A Review of QoS in Mobility Phillic Communication

Mr. Sumit Joshi[1] Mr. Rajeev Kumar[2]

Department of Electronics & Communications
GRD-IMT, Dehradun-248001, India

ABSTRACT: ***This particular outlook represents, in brief the recent & upcoming issues associated with QoS guarantee & mobility in communications. Moreover it also presents a brief context of QoS attributes & handling techniques thereby. Even more, it covers aspects of QoS fundamentals in deployment of mobility led approaches. There are different kinds of systems that facilitate different QoS attributes for variable classes of services. This review represents different types of approaches involved in the process of modern communication networks with respect to the QoS offered by a particular service. Moreover the parameters such as: delay, bandwidth, jitter etc. are system specific along with being service specific too. All the system types are actually a broad classification which involves different service primitives. In this review we focus mainly on mobility aspects of computing in the modern arena.***

Keywords: *Quality aspects, mobility, QoS management.*

I.INTRODUCTION

Many business & technological issues employ good processing, battery life, interface compatibility etc. and hence application based deployment is a concern. Thus a constant feed backing in the form of standards, developments & algorithms are continuously used. Therefore the background engineering must concentrate on issues of QoS& system mobility.

II.DEFINING QoS FOR MOBILITY LEAD COMMUNICATIONS

Quality is the first term of QoS which addresses the behavioral approach of action in any kind of devices or strategies used for communicating. More elaborative, the term actually expresses the characteristic point which focuses on the issue of quality perception. FIG.1 shows distinct parameters on which QoS functions. The predicates used to review it can vary according to the kind of service & the application for which it is being provided. Here, we look in to the model for QoS with a bit deeper insight. Moreover, ITU defines it as the level of satisfaction of a user of any particular or specific service primitive. Another definition relates QoS to systems/networks capability in terms of factors like: bandwidth, transmission rate etc.[1] Broadly, we can sub-divide QoS in to three types: 1.operational 2.perceptability 3.assessebility

Figure.1.Demonstrating core factors in relation to QoS.

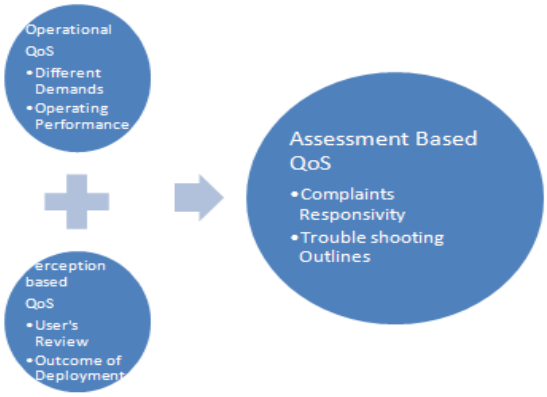

Figure.2.Types of QoS Sub-divisions.

This classification actually is multiple-leveled & works only in accordance with information availability at each respective level, each level is responsible for a particular kind of a service primitive as shown in the functional outlet in Figure.2

While defining QoS it is important to mention & specify these types as described in the section earlier. Operational QoS refers to the network's connection & resources associated to it from design point of view.[5] On contrary the perception based QoS refers to the degree of satisfaction estimates obtained via. Responses from customer side .The most interesting is the assessment based QoS as it depends on the first two; it deals only with after sales review of the product.

The service quality can be expressed as a function of all these three types of QoS. Also the major dependence of service quality is on the first one, as it paves the way for all of the others to play their part. This QoS term can also be defined in terms of degrees of freedom available to the user for better perception.

MOBILE COMPUTING APPLICATION

Mobility along with it accompanies portability as a feature which leads to reduction in product's market price .These type of devices find use in accessing basic services of today[2] .many other devices are being used in conjunction with these devices which has lead to the convolving of communication with computer based mathematics. Most of these applications are less massy and thus are preferred over earlier user preferred services delivery methodologies. These applications are even more favorable in terms of integrity with other similar user-selective applications. A lot many web based applications are presently in run but are bounded only up to personal computers, for a better integrity that could cover recent innovations & growing technologies, a positive development towards a more practically accepted monetary value with respect to the wireless communications is required for better & numerically advanced functioning. However, earliest of the developments like: internet supporting devices, mobility enabled communication platforms etc. are in a process of continuous eruption.

