TECNOTREE

Next Generation Messaging

Advanced Course

Contents

- NGM node operation
- TSS 2.1.1 operation
- Operation and Maintenance Tool

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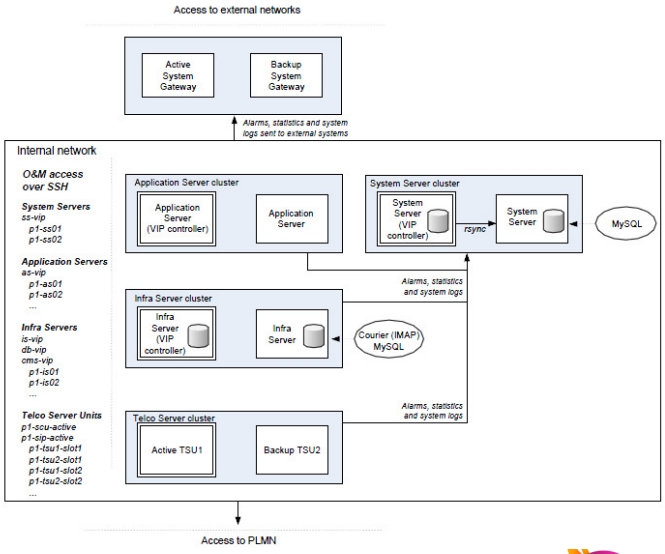
NGM System O&M



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NGM node operation

- Access through SSH
- `root` user to manage the NGM nodes
- Access through terminal server if SSH connection to the node is lost
- First log in to the System Server, and then to the node VIP adress:
  - System Server: ss-vip
  - Application Server: as-vip
  - Infra Server: cms-vip
  - MySQL database: db-vip
  - Courier mail server: cms-vip
  - IVR-Application Server: ivras-vip

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Checking NGM software version

```
[root@p1-ss01 ~]# repo-tool latest
target  date       rpm
-----------------------------------------
updates No info available
NGMMAS  2010-07-29      NGMMAS-5.1.3_U8-98826.tar
NGMPLAT 2010-07-21      NGMPLAT-5.1.3-98791.tar
TSS     2010-08-12      TSS_2-1-1_16_GEN.tar
NGIVR   2010-07-21      NGIVR-1.0.14-56573.tar
VMG     2011-05-30      VMG-1.0.0.8-119792-REL.tar

For details on target use /usr/bin/repo-tool latest
<target>
Example /usr/bin/repo-tool latest NGMPLAT
```


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```
[root@p1-ss01 ~]# repo-tool latest TSS
target  date       rpm
-----------------------------------------
updates No info available
NGMMAS  2010-07-29      NGMMAS-5.1.3_U8-98826.tar
NGMPLAT 2010-07-21      NGMPLAT-5.1.3-98791.tar
TSS     2010-08-12      TSS_2-1-1_16_GEN.tar
NGIVR   2010-07-21      NGIVR-1.0.14-56573.tar
VMG     2011-05-30      VMG-1.0.0.8-119792-REL.tar

Details on TSS
Release tar-file: TSS_2-1-1_16_GEN.tar
 size: 39116800
 date: 2010-08-12
AA tss-vbr-2.1.1-10.i686.rpm
 release nr: 10
 build date: Mon 05 Jul 2010 08:25:09
  release nr and build date information above may not be relevant
  for your needs, as it's taken from tss-vbr-2.1.1-10.i686.rpm
 files in tar-file:
  php-5.2.2-1.i686.rpm
  tss-bls-2.1.1-17.i686.rpm
  tss-dbt-2.1.0-27.i686.rpm
  .......
```


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Operating System Servers

- Some useful commands for operating the System Servers:
- ps ax | grep <keyword>
  - ldirectord (only on the System Server acting as the VIP controller in the cluster)
  - heartbeat (ss01 and ss02)
  - java (jboss)
  - httpd.worker
  - mysql
- ipvsadm –l (only on the active System Server)
- /etc/init.d/xjboss start|stop|restart

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- Some useful log files:

- `/usr/java/jboss/server/jboss-clustered/log/server.log` - Contains Java application log data.
- `/var/lib/mysql/<hostname>.err` - Contains MySQL database server error logs.
- `/var/log/messages` - Contains Linux system-level error messages.
- `/var/ngm-spool/logs/` - Contains system logs.

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Operating Application Servers

- Some useful commands for operating the Application Servers:

- ps ax | grep <keyword>
  - ldirectord (only on the Application Server acting as the VIP controller in the cluster)
  - heartbeat
  - java (jboss)
  - httpd.worker
- ipvsadm –l (only on the active Application Server)
- /etc/init.d/xjboss start|stop|restart

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- Some useful log files:

- `/usr/java/jboss/server/jboss-clustered/log/server.log` - Contains Java application log data.
- `/var/log/httpd/access_log` - Contains the Apache web server logs.
- `/var/log/messages` - Contains Linux system-level error messages.
- `/var/log/ldirectord.log` - Contains load balancer log data.
- `/var/log/ha-log` - Contains heartbeat log data.

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Operating Infra Servers

- Some useful commands for operating the Infra Servers:
- ps ax | grep <keyword>
  - ldirectord (only on the Infra Server acting as the VIP controller in the cluster)
  - heartbeat
  - createdird (Mailbox dispatcher)
  - courier-imap
  - httpd.worker
  - mysql
- ipvsadm –l (only on the active Infra Server)
- mount –t gfs
- To check IS clustering:
  - cat /proc/cluster/nodes
  - cat /proc/cluster/services
  - cat /proc/cluster/status

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- Some useful log files:

- `/var/lib/mysql/<hostname>.err` - Contains MySQL database server error logs.
- `/var/log/maillog` - Contains Courier mail server error logs.
- `/var/log/messages` - Contains Linux system-level error messages.
- `/var/log/ldirectord.log` - Contains load balancer logs.
- `/var/log/ha-log` - Contains heartbeat logs.

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System logging

- System logs are aggregated from nodes to the System Server using standard UNIX syslog facilities.
- Log files located in the `/var/ngm-spool/logs`
- Each log entry has the following format: `<date and time> <node host alias> <process> <message>`
- The following log files are available:

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- `system_alert` - Contains alerts, for example, related to authentication (Pluggable Authentication Modules, PAM).
- `system_crit` - Contains critical log data.
- `system_emerg` - Contains emergency log data.
- `system_err` - Contains standard error log data.
- `system_audit` - Contains log data on the actions of O&M Tool and CS Tool users.
- `system_warning` - Contains warning-level log data.
- `system_local0` and `system_local2` - Contains Telco Server-related log data.

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Database Maintenance Checks (SS/IS)

- The System Server and Infra Server cluster have MySQL databases that must be synchronized between the servers in the cluster.
- The System Server database contains the billing records, alarm data and the system configuration.
- The Infra Server database contains the subscriber data, as well as the service settings.
- NGM automatically takes nightly counts of the database tables on both Infra Servers in the cluster, and compares the counts to check if the databases are in sync.

- NGM automatically takes nightly database backups.
- Database backups are located in `/var/lib/mysql-backup-<date>`
- You can take database backups manually, but **taking database dumps can affect the service provided to subscribers, it is highly recommended to perform it during very low traffic times!!!**

NGM mysql Databases

Database	Location	Description
jalladb	Infra Servers (used by the Application Servers)	Main NGM database, which contains subscriber and service data and settings.
sconfdb	System Servers	Contains data used by SCT (sconf), for example, data on the nodes, roles, and node configuration parameters.
simppudb	System Servers	Contains the alarms and statistics.
billingdb	System Servers	Contains the billing data.
tomdb	Infra Servers	Contains the O&M Tool data.

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- To check Infra Server database synchronization: (**perform it during very low traffic times!!!**):

1. Use SSH and open two windows to log in to the both Infra Servers as root user.

2. In both windows, enter the command (without pressing **Enter**) for taking a database dump:

```
mysqldump –ujboss –pjboss jalladb > jalladb.sql
```

3. Press **Enter** in one window, and switch to the other window and press **Enter**.

- The database dumps are not taken exactly at the same time, but they should be close enough.

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4. When both database dumps are completed, verify that the size of the .sql files is the same by giving the following command:

```
ls -l
```

5. If the file sizes are different, it means the databases are not synchronized and corrective action is needed. In this case call Tecnotree support to perform correct database synchronization.

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Monitoring Database Table size

- It is recommended that you check the contents of some tables in the System Server and in the Infra Server database on a regular basis to monitor the patterns in table size. If a table grows abnormally, it could indicate a problem in the system. The following table should be checked in the System Server:

1. `billing_ticket` - table contains information about billing

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- The following tables should be checked in the Infra Server:

1. `omf_messages`, `missed_call_attempts` and `workqueue_references` – contain information about pending notifications
2. `accounts` and `subscriptions` – contain information about subscribers

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- To check System Server tables size:

1. To access the database, as the root user, enter the following command:

```
hasql ss billingdb
```

2. Enter the following SQL command:

```
select count(*) from billing_ticket;
```

3. Record the displayed values and compare them with the previous values.

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- To check Infra Server tables size:

1. To access the database as the root user, enter the following command:

```
hasql is jalladb
```

2. Enter the following SQL command:

```
select count(*) from omf_messages;
select count(*) from
workqueue_references;
select count(*) from accounts;
select count(*) from subscriptions;
```

3. Record the displayed values and compare them with the previous values.

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Checking Disks and server load

- The commands below are used in all NGM servers (Infra Servers, System Servers, Application Servers, Proxy Servers and Telco Server units)
- To check disc space in use the following command:

```
df –h
```

- All the servers have hardware disc mirroring, to check use the following command:

```
mpt-status
```

- To check server load use the following command:

```
top
```


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Checking Heartbeat

- All the NGM servers have Linux heartbeat installed and configured to provide High Availability (HA)
- Heartbeat is installed in the first pair of the the servers in the same cluster (i.e. in case of having 3 or more AS, only AS-01 and AS-02 have heartbeat installed)
- The procedure is valid for SS's, AS's, IS's and TSS (only CPC's)

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- The following commands are available to check heartbeat:

```
[root@p1-ss01 ~]# crm_mon -i5
Refresh in 5s...

============
Last updated: Thu Feb 23 17:15:58 2012
Current DC: p1-ss01 (a68b9c17-44e4-4b07-a98e-3ed35834a7db)
2 Nodes configured.
1 Resources configured.
============

Node: p1-ss01 (a68b9c17-44e4-4b07-a98e-3ed35834a7db): online
Node: p1-ss02 (fef779f0-1b3d-4ed8-9fcb-a3679389e77c): online

Resource Group: vip_group
    vip (heartbeat::ocf:IPaddr2):       Started p1-ss01
    dhcpd       (lsb:dhcpd):    Started p1-ss01
    rsync       (heartbeat::ocf:Xinetd):        Started p1-ss01
    lvs (heartbeat:ldirectord): Started p1-ss01
    failover    (lsb:failover): Started p1-ss01
```


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- Heartbeat processes must be running

```
[root@p1-ss01 ~]# service heartbeat status
heartbeat OK [pid 31632 et al] is running on p1-ss01 [p1-ss01]...

[root@p1-ss01 ~]# ps aux | grep -i heartbeat
root     22957  0.0  0.0  4316  688 pts/0    R+   17:17   0:00 grep -i heartbeat
root     31632  0.0  0.3 12608 12608 ?       SLs  2011   0:39 heartbeat: master control
process
root     31634  0.0  0.1  6012 6012 ?        SL   2011   0:00 heartbeat: FIFO reader
root     31635  0.0  0.1  6008 6008 ?        SL   2011   0:00 heartbeat: write: ucast bond0
nobody   31636  0.0  0.1  6008 6008 ?        SL   2011   0:00 heartbeat: read: ucast bond0
root     31637  0.0  0.1  6008 6008 ?        SL   2011   0:00 heartbeat: write: ucast bond0
root     31638  0.0  0.1  6008 6008 ?        SL   2011   3:09 heartbeat: read: ucast bond0
498      31641  0.0  0.0  4984 1888 ?        S    2011   0:00 /usr/lib/heartbeat/ccm
498      31642  0.0  0.0  8568 3008 ?        S    2011   0:01 /usr/lib/heartbeat/cib
root     31643  0.0  0.0  5276 1576 ?        S    2011   0:00 /usr/lib/heartbeat/lrmd -r
root     31644  0.0  0.1  4696 4696 ?        SL   2011   0:00 /usr/lib/heartbeat/stonithd
498      31645  0.0  0.0  5540 1424 ?        S    2011   0:00 /usr/lib/heartbeat/attrd
498      31646  0.0  0.0  5552 1988 ?        S    2011   0:00 /usr/lib/heartbeat/crmd
root     31647  0.0  0.0  5828 2040 ?        S    2011   0:00 /usr/lib/heartbeat/mgmtd -v
498      31808  0.0  0.0  5208 1440 ?        S    2011   0:00 /usr/lib/heartbeat/tengine
498      31809  0.0  0.0  6044 1568 ?        S    2011   0:00 /usr/lib/heartbeat/pengine
```


- In the active side ipvsadm –l command shows the servers state (not valid for TSS CPC's which are used in hot standby mode)

```
[root@p1-ss01 ~]# HAstate
active

[root@p1-ss01 ~]# ipvsadm -l
IP Virtual Server version 1.2.0 (size=4096)
Prot LocalAddress:Port Scheduler Flags
  -> RemoteAddress:Port           Forward Weight ActiveConn InActConn
TCP  ss-vip:8816 wlc
  -> p1-ss01:8816                 Local   1      0          0
  -> p1-ss02:8816                 Route   1      0          0
TCP  ss-vip:8811 wlc
  -> p1-ss02:8811                 Route   1      0          0
  -> p1-ss01:8811                 Local   1      0          0
TCP  ss-vip:8806 wlc
  -> p1-ss01:8806                 Local   1      0          0
  -> p1-ss02:8806                 Route   1      0          0
TCP  ss-vip:8801 wlc
  -> p1-ss01:8801                 Local   1      0          0
  -> p1-ss02:8801                 Route   1      0          0
```


System Gateway Operation

- The System Gateway operating system (OS) is OpenBSD and the firewall software used is Packet Filter (PF).
- All operations be done through the master control script `sgwctl`.
- Needs preconfigured SSH keys to access.
- Usually installed as a master/backup pair for High Availability (HA):

1. CARP - Common Address Redundancy Protocol
2. PFSYNC - used to synchronize firewall states between machines running Packet Filter (PF)

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```
p1-sygw01.claro.cr$ sgwctl

Usage: sgwctl <command> [args]

Commands available for all users are:

status [n]              Print short system status information [every n seconds]
fullstatus              Print extended system status information
ifstatus [if]           Print network interface status for <if> or for all
confdump                Dump current configuration
conflog                 Show configuration history
exportconf [version]    Export current (or <version>) configuration into a file
compareconf [peer]      Compare configuration with an another unit
show <key>              Show configuration information on <key>
                        Key can be any object name (hostname, network name,
                        etc., or "hosts", "networks", "services" or "users"
createnodes <net> ...   Generate nodes.xml file for <net> network and
                        for all other listed networks
passwd [user]           Set local access password for self or <user>

Commands available only for ADMIN users:

fwstatus [option]       Print firewalling status
                        Options: nat, rules, state, tables, interfaces
livestatus              Show live firewall status (use 'q' to quit)
…
```


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- To check SGW status:

```
p1-sygw01.claro.cr$ sgwctl status
NGM System Gateway Status
=========================

Node: p1-sygw01, Part of cluster: p1-sygwpair1
 4:59PM  up 9 days, 21:28, 1 user, load averages: 0.17, 0.18, 0.30

Status of cluster shared interfaces:

VHID  VIPIF  PRI      IF    STATE IP-Address       REAL-IF-STATE NETWORK
====  ====== ======= ===    ===== ================ ============= =============
   1   carp0   0/  0 em0   MASTER      10.196.23.7       -active  intermed-net
   2   carp1   0/  0 em4   MASTER    10.196.22.115       -active       ngm-net
---- pfsync0 ------- em5    -----     10.196.17.33       -active      sync-net

Latest configuration change: Feb 14 19:24
System Gateway Software Release: $Name: SGW_1-11a_GEN $
Operating System Version: OpenBSD 4.6 GENERIC#58
```


- To shut down or reboot the system:

```
$ sgwctl shutdown
$ sgwctl reboot
```

- To disable a System Gateway - This changes all the CARP interfaces to INIT (disabled) state:

```
$ sgwctl demote
```

- To enable a System Gateway, either reboot it or use the following command:

```
$ sgwctl promote
```


- To backup SGW configuration:

```
p1-sygw01.claro.cr$ sgwctl exportconf
```

- A .uncl file is crated with the current configuration:

```
ngm-costa-rica-p1-sygw01-201202241706.uncl
```

- Also is possible to burn a CD or create a backup .iso file:

```
p1-sygw01.claro.cr$ sgwctl backup
A backup can be written to a CD-R or CD-RW disk or left
in your home directory as an ISO image file.

If you plan to burn the CD now, please insert a blank CD-R or
any CD-RW disk in the CD-ROM drive before answering the question
below.

(R) Burn on CD-R or pre-blanked CD-RW disk
(W) Burn on CD-RW disk, disk will be blanked automatically before writing
(I) Do not burn a CD, create an ISO image to home directory

Please select (r), (w) or (i) or press CTRL-C to abort>
```


- To see live logs from SGW:

```
p1-sygw01.claro.cr$ sgwctl livelog
tcpdump: WARNING: pflog0: no IPv4 address assigned
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on pflog0, link-type PFLOG (Packet filter logging, by pcap people), capture
size 10000 bytes
2012-02-24 17:13:41.243834 rule 0/0(match): unkn(12) in on em4: 10.196.22.91.46092 >
10.196.22.115.22: Flags [.], ack 2982994340, win 267, options [nop,nop,TS val
2326869915 ecr 630243065], length 0
2012-02-24 17:13:41.243848 rule 0/0(match): unkn(12) in on em4: 10.196.22.91.46092 >
10.196.22.115.22: Flags [.], ack 145, win 267, options [nop,nop,TS val 2326869915 ecr
630243065], length 0
2012-02-24 17:13:41.402854 rule 0/0(match): unkn(12) in on em4: 10.196.22.91.54576 >
228.8.8.1.45503: UDP, length 66
2012-02-24 17:13:41.402864 rule 0/0(match): unkn(12) in on em4: 10.196.22.91.54576 >
228.8.8.1.45503: UDP, length 66
2012-02-24 17:13:41.489173 rule 0/0(match): unkn(12) in on em4: 10.196.22.71.37010 >
228.8.8.2.45500: UDP, length 79
2012-02-24 17:13:41.489182 rule 0/0(match): unkn(12) in on em4: 10.196.22.71.37010 >
228.8.8.2.45500: UDP, length 79
2012-02-24 17:13:41.599728 rule 0/0(match): unkn(12) in on em4: 10.196.22.73.53645 >
228.8.8.2.45503: UDP, length 56
2012-02-24 17:13:41.599737 rule 0/0(match): unkn(12) in on em4: 10.196.22.73.53645 >
228.8.8.2.45503: UDP, length 56
```


TSS hardware and software

- CPC card - Called Party Contribution:

- Disk host for the IOP cards on the same Voice Browser Unit (VBU) – DHCP/NFS server
- Two CPC cards run the Signaling Controlling Unit (SCU) software that implements the upper levels of SS7 signaling stack in a fault tolerant configuration.
- SIP signaling
- GMI - Generic Messaging Interface which is responsible for handling notifications such as MWI and MCN

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- IOP card - IO Processing card:

- Diskless card, boot up using CPC card – NFS client,
- Responsible for E1s to connect with the MSC, using Trunk Interface Card (TIC),
- Implement the MTP1 and MTP2 layers of SS7 stack,
- Run the VoiceXML Browser, which consists of Dialog Controller (DC), VoiceXML Interpreter (VXI) and Media Controller (MC),
- SIP – responsible for RTP sessions

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CPC Processes

```
------------------------------------------------
The process list:
>1. BM                                    00
 2. SDS                                   00
 3. NI                                    01
 4. MGMT                                  01
 5. SIP                                   00
 6. CALLISUP                              01
 7. MAP                                   01
 8. MTP3                                  01
 9. SCCP                                  01
 a. DIAG                                  01
 b. ALARM HANDLER                         01
 c. SSF                                   01
 d. STAT                                  01
------------------------------------------------
```


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IOP Processes

```
-------------------------------------------------
The process list:
>1. BM                                    00
 2. SDS                                   00
 3. DC                                    01
 4. VXI                                   00
 5. MGMT                                  01
 6. MC                                    01
 7. SRF                                   01
 8. FRAMER_IF RX framer                   01
 9. FRAMER_IF TX framer                   02
 a. FRAMER_IF TX framer                   04
 b. TIC                                   01
 c. PRA                                   01
-------------------------------------------------
```


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Checking TSS software version

```
[root@p1-tsu2-slot1 ~]# tss-software

TSS release  : tss-2.1.1-16
TCONF release: tconf-2.1.1-17.build16

PACKAGE          VERSION   RELEASE        PRODUCT   INSTALLATION DATE
mibs             1.1e      06             NGM       Tue 17 Aug 2010 07:18:02 PM UTC
tss-bls          2.1.1     17             TSS 2.1   Tue 17 Aug 2010 07:18:07 PM UTC
tss-scu-mgmt     2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:15 PM UTC
tss-scu-callisup 2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-l3       2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-sccp     2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-dbt          2.1.0     29.rc.1        TSS 2.1   Tue 06 Sep 2011 04:47:38 PM UTC
tss-scu          2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:15 PM UTC
tss-scu-alert    2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:16 PM UTC
tss-scu-diag     2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-map      2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-sip          2.1.0     40             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-gmi          2.1.0     30.rc.1        TSS 2.1   Tue 06 Sep 2011 04:47:36 PM UTC

tss-dbt-2.1.0-29.rc.1 does not belong to the TSS release tss-2.1.1-16.
tss-gmi-2.1.0-30.rc.1 does not belong to the TSS release tss-2.1.1-16.
```


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TSS Base software

- Common tasks for all TSS200 units, that are parts of the baseline SW that is installed on all the TSS 2.1.1 units:

- BM - Baseline Manager, the application watchdog task. It monitors that all the tasks are alive, and restarts a task that has died. BM also monitors Squid HTTP Proxy, Apache HTTP Server, SNMPD and syslogd.
- SDS - System Diagnostics Server. It provides applications with resources to generate alarms based on the statistics (for example, percentage of failed calls, and so on).

Signaling Software

- The SCU modules manage SS7 signaling and call handling.
- SIP module manages the Session Initiated Protocol (SIP) signaling interface.
- High Availability - cluster pairs are used, controlled by the Linux Heartbeat.

CPC software

- Main signaling stack - handles SS7 layers above MTP2 and other support modules.

- MTP3 - MTP3 process handles the core SS7
- CALLISUP, ISUP – Call Handler support connection-orientated calls (voice calls)
- MAP - Transaction Capabilities Application Part (TCAP) and Mobile Application Part/Message Waiting Indication (MAP/MWI) make up the process
- MGMT - Stack/Card Manager supports the monitoring of distributed processes

- STAT - statistics module
- ALARM HANDLER - format a given alarm and report it to the SyS
- DIAG - diagnostics module
- SIP – SIP signaling module
- SSF - handles IN messages between CALLISUP and SCCP
- NI - **NI** task consists of GMI and CSS processes. The GMI is used for both integrated SMSC functions and as an interface to external SMSCs, and CSS is the database for GMI

IOP software

- Two PMC sites, one site for four Digital Signal Processors (DSPs), the other for four Trunk Interface Devices (TIC card)
- TIC - The TIC software terminates the PCMs and one TIC process supports a maximum of four PCMs.
- MTP2 - MTP2 level signaling
- Framer IF (TX/RX Interface) - The transmit process supports the transmission of messages, configuration, and commands from the application processes to the device driver and the receive process supports the reception of alarms and signaling messages from the device driver to the application

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- PRA - The Primary Rate (PRA) module provides the primary rate ISDN link functionality. Currently, the TSS200 does not support PRA.
- SRF - The SRF (Special Resource Function) process communicates with the SCF (Service Control function) and the CALLISUP process and manages input and output between the TSS user interface and the SCF for IN calls.
- MC, DC and VXI – VoiceXML Browser software responsible for interpreting the VoiceXML documents it receives from the Application Server to the caller

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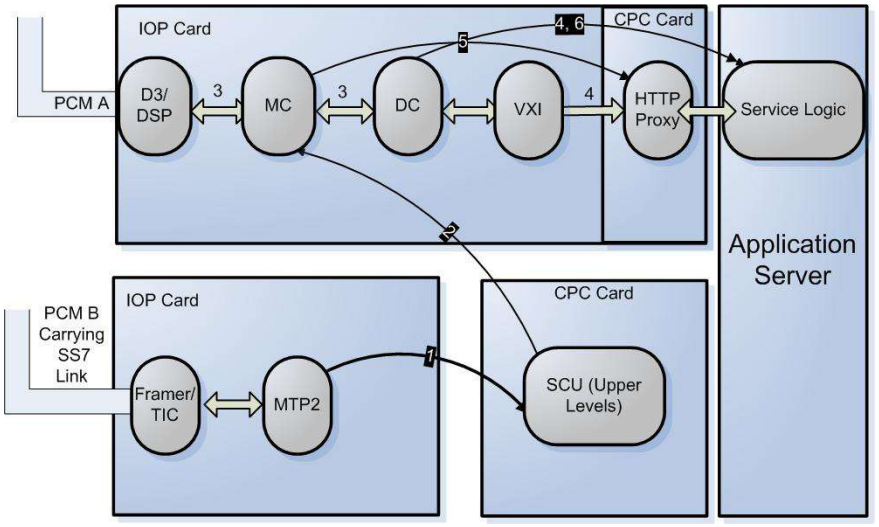
Call Flow – incoming call



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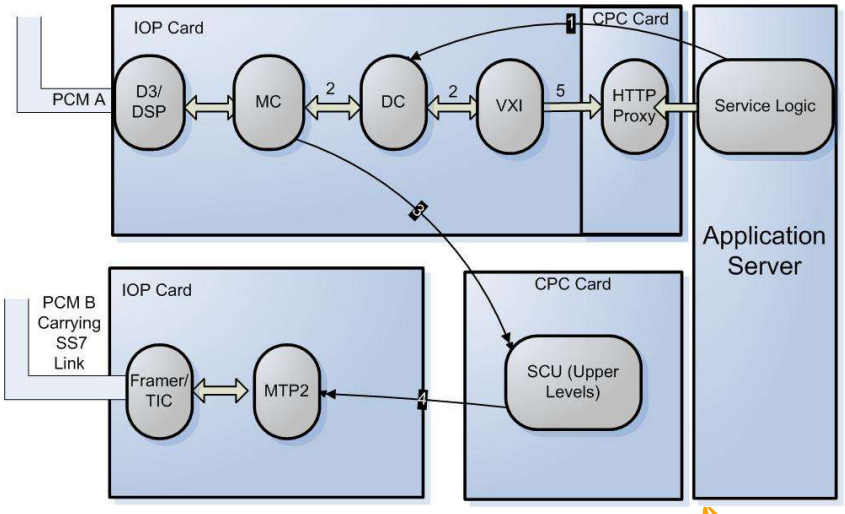
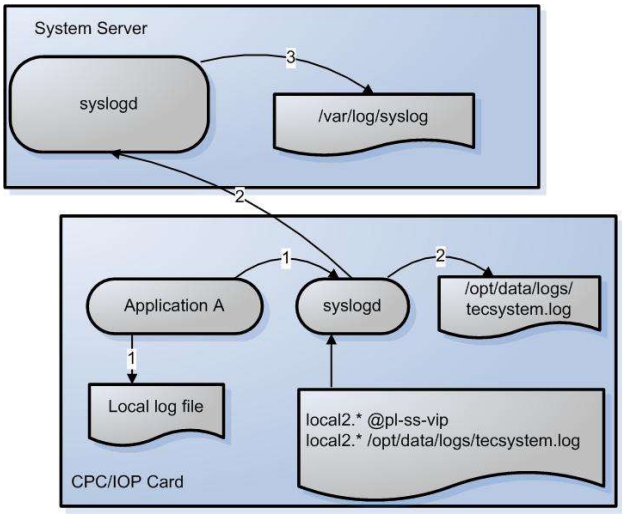
Call Flow – outgoing call



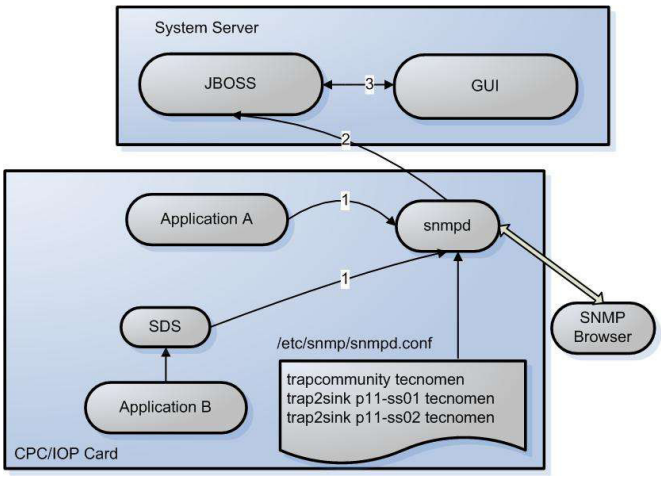
TECNOTREE

Logging Subsystem



TECNOTREE

Alarms, Events, and Statistics Subsystem



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GMI – Generic Messaging Interface

- GMI is common interface to access different messaging media for both incoming and outgoing messages.
- The interface can be used by all the applications that use messaging. This interface is to provide a straightforward way to send and receive messages to mobile networks as well as paging networks.
- This interface is designed in a manner that it is flexible enough for adding new interfacing protocols for future needs without changing the interface itself.
  - NGM utilizes currently GMI for outgoing messaging: meaning sending of SM notification
  - GMI runs in TSS CPC-cards (active and hot standby), and it is triggered from AS

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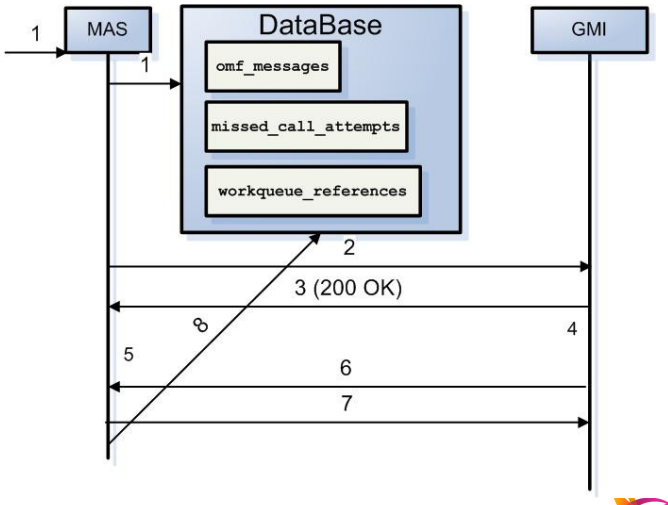
Missed Call Notification



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- A missed call is handled as follows:

1. A notification of a missed call is sent to MAS. An entry of the event is made into the omf_messages, missed_call_attempts, and workqueue_references tables.
2. MAS sends a notification request to GMI.
3. GMI sends a response to MAS (200 OK), and the record is deleted from the workqueue_references table. The record in omf_messages table is updated to indicate the status (wait for delivery Report).
4. Alternatively: no OK 200 message is sent from GMI and MAS will keep retrying to notify GMI until it succeeds.
5. MAS waits for a delivery report from GMI.
6. SM is delivered, and GMI sends a delivery report to MAS.
7. MAS sends an ACK (200 OK).
8. Entry made into the omf_messages table is removed. The entry in table missed_call_attempts is either removed (if A Number based Missed Call notification) or the A Number list is updated. Entries from both tables are also removed if a retrieval call is made, or if MAS housekeeping removes them (based on expiry_time).

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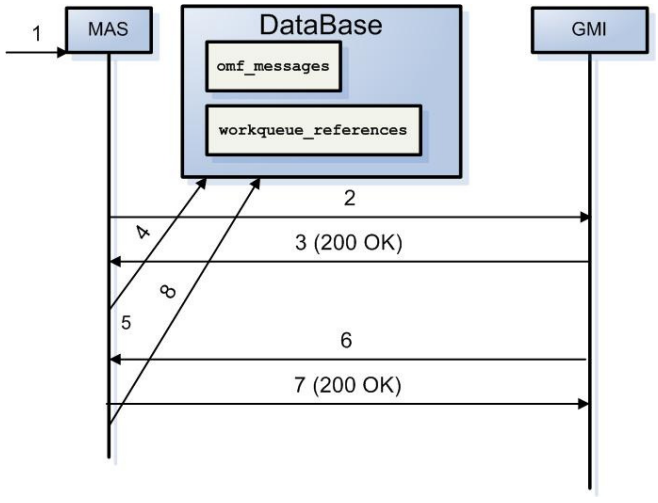
Deposit Call Notification (Icon)



TECNOTREE

- A deposit call notification is handled as follows:

1. A notification of a deposit call is sent to MAS. An entry of the event is made into the omf_messages and workqueue_references tables.
2. MAS sends a notification request to GMI.
3. GMI sends a response to MAS (200 OK), and the record is deleted from the workqueue_references table. The record in omf_messages table is updated to indicate the status (wait for delivery Report).
4. Alternatively; no OK 200 message is sent from GMI, and MAS will keep retrying to notify GMI until it succeeds.
5. MAS waits for a delivery report from GMI.
6. SM is delivered, and GMI sends a delivery report to MAS.
7. MAS sends an ACK to GMI (200 OK).
8. MAS removes the entry made into the omf_messages table. The entry is also removed if a retrieval call is made, or if MAS housekeeping removes it (based on expiry_time).

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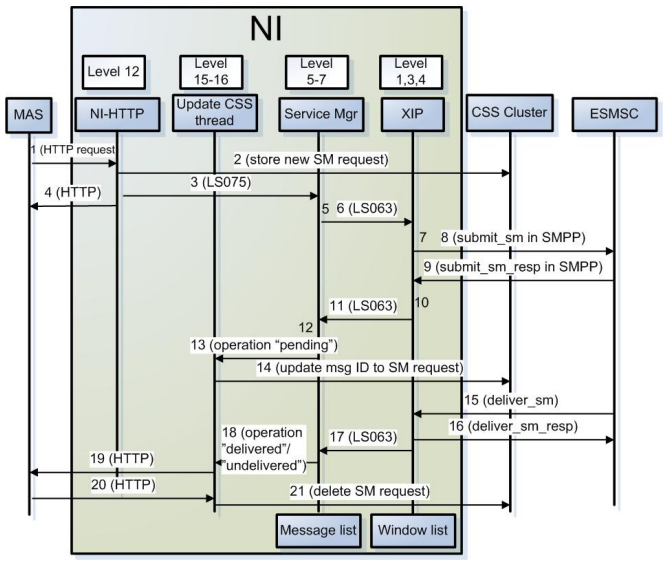
SM Delivery



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- The process proceeds as follows:

1. MAS sends SM request to NI (HTTP request).
2. The sent message is stored in CSS Cluster (store new SM request).
3. The SM to Service Manager (LS075).
4. An 200 OK message is sent to MAS (HTTP).
5. The message is put to message list and the list is polled.
6. The SM is submitted (LS063).
7. XIP puts the message to Window list.
8. SM is submitted to ESMSC (submit_sm in SMPP).
9. SM response is received (submit_sm_resp in SMPP).
10. Message is removed from Window list.
11. SM response OK is submitted (LS063).

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12. Message is removed from Message list.
13. SM response is sent (operation “pending”).
14. Update message ID to CSS record.
15. Delivery report is received (deliver_sm).
16. Delivery report response is sent.
17. Delivery report is sent (LS063).
18. Delivery report is sent (operation “delivered” / “undelivered”).
19. Delivery report is sent to MAS (HTTP).
20. A 200 OK message is received from MAS (HTTP).
21. CSS record is deleted.

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TSS troubleshooting

- TSS processes can be verified with the command:

```
[root@p1-vbu2-slot1 ~]# service telcoserver status
Checking TT (pid 3093)...                                  [  OK  ]
Checking NI (pid 14573)...                                 [  OK  ]
Checking SIP (pid 3146)...                                 [  OK  ]
MGMT isChecking MGMT (pid 9332)...                         [  OK  ]
Checking CALLISUP (pid 9411)...                            [  OK  ]
Checking MAP (pid 9443)...                                 [  OK  ]
Checking MTP3 (pid 9475)...                                [  OK  ]
Checking SCCP (pid 9508)...                                [  OK  ]
Checking DIAG (pid 9537)...                                [  OK  ]
Checking AHANDLER (pid 9569)...                            [  OK  ]
Checking STAT (pid 9605)...                                [  OK  ]
SDS (pid 3027) is running...
BM (pid 3013) is running...
TC (pid 2999) is running...
```


- Checking signaling link:
- Log into active CPC

```
[root@p1-tsu2-slot1 ~]# HAstate
active
[root@p1-tsu2-slot1 ~]# TCattach
> 7. MTP3                                01
Debug> s display to l3lower
s display to l3lower
```

Link	Failed	Blocked	Inhibited
0	0	0	0
1	0	0	0

- Checking SS7 routes:

```
Debug> s display to l3upper
s display to l3upper

 ------------------------------------------
| PC (dec) | PC (hex) |  Available |   Alarm   |
|----------|----------|------------|-----------|
|   1837   |    72d   |      1     |     0     |
 ------------------------------------------
```

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- Checking if all TIC cards are OK:

TCattach > DIAG > m diagom > s displaytic

```
Debug> s displaytic

TIC_status:
===========

 ================================================
| TIC | address | status || TIC | address | status |
 ================================================
|  0       0        OK   || 32       -         -   |
|  1       0        OK   || 33       -         -   |
|  2       0        OK   || 34       -         -   |
|  3       0        OK   || 35       -         -   |
|  4       1        OK   || 36       -         -   |
|  5       1        OK   || 37       -         -   |:
```

- If any of the TICs is in NOK state connect into IOP cards and check the proceesses

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- Checking PCM status:

TCattach > *CALLISUP* > *m tupom* > *s enqtupcircuitgroupstatus x* , where x is the PCM number.

```
internal_pcm:            0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
TUP_OM.isup.scu     :0                    Idle             TUP_circuit_grou
MONITOR.lib.smile   :0    <-

pcm:                     0
status:                  0       0       0       0       0
                         0       0       0       0       0
                         0       0       0       0       0
                         0       0       0       0       0
                         0       0       0       0       0
                         0       0       0       0       0
                         0       0
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

- The PCM status codes are listed in the next slide

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```
                    GENERAL TUP
(msb)                                        (lsb)
  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X            Decimal
          |_||_||_||_||_||_||____||____||__________|
            |  |  |  |  |  |     |     |
            |  |  |  |  |  |     |     |--> Circuit State:

            |  |  |  |  |  |     |           0000: IDLE
            |  |  |  |  |  |     |           0001: SEIZE_IN       1
            |  |  |  |  |  |     |           0010: SEIZE_OUT      2
            |  |  |  |  |  |     |           0011: IN_CC_IN       3
            |  |  |  |  |  |     |           0100: RESERVED       4
            |  |  |  |  |  |     |           0101: UNKNOWN        5
            |  |  |  |  |  |     |
            |  |  |  |  |  |     |--> Local Main. Block:
            |  |  |  |  |  |              00: Not Blocked
            |  |  |  |  |  |              01: Single Blocked       16
            |  |  |  |  |  |              10: Group Blocked        32
            |  |  |  |  |  |--> Remote Main. Block:
            |  |  |  |  |               00: Not Blocked
            |  |  |  |  |               01: Single Blocked          64
            |  |  |  |  |               10: Group Blocked           128
            |  |  |  |  |--> Local H/W Block:
            |  |  |  |             0: Not Blocked
            |  |  |  |             1: Blocked                        256
            |  |  |  |--> Remote H/W Block:
            |  |  |                0: Not Blocked
            |  |  |                1: Blocked                        512
            |  |  |--> PCM_Fail:
            |  |             0: Circuit not in Failed PCM
            |  |             1: Circuit in Failed PCM               1024
            |  |--> Local S/W Block:
            |               0: Not Blocked
            |               1: Blocked                              2048
            |--> Remote S/W Block:
                       0: Not Blocked
                       1: Blocked                                  4096
```


TECNOTREE

- Blocking/unblocking PCMs:

- Below are the most used PCM maintenance commands, all used in CPC:
- To Block a PCM
  - TCattach > CALLISUP > m tupom > s tupblockconfig >x > 1 > 1, where x is PCM number.
- To Unblock a PCM
  - TCattach > CALLISUP > m tupom > s tupblockconfig > x > 0 > 0, where x is PCM number
- To Reset circuits on a PCMs
  - TCattach > CALLISUP > m tupom > s tupcircuitreset > x > 1 > 1, where x is PCM number

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- Checking TIC cards (on the IOP card):

- Example on the IOP 5 which handles PCMs from 16 to 19:
  - TCattach > TIC > m ticom : <from TIC>: <to TIC>

```
Debug> m ticom:16:19

Monitoring:   TIC_OM.tic.scu      :16  :19   (Press key for debugger prompt)

From/To                    Input           State            Output
-------------------------------------------------------------------------------
TIC_OM.tic.scu      :16                    TIC_active
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
TIC_OM.tic.scu      :17                    TIC_active
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
TIC_OM.tic.scu      :18                    TIC_active
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
TIC_OM.tic.scu      :19                    TIC_active
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```


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- Example on an individual TIC (18):
  - TCattach > TIC > m ticom : 18 > s displayticstatus

```
Debug> m ticom:18

Monitoring:   TIC_OM.tic.scu      :18        (Press key for debugger prompt)

From/To                     Input            State             Output
-------------------------------------------------------------------------------
TIC_OM.tic.scu      :18                      TIC_active
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
s displayticstatus
Debug> s displayticstatus

----------------------------------------

TIC in service.
TIC diagnostics OK.
PCM Number :- 18
TIC Card Type :- Uninitialized
```


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- Example on checking PCM statistics (TIC 18):
  - TCattach > TIC > m ticom : 18 > s displayticstatistics 0 (or 1 if you want to reset counters)

```
Debug> s displayticstatistics
clear_counters      : 0
0

--------------------------------

TIC                          : 18

Frame errors                 : 0
CRC4 errors                  : 0
Bipolar violations           : 0
Unavailable time             : 0
Available time               : 9061906
Errored seconds(~64Kb/s)     : 0
Raw errored seconds(~2Mb/s)  : 0
Severely errored seconds     : 0
Degraded minutes             : 0
Slips                        : 0

--------------------------------
```


TECNOTREE

- Checking GMI connection with external SMSC (CPC)
- Check tecsystem.log for GMI logs, ConnOk parameter should be equal 1

```
[root@p1-tsu2-slot1 ~]# tail -200f /opt/data/logs/tecsystem.log | grep GMI
Feb 16 20:11:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:12:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:13:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:14:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:15:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:16:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
Feb 16 20:17:25 p1-tsu2-slot1 NI[15809]: tss> ? 7:GMI : Diagnostic(alarm) info: ParamOk
= 1, ConnOk = 1, MsgDeliveryRatio = 99 %
```


TECNOTREE

Call statistics – ISUP Calls

- It is possible to retrieve statistics information for the number of calls from modules CHOM and SWCOM of the SCU SW.
- Both of these modules are accessible from CALLISUP window in TCattach menu.
- Examples of the most common commands are shown on the following slides.

TECNOTREE

- TCattach > CALLISUP > m chom > s display_statistics > Enter > Enter

```
Debug> s display_statistics
pool_num            :
clear_counters      :

   Incoming call attempts           :   15758172
   Incoming addr complete           :   15754044
   Incoming answered                :   15662058
   Incoming to invalid subs         :          0
   Cumulative ans delay [ticks]     :   30064361
   Cumulative hold time [s]         :  141300352
   Number of calls with ans >  20   :       1899
   Number of calls with ans >  50   :        306
   Outgoing call attempts           :          0
   Outgoing addr complete           :          0
   Outgoing answered                :          0
   Transfer call attempts           :          0
   Transfer call rejected           :          0
   CPS choked calls                 :          0
   Simultaneous choked calls        :          0
   Dual Seizure Occurances          :          0
```


- TCattach > CALLISUP > m chom > s display_pcm_statistics > Enter > PCM number > Enter

```
Debug> s display_pcm_statistics
pool_num            :
pcm_num             : 1
clear_counters      :

   Incoming call attempts           :     492781
   Incoming addr complete           :     492671
   Incoming answered                :     489815
   Incoming to invalid subs         :          0
   Cumulative ans delay [ticks]     :     931346
   Cumulative hold time [s]         :    4392903
   Number of calls with ans >  20   :         48
   Number of calls with ans >  50   :          9
   Outgoing call attempts           :          0
   Outgoing addr complete           :          0
   Outgoing answered                :          0
   Transfer call attempts           :          0
   Transfer call rejected           :          0
   CPS choked calls                 :          0
   Simultaneous choked calls        :          0
   Dual Seizure Occurances          :          0
```


- TCattach > CALLISUP > m swcom > s display_swc_vbt_statistics> Enter >Enter

```
Debug> s display_swc_vbt_statistics
iClearCounters      :

-----------------------------------------------------
VMU statistics : totals
-----------------------------------------------------
VMUs in service      8
 current calls       26
 choked calls        0
 lost calls          0
 completed calls     15754683
 time busy(ticks)    0
 interval (ticks)    95532289
 Connections         15754709
 Disconnections      15754683
VMUs out of service  0
 current calls       0
 choked calls        0
 lost calls          0
 completed calls     0
 time busy(ticks)    0
 interval (ticks)    95532289
 Connections         0
 Disconnections      0
```


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- Checking number of calls per IOP:
- TCattach > CALLISUP > m swcom > s displayswcvbtconfig > Enter > Enter

```
Debug> s displayswcvbtconfig
iStart              :
iNumber             :


-------------------------------------------------------------
VMU Blocking Table (VBT)
-------------------------------------------------------------
VMU : Type : Stat : Cnx : Max : Choke : Total  : Total : Total
    :      :  -us : Now : Cnx :       : Choked : Made  : Lost
-------------------------------------------------------------
01     000    I.S.    06    18      124       0       1771213       0
02     000    I.S.    09    20      124       0       1770842       0
03     000    I.S.    04    18      124       0       1770508       0
04     000    I.S.    09    21      120       0       1770547       0
05     000    I.S.    03    18      120       0       1769975       0
06     000    I.S.    05    19      120       0       1770078       0
07     000    I.S.    04    17      120       0       1770350       0
08     000    I.S.    07    17      120       0       1769843       0

Least busy VMU : 5 : current connections 3
```


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- DC statistics per hour (IOP cards)
- TCattach > DC > history stat 24h > Enter

```
DC>history stat 24h

--+------+------+------+------+------+------+------+------+------+------+-----+
H |TOTAL |INCALL|OUTC  |INERR |OUTERR|REDIR |SETUP |RELEAS|SETMAX|RELMAX|CPS  |
--+------+------+------+------+------+------+------+------+------+------+-----+
00|  2217|  2217|     0|     0|     0|     0| 218ms|  55ms|1042ms|6042ms| 0.62|
01|  1860|  1860|     0|     0|     0|     0| 219ms|  51ms|1041ms| 534ms| 0.52|
02|  1600|  1600|     0|     0|     0|     0| 218ms|  50ms|1140ms| 538ms| 0.44|
03|  1192|  1192|     0|     0|     0|     0| 217ms|  52ms|1132ms| 673ms| 0.33|
04|   661|   661|     0|     0|     0|     0| 216ms|  56ms| 947ms| 787ms| 0.18|
05|   317|   317|     0|     0|     0|     0| 226ms|  65ms|1383ms|1001ms| 0.09|
06|   176|   176|     0|     0|     0|     0| 229ms|  59ms| 829ms| 434ms| 0.05|
07|    80|    80|     0|     0|     0|     0| 204ms|  64ms| 779ms| 479ms| 0.02|
......
20*  1853|  1853|     0|     0|     0|     0| 214ms|  48ms|1431ms| 652ms| 0.51|
21*  1897|  1897|     0|     0|     0|     0| 216ms|  50ms|1046ms| 669ms| 0.53|
22*  2064|  2064|     0|     0|     0|     0| 217ms|  51ms|1241ms| 749ms| 0.57|
23*  2225|  2225|     0|     0|     0|     0| 220ms|  49ms|1239ms| 639ms| 0.62|
--+------+------+------+------+------+------+------+------+------+------+-----+
since      : 2011-11-03T23:43:39GMT (111 days, 15h 11m 22s)
```

- **Remember that all times are UTC!!!**

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Checking TSS software version

```
[root@p1-tsu2-slot1 ~]# tss-software

TSS release  : tss-2.1.1-16
TCONF release: tconf-2.1.1-17.build16

PACKAGE           VERSION   RELEASE        PRODUCT   INSTALLATION DATE
mibs              1.1e      06             NGM       Tue 17 Aug 2010 07:18:02 PM UTC
tss-bls           2.1.1     17             TSS 2.1   Tue 17 Aug 2010 07:18:07 PM UTC
tss-scu-mgmt      2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:15 PM UTC
tss-scu-callisup  2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-l3        2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-sccp      2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-dbt           2.1.0     29.rc.1        TSS 2.1   Tue 06 Sep 2011 04:47:38 PM UTC
tss-scu           2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:15 PM UTC
tss-scu-alert     2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:16 PM UTC
tss-scu-diag      2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:17 PM UTC
tss-scu-map       2.1.1     19             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-sip           2.1.0     40             TSS 2.1   Tue 17 Aug 2010 07:18:18 PM UTC
tss-gmi           2.1.0     30.rc.1        TSS 2.1   Tue 06 Sep 2011 04:47:36 PM UTC

tss-dbt-2.1.0-29.rc.1 does not belong to the TSS release tss-2.1.1-16.
tss-gmi-2.1.0-30.rc.1 does not belong to the TSS release tss-2.1.1-16.
```


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Operation and Maintenance Tool

- The O&M Tool is a Graphical User Interface (GUI) that provides easy access to the system
- It is intended for monitoring, managing, and configuring the status and alarms information on the NGM application and Telco Server platform.
- The application is web-based and is used with a standard Java-compliant web browser.
- Customer Service Tool (CS Tool) - independent web-launched application which is used mainly for performing administrative tasks related to subscribers' accounts (for customer care)

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- O&M Tool has the following functionalities:

1. Security management
2. System management
3. Customer Service
4. Service management
5. Billing management
6. Telco Server management

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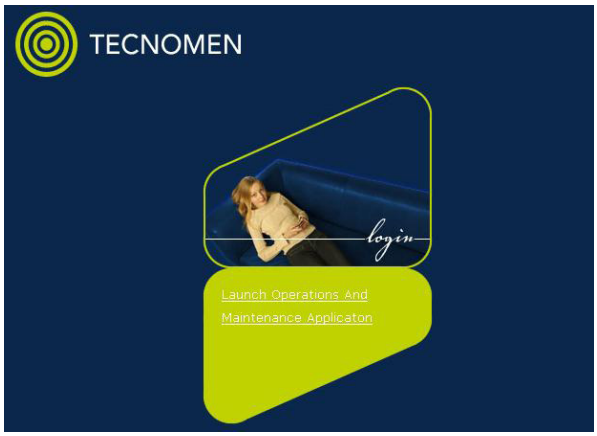
- Access through http:

`http://<as-vip>:8801/tom-proxy/tom-index.jsp`



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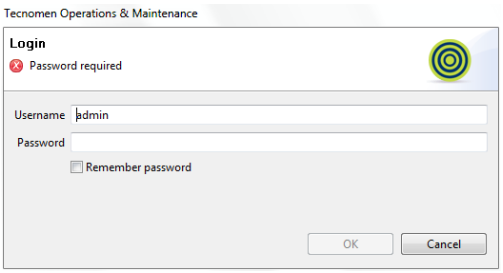
- Click **Launch Operations And Maintenance Application**, the O&M Tool Java application is launched, and the login window opens:



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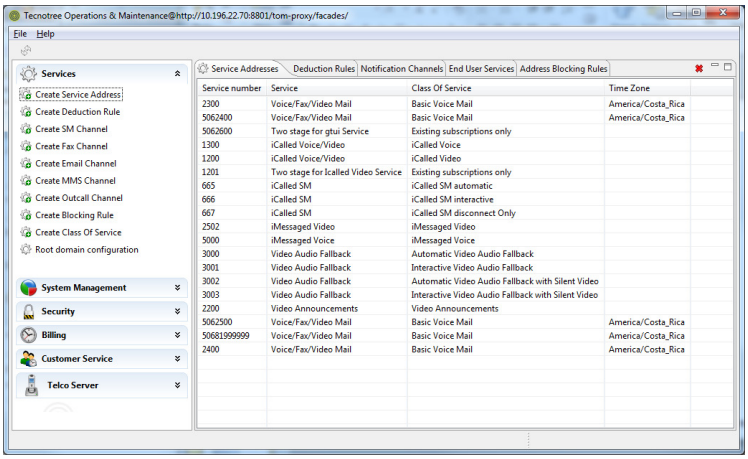
- O&M Tool funcionalities

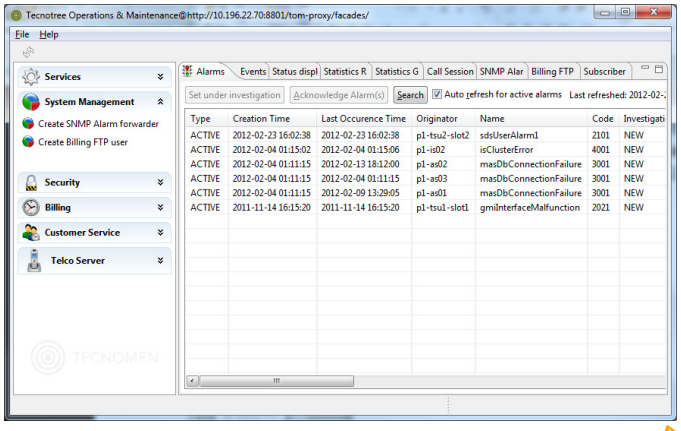
TECNOTREE

- Services – managing service settings such as Classes of Service (CoS), Service Addresses, Notification Channels, etc.



TECNOTREE

- System Management - Managing faults and performance, configuring alarm forwarding to Network Management Systems (NMS), and managing billing FTP users



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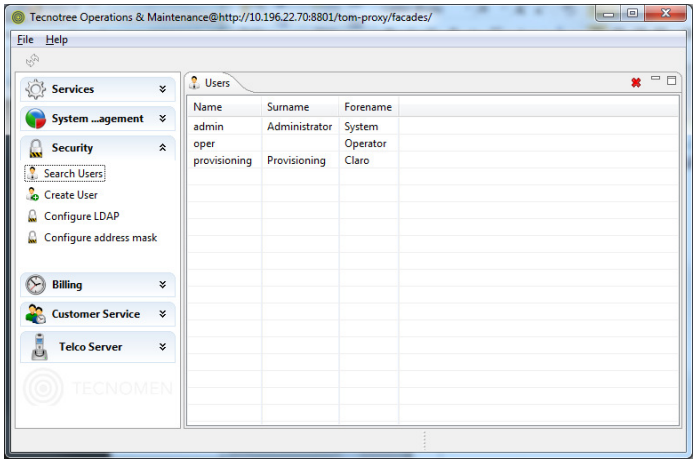
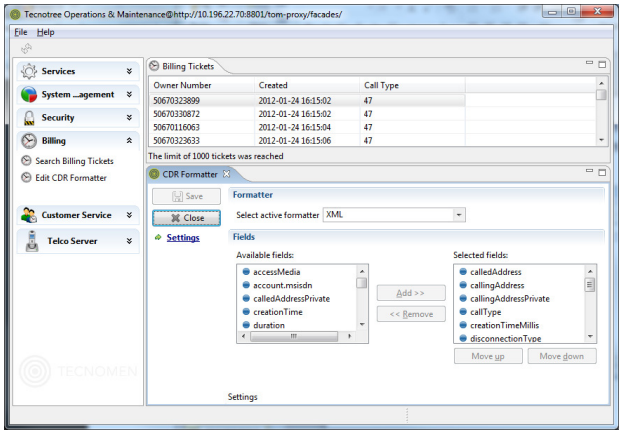
- Security - Managing O&M users



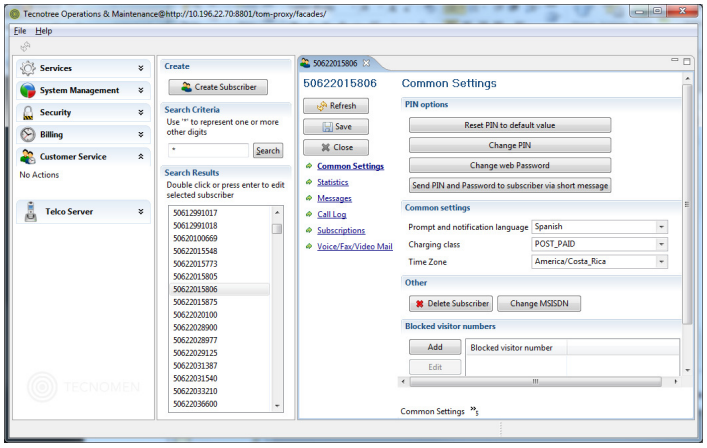
TECNOTREE

- Billing – Viewing information related to billing tickets and defining the Call Detail Record (CDR) format



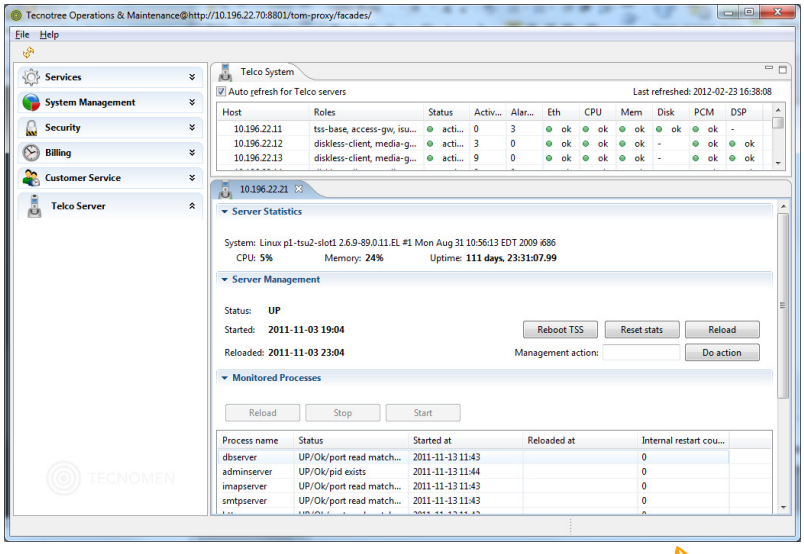
TECNOTREE

- Customer Service – Managing subscribers' accounts in the CS Tool, which can also be used separately as its own application



TECNOTREE

- Telco Server - Managing Telco Server



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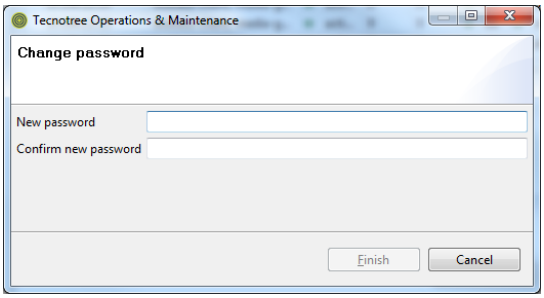
- Changing password - On the O&M Tool main menu, select **File** -> **Change Password**.
- Enter the new password.



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Security management

- The user management is divided into users and roles.
- All permissions (that is, what users are allowed to see and do) are bound to security roles.
- The roles refer to a combination of permitted actions set for the user.

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- The following roles for the **Services** perspective:

1. ROLE_SERVICES_READ: the user can view the **Services** perspective in read-only mode
2. ROLE_SERVICES_CREATE: the user can create new components for services, such as new Classes of Service, notification channels and deduction rules
3. ROLE_SERVICES_UPDATE: the user can modify the service configurations, for example, edit notification templates for services and modify the settings of existing notification channels
4. ROLE_SERVICES_DELETE: the user can delete components of services, for example, delete deduction rules

- The same actions (read/create/update/delete) can be selected for each perspective, for example ROLE_CUSTOMER_SERVICE_*

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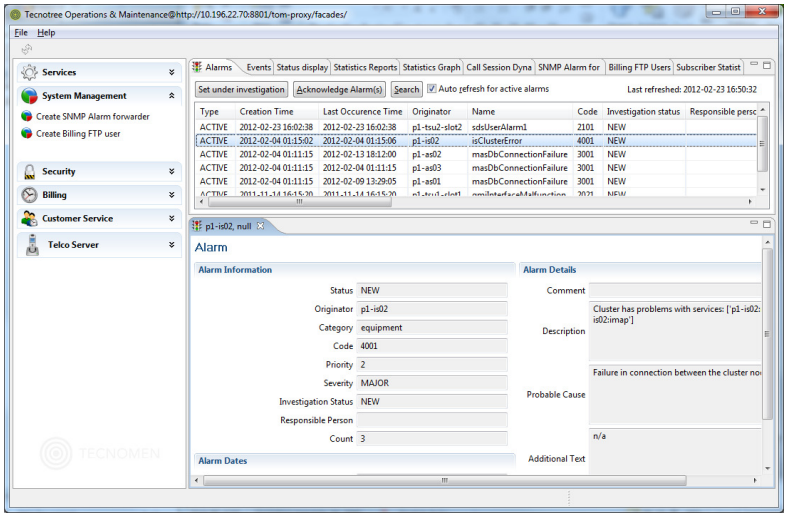
System Management

- The following NGM functions available through the O&M Tool:

1. Managing alarms
2. Monitoring node status
3. Managing system performance
4. Logging
5. Configuring NMS interface
6. Managing FTP users for billing

TECNOTREE

Alarms



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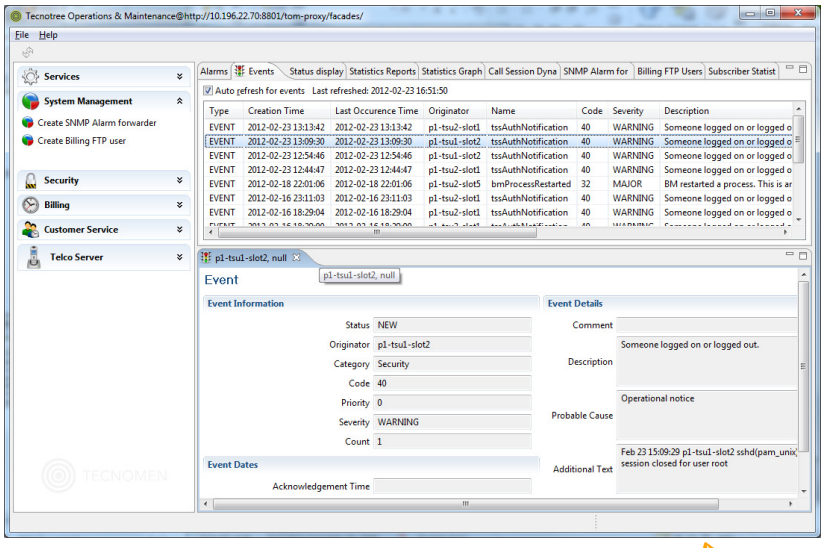
Events



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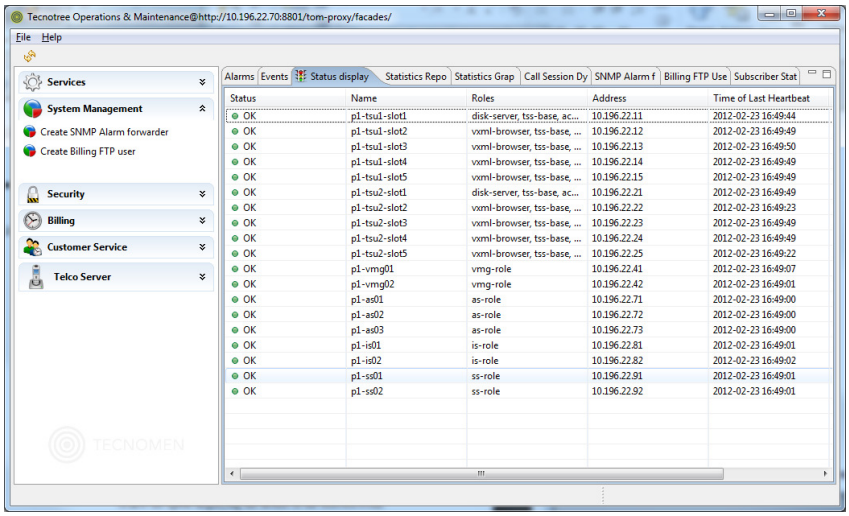
Status Display



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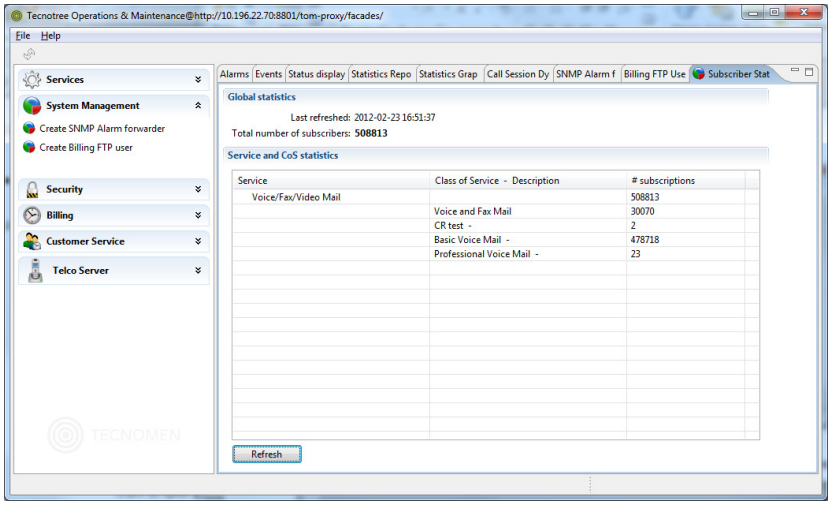
Subscriber Statistics – by Service and CoS



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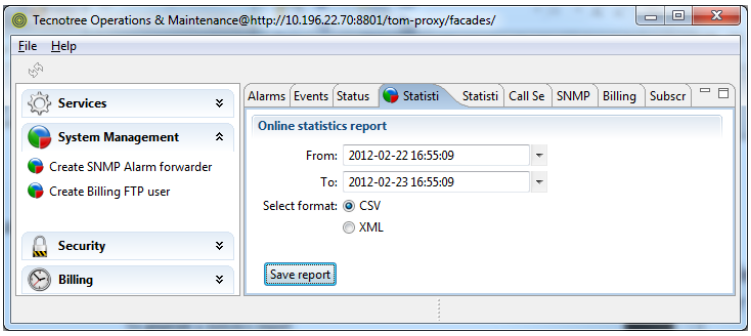
Statistics

- Statistics data is collected from the nodes and stored in the System Server database.
- Statistics reports are stored on the System Server in the `/var/ngm-spool/reports` directory .
- You can also generate statistics reports manually for a specific time interval, in CSV and XML formats, or generate a statistical graph about selected statistical variables.

TECNOTREE

Generating Statistics Reports

- Select System Management > Statistic Reports
- Choose date interval and CSV or XML format



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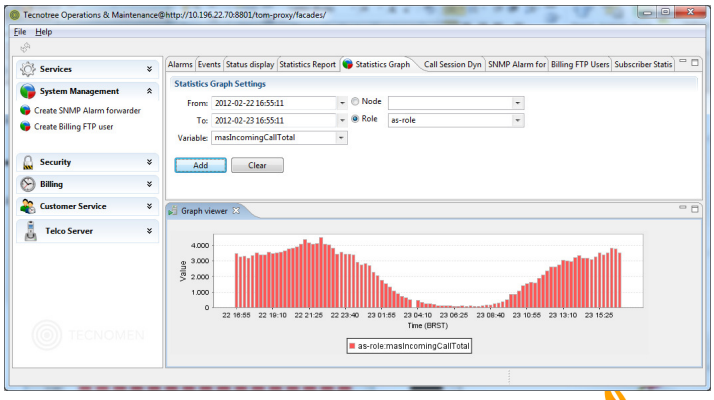
Generating Online Statistics Graphs

- Select System Management > Statistic Graph
- Choose date interval and the variable you want to see.
- Define whether you want to generate the graph for a specific node or role.



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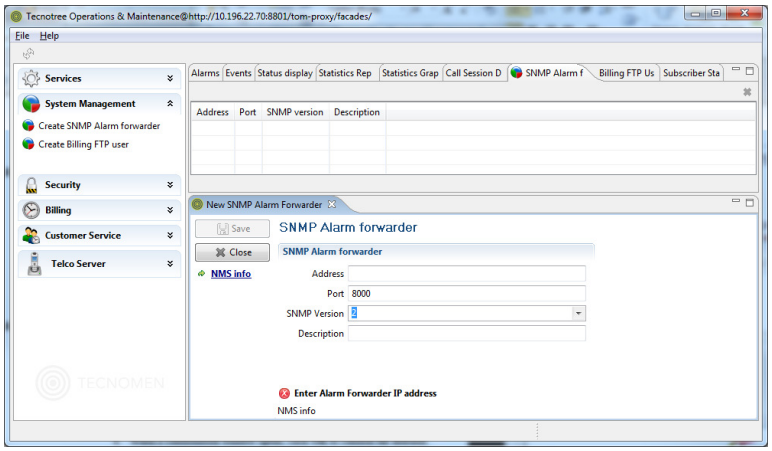
Configuring Alarm Forwarding to NMS

- Forward alarms to Network Management Systems (NMS) using SNMPv2c or SNMPv3 protocol



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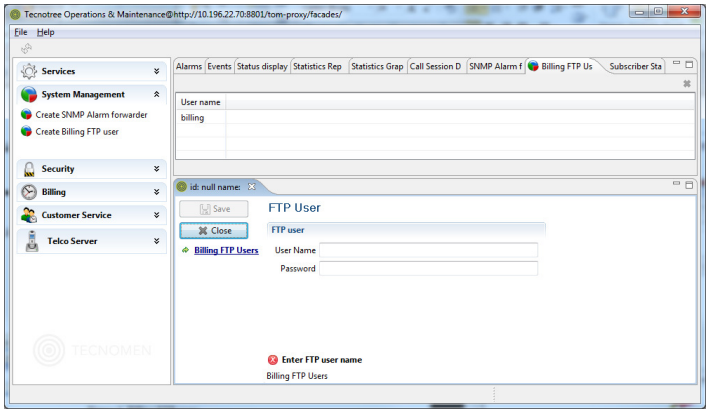
Managing Billing FTP Users

- Define users and password to access the billing interface through FTP



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Customer Service

- To perform administrative tasks related to subscribers' accounts.
- Offers the same functionality as the CS Tool.
- Creating, viewing, modifying and deleting subscribers.
- Viewing subscriber statistics and call logs are also possible.
- CS Tool link:

`http://10.196.22.70:8801/tom-proxy/cstool-index.jsp`

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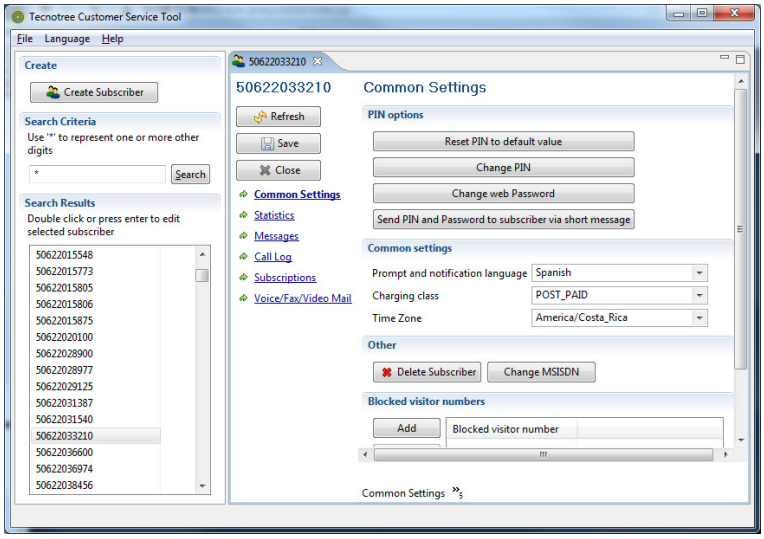
CS Tool



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Service Management

- To manage service related functions:

- Clases of Service (CoS) – subscriber profiles
- Call routing and service addresses
- Service settings
- Notification settings
- Address blocking

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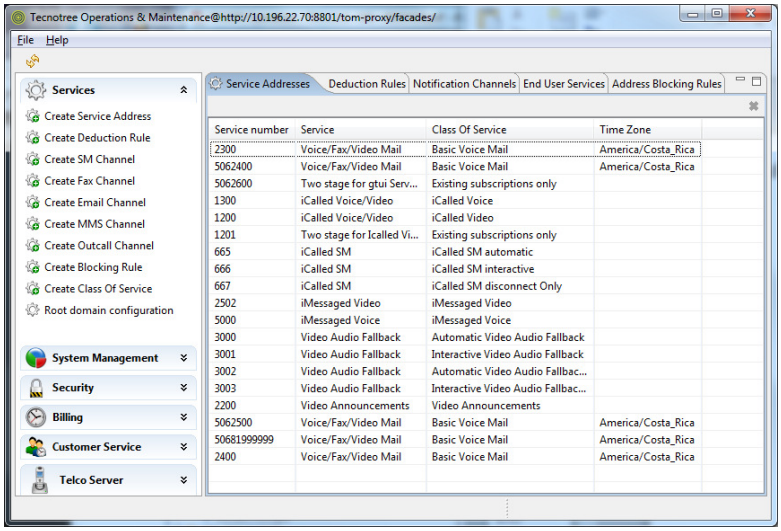
Service Addresses



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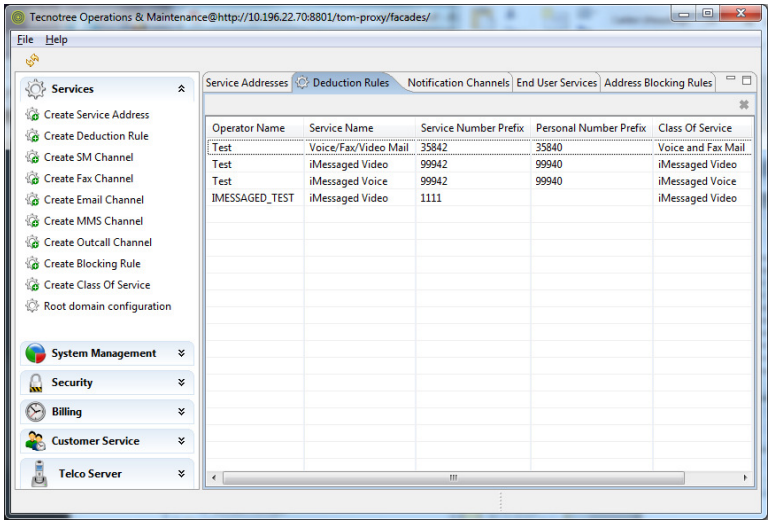
Deduction Rules



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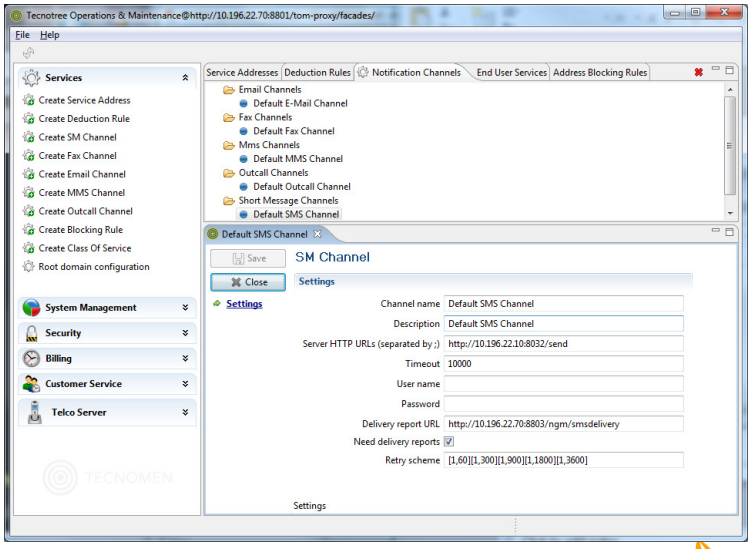
Notification Channels



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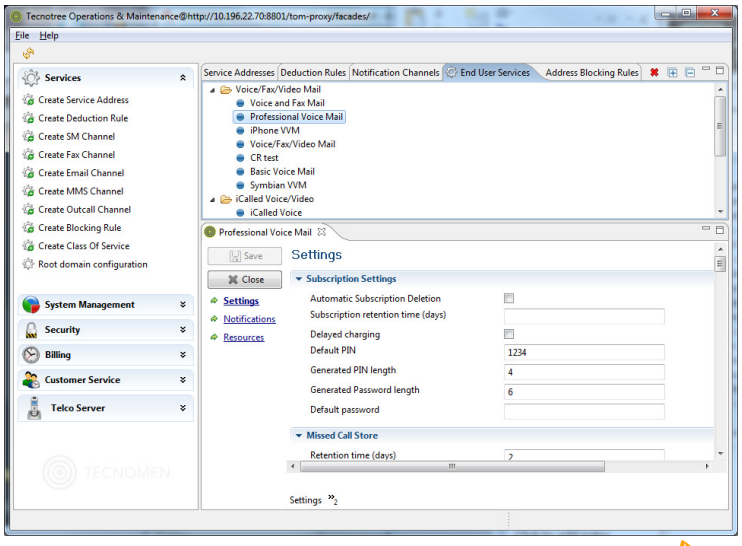
End User Services



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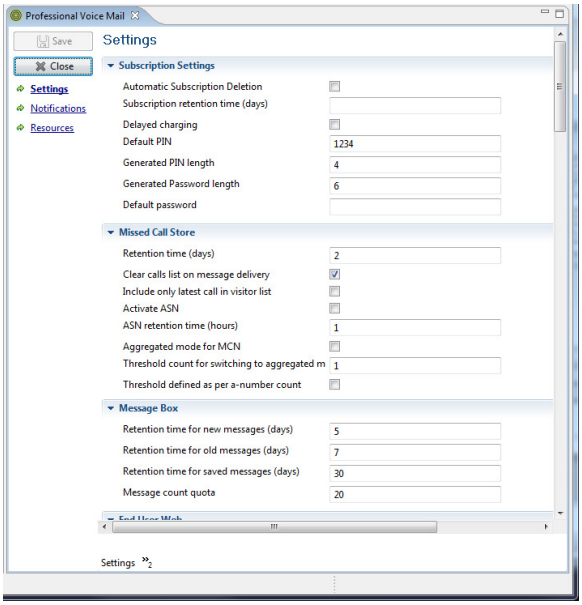
End User Services



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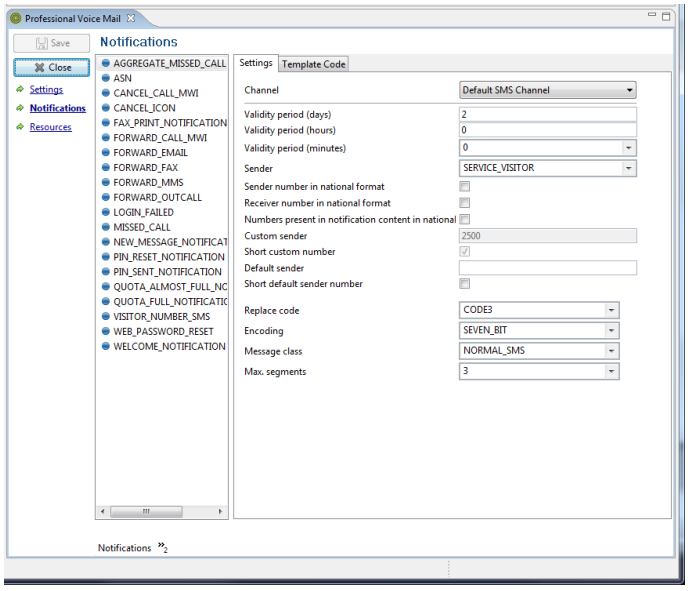
End User Services



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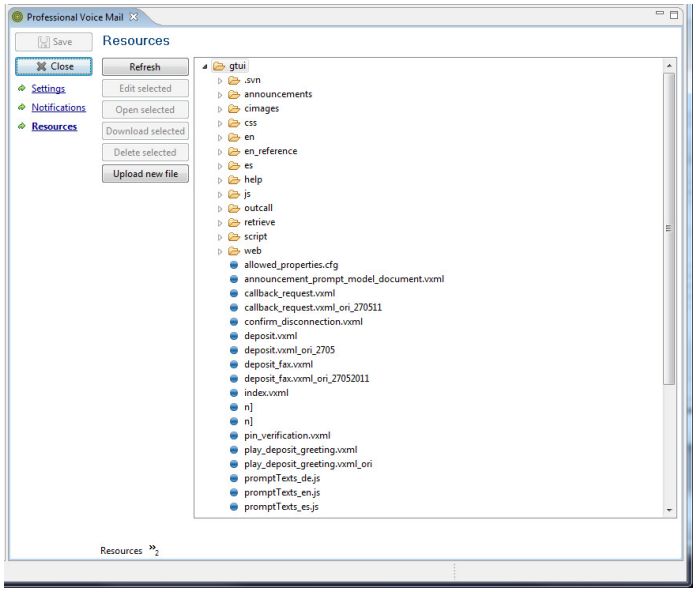
End User Services



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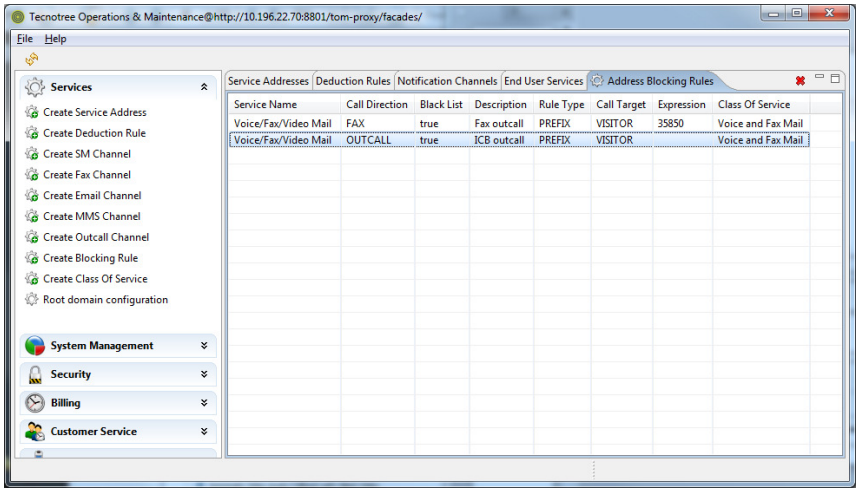
Address Blocking Rules



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Billing Management

- The NGM billing system generates billing data for charging and analysis purposes. The billing data is aggregated from the NGM system using events, and the events can be used to generate CDR files that the operator's external billing system can retrieve over FTP for further analysis.
- Each event is identified by a 'call type', and it contains a configurable set of fields with information related to the event.
- The System Server generates the CDR files **on-the-fly** when the external system requests them over FTP. Due to this dynamic generation, the **CDR files are not stored on disk space**. The FTP file view shows a virtual view of files that can be retrieved, indicating **zero (0) as the file size** and **the date 1.1.1970 for all files.**

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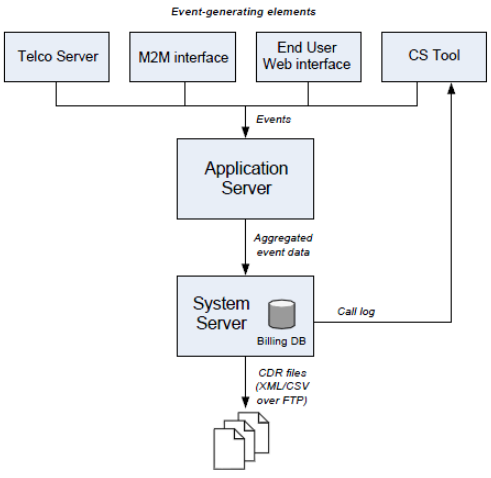
NGM Billing proccess



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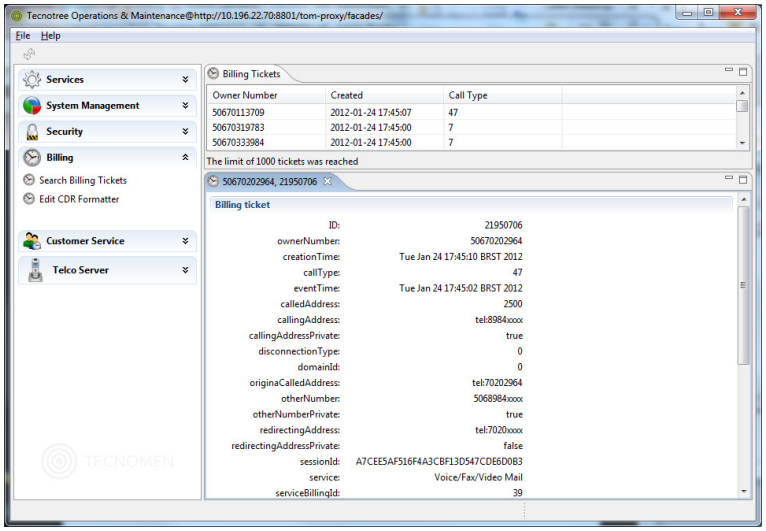
Viewing Billing Events



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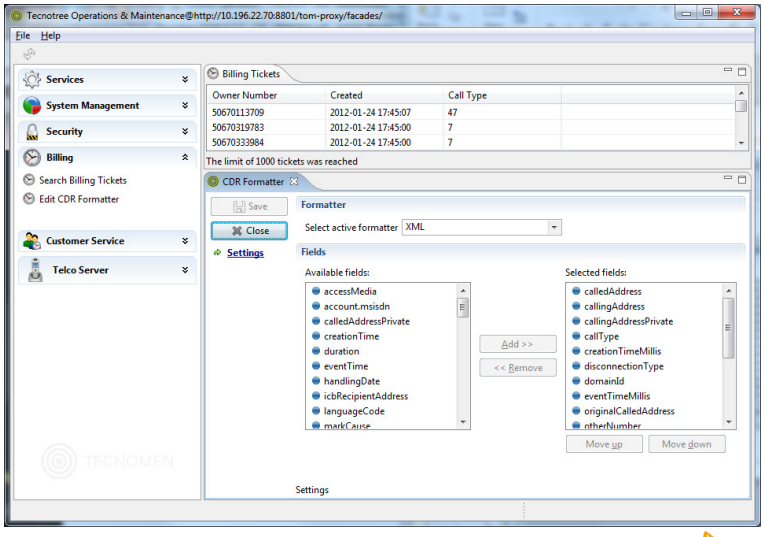
Configuring CDR Format



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