IMPROVING QoS IN HETEROGENEOUS NETWORKS USING MULTIPLE RATS

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ABSTRACT: It is known that all over the world there has been found to be expanding the Mobile Network Traffic in view of the ever increasing number of Mobile Users. As a matter of fact, the present 10 billion numbers of contrivances is likely to upsurge further and surpass the expected Global population.

The Current Wireless and Cellular Technologies that are in vogue today will have to be developed further and upgraded to match the Network Complexities and use. By and large the present day usability of bandwidth has expanded in view of the ever increasing consumer usage. Therefore, in order to ensure good, user friendly and remarkable performance with excellent Quality of Service, the QoS system has to be developed in the wake of the magnitude of Bandwidth consumption, being on the rise. This paper addresses the key issues concerning the QoS architecture and focuses at resolving the shortcomings, so that on the basis of field trails, a QoS System prototype with optimum functionality can be developed making use of multiple RAT Technologies.

Finally as a consequence of this research work, it would be ascertained as to how it would be easier in order to evaluate the QoS access networks alongside the complex Network Configuration. Furthermore, on the basis of the applications, it would be better evaluated that the applications prove to be result oriented and flawless.

Keywords: QoS, Bandwidth, RAT technologies, Network configuration, network traffic, mobile users

I. INTRODUCTION

This paper shows the key components of the QoS design and depicts the primary outcomes got in field trials performed on a completely practical QoS framework model created utilizing different RAT innovations.

The client interest for mixed media application over the Internet has been quickly developing in the previous couple of years. Voice over IP (VoIP), and particularly IPTV and Video on Demand (VoD) applications are picking up a consistently expanding [, supported by the gigantic sending of assorted access advances, for example, 802.11/WiFi, UMTS (Universal Mobile Telecommunications System), xDSL (variations of Digital Subscriber Line), and Ethernet LANs. Supporting these applications requires Quality of Service (QoS) provisioning and administration at all the significant focuses in the Internet. Specifically, QoS provisioning infers to ace the collaboration of a few building squares. While each of the above points has been the subject of broad research over the most recent fifteen years, as affirmed by the wealth of related writing, up to now just halfway arrangements, tending to either particular system innovations or particular building pieces have really been conveyed. Among the reasons that have counteracted organization, there are the outstanding issues of system heterogeneity, and decentralized control of the Internet, made extremely complex by the required properties of versatility and dependability of QoS provisioning. On one hand, QoS provisioning is viable just in the event that it is accomplished on a full end-to-end basis. Distinctive investigations have thought of different execution measurements for QoS assessment of these systems.

1.1 The Challenge for Heterogeneous Networks:

The general objective for inquire about on heterogeneous systems is: to empower clients to get and share vital and opportune data in the correct frame over a coordinated heterogeneous dynamic system that is versatile, evolvable and secure.

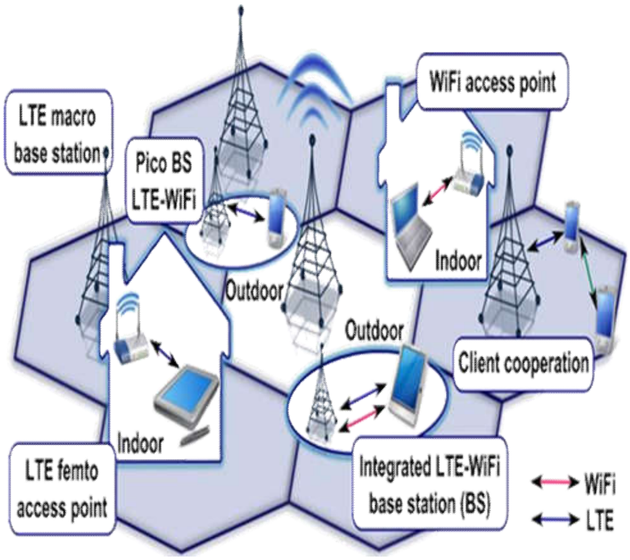

Figure 1

Heterogeneous Network = multi-tier + multi-RAT

Heterogeneous application quality of service requirements:

a) From strict time deadline to best effort only
b) From no mistake satisfactory to high blunder rates fair
c) From no downtime adequate to arbitrary separations fair

