Implementation of QoS for Adaptive Multimedia in Wireless/ Mobile Network-A Review

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Abstract: **Most of the data communications depend on these emerging technologies. Mobile computing systems have non-functional properties that differ from fixed distributed systems due to the radio and mobile terminal characteristics. The term mobile computing system is used when considering a system consists of: application, middleware, operating system (OS), mobile terminal, and mobile communication system. End-to-end quality of service (QoS) in mobile computing systems is therefore the combination of QoS characteristics and QoS mechanisms across the system.**

INTRODUCTION

In today's environment, the need, uses and applications of the mobile networks are increasing. Most of the data communications depend on these emerging technologies. Mobile computing systems have non-functional properties that differ from fixed distributed systems due to the radio and mobile terminal characteristics. The term mobile computing system is used when considering a system consists of: application, middleware, operating system (OS), mobile terminal, and mobile communication system. End-to-end quality of service (QoS) in mobile computing systems is therefore the combination of QoS characteristics and QoS mechanisms across the system [1].

Reliable message transfer with error control and notification of non-delivery is common in many modern communication systems. However, it is only recently that much thought has been given to the ability to specify timeliness, and the perceived quality of the data arriving, particularly where more complex (multi-) media are being used. The underlying concepts of bandwidth, throughput, timeliness (including jitter), reliability, perceived quality and cost are the foundations of what is known as Quality of Service (QoS).

In designing the applications over mobile networks, one must focus on quality of service (QoS). It is often required where a fixed bit rate is provided and the application are delay sensitive, and in those networks where the capacity is a limited resource, for example in mobile data communication. Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow. [1][2][3].

QoS provides the following benefits [4]:

- Gives administrators control over network resources and allows them to manage the network from a business, rather than a technical, perspective.
- Ensures that time-sensitive and mission-critical applications have the resources they require, while allowing other applications access to the network.
- Improves user experience.
- Reduces costs by using existing resources efficiently, thereby delaying or reducing the need for expansion or upgrades.

Modeling is a necessary activity while designing a system or application. It aims to express the essentials of some aspect of the system being designed, without unnecessary detail. It is often represented by visually by one or more diagrams [5]. QoS requirements are identified already at design-time. For modeling a system, we need adequate modeling languages. There are many modeling languages according to the area of applications. For modeling the QoS of any system, a specialized QoS Modeling Language (QML) has also been developed. Therefore, the QML can be applied to specify QoS properties like reliability and performance [6].

QUALITY OF SERVICE (QoS)

Many multimedia and real-time applications entail the concept of QoS, where there may be a scale of performance which is acceptable, and the boundary between success and failure of the system may be blurred or varying [BLAIR 97b]. For instance, a video may still be acceptable if presented with a lower frame rate, or reduced resolution, but be unacceptable for viewing if there are pauses or gaps in the film. The results of a search on data potentially returning many fields may still be acceptable if only the first few results are given initially, as long as this is done within a time limit, when appearance of efficiency is needed in front of customers, or where connection time waiting for results incurs cost. Management of QoS includes various aspects, relating to the nature of perceived quality. This section

provides an overview of these, and the treatment they have been given in the literature. The topics covered are: i) Definitions Fundamental to QoS management; ii) Techniques for the static management of QoS; iii) Techniques for the dynamic management of QoS; iv) QoS issues relating to multiple stream systems, common in multimedia applications; v) QoS issues relating to managing faults and availability; vi) A brief overview of the work described in the literature relating to formal specifications, standards and practical investigations where the previously described techniques are applied.

Definitions and Categories of QoS

The ISO/IEC recommendation X.901-5, Open Distributed Processing Reference Model (RMODP) provides a de-jure definition of QoS. This subsection presents an overview of the most critical parts of what QoS is, and what it entails, based on [BLAIR 97b, HUTCHISON 94,STOREY 96], whose treatment is primarily concerned with multimedia.

QoS in Mobile Computing System

There has been much recent research on the provision of Quality of Service (QoS) guarantees in mobile computing environment. The critical design issues for mobile system include Quality-of-Service (QoS) guarantees, high service accessibility, reliable data transfer, and high communication performance [1] [10].These all parameters affected by mobility, both during and between connections.

One of the aims of QoS is to manage the service response provided to low-speed devices such as mobile wireless devices. The QoS can be ensured only when the achieved / actual performance is greater than or equal to the desired performance [11] [12][13].

