MAPS™ UMTS Emulator for IuCS and IuH Interfaces

(IuCS Emulation over IP and ATM; and IuH Emulation over IP)

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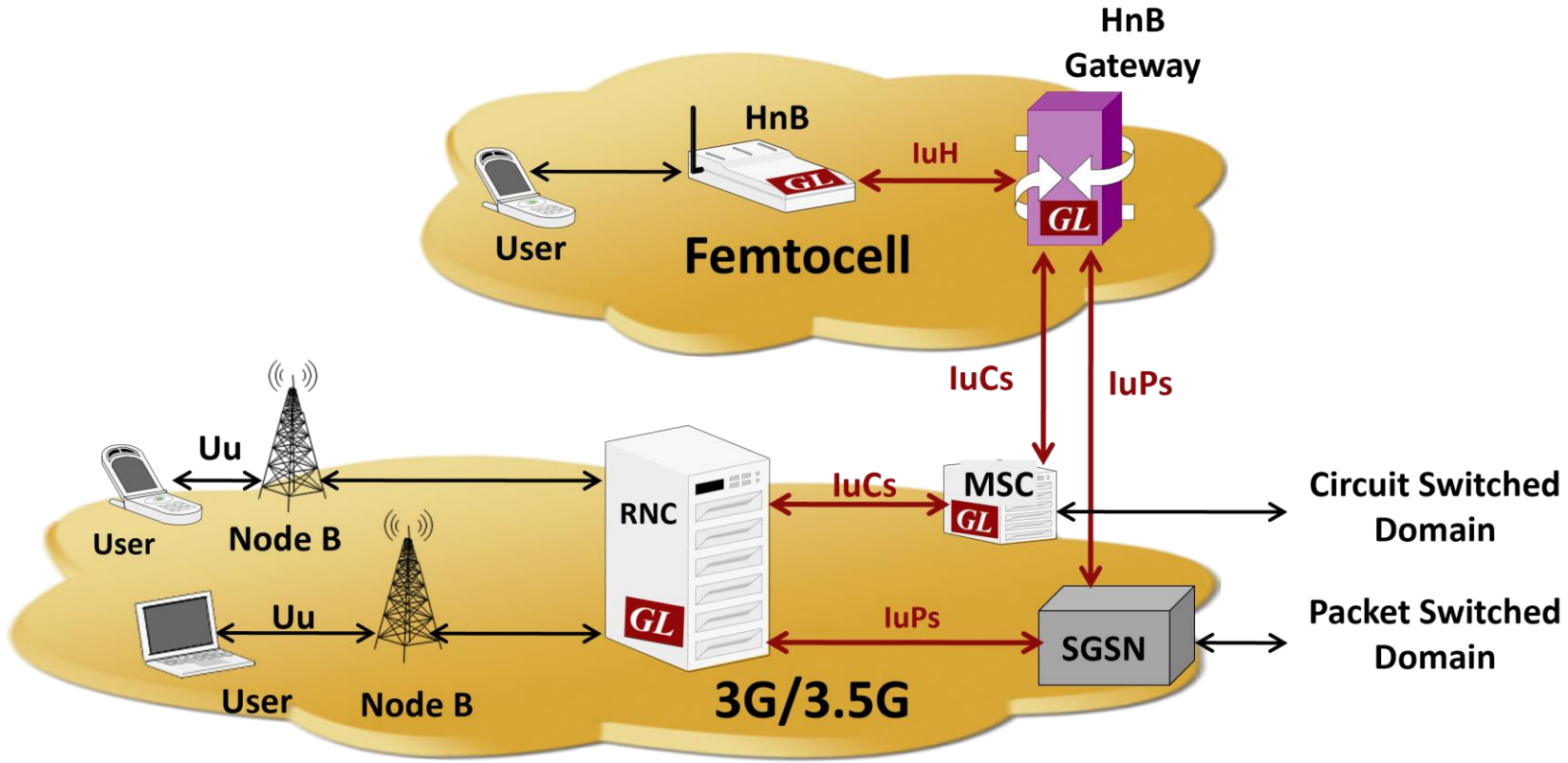
MAPS™ UMTS for IuCS and IuH Interfaces



MAPS™ UMTS-IuCs and IuH Emulator
Generate up to 20,000 Subscribers
Up to 2000 Simultaneous Calls

MAPS™ UMTS-IuCS and IuH Emulator
HD RTP Generator Hardware
Generate up to 20,000 Subscribers
20,000 Simultaneous Calls (with RTP Traffic)

GL Communications

Highlights

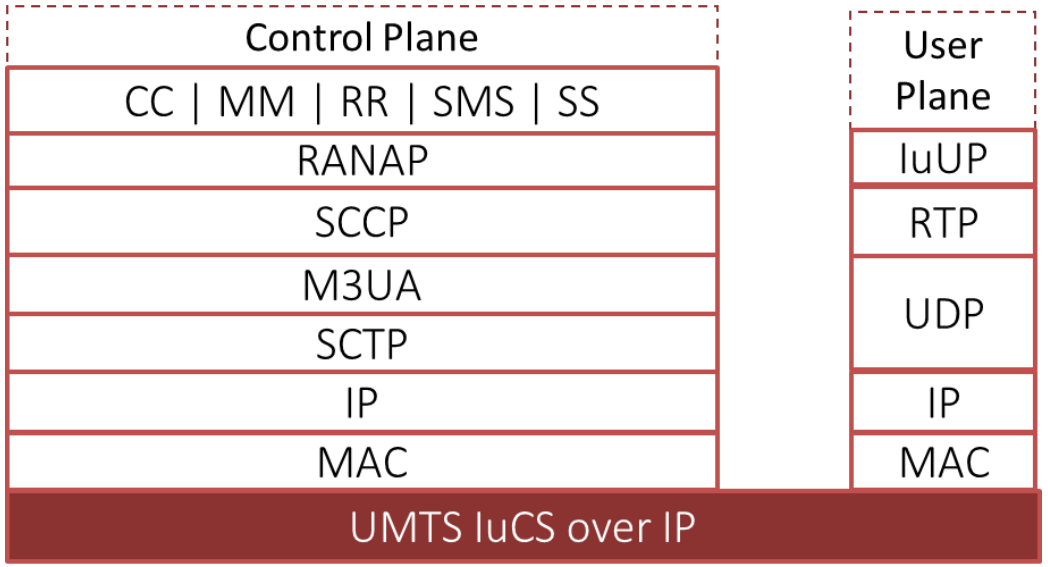
- Emulates RNC, MSC, Home NodeB (HnB) and Home NodeB Gateway (HN GW) entities
- Generates and process all Mobility Management, Session Management, RANAP, ALCAP, and DTAP messages over SSCOP
- User controlled access to RANAP, and DTAP signaling messages over SCTP
- Ready scripts for Mobile Originating, Mobile Terminating, Location Updating procedures for quick testing
- Supports RAB Assignment, Authentication, TMSI Reallocation, Encryption, and other optional procedures
- SSCOP links over which RANAP and ALCAP signaling will be carried further for making calls
- SSCOP Server (GL's WCS based server module) provides SSCOP, AAL5 and AAL2 layer services
- Supports various traffic types including Tone, Digits and File playback over AAL2
- Supports traffic over Iu UP protocol layer and also over normal RTP sessions (requires additional licenses)
- All Codec supported including - G.711, G.711 App II with VAD, G.729, G.726, G.726 with VAD, GSM, AMR NB and WB, EVRC, SMV, iLBC, SPEEX NB and WB, G722, and G722.1

High Density (HD) RTP Traffic Simulation

- Rackmount network appliance with 4x1GigE NIC
- Transport over UDP and TCP, IPv4 and IPv6, and TLS for secure transport
- Easily achieve up to 20,000 endpoints per appliance (5000 per port)
- Up to 250 calls per second (with RTP traffic)
- Scales to around 100,000 to 200,000 endpoints with use of Master Controller for single point of control
- Manage 10+ MAPS™ systems with single point of control from Master Controller

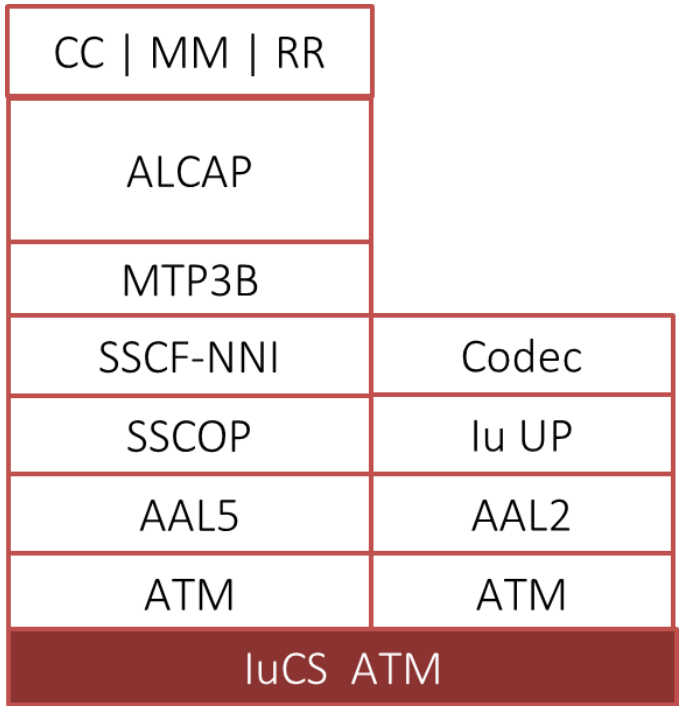
GL Communications

UMTS IuCS IP Protocol Stack



Supported Protocols	Specification Used
IuCS IP Interface	
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	Q.703, ITU-T Blue Book
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 24.008 V5.16.0 (2006-06)
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998
Iu-UP (User Plane)	3GPP TS 25.415
SCTP	RFC4960

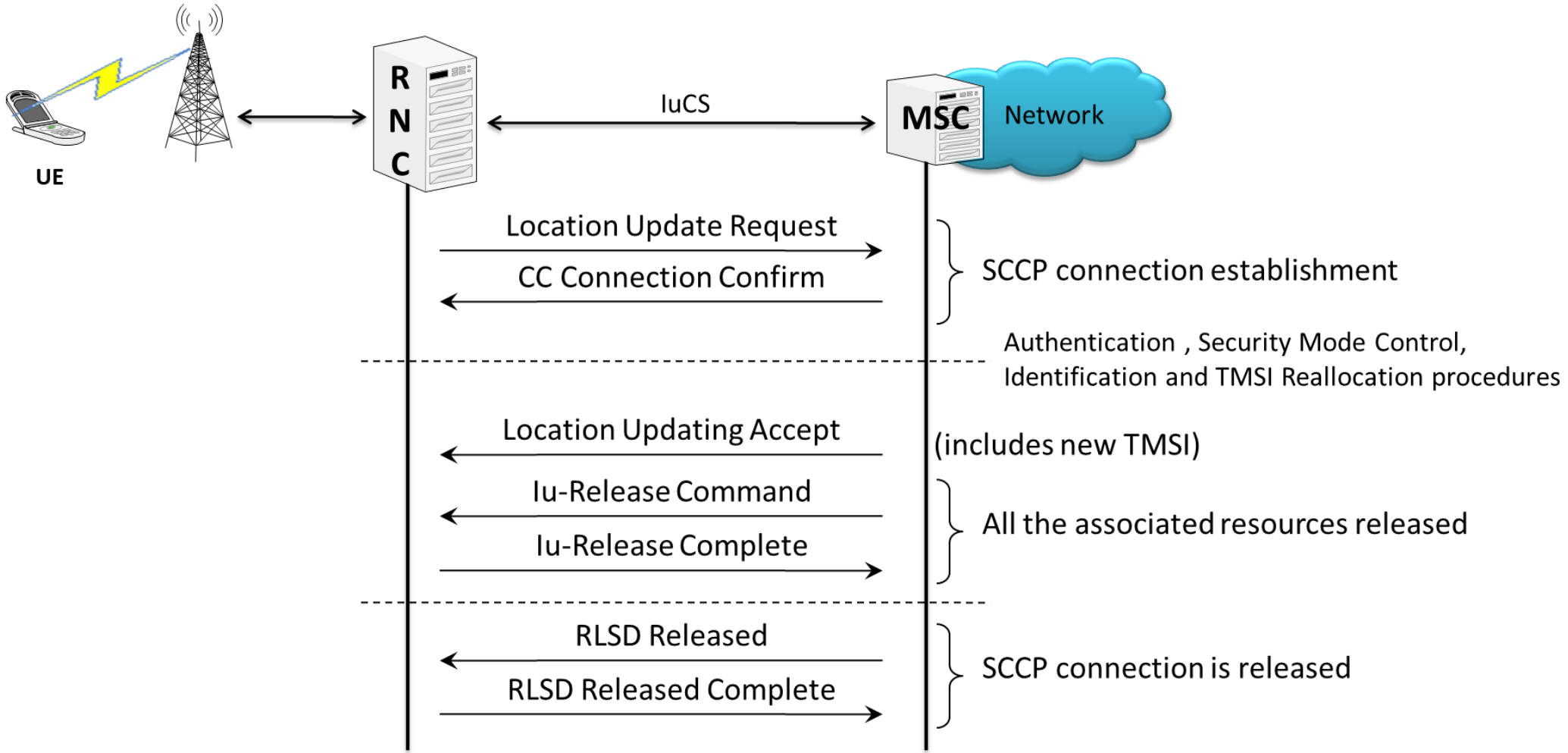
UMTS IuCS ATM Protocol Stack



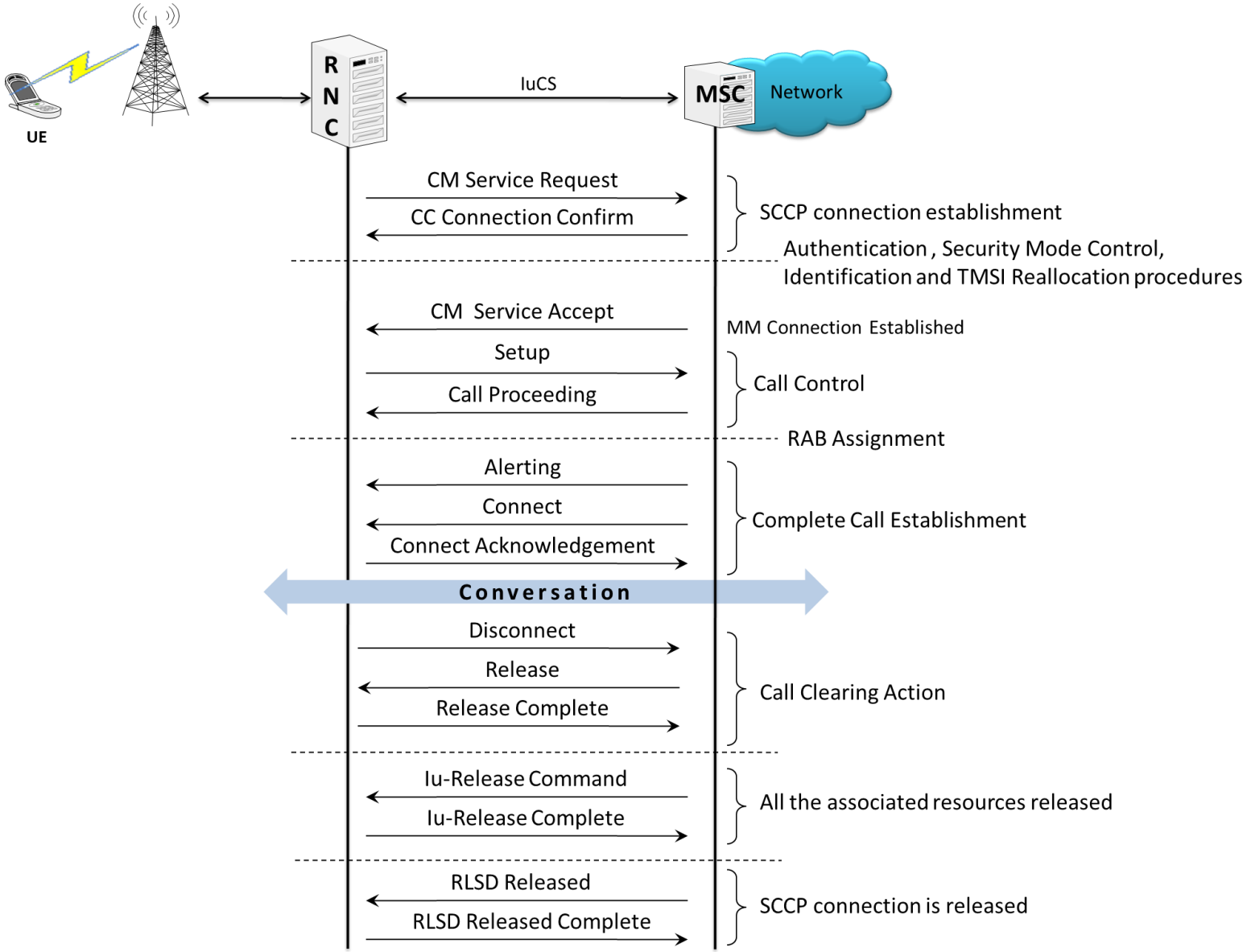
Supported Protocols	Specification Used
IuCS ATM Interface	
SSCOP	ITU-T Q.2110
MTP3b	ITU-T Recommendation Q.2210
AAL Type 2 (ALCAP)	ITU-T Recommendation Q.2630.1
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 24.008 V5.16.0 (2006-06)
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998
Iu-UP Iu User Plane Interface	3GPP TS 25.415