1.2 End-to-End Quality of Service:

Market driven with service guarantees Today service level agreements (SLAs) for communication services include standard performance metrics such as average and peak bandwidth, minimum availability (e.g., 99.999% availability), maximum bit error rates, and maximum packet drop rates. These metrics are sufficient for a wide variety of applications, but for applications in the future they may be too coarse and inflexible. For example, in the case of say 99.9% availability over a period of a month (31 days), it is only required that the communication service has total accumulated outage of at most 0.01% of the time or 45 minutes in a month. Thus, a single outage can have length over 40 minutes. For some applications, availability of 99.9% may be acceptable as long as no outage can be longer than say 5 minutes. Hence, it is important for SLAs to be formatted so that it can be more flexible to accommodate new and finer grained services and constraints. The goal of e2e reliability and quality of service in general becomes even more challenging when underlying networking substrates within each domain is more diverse and heterogeneous across multiple domains. Inter-domain interfaces allowing swift and effective expression of performance 35 requirements are crucial to glue together services and performance guarantees offered by such diverse set of domains.

1.3 Quality of Service:

These are architectural options to improve the assurance that a promised QoS will be met, and to enable providing more flexible QoS options to developers/applications/users. More specifically, these architectural techniques are oriented to enable:

• End-to-end situational awareness to determine whether SLAs can be met 53 • network controls topology to meet application needs (e.g. assign wavelength)\

• Application-appropriate caching, retransmission, replication, delay tolerance, resource management of network storage, provided as an integral network service

• Opportunistic exploitation of diverse networks by smart applications Redefine/extend notion of QoS to be at application level: Today QoS is expressed in low-level network metrics like latency and jitter. It would be much more useful and flexible to enable applications to describe their desired QoS at a much higher abstraction level. One example is a computing cluster that needs some guaranteed level of connectivity among its nodes.

1.4 Use dynamic SLAs:

An SLA is a Service Level Agreement defining a certain quality of service. Normally they are static. As an architectural option, use dynamic SLA's where the quality of service offered is conditional on external factors. For example, bandwidth will be X MB/sec when network is in normal operating mode, Y MB/sec when network is declared in emergency mode. Architectural notion of independent islands: We coined the term "island" to describe a region of the network that is relatively homogenous internally and hence capable of tight management and strong QoS guarantees. Architecturally the network should be considered as a collection of islands. Each island exports its service capability – expressed as a dynamic SLA – rather than low-level info like BGP describes such as link up/down. Each island has the option of doing its own L4 transport on data flows if necessary to meet its SLA guarantees. Make gateways between islands a 1st class entity in network: The boundaries between the islands are gateways. The gateways are connected by an enterprise-level control plane that manages their resources – including storage – to guarantee end-to-end dynamic SLAs. New interfaces between applications and control plane: The goal is application-aware networking and network-aware applications. Virtualization of communication resources to support multiple networks making different resource use/QoS tradeoffs: Rather than attempting to support all application needs in a single network (single routing layer, transport layer, naming mechanism, etc.), this architectural approach proposes sharing the available physical resources (channels, transmit power, fibers, etc.) among multiple networks. Each of the sharing networks can then be 54 specialized and optimized to support a class of applications whose needs cannot be met using the techniques selected for other networks. Virtualization at the appropriate level enables overall resource management and isolation between the separate networks. One important area for research is automatic conflict resolution between different networks that compete for the same (physical) resources.

II. LITERATURE SURVEY

Review Of Existing papers:

The progression and expansion of current remote and cell advancements have changed the way individuals work and convey. By 2020, the information movement over versatile systems is relied upon to achieve 15.9 Exabyte's for every month, with 69 percent of that comprising of video. There will be more than 10 billion versatile associated gadgets by

2020, which will surpass the world's normal populace around then.

