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Error Resilient Multipath Video Delivery on Wireless Overlay Networks

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Abstract

Real time applications delivering multimedia data over wireless networks still pose many challenges due to high throughput and stringent delay requirements. Overlay networks with multipath transmission is the promising solution to address the above problems. But in wireless networks the maintenance of overlay networks induce additional overheads affecting the bulky and delay sensitive delivery of multimedia data. To minimize the overheads, this work introduces the Error Compensated Data Distribution Model (ECDD) that aids in reducing end to end delays and overheads arising from packet retransmissions. The ECDD adopts mTreebone algorithm to identify the unstable wireless nodes and construct overlay tree. The overlay tree is further split to support multipath transmissions. A sub packetization mechanism is adopted for multipath video data delivery in the ECDD. A forward error correction mechanism and sub-packet retransmission techniques adopted in ECDD enables to reduce the overhead and end to end delay. The simulation results presented in this paper prove that the ECDD model proposed achieves lower end to end delay and outperforms the existing models in place. Retransmission requests are minimized by about 52.27% and bit errors are reduced by about 23.93% than Sub-Packet based Multipath Load Distribution.

Keywords: *overlay network, video streaming, multipath, wireless network*

1. Introduction

Multihop wireless networks are characterized by their low deployment costs and flexible infrastructure. Multiple applications can be executed on multihop wireless networks. The most complex and challenging of these applications are Real-time multimedia based applications. These applications demand sufficient bandwidth that varies from 4 to 25Mbps. Rigid delay requirements [1] pose a major challenge that needs to be addressed. Researchers in [2-5] have adopted the multipath transmission scheme to deliver multimedia data on wireless networks. The results presented by them prove the effectiveness of the multipath scheme to transmit multimedia data. Multipath distribution mechanisms enable to achieve optimum bandwidth utilization and enable to fulfill the delay requirements posed in distribution of multimedia or video applications [6, 7].

Another solution considered to support multimedia applications is to adopt overlay networks based on the application layer [8-10]. In overlay networks the intermediate hop nodes aid multimedia data delivery as they not only behave as receivers but also as data forwarding nodes. The hop nodes, buffer video data and can retransmit independently when packet is lost rather than requesting the source node for the lost data enabling to reduce end to end delays and per hop delays. Initially researchers considered the use of tree structures for video data distribution [8, 11] which was proved to be efficient. The major drawback of such single tree mechanisms is the overhead arising from tree updation due to the dynamic nature of the network.The overhead observed, especially in case of wireless networks due to node mobility, join, leave etc., negated its purpose of adoption. Considering wireless overlay networks the tree maintenance cannot be completely eliminated, but by reducing end to end delays and retransmission overheads an optimum balance can be achieved. This work introduces an Error Compensated Data Distribution Model (ECDD) for multimedia data delivery over wireless networks using multipath transmission. The ECDD considers application layer based overlay network. The mTreeBone [12] mechanism is adopted in the ECDD to identify the unstable node

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and generate the overlay tree. The tree generated is further split into multiple sub-trees to support multipath video data distribution. In ECDD video data packets are further split into sub packets, that are delivered over multiple paths. Efficient multimedia data delivery on wireless networks can be achieved by reducing the end to end delays. End to end delays are dependent on the per hop delays in wireless networks. To minimize transmission errors and adhere to the QoS requirements of the multimedia data, the ECDD considers the use of forward error correction FEC mechanism and overlay based retransmission techniques discussed in this work. The novelty of the ECDD is the adoption of the mTreebone to wireless networks (presently it has been considered for wired networks). Novel sub tree generation technique to support multipath transmission, sub-packetization based multipath distribution[14], adoption of FEC to reduce errors and retransmission techniques to reduce end to end delays. Results presented in the latter sections prove efficiency of ECDD over existing state of art systems.

