

Implementation of a new Authoring Tool to provide Distance Educational Courses over 2.5 G Wireless Telecommunications Platforms

D. Zevgolis, Hellenic Open University, Greece

S. Kotsopoulos, Wireless Telecommunications Laboratory – University of Patras

The present paper deals with the Implementation of an Authoring Tool and the development of a Multimedia Application for Distance Education. In the proposed paper the Users can access the multimedia application through a wireless telecommunication platform such as various mobile telephony networks. The pilot application has been tested in the City of Patras, and the Quality of Service parameters have been measured.

The increasing demand for interactive multimedia applications for Distance Education and residential users is met by a special designed hardware and software platform. The platform allows users to have wireless or wired access to audio-visual-graphics content. Major languages such as JAVA, and Authoring Tools such as OPUS, e.t.c, are used to represent the multimedia applications.

The increasing demand for interactive multimedia on-demand type applications for business and residential users is met by a platform for interactive services in compliance with the specifications of the Digital Audio Video Council (DAVIC). The platform allows users to have seamless access to audio-visual content prepared by content providers and offered by service providers. Major formats/languages such as MHEG, HTML and JAVA are used to represent the applications. MHEG clients are being developed for various end systems including set-top boxes. Generation of MHEG objects on the fly provides for customisation and fast updates of information similar to the Common Gateway Interface in a WWW environment. Object retrieval, software downloading, transport and in time delivery of continuous-media streams are key factors in these developments. Interworking with WWW environments is envisaged through JAVA applets using CORBA technology.

In order to design and implement a specific Multimedia application, the following informational entities are needed (see Figure 1):

1. A suitable Database, where the involved multimedia entities will be dynamically introduced.
2. Appropriate software tools, that are necessary to implement the Multimedia Application.
3. General software for sending and retrieving informational entities from the multimedia sources.
4. Communication software to send and receive information to specific points via the telecommunication network (wireless or wired).

It is obvious that the Multimedia Information is manipulated in a Multimedia Studio, that has the appropriate hardware and software facilities (i.e cameras, sound facilities, graphics sources, computers, software management, e.t.c)

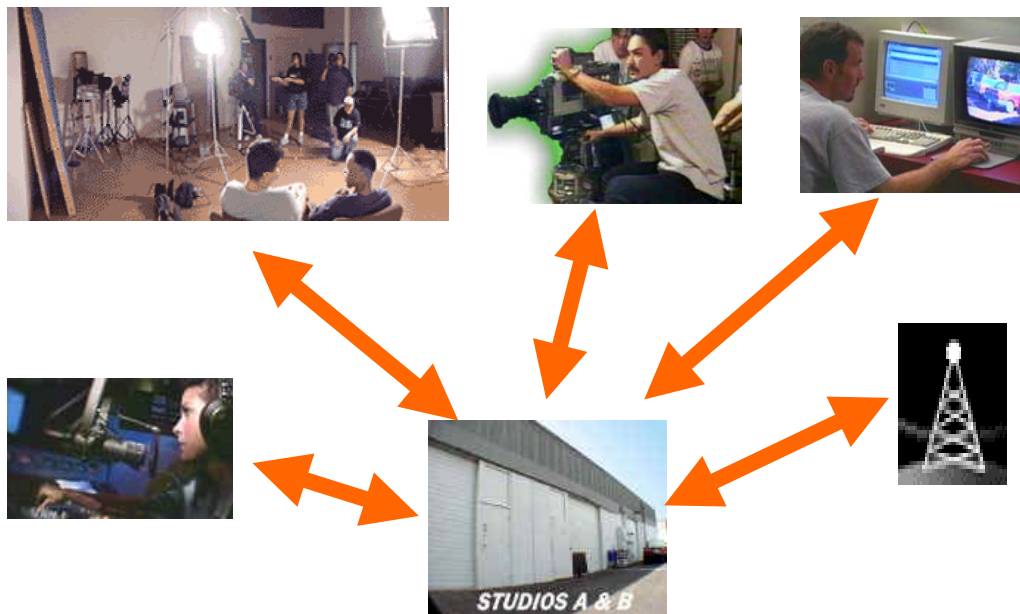


Figure 1: Informational Entities for Multimedia Applications

The General Structure of the Multimedia Environment (see Figure 2), consists of:

1. Satellite sources (i.e the NOVA Bucket).
2. Sources that are taken from Communication Multipoint Distribution Systems (MDSs).
3. Sources that are taken from Fixed Networks (i.e Cable TV, Telephone network [using MODEM] Broadband ISDN, ADSL, e.t.c).
4. Sources that are taken from terrestrial wireless networks (i.e Mobile Telephony, Digital Audio Broadcasting – Terrestrial, Digital Video Broadcasting – Terrestrial, High Definition TV – HDTV, e.t.c).
5. Sources from independent devices (i.e DVD, DVC, e.t.c).

