3.4.3.8 Allocation of the DSP

Note.— The DSP fields of an ATN NSAP address are the VER, ADM, RDF, ARS, LOC, SYS and SEL fields. The size of each of these fields is given in Table 3-4.

Table 3-4. DSP NSAP address field sizes

Address field name	*Address field size*
VER	1 octet
ADM	3 octets
RDF	1 octet
ARS	3 octets
LOC	2 octets
SYS	6 octets
SEL	1 octet

3.4.3.8.1 The Version (VER) field

Note 1.— The purpose of the VER field is to partition the ATN network addressing domain into a number of sub-ordinate addressing domains.

Note 2.— The values currently specified for the VER field and the network addressing domains so defined, are summarized in Table 3-5.

Table 3-5. VER field assigned values

VER field value	*Network addressing domain*	*Common NSAP address prefix for domain*
[0000 0001]	Fixed AINSC	470027+01
[0100 0001]	Mobile AINSC	470027+41
[1000 0001]	Fixed ATSC	470027+81
[1100 0001]	Mobile ATSC	470027+C1

3.4.3.8.1.1 The VER field shall be one octet in length.

3.4.3.8.1.2 A VER field value of [0000 0001] shall be used for all NSAP addresses and NETs in the network addressing domain that comprises all fixed AINSC NSAP addresses and NETs.

Note.— The NSAP address prefix "470027+01" is therefore the common NSAP address prefix for the fixed AINSC network addressing domain.

3.4.3.8.1.3 A VER field value of [0100 0001] shall be used for all NSAP addresses and NETs in the network addressing domain that comprises all mobile AINSC NSAP addresses and NETs.

Note.— The NSAP address prefix "470027+41" is therefore the common NSAP address prefix for the mobile AINSC network addressing domain.

3.4.3.8.1.4 A VER field value of [1000 0001] shall be used for all NSAP addresses and NETs in the network addressing domain that comprises all fixed ATSC NSAP addresses and NETs.

Note.— The NSAP address prefix "470027+81" is therefore the common NSAP address prefix for the fixed ATSC network addressing domain.

3.4.3.8.1.5 A VER field value of [1100 0001] shall be used for all NSAP addresses and NETs in the network addressing domain that comprises all mobile ATSC NSAP addresses and NETs.

Note.— The NSAP address prefix "470027+C1" is therefore the common NSAP address prefix for the mobile ATSC network addressing domain.

3.4.3.8.1.6 All other VER field values shall be reserved.

3.4.3.8.2 The Administration (ADM) field

3.4.3.8.2.1 *General*

Note.— The purpose of the ADM field is to subdivide each of the network addressing domains introduced by the VER field into a further set of sub-ordinate network addressing domains and to permit devolved administration (i.e. address allocation) of each resulting domain to an individual State or organization.

The ADM field shall be three octets in length.

3.4.3.8.2.2 *Fixed AINSC NSAP addresses and NETs*

Note.— In the fixed AINSC network addressing domain, the ADM field is used to subdivide this addressing domain into a number of sub-ordinate network addressing domains, each of which comprises NSAP addresses and NETs for fixed systems operated by a single AINSC organization.

3.4.3.8.2.2.1 Allocation of NSAP addresses and NETs in each such network addressing domain subordinate to the fixed AINSC network addressing domain shall be the responsibility of the organization identified by the value of the ADM field.

3.4.3.8.2.2.2 The field value should be derived from the set of three-character alphanumeric symbols representing an IATA airline or aeronautical stakeholder designator, according to 3.4.1.4.

Note.— AINSC organizations are intended to register their ADM values with IATA.

3.4.3.8.2.3 *Fixed ATSC NSAP addresses and NETs*

Note.— In the fixed ATSC network addressing domain, the ADM field is used to subdivide this addressing domain into a number of sub-ordinate network addressing domains, each of which comprises NSAP addresses and NETs for fixed systems operated by a single State or within an ICAO Region.

3.4.3.8.2.3.1 Allocation of NSAP addresses and NETs in each such network addressing domain subordinate to the fixed ATSC network addressing domain shall be the responsibility of the State or ICAO Region identified by the value of the ADM field.

3.4.3.8.2.3.2 When used for identifying a State, the ADM field shall be derived from the State's three-character alphanumeric ISO 3166 country code, represented as upper case characters.

