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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The present document defines the stage 2 of the Advice of Charge (AoC) supplementary services within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
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 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

0 Scope

The present document gives the stage 2 description of the Advice of Charge (AoC) supplementary services.

The charging supplementary services currently defined are:

- Advice of Charge (Information) (AoCI) (clause 1);
- Advice of Charge (Charging) (AoCC) (clause 2).

0.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: " Vocabulary for 3GPP Specifications ".
- [2] 3GPP TS 22.024: "Description of Charge Advice Information (CAI)".
- [3] 3GPP TS 22.086: "Advice of Charge (AoC) Supplementary Services; Stage 1".
- [4] 3GPP TS 23.011: "Technical Realization of Supplementary Services - General Aspects".

0.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TR 21.905 [1].

1 Advice of Charge (Information) (AoCI)

1.1 Advice of Charge (Information) MSC SDL diagram

The SDL diagram for the Advice of Charge (Information) supplementary service within the MSC is given in figure 1.1.

NOTE 1: AoC (Information) is not applicable to emergency calls.

NOTE 2: The request of generation of the Charge Advice Information (CAI) applies to AoC initiation or charge modification.

1.2 Advice of Charge (Information) mobile equipment SDL diagram

The SDL diagram for the Advice of Charge (Information) supplementary service within the mobile equipment is given in figure 1.2. This SDL indicates when charging calculations are started, amended and stopped, within the mobile equipment. The mobile equipment should start charging calculations as soon as possible after receiving the charging information. Charging calculations should be amended by the mobile equipment in accordance with GSM 02.24.

NOTE: The point at which the charging calculations are amended can occur before or after sending the AoC Acknowledge.

Charging calculations are stopped when the call ends for any reason.

The reception of the CAI shall be acknowledged only if the MS supports the AoCI functionality specified in GSM 02.24 and GSM 02.86, however the network does not action this acknowledgement in the AoC (Information) case.

1.3 Advice of Charge (Information) information flow diagram

The Advice of Charge (Information) information flow diagrams are shown in figure 1.3.