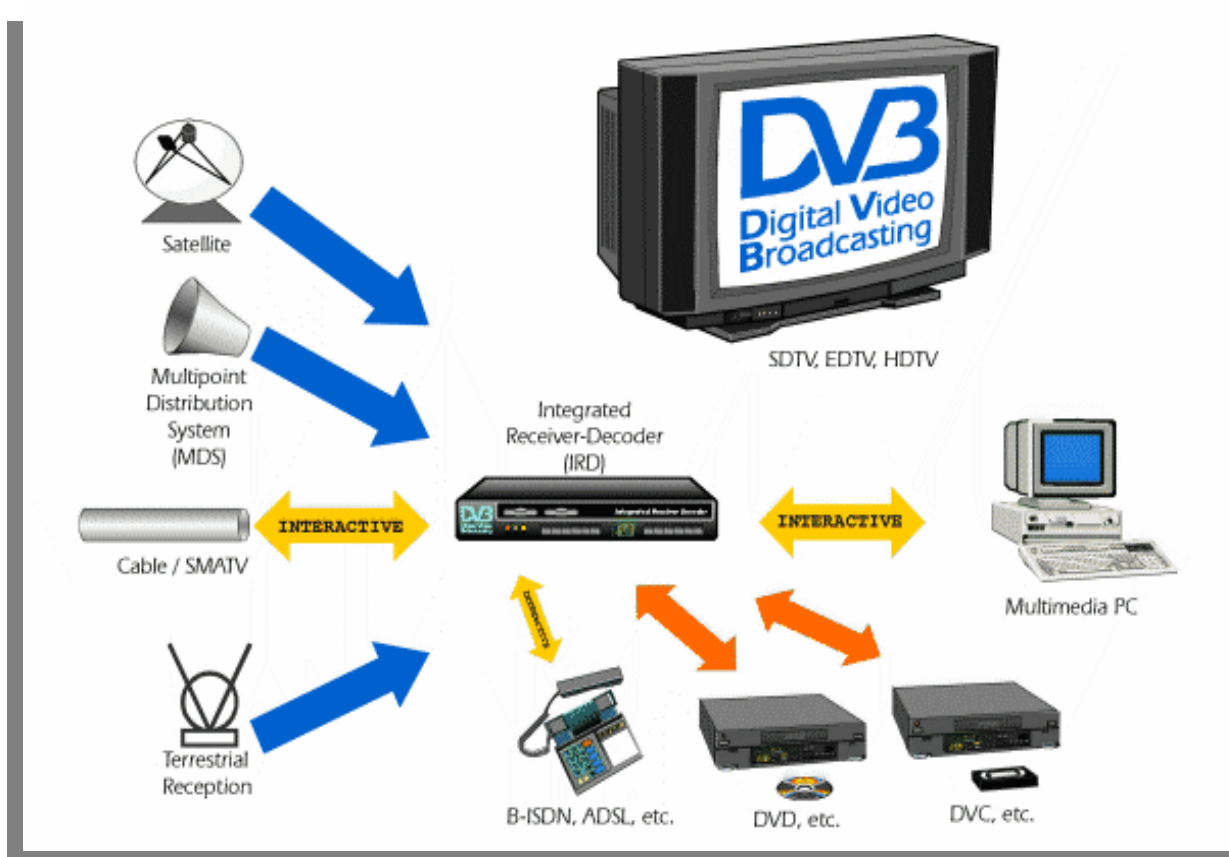
