ADAPTIVE SCHEDULING SCHEME IN SECURE TELEMEDICINE TRAFFIC (ASSISTT)

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ABSTRACT

In the next generation, high-speed wireless networks, it is important to provide quality-of-service (QOS) guarantees as they are expected to support multimedia applications. This project uses an admission control scheme based on adaptive bandwidth reservation to provide QOS guarantees for multimedia traffic networks and proposes an adaptive scheduling scheme. The policing scheme uses multilevel queuing model. The proposed scheme allocates bandwidth to a connection in the cell where the connection request originates and reserves bandwidth in all neighboring cells. When a user moves to a new cell and a hand-off occurs, bandwidth is allocated in the new cell; bandwidth is reserved in the new cell's neighboring cells; and reserved bandwidthin more distant cells is released. This project also elaborates the issues of managing live videoconference multimedia data for telemedicine applications.The theoretic study of inter and intra-hospitalcommunications traffic constitutes the first step inTelemedicine network design.Real Time (RT)applications requirements and Quality of Service (QoS)parameter analysis are needed during the evaluation of acomplete system.The proposed method can be used toadjust traffic parameters (e.g. transferred clinical file sizesor electrocardiograph (ECG) signal transmission rates),to guarantee desirable QoS requirements.It is designed to communicate the personnel of an ambulance with medical specialists in a remote hospital. A distributed predictive channel-reservation scheme, called the road-map-based channel-reservation scheme is used. The goal is to reduce the handoff-dropping probability and to improve the bandwidth utilization.

Key words: QoS, Telemedicine, Policing Scheme, Bandwidth Reservation Scheme, Handoff.

INTRODUCTION

Recent advances in broadband networking technology have resulted in developing interesting new distributed multimedia applications. Noted among them is the telemedicine application allowing geographically distributed physicians to carryout patient's diagnostic in a collaborative manner. The key technology components to support such application include real-time videoconferencing and sharing of patient's medical records. Healthcare is often a commodity whose level of availability is much below its demand. The use of multimedia technology can provide cost effective methods for management and dissemination of information in health-care industry, and hence can increase the economic efficiency. As an example, studies indicate that in the area of health care delivery the use of telecommunication access to patient's information can save more than thirty billion dollars annually. Telemedicine involves interactions between medical specialists at one station and patients at other stations and utilizes healthcare application which can be divided into video images, images, clinical equipment, and radiographic images. Telemedicine is employed in many areas of health care, such as intensive neonatology, critical surgery, pharmacy, public health, and patient education. Currently, the telemedicine utilizes available wired and wireless infrastructures. Telemedicine can be defined as the use of information and communication technology (ICT) to deliver medical services and information from one location to another. In other words, telemedicine can be seen as a way of distributing medical expertise and services to medically underserviced areas such as remote and rural areas using ICT as a communication platform. Though any communication system can be used in telemedicine, rapid development in computer technology and easiness to purchase has led to more amenability to computer-based telemedicine technologies which are IP-based. Telemedicine is also used for Continued Medical Education (CME), administration, research and development. Telemedicine is supposed to contribute quality health care to those in need irrespective of socio economic density, geographical disparities and should be available for the benefit of all people located in dense urban, rural, remote and inaccessible places, and to further enhance its end-to-end capability. An efficient telemedicine network would mean that a large amount of data (like medical records) is generated and maintained. These databases would be accessible on a national/ international telemedicine grid. Software and hardware is needed to manage all this, and organizations to take care of the operations. Telemedicine offers the potential to alleviate the severe shortage of medical specialists in developing countries. For example, with the use of a biosignal monitor used for biosignals acquisition, connected to a portable PC which interfaces to a cellular phone equipped with built-in GSM modem, vital signs can be transmitted from an ambulance to a hospital in real-time mode.

Most decision-makers, managers, health care professionals and citizens lack basic information on telemedicine services and potential. This has resulted in misconceptions, resistance to telemedicine and relative lack of progress in project initiation. Telemedicine is still not recognized as a technical program within the ministries of health and is not a unit at the ministries of telecommunications. The idea of being treated from one's home is very comforting and is proving to be cost-effective. Driven by the aging population, the increased medical requirements in remote locations, and the recent advancements in technology, the world market for telemedicine is forecast to reach $18 billion by 2015. Hence, telemedicine will soon play a very important role in human life. This has resulted in dealing with telemedicine projects as pilot or demonstration projects despite the fact that they are fully functional and operational in most cases.