2. Literature Survey

Wang, et al., [12] proposed mTreebone overlay creation mechanism to support multicast video streaming. Both tree and mesh overlay designs are combined to form a tree bone which will act as a backbone that will push all data to the overlay network. In this a single source node sends data to all other nodes. In mTreebone the overlay formulation is proposed to effectively handle the nodes join and leave events in the overlay. The model mainly struggled to obtain low overhead and also short delay. To the best of our knowledge the adoption of mTreebone for wireless networks has not been considered. The authors in [13] propose combined scalable Video Coding method to improve the video streaming quality in wireless network.

A novel sub-packetization based multipath load distribution technique for multimedia data is proposed in [14]. The technique proposed in this paper is referred to as “Sub-Packet based Multipath Load Distribution for Real-Time Multimedia Traffic” (SPMLD). The model proposed in [14] effectively achieved packet delay minimization by aggregating the multiple available parallel paths as a single virtual path for transmission. A packet splitting strategy is adopted in SPMLD. The D/M/1 model introduced is used to analyze the packet queuing delay and derive the dynamic packet splitting ratio for each path. In SPMLD, scheduling of sub-packet distribution was achieved by developing independent scheduling algorithms for the source node and the destination node. The results prove that SPMLD outperforms existent algorithms presented in [2-5]. The performance of SPMLD could be improved further by adopting error correction mechanisms to reduce packet retransmission overhead.

3. Error Compensated Data Distribution Model-ECDD

A wireless overlay network considered over an area of $\mathcal{A}$ square meters defined as $\mathrm{W} = (\mathrm{B}, \mathrm{F})$, with $\mathrm{R} = |\mathrm{B}|$ vertices and F edges. Let us denote $\mathrm{S_o}$ as the source of the overlay network and tree on which the source is rooted is a tree-mesh denoted as $\mathrm{Tree_j}$ which passes copies of video packet j to the nodes in B. Any packet j that is transmitted from source $\mathrm{S_o}$ to a node b in B crossing over all the per hop delays which is the total distance of overlay path is given by $\mathrm{l_0}$. Total end to end delay is given by:

$$\mathrm{ED_j}(\mathrm{b}, \mathrm{l_0}) = \sum_{\mathrm{i}=1}^{\mathrm{l_0}} \mathrm{D_i}(\mathrm{b}) \tag{1}$$

Where $\mathrm{D_i}(\mathrm{b})$ are the per hop delays. The proposed model considers the individual hop delays amongst the nodes as independent and follows the probability distribution represented as $\mathrm{D_i}(\mathrm{b})$. Thus the independent end to end delay is given by:

$$\mathrm{ED_j}(\mathrm{b}) = \sum_{\mathrm{i}=1}^{\mathrm{R}-1} \mathrm{ED_j}(\mathrm{b}, \mathrm{l_0}) \mathrm{Q}\big(\mathrm{S_j}(\mathrm{b}) = \mathrm{l_0}\big) \tag{2}$$

where $Q(S_j(b) = l_0)$ represents the probability that the j^{th} video packet is lost due to errors at node b. R represents the vertices. The variable $S_j(b)$ is the length of the path from source S_o to a node b in $Tree_j$.

Let us consider r independent and identically distributed random variables $D(d = 1,2,3 \ldots r, r>0$ having a marginal probability density function (pdf) represented as xiy and also joint pdf as $x(d_1, \ldots \ldots \ldots \ldots . d_n)$ such that $F(e^{\alpha D_r}) < \infty$. α represents a variable and Q represents probability. The average of D considering $d > F[D]$ can be defined as:

$$Q\left(\frac{\sum_{k=1}^{r} D_k}{r} \geq d\right) \leq e^{-r\mathcal{J}(d)} \tag{3}$$