3.4.3.8.2.3.3 In this case, the value of the field shall be determined according to 3.4.1.4.

Note.— For example, the encoding of "GBR" is 474252 in hexadecimal. Therefore the NSAP address prefix 470027+81474252 is the common NSAP address prefix for all NSAP addresses and NETs in the UK fixed ATSC network addressing domain.

3.4.3.8.2.3.4 When used to identify an ICAO Region, the first octet of the ADM field shall identify the ICAO Region, according to Table 3-6, while the values of the remaining two octets shall be assigned by the identified ICAO Region.

Table 3-6. ICAO Region identifiers

ADM Field First Octet	*ICAO Region*
[1000 0000]	Africa
[1000 0001]	Asia
[1000 0010]	Caribbean
[1000 0011]	Europe
[1000 0100]	Middle East
[1000 0101]	North America
[1000 0110]	North Atlantic
[1000 0111]	Pacific
[1000 1000]	South America

Note 1.— The ISO 3166 character codes are always represented as binary octets, each of which has a zero most significant bit. Therefore, it is possible to guarantee that the field values listed in Table 3-6 do not conflict with ISO 3166 derived State identifiers.

Note 2.— This addressing plan enables ICAO Regions to allocate ADM field values in the fixed ATSC network addressing domain to States and Organizations within the ICAO Region in a structured manner. This is in order to permit the efficient advertisement of routing information, for example, in the advertisement of routes to "all RDs in the same ATN island" as recommended in 3.3.7.1.4.2.

3.4.3.8.2.3.5 All ADM field values in the fixed ATSC network addressing domain that do not correspond to valid ISO 3166 country codes or which are not assigned to ICAO Regions shall be reserved.

3.4.3.8.2.4 *Mobile NSAP addresses and NETs*

Note.— In both the mobile AINSC and the mobile ATSC network addressing domains, the ADM field is used to subdivide this addressing domain into a number of sub-ordinate network addressing domains, each of which comprises NSAP addresses and NETs for mobile systems operated by a single airline or onboard the general aviation aircraft of a single State.

3.4.3.8.2.4.1 For mobile AINSC NSAP address and NETs, the ADM field value shall be set according to 3.4.3.8.2.2, and the corresponding sub-ordinate network addressing domain administered by the organization identified by the value of the ADM field.

3.4.3.8.2.4.2 For mobile ATSC NSAP address and NETs, the ADM field value shall be set according to 3.4.3.8.2.3, and the corresponding sub-ordinate network addressing domain administered by the State identified by the value of the ADM field.

3.4.3.8.3 The Routing Domain Format (RDF) field

Note 1.— There is no absolute requirement for the remainder of the DSP in each of the above defined network addressing domains to be allocated according to a coordinated addressing plan, or for even the same fields to exist, or the NSAP addresses to have the same length. However, in order to encourage common equipment development, this specification specifies the existence, size and use of the RDF, ARS and LOC fields.

Note 2.— The reason for the existence of the RDF field is historical.

3.4.3.8.3.1 The RDF field shall be one octet in length and its value shall be [0000 0000] in binary.

3.4.3.8.3.2 All other values shall be reserved.

3.4.3.8.4 The Administrative Region Selector (ARS) field

Note 1.— In fixed network addressing domains, the purpose of the ARS field is to distinguish routing domains or routing domains and subordinated routing areas respectively operated by the same State or organization.

Note 2.— In mobile network addressing domain, the purpose of the ARS field is to identify the aircraft on which the addressed system is located. When the systems on board an aircraft form a single routing domain, then the ARS field also identifies the routing domain. When the systems on board an aircraft form multiple RDs, then part of the LOC field is used to distinguish them.

3.4.3.8.4.1 The ARS field shall be three octets in length.

3.4.3.8.4.2 In the fixed AINSC and ATSC network addressing domains, the value of the ARS field shall be a 24-bit unsigned binary number which is used to uniquely identify a routing domain or a routing domain and a subordinated routing area, respectively.

Note.— A State or organization may choose to use either the most significant 8 bits, the most significant 16 bits or all 24 bits of the ARS field to uniquely distinguish its routing domains.

3.4.3.8.4.3 In the case that the body responsible for the assignment of the ARS field chooses to use only the leading bits of the ARS field to distinguish its routing domains, the remaining part of the ARS field shall, together with the LOC field (see 3.4.3.8.5), be used to uniquely identify the routing areas within those routing domains.

