3GPP TSG CN Plenary **Tdoc NP-010058**
Meeting #11, Palm Springs, U.S.A
14th - 16th March 2001

Source: **TSG CN WG 2**

Title: **CR to Rel-4 on Work Item SS7IP 29.078**

Agenda item: **6.2.1**

Document for: **APPROVAL**

Introduction:

This document contains **1** CR on **Rel-4** Work Item **"SS7IP"**, that have been agreed by **TSG CN WG2**, and are forwarded to TSG CN Plenary meeting #11 for approval.

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
29.078	150		N2-010153	Rel-4	Introduction of CAP over IP in accordance with SIGTRAN	B	3.6.0

3GPP TSG_CN WG2#17 **Tdoc N2-010153**
Sophia-Antipolis, France
26.th February - 2.nd March, 2001

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010289**
~~75~~
Madrid, SPAIN from 13th to 15th February 2001

CHANGE REQUEST

⌘ **29.078** **CR** **150** ⌘ rev ⌘ Current version: **3.6.0** ⌘

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Introduction of CAP over IP in accordance with SIGTRAN
Source:	⌘	LM Ericsson AB (CN4 endorced)
Work item code:	⌘	SS7IP
Date:	⌘	16-02-2001
Category:	⌘	**B**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Independence of transport technologies is one key characteritic of 3GPP Release 4. This transport indpendence shall also be introduced for the Core Network Signalling (e.g. MAP, CAP and BSSAP+). Therefore the SIGTRAN stacks need to be introduced.
Summary of change:	⌘	The specific references to MTP or MTP3 have been generalised by using the term "signalling transport". The reference to MTP has to be replaced by the reference to 3GPP TS 29.202. In fact, TS 29.078 does not mention MTP3 at the moment. It only mentions MTP.
Consequences if not approved:	⌘	If not approved than the indendence of the signalling transport can not be introduced for Release 4. This will mismatch the “agreed” independence of transport technology on the User Plane.

Clauses affected:	⌘	2, 3, 12.2		
Other specs affected:	⌘	☒ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	TS 29.202~~, CR 29.002-xxx, CR 29.016-xxx~~
Other comments:	⌘			

FIRST MODIFICATION

2 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.

[1] ETSI ETR 186-2: "Intelligent Network (IN); Interaction between IN Application Protocol (INAP) and Integrated Services Digital Network (ISDN) signalling protocols; Part 2: Switching signalling requirements for IN Capability Set 2 (CS2) service support in a Narrowband ISDN (N-ISDN) environment".

[2] ~~ETSI ETS 300 008-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Message Transfer Part (MTP) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.701 (1993), Q.702 (1988), Q.703 to Q.706 (1993), modified]".~~3GPP TS 29.202: "SS7 Signalling Transport in Core Network; Stage 3 ~~(Release 4)~~".

[3] ETSI ETS 300 009-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Signalling Connection Control Part (SCCP) (connectionless and connection-oriented class 2) to support international interconnection; Part 1: Protocol specification [ITU-T Recommendations Q.711 to Q.714 and Q.716 (1993), modified]".

[4] ETSI ETS 300 121: "Integrated Services Digital Network (ISDN); Application of the ISDN User Part (ISUP) of CCITT Signalling System No.7 for international ISDN interconnections (ISUP version 1)".

[5] ETSI EN 300 196-1: "Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services; Digital Subscriber Signalling System No. one (DSS1) protocol; Part 1: Protocol specification".

[6] ETSI ETS 300 287-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]".

[7] ETSI ETS 300 348: "Intelligent Network (IN); Physical plane for intelligent network Capability Set 1 (CS1) [ITU-T Recommendation Q.1215 (1993)]".

[8] ETSI EN 300 356-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997), modified]".

[9] ETSI ETS 300 374-1:"Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: Protocol specification".

[10] ETSI EN 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".

[11] ETSI EN 301 070-1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 interactions with the Intelligent Network Application Part (INAP); Part 1: Protocol specification [ITU-T Recommendation Q.1600 (1997), modified]".