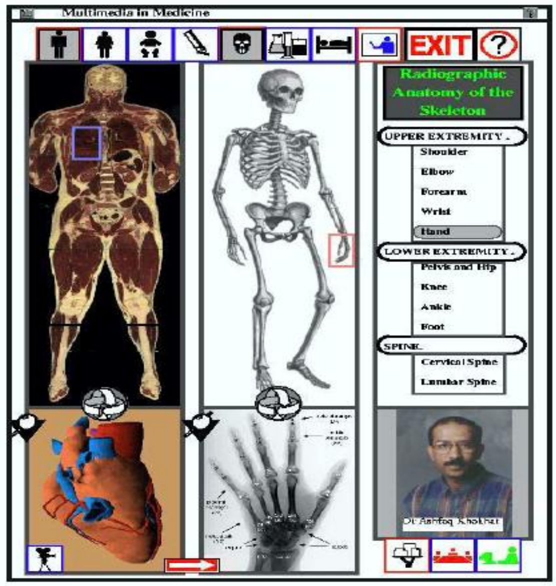

Fig 1: Physician's Display for telemedicine.

BANDWIDTH ALLOCATION

Bandwidth allocation refers to various methods used in the communication industry to design and assign frequency channels to various wireless applications. It can be defined as a process which allocates resources to various connections so that minimum rate requirements of every connection are satisfied. The success of emerging high-speed mobile integrated services network architectures will depend on their ability to arbitrate among various data sources with different quality of service (QoS) requirements over shared wireless links. In case of high speed digital audio and videos, multimedia application requires the source of inflexible Quality of Service (QoS), when compared with traditional application. The purpose of proper Bandwidth allocation is essential for these conditions. The wide coverage provided by cellular networks and their capacity to serve moving vehicles, have brought about new possibilities in telemedicine. As the traffic streams of the sources will have widely varying traffic characteristics (bit-rate, performance requirements), the new air interfaces of beyond 3G wireless networks should have in common high degree of flexibility and capacity, in order to support the very different traffic types.

BANDWIDTH RESERVATION

Bandwidth reservation refers to utilizing an amount of bandwidth for certain application. Using the bandwidth request and bandwidth reply messages, the destination node reserves the bandwidth along the reply path, based on the priority of traffic classes. The proposed scheme thus uses both local and remote information and allocates bandwidth in the cell where a connection request originates and reserves bandwidth in all neighboring cells. When a user moves to a new cell necessitating a call hand-off, the reserved bandwidth in the cell that the user is moving into is used to support the hand-off connection. In addition, every time a user moves to a new cell, bandwidth is reserved in the new neighboring cells, and the reserved bandwidth in the cells which are no longer neighboring to the new cell is release.

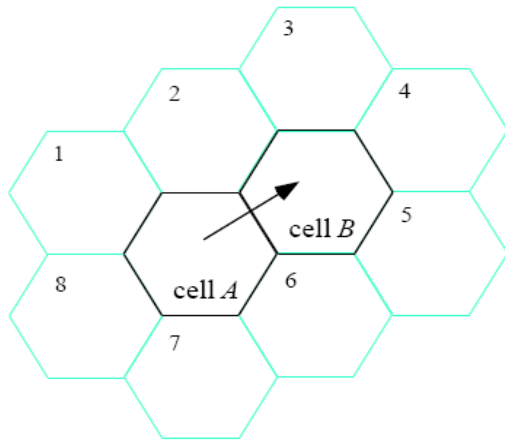

Fig 2: Example of Bandwidth Reservation Procedure.

When the bandwidth reservation is done based on the current network conditions, such a bandwidth reservation is called as adaptive bandwidth reservation. This type of bandwidth reservation process is efficient for the transmission of telemedicine traffic.

We consider hexagonal cell architecture, as shown in Figure 3. We consider in all cells the uplink (wireless terminals to BS) wireless channel. Each cell has six neighbors. The cell diameter is 300 m. Roads are modeled by straight lines. Each road is assigned a weight (ωj for road j), which represents the traffic volume. Each new call is generated with a probability of 50% to be moving on the road and 50% to be stationary. Moving users are assumed to be traveling only on the roads and are placed on each road k with the following probability:

$$\frac{\omega_k}{\sum_{j=1}^{N}\omega_j} \quad (1)$$

where N is the total number of roads.

