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A NEW LOAD BALANCING MECHANISM FOR IMPROVED VIDEO DELIVERY IN WIRELESS NETWORKS

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Abstract:

Due to the evolution of wireless communication, now a day's peoples were using mobiles as a sixth finger of the hand. Due to immunize of the Mobile and network usage traffic occurs in Wireless network. In order to decrease the network traffic on deployed wireless networks in general and on cellular networks in particular to support high quality of service, implementation of load balancing technique helps us to reduce the traffic in the network. The K-classification algorithm is used to detect the nearest neighbor, reduce the network traffic and maintain the load balance. In this paper load balancing solution for video deliveries is proposed. Here clustering can be used for load balancing to transmit the data very easily by using K means algorithm and thereby reducing energy consumption. Load balancing distributes workloads across multiple computing network links. Load balancing aims to maximize throughput, minimize response time, and avoid overload of any single resource.

Key Words: Load Balancing, K-Means Clustering, Wireless Networks, Energy Consumption & Throughput

1. Introduction:

In the modern society, large data delivery between wireless network devices puts an important pressure on network resources. For instance, it is expected that large amounts of continuous data such as multimedia streams to be transmitted through wireless network with strict timing requirements and support good user perceived quality at the remote device. In order to achieve this, the network architecture and the delivery solutions have to be capable of supporting and maintaining high throughput and low loss while cost-effectiveness and service stability are also essential factors to be considered. In the quest for offering the features mentioned above wireless mesh is one of the most widely-used network architectures. WMNs are suitable for both short-term small range applications (e.g. a concert, street fair), and long-term metropolitan service deployments (e.g. city-wide mesh network connecting citizens and public services). Characterized by multi-hop capabilities,

WMNs can be used as well in areas with weak cellular coverage, such as rural zones. WMNs consist of wireless interconnected routers arranged in a mesh topology, which forward the traffic in a multi-hop fashion. Beside the many characteristics of WMNs, which make this technology a desirable option for an easy and fast deployment, WMNs also face multiple challenges. One of them is their limitations in fulfilling user expectations in terms of high QoS levels. One of the reasons is that WMNs were not designed originally to work in conjunction with any QoS mechanism. Another reason is that most of the times the traffic is not evenly distributed in the network. This means that some nodes carry more traffic than the others and become congested. Congestion will cause the nodes to drop packets which will influence negatively the transmission of

any content. In particular loss affects the quality of video transmissions and therefore remote viewer perceived quality or Quality of Experience (QoE) severely decreases.

In this paper, this work addresses the problem of unbalanced traffic distribution in a wireless mesh network. The classic routing solutions re-route the traffic in the mesh network without considering the load at the mesh nodes queues, and therefore some mesh nodes may rapidly get overloaded because they carry too much data and/or too many video flows. This causes traffic congestion at those nodes, which results in significant reduction of the overall network capacity and affects the remotely transmitted video quality levels.

To address this issue, in this paper we propose a queue occupancy- based load-balancing solution, ViLBaS, which identifies congested nodes and increases viewer Quality of Experience (QoE) levels for video deliveries over WMNs by re-routing flows selectively around those nodes.

2. Related Works:

In this section, Different routing techniques have been suggested that considers load balancing are to be discussed. In WMN routing is the process of finding a path from a source node to destination node. Mesh network requires each node to share route information with others. An efficient routing algorithm should consider the factors like minimizing delay, maximizing probability of path delivery, fault tolerance and load balancing.

WMN is a technology developed to provide high bandwidth broadband service to a large community of users. As a result a great portion of users intends to communicate with the outside networks via the internet gateways, so due to high traffic there will be potential bottleneck in the gateway. Incrementing the number of gateway nodes does not improve the throughput of Wireless mesh network unless load balancing scheme is employed. If the routing algorithm does not take account of traffic load, some gateway may be overloaded while others may not. So load balancing is essential to exploit the underutilized paths in the network.

