Comfone Pulse
Signalling Applications
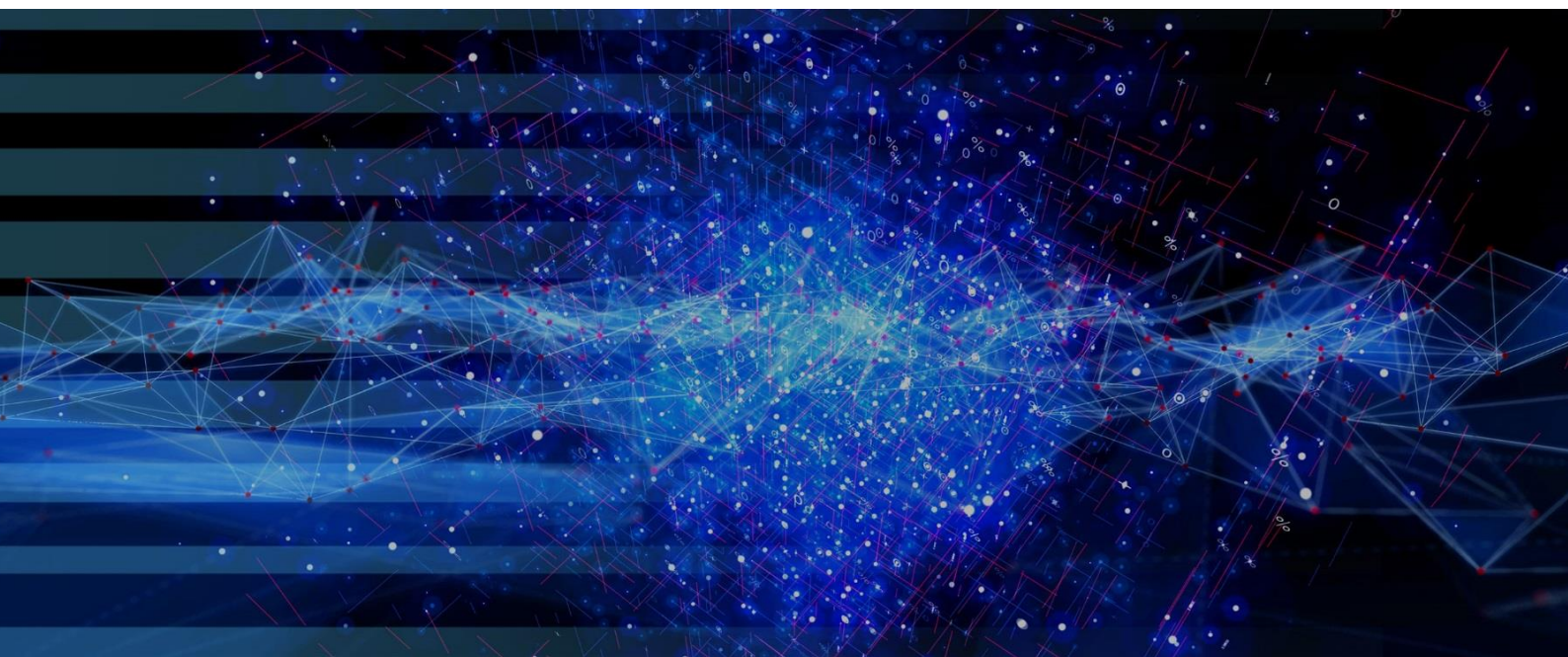
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1   Introduction

Comfone Pulse, the Web portal that allows Comfone customers to interact with all Comfone services, is based on modern Web technologies. Comfone reporting systems synthesize the raw signalling data gathered by the STPs and DRAs and produce reports that highlight areas that may require the customer's attention and further investigation. Those reports are a combination of graphics and tables, all of them can be exported to Excel for further analysis. Access to the portal is secured by credentials and all reports are encrypted using SSL security (https). The portal can be accessed from any common Web browser.

Pulse's Signalling application measure the quality of the signalling traffic sent and received by a Comfone customer over the access links to Comfone. The signalling applications are also available to Key2roam hub customers that have no direct signalling access links to Comfone. Signalling statistics are available per destination MNO network.

This document describes the main features of the Signalling applications on Comfone Pulse. Comfone Pulse is a live tool – changes and improvements are made regularly based on input from customers. The information contained in this document may therefore change in the future.

2   Pulse signalling applications

Pulse contains two signalling applications:

- SS7 signalling application
- Diameter signalling application

Figure 1: General information of the service

The signalling applications provide general information about the service: access to the latest service description, list of customers and list of Comfone contacts, including 24/7 support and escalation contacts.

The sections below describe the reports available for each application. Comfone reports offer monthly, daily and our hourly views of the signalling statistics.

3   SS7 Signalling Application

3.1   SS7 Signalling dashboard

The SS7 signalling dashboard presents a graphical summary with key traffic statistics:

Figure 2: SS7 Signalling dashboard

The top section displays the traffic from the last 24 hours compared to the same day a week earlier. It also displays the volumes of the month compared to the previous month. Those graphs give a quick indication if the current volumes are in-line with historical data.

The lower part indicates the number of successful and failed transactions for the most important destinations (in terms of transactions volumes). Daily statistics are matched against the monthly average to highlight any deviation that might require further investigation from the operator.

