



N-Squared Software N2SCP
CAP/INAP Protocol Conformance Statement

Version 2020-08

1 Document Information

1.1 Scope and Purpose

This document describes the implementation of the CAMEL (including INAP variants) protocol for real-time SCP flows for voice interaction control using the N-Squared Service Control Point (N2SCP) family of applications.

The N2SCP family of applications includes:

- N2DSG-SCP (CAMEL/Diameter Signalling Gateway)
- N2NP-SCP (Number Portability translation application)
- N2ACD-SCP (Advanced Call Distribution application for Toll-Free and other routing services)
- ...plus other custom SCP services that may be developed.

All of these applications use the N2SCP framework. They do not typically use all of the framework. Please refer to the relevant technical guide ([R-N2-DSG-TG], [R-N2-NP-TG], [R-N2-ACD-TG]) for application-specific scenarios and configuration parameters.

This document assumes a working knowledge of the relevant CAP/INAP and other telephony concepts, including the standard CAP/INAP interactions between an SCP, an SSP, and an SRP (or Intelligent Peripheral).

1.2 Definitions, Acronyms, and Abbreviations

Term	Meaning
AC	Apply Charging
ACR	Apply Charging Report
ARI	Assist Request Instructions
ASN.1	Abstract Syntax Notation One
AT	Activity Test
BCSM	Basic Call State Model
CAMEL	Customized Applications for Mobile Network Enhanced Logic
CAP	CAMEL Application Part
CIR	Call Information Request/Report
CTR	Connect To Resource
CWA	Continue With Argument
DFC	Disconnect Forward Connection
DFCWA	Disconnect Forward Connection With Argument
DL	Disconnect Leg
DP	Detection Point
EDP-N	Event Detection Point, Notify
EDP-R	Event Detection Point, Request
ERBCSM	Event Report BCSM
ETC	Establish Temporary Connection
ETSI	European Telecommunications Standards Institute
FCI	Furnish Charging Information

IDP	InitialDP
IE	Information Element
INAP	Intelligent Networking Application Part
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
ITU-T	International Telecommunication Union Telecommunication Standardization Sector
M3UA	MTP3 User Adaption Layer
MSC	Mobile Switching Center
MTP3	Message Transfer Part Level 3
N2	N-Squared Software
N2ACD	N-Squared Software Advanced Call Distribution
N2DSG	N-Squared Software Diameter Signalling Gateway
N2NP	N-Squared Software Number Portability
N2SVCD	N-Squared Software Service Daemon
PA	Play Announcement
PACUI	Prompt And Collect User Information
RRBCSME	Request Report BCSM Event
SCCP	Signalling Connection Control Part
SCP	Service Control Platform
SCTP	Stream Control Transmission Protocol
SLC	Service Logic Controller
SRF	Specialized Resource Function
SRP	Specialized Resource Platform
SRR	Specialized Resource Report
SSP	Service Switching Platform
SUA	SCCP User Adaption Layer
TCAP	Transaction Capabilities Application Part
TS	Technical Specification

1.3 References

The following documents are referenced within this document:

Reference	Document
[R-N2-ACD-TG]	N-Squared Software Advanced Call Distribution (N2ACD) Technical Guide
[R-N2-DSG-TG]	N-Squared Software Diameter Signalling Gateway (N2DSG) Technical Guide
[R-N2-NP-TG]	N-Squared Software Number Portability (N2NP) Technical Guide
[R-N2-SVCD-TG]	N-Squared Software Service Daemon (N2SVCD) Technical Guide

[R-N2-SVCD-TCAP-PICS]	N-Squared Software Service Daemon (N2SVCD) SIGTRAN-TCAP Protocol Conformance Statement
[R-3GPP-CAP1-S1]	<p>CAMEL Phase 1 (Release 1996) Stage 1 3GPP TS 02.78 Customized Applications for Mobile network Enhanced Logic (CAMEL); Service definition (Stage 1) Release 1996, Version 5.6.0 [1999-02-12]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1 (GSM 02.78 version 5.6.0 Release 1996)</p>
[R-3GPP-CAP1-S2]	<p>CAMEL Phase 1 (Release 1996) Stage 2 3GPP TS 03.78 Customized Applications for Mobile network Enhanced Logic (CAMEL) Phase 2; Stage 2 Release 1996, Version 5.8.0 [1999-06-25]</p> <p>Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL); Stage 2 (GSM 03.78 version 5.8.0 Release 1996)</p>
[R-3GPP-CAP1-S3]	<p>CAMEL Phase 1 (Release 1996) Stage 3 3GPP TS 09.78 CAMEL Application Part phase 2 (stage 3) Release 1996, Version 5.7.0 [1999-06-25]</p> <p>Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL); CAMEL Application Part (CAP) specification (GSM 09.78 version 5.7.0 Release 1996)</p>
[R-ETSI-CAP1-S1]	<p>CAMEL Phase 1 (Release 1996) Stage 1 ETSI GTS GSM 02.78 Version 5.6.0 [1999-03]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1 (GSM 02.78 version 5.6.0 Release 1996)</p>
[R-ETSI-CAP1-S2]	<p>CAMEL Phase 1 (Release 1996) Stage 2 ETSI TS 101 044 Version 5.8.0 [1999-08]</p> <p>Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL); Stage 2 (GSM 03.78 version 5.8.0 Release 1996)</p>

[R-ETSI-CAP1-S3]	<p>CAMEL Phase 1 (Release 1996) Stage 3 ETSI TS 101 046 Version 5.7.0 [1999-08]</p> <p>Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL); CAMEL Application Part (CAP) specification (GSM 09.78 version 5.7.0 Release 1996)</p>
[R-3GPP-CAP2-S1]	<p>CAMEL Phase 2 (Release 1998) Stage 1 3GPP TS 02.78 Customized Applications for Mobile network Enhanced Logic (CAMEL); Service definition (Stage 1) Release 1998, Version 7.2.0 [2002-01-14]</p> <p>3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; (CAMEL); Service definition - Stage 1 (Release 1998)</p>
[R-3GPP-CAP2-S2]	<p>CAMEL Phase 2 (Release 1998) Stage 2 3GPP TS 03.78 Customized Applications for Mobile network Enhanced Logic (CAMEL) Phase 2; Stage 2 Release 1998, Version 7.8.1 [2002-08-21]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 2; Stage 2 (Release 1998)</p>
[R-3GPP-CAP2-S3]	<p>CAMEL Phase 2 (Release 1998) Stage 3 3GPP TS 09.78 CAMEL Application Part phase 2 (stage 3) Release 1998, Version 7.1.0 [2000-06-21]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); CAMEL Application Part (CAP) specification (GSM 09.78 version 7.1.0 Release 1998)</p>
[R-ETSI-CAP2-S1]	<p>CAMEL Phase 2 (Release 1998) Stage 1 ETSI TS 101 285 Version 7.2.0 [2001-12]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition; Stage 1 (3GPP TS 02.78 version 7.2.0 Release 1998)</p>

[R-ETSI-CAP2-S2]	<p>CAMEL Phase 2 (Release 1998) Stage 2 ETSI TS 101 441 Version 7.8.1 [2002-08]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 2; Stage 2 (3GPP TS 03.78 version 7.8.1 Release 1998)</p>
[R-ETSI-CAP2-S3]	<p>CAMEL Phase 2 (Release 1998) Stage 3 ETSI TS 101 046 Version 7.1.0 [2000-07]</p> <p>Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); CAMEL Application Part (CAP) specification (GSM 09.78 version 7.1.0 Release 1998)</p>
[R-3GPP-CAP3-S1]	<p>CAMEL Phase 3 Stage 1 3GPP TS 22.078 Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1 Release 4, Version 4.5.0 [2002-03-25]</p> <p>3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description, Stage 1 (Release 4)</p>
[R-3GPP-CAP3-S2]	<p>CAMEL Phase 3 Stage 2 3GPP TS 23.078 Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4; Stage 2 Release 4, Version 4.11.1 [2004-04-21]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 - Stage 2 (Release 4)</p>

[R-3GPP-CAP3-S3]	<p>CAMEL Phase 3 Stage 3 3GPP TS 29.078 Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase X; CAMEL Application Part (CAP) specification Release 4, Version 4.9.0 [2009-09-29]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3; CAMEL Application Part (CAP) specification (Release 4)</p>
[R-ETSI-CAP3-S1]	<p>CAMEL Phase 3 Stage 1 ETSI TS 122 078 Version 4.5.0 [2002-03]</p> <p>Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customized Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1 (3GPP TS 22.078 version 4.5.0 Release 4)</p>
[R-ETSI-CAP3-S2]	<p>CAMEL Phase 3 Stage 2 ETSI TS 123 078 Version 4.11.1 [2004-04]</p> <p>Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); customized Applications for Mobile network Enhanced Logic (CAMEL); Stage 2 (3GPP TS 23.078 version 4.11.1 Release 4)</p>
[R-ETSI-CAP3-S3]	<p>CAMEL Phase 3 Stage 3 ETSI TS 129 078 Version 4.9.0 [2009-10]</p> <p>Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Customized Applications for Mobile network Enhanced Logic (CAMEL) Phase X; CAMEL Application Part (CAP) specification (3GPP TS 29.078 version 4.9.0 Release 4)</p>

[R-3GPP-CAP4-S1]	<p>CAMEL Phase 4 Stage 1 3GPP TS 22.078 Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1 Release 15, Version 15.0.0 [2018-07-04]</p> <p>3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1 (Release 15)</p>
[R-3GPP-CAP4-S2]	<p>CAMEL Phase 4 Stage 2 3GPP TS 23.078 Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4; Stage 2 Release 15, Version 15.0.0 [2018-06-22]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4; Stage 2 (Release 15)</p>
[R-3GPP-CAP4-S3]	<p>CAMEL Phase 4 Stage 3 3GPP TS 29.078 Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase X; CAMEL Application Part (CAP) specification Release 15, Version 15.0.0 [2018-06-22]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4; CAMEL Application Part (CAP) specification (Release 15)</p>
[R-ETSI-CAP4-S1]	<p>CAMEL Phase 4 Stage 1 ETSI TS 122 078 Version 15.0.0 [2018-07]</p> <p>Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service description; Stage 1 (3GPP TS 22.078 version 15.0.0 Release 15)</p>

[R-ETSI-CAP4-S2]	<p>CAMEL Phase 4 Stage 2 ETSI TS 123 078 Version 15.0.0 [2018-07]</p> <p>Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4; Stage 2 (3GPP TS 23.078 version 15.0.0 Release 15)</p>
[R-ETSI-CAP4-S3]	<p>CAMEL Phase 4 Stage 3 ETSI TS 129 078 Version 15.0.0 [2018-07]</p> <p>Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase X; CAMEL Application Part (CAP) specification (3GPP TS 29.078 version 15.0.0 Release 15)</p>
[R-ETSI-INAPCS1]	<p>INAP CS-1 ETSI ETS 300 374-1 Edition 1 [1994-09]</p> <p>Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: Protocol specification</p>
[R-3GPP-MAP-CAP1]	<p>MAP for CAMEL Phase 1 (Release 1996) 3GPP TS 09.02 Mobile Application Part (MAP) specification Release 1996, Version 5.19.0 [2003-10-09]</p> <p>3rd Generation Partnership Project; Technical Specification Group Core Network; Mobile Application Part (MAP) specification (Release 1996)</p>
[R-ETSI-MAP-CAP1]	<p>MAP for CAMEL Phase 1 (Release 1996) ETSI TS 100 974 Version 5.19.0 [2003-09]</p> <p>Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification (3GPP TS 09.02 version 5.19.0 Release 1996)</p>

[R-3GPP- MAP-CAP2]	MAP for CAMEL Phase 2 (Release 1997) 3GPP TS 09.02 Mobile Application Part (MAP) specification Release 1996, Version 6.14.0 [2003-10-09] 3rd Generation Partnership Project; Technical Specification Group Core Network; Mobile Application Part (MAP) specification (Release 1997)
[R-ETSI- MAP-CAP2]	MAP for CAMEL Phase 2 (Release 1997) ETSI TS 100 974 Version 6.14.0 [2003-09] Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification (3GPP TS 09.02 version 6.14.0 Release 1997)
[R-3GPP- MAP-CAP3]	MAP for CAMEL Phase 3 (Release 1999) 3GPP TS 29.002 Mobile Application Part (MAP) specification Release 1999, Version 3.20.0 [2004-06-17] 3rd Generation Partnership Project; Technical Specification Group Core Network; Mobile Application Part (MAP) specification (Release 1999)
[R-ETSI- MAP-CAP3]	MAP for CAMEL Phase 3 (Release 1999) ETSI TS 129 002 Version 3.20.0 [2004-06] Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile Application Part (MAP) specification (3GPP TS 29.002 version 3.20.0 Release 1999)
[R-3GPP- MAP-CAP4]	MAP for CAMEL Phase 4 (Release 9) 3GPP TS 29.002 Mobile Application Part (MAP) specification Release 9, Version 9.13.0 3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Mobile Application Part (MAP) specification (Release 9)

[R-ETSI- MAP-CAP4]	MAP for CAMEL Phase 4 (Release 9) ETSI TS 129 002 Version 9.13.0 [2016-08] Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Mobile Application Part (MAP) specification (3GPP TS 29.002 version 9.13.0 Release 9)
[R-ETSI- ISUP-BS]	ISUP Basic Services ETSI EN 300 456 Version 4.2.1 [2001-07] Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part (ISUP) version 4 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1999) modified]
[R-ITU- ISUP-P3]	ISUP Formats & Codes ITU-T REC Q.763 Version 12-1999 SERIES Q: SWITCHING AND SIGNALLING Specifications of Signalling System No. 7 – ISDN user part Signalling System No. 7 – ISDN user part formats and codes

1.4 Ownership and Usage

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3 Introduction

3.1 N2SCP Overview

The N-Squared Service Control Point (N2SCP) is a framework which supports several different CAMEL/INAP call-control services, such as the N-Squared CAMEL/Diameter Signalling Gateway (N2DSG-SCP) which performs real-time Diameter charging control for CAMEL-controlled voice calls.

The following diagram uses N2DSG-SCP as an example service built using N2SCP:

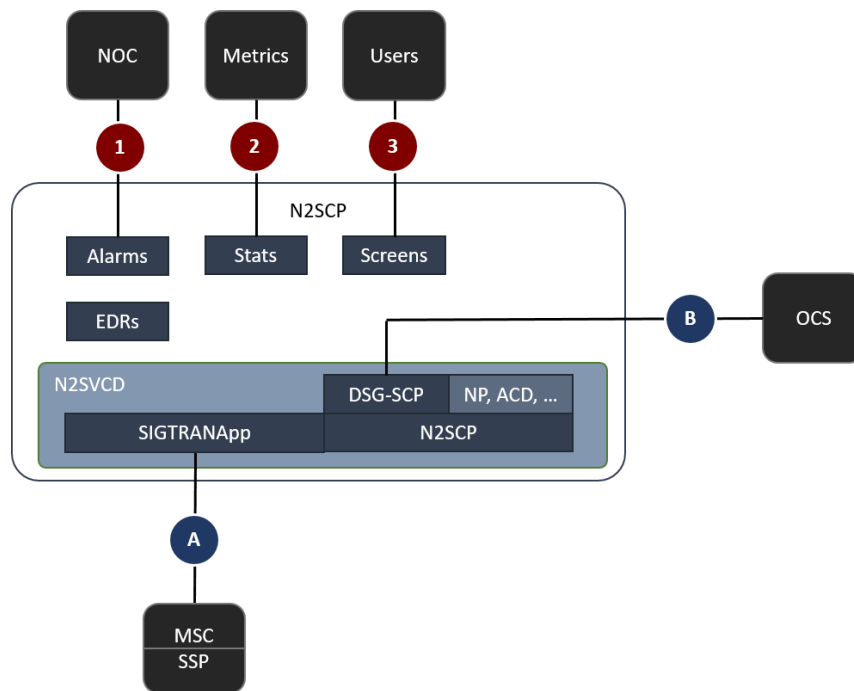


Figure A: N2SCP Integration

This document relates only to N2SCP Compliance for the CAP (or INAP) layer of Interface "A", which has the following stack:

- **CAP (or INAP)**
 - TCAP
 - SCCP
 - SIGTRAN M3UA
 - SCTP/IP

Within this interface, this document describes only the uppermost CAP (or INAP) layer. The common N2SVCD Conformance for TCAP and the lower layers of the stack are described in the separate document [R-N2-TCAP-PICS].

3.2 Conformance Scope

Conformance is based on the referenced standards or other non-standard functionality but noting that solution conformance to the above is limited to the extent expressly described herein.

Specifically:

- Any statement of conformance to a standard in no way implies compliance with the complete standard. This may even apply to a feature which the standard describes as mandatory.
- Where conformance to a higher-level message, parameter, message flow, or feature is asserted by N-Squared, then any underlying functionality can be implicitly assumed – at least to the level necessary to support the asserted functionality.
- If conformance to a message, parameter, message flow, or feature is not expressly asserted or implicitly assumed, then it should not be assumed.
- The N-Squared conformance may expressly indicate that a message, parameter, message flow, or feature is implemented in contradiction to the standard.

3.3 Conformance Terminology

The term “Supported” means that the N2SCP framework provides access to the protocol feature which is either (as relevant)

- ...an inbound parameter which the N2SCP framework or service-specific logic may (as appropriate) receive via the appropriate interface and use within service processing, and/or
- ...an outbound parameter which the N2SCP framework or service-specific logic may (as appropriate) caused to be sent via the appropriate interface.

Please refer to the per-service Technical Guide ([R-N2-ACD-TG], [R-N2-DSG-TG], [R-N2-NP-TG]) to determine if an individual service uses that feature, and how it is enabled and controlled at the N2SCP and/or service logic layer.

For further clarification of “Supported” features:

- “Service configuration” indicates a feature which can be enabled or configured at a coarse level for a service.
- “Service logic” indicates a feature which can be enabled or configured at a coarse level for a service, but whose behavior also determined by service logic depending on input parameters, subscriber attributes, environmental factors, and/or interaction with external nodes such as an online charging server (OCS), etc.
- “Service custom” indicates a feature which does not have a clear “standard behavior” but which (if used) is defined on site-specific basis, if required.

The term “Ignored” indicates an inbound feature which will be accepted by the N2SCP framework but the presence (or absence) of which will not cause any change in N2SCP behavior.

The term “Not Supported” indicates an inbound feature the use of which will likely cause a failure or rejection by the N2SCP framework.

The terms “Never Present” or “Not Used” indicates an outbound feature which the N2SCP framework does not implement.