[12] 3GPP TS 24.008: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification (3GPP TS 24.008)".

[13] 3GPP TS 29.002: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification (3GPP TS 29.002)".

[14] ISO 639 (1988): "Code for the representation of names of languages".

[15] ISO 9545 (1989): "Information technology - Open Systems Interconnection - Application Layer structure".

[16] ITU-T Recommendation Q.71: "ISDN circuit mode switched bearer services".

[17] ITU-T Recommendation Q.700: "Introduction to CCITT Signalling System No.7".

[18] ITU-T Recommendation Q.710: "Signalling System No.7 - Simplified MPT version of small systems".

[19] ITU-T Recommendation Q.762: "General function of messages and signals of the ISDN user part of signalling system no.7".

[20] ITU-T Recommendation Q.763: "Formats and codes of the ISDN user part of Signalling System No.7".

[21] ITU-T Recommendation Q.767: "Application of the ISDN user part of CCITT Signalling System No.7 for international ISDN interconnections".

[22] ITU-T Recommendation Q.850: "Usage of cause and location in the digital subscriber signalling system no.1 and the signalling system no.7 ISDN user part".

[23] ITU-T Recommendation Q.932: "Digital subscriber Signalling System No.1 (DSS 1) - Generic procedures for the control of ISDN supplementary services".

[24] ITU-T Recommendation Q.1224: "Distributed functional plane for intelligent network CS2".

[25] ITU-T Recommendation Q.1225: "Physical plane for intelligent network CS2".

[26] ITU-T Recommendation Q.1228: "Interface ITU-T Recommendation for intelligent network CS2".

[27] ITU-T Recommendation Q.1290: "Glossary of terms used in the definition of intelligent networks".

[28] ITU-T Recommendation Q.1400: "Architecture framework for the development of signalling and organization, administration and maintenance protocols using OSI principles".

[29] CCITT Recommendation X.208: "Specification of Abstract Syntax Notation One (ASN.1)".

[30] CCITT Recommendation X.209: "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".

[31] CCITT Recommendation X.219: "Remote operations: Model, notation and service definition".

[32] CCITT Recommendation X.229: "Remote operations: Protocol specification".

[33] ITU-T Recommendation X.680 ASN.1: "Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[34] ITU-T Recommendation X.690: "ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".

[35] ITU-T Recommendation X.831: "Information technology - Open Systems Interconnection - Generic upper layers security: Security Exchange Service Element (SESE) service definition".

[36] ITU-T Recommendation X.832: "Information technology - Open Systems Interconnection - Generic upper layers security: Security Exchange Service Element (SESE) protocol specification".

[37] ITU-T Recommendation X.880 | ISO/IEC 9072-1: "Information technology - Remote Operations: Concepts, model and notation".

[38] ETSI ES 201 296: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Signalling aspects of charging".

[39] ETSI EN 301 140-5: "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 1: Protocol Specification".

[40] ANSI T1.112-1996: " American National Standards for Telecommunications- Signalling System Number 7 (SS7) - Signalling Connection Control Part (SCCP)".

[41] CCITT Recommendation Q.713: "Specifications of Signalling System No.7; SCCP formats and codes".

[42] 3GPP TS 23.078: " Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 - Stage 2".

[43] 3GPP TS 29.060: "General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[44] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[45] 3GPP TS 24.011: "Point-toPoint (PP) Short Message Service (SMS); support on mobile radio interface".

[46] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS); Point-to-Point (PP)".

[47] 3GPP TS 22.024: "Description of Charge Advice Information (CAI)".

[48] ITU-T Recommendation Q.773: "Specifications of Signalling System No.7; Transaction capabilities formats and encoding".

[49] 3GPP TS 23.003: "Numbering, addressing and identification".

[50] ITU-T Recommendation Q.714: "Specifications of Signalling System No.7; Signalling Connection Control Part procedures".