QML

To facilitate QoS specification, a general Quality of Service Modeling Language has been introduced for defining multi-category QoS. QML is designed to support QoS in general QoS category such as reliability, performance, security, and timing [14]. QML has been developed at HP Software Technology Laboratory [15][16]. QML is similar to interface definition language that describes the functional prosperities of software component. It also allows specification at a fine-grained level for operations, operation arguments, and attributes. QML is designed for a good fit with object-oriented distribution architecture [6] [17].

OVERVIEW OF MOBILE ADHOC NETWORKS

The increased demands for mobility and flexibility in our daily life are demand that lead the development from wired LANs to wireless LANs (WLANs). Today a wired LAN can offer users high bit rates to meet the requirements of bandwidth consuming services like video conferences, streaming video etc. With this in mind a user of a WLAN will have high demands on the system and will not accept too much degradation in performance to achieve mobility and flexibility. This will in turn put high demands on the design of WLANs of the future.

During the last few years Wireless mesh networking has become increasingly ubiquitous and the preferred mechanism to provide coverage to campuses, small towns, etc. In Wireless mesh networks a subset of the wireless nodes are connected to the wired backbone and provide connectivity to the other nodes in the network through multi hopping over the wireless links. As a natural extension to WLANs, the medium access mechanism of choice for these networks is the CSMA/CA based IEEE 802.11 distributed MAC protocol [1].

While IEEE 802.11 MAC protocol was designed for and provides a reasonable performance in a single hop network, it results in severe performance degradation in a multi-hop setting. In a single hop 802.11 network, all nodes contend for the channel with equal opportunity and act as greedy as possible to increase their one hop throughput which directly results in increase of the network aggregate throughput. In a multi-hop network, however, the greedy behavior of the nodes may result in service degradation as the packets transmitted by a source might not reach their final destination due to network congestion. In a congested network packets might be dropped in an intermediate node. Such a behavior will result in waste of the system resources used to deliver the packets to the intermediate node [2].

Reliable message transfer with error control and notification of non-delivery is common in many modern communication systems. However, it is only recently that much thought has been given to the ability to specify timeliness, and the perceived quality of the data arriving, particularly where more complex (multi-) media are being used. The underlying concepts of bandwidth, throughput, timeliness (including jitter), reliability, perceived quality and cost are the foundations of what is known as Quality of Service (QoS).

STATE OF ART

Chalmers, D. Sloman, M.[1] presented the specification and management of Quality of Service (QoS) is important in networks and distributed computing systems, particularly to support multimedia applications. This paper is a survey of QoS concepts and techniques for mobile distributed computing environments.

Garcia, C.[4] presented the arrival of fourth generation mobile networks, based on IP core networks, lead us to the development of certain services, such as: Quality of service, mobility and AAA. This paper proposes architecture to supply quality of service support based in the differentiated services technique.

Frolund Svend, Koistinen Jari[6] presented a general Quality of

service Modeling Language (QML) for defining multi-category QoS specifications for components in distributed object systems. QML is designed to support QoS in general, encompassing QoS categories such as reliability, performance, security, and timing.

Frolund Svend, Koistinen Jari[9], proposed a general Quality-of-Service specification language, which we call QML. In this paper we show how QML can be used to capture QoS properties as part of designs. In addition, we extend UML, the de-facto standard object-oriented modeling language, to support the concepts of QML. Yang Xiao and C. L. Philip Chen [11], presented Adaptive multimedia is promising in wireless/mobile networks since it mitigates the fluctuation of resources caused by the mobility in wireless/mobile networks.

Samad, M. and Herman, S.H[12] presents a study of the quality of service (QoS) performance over the mobile IP in wireless network. This mobile IP models are developed using the OPNET modeler 10.0, a hierarchical software programming and it is utilised to analyze the performance of two metrics for QoS; throughput and packet data dropped during forwarding and receiving data packets operation. The results achieved are based on the comparison of two scenarios of mobile IP model in a wireless network.

Srivastava, M. and Mishra, P.P.[13] describes the necessary support required in various layers of mobile wireless networks, and advocates specific solutions based on empirical validations. This addresses the choices that need to be made in the design of a quality of service (QoS) framework for mobile and wireless networks. Miguel A. de Miguel[14] presented QoS-aware models support the description of software architectures with quality requirements are part of an initial submission of OMG RFP "UML Profile for Quality of Service and Fault Tolerance Characteristics and Mechanisms".

Sten L. Amundsen, Frank Eliassen, Jan Øyvind Aagedal[15], presents a general QoS framework with QoS specific elements for mobile middleware, which combines and extends existing QoS frameworks. Becker Steffen[16] presented the Quality of Service Modeling Language (QML), a language which can be used to describe QoS offerings or needs of specified services.QML has been developed at HP Software Laboratory.