4 CAP/INAP Compliance

4.1 CAP/INAP Overview

N2SCP applications (e.g. N2DSG-SCP, etc.) use CAP (or INAP) to communicate with an MSC (CAMEL Mobile Switching Centre) or an SSP (INAP Service Switching Point) to perform call control. In general, the terms “CAP” and “INAP” are interchangeable herein, as are “MSC” and “SSP”.

Communication is initiated by the MSC, which sends an InitialDP (IDP) operation to the N2SCP service at the commencement of each call.

When required by call control logic, N2SCP applications may also use CAP (or INAP) to communicate with an SRF (e.g. the N-Squared N2SRP product). The N2SCP framework initiates this communication to enable playing announcements to - and collecting information from - the participants in the call.

N2SCP also supports INAP variants. In general, INAP integration is a subset of the CAMEL integration. Where our INAP support diverges from CAP, it is expressly mentioned herein. N2DSG also supports some vendor-proprietary extensions as described herein.

N2SCP framework and application compliance with CAP is formally based on:

- CAP phase 1, specified by:
 - Stage 1: 3GPP TS 02.78, Release 1996, Version 5.6.0 [R-3GPP-CAP1-S1] and ETSI GTS GSM 02.78, Version 5.6.0 [R-ETSI-CAP1-S1]
 - Stage 2: 3GPP TS 03.78, Release 1996, Version 5.8.0 [R-3GPP-CAP1-S2] and ETSI TS 101 044, Version 5.8.0 [R-ETSI-CAP1-S2]
 - Stage 3: 3GPP TS 09.78, Release 1996, Version 5.7.0 [R-3GPP-CAP1-S3] and ETSI TS 101 046, Version 5.7.0 [R-ETSI-CAP1-S3]
- CAP phase 2, specified by:
 - Stage 1: 3GPP TS 02.78, Release 1998, Version 7.2.0 [R-3GPP-CAP2-S1] and ETSI TS 101 285, Version 7.2.0 [R-ETSI-CAP2-S1]
 - Stage 2: 3GPP TS 03.78, Release 1998, Version 7.8.1 [R-3GPP-CAP2-S2] and ETSI TS 101 441, Version 7.8.1 [R-ETSI-CAP2-S2]
 - Stage 3: 3GPP TS 09.78, Release 1998, Version 7.1.0 [R-3GPP-CAP2-S3] and ETSI TS 101 046, Version 7.1.0 [R-ETSI-CAP2-S3]
- CAP phase 3, specified by:
 - Stage 1: 3GPP TS 22.078, Release 4, Version 4.5.0 [R-3GPP-CAP3-S1] and ETSI TS 122 078, Version 4.5.0 [R-ETSI-CAP3-S1]
 - Stage 2: 3GPP TS 23.078, Release 4, Version 4.11.1 [R-3GPP-CAP3-S2] and ETSI TS 123 078, Version 4.11.1 [R-ETSI-CAP3-S2]
 - Stage 3: 3GPP TS 29.078, Release 4, Version 4.9.0 [R-3GPP-CAP3-S3] and ETSI TS 129 078, Version 4.9.0 [R-ETSI-CAP3-S3]
- CAP phase 4, specified by:
 - Stage 1: 3GPP TS 22.078, Release 15, Version 15.0.0 [R-3GPP-CAP4-S1] and ETSI TS 122 078, Version 15.0.0 [R-ETSI-CAP4-S1]
 - Stage 2: 3GPP TS 23.078, Release 15, Version 15.0.0 [R-3GPP-CAP4-S2] and ETSI TS 123 078, Version 15.0.0 [R-ETSI-CAP4-S2]
 - Stage 3: 3GPP TS 29.078, Release 15, Version 15.0.0 [R-3GPP-CAP4-S3] and ETSI TS 129 078, Version 15.0.0 [R-ETSI-CAP4-S3]

Note that ASN.1 is not a backwards-compatible format. Other non-listed fields received in CAP/INAP operations will cause a decode error.

4.2 CAP/INAP Operation Support

The N2DSG supports only the following CAP/INAP operations with the MSC and/or SRF.

Operation	Direction	CAP/INAP Variants
ActivityTest	To MSC	All
Result (ActivityTest)	From MSC	All
ApplyCharging	To MSC	CAP 2, 3, and 4
ApplyChargingReport	From MSC	CAP 2, 3, and 4
AssistRequestInstructions	From SRF	CAP 2, 3, and 4
CallInformationReport	From MSC	CAP 2, 3, and 4
CallInformationRequest	To MSC	CAP 2, 3, and 4
Connect	To MSC	All
ConnectToResource	To MSC	CAP 2, 3, and 4
Error (ConnectToResource)	From MSC	CAP 2, 3, and 4
Continue	To MSC	All
DisconnectForwardConnection	To MSC	CAP 2, 3, and 4
EstablishTemporaryConnection	To MSC	CAP 2, 3, and 4
Error (EstablishTemporaryConnection)	From MSC	CAP 2, 3, and 4
EventReportBCSM	From MSC	All
FurnishChargingInformation	To MSC	CAP 2, 3, and 4
InitialDP	From MSC	All
PlayAnnouncement	To SRF	CAP 2, 3, and 4
Error (PlayAnnouncement)	From SRF	CAP 2, 3, and 4
PromptAndCollectUserInformation	To SRF	CAP 2, 3, and 4
Error (PromptAndCollectUserInformation)	From SRF	CAP 2, 3, and 4
Result (PromptAndCollectUserInformation)	From SRF	CAP 2, 3, and 4
ReleaseCall	To MSC	All
RequestReportBCSMEvent	To MSC	All
ResetTimer	To MSC	CAP 2, 3, and 4
SpecializedResourceReport	From SRF	CAP 2, 3, and 4

Table 1: CAP/INAP Operations

4.3 ActivityTest

The CAP/INAP ActivityTest (AT) operation may be sent from N2SCP to the MSC to confirm that the link between N2SCP and the MSC is still active. N2SCP expects to receive a subsequent ReturnResult from the MSC to confirm that the link is still active.

AT does not have any IEs.

4.3.1 ReturnResult

The MSC should send a ReturnResult containing a Boolean True value to N2SCP upon reception of an AT. If this ReturnResult is not received within a reasonable time period, N2SCP will tear down the call.

4.4 ApplyCharging

The CAP/INAP ApplyCharging (AC) operation is sent from N2SCP to the MSC to control the duration of the call and enable the application of charging logic.

AC is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in AC:

Attribute	Tag	Type	Notes
aChBillingChargingCharacteristics	0	Octet String	Supported Content defined by CAMEL- AChBillingChargingCharacteristics as detailed in 4.4.1 and 224.4.2.
partyToCharge	2	SendingSideID (Choice)	Supported as below
.sendingSideID	0	LegType (Octet String)	Supported Set to 1 (leg 1) for MO/MF Set to 2 (leg 2) for MT
extensions	3	Extensions	Never present
aChChargingAddress	50	AChChargingAddress (Choice)	Never present CAP 4 only

Table 2: CAP/INAP AC IEs

N2SCP supports the CAP 2 and CAP 3-and-4 variants of the CAMEL-aChBillingChargingCharacteristics IE structure.

4.4.1 CAP 2 CAMEL-aChBillingChargingCharacteristics

The CAP 2 CAMEL-aChBillingChargingCharacteristics IE is a Choice of:

Attribute	Tag	Type	Notes
timeDurationCharging	0	Sequence	Supported as below
.maxCallPeriodDuration	0	Integer	Supported Unit = deci-seconds Service logic
.releaselfDurationExceeded	1	Sequence	Supported as below Service logic
.tone	-	Boolean	Supported Service logic
.extensions	10	Extensions	Never present
.tariffSwitchInterval	2	Integer	Never present Unit = seconds

Table 3: CAP 2 AC CAMEL-aChBillingChargingCharacteristics IEs

4.4.2 CAP 3 And 4 CAMEL-aChBillingChargingCharacteristics

The CAP 3 and 4 CAMEL-aChBillingChargingCharacteristics IE is a Choice of:

Attribute	Tag	Type	Notes
timeDurationCharging	0	Sequence	Supported as below
.maxCallPeriodDuration	0	Integer	Supported Unit = deci-seconds Service logic
.releaselfDurationExceeded	1	Boolean	Supported Service logic
.tariffSwitchInterval	2	Integer	Never present Unit = seconds
.audibleIndicator	3	AudibleIndicator (Choice)	Supported as below
.tone	-	Boolean	Supported Service logic
.burstList	1	BurstList (Sequence)	Never present
.extensions	4	Extensions	Never present

Table 4: CAP 3 And 4 AC CAMEL-aChBillingChargingCharacteristics IEs

4.4.3 ReturnError

N2SCP does not support ReturnError for AC.

4.5 ApplyChargingReport

The CAP/INAP ApplyChargingReport (ACR) operation is sent from the MSC to N2SCP when the time granted by the previous ApplyCharging has elapsed or the call has ended. It enables the charging logic to allow or deny continuation of the call, or complete charging for the call.

ACR is only defined for CAP 2, 3, and 4.

The content of an ACR is defined by CallResult which is an Octet String whose content is defined by CAMEL-CallResult. CAMEL-CallResult is a Choice.

N2SCP supports receiving the following IEs in CAMEL-CallResult:

Attribute	Tag	Type	Notes
timeDurationChargingResult	0	Sequence	Supported as below
.partyToCharge	0	ReceivingSidelID (Choice)	Ignored
.timeInformation	1	TimeInformation (Choice)	Supported as below
.timelfNoTariffSwitch	0	TimelfNoTariffSwitch (Integer)	Supported Unit = deci-seconds
.timelfTariffSwitch	1	TimelfTariffSwitch (Sequence)	Ignored

.legActive	2	Boolean	Supported Known as callActive in CAP 2 and 3
.callLegReleasedAtTcpExpiry	3	Null	Supported CAP 3 and 4 only Known as callReleasedAtTcpExpiry in CAP 3
.extensions	4	Extensions	Ignored CAP 3 and 4 only
.aChChargingAddress	5	AChChargingAddress (Choice)	Ignored CAP 4 only

Table 5: CAP/INAP ACR IEs

4.5.1 ReturnError

N2SCP does not send ReturnError upon reception of an unacceptable ACR. Rather, N2SCP will tear down the call.

4.6 AssistRequestInstructions

The CAP/INAP AssistRequestInstructions (ARI) operation is sent from an assisting SRF to N2SCP after the MSC – upon reception of an EstablishTemporaryConnection (ETC) operation - establishes a connection to the SRF.

ARI is only defined for CAP 2, 3, and 4.

N2SCP supports receiving the following IEs in ARI:

Attribute	Tag	Type	Notes
correlationID	0	CorrelationID (Digits -> Octet String -> Generic Number)	Supported
iPSSPCapabilities	2	IPSSPCapabilities (Octet String)	Ignored
extensions	3	Extensions	Ignored

Table 6: CAP/INAP ARI IEs

4.6.1 ReturnError

N2SCP does not send ReturnError upon reception of an unacceptable ARI. Rather, N2SCP will tear down the call.

4.7 CallInformationReport

The CAP/INAP CallInformationReport operation is sent from the MSC to N2SCP at the end of a call if a CallInformationRequest was previously sent to the MSC. The CallInformationReport should contain the information requested by the original CallInformationRequest.

CallInformationReport is only defined for CAP 2, 3, and 4.

N2SCP supports receiving the following IEs in CallInformationReport:

Attribute	Tag	Type	Notes
-----------	-----	------	-------

requestedInformationList	0	RequestedInformation List (Sequence Of RequestedInformation)	Supported as below
.requestedInformationType	0	RequestedInformation Type (Enumerated)	Supported Values: <ul style="list-style-type: none"> • 0 = callAttempt ElapsedTime • 1 = callStopTime • 2 = callConnected ElapsedTime • 30 = releaseCause
.requestedInformationValue	1	RequestedInformation Value (Choice)	Supported
.callAttemptElapsedTimeValue	0	Integer	Unit = seconds
.callStopTimeValue	1	DateAndTime (Octet String)	
.callConnectedElapsedTimeValue	2	Integer4	Unit = deci-seconds
.releaseCauseValue	30	Cause (Octet String -> Cause)	
extensions	2	Extensions	Ignored
legID	3	ReceivingSideID (Choice)	Ignored

Table 7: CAP/INAP CallInformationReport IEs

4.8 CallInformationRequest

The CAP/INAP CallInformationRequest operation is sent from N2SCP to the MSC during call setup if call information needs to be collected and reported at the end of the call.

CallInformationRequest is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in CallInformationRequest:

Attribute	Tag	Type	Notes
requestedInformationTypeList	0	RequestedInformation TypeList (Sequence Of RequestedInformation Type (Enumerated))	Supported Values: <ul style="list-style-type: none"> • 0 = callAttemptElapsedTime • 1 = callStopTime • 2 = callConnectedElapsedTime • 30 = releaseCause Service configuration
extensions	2	Extensions	Never present
legID	3	SendingSideID (Choice)	Never present

Table 8: CAP/INAP CallInformationRequest IEs

4.8.1 ReturnError

N2SCP does not support ReturnError for CallInformationRequest.

4.9 Connect

The CAP/INAP Connect operation is sent from N2SCP to the MSC to instruct the MSC to attempt to connect the call, with a modified called party number.

N2SCP supports sending the following IEs in Connect:

Attribute	Tag	Type	Notes
destinationRoutingAddress	0	DestinationRoutingAddress (Sequence Of CalledPartyNumber -> Octet String -> Called Party Number)	Supported Service logic
alertingPattern	1	AlertingPattern (Octet String)	Never present CAP 2, 3, and 4 only
originalCalledPartyID	6	OriginalCalledPartyID (Octet String -> Original Called Number)	Supported Service logic
extensions	10	Extensions	Never present
carrier	11	Carrier (Octet String)	Never present CAP 3 and 4 only
callingPartysCategory	28	CallingPartysCategory (Octet String)	Never present
redirectingPartyID	29	RedirectingPartyID (Octet String -> Redirecting Number)	Supported Service logic
redirectionInformation	30	RedirectionInformation (Octet String -> Redirection Information)	Supported Service logic
genericNumbers	14	GenericNumbers (Set Of Octet String -> Generic Number)	Never present
serviceInteractionIndicatorsTwo	15	ServiceInteractionIndicators Two (Sequence)	Never present CAP 3 and 4 only
chargeNumber	19	ChargeNumber (LocationNumber -> Octet String)	Never present CAP 3 and 4 only
legToBeConnected	21	LegID (Choice)	Never present CAP 4 only
cug-Interlock	31	CUG-Interlock (Octet String)	Never present CAP 3 and 4 only
cug-OutgoingAccess	32	Null	Never present CAP 3 and 4 only
suppressionOfAnnouncement	55	SuppressionOfAnnouncement (Null)	Never present

Attribute	Tag	Type	Notes
oCSIAplicable	56	OCSIAplicable (Null)	Never present
na-Info	57	NA-Info (Sequence)	Never present CAP 2 only
naOlInfo	57	NAOlInfo (Octet String)	Never present CAP 3 and 4 only
bor-InterrogationRequested	58	Null	Never present CAP 4 only
suppress-N-CSI	59	Null	Never present CAP 4 only

Table 9: CAP/INAP Connect IEs

4.9.1 ReturnError

N2SCP does not support ReturnError for Connect.

4.10 ConnectToResource

The CAP/INAP ConnectToResource (CTR) operation is sent from N2SCP to the MSC to instruct the MSC to attempt to connect to a resource such as an SRF.

CTR is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in CTR:

Attribute	Tag	Type	Notes
resourceAddress	-	Choice	Supported as below
.ipRoutingAddress	0	IPRoutingAddress (CalledPartyNumber -> Octet String -> Called Party Number)	Never present
.none	3	Null	Always present
extensions	4	Extensions	Never present
serviceInteractionIndicatorsTwo	7	ServiceInteractionIndicatorsTwo (Sequence)	Never present
callSegmentID	50	CallSegmentID (Integer)	Never present CAP 4 only

Table 10: CAP/INAP CTR IEs

4.10.1 ReturnError

The MSC should send a ReturnError to N2SCP upon reception of an unacceptable CTR, or failure to connect to the specified resource. In this case, N2SCP will allow the service logic to decide how to proceed – either tear down the call or continue without the interaction.

4.11 Continue

The CAP/INAP Continue operation is sent from N2SCP to the MSC to instruct the MSC to continue processing the call, with no additional details. This operation may be sent to the MSC during call setup and tear-down.

Continue does not have any IEs.

4.12 DisconnectForwardConnection

The CAP/INAP DisconnectForwardConnection (DFC) operation is sent from N2SCP to the MSC to instruct the MSC to attempt to disconnect the most recently established resource or temporary connection.

DFC is only defined for CAP 2, 3, and 4.

DFC does not have any IEs.

4.12.1 ReturnError

N2SCP does not support ReturnError for DFC.

4.13 EstablishTemporaryConnection

The CAP/INAP EstablishTemporaryConnection (ETC) operation is sent from N2SCP to the MSC to instruct the MSC to attempt to connect to an assisting SRF. If the connection is established successfully, N2SCP expects to receive an AssistRequestInstructions (ARI) operation from the assisting SRF, indicating the SRF is ready for instructions. Otherwise, if the connection cannot be established, N2SCP expects to receive a ReturnError from the MSC.

ETC is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in ETC:

Attribute	Tag	Type	Notes
assistingSSIPRoutingAddress	0	AssistingSSIPRoutingAddress (Digits -> Octet String -> Generic Number)	Supported Service configuration (see note below)
correlationID	1	CorrelationID (Digits -> Octet String -> Generic Digits)	Supported Service configuration (see note below)
scfID	3	ScfID (Octet String)	Supported Service configuration
extensions	4	Extensions	Never present
carrier	5	Carrier (Octet String)	Never present CAP 3 and 4 only
serviceInteractionIndicatorsTwo	6/7	ServiceInteractionIndicatorsTwo (Sequence)	Never present Tag is 7 for CAP 2 Tag is 6 for CAP 3/4
callSegmentID	7	CallSegmentID (Integer)	Never present CAP 4 only
na-info	50	NA-Info (Sequence)	Never present CAP 2 only
naOlInfo	50	NAOlInfo (Octet String)	Never present CAP 3 and 4 only

chargeNumber	51	ChargeNumber (LocationNumber -> Octet String)	Never present CAP 3 and 4 only
originalCalledPartyID	52	OriginalCalledPartyID (Octet String -> Original Called Number)	Never present CAP 4 only
callingPartyNumber	53	CallingPartyNumber (Octet String -> Calling Party Number)	Never present CAP 4 only

Table 11: CAP/INAP ETC IEs

Note that the service provides configurable flexibility regarding the mapping of the logical “correlation ID” and “SCF ID” concepts into the on-the-wire correlationID and assistingSSIPRoutingAddress parameters. Refer to product technical guides – for example: [R-N2-DSG-TG] and [R-N2-ACD-TG] - for details.