A more sophisticated set of services such as: position aware services are offered via. most of the new devices that have embedded capabilities for the same. These devices can easily locate device coordinates; update weather information & roadside traffic updates etc. on a given map with Global Positioning Systems. Even more it can be used in different prospects of getting details regarding nearby local centers of interest.

Another aspect discussed, focuses on usability part of mobility lead computations in integrity with services offered in serendipitous conditions like fire, earthquake or any situation of natural disasters .In these particular cases far away information can easily be assessed & fetched with it. Portable hand-held devices, cell phones etc. are other features which supports regulation & information exchange simultaneously. Other requirements, such as: safe initiation while any kind of communication is in progress.

It also supports access to digital data warehouse from which academic content is easily distributed to the local as well as far away users being mobile. Further more the concepts of learning in alignment with web access & online resource sharing is addressed. The most happening feature of all these technologies is

integrity & portability with respect to any type of data under processing.

CHARACTERSTIC SUPPORTING FACILITIES

The first issue to be fore taken is to sub-divide communications in to its types based on whether the communication platform is static or dynamic (movable).It is also important to consider the factors or parameters associated with respective platforms.

Mobile systems are intended to work under either LAN or line based dialing configurations, moreover the issues such as opaqueness & desired performance while the user is in mobile state need to be addressed, i.e. we need to have broader capability spectrum with better deployment in terms of commonly available resources. The term 'mobility' involves both types of systems i.e. the systems which are actually mobile & the systems which are not mobile but uses the support of mobile devices. It is observed that all such sorts of services are categorized under "Location-Aware Services".

Still, there are certain services that are called 'Context-Aware Services', these services do require information regarding characteristics of particular computation tool being used along with locating information. In order to provide the required quality associated with communication services computation facilitation concept is employed with resource allocation as the core.

AN INSIGHT IN TO QoS MANAGEMENT

QoS deals fundamentally with those parameters of a system which are related on service basis but independent of functionality of a system. The flow-charts below shows the core networking parameters defined in relation to QoS and also the user-perception lead QoS characteristics, as shown in Figure.3

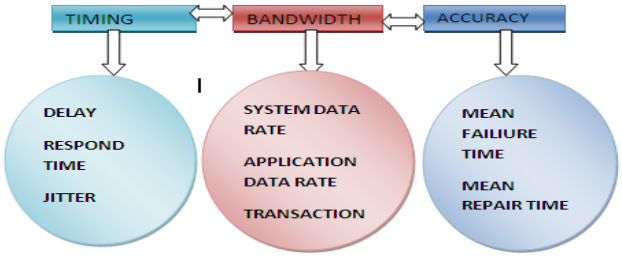

Figure.3.QoS AS BASIS OF TECHNOLOGY

Broadly QoS management can be classified under two heads, namely: static QoS management & dynamic QoS management.

NON-ADAPTIVE QoS MANAGEMENT

The static QoS management deals with those parameters which seldom change during the entire period of transaction or operation within any kind of network in action. Moreover user intervention here, in any operation is must as it is the user who perceives the service standards. Its main objective is to focus only on those services which are non-varying or where variability is unacceptable example: frame transfer rate in multimedia processing.

ADAPTIVE QoS MANAGEMENT

Dynamic QoS aspects focus on changing environment under which service is being provided via. Any kind of network & it also allows the network services to adjust themselves as per the requirements & environment in which network is functioning, whether it be any. This mainly involves variable parameters like data flow rate, resource utilization index etc.[3] Table 1.1 displays a comparison between the two management aspects as discussed in this review.

NON-ADAPTIVE QoS	ADAPTIVE QoS
1. Involves features that remain constant throughout some activity.	**1. Involves changing features with respect to environment.**

2.Activities like resource reservation, admission control are the key functions	**2. Activities like adaptation, synchronization are the key functions with respect to changing conditions.**
3. Other functions involved are specification at various abstraction levels.	**3. Other functions here are monitoring & policing to keep a check over QoS actually being offered.**
4. Negotiations for QoS of an acceptable liability between two entities are also a feature of importance.	**4. Maintenance is another very important aspect which if required also modifies required parameter as per needs.**

Table 1.1.Comparison between two types of QoS managment.

