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AERONAUTICAL TELECOMMUNICATION NETWORK PANEL

WORKING GROUP 2

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CIDIN as an ATN Subnetwork - Proposal to Extend the ATN ICS Guidance Material

Working Paper

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SUMMARY

During the second meeting of the ATN panel, guidance material for the internet communication service was presented. This material was approved by the meeting, however it was identified that the material lacks guidance on the use of CIDIN as a subnetwork of ATN and it was agreed to extend the material until the WGW meeting. This paper provides such additional material. It has been developed under cooperation with experts from the russian delegation at ATNP/2.

1 History

During the second meeting of the ATN panel, guidance material for the internet communication service was presented. This material was approved by the meeting, however it was noted that certain elements were missing from the material and it was agreed to extend the material by guidance on the use of CIDIN as a subnetwork of ATN.

2 Discussion

Material had been developed by ATN experts and CIDIN experts. This material has been coordinated amongst technical experts including those from the russian delegation which were concerned about the omission with respect to CIDIN.

3 Recommendation

It is recommended that

(a) the working group approves the attached material as extension to the guidance material on the internet communication service as approved by ATNP/2; and

(b) forwards the approved material to ICAO, requesting its inclusion it in the material presented to the ANC.

4 Reference

ATNP/2-WP/67, APPENDIX D to the report of Agenda item 3 (Guidance Material for the ATN Internet Communications Service SARPs)

7 ATN Subnetworks

7.5 Ground/Ground Subnetworks

This section presents guidance to States and Organisations wanting to implement new or already existing networks as ATN subnetworks inside their respective boundaries. Figure 7-1 shows various ground-ground networking technologies that may be used as subnetworks to support the ATN Internet Communications Service. Some of these technologies may also be applicable within an aircraft.

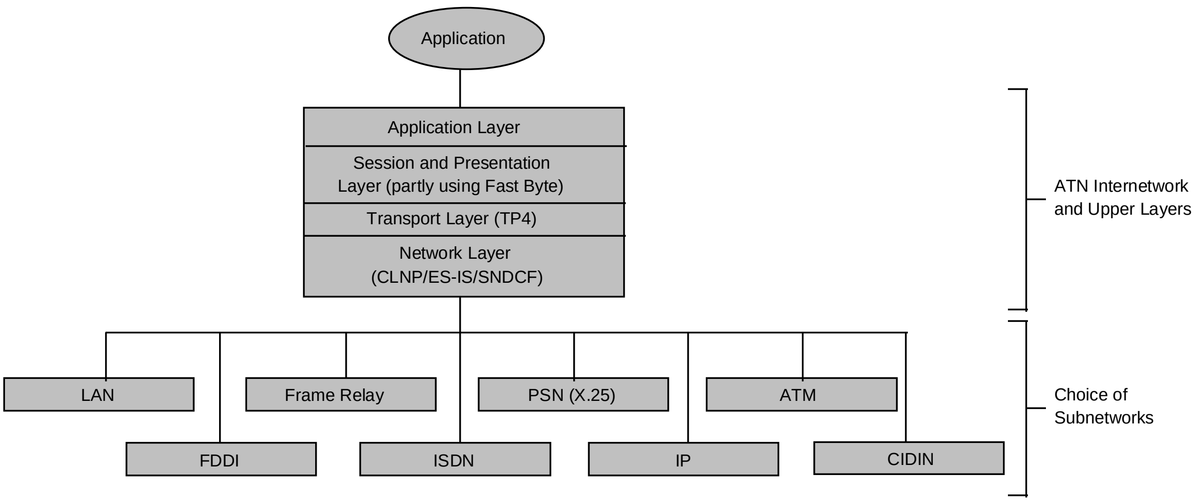

Figure 7-1 ATN Use of Various Ground-Ground Subnetworks

remaining text remains unchanged

7.5.8 Mapping CLNP over CIDIN

Note.- The Common ICAO Data Interchange Network (CIDIN) is specified in Annex 10, Vol. III. In addition, ongoing working group activities in the European region are concerned with protocol refinements, profile specifications, network management and provision of guidance material for the CIDIN. The outcome of these activities is published in the EUR CIDIN Manual (ICAO EUR DOC 005).