3.4.3.8.4.4 In the fixed AINSC and ATSC network addressing domains, the State or organization identified by the value of the ADM field shall be responsible for assigning the ARS field.

Note 1.— For example, 470027+8147425200000000 and 470027+8147425200000001 are therefore NSAP address prefixes common to all NSAP addresses and NETs assigned to fixed systems in two distinct routing domains operated by the UK ATSC authority.

Note 2.— Where necessary, the allocation of NSAP addresses and NETs may thus readily be delegated to a network administrator responsible for each network addressing domain that corresponds to each routing domain.

3.4.3.8.4.5 In mobile AINSC and ATSC network addressing domains, the value of the ARS field shall be the 24-bit ICAO aircraft address that uniquely identifies the NSAP addresses and NETs in a single routing domain.

Note 1.— If the aircraft is operated by an IATA airline then the NSAP address or NET is in a mobile AINSC network addressing domain.

Note 2.— For general aviation aircraft, the NSAP address or NET is in a mobile ATSC network addressing domain.

3.4.3.8.5 The Location (LOC) field

Note 1.— In fixed network addressing domains, the purpose of the LOC field is to distinguish routing areas within the same routing domain.

Note 2.— In mobile network addressing domains, the LOC field is used:

a) to distinguish routing areas within the same mobile routing domain; or,

b) when more than one routing domain is located on a single aircraft, to distinguish each routing domain and the routing areas contained within them.

Note 3.— For example, the first octet of the LOC field may be used to distinguish each routing domain on board a single aircraft, and the second octet to distinguish each routing area.

Note 4.— The combination of AFI, IDI, VER, ADM, RDF, ARS and LOC fields therefore forms an area address.

3.4.3.8.5.1 The LOC field shall be two octets in length and may be given any binary value.

3.4.3.8.5.2 The administrator of the network addressing domain that coincides with the routing domain in which a given routing area is located shall be responsible for the allocation of a LOC field value that provides a unique area address for that routing area.

Note.— For example, 470027+8147425200000001 0045 is an area address in a routing domain operated by the UK ATSC Administration.

3.4.3.8.6 The System Identifier (SYS) field

Note.— ISO/IEC 10589 defines the system identifier as a variable length field which uniquely identifies an end or intermediate system within a ISO/IEC 10589 routing area. Within a routing area, all system identifiers are of the same length, although a router is not able to make assumptions about the length of this field outside of its own routing area. However, the ATN addressing plan does specify this field to always be six octets in length in order to encourage a common equipment base.

3.4.3.8.6.1 In an ATN NSAP address or NET, the System Identifier (SYS field) shall be six octets in length.

3.4.3.8.6.2 The value of the SYS field shall be a unique binary number assigned by the addressing authority responsible for the network addressing domain that corresponds with the routing area in which the identified system is located.

Note.— If the system is attached to an IEEE 802 local area network (e.g. an Ethernet), then a common approach is to use the 48-bit LAN address as the value of the SYS field.

3.4.3.8.7 The NSAP Selector (SEL) field

Note.— The NSAP Selector (SEL) field identifies the end system or intermediate system network entity or network service user process responsible for originating or receiving Network Service Data Units (NSDUs).

3.4.3.8.7.1 The SEL field shall be one octet in length.

3.4.3.8.7.2 The SEL field value for an intermediate system network entity shall be [0000 0000], except for the case of an airborne intermediate system implementing the procedures for the optional non-use of IDRP.

3.4.3.8.7.3 In the case of an airborne intermediate system implementing the procedures for the optional non-use of IDRP, the SEL field value shall be [1111 1110].

3.4.3.8.7.4 The SEL field value [1111 1111] shall be reserved.

Note 1.— In an intermediate system, any other SEL field value may be assigned to NSAPs. The actual value chosen is a local matter.

Note 2.— SEL field values in stand-alone end systems (i.e. in end systems not co-located with intermediate systems) are not constrained.

3.4.3.8.7.5 SEL field values other than those defined for intermediate system network entities in 3.4.3.8.7.2 and 3.4.3.8.7.3 or being reserved, shall be assigned by the addressing authority responsible for the identified end or intermediate system.

3.4.3.9 Pre-defined NSAP address prefixes

3.4.3.9.1 All AINSC mobiles

The NSAP address prefix 470027+41 shall provide a common NSAP address prefix for all AINSC mobiles.