EFFECT OF MOBILE ENVIRONMENT ON QoS

This covers those aspects of QoS which are effected via. Mobile conditions proportionally .The major focus will be on mobility impact on QoS for a given network under work.

PERFORMANCE WITH DIFFERENT LINKS

Mobile systems usually are dynamic by nature and thus connect through a local network via. a LAN or WI-FI access point in a network. Basically, wireless links are included as sub-centers of support for mobility prone environments.

These sorts of systems have certain essentially required considerations like:

- Range of coverage.
- Infrastructural & interfacial costs
- Required bandwidth support.

In the present time lots of new technologies supporting greater quality services as compared to earlier one's are budding out & this will lead to improved standards in terms of customer satisfaction. Still, the issue of wire phobic applications involves environmental susceptibility as a key. Other majority multimedia applications have some common issues like throughput, data rate etc.[6] as the fundamental problems with respect to mobility. In designing & analyzing such systems the sole responsibility is to make these systems more adaptive to these kinds of variations normally encountered which are a much better step in this direction.

ISSUES WITH MOBILITY

These fundamentally include issues like coverage area, handing off etc. which are of greater concern in applications such as image & video transmission. This requires utilizing QoS based estimation of available resources & processing this information for seizing of the same, this can be done using knowledge of available routes in any network located in any known & well-mapped boundary. This knowledge in convolution with information with respect to operating environment facilitates better measures based on statistical predictions & thus makes the resource seizing more efficient & reliable. Moreover it leads to better analysis possibilities for further deployment later on.

In all these techniques are good enough but not the best to compensate for all sorts of connectivity issues because there are still some loop holes left which may lead to degradation in quality & non-permanent falling of signal strength. The cause of these kinds of degradations can be many & thus an efficient mechanism is required in curing this out in form of adaptive QoS.

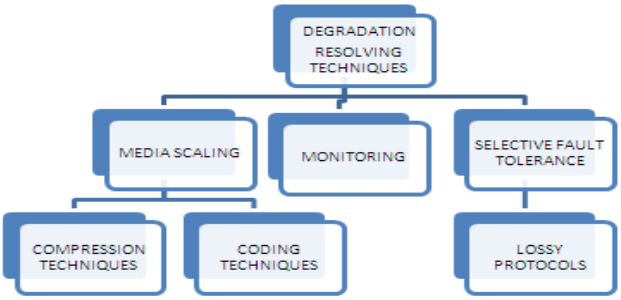

Figure.4. Speedy Degradation Recovery Methodologies

For speedy degradation recovery the major methodologies used are summarized as in the block diagram of Figure.4 this clarifies the fact that speedy recovery & quality are the issues which require resolute focus. Even more the system should be such, that it has enough time to

adjust according to the transient changes encountered.

Thus, this clarifies the fact that for better service quality some standards in terms of certain major well defined & structured parameters like: capability life, generosity aspects, operational environment etc. are the key concerns. Moreover another very delightful parameter of interest is the 'user health'; this parameter is a key concern nowadays when many upcoming technologies mostly inclined towards radio propagation are in huge & populous eruption all over the world.

These concerned parameters really have an impact on user behavior & market too. Even some special core challenging & more managerial then technical parameters of concern along with QoS enabled service infrastructure are as: recreational outlook, per person popularity index etc. these are some of the core parameters & challenges overlooked here in this context in a brief summarization.[4] Issues of network availability & reliability are also major concerns associated with proper design technicalities in reference to a networks basic functional outlook, which have been foreseen with impact.

We now describe each of these QoS coverage factors in detailed aspects. The major coverage aspects involve following:

1. **Capability life span –**

This under covers various aspects of exact service primitives like period for which the services are available along with aspects of quality improvement & enhancement features. Specifically, for a wireless mobile channel where channel parameters are always variable & ever-changing the QoS aspects like these are of due interest. When mobility as a whole is considered, it even becomes more important to measure or represent QoS in terms of connectivity life span which actually signifies the time for which the transmission is smooth & of the estimated quality. Another aspect integrated with the capability term is the estimated handling capacity for a link in terms of packets delivered at receiving end via. a network of links, that means QoS is not only associated with link failures or packet delivery ratio only but also with the aspects of data being transmitted over kinds of links. A comparative assessment of different kinds of data over the mobile channel under research under varying conditions facilitates the study of possible performance profiles that could be obtained while real time situation is met. On, the basis of this kind of study more adaptive & less quality compromising algorithms for better performance can be structured & thus it also includes aspects of link life or link failures at same.