Call Emulation Procedures over IP

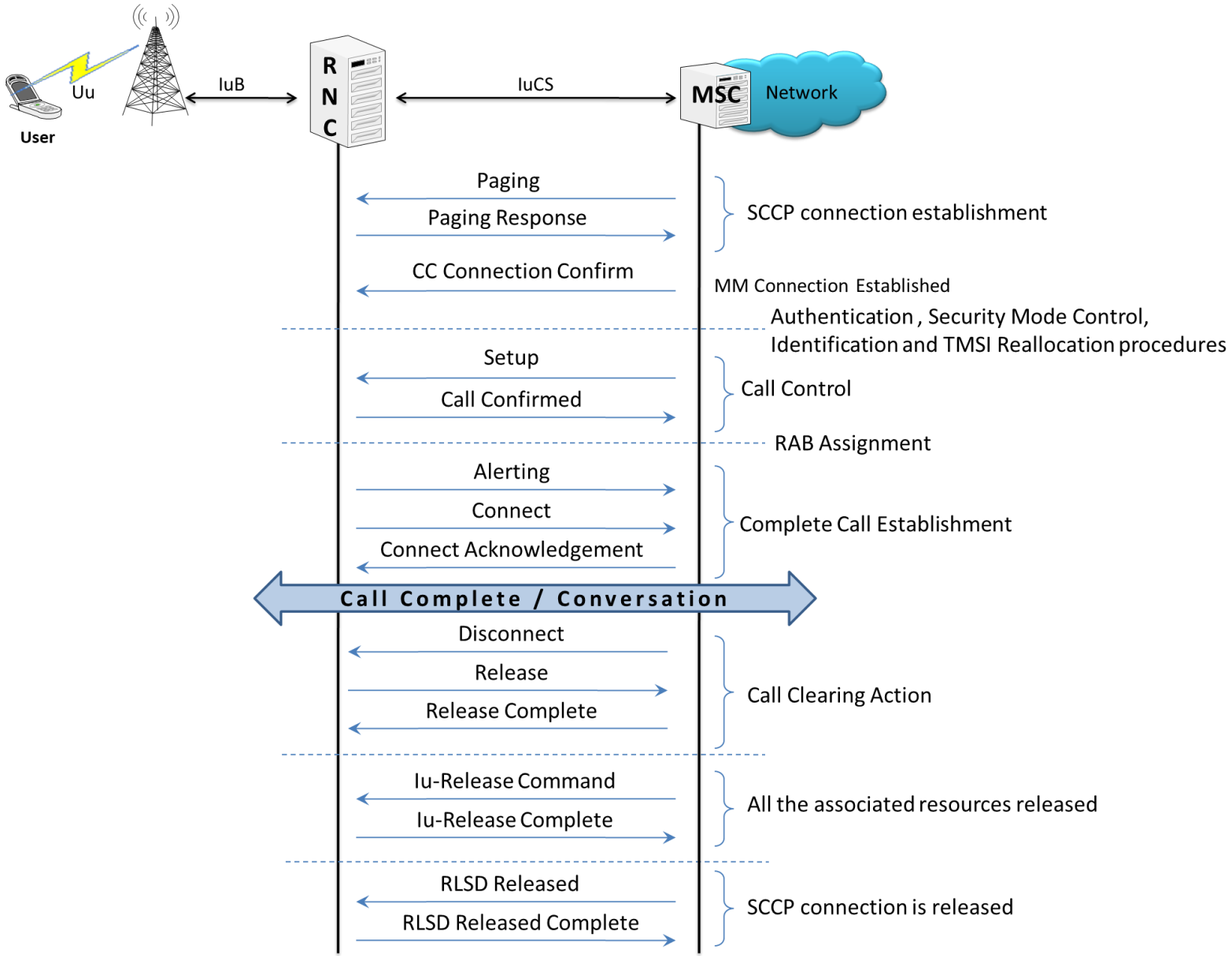
Location Updating (LU) Call Flow



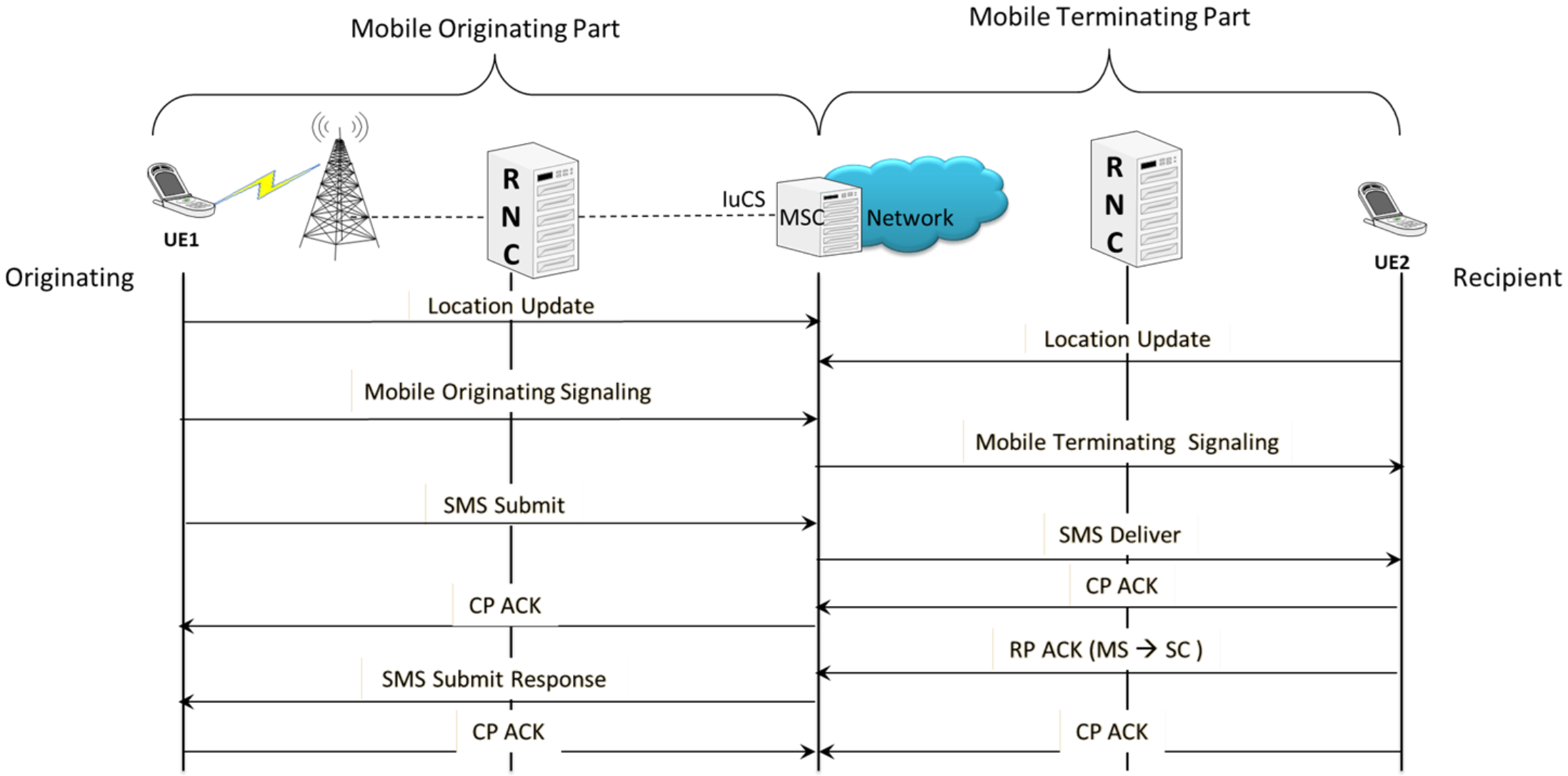
Mobile Originating Call Procedure



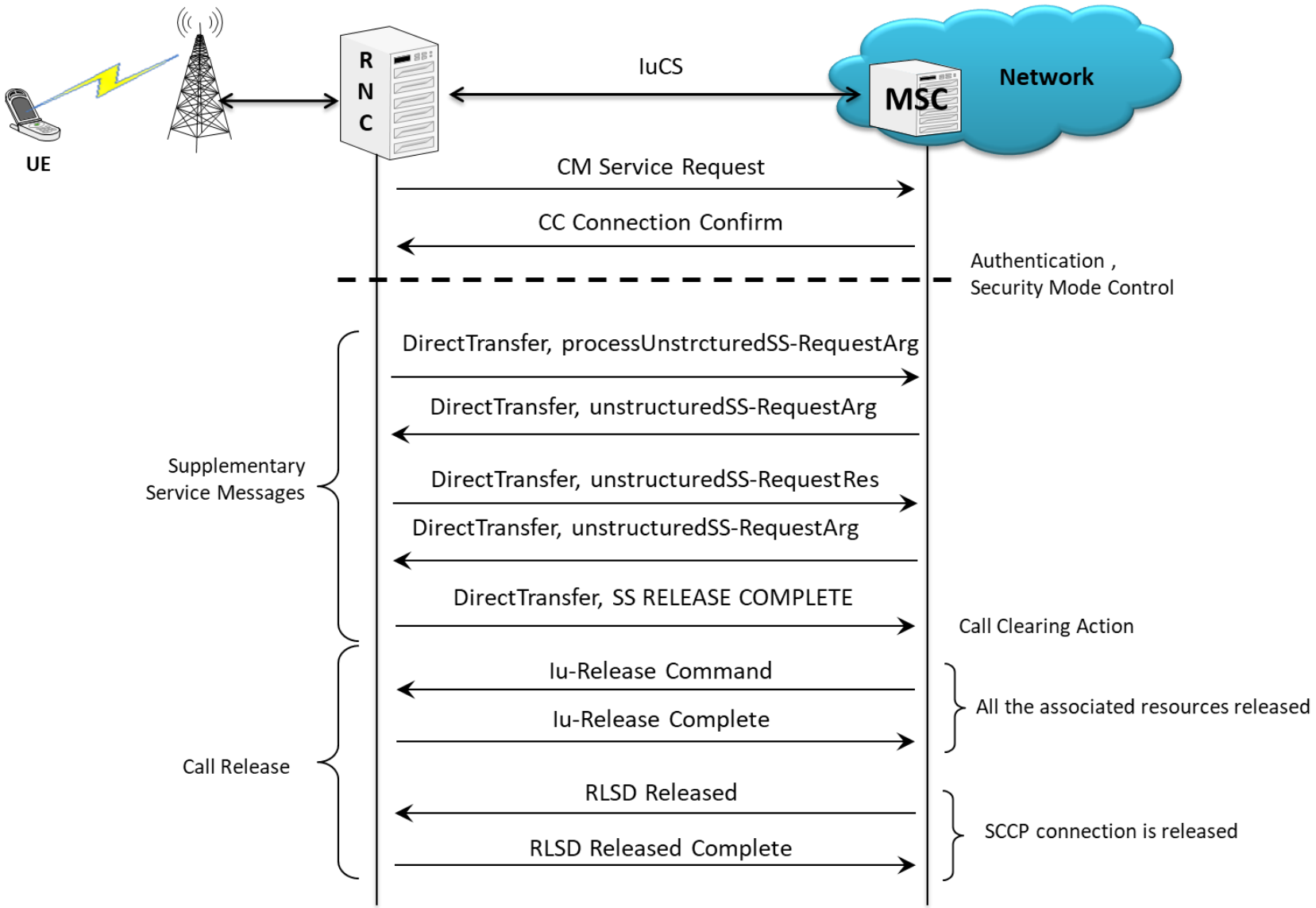
Mobile Terminating Call Procedure



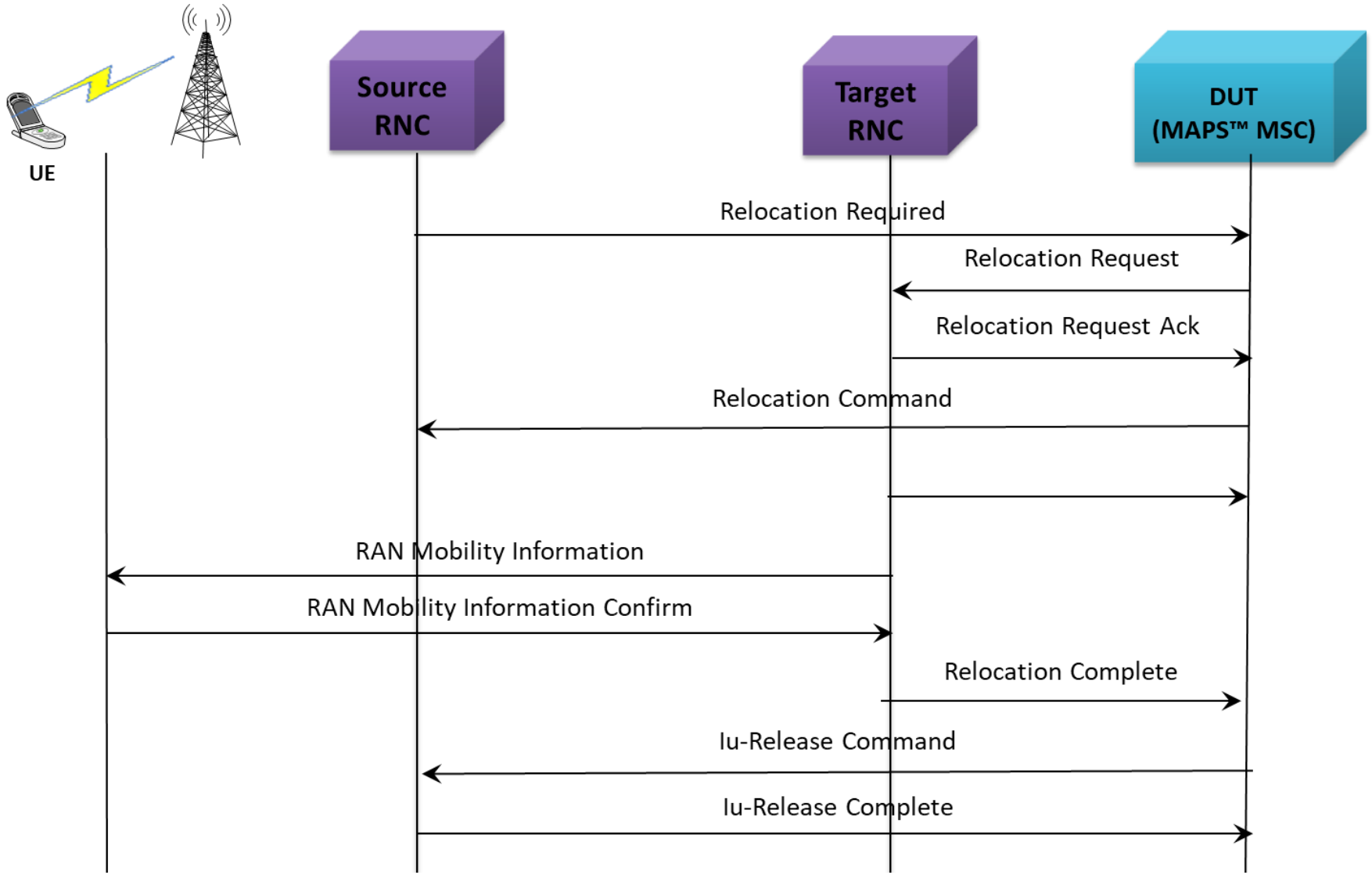
Mobile to Mobile SMS Call Procedure



Supplementary Service Call Flow

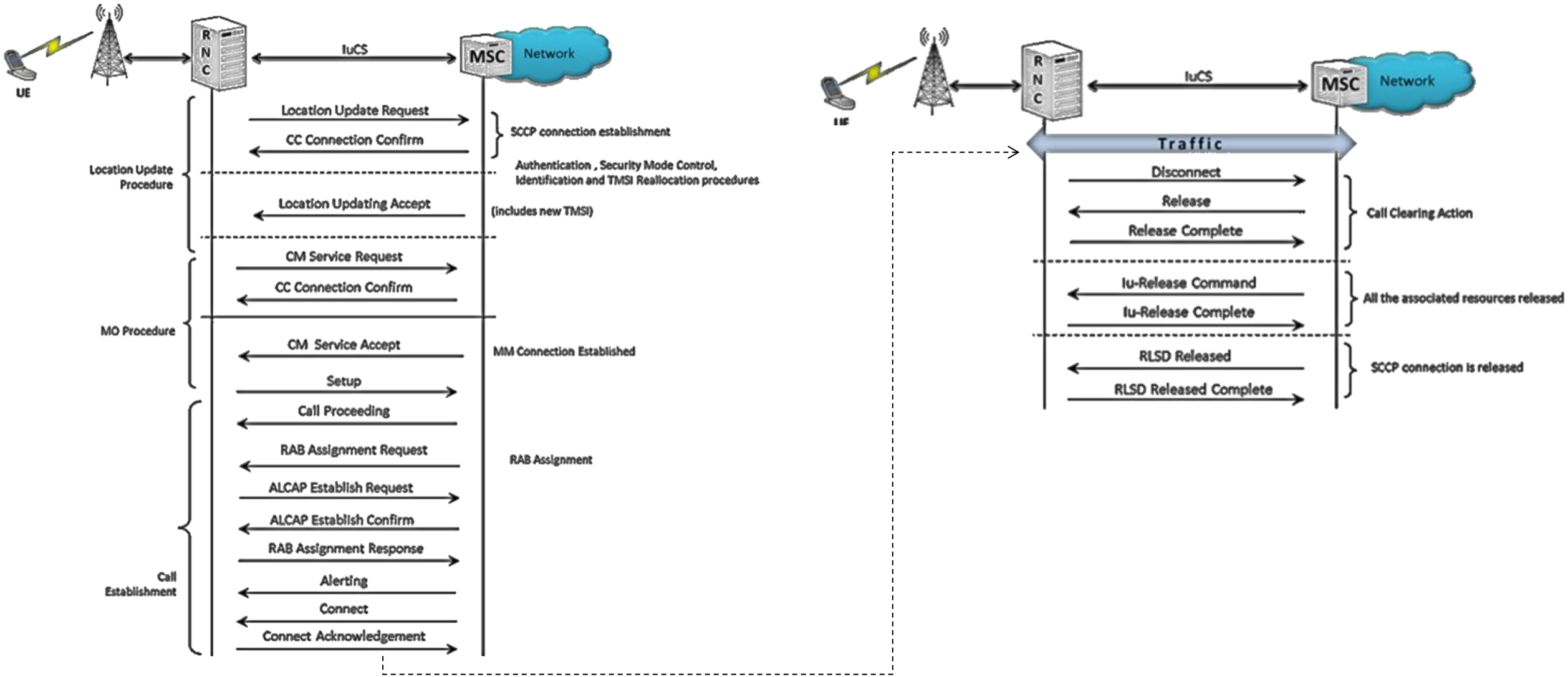


Relocation Call Procedure

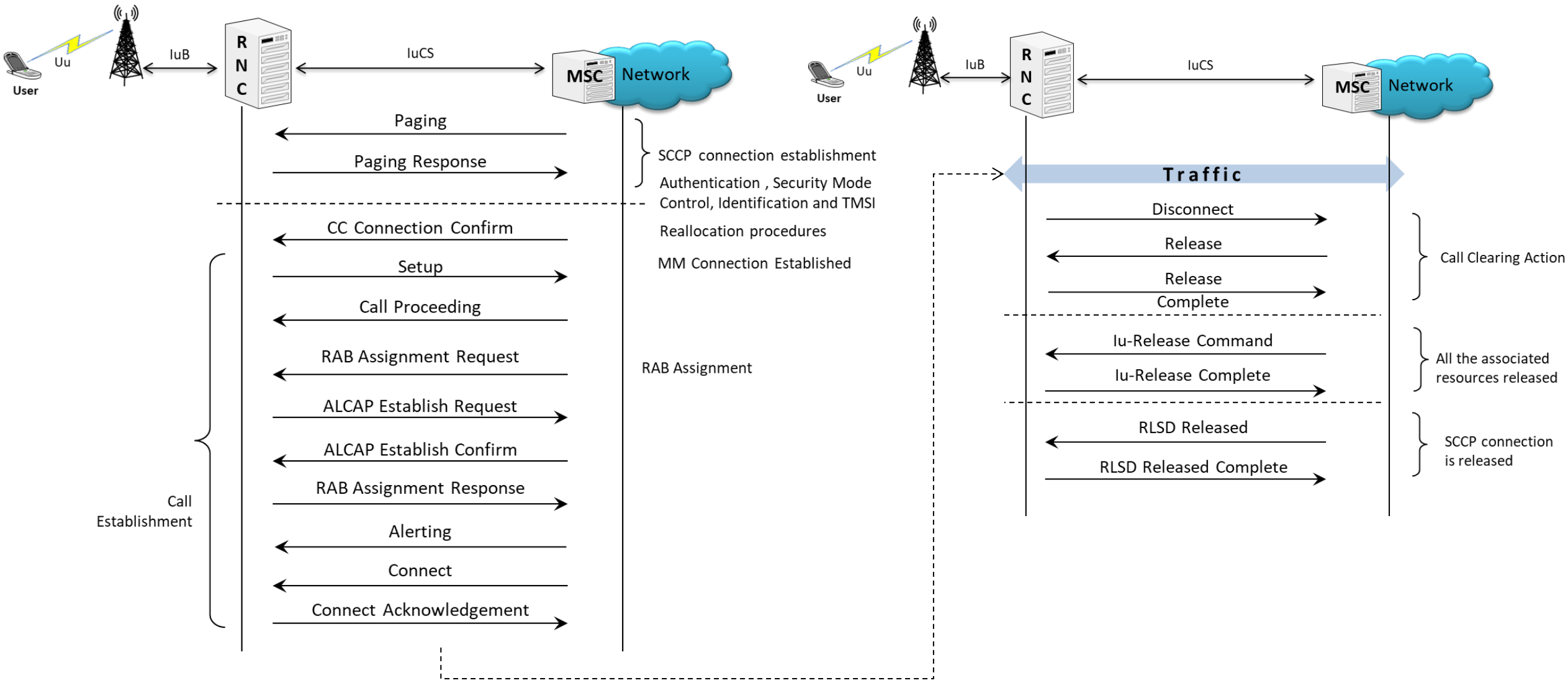


Call Emulation Procedures over ATM

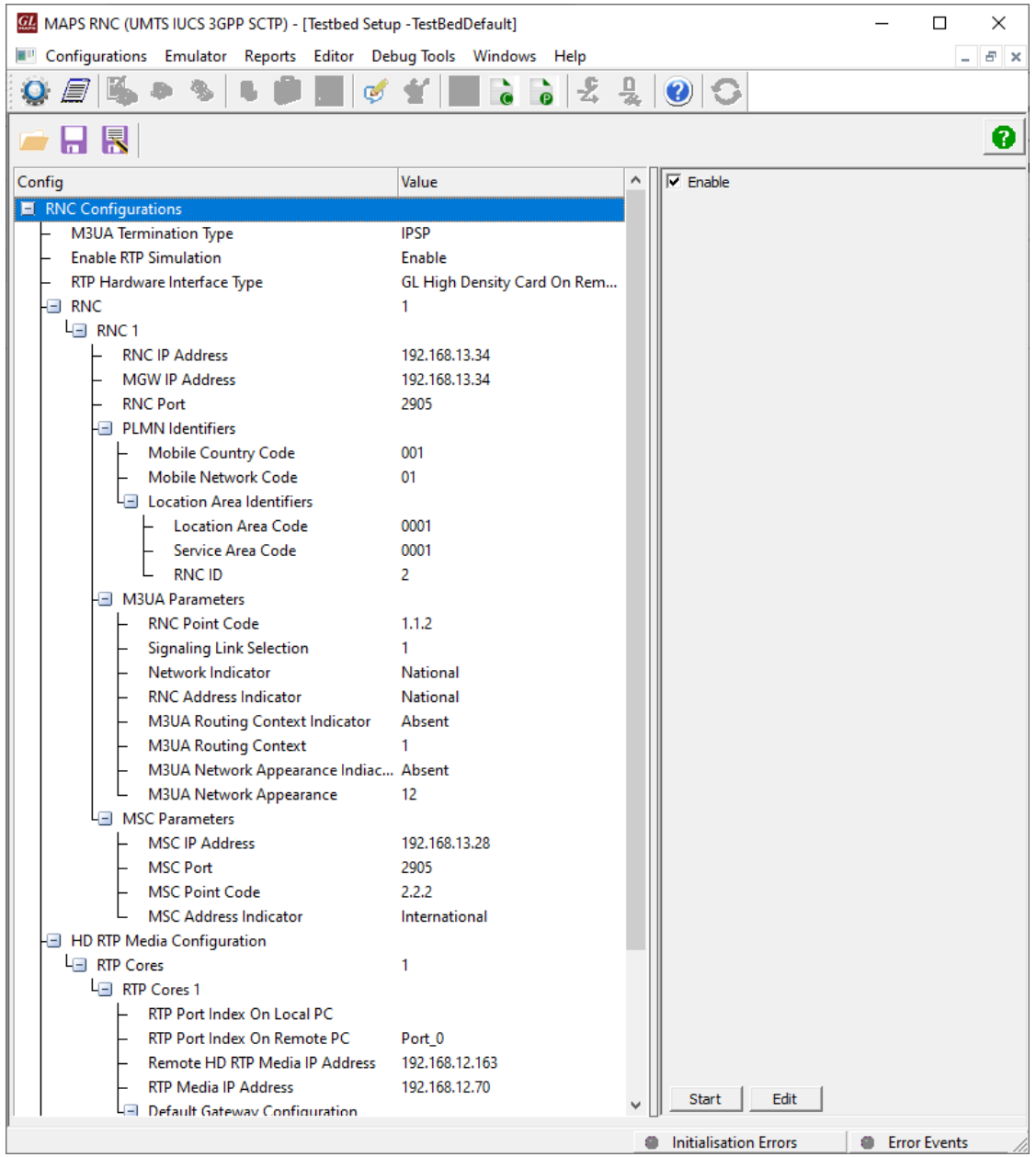
MO Call Procedure



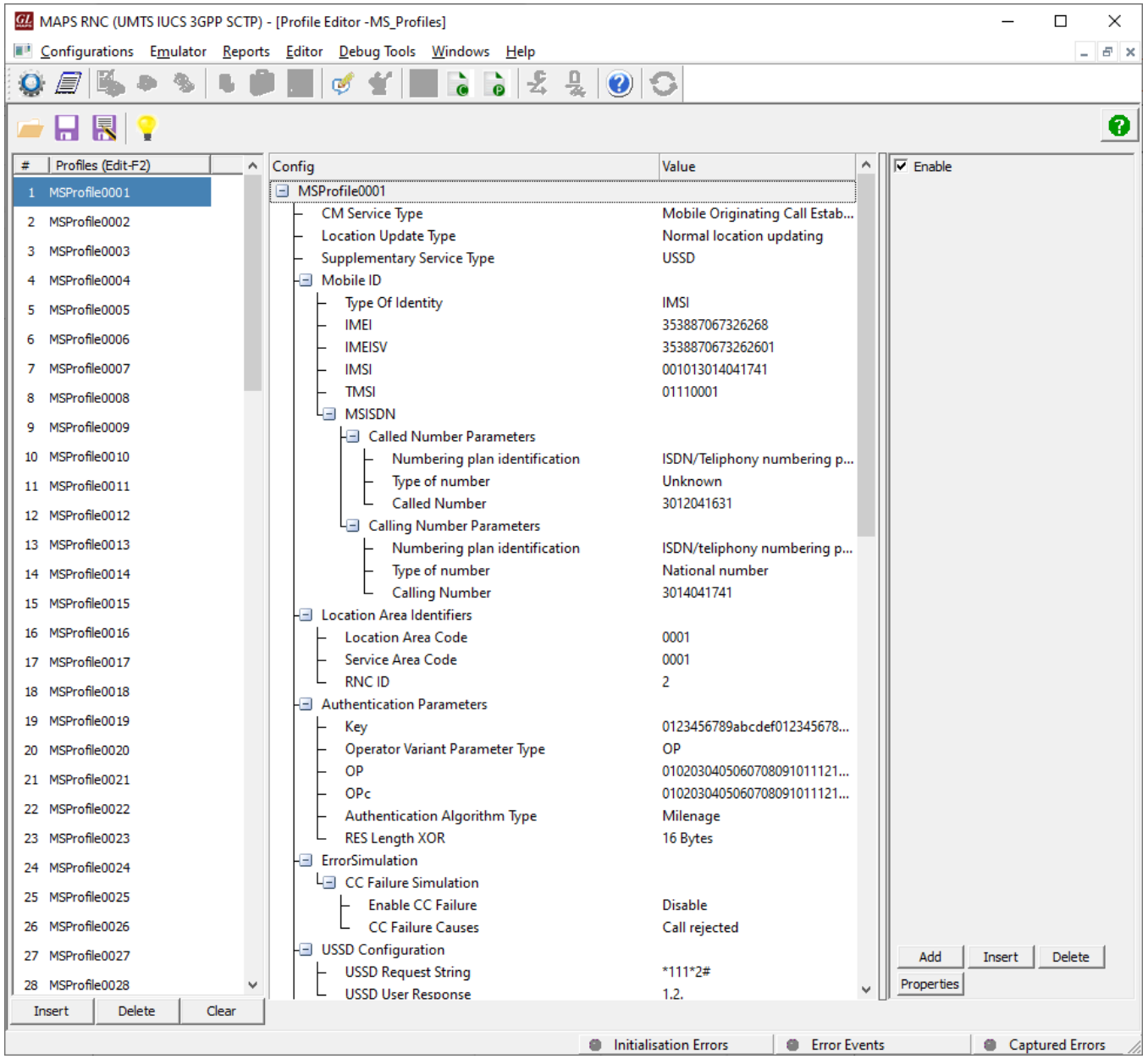
MT Call Procedure



Testbed Configuration

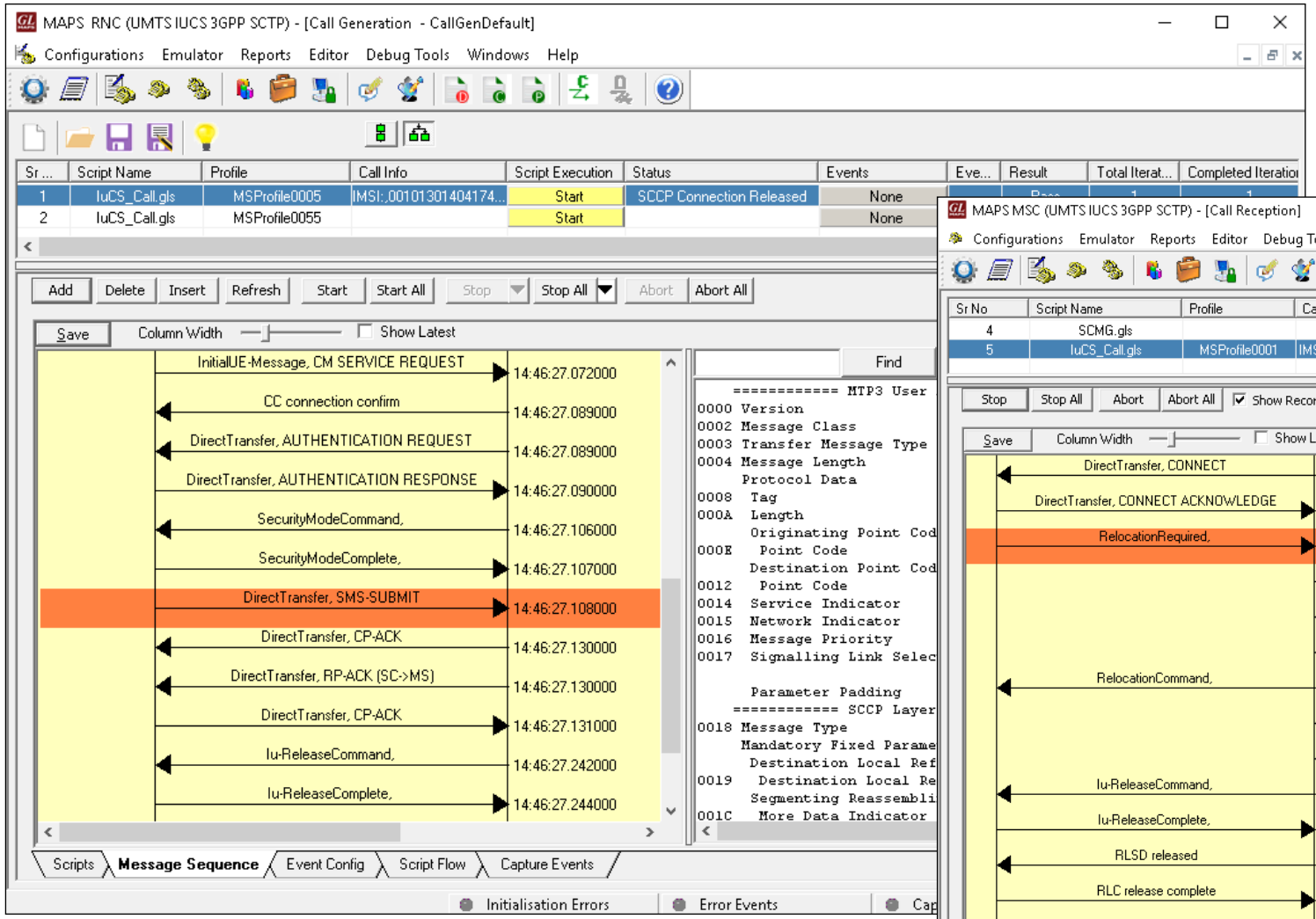


Profile Configuration

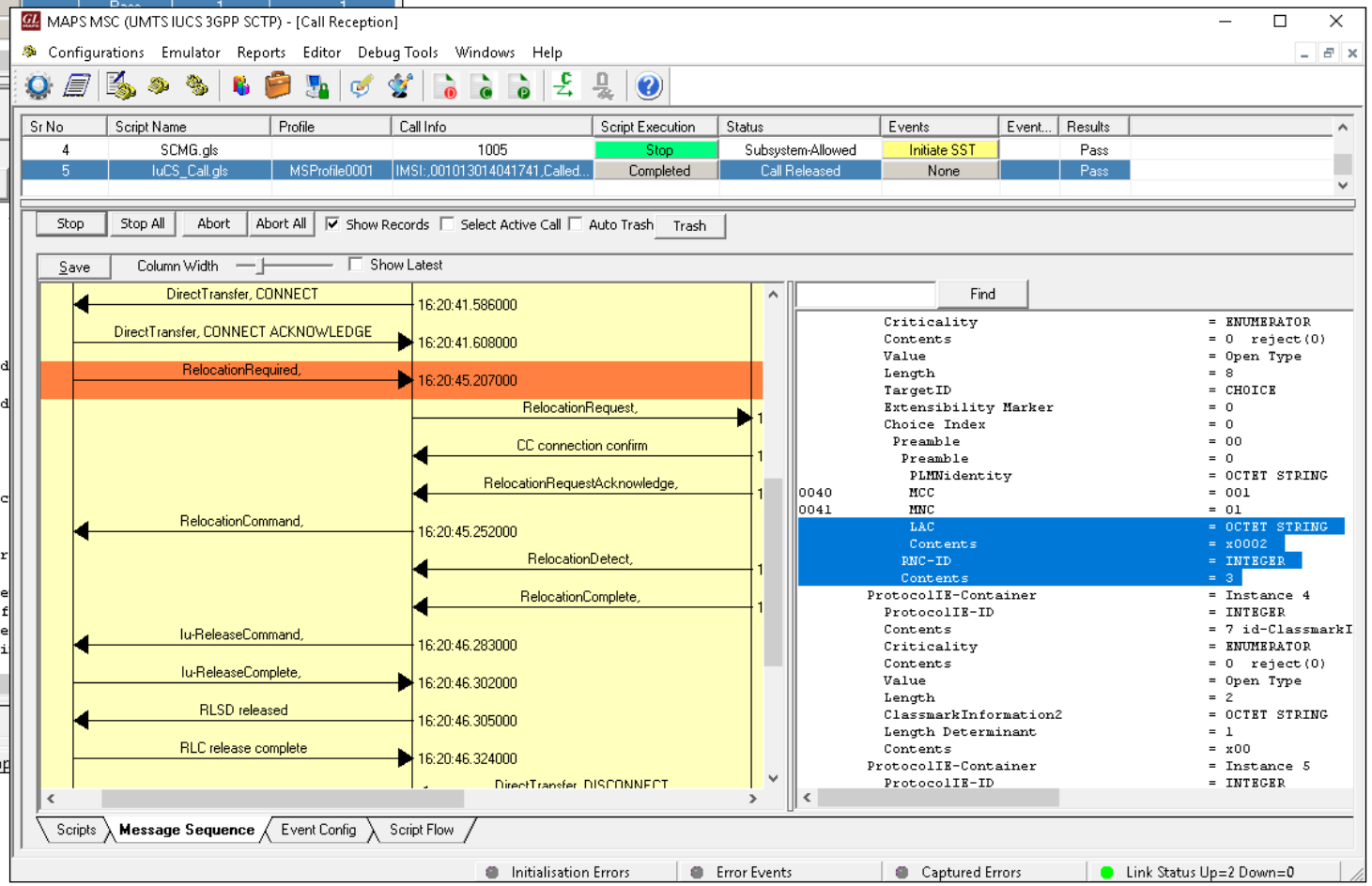


Call Emulation over IuCS IP

SMS over Voice Call Emulation

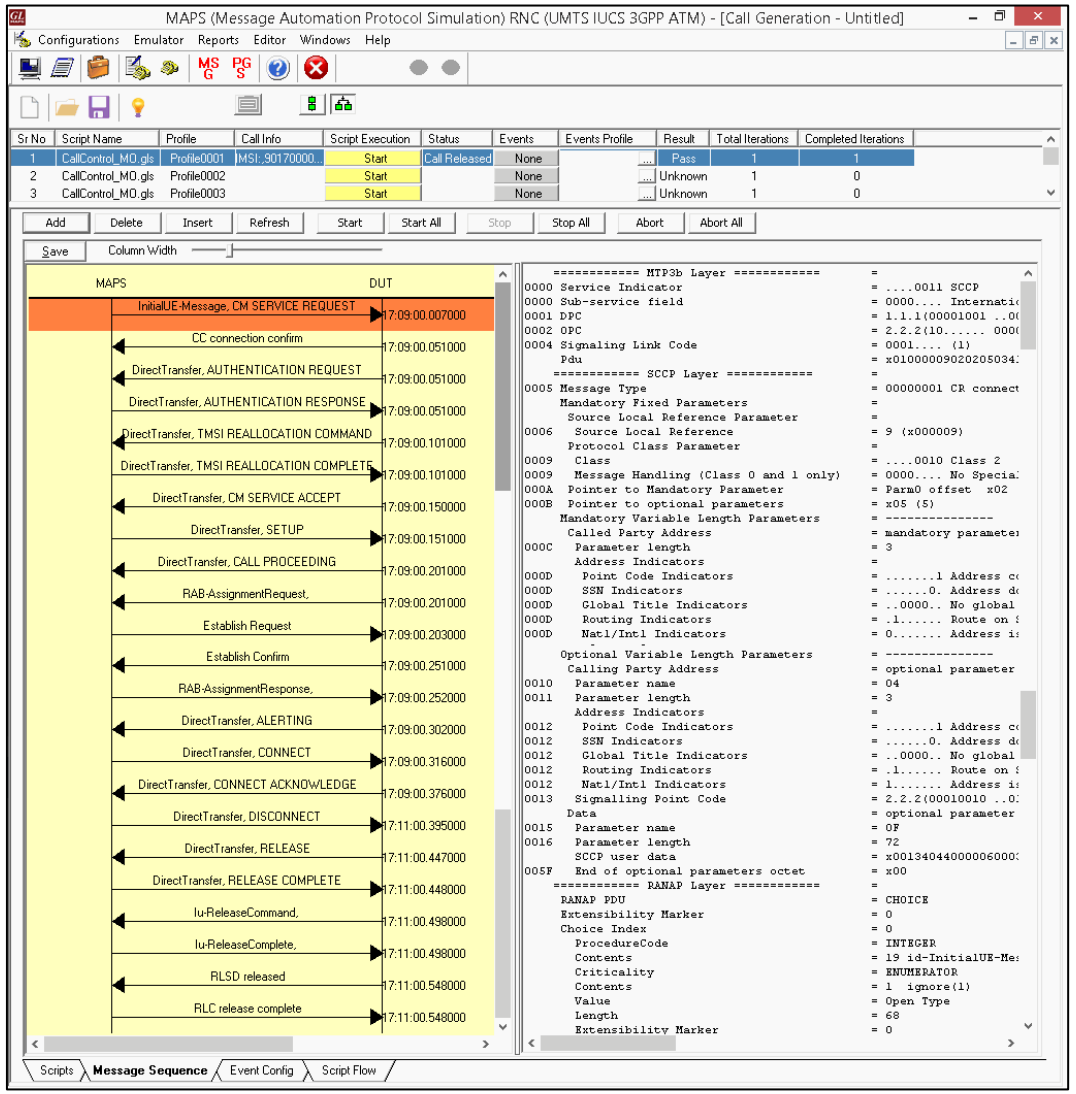


Relocation Procedure Emulation

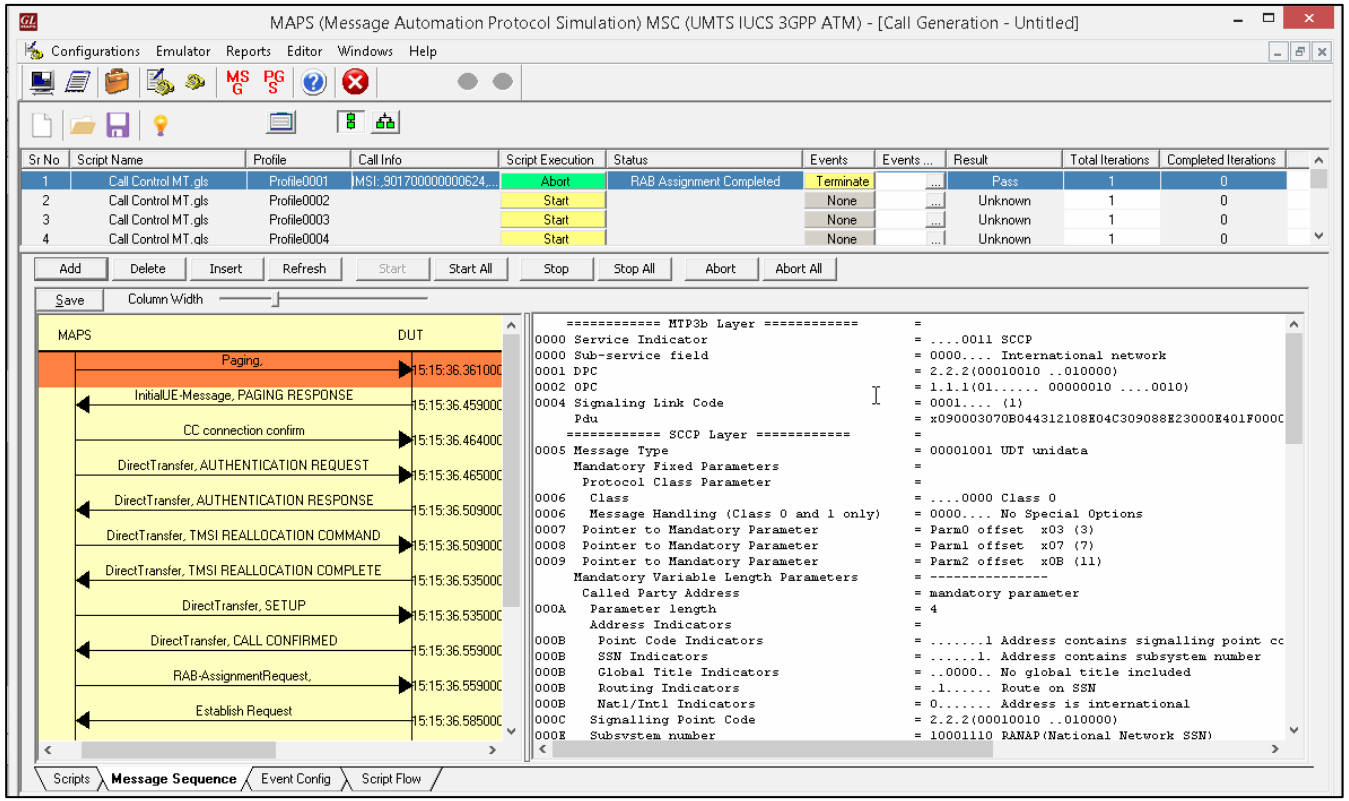


Call Emulation over IuCS ATM

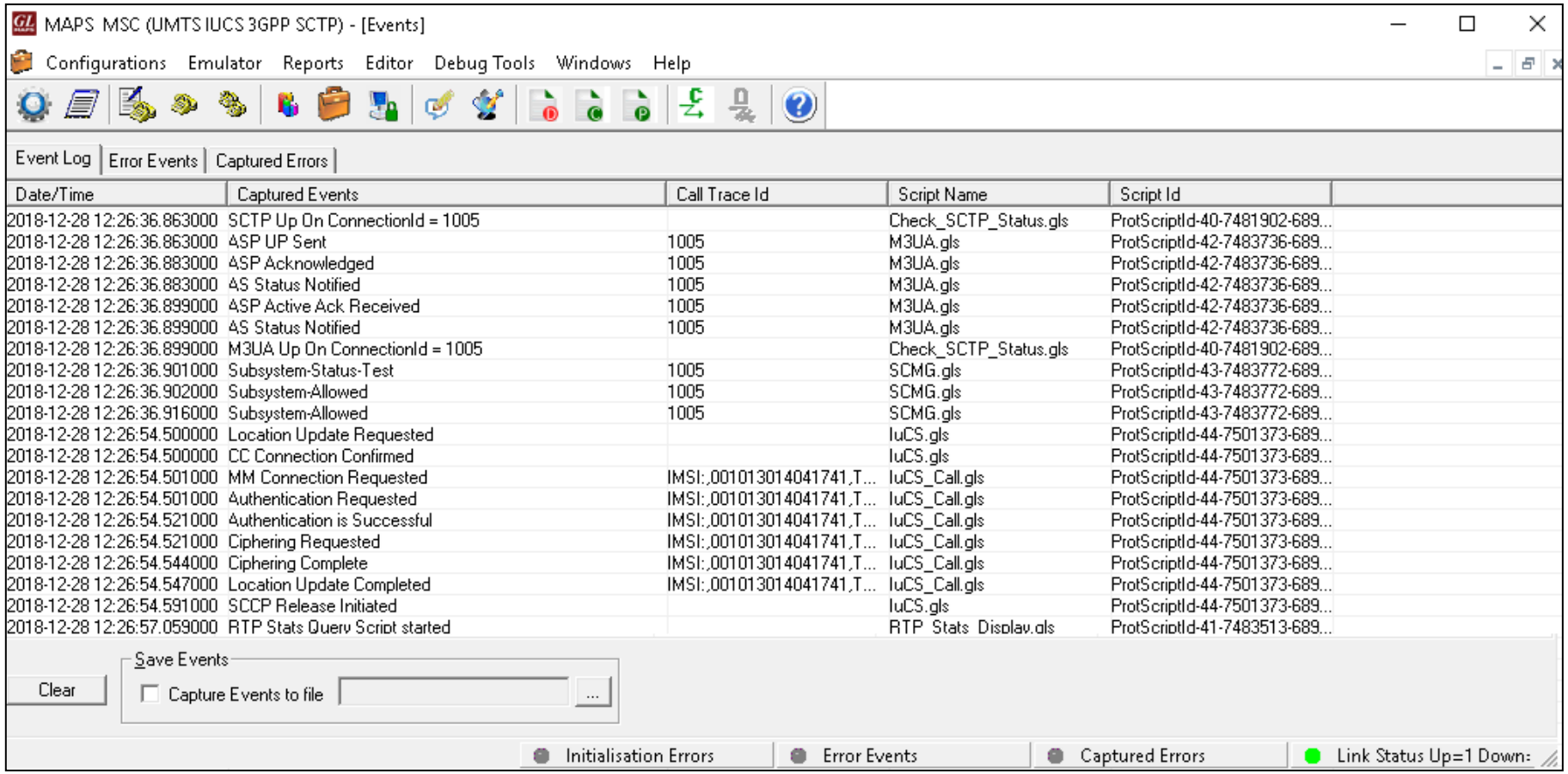
Call Control MO Procedure



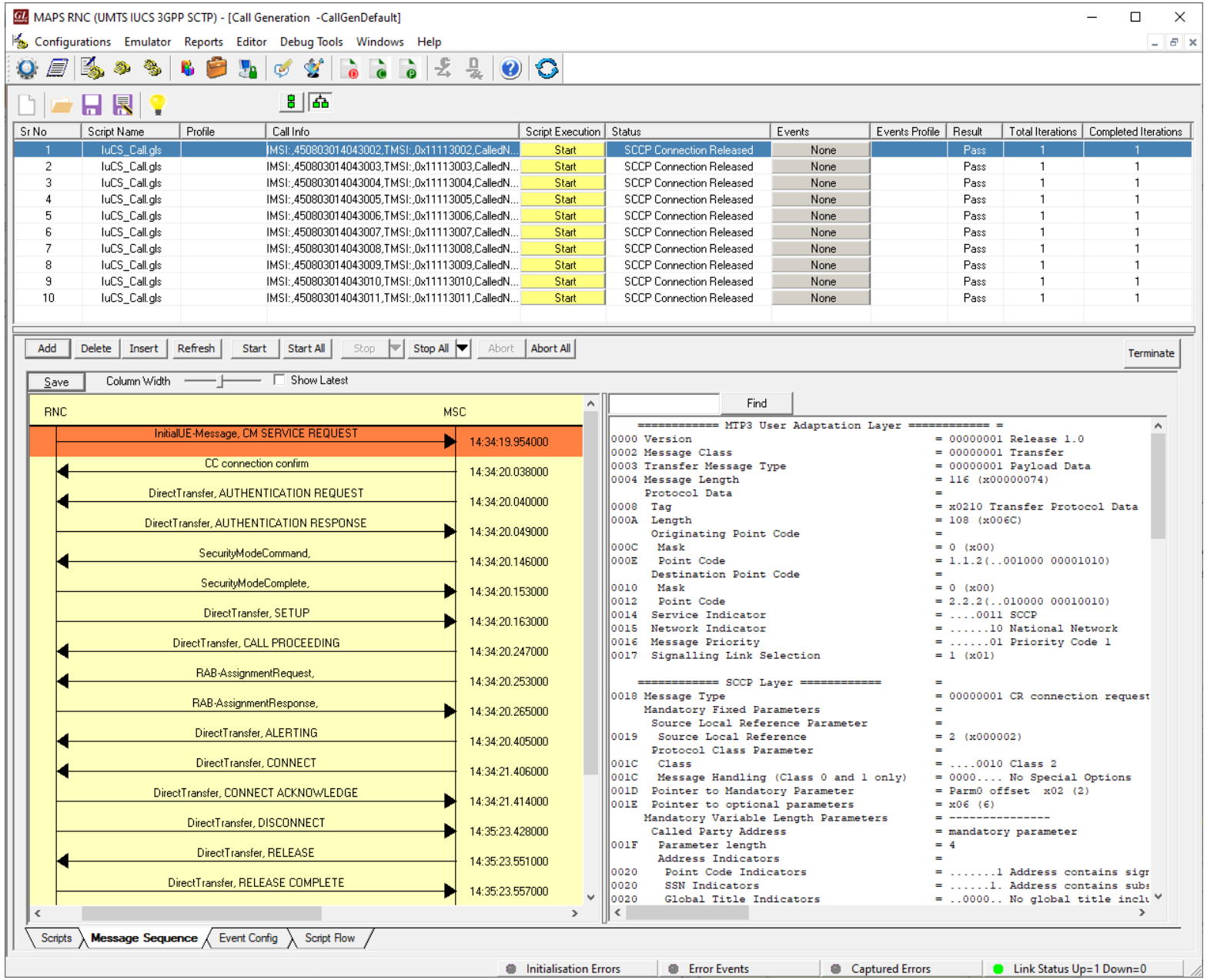
Call Control MT Procedure



Events Log