4.13.1 ReturnError

The MSC should send a ReturnError to N2SCP upon reception of an unacceptable ETC, or failure to connect to the specified resource. In this case, N2SCP will allow the service logic to decide how to proceed – either tear down the call or continue without the interaction.

4.14 EventReportBCSM

The CAP/INAP EventReportBCSM (ERBCSM) operation is sent from the MSC to N2SCP when an armed detection point (DP) is encountered/triggered. DPs can be armed (and disarmed) with the RequestReportBCSMEvent operation.

N2SCP supports receiving the following IEs in ERBCSM:

Attribute	Tag	Type	Notes
eventTypeBCSM	0	EventTypeBCSM (Enumerated)	Supported
eventSpecificInformationBCSM	2	EventSpecificInformationBCSM (Choice)	Supported as below
.routeSelectFailureSpecificInfo	2	Sequence	Supported as below CAP 2, 3, and 4 only
.failureCause	0	Cause (Octet String -> Cause)	Supported
.oCalledPartyBusySpecificInfo	3	Sequence	Supported as below CAP 2, 3, and 4 only
.busyCause	0	Cause (Octet String -> Cause)	Supported
.oNoAnswerSpecificInfo	4	Sequence	Ignored CAP 2, 3, and 4 only
.oAnswerSpecificInfo	5	Sequence	Ignored CAP 2, 3, and 4 only
.oMidCallSpecificInfo	6	Sequence	Ignored CAP 4 only
.oDisconnectSpecificInfo	7	Sequence	Supported as below
.releaseCause	0	Cause (Octet String -> Cause)	Supported

.tBusySpecificInfo	8	Sequence	Supported as below CAP 2, 3, and 4 only
.busyCause	0	Cause (Octet String -> Cause)	Supported
.callForwarded	50	Null	Supported
.routeNotPermitted	51	Null	Ignored CAP 3 and 4 only
.forwardingDestinationNumber	52	CalledPartyNumber (Octet String -> Called Party Number)	Ignored CAP 4 only
.tNoAnswerSpecificInfo	9	Sequence	Supported as below CAP 2, 3, and 4 only
.callForwarded	50	Null	Supported
.forwardingDestinationNumber	52	CalledPartyNumber (Octet String -> Called Party Number)	Ignored CAP 4 only
.tAnswerSpecificInfo	10	Sequence	Ignored CAP 2, 3, and 4 only
.tMidCallSpecificInfo	11	Sequence	Ignored CAP 4 only
.tDisconnectSpecificInfo	12	Sequence	Supported as below
.releaseCause	0	Cause (Octet String -> Cause)	Supported
.oTermSeizedSpecificInfo	13	Sequence	Ignored CAP 4 only
.callAcceptedSpecificInfo	20	Sequence	Ignored CAP 4 only
.oAbandonSpecificInfo	21	Sequence	Ignored CAP 4 only
.oChangeOfPositionSpecificInfo	50	Sequence	Ignored CAP 4 only
.tChangeOfPositionSpecificInfo	51	Sequence	Ignored CAP 4 only
.dpSpecificInfoAlt	52	DpSpecificInfoAlt (Sequence)	Ignored CAP 4 only
legID	3	ReceivingSideID (Choice)	Supported as below
.receivingSideID	1	LegType (OctetString)	Supported
miscCallInfo	4	MiscCallInfo (Sequence)	Supported as below
.messageType	0	Enumerated	Supported Values: <ul style="list-style-type: none"> 0 = request 1 = notification All values are supported
extensions	5	Extensions	Ignored

Table 12: CAP/INAP ERBCSM IEs

4.15 FurnishChargingInformation

The CAP/INAP FurnishChargingInformation (FCI) operation is sent from N2SCP to the MSC to provide the MSC with additional information to include in its call record.

FCI is only defined for CAP 2, 3, and 4.

The content of an FCI is defined by FCIBillingChargingCharacteristics which is an Octet String whose content is defined by CAMEL-FCIBillingChargingCharacteristics. CAMEL-FCIBillingChargingCharacteristics is a Choice.

N2SCP supports sending the following IEs in CAMEL-FCIBillingChargingCharacteristics:

Attribute	Tag	Type	Notes
fCIBCCCAMELsequence1	0	Sequence	Supported as below
.freeFormatData	0	Octet String	Supported Service custom
.partyToCharge	1	SendingSideID (Choice)	Supported as below
.sendingSideID	0	LegType (Octet String)	Supported Service custom
.appendFreeFormatData	2	AppendFreeFormatData (Enumerated)	Supported Values: <ul style="list-style-type: none"> 0 = overwrite 1 = append All values are supported Service custom

Table 13: CAP/INAP FCI CAMEL-FCIBillingChargingCharacteristics IEs

4.15.1 ReturnError

N2SCP does not support ReturnError for FCI.

4.16 InitialDP

The CAP/INAP InitialDP (IDP) operation is sent from the MSC to N2SCP at the commencement of a call attempt, when the initial BCSM detection point (DP) is encountered/triggered.

N2SCP supports receiving the following IEs in IDP:

Attribute	Tag	Type	Notes
serviceKey	0	ServiceKey (Integer4)	Supported
calledPartyNumber	2	CalledPartyNumber (Octet String -> Called Party Number)	Supported
callingPartyNumber	3	CallingPartyNumber (Octet String -> Calling Party Number)	Supported
callingPartysCategory	5	CallingPartysCategory (Octet String)	Supported

cGEncountered	7	CGEncountered (Enumerated)	Ignored CAP 3 and 4 only
iPSSPCapabilities	8	IPSSPCapabilities (Octet String)	Ignored CAP 2, 3, and 4 only
locationNumber	10	LocationNumber (Octet String -> Location Number)	Supported
originalCalledPartyID	12	OriginalCalledPartyID (Octet String -> Original Called Number)	Supported
extensions	15	Extensions	Ignored
highLayerCompatibility	23	HighLayerCompatibility (Octet String)	Supported
additionalCallingPartyNumber	25	AdditionalCallingPartyNumber (Digits -> Octet String -> Generic Number)	Supported
bearerCapability	27	BearerCapability (Choice)	Supported as below
.bearerCap	0	Octet String	Supported
eventTypeBCSM	28	EventTypeBCSM (Enumerated)	Supported Values: <ul style="list-style-type: none"> • 2 = collectedInfo • 3 = analyzed Information • 12 = termAttempt Authorized All values are supported analyzedInformation is only available in CAP 3 and 4
redirectingPartyID	29	RedirectingPartyID (Octet String -> Redirecting Number)	Supported
redirectionInformation	30	RedirectionInformation (Octet String -> Redirection Information)	Supported
cause	17	Cause (Octet String -> Cause)	Supported CAP 3 and 4 only
serviceInteractionIndicatorsTwo	32	ServiceInteractionIndicators Two (Sequence)	Ignored CAP 3 and 4 only
carrier	37	Carrier (Octet String)	Ignored CAP 3 and 4 only
cug-Index	45	CUG-Index (Integer)	Supported CAP 3 and 4 only
cug-Interlock	46	CUG-Interlock (Octet String)	Ignored CAP 3 and 4 only
cug-OutgoingAccess	47	Null	Supported CAP 3 and 4 only

iMSI	50	IMSI (TBCD-String -> Octet String)	Supported
subscriberState	51	SubscriberState (Choice)	Supported
locationInformation	52	LocationInformation (Sequence)	Supported as below
.ageOfLocationInformation	-	AgeOfLocationInformation (Integer)	Supported
.geographicalInformation	0	GeographicalInformation (Octet String)	Ignored
.vlr-number	1	ISDN-AddressString (AddressString -> Octet String -> Address String)	Supported
.locationNumber	2	LocationNumber (Octet String -> Location Number)	Supported
.cellIdOrLAI	3	CellIdOrLAI (Choice)	Supported as below CAP 1 and 2 only
.cellIdFixedLength	0	CellIdFixedLength (Octet String -> Cell Global ID or Service Area ID Fixed Length)	Supported
.laiFixedLength	1	LAIFixedLength (Octet String -> LAI Fixed Length)	Supported
.cellGlobalIdOrService AreaIdOrLAI	3	CellGlobalIdOrService AreaIdOrLAI (Choice)	Supported as below CAP 3 and 4 only
.cellGlobalIdOrService AreaIdFixedLength	0	CellGlobalIdOrService AreaIdFixedLength (Octet String -> Cell Global ID or Service Area ID Fixed Length)	Supported
.laiFixedLength	1	LAIFixedLength (Octet String -> LAI Fixed Length)	Supported
.extensionContainer	4	ExtensionContainer (Sequence)	Ignored
.selectedLSA-Id	5	LSAIdentity (Octet String)	Ignored CAP 3 and 4 only
.msc-Number	6	ISDN-AddressString (AddressString -> Octet String -> Address String)	Supported CAP 3 and 4 only
.geodeticInformation	7	GeodeticInformation (Octet String)	Ignored CAP 3 and 4 only
.currentLocationRetrieved	8	Null	Supported CAP 3 and 4 only
.sai-Present	9	Null	Supported CAP 3 and 4 only
.locationInformationEPS	10	LocationInformationEPS (Sequence)	Ignored CAP 4 only

.userCSGInformation	11	UserCSGInformation (Sequence)	Ignored CAP 4 only
ext-basicServiceCode	53	Ext-BasicServiceCode (Choice)	Supported as below
.ext-BearerService	2	Ext-BearerServiceCode (Octet String)	Supported
.ext-Teleservice	3	Ext-TeleserviceCode (Octet String)	Supported
callReferenceNumber	54	CallReferenceNumber (Octet String)	Supported
mscAddress	55	ISDN-AddressString (AddressString -> Octet String -> Address String)	Supported
calledPartyBCDNumber	56	CalledPartyBCDNumber (Octet String -> Address String)	Supported
timeAndTimezone	57	TimeAndTimezone (BCD Digits -> Octet String)	Supported CAP 2, 3, and 4 only
callForwardingSS-Pending	58	Null	Supported CAP 2, 3, and 4 only Known as gsm-Forwarding Pending in CAP 2 and 3
initialDPArgExtension	59	InitialDPArgExtension	Supported as below CAP 2, 3, and 4 only
.naCarrierInformation	0	NACarrierInformation (Sequence)	Ignored CAP 2 only
.gmscAddress	0/1	ISDN-AddressString (AddressString -> Octet String -> Address String)	Supported Tag is 1 for CAP 2 Tag is 0 for CAP 3/4
.forwardingDestinationNumber	1	CalledPartyNumber (Octet String)	Supported CAP 4 only
.ms-Classmark2	2	MS-Classmark2 (Octet String)	Ignored CAP 4 only
.iMEI	3	IMEI (TBCD-String -> Octet String)	Supported CAP 4 only
.supportedCamelPhases	4	SupportedCamelPhases (Bit String)	Ignored CAP 4 only
.offeredCamel4Functionalities	5	OfferedCamel4Functionalities (Bit String)	Ignored CAP 4 only
.bearerCapability2	6	BearerCapability (Choice)	Supported as below CAP 4 only
.bearerCap	0	Octet String	Supported
.ext-basicServiceCode2	7	Ext-BasicServiceCode (Choice)	Supported CAP 4 only
.ext-BearerService	2	Ext-BearerServiceCode (Octet String)	Supported

.ext-Teleservice	3	Ext-TeleserviceCode (Octet String)	Supported
.highLayerCompatibility2	8	HighLayerCompatibility (Octet String)	Supported CAP 4 only
.lowLayerCompatibility	9	LowLayerCompatibility (Octet String)	Supported CAP 4 only
.lowLayerCompatibility2	10	LowLayerCompatibility (Octet String)	Supported CAP 4 only
.enhancedDialledServices Allowed	11	Null	Supported CAP 4 only
.uu-Data	12	UU-Data (Sequence)	Ignored CAP 4 only
.collectInformationAllowed	13	Null	Supported CAP 4 only
.releaseCallArgExtensionAllowed	14	Null	Supported CAP 4 only

Table 14: CAP/INAP IDP IEs

4.16.1 ReturnError

N2SCP does not send ReturnError upon reception of an unacceptable IDP. Rather, N2SCP will tear down the call.

4.17 PlayAnnouncement

The CAP/INAP PlayAnnouncement (PA) operation is sent from the N2SCP to an SRF - either directly (assisted, ETC) or via the MSC (not assisted, CTR) - to instruct it to play an announcement without performing digit collection.

PA is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in PA:

Attribute	Tag	Type	Notes
informationToSend	0	InformationToSend (Choice)	Supported as below Service logic & configuration
.inbandInfo	0	InbandInfo (Sequence)	Supported as below
.messageID	0	MessageID (Choice)	Supported as below
.elementaryMessageID	0	Integer4	Supported
.text	1	Sequence	Never present
.elementaryMessageIDs	29	Sequence Of Integer4	Supported
.variableMessage	30	Sequence	Supported as below
.elementaryMessageID	0	Integer4	Supported
.variableParts	1	Sequence Of VariablePart (Choice)	Supported
.integer	0	Integer4	Supported
.number	1	Digits (Octet String -> Generic Digits)	Supported

.time	2	Octet String -> BCD Digits	Supported
.date	3	Octet String -> BCD Digits	Supported
.price	4	Octet String -> BCD Digits	Supported
.numberOfRepetitions	1	Integer	Supported
.duration	2	Integer	Supported Unit = seconds; Value 0 means infinite
.interval	3	Integer	Supported Unit = seconds
.tone	1	Tone (Sequence)	Never present
disconnectFromIPForbidden	1	Boolean	Never present
requestAnnouncement CompleteNotification	2	Boolean	Never present Known as requestAnnouncement Complete in CAP 2 and 3
extensions	3	Extensions	Supported May include <ul style="list-style-type: none"> Language ID Extension (see separate notes)
callSegmentID	5	CallSegmentID (Integer)	Never present CAP 4 only
requestAnnouncement StartedNotification	51	Boolean	Never present CAP 4 only

Table 15: CAP/INAP PA IEs

4.17.1 ReturnError

The SRF should send a ReturnError to N2SCP upon reception of an unacceptable PA, or failure to play the announcement.

4.18 PromptAndCollectUserInformation

The CAP/INAP PromptAndCollectUserInformation (PACUI) operation is sent from the N2SCP to an SRF - either directly (assisted, ETC) or via the MSC (not assisted, CTR) - to instruct it to play a prompt and perform digit collection. If collection succeeds, N2SCP expects to receive a ReturnResult from the SRF; otherwise, a ReturnError is expected.

PACUI is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in PACUI:

Attribute	Tag	Type	Notes
collectedInfo	0	Sequence	Supported as below Service logic & configuration
.collectedDigits	0	Sequence	Supported as below
.minimumNbOfDigits	0	Integer	Supported
.maximumNbOfDigits	1	Integer	Supported

.endOfReplyDigit	2	Octet String	Supported
.cancelDigit	3	Octet String	Supported
.startDigit	4	Octet String	Never present
.firstDigitTimeout	5	Integer	Supported Unit = seconds
.interDigitTimeout	6	Integer	Supported Unit = seconds
.errorTreatment	7	ErrorTreatment (Enumerated)	Never present
.interruptableAnnInd	8	Boolean	Supported
.voiceInformation	9	Boolean	Never present
.voiceBack	10	Boolean	Never present
disconnectFromIPForbidden	1	Boolean	Never present
informationToSend	2	InformationToSend (Choice)	Supported as below
.inbandInfo	0	InbandInfo (Sequence)	Supported as below
.messageID	0	MessageID (Choice)	Supported as below
.elementaryMessageID	0	Integer4	Supported
.text	1	Sequence	Never present
.elementaryMessageIDs	29	Sequence Of Integer4	Supported
.variableMessage	30	Sequence	Supported as below
.elementaryMessageID	0	Integer4	Supported
.variableParts	1	Sequence Of VariablePart (Choice)	Supported as below
.integer	0	Integer4	Supported
.number	1	Digits (Octet String -> Generic Digits)	Supported
.time	2	Octet String -> BCD Digits	Supported
.date	3	Octet String -> BCD Digits	Supported
.price	4	Octet String -> BCD Digits	Supported
.numberOfRepetitions	1	Integer	Supported
.duration	2	Integer	Supported Unit = seconds; Value 0 means infinite
.interval	3	Integer	Supported Unit = seconds
.tone	1	Tone (Sequence)	Never present

extensions	3	Extensions	Supported May include <ul style="list-style-type: none"> Language ID Extension (see separate notes)
callSegmentID	4	CallSegmentID (Integer)	Never present CAP 4 only
requestAnnouncement StartedNotification	51	Boolean	Never present CAP 4 only

Table 16: CAP/INAP PACUI IEs

4.18.1 ReturnError

The SRF should send a ReturnError to N2SCP upon reception of an unacceptable PACUI, or failure to play the prompt, or failure to collect the specified information from the user.

4.18.2 ReturnResult

The SRF should send a ReturnResult containing a ReceivedInformationArg to N2SCP after successfully playing the prompt and collecting the specified information from the user.

N2SCP supports receiving the following IEs in the ReturnResult:

Attribute	Tag	Type	Notes
digitsResponse	0	Digits (Octet String -> Generic Digits)	Supported

Table 17: CAP/INAP PACUI ReturnResult IEs

4.19 ReleaseCall

The CAP/INAP ReleaseCall operation is sent from N2SCP to the MSC to instruct the MSC to release the call.

ReleaseCall is defined as a Choice. N2SCP supports sending the following alternatives:

Attribute	Tag	Type	Notes
initialCallSegment	-	Cause (Octet String -> Cause)	Supported Service logic & configuration
allCallSegmentsWithExtension	2	AllCallSegmentsWithExtension (Sequence)	Never present CAP 4 only

Table 18: CAP/INAP ReleaseCall IEs

4.20 RequestReportBCSMEvent

The CAP/INAP RequestReportBCSMEvent (RRBCSME) operation is sent from N2SCP to the MSC to instruct the MSC to arm (or disarm) a set of detection points (DPs). When the event associated with an armed DP occurs, the MSC is expected to notify N2SCP using an EventReportBCSM operation, and – depending on the monitor mode used to arm the DP – either wait for further instructions from N2SCP or continue processing the call.

