

Abstract

The work presented in this dissertation reflects the research, developments, experimental tests and analyses conducted by the candidate towards the obtention of feasible and optimal solutions for the problem of achieving QoS, context-aware and bandwidth-efficient transmission of audio-visual sources. The focus of this thesis is on designing and optimising the infra-structural support for the provision of ubiquitous and non-discriminatory access to multimedia content, looking at dynamic operation aspects. We developed a framework that combines the use of metadata with distributed technologies to achieve this goal. The use of metadata is instrumental to provide the support for content adaptation operations, which in turn is essential to provide the QoS-aware ubiquitous access to multimedia content regardless of coding formats, network resources availability or user terminal capabilities and preferences.

This can be translated in the provision of context-aware multimedia services resulting in universal access to multimedia content.

The outcomes of this thesis include the specification of a middleware architecture and associated services to enable the provision of context-aware adaptable multimedia services in heterogeneous environments. The undertaken work has enabled the design and development of a reference architecture in the form of a set of services and interfaces based on standard emergent technologies, notably the MPEG-21 standards and Web Services technologies. This reference architecture can be used in a number of different environments, thus constituting an interoperable framework suiting different requirements and goals.

Keywords: Context awareness, content adaptation, ubiquitous access, interoperability, Quality of Service, metadata, ontology, reasoning, statistical inference, Bayesian analysis, probabilistic modeling, statistical multiplexing.