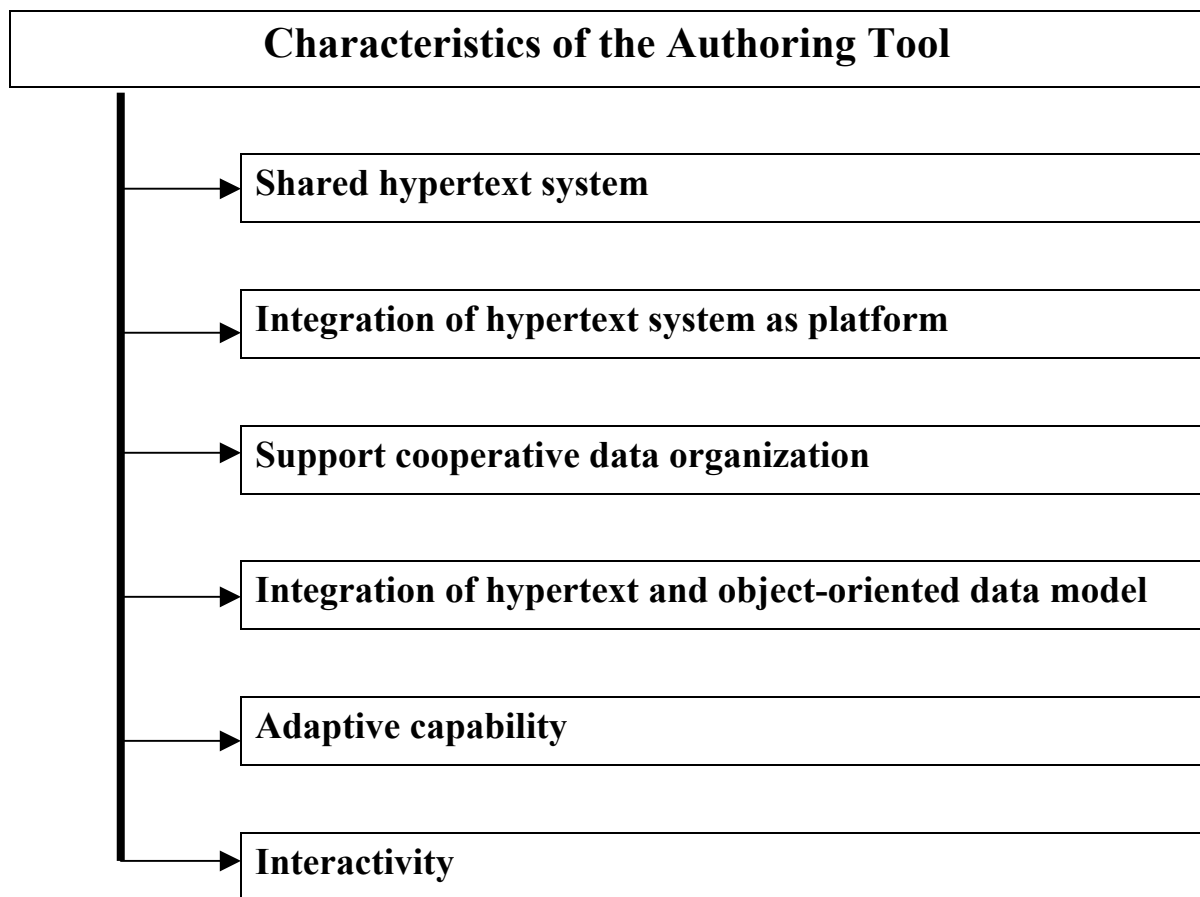


