RC:0** from the navigation pane.

Click the **Actions** tab in the operation pane, choose **M3IETF-Remote AS Status**, and click **Send**.

4. Check if the selected process status is active in the **Action Results** tab in the information pane.



## 4 Post Activities

After configuring SS7 on the IPWorks node, configure the SS7 stack on the peer node and check if the two nodes can communicate.

For details, refer to the *Checking INAP*, *Checking AIN*, or *Checking MAP* section in *IPWorks Manual Health Check*.

**Note:** When configuring the SS7 stack on the peer node, it is recommended to set the following parameters to the values in Table 10.

*Table 10 Recommended Configuration for Peer SS7 Stack*

Navigation Pane	Operation Pane Properties	Recommended Value
SCTPs > Sctp FE > Sctp End Point Profile > Sctp End Point Profile #0	Min RTO	200
SCTPs > Sctp FE > Sctp End Point Profile > Sctp End Point Profile #0	Max RTO	800
SCTPs > Sctp FE > Sctp End Point Profile > Sctp End Point Profile #0	Init RTO	200
SCTPs > Sctp FE > Sctp End Point Profile > Sctp End Point Profile #0	Assoc Max RTX	10
SCTPs > Sctp FE > Sctp End Point Profile > Sctp End Point Profile #0	Path Max RTX	5
M3UA IETF > M3UA > Remote SP Profiles > Remote SP Profile #1	Timer Tassoc	100





## 5 Appendix A: Opening Trace Log

This section describes how to start and use the Trace Viewer Tool (TvTool).

**Note:** During the operation, if the users receive a message indicating that the command is not found, set the environment variable for Java as follows:

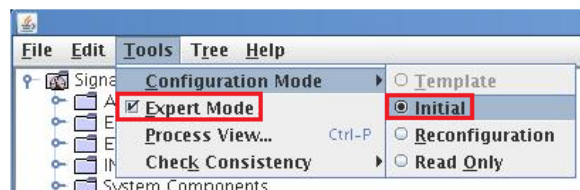
```
# export JAVA_HOME=/opt/sign/EABss7069/jre
# export PATH=$JAVA_HOME/bin:$PATH
```

This setting will be cleared when users log out and in the system.

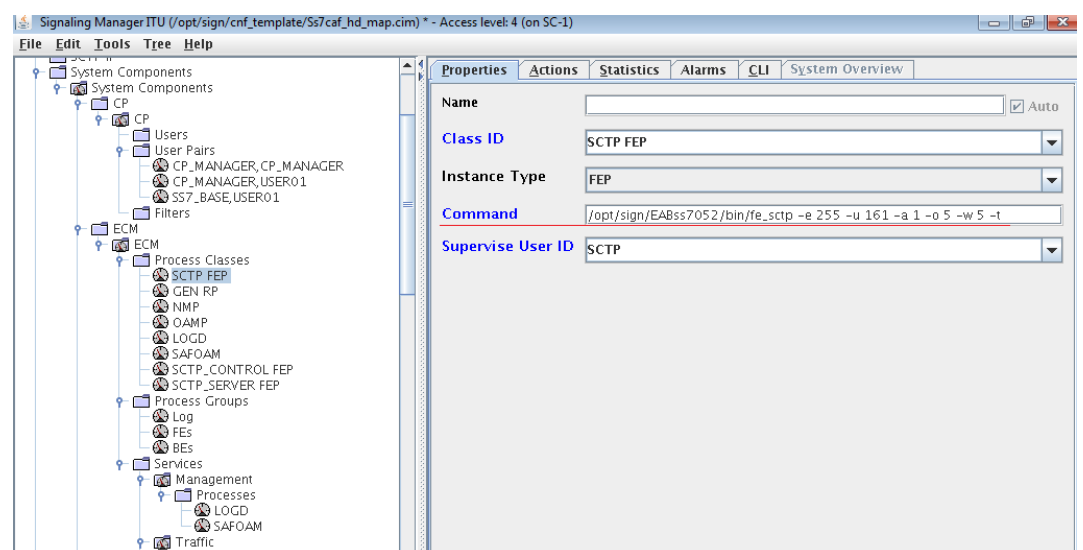
1. Start the Signaling Manager.

```
# /opt/sign/EABss7050/bin/signmgui -own.conf
/opt/sign/etc/signmgr.cnf &
```

