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Journal Menu

- [Abstracting and Indexing](#)
- [Aims and Scope](#)
- [Article Processing Charges](#)
- [Articles in Press](#)
- [Author Guidelines](#)
- [Bibliographic Information](#)
- [Contact Information](#)
- [Editorial Board](#)
- [Editorial Workflow](#)
- [Reviewers Acknowledgment](#)
- [Subscription Information](#)

- [Open Special Issues](#)
- [Closed Special Issues](#)
- [Published Special Issues](#)
- [Special Issue Guidelines](#)

[Call for Proposals for Special Issues](#)

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Research Article

P2P and MPEG FGS Encoding: A Good Recipe for Multipoint Video Transmission on the Internet

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[Abstract](#)

[Full-Text PDF](#)

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[Linked References](#)

[How to Cite this Article](#)

[Complete Special Issue](#)

Abstract

In the last years Peer-to-Peer (P2P) systems have gained ground for content sharing between communities, determining a real revolution on the Internet. The characteristics of P2P systems make them a very good choice for multimedia content distribution over IP networks. However, although P2P technology gives new opportunities to define an efficient multimedia streaming application, at the same time it involves a set of technical challenges and issues due to the best-effort service offered by the Internet and its dynamic and heterogeneous nature. The most of existent protocols for video communications over P2P mainly focus on tree topology maintenance, without paying any attention to the encoding problem. The idea of this paper is to propose a multipoint video broadcast framework over a heterogeneous content distribution P2P network. In the proposed system the source generates the video flow by using an MPEG-4/FGS encoder, in such a way that no losses occur at the Baselayer stream even in the presence of short-term bandwidth fluctuations. Although in the past the FGS was not employed due to its encoding complexity, today, thanks to advances in hardware technology, we were able to develop an MPEG-4/FGS encoder on low-cost PCs which turned out to be more feasible and appealing for its flexibility. The FGS layer is sent together with the Base layer, but with a lower priority. The source uses a rate controller to regulate the encoding rate of the Base layer. To this aim, a protocol is defined in order to provide the source with information related to the most stringent bottleneck link on the overlay network. A technique to reorganize the content distribution tree is proposed and discussed. To evaluate the performance of the proposed framework a case study is introduced; improvements obtained with respect to several reference cases where FGS is not applied are also shown.