Figure 2: General structure of the Multimedia Environment

The involved information is routed for processing and retrieved from the subscribers using special receiving Decoders (i.e the Integrated Receiver Decoder – IRD, e.t.c).

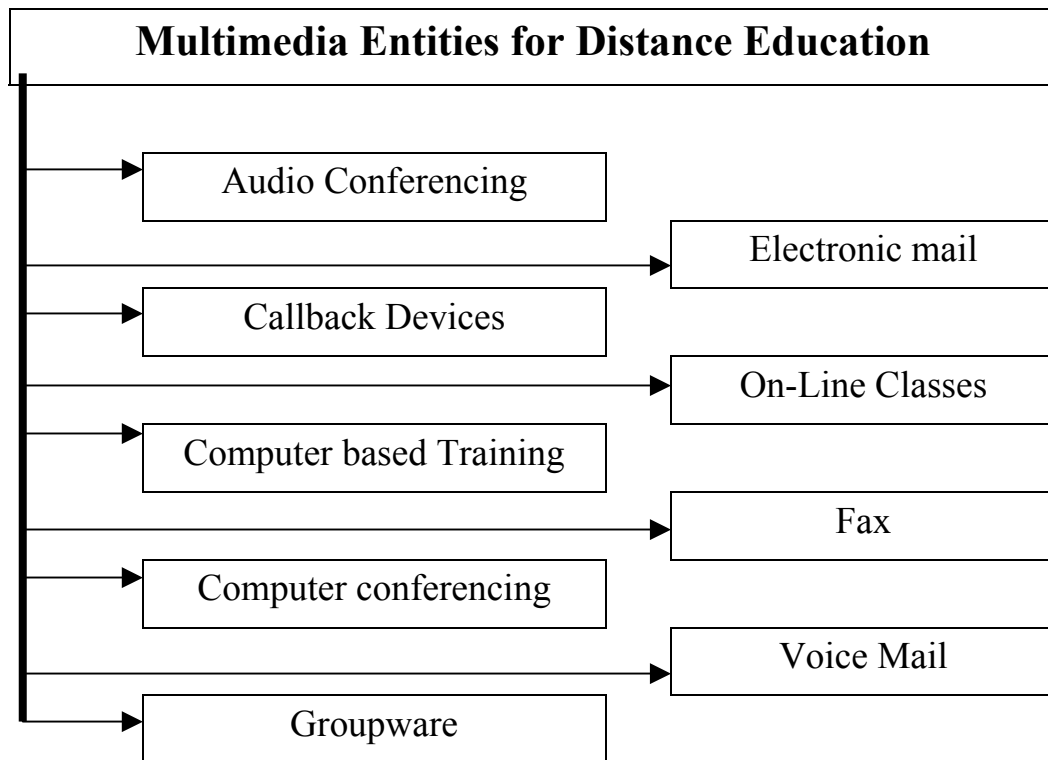
The main operational procedure from the subscriber's point of view is the INTERACTIVITY. Moreover the INTERACTIVITY is the main characteristic of the implemented MULTIMEDIA DATABASE. It is noted that the involved hardware and software entities are managed and supported by Unified Viewing facilities.

The Authoring Tool is very important for implementing Multimedia Applications. The main characteristics of an Authoring Tool are the following:



Within the framework of the Multimedia Application, today, in the worldwide market the following Authoring Tools are best known: the QUEST, the OPUS and the HYPERMETHOD.

Especially for Multimedia Applications that can be used in the Distance Education, the following should be included in the application (except the multimedia entities):



Taking into account the possible informational sources that can be used for implementing a multimedia application, the architecture of the European NOVA network is given (Figure 3):

1. Studio.
2. Line Connection from the Studio Site to the Satellite Up-Link Station
3. Satellite [HOTBIRD 3].
4. INDIVIDUAL RECEPTION [the user should be provided by Satellite Antenna, Coaxial Cable, Satellite Receiver].
5. COMMUNITY RECEPTION [the user has an access to the satellite signal through constructive horizontal public cabling and vertical building cabling].