Work done by various researchers has been studied and some of the works have been found relevant to this work are as follows:

[1] Recent work in multicast routing for wireless mesh networks has focused on metrics that estimate link quality to maximize throughput. Nodes must collaborate in order to compute the path metric and forward data. The assumption that all nodes are honest and behave correctly during metric computation, propagation, and aggregation, as well as during data forwarding, leads to unexpected consequences in adversarial networks where compromised nodes act maliciously.

In this work we identify novel attacks against high-throughput multicast protocols in wireless mesh networks. The attacks exploit the local estimation and global aggregation of the metric to allow attackers to attract a large amount of traffic. We show that these attacks are very effective against multicast protocols based on high-throughput metrics. We conclude that aggressive path selection is a double-edged sword: While it maximizes throughput, it also increases attack effectiveness in the absence of defense mechanisms. Our approach to defend against the identified attacks combines measurement-based detection and accusation-based reaction techniques. The solution also accommodates transient network variations and is resilient against attempts to exploit the defense mechanism itself. A detailed security analysis of our defense scheme establishes bounds on the impact of attacks. We demonstrate both the attacks and our defense using ODMRP, a representative multicast protocol for wireless mesh networks, and SPP, an adaptation of the wellknown ETX unicast metric to the multicast setting.

[2] Several protocols for ad hoc network try to reduce redundancy as an effective measure against broadcast problems. Though these protocols ensure good performance in a favorable environment, they perform poorly when node cooperation cannot be guaranteed due to intentional misbehavior or environmental hostility. As a result, the expected behavior of nodes to forward packets, which is the basic assumption of all broadcast approaches, cannot be achieved always. In this paper, we analyze the performance deterioration of these algorithms in hostile environment. As a remedy, we focus on the reverse direction and interestingly find that adding redundancy in a controlled manner can greatly compensate the performance loss due to node misbehavior. Here we propose a novel approach that tunes the amount of redundancy so that reach ability and routing load both remain at a satisfactory level. Comparing their relative performance we end up with the conclusion that though redundancy is undesired, controlled redundancy is effective in special situations like uncooperative environments.

[3] Cluster based routing protocols are used to improve the performance of large-scale networks. In this paper, we propose a new approach for intra and inter cluster routing in different scenarios. Our proposed algorithm takes the advantages of proactive and reactive routing protocols. For intra and inter cluster routing, proactive and reactive routing concepts are used, respectively. We have assumed that common nodes among the clusters are gateway nodes and act as intermediate nodes. Our proposed algorithm enhances the performance of cluster based routing protocol. We use an analytical model to calculate the overheads during update process of routing tables. Our results show the enhanced performance of proposed technique.

[4] Routing protocols play an important role in Mobile Ad hoc Networks (MANETs) since they are necessarily required by all nodes in these networks to find the best paths to reach the other nodes. However, these protocols are usually measured / analyzed in homogeneous networks where all nodes in these networks have the same capabilities e.g. transmission ranges, transmitting power, link bandwidth and so on. Hence, homogeneous networks are not suitable for theoretical analysis, simulation measurement or performance testbed in the real applications because different types of nodes usually exist (or they are configured with different parameters). So, they practically have different characteristics and capabilities. This is called heterogeneous networks. In this work, various scenarios (e.g. load-, mobility- and density-varying conditions) are constructed to measure the performances of ad hoc routing protocols in heterogeneous networks. The protocols that are taken into consideration are DSR, AODV and OLSR since they are accepted by IETF MANET working group for standardization.

[5] Mobile Ad hoc Network (MANET) is a collection of wireless mobile devices such as laptops, handheld digital devices, personal digital assistants and wearable computers forming a temporary network without the aid of any infrastructure or centralized administration. In MANET, the task of routing is distributed among network nodes which act as both end points and routers in a wireless multi-hop network environment. To discover a route to a specific destination node, existing on-demand routing protocols employ a broadcast scheme referred to as simple flooding.

Broadcasting is a means of diffusing a control message such as route request (RREQ) for route discovery in MANET environment. In on-demand routing protocols such as DSR and AODV, route request (RREQ) packets are propagated throughout the MANET to determine a route from source to destination. This paper presents the analysis of the impact of broadcast mechanism in proactive routing protocol (DSDV) and reactive routing protocols (DSR and AODV) on network performance with respect to broadcast overhead, network load, MAC load, and throughput.