3.4.3.9.2 All ATSC mobiles

The NSAP address prefix 470027+C1 shall provide a common NSAP address prefix for all ATSC mobiles.

Note.— The NLRI for the default route to all mobiles comprises both the NSAP address prefixes defined above.

3.4.3.9.3 All aircraft belonging to an airline

The NSAP address prefix 470027+41 plus the value of the ADM field assigned to the airline shall provide a common NSAP address prefix for all AINSC mobiles operated by a single airline.

Note.— The NLRI for the route to the “home” for the aircraft belonging to a given airline contains this NSAP address prefix.

3.4.3.9.4 All general aviation and other types of aircraft registered by a State

The NSAP address prefix 470027+C1 plus the value of the ADM field assigned to the State shall provide a common NSAP address prefix for all ATSC mobiles registered by a single State.

Note.— The NLRI for the route to the "home" for the general aviation and other types of aircraft registered by a single State contains this NSAP address prefix.

3.5 TRANSPORT SERVICE AND PROTOCOL SPECIFICATION

3.5.1 General

3.5.1.1 Overview

3.5.1.1.1 The COTP (Connection Oriented Transport Protocol) shall be used to provide an end-to-end reliable data transfer service between transport service users on two ATN end systems.

3.5.1.1.2 In ATN end systems, the implementation of the COTP shall conform to ISO/IEC 8073 and the mandatory requirements given in this chapter.

3.5.1.1.3 The CLTP (Connectionless Mode Transport Protocol) shall be used to provide a connectionless data transfer service between transport service users on two ATN end systems.

3.5.1.1.4 In ATN End Systems, the implementation of the CLTP shall conform to ISO/IEC 8602 and the mandatory requirements given in this chapter.

Note.— The transport protocols specified for use in ATN end systems provide both connection mode and connectionless mode communication services. The implementation and use of a particular mode of the transport layer service depends on the requirements of the application(s) supported by a given ATN end system.

3.5.1.2 Transport service description

Note 1.— When the TS-user requires use of the connection mode transport service the TS-user will provide the following information to the TS-provider on a per transport connection basis:

a) called and calling TSAP address;

b) whether or not the expedited data option is required;

c) the required residual error rate (RER) to determine whether use or non-use of the transport checksum is required, or whether the extended 32-bit checksum is to be used;

d) the application service priority to be mapped into the resulting CLNP NPDUs according to Annex 10, Volume III, Part 1, Chapter 3, Table 3-1;

e) the ATN security label specifying the ATN traffic type, i.e.

- *ATN operational communications;*
- *ATN administrative communications;*
- *General communications;*
- *ATN systems management communications.*

Note 2.— In the case where the traffic type specified is ATN operational communications the TS-user will additionally provide the traffic category, i.e. air traffic services communications (ATSC) or aeronautical operational control (AOC).

Note 3.— In the case of the ATSC traffic category the TS-user will further specify the required ATSC class as defined in Table 3-2, or no traffic type policy preference.

Note 4.— In the case of the AOC traffic category the TS-user will further specify the subnetwork preference (including no preference).

Note 5.— The ATN traffic types and their associated traffic categories are specified in Table 3-9. The encoding of the ATN security label is specified in Figure 3-7 and 3.6.2.2.2.2 bullet b).

Note 6.— The TS-user is not required to specify any other transport service Quality of Service parameters.

3.5.1.3 Transport service access point addresses

3.5.1.3.1 A TSAP address shall comprise two elements, a NSAP address and a TSAP selector.

3.5.1.3.2 The NSAP address and the TSAP selector shall conform to the provisions in 3.4.

3.5.1.4 Exchange of transport-selector parameters

Note.— TSAP selectors are transmitted in calling and called transport-selector parameters in COTP, and in source and destination transport-selector parameters in CLTP.

3.5.1.4.1 The transport entity shall support transport-selector parameters to accommodate the ATN TSAP selector syntax and encoding requirements as specified in 3.4.

3.5.1.4.2 The transport entity should support remote transport-selector parameters of variable size from 0 up to 32 octets using any encoding and any value.

Note.— The absence of a calling and called transport-selector assumes the network address alone unambiguously defines the transport address.

3.5.1.4.3 In COTP, on receipt of CR (Connection Request) TPDU, the absence of a calling or called transport-selector shall be treated as equivalent to a zero length calling or called transport-selector.