The initial location of a moving user on a particular road is a uniform random variable between zero and the length of that road. During their call, stationary callers remain stationary, and mobile users travel at a constant speed. Mobile users can travel in either direction of a road with an equal probability and with a speed randomly chosen in the range of [36, 90] km/h. At the intersection of two roads, a mobile user might continue to go straight or turn left, right, or around with probabilities 0.55, 0.2, 0.2, and 0.05, respectively. If a mobile user chooses to go straight or turn right at the meeting point, it needs to stop there, with probability 0.5 for an arbitrary time between 0 and 30 s due to a red traffic light. If the user chooses to turn left or around, it needs to stop there for a random time between 0 and 60 s due to the traffic signal [1]. Each BS is loaded with the road map of its coverage area and its neighboring cells. Mobile stations report their position to the BS of their cell through a control channel. The position information includes the mobile user's exact location (cell and road), moving direction, and speed and can be provided with an accuracy of 1 m through the Global Positioning System.

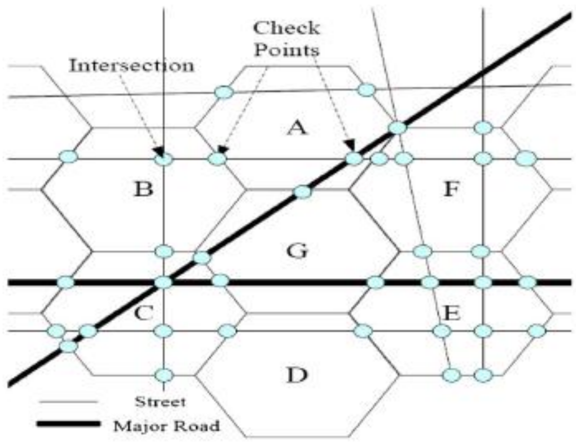

Fig 3: Road map and network model.

The following two main categories of methods exist to perform mobile stations' movement predictions: 1) the location based method, which measures the current location and movement direction of the ongoing calls and predicts the next cell to be reached by the mobile stations, and 2) the history based method, which considers the movements of previous subscribers and assumes that the ongoing subscribers move in similar patterns or tries to deduct each user's movement pattern. The proposed method belongs to the first category. The bandwidth reservation schemes require mobile stations to report their location information to the BS every T s [1].

ADAPTIVE SCHEDULING SCHEME

We present a scheme which prioritizes critical telemedicine traffic among a group of telemedicine traffic. For this, a more efficient policing scheme is required. So an adaptive scheduling scheme known as Slow Start (SS) scheduling is used.This scheme is called adaptive because depending upon the current network conditions prioritizing is done.This scheme prioritizes critical telemedicine traffic among a group of telemedicine traffic. For this, a multi level queuing model is required. The proposed scheme uses a bandwidth reservation scheme along with the scheduling scheme. The multi level queuing model consists of multiple ques.

MULTI LEVEL QUEUING

Multi level queue scheduling was created for situation in which processes are easily classified into different groups. Each queue has its own scheduling algorithm. For example, a process A may use round robin scheduling method, while process B uses the FCFS method. In addition, there must be scheduling among the queue and is generally implemented as fixed priority preemptive scheduling. Foreground process may have higher priority over the background process.

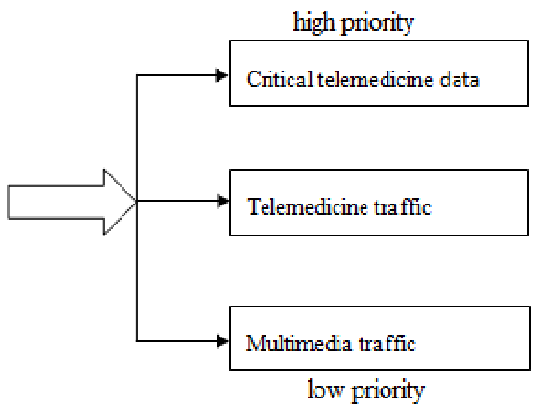

Fig 4: Multilevel Queuing Scheduling

The various kinds of communications during medical activities have been considered: medical test and administrative file transfer (from clinical data exchange between centre's or speciality sections), biomedical signals transmission (e.g. ECG, blood pressure or oxygen saturation), patient reports and clinical routine consults (that occur during accesses to databases, queries to medical report warehouse, and so on), and multimedia applications (e.g.an inter-hospital videoconference including audio and video). For these transmissions, a hospital network model is considered.