Chonggang Wang.,Vetorlawrence, introduction of an efficient congestion control mechanism for heterogeneous data originated from multipurpose sensor nodes.We have demonstrated through simulationresults andanalysis that PHTCCP achieves, i). desired throughput for diverse data according to the priorityspecified by the base station, ii). high link utilization, iii). moderate queue lengthto reduce packet loss,iv). relativelylow packetdrop rate. Therefore PHTCCP is energy efficient and provide slower delay. It is also feasible in terms of memory requirements considering the configurations of today's multi-purpose motes.As our future work, we would like to work on integrating end-to-end reliability mechanism and improving fairness for PHTCCP.

JangPing sheu., Lijenchang., Concept of the the problem of congestion control in the sensor networks. We propose a Hybrid Congestion Control Protocol(HCCP),whichconsiders both the packets delivery rate and remaining buffer size of each node. We discuss the congestion control problem including the congestion detection, congestion information advertisement, and data rate adjustme nt. In congestion detection phase, our HCCP detects the congestion in advance with a time periodT and takes the preventivemeasures. In data rate adjustment phase, the upstream neighbors the attend to congest will be allocated more data rate. Simulation results show that the performance of our proposed protocol is better than the previous works in terms of total source rate.Although our control overhead is higher than other protocols, the control message compared to the total number of data packets is extremely low and can be negligible.

G.Shrivasan&S.murugappan, introduction the concept of the various congestion control techniques were discussed in detail.The various algorithms and concepts were analyzed for congestion control in WSN.It is important to design proper way for creating new congestion control techniques for node level and link level.The CR is one of the efficient methods for avoiding congestion using upstream anddownstream traffics.InACT the packet reduction method is applied using various compression techniques.

Huaizhou SHI, R. Venkatesha Prasad, introduction of the fairness issues in wireless networking research.In particular the challenges in resource sharing fairnessis addressed in depth. Raised three core questions to explore the essence of investigations with respect to fairness studies in wireless networks .Based on these questions, we summarized some general analytical models offairness and compared them.Then,fairness issues in wireless networks were classified and analyzed.We also presented the relationship between fairness,utility and resource allocation.The properties of a fairness model and an example of fairness management process were provided.We also listed the challenges in this particular domain. There are many open issues in the study of fairness in wireless networks.

Saeed Rasouli Heikalabad, Ali Ghaffari, Mir Abolgasem Hadian2 and HosseinRasouli ,introduction the concept of the dynamic predictive congestion control (DPCC) algorithm. The DPCC can predict congestion in the node and will broadcast traffic on the entire network fairly and dynamically. Simulation results show that the proposed protocol is more efficient than previous algorithms especially in network throughput evaluation.

Raheleh Hashemzehiet.al ., introduction the concept of the impact of wireless sensor networks on our day to day life can be preferably compared to what Internet has doneto us. Both the factors of congestion control and reliability helps in reducing packet loss, which results in an energy efficient operation of the network, which is a key factor in increasing the lifetime of the sensor network. Another factor to be taken into account by the transport protocols is the limited resources of the node devices. Although these congestion control techniques are promising there are still there are many challenges to solve in wireless sensor network to handle congestion control efficiently. And more research efforts are needed to continue to improve congestion control in WSNs.

Ekaterina Dashkova and Andrei Gurtov, introduction of Wireless sensor networks often experience congestion, so an advanced congestion control solution is required. The CC mechanism should differ from its sibling deployed in the Internet. A lot of research and solutions were published targeted to solve the congestion problem in resource restricted communications. For our purpose most of them are not suitable because of the fixed protocol stack and assumptions concerning network topology and mobility..

Jamal N. Al-KarakAhmed E. Kamal introduction the concept of routing techniques are classied based on the network structure into three categories: at, hierarchical, and location based routing protocols. Furthermore, these protocols are classied into multipath-based, query-based, negotiation-based, or QoS-based routing techniques depending on the pro-tocol operation. We also highlight the design tradeors between energy and communication overhead savings in some of the routing paradigm, as well as the advantages and disadvantages of each routing technique. Although many of these routing techniques look promising, there are still many challenges that need to be solved in the sensor networks. We highlighted those challenges and pinpointed future research directions in this regard.

JilaniSayyad et.al introduction the concept of control congestion and improve the efficiency of the system to the best possible level. Several data link layer, network layer, transport layer and cross layer based congestion control techniques are studied. These analysis leads to the following conclusion: Cross layer design can make the network more specific and reliable. WSN should design protocols for cross-layer design methodology. A unified protocol that can handle both reliability and congestion control is needed.

Ahmad Salehi S., M.A. Razzaque, ParisaNaraei, Ali Farrokhtala introduction the concept of the WSN security and therefore the abstract of the WSNs threats that influence varied layers alongside their defense techniques is given. In recent times, in situ of that specialize in varied layers; scientists are attempting for integrated system for security mechanism.

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