[51] 3GPP TS 09.12: "Application of ISDN User Part (ISUP) version 2 for the ISDN-Public Land Mobile Network (PLMN) signalling interface; Part 1: Protocol specification".

[52] 3GPP TS 22.115: "Service Aspects Charging and Billing".

[53] ANSI T1.113-1995: “American National Standards for Telecommunications- Signalling System Number 7 (SS7) - ISDN User Part”.

NEXT MODIFICATION

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AC	Application Context
ACI	Access Control Information
AE	Application Entity
AEI	Application Entity Invocation
APDU	Application Protocol Data Unit
ASE	Application Service Element
ASN.1	Abstract Syntax Notation One
BCSM	Basic Call State Model
BCUSM	Basic Call Unrelated State Model
BPIM	Basic Primitive Interface Model
C-ALG	Data confidentiality algorithm
CBC	Connectionless Bearer Control
CCF	Call Control Function
CS1	Capability Set 1
CS2	Capability Set 2
CSI	CAMEL Subscription Information
DP	Detection Point
DSS1	Digital Subscriber Signalling System No. One
EDP	Event Detection Point
EDP-N	Event Detection Point - Notification
EDP-R	Event Detection Point - Request
FE	Functional Entity
FEAM	Functional Entity Access Manager
ffs	for further study
FSM	Finite State Model
GprsSSF	GPRS SSF
gsmSCF	GSM SCF
gsmSSF	GSM SSF
gsmSRF	GSM SRF
GT	Global Title
GULS	Generic Upper Layers Security
I-ALG	data Integrity ALGorithm
ID	IDentifier
IE	Information Element
IN	Intelligent Network
CAP	Intelligent Network Application Protocol
IP	Intelligent Peripheral
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
K-ALG	Key management ALGorithm
LE	Local Exchange
M3UA	MTP3-User Adaptation
MAC	Message Authentication Code
MACF	Multiple Association Control Function
MSC	Mobile services Switching Centre
MTP	Message Transfer Part
MTP3	MTP Level 3
NA	North American
O-ALG	One-way function ALGorithm
O-BCSM	Originating BCSM
PCO	Point of Control and Observation
PDU	Protocol Data Unit
PE	Physical Entity
PIA	Point In Association

PIC	Point In Call
PLMN	Public Land Mobile Network
PSTN	Public Switched Telecommunication Network
QOP	Quality of Protection
RCO	Resource Control Object
ROS	Remote Operations Service
ROSE	ROS Element
RRB	Request Report BCSM Event
SACF	Single Association Control Function
SAO	Single Association Object
SCCP	Signalling Connection Control Part
gsmSCF	Service Control Function
SCP	Service Control Point
SDL	System Description Language
SESE	Security Exchange Service Element
SL	Service Logic
SLP	Service Logic Program
SLPI	Service Logic Program Instance
SMSC	Short Message Service Centre
SMF	Service Management Function
SPKM	Simple Public Key GSS-API Mechanism
gsmSRF	Specialized Resource Function
SRME	gsmSRF Management Entity
SRSM	gsmSRF Call State Model
SS7	Signalling System no. 7
gsmSSF	Service Switching Function
SSME	gsmSSF Management Entity
SSN	Sub-System Number
SSP	Service Switching Point
STUI	Service To User Information
T-BCSM	Terminating BCSM
tbd	to be determined
TC	Transaction Capabilities
TCAP	Transaction Capabilities Application Part
TDP	Trigger Detection Point
TDP-R	Trigger Detection Point - Request

NEXT MODIFICATION

4.1.3 CAP protocol architecture

Many of the terms used in this subclause are based on the OSI application layer structure as defined in ISO 9545.