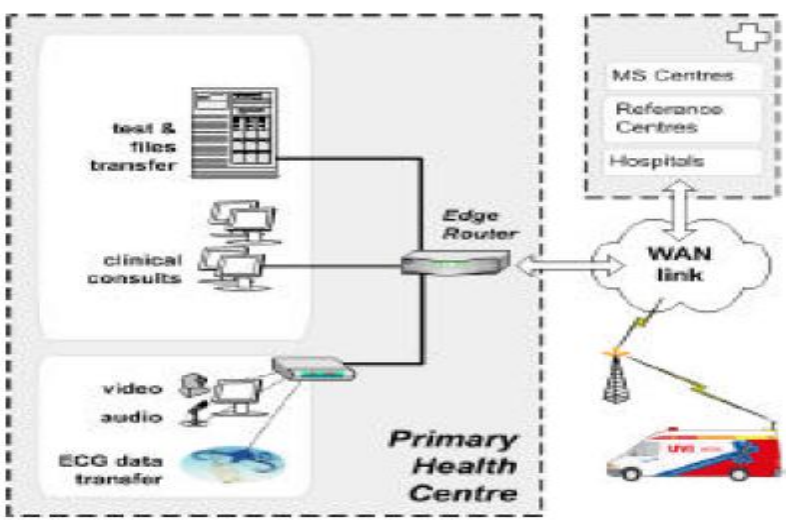

Fig 5: Hospital Network Model

The performance of the proposed scheme is evaluated through simulations of realistic cellular environments. The simulated network consists of a large number of cells; mobile users with various movement patterns are assumed; and a variety of multimedia applications (e.g., audio phone, videoconference, video on demand, file transfer, etc.) are considered. The figure 5 shows the simulation results.

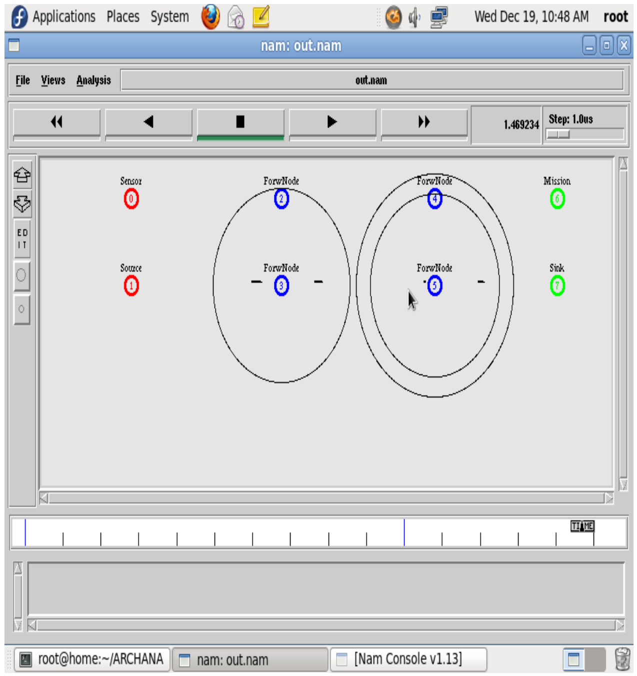

Figure 5.Transferring Telemedicine Data from Source to Destination.

