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# SCALABILITY IMPROVIZATION OF VOD SYSTEMS BY OPTIMAL PROFITEERING

**G.M.Viji[1], Priyanga.P[2], Jayashree.J[3],Vishnupriya.S[4]**

*AP/CSE , Final year IT Students*

*Indira Gandhi College Of Engineering & Technology For Women, Chengalpattu*

## ABSTRACT

*In our paper a joint Forward Error Correction (FEC) coding and rate allocation scheme to minimize energy consumption while satisfying goodput constraint. Video on demand system will provide required content to all the clients at same time with the help of peer to peer systems. It focus more on mending service architectures and optimizing overlays. Concurrent multipath video transmission also requires higher energy consumption of wireless devices.*

***keywords— Real-time video communication, Stream control transmission protocol, Energy awareness.***

## I.INTRODUCTION

The state-of-the-art mobile terminals are equipped with multiple radio interfaces to concurrently receive data through multiple wireless access networks. With the popularity of such multihomed mobile terminals, the future wireless networking is expected to incorporate heterogeneous access options for providing high-quality mobile services. The resource restrictions of single wireless networks prompt the integration of heterogeneous access medium for concurrent multipath transfer (CMT) of bandwidth intensive multimedia content. Stream control transmission protocol (SCTP) is an important transport-layer protocol standardized by the IETF to enable multipath data transfer over communication networks with multihomed terminals.

SCTP is a promising transport-layer solution to support CMT of real-time multimedia traffic over heterogeneous wireless networks. concurrent multipath video transmission also requires higher energy consumption of wireless devices. Contemporary mobile terminals are usually powered by batteries with limited capacities and the radio communication modules constitute the main portion of energy consumption. The proposed Energy and good Put Optimized CMT (EPOC) scheme advances the state-of-the-art with joint Forward Error Correction (FEC) coding and flow rate allocation based on the energy-good put tradeoff. EPOC is able to effectively integrate heterogeneous network resources to minimize the energy consumption on mobile devices while satisfying good put constraint.

### i) CMT *SOLUTIONS*

Multipath TCP (MPTCP) is an important transport protocol to enable CMT in heterogeneous networks. The CMT-DA scheme introduces the end-to-end video distortion model into SCTP for optimizing mobile video delivery in heterogeneous wireless networks. CMTDA achieves transmission reliability with data retransmission, and thus is not suitable for real-time video applications with stringent delay constraint.

### ii) MULTIHOMED VIDEO TRANSMISSION

This system is designed to maximize the video encoding rate on the basis of aggregate bandwidth, as well as overcoming the wireless channel loss. Sub-frame level (SFL) scheduling approach splits large-size video frames to optimize the delay performance of HD video streaming over heterogeneous wireless networks a delay-stringent coded transmission framework is to address the problem of large-size I (Intra) frame transmission in high definition video streaming. The transport protocol leverages the tradeoff between bandwidth consumption and video quality in multipath video transmission.

### iii)ENERGY-EFFICIENT MULTIMEDIA TRANSMISSION TO MOBILES

A multipath protocol is proposed to optimize the energy efficiency of mobile devices by leveraging the diversity of radio interfaces. It proposes a content and energy aware packet scheduling approach for video upload service in heterogeneous networks. An energy management sub-system is developed for mobile terminals to sustain multihomed video streaming. A bandwidth aggregation scheme named ELBA is developed to model the frame-level energy-quality tradeoff for delay constrained video streaming to multihomed mobiles.

**The main contributions of this work can be summarized as follows.**

1) Develop an analytical framework to characterize the relationship between energy consumption and good put performance for real-time video delivery over multiple wireless access networks.

2) Propose a SCTP-based CMT scheme featured by the load-adaptive and availability-based rate allocation algorithm to minimize the energy consumption under good put constraint. A FEC coding scheme striking the balance between delay and recoverability performance to minimize effective loss rate. Reconstruct the CP-ABE scheme to fit our proposed framework and propose a robust and high-efficient access control scheme; meanwhile the scheme still preserves the fine granularity, flexibility and security features of CPABE.

3) Conduct extensive semi-physical emulations in the Exata platform involving real-time H.264 video streaming.

## II. PRELIMINARIES AND DEFINITIONS

Here we briefly introduce VOD SERVER, BATCHING, PATCHING,HYBRID CATCHING & GOSSIP which are the constituents in our scheme.

**A.VOD Server:**

VOD Server adopts the combination of batching and patching. Such a design is flexible with substantive concurrent and asynchronous clients. The server can send a video to clients to host. It shows waiting for a peer. It will wait until client give request.