3.5.1.4.4 The absence of a calling or called transport-selector in a received CC (Connection Confirm) TPDU shall indicate that calling or called transport-selector is equivalent to the corresponding parameter specified in the sent CR TPDU.

3.5.1.4.5 When present in a received CC TPDU, calling and called transport-selector parameters shall be identical in length and value to the corresponding parameter specified in the sent CR TPDU.

3.5.1.4.6 In CLTP, on receipt of UD (User Data) TPDU, the absence of a source or destination transport-selector shall be treated as equivalent to a zero length source or destination transport-selector.

3.5.2 Connection mode transport layer operation

3.5.2.1 Connection mode transport service primitives

Note 1.— For the purpose of describing the notional interfaces between different OSI protocol layers, each protocol layer is assumed to provide a service to the next higher protocol layer. The assumed service provided by the ATN transport layer to its user is described in ISO/IEC 8072.

Note 2.— ATN applications may specify their use of the COTP implemented in ATN end systems using the transport service specified in ISO/IEC 8072, including use of ATN priority, and security parameters as defined in this specification.

Note 3.— There is no requirement to implement the service specified in ISO/IEC 8072 as a software interface.

3.5.2.2 ATN specific requirements

3.5.2.2.1 ATN end systems shall implement the ISO/IEC 8073 Class 4 transport protocol in order to provide connection mode communications over the ATN Internet.

3.5.2.2.2 The COTP shall operate using the CLNS (Connectionless Network Service) as specified in 3.6.

Note.— TPDUs (Transport Protocol Data Units) are sent via the N-UNITDATA request primitive.

3.5.2.2.3 The transport entity shall not concatenate TPDUs from TCs with different transport priorities or different security labels.

3.5.2.2.4 The selective acknowledgement mechanism should be used for conservation of bandwidth by preventing retransmission of correctly received out-of-sequence TPDUs.

3.5.2.2.5 The request of acknowledgement mechanism should be used to reduce AK traffic.

3.5.2.2.6 The maximum TPDU size should be at least 1 024 octets.

Note.— This is to support efficient transmission of anticipated application data exchanges.

3.5.2.2.7 The transport layer should propose a TPDU size of at least 1 024 octets.

3.5.2.2.8 The transport layer should use the TPDU size parameter rather than the preferred maximum TPDU size parameter.

3.5.2.2.9 Implementations of the ATN transport layer should propose use of normal format in the CR TPDU.

3.5.2.2.10 The extended format should only be proposed when explicitly necessary to meet application Quality of Service requirements.

Note.— Because the increased TPDU size resulting from use of extended data TPDU numbering may be more inefficient, this option is used on a TC only when absolutely required.

3.5.2.2.11 The transport layer should accept non-use of checksum when proposed in a CR TPDU.

3.5.2.2.12 Implementations of the transport protocol shall support configurable values for all timers and protocol parameters, rather than having fixed values, in order to allow modification as operational experience is gained.

3.5.2.2.13 When intended for operation over air-ground subnetworks, transport protocol implementations shall support the minimum–maximum ranges for COTP timer values as presented in Table 3-7.

3.5.2.2.13.1 When intended for operation over air-ground subnetworks, the nominal values indicated in Table 3-7 should be used to initialize the COTP timers and protocol parameters.

Note.— The local retransmission time (T1) is dynamically updated as a function of the round-trip time measured on a given transport connection (see 3.5.2.8). The recommended algorithms for the dynamic computation of the local retransmission time are specified in 3.5.2.8.

3.5.2.2.13.2 The assignment of initial values for timers and parameters other than the nominal values indicated in Table 3-7 should be based on operational experience.

3.5.2.2.14 When intended for operation exclusively over ground-ground subnetworks, implementations of transport protocol timer values should be optimized to ensure interoperability.

Table 3-7. COTP timer value ranges

Name	*Description*	*Minimum value*	*Nominal value*	*Maximum value*
M_{RL}, M_{LR}	NSDU lifetime, seconds	26	400	600
E_{RL}, E_{LR}	Maximum transit delay, seconds	1	100	150
A_L, A_R	Acknowledgement time, seconds	0	1	400
T1	Local retransmission time, seconds	2	202	701
R	Persistence time, seconds	1	405	6 310
N	Maximum number of transmissions	1	3	10
L	Time bound on reference and/or sequence numbers, seconds	160	1 206	7 910
I	Inactivity time, seconds	600	4 500	6 000
W	Window time, seconds	160	4 000	5 500