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Algorithm based on QoS Awareness in Wireless Networks

Xunfang Liu
Hunan City University, Yiyang, 413000, China

Abstract: Wireless network, to achieve load diversification and to improve end quality of service, while there are many problems on the dropout rate of the traditional load balancing algorithm in processing throughput, delay and business, therefore, gateway load balancing algorithm is proposed in this paper. All network load level of the network, this algorithm will gain weight of the load in the network of small business terminal to switch to the network load which is light. First, it defines the heterogeneous networks and network terminal payoff function utility function which are used to characterize terminal load situation, a has strong robustness to achieve network load balancing and to achieve a balanced use of network resource.

Keywords: Efficiency; Loading differences; Real-time business; Switching decision

1. Introduction

The integration of heterogeneous networks has become the developmental direction of next-generation wireless networks, wireless resources shared is the premier intention for the integration of heterogeneous wireless networks and reasonable heterogeneous network resource scheduling is a key technologies to achieve efficient radio resource sharing [1-3] .Load balancing is determined by multiple servers in a symmetrical manner to form a collection of servers, each server has the equivalent status, and it can provide service outside independently without the aid of other servers. Through some sort of load balancing technology that is to be sent to external requests which are evenly distributed to the symmetrical structure of a server, and the server receives the request independently and responds to customers' requests [4-5]. Load balancing evenly gives out client requests to a server array, aiming at providing quick access to important data, to solve a large number of concurrent access to service issues. Network load balancing can effectively reduce the imbalance of resource utilization among heterogeneous networks, rational management of network resources is one important way. In the fusion of heterogeneous wireless network, terminals can carry out dynamic network choices, accessing and switching, to achieve load balancing of the RAN in heterogeneous radio access network (Radio access network, RAN), thereby improves network throughput and overall performance. Currently, the network load balancing research has focused on homogeneous network load balancing between different cells and certain types of load balancing among heterogeneous networks. Depended on the implementation of existing research, methods can be divided into two categories: one is the accessing load balancing, the other is switched load balancing. Compared with the access-type load balancing, switching load balancing has its quick response, fast convergence advantages. However, the key premise of load balancing switch is correct assessment of each cell load. For homogeneous network, the load of each cell is available and can be stated by unified indicators. However, in heterogeneous wireless network environment, the business type, resource allocation, and the assurance capabilities of service quality of the heterogeneous network, etc. are different. How to measure and compare the heterogeneous network load becomes a problem.

2. Proposed Scheme

The core of load balancing algorithm based on QOS - awareness is: Web-based utility accessing network selection to be burdens, to be based on the weighted QOS gains selection of subjecting to switch terminals, terminal and network-based utility and accessibility testing negative access network to be increased selection.

2.1. Web-based utility accessing network selection to be burdens

In order to make load balancing rapidly converge, algorithms in each iteration find the heaviest load of the whole network accessing network, and select one of the appropriate terminal switch to other accessing networks. According to the definition and analysis of the effectiveness of the network utility in the section of 3.1, it can effectively reflect the access network load conditions. Therefore, the algorithm selects the lowest utility network accessing network as a network to be burdens. If pending burdens network denoted $J \in I$, then

$$r^n = \arg\min_{j\in J}\left\{\bar{m}_j\right\}$$
$$r^i = \arg\min_{i\in I}\left\{\bar{m}_i\right\} \quad (1)$$

2.2. The weighted selection of subjecting to switch terminal about QoS benefit to be based on

In order to make load balancing rapidly converge, algorithms in each iteration find the heaviest load of the whole network accessing network, and select one of the appropriate terminal switch to other accessing networks. When the accessing network subject to reducing the burdens selects to switch's terminal, it not only needs to consider the quality of service experience of terminal at the corresponding to the accessing network, namely it should choose a lower the QOS experience in order to the user expects to switch to other network medium to get improved; and it needs to consider the users' radio resource utilization efficiency to be burdens in the accessing network, which should tend to choose the channel conditions of poor terminal to switch to other networks, in order to terminate their treatment on resources inefficient usage in subjecting to reducing the burdens in the accessing network channel. Considering two aspects as defined in the terminal i in the weighted QOS benefit function of the RAN j is as follows:

$$J_{ij}^{*} = a_{ij} \times J_{ij}$$
$$J_{ij}^{*} = (a_{ij} + J_{ij}) \quad (2)$$

Wherein the weighting factor a_{ij} reflects resource utilization efficiency of the terminal i in the radio accessing network j, which is defined as

$$a_{ij} = \frac{J_{ij}(e_{ij})}{J_{ij}^{\max}}$$
$$e_j^i = \sum_{g}^{a_{ij}} b u_i^j \quad (3)$$