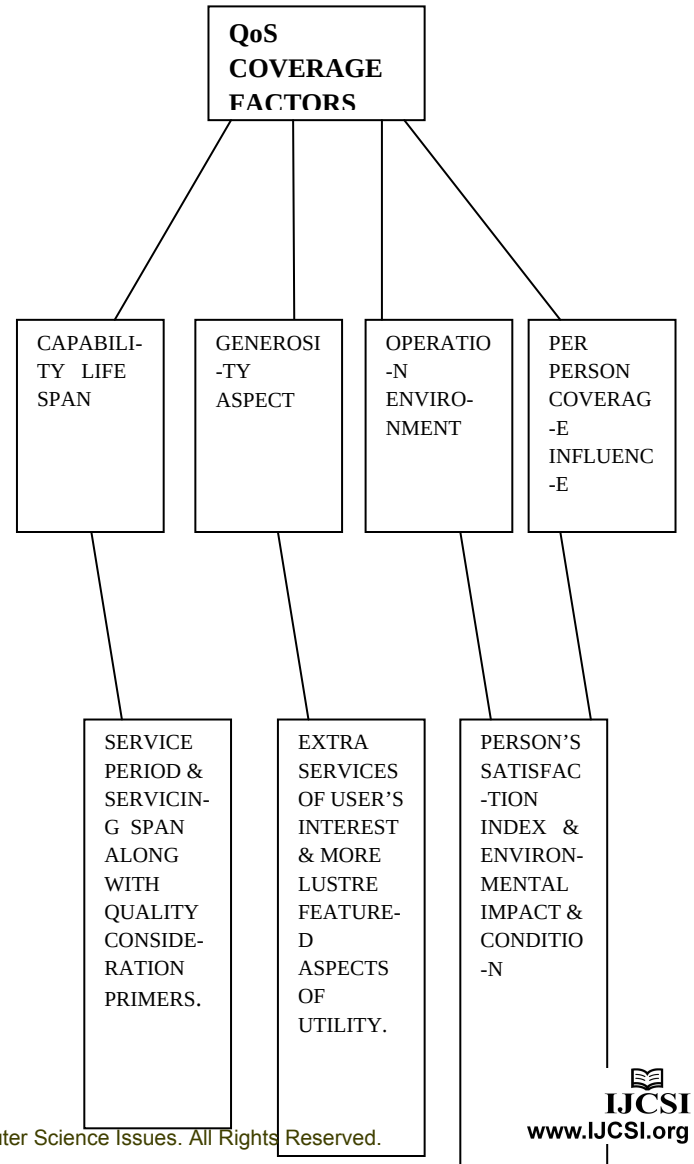

Figure.5.Total reviewed factors binding QoS

2. **Generosity Aspects-**
   Special facilities provided along with usual QoS concerns are a part of these aspects; these sorts of features in today's market are core issues & are a definite feature for good QoS providence in eyes of users of service. These aspects sometimes are available as specific extra facilities wit already available ongoing scenario; these not only enhance the user base but at the same time impinge on psychological framework of a user in terms of trust & goodwill for that service. That means QoS is indirectly associated to these aspects too.

3. **Operational Environment-**
   An important feature of any QoS architecture is the environment for which it is designed & considered. More over the factors like terrain, mobility etc. also encompasses actual QoS measurement for a network.

4. **Per Person Coverage Influence-**
   This is one of the cause-effect aspect which actually expresses the satisfaction of a customer or a user in a particular domain of influence, for example- a user if feels more satisfied & at ease with the services provided by (say) network A in comparison to network B ,definitely in his understanding the QoS offered by the same is of an acceptable level, although the same network in some another domain of interest may not be of equivalent state. So, this means it is very important to categorize the services before actually evaluating them under required domains of interest.[8] Here, we propose a domain based approach in this review for better deployment of QoS.