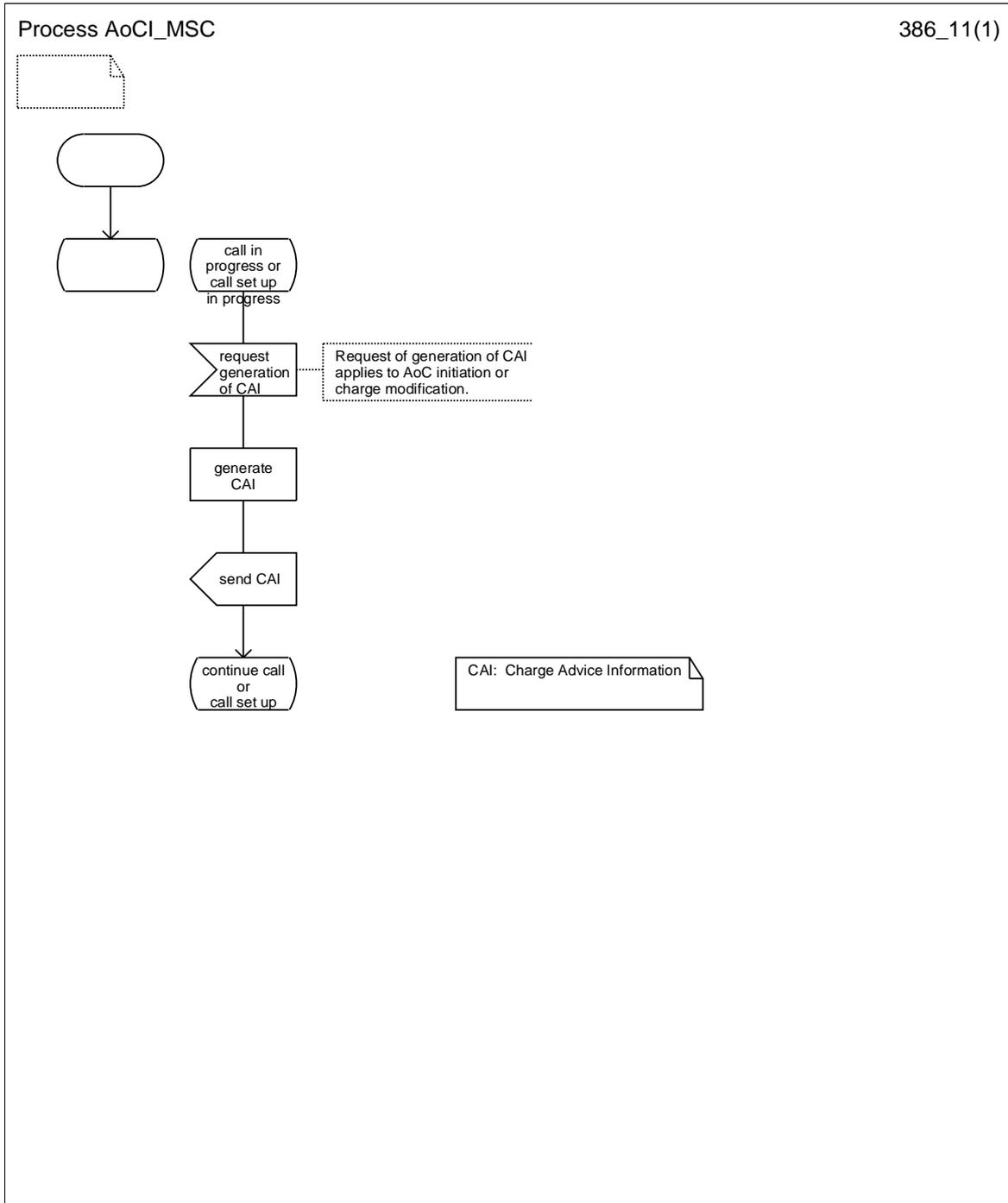


Figure 1.1: SDL diagram of advice of charge (information) in the MSC