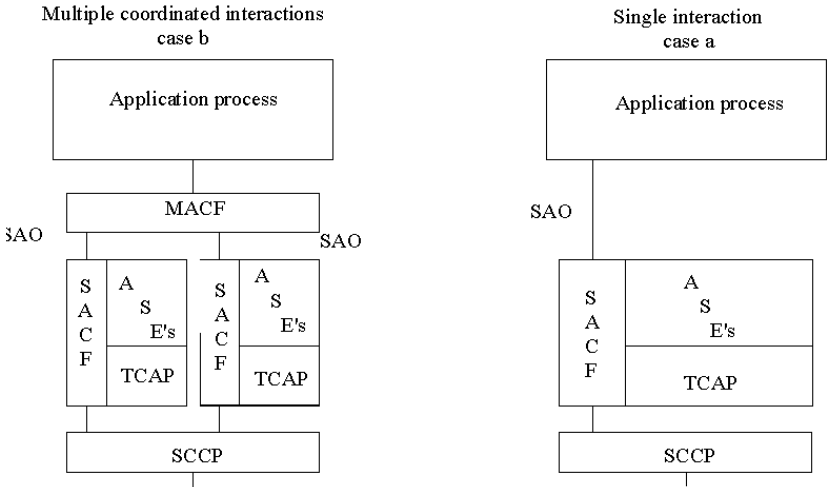
The CAP protocol architecture is illustrated in figure 4-2.

A PE has either single interactions (case a) or multiple co-ordinated interactions (case b) with other PE.

In case a, SACF provides a co-ordination function in using ASE's, which includes the ordering of operations supported by ASE(s), (based on the order of received primitives). The Single Association Object (SAO) represents the SACF plus a set of ASE's to be used over a single interaction between a pair of PE's.

In case b, MACF provides a co-ordinating function among several SAO's, each of which interacts with an SAO in a remote PE.

Each ASE supports one or more operations. Description of each operation is tied with the action of corresponding FE modelling (see ITU-T Recommendation Q.1224 and clause 11 of the present document). Each operation is specified using the OPERATION macro described in figure 4-3.



NOTE: CAP is the collection of all specifications in ASEs.