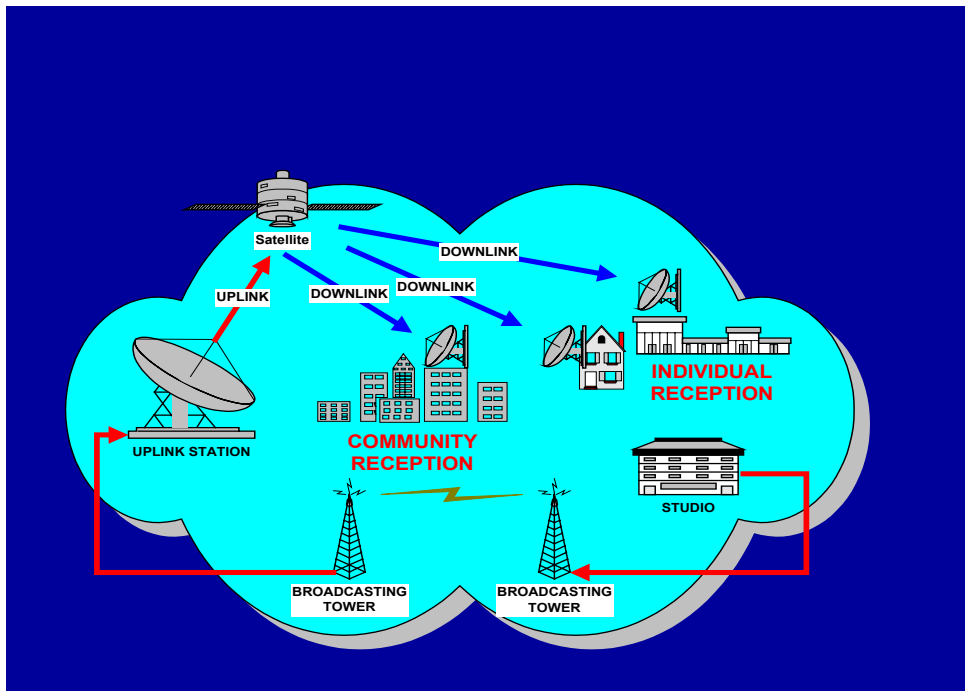


Figure 3: NOVA Telecommunication Infrastructure

It is obvious, that the Multimedia Studio, has an access to one of the destinations of the above network (i.e. connection using Individual facilities [satellite antenna, coaxial cable, satellite receiver] or direct connection to the NOVA studio [using wireless facilities {line-of-sight Link} or wired facilities {Fixed Networking}]) The proposed multimedia application can be supported by the following communications networks:

1. 2nd Generation Wireless Networks: Global System for Mobile communications [GSM].
2. 2.5 Generation Wireless Networks: General packet Radio Service [GPRS].
3. 2.5+ Generation Wireless Networks: Enhanced Data rates for GSM Evolution [EDGE].

The main characteristics are shown on the figure 4.

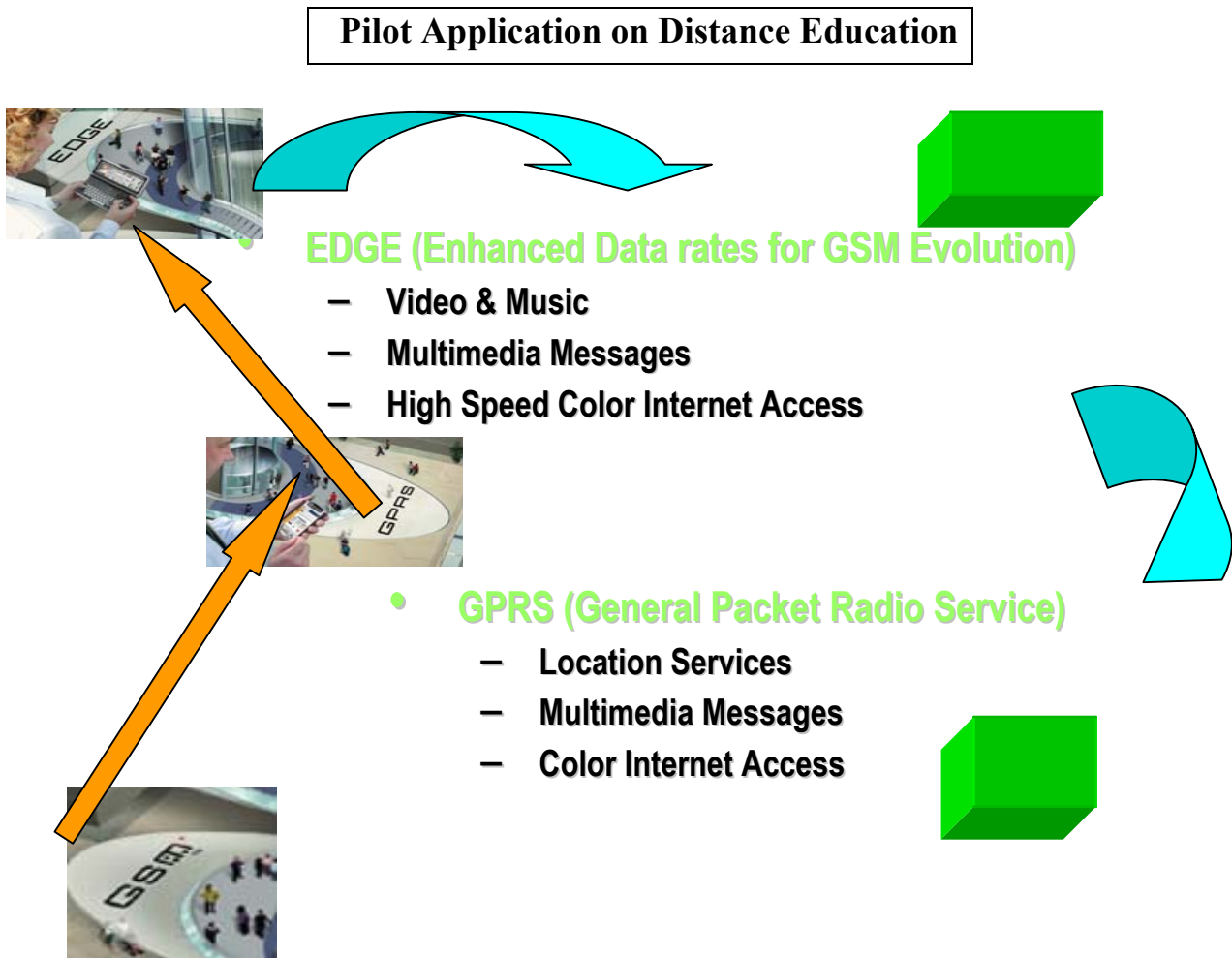


Figure 4: GSM Evolution

The Multimedia Application, requires the following system [hardware+software] structure:

1. Applets that contain the user requirements of the multimedia application [i.e the operational rules of the application].
2. Multimedia Engine [this is responsible for the input and output hardware and software resources.
3. User/Device profiles [this refers to the user requirements in respect to the structure of the multimedia application].

The figure 5 shows the following hardware and software units:

1. Mobile telephones with the appropriate software facilities for accessing the multimedia database.
2. Instant Messenger. This is the main Application Window, where the user can activate the Multimedia Application.
3. Independent Communication Devices (i.e external databases, voice mail, other Servers, e.t.c).

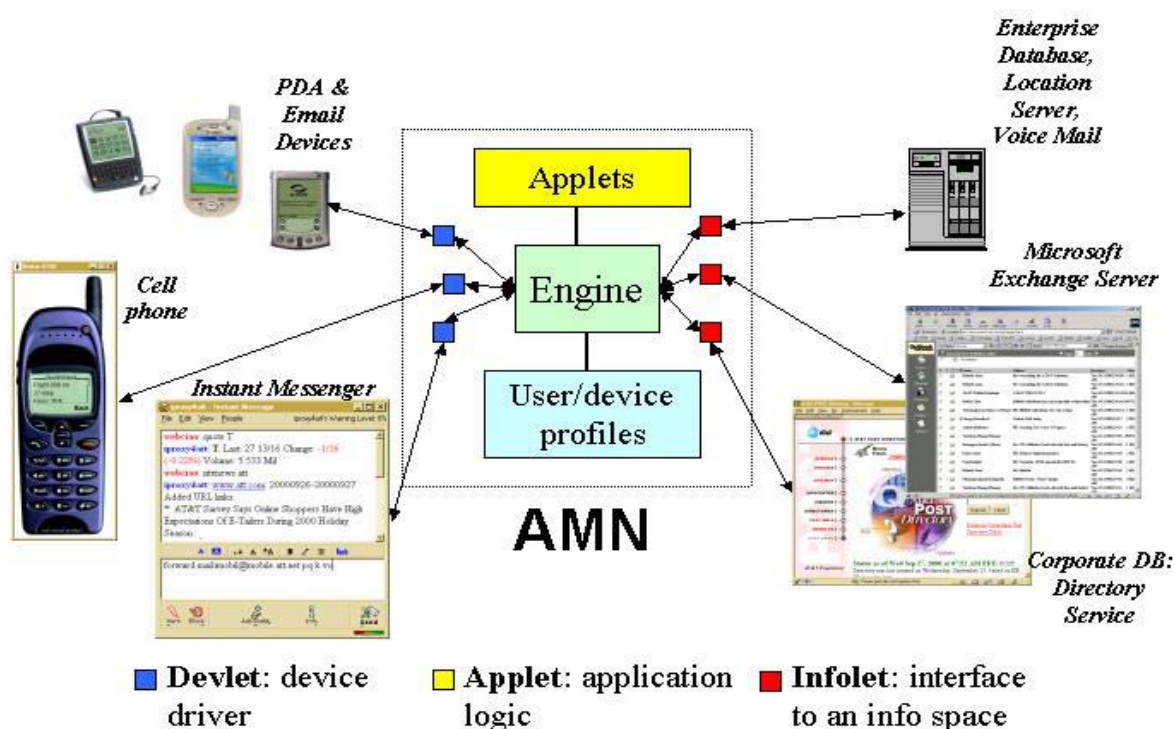


Figure 5: Multimedia Application Units

The figure 6 shows the Cellular Concept of the Mobile Telephone Systems. The geographic area is divided in small zones and a special designed antenna serves each zone. Our pilot application is taken place in the geographic area of the City of Patras - Greece. In this figure, a typical zone is shown (marked by a blue circle)