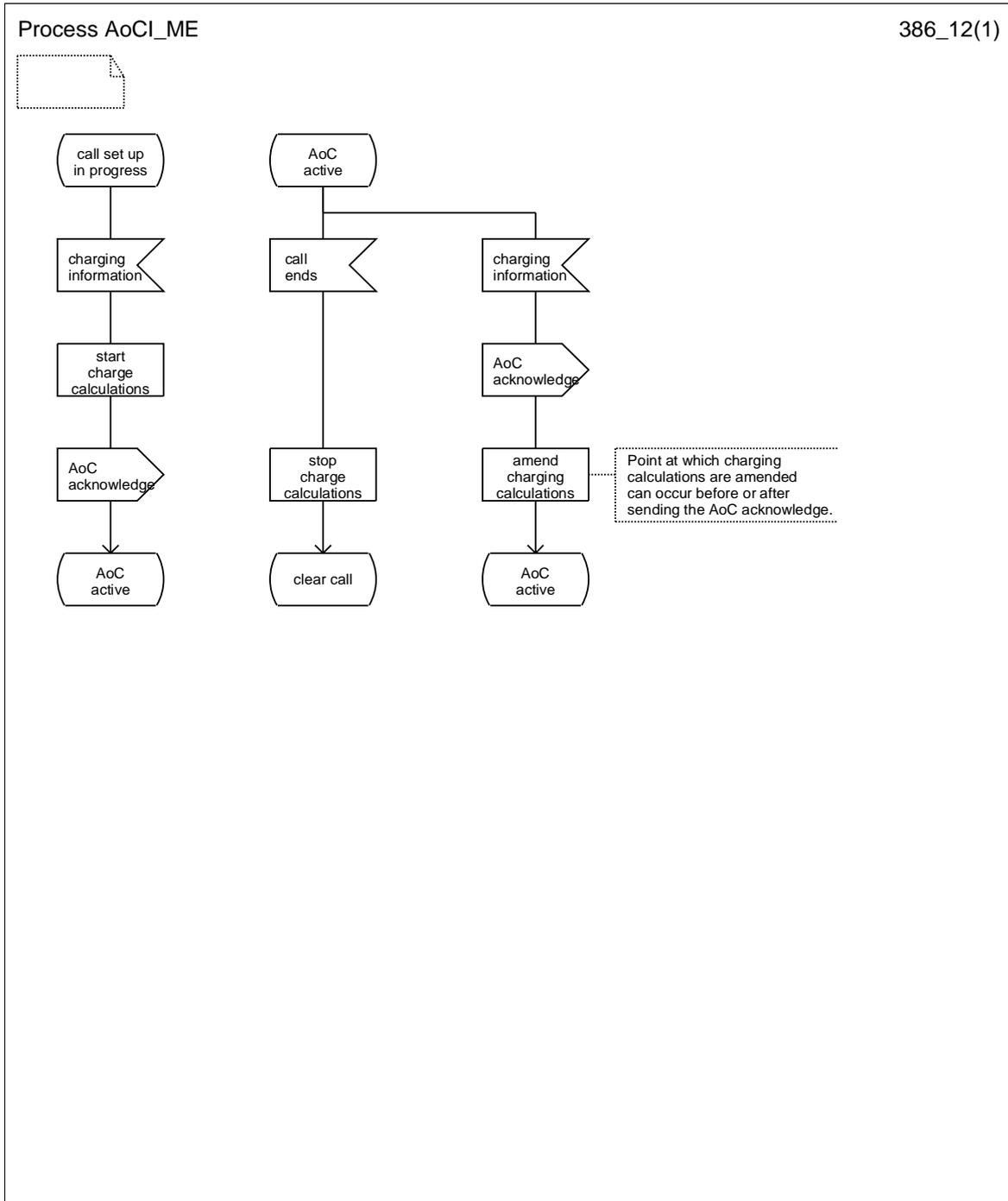


Figure 1.2: SDL diagram of advice of charge (information) in the mobile equipment