3.2   MAP transactions

Comfone accounting systems correlate sent and received MSUs to form MAP transaction records (authentication, mobility mgmt., SMS, USSD, voice mgmt.). Comfone records the number of successful or failed MAP transactions for the following MAP operations:

- Send Authentication Info,

- Update Location, Update GPRS location,

- Cancel Location, Purge MS,

- MO Forward SM, SRI for SM, MT Forward SM, Report SM delivery Status, Ready For SM, Alert Service Center,

- Provide Roaming Number

- Process Unstructured SS Request, Unstructured SS Notify

The following figures provide some examples of the reports available for TX and RX MAP transactions:
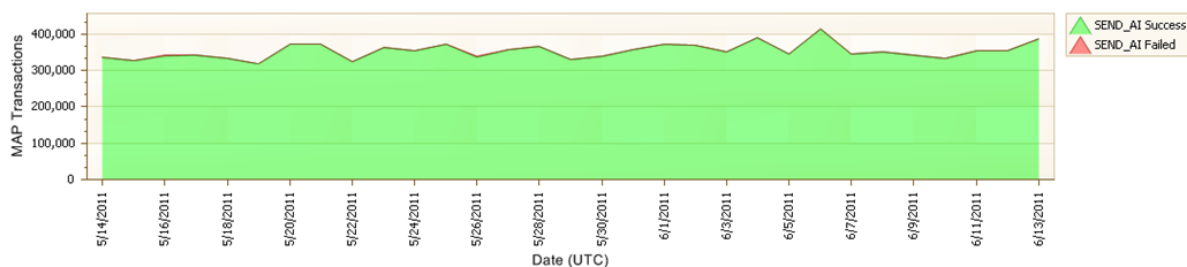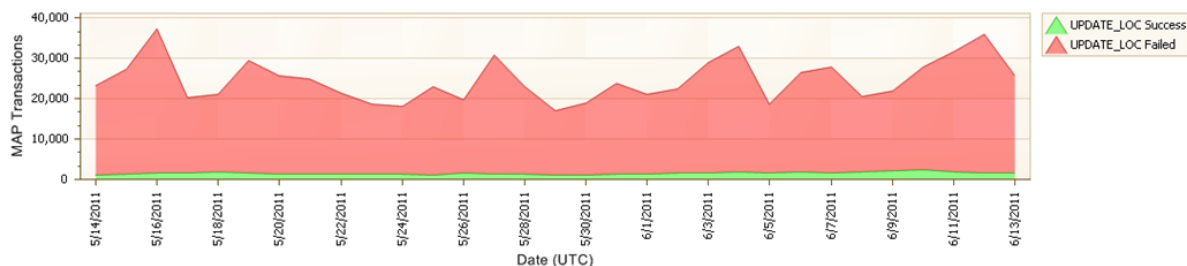
Figure 3: MAP operation overall success rates per MAP operation

Figure 4: Update Location MAP transactions success rate for top 20 destinations (based on total amount of transactions) and top 20 destinations (based on amount of failed transactions)

3.3 UDTS

Comfone Pulse provides statistics of the number of UDT and UDTS transmitted and received over the link sets that connect the Customer to Comfone.

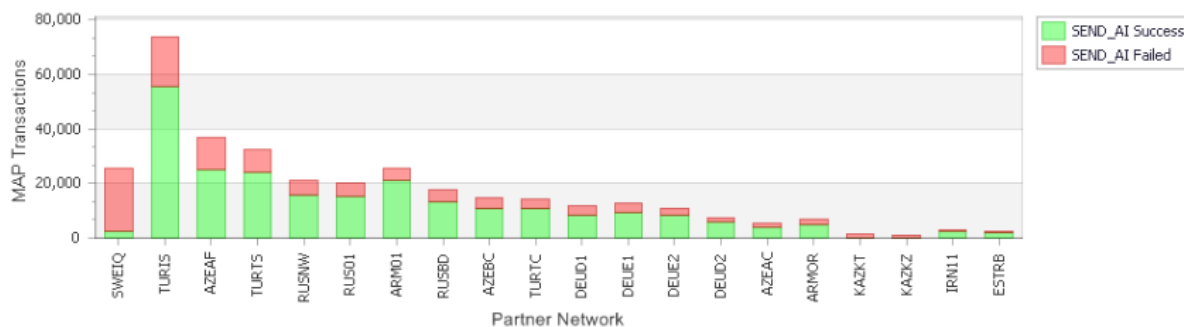| Date (UTC)	Partner Company	Partner Network-Name	Partner Network-Country	UDTS Ratio Tx	UDT Tx	UDTS Tx	UDTS Ratio Rx	UDT Rx	UDTS Rx
08/01/2012	AAM21	SeaNet Maritime Communicatio...	Sweden	0.00	76	0	0.00	0	0
08/01/2012	ABWDC	Digicel Aruba	Aruba	0.00	141	0	0.00	0	0
08/01/2012	ABWSE	SETAR N.V.	Aruba	0.00	8,673	0	0.00	7,973	0
08/01/2012	AFGAR	MTN Afghanistan	Afghanistan	0.00	862	0	0.98	812	8
08/01/2012	AFGAW	Afghan Wireless Communicatio...	Afghanistan	0.00	4,713	0	0.88	4,527	40
08/01/2012	AFGEA	Etisalat - Afghanistan	Afghanistan	0.11	5,641	6	0.00	5,599	0
08/01/2012	AFGTD	Telecom Development Compan...	Afghanistan	0.00	10,138	0	0.01	19,634	2
08/01/2012	AGOMV	Movicel	Angola	0.00	5,381	0	0.00	1,265	0
08/01/2012	AGOUT	UNITEL S.a.r.l.	Angola	0.00	44,119	0	0.00	44,802	0
08/01/2012	AIACW	Cable & Wireless (West Indies)...	Anguilla	0.00	24	0	0.00	0	0
08/01/2012	ALBAM	Albanian Mobile Communication...	Albania	0.00	2,537	0	0.28	2,520	7
08/01/2012	ALBEM	Eagle Mobile	Albania	0.00	1,105	0	0.00	1,144	0

Figure 5: Example of daily UDT/UDTS statistics per roaming destination

The detailed UDT/UDTS statistics also indicate the UDTS error code.