7.5.8.1 General characteristics of CIDIN

7.5.8.1.1 Provided communication service

CIDIN, at the time of definition conceived as a general purpose data network providing a code and byte independent connectionless transport service for AFS applications, makes use of packet switching techniques according to the CCITT Recommendation X.25. CIDIN protocols are defined at four levels: data link protocol (level 2), X.25 packet protocol (3a), CIDIN packet protocol (3b) and transport protocol (4). The level 1 is related to the physical interface to the tranmission media. Routing and multiple dissemination is performed at the level of the CIDIN packet protocol. The user interface is provided at the level 4. The X.25 packet protocol may be performed in the DTE-DTE mode on leased lines (using permanent virtual circuits) or at the DTE-DCE interface to packet switched data networks (using switched or permanent virtual circuits).

Note.- For CIDIN use of packet switched data networks see EUR CIDIN Manual.

In the CIDIN concept a user of the CIDIN service is represented by an abstract functional unit called application entity. An application entity invokes the CIDIN transport service for user data and provides the parameters needed to specify the requested service (request to send a CIDIN message). In the opposite direction, control information and transported user data are accepted (reception of a CIDIN message). Individual types of application entities are distinguished by the assigned Message Code and Format (MCF) value. Only application entities of the same type (MCF value) are allowed to communicate across the CIDIN.

Note.-Presently, application entities and the corresponding MCF values are specified for the transport of AFTN formatted messages, OPMET data, and CIDIN management information (EUR CIDIN Manual).

The access point of an application entity to the CIDIN transport service is identified by the CIDIN entry address (point of CIDIN message submission) and exit address (point of CIDIN message delivery).

Note.- Special structures for the 8-letter CIDIN entry/exit addresses may be established on a regional basis.

When sending a CIDIN message, the application entity can indicate by a service parameter whether the message transport should be acknowledged end-to-end within the CIDIN. Using this acknowledgement option, the CIDIN provides information on successful or non-successful message delivery per exit address delivery confirmation.

7.5.8.1.2 The CIDIN transport interface

The interactions with the users of the CIDIN transport service (level 4) are a local matter, i.e. not specified in Annex 10, Vol III. In accordance with the EUR CIDIN manual, Table 7-3 provides some guidance to the use of service parameters at this interface when sending or receiving a CIDIN message respectively.

Service Parameter	Sending a CIDIN Message	Receiving a CIDIN Message
Exit Address (Ax)	Mandatory	Optional [1)]
Entry Address (Ae)	Mandatory	Mandatory
Message Code and Format (MCF) indicator	Mandatory	Mandatory
Message Priority (MP) Indicator	Mandatory	Mandatory
Network Acknowledgement (NA) Indicator	Optional	Optional
User Data (CIDIN Message)	Mandatory	Mandatory

1) Is known to the addressed application entity

Table 7-3: Service parameters used for sending and receiving CIDIN messages

In the following some explanations are given to the service parameters listed in Table 7-3.

- Exit Address(es) (Ax): Identification of the receiving application entity (entities).

Note.- In the European Region, a maximum number of 16 exit addresses may be associated with a CIDIN message (EUR CIDIN Manual).

- Entry Address (Ae): Identification of the sending application entity.
- Message Code and Format (MCF) Indicator: Identifies the type of the communicating application entities.
- Message Priority (MP) Indicator: Eight levels of priorities are defined. The highest priority (level 1) is reserved for CIDIN network management messages. The remaining priorities are available for user messages.

Note.-For the transport of AFTN-formatted message the following correspondences between AFTN priority indicators and CIDIN priorities have been agreed: SS = 2, DD = 4, FF = 5, GG = 6, and KK = 7. (EUR CIDIN Manual)

- Network Acknowledgement (NA) Indicator: NA = 0 (no acknowledgement required) or NA = 1 (acknowledgement required).
- User Data (CIDIN message): The coding of the user data is code and byte independent. According to the CIDIN SARPs user data may have unlimited length.

