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Terrestrial Trunked Radio (TETRA); Technical requirements specification for Digital Advanced Wireless Service (DAWS)

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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

Introduction

The present document has been prepared (based upon the finalized work of EP-TETRA) as a communication to the ETSI Membership and Board and as a general working document for EP-TETRA Working Group 4 in the field of Wireless ATM Mobile Networking.

The present document describes the basic ideas behind Digital Advanced Wireless Services (DAWS), relevant to market aspects and positioning within the present portfolio of ETSI Projects and Standardization activities.

Following the publication of the Strategic Review Committee (SRC6) Report on EII, June 1995 and the Global Multimedia Mobility (GMM) Report, October 1996 an ever increasing pace of activities within the field of Multimedia, Internetworking and 4th Generation Broadband technologies has been experienced throughout all three ITU Regions.

New approved ETSI Projects in this field are EP TIPHON, EP BRAN and to an extent EP EASI and with the formal procedures of co-operation with the ATM Forum it is proved, that ETSI is well prepared to meet the fast increasing pressure from the market to realign capacity and throughput of the wireless world with that of the fixed networks.

In order to be successful both:

1) fast time to market; and

2) careful forward migration of second generation Infrastructure,

have to be factored in.

Both these criteria lead to the initiative of building upon existing standards and already expended effort. Emergence of new generations should happen through evolution not revolution.

Well known examples are the current implementation of GPRS (General Packet Radio Services) onto the existing GSM platform to expand throughput and the reuse of GSM Protocol Architectures in the 1 800 and 1 900 MHz bands to expand capacity.

Likewise within EP TETRA a number of members (initially SIMOCO, TeleDanmark, BT, Motorola and UK Home Office), based on a study report [5] decided to work on migrating the TETRA Packet Data Optimized (PDO) wireless networking standard (ETS 300 393 [1] to [3]) to aim at a combination of full mobility/roaming and Wireless ATM bit rates up to 155 Mbit/s. This enhancement was given the code-name DAWS and has already been studied with much interest within the ATM Forum (Working Group WATM).

The cellular world's market has been pampered with seamless on-line facilities and functions. Full mobility seems hard to disregard from future hand-held "Wireless WEB-Surfers" offering continuous transmission of live pictures as well as Automatic Vehicle Location (AVL) and Automatic Person Location (APL).

In the early seventies some forward looking heads of laboratories within the old telephone monopolies of Europe suggested how to add mobility to communication services not realizing they were giving birth to one of the largest success-stories of communications of this century, the digital cellular industry.

Now envisage a wireless hand-held WEB-Browsing device (a DAWS terminal) featuring the same mobility as a wireless phone service with throughput enough to process Wireless Packet Voice Telephony (The Mobile TIPHON-Phone) and other future "bit-hungry" applications.

Just as telephone subscribers were waiting to go unwired 25 years ago the exploding Internet/Intranet community is still waiting for a solution, which also satisfies the requirements of the operators. DAWS seem to be an interesting approach, which completes the current menu of ETSI Standardization activities.

1 Scope

The present document is to inform the ETSI Members how far the work on DAWS has been carried out and to outline the market potential for seamless ATM based mobile services. A proposal for deliverables in this field and an assessment of the time to deliver is presented later in the present document.

The DAWS Standard according to the ETSI TA Decisions is divided into three parts:

1) network aspects including Wireless Node Interlink Protocol Specifications;

2) terminal Air-Interface, including layer 3 entities;

3) authentication, encryption and security aspects.

Current work has shown, that a major reuse of the ETS 300 393 [1] to [3] standard is feasible and highly recommended. It took a substantial amount of effort to implement the Mobility Management (MM) and Mobile Link Entity (MLE) structures of the protocol hierarchy, effort which can be reused to move forward into the much higher bitrate environments.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ETS 300 393-1: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Packet Data Optimized (PDO); Part 1: General network design".

[2] ETS 300 393-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Packet Data Optimized (PDO); Part 2: Air Interface (AI)".

[3] ETS 300 393-7: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Packet Data Optimized (PDO); Part 7: Security".

[4] US Investment Bank, Stanley Morgan as quoted by FT March 17, 1997.

[5] EPT.4/DAWS(97)03 rev 2, Digital Advanced Wireless Services.

[6] Boersen, September 17, 1997.

[7] TRAC/29/01 Minutes of the 28th TRAC Plenary, 14/15 May, 1997.

3 Abbreviations

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

APL	Automatic Person Location
AVL	Automatic Vehicle Location
CONS	Connection Oriented Network Services
DAWS	Digital Advanced Wireless Services
EII	European Information Infrastructure
GMM	Global Multimedia Mobility
GPRS	General Packet Radio Services
MLE	Mobile Link Entity
MM	Mobility Management
PDO	Packet Data Optimized
PTMP	Point-To-MultiPoint
PTP	Point-To-Point
SRC	Strategic Review Committee
TRAC	Technical Regulations Applications Committee
WATM	Wireless Asynchronous Transfer Mode

4 Market Considerations

Today over 100 million Internet connected computers are in daily operation, a number exceeding currently the world population of private TV-dish receivers. These fixed terminals are supported by more than 16 million servers - up from 1 000 back in 1988 according to Frost & Sullivan, 1997.

By the year 2000, MCI estimates that 200 million active Internet terminals will be in constant operation, a lucrative market trend for the development and operation of "Personal Seamless Internet Access" as well as offering the vehicle for the European Information Infrastructure (EII) Services.

As entertainment and information technology become more and more integrated it is also interesting to observe the market acceleration seen from the media side:

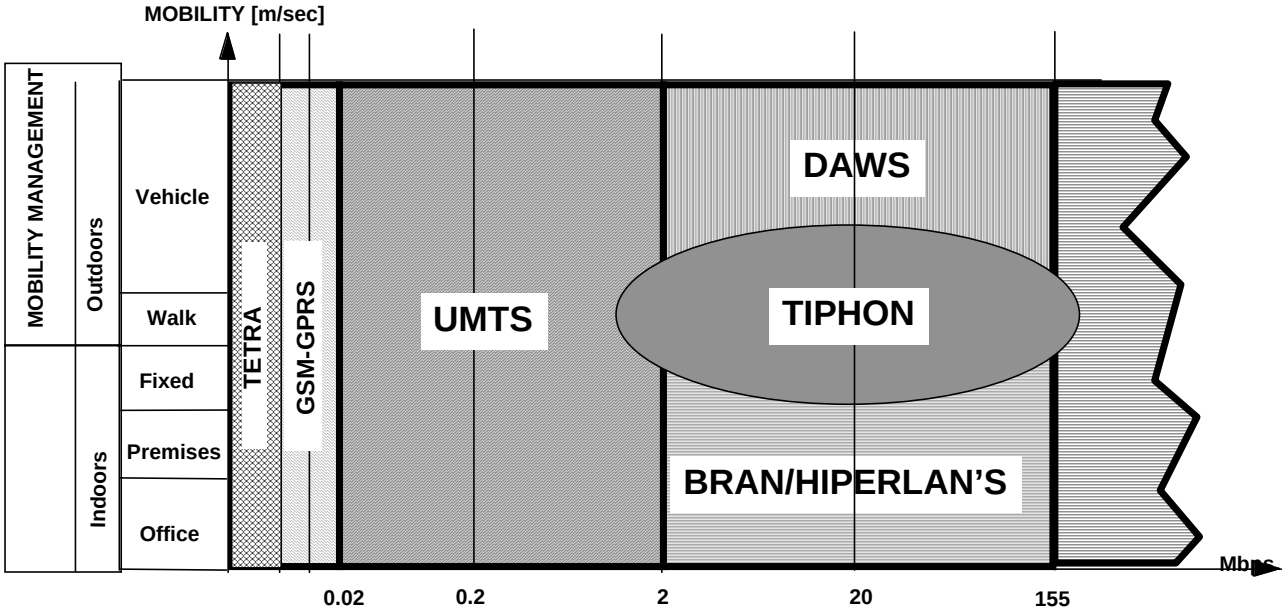
- in the US (see US Investment Bank [4]) it took about:
  - 38 years for radio broadcasting to reach 50 million listeners;
  - 13 years for television to reach that same number of viewers;
  - 10 years for cable TV; and

by 1998 this number of active Internet users will be reached, just 5 years after its commercial roll-out.

According to Business Newspaper "Boersen" [6], 5 % of all international telephony will be Internet based by the turn of the millennium. This means a total accessible market of more than 5 million potential users of wireless high capacity links, including telephony, is waiting to be served by the time of completion of the DAWS standard.

The DAWS approach has always been in full compliance with the new ETSI initiative of bringing professional products to market faster. It has been proved that DAWS is reducing the technical risk involved in any such breakthrough and it will further reduce spending for both ETSI and the European Union (EU).