SCCP Traffic - Record Details Table

Date/Hour (UTC)	Customer Network	Partner Network	Calling Party	Calling GT	Called Party	Called GT	Directi	Count	Message Type	UDTS Return Cause
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4670796	Rx	1	UDTS	1 - No translation for this specific address
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556914	SWEIQ	4670799	Rx	2	UDTS	1 - No translation for this specific address
09/01/2012 10:00	ZAFVC	ALBVF	ZAFVC	2782913	ALBVF	3556954	Tx	1	UDT	
09/01/2012 10:00	ZAFVC	ALBVF	ZAFVC	2782913	ALBVF	3556920	Tx	5	UDT	
09/01/2012 10:00	ZAFVC	ALBVF	ZAFVC	2782910	ALBVF	3556920	Tx	8	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676945	Rx	2	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676908	Rx	2	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676711	Rx	2	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676567	Rx	5	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676282	Rx	2	UDT	
09/01/2012 10:00	SWEIQ	ALBVF	ALBVF	3556920	SWEIQ	4676247	Rx	2	UDT	

Figure 6: Detailed UDT/UDTS statistics per calling and called GT

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3.4 SCCP traffic

Comfone Pulse also reports the total SCCP traffic and the ITU/ANSI traffic. Those data are helpful to verify that current volumes are in-line with expectations based on historical values and also provide projections of future traffic.

The following figures provide some examples of the reports available for the SCCP reporting application:
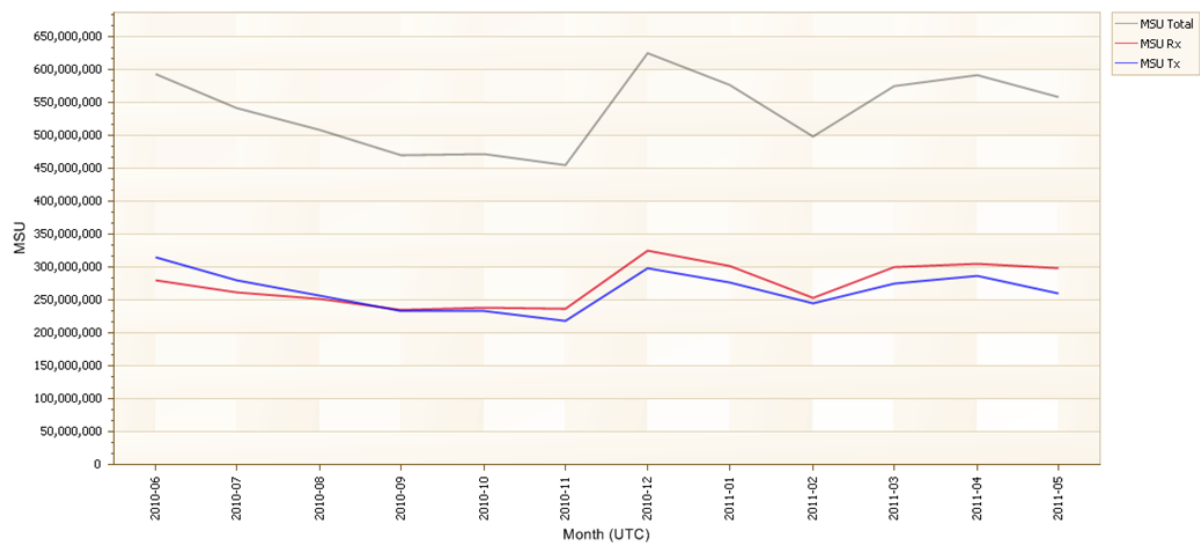

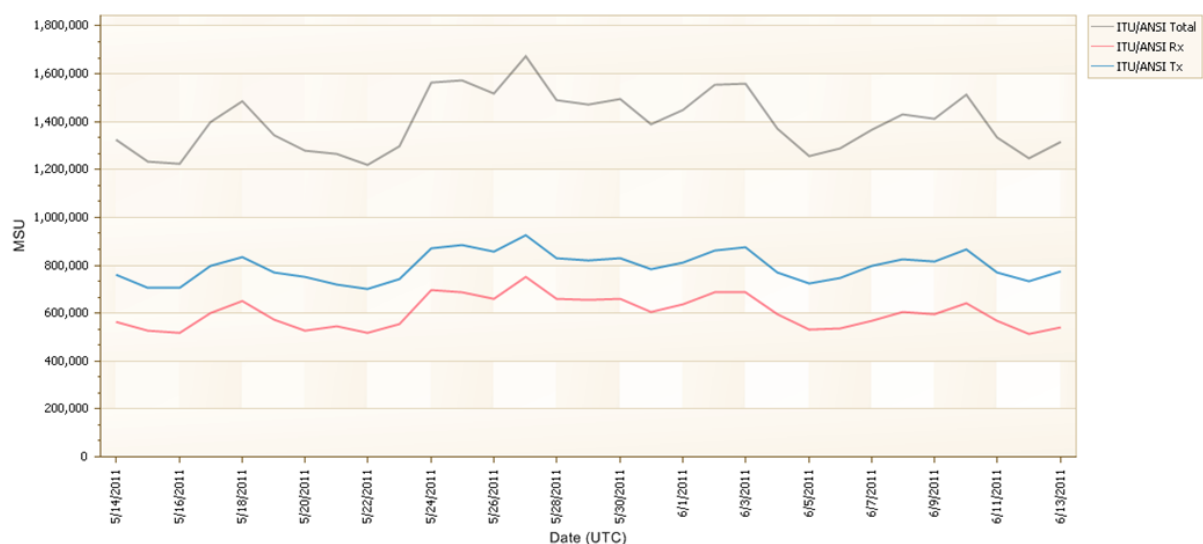Figure 7: Monthly summary trend of traffic in MSUs

Figure 8: Daily summary evolution of traffic undergoing ITU/ANSI conversion

As with many other reports, the Customer has the possibility to select the set of destinations that should be reported:
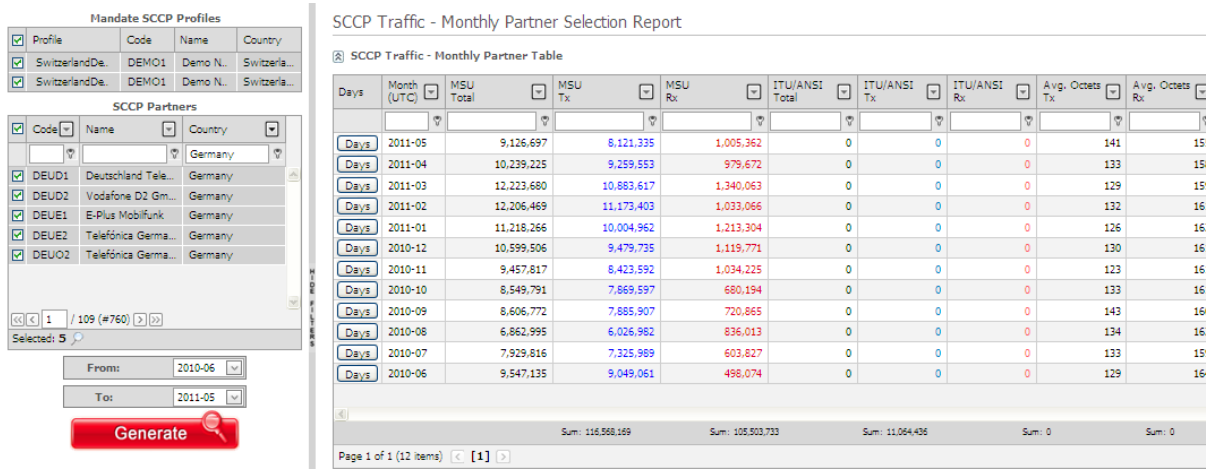
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Figure 9: Monthly SCCP traffic statistics to/from all destinations in Germany

3.5   SS7 access links - Link load and link availability

Customers can monitor the state of the access links that connect their infrastructure to Comfone STPs.

The TX and RX link loads are displayed in Kbps and Erlang. The STPs provide values every 5 minutes, and indicate the maximum and minimum load during the 5 minutes period. Pulse also provides a report with per day values.

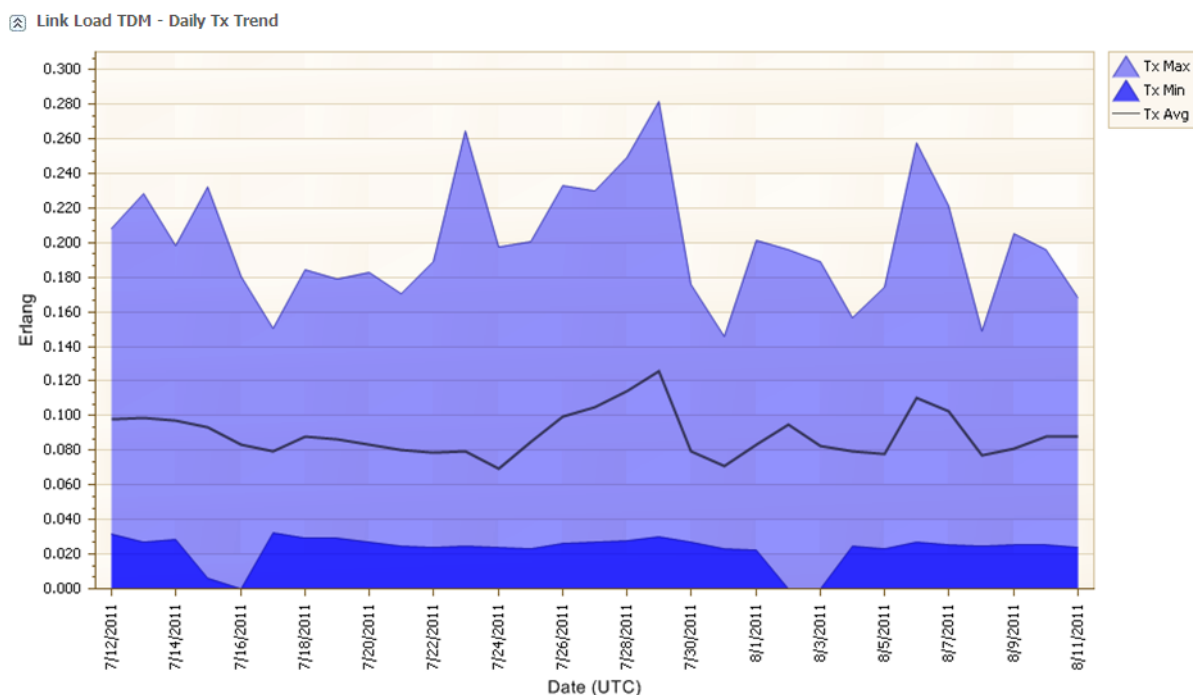
Figure 10: Overall load of TDM access links for TX traffic in Erlang

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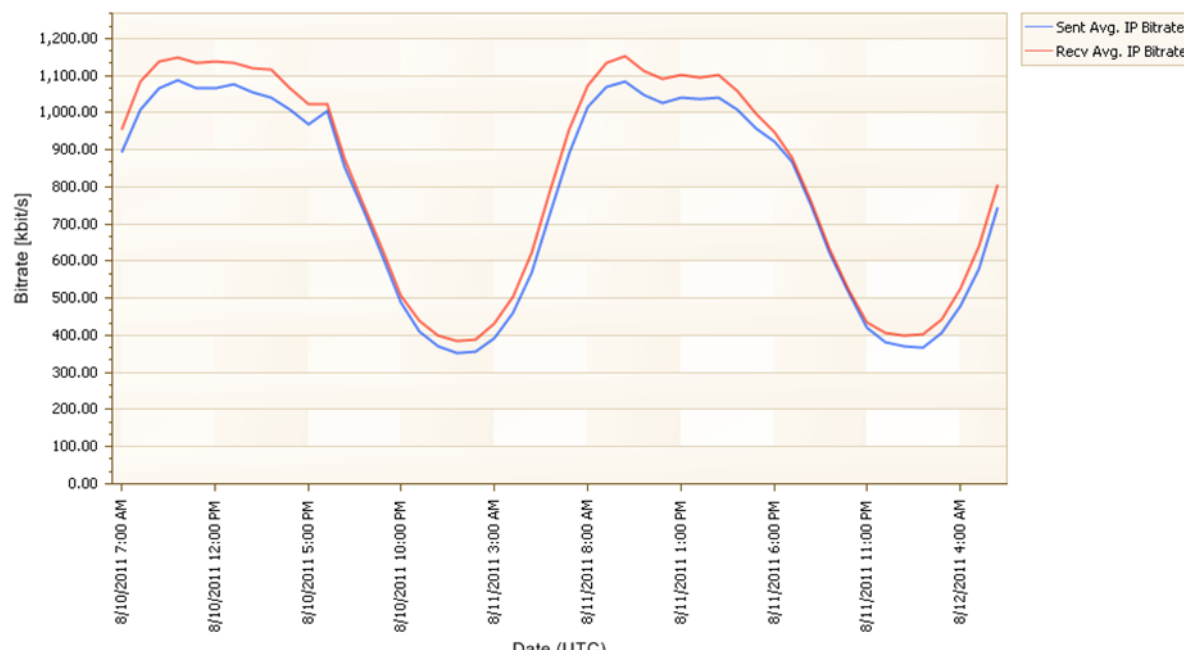Version   8.0

Figure 11: Overall load of SIGTRAN access links in Kbps

The link availability report indicates the availability of each access link. It combines the availability of all links to indicate if at any point in time there was a service outage.

Outages	Day (UTC)	Profile Availability (%)	Profile Outages	Profile Avg. Outage Time (sec)	Linkset1 Name	Linkset1 Availability (%)	Linkset1 Outages	Linkset1 Avg. Outage Time (sec)	Linkset2 Name	Linkset2 Availability (%)	Linkset2 Outages	Linkset2 Avg. Outage Time (sec)
Outages	6/13/2011	100.000			CH.CB7-CO.ME6	99.999	1	1	CH.CL7-CO.BO6	100.000		
Outages	6/12/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/11/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/10/2011	100.000			CH.CB7-CO.ME6	99.876	1	107	CH.CL7-CO.BO6	100.000		
Outages	6/9/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	98.968	1	892
Outages	6/8/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/7/2011	100.000			CH.CB7-CO.ME6	99.280	1	622	CH.CL7-CO.BO6	100.000		
Outages	6/6/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/5/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/4/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		
Outages	6/3/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	99.899	2	44
Outages	6/2/2011	100.000			CH.CB7-CO.ME6	100.000			CH.CL7-CO.BO6	100.000		

Figure 12: Availability statistics per link and linkset

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4 Diameter signalling application

4.1 Diameter Signalling dashboard

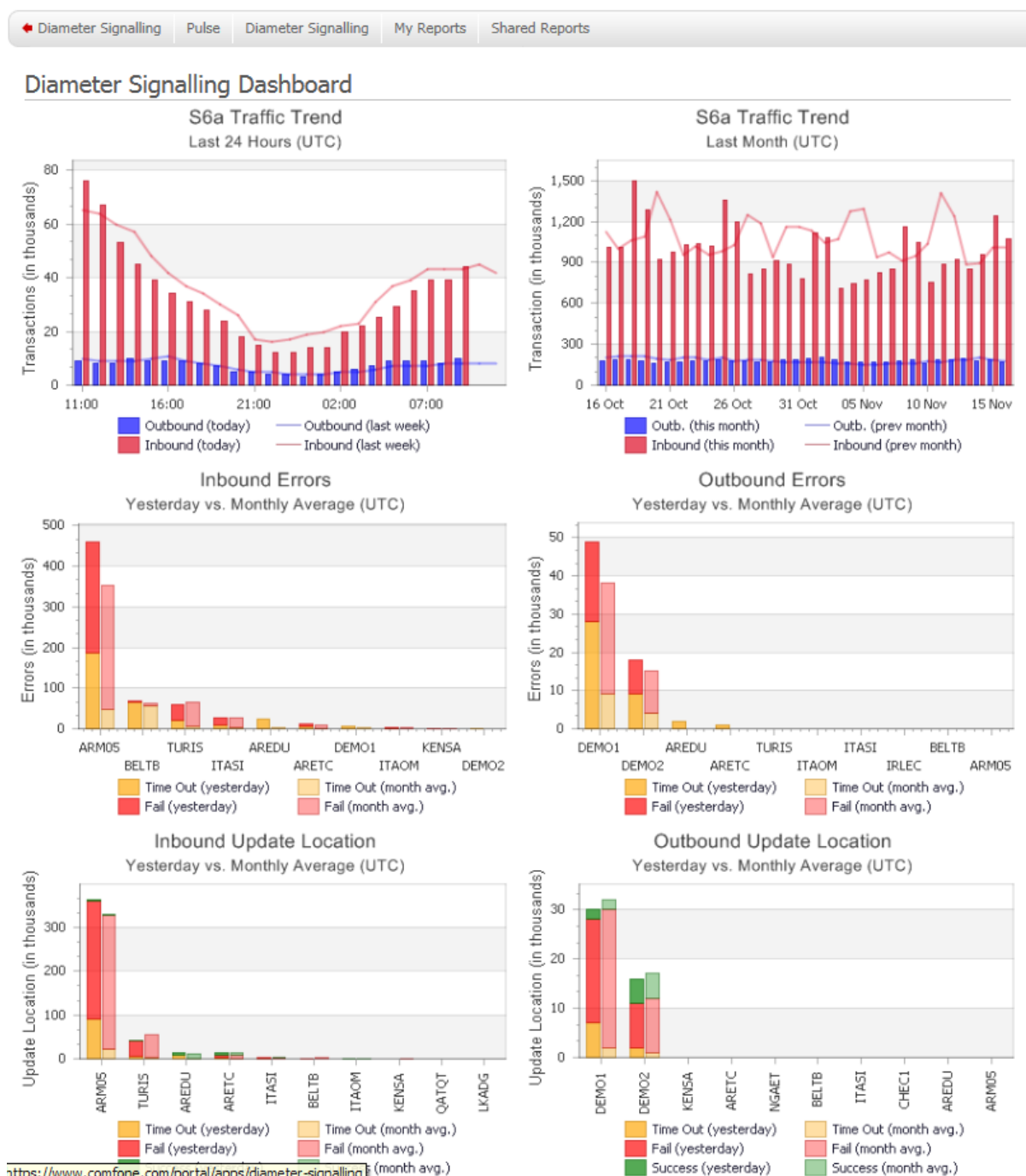The Diameter signalling dashboard presents a graphical summary with key traffic statistics:

Figure 13: Diameter Signalling dashboard

The top section displays the traffic from the last 24 hours compared to the same day a week earlier. It also displays the volumes of the month compared to the previous month. Those graphs give a quick indication if the current volumes are in-line with historical data.

The lower part indicates the number of successful and failed transactions for the most important destinations (in terms of transactions volumes). Daily statistics are matched against the monthly average to highlight any deviation that might require further investigation from the operator.

4.2 S6a/S9 Diameter transactions

Comfone signalling systems correlate sent and received Diameter requests/responses to form S6a transaction records (authentication and mobility mgmt.). Comfone records the number of successful, timeout or failed S6a transactions for the following operations:

- Authentication Info,

- Update Location

- Cancel Location, Purge MS,

The following figures provide some examples of the reports available for inbound and outbound S6a transactions:

S6A Transaction - One Hour Summary Table

Show Customization Window

Day	Partner Code	Partner Name	Partner Country	AUTH_INFO Success	AUTH_INFO Fail	AUTH_INFO Time out	AUTH_INFO Success Ratio (%)	UPDATE_LOC Success	UPDATE_LOC Fail	UPDATE_LOC Time out	UPDATE_LOC Success Ratio (%)
16/11/2014	AREDU	DU (Emirat...	United Ara...	16,949	85	17,080	50	7,274	189	7,547	48
16/11/2014	ARETC	ETISALAT...	United Ara...	13,590	924	2,818	78	3,727	6,257	3,384	28
16/11/2014	ARM05	K Telecom...	Armenia	290,615	201	95,799	75	502	271,581	90,019	0
16/11/2014	BELTB	Belgacom...	Belgium	913	911	66,161	1	14	691	247	1
16/11/2014	CHEC1	Swisscom...	Switzerland	227	21	37	80	57	24	33	50
16/11/2014	DEMO1	Demo Net...	Switzerland	0	0	0		0	0	0	
16/11/2014	DEMO2	Demo Net...	Austria	0	0	0		0	0	0	
16/11/2014	IRLEC	Vodafone I...	Ireland	63	652	209	7	21	11	14	46
16/11/2014	ITAOM	Vodafone...	Italy	946	1,828	746	27	514	7	34	93
16/11/2014	ITASI	Telecom It...	Italy	3,574	17,405	6,473	13	496	2,159	996	14
16/11/2014	KENSA	Safaricom...	Kenya	360	1,058	142	23	0	343	157	0
16/11/2014	LKADG	Dialog Axia...	Sri Lanka	201	0	100	67	156	1	1	99

Figure 14: S6a transactions statistics per destination network
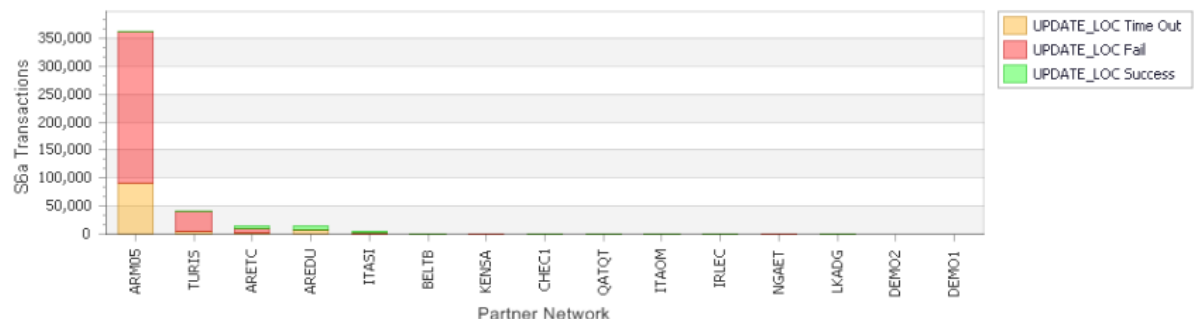

Figure 15: Top 20 destinations with failing/timeout S6a Update Location transactions

Reports for S9 transactions will be provided as soon as a customer requires S9 signalling.

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5 SMS Gateway application

For those customers that have contracted the SMS Gateway service, Pulse reports the volume of inter-working SMS per destination, including the number of delivery successes and failures. The SMS Gateway application also reports the number of IW SMS that are screened following the Customer's policy.

The following figures provide examples reports available for the SMS Gateway application:
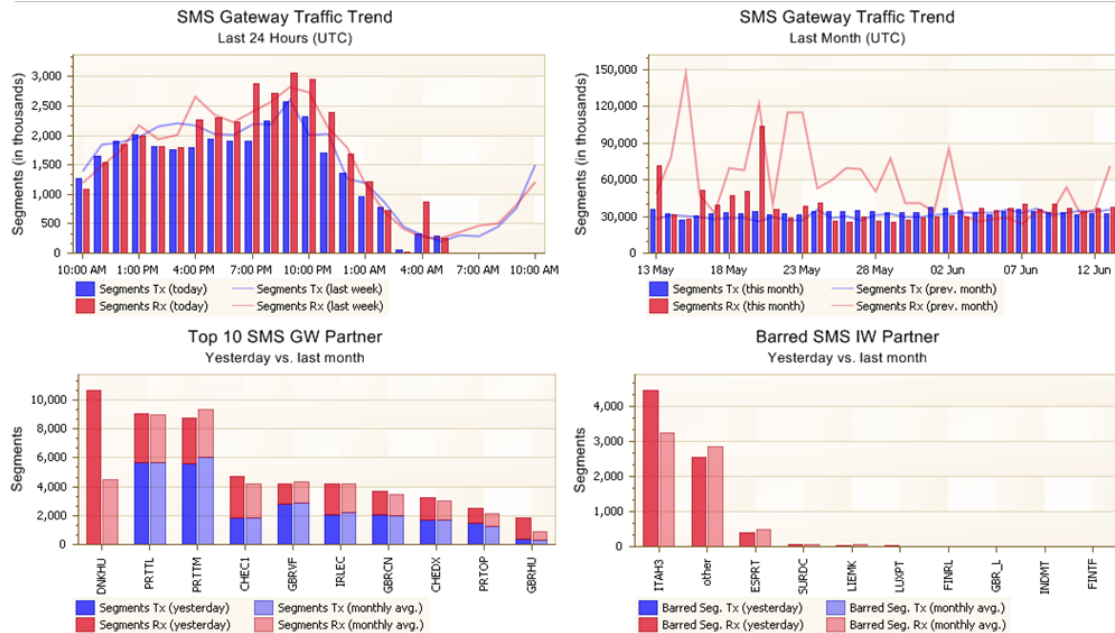

Figure 16: SMS gateway dashboard
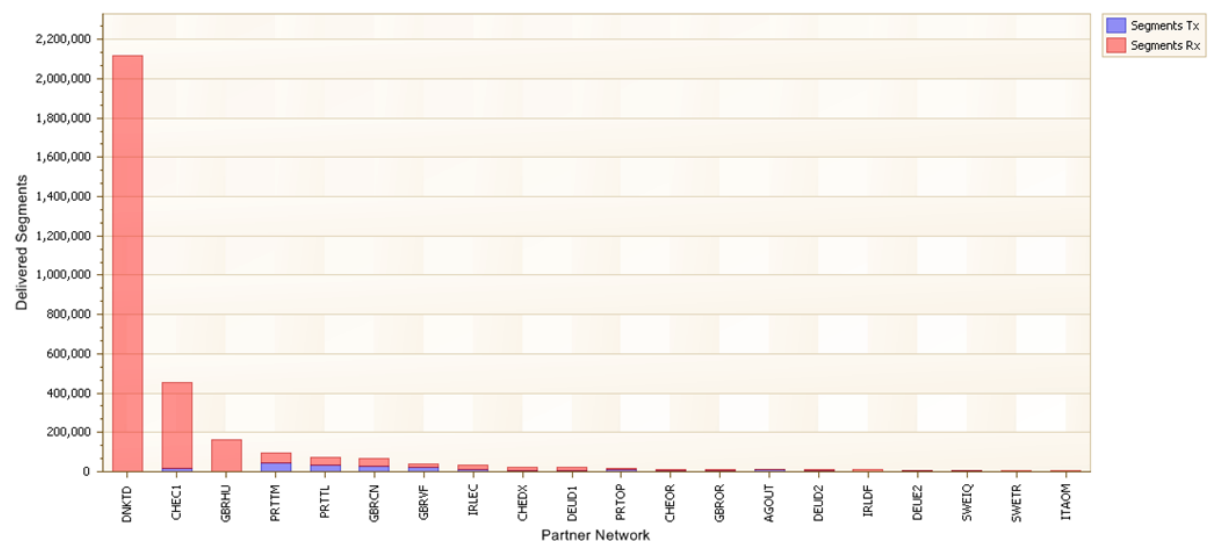
Figure 17: Report of successfully sent & received IW SMS for the top 20 IW SMS relations.

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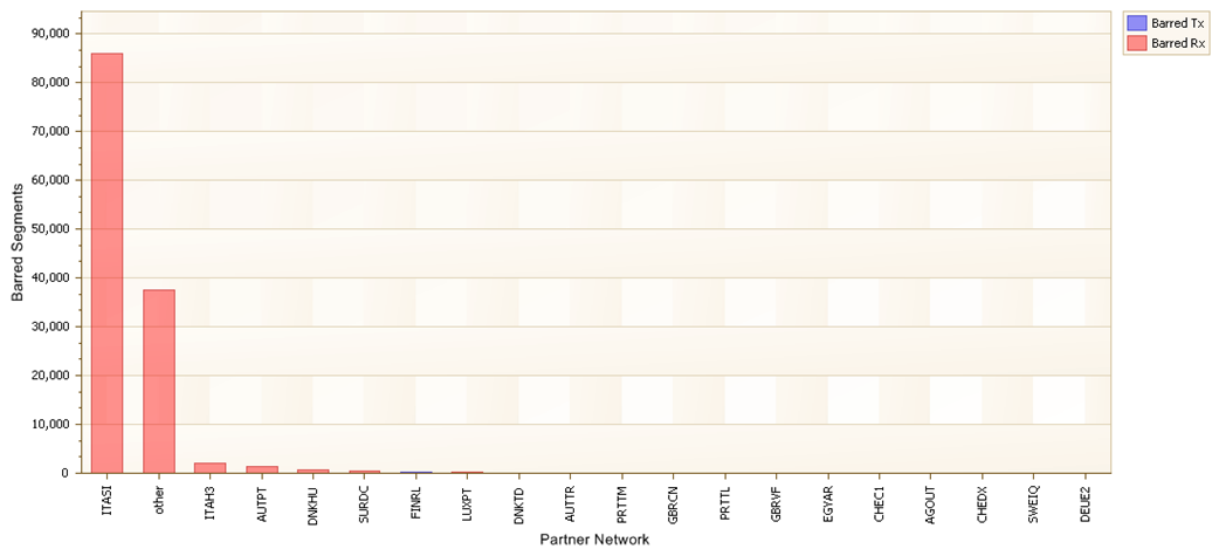
Figure 18: Report of incoming IW SMS blocked by the SMS gateway based on the customer screening instructions

Figure 19: Full details of delivered, failed and barred IW SMS per destination network

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7 IR.21 report

Comfone maintains a database with all IR.21 of GSM operators with whom it exchanges signalling traffic. The operator can verify that Comfone has correctly implemented its IR.21 with the "My Global Titles Ranges" report:

⊗ **My Global Title Ranges**

TAP Code ▼	Country Code ▼	Code ▼	GT Range ▼	GT Type ▼	Valid since ▼
🔖	🔖	🔖	🔖	🔖	▼ 🔖
VNMVT	84	162	84162	E.164 MSISDN	8/8/2008
VNMVT	84	163	84163	E.164 MSISDN	8/8/2008
VNMVT	84	164	84164	E.164 MSISDN	8/8/2008
VNMVT	84	165	84165	E.164 MSISDN	8/8/2008
VNMVT	84	166	84166	E.164 MSISDN	8/8/2008
VNMVT	84	167	84167	E.164 MSISDN	8/8/2008
VNMVT	84	168	84168	E.164 MSISDN	8/17/2007
VNMVT	84	169	84169	E.164 MSISDN	3/8/2008
VNMVT	84	97	8497	E.214	
VNMVT	84	97	8497	E.164 MSISDN	
VNMVT	84	98	8498	E.214	
VNMVT	84	98	8498	E.164 MSISDN	
VNMVT	84	980204	84980204	E.164 Network Node GT	4/28/2011

Figure 20: List of E.164 and E.214 implemented from the IR.21 of the customer.

8 Reporting specifics

Signalling reports are based on the integrated accounting and monitoring of Comfone STPs. The STPs record all MSUs on the access links between the Customer and Comfone. The high availability accounting system receives hourly files with the MSU statistics from Comfone's STPs. Data are available on the portal at a maximum of 4 hours after they have occurred. The same data displayed on Pulse are used to produce the monthly service invoices for the Signalling service.

8.1 Identification of source and destination networks

Comfone aggregates and maps the calling and called Global Titles/MSISDNs/Realms to PMN codes (i.e. TADIG codes) for better readability. The mapping is based on the Comfone internal IR.21 database that is updated continuously from the IR.21 updated by mobile operators.

GT to network mapping accuracy is currently limited to 7 digits for SCCP, UDTS and MAP reports. If more than 7 digits are needed to resolve an address to a network, the traffic is classified as "other". For all other reports, accuracy is at the full length of the addresses.

8.2 Data availability

Comfone manages a high availability database for Pulse reporting that contains close to half a terabyte of data. Comfone archives detailed information after a certain time to maintain the performance of report generation.

SCCP and UDTS reports:

- Record-Level data are kept for 35 Days

- Hourly Relations data are kept for 4 Month

- Daily Relations data are kept for 12 Month

- Monthly Relations data are kept for a minimum of 12 Month

- Summaries are kept for over 5 Years

MAP and S6a transactions reports:

- Hourly Relations data are kept for 4 Month

- Daily Relations data are kept for 12 Month

- Monthly Relations data are kept for a minimum of 12 Month

- Summaries are kept for over 5 Years

9 Roadmap

Comfone has the following developments in store for the Pulse signalling applications:

- MAP and SCCP reports with full GT length resolution (Q1 2015)

- Enhanced IW SMS reports (Q2 2015)

10   Glossary

ANSI	American National Standards Institute
CAP	Camel Application Part
GSM	Global System for Mobile
GSMA	GSM Association
GT	Global Title
HLR	Home Location Register
HPMN	Home Public Mobile Network
IP	Internet Protocol
ISP	Internet Service Provider
ISPC	International Signalling Point Code
ISUP	ISDN User Part
ITU	International Telecommunication Union
MAP	Mobile Application Part
MSC	Mobile Switching Centre
MSU	Messaging Signalling Unit
MTP	Message Transfer Part
RTT	Round Trip Time
RX	Reception: MSU from Comfone to the Customer
SCCP	Signalling Connection Control Part
SCTP	Stream Control Transmission Protocol
SPC	Signalling Point Code
SS7	Signalling System No. 7
STP	Signalling Transfer Point
TCAP	Transaction Capabilities Application Part
TX	Transmission: MSU from the Customer to Comfone
VPMN	Visited Public Mobile Network