

# Institute of Information Technology @ University Klagenfurt

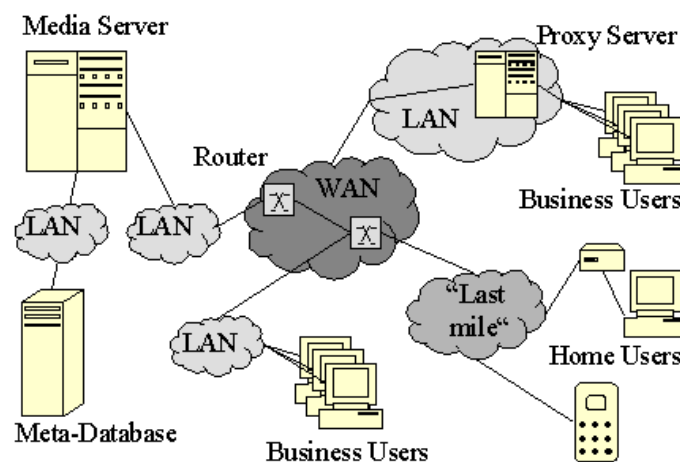
## Presentation Letter

The Institute Presents Its R&D Activities

Status: May 2004

The Institute of Information Technology at University Klagenfurt has gained an approved expertise in the area of distributed multimedia systems over the last years. Initially, it has started with building standard compliant RTSP/RTP server and clients for MPEG-1 and MPEG-4 video streams to get familiar with this kind of distributed systems. Actually, the Institute has gained deep knowledge in multimedia streaming fundamentals and does research in the area of network and terminal aware multimedia streaming technologies.

The emphasis in all streaming-related scientific questions lies on adaptation, which is regarded as an increasingly important tool for multimedia systems with heterogenous networks and different terminal devices. All scientific works and developed prototypes of the Institute of Information Technology are part of the experimental multimedia system illustrated in Figure 1.



**Figure 1:** The Experimental Multimedia System

The following non-exhaustive list gives an overview of the tools and its major features developed at the Institute of Information Technology:

- Media server:
  - standard compliant media streaming by using RTSP and RTP/UDP
  - streams all media formats supported by the ffmpeg library (e.g. MPEG-1, MPEG-2, MPEG-4)
  - communicates terminal capabilities of the client device and user preferences using standardized MPEG-21 descriptors
  - supports real-time adaptation of media content according to the clients' terminal capabilities, the user preferences, and the available network resources; for example, mobile devices get a lower stream quality than e.g. PCs do
  - implements standardized RTP extensions to allow an intelligent retransmission of lost video frames
  - can be run in a distributed environment that supports proactive service and content replication and migration operations; this is especially helpful when content adaptation steps are not allowed due to legal constraints or the user still wants to perceive the original stream in its full quality
  - supports proactive adaptations by actively measuring and forecasting available server and network resources on and between server nodes

- Proxy server:
  - incorporates the server and the client implementation
  - caches elementary streams in different quality versions
  - implements quality aware replacement strategies
  - can be dynamically relocated in the vicinity of requesting clients
  
- Meta database:
  - multimedia database schema based on the MPEG-7 standard
  - multimedia indexing framework
  - cost-based query optimization for range and k-nearest neighbour searches
  - application-level libraries for content-based image retrieval systems, audio recognition tools, video browsing tools, and quality aware MPEG-4 proxies
  
- Media player:
  - standard compliant control of RTP-based media streams by using RTSP
  - supports Calm Technologies
  - implements a general framework for SMIL and BIFS based presentations

In addition to the scientific work done in the context of the experimental multimedia system, the Institute has been actively participating in the standardization processes of the Moving Picture Experts Group (MPEG), especially in the area of MPEG-21, for several years. A number of contributions in the context of Digital Item Adaptation (DIA) can already be exhibited.

The Institute of Information Technology actually consists of two regular and one non-regular professorships covering the research areas parallel and distributed systems and system integration. In the near future a third regular professorship will be assigned to the area of wireless multimedia communications. With this new chair the wireless part of the currently running **ADMITS**<sup>1</sup> (**A**daptation in **D**istributed **M**ultimedia **IT** Systems) project will become the center of research interest.

The ADMITS project has internally defined a number of research topics. Each research topic is accomplished in the context of at least one PhD thesis and briefly described in the accompanying project description letter.

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<sup>1</sup> See project home page: <http://admits-itec.uni-klu.ac.at/>