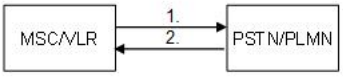
WTL Core Call Flow

1. CS Mobile Originated Call

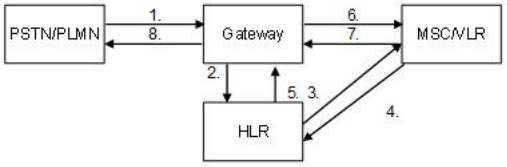


1. ISUP: IAM/ACM CALL_SETUP_MSG (MSC <-> PSTN/PLMN)
2. ISUP: IAM/ACM CALL_RELEASE_MSG (PSTN/PLMN <-> MSC)

Key Configurations	Required Network Elements
Subscriber provisioned in HLR, MO call service active, MSC routing configured	MS, BTS/BSC/NodeB/RNC, MSC/VLR, HLR

- **HLR/HSS:** A subscriber profile must be defined, including the International Mobile Subscriber Identity (IMSI) and the Mobile Station International Subscriber Directory Number (MSISDN).
- **VLR:** The VLR must have a record of the subscriber's location, including the Location Area Identity (LAI) and a temporary subscriber identifier (TMSI).
- **MSC:** Must be configured with routing tables and digit analysis to interpret the dialed number and route the call to its destination.
- **BSC/RNC:** Must be configured with radio channel definitions, including frequencies and timeslots, for the serving cells.

2. CS Mobile Terminating Call



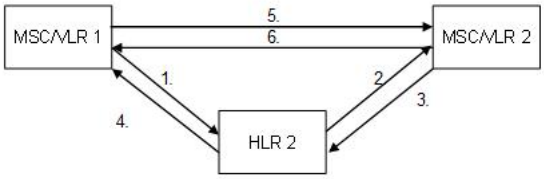
1. ISUP: IAM/ACM CALL_SETUP_MESSAGE (PSTN <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR)
3. MAP: PROVIDE_ROAMING_NUMBER (HLR <-> VLR)
4. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR <-> HLR)
5. MAP: SEND_ROUTING_INFO_ACK (HLR <-> Gateway)
6. ISUP: IAM/ACM CALL_SETUP_MESSAGE (Gateway <-> MSC)
7. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC <-> Gateway)
8. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN)

Key Configurations	Required Network Elements
MT call service active, GMSC routing to MSC, subscriber reachable in VLR	MS, BTS/BSC/NodeB/RNC, GMSC, MSC/VLR, HLR

- **HLR/HSS:** The HLR must contain the subscriber's profile and be addressable by the Gateway MSC (GMSC) to provide routing information. It must be able to provide the address of the serving VLR.
- **GMSC:** Must be configured to query the HLR for the called subscriber's routing information.
- **VLR:** Must have a valid location record for the subscriber.
- **MSC:** Must be configured to receive the call from the GMSC and initiate the paging process to locate the mobile station.

WTL Core Call Flow

3. CS Mobile Mobile Call



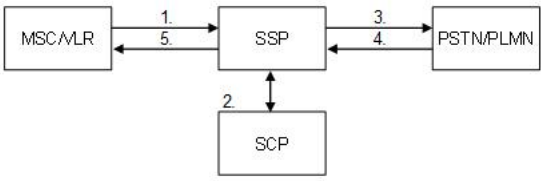
1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
2. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
6. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> MSC 1)

Remark: MSC 1 and MSC 2 maybe identical

Key Configurations	Required Network Elements
Both subscribers active in HLR/VLR, MSC-MSC routing/trunks configured	Calling MS, Called MS, MSCs, HLR, VLR

Definitions: This is a combination of MO and MT definitions. Both the originating and terminating subscribers must have their respective profiles and location data defined in the network.

4. CS Prepaid Mobile Originated Call



1. ISUP: IAM/ACM CALL_SETUP_MSG (MSC <-> SSP)
2. CAP: IN_PPS_DIALOG (SSP <-> SCP)
3. ISUP: IAM/ACM CALL_SETUP_MSG (SSP <--> PSTN/PLMN)
4. ISUP: IAM/ACM CALL_RELEASE_MSG (PSTN/PLMN <-> SSP)
5. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP <-> MSC)

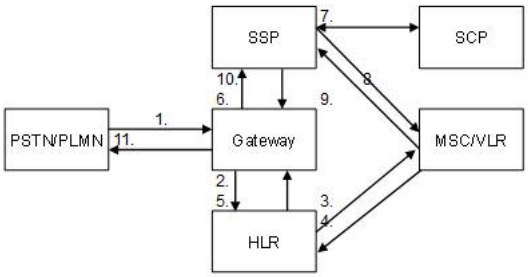
Remark: The SSP (gsmSSF) is normally included in the MSC. If this is not the case the call has to be forwarded to the next MSC providing SSP functionality.