In 2014, M. Kserawi, S. Jung, D. Lee, J. Sung, and J.-K. K. Rhee worked on "Multipath video real-time streaming by field-based anycast routing". This paper introduced field based anycast routing. It also handles congestion avoidance and node failure with the assistance of gateway load sharing. It can deliver only two streams sent over a particular time.

In 2014, E. P. da Silva Mineiro and D. C. Muchaluat-Saade, worked on "CAC-OLSR: Extending OLSR to provide admission control in wireless mesh networks". This paper introduced a call admission control OLSR. It focuses on voice and video categories. It fails to work with large number of mesh nodes. And the channel occupation estimation varies with the actual value.

In 2014, Liang Chen, Yipeng Zhou, and Dah Ming Chiu worked on "Smart Streaming for Online Video Services". This paper introduced a smart streaming mechanism. It focuses on the bandwidth. It has been implemented for a single video through a peer network.

In 2013, A. Hava, G.-M. Muntean, Y. Ghamri-Doudane, and J. Murphy, worked on "A new load balancing mechanism for improved video delivery over wireless mesh networks". This paper introduced an hybrid architecture which is a combination of centralized and decentralized architecture. It computes the threshold dynamically. It monitors and reports the traffic at periodic intervals. It doesn't focus on handling node failure.

In 2012, R. Matos *et al.* worked on "Quality of experience-based routing in multi-service wireless mesh networks". This paper focus on quality of experience by introducing double reinforcement learning mechanism with the help of Q-learning algorithm. It splits up the work into two phases exploration and exploitation. The convergence speed and adaptation to the network traffic was not explored.

In 2011, K.-H. Kim and K. G. Shin worked on "Self-reconfigurable wireless mesh networks". This paper proposes autonomous reconfiguration system. It can monitor the system periodically to detect failure and reconfigure the system. It reconfigure despite of the flow assignment and routing.

In 2006, Deepti Nandiraju, Lakshmi Santhanam, Nagesh Nandiraju, and Dharma P. Agrawal worked on "Achieving Load Balancing in Wireless Mesh Networks through Multiple Gateways." This paper proposes a load balancing mechanism that discovers the ateway initially and the mitigate the load through the discovered channel in the case of congestion. Packet drop percentage was not taken into account.

In 2005, G.-M. Muntean, P. Perry, and L. Murphy worked on "Objective and subjective evaluation of QOAS video streaming over broadband networks". This paper introduced QOAS scheme for high quality video streaming. It should be implemented on multicast transmission with feedback and arbitration of heterogeneous client.

In 2004, R. Draves, J. Padhye, and B. Zill worked on"Routing in multi-radio, multi-hop wireless mesh networks." ETT and WCETT that measures the transmission time and choose the node for video transmission. It is implemented in static scenarios. In , Liang Ma and Mieso K.Denko worked on "A Routing Metric For Load Balancing In WMN". This paper proposed a novel traffic splitting algorithm. It balances the load globally with congestion aware routing.

3. Proposed Scheme:

Load Balancing:

Load balancing is dividing the amount of work that a computer has to do between two or more computers so that more work gets done in the same amount of time and, in general, all users get served faster. Load balancing can be implemented with hardware, software, or a combination of both. Typically, load balancing is the main reason for computer server

K-Means Clustering Algorithm:

K-means is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed apriori. The main idea is to define k centers, one for each cluster. These centers should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest center. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as barycenter of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new center. A loop has been generated. As a result of this loop we may notice that the k centers change their location step by step until no more changes are done or in other words centers do not move any more. Finally, this algorithm aims at minimizing an objective function knows as squared error function given by:

$$J(V) = \sum_{i=1}^{c} \sum_{j=1}^{c_i} (\|x_i - v_j\|)^2$$

where,
'$||x_i - v_j||$' is the Euclidean distance between x_i and v_j.
'c_i' is the number of data points in i^{th} cluster.
'c' is the number of cluster centers.