Where $J(d)$ is the rate function given as:

$$\mathcal{J}(d) = \max_{\alpha>0}(\alpha_d) - \ln(F(e^{\alpha D})) \tag{4}$$

The function $\mathcal{J}(d)$ is convex for the random variables which increases depending on $(F[D], \infty)$ and $\mathcal{J}(F[D]) = 0$ based on [15]. For positive random variables D with $F[D] \geq 0$, then the derivative $\frac{\partial \mathcal{J}(d)}{\partial x} |_{d_0} \geq \mathcal{J}(d_0)/d_0$ for all $d_0 > F[D]$. Based on [15] for $d > F[D]$ and $c > 1$, we can write:

$$\mathcal{J}(cd) \geq (\mathcal{J}(d) + (cd - d)\, \mathcal{J}(d)/d) = c\mathcal{J}(d) \tag{5}$$

Based on $\mathcal{J}(cd)$ we can define probability as:

$$Q\left(\frac{\sum_{k=1}^{r} D_k}{r} \geq cd\right) \leq \left(e^{-r\mathcal{J}(cd)}\right) \leq \left(e^{-cr\mathcal{J}(d)}\right) = \left(e^{-r\mathcal{J}(d)}\right)^c \tag{6}$$

For end to end delay $ED_j(b)$ based on Equation (6), Equation (3) and $r = unity$ we get:

$$Q(ED_j(b) \geq c) \leq e^{-\mathcal{J}(c)} \tag{7}$$

$$Q(ED_j(b) \geq ca) \leq e^{-\mathcal{J}(ca)} \leq \left(e^{-\mathcal{J}(a)}\right)^c \tag{8}$$

Equation (8) gives the probability of losing data in the network based on delay.

The video data are large and are modeled using heavy tailed distributions [16, 17] Let us consider independent and identically distributed random variables D_j with the distribution function $E(y) < 1$, $\forall$ $y > 0$ and $D_j : j \in R$. Let the tail of E be $\overline{E}(y) = 1 - E(y)$ and by $\overline{E^{l_0 *}}(y) = Q(Y_1 + \cdots + Y_{l_0} > y)$ is the tail of the l_0 the part of E. For sub exponential distribution:

$$\frac{\overline{E^{l_0 *}}(y)}{\overline{E}(y)} \approx l_0 \tag{9}$$

The total sum exponential distributions of the video packets transmitted over the overlay network W is characterized by:

$$\sum_{l_0=0}^{\infty} q_{l_0} (1 + \omega)^{l_0} < \infty \tag{10}$$

where the variable $\omega > 0$, q_{l_0} represents the probability such that $Q(S_j(b) = l_0)$.Let us define a function $W(y) = \sum_{l_0=0}^{\infty} q_{l_0} E^{l_0 *}(y)$. Applying a summation ranging from 0 to ∞ in Equation 9 we get:

$$\frac{\overline{W}(y)}{\overline{E}(y)} \approx \sum_{l_0=0}^{\infty} l_0 \, q_{l_0} \quad (11)$$

As q_{l_0} represents the probability such that $Q(S_j(b) = l_0)$, similarily $\overline{W}(y) = Q(ED_j(b) > a)$ and also $\overline{E}(y) = Q(D_j(b) > a)$. Therefore:

$$Q(ED_j(b) > a) \approx F[S_j(b)] \, Q(D_j(b) > a) \quad (12)$$

Based on Equation 12 it can be observed that as the per hop delay increases the probability of the missing packets also increases. Similarly as the per hop delays decreases sub exponentially, the probability of packets lost in the overlay network also reduces sub exponentially.

