



A Resourceful Broadcasting in MANET Using System Code for Reducing Redundant Information

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Abstract— Flooding is an important communication primitive in mobile ad-hoc networks and also serves as a building block for more complex protocols such as routing protocols. In any flooding mechanism, one must balance reliability against message overhead. On the one hand, increasing reliability generally involves sending a greater number of surplus messages and thus increases message overhead. Redundant messages are needed to reach all nodes and to recover from packet loss; hence reducing the overhead will generally decrease reliability. Selective Broadcast of data packets improves the reliability factor as well packet drop. The compensation packets are constructed from dropped data packets, based on techniques borrowed from forward error correction. Mobile broadcast systems typically apply Forward Error Correction (FEC) on upper layers viz., [Data link layer or Application layer] to cope with conduction errors, which the physical layer FEC cannot correct. FEC solutions are optimized to convey single layer video. The utilization of the dependencies in layered media codec using FEC is more significant. This scheme is called layer-aware FEC (LA-FEC). A combinatorial analysis of both FEC and Layer Aware-FEC rapidly increases the decoding probability and video quality.

Keywords— Broadcast, Forward error correction, flooding, Selective Broadcasting, Layer Aware FEC.

I. INTRODUCTION

A mobile ad hoc network (MANET) enables wireless communications between participating mobile nodes without the support of any base station. Two nodes that are out of each other communication range needs the support of transitional nodes, which relay messages to set up a communication between each other. The broadcast operation is the most fundamental role in MANET because of the broadcasting nature of radio transmission. When a sender transmits a packet, all nodes within the sender's transmission range will be affected by this program. The advantage is that, if one node transmits a packet, all its neighbors can receive the message. This circumstance is also referred to as "all neighborhood nodes are covered or dominated by the transmitting node". On the pessimistic side, one transmission may interfere with other transmissions, creating the exposed terminal problem where an outgoing transmission collides with an incoming transmission and the hidden terminal problem where two incoming transmissions collide with each other.

II. EFFICIENT FLOODING – FORWARD ERROR CORRECTION

Flooding is the mechanism by which a node, receives flooded message m and it, rebroadcasts m to other nodes. There is a difference between flooding and broadcast, which is a transmission that is received by all nodes within transmission range of the broadcasting node. Flooding usually covers all the nodes in a network, but can also be limited to a set of nodes that is defined by a geographical area (also called geocast flooding or by the time-to-live (TTL) parameter of m). Thus, a node receiving the flooded message only rebroadcasts it if it is within the specified area. Another one condition is its message's TTL is greater than 0.

The three phases in the Mistral Algorithm are:

- Composition of a Compensation Packet
- Recovering from Compensation Packets
- Mutable Payloads

A. Composition of a Compensation Packet

The data packets are of fixed size, e.g., 512 bytes, and contain the payload, a sender ID and some locally unique sequence number known as packet id. The payload is assumed to remain unchanged during the course of the flooding. In some protocols, payloads do change as packets are routed. If suppose the size of packet is increased for broadcast (for example: 1200 bytes) then the algorithm is unable to reach the targeted solution. To encode the payload of the data packets into the compensation packet, we use the XOR (operator), which is the simplest and best known FEC mechanism. A new data packet is added to the compensation packet by computing the XOR of its payload with the current payload in the compensation packet (initially, zero). Obviously, much more sophisticated error correction mechanisms are also possible; the advantage of XOR is its simplicity and low computational overhead.

B. Recovering from Compensation Packets

Two levels of recovery mechanism are used to recover data packet from compensation packets. The first level recovery is based on the data packets which are already received. The compensation packets contain missing data packets which is stored in compensation buffer (cp buffer).The second level recovery mechanism considering incoming and recovered data packets. This algorithm matches compensation packets against each other. The matching operation works as a reduction. Each new compensation packet is compared with all stored compensation packets. If either one of the packets is completely contained in the other, then a new compensation packet is added, which contains the set of data packet IDs of the larger packet minus the ones in the smaller packet.

C. Mutable Payloads

Many routing protocols modify the flooded packets but some protocols modify other parts of data packets based on the time to live values. The protocols of mutable payloads are based on internal parameters, building a route trace, etc. The mechanism of compensation packets includes a mutable part and an immutable part of the payload. The difference between the mutable part and an immutable part is determined by the size of the compensation packet.

