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# Priority Queuing Approach for Video Streaming Over Mobile Adhoc Network Using WEAC Protocol

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**Abstract:** ***Video Transmission over mobile adhoc network crosses many challenges like link failures, Bandwidth problem, time delay which affects Quality of service (QoS) . In such occasion using multipath routing protocols such as WEAC provides efficient packet scheduling mechanism to improve the performance of video delivery over Mobile Adhoc Network. In this paper we propose a new packet scheduling mechanism for multipath video transmissions. Different video frame types are compressed and delivered on time based on the priority. Our proposed scheme for video packet scheduling is priority queuing that schedules that schedules transmission of different video packets over different paths. For this purpose, condition of each routing path is periodically evaluated and the high priority video packets are transmitted through high quality paths. Simulation results show that our proposed scheduling improves the quality of the perceived video at the receiver, considerably.***

**Keywords:** Priority Queuing, WEAC Protocol, Mobile Adhoc Network.

## 1. Introduction

If there is vast amount of transfers in the network, then using multipath routing cannot give the required quality for the video Data. So, an extra mechanism such as Priority Queuing will be desired. The task of such an extra mechanism is to provide proper priority to each video frame in combination to the other data to keep away from frame losses while achieving QoS for video Transmission [1].

Varieties of video frames in a compressed video stream have various effects on the perceived video quality at the receivers. Reference frames have much more effect on the video quality.[2] Moreover, unsuccessful reception of a reference frame would eventuate the unsuccessful decoding of all dependent frames. Consequently, this causes resource inefficiency in the network.

In this section we propose a packet scheduling mechanism for transmission of video packets through multiple paths in the network based on the type of the vide packets[3]. Our proposed solution has three parts: A) Packet scheduling, B) Queue scheduling, C) Path scheduling. In the remaining of this section we explain each part[4].

## 2. Queue Scheduling

We also propose a scheduling mechanism for the intermediate nodes in each path. Such a mechanism can improve the video delivery over WMSN.[5] In our queue priority scheduling, nodes' buffer is divided into four queues and a round robin scheduling is executed for them. Each arriving packet to a node is placed on one of the queues according to following rules:[6]

- A packet that contains I-frame is placed in the first queue.
- A packet that contains P-frame is placed in the second queue.
- A packet that contains B-frame is placed in the third queue.
- A packet with no video data is placed in the fourth queue.
- The algorithm for enquiring the packets in the nodes' buffer is shown in Algorithm 1.

**Algorithm 1** Enqueuing of Receiving Packets in each Node
1 **for** each node
2 **if** physical buffer length > sum of length of four queues
3 Place packet in the each queue based on the type of packet;
4 **else**
5 Drop packet;
6 **end if**
7 **end for**

The proposed scheduling scheme operates in this way. The packets of three queues that have higher priorities, because of containing video packets, are transmitted with round-robin scheduling[7]. If these three queues are empty and don't have any packets, then the fourth queue is served one packet. It is worth to mention that First-In-First-Out (FIFO) discipline is used for each queue[8]. The proposed queue scheduling mechanism for each node is provided in Algorithm 2.

**Algorithm 2** Queue Scheduling
1 **for** each node
2 **for** any three queues have video frames
3 Perform RRS1;
4 **end for**
5 **if** there is not any packet in three video buffers
6 Send one packet from fourth queue;
7 **go** to 2;
8 **end if**
9 **end for**

## 3. Literature Survey

### 3.1 Packet Scheduling

Since different video frames in a GOP have different impact of the perceived video quality, it is better to give per frame different priority. In this way, reference frames would have the most priority compared with the other video frames[9][10]. In our proposed packet priority scheduling, the highest priority is given to the packets that containing frames with type of I-frame (Intra coded picture) and P-frame (Predictive coded picture) then B-frame (Bidirectional predictive coded picture), respectively. Furthermore, the packets containing I-frames must be sent through the most reliable paths in the network[11][12].

