Quality of services in addition with Admission-Control in WI-Max-A Tutorial

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Abstract: **As we, all know that in every field it is very important to have quality of services. In the field of Real-time, applications like ATM and Wi-Fi are few examples. Some metrics for quality of services are Cost, Flexibility, Reliability and Efficiency. In this paper, we deal with quality of services in relation to admission control of the packets. In admission control, it should concentrate on scheduling and routing that at which time a packet should sent from source to destination for less jitter and delay. There should be regular intervals of checkpoints, which show statistics of the networks that how the packets are, delivered.**

Keywords- **WI-Max, Scheduling, Routing, Admission-Control, Traffic-Management.**

I. INTRODUCTION

WI-Max is considered as a MAN technology based on standard in IEEE 802.16.In addition to it uses point-to-point, point to multipoint or mesh topologies. For the support of these topologies, it uses pair of directional antennas, which increase the effective range of system, and provides bandwidth up to few hundred Mbps. WI-MAX technologies can be, used as **"last mile" broadband connections** to deliver audio or video to clients. Thus, Quality of Service is very important for WI-MAX networks. Providing Quality in multi-hop WI-MAX networks such as WI-MAX mesh or mobile multi-hop relay networks is challenging as multiple links can interfere with each other if they are, scheduled at the same time.

II. WI-MAX ARCHITECTURE

WI-MAX is using OFDMA technique based on IP technology and is ready to deploy worldwide. WI-MAX is, based on IEEE 802.16e-2005, which specifies the PHY and MAC of the radio link. It cannot stand alone to build an interoperable broadband wireless network so for that interoperable network deals with end-to-end service such as IP connectivity and Session management, Security, Quality, and Mobility. The main design principles for WI-Max are as following:

- For multivendor interoperability, the architecture should be, decomposed in to functions.
- To deploy the architecture it should provide modularity and flexibility for the support of new system.
- WI-max supports two types of models that are fixed and portable because the main factors are mobility and portability.
- The architecture shall support decomposition of access network and connectivity network.
- The architecture shall support internetworking with different kind of protocols and networks supported by IETF that are 3GPP, 3GPP2, Wi-Fi, and wire-line networks

❖ Properties of WI-Max

1. The range of WI-max is 50km for line of sight and 6-8 km for non line of sight.
2. The data rate supported by WI-max is 70mbps.It provides high rate of bandwidth.
3. The spectrum supported is 2.3 - 2.7 GHz, 3.4 - 3.6 GHz, 5.8 GHz (unlicensed).
4. Different kind of spectrum models access types are, **"Fixed and Mobile".**
5. The different topologies supported are point to point, multi-point mesh mode, multi-hop mode to maintain the admission control of the packets.
6. The channel size supported by WI-max in concern to flexibility is 1.5MHz to 20 MHz.
7. The spectral efficiency for WI-max is 3.7(bit/s)/Hz.

❖ Advantages of WI-MAX

The origin of 802.16 give more rise to speed, bandwidth referred as error-prone networks. In the case of WI-Max, the common Media Access Control layer (MAC) is, used to work on the top of physical layers (PHY).The following are some of the main benefits of using WI-MAX technology:

1. It provides higher speed for broadband services like voice, data, and video applications.
2. It supports wide coverage area with high capacity at low cost.
3. WI-MAX is a standard-based technology supported by IEEE and enjoys a wide industry support.
4. As it is a wireless technology, there is no need of establishing paths and cables due to which it becomes cost-effective.
5. WI-MAX can be, used for backhaul connectivity, fixed and mobile broadband internet access for data and voice using VoIP (Voice-over-IP) technology because there is no need of establishing any kind of topology physically. Everything is, done through satellite transmissions in which the main medium is air and microwaves.
7. It is very easier to extend broadband Internet access to sub-urban and rural areas because it only requires the exact infrastructure to be, placed at right position.