Block Diagram:

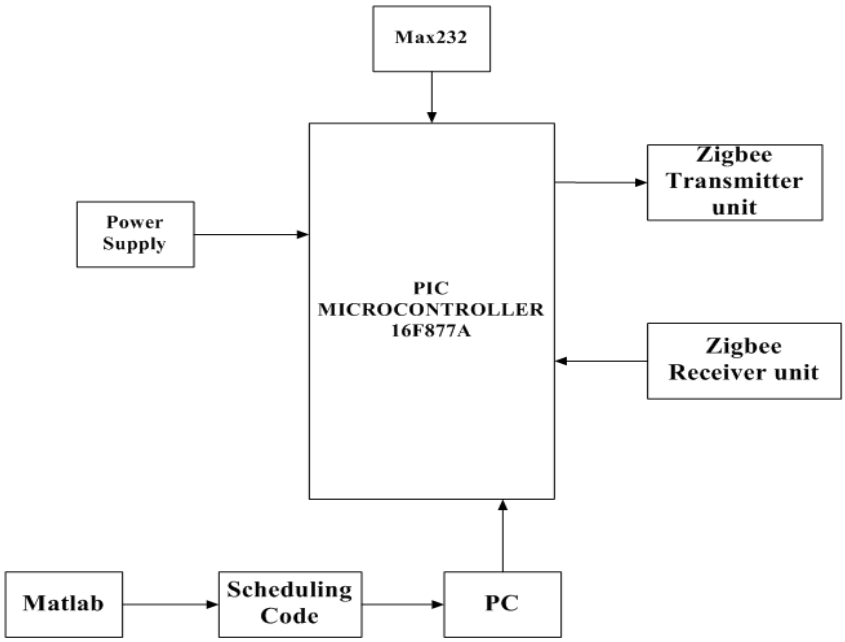

Figure 3.1: Base station Block Diagram

Working Principle:

The input 230V AC voltage applied to the step down transformer it step down into 12v Ac. The switch is connected with secondary side of step down transformer. Bridge rectifier is converting AC into pulsating DC of 12V.In Bridge Rectifier analog input is connected to the switch and positive, negative edge is connected to the ceramic capacitor. Ceramic capacitor is connected for noise rectification.1000uf Ceramic capacitor is used to filter the harmonics in the power supply line. Capacitor is connected to the voltage regulator. The 7805 voltage regulator has 3 pins. First pin is 12v input pin, second pin is ground pin and third pin is 5v output pin. Input 5v is given to PIC 16F877a microcontroller. An innovative selective load balancing solution for video deliveries in WMN. Here we propose an innovative load balancing solution for video deliveries in WMN. If node 1 access the base station the data transmission between base station and node will be speed. At the same time many node access the same base station then speed of data transmission is low because all the nodes are accessing at the same time so packets are congested. Our proposed VILBAs technique overcome this solution by using K means algorithm. Now many nodes access the base station at the same time then the base station find the nearest neighbor by using k means algorithm then it send packets to that particular accessed nodes. Therefore the data transmission is very high and Qos levels are increased. The output will be shown in Network simulator 2. Here we are using ZigBee to send the data. Speed calculation of the data transmission between base station to node will be show in MATLAB

Output:

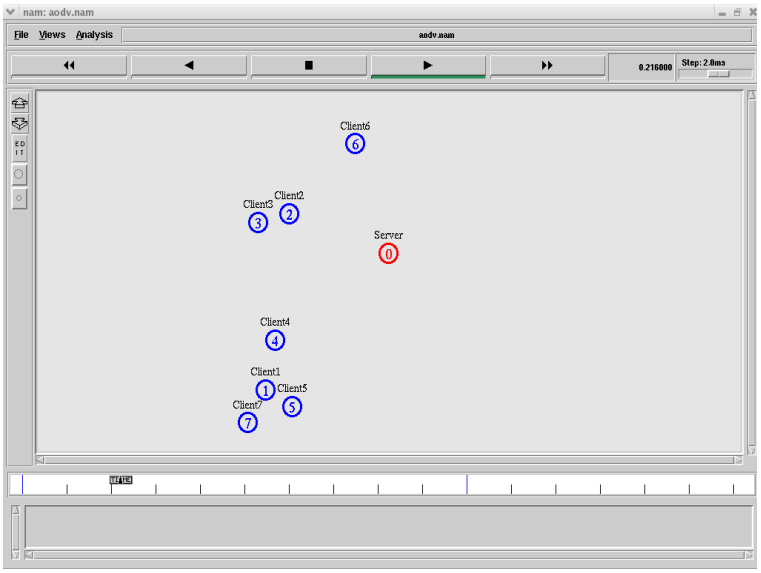

Figure 3.2: Representation of server and client

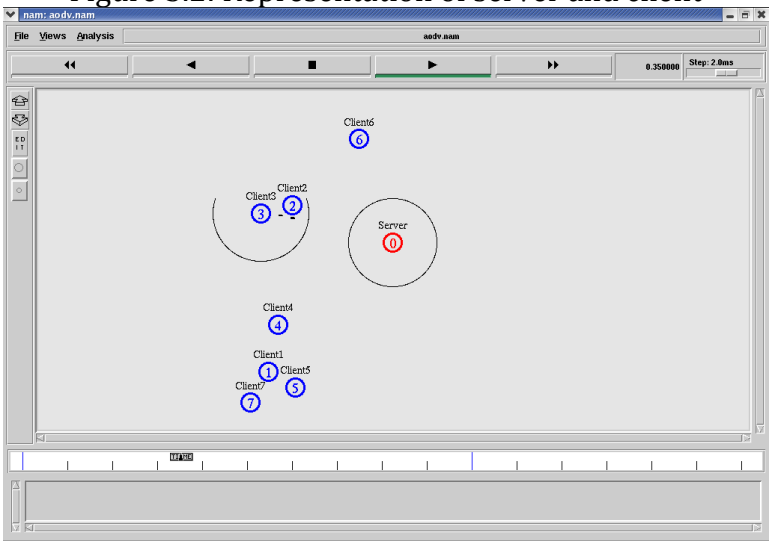

Figure 3.3: Data send from Server to Client3

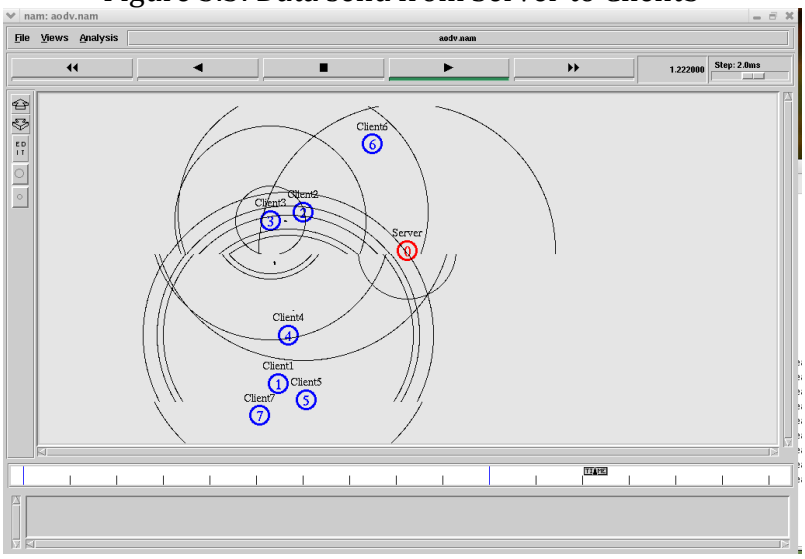

Figure 3.4: Data transfer process after request from client

4. Conclusion:

The Wireless mesh network infrastructure plays an essential role in the delivery of video over the users. Video delivery is currently one of the most demanding applications in terms of traffic. Our proposed method addressed the issue of unbalanced traffic distribution in WMNs with focus on video flows. We establish wireless network routing with the aim of achieving good performance in terms of load-balancing ratio. Our project describes ViLBaS, a selected load-balancing mechanism, which prevents congestions by monitoring the video traffic. We used k means algorithm to find nearest neighbor node and transmitted data. It reduce the traffic as well as energy consumption. The quality of the video delivered when employing ViLBaS was associated with a value 30% higher than the other methods. Unlike other techniques, the proposed approach tries to give the optimal performance as time developments.