QoS Domains of Interest- Under this we categorize different kinds of mobility prone networks under different domains that are of required interest**.**

- Wireless adhoc networks domain.
- Cellular networks domain.
- Wireless sensor networks domain.
- Wireless multimedia networks domain

These domains along with earlier proposed QoS models will be reviewed in the continuing context as:

Wireless Adhoc Networks Domain

Here, in adhoc networks usually the topology is ubiquitous & configurable that means for these kinds of applications there must be issues related to a definite level of quality regarding the services offered by these networks & hence QoS is to be considered seriously. Moreover, here in these kinds of networks we have some major issues as: unicast routing, multicast routing, battery management & TCP transport issues.[7] These all major issues influence the QoS in real aspects as depicted in Figure.6

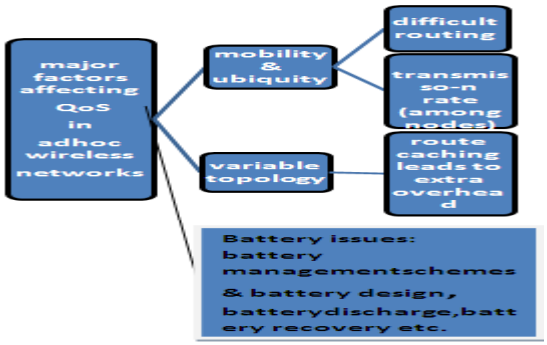

Figure.6.QoS effecting factors in wireless adhoc networks

Cellular networks domain

In cellular networks the majority factors effecting QoS are: mobility, handoff, population density, coverage area etc. these are the parameters which do impinge QoS in a certain manner. Although, apart from these, there are many other factors also like: network accessibility, offered service cost, special offers etc.

Thus we can classify these in to 2 specific classes for the sake of simplicity as: macro-impact factors & micro-impact factors, as Figure.7.

Wireless Sensor Networks Domain

Although, these are a special class of adhoc wireless networks but on basis of the issues associated, they need a separate addressing.[2] They consist of miniature devices that are called sensor nodes which are capably designed to sense & monitor different physical entities of due interest with respect to the application for which these are being used. As, we know sensing can be either of the two types: periodic & sporadic depending on the application type. Thus, the issues associated are: mobility among nodes, network dimensions, deployable coverage, power limitations etc. depicted as Figure.8

Wireless multimedia network domain

This domain focuses on multimedia data transmission over mobility led wireless networks, the major causal factors effecting QoS here are network load capability, actual load processed, reconfiguration actions etc. these are depicted as Figure.9

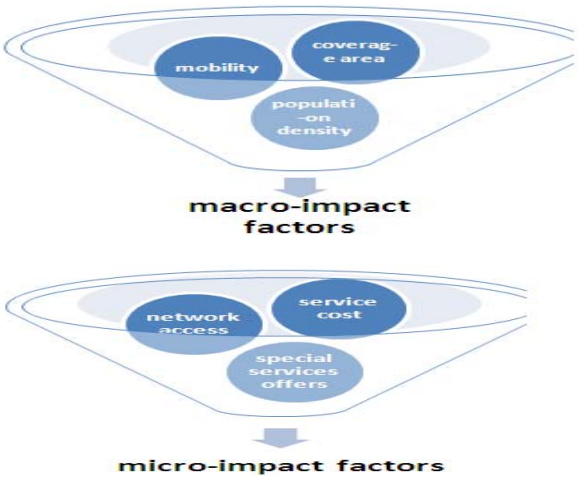

Figure.7. Micro & Macro Impact factors.

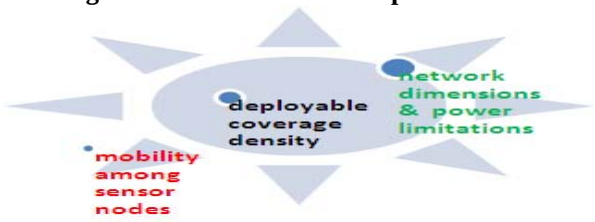

Figure.8. QoS effecting factors in sensor network domain

Figure.9.Factors effecting QoS in wireless multimedia networks.

Now, some of wireless QoS schemes which are based on 5 principles as:

1) **PRINCIPLE OF UNITEDNESS→**According to this principle quality of service for any network based application should include features like: reliability, maintenance capability, reconfiguring ability over different designs in order to achieve better user-to-user service quality.