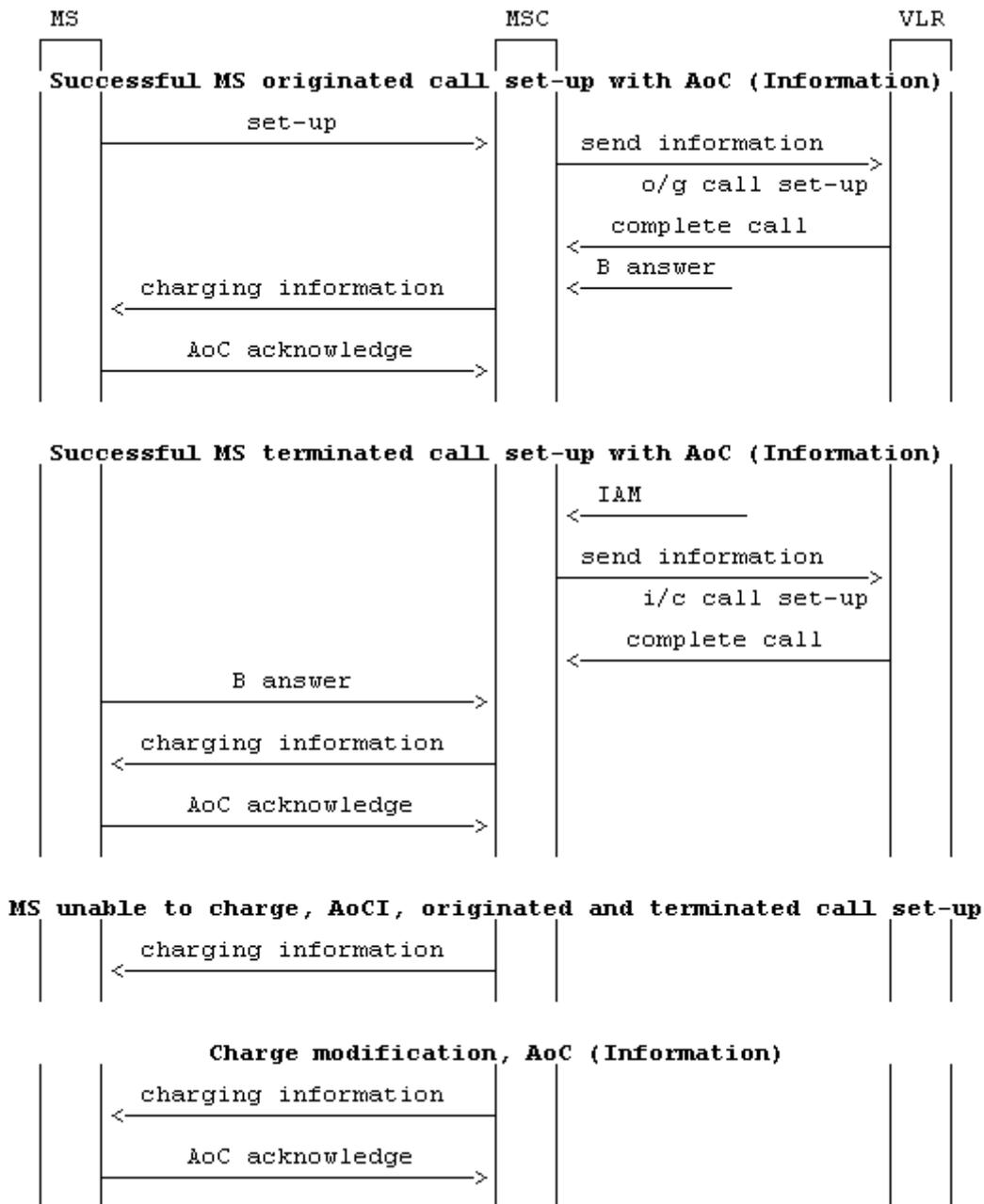


Figure 1.3: Information flow for Advice of Charge (Information)

1.4 Information stored in the HLR

AoCI may have the following logical states (refer to GSM 03.11 for an explanation of the notation):

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

The HLR shall store the logical state of AoCI (which shall be one of the valid states listed above) on a per subscriber basis.