Note.- There is an agreement between States in the European Region to restrict the maximum length of user data to 64 kilobytes (EUR CIDIN Manual).

7.5.8.2 Integration of CIDIN as ATN Subnetwork

As illustrated in the section above, CIDIN has been specified as a general purpose transport system between peer CIDIN entry/exit centers. Thus the concept of "underlying subnetworks" as applied by the ATN architecture is not obvious in the CIDIN context.

However, CIDIN can be integrated in the ATN as an ATN subnetwork in which the subnetwork service is provided by the CIDIN transport service. In this configuration, the CIDIN transport protocol operates as subnetwork access protocol (SNAcP) according to the structure of the OSI network layer. The service provided by the CIDIN transport protocol is raised to the level required by the ATN internetwork protocol (CLNP) by means of a suitable SNDCF. This CIDIN SNDCF is described in more detail in section 7.5.8.3 below. The following figure 7-6 illustrates how the CIDIN transport service is accessed by the ATN internetwork layer.

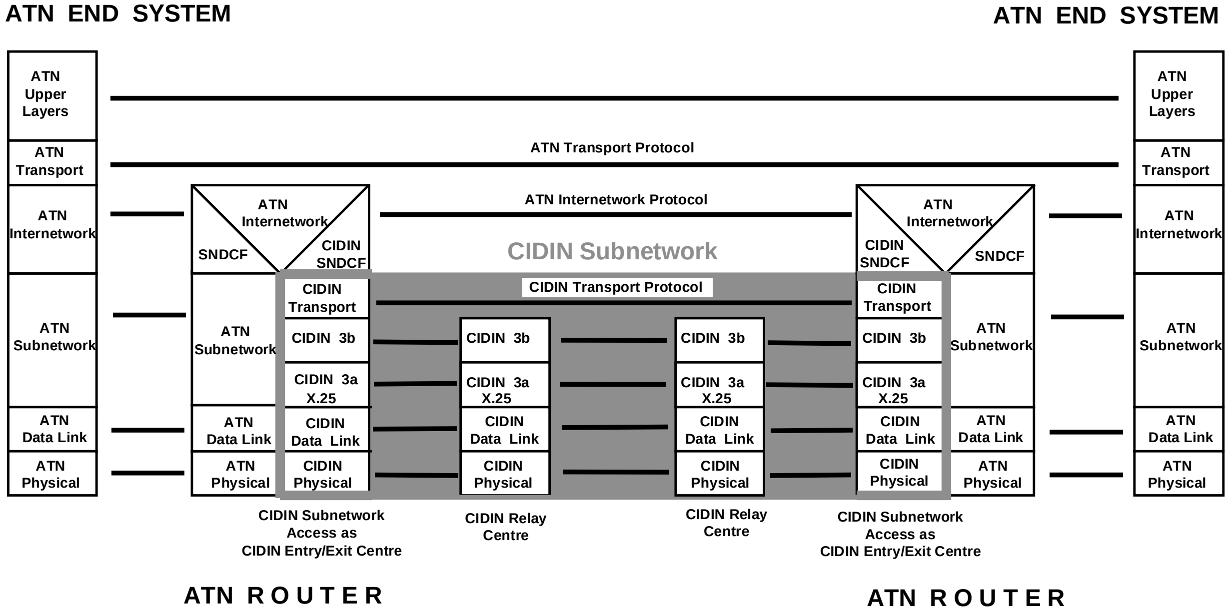

Figure 7-6 CIDIN as ATN Subnetwork

In this configuration where the ATN internetwork protocol operates over the CIDIN transport protocol, there is a considerable degree of functional overlap between the SNIDP (i.e. the ATN CLNP) and the SNAcP (i.e. the CIDIN transport protocol and packet protocol). For example, the CIDIN transport protocol also provides segmenting and reassembling functions and the CIDIN packet protocol performs routing on permanent or switched virtual circuits. The CIDIN transport and packet headers have to be carried in addition to the CLNP headers within the CIDIN subnetwork.