Figure 4-2: CAP protocol architecture

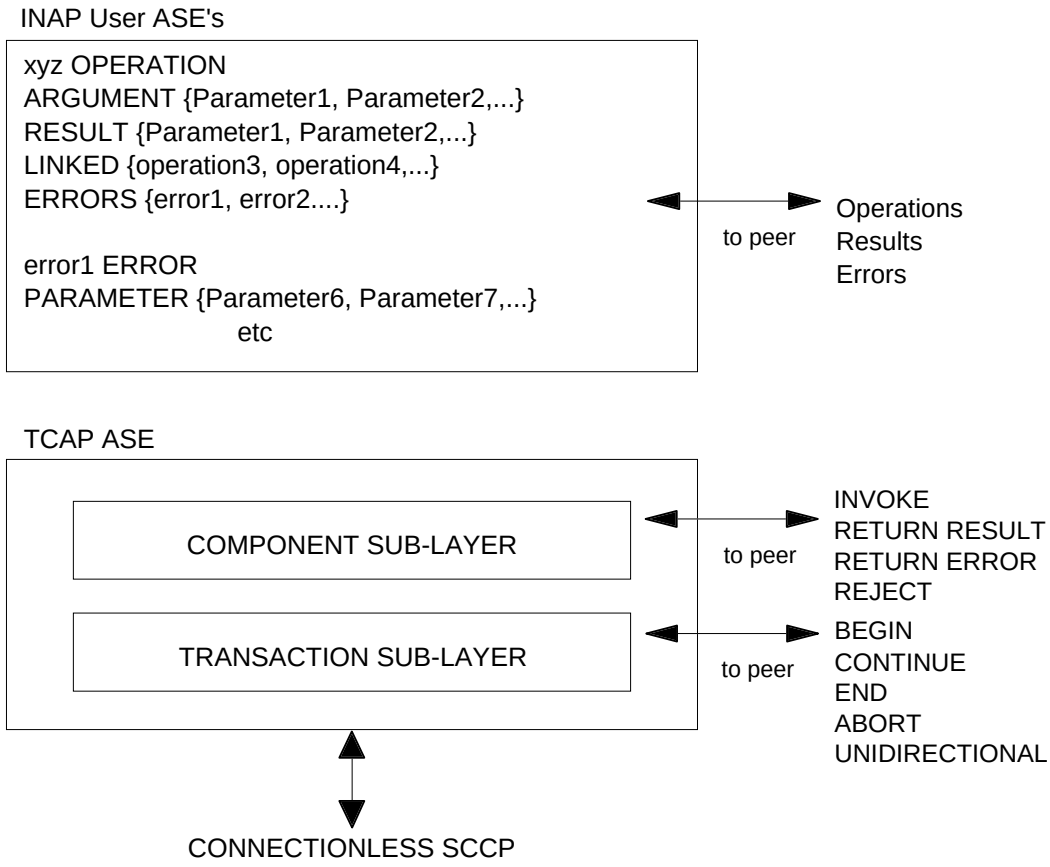


Figure 4-3: Operation description

NEXT MODIFICATION

12.2 Services assumed from SCCP

This subclause describes the services required from the SCCP that may be used by the CAMELapplications for the CAMEL Application Part (CAP) used between the gsmSSF, assisting gsmSSF, gsmSRF, gprsSSF, and gsmSCF

The following SCCP revisions are supported by CAP version 3:

- Signalling Connection Control Part, Signalling System no. 7 CCITT ('Blue Book SCCP')
- Signalling Connection Control Part, Signalling System no. 7 ITU-T Recommendation Q.711 to Q.716 ('White Book SCCP')

NOTE: Support of White Book SCCP at the receiving side shall be mandated from 00:01hrs, 1st July 2002(UTC).

- ANSI T1.112-1996 [40]: "American National Standards for Telecommunications– Signalling System Number 7 (SS7) – Signalling Connection Control Part (SCCP)".

When CAP uses White Book SCCP to send a message, and SCCP segments the message into one or more XUDT messages, then the transmission of this message may fail.

Failure will occur when the destination SCCP, or any intermediate SCCP, does not support White Book SCCP.

Support of ANSI T1.112 SCCP applies only to PLMNs in North America. Interworking between a PLMN in North America and a PLMN outside North America will involve a STP to translate between ANSI SCCP and ITU-T/CCITT SCCP.

12.2.1 Normal procedures

The SCCP is an MTP3-User, as defined within TS 29.202 [2]. ~~and~~ The SCCP ~~it The SCCP~~ forms the link between the TC and the ~~MTP~~ signalling transport (e.g MTP3, M3UA) and provides (in conjunction with the ~~MTP~~signalling transport) the network services for the CAMEL applications. The network services provided allow the signalling messages sent by the application to the lower layers to be successfully delivered to the peer application.

12.2.2 Service functions from SCCP

12.2.2.1 SCCP connectionless services

The services described are those given in the SCCP ITU-T recommendations Q.711 to Q.716 should be consulted to identify possible interworking and compatibility issues between the different SCCP versions.

The following Connection-less services are expected from the SCCP:

a) Network Addressing to enable signalling connections between SCCP users;

b) Sequence Control to enable the SCCP users to invoke "sequence guaranteed" or "sequence not guaranteed" options for a given stream of messages to the same destination;

c) Segmentation/reassembly of large user messages (only for 'White Book SCCP');

d) Return Option to enable the SCCP users to invoke "discard message on error" or "return message on error" for a given message not able to be delivered by the SCCP to the destination SCCP user, due to routeing or segmentation/re-assembly failure;

e) Congestion control.

The primitives used for the above services are given below.

The N-UNITDATA request and N-UNITDATA indication primitives are used to send and receive data. The parameters of these primitives include the Called and Calling Addresses, Sequence Control, Return Option and User Data with the addressing parameters always mandatory.

The N-NOTICE indication primitive is used to return undelivered data if return option is set and a routeing/segmentation error occurs.