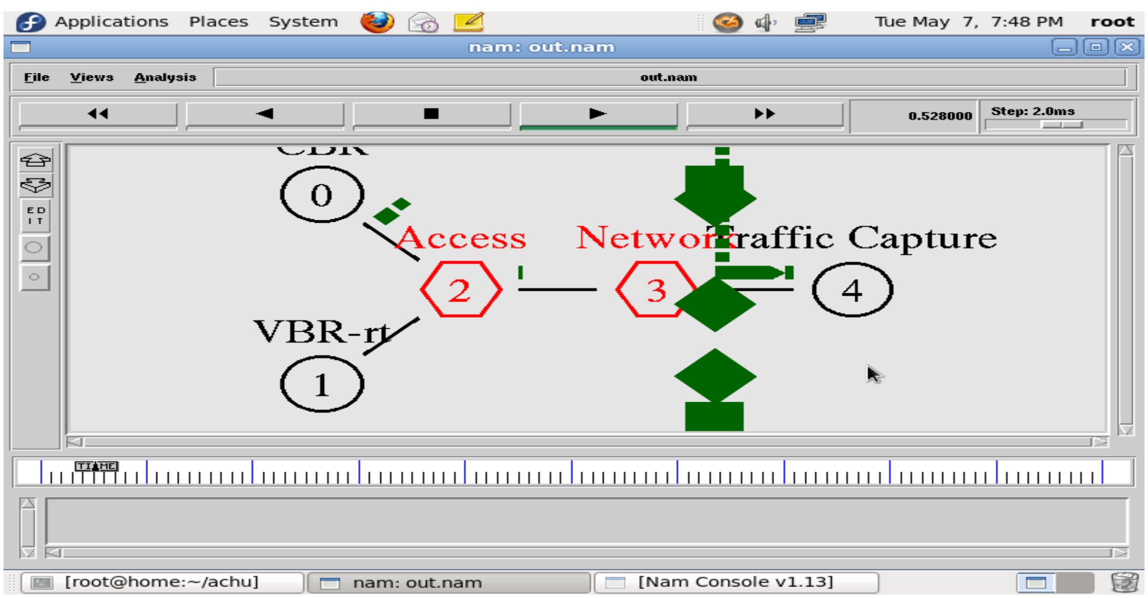

Fig 6: Transmission of packets

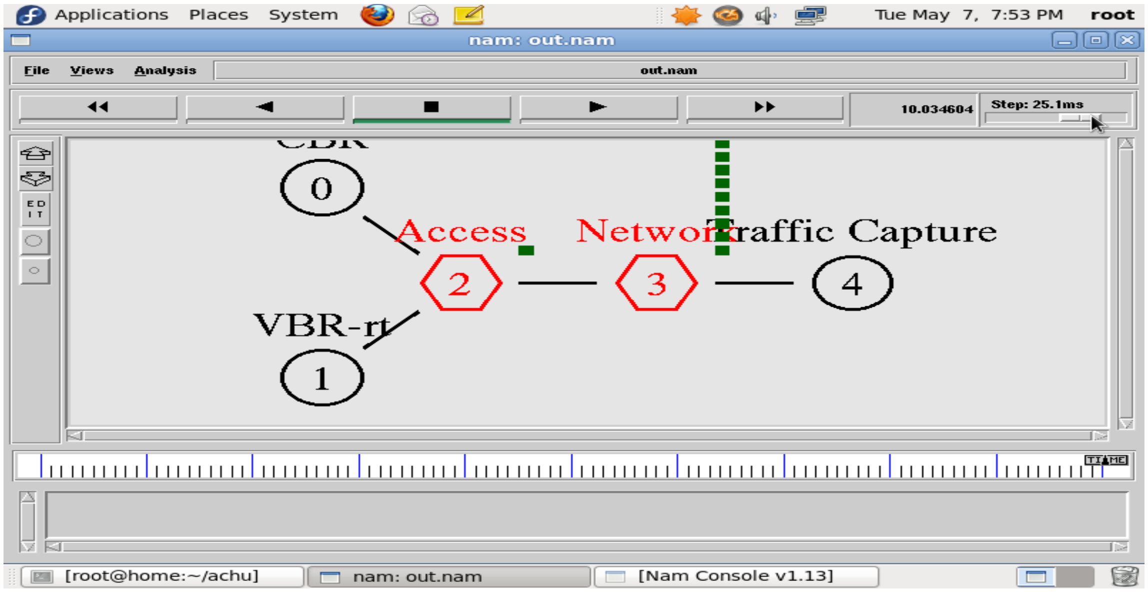

Fig 7: Giving priority to VBR packets

CONCLUSION AND FUTUREWORK

The telemedicine traffic may contain information about many patients .In this paper we have suggested an adaptive scheduling scheme along with adaptive bandwidth reservation scheme. This will prioritize efficiently the critical patient's information among other telemedicine traffic .By examining the ECG, images etc. of these patients, it is possible to detect their condition and prioritize them. More critical patients need maximum attention and priority. The ambulance carrying them should also be given more priority. For that their arrival should be alarmed at the next traffic junction in order to avoid the road traffic. Analyzing most critical information from others is done through MAT lab. So, the analyzing tool used is MAT lab. For simulation, NS2 is used.