1.5 State transition model

The following figure shows the successful cases of transition between the applicable logic states of AoCI. The state changes are caused by actions of the service provider.

Note that error cases are not shown in the diagram as they normally do not cause a state change. Additionally, some successful requests may not cause a state change. Hence they are not shown in the diagram.

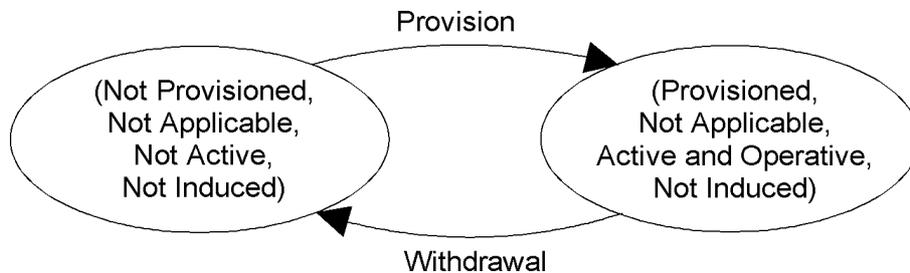


Figure 1.4: State transition model for AoCI

1.6 Transfer of Information from HLR to VLR

If the provisioning state for AoCI is "Provisioned" then when the served subscriber registers on a VLR the HLR shall send that VLR information about the logical state of AoCI.

If the logical state of AoCI is changed while a subscriber is registered on a VLR, then the HLR shall inform the VLR of the new logical state of AoCI.

1.7 Information stored in the VLR

For the supplementary service AoCI the VLR shall store the service state information received from the HLR.

1.8 Handover

Handover will have no impact on AoC control procedure.

2 Advice of Charge (Charging) (AoCC)

2.1 Advice of Charge (Charging) MSC SDL diagram

The SDL diagram for the Advice of Charge (Charging) supplementary service within the MSC is given in figure 2.1. At invocation of the Advice of Charge (Charging) supplementary service the network shall send the "Charging" MS the CAI. The network shall allow the call to proceed whilst waiting for an acknowledgement of the CAI. The waiting period is governed by Timer T(AoC). On expiry of T(AoC) the network shall initiate call clearing.

NOTE 1: AoC (Charging) is not applicable to emergency calls.

NOTE 2: The request of generation of CAI applies to AoC initiation or charge modification.

2.2 Advice of Charge (Charging) mobile equipment SDL diagram

The SDL diagram for the Advice of Charge (Charging) supplementary service within the mobile equipment is given in figure 2.2. The SDL indicates when charging calculations are started, amended and stopped, within the mobile equipment. The mobile equipment should start charging calculations as soon as possible after receiving the charging information. Charging calculations should be emended by the mobile equipment in accordance with GSM 02.24.

NOTE: The point at which charging calculations are amended can occur before or after sending the AoC Acknowledge.

Charging calculations are stopped when the call ends for any reason.

The reception of the CAI shall be acknowledged only if the MS supports the AoCC functionality specified in GSM 02.24 and GSM 02.86.

For mobile originated calls, the MS shall prevent a call set-up attempt if the ACM value is equal to or greater than ACMmax.

For mobile terminated calls, a call set-up attempt shall be allowed even if the ACM value is equal to or greater than ACMmax. In this case, when the MS detects that this is a chargeable call and that the ACM value is equal to or greater than ACMmax then the call shall be released.

During an active call, when the MS detects that ACM is equal to or greater than ACMmax then the MS shall release the call.

2.3 Advice of Charge (Charging) information flow diagram

The Advice of Charge (Charging) information flow diagrams are shown in figure 2.3.

2.4 AoCC subscriber roaming requirements

When an AoCC subscriber first roams into an MSC area not supporting AoCC, or the subscription is given to him while he is roaming in an MSC area not supporting AoCC the following applies:

The HLR shall indicate to the VLR that roaming is restricted in this MSC area due to unsupported feature, and it prevents further mobile terminated traffic. In this case the MS is not reachable.

When entering an AoCC supporting area the AoCC related roaming restriction shall be removed in the HLR.

When AoCC is withdrawn the AoCC related roaming restriction shall be removed in the HLR and VLR. This is independent from roaming restrictions due to other reasons.