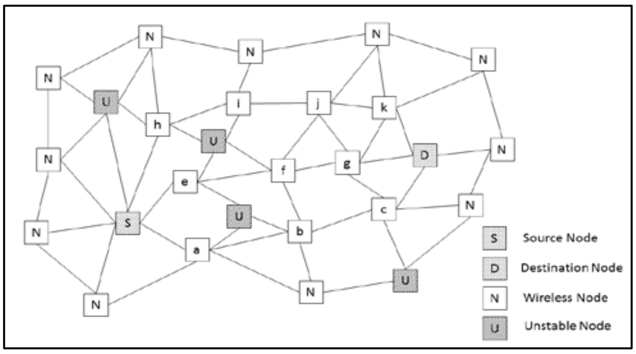

Figure 1. Sample Wireless Network

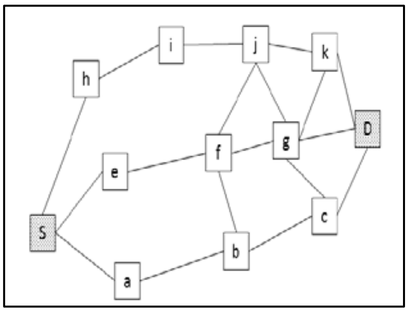

Figure 2. Overlay Formulation using mTreeBone

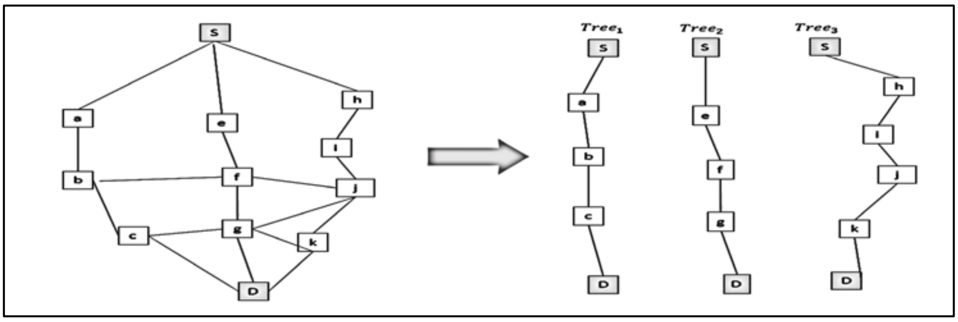

Figure 3. Overlay Sub-tree Formulation to Support Multipath Transmissions

4. Proposed ECDD Model

We discussed in previous section, reducing per-hop delay reduces the missing packet probability. Consider a wireless network as shown in Figure 1. It is assumed that each node in the wireless network have equal bandwidth capacity capable of supporting large video transmission streams. The ECDD model proposed considers the mTreebone algorithm for detecting the stable, unstable nodes and overlay formation. The source node (represented as S) is considered as the root node and the destination (represented as D) is considered as the leaf node in the overlay construction. The ECDD model proposed in this paper considers multipath transmissions. The overlay constructed using the mTreebone algorithm for the wireless topology is as shown in Figure 2 for the sample wireless network of Figure. 1 and is denoted as Tree. The overlay network generated is further split to construct subtrees as shown in Figure 3. Nodes labeled S, a, b, c and D form the first sub tree i.e. $Tree_1$. Nodes labeled S, e, f, g and D constitute the second sub tree $Tree_2$. The nodes S, h, i, j, k and D form the third sub tree $Tree_3$. Let us consider overlay network represented as Tree consists of R wireless nodes. To reduce the hop delays, ECDD adopts a multipath distribution model. The overlay network Tree formed is split to a number of sub trees. The k^{th} subtree is denoted as $Tree_k$.

The end to end delay ED observed per path is dependent on the size of the subtree formed. Let $Tl_k(b)$ represent the level of a node b in sub tree k. The length N_L of a sub tree can be computed using:

$$N_L = max_{k,b} Tl_k(b) \quad (13)$$

The probability that the b^{th} node will receive $C_b(a)$ video sub-packet out of the total r video sub-packet distributed in a multipath network of R overlay nodes is defined as:

$$Q^{VP}(a) = F\left[\sum_b \frac{C_b(a)}{\left(\frac{r}{R}\right)}\right] \quad (14)$$

Similarly missing probability can be defined as:

$$Q\big(ED_j(b) \geq a\big) = 1 - Q^{VP}(a) = 1 - \left(F\left[\sum_b \frac{C_b(a)}{\left(\frac{r}{R}\right)}\right]\right) \quad (15)$$

