Research on Algorithm based on Wireless Network

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Abstract: All terminals in the access network can reflect the effectiveness of the average 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 the experience and network QOS terminal load situation, and then presents the specific processes of the gateway load balancing algorithm. Finally, switching decisional load balancing algorithm, proposed by Yan X, etc. is compared with simulation experiments and it shows that: the proposed gateway load balancing algorithm has strong robustness to achieve network load balancing and to achieve a balanced use of network resource.

Keywords: Networks; Awareness; Load

1. Introduction

Load balancing is an important way, which makes full use of heterogeneous wireless network resources. Through the load balancing among the heterogeneous networks, the high probability of network load can be reduced, the overall utilization of network resources is improved and the blocking probability is reduced to provide users a better QOS, so the load balancing between the networks is also an important aspect of considering the access algorithm selected [1-3].

The user can only access a kind of network at the same time with the traditional hard load balancing service, which can not satisfy differentiation of the user service, resulting in partially utilized heterogeneous network resources and higher traffic blocking ratio. Literature [4] proposes the soft load balancing algorithm, which dynamically changes the best ratio of IP flow; when the network load is heavy, each network sub-flow rate of accessing users is consistently improve, while when the network load is light, there is a differences between the needs of users business rate and wireless resources [4-5].

The main purpose of heterogeneous networks is to achieve a variety of fast, reliable and secure exchange and transmission of information, that is, through the network to provide a wide range of high quality services, thus, business development, prosperity and evolution is the foundation and a key procedure of network development, prosperity and evolution. This point is especially evident since 2000, which is during a commercial 3G network and the development process of the Internet. As a whole, mobile communications operators can provide a variety of services through a variety of networks, and fully guarantee the user in the network to enjoy a variety of services, to improve the quality of the user experience. It is an inevitable tendency of development of wireless networks .

This paper mainly made a work in the following areas expansively and innovatively:

(a) When dealing with throughput, latency and packet loss rate on business, the traditional load balancing algorithm in heterogeneous wireless network has many problems, so gateway load balancing algorithm is proposed. The QOS income of generalized users and network utility of the algorithm, which is based on the features of wireless business, are able to characterize the quality of service experience in the terminal network and network load conditions. And for a variety of heterogeneous network it is universal. Among them, the network utility's universality to heterogeneous network makes load conditions of each heterogeneous network comparable. TTERATIVE algorithm, by scheduling the QOS gains in the network with the heaviest load and the terminal with the lower resource efficiency to the network that is able to improve the QOS benefit with the lightest load, which can achieve switching load balancing among heterogeneous networks.

2. QoS Revenue and RAN Utility

Different types of wireless network services have different QOS requirements. Based on the characteristics of the various services, wireless services can be classified into three types of basic services, as shown in Table 1.

According to real-time requirements, the wireless business can be classified into real-time business (Real time, RT) and non-real-time service (Non-real time, NRT). According to whether the rate can change or not, real-time service has been divided into two types of constant rate and variable rate. Minimum service time at a constant rate $^{\min}$ and the maximum rate requirements $^{\max}$

are equal, that is the rate are unchanged. The variable rate real-time service is possessed of the minimum and maximum rate requirements. When the waiting time of a real-time service exceeds the maximum packet delay tolerance $d_{\max}$, the packet will be discarded. Non-real-time service needs not to delay, and the minimum bandwidth can become zero.

Table 1. Wireless network traffic types and their QOS requirements

	Rate of change	The minimum rate	Maximum rate	Time delay requirements	A typical business
Real-time business	constant	$r_{\min} = r_{\max}$	$r_{\min} = r_{\max}$	$d_{\max}$	VoIP
	variable	$r_{\min}$	$r_{\max}$	$d_{\max}$	MPEG
The real-time business	variable	$r_{\min}$	$r_{\max}$	φ	HTTP

In order to characterize the obtained terminal from the current network quality of service, based on the QOS requirements of different business, si_{gmond} function to construct the terminal payoff function is used. So suppose J is the set of kinds of RAN, I represents the set of terminals in the network, defining an accessing terminal $i \in I$ of RAN $j \in J$ QOS benefit function is as follows:

$$U_{ij} = \begin{cases} (1 - \dfrac{1}{1+\exp(-\partial_m \times \dfrac{d_{ij} - d_{ij}^e}{d_{ij}^{\max} - d_{ij}^m})}).BT \\ (1 - \dfrac{1}{1+\exp(-\partial_m \times \dfrac{d_{ij} - d_{ij}^e}{d_{ij}^{\min} - d_{ij}^r})}).BRT \end{cases} \quad (1)$$

When the integration of heterogeneous networks presents a state of uneven load distribution, load balancing algorithm based on QOS -awareness will be triggered. Network load distribution algorithm will undergoes iterative adjustments. Each iteration process can be described as:

(a)Select a heavy-duty accessing network from an entire network called upon burdens;

(b)Select offloading terminal from the accessing network, as a switch to a different accessing network of the terminal, called subject to switch the terminal;

(c)Select an accessing network with a lighter load from subject to switch the terminal, switched to as the purpose of switching the terminal accessing network, called upon subject to increasing negative network;

(d)If the selected network can be added to improve the negative terminal, the quality of service to be switched, then the switch terminal is switched to be negative to the network which is to be added into the next iteration; otherwise, the terminal remains in the burden upon the network, then offloading network is selected to be another terminal as a terminal to be switched and it is performed (c) and (d) again .If the burdens upon all terminals in the network choose to stay in the accessing network to be reduce the burden, it is considered as a more balanced distribution of network load that can no longer improve the algorithm ends.

