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Publicly Available Specification

TETRAPOL Specifications
Part 11: Gatyeway to External Networks;
SubPart 3:Gateway to IP Networks

Reference

Keywords

Tetrapol

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Foreword

This document is the Publicly Available Specification (PAS) of the TETRAPOL land mobile radio system, which shall provide digital narrow band voice, messaging, and data services. Its main objective is to provide specifications dedicated to the more demanding PMR segment: the public safety. These specifications are also applicable to most PMR networks.

This PAS is a multipart document which consists of:

Part 1 General Network Design

Part 2 Radio Air interface

Part 3 Air Interface Protocol

Part 4 Gateway to X.400 MTA

Part 5 Interface to dispatch centre

Part 6 Line Connected Terminal interface

Part 7 Codec

Part 8 Radio conformance tests

Part 9 Air interface protocol conformance tests

Part 10 Inter System Interface

Part 11 Gateway to PABX, ISDN, PDN

Part 12 Network Management Centre interface

Part 13 User Data Terminal to System Terminal interface

Part 14 System Simulator

Part 15 Gateway to External Data Terminal

Part 16 Security

Part 17 Guide to TETRAPOL features

Part 18 Base station to Radioswitch interface

Part 19 Stand Alone Dispatch Position interface

1. Scope

The purpose of this part is to specify the interface between the Radio Switch and a IP network at the R15 reference point (see PAS 0001-1-1 [1]).

2. Normative references

This PAS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this PAS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] PAS 0001-1-1: "TETRAPOL Specifications; General Network Design; Reference Model".

[2] RFC 768 (August 80): “User Datagram Protocol”, J. Postel.

[3] RFC 791 (September 81): “Internet Protocol”, J. Postel.

[4] RFC 792 (September 1981): “Internet Control Message Protocol”, J. Postel.

[5] RFC 919 (October 1984): “Broadcasting Internet datagrams”, J. Mogul.

[6] RFC 922 (October 1984): “Broadcasting Internet datagrams in the presence of subnets”, J. Mogul.

[7] RFC 1122 (October 1989): “Requirements for Internet hosts - communication layers”, R. Braden.

[8] RFC 1123 (October 1989): “Requirements for Internet hosts - application and support”, R. Braden.

[9] RFC 1812 (June 1995): “Requirements for IP version 4 routers”, F. Baker.

[10] RFC 1920 (March 1996): “Internet official protocol standards”, J. Postel.

3. Definitions and abbreviations

3.1. Definitions

For the purposes of this PAS, the following definitions apply:

Data Application Server (DAS): Functional entity in the external system managing IP applications. These applications are also located in the UDT. TETRAPOL SwMI provides IP transmission between UDTs and DASs.

Data Network Controller (DNC): Functional entity in the TETRAPOL SwMI, featuring the access point to the external system for the IP transmission. The DNC handles the IP routing between the TETRAPOL system and external systems.

Downlink message: Message transmitted by the SwMI to an ST, then to a UDT.

Uplink message: Message transmitted by a UDT to an ST, then to the SwMI.

3.2. Abbreviations

For the purposes of this PAS, the following abbreviations apply as well as those given in PAS 0001-1-1 [1]:

CS	Control and Supervision driver
DAS	Data Application Server
DNC	Data Network Controller
FDDI	Fibre Distributed Data Interface

IP	Internet Protocol
IPM	Inter-Personal Messaging
LAN	Local Area Network
LSB	Least Significant Bit
NDIS	Network Driver Interface Specification
TCP	Transport Connected Protocol
TOS	Type Of Service
TTL	Time To Live
UDP	User Data Protocol

4. Interface specification

4.1. Communication layers

4.1.1. External interfaces layers

The external interfaces are represented by the pieces of equipment connected to the TETRAPOL system.

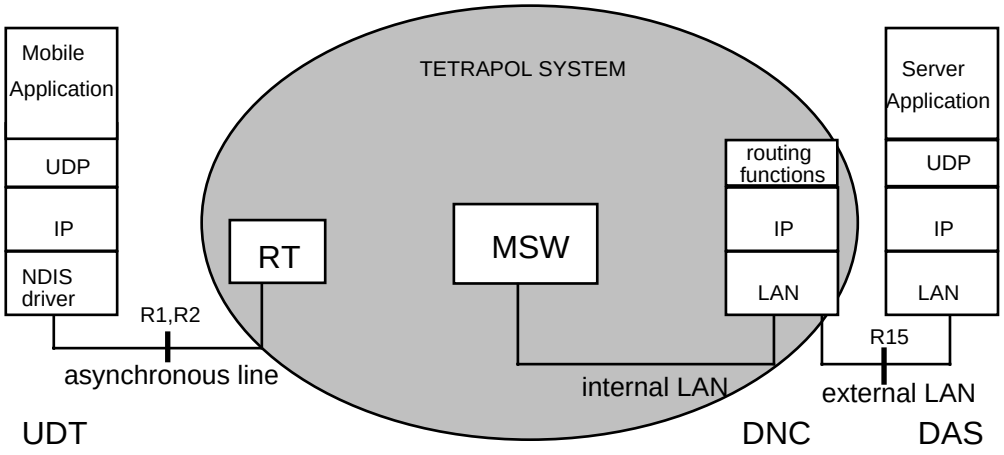

Figure 1: External interfaces layers

On the external LAN side, the interface is the DNC. The DNC is equipped with routing functions, laying on IP protocol over a LAN connection. The DNC is customised to support different types of external LAN: Ethernet, DIX Ethernet, Token Ring, FDDI, etc...