Key Configurations	Required Network Elements
CAMEL trigger in HLR, prepaid profile in SCP, CAP signaling enabled	MS, MSC/VLR, HLR, SCP/IN

- **HLR/HSS:** The subscriber's profile must be flagged to indicate that they are a prepaid subscriber. This flag triggers a routing instruction to the Intelligent Network (IN) platform.
- **MSC/SSP:** The Mobile Switching Center (MSC) must be provisioned as a Service Switching Point (SSP) and configured with an Initial Detection Point (IDP) trigger for prepaid subscribers.
- **SCP:** The Service Control Point (SCP) must be provisioned with the subscriber's account balance, tariff plan, and the logic to approve the call and a granted duration.

5. CS Prepaid Terminating Call

WTL Core Call Flow



1. ISUP: IAM/ACM CALL_SETUP_MESSAGE (PSTN <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR)
3. MAP: PROVIDE_ROAMING_NUMBER (HLR <-> VLR)
4. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR <-> HLR)
5. MAP: SEND_ROUTING_INFO_ACK (HLR <-> Gateway)
6. ISUP: IAM/ACM CALL_SETUP_MESSAGE (Gateway <-> SSP)
7. CAP: IN_PPS_DIALOG (SSP <-> SCP)
8. ISUP: IAM/ACM CALL_SETUP_MESSAGE (SSP <-> MSC)
9. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC <-> SSP)
10. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP <-> Gateway)
11. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN)

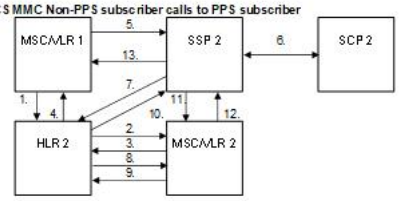
Remark: The SSP (gsmSSF) is normally included in the MSC. If this is not the case the call has to be forwarded to the next MSC providing SSP functionality.

Key Configurations	Required Network Elements
CAMEL trigger in HLR, prepaid SCP routing for incoming calls	MS, GMSC, MSC/VLR, HLR, SCP/IN

Definitions: For a terminating call to have prepaid logic (e.g., for certain forwarded calls or premium services), the HLR profile and the MSC/SSP must have specific triggers defined for Mobile Terminating calls to initiate an IN query to the SCP.

6. CS Prepaid Mobile Mobile Call

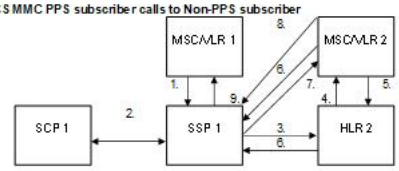
1. Case: CS MMC Non-PPS subscriber calls to PPS subscriber



1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
4. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> SSP 2)
6. CAP: IN_PPS_DIALOG (SSP2 <-> SCP 2)
7. MAP: SEND_ROUTING_INFO (SSP 2 <-> HLR 2)
8. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
9. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
10. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> SSP 2)
11. ISUP: IAM/ACM CALL_SETUP_MSG (SSP 2 <-> MSC 2)
12. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> SSP 2)
13. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP 2 <-> MSC 1)

Remark: MSC 1 and MSC 2 may be identical
SSP2 typically integrated in MSC2

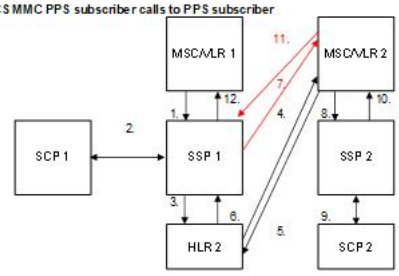
2. Case: CS MMC PPS subscriber calls to Non-PPS subscriber



1. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> SSP 1)
2. CAP: IN_PPS_DIALOG (SSP1 <-> SCP 1)
3. MAP: SEND_ROUTING_INFO (SSP 1 <-> HLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
5. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
6. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> SSP 1)
7. ISUP: IAM/ACM CALL_SETUP_MSG (SSP 1 <-> MSC 2)
8. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> SSP 1)
9. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP1 <-> MSC 1)

Remark: MSC 1 and MSC 2 may be identical
SSP1 typically integrated in MSC1

3. Case: CS MMC PPS subscriber calls to PPS subscriber



1. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> SSP 1)
2. CAP: IN_PPS_DIALOG (SSP1 <-> SCP 1)
3. MAP: SEND_ROUTING_INFO (SSP 1 <-> HLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
5. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
6. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> SSP1)
7. ISUP: IAM/ACM CALL_SETUP_MSG (SSP1 <-> MSC 2)
8. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> SSP 2)
9. CAP: IN_PPS_DIALOG (SSP2 <-> SCP 2)
10. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP 2 <-> MSC 2)
11. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> SSP 1)
12. ISUP: IAM/ACM CALL_RELEASE_MSG (SSP 1 <-> MSC 1)