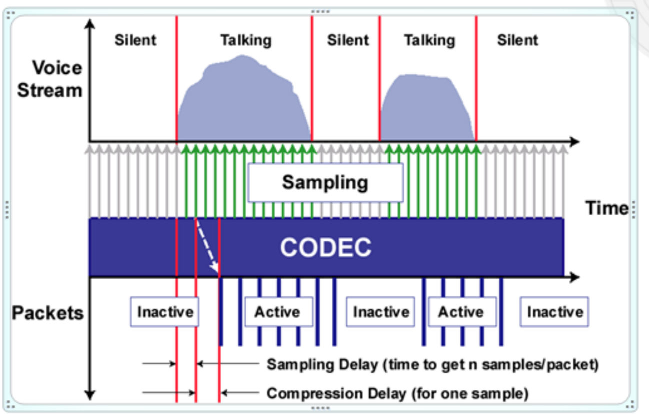
### 3.2 Priority Scheduling

In this proposed work priority gives for the packets according to the following model.

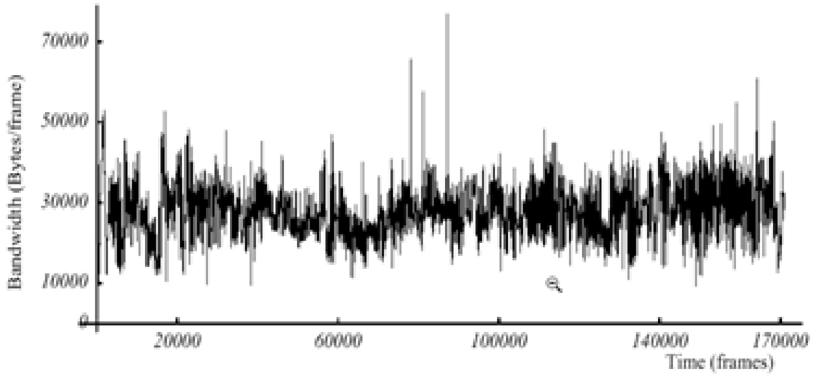
### 3.3 Source Types used

- Voice sources (1- Priority)
- Video sources (2- Priority)
- CBR Sources (3- Priority)
- TCP Sources (4 Priority)

### 3.4 Typical Voice Source Behavior




### 3.5 MPEG1 Video Source Model




## 4. Methods / Approach

### 4.1 Device Queuing Mechanisms

- Common queue examples for IP routers
  a) FIFO: First In First Out
  b) PQ: Priority Queuing
  c) WFQ: Weighted Fair Queuing
  d) Combinations of the above
- Service types from a queuing theory standpoint
  a) Single server (one queue - one transmission line)
  b) Multiple server (one queue - several transmission lines)
  c) Priority server (several queues with hard priorities - one transmission line)
  d) Shared server (several queues with soft priorities - one transmission line)

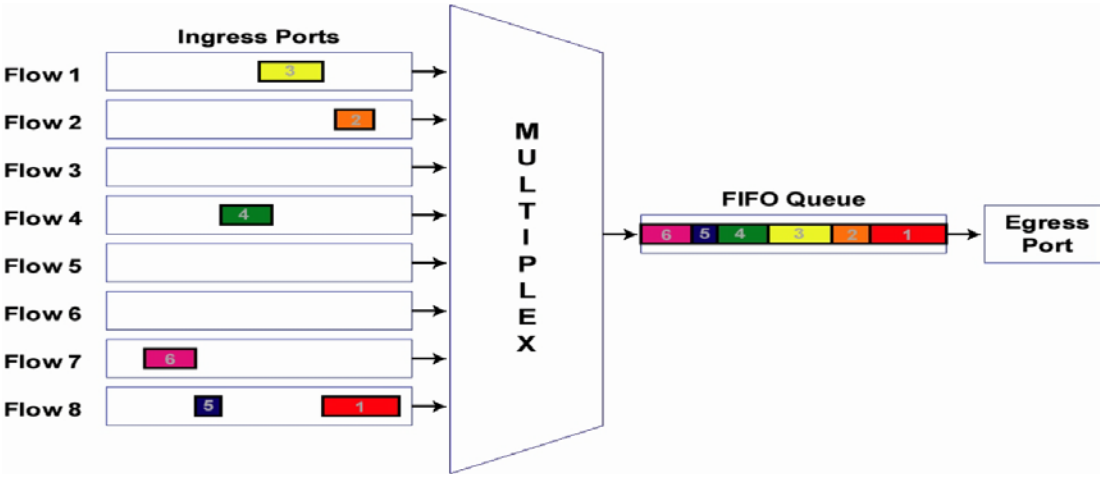
### 4.2 Single server (one queue - one transmission line)

- Single transmission line serving packets on a FIFO (First-In-First-Out) basis
- Each packet must wait for all packets found in the system to complete transmission, before starting transmission
- Departure Time = Arrival Time + Workload Found in the System + Transmission time