4.1 Positioning of DAWS



NOTE: Observe the TIPHON application and its multi platform relevance.

Figure 1: The segmentation of different platforms

As figure 1 indicates, the large segment from UMTS into WATM (X-axis) and from the top of the HIPERLAN's and (Y-axis) into outdoor coverage with terminal mobility and roaming has been identified by the ETSI DAWS team as hitherto not covered.

At present the common view regarding implementation of UMTS Packet Services seems to indicate that the GSM-GPRS standardization should lead the way. Regrettably little attention has yet been paid to dedicated UMTS Packet Radio Services.

5 The Scenario

Over the past decade expensive lessons have been learnt in the process of matching services and applications with the applied bearer technology. As an example it does not seem particular ideal to offer a telefax service on a packet switched mobile data system, which by nature is optimized for the transaction oriented environment.

It is therefore necessary to plan for the standardization of different but mutually compatible platforms when a future wireless MULTI-Media Services environment is the target.

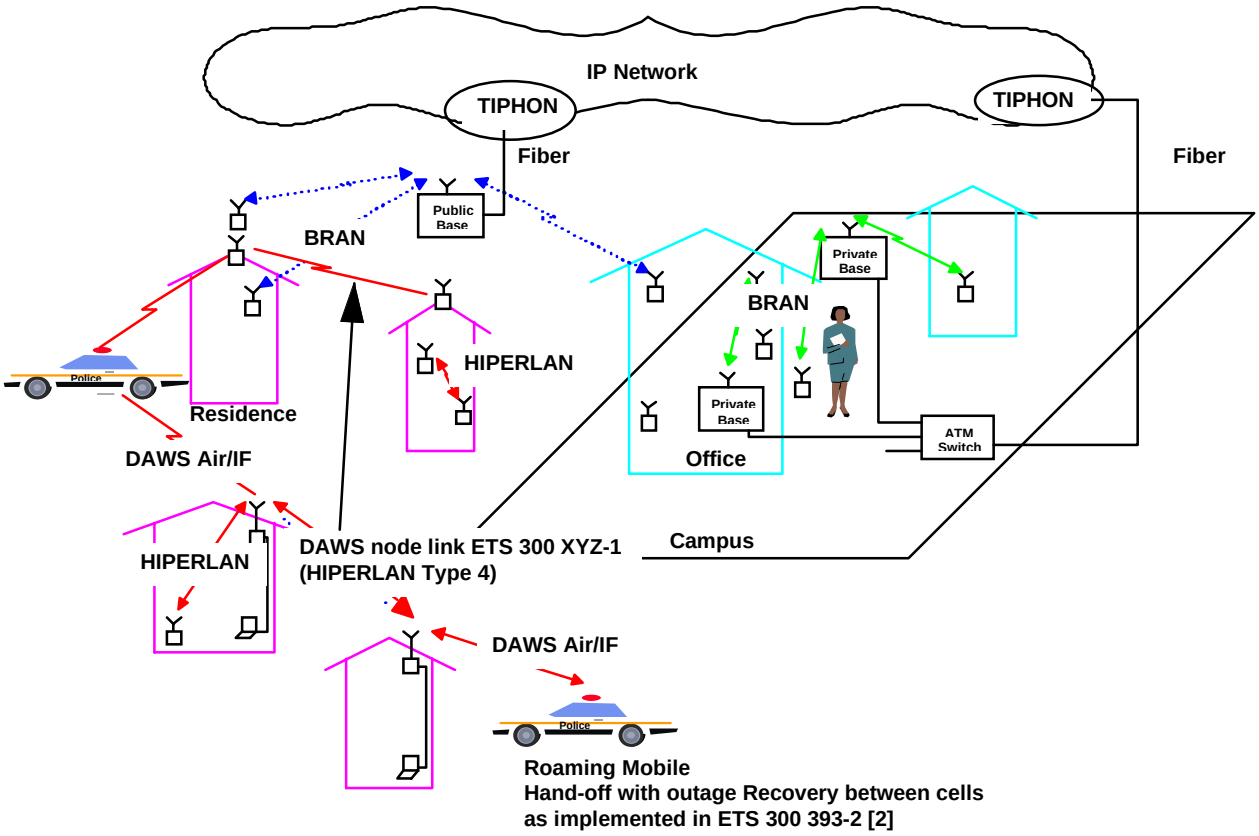


Figure 2: The DAWS Scenario

The DAWS platform protocols makes it possible to apply HIPERLAN Type 4 as the DAWS Node Interlink Protocol Architecture. HIPERLAN Type 4 may be adopted by ETSI around year 2004 - 2005.