Remark: MSC 1 and MSC 2 may be identical
SSP1 typically integrated in MSC1
SSP2 typically integrated in MSC2
ISUP Msg x not included in Netcop

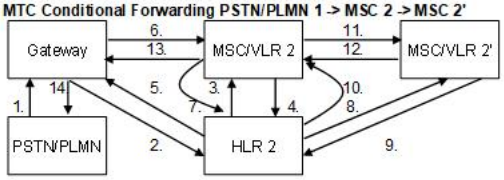
Key Configurations	Required Network Elements
Both subs prepaid-enabled, CAMEL triggers in HLR, MSC-IN connectivity	Calling MS, Called MS, MSCs, HLR, SCP/IN

Definitions: This scenario combines the definitions of prepaid MO and MT calls for both the originating and terminating legs of the call, as applicable.

WTL Core Call Flow

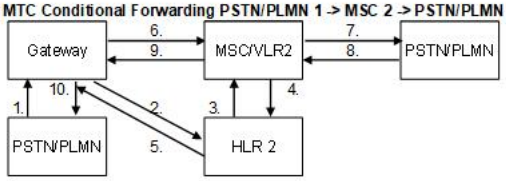
7. CS Mobile Terminating Call with Conditional Forwarding

1. Case: CS MTC Conditional Forwarding PSTN/PLMN 1 -> MSC 2 -> MSC 2'



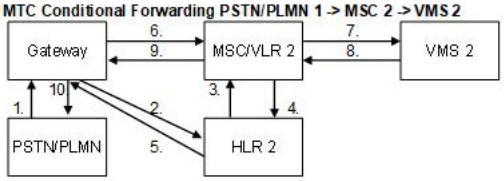
1. ISUP: IAM/ACM Call-Setup-Msg (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
5. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> Gateway)
6. ISUP: IAM/ACM Call-Setup-Msg (Gateway <-> MSC 2)
7. MAP: SEND_ROUTING_INFO (MSC 2 <-> HLR 2)
8. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2')
9. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2' <-> HLR 2)
10. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 2)
11. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> MSC 2')
12. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2' <-> MSC 2)
13. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> Gateway)
14. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN)

2. Case: CS MTC Conditional Forwarding PSTN/PLMN 1 -> MSC 2 -> PSTN/PLMN 2



1. ISUP: IAM/ACM CALL_SETUP_MSG (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
5. MAP: SEND_ROUNTING_INFO_ACK (HLR 2 <-> Gateway)
6. ISUP: IAM/ACM CALL_SETUP_MSG (Gateway <-> MSC 2)
7. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> PSTN/PLMN 2)
8. ISUP: IAM/ACM CALL_RELEASE_MSG (PSTN/PLMN 2 <-> MSC 2)
9. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> Gateway)
10. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN 1)

3. Case: CS MTC Conditional Forwarding PSTN/PLMN 1 -> MSC 2 -> VMS 2



1. ISUP: IAM/ACM CALL_SETUP_MSG (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
5. MAP: SEND_ROUTING_INFO (HLR 2 <-> Gateway)
6. ISUP: IAM/ACM CALL_SETUP_MSG (Gateway <-> MSC 2)
7. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> VMS 2)
8. ISUP: IAM/ACM CALL_RELEASE_MSG (VMS 2 <-> MSC 2)
9. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> Gateway)
10. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN 1)

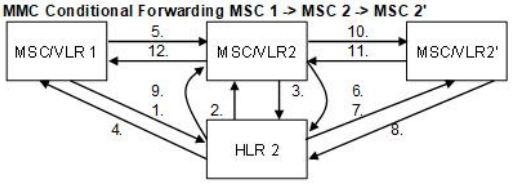
Key Configurations	Required Network Elements
Conditional forwarding (CFB/CFNRy) provisioned in HLR with valid target number	MS, MSC/VLR, HLR, Forwarding Number

HLR/HSS: The subscriber's HLR profile must have the conditional forwarding flag enabled and the forwarded-to number stored. The profile must also specify the conditions for forwarding, such as "Forward on Busy," "Forward on No Reply," or "Forward on Not Reachable."