5. Future Enhancement:

This project is based on the concept of providing better solution for above reduction in wireless network by providing load balancing scheme. Performance of the wireless network communication has been examined. This project has increased the load balancing options then current environment. In future, the wireless communication networks would be the convergent of various access networks, including transmission features and abilities. We increased transmission throughput and enhanced reliability.

6. References:

1. D. S. De Couto, S. J. Douglas, D. Aguayo, J. Bicket, and R. Morris, "A high-throughput path metric for multi-hop wireless routing," Wireless Networks, vol. 11, no. 4, pp. 419–434, 2005
2. R. Draves, J. Padhye, and B. Zill, "Routing in multi-radio, multi-hop wireless mesh networks," in Proc. 10th Annu. Int. Conf. Mobile Comput. Netw. (MobiCom), Philadelphia, PA, USA, 2004, pp. 114–128.
3. Y. Yang, J. Wang, and R. Kravets, "Designing routing metrics for mesh networks," in Proc. IEEE Workshop Wireless Mesh Netw. (WiMesh), Santa Clara, CA, USA, 2005.
4. Z. Wang and J. Crowcroft, "Quality-of-service routing for supporting multimedia applications," IEEE J. Sel. Areas Commun., vol. 14, no. 7, pp. 1228–1234, Sep. 1996.
5. C. Olariu, J. Fitzpatrick, Y. Ghamri-Doudane, and L. Murphy, "Provisioning call quality and capacity for femtocells over wireless mesh backhaul," in Proc. IEEE 24th Int. Symp. Pers. Indoor Mobile Radio Commun. (PIMRC), London, U.K., 2013, pp. 3071–3076.
6. R. Matos et al., "Quality of experience-based routing in multi-service wireless mesh networks," in Proc. IEEE Int. Conf. Commun. (ICC), Ottawa, ON, Canada, 2012, pp. 7060–7065.
7. C. Olariu, A. Hava, P. Szczechowiak, and Y. Ghamri-Doudane, "Prototyping telematic services in a wireless vehicular mesh network environment," in Proc. IEEE Wireless Commun. Netw. Conf. Workshops (WCNCW), Paris, France, 2012, pp. 371–376.
8. M. H. Pinson and S. Wolf, "A new standardized method for objectively measuring video quality," IEEE Trans. Broadcast., vol. 50, no. 3, pp. 312–322, Sep. 2004.
9. Z. Wang, L. Lu, and A. C. Bovik, "Video quality assessment using structural distortion measurement," in Proc. Int. Conf. Image Process., vol. 3. Rochester, NY, USA, 2002, pp. III-65–III-68.
10. S. Chikkerur, V. Sundaram, M. Reisslein, and L. J. Karam, "Objective video quality assessment methods: A classification, review, and performance comparison,"

11. ITU-T Rec. P.913, "Methods for the subjective assessment of video quality, audio quality and audiovisual quality of internet video and distribution quality television in any environment," Jan. 2014.
12. S. Winkler and P. Mohandas, "The evolution of video quality measurement: From PSNR to hybrid metrics," IEEE Trans. Broadcast., vol. 54, no. 3, pp. 660–668, Sep. 2008.
13. V. Vassiliou, P. Antoniou, I. Giannakou, and A. Pitsillides, "Requirements for the transmission of streaming video in mobile wireless networks," in Proc. 16th Int. Conf. Artif. Neural Netw. (ICANN), Athens, Greece, 2006, pp. 528–537.
14. T. Zinner, O. Abboud, O. Hohlfeld, T. Hossfeld, and P. Tran-Gia, "Towards QoE management for scalable video streaming," in Proc. 21st ITC Spec. Sem. Multimedia Appl. Traffic Perform. QoE, Miyazaki, Japan, 2010, pp. 64–69.
15. G.-M. Muntean, P. Perry, and L. Murphy, "Objective and subjective evaluation of QOAS video streaming over broadband networks," IEEE Trans. Netw. Service Manag., vol. 2, no. 1, pp. 19–28, Nov. 2005.