2. Open the Expert Mode and Initial Configuration Mode in Signaling Manager.



3. Change the start command line for user's interested module process as shown in the following figure by adding `-t`.



4. Restart the stack to enable the modification.



5. Copy EABss7049 from PL node to SC node if it is not installed on SC node.

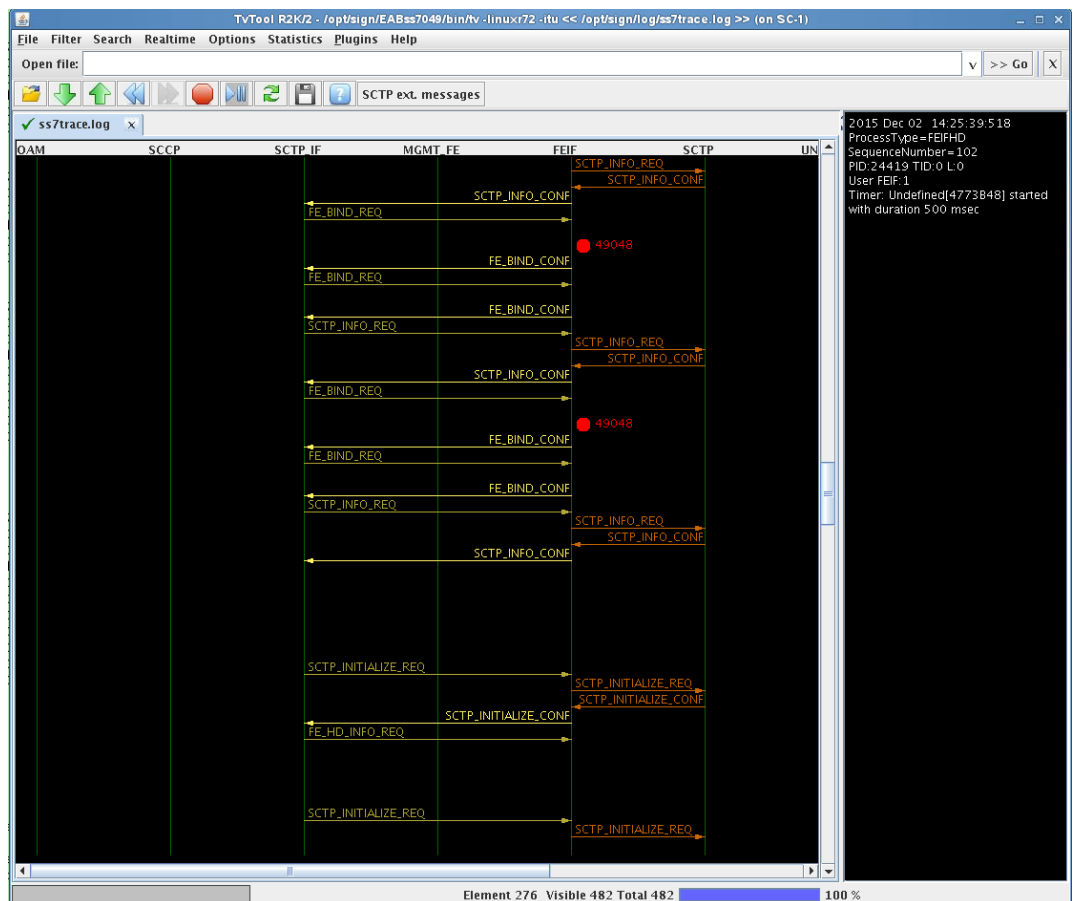
```
# scp -r root@PL-X:/opt/sign/EABss7049 /opt/sign
```

6. The SS7 trace log directory is /opt/sign/log/ss7trace.log. Open the trace log:

```
# /opt/sign/EABss7049/bin/tvtool -f /opt/sign/log/ss7trace.log
```

7. Let the program running in the background:

```
# /opt/sign/EABss7049/bin/tvtool -f /opt/sign/log/ss7trace.log &
```





## Reference List

### **Ericsson Documents**

- [1] *Trademark Information*
- [2] *Typographic Conventions*
- [3] *Glossary of Terms and Acronyms*
- [4] *Reconfiguring SS7 Network, Creating and Defining GT Routing*
- [5] *IPWorks Manual Health Check*