MAPS MSC (UMTS IUCS 3GPP SCTP) - [Events]
Configurations Emulator Reports Editor Debug Tools Windows Help
Event Log
Error Events
Captured Errors
Date/Time | Captured Events | Call Trace Id | Script Name | Script Id
2018-12-28 12:26:36.863000 | SCTP Up On ConnectionId = 1005 | | Check_SCTP_Status.gls | ProtScriptId-40-7481902-689...
2018-12-28 12:26:36.863000 | ASP UP Sent | 1005 | M3UA.gls | ProtScriptId-42-7483736-689...
2018-12-28 12:26:36.883000 | ASP Acknowledged | 1005 | M3UA.gls | ProtScriptId-42-7483736-689...
2018-12-28 12:26:36.883000 | AS Status Notified | 1005 | M3UA.gls | ProtScriptId-42-7483736-689...
2018-12-28 12:26:36.899000 | ASP Active Ack Received | 1005 | M3UA.gls | ProtScriptId-42-7483736-689...
2018-12-28 12:26:36.899000 | AS Status Notified | 1005 | M3UA.gls | ProtScriptId-42-7483736-689...
2018-12-28 12:26:36.899000 | M3UA Up On ConnectionId = 1005 | | Check_SCTP_Status.gls | ProtScriptId-40-7481902-689...
2018-12-28 12:26:36.901000 | Subsystem-Status-Test | 1005 | SCMG.gls | ProtScriptId-43-7483772-689...
2018-12-28 12:26:36.902000 | Subsystem-Allowed | 1005 | SCMG.gls | ProtScriptId-43-7483772-689...
2018-12-28 12:26:36.916000 | Subsystem-Allowed | 1005 | SCMG.gls | ProtScriptId-43-7483772-689...
2018-12-28 12:26:54.500000 | Location Update Requested | | IuCS.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.500000 | CC Connection Confirmed | | IuCS.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.501000 | MM Connection Requested | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.501000 | Authentication Requested | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.521000 | Authentication is Successful | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.521000 | Ciphering Requested | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.544000 | Ciphering Complete | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.547000 | Location Update Completed | IMSI:,001013014041741,T... | IuCS_Call.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:54.591000 | SCCP Release Initiated | | IuCS.gls | ProtScriptId-44-7501373-689...
2018-12-28 12:26:57.059000 | RTP Stats Query Script started | | RTP_Stats_Display.gls | ProtScriptId-41-7483513-689...
Save Events
Clear
Capture Events to file
...
Initialisation Errors
Error Events
Captured Errors
Link Status Up=1 Down:

Bulk Call Generation using CSV Profiles

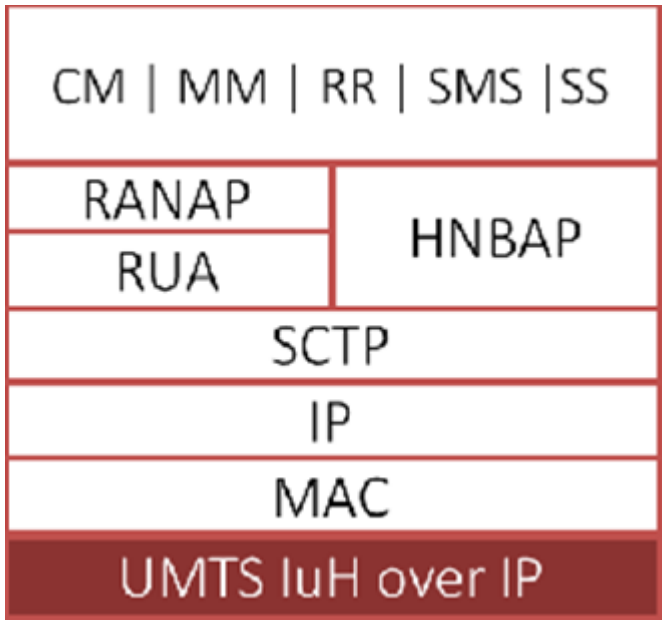


MAPS™ UMTS for IuH Interfaces

Key Features of IuH Network

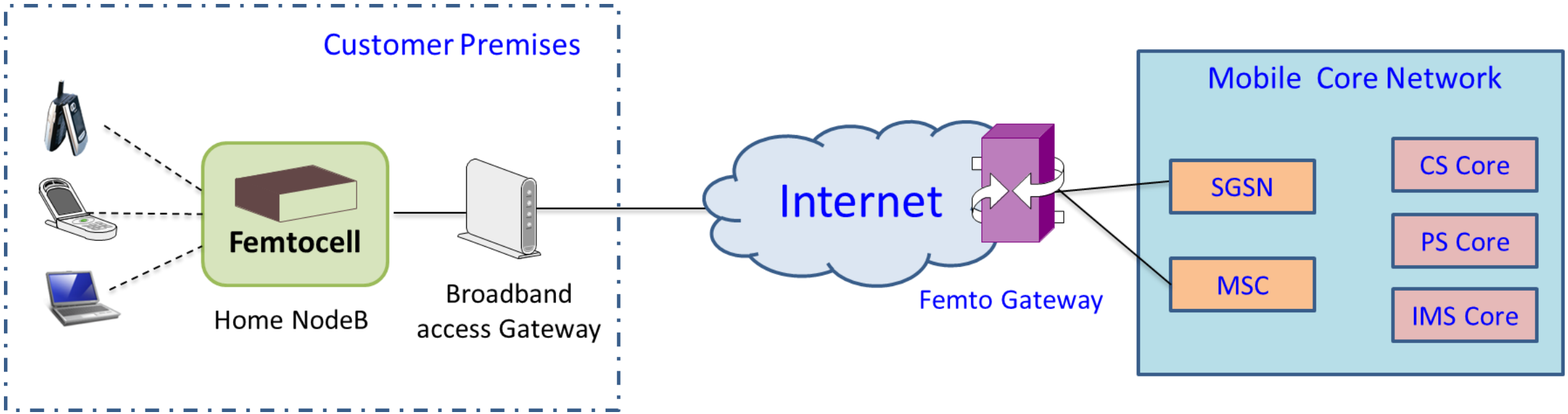
- Emulate RNC, MSC, Home NodeB (HnB) and Home NodeB Gateway (HN GW) entities
- Transmitting Voice Files
- Transmitting DTMF, MF Digits and other Tones and Dual Tones
- Recording Voice Files
- Monitoring Single and Dual Tones, DTMF, and MF digits
- Loopback, Talk using Microphone, Play to Speaker

UMTS IuH Protocol Stack

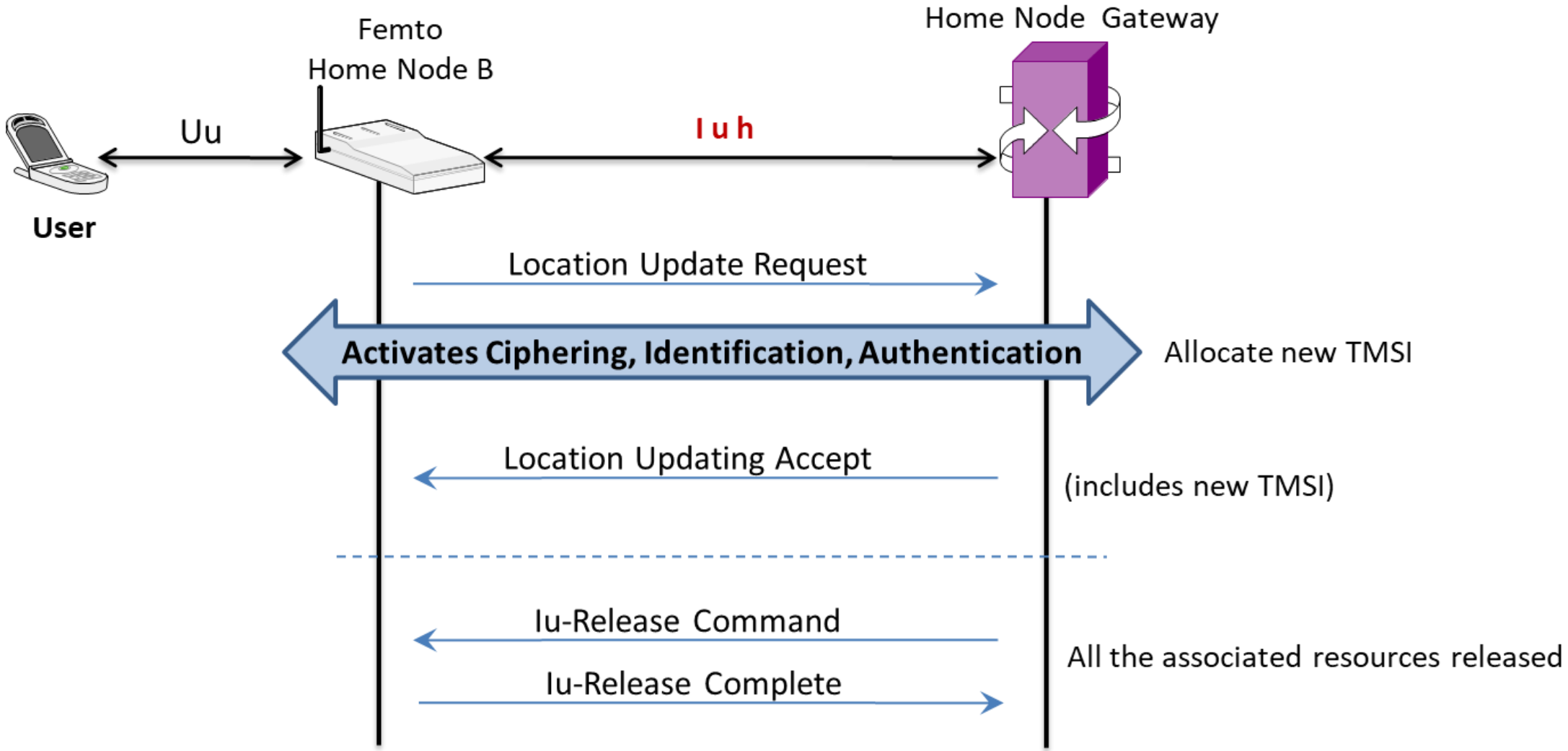


Supported Protocols	Specification Used
IuH Interface	
RUA	3GPP TS 25468 V9.1.0
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 04.08 V7.17.0
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998
SCTP	RFC 4960
HNBAP Home Node B (HNB) Application Part	Release 9 - 3GPP TS 25.469 V9.1.0 (2010-03) Release 12 - 3GPP TS 25.469 V12.2.0 (2014-09) (Release 12)