8. CS Mobile Mobile Call with Conditional Forwarding

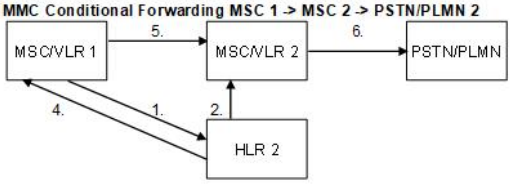
WTL Core Call Flow

1. Case: CS MMC Conditional Forwarding MSC 1 -> MSC 2 -> MSC 2'



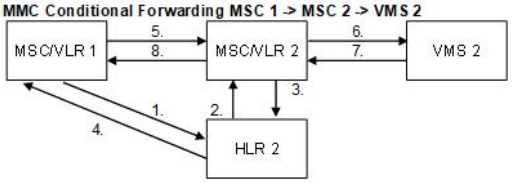
1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
4. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
6. MAP: SEND_ROUTING_INFO (VLR 2 <-> HLR 2)
7. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2')
8. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2' <-> HLR 2)
9. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 2)
10. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> MSC 2')
11. ISUP: IAM/ACM CALL_RELEASE (MSC 2' <-> MSC 2)
12. ISUP: IAM/ACM CALL_RELEASE (MSC 2 <-> MSC 1)

2. Case: CS MMC Conditional Forwarding MSC 1 -> MSC 2 -> PSTN/PLMN 2



1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
4. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
6. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> PSTN/PLMN 2)

3. Case: CS MMC Conditional Forwarding MSC 1 -> MSC 2 -> VMS 2



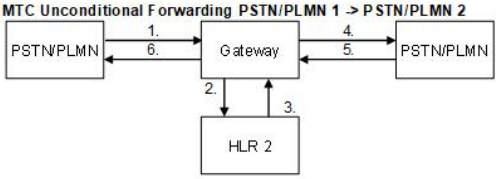
1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
4. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
6. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 2 <-> VMS 2)
7. ISUP: IAM/ACM CALL_RELEASE (VMS 2 <-> MSC 2)
8. ISUP: IAM/ACM CALL_RELEASE (MSC 2 <-> MSC 1)

Key Configurations	Required Network Elements
Forwarding active for called MS, MSC routes to forwarding number	Calling MS, Called MS, MSCs, HLR

Definitions: Similar to the previous item, the called subscriber's HLR profile must define the conditional forwarding criteria. The MSC handling the terminating leg must recognize the busy or no-reply condition and initiate the forwarding procedure.

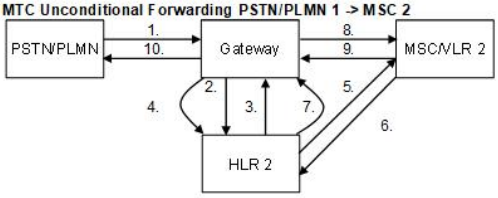
9. CS Mobile Terminating Call with Unconditional Forwarding

1. Case: CS MTC Unconditional Forwarding PSTN/PLMN 1 -> PSTN/PLMN 2



1. ISUP: IAM/ACM CALL_SETUP_MSG (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> Gateway)
4. ISUP: IAM/ACM CALL_SETUP_MSG (Gateway <-> PSTN/PLMN 2)
5. ISUP: IAM/ACM CALL_RELEASE_MSG (PSTN/PLMN 2 <-> Gateway)
6. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN 1)

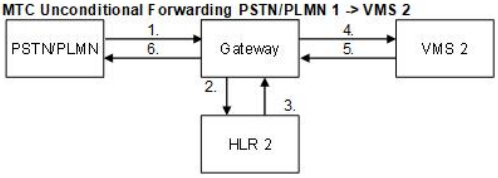
2. Case: CS MTC Unconditional Forwarding PSTN/PLMN 1 -> MSC 2



1. ISUP: IAM/ACM CALL_SETUP_MSG (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> Gateway)
4. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
5. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
6. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
7. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> Gateway)
8. ISUP: IAM/ACM CALL_SETUP_MSG (Gateway <-> MSC 2)
9. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> Gateway)
10. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN 1)

Remark: Netcop does not include 2nd interrogation.
Message 2 includes "forwarded to number" (FTNO).
Message 7 includes the MSRN.

