CHAPTER V

CONCLUSION

Increasing of wireless and Internet usages lead to a new emerging technology, wireless Internet. An adaptive QoS aware application that can adapt itself to high variable environments is needed as a tool to improve the quality of service to this competitive situation.

In this dissertation, a conceptual adaptive QoS management model is proposed, emphasizing on managing limited resource availability and also maximizing overall user satisfaction and individual user satisfaction. This model contains QoS management functions and QoS management cycle. The QoS management functions are designed to work on both end-to-end; wireline and wireless network, in order to reduce the QoS gaps and handle different requests from the users. Moreover, the QoS management cycle is stated as the processing timeline. The renegotiation algorithm in the QoS model allows system to respond to more resource requests.

A feature adaptation technique, transmission rate adaptation, is shown as a case study of the QoS management model. The result confirms that the relation of packet length (L) and transmission rate (R) are related to transmission delay (D), where D reverses to R and D follows to L. It is also concluding that the user satisfaction can be increased by adjusting the features.

Furthermore, this dissertation proposes the Multicriteria-Based (MCB) scheduling policy to manage incoming request scheduling for web server; the initial step in our proposed QoS management cycle. Since many researches tend to work on single criterion scheduling policies, which focused on achieving overall user satisfaction, while it remains unclear whether an individual user satisfaction can be ensured regarding with these studies.

MCB is a compromising policy, which puts effort on both overall user satisfaction and individual user satisfaction, The merit validation of MCB over those three traditional approaches: FIFO, EDF, and SPT, is stated by following the vector calculus concept.

The three well-known characteristics of the web's request: arrival time, deadline, and processing time, are nominated for the scheduling criteria. The objective of MCB is to minimize average, maximum, and Sd. waiting times. The proposed MCB scheduling model is expressed in the scheduling function and performance measurement function with weighted aggregation method. The M/G/1 queuing system is experimented based on MATLAB for indicating the merit verification of MCB. Comparing MCB to the three traditional scheduling policies, the simulation results indicated that MCB is an optimal policy by optimizing average, maximum, and Sd. waiting times for the ideal situation; non-deadline checking case.

For both medium loaded and heavily loaded cases of non-deadline checking, all MCB method (MCBs) have average waiting times lower than FIFO and EDF but higher than SPT. For instances, average waiting time of MCB-2 is 2.9 and 2.3% lower than FIFO and EDF, and 8.3% and 6.0% higher than SPT, respectively, while average waiting time of MCB-3 is 1.5% and 1.2% lower than FIFO and EDF, and 9.6% and 7.0% higher than SPT, respectively.

Furthermore, MCBs' maximum and Sd. waiting times are lower than SPT, but higher than FIFO and EDF. For examples, maximum waiting time of MCB-2 is 46.6% and 5.9% lower than SPT, respectively, and 11.7% and 1.0% higher than FIFO and EDF, respectively, while maximum waiting time of MCB-3 is 54.6% and 6.6% lower than

SPT, and 6.8% and 0.4% higher than FIFO and EDF, respectively. For Sd. waiting time examples, Sd. waiting time of MCB-2 is 61.8% and 7.2% lower than SPT, respectively, and 2.1% and 0.2% higher than FIFO and EDF, respectively, while Sd. waiting time of MCB-3 is 65.0% and 7.4% lower than SPT, 0.2% higher than FIFO and EDF in medium loaded case, and equals to FIFO and EDF in heavily loaded case.

For coarse gain at scheduling level, the above results indicate that MCB is an optimal policy among the comparative policies.

For fine gain at performance measurement level, the MCB approaches are more realistic to the dynamic situation of the web server because MCB is a preference approach in the weight interval of average waiting time (w_1) 0.5-0.8 and 0.3-0.5 for medium and heavily loaded cases without deadline, respectively. The average waiting time should have higher weight than maximum (w_2) and Sd. waiting times (w_3), because average waiting time has high affect to large group of users.

The non-deadline checking case presents the ideal performance of each policy according to the vector calculus analysis, however, the deadline checking case is also conducted to reflect the situation of each policy when having rejection.

For medium and heavily loaded cases with deadline checking, MCB policy did not show extremely advantage over other policies. This might be because of no consideration in main criterion of the deadline situation; number of rejected request. The further work shall cover this criterion. However, this indicates that selecting the proper criteria for each situation is the key success of MCB.

Both of the validation and verification results provide the evidences confirming that the proposed MCB policy is potent enough to broaden it into the high variable environments.

For future work, we recommend to focus on increasing the capabilities of the simulation system, which is limitations of this study, and considering the other objectives of the system. The limited capabilities of the simulation system, for instances, preemptive running, more classes of service to be consider as differentiated services, and other HTTP characteristics, such as TIMEOUT, inter-pages and inline-objects relations, should be implemented to fulfill the simulation system. The other objectives of the system, such as minimizing mean lateness, maximum lateness, number of tardy job, and number of rejected request, should be considered for comparative. The proposed MCB policy should be applied as a part of the admission control system of the web server to achieve the individual and overall user satisfaction.