However, the Quality of Service (QoS) assessment of this kind of system design is exceptionally testing because of the nearness of various correspondence advancements. Distinctive correspondence advancements have diverse qualities and the applications that use them have one of a kind QoS necessities. Managing QoS for video or voice applications over heterogeneous networks is a challenging task.

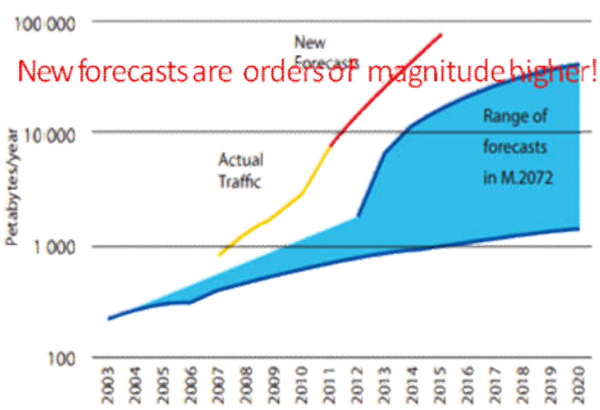

Figure 2

Existing work of Researchers has been summarized in Table.

S.NO	TITLE	YEAR	Discussion
1	Measuring Quality of Service Parameters over Heterogeneous IP Networks(1)	2005	It study on QoS parameters in UDP & TCP by using n/w performance evaluation tool D-ITG(Distributed Internet Traffic Generator)
2	Quality of service statistics over heterogeneous networks: Analysis and applications(2)	2007	In this, tests conducted on QoS properties like throughput, delay & jitter using NS2 simulator.
3	Optimizing end user QoS in heterogeneous network environments using reputation and prediction(3)	2013	In existing paper through the use of MADM algorithm authors improved upon the QoS perceived by the mobile node in the n/w selection process. In proposed VHO decision algorithm using AI are through the use of Fuzzy logic in association with a TOPSIS MADM model is used to represent the overall QoS of the n/w.
4	Analysis of Packet loss and Throughput In Heterogeneous Mobile Ad-hoc Networks over UDP(4)	2013	In this paper author compares the different graphs on the basis of various performance metrics. Thus the paper represents a novel technique of optimization of the traffic for UDP classes under various constraints of net-work parameters that may be useful in the analysis of study in multimedia routing in MANET.
5	QoS Improvement for the Next Generation Heterogeneous Network(5)	2014	IPQoS algorithm is used to improve overall performance of n/w by configuring of queuing methods. LTE is designed to increase the capacity & speed of mobile telephone n/w. In this a hybrid coupled interworking model WLAN-WiMAX-LTE-LB-IPQoS architecture will improve the n/w performance and decrease handover delay.
6	A Dynamic Link Aggregation Scheme for Heterogeneous Wireless Networks(6)	2014	Existing technique not achieved expected data rates. In this paper link aggregation is used for achieving high data rates. It is consider dynamic of wireless links. It proposes DLAS in NS3 simulator & found that DLAS schemes achieve considerable improvement in data rates.
7	A Study on the Effect of Transmission Power Adaptation of QOS/QOE Mechanisms in Heterogeneous Wireless Networks(7)	2014	In this by reducing delay & jitter it improves the QoS. Author used the PIM-SM,PIM-DM tree based protocols because it is protocol independent because PIM does not include its own topology discovery mechanism, but instead uses routing information supplied by other routing protocols
8	Improving heterogeneous	2015	Cross-layer information allows monitoring of the condition of the