N2SCP supports sending the following IEs in RRBCSME:

Attribute	Tag	Type	Notes
bcsmeEvents	0	Sequence Of BCSMEvent (Sequence)	Supported as below Service logic & configuration
.eventTypeBCSM	0	EventTypeBCSM (Enumerated)	Supported
.monitorMode	1	MonitorMode (Enumerated)	Supported Values: <ul style="list-style-type: none"> 0 = interrupted 1 = notifyAndContinue 2 = transparent All values are supported
.legID	2	LegID (Choice)	Supported as below
.sendingSideID	0	LegType (Octet String)	Supported
.receivingSideID	1	LegType (Octet String)	Never present
.dpSpecificCriteria	30	DpSpecificCriteria (Sequence)	Supported as below
.applicationTimer	1	ApplicationTimer (Integer)	Supported Unit = seconds
.midCallControlInfo	2	MidCallControlInfo (Sequence)	Never present CAP 4 only
.dpSpecificCriteriaAlt	3	DpSpecificCriteriaAlt (Sequence)	Never present CAP 4 only
.automaticRearm	50	Null	Never present CAP 4 only
extensions	2	Extensions	Never present

Table 19: CAP/INAP RRBCSME IEs

4.20.1 BCSM Event Arming

N2SCP's support for EventTypeBCSM EDP values is as follows:

Name	Value	Supported	Notes
collectedInfo	2	N	CAP 4 only
routeSelectFailure	4	Y	CAP 2, 3, and 4 only
oCalledPartyBusy	5	Y	CAP 2, 3, and 4 only
oNoAnswer	6	Y	CAP 2, 3, and 4 only
oAnswer	7	Y	
oMidCall	8	N	CAP 4 only
oDisconnect	9	Y	
oAbandon	10	Y	CAP 2, 3, and 4 only
tBusy	13	Y	CAP 2, 3, and 4 only
tNoAnswer	14	Y	CAP 2, 3, and 4 only
tAnswer	15	Y	
tMidCall	16	N	CAP 4 only

tDisconnect	17	Y	
tAbandon	18	Y	CAP 2, 3, and 4 only
oTermSeized	19	N	CAP 4 only
callAccepted	27	N	CAP 4 only
oChangeOfPosition	50	N	CAP 4 only
tChangeOfPosition	51	N	CAP 4 only
oServiceChange	52	N	CAP 4 only
tServiceChange	53	N	CAP 4 only

Table 20: CAP/INAP RRBCSME EventTypeBCSM Values

N2SCP will arm BCSM events with monitor mode notifyAndContinue (EDP-N) or interrupted (EDP-R) for charged calls as follows:

Event	Leg	CAP 1 MOC/MFC	CAP 1 MTC	CAP 2/3/4 MOC/MFC	CAP 2/3/4 MTC
routeSelectFailure	2			EDP-R	
oCalledPartyBusy	2			EDP-R	
oNoAnswer	2			EDP-R	
oAnswer	2	EDP-N		EDP-N	
oDisconnect	1	EDP-N		EDP-N	
oDisconnect	2	EDP-R		EDP-R	
oAbandon	1			EDP-N	
tBusy	2				EDP-R
tNoAnswer	2				EDP-R
tAnswer	2		EDP-N		EDP-N
tDisconnect	1		EDP-N		EDP-N
tDisconnect	2		EDP-R		EDP-R
tAbandon	1				EDP-N

Table 21: CAP/INAP Charged Call RRBCSME BCSM Event Arming

N2SCP will arm BCSM events with monitor mode notifyAndContinue (EDP-N) or interrupted (EDP-R) for attempt terminate calls as follows:

Event	Leg	CAP 1 MOC/MFC	CAP 1 MTC	CAP 2/3/4 MOC/MFC	CAP 2/3/4 MTC
routeSelectFailure	2			EDP-R	
oCalledPartyBusy	2			EDP-R	
oNoAnswer	2			EDP-R	
oAnswer	2	EDP-N		EDP-N	
oDisconnect	1				
oDisconnect	2				
oAbandon	1			EDP-N	
tBusy	2				EDP-R
tNoAnswer	2				EDP-R
tAnswer	2		EDP-N		EDP-N

tDisconnect	1				
tDisconnect	2				
tAbandon	1				EDP-N

Table 22: CAP/INAP Attempt Terminate Call RRBCSME BCSM Event Arming

4.20.2 ReturnError

N2SCP does not support ReturnError for RRBCSME.

4.21 ResetTimer

The CAP/INAP ResetTimer operation can be sent from N2SCP to the MSC to instruct the MSC to reset a specific timer. This may be necessary [for example] during interaction, to avoid t_{ssf} expiring.

ResetTimer is only defined for CAP 2, 3, and 4.

N2SCP supports sending the following IEs in ResetTimer:

Attribute	Tag	Type	Notes
timerID	0	TimerID (Enumerated)	Supported Values: <ul style="list-style-type: none"> 0 = tssf All values are supported Service configuration
timerValue	1	TimerValue (Integer)	Supported Service configuration
extensions	2	Extensions	Never present
callSegmentID	3	CallSegmentID (Integer)	Never present

Table 23: CAP/INAP ResetTimer IEs

4.21.1 ReturnError

N2SCP does not support ReturnError for ResetTimer.

4.22 SpecializedResourceReport

The CAP/INAP SpecializedResourceReport (SRR) operation may be sent from the SRF to N2SCP during interaction, depending on the PlayAnnouncement or PromptAndCollectUserInformation IE values. It indicates the successful commencement of playback for the first announcement, or completion of playback for the last announcement.

SRR is only defined for CAP 2, 3, and 4.

The content of an SRR is defined by SpecializedResourceReportArg, which has varying definitions.

N2SCP supports the CAP 2-and-3 and CAP 4 variants of the SpecializedResourceReportArg structure.

4.22.1 CAP 2 And 3 SpecializedResourceReportArg

The CAP 2-and-3 SpecializedResourceReportArg is a Null value.

4.22.2 CAP 4 SpecializedResourceReportArg

The CAP 4 SpecializedResourceReportArg is a Choice.

N2SCP supports receiving the following IEs in the CAP 4 SpecializedResourceReportArg:

Attribute	Tag	Type	Notes
allAnnouncementsComplete	50	Null	Ignored
firstAnnouncementStarted	51	Null	Ignored

Table 24: CAP 4 SpecializedResourceReportArg IEs

4.23 Extension Support

Many CAP/INAP operations are extensible. N2SCP generally does not support any extensions, with specific exceptions.

4.23.1 Extensions Type

The Extensions IE type is defined as a Sequence Of ExtensionField, where ExtensionField is a Sequence with the following IEs:

Attribute	Type	Notes
type	Code (Integer)	Supported Service configuration & logic
criticality	CriticalityType (Enumerated)	Supported Values: <ul style="list-style-type: none"> ignore abort Service configuration & logic
value	-	Encoding is operator/vendor-specific Service configuration & logic

Table 25: CAP/INAP ExtensionField IEs

4.23.2 Language ID Extension

N2SCP supports sending a "Language ID" extension in PlayAnnouncement (PA) and PromptAndCollectUserInformation (PACUI) operations. The intention of the extension is to enable the receiving SRF to select and play a language-appropriate version of the announcement or prompt to the connected subscriber.

At this time, the only supported value encoding is the "NAP" encoding, which is encoded as follows:

- SEQUENCE (Universal)
 - **LanguageID** (Tag=0/Context, Implicit Integer, Mandatory)
 - **Extras** (Tag=1/Context, Implicit Sequence, Mandatory)
 - **Extra0** (Tag=0/Context, Implicit Integer, Optional)
 - **Extra1** (Tag=1/Context, Implicit Integer, Optional)
 - **Extra2** (Tag=2/Context, Implicit Integer, Optional)
 - **Extra3** (Tag=3/Context, Implicit Integer, Optional)

The language identifier can be found in the *LanguageID* IE. The mandatory *Extras* IE is included, but its sub-IEs are never present.

5 Extended Data Types

5.1 Introduction

Many of the information elements referenced in the supported CAP/INAP operations described herein are themselves complex datatypes defined by other standards such as MAP ([R-3GPP-MAP-CAP1], [R-ETSI-MAP-CAP1], [R-3GPP-MAP-CAP2], [R-ETSI-MAP-CAP2], [R-3GPP-MAP-CAP3], [R-ETSI-MAP-CAP3], [R-3GPP-MAP-CAP4], [R-ETSI-MAP-CAP4]) or ISUP ([R-ETSI-ISUP-BS], [R-ITU-ISUP-P3]).

In general, the N2SCP supports access and setting of all datatype sub-parameters, however there are some cases where limitations apply as described here.

5.2 TBCD String

TBCD String is a MAP data type that is supported with fields:

- Digits

Supported in:

- Inbound CAP/INAP InitialDP
 - IMSI
 - InitialDPArgExtension.forwardingDestinationNumber.iMEI

5.3 BCD Digits

BCD Digits is supported with fields:

- Digits

Supported in:

- Inbound CAP/INAP InitialDP
 - timeAndTimezone
- Outbound CAP/INAP PlayAnnouncement
 - InformationToSend.inbandInfo.variableMessage.variableParts.date
 - InformationToSend.inbandInfo.variableMessage.variableParts.time
 - InformationToSend.inbandInfo.variableMessage.variableParts.price
- Outbound CAP/INAP PromptAndCollectUserInformation
 - InformationToSend.inbandInfo.variableMessage.variableParts.date
 - InformationToSend.inbandInfo.variableMessage.variableParts.time
 - InformationToSend.inbandInfo.variableMessage.variableParts.price

5.4 LAI Fixed Length

LAI Fixed Length is a MAP data type that is supported with fields:

- MCC
- MNC
- LAC

Supported in:

- Inbound CAP/INAP InitialDP

- locationInformation.cellIdOrLAI.laiFixedLength
- locationInformation.cellGlobalIdOrServiceAreaIdOrLAI.laiFixedLength

5.5 Cell Global ID or Service Area ID Fixed Length

Cell Global ID or Service Area ID Fixed Length is a MAP data type that is supported with fields:

- MCC
- MNC
- LAC
- CI

Supported in:

- Inbound CAP/INAP InitialDP
 - locationInformation.cellIdOrLAI.cellIdFixedLength
 - locationInformation.cellGlobalIdOrServiceAreaIdOrLAI.cellGlobalIdOrServiceAreaIdFixedLength

5.6 Address String

Address String is a MAP data type that is supported with fields:

- Digits
- NoA
- NPI

Supported in:

- Inbound CAP/INAP InitialDP
 - locationInformation.vlr-number
 - locationInformation.msc-Number
 - mscAddress
 - calledPartyBCDNumber
 - initialDPArgExtension.gsmcAddress

5.7 Location Number

Location Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- INN
- NPI
- PRI
- SI

Supported in:

- Inbound CAP/INAP InitialDP
 - locationNumber
 - locationInformation.locationNumber

5.8 Generic Number

Generic Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- NQI
- NI
- NPI
- PRI
- SI

Supported in:

- Inbound CAP/INAP InitialDP
 - additionalCallingPartyNumber
- Outbound CAP/INAP AssistRequestInstructions
 - correlationID
- Outbound EstablishTemporaryConnection
 - assistingSSIPRoutingAddress

5.9 Redirection Information

Redirection Information is an ISUP data type that is supported with fields:

- IND
- ORIG
- NUM
- NAT
- Reason

Supported in:

- Inbound CAP/INAP InitialDP
 - redirectionInformation
- Outbound CAP/INAP Connect
 - redirectionInformation

5.10 Redirecting Number

Redirecting Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- NPI
- PRI

Supported in:

- Inbound CAP/INAP InitialDP
 - redirectingPartyID
- Outbound CAP/INAP Connect
 - redirectingPartyID

5.11 Original Called Number

Original Called Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- NPI
- PRI

Supported in:

- Inbound CAP/INAP InitialDP
 - originalCalledPartyID
- Outbound CAP/INAP Connect
 - originalCalledPartyID

5.12 Calling Party Number

Calling Party Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- NI
- NPI
- PRI
- SI

Supported in:

- Inbound CAP/INAP InitialDP
 - callingPartyNumber

5.13 Called Party Number

Called Party Number is an ISUP data type that is supported with fields:

- Digits
- NoA
- INN
- NPI

Supported in:

- Inbound CAP/INAP InitialDP
 - calledPartyNumber
 - initialDPArgExtension.forwardingDestinationNumber
- Outbound CAP/INAP Connect
 - destinationRoutingAddress

5.14 Cause

Cause is an ISUP data type that is supported with fields:

- Cause (integer)
- Standard
- Location

Supported in:

- Inbound CAP/INAP CallInformationReport
 - requestedInformationList.requestedInformationValue.releaseCauseValue
- Inbound CAP/INAP EventReportBCSM
 - tBusySpecificInfo.busyCause
 - routeSelectFailureSpecificInfo.failureCause
 - oCalledPartyBusySpecificInfo.busyCause
 - oDisconnectSpecificInfo.releaseCause
 - tDisconnectSpecificInfo.releaseCause
- Inbound CAP/INAP InitialDP
 - cause
- Outbound CAP/INAP ReleaseCall
 - initialCallSegment

5.15 Generic Digits

Generic Digits is an ISUP data type that is supported with fields:

- Digits
- Scheme
 - 0 = BCD even (supported)
 - 1 = BCD odd (supported)
 - 2 = IA5 (supported)
 - Other Schemes are not supported.
- Type

Supported in:

- Inbound CAP/INAP PromptAndCollectUserInformation-Result
 - digitsResponse
- Outbound CAP/INAP EstablishTemporaryConnection
 - correlationID
- Outbound CAP/INAP PlayAnnouncement
 - InformationToSend.inbandInfo.variableMessage.variableParts.number
- Outbound CAP/INAP PromptAndCollectUserInformation
 - InformationToSend.inbandInfo.variableMessage.variableParts.number

6 CAMEL 2+ Message Flows

6.1 Introduction

This section provides diagrams for CAMEL 2 (or later) message flows comprising the super-set of flows supported by applications implemented using the N2SCP framework.

Except where expressly indicated, the flows in this section 5 do not apply to CAMEL 1. The flows specific to CAMEL 1 flows are described separately in the subsequent chapter.

The labelling for these flows denotes the “N2DSG” (N-Squared Diameter Signalling Gateway) endpoint. The N2DSG-SCP application is one of the applications built on the N2SCP framework and is selected here because it is relevant to the complete set of call flow diagrams.

Not all flows are applicable to all applications. For example, the charging flows will not be applicable to a Number Portability application, etc.

Refer to the application configuration in the product technical guide – for example: [R-N2-ACD-TG], [R-N2-DSG-TG], [R-N2-NP-TG] - for a detailed description of configuration parameters which can control operation and operation parameter behavior for these call flows.

These flow diagrams are also available in a separate ZIP file in high-resolution PNG format.

6.2 Scenarios

For all call flows in this section, the call is originated by an inbound InitialDP operation from the MSC to the SCP. Outbound-initiated calls are not currently supported by any N2SCP-based application.

When an application using the N2SCP framework permits a call to proceed, it uses one of three different scenarios.

- A. Unconditional Terminate
- B. Attempt Terminate
- C. Charged

In all scenarios A-C, the service may use a CAP/INAP Connect operation or CAP/INAP Continue as applicable. Alternatively, a call may be denied. Interaction may occur before and/or after the call.

6.3 TCAP Transactions

For all call flows in this section, the N2SCP framework may perform call shutdown using TCAP Abort in the case of non-recoverable call error.

TCAP Application Context interaction is not shown. Please refer to the service documentation for information on handling and return of TCAP Application Contexts.

Unless expressly indicated otherwise within this document or within the application technical guide, when the flow indicates that the N2SCP framework sends multiple outbound CAP/INAP operations consecutively, they will be bundled within a single TCAP message.

6.4 [A] Unconditional Terminate

The following flow is used to provide an unconditional response to a call request from the MSC. There is no subsequent monitoring or control. The service does not know if the A-party was connected by speech path to the B-party or not.

- RequestReportBCSMEvent is not applicable.
- CallInfoRequest is not applicable.
- ApplyCharging is not applicable.
- The service may use FurnishChargingInformation.
- The service may use pre-call interaction.

This scenario is typically used by:

- N2DSG for emergency number handling.
- N2NP for number portability translation.
- N2ACD for number translation without sequential hunting.

Refer to the service-specific documentation ([R-N2-DSG-TG], [R-N2-NP-TG], [R-N2-ACD-TG]) to determine if FCI or Interaction features apply.

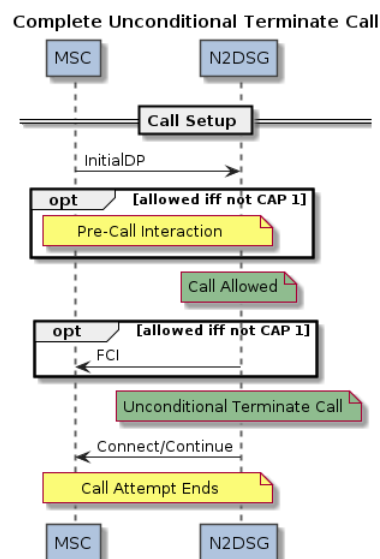


Figure A - CAP/INAP Flow (Unconditional Terminate)

6.5 [B] Attempt Terminate

The following flow is used to provide a conditional response to a call request from the MSC. The service will monitor and register the success or failure of the A-party to B-party speech path connection.

If call information is enabled, it may also wait until the call is over and record additional call information such as the talk time.

- RequestReportBCSMEvent is performed (but not for disconnect).
- ApplyCharging is not applicable.
- The service may use CallInformationRequest.
- The service may use FurnishChargingInformation.
- The service may use pre-call interaction.

This scenario is typically used by:

- N2ACD for number translation with sequential hunting.

Refer to the service-specific documentation ([R-N2-ACD-TG]) to determine which optional features apply.

6.5.1 Attempt Terminate Setup

All Attempt Terminate scenarios begin with the following flow:

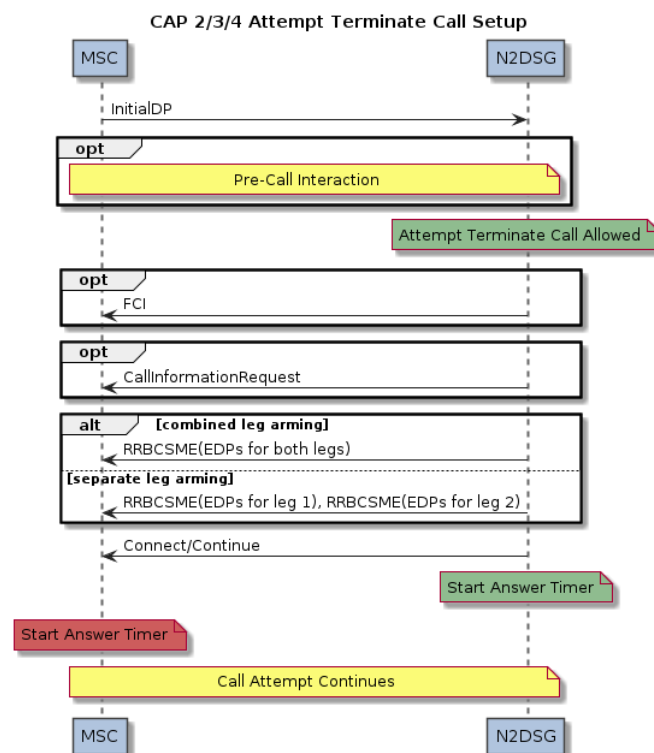


Figure B - CAP/INAP Flow (Attempt Terminate Setup)

6.5.2 Attempt Terminate RouteSelectFailure, Busy, NoAnswer, Abandon

The following flow is for RouteSelectFailure.