Let $Q^{VPR}_{k,l_0}(T)$ represent the probability that an overlay node at l_0 level in the $Tree_k$ would receive a video sub-packet (post the transmission commencement from the source node) within T seconds. $Q^{VPR}_{k,l_0}(T)$ is defined as:

$$Q^{VPR}_{k,l_0}(T) = Q\big(BR_{k,l_0}(T) = 1\big), \quad (16)$$

Where $BR_{k,l_0}(T)$ is a binary random variable.The probability $\mathbb{A}_{k,l_0}(T)$ that the event $\mathcal{E}_{rs}$ would occur within T seconds is given by:

$$\frac{\partial \mathbb{A}_{k,l_0}(T)}{\partial T} = \int_0^T \frac{\partial Q^{VP^x}_{k,l_0-1}(T-b)}{\partial T} x_{rs}(b)db \quad (17)$$

Where x_{rs} represents the probability density function of the time instance at which the event $\mathcal{E}_{rs}$ occurs and $\int_0^\infty x_{rs}(T)dT = 1 - q$. In Equation 17, $Q^{VP^x}_{k,l_0-1}(T-b)$ represents the probability that the previous hop node i.e. at the level $l_0 - 1$ in the sub $Tree_k$ has the video sub-packet.The probability density function $\mathbb{B}_{k,l_0}(T)$ of the time elapsed to detect the occurrence of the sub-packet loss event $\mathcal{E}_{rf}$ is defined as:

$$\mathbb{B}_{k,l_0}(T) = \int_0^T \frac{\partial Q^{VP^x}_{k,l_0-1}(T-b)}{\partial T} x_{rf}(b)db \quad (18)$$

Where x_{rf} represents the probability density function of the time instance at which the event $\mathcal{E}_{rf}$ occurs and $\int_0^\infty x_{rf}(T)dT = q$.An overlay node at l_0 level in the $Tree_k$, on detecting a lost or irrecoverable error sub-packets initiates a retransmission request to the previous hop node or nodes based on the availability of the sub-packet and is given as:

$$\mathbb{C}_{k,l_0}(T) = \mathbb{B}_{k,l_0}(T) + \mathbb{D}_{k,l_0}(T) + \mathbb{E}_{k,l_0}(T) \quad (19)$$

Where $\mathbb{B}_{k,l_0}(T)$ the probability that the node detects a sub-packet loss from its previous hop node, $\mathbb{D}_{k,l_0}(T)$ is the probability when the retransmission from the previous hop node/nodes in the $Tree_k$ is unsuccessful and $\mathbb{E}_{k,l_0}(T)$ is the probability when the retransmission request has been lost due to channel noise.The probability $\mathbb{F}_{k,l_0}(T)$ that the event $\mathcal{E}_{trs}$ would occur within T seconds is:

$$\mathbb{F}_{k,l_0}(T) = \int_0^T \mathbb{C}_{k,l_0}(T-b)x_{trs}(b)db. \tag{20}$$

Where x_{trs} represents the probability density function of the time instance at which the event $\mathcal{E}_{trs}$ occurs and $\int_0^\infty x_{trs}(T)dT = 1 - q$. The probability $\mathbb{G}_{k,l_0}(T)$ that the event $\mathcal{E}_{trr}$ (i.e. receiving the retransmission sub-packet successfully from the node at $l_0{}^*$ level in Tree_k) of would occur within T seconds is:

$$\frac{\partial \mathbb{G}_{k,l_0}(T)}{\partial T} = \int_0^T \mathbb{F}_{k,l_0}(T-b)Q^{VP}_{k,l_0{}^*}(T-b)x_{trr}(b)db \tag{21}$$

Where x_{trr} represents the probability density function of the time instance at which the event $\mathcal{E}_{trr}$ occurs and $\int_0^\infty x_{trr}(T)dT = 1 - q$.The probability density function $\mathbb{D}_{k,l_0}(T)$ of the time elapsed to detect the occurrence of the retransmission of data sub-packet unavailability with the node at $l_0{}^*$ level in Tree_k is defined as.