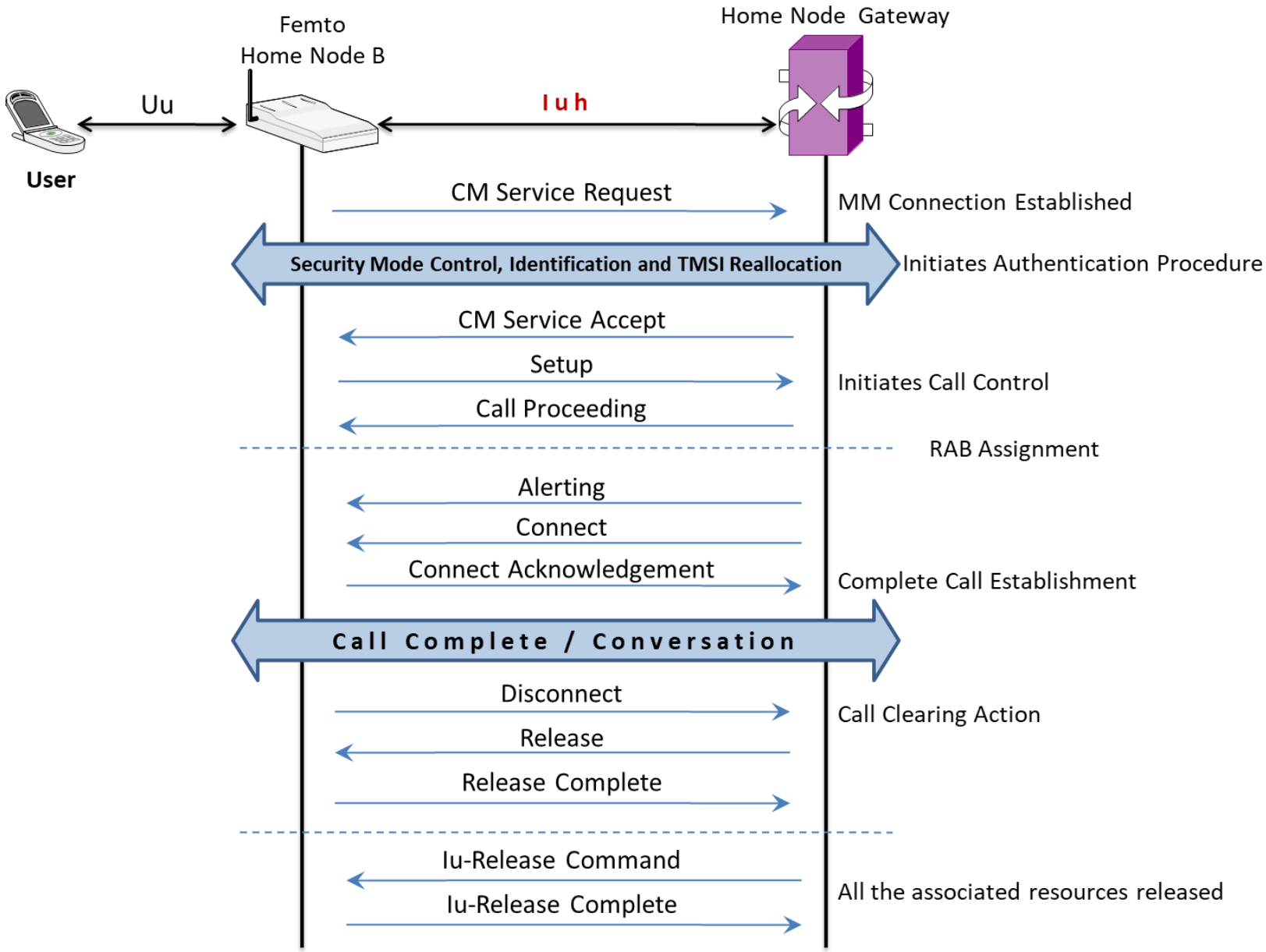
Femtocells Overview



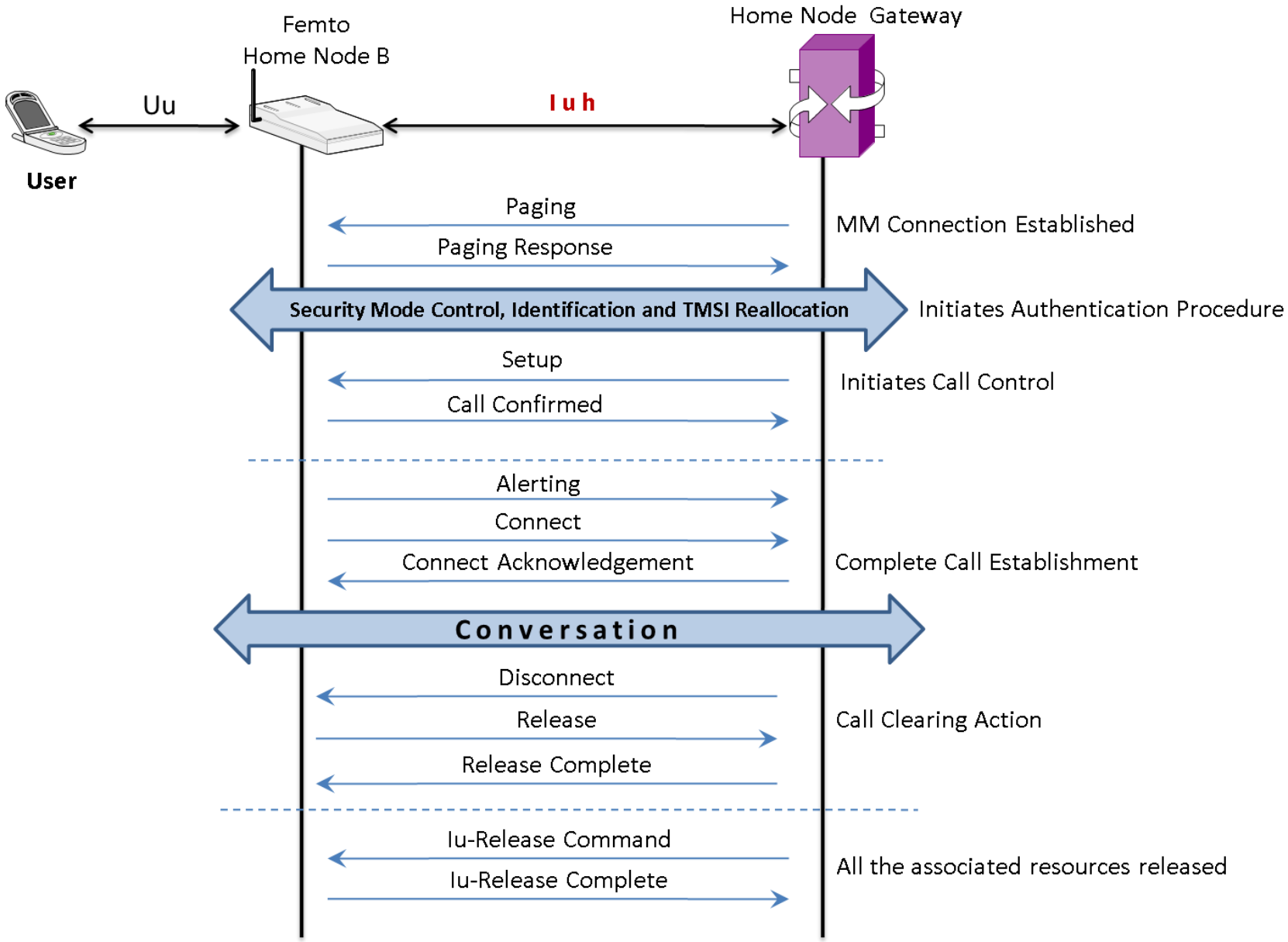
Location Update Call over IuH IP



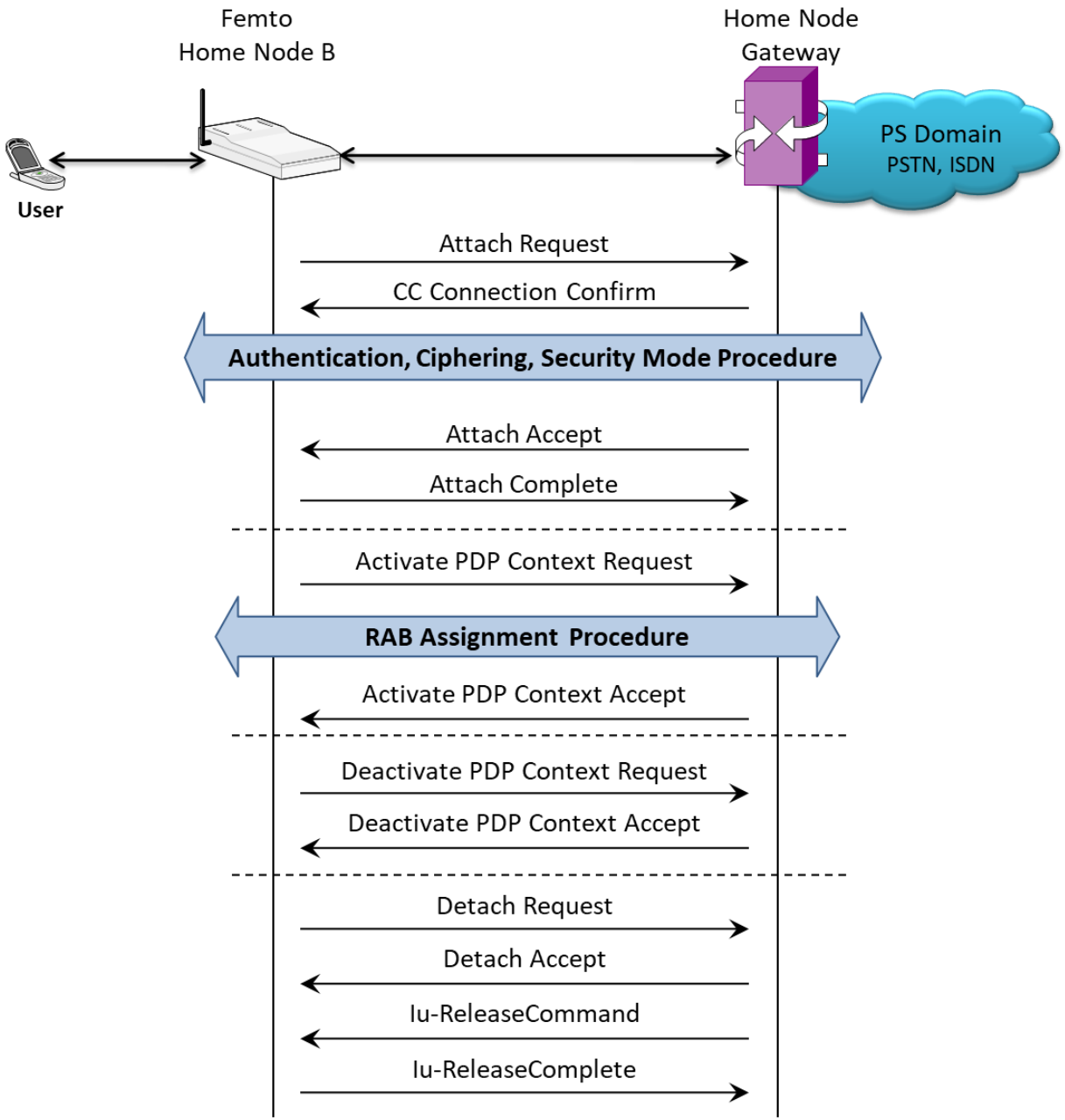
Mobile Originating Call over IuH IP



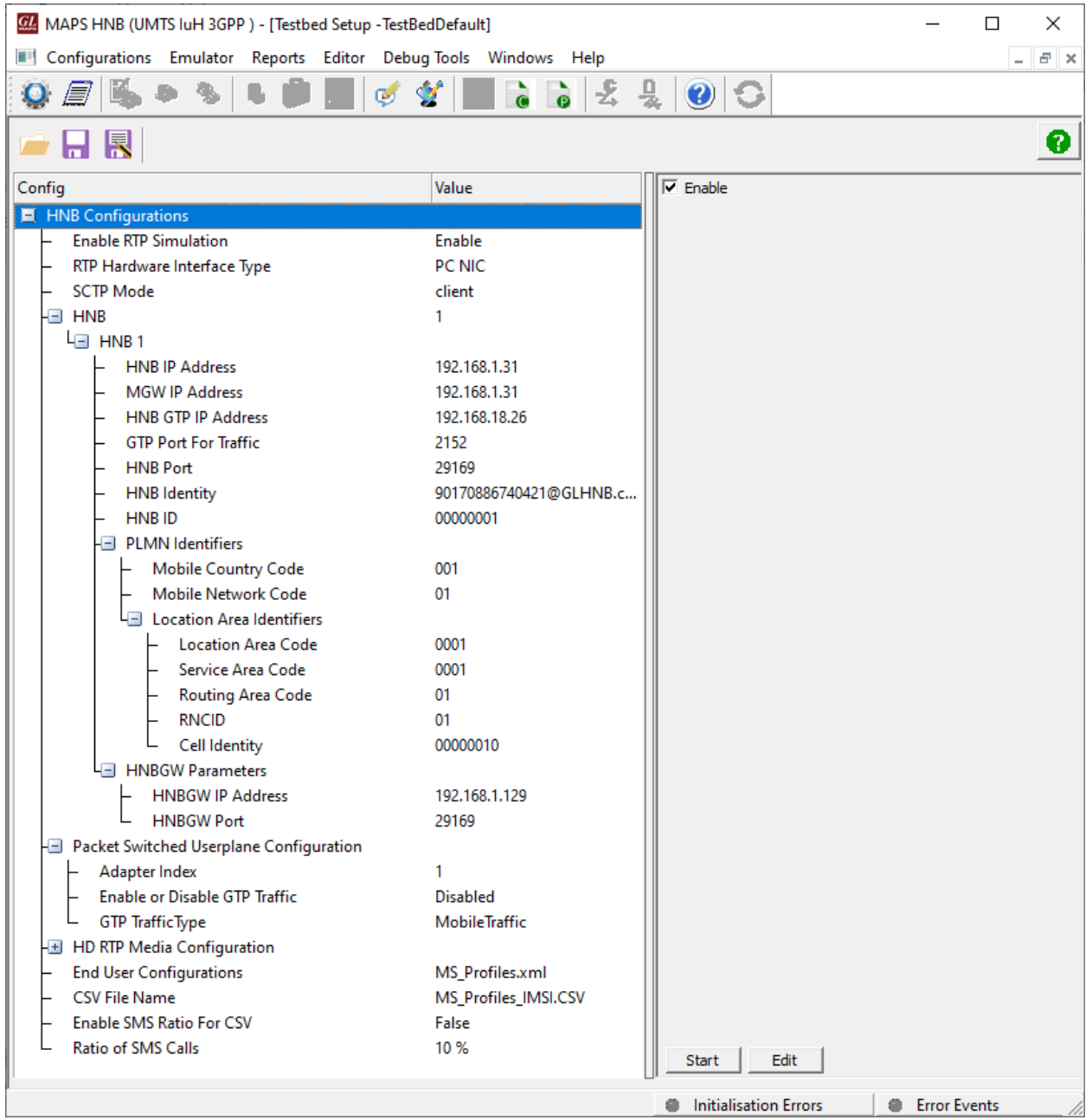
Mobile Terminating Call over IuH IP



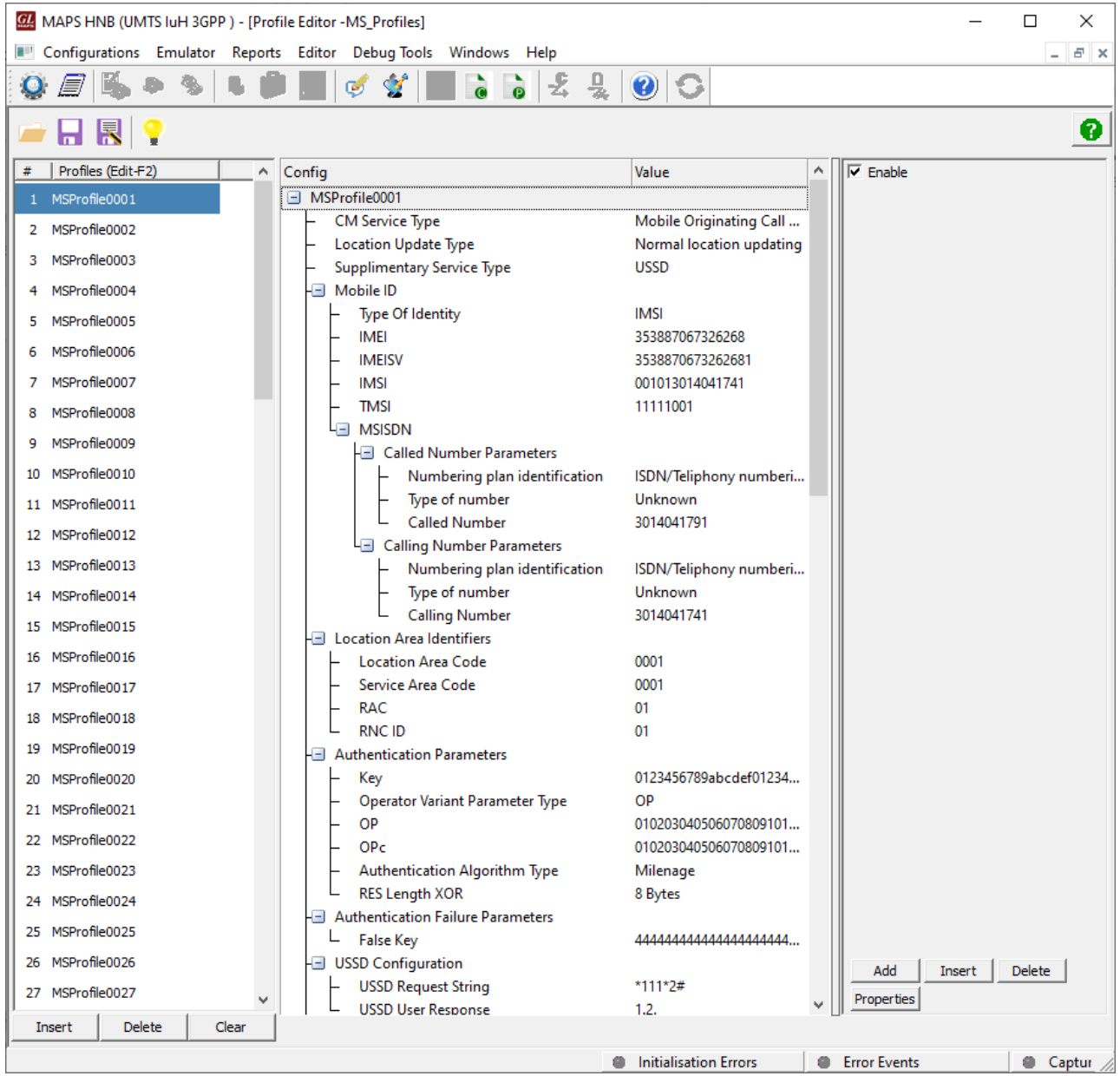
PS Domain IuH Call Procedure



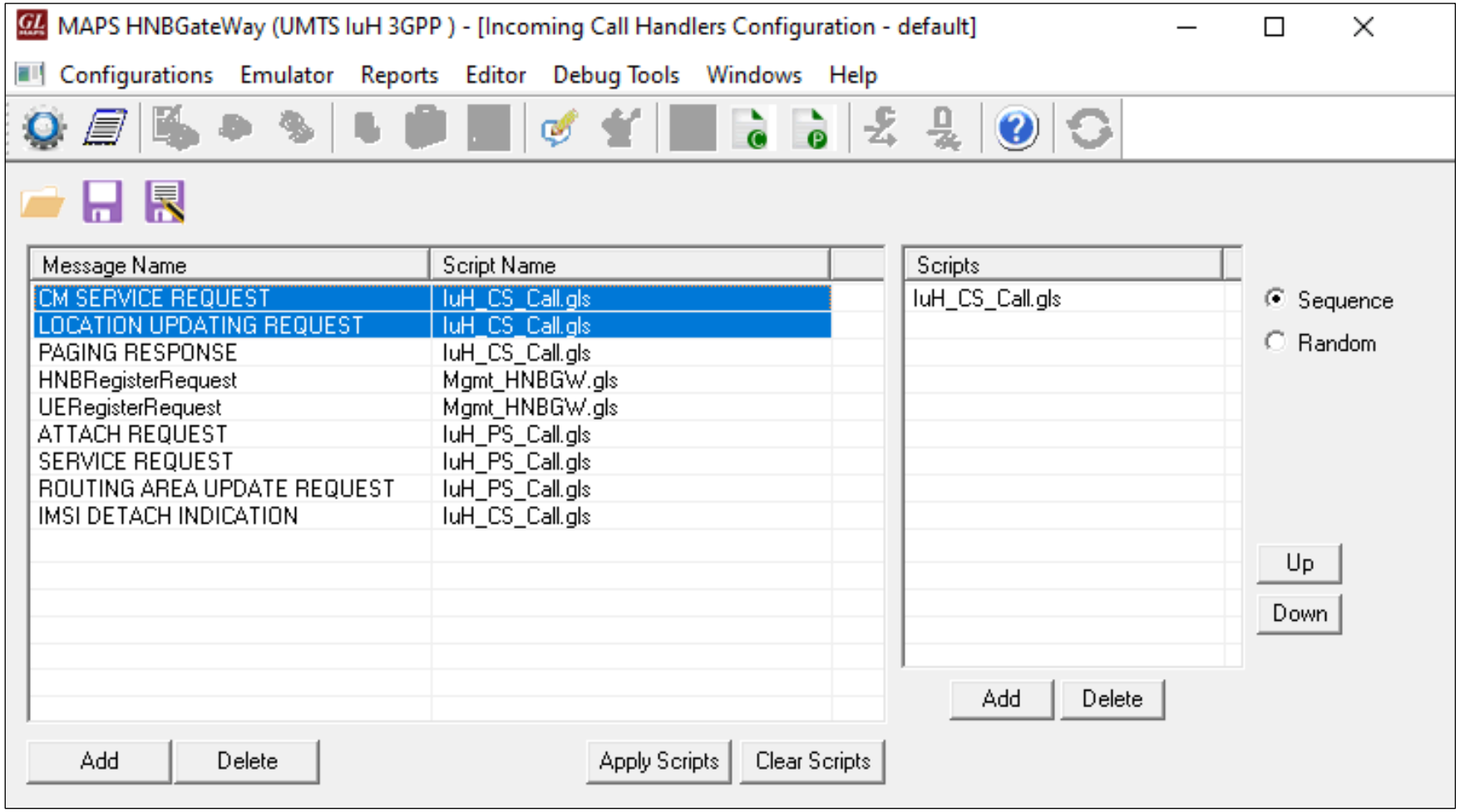
IuH over IP Testbed Configuration



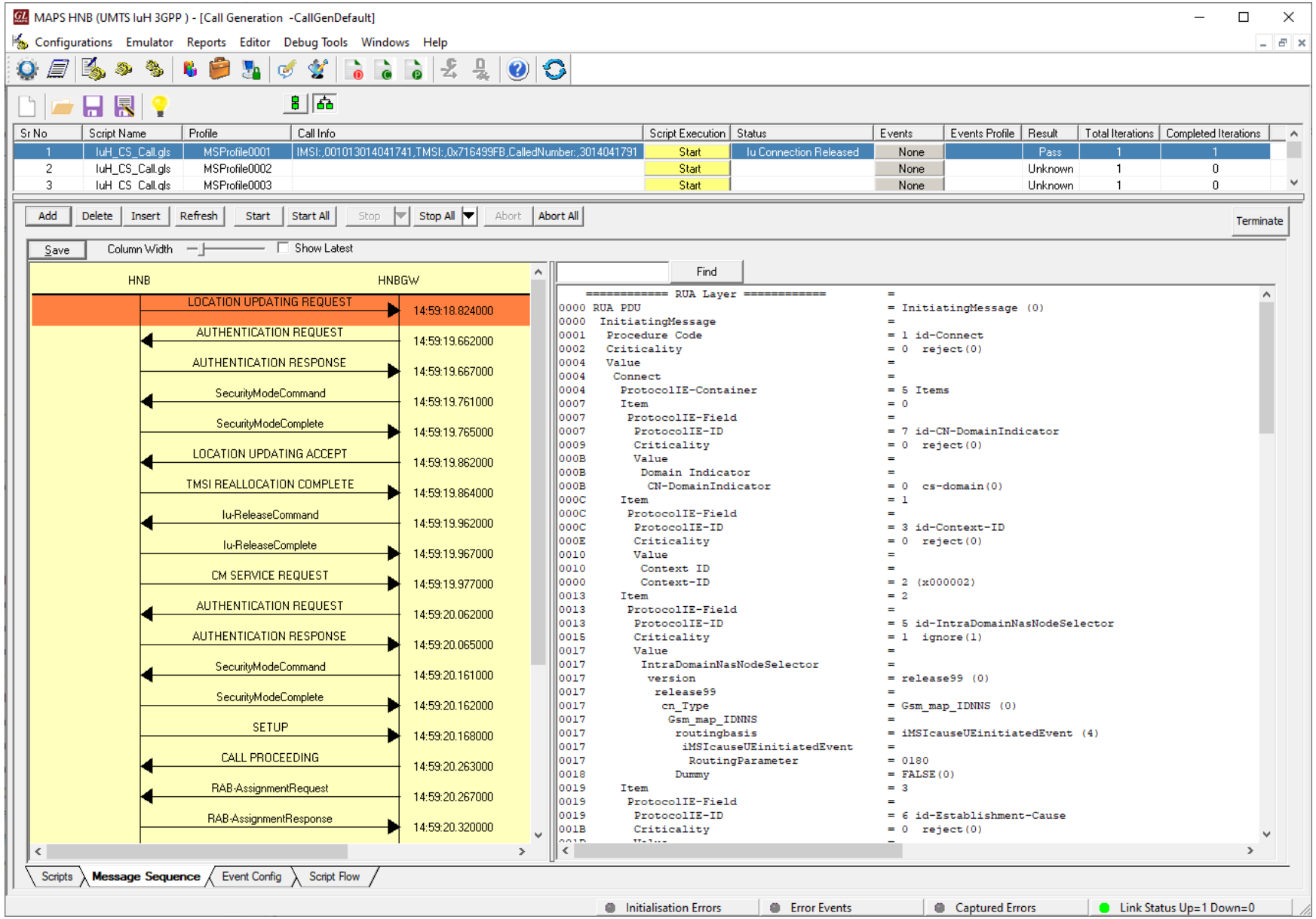
IuH over IP Profile Configuration



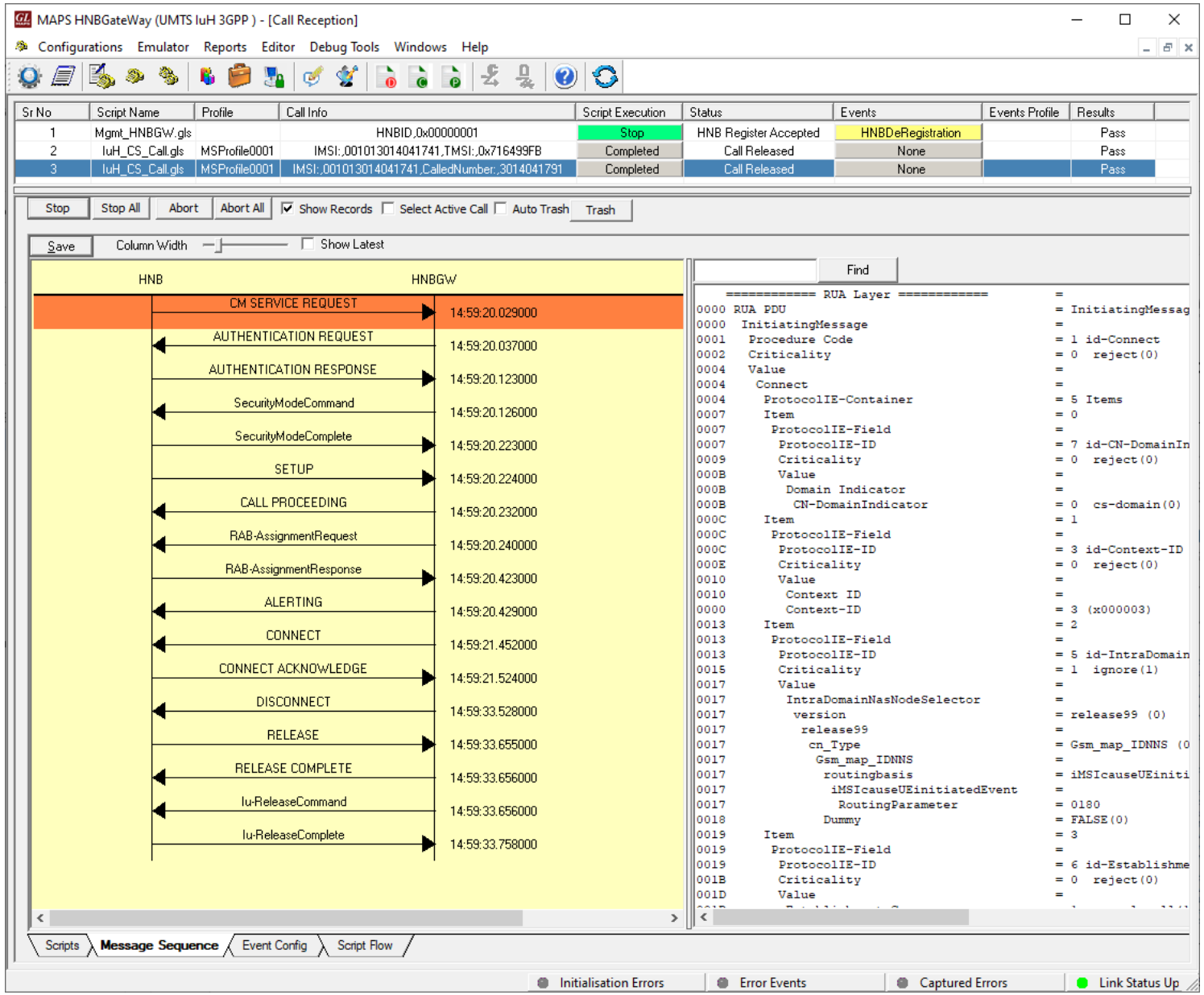
IuH over IP Incoming Call Handler Configuration



