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PRIORITY BASED DEFICIT ROUND ROBIN SCHEDULING ALGORITHM FOR WI-MAX

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Abstract: Deficit Round Robin (DRR) is a fair packet-based scheduling discipline commonly used in wired networks where link capacities do not change with time. In wireless networks especially wireless broadband networks such as IEEE 802.16e Mobile Wi-MAX, the capacity can change over time and also depends on the user location. Moreover, Wi-MAX allows packet which violates the packet-based service concept of DRR. Therefore, the traditional DRR can't directly be used in such networks. Therefore, we introduce Priority based Deficit Round Robin (PBDRRF) to allocate resources in a fair manner, while allowing for varying link capacity. In addition, we extend PBDRR to support users with minimum reserved traffic rate, minimum delay and traffic priority.

Key words: Deficit Round Robin, priority, WiMAX, IEEE 802.16e, Scheduling, Fairness, QoS

Introduction

Wi-MAX (Worldwide interoperability for Microwave Access) is the most emerging technologies for Broadband Wireless Access (BWA). Wi-MAX can be used for a number of applications, including "last mile" broadband connections, hotspots and high-speed connectivity for business customers. Furthermore, Wi-MAX not only enhances the existing features of the competitive cabled access networks, but provides high data rate applications with a variety of Quality of Service (QoS) requirements.
The Institute of Electrical and Electronics Engineers (IEEE) 802 committee, which defines networking standards such as Ethernet (802.3) and Wi-Fi (802.11), has published some standards that define WiMAX. IEEE 802.16-2004 (also known as Revision D) was published in 2004 for fixed applications; 802.16 Revision E (which adds mobility) is published in July 2005. The WiMAX Forum is formed to promote the IEEE 802.16 standard and perform interoperability testing. The WiMAX Forum has accepted some profiles based on the 802.16 standards for interoperability testing and "WiMAX certification".
We are discussing the goal of realizing a unique wireless network to cover a big area. In a large scale wireless network, the radio resource must be shared among multiple users.

2. WiMAX Architecture

Wi-MAX contains the following four components to describe architecture of Wi-MAX network. They are:
Base Station-A Base station basically describe a wireless access point .it communicate with devices or subscribers based on Wi-Fi standards. It is also works on a Master-relay base station in multiple relay topologies.
Subscriber Station-Subscriber station refers to a generalized equipment set that provides connectivity between the subscriber equipment and the base station within the mobile wireless network that user subscriber is using.
Mobile subscriber- Mobile Subscriber is nothing but a wireless node that runs along with the vehicular speed. For e.g. cellular phones, laptops and other portable devices
Relay Subscriber-Basically Relay Stations are subscribers stations configured for traffic forwarding to other station like relay station, subscriber station or mobile station in a multi-hop security zone.

3.1. IEEE 802.16 Service Classes

The IEEE 802.16-2004 standard [10] specifies the provision of four scheduling services:
Unsolicited Grant Service (UGS): This scheduling service is designed to support applications that generate fixed-size data packets periodically such as T1/E1 and VoIP without silence suppression. To support the real-time needs of such applications and reduce overhead by the bandwidth request-grant process, the BS allocates

fixed size data grants without receiving explicit requests from the SS. The size of the grants is based on the maximum rate that can be sustained by the application and is negotiated at connection setup.

real-time Polling Service (rtPS): This scheduling service is designed to support real-time applications that generate variable size packets on a periodic basis such as MPEG video or VoIP with silence suppression. The BS allows the SSs to make periodic unicast requests and allows them to specify the size of the desired grant. this class are prohibited from using contention request opportunities.

non real-time Polling Service (nrtPS): nrtPS is designed to support non-real time applications that require variable size data grant bursts on a regular basis. This scheduling service supports applications that are delay tolerant but may need high throughput such as File Transfer Protocol (FTP) applications. The BS allows the SS to make periodic unicast grant requests, just like the rtPS scheduling service, but the requests are issued at longer intervals.

Best Effort (BE): This traffic class contains applications such as telnet or World Wide Web (WWW) access that do not require any QoS guarantee. The bandwidth request by such applications is granted on space-available basis. The SS is allowed to use both contention-free and contention based bandwidth requests, although contention-free is not granted when the system load is high.