### 4.3 Packets arriving to a full buffer are dropped

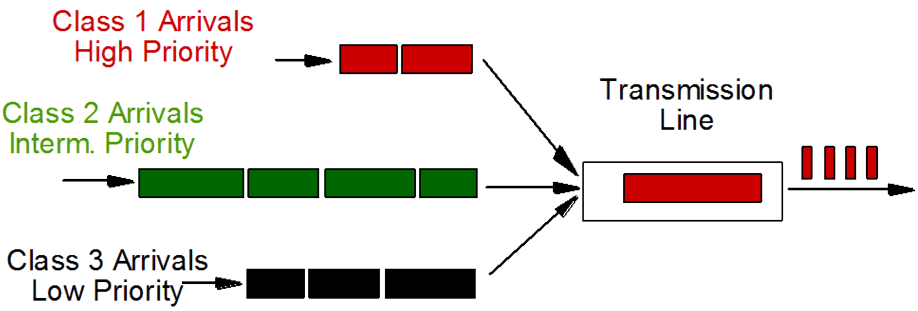

### 4.4 Multiple Server (one queue - several transmission lines)

- Packets are placed on outbound link to egress device in FIFO order
  – Device (router, switch) multiplexes different flows arriving on various ingress ports onto an output buffer forming a FIFO queue




**Priority Servers**

- Packets form priority classes (each may have several flows)
- There is a separate FIFO queue for each priority class
- Packets of lower priority start transmission only if no higher priority packet is waiting
- Priority types:
  – Non-preemptive (high priority packet must wait for a lower priority packet found under transmission upon arrival)
  – Preemptive (high priority packet does not have to wait …)




## 5. Priority Queuing Method

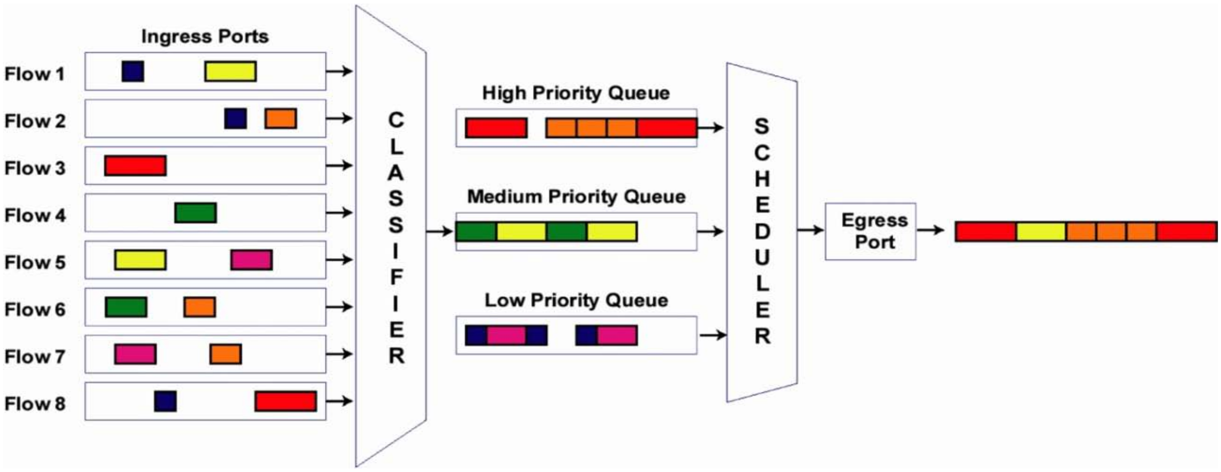



**Diagram of the proposed video transmission**

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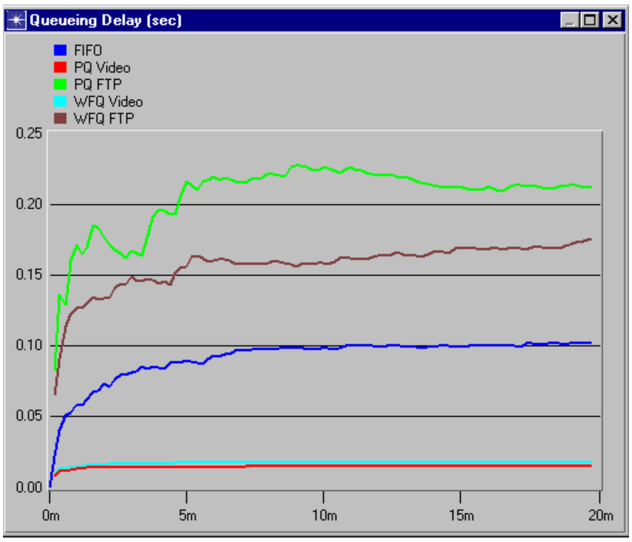
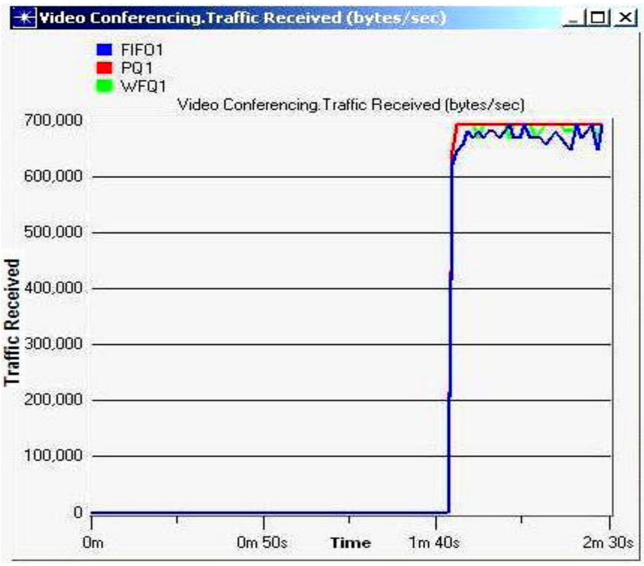
### 5.1 Parameters of the Simulation Setup

| *Parameters* | *Value* |
|---|---|
| Network Dimension | 1000m x 1000m |
| Mapping Type | Dynamic Mapping |
| Channel | Wireless Channel |
| Propagation Model | Radio Propagation model |
| Protocol | WEAC Protocol |
| Number of Nodes | 150 |
| Data rate | 3 mbps |
| Node Placement | Uniformly Distributed Two nodes send video traffic to the base station and each other node sends 400 bps traffic to the base station. |
| Packet size | 1500 |
| Max. Packet in queue | 50 |
| Average Hop Delay | 20ms |
| Control Packet T | 20s |

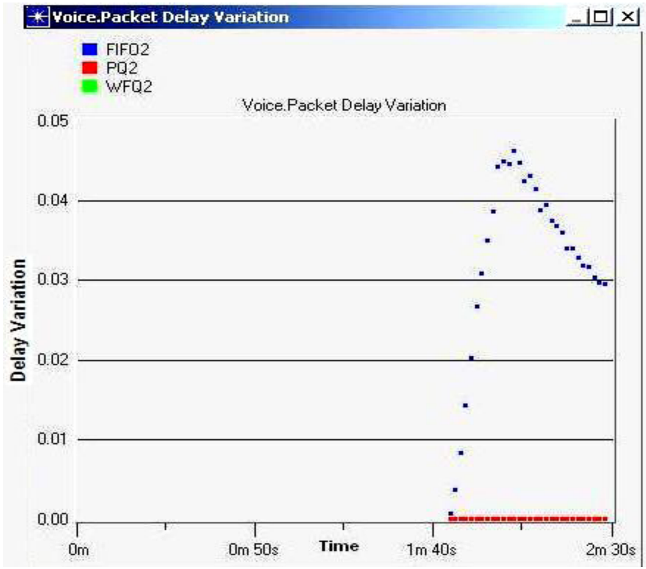
## 6. Results and Discussion




**Priority Queuing delay**




**Video Packet Delay**




**Voice Packet delay variation**

## 7. Conclusion and Future Scope

The result shows that priority queuing mechanism helps to improve video quality and reduces the time delay even in heavy video traffic. After mapping to the priority, four sample packets have been taken to check the delivery time based on the priority scheduled. A packet is delivered according to their priority and provides improved quality. This mechanism is used to provide the preference to urgent packets which are need to be transmitted immediately. This paper also explains various queuing models and their uses. Hence adding priority queuing mechanism to the protocol results in improved video streaming over mobile adhoc network during heavy video traffic. In future this paper can be extended for all 3G and 4G mobile adhoc network for video transmission with high quality video and priority based approach.

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