$$\mathbb{D}_{k,l_0}(T) = \int_0^T \mathbb{F}_{k,l_0}(T-b)\left(1 - Q^{VP}_{k,l_0{}^*}(T-b)\right)x_{trr}(b)db \tag{22}$$

The probability $\mathbb{F}_{k,l_0}(T)$ that the event $\mathcal{E}_{tl}$ would occur within T seconds is:

$$\mathbb{E}_{k,l_0}(T) = \int_0^T \mathbb{C}_{k,l_0}(T-b)x_{tl}(b)db \tag{23}$$

Where x_{tl} represents the probability density function of the time instance at which the event $\mathcal{E}_{tl}$ occurs and $\int_0^\infty x_{tl}(T)dT = 1-(1-q)^2$. The probability that the overlay node at l_0 level in the Tree_k would receive a sub-packet directly or through retransmissions is defined as:

$$\frac{\partial q_{k,l_0}(T)}{\partial T} = \frac{\partial \mathbb{A}_{k,l_0}(T)}{\partial T} + \frac{\partial \mathbb{G}_{k,l_0}(T)}{\partial T}. \tag{24}$$

Based on the packet receiving probability given by Equation 24, the probability that an overlay node at l_0 level in the Tree_k will be able to reconstruct the received error sub-packet from its previous hop node/nodes using the $\text{FEC}(r, D_{EC})$ function is defined as:

$$Q^{VP^x}_{k,l_0}(T) = q_{k,l_0}(T) + \left(1 - q_{k,l_0}(T)\right)Q\left(\sum_{j\neq k} BR_{j,l_{0_j}}(T) \geq D_{EC}\right) \tag{25}$$

Where $l_{0_j} = l_0$ for overlay nodes that transmit the data packets without errors, $l_{0_j} = N_{L_{l_0}}$ for overlay nodes in which transmission packet errors have been detected. The probability of recovering the error sub-packet from the source node transmitting at a rate of $\frac{c}{r_b}$ is defined as:

$$Q^{VP^x}_{k,0}(T) = \mathbb{H}\left(T - (k-1)\left(\frac{C}{S}\right)\right) \tag{26}$$

Where c is the average sub-packet size of the sub-packets is, S is the stream bit rate of video stream and $\mathbb{H}$ is the Heaviside step function. The probability that an overlay node at l_0 level in $Tree_k$ having a required packet and can send it to a requested node within a time frame of a seconds is given as:

$$Q^{VP}_{k,l_0}(a) = q_{k,l_0}(T_k) + \left(1 - q_{k,l_0}(T_k)\right) Q\left(\sum_{j \neq k} BR_{j,l_{0_j}}(T_k) \geq D_{EC}\right) \quad (27)$$

If the sub-packet requested is unavailable in the sub-tree Tree_k then the probability of the sub-packet availability within the entire network Tree is given as:

$$Q^{VP}(a) = \frac{1}{r}\sum_{k=1}^{r}\frac{1}{R}\sum_{l_0=1}^{N_l} Q^{VP}_{k,l_0}(a)(T)R_{l_0} \quad (28)$$

The ECDD adopts a multipath distribution model for video or multimedia data. To reduce per hop delay, D and end to end delay, ED the ECDD adopts a FEC technique with a novel retransmission technique to ensure data delivery within the delay bounds. To evaluate the performance of ECDD an experimental study is conducted and is presented in the following section of this paper.

5. Experimental Study and Simulation Results

To evaluate the performance of the proposed ECDD model we consider multipath video transmission scenarios over wireless nodes in a simulation platform. The simulation platform is developed using MATLAB and C++. An area i.e. $\mathcal{A} = 100\mathrm{m} \times 100\ \mathrm{m}$ was considered to deploy 100 wireless nodes. The bandwidth assigned to each wireless node is $1\ \mathrm{Mbps}$. The wireless channels are modeled using the Additive white Gaussian noise based noise model. The physical layer developed for the simulation environment is in accordance to the IEEE 802.11g standard. Orthogonal Frequency Division Multiplexing is considered for transmitting and receiving video data. The video data to be transmitted is initially encoded using H.264/SVC JSVM [18].The encoded video data is transmitted via a multipath channel. The mTreeBone algorithm is adopted to construct the overlay and eliminate unstable wireless nodes. The overlay tree i.e. Tree constructed considers source node S as the root node and the leaf node as destination node D.

The source and destination are selected so as to support 5 multipath transmissions of the video data. The Tree obtained from adopting the mTreebone algorithm is further split into five sub-trees namely Tree1, Tree2, Tree3, Tree4 and Tree5. Each sub-tree obtained has $l_0 = 7$ i.e. S, 5 hop nodes and the destination D. The performance of ECDD is compared with the state of art SPMLD algorithm. Jiyan [14] has reported the superior performance of SPMLD over the existing Effective Delay-Controlled Load Distribution model [2], FLARE [3], Least-Loaded-First approach [4], Load Balancing Parallel Forwarding [5] and the Flow Slice scheme [19]. In this paper, the authors present the comparison results between the proposed ECDD and the SPMLD algorithm.

A scenario considering 500 video data packets are simulated using the ECDD and the SPMLD algorithms. The symmetric Signal to Noise Ratio is considered to be $5\mathrm{db}$. The number of retransmission requests observed by all the nodes in the Tree constructed is as shown in Figure 4. From the graph it can be observed that the retransmission requests are reduced by about 52.27% considering the ECDD when compared to SPMLD algorithm.

Reducing ED also helps in reducing the lost packet probabilities. Reduction in lost packet probabilities in turn helps in efficient video transmission and reconstruction. To measure the quality of reconstruction, the authors have adopted video PSNR computations at frame level. To measure the reconstruction quality in terms of PSNR and to measure the end to end delay, video data of N + x frames are considered. The sub packetization scheme is adopted and the sub packets are transmitted from S node to D node through 5 multi paths. The symmetric Signal to Noise Ratio in this case is taken as 5db. The video reconstruction results thus obtained considering ECDD and SPMLD schemes are shown in Figure 5. In SPMLD the highest

PSNR value observed is 46.1770 dB which is in concurrence with the results published in [14]. From Figure 5 it is evident that ECDD exhibits higher PSNR values when compared to SPMLD and the highest value observed in ECDD is 48.6831 dB.

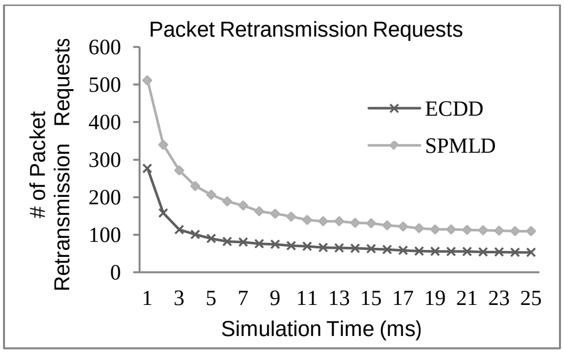

Figure 4. Number of Retransmission Requests in ECDD and SPMLD

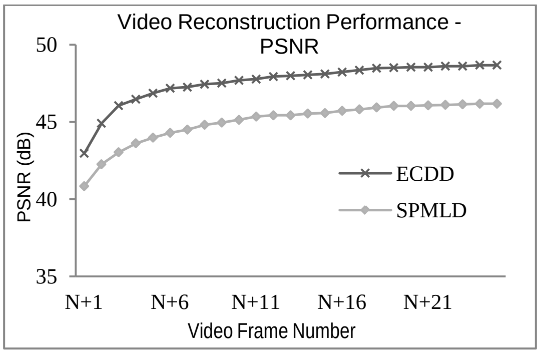

Figure 5. Video frame reconstruction at the destination based on PSNR

The end to end delay is measured and the results obtained is shown in Figure 6. It can be observed that the ED for ECDD and SPMLD are exponential in nature. This is in consistent with model obtained in Equation.12 for per hop delays. The cumulative per hop delays are used to obtain the end to end delay i.e. ED. The end to end delay over x number of wireless hop nodes for ECDD i.e. ED_{ECDD} is found to be:

$$ED_{ECDD} = 16.484\ e^{(x \times 0.30)}$$

The end to end delay for SPMLD is found to be:

$$ED_{SPMLD} = 14.936\ e^{(x \times 0.32)}$$

Based on the definitions for ED_{ECDD} and ED_{SPMLD} it can be concluded that the ECDD exhibits a lower end to end delay and the performance improvement is higher for larger networks. Experimental study is conducted to study the effect of wireless channel noise and video data transmission on ECDD and SPMLD mechanisms. Experimental study is conducted to study the effect of wireless channel noise and video data transmission on ECDD and SPMLD mechanisms. The signal to noise ratio is varied from $0dB$ to $4dB$. The bit errors observed at the sub packet level are measured and the results obtained are shown in Figure 7.

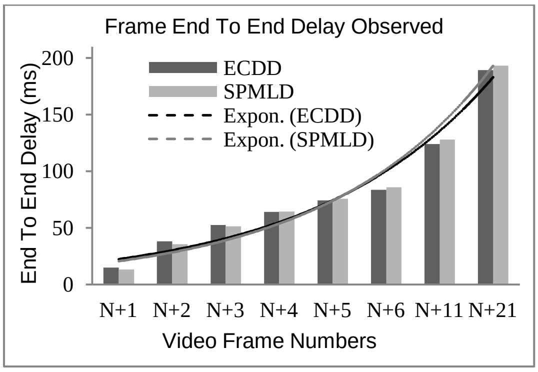

Figure 6. Frame based End to End Delay measured at the destination

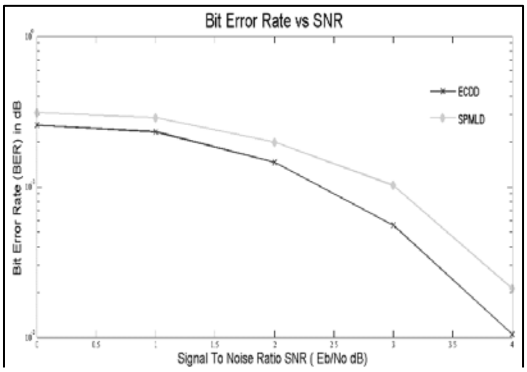

Figure 7. Bit Error Rate measured with varying SNR considering ECDD and SPMLD

The results obtained show that the bit errors induced by the wireless channel noise are reduced by about 23.93% using proposed ECDD. Based on the experimental study and the corresponding results presented in this paper it can be concluded that the ECDD achieves better performance owing to the adoption of the FEC and packet retransmission techniques incorporated.

6. Conclusion

In this paper the issues with supporting real-time multimedia or video based applications over wireless network are presented. The work carried out so far to address these issues and their drawbacks have been clearly discussed. It is observed that sub packetization techniques prove to be efficient for video delivery over multi paths. Overlay networks can aid information feedback essential for video data delivery. The overlay networks induce overheads due to tree maintenance. To reduce these overheads this work proposed ECDD model. For efficient video data delivery and to minimize the delay, ECDD adopts a sub packetization technique. The overheads are predominantly induced due to packet losses. To reduce packet losses ECDD adopts a FEC mechanism aiding in recovery. A retransmission technique is also discussed to obtain the lost packets in the network. The performance of ECDD is compared with a state of art existing model in the experimental study. The performance improvement of the ECDD is proved in terms of the end to end delay, video reconstruction quality, reduced number of retransmissions and robustness to noise. As a future work, the performance of the ECDD will be evaluated for larger networks supporting multiple video streams.

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