[End Of] CAP 2/3/4 Attempt Terminate Call, Route Select Failure

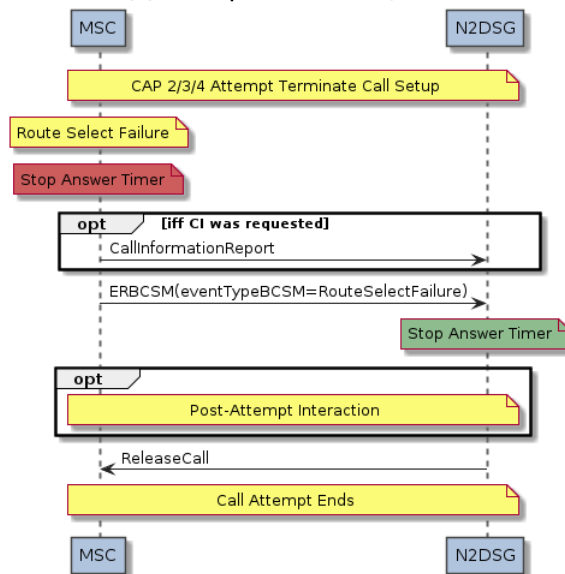


Figure C - CAP/INAP Flow (Attempt Terminate RSF)

Forwarding information is optionally supplied in CAMEL terminating BCSM variants on Busy.

[End Of] CAP 2/3/4 Attempt Terminate Call, B-Party Busy

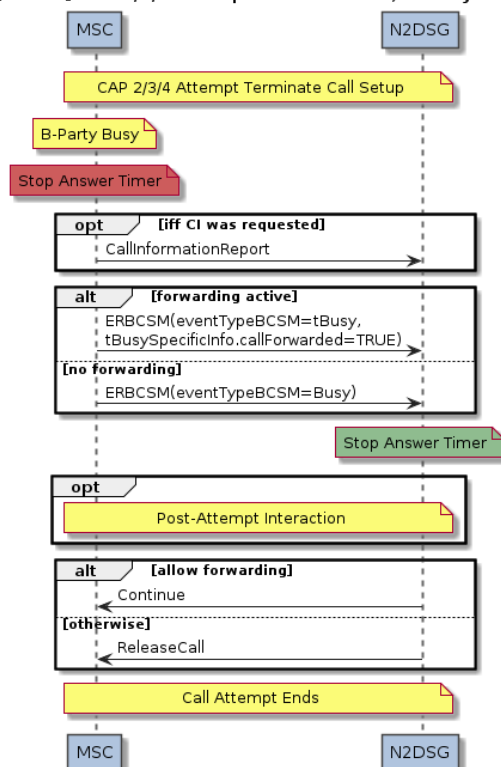


Figure D - CAP/INAP Flow (Attempt Terminate Busy)

Forwarding information is optionally supplied in CAMEL terminating BCSM variants on NoAnswer.

[End Of] CAP 2/3/4 Attempt Terminate Call, B-Party No Answer

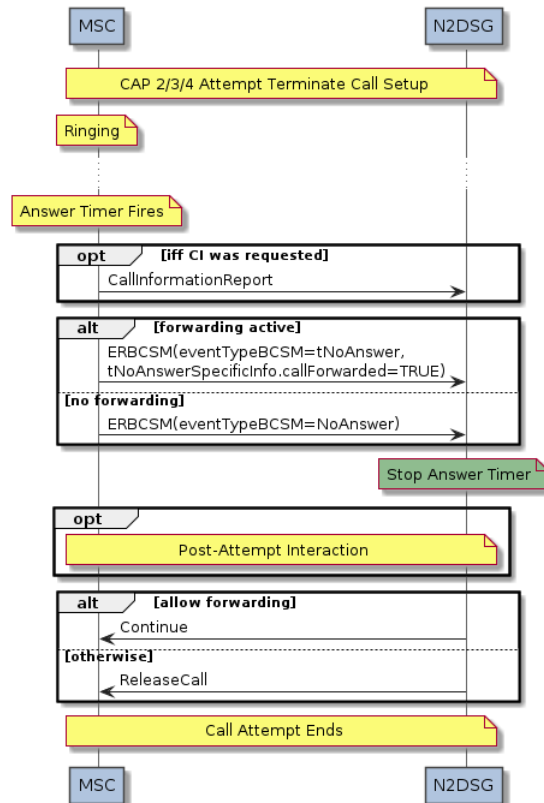


Figure E - CAP/INAP Flow (Attempt Terminate NoAnswer)

The following flow shows where the caller abandons before answer.

[End Of] CAP 2/3/4 Attempt Terminate Call, A-Party Abandon

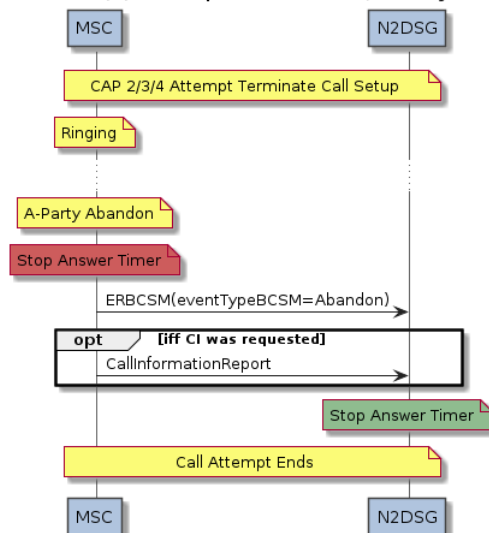


Figure F - CAP/INAP Flow (Attempt Terminate Abandon)

6.5.3 Attempt Terminate Answer

The following flow is where the Answer is received as expected.

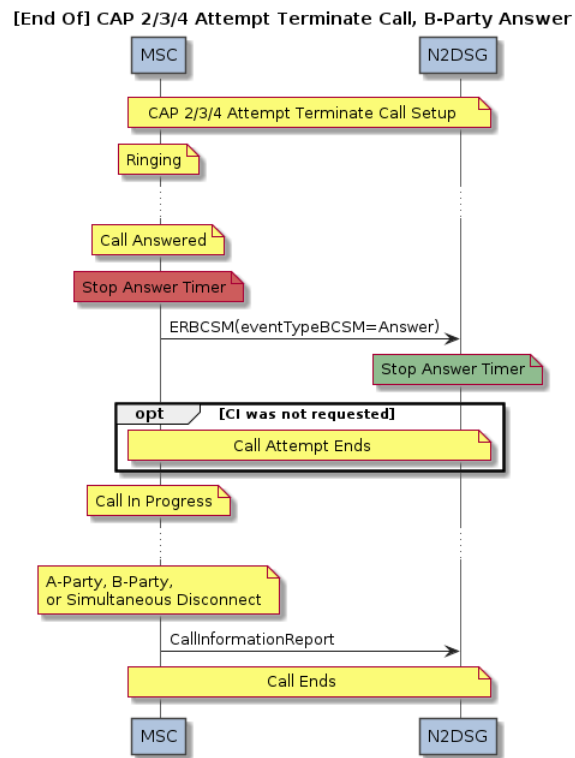


Figure G - CAP/INAP Flow (Attempt Terminate Answer)

6.6 [C] Charged Calls

6.6.1 Charged Setup

The Charged call scenario is used for services such as N2DSG-SCP which are performing a real-time balance control and charging function.

- RequestReportBCSMEvent is performed.
- ApplyCharging is performed.
- The service may use CallInformationRequest.
- The service may use FurnishChargingInformation.
- The service may use pre-call and/or post-call interaction.

This scenario is typically used by:

- N2DSG for real-time control of charged calls.

Refer to the service-specific documentation ([R-N2-DSG-TG]) to determine which optional features apply.

The following flow shows the setup for a Charged call.

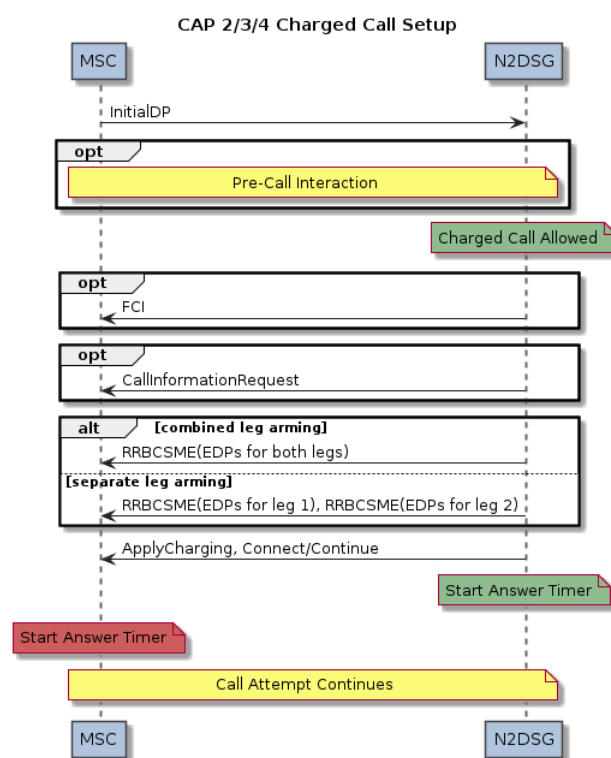


Figure H - CAP/INAP Flow (Charged Setup)

6.6.2 Charged RouteSelectFailure, Busy, NoAnswer, Abandon

The following flow is for RouteSelectFailure.

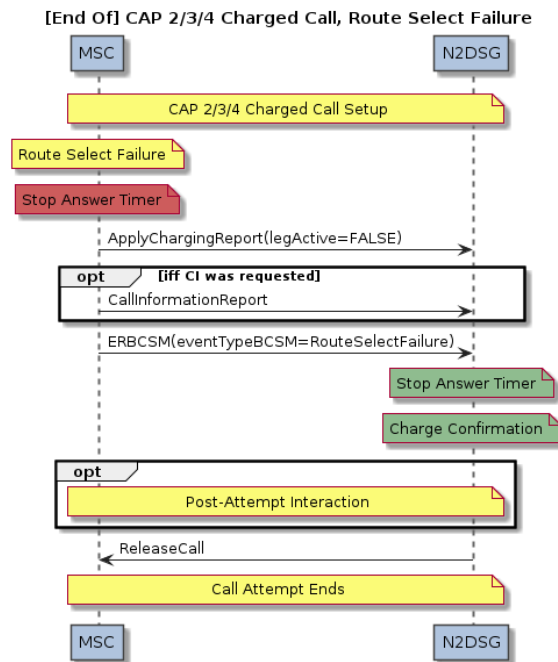


Figure I - CAP/INAP Flow (Charged RSF)

Forwarding information is optionally supplied in CAMEL terminating BCSM variants on Busy.

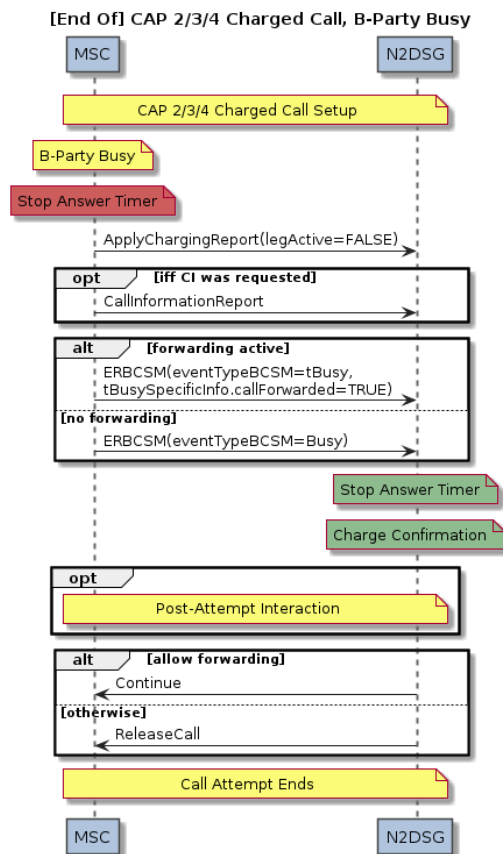


Figure J - CAP/INAP Flow (Charged Busy)

Forwarding information is optionally supplied in CAMEL terminating BCSM variants on NoAnswer.

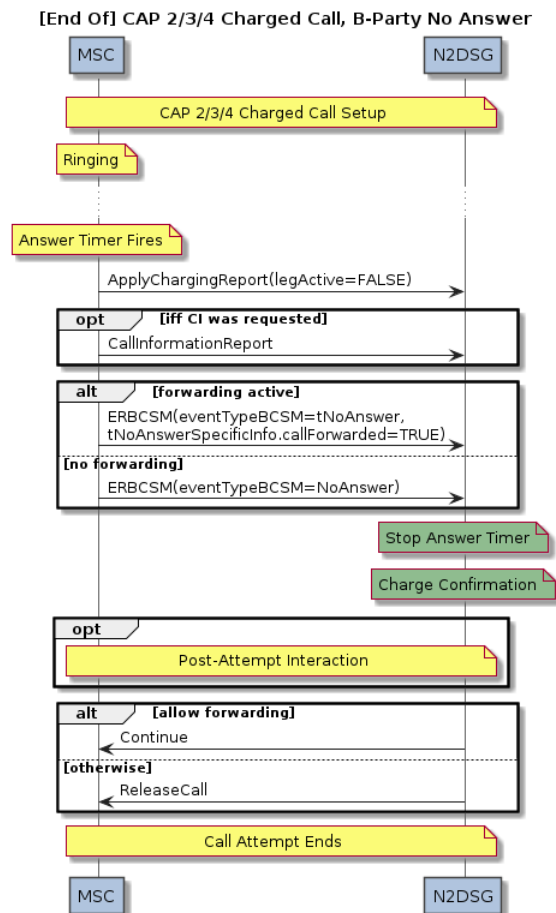


Figure K - CAP/INAP Flow (Charged NoAnswer)

The following flow shows where the caller abandons before answer.

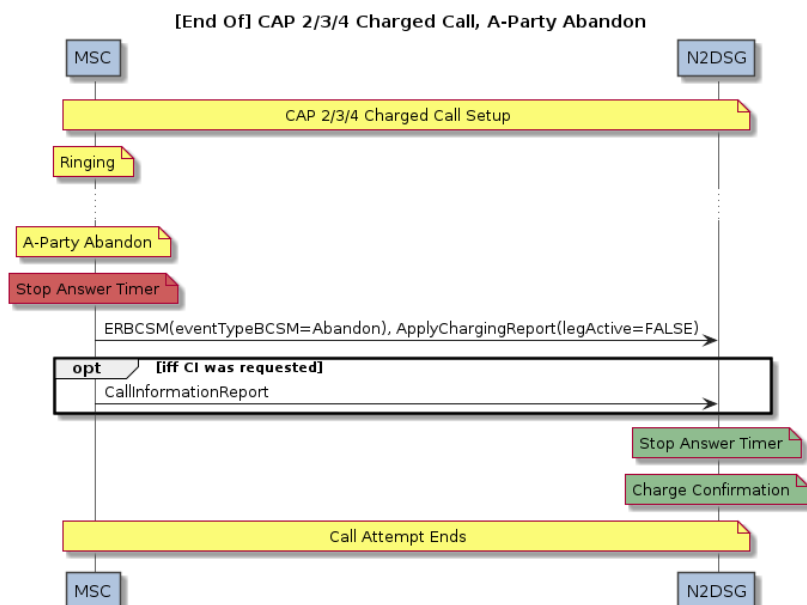


Figure L - CAP/INAP Flow (Charged Abandon)

6.6.3 Charged Extension (Allowed or Denied)

During a charged call, the MSC will periodically request that the call be extended.

If the extension is allowed, then the following flow applies:

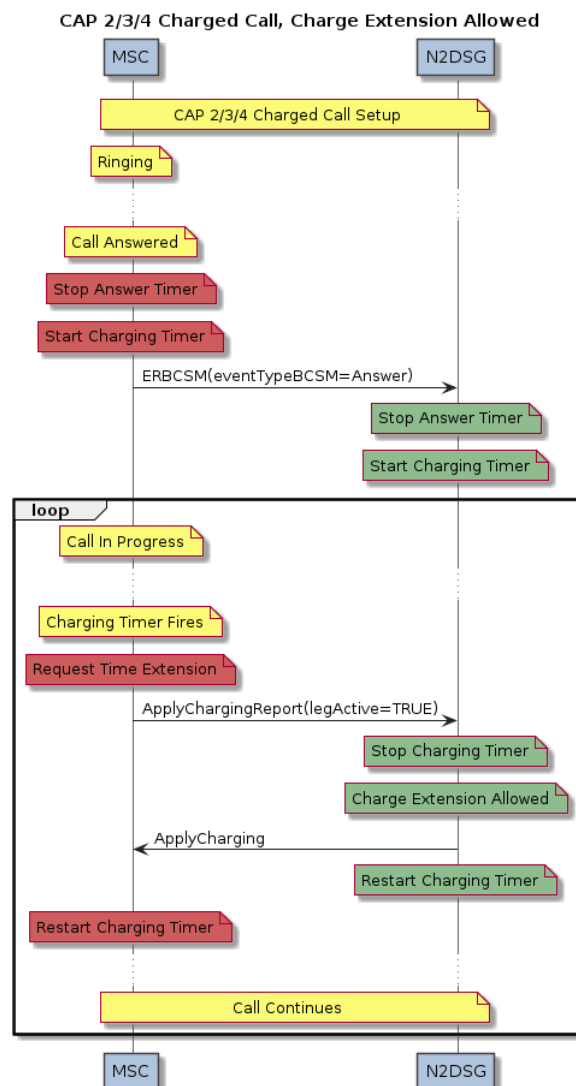


Figure M - CAP/INAP Flow (Charged Call Extension Allowed)

The above “Extension Allowed” process may occur none or more times during a charged call.

Note that the use of ActivityTest is optional and is described separately (not shown in this diagram).

The service may, of course, deny the extension – in which case the following flow applies.

[End Of] CAP 2/3/4 Charged Call, Charge Extension Denied

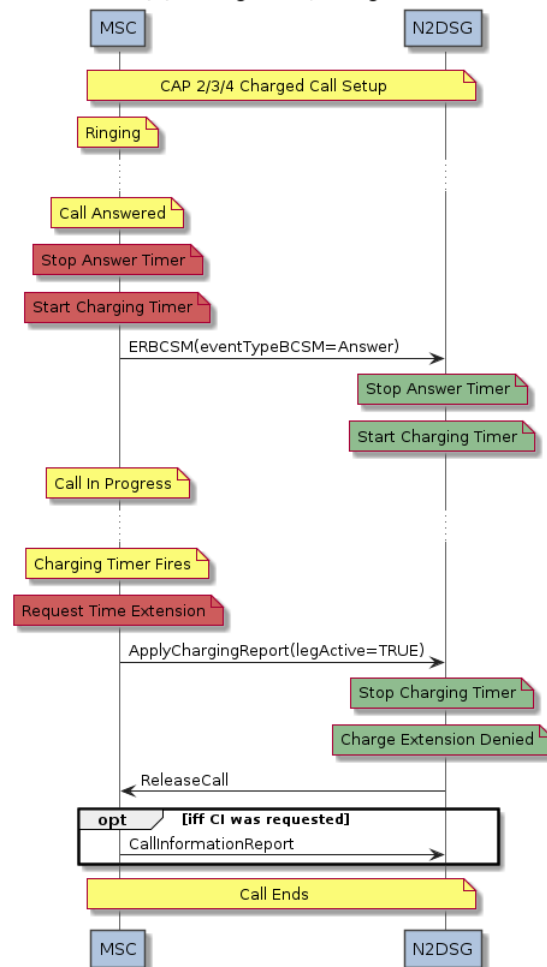


Figure N - CAP/INAP Flow (Extension Denied)

6.6.4 Charged End of Call (Network-Initiated)

The following series of flows define the N2SCP service support for end of call scenarios that are initiated by the network either due to subscriber disconnect, or expiry of the final ApplyCharging.

The first flow is the A-Party (Leg 1) Disconnect while the MSC is controlling the charge timer.

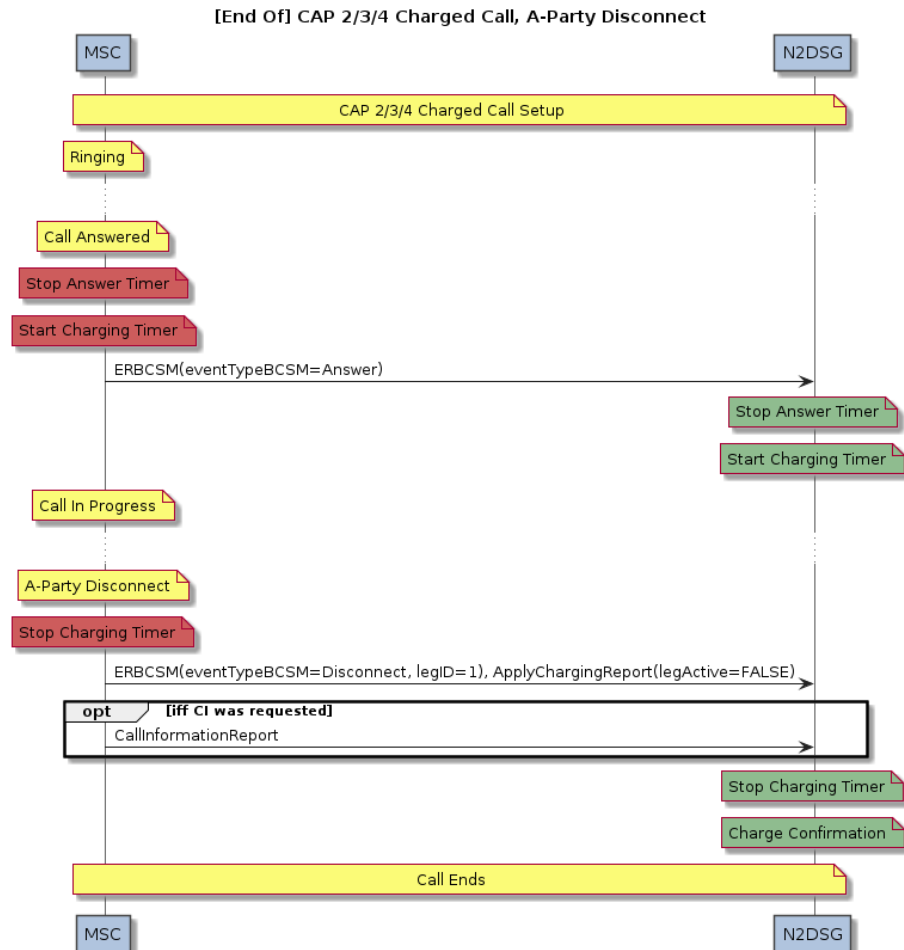


Figure O - CAP/INAP Flow (A-Party Disconnect)

This flow is a variant where the A-Party Disconnect is detected by the network during the brief interval while the service is processing the extension request. The disconnection is received by the service before the extension processing is complete.

[End Of] CAP 2/3/4 Charged Call, A-Party Disconnect While Awaiting Authorisation

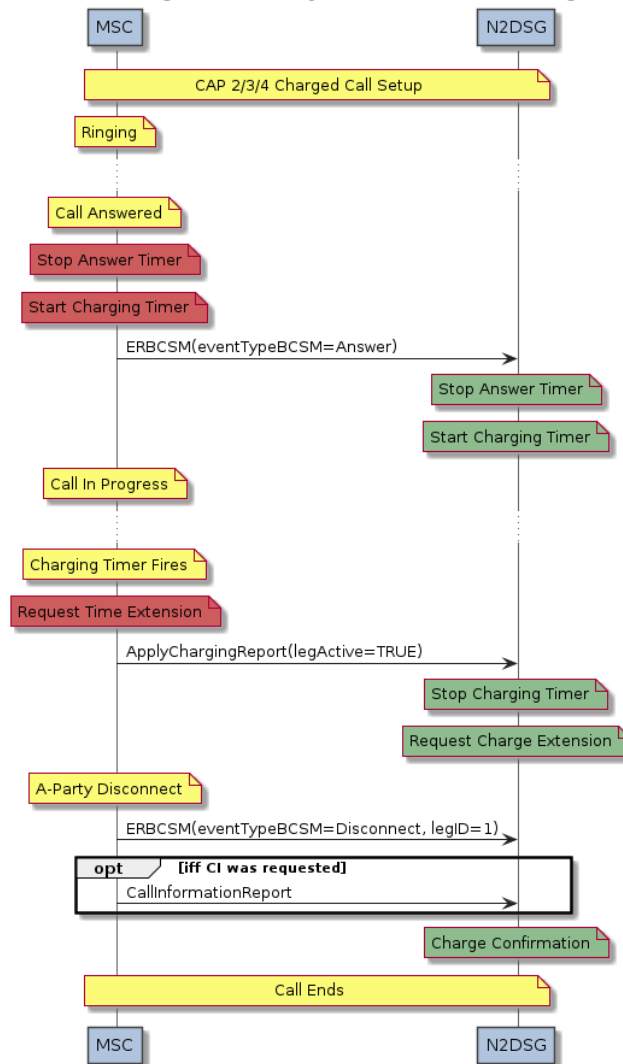


Figure P - CAP/INAP Flow (A-Party Disconnect Awaiting Authorization)

In the case of B-Party Disconnect, follow-on call interaction may occur. This flow shows the case where the B-Party disconnect occurs while the MSC is controlling the charge timer.

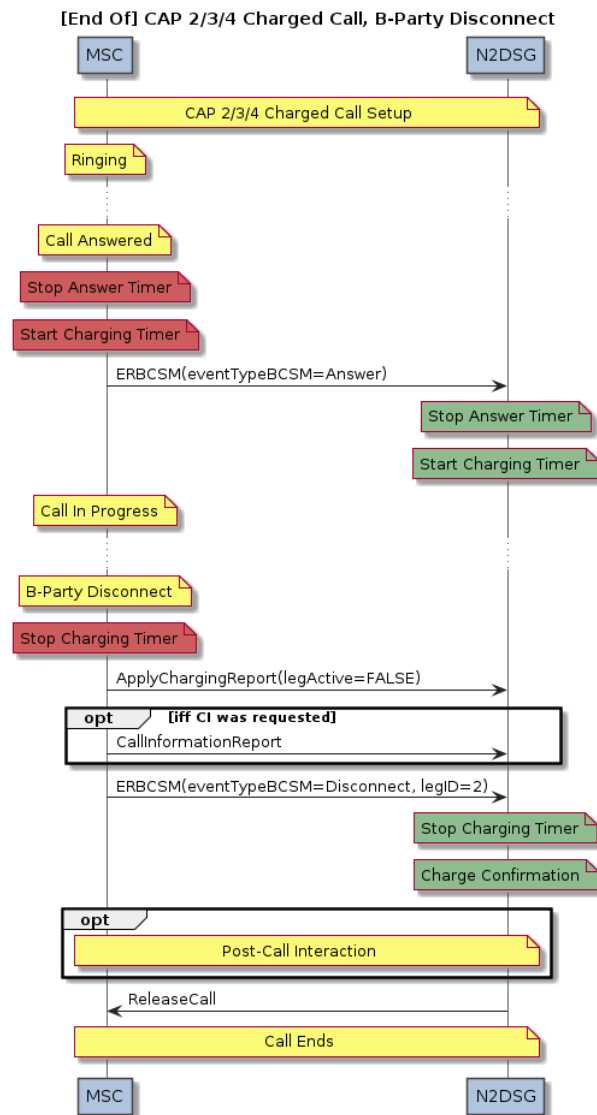


Figure Q - CAP/INAP Flow (B-Party Disconnect)

Similarly, there is a variant where the B-Party disconnect occurs during the brief interval while the MSC is waiting for the N2SCP to confirm or deny the call time extension.

[End Of] CAP 2/3/4 Charged Call, B-Party Disconnect While Awaiting Authorisation

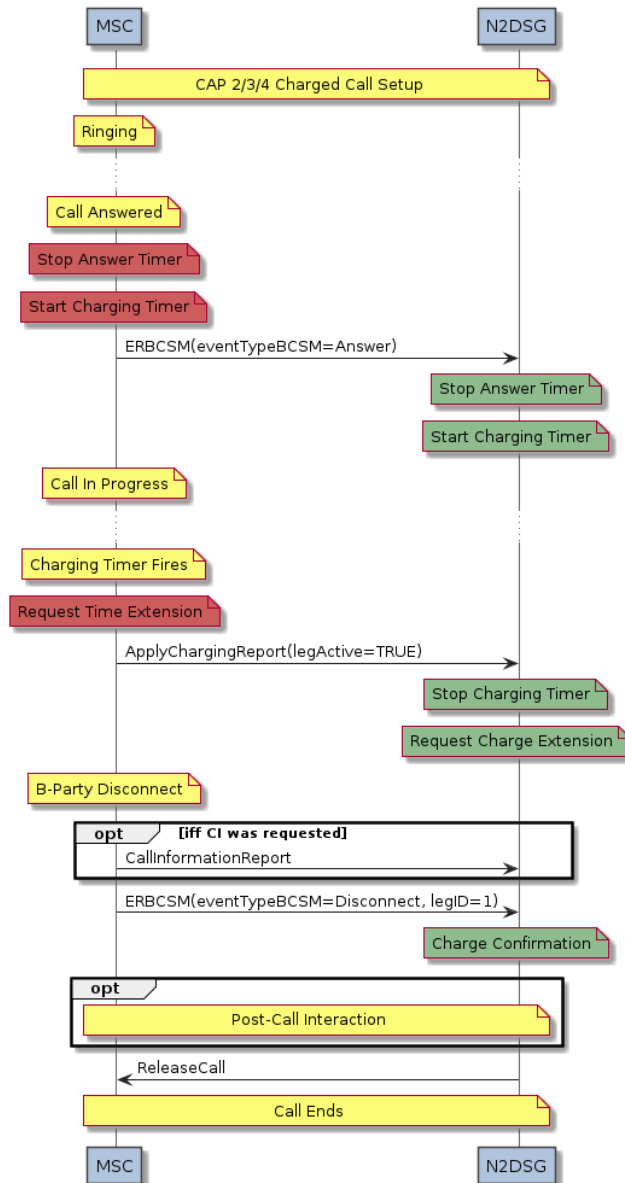


Figure R - CAP/INAP Flow (B-Party Disconnect Awaiting Authorization)

Some MSC will signal a “simultaneous disconnect” by reporting both A-party and B-party disconnect immediately. An N2SCP service will handle this when it occurs with the following flow:

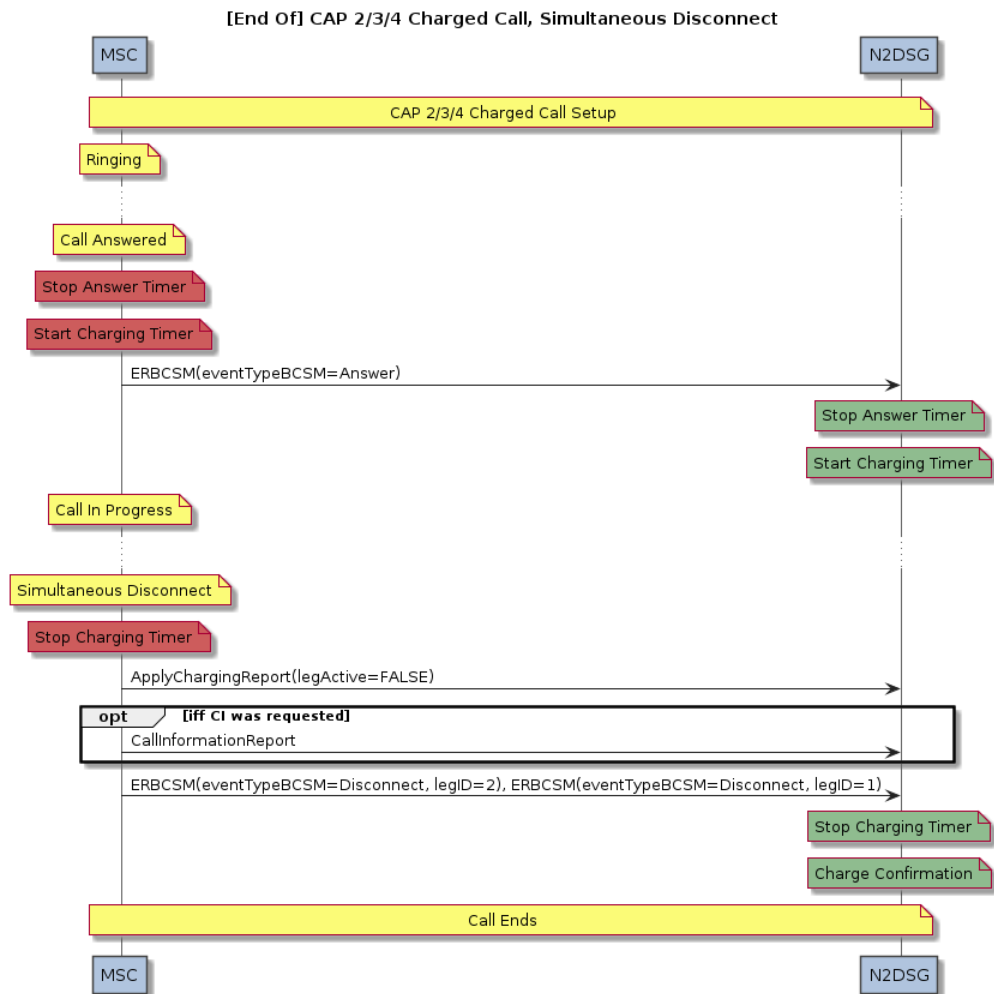


Figure S - CAP/INAP Flow (Simultaneous Disconnect)

Once again, there is a variant where “simultaneous disconnect” occurs during the brief interval when the SCP is controlling the call and performing the charged call extension logic. The flow is:

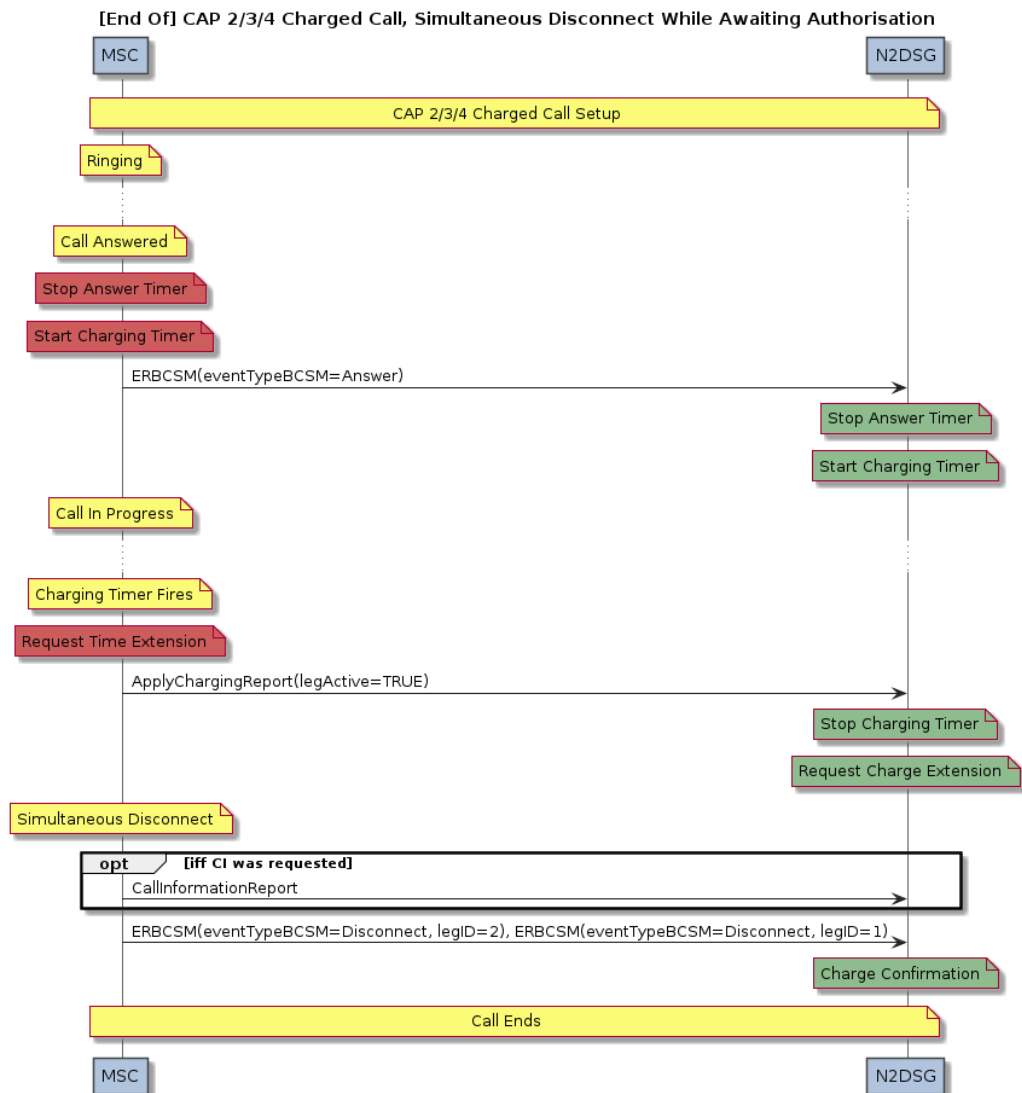


Figure T - CAP/INAP Flow (Simultaneous Disconnect Awaiting Authorization)

When the final TCP (Timer for Call Period) expires on the MSC, the MSC will forcefully release the call and will notify the N2SCP service logic that this has occurred, as shown in this flow:

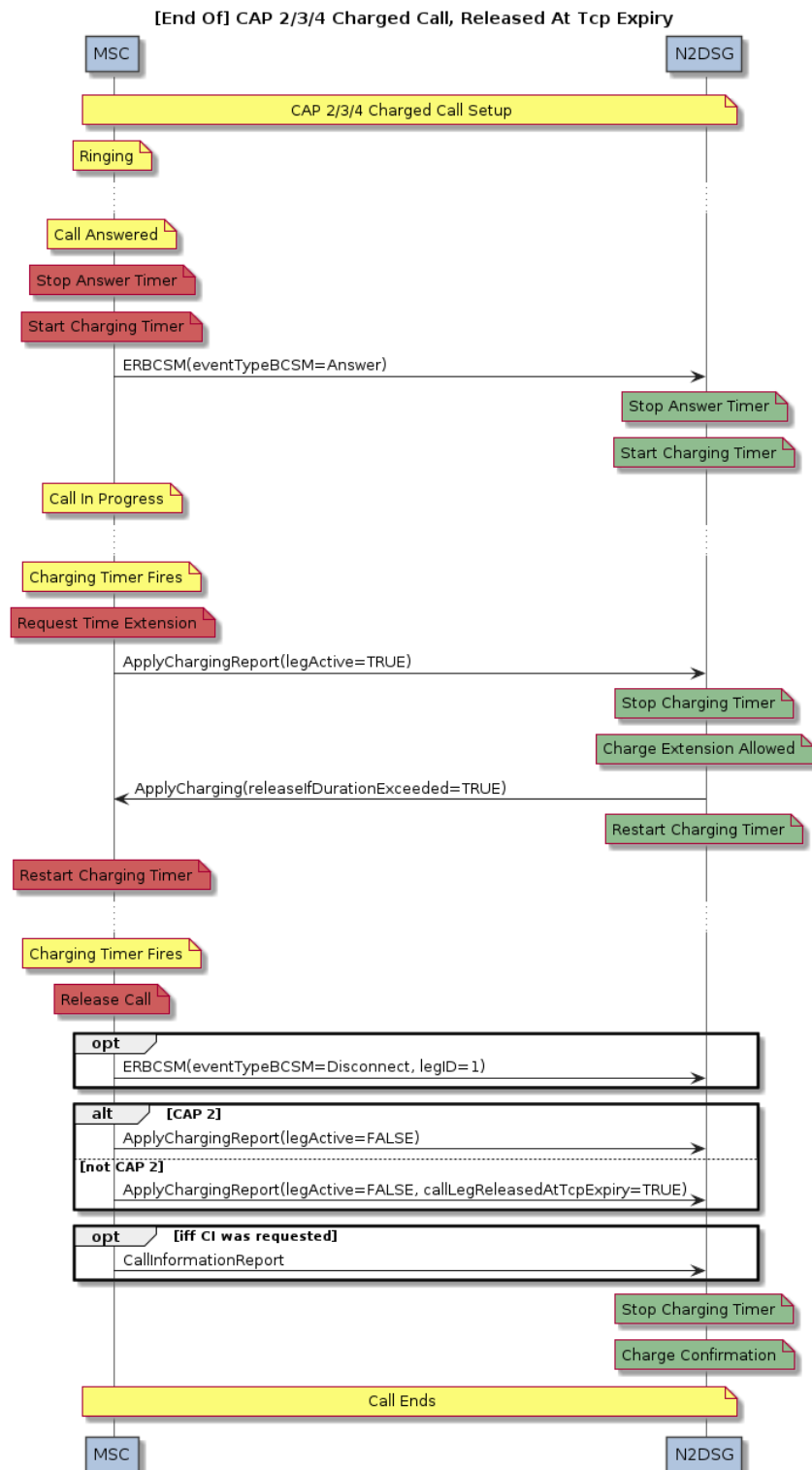


Figure U - CAP/INAP Flow (Released at Tcp Expiry)

6.7 Call Denied

The following flow is used to deny a call request from the MSC. There is no subsequent monitoring or control. Pre-call announcements are supported, but not post-call announcements.

CAP 2/3/4 Call Attempt Denied

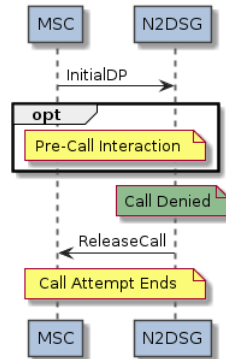


Figure V - CAP/INAP Flow (Call Attempt Denied)

6.8 Interaction

6.8.1 Integrated SRF

The following flow is supported for integrated (on-switch SRFs). Not applicable for CAP1.

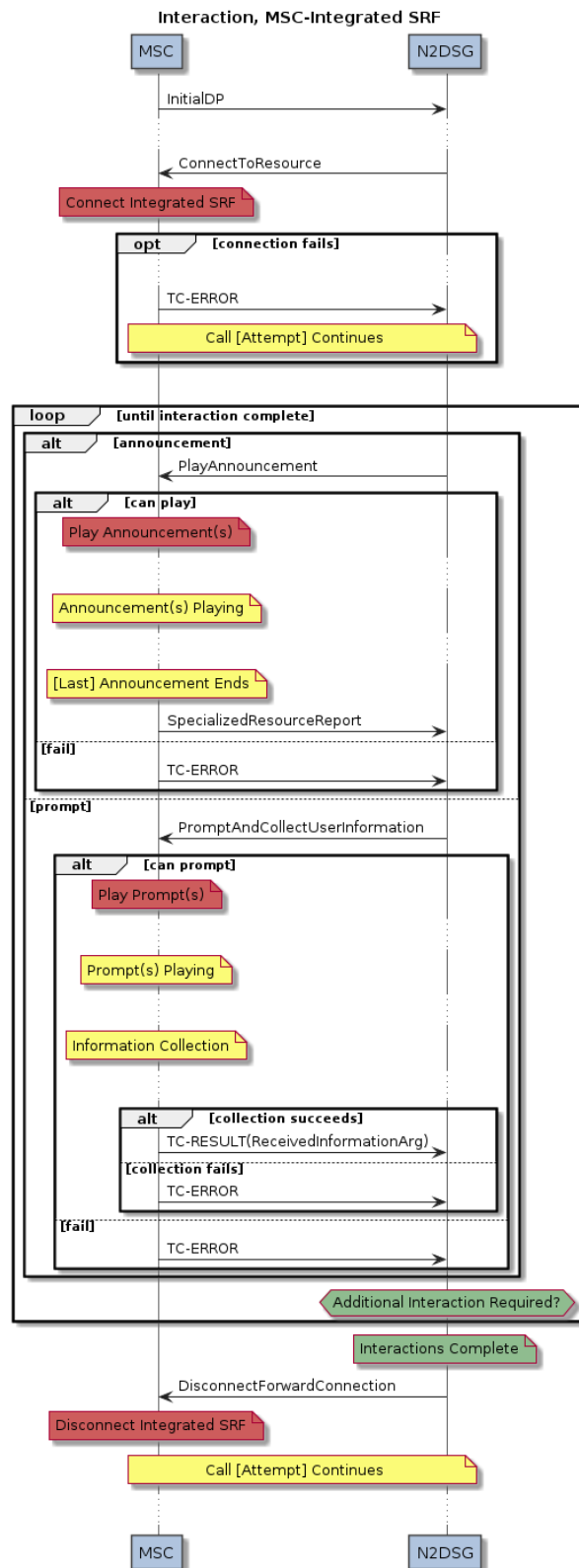


Figure W - CAP/INAP Flow (Interaction, Integrated SRF)

6.8.2 Assisting SRF

The following flow is supported for an assisting (of-switch) SRF. Not applicable for CAP1.

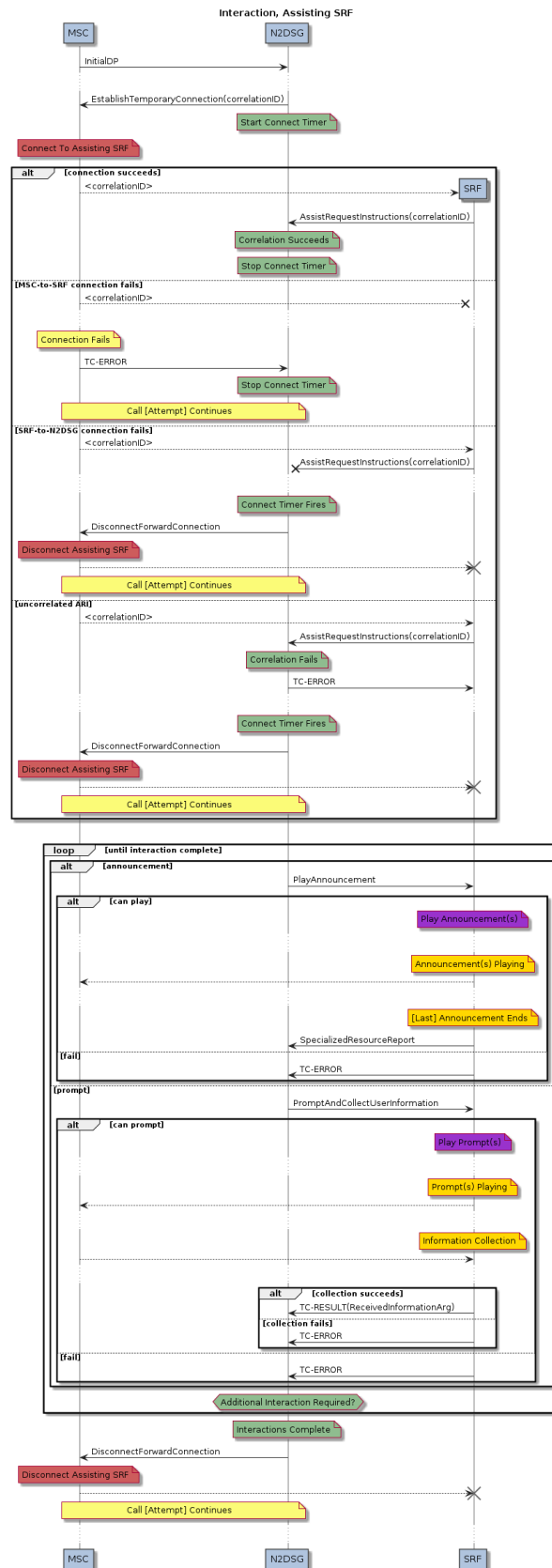


Figure X - CAP/INAP Flow (Interaction, Assisting SRF)

6.9 Lost Message Flows

In the general case where the N2SCP service expects a CAP/INAP operation, but it does not arrive within a reasonable timeframe, then the call processing logic will be terminated with a system log warning and a TC-ABORT on all open TCAP Transactions.

This section describes only exception handling flows where some form of recoverable handling is applicable.

6.9.1 Lost ERBCSM (Answer)

The following flow is the case where the EventReportBCSM (Answer) fails to arrive in the expected time.

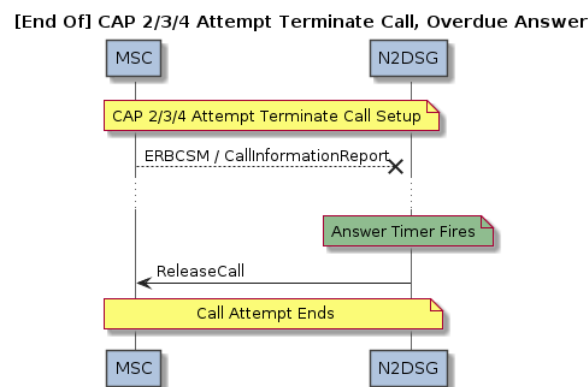


Figure Y - CAP/INAP Flow (Attempt Terminate Answer Lost)

6.9.2 Overdue ARI

Overdue ARI is recoverable.

6.10 Supplementary & Variant Flows

6.10.1 Split RRBCSME Arming

The N2SCP framework is configurable use either split or combined RRBCSME operations.

When split RRBCSME operations are configured, the RequestReportBCSM for leg1 and leg2 are sent in separate CAP/INAP operations (within a single TCAP-CONTINUE).

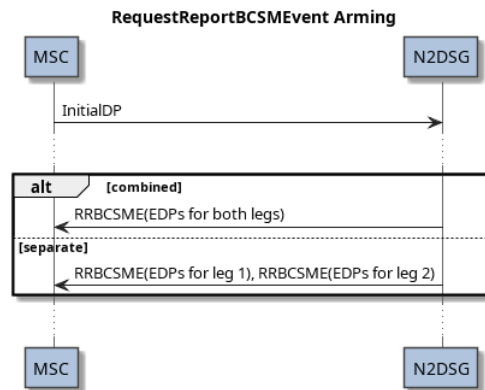


Figure Z - CAP/INAP Flow (RRBCSME Arming)

6.10.2 Activity Test (MSC)

The use of Activity Test (to the MSC only) may be enabled by some services and applies to calls of type Attempt Terminate (where CallInformationRequest is used but ApplyCharging is not used), or type Charged (where ApplyCharging is used, and CallInformationRequest is optional).

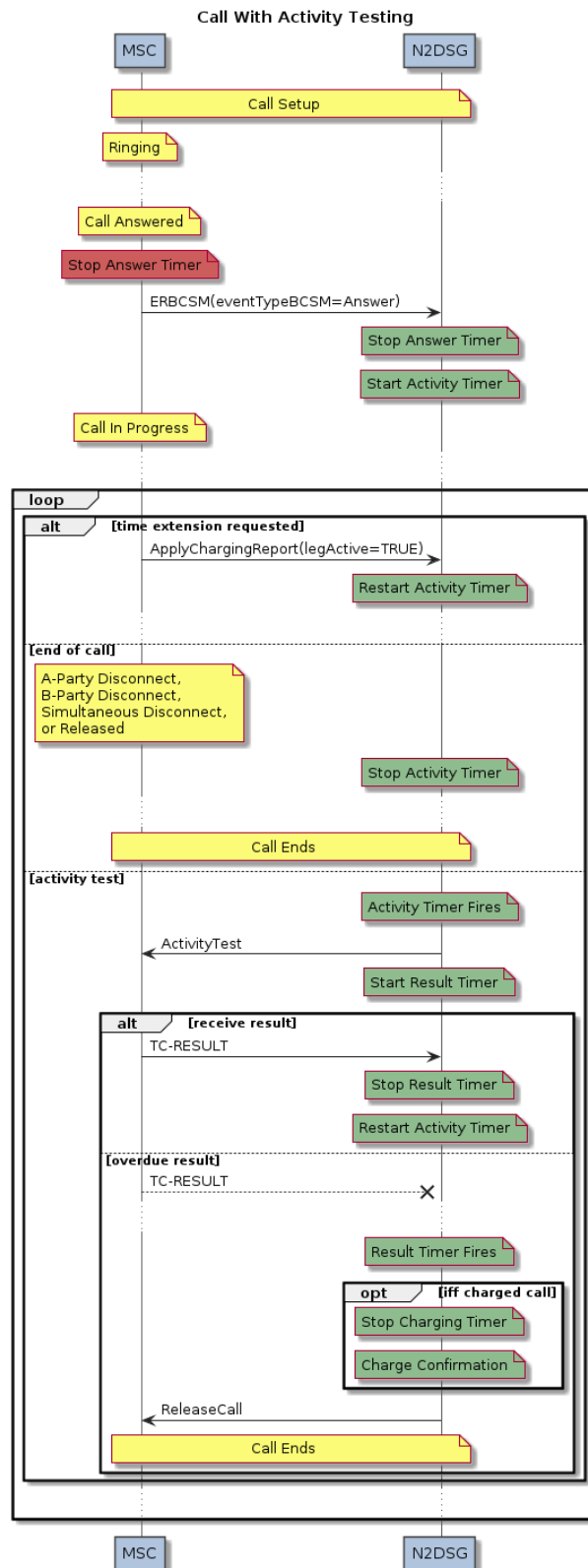


Figure AA - CAP/INAP Flow (Activity Test)

7 CAMEL 1 Message Flows

7.1 Introduction

This section provides diagrams for CAMEL 1 message flows comprising the super-set of flows supported by applications implemented using the N2SCP framework in conjunction with a CAMEL 1 MSC.

See also the general comments in 6.1 Introduction for CAMEL 2+ which also generally apply here.

7.2 Scenarios

For all call flows in this section, the call is originated by an inbound InitialDP operation from the MSC to the SCP. Outbound-initiated calls are not currently supported by any N2SCP-based application.

When an application using the N2SCP framework permits a call to proceed, it uses one of three different scenarios.

- A. Unconditional Terminate
- B. Attempt Terminate
- C. Charged

In all scenarios A-C, the service may use a CAP/INAP Connect operation or CAP/INAP Continue as applicable. Alternatively, a call may be denied. Interaction is not supported in CAMEL 1.

7.3 TCAP Transactions

CAMEL 1 TCAP Transaction management follows the same principles as for CAMEL 2+. See the comments in section 6.3 TCAP Transactions.