Furthermore, some functions provided by the CIDIN transport service together with the CIDIN packet protocol responsible for the handling of the 256-octet CIDIN packets are not used by the CLNP in this configuration. This includes the multiple dissemination of messages and the acknowledgement of messages between CIDIN entry and CIDIN exit centres.

However it is important to note that when CLNP operates over the CIDIN transport protocol, CIDIN maintains its integrity, i.e. it could simultaneously serve as an ATN subnetwork and as an end-to-end data network providing service to other CIDIN applications, such as the transport of AFTN-formatted messages.

Because of the almost unlimited length of CIDIN messages, the non-segmenting subset of the CLNP is sufficient when operating over CIDIN.

7.5.8.3 CIDIN SNDCF

The CIDIN SNCDF performs a mapping between the SN-Service required by the ATN internetwork protocol (CLNP) and the CIDIN (transport) service. The ATN ICS SARPs specify the relationship between the SN-UNITDATA service primitives and the actions at the CIDIN (transport) interface:

- A SN-UNITDATA Request corresponds to a request to send a CIDIN message.

- A CIDIN message received at a CIDIN exit center translates into a SN-UNITDATA Indication.

The acknowledgement option of the CIDIN is not invoked by the CIDIN SNDCF. This means that CIDIN will not provide a delivery confirmation, when used as ATN subnetwork. No segmentation of the SNS-Userdata is needed.

The parameters of the SN-UNITDATA service primitive, i.e. SN-Source-Address, SN-Destination-Address, SN-Priority and SN-Userdata have equivalents handled by the CIDIN transport service. Table 7-4 indicates the correspondence between these SN-UNITDATA service parameters and the CIDIN service parameters.

The SN-Quality-of-Service parameter of the SN-UNITDATA service primitive can be assumed to have a constant (a-priori) value for a CIDIN subnetwork and is entered e.g. as management data in the ATN router. It is ignored by the CIDIN SNDCF when receiving a SN-UNITDATA request and pre-set by the CIDIN SNDCF when generating a SN-UNITDATA indication.

SN Service Parameter	**CIDIN Transport Parameters**
SN-Source-Address	Entry Address (Ae)
SN-Destination-Address	Exit Address (Ax)
SN-Priority	Message Priority (MP) Indicator
SNS-Userdata	CIDIN Message

Table 7-4: Correspondence between SN-Service and CIDIN Service Parameters

Except for the above mapping to and from CIDIN transport parameters, the CIDIN SNDCF has to assign an MCF value identifying the User Data as ATN traffic.

Note.- The currently (january 1997) unassigned MCF value of 4 may be used for ATN communication traffic over CIDIN. Corresponding allocation will be initiated on a regional basis.

The correspondence between ATN CLNP priority and CIDIN priority as recommended by ASPP/3 is shown in Table 7-5:

CLNP priority	***CIDIN priority***
12-15	*2*
6-11	*5*
0-5	*7*

Table 7-5: Mapping of Priorities

A-priory values for transit delay, protection against unauthorized access, cost determinants and residual error probability have to be entered as management data into the ATN router.

7.5.8.4 Synopsis

CIDIN is in wide use in certain regions as communication service for AFS applications, and may provide the only means of data communication to remote facilities. However, the use of CIDIN as an ATN subnetwork can often not be regarded as technically straight forward solution.

If ATN-compliant X.25 services are available for the whole communication path (i.e. SVCs) which are accessible on X.25 level, it is more advisable to use the underlying X.25 service directly as an ATN subnetwork in order to reduce overhead from the encapsulation of CLNP. In this case, a “standard“ X.25 SNDCF can be used in the ATN router.

However, if the X.25 protocol cannot be accessed directly, then the use of a CIDIN SNDCF provides the possibility to make use of the already existing infrastructure for ATN purposes.