HYBRID SCHEDULING FOR WIMAX(Proposed)

4.1 Priority based Deficit Round Robin

In DRR, we use round-robin servicing with a quantum of service assigned to each queue, the only difference from traditional Deficit round robin is that if a queue was not able to send a packet in the previous round,, the remainder from the previous quantum is added to the quantum for next round. Then among packets higher priority packet have chance to send packet first. Priority based Deficit round robin scheduling is the same as a normal round robin except that if a queue was not able to send a packet in the previous round because its packet size was too large, the remainder from the previous quantum M added to the quantum for the next round. Then higher priority packet have chance to send packet. Thus deficits are kept track off, queues that were short-changed in a round are compensated in the next round.

4.1 PBDRR scheduler retrieve packet.

// this function checks priority assignments before running PBDRR scheduling technique.
If (user not assigned priority):
// retrieve function call Auto priority assignment function.
// auto priority assignment assigns to each active queue weight.
Auto priority assignment
// calculate sum of all active queues (priority).
For (i=0; i < num queues; i++):
Sum Queue Priority += (Queue Data [i]. priority).
1. End if.
// gives priority to each active queue based on its priority.
2. Assign priority to each active queue.
3. For (i=1; i <= num queues; i++):
4. Queue Data [i] = (Queue Data [i]. priority) / sum Queue Priority.
// this function calculates the total priority counter value for PBWRR packet scheduler
8. Calculate PBWRR service Round.
9. For (i=0; i < num queues; i++):
10. Service Round += QueueInfo [i]. Priority Counter

5.SIMULATION AND RESULTS

The proposed SS-assisted scheduling algorithm was simulated under the Network Simulator NS-3.17 [19] using first a network topology consisting of 02 SS nodes interconnected through a single BS node. Then, the number of SSs was varied to test the scalability of the proposed approach.
The following parameters are used in scenario:

- Bottleneck-link-delay – 1 ms

- Bottleneck Bandwidth– 10 Mbps
- Transport protocol type– UDP/TCP
- routing protocol– DSDV
- Packet size of UDP/TCP– 1500 bytes
- Scheduler– PBDRR
- Simulation Duration - 100 sec
- Modulation– OFDM 64 QAM
- Coverage area of base station– 500 m radius
- Other parameters used in queue scheduling schemes are set to the default values

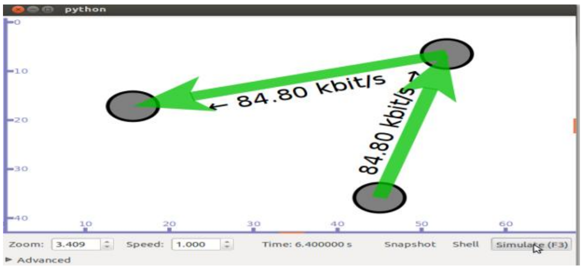

Fig 5.1 shows simulation of 3 nodes

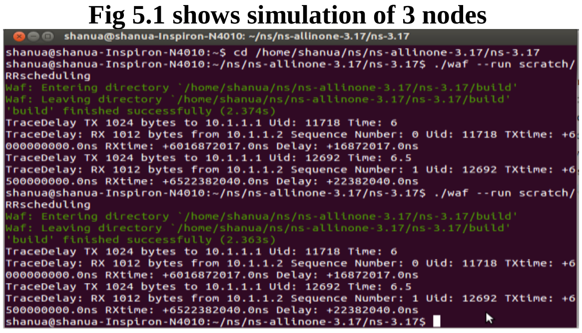

Fig 5.2 shows Results using ns3

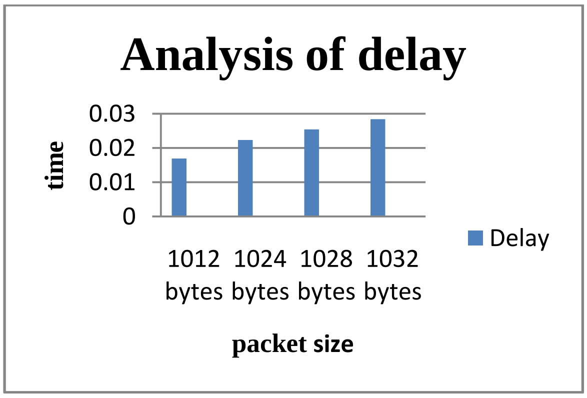

Fig 5.2 analysis of delay at various packet size

Conclusion

In this proposed method PBDRR algorithm is implemented using ns3. We analysis delay at various packet size .as results shows as packets size is longer delay is longer as less packet size. In future work develop algorithm for mobile wimax.

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