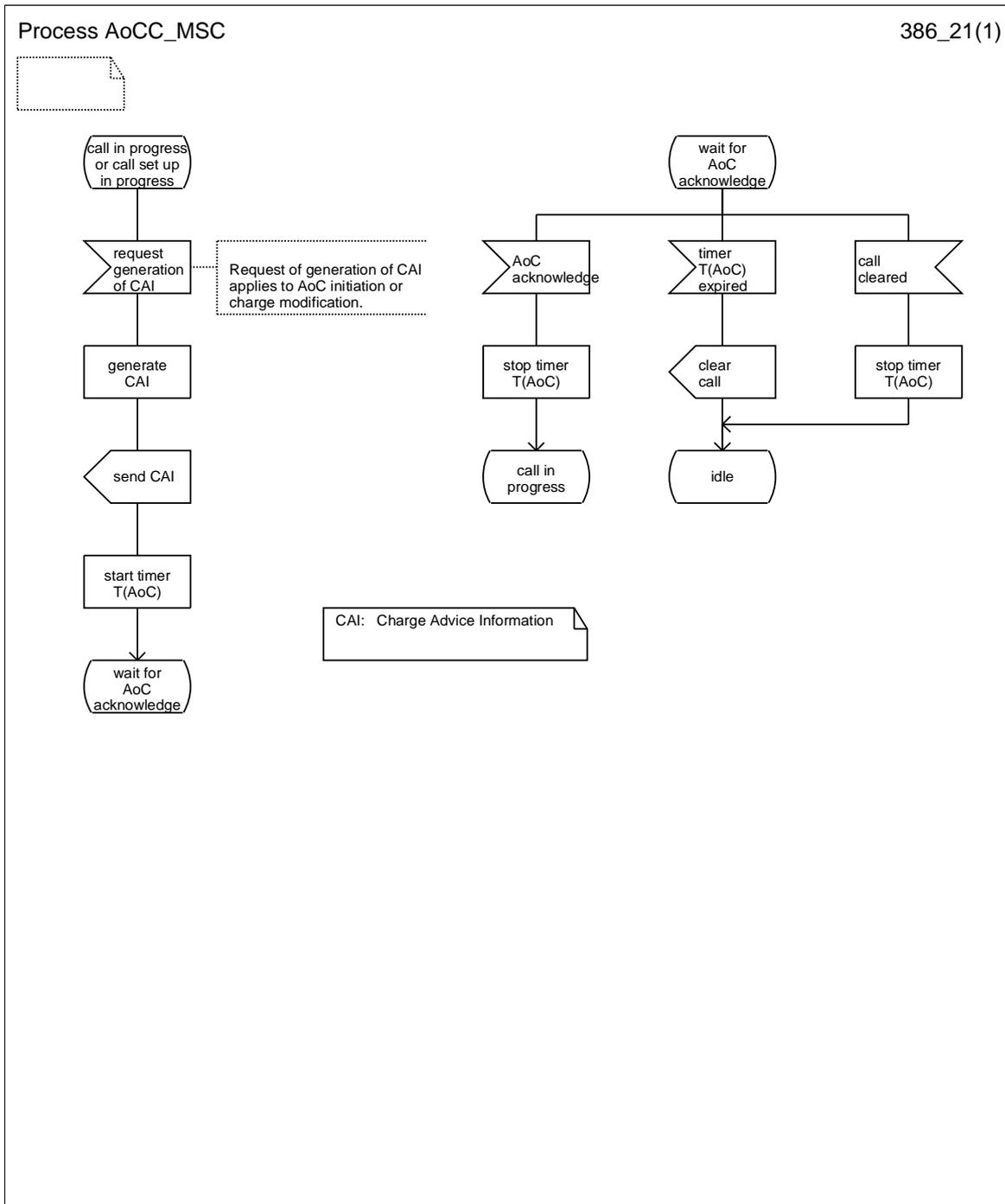


Figure 2.1: SDL diagram of advice of charge (charging) in the MSC

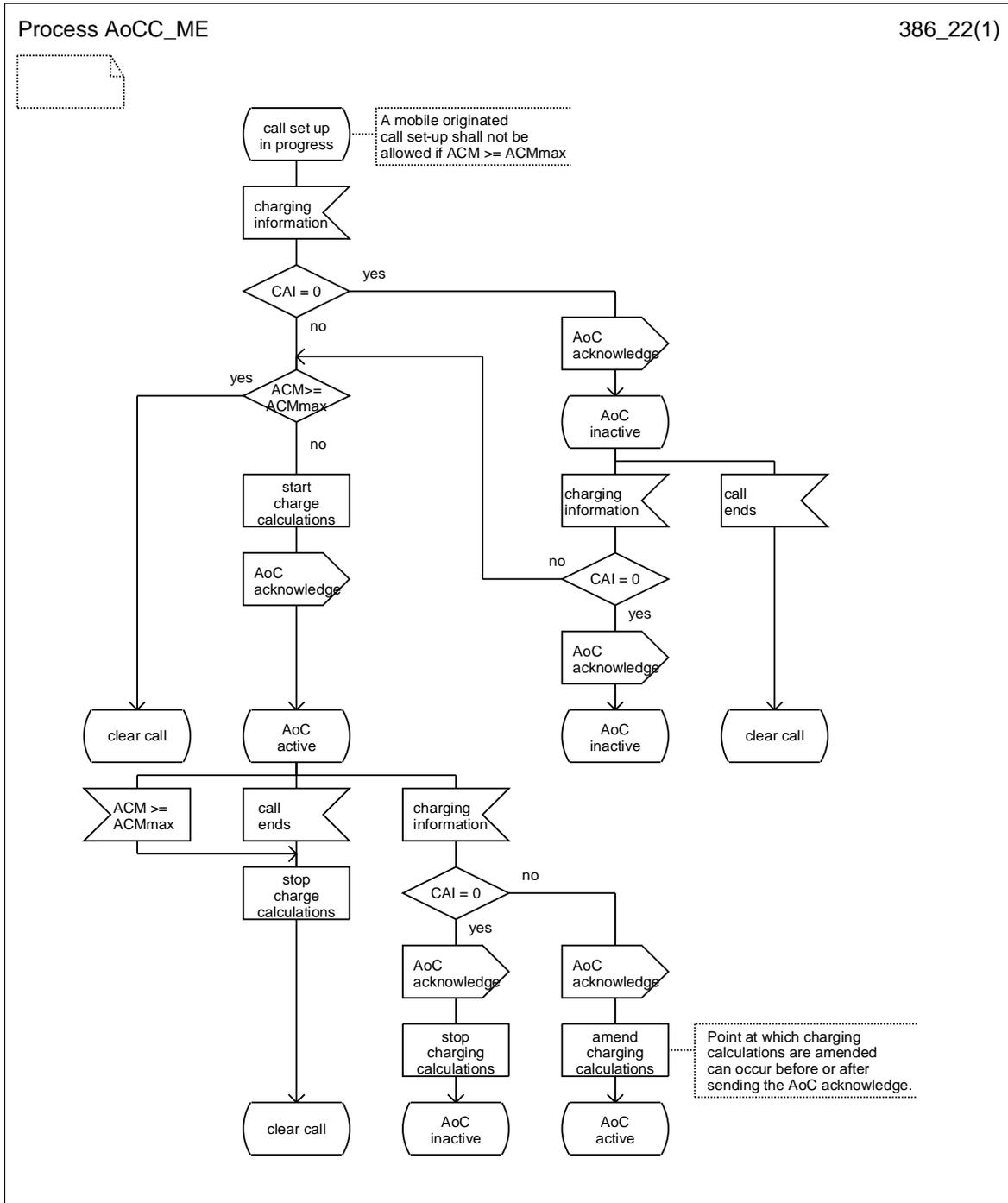