IuH over IP Call Generation

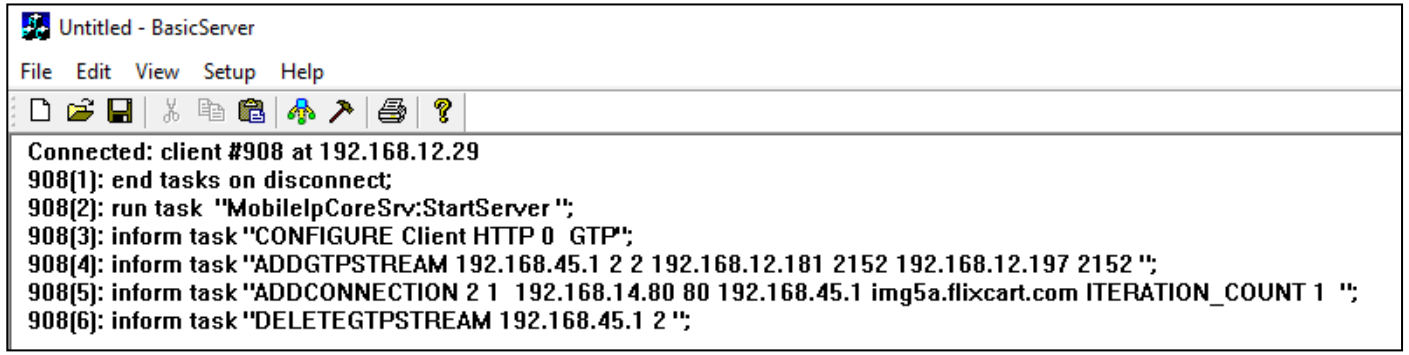


IuH over IP Call Reception

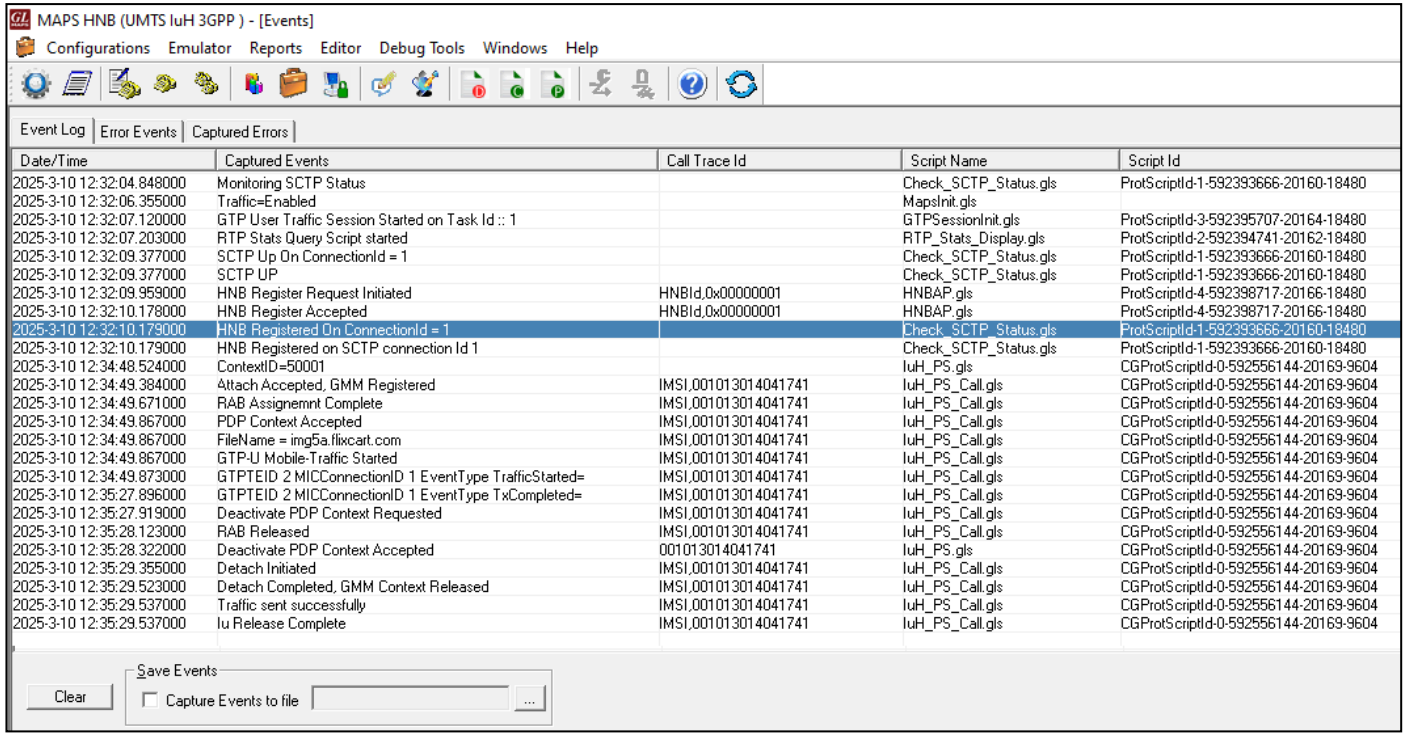


IuH over IP Event and Traffic Log

Server Traffic Log

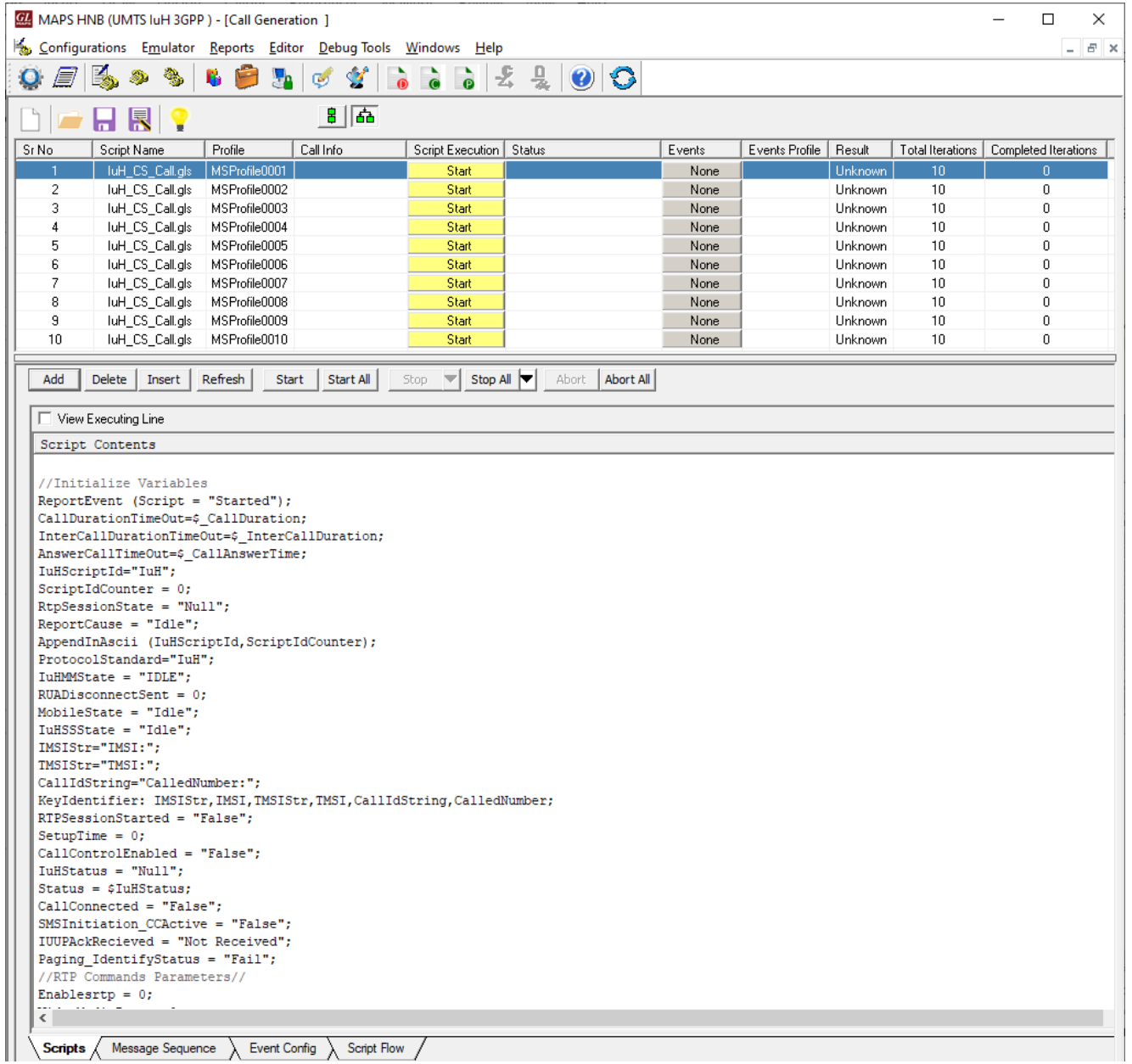


Events Log

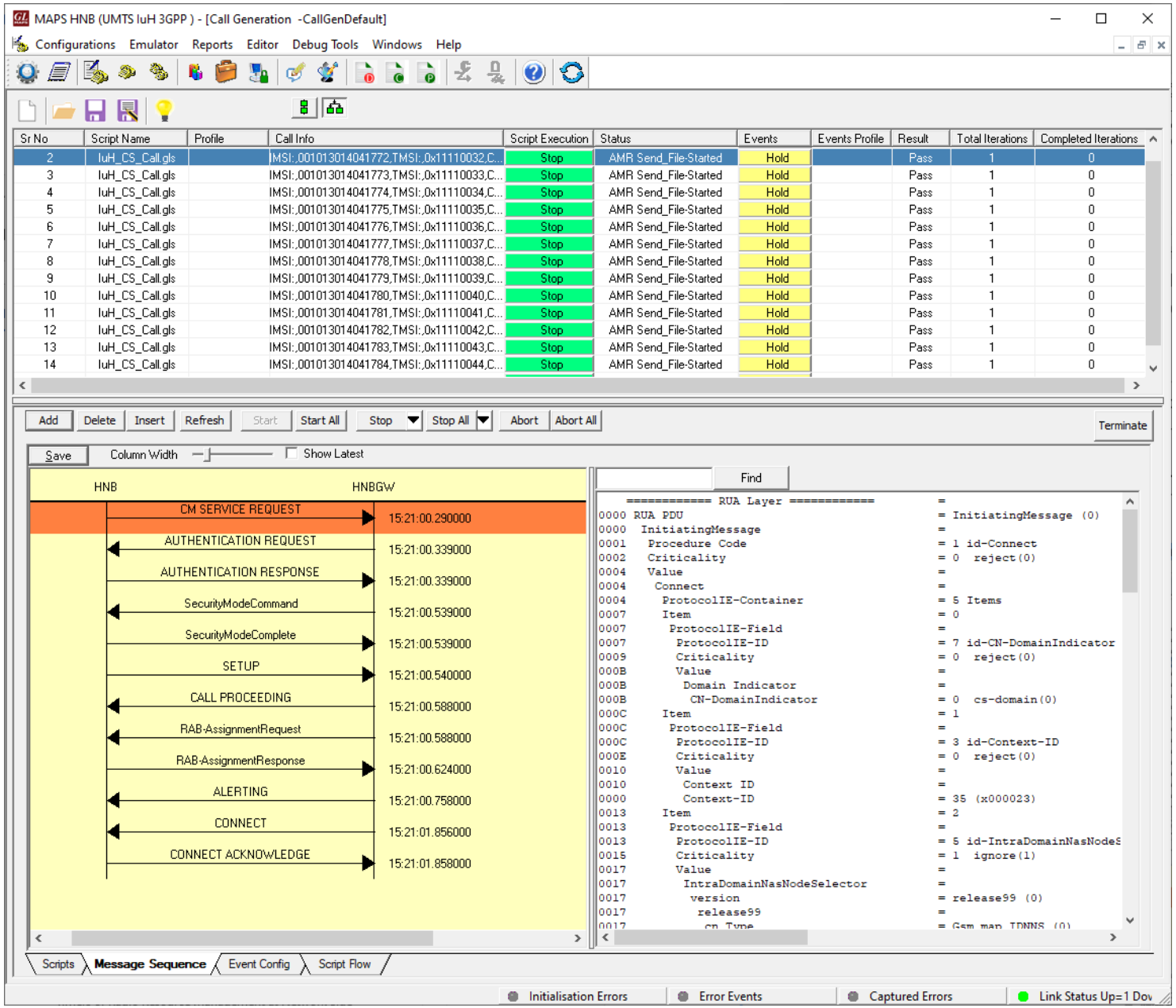


GL Communications

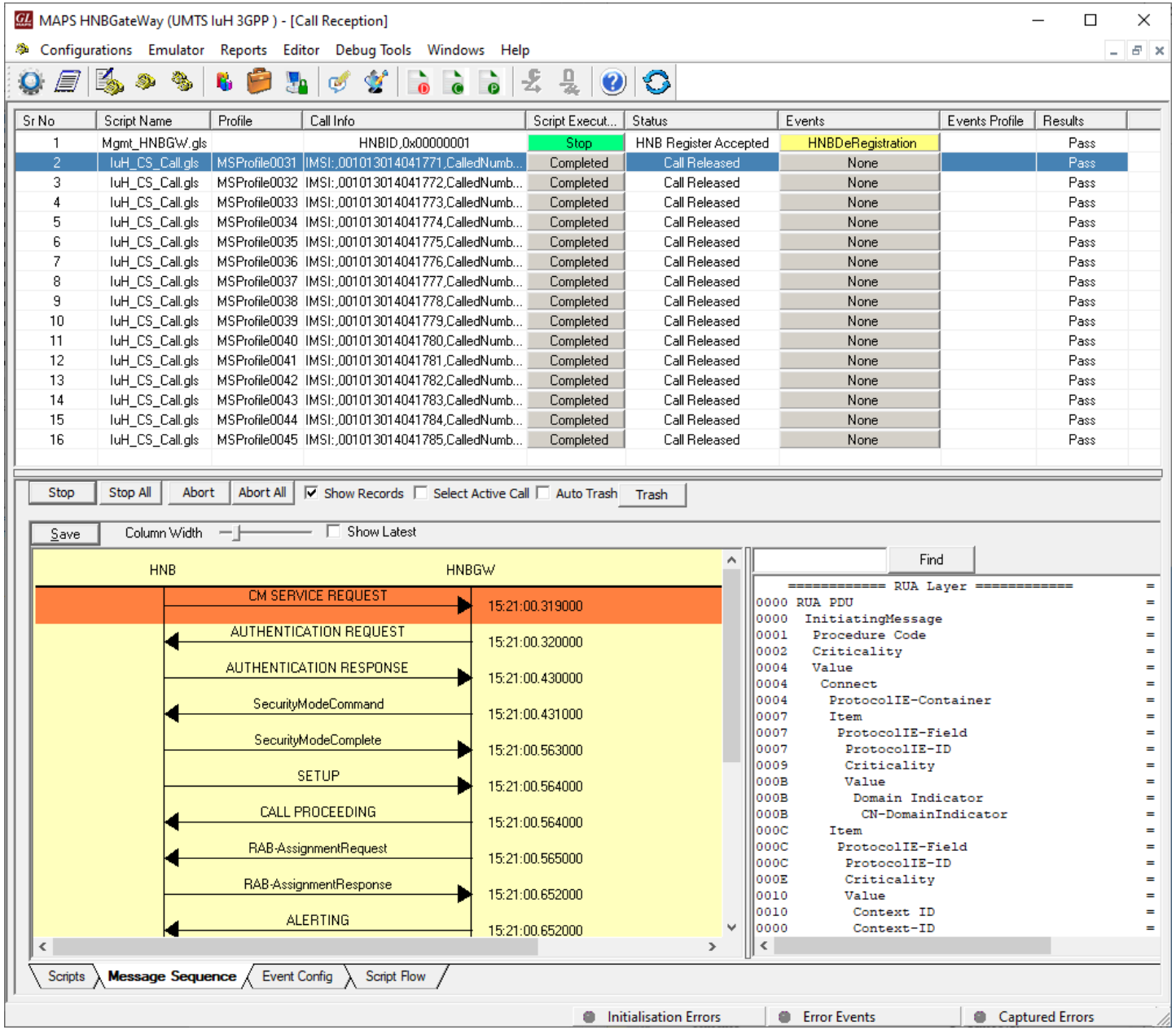
Bulk Call Generation using XML profiles



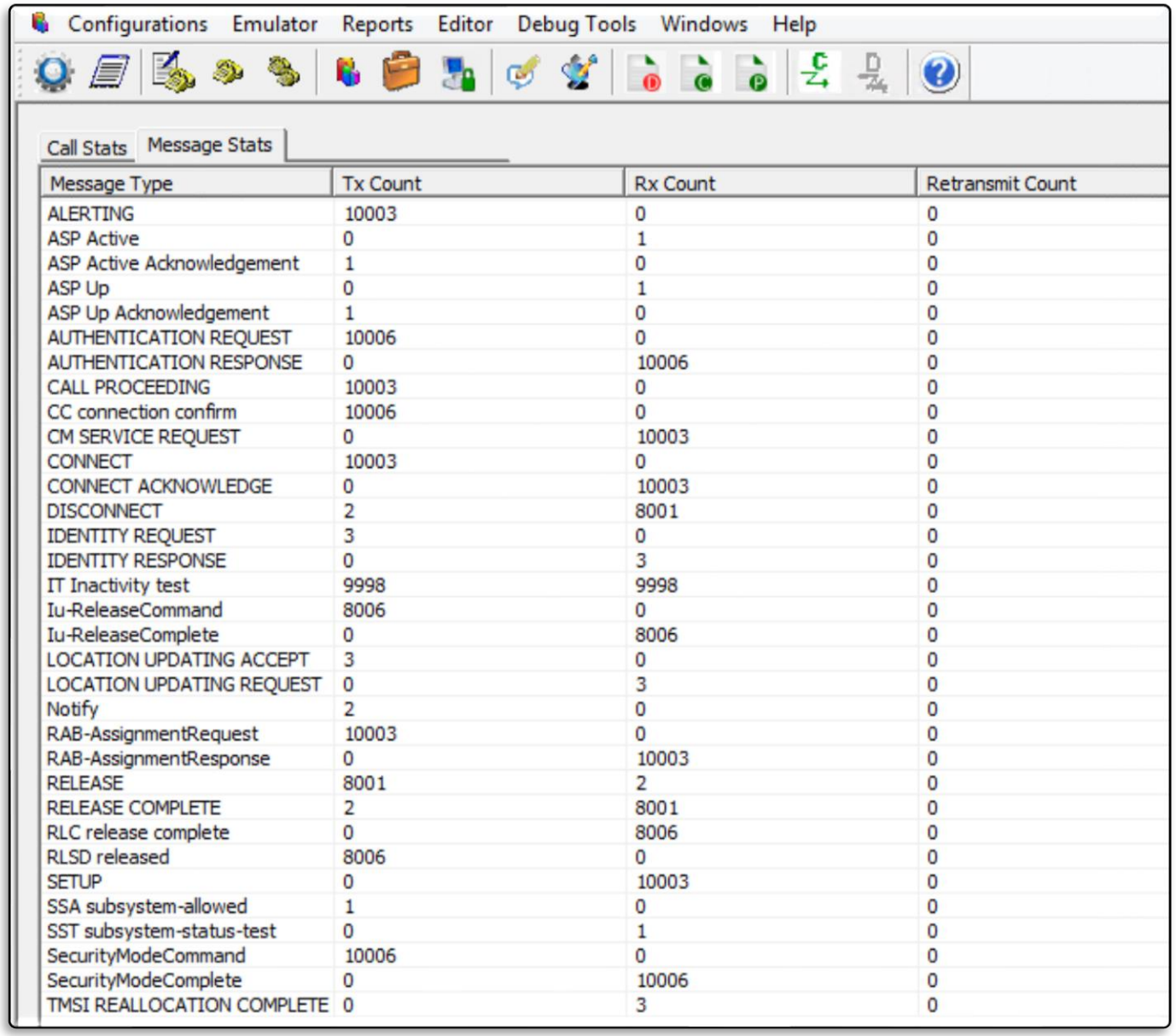
Bulk Call Generation using CSV Profiles



Bulk Call Reception using CSV Profiles



Message Statistics



Message Type	Tx Count	Rx Count	Retransmit Count
ALERTING	10003	0	0
ASP Active	0	1	0
ASP Active Acknowledgement	1	0	0
ASP Up	0	1	0
ASP Up Acknowledgement	1	0	0
AUTHENTICATION REQUEST	10006	0	0
AUTHENTICATION RESPONSE	0	10006	0
CALL PROCEEDING	10003	0	0
CC connection confirm	10006	0	0
CM SERVICE REQUEST	0	10003	0
CONNECT	10003	0	0
CONNECT ACKNOWLEDGE	0	10003	0
DISCONNECT	2	8001	0
IDENTITY REQUEST	3	0	0
IDENTITY RESPONSE	0	3	0
IT Inactivity test	9998	9998	0
Iu-ReleaseCommand	8006	0	0
Iu-ReleaseComplete	0	8006	0
LOCATION UPDATING ACCEPT	3	0	0
LOCATION UPDATING REQUEST	0	3	0
Notify	2	0	0
RAB-AssignmentRequest	10003	0	0
RAB-AssignmentResponse	0	10003	0
RELEASE	8001	2	0
RELEASE COMPLETE	2	8001	0
RLC release complete	0	8006	0
RLSD released	8006	0	0
SETUP	0	10003	0
SSA subsystem-allowed	1	0	0
SST subsystem-status-test	0	1	0
SecurityModeCommand	10006	0	0
SecurityModeComplete	0	10006	0
TMSI REALLOCATION COMPLETE	0	3	0

GL Communications

Customizations - Statistics and Reports

MOS, R-Factor

Packet Loss

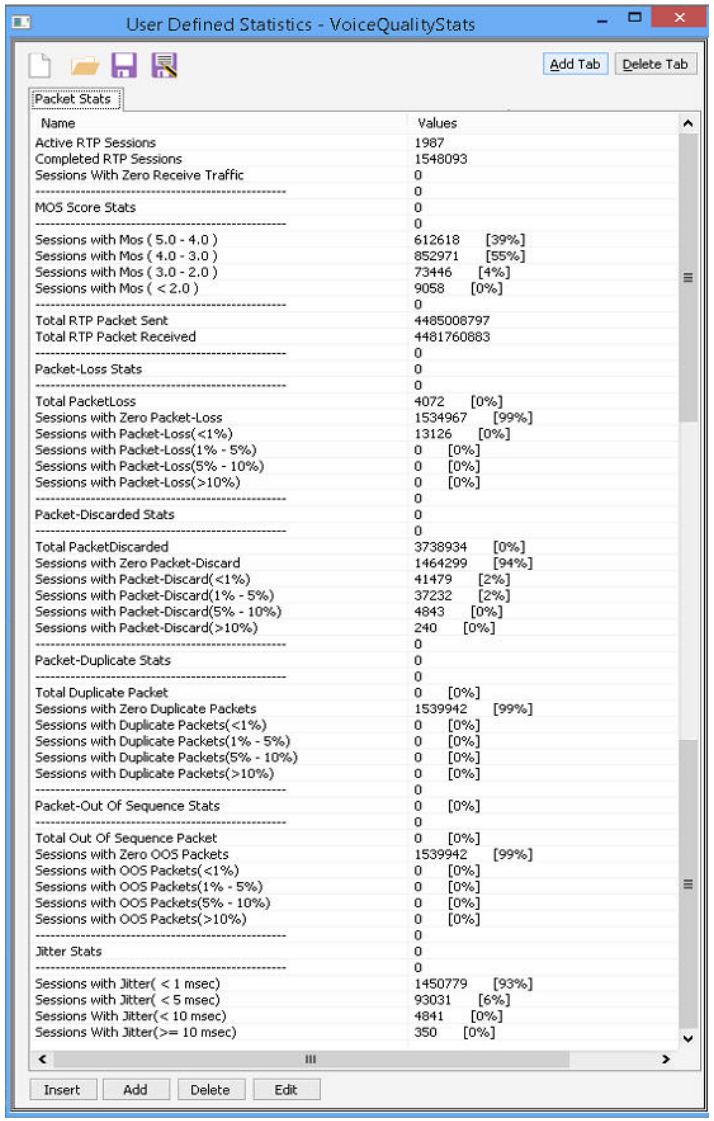
Packets Discarded

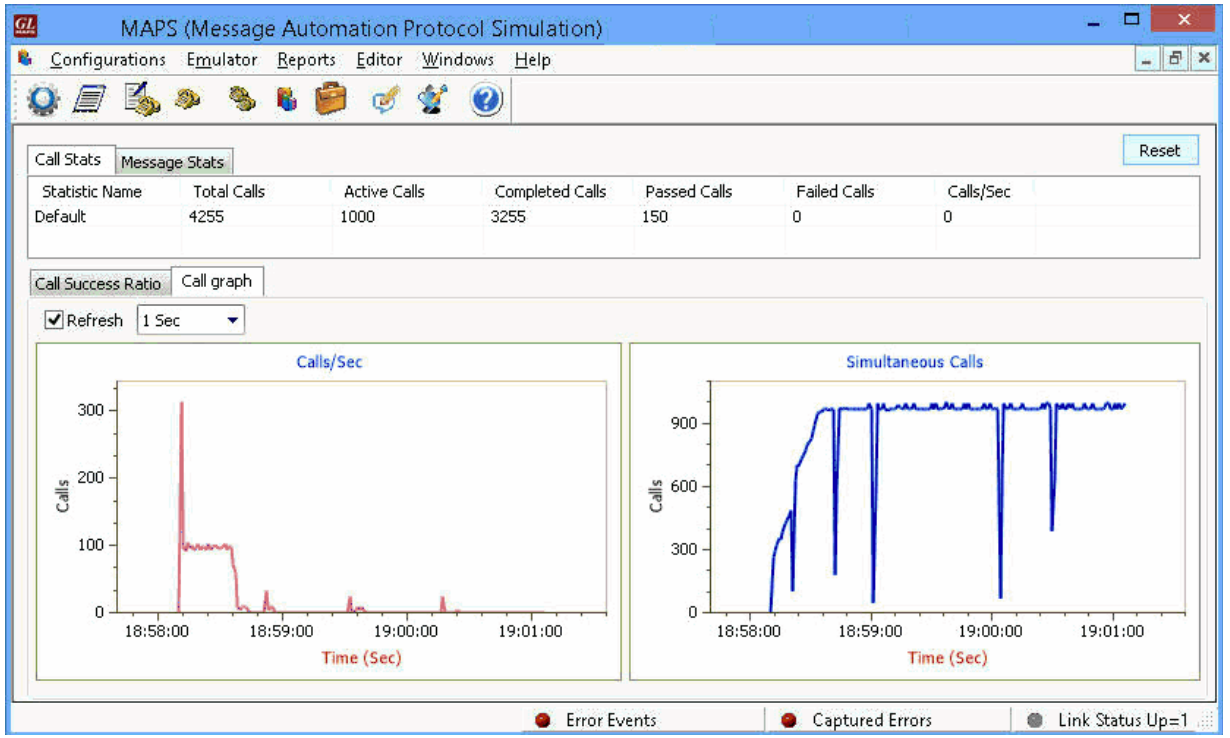
Duplicate Packets

Out-Of-Sequence

Packets

Jitter Statistics

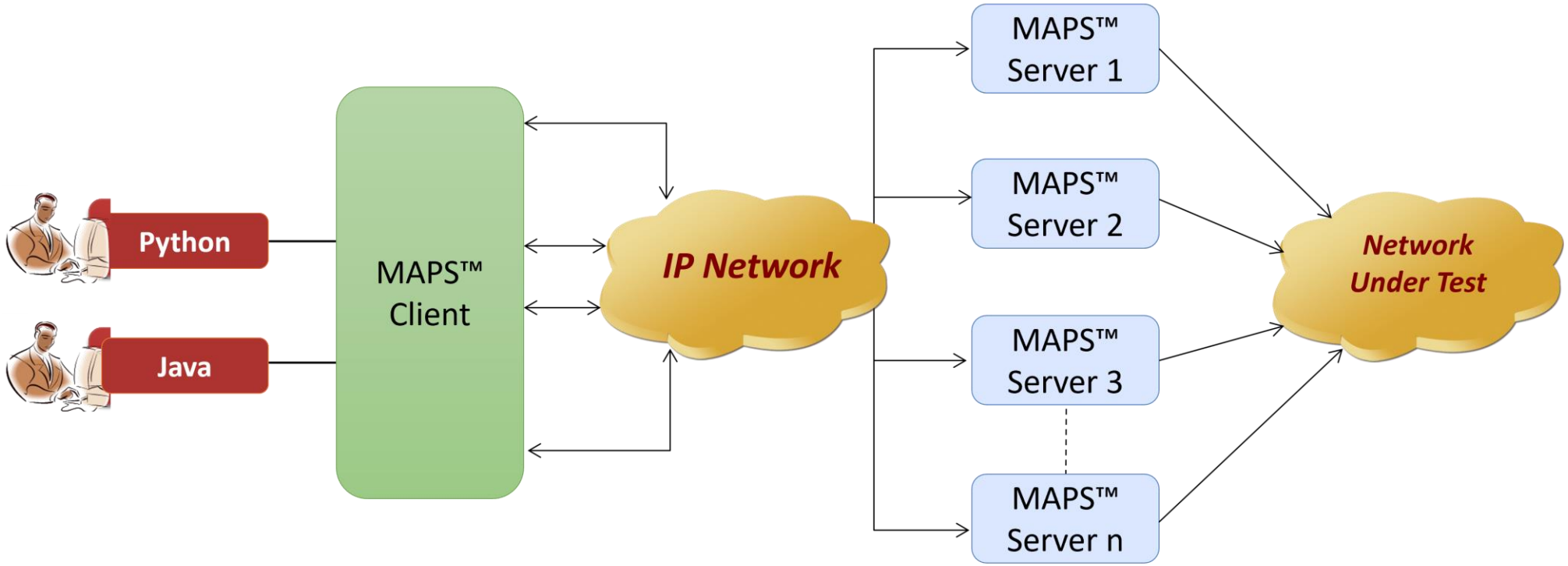




Call Stats provide a running tabular log of system level stats, tracked stats include: Total Calls, Active Calls, Completed Calls, Passed Calls, Failed Calls, Instantaneous Calls/Sec