III. SCOPE OF WI-MAX SPECIFICATIONS

WI-MAX, being an access technology, defines specifications only for the following layers of the network protocol stack:

- **Physical layer**
- **Media Access Control (MAC) part of data link layer.**

WI-MAX specification divides the MAC layer into three sub layers. These areas following:

- **Service Specific Convergence Sub-layer** (CS): It interfaces with higher layers, converts higher layer packets into MAC layer Service Data Units (SDUs) and maps higher-level transmission parameters to MAC level service flow and connection parameters.

- **MAC Common Part Sub-layer (MAC CPS)**: It implements common MAC functionalities like link initialization, admission control, controlling channel access, transmission scheduling, quality of service, fragmentation, error control and retransmission

- **Security Sub-layer:** It provides security through authentication, key management and encryption. This layer provides secure key distribution. X.509 standard is used for certificate-based identification of nodes.

IV. Existing Protocol Architecture of WI-Max

The general protocol architecture of the IEEE 802.16 standard is, depicted in the given figure below. As can be seen, a common media access control (MAC) is, provided to work on top of different physical layers (PHY). The interface between the different PHYs and the MAC is, accommodated as a separate sub layer, which is the Transmission Convergence sub layer. A Convergence Sub layer (CS) is, provided on top of the MAC, to accommodate both IP as well as ATM-based network technologies. A basic privacy support is provided at the MAC layer.

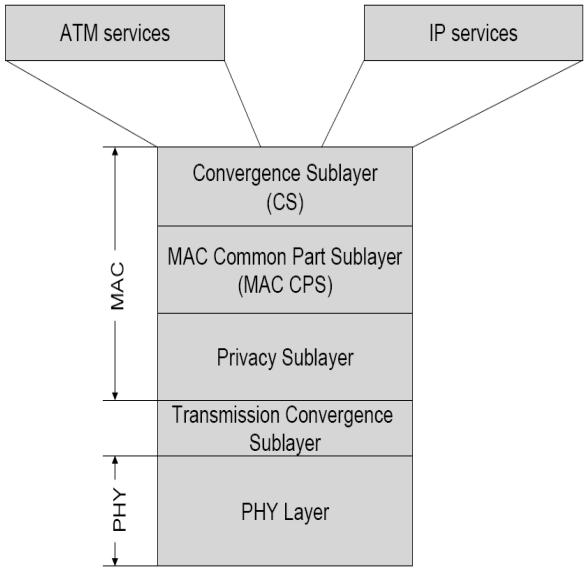

Fig. 1 Protocol Architecture supported by IEEE 802.16

V. Scheduling and Routing Algorithms Proposed:

As we, all know for sending of the packets from base station to subscriber's station. WI-Max uses the technology named as **Orthogonal Frequency Division Multiple Access** (OFDMA) and **Scalable** OFDMA. These are two signaling systems, which are very important to maintain the features like:

- Quality Of Services
- Scalability
- Mobility
- High Data Rate
- Security
- Robustness

In the case of well -known, operating systems the CPU scheduling of the process done by algorithms. Some of the well-organized algorithms are:

1. First Come First Serve Scheduling: In this kind of scheduling the process, which is, coming first will be admitted first for processing.

2. Shortest Job First: In this kind of scheduling algorithm, the process whose burst time is less will be, processed first.

3. Priority Scheduling: In this scheduling Algorithm the priorities of the process is set according to the user requirement, the process whose priority is high will be, processed first.

4. Round Robin Scheduling: In this, the time quantum is set priori. As process starts its execution, it will automatically expires if the time quantum finishes, then another processes will finishes their processing coordinating one by one according to their turns

The main objective of discussing these scheduling algorithms is to set a metric based on these kinds of scheduling algorithms is that how we can overcome with the shortcomings of the networks to send the packets and to maintain the quality of services over different sessions. For the sake of scheduling the admission, control of the packet requires multi-hop agents. It is very important which packet should be admitted and which should be rejected. If the packet is, rejected at some moment of time that means the service is not, provided. This kind of activity is, called as **Denial of Service**. The Denial of Service can be due to many factors that the originator does, not send the packet that is arriving on the network, as it can contain false information, which is not required at all. This same criteria can be followed in the formulation of packets so as to satisfy the CPU utilization,, throughput, waiting time, turnaround time when the packets is admitted and transferred and the last is response time, when the packet got first service to transfer from base station to subscriber station.

VI. Routing Algorithms:

We have different king of routing algorithms in the support for WI-Max. Simple routing algorithm can be, proposed that are **Shortest Path** algorithm in support with **Distance Vector** algorithms that are **Dijkastra** algorithm, **OSPF, Link State routing algorithms** etc. Routing algorithms are, selected to choose the shortest distance among different nodes of the given path and to deliver the packet at right destination. In this we focus upon those routing protocols especially designed for wireless networks. Here, we study and compare the performance of four wireless

routing protocols **(AODV, DSR, OLSR and ZRP)** for Mobile WI-MAX environment under the assumption that each of the subscriber station has routing capabilities within its own network

A. Ad-hoc On-demand Distance Vector Routing Protocol (AODV)

Ad-hoc On-demand distance vector (AODV) is another variant of classical distance vector routing algorithm. In AODV, each host maintains a traditional routing table, one entry per destination.. AODV uses a broadcast route discovery mechanism where source node initiate route discovery method by broadcasting a route request (RREQ) packet to its neighbor.

B. Dynamic Source Routing (DSR)

The Dynamic Source Routing (DSR) protocol is a reactive routing protocol that is based on the concept of source routing. DSR is composed of the two mechanisms of **Route Discovery** and **Route Maintenance**, which work together to allow nodes to discover and maintain source routes to arbitrary destinations in the network.

C. Optimized Link State Routing (OLSR*)*

Optimized Link State Routing protocol (OLSR) is, based on link state algorithm. OLSR reduces the size of control packet by declaring only a subset of links with its neighbors who are its multipoint relay selectors and only the multipoint relays of a node retransmit its broadcast messages.

D. Zone Routing Protocol (ZRP)

The Zone Routing Protocol (ZRP) is a combination of proactive and reactive routing protocol, which takes the advantages of both approaches. In ZRP, each node maintains routing information only for those nodes that are within its routing zone.

Both qualitative and quantitative metrics are, needed to evaluate the performance of routing protocols. Most of the routing protocols ensure the qualitative metrics. For this reason, we use four different quantitative metrics to compare the performance. They are as given below:

1. Delivery of Packets: The packets sent by the sender and the application that are, received by the receivers.

2.Overhead for Maintaining Routing: As in the case of context switching referred as passing the control from one process to another which is of higher priority but increases overhead. Similar to that in WI-Max the routing overhead describes how many routing packets for route discovery and route maintenance need to be, sent in order to propagate the data packets.

3. End-to-end transmission and delay: Transferring packets from source to destination indicates how long it took a packet to travel from the source to the application layer of the destination. The main factor regarding imposes the condition of less jitter at regular intervals of time.

4.Throughput: The throughput is defined as the final output in constraint to full utilization of CPU an resources provided which further can be described as the total amount of data a receiver actually receives from the sender divided by the time it takes for to get the last packet.

5. Quality of Services: In the case of admission control, it is important to have the secured sessions in between the networks. There should be proper security management, privacy and confidentiality, checkpoints while sending the packets over multimedia that is internet to protect the data from unethical hackers as cyber crime increasing day by day.

VII. CONCLUSION

To conclude the paper, it is all about maintaining quality of services for admission of the packets. In this paper, I mainly stressed on the criteria supported by different operating system as well as the different routing algorithm for choosing the shortest path and the special wireless protocols in support to proposed methods. Existing system are, also described in support with advantages, properties and WI-max architecture. At last, the main idea of this paper is that on which layer of the model should be, improved to have the quality of services.

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