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REFERENCE

[1]Lu Qiao and PolychronisKoutsakis (2011), "Adaptive Bandwidth Reservation and Scheduling for Efficient Wireless Telemedicine Traffic Transmission", IEEE Transactions on Veh. Technol., Vol. 60, no. 2.

[2] Choi S. and K. G. Shin (2002), "Adaptive bandwidth reservation and admission control in QoS-sensitive cellular networks," IEEE Transactions on Parallel Distrib. Syst., vol. 13, no. 9, pp. 882–897.

[3] AnuBhargava, ArifGhafoor, M.Farrukh Khan, (2003), "QoS Management in multimedia Networking for Telemedicine Applications," in proceedings of IEEE WSTFES.

[4] Hong Bong Kim (2005), "An adaptive bandwidth reservation scheme for multimedia mobile cellular networks,"IEEE.

[5] Hsing-Lung Chen, Jau-Yang Chang and (2003),"Dynamic-Grouping Bandwidth Reservation Scheme for Multimedia Wireless Networks,"IEEE Journal on selected areas in communications, vol. 21, no. 10.

[6] Jun Yi, Christian Poellabauer, Xiaobo Sharon, Liqiang Zhang (2011), "Minimum Bandwidth Reservations for Periodic Streams in Wireless Real-Time systems", IEEE Transactions on mobile computing, vol. 10, no. 5.

[7]Koutsakis P., S. Psychis, and M. Paterakis (2005), "Integrated wireless access for video conference from MPEG-4 and H.263 video coders with voice, email and web traffic," IEEE Transactions. Veh.Technol., vol. 54, no. 5, pp.1863–1874.

[8] Lee D.S. and Y.H. Hsueh (2004), "Bandwidth-reservation scheme based on road information for next-generation cellular networks," IEEE Transactions on Veh. Technol., vol. 53, no. 1, pp. 243–252.

[9] LeonidasGeorgiadis, Philippe Jacquet and Bernard Mans, "Bandwidth Reservation in Multihop Wireless Networks: Complexity and Mechanisms," Proceedings of INRIA.

[10] Qiao L, and P. Koutsakis (2008), "Guaranteed bandwidth allocation and QoS support for mobile telemedicine traffic," in Proceedings of IEEE Sarnoff Symp., Princeton, NJ, pp.1–5.

[11] Navarro E. A. V., J. R. Mas, J. F. Navajas, and C. P. Alcega (2006), "Performance of a 3G-based mobile telemedicine system," in Proceedings of IEEE CCNC, Las Vegas, pp. 1023–1027.

[12] David Chieng, Alan Marshall and Gerard Parr (2005), "SLA Brokering and Bandwidth Reservation Negotiation Schemes for QoS-aware Internet,"IEEETransactions on Network and Service Management.

[13] Samratanguly, BadriNath and NavinGoyal (2003), "Optimal Bandwidth Reservation Schedule in Cellular Networks," in Proceedings ofIEEE INFOCOM.

[14] Soh W.S. and H. S. Kim (2006), "A predictive bandwidth reservation scheme using mobile positioning and road topology information," IEEE/ACM Transactions on Networking., vol. 14, no. 5, pp. 1078–1091.

[15] Vuran M. C. and I. F. Akyildiz (2007), "A-MAC: Adaptive medium access control for next-generation wireless terminals," IEEE/ACM Transactions onNetworking.,vol. 15, no. 3, pp. 574–587.

[16] Xiang Chen, Bin Li, and Yuguang Fang (2005), “A Dynamic Multiple-Threshold Bandwidth Reservation (DMTBR) Scheme for QoS Provisioning in Multimedia Wireless Networks,” IEEE Transactions on wireless communications, vol. 4, no. 2.

[17] Yu F. R., V. W. S. Wong, and V. C. M. Leung (2008), “A new QoS provisioning method for adaptive multimedia in wireless networks,” IEEE Transactions onVeh. Technol., vol. 57, no. 3, pp. 1899–1909.