**B.Batching:**

The VOD server uses batching to serve asynchronous peers. The server allocates a certain amount of dedicated outgoing bandwidth for each batching session. In each session, early joining peers directly become the children of the server. After the allocated bandwidth is fully occupied, late peers are redirected by the server and become the descendants of the early ones. Since the peers in a session transfer same video content currently broadcast by the server, the streaming mechanism inside a batching session is similar with P2P live streaming. Moreover, VOD reinforces the batching scheme with patching. The server sends a list of randomly selected peers to each joining peer. When a peer joins in a session late and misses the initial part of the video, it picks up a few peers from the random list as patching sources and immediately starts to download the missing part from them.

C. **Patching:**

Peers are clustered according to their arrival times and form sessions. Each session, together with the server, constructs an application multicast tree.Later, peers can retrieve the missing parts from the server or other peers. VOD divides the peers into generations according to their requests.Peers in VOD always cache the most recent content of a video. Only one stream from an early peer is needed to serve a late peer in VOD, while two streams, a patching, and a base stream are necessary for serving a late peer.Instead of deploying a patch server as failures and dynamics are handled locally in VOD, so that the server stress is further reduced.

**D.Hybrid caching:**

To support asynchronous accesses to the video content. When the server starts a new batching session, it need not wait any late peers.The early peers in a batching session obtain the video content and become the substitute video sources. Late peers can make up the missing content using patching from the early ones. Meanwhile, patching improves the system flexibility.VOD provides abundant backup stream sources for patching by adopting the hybrid caching strategy, where all the peers keep both the initial 5 minutes and the latest 5 minutes of the video played. Any late peer can instantly find patching sources and make up the missing part immediately after join, no matter if it starts from the beginning or any other offset of the video. Because the patching sources are selected randomly, load balance is kept among the peers.

**E.Gossip:**

Peers in VOD conduct periodical gossips to exchange their state information. During each period, a peer generates a state message, including its latest state information.The format of the state message is IP, Incremental playback record, Time stamp, where IP is the peer's IP address, Incremental playback record refers to the string of segments.The peer plays after it generates last state-message last time, Time stamp is the time since the peer joins in. On the other hand, each peer maintains a list of records.Each entry in the list corresponds to a peer and records its latest state.

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On receiving a state message, a peer performs relevant operations before it forwards the message to its neighbors.If the time stamp of the state message is greater than that in the entry, the incremental playback record is inserted into the tail of the playback record in the entry, and the time stamp in the entry is updated. Using the gossip-based state propagation, a peer is able to accumulate the information of playback history of all the peers.Furthermore, since the hybrid caching strategy is well known to all, through periodical gossips every peer can keep aware of the global distribution of video data on all the peers.

### III. SYSTEM MODEL

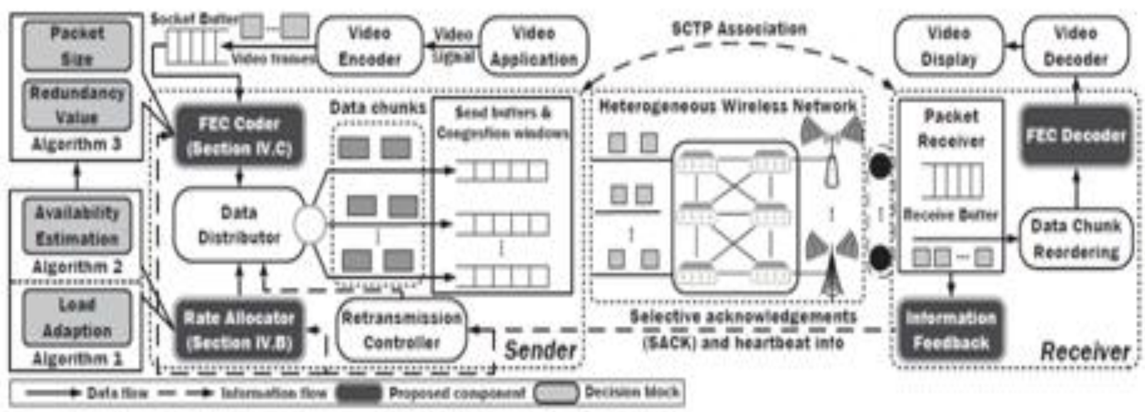


Fig. 2. System diagram of the proposed EPOC (Energy and goodPut Optimized CMT scheme).