2) **PRINCIPLE OF SAGREGATION→**It illustrates that functions like: data transfer of any kind, flow control & resource management etc. are the activities which are distinct from each other in terms of operation & design aspects.[7] Therefore, these should be handled in a segregating manner. The actual segregation is between the two core aspects of data transfer & information control.
3) **PRINCIPLE OF CLARITY→**This principle can also be termed as principle of abstraction that means different variety of associated or non-associated applications should be abstracted i.e they should be kept apart from influence of issues such as: QoS control & handling. Advantages of abstraction are depicted in form of a block as Figure.10

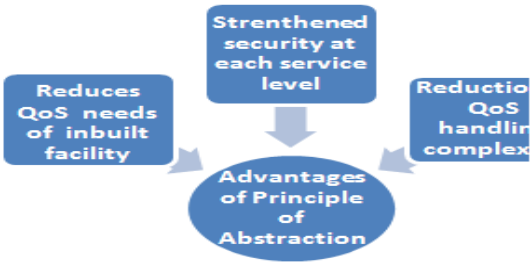

Figure.10.Advantages of Abstraction

4) **PRINCIPLE OF RANDOM ENTITY DISTRIBUTION→**
This principle coordinates the distribution of operation between different structural designs, in all it is responsible for design of the entire control, scheduling, flow & operational management aspects.
5) **PRINCIPLE OF RELIABILITY→**This specifies the aspects of reliable performance by different structured communication protocols for enhanced performance with respect to some or the other of design principles.

Different QoS specifications are as:

1) **Tuning in flow control:**
This is the feature that characterizes different related traffics on the basis of tuning which exists between them. In many applications like: multimedia applications data tightness or tuning is an important centralized feature, without which information has no logical meaning. Therefore, precise tuning is the key in such cases & certain other applications may not require this level of tuning; there we don't require such controlled tightness.
2) **Flow action primitives:** These primitives define the requirements of flow activity from user end. Specifically, for multimedia applications it becomes important to ensure that the factors like: throughput, jitter, delay etc. are guaranteed from network traffic point of view. These flow-action primitives may vary with the application on demand i.e. QoS infrastructure must have pre-information regarding traffic volume.
3) **Service hierarchy:** It specifies the performance indices in a qualitative fashion of distinction which classifies them into classes such as: micro, macro & sublime guarantees of performance.
4) **Policy based QoS control:** It demonstrates the tolerable flow based QoS adaptability. It also covers aspects of QoS management at every level of service being provided.
5) **Monetary aspects of service:** This includes the monetary value being charged as per user interest in a particular

level of service to be offered to the users as per their liking. This certainly enables user to select the services in accordance with the cost of service as per QoS specifications.

Some of the popular QoS models as:

1) Heidelberg QoS model:

This model is designed specifically for heterogeneous networks of today. Moreover, it provides better services for end-systems & networks. Its design is

composed of regular data transport mechanism which is responsible for providing QoS provisioning functionalities to the design along with compression & coding aspects as depicted below as Figure.11.

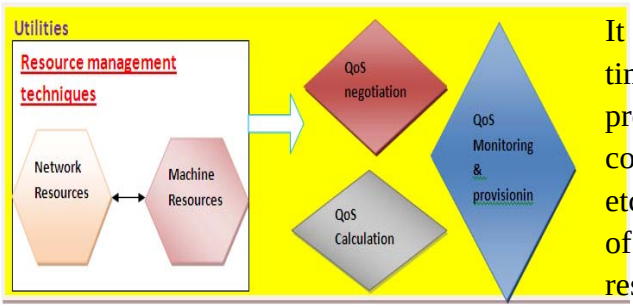

Figure.11.Simplified Heidelberg'sQoS Model

2) The OMEGA Architecture:

This architecture provides QoS guarantees at different imaginary levels in a network. These kinds of resource management by this model are facilitated via. a middleman model which includes features like: QoS based resource allocation, QoS middleman based translation at network-node interface. The OMEGA Architecture is developed by University of Pennsylvania with end-point architecture in view. Its simplified outlook has been presented as fig.3 below. This architecture classifies OMEGA communication prototype in to two fundamental units namely: transport unit & application unit, where each unit consists of two functional sub units. Moreover the core feature of the design is a middle-man which serves both the fundamental units by performing translational operations at different imaginary network levels.

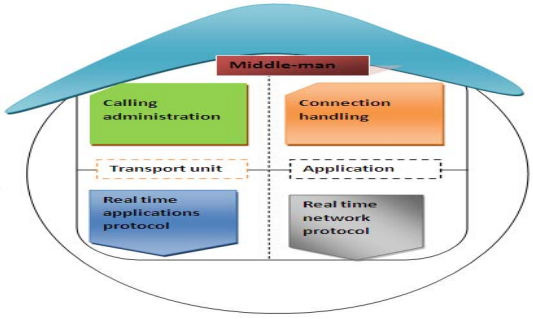

Figure.12.Simplified OMEGA Communication prototype

3) The IMAC architecture:

It is based on ANSA QoS outlines & is a real-time operation facilitating design. Thus, it provides features such as: QoS details, real-time coding based on QoS facilitated encapsulation etc. this architecture in all covers 3 major aspects of real-time network services ,which are resource demand , resource assigning & resource timing.

Apart from these architectures discussed above, there are many more designs which are present or are in their initial phase of development & deployment. This discussion focuses only on reviewing the fundamental aspects.

Heterogeneity & mobility prone networks

Still a lot is to be done & a lot is being done by different groups & people at different places in the world for a better QoS guarantee in modern ever mobile & heterogeneous operational environment. While discussing different QoS parameters we observed that each parameter needs special attention with regard to some or

the other applications ,that means QoS is now no more a general aspect but has become application specific by its sole nature in modern times. We also noticed that all the designs & strategies developed & deployed till now are more focused on adaptively of the network parameters with the flow control & resource allocation as the core. The most important observation is that, the QoS guarantee depends not only on network parameters only but also on the nature of these parameters with respect to the deploying circumstances in which the network will be actually functioning. One of the key aspect that is to be thought of is that we need to develop more stringent & abstract designs for an appreciable QoS demand to be satisfied.

Comparative outlook of different modern networks

It is clear that modern networks are more or less similar in terms of their operating environments & aspects of functioning .For example the adhoc networks & sensor networks are nearly same functionally & moreover the parameters for QoS guarantee to be looked for are not much different .we observe that these sort of networks are definitely going to be a big boom if the issues of ubiquity & mobility associated with them are properly addressed via. Better QoS provisioning & management schemes. Further, the issues of QoS routing & energy efficient network handling are the core issues to be considered while any design is to be undertaken.

CONCLUSION

This review is in context of effect of mobility on performance of any network in communication & by the review of QoS for it, we came to certain important derivatives, that there are many factors capable of affecting the performance of a network in mobile conditions & also that each of the factor needs attention singularly for better QoS design. Generally, a desired QoS is never offered but a average or near is offered by means of better network handling & resource allocation techniques.

REFERENCES

[1] R.Timusset al., Mobility and Multimedia Information Software Agents and Soft Computing, Towards Enhancing Machine Intelligence Concepts and Applications, Springer-Verlag,1997,pp.146-59.

[2]. KimayaSanzgiri, Elizabeth M. Belding-Royer, Leveraging Mobility to Improve Quality of Service in Mobility Networks, Deptt. of Computer Science, University of California.

[3]. AngelosAmanatiadias, KonstantinosDrakatos, Lukas Tsironis, VassilisMoustakis, Defining the Main Factors of Quality of Service in Mobile Telephony, IEEE-2006.

[4].Dan Chalmers, Morris Sloman, A Survey of Quality of Service In Mobile Computing Environments, IEEE Communication surveys, second quarter-1999.

[5]. LilianaDiazOlavarrieta, Wireless Communications Education Guide to Important Topics, November, 2005.

[6].Diedrich, Simple Quality of Service for Wireless Mobile Networks, Verlag, 2003.

[7]. YigalBejerano, Randeep S Bhatia, MiFi: A Framework for Fairness and QoS Assurance in Current IEEE 802.11 Networks with Multiple Access Points, IEEE-2004.

[8].ManojB.S, Shiva Rama Murthy C, Adhoc Wireless Networks, Prentice Hall, 2004.

Rajeev Kumar
Presently, Assistant professor at Dehradun Institute of Technology. He has many years of experience in Teaching and is an IEEE reviewer.

Sumit Joshi
Mr. Sumit Joshi is working as an assistant professor in Deptt. Of Electronics & Communications at GRD-IMT, Dehradun. He is also a member of IAENG & IJOE.