Figure 2.2: SDL diagram of advice of charge (charging) in the mobile equipment

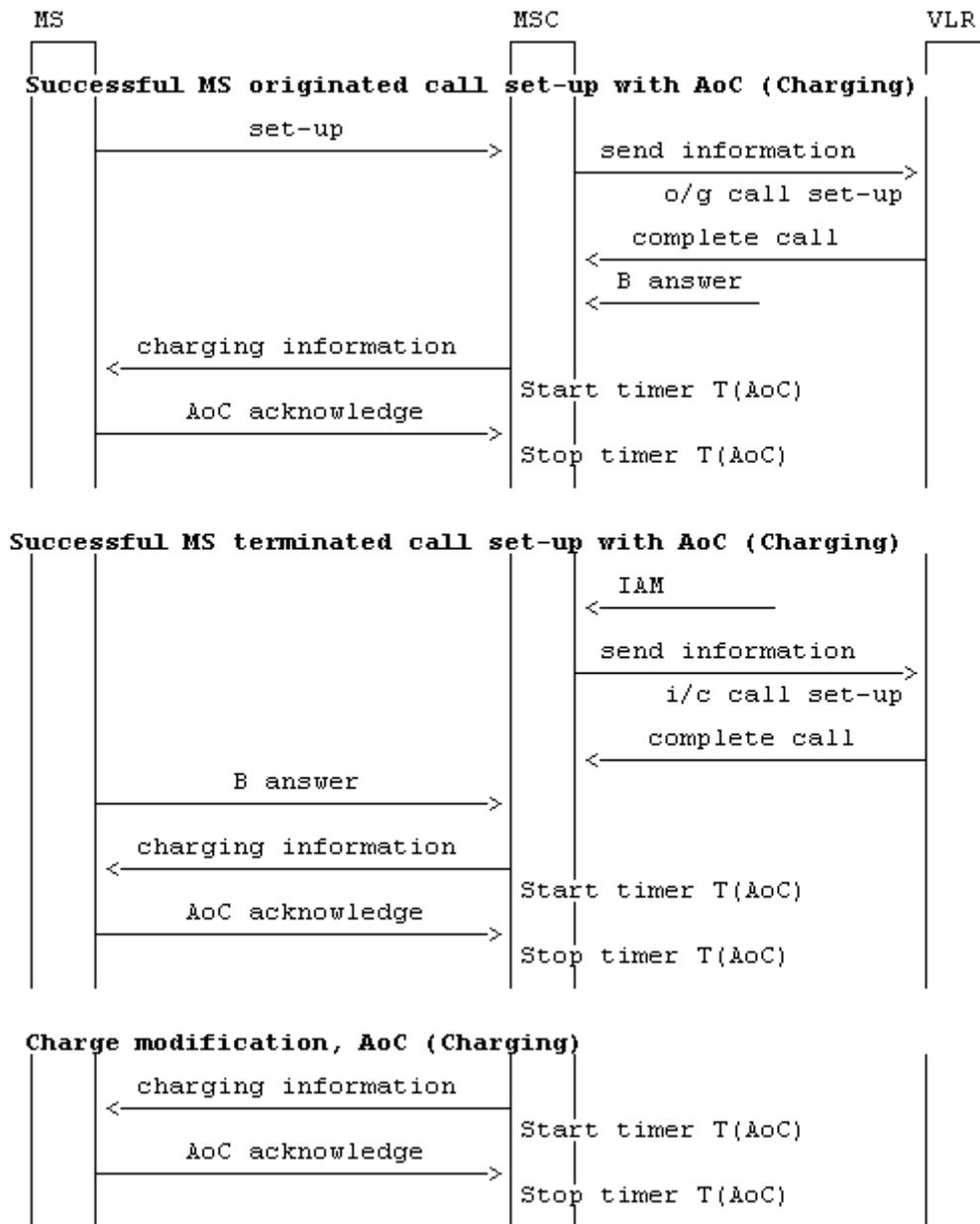


Figure 2.3 (sheet 1 of 2): Information flow for Advice of Charge (Charging)