$J_{ij}(e_{ij})$ is the actual rate that each unit bandwidth obtained for the accessing terminal i to the accessing network j ; it indicates channel condition between the terminal i and accessing network j ; $R_{i,j}^{\max}$ presents the maximum rate can obtain per unit of bandwidth from accessing terminal i to the accessing network j theoretically. Thus, the greater a_{ij} is, indicating that the channel conditions is better between terminals i and accessing network j the terminal i has a good utilization efficiency in the accessing network channel .

Considering the quality of service experience and radio resource utilization of terminal accessing network, algorithm selects the lowest weighted terminal of subjecting to reducing the burdens based on QOS gains as a terminal to be switched. So suppose e_j^i is the set of e_j^i , all of the access terminals, then e^i , the terminal to be switched, selected in the offloading accessing network, is supposed to be met

$$e^i = \arg\min_{i \in j^i} \left\{ e_{ij}^* n \right\} .t_j^i (e_{ij}^* n) \quad (2)$$

3. QoS- Awareness Load Balancing Algorithm

Based on the above analysis, the designation of gateway load balancing algorithm process is as follows:

Initialization: Let J represents algorithm converged network within the scope of all the heterogeneous collection of RAN, I represents the set of all terminals in the network; / / Algorithm carries through load balancing to a certain geographical area of heterogeneous converged network.

Step 1: Select (3) to satisfy the access network e^i as a network to be the network subject to reducing the bur-

dens; e_j^i as a collection of all terminals e^i connected, optionally switch the terminal to be set $e_j^i = \bar{e}_j^{\,i}$.

/ / selects the heaviest accessing network, ready to be moved to another part of the load in the accessing network.

Step 2: In $\bar{e}_j^{\,i}$, select the terminal $e^i = \arg\min_{i \in m} \{e_{ij}^*\}$ as to be switching terminals.

/ / selects the terminal with a lower service quality of experience and resource utilization, ready to be switched to another accessing network.

Step 3: among other accessing network options except e^i, select e_j^i to meet (7) formula and (8) as accessing network to be negative growth.

/ / selects an accessing network terminal with a lighter load to be switched as the intending accessing network.

Step 4: switch the terminal to be switched e^i to the accessing network to be negative growth e_j^i, if

$$e_j^i \succ e_{i^h, j^h} \tag{3}$$

The terminal e^i switch to e_j^i, then return to step 1; otherwise terminal e^i going back to e_j^i, while the optional terminal to be switch can is updated to $\bar{e}_j^{\,i} = e_j^i - \{e^i\}$ and perform step 5.

/ / If the accessing network can be increased to improve the negative terminal of the quality of service to be switched, the adjustment is successful and re-select the accessing network of subjecting to reducing the burdens to carry out a new round of adjustment; otherwise the terminal to be switched from the optional subject can be removed from the terminal concentrator.

Step 5: If $\bar{e}_j^{\,i} \neq 0$, then go back to step 2;

/ / From the accessing network of pending burdens to be switched of the terminal concentrator, choose optional weighted QOS benefit low end times, try to switch to another accessing network. Otherwise, the algorithm terminates.

/ / Accessing network to reduce the burden of all the terminals are choose to stay in the accessing network, unable to further improve the extent of the network load balancing, it can be considered that the state has achieved load balancing.

It can be seen that network utility and terminal benefits can achieve quantitative balance from the algorithm through a unified QOS revenue function designation. By choosing and switching network and terminal QOS benefit between the network utility and terminals tends to equilibrium. The cost is based on algorithm designation, need to run on the network and terminal management entity execution algorithm, and the corresponding QOS information and interactive network selection strategy. Network side and terminal side executing algorithm, network management entity, can be naturally and easily completed by heterogeneous network convergence in the framework of NSM and TSM, interaction of information and strategies can be completed by the contextual messages of the MCC. In the current level of technology, NSM and TSM itself has a powerful computing capabilities, and load balancing does not require strict real-time and interactive information and data of selection strategies for QOS is a small amount, therefore the proposed algorithm can obtain improved network and terminal performance significantly at little cost.

4. Conclusion

For the integration of heterogeneous wireless network communication scenario, the network load balancing algorithm was proposed based on the QOS, which is fallen into switchable load balancing algorithm. Algorithm is based on QOS gains and network utility of a generalized feature for wireless business users, and it is able to characterize the quality of service terminal network experience and network load conditions, and it is universally applicable for a variety of heterogeneous network.

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