The system diagram of the proposed EPOC is presented in Fig. 2. The goal of the proposed EPOC scheme is to minimize the energy consumption of real-time video communication while achieving target quality constraint. The working components are implemented at both sender and receiver sides. The key contribution of EPOC is in the flow rate allocation and FEC coding adaption. Specifically, the decision making blocks at sender side include the FEC coder, rate allocator and retransmission controller. The information feedback unit is implemented at the receiver side to periodically send back the decision information.

At the sender side, the input video data is divided into multiple SCTP segments and each is allocated onto a different communication path. In the standard SCTP, the packet retransmission is used for reliable data transfer and this protection mechanism is not effective for real-time video applications. Therefore, the FEC coding is employed in EPOC to combat network packet losses. In each decision epoch, the video frames to be delivered are converted into FEC packets. Then, the data distributor encapsulates the FEC packets into data chunks and adds SCTP common headers. Each data chunk is assigned a transmission sequence number (TSN) and may be bundled with other chunks into a single segment. The number of data chunks for each communication path is determined by the flow rate allocation vector.

At the receiver side, the information feedback unit is responsible for sending back heartbeat information and selective acknowledgements (SACK) of received packets. SCTP manages multipath connectivity by sending periodic heartbeat packets to maintain an active IP address list. In the design of EPOC, the path estimation model developed is employed to capture the physical path characteristics and modulate heartbeat probing traffic. Due to the path asymmetry in heterogeneous wireless networks, the sent data packets may arrive at the destination out-of-order. The data chunks will be reordered using the TSN and begin/end flags in SCTP header to restore the original FEC packets.

- **Heterogeneous Wireless Network** is the integrating *P* access options between communication terminals. the end-to-end connection represents a communication path in SCTP and can be constructed by binding a pair of IP addresses .
- **Real-Time Video Streaming** is dependent on the good put performance of multimedia traffic transmission in the context of video stream good put represents the amount of data useful for the decoding process he successful delivery of a data packet satisfies to the constraints of reception of preceding packets in the same GoP.
- **Energy Consumption** considers the ramp, transfer and tail energy. The device-specific energy and power consumptions are profiled with the input parameters of signaling frequency, packet size and data transfers. The energy consumption of FEC encoding can be ignored because this encoding is performed at the sender side. This paper focuses on the energy consumption of mobile devices due to the capacity limitation of batteries and power-intensiveness of video streaming. Therefore, the FEC encoding energy at the sender side can be ignored for the proposed scheme.

## IV. OUR PROPOSED EPOC SCHEME

Our scheme consists of five phases, namely **Problem Formulation, Flow Rate Allocation, FEC coding Adaption, Delay and Energy Aware retransmission Control.**

**1)Problem Formulation** :The optimization problem can be stated as: given the feedback channel status $\{RTTp, \mu p, \pi B\}p\in P$, goodput constraint G, delay requirement T, and input video data, find the optimal flow rate allocation $R = \{Rp\}p\in P$ vector and FEC block size $n$ to minimize the energy consumption for video data transmission to mobile devices.

**2) Flow Rate Allocation:** The solution procedure of the proposed flow rate allocation scheme can be summarized as follows:

1) the adaption of video traffic load to approach the imposed good put constraint G.

2) rate allocation based on the resource availability to achieve maximum utilization.

**2.1) Traffic Load Adaption:** It is motivated by Observation 1, *i.e.*, higher video transmission rate more energy Consumption for multipath data communication. Therefore, we present an algorithm to appropriately reduce the traffic rate according to the good put constraint G and video content parameters. Specifically, the video frames are characterized by different priority [*e.g.*, Intra (I), Predicted (P), and Bidirectional (B) frames], decoding dependency, *etc*. The frame type and payload size can be identified by reading the header of network abstract layer unit.

**2.2) Availability-Aware Rate Allocation***:* It find the solution by allocating transmission rate according to the resource availability of each communication path. This model is motivated by the availability parameter to describe the reliability of heterogeneous distributed systems.

## V.CONCLUSION

Delivering high-quality live video streaming to the battery constrained mobile devices is challenging with regard to the contradiction between streaming quality and energy consumption.SCTP is an important transport-layer protocol standardized by IETF for multihomed data communication to mobile devices. Developing an effective SCTP is a critical step towards improving the real-time multimedia quality and energy efficiency of mobile streaming services. This paper proposes an Energy and good put optimized CMT (EPOC) scheme for real-time video transmission to multihomed terminals in heterogeneous wireless networks. Through systematic modeling and analysis, we develop solutions for energy-minimized rate allocation and FEC coding adaption to achieve target good put value. Extensive emulations in Exata demonstrate that EPOC outperforms the reference CMT solutions in reducing the energy consumption, improving video PSNR, and increasing the good put.

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