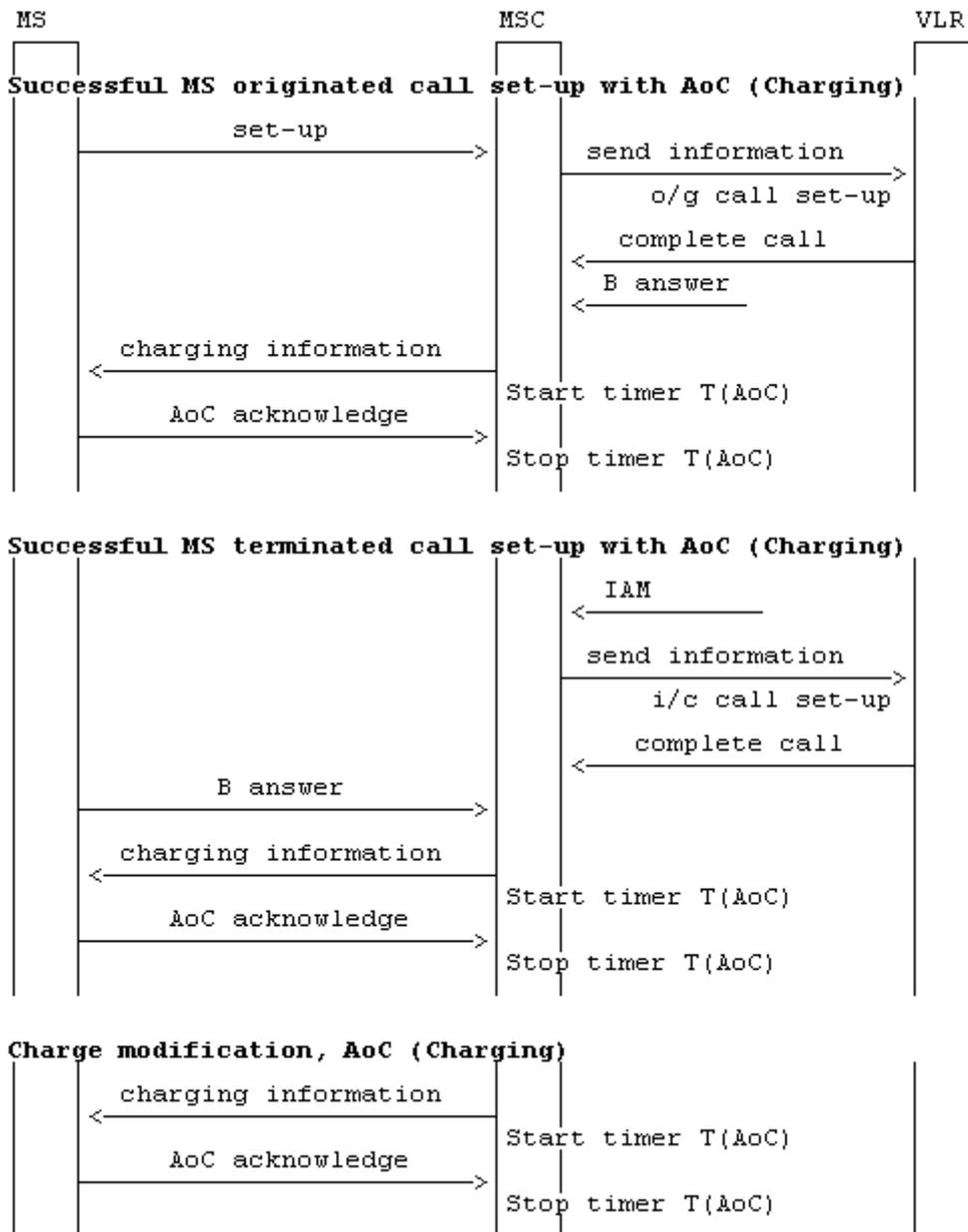


Figure 2.3 (sheet 2 of 2): Information flow for Advice of Charge (Charging)

2.5 Information stored in the HLR

AoCC may have the following logical states (refer to GSM 03.11 for an explanation of the notation):

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

The HLR shall store the logical state of AoCC (which shall be one of the valid states listed above) on a per subscriber basis.

2.6 State transition model

The following figure shows the successful cases of transition between the applicable logic states of AoCC. The state changes are caused by actions of the service provider.

Note that error cases are not shown in the diagram as they normally do not cause a state change. Additionally, some successful requests may not cause a state change. Hence they are not shown in the diagram.

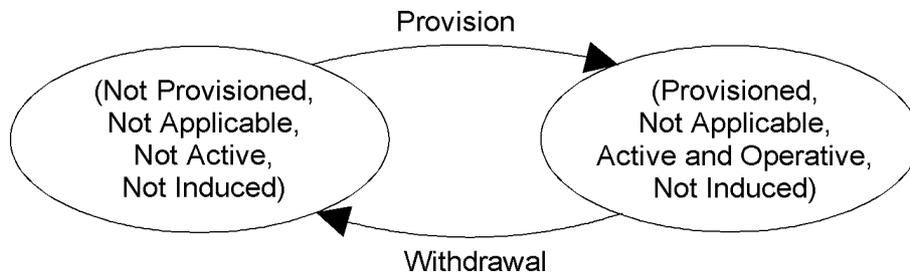


Figure 2.4: State transition model for AoCC

2.7 Transfer of Information from HLR to VLR

If the provisioning state for AoCC is "Provisioned" then when the served subscriber registers on a VLR the HLR shall send that VLR information about the logical state of AoCC.

If the logical state of AoCC is changed while a subscriber is registered on a VLR, then the HLR shall inform the VLR of the new logical state of AoCC.

2.8 Information stored in the VLR

For the supplementary service AoCC the VLR shall store the service state information received from the HLR.

2.9 Handover

Handover will have no impact on AoC control procedure.

Annex A (normative): Information stored in the MSC

The MSC shall have access to the following tables to enable the call handling function to generate the Charge Advice Information (CAI), see GSM 02.24. The table will give the CAI element values corresponding to service request, call destination, type of day and the time of day.

- Units per interval table (e1 values);
- Seconds per internal table (e2 values);
- Scaling factor table (e3 values);
- Unit increment table (e4 values);
- Units per data interval table (e5 values);
- Segments per data interval table (e6 values);
- Initial seconds per time interval table (e7 values).

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
Apr 1999						Transferred to 3GPP CN1	
CN#03						Approved at CN#03	3.0.0
						Reference list updated from 2G to 3G	3.0.1
CN#09			001	1		SDL refresh	3.1.0
CN#11						Release 4 after CN#11	4.0.0
CN#16						Release 5 after CN#16	5.0.0
CN#26						Release 6 after CN#26	6.0.0
CT#30			000 2			Incorrect References	6.1.0
CT#36						Upgraded unchanged from Rel-6	7.0.0
CT#42						Upgraded unchanged from Rel-7	8.0.0
CT#46			-	-		Update to Rel-9 version (MCC)	9.0.0
2011-03			-	-		Update to Rel-10 version (MCC)	10.0.0
2012-09			-	-		Update to Rel-11 version (MCC)	
2014-09			-	-		Update to Rel-12 version (MCC)	12.0.0
2015-12			-	-		Update to Rel-13 version (MCC)	13.0.0
2017-03			-	-		Update to Rel-14 version (MCC)	14.0.0
2018-06			-	-		Update to Rel-15 version (MCC)	15.0.0
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