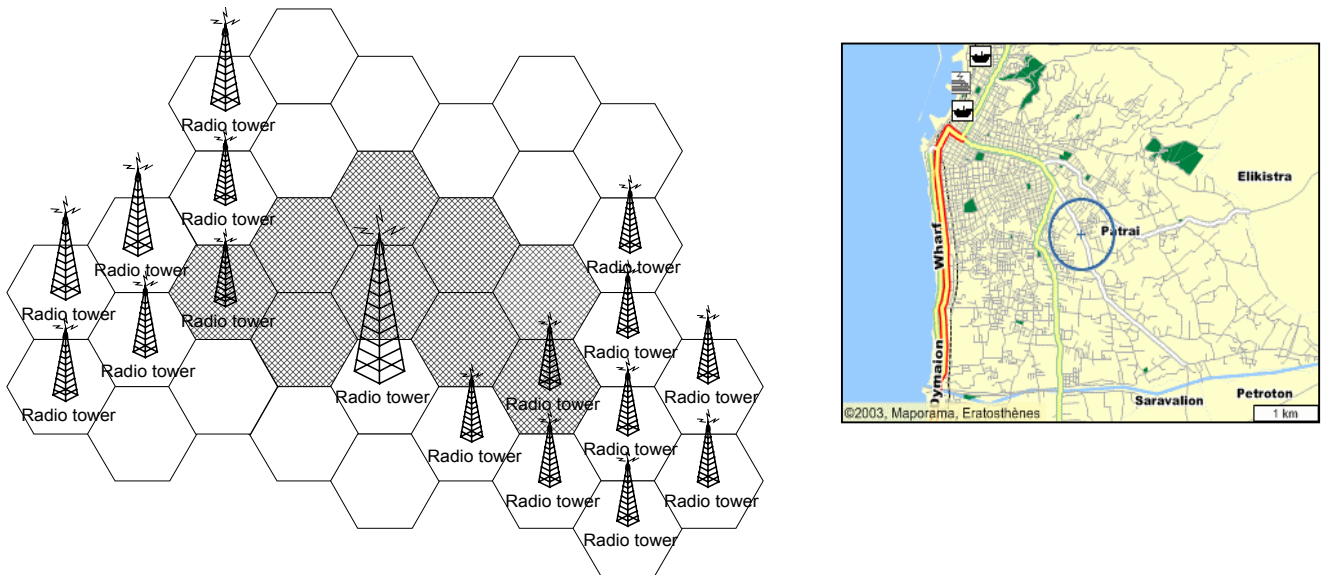


Figure 6

It is noted that the Quality of Service, from the telecommunications point of view, depends on:

1. The handover operational procedure [the subscriber moves from one zone to another].
2. The received signal level.
3. The communication traffic [especially during the Busy Hour].

The table 1 depicts the measurements that are taken during the pilot application, and refers to the following design parameters:

1. The Total Blocking Probability (is the probability that the system has reserved all the available frequencies, and the user cannot access the system for services).
2. The Number of the Total Activated Frequencies.

The experiment takes into account the following:

1. Fixed Frequency Allocation Scheme [this means that the frequencies in each zone are fixed].

2. Cluster Size $N=3$ [this means that all the available frequencies are distributed in 3 zones].
3. Cluster Size $N=7$ [this means that all the available frequencies are distributed in 7 zones].

The measurements are examined for the Busy Hours and for Non Busy Hours.

Table 1

		Fixed	Proposed for cluster $N=3$	Proposed for cluster $N=7$
Total Blocking Probability	Non Busy	0.5610	0.4668	0.4017
	Busy Hours	0.0539	0.0661	0.0715
Number of Total Activated Frequencies	Non Busy	134	134	136
	Busy Hours	119	119	110

The figure 7 shows the distribution of the Local Received Power versus the Distance, in a specific street of the City of Patras.

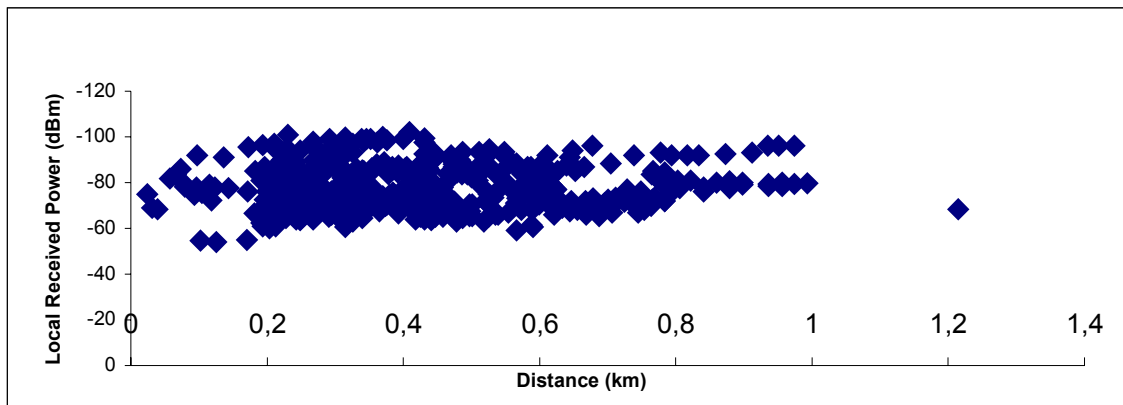


Figure 7

Figure 8a shows the variation of the LOSSES of the electromagnetic waves of the 900 MHz frequency versus the DISTANCE (the measurements are taken in a specific street in Patras area).

Figure 8b shows the Time Variation of the Total Blocking Probability.

Figure 8c shows the Time Variation of the Available Activated Frequencies of the involved geographical zones.

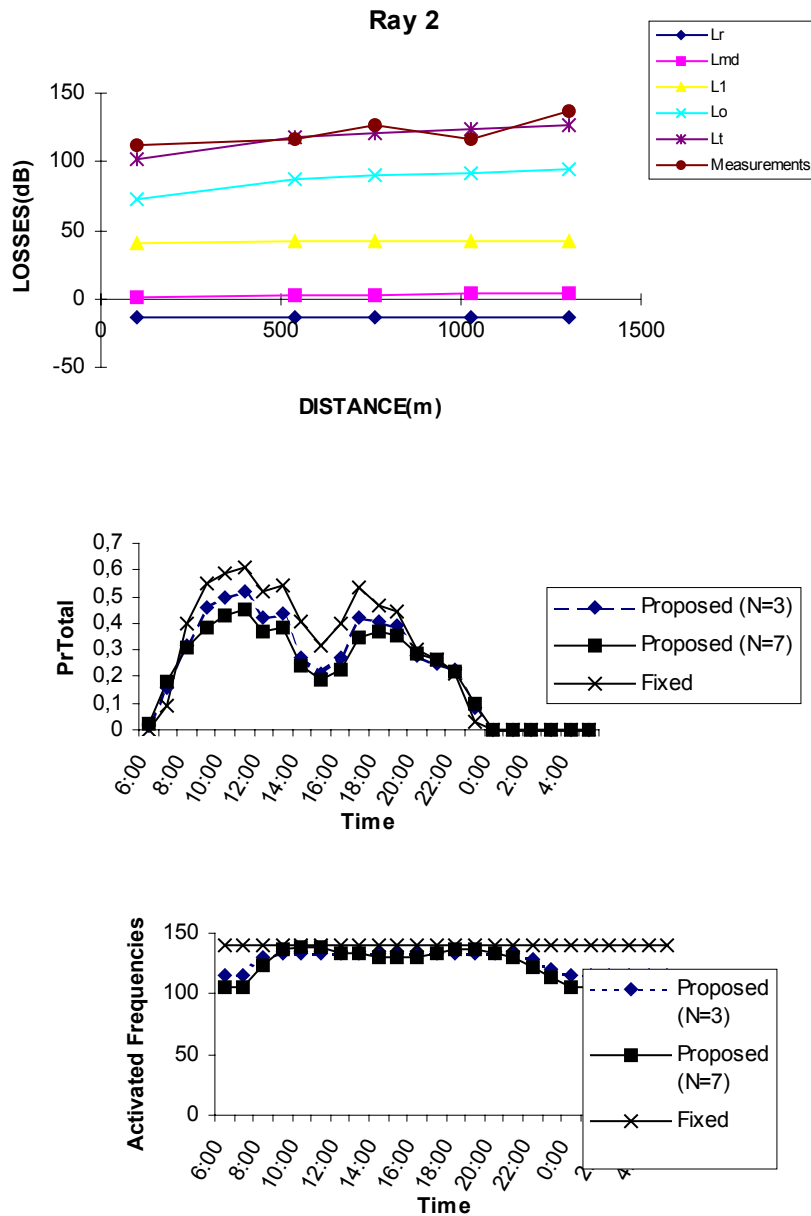


Figure 8