GL Communications

MAPS™ API Architecture



- API wraps our proprietary scripting language in standard languages familiar to the user:
  - Python
  - Java
- Clients and Servers support a “Many-to-Many” relationship, making it very easy for users to develop complex test cases involving multiple signaling protocols

CLI Support

Python 3.7.5 Shell

File Edit Shell Debug Options Window Help

```
Python 3.7.5 (tags/v3.7.5:5c02a39a0b, Oct 15 2019, 00:11:34) [MSC v.1916 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:\Program Files\GL Communications Inc\MAPS-IuCS\MAPSCLI\PythonClient\examples\IuCS\RNC\IuCS_PlaceCall.py
IuCS Server Connection... True
IuCS Testbed Starting ... True
IuCS Profile Loading... True
Check M3UA Health Status... True
IuCS Call Initiated... True
Call Connecting...
Call Answered...
Send File started
IuCS Call Status...CALL ACTIVE
IuCS Call Terminating... True
CMOS = 4.15625
LMOS = 4.15625
CR_FACTOR = 91
LR_FACTOR = 91
TX_PACKETS = 502
RX_PACKETS = 1604
LOST_PACKETS = 0
DISCARDED_PACKETS = 0
OUT_OF_SEQ_PACKETS = 0
DUPLICATE_PACKETS = 0
AVG_JITTER = 0.6875

IuCS Script Stopping... True
IuCS Server Disconnecting... True
>>>
```

MapsCLI RNC (UMTS IUCS 3GPP SCTP)

File Edit View

View Latest Command

```
1 :: 2019-1-11 12:08:13.519000 : UserEvent 1 "GetMessageInfo"# "Index"=12;
1 :: 2019-1-11 12:08:13.619000 : UserEvent 1 "GetMessageInfo"# "Index"=13;
1 :: 2019-1-11 12:08:13.717000 : UserEvent 1 "GetMessageInfo"# "Index"=14;
1 :: 2019-1-11 12:08:13.826000 : UserEvent 1 "GetMessageInfo"# "Index"=15;
1 :: 2019-1-11 12:08:13.926000 : UserEvent 1 "GetMessageInfo"# "Index"=16;
1 :: 2019-1-11 12:08:14.024000 : UserEvent 1 "GetMessageInfo"# "Index"=17;
1 :: 2019-1-11 12:08:14.123000 : UserEvent 1 "GetMessageInfo"# "Index"=18;
1 :: 2019-1-11 12:08:14.222000 : UserEvent 1 "GetMessageInfo"# "Index"=19;
1 :: 2019-1-11 12:08:15.288000 : StopScript 1;
```

GL Communications

Thank you