7.4 [A] Unconditional Terminate

See the comments in 6.4 regarding the purpose of the Unconditional Terminate scenario.

Note that announcements are not supported in CAMEL 1. Hence the flow is:

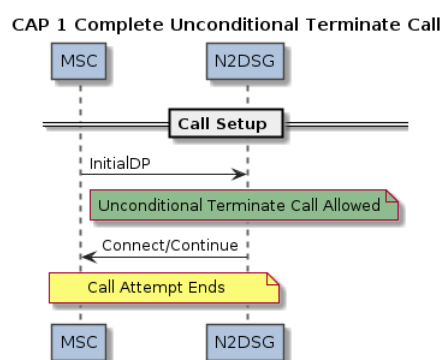


Figure BB - CAP1 Flow (Unconditional Terminate)

7.5 [B] Attempt Terminate

See the comments in 6.5 for the purpose of Attempt Terminate.

Note that CallInformationRequest is not supported for CAMEL 1, nor is pre-call interaction. Also, there is no explicit BCSM support for RSF, Busy, NoAnswer, or Abandon.

7.5.1 Attempt Terminate Setup

All Attempt Terminate scenarios begin with the following flow in CAMEL 1:

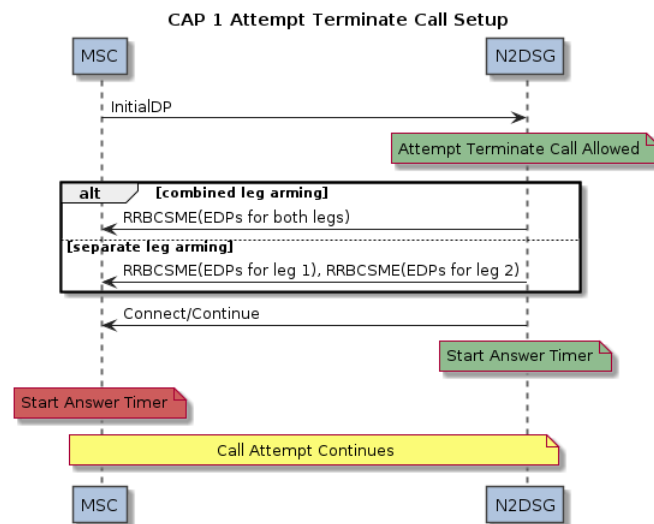


Figure CC – CAP1 Flow (Attempt Terminate Setup)

7.5.2 Attempt Terminate RouteSelectFailure, Busy, NoAnswer, Abandon

The following flow is for RouteSelectFailure. Note that CAMEL 1 does not have an explicit RSF ERBCSM, so we must imply it from the TC-ABORT.

Note that pre-call interaction is not supported and CallInformationRequest is not supported.

[End Of] CAP 1 Attempt Terminate Call, Route Select Failure

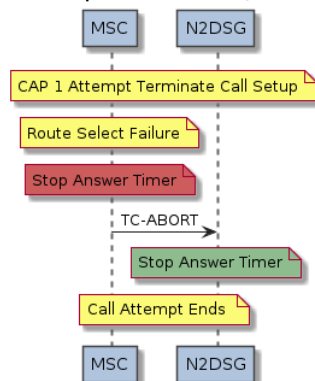


Figure DD – CAP1 Flow (Attempt Terminate RSF)

The Busy scenario is identical to RSF in CAMEL 1, and in fact cannot be distinguished from RSF on the N2SCP service side. There is no forwarding information available under CAMEL 1.

[End Of] CAP 1 Attempt Terminate Call, B-Party Busy

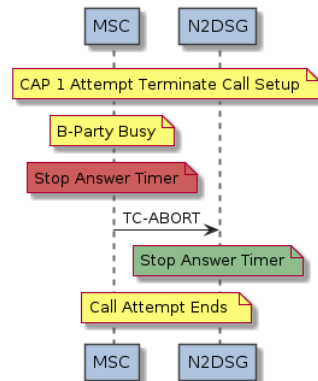


Figure EE – CAP1 Flow (Attempt Terminate Busy)

Under CAMEL 1 there is no explicit ERBCMS for NoAnswer. It must be implied on the N2SCP service by the expiry of a service-side NoAnswer timer.

Again there is no CallInformationRequest, no pre-call interaction, and no forwarding information.

[End Of] CAP 1 Attempt Terminate Call, B-Party No Answer

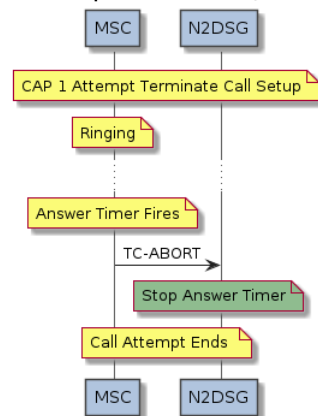


Figure FF – CAP1 Flow (Attempt Terminate NoAnswer)

The following flow shows where the caller abandons before answer under CAMEL 1.

It is not strictly possible for the N2SCP service side to reliably distinguish this from the RSF or Busy scenarios, although it can be implied by considering the timing between the sending of Connect and the receipt of TC-ABORT.

An “immediate” TC-ABORT will be RSF/Busy, a delayed TC-ABORT will be Abandon.

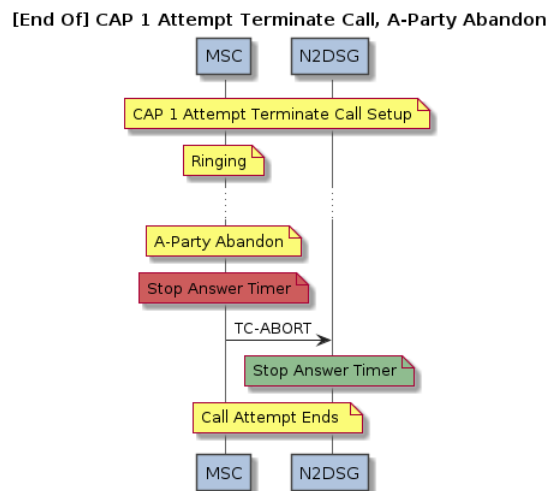


Figure GG – CAP1 Flow (Attempt Terminate Abandon)

7.5.3 Attempt Terminate Answer

The following CAMEL 1 flow is where the Answer is received as expected.

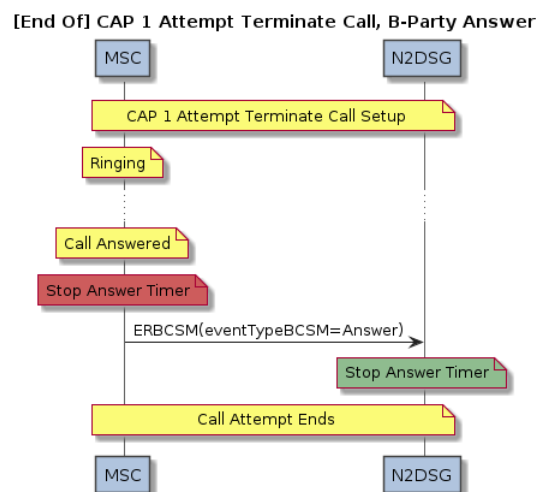


Figure HH – CAP1 Flow (Attempt Terminate Answer)

7.6 [C] Charged Calls

7.6.1 Charged Setup

See the comments in 6.6 for the purpose of the Charged Call scenario.

Again, note that there is no CallInformationRequest under CAMEL 1, and no explicit BCSM report for RSF, Busy, NoAnswer or Abandon. Also, ApplyCharging is not available.

The following flow shows the setup for a Charged call under CAMEL 1.

Note that it is identical to the Attempt Terminate setup from 7.5.1 except that the Disconnect BCSM EDPs for leg 1 and leg 2 are armed.

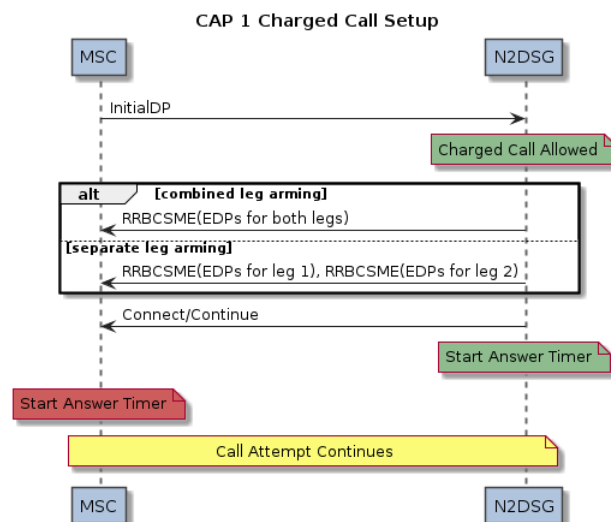


Figure II – CAP1 Flow (Charged Setup)

7.6.2 Charged RouteSelectFailure, Busy, NoAnswer, Abandon

Under CAMEL 1, all of these scenarios for Charged Call are identical to the CAMEL 1 Attempt Terminate cases. Refer to the flows and comments in section 7.5.2.

7.6.3 Charged Extension (Allowed or Denied)

During a CAMEL 1 charged call, the N2SCP framework is entirely responsible for maintaining all call authorization grant timers, and hence for determining when a follow-on extension grant is required.

When an extension is required and is allowed by the charging server, this does not lead to any explicit CAMEL 1 protocol interaction.

Note that the use of ActivityTest is optional and is described separately (not shown in this diagram).

If an extension is declined, then the following flow applies:

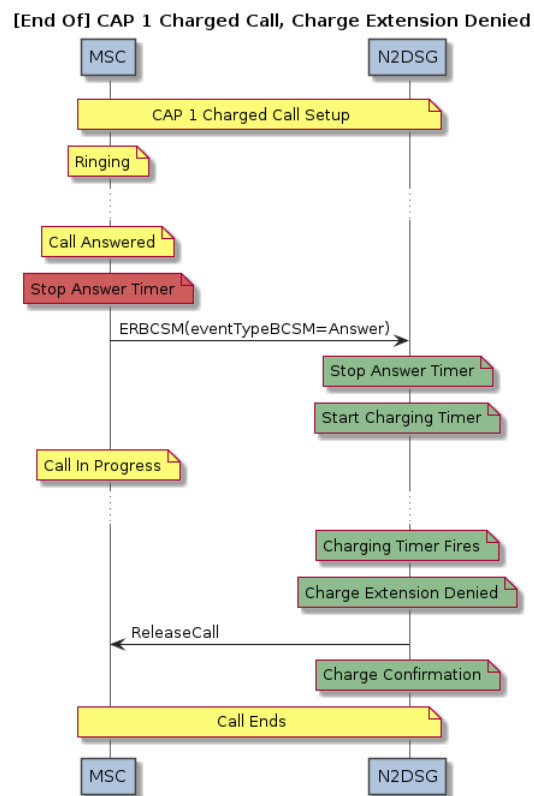


Figure JJ – CAP1 Flow (Charged Call Extension Declined)

7.6.4 Charged End of Call (Network-Initiated)

The following series of CAMEL 1 flows define the N2SCP service support for end of call scenarios that are initiated by the network due to subscriber disconnect.

The first flow is the A-Party (Leg 1) Disconnect.

Because there is no ApplyChargingReport/ApplyCharging cycle, the “awaiting authorizing” complexities from CAMEL 2+ is not visible to the CAMEL interaction.

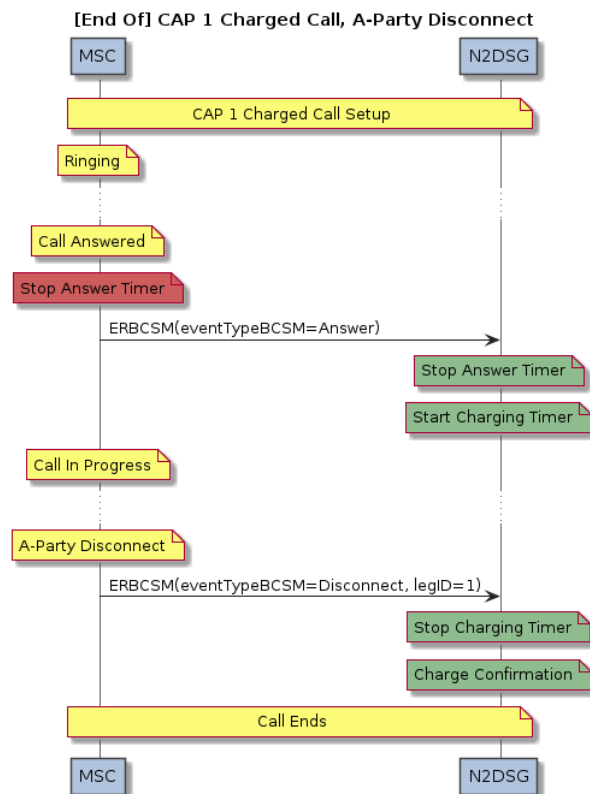


Figure KK – CAP1 Flow (A-Party Disconnect)

The CAMEL 1 Charged Call B-Party Disconnect scenario is essentially identical to the A-Party Disconnect. The only difference is that the SCP must send ReleaseCall to terminate the control relationship and tear-down the A-Leg.

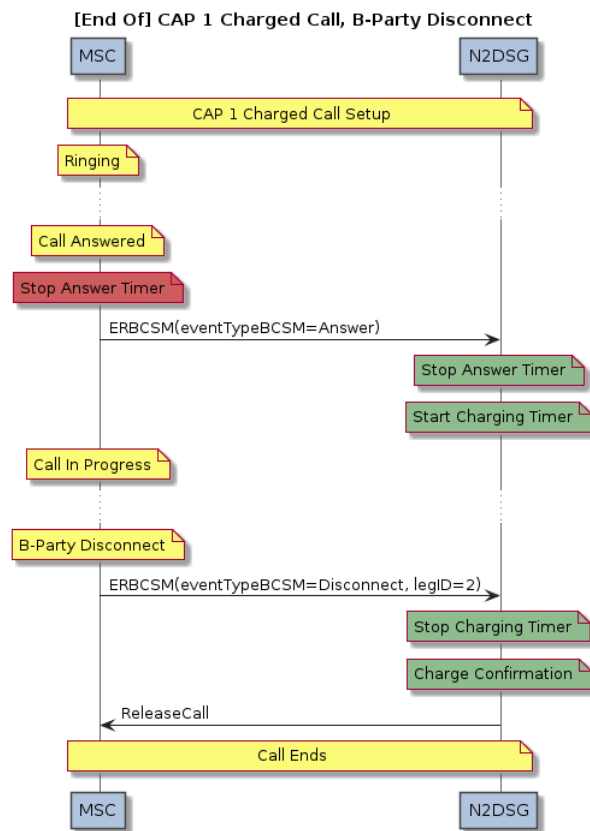


Figure LL – CAP1 Flow (B-Party Disconnect)

Some MSC will signal a “simultaneous disconnect” by reporting both A-party and B-party disconnect immediately. An N2SCP service will handle this when it occurs with the following CAMEL 1 flow:

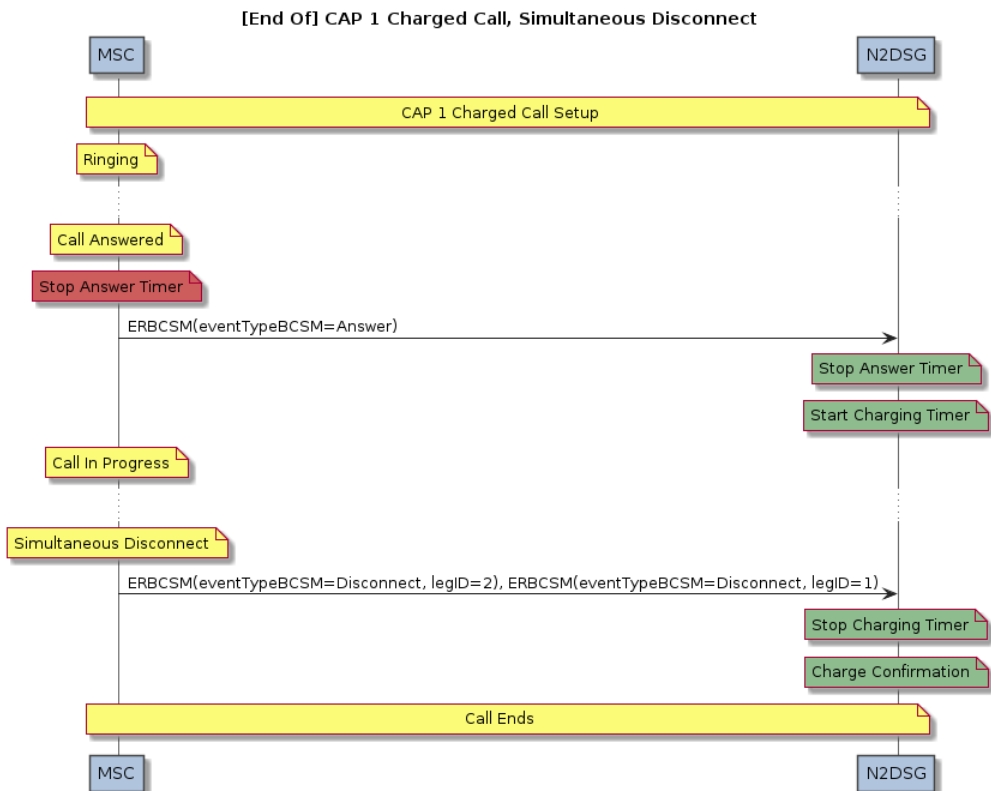


Figure MM – CAP1 Flow (Simultaneous Disconnect)

7.7 Call Denied

The following flow is used to deny a call request from the MSC under CAMEL 1. There is no subsequent monitoring or control.

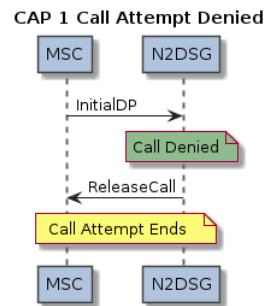


Figure NN – CAP1 Flow (Call Attempt Denied)

7.8 Interaction

Not applicable under CAMEL 1.

7.9 Lost Message Flows

None.

There are no recoverable lost-message flows under CAMEL 1.

7.10 Supplementary & Variant Flows

7.10.1 Split RRBCSME Arming

Under CAMEL 1 the Answer and the Disconnect legs can be split into separate RRBCSM if the MSC requires this behavior.

See the description and notes in section 6.10.1.

7.10.2 Activity Test (MSC)

The use of Activity Test (to the MSC only) may be (and typically is) enabled for Charged Call scenarios.

See the description in section 6.10.2.