3. Case: CS MTC Unconditional Forwarding PSTN/PLMN 1 -> VMS 2

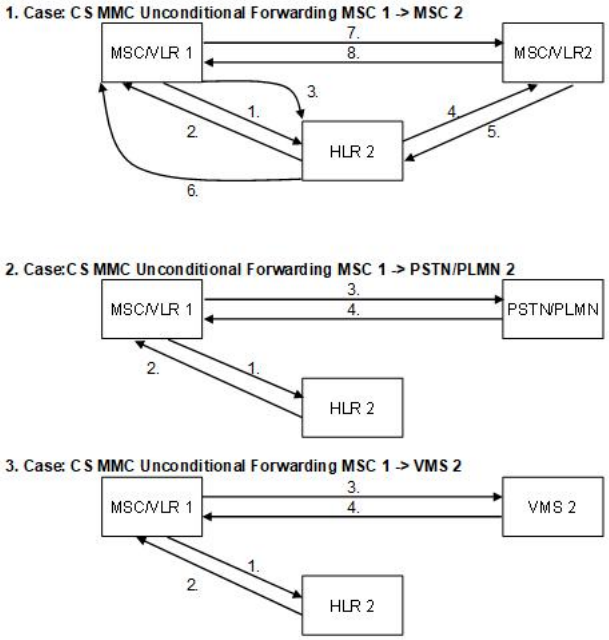


1. ISUP: IAM/ACM CALL_SETUP_MSG (PSTN/PLMN 1 <-> Gateway)
2. MAP: SEND_ROUTING_INFO (Gateway <-> HLR 2)
3. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> Gateway)
4. ISUP: IAM/ACM CALL_SETUP_MSG (Gateway <-> VMS 2)
5. ISUP: IAM/ACM CALL_RELEASE_MSG (VMS 2 <-> Gateway)
6. ISUP: IAM/ACM CALL_RELEASE_MSG (Gateway <-> PSTN/PLMN 1)

Key Configurations	Required Network Elements
CFU provisioned in HLR, MSC routes directly to forwarding number	MS, MSC/VLR, HLR, Forwarding Number

HLR/HSS: The subscriber's HLR profile must be defined with the "unconditional forwarding" flag and the number to which all calls should be forwarded. This setting bypasses the standard location query to the VLR.

10. CS Mobile Mobile Call with Unconditional Forwarding



1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
3. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
4. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
5. MAP: PROVIDE_ROAMING_NUMBER_ACK (HLR 2 <-> VLR 2)
6. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
7. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
8. ISUP: IAM/ACM CALL_RELEASE (MSC 2 <-> MSC 1)

Remark: Message 2 and 3 are not provided in Netcop.
Message 2 includes "forwarded to number" (FTNO).
Message 6 includes the MSRN.

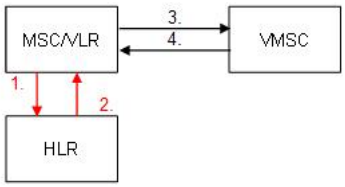
1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
3. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> PSTN/PLMN 2)
4. ISUP: IAM/ACM CALL_RELEASE_MSG (PSTN/PLMN 2 <-> MSC 2)

1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. NAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
3. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> VMS 2)
4. ISUP: IAM/ACM CALL_RELEASE_MSG (VMS 2 <-> MSC 1)

Key Configurations	Required Network Elements
CFU active, called subscriber always forwarded to defined number	Calling MS, Called MS, MSCs, HLR

Definitions: The HLR profile of the called subscriber must be defined with unconditional forwarding. The originating MSC's query to the HLR for the called party's location will be redirected to the forwarded number.

11. CS VMS Retrieval



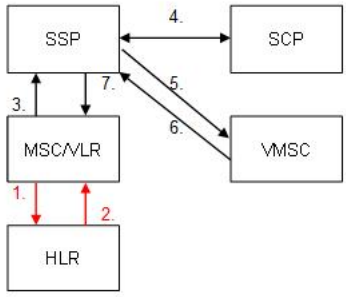
1. MAP: SEND_ROUTING_INFO (VLR <-> HLR)
2. MAP: SEND_ROUTING_INFO_ACK (HLR <-> VLR)
3. ISUP: IAM/ACM CALL_SETUP_MSG (MSC <-> VMSC)
4. ISUP: IAM/ACM CALL_RELEASE (VMSC <-> MSC)

Remark: Message 1 and 2 are not included in Netcop
Messages 1 and 2 can be made obsolide
by using SDDPFC in the MSC.

Key Configurations	Required Network Elements
VMS number provisioned in HLR, MSC routes to VMS system	MS, MSC/VLR, HLR, Voice Mail System (VMS)

- **MSC:** The MSC's digit analysis and routing tables must have a specific entry that routes calls to the Voice Mail System (VMS) platform based on the dialled VMS retrieval short Code (e.g., *123).
- **VMS:** The VMS platform must be configured to receive calls and authenticate the subscriber based on their CLI (Calling Line Identity).

12. CS PPS VMS Retrieval



1. MAP: SEND_ROUTING_INFO (VLR <-> HLR)
2. MAP: SEND_ROUTING_INFO_ACK (HLR <-> VLR)
3. ISUP: IAM/ACM CALL_SETUP_MSG (MSC <-> SSP)
4. CAMEL: IN_PPS_DIALOG (SSP <-> SCP)
5. ISUP: IAM/ACM CALL_SETUP_MSG (SSP <-> VMS)
6. ISUP: IAM/ACM CALL_RELEASE (VMSC <-> SSP)
7. ISUP: IAM/ACM CALL_RELEASE (SSP <-> MSC)

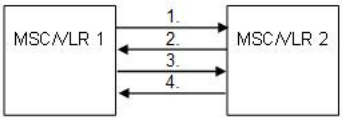
Remark: Messages 1+1 are not included in Netcop

Key Configurations	Required Network Elements
Prepaid profile provisioned, CAMEL routing to VMS	MS, MSC/VLR, SCP/IN, VMS

Definitions: Similar to prepaid calls, the VMS short Code in the MSC must be configured with an IN trigger to query the SCP for the subscriber's balance before allowing access to the voicemail service.

13. CS Inter MSC Handover

(subscriber moves from MSC 1 to MSC 2 with an ongoing call)



1. MAP: PREPARE_HANDOVER (VLR 1 <-> VLR 2)
2. MAP: PREPARE_HANDOVER_ACK (VLR 2 <-> VLR 1)
3. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
4. ISUP: IAM/ACM CALL_RELEASE (MSC 2 <-> MSC 1)

Remark: In some case a subsequent handover will appear.
If possible additional legs are released after a subsequent handover.

Subsequent HOs and release and setup of additional legs is ignored in Netcop.

LUP is used to update the location in the HLR.
This will happen at the end of the call.

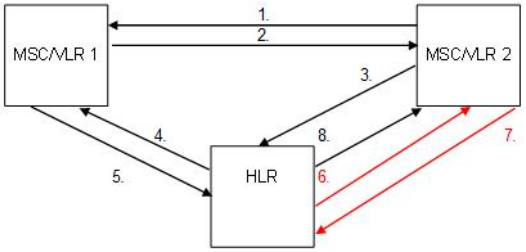
Key Configurations	Required Network Elements
Inter-MSC trunks configured, MAP/ISUP for HO signaling	MS, Source MSC, Target MSC, BTS/BSC, RNC

- **MSC:** Both the Source and Target MSCs must have a defined signalling route (ISUP/SS7) between them. The MSCs must also be configured to accept and process `Handover Required` and `Handover Request` messages.
- **BSC/RNC:** The BSC/RNCs must be configured with a list of neighbouring cells and the MSCs that serve them.

WTL Core Call Flow

14. CS Inter VLR Location Update (subscriber moves from VLR 1 to VLR 2)

(subscriber moves from VLR 1 to VLR 2 without an ongoing call; IMSI retrieved from previous VLR)

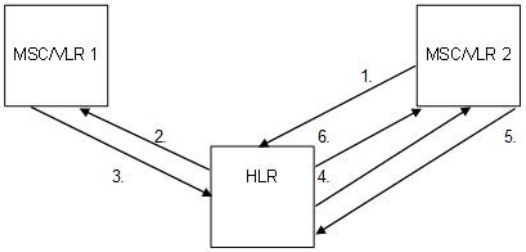


1. MAP: SEND_IDENTIFICATION (VLR 2 <-> VLR 1)
2. MAP: SEND_IDENTIFICATION_ACK (VLR 1 <-> VLR 2)
3. MAP: UPDATE_LOCATION (VLR 2 <-> HLR)
4. MAP: CANCEL_LOCATION (HLR <-> VLR 1)
5. MAP: CANCEL_LOCATION_ACK (VLR 1 <-> HLR)
6. MAP: INSERT_SUBSCRIBER_DATA (HLR <-> VLR 2)
7. MAP: INSERT_SUBSCRIBER_DATA_ACK (VLR 2 <-> HLR)
8. MAP: UPDATE_LOCATION_ACK (HLR <-> VLR 2)

Remark: 1. Request of triples from previous VLR 1 with SEND_IDENTIFICATION
Messages 2-4 are called in combination.
Message 2 is the outer message and is finished after 3 and 4 are performed.

Messages 6+7 are ignored by Netcop.

CS Inter VLR Location Update (subscriber moves from VLR 1 to VLR 2)
(subscriber moves from VLR 1 to VLR 2 without an ongoing call; IMSI cannot be retrieved from previous VLR)



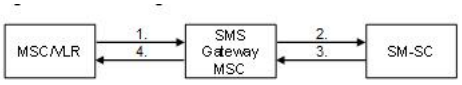
1. MAP: UPDATE_LOCATION (VLR 2 <-> HLR)
2. MAP: CANCEL_LOCATION (HLR <-> VLR 1)
3. MAP: CANCEL_LOCATION_ACK (VLR 1 <-> HLR)
4. MAP: INSERT_SUBSCRIBER_DATA (HLR <-> VLR 2)
5. MAP: INSERT_SUBSCRIBER_DATA_ACK (VLR 2 <-> HLR)
6. MAP: UPDATE_LOCATION_ACK (HLR <-> VLR 2)

Remark: 1. Request of triples from previous VLR 1 with SEND_IDENTIFICATION
Messages 2-4 are called in combination.
Message 2 is the outer message and is finished after 3 and 4 are performed.

Key Configurations	Required Network Elements
MAP LU procedures enabled, HLR updates subscriber location	MS, Old VLR/MSC, New VLR/MSC, HLR

- **HLR/HSS:** The HLR must be configured to maintain a record of the serving VLR's address.
- **VLR:** The VLRs must be configured with SS7 links to the HLR and other VLRs to exchange location update and cancellation messages.
- **MS/UE:** The mobile device must be configured to detect a change in the Location Area Identity (LAI) and initiate a new `Location Update` procedure.

15. CS Mobile Originated Short Message Service



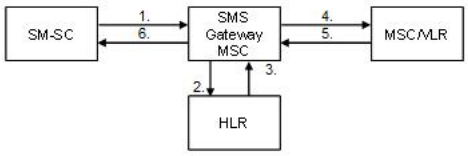
1. MAP: MO_FORWARD_SHORT_MESSAGE (MSC/VLR <-> SMS Gateway MSC)
2. MAP: SEND_SHORT_MESSAGE (SMS Gateway MSC <-> SM-SC)
3. MAP: SMS_DELIVERY_REPORT (SM-SC <-> SMS Gateway MSC)
4. MAP: MO_FORWARD_SHORT_MESSAGE_RESULT (SMS Gateway MSC <-> MSC/VLR)

Remark: Instead of SMS Gateway MSC also a SMS Gatway SGSN could be used.

Key Configurations	Required Network Elements
SMSC routing configured in MSC, MO-SMS subscription active in HLR	MS, MSC/VLR, SMSC, HLR

- **VLR/MSC:** Must have a signaling route to the SMSC.
- **HLR/HSS:** The subscriber's profile must include the address of their home SMSC.
- **SMSC:** The SMSC must be configured to receive and store messages and forward them to their destination.

16. CS Mobile Terminated Short Message Service



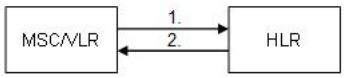
1. MAP: SEND_SHORT_MESSAGE (SM-SC <-> SMS Gateway MSC)
2. MAP: SEND_ROUTING_INFO (SMS Gateway MSC <-> HLR)
3. MAP: SEND_ROUTING_INFO_ACK (HLR <-> SMS Gateway MSC)
4. MAP: MT_FORWARD_SHORT_MESSAGE (SMS Gateway MSC <-> MSC)
5. MAP: MT_FORWARD_SHORT_MESSAGE_RESULT (MSC <-> SMS Gateway MSC)
6. MAP: SMS_DELIVERY_REPORT (SMS Gateway MSC <-> SM-SC)

Remark: Instead of SMS Gateway MSC also a SMS Gatway SGSN could be used.

Key Configurations	Required Network Elements
MT-SMS subscription active, SMSC delivery to MSC configured	MS, SMSC, MSC/VLR, HLR

- **SMSC:** The SMSC must be configured with a signaling route to the HLR to query the subscriber's serving VLR.
- **HLR/HSS:** Must be able to provide the serving VLR address to the SMSC in response to a `Send Routing Info for SM` (SRI-SM) query.

17. CS Subscriber Controlled Input

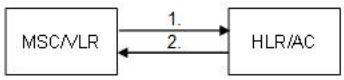


1. MAP: ACTIVATE_SERVICE (MSC/VLR <-> HLR)
2. MAP: ACTIVATE_SERVICE_ACK (HLR <-> MSC/VLR)

Key Configurations	Required Network Elements
USSD service provisioned in HLR, USSD gateway or IN node configured	MS, MSC/VLR, HLR, SCP/IN

MSC: The MSC's digit analysis must be configured to recognize specific USSD codes (e.g., `*#100#`) and route them to the relevant application server or gateway.

18. CS Authentication

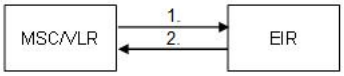


1. MAP: MAP_SEND_AUTHENTICATION_INFO (VLR <-> HLR)
2. MAP: MAP_SEND_AUTHENTICATION_INFO_ACK (HLR <-> VLR)

Key Configurations	Required Network Elements
Authentication vectors in AuC, IMSI/Ki provisioned, RAND/SRES exchange enabled	MS, MSC/VLR, HLR, AuC

- **AuC:** The Authentication Center (AuC) is co-located with or securely linked to the HLR. It is the repository for the subscriber's secret authentication key (Ki) and the algorithm for generating authentication triplets (RAND, SRES, Kc).
- **VLR:** The VLR is configured to request authentication triplets from the HLR/AuC and perform the authentication challenge with the mobile station.

19. CS IMEI Check



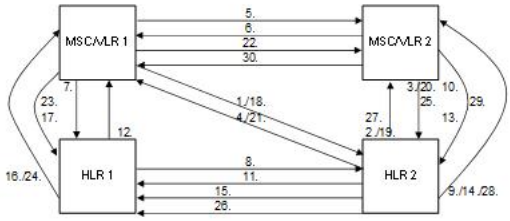
1. MAP: CHECK_IMEI (VLR <-> EIR)
2. MAP: CHECK_IMEI_ACK (EIR <-> VLR)

Key Configurations	Required Network Elements
IMEI database in EIR configured, MSC query to EIR enabled	MS, MSC/VLR, EIR

- **MSC:** The MSC must have a signaling route to the Equipment Identity Register (EIR).
- **EIR:** The EIR database must contain the white list, black list, and grey list of IMEIs. The MSC sends a query to the EIR to check the status of the mobile device's IMEI.

20. CS Mobile Mobile Call with Call Completion to Busy Subscriber

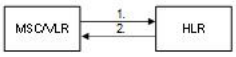
WTL Core Call Flow



1. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
2. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
3. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
4. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
5. ISUP: IAM/ACM CALL_SETUP_MSG (MSC 1 <-> MSC 2)
6. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> MSC 1)
7. MAP: REGISTER_CC_ENTRY (VLR 1 <-> HLR 1)
8. MAP: CCBS_REQUEST (HLR 1 <-> HLR 2)
9. MAP: SET_REPORTING_STATE (HLR 2 <-> VLR 2)
10.MAP: SET_REPORTING_STATE_ACK (VLR 2 <-> HLR 2)
11. MAP: CCBS_REQUEST_ACK (HLR 2 <-> HLR 1)
12. MAP: REGISTER_CC_ENTRY_ACK (HLR 1 <-> VLR 1)
13. MAP: STATUS_REPORT (VLR 2 <-> HLR 2)
14. MAP: STATUS_REPORT_ACK (HLR 2 <-> VLR 2)
15. MAP: REMOTE_USER_FREE (HLR 2 <-> HLR 1)
16. MAP: REMOTE_USER_FREE (HLR 1 <-> VLR1)
17. MAP: REMOTE_USER_FREE_ACK (VLR1 <-> HLR1)
18. MAP: SEND_ROUTING_INFO (VLR 1 <-> HLR 2)
19. MAP: PROVIDE_ROAMING_NUMBER (HLR 2 <-> VLR 2)
20. MAP: PROVIDE_ROAMING_NUMBER_ACK (VLR 2 <-> HLR 2)
21. MAP: SEND_ROUTING_INFO_ACK (HLR 2 <-> VLR 1)
22. ISUP: IAM/ACM CALL_SETUP_MSG (MSC1 <-> MSC2)
23. MAP: STATUS_REPORT (VLR 1 <-> HLR 1)
24. MAP: STATUS_REPORT_ACK (HLR 1 <-> VLR 1)
25. MAP: STATUS_REPORT (VLR 2 <-> HLR 2)
26. MAP: RESULT (HLR 2 <->HLR 1)
27. MAP: STATUS_REPORT_ACK (HLR 2 <-> VLR 2)
28. MAP: SET_REPORTING_STATE (HLR 2 <-> VLR 2)
29. MAP: SET_REPORTING_STATE_ACK (VLR 2 <-> HLR 2)
30. ISUP: IAM/ACM CALL_RELEASE_MSG (MSC 2 <-> MSC 1)

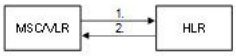
Remark: Msg. 6 with cause REL due to BUSY
Msg. 13 after release of B-call

CS CCBS Activation



1. MAP: REGISTER_CC_ENTRY (VLR <-> HLR)
2. MAP: REGISTER_CC_ENTRY_ACK (HLR <-> VLR)

CS CCBS Deactivation



1. MAP: ERASE_CC_ENTRY (VLR <-> HLR)
2. MAP: ERASE_CC_ENTRY_ACK (HLR <-> VLR)

Key Configurations	Required Network Elements
CCBS service active in HLR, MSC supports CCBS signaling	Calling MS, Called MS, MSC/VLR, HLR

- **HLR/HSS:** Both the originating and terminating subscribers must have the CCBS supplementary service provisioned in their HLR profiles.
- **MSC:** The MSCs must be configured to support the CCBS signaling procedures, including setting timers to monitor when a busy subscriber becomes idle and initiating the recall procedure.