III. LAYER AWARE FORWARD ERROR CORRECTION-LA-FEC

Forward error correction (FEC) is typically used in mobile broadcast systems to increase service robustness. FEC mechanisms can be categorized into those working at the physical layer or at any upper layer above it, such as the link or application layers. On physical layer, typically LDPC or Turbo codes are applied. On upper layers, today’s state-of-the-art FEC solutions of mobile broadcast standards are Raptor code or RaptorQ . All these FEC algorithms are optimized for transmitting single layer video. The traditional FEC approach to achieve a more efficient delivery for multi-layer media is to apply unequal error protection (UEP) to the media stream, where more important layers get stronger FEC protection.

A. Scalable Video Coding

The SVC extension of H.264/AVC allows for extracting different video representations from a single bitstream, where the different substreams. The base layer of SVC provides the lowest level of quality and is an H.264/AVC submissive bitstream to ensure backwards-compatibility with existing receivers. Each supplementary enhancement layer improves the video quality in a certain dimension. SVC allows up to three dissimilar scalability dimensions within one bitstream: temporal, spatial, and quality scalability. SVC utilizes different temporal and inter-layer prediction methods for gaining coding efficiency while introducing dependencies between quality layers of the SVC video stream.

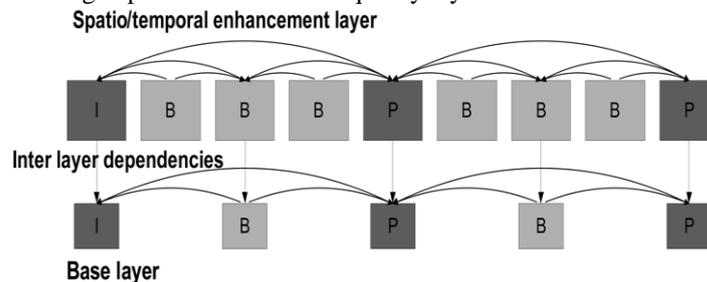


Fig : 1 Dependencies within an SVC bitstream using hierarchical prediction and inter-layer prediction.

B. Multiview Video Coding

MVC is an amendment of the H.264/AVC standard that enables efficient encoding of sequences captured parallel from multiple cameras using a single video stream. For MVC, the single-view concepts of H.264/AVC are extended in a way that a picture uses temporal reference pictures as well as inter-view reference pictures for predictive coding. Figure illustrates an exemplary inter-view prediction structure using MVC. Due to the inter-view prediction in MVC, a differentiation in robustness is in general beneficial, like in SVC. With traditional UEP, the FEC parity data are generated separately for each layer. Several protection schemes have been anticipated which benefit in performance by considering the layered distinguishing by integrating the UEP behavior within the FEC algorithm. The Layer-Aware FEC (LA-FEC) follows a similar approach. But instead of changing the basic FEC algorithm, it extends existing FEC algorithms enhanced decoding capabilities in case of dependent video layers. The basic FEC algorithm is not modified, thereby preserving the optimized correction performance and easing backwards attuned. The LA-FEC scheme can be applied to the physical layer or upper layer FEC.

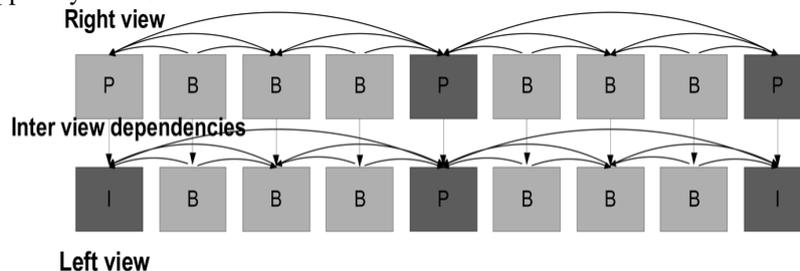


Fig:2 Dependencies within two views of a MVC stream, where the right view is encoded dependent on the base view.

C. Steps for LA-FEC Algorithm

End-to-end error correction should be addressed at the transport layer, since it responsible for packet reliability. In the handshake process, the connection initiator adds a LFEC flag inside the TCP options inside the ‘Syn’ packet. If the receiver also knows how to deal with LFEC, its ‘Syn-Ack’ packet will also contain the LFEC flag. The sender now knows that it can encode its data.

For each new packet, it adds the LFEC header. The LFEC header contains n, k and the index of the packet in the block. It saves the packet payload in the LFEC buffer. It sends the packet. When it sends a full data block (k packets), it encodes the data using the data in LFEC buffer, creates the LFEC packets and sends them as well.

Each and every incoming packet pulls the LFEC header. If this is redundant LFEC packet it throws its payload, else it adds the packet to the LFEC queue. If this is a LFEC packet, it doesn’t send its payload to the application layer. If there is a block with up to n-k missing packets, it decodes it (using LFEC queue), handles queues, and sends the reconstructed data to the application layer.

D. Simulation Settings

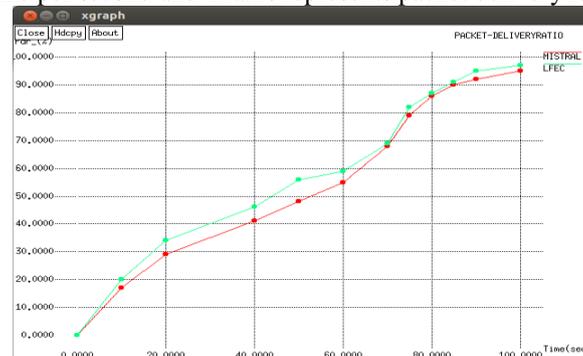
The table gives the simulation set up for simulation of results.

Table 1 Simulation Results

Routing Protocol	DSR
No.of nodes	40
Area size	1400*1200 sq meter
Initial energy	100 Joules
Queue length	300 m
Propagation medium	Two-way ground
Transmission Range	35 metre
Received power	0.036 joules
Transmission power	0.02 joules
Mobility	5 millisecc
Packet size	256 bytes/sec
Traffic model	VBR Variable bit rate
Packet Interval	0.082 sec

E. Packet Delivery Ratio Vs Time

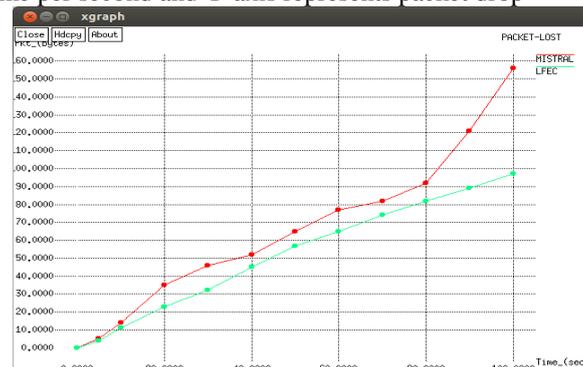
In this graph X-axis represents time per second and Y-axis represents packet delivery ratio



In this graph X-axis represents time per second and Y-axis represents packet delivery ratio

F. Packet Drop Vs Time

In this graph X-axis represents time per second and Y-axis represents packet drop



G. Energy Consumption Vs Time

In this graph X-axis represents time per second and Y-axis represents energy consumption.



H Delay vs time

In this graph X-axis represents time per second and Y-axis represents delay.



III. CONCLUSIONS

The total amount of protection packets is same for different coding schemes. The number of lost base layer IP packets for all code rate distributions are significantly lower when applying LA-FEC. All LA-FEC schemes show a similar base layer decoding probability which strongly depends on the assigned code rate. Considering the video quality settings the performance is better in LA-FEC which is absent in FEC technique. Within this area, the video service with LA-FEC achieves a video quality in terms of PSNR[Peak - to -Signal Noise ratio] over 30 dB , which can be assured as an acceptable video quality from the users point of view. Therefore LA-FEC significantly improves the service robustness and reliability. The signaling of LA-FEC improves the service quality and reliability which controls traffic congestion and collision. This scheme can be extended by implementing it in various routing protocols. It can be applied on the application means for transport and signaling of LA-FEC.

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