As figure 2 indicates, the DAWS infrastructure is foreseen to be implemented by an array (or in the case of wide area, continuous coverage) by a grid of wireless Nodes interlinked by a dedicated very high speed node-link Point-To-Point (PTP)/Point-To-MultiPoint (PTMP) protocol architecture (perhaps HIPERLAN 4 in the 17 GHz range should be a candidate). A Node will service the terminals within its coverage area and communicate with its neighbouring Nodes on roaming details as well as its relay of user data safely to and from the fixed ATM fabric.

6 Suggested frequencies for DAWS

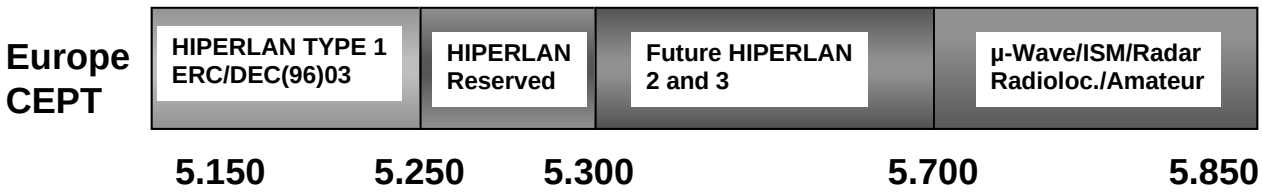


Figure 3: A brief overview of the European 5 GHz situation

EP TETRA fully recognizes that TC ERM has to process all matters with regards to frequency allocation questions and liaise on behalf of ETSI with the EU and CEPT.

However it is tentatively suggested to propose a sharing scheme with the planned services in the band 5,150 GHz to 5,700 GHz and DAWS.

During the 28th Technical Regulations Applications Committee (TRAC) Plenary Assembly Meeting [7] in Vienna, 14/15 May, 1997 the concept of DAWS was thoroughly presented and endorsed. A Scope Statement for DAWS was

produced during a preceding meeting of TMG. It is suggested, that a CTR for DAWS should now be drafted realizing that no harmonized spectrum yet is allocated to this technology.

It should be noted that the TRAC Chairman: "concluded and summarizes TRAC's position as noting the views expressed within TMG that there was a potential market for DAWS, but waiting for allocation of harmonized spectrum by CEPT/ERC before proceeding with consideration of whether there should be a CTR, for emergency services and/or private applications".

EP TETRA therefore invites TC ERM to consider if a CEC-Bon de Commande-T in this field to ERC/ERO should be pursued for the purpose of finding a realistic solution for the market demands already today identified.

7 Suggested work plan

SUBJECT	ACTIVITY	START	COMPLETED
Implement PDO protocol	Laboratory tests in 25 MHz bandwidth at 5,2 GHz	July 97	September 1997
OSI Layer 1 - Air Interface	Prepare the alterations for increased data rate.	1Q98	1Q99
OSI Layer 2 - Data Link, MAC and LLC	Implement alterations for new addressing and Layer 1	1Q98	1Q99
Layer 3 - Network - Mobility Management	Integration of IPv6 Simplification of the menu of OSI Services such as Connection Oriented Network Services (CONS) Realignment of the address mapping Co-ordination with other ETSI Projects.	2Q98	2Q99
ETSI formal procedures Eventual transfer to a harmonized standard	Public Enquiry - Resolution and Vote EU/ETSI Involvement	2Q99	1Q00

Final validation and SDL Modelling of the TETRA PDO standard is currently in its final stages within ETSI STF 93 and is planned to be completed by the end of 1997.

The PDO protocol has been implemented and tested on a radio platform at 5,2 GHz with a 25 MHz bandwidth. Gross throughput of 36 Mbit/s has been achieved, with a net throughput of 19,2 Mbit/s. This represents a scaling factor of 1 000 based on the ETS 300 393-2 [2] implementation. A further scaling by a factor of 10 could achieve 155 Mbit/s, using a 250 MHz bandwidth, with some spare capacity.

In addition to this the DAWS Node interlink specification has to be implemented, ideally adoption of HIPERLAN Type 4 or parts thereof should be assessed.

History

Document history		
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