12.2.2.1.1 Sub-System Number (SSN)

The use of SSN is a network operator option and values for intra-PLMN usage are network specific. A CAP SSN has been reserved for inter-PLMN use, as defined in 3GPP TS 23.003 [49].

12.2.2.1.2 Addressing

The addressing elements consist of information contained within the Calling and the Called Party Addresses which are sent by the application to the lower layers.

The application expects the SCCP to route messages by either (a) the use of the Destination Point Code (DPC) plus the Subsystem Number (SSN), or (b) the use of the GT plus optionally the SSN. The application also specifies to the lower layer whether to route the message on the DPC or the GT.

Method (a) above may be used when the application is aware of the destination point code and the destination SSN located at that point code to which the message is to be delivered. Within a national network different SSNs, according to ITU-T SCCP recommendation Q.713 [41], may be allocated for the different network specific applications, e.g. a SSN may be allocated for a gsmSCF functionality.

Method (b) above may be used when a message is to be delivered to a SCCP-user which can be identified by the combination of the elements within the GT. An example of the use of this method is when messages have to be delivered between different networks. This method may be used since the originating network is unaware of the point code and SSN's allocations within the destination network. The network that determines the end-node to which the message is to be delivered has to perform a GT Translation to derive the destination Point Code and the SSN. If optionally the original address contained the SSN, then this may be used as the destination SSN, or the translation may, if required, provide an appropriate new SSN.

When GT is used for addressing, the CAMEL application expects that the SCCP supports the following elements as defined in ITU-T SCCP recommendation Q.713 [41]:

Address Indicator:

The application will set this indicator to indicate one or any combination of the elements "signalling point code, GT, subsystem number" in the address information octets.

GT Indicator:

This indicator specifies the method employed for the formatting of the address information. There are four values (1 to 4), for example, the value 4 indicates that the format includes the numbering plan, the nature of the address indicator and the translation type. The format with the indicator value 4 is always used for internetwork connections.

Translation Type:

The Translation Types are defined within ITU-T SCCP recommendation Q.713 [41].

Numbering Plan:

1) The *proposed* “generic numbering plan" is described within the ITU-T SCCP recommendation Q.713 [41]. This numbering plan identifies the SCCP nodes or SCCP subsystems unambiguously such that messages may be efficiently routed within one or more networks, and is particularly useful when used in the Calling Address for the sending of a response message back to the originating node. This is achieved by having an international and a national part in the generic numbering plan. For response messages the responding node analyses the international part of the generic numbering plan to determine the gateway node to which the response is to be routed. Having routed to the gateway node, the national part (which was populated within the originating network) is analysed to determine the originating node within the originating network.

2) A numbering plan which would define particular nodes based specifically on services is *outside the scope of CAMEL.*

3) The SCCP caters for a number of other numbering plans (e.g. ISDN, Mobile etc. numbering plans). The whole range catered for is shown in [2]. These may be used by CAMEL applications if deemed suitable.

Encoding Scheme:

This identifies the encoding scheme employed by the application and is generally BCD encoded with odd or even number of digits.

GT Address Information:

These are the actual address digits supplied by the application and may be BCD digits or encoded as indicated by the encoding scheme.

The network provider must ensure that any change of GT value during translation preserves any CAP specific information contained in the initial GT value.

This requirement applies to all interfaces, not just those used for internetworking.

If *route on SSN* is to be supported from the originating node then a ITU-T non-zero internationally standardized SSN is required for international internetworking.

In the absence of a ITU-T standardized non-zero SSN for CAP services, the use of *route on GT* is mandatory from the origin node to the network containing the destination node.

When the SCCP of CCITT Signalling System No. 7 is used, the format and coding of address parameters carried by the SCCP for that purpose shall comply with ITU-T Recommendation Q.713 [41] with the following restrictions:

1) Intra-PLMN addressing

   For communication between entities within the same PLMN, the use of SCCP addressing is network specific, and method (a) and (b) are both applicable.