	wireless networking with cross-layer information services(8)		network in multiple layers on a user and application basis. The second research topic considers the techniques the network management entities can use to improve resource usage in wireless networks based on the Collected cross-layer information.
9	QoS In heterogeneous wireless networks: a review(9)	2015	It discuss on existing technique. It also describes difference between Wimax and WiFi.
10	QOS Evaluation of heterogeneous networks: application-based approach(10)	2016	It is mainly subject to change depending on the requirements of particular n/w. In the wireless n/w the application performance is affected by different factors like environment, technology, n/w architecture.(Education & Health)
11	Simulation and Analysis of Quality of Service (QoS) Parameters of Voice over IP (VoIP) Traffic through Heterogeneous Networks(11)	2017	It discuss all the QoS parameters in different n/w.
12	Enhancing Quality of Service in Heterogeneous Wireless Network using EDLAS(12)	2017	It is proposed to DLAS, it uses Fuzzy system, it is an enhanced technique for the transmission of data through different interfaces present in different wireless n/w. The work is implemented using MAT Lab.

III. PROPOSED TECHNIQUE

3.1 What are Multi-RAT Heterogeneous Networks

Integrated Networks supporting a range of cell sizes and backhaul solutions that allow for seamless interworking between multiple radio access technologies and are operated using novel scalable self-organizing and self-optimizing techniques

• Cell sizes include macro, micro, pico, and femto

• Backhaul solutions include existing carrier-grade backhaul, commercial grade wired backhaul, DSL, Cable, in-band wireless backhaul, i.e. relays, and out-of-band wireless backhaul

• Radio access technologies include 2G onwards + WiFi and other unlicensed technologies where coupled with LTE/LTE-A radio access networks

• Self-organizing and self-optimizing techniques apply e2e and include those for RAN and CORE Such networks allow for Seamless mobility

• Leveraging of Common Network Assets especially in the CORE

• Common architecture and infrastructure for service delivery across the entire network

• Unconstrained radio evolution to meet changing subscriber needs

A good example is CDMA networks evolving to LTE via eHRPD

3.2 Multi-RAT network architecture for the 5G wireless world:

Confined in this specific situation, the paper portrays the normal vision on Multi-RAT organize design advancement and the presentation of insight towards the making of brilliant frameworks past the 2020, 5G remote world. By distinguishing current patterns in portable systems, the White Paper gives principle parts of key functionalities to layout an unmistakable way to future system arrangements. NGMN (Next Generation Mobile Networks) has additionally a committed undertaking identified with

"RAN Evolution" in order to give suggestions on future radio access arrange designs.

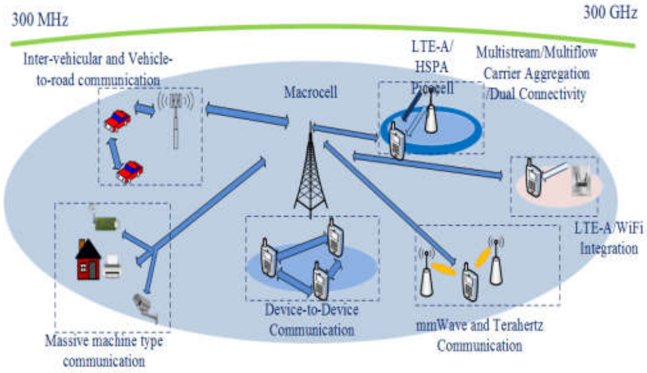

Figure 3

3.3 Trends and Challenges of MBB More traffic; Denser networks:

Expanded heterogeneity With versatile broadband (MBB) development and advancement of the system, the system is getting to be noticeably thick and refluxing, each site can be up to seven groups range, five modes (GSM/UMTS/LTE-FDD/TD-LTE/WiFi), and five layers organize engineering (Low-recurrence large scale scope layer/high-recurrence limit layer/hotspot Micro limit layer/indoor Pico layer/WiFi hotspots). On the off chance that absence of compelling coordination, it can't viably utilize the majority of the remote system assets and can't ensure client encounter. Then, perspective terminals, cushions and different sorts of clients' hardware (UEs) spread rapidly, and the administration kinds of MBB increment quickly. In such a multi-layer/multi-band/multi-mode remote system, an inquiry on the best way to enhance the use productivity of radio assets, to ensure QoE of MBB benefit, to streamline multi-RAT organize administration, is a colossal test of the Single-RAN.