The DAS is equipped with standard IP and UDP protocols. The DAS application uses UDP protocol for its communications with UDT.

The Application layer in the UDT communicates with the Application layer in the DAS. Application messages are embedded in UDP protocol.

The UDP and IP layers interfacing at the R15 reference point shall be compliant with the normative references [2] to [10]

4.1.2. IP protocol

4.1.2.1. IP supported protocol elements

Standard IP Header and data has the following format:

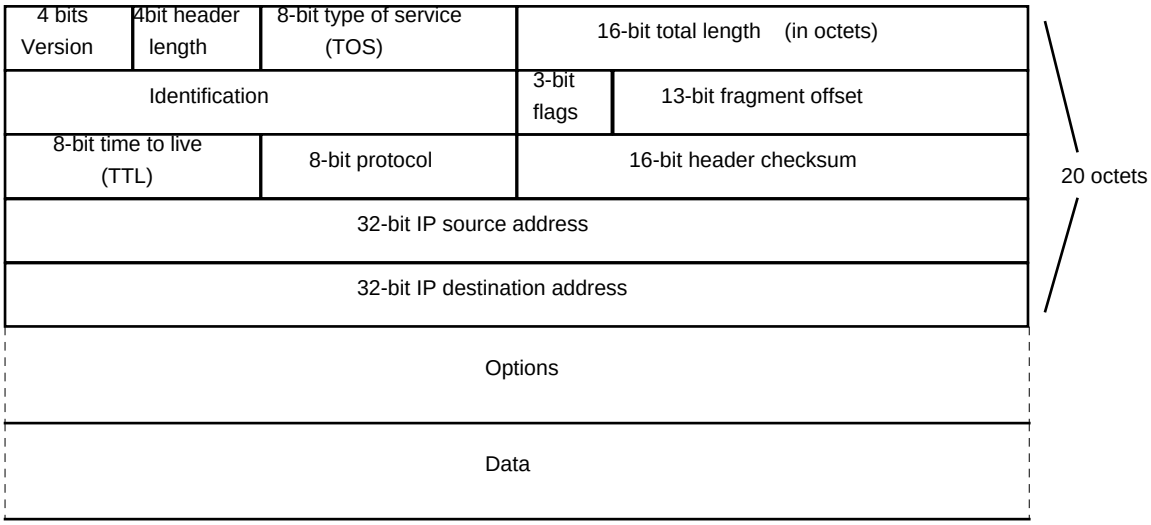

Figure 2: Information elements

he following table gives the list of supported and not-supported protocol elements of IP header:

- "**Re-established**" means the IP elements are not transmitted inside the TETRAPOL system but restored at the external interface;

- "**Not Supported**" means the IP element is not processed in the TETRAPOL system and shall not be used by the application;

- "**Processed**" means the IP elements are used for routing by the TETRAPOL system.

Table 1: List of protocol elements

	Re-established	**Not Supported**	**Processed**
Version	X (V4)		
Header length	X		
TOS	X		
Total length	X		
Identification	X		
Flags	X		
Fragment offset		X	
TTL		X	
Protocol	X		
Header Checksum	X		
IP source address			X
IP destination address			X

Options		X	

IP fragmentation is not supported.

4.1.2.2. IP address coding

4.1.2.2.1. Individual UDT/ST addressing

Class A of IP addresses shall be used to designate individual address of a ST and its associated UDT. This class offers the largest range of values for the stations addressing.

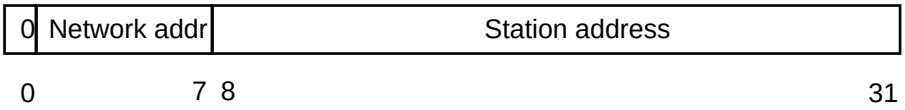

Figure 3: General description of class A IP address

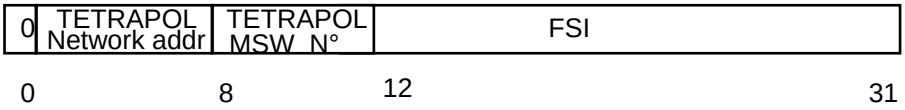

Figure 4: Class A IP individual addressing of UDT

TETRAPOL MSW N° is translated from the prefix R (3 digits) of the RFSI address. FSI values (6 digits) shall be coded in binary (20 bits).

A TETRAPOL system may form up to 8 IP networks, coded in the TETRAPOL Network Address field. The TETRAPOL Network Addresses shall be configure to not have collisions in the external addressing plan with the other IP class A networks, that may be addressed.

4.1.2.2.2. Operational Group addressing

Operational Group addresses shall be coded as a class A IP address in a range not used by the Individual addresses.

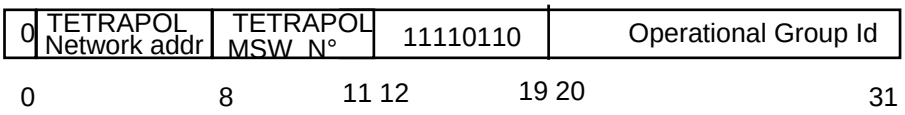

Figure 5: Class A IP address for Operational Groups

The specific pattern in bits 12 to 19 indicates that an OG Identifier in coded in bits 20 to 31. The RFSI numbering plan for Individual addresses shall be defined in a way that this specific pattern cannot occur in the coding of an IP Individual address.

A special value of the Operational Group Id shall be used to designate all the UDTs for broadcasting.

4.1.2.2.3. Functional addressing

Functional addressing permits to identify pre-defined DASs without giving the real IP address of these DASs. The translation is done by the SwMI.

Functional addresses shall be coded as a class A IP address in a range not used by the Individual and Operational group addresses.

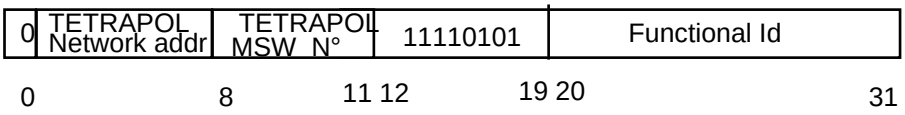

Figure 6: Class A IP address for TETRAPOL functional addresses

The specific pattern in bits 12 to 19 indicates that a Functional Identifier in coded in bits 20 to 31. The RFSI numbering plan for Individual addresses shall be defined in a way that this specific pattern cannot occur in the coding of an IP Individual address.

4.1.2.2.4. External IP addressing

Class A IP addresses containing a network address different of a TETRAPOL Network address, class B IP addresses, class C IP addresses are authorised to designate a recipient in an external IP network.

4.1.3. TCP/UDP protocol

4.1.3.1. TCP/UDP source port coding

The TETRAPOL system makes a specific use of this field, to identify the radio service over the air interface, the priority and encryption of the message.

The Source Port is assigned by the DAS for downlink messages. It shall then be considered by the SwMI to route the message according to the relevant TETRAPOL protocols over the air interface.

The Source Port format includes radio service, priority and encryption flag.

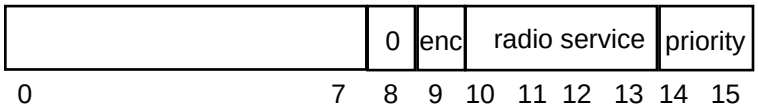

Figure 7: TCP/UDP source port coding

4.1.3.1.1. Priority of the message

There are 3 priorities, namely routine, urgent and flash represented by the 2 LSB at the source port of the TCP/UDP header.

b_{14} b_{15} = 00 for normal priority

b_{14} b_{15} = 01 for urgent priority

b_{14} b_{15} = 10 for flash priority

b_{14} b_{15} = 11 reserved

4.1.3.1.2. Radio service

This element is used by the DAS to request the appropriate radio service to deliver the message from the SwMI to the ST.

source port coding	TETRAPOL radio delivery
$b_{10}b_{11}b_{12}b_{13}$= 0000	standard connected packet delivery
$b_{10}b_{11}b_{12}b_{13}$ = 0100	fast connected packet delivery
$b_{10}b_{11}b_{12}b_{13}$ = 0001	unannounced datagram delivery
$b_{10}b_{11}b_{12}b_{13}$ = 0010	announced datagram delivery

$b_{10}b_{11}b_{12}b_{13}$ = 1111	multi-channel datagram delivery

Figure 8: Radio services coding

4.1.3.1.3. Encryption of the message

b_9=0 for optional encryption. The message shall be encrypted in the TETRAPOL system as long as the encryption function is operational. If the encryption function is not operational, the message is transmitted without encryption.

b_9=1 for mandatory encryption. The message shall be encrypted in the TETRAPOL system. If the encryption function is not operational, the message shall not be transmitted and shall be discarded by the TETRAPOL system.

b_8 is reserved for future use.

4.1.3.2. UDP datagram length

According to the IP fragmentation, which is not supported by the TETRAPOL system, the UDP datagram length is limited to 1480 octets including the UDP header (8 octets). So, applications using UDP shall segment the applicative data units which exceed 1472 octets.

History

Document history		
Date	**Status**	**Comment**
23 May 1997	Version 0.0.1	First version
3 June 1997	Version 0.1.0	Update after review
25 June 1997	Version 1.0.0	Tetrapol Forum Approval