2.3. The selection of the accessing network subject to be negative growth

When the terminal to be switched e_j^i selects e^i, the intending accessing network, for the purpose of switching accessing networks, on the one hand, it needs to identify whether the terminal e_j^i is within the coverage area of the accessing network e^i, and the remaining capacity of e^i can meet the minimum rate requirements of e_j^i. That the intending accessing network e^i shall meet

$$\begin{cases} e_{i^n}(r_n^i, e^i) \ \mathbf{f}\ 0 \\ e_{ij}^{\max} + \sum_{j\in i} \partial_{ij}^{\min} \le r_{ij}^{\max} \end{cases} \quad (4)$$

Among which, $r_{ij}^{\max}$ represents the maximum network capacity of accessing networks e^i.

On the other hand, for the benefit of rapid convergence load balancing, you should choose a lighter network load to be switched as the intending accessing network. Thus, the algorithm for all the condition (7) of the accessing network (except the accessing terminal subject to being switched and reducing the burdens) of a collection (referred to as e_j^i), select the accessing network with highest utility network , as the purpose of the accessing network terminal to be switched, the network to be negative growth can be expressed as

$$e_j^i = \arg\max_{j\in i^{\min}}\left\{\bar{m}_j\right\} \quad (5)$$

3. Experimental Results

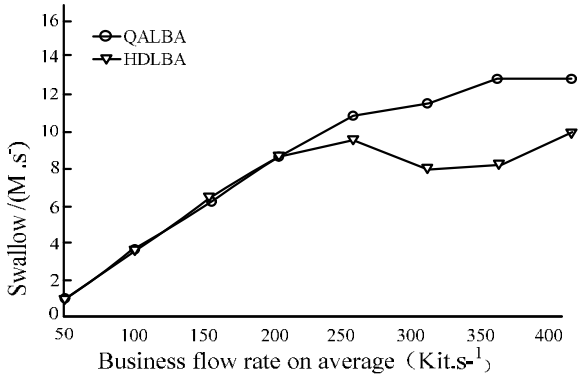

Figure 1. The Throughput of Whole Network

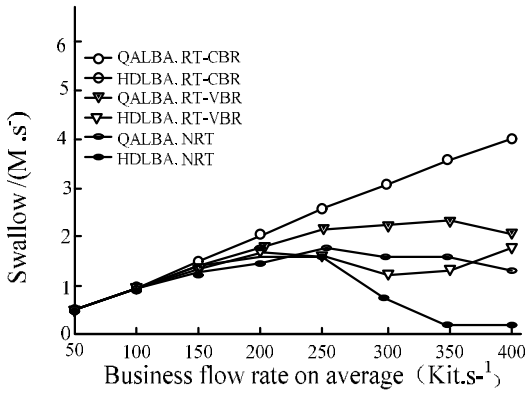

Figure 2. The Throughput of Various Business

Figure 1 and Figure 2 show that the changing situation of real time constant bit rate and real time constant varia-

ble bit rate, average packet loss rate and packet delay variation when the average rate of each connection from 50Kbit /s increased to 400Kbit /s. As can be seen, the proposed gateway load balancing algorithm significantly reduces the real-time variable rate, packet loss rate and packet delay; while the average delay and packet loss rate of real-time business a constant rate in the two algorithms is basically to keep unchanged. It is because the priorities safeguard mechanism of 802.16 networks for real-time business with a constant rate can guarantee QOS service of real-time at a constant rate, while the two algorithms, which can ensure a constant rate of real business users, always stay in the 802.16 network, and get a guaranteed quality of service.

Figure 2 shows as the load increases, the proposed gateway load balancing algorithm can significantly improve the throughput of the whole network. Figure 4 shows the throughput of the two algorithms of different business changes. For real-time and non-real-time variable rate business operations (Non Real Time, NRT), QALBA algorithm's performance is significantly better than HDLBA algorithm; and this algorithm can always meet the real needs for traffic throughput at a constant rate. With the increase of user's average traffic rates, the network throughput of the users is gradually increased, because the QALBA algorithm can split the IP flow of the users service into two sub-streams, which can be inserted two networks at the same time, when the load of the two nets are high. The load balancing between networks is achieved and the network resources are rational allocated when the load is relatively light, so the throughput of

4. Conclusion

Among them, the universality of network utility to heterogeneous network makes heterogeneous network load comparability comparable, able to achieve switching between heterogeneous network load balancing. Simulation results show that the proposed gateway load balancing algorithm can improve integration of heterogeneous network throughput, reduce business latency and packet loss rate, with strong robustness to achieve network load balancing and to achieve a balanced use of network resources.

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