3.4 Three targets of multi-RAT network architecture:

Empowering brought together administration and composed use of assets At show, the conjunction of a few systems accept the presence of various abilities. Not the greater part of the current terminals can bearing every radio framework, so multi-RAT systems can't completely substitute for the distinctive sort of administrations to help execution. For instance, throughput rate of information is speedier than different RATs in the current LTE arrange. What's more, the VoLTE (Voice over LTE Initiative) is proposed by GSMA [8] in order to guarantee congruity of voice calls when a client moves from a LTE cell to a non-LTE cell. According to service requirements, SRC needs real-time unified management of all wireless resources so as to coordinate the usage of resources in different RATs (Figure 3-1), in order to meet the following targets:

1) Improve the overall utilization of radio resources;

2) Guarantee users that they get consistent service experience regardless the used system;

3) simplify the process of multi-RAT interoperability, reduce network management difficulty;

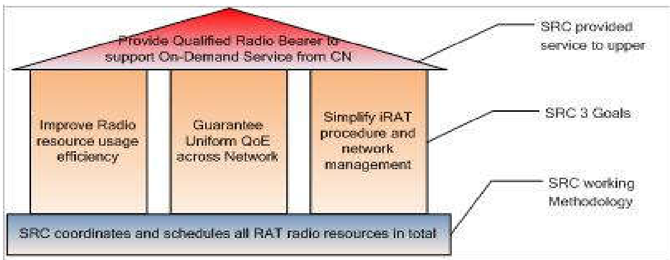

Figure 4

Single Radio Controller (SRC) for Multi-RAT operation SRC is a unified controller network entity for unified radio resource and traffic management SRC is a unified controller network entity that is integrated with RNC/BSC/WiFi AC/eCo functions and provides unified multi-standard radio resource management and unified traffic management. SRC uses common hardware and has software-defined configurable capabilities. As Figure 4-1 illustrates, in the SRC, eCo and RNC, BSC and other controllers are integrated. Multi-RAT controller and eCo are integrated to a big controller, responsible for the management and coordination of all multi-standard base station radio resources and unified wireless bearer capabilities to Single Core.

Similar to UMTS/GSM coordination are the management functions within multi-cell in RNC and BSC. SRC as multi-RAT controller is responsible for coordinating G/U/L/WiFi multi-RAT cell. As Figure 5-1 illustrates, SRC functions can be divided into three layers, each of which has multi-RAT coordination function and coordination function among eNBs, as well as the coordination of the cellular network with WiFi.

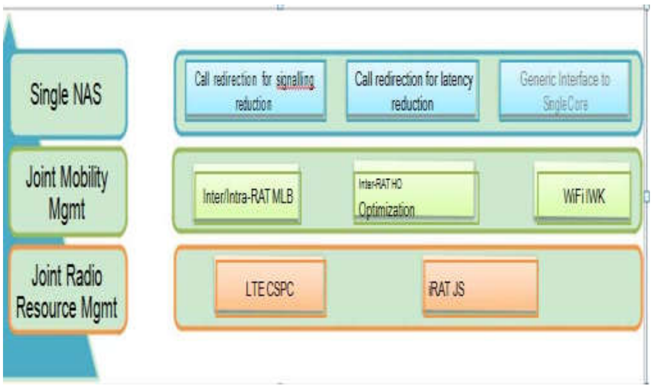

Figure 5

IV. CONCLUSION

New application classes, for example, upgraded portable broadband (eMBB) correspondence, ultra-dependable and low dormancy interchanges (uRLLC), gigantic machine compose interchanges (mMTC), and Internet of Things (IoT), have increased huge intrigue as of late for 5G remote systems. The pattern on the choice and the quantity of cell phones alongside the portable applications will positively proceed past 4G, making an extensive variety of specialized difficulties like cost, control productivity, range effectiveness, extraordinary unwavering quality, low idleness, heartiness against different channel conditