

## OsmoMSC - Feature #3614

Feature # 2583 (In Progress): SGsAP Interface for LTE/ePC CSFB Support

### SGs integration tests in TTCN3

10/02/2018 04:20 PM - laforge

<b>Status:</b>	In Progress	<b>Start date:</b>	10/02/2018
<b>Priority:</b>	High	<b>Due date:</b>	
<b>Assignee:</b>	dexter	<b>% Done:</b>	90%
<b>Category:</b>	SGs Interface		
<b>Target version:</b>			
<b>Resolution:</b>			

#### Description

Let's use the TITAN SGsAP encoder to implement integration tests against a [future] SGs interface of OsmoMSC.

This includes our usual stack of something like a SGsAP\_CodecPort, SGsAP\_Emulation,... as well as the individual test cases.

The tests become part of MSC\_Tests.ttcn, and can hence interact on AoIP, GSUP, SGs, VTY, CTRL, etc. with the IUT (OsmoMSC).

Tests should include tests for successful procedures as well as common error paths/cases.

Let's use the checklist here to collect what to test.

#### History

##### #1 - 10/02/2018 05:55 PM - laforge

- Priority changed from Normal to High

##### #3 - 10/10/2018 08:35 PM - laforge

I've started to create a quite extensive list of send and receive templates for SGsAP, see <https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+/11305/>

Those will be the basis for the actual tests, together with the SGsAP\_CodecPort.ttcn (<https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+/11306/>) and upcoming SGsAP\_Emulation.ttcn modules.

##### #4 - 10/28/2018 11:27 PM - laforge

- Checklist item [x] LU for non-EPS services (MME originated) set to Done
- Checklist item [x] IMSI detach from PS indication (MME originated) set to Done
- Checklist item [x] IMSI detach from non-EPS indication (MME originated) set to Done
- Status changed from New to Stalled
- Assignee set to laforge
- % Done changed from 0 to 20

First couple of test cases have been implemented. Now it's up for OsmoMSC to catch up in terms of an actual implementation that can be tested.

##### #5 - 01/03/2019 02:30 PM - laforge

- Assignee changed from laforge to dexter
- % Done changed from 20 to 60

[dexter](#) has been working on this, we should have transferred ownership of this ticket sooner. Please check those boxes that have tests, and think about whether it makes sense to add tests for those unchecked boxes remaining.

#### #6 - 01/07/2019 11:31 AM - dexter

- Checklist item [x] Paging for non-EPS services (VLR originated) set to Done  
Checklist item [x] MM-INFO (VLR originated) set to Done  
Checklist item [x] downlink unitdata (VLR originated) set to Done  
Checklist item [x] MME failure/reset (MME originated) set to Done  
Checklist item [x] tunneling / uplink unitdata (MME originated) set to Done  
Checklist item [x] service request (MME originated) set to Done

#### #7 - 01/07/2019 05:44 PM - dexter

The first batch of SGs related TTCN3 tests are merged to master. Since the related osmo-msc patches are not yet merged to master, those tests are expected to fail. Unfortunately there is a problem with the testsuite now since the testsuite now tries to reach the SGs interface of osmo-msc during initialization. This causes almost all testcases to fail. The following patch adds a configuration option that makes the SGs interface optional and switches it off by default. As soon as the related osmo-msc patches are merged to master we can enable the SGs interface again.

See also: <https://gerrit.osmocom.org/12477>

#### #8 - 01/07/2019 11:10 PM - laforge

sorry, that was my bad. I somehow thought the MSC side patches were merged.

However, after checking now, I realize the SGs patch for the MSC is still marked as WIP and not ready for merge. Can you please remind me why that was the case?

#### #9 - 01/08/2019 11:14 AM - dexter

- Checklist item [x] VLR failure/reset (VLR originated) set to Done

I have removed the WIP flag now. I think could merge it since even if there are still problems with the SGs interface we could fix that in a follow up patch. The risk that it interferes with the existing A/Iu functionality is low since SGs is more or less a separate thing. I ran the current state through docker locally now, everything seems to be fine.

With SGs in particular I still see a few minor problems:

- Service abort: This message is sent if the VLR/MSC decides to abort the call just before any sccp communication happens. I wonder what this abort reasons could be. Maybe using Ts14 would be a good idea, however, the spec seems not to mention that explicitly exactly when the service abort should be sent.
- NON-EPS Alert: When I get 3GPP TS 29.118, chapter 5.3 correctly this functionality is used to notify to the MSC that there is signaling activity between UE and MME. I am not sure what we do with this information on osmo-msc. To me this looks like an optional feature that can be omitted.
- IMSI Detach: There seems to be not much difference between an implicit and an explicit IMSI detach. The only difference I can see so far is that an implicit IMSI detach must not remove the subscriber from the VLR when there is an existing signalling connection. From my understanding that means if we are attached on A or Iu an implicit imsi detach must not have any effect other than moving the SGs association to NULL (it should already be NULL anyway)

In my opinion the patchset should now receive a practical test on a real MME so that we can see where the real problems are.

**#10 - 01/08/2019 11:15 AM - dexter**

- % Done changed from 60 to 80

**#11 - 02/07/2019 12:50 PM - dexter**

- File *spurious\_cp-error.pcap* added

- Status changed from Stalled to In Progress

The patchset for current master that implements (the basic) SGs interface is now merged to current master, so its time to enable the SGs interface in TTCN3 so that the SGs related tests can run.

See also: <https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+12855> MSC\_Tests: Enable SGs interface by default

Unfortunately after enabling the SGs interface the tests won't pass. Further investigation revealed that the problem is caused by spurious SMS related messages that distract the SGs tests. To make sure that this interference is not caused by re-using already used IMSI I have made sure that each SGs related tests uses an individual IMSI and never uses the same IMSI again.

See also: <https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+12856> MSC\_Tests: make sure SGs tests don't interfere

Unfortunately this did not help. The symptom is the MO SMS that is sent from the helper function `f_sgsap_bssmap_screening()` seems to go through without any problem, but the clear command is not sent by the MSC immediately, instead after a while a CP-ERROR and a CLEAR COMMAND is sent. This behavior is odd because as far as I can tell there should be just a CLEAR COMMAND after the CP-ACK. The behavior is not visible when `MSC_Tests.TC_sgsap_lu` is executed alone. But when `MSC_Tests.TC_gsup_mt_multi_part_sms` (which xfails) is executed before, then the odd behavior is triggered (see attached trace)

**#12 - 02/07/2019 03:10 PM - fixeria**

The behavior is not visible when `MSC_Tests.TC_sgsap_lu` is executed alone.  
But when `MSC_Tests.TC_gsup_mt_multi_part_sms` (which xfails) is executed before,  
then the odd behavior is triggered (see attached trace)

Ah, yes. I also noticed quite strange behaviour of OsmoMSC during and after this test case.  
I will try to replicate your problem on my side, but for now feel free to disable this test case, multi-part SMS is not (yet) implemented in OsmoMSC anyway.

**#13 - 02/07/2019 03:29 PM - dexter**

Thanks for telling me, I will try another full run in docker, but without MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms.

The symptoms seem not to be related to SGs. When I run MSC\_Tests.TC\_lu\_and\_mo\_sms after MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms the bug is also triggered. Harald suggested to modify the message reference parameters, so I changed tp.msg\_ref and rp.msg\_ref to something different but this did not change anything. I also tried with a different tp\_addr.

```
template (value) SmsParameters t_SmsPars(hexstring tp_daddr := '12345'H) := {
  tp := {
    msg_ref := '23'O,
    da := ts_TP_DA('0000'B, '000'B, tp_daddr),
    pid := '00'O,
    dcs := '00'O,
    udl := 0,
    ud := ''O
  },
  rp := {
    msg_ref := '42'O,
    orig := omit,
    dest := { '0000'B, '000'B, '0'B, '98765'H }
  },
  tid := 0,
  dlci := '03'O,
  exp_rp_err := omit
}
```

Presumably this is a bug in osmo-msc and the attempt with the multipart SMS puts the MSC into a wired state. However, I wonder how this can be. Almost everything (ISMI etc.) is different and there is even a BSSMAP RESET in-between the two tests.

#### #14 - 02/07/2019 04:16 PM - dexter

I have tried now an entire run in docker with MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms removed from the control section. Then everything looks normal. Maybe it would be compromise to move MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms to the end of the testsuite?

#### #15 - 02/11/2019 04:31 PM - dexter

There is a problem with MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms, this test seems to mess up osmo-msc in a way that it fails any future SMS related operations, so it also fails the SGSAP tests which rely on sending SMS. I recommend to move MSC\_Tests.TC\_gsup\_mt\_multi\_part\_sms after the SGSAP tests.

See also: <https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+12877/>

Also there is now a patch that turns on the SGs interface for the TTCN3 testsuite.

See also: <https://gerrit.osmocom.org/#/c/docker-playground/+12878/>

**#16 - 02/14/2019 10:10 AM - dexter**

From what I can see all dependencies now merged and we are ready to turn on the SGs interface in the testsuite. I also checked the tests with a full run in docker and I get no unexpected failures.

See also: <https://gerrit.osmocom.org/#/c/docker-playground/+12878/>

**#17 - 02/14/2019 11:00 AM - laforge**

On Thu, Feb 14, 2019 at 10:10:28AM +0000, dexter [REDMINE] wrote:

From what I can see all dependencies now merged and we are ready to turn on the SGs interface in the testsuite. I also checked the tests with a full run in docker and I get no unexpected failures.

I'd love to have merged such a patch, but as discussed on IRC >= 1 week ago, we cannot merge the "naive approach" patch due to compatibility with the "latest" tests :(

There needs to be a different config file depending on master vs. latest tests.

**#18 - 02/14/2019 06:00 PM - dexter**

Unfortunately there are different test runs in docker, those with SGs enabled osmo-msc and those with the old osmo-msc that does not yet support the SGs interface. When we enable the SGs interface globally in the TTCN3 tests we will fail those testruns which test the older osmo-msc. I now have changed the testsuite so that the SGs interface is only initialized and connected for SGs related tests. This means the SGs tests will still fail on old osmo-msc versions, but the failure will be limited to the SGs tests and not extend over the whole testsuite.

See also: <https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+12913> MSC\_Tests: Make sure only sgsap related tests use the SGs interface

**#19 - 02/18/2019 04:49 PM - dexter**

- % Done changed from 80 to 90

All currently available tests are now enabled. The Testsuite shows fluctuation in TC\_sgsap\_reset, but otherwise the results look good.

**#20 - 03/12/2019 11:47 PM - laforge**

it would be great to get the missing four tests still implemented at some point, so the ticket can be closed.

#### #21 - 03/21/2019 11:16 AM - dexter

- Checklist item [x] *Implicit IMSI detach from non-EPS (MME originated) set to Done*  
Checklist item [x] *implicit IMSI detach from EPS (MME originated) set to Done*

I have added testcases that send an implicit IMSI detach messages (noneps and eps):

<https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+13351> MSC\_Tests: add testcase TC\_sgsap\_impl\_imsi\_det\_noneps

<https://gerrit.osmocom.org/#/c/osmo-ttcn3-hacks/+13352> MSC\_Tests: add testcase TC\_sgsap\_impl\_imsi\_det\_eps

Regarding the alerting I still do not understand for what it is for. The procedure is described in 5.3. In the end it means that the VLR can request the MME to send SGsAP-UE-ACTIVITY-INDICATION messages when there is signaling activity detected for the UE. If we implement this, there are basically two open questions:

- On what condition do we request alerting? Always? (VTY-Option)
- What do we do when we receive SGsAP-UE-ACTIVITY-INDICATION? (In 5.3.2.4 there is an Deployment option 2 mentioned, but I am not sure if this applies to our situation)

For the service abort we might want to investigate. At the moment the sending of a service abort is not implemented in osmo-msc. The service abort procedure seems also be only of interest in the time frame where a SGsAP-PAGING-REQUEST had been sent but no L3 complete message on the A interface was carried out yet. Once the SCCP connection is made, the procedure seems not to apply anymore. I wonder how we could test this. We would have to make the MSC to abort the call somehow. Maybe we can do this via the MNCC interface?

#### #22 - 03/21/2019 01:00 PM - laforge

On Thu, Mar 21, 2019 at 11:16:34AM +0000, dexter [REDMINE] wrote:

Regarding the alerting I still do not understand for what it is for.

I guess this may refer to the standard "MAP-READY-FOR-SM" procedure between VLR and HLR?

This is e.g. used to let the HLR know whenever the subscriber has performed some activity, which means he is reachable again, which means that e.g. pending/previously-failing SMS can be delivered (The SMSCs will register themselves with the HLR if any SMS delivery fails, so the HLR can notify the SMSCs when it makes sense to re-try)

- On what condition do we request alerting? Always? (VTY-Option)
- What do we do when we receive SGsAP-UE-ACTIVITY-INDICATION? (In 5.3.2.4 there is an Deployment option 2 mentioned, but I am not sure if this applies to our situation)

This is about 5G/NR deployment options. Option 1 refers to 5G base stations attached to a 4G Core, where Option 2 refers to an entirely new 5G core. I guess we can ignore that for now.

In general, I think we can leave this alerting procedure open for now.

For the service abort we might want to investigate. At the moment the sending of a service abort is not implemented in osmo-msc. The service abort procedure seems also be only of interest in the time frame where a SGsAP-PAGING-REQUEST had been sent but no L3 complete message on the A interface was carried out yet. Once the SCCP connection is made, the procedure seems not to apply anymore. I wonder how

we could test this. We would have to make the MSC to abort the call somehow. Maybe we can do this via the MNCC interface?

From what you're saying isn't that siply a paging timeout ? So when we don't get any response to the paging, we send the service abort to the MME?

## Files

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spurious_cp-error.pcap	11 KB	02/07/2019	dexter
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