Abstract - We describe an architecture that supports networked multimedia applications. The architecture is based on a separation of multimedia stream processing and application processing. Applications reside in *application pools* whereas media stream processing is performed in *multimedia terminals*. An application controls a set of terminals that exchange multimedia data streams directly between each other. A tele-teaching and a home shopping example demonstrate important aspects of our architecture.

I. Introduction

Current platforms for community networking are based on PCs and on simple terminals such as the French Minitel. To bring multimedia services to the home these devices must be enhanced to multimedia terminals that offer the user a window to the multimedia services and applications in the network. Services will evolve from retrieval services such as video-on-demand to interactive services such as video-conferences and games.

To provide these multimedia services an architecture is required that supports a wide variety of foreseeable services and that can be extended to support upcoming services with new features. Most of the multimedia architectures proposed in literature build on powerful workstations that communicate as peer-systems. Such architectures are not adequate for community networking because they do not support service diversity. For multimedia communication to be successful in community networking, an approach similar to the *Intelligent Network* concept [1] is required, where terminals with simple interfaces access a wide variety of services that are installed on servers within the network. Corresponding to the Global Functional Plane in the Intelligent Network architecture, there must be a high-level implementation platform that eases the introduction of new multimedia services to the community network.

Customer premises equipment must be optimized for multimedia communication and especially for the processing of digital audio and video that have high requirements on the CPU and on the I/O bandwidth. The customer equipment must be able to guarantee a quality of service (QoS) for every processed medium stream.

Although the focus of a new multimedia architecture is on communication rather than processing it should not neglect traditional networked applications. A multimedia application often combines communication and processing, for which computer supported collaborative work (CSCW) may serve as an example.

We propose an architecture that supports fast service deployment and that is optimized for multimedia communication without sacrificing traditional applications. Since most multimedia applications do not process medium content it is possible to divide them into a media processing part and an application processing part. In our architecture, media processing is performed by multimedia terminals that are optimized for this purpose. Besides media acquisition, presentation and transport they also implement the user interface that allows a user to interact with applications. Applications run on central application pools within the network. They implement the services that are offered to users. Application pools provide an application programming interface to manage applications and to build multiparty sessions between terminals. Media data are directly exchanged between terminals, while the control of the application and of the terminal is concentrated on the application pool. The control and data interfaces of our architecture are extensible to make it flexible towards technical evolution.

In the next section we give an overview of the architecture and its main components. The architecture of the terminal is discussed in detail in Section III. Section IV describes the control flows between terminal and application. Section V presents two examples, tele-teaching and home shopping, that demonstrate how services are deployed on top of our architecture. We conclude with a discussion of the architecture and the state of our work.

II. Architecture Overview

Requirements of multimedia in terms of system architecture, operating system and networking are quite different from those of conventional applications. It is not trivial to come up with a system that accommodates both multimedia stream processing and application processing in an efficient way.

Most current systems are based on multimedia-enhanced workstations. Workstations are designed for a very broad range of applications; adding multimedia to such a general system is likely to compromise the quality of the multimedia services or the performance of the other applications. Multimedia will finally be used on systems that are especially conceived for this purpose and that are similar in spirit to the one proposed in the Pegasus project [2]. Such systems will integrate multimedia and traditional application processing into a single workstation and might eventually become the standard for future research and engineering environments. They will not be adequate for public multimedia service provision because they will be expensive and because they require the user to install software on her station for every service she wants to use. This approach is not acceptable for community networking where a high number of users want access to rapidly changing and evolving services provided by multiple independent parties.

We are developing an architecture that should be efficient in terms of multimedia stream processing and that supports the introduction of new multimedia applications or services. Such a system can then be deployed in both a research and a public environment.

The following provides a closer look at the nature of multimedia applications. Proceeding from this a new multimedia system architecture is proposed.