2) Inter-PLMN addressing

   method (b) with the mandatory SSN is only applicable with the following format:

   i) Called Party Address

   - SSN indicator = a standardised SSN shall be used. The SSN used shall be that specified for CAP in 3GPP TS 23.003[49];
   - Point Code indicator = 0;
   - Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
   - Translation type = 0 (Not used);
   - Routing indicator = 0 (Routing on global title);

   The format is also described in the table 12-2 below (for NP=1, NAI=4):

Table 12-2: Called Party Address format

8	7	6	5	4	3	2	1	
0	RI = 0	GTI = 4 (0100)				SSNI = 1	PCI = 0	Octet 1
SSN = a value for CAP as specified in 3GPP TS 23.003 [49]								Octet 2
Translation type = 0								Octet 3
Numbering plan = 1 (E.164)				Encoding scheme = 1 or 2				Octet 4
0	Nature of address indicator = 4 (International)							Octet 5
Country code digit 2 (if present)				Country code digit 1				Octet 6
National Destination Code (NDC) Digit 1				Country code digit 3 (if present)				Octet 7
NDC digit 3 (if present)				NDC digit 2 (if present)				Octet 8
NDC digit 5 (if present)				NDC digit 4 (if present)				Octet 9
Equipment idntification digit 2				Equipment idntification digit 1				Octet 10
...				...				...
filler = 0 (if needed)				Equipment idntification digit m				Octet n

Note - Country code, National Destination Code, and SN(equipment id) are provided as example, so each digit may differ for each Inter-PLMN addressing case. (e.g., there is a case where only CC digit 1 shall be used). See ITU-T recommendation Q.713 [41] for translation rules.

ii) Calling Party Address

- SSN indicator = a standardised SSN shall be used. The SSN used shall be that specified for CAP in 3GPP TS 23.003[49];
- Point code indicator = 0;
- Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
- Translation type = 0 (Not used);
- Routing indicator = 0 (Routing on Global Title).

The format is also described in the table 12-3 below (for NP=1, NAI=4):

Table 12-3: Calling Party Address format

8	7	6	5	4	3	2	1	
0	RI = 0	GTI = 4				SSNI = 1	PCI = 0	Octet 1
SSN = a value for CAP as specified in 3GPP TS 23.003 [49]								Octet 2
Translation type = 0								Octet 3
Numbering plan = 1 (E.164)				Encoding scheme = 1 or 2				Octet 4
0	Nature of address indicator = 4 (International)							Octet 5
Country code digit 2 (if present)				Country code digit 1				Octet 6
National Destination Code (NDC) Digit 1				Country code digit 3 (if present)				Octet 7
NDC digit 3 (if present)				NDC digit 2 (if present)				Octet 8
NDC digit 5 (if present)				NDC digit 4 (if present)				Octet 9
Equipment idntification digit 2				Equipment idntification digit 1				Octet 10
...				...				...
filler = 0 (if needed)				Equipment idntification digit m				Octet n

Note - Country code, National Destination Code, and SN(equipment id) are provided as example, so each digit may differ for each Inter-PLMN addressing case. (e.g., there is a case where only CC digit 1 shall be used). See ITU-T recommendation Q.713 [41] for translation rules.

When the SCCP of ANSI Signalling System No. 7 is used, the format and coding of address parameters carried by the SCCP for the purpose of signalling transfer shall comply with ANSI Recommendation T1.112 [40] with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, the use of SCCP addressing is network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = a standardised SSN shall be used. The SSN used shall be that specified for CAP in 3GPP TS 23.003[49];
- Point Code indicator = 0;
- Global title indicator = 0010 (Global title includes translation type);
- the Translation Type (TT) field shall be coded according to the content of the address information as follows:

  TT = 9 (decimal), if IMSI is included

  TT = 14 (decimal), if MSISDN is included,

  or TT = 10 (decimal), if a Network Element address is included. (If TT=10, then Number Portability is not applicable, if TT=14, then Number Portability is applicable)
- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = a standardised SSN shall be used. The SSN used shall be that specified for CAP in 3GPP TS 23.003[49];
- Point code indicator = 0;
- Global title indicator = 0010 (Global title includes translation type);
- the Translation Type (TT) field shall be coded according to the content of the address information as follows:

  TT = 9 (decimal), if IMSI is included

  TT = 14 (decimal), if MSISDN is included,

  or TT = 10 (decimal), if a Network Element address is included. (If TT=10, then Number Portability is not applicable, if TT=14, then Number Portability is applicable)
- Routing indicator = 0 (Routing on Global Title).

12.2.2.1.3 Sequence control

The application will specify whether SCCP protocol class 0 or 1 is required. Class 0 provides a basic connection-less service where the sequence of message delivery is not guaranteed. Class 1 connection-less service provides a guaranteed sequence delivery of messages (with the same called address) for a given stream of messages. Class 1 shall be requested by any application that can send more than 1 TC message to its peer (consecutive TR-CONTINUE) before receiving a response from its peer (TR-CONTINUE or TR-END).

On receipt of a TC-RESULT-NL indication, the TC-USER shall request the transfer of a reject component using TC-U-REJECT request primitive, with the appropriate problem code (mistyped parameter).

The return option may be used if requested by the application (Network Operator to determine).

12.2.2.1.4 Return on error

Return on Error mechanism may be required by the CAMEL applications such that the application is aware of messages that have not been delivered to the destination by the SCCP. The return option allows the return of the message that was not delivered due to routeing or segmentation/re-assembly failure back to the issuing user. This return option may be required in all segments of a long message or only in the first segment by the CAMEL applications.

If the return option is invoked by the application and the message is not delivered then the SCCP specifies the "return reason" as specified in ITU-T SCCP recommendation Q.713 [41]. The N-NOTICE primitive is used to return the undelivered message to the originating user.

12.2.2.1.5 Segmentation / reassembly

The application expects that since the SCCP can send up to 260 octets of user data (including the address information and TC-message) in a UDT message (248 octets in a XUDT message performing segmentation and congestion control), segmentation is available for long user messages.

Also the SCCP is expected to perform the reassembly function on received segmented messages and deliver the reassembled message to the user.

However, it should be noted that even though the theoretical maximum size of SCCP-user data and addresses that can be segmented by the SCCP is 3 968 octets, the SCCP-user would limit the length to about 2 560 octets to allow for the largest known addresses. Note that the application must also allow for the octets used for the TC-message in the 2 560 octets.

The CAMEL application does not expect the SCCP to segment the long message into more than 16 segments.

12.2.2.1.6 Congestion control

To help control of possible congestion that might occur in the lower layers the application may assign a value to indicate the importance of the message. The use of this parameter requires the use of SCCP (1997) ITU-T Recommendations.

Also there exist other congestion control mechanisms as indicated below in SCCP Management.

These congestion control methods are network operator option in case of intra-PLMN network signalling, and shall not be used in case of inter-PLMN network signalling.

12.2.2.2 SCCP connection oriented services

The use by CAMEL applications for the Connection-oriented services is outside the scope of CAMEL.

12.2.2.3 SCCP management

The subsystems used within the CAMEL application expect the SCCP to provide management procedures to maintain network performance by re-routeing in the event of failure of a subsystem, and in case of network congestion by use of the congestion handling procedure. These procedures have appropriate interactions with the SCCP user as described in ITU-T SCCP recommendations Q.713 [41] and Q.714 [50].

To achieve the above the SCCP is expected to perform the following procedures*:*

- Signalling point status management (which include the signalling point prohibited, signalling point allowed, signalling point congested, and local ~~MTP~~ "signalling transport" availability sub procedures).
- Subsystem status management (which include the subsystem prohibited, subsystem allowed, and subsystem status test sub procedures).
- Co-ordinated state change (a procedure which allows a duplicated subsystem to be withdrawn from service without affecting the performance of the network).

These SCCP management procedures are network operator option in case of intra-PLMN network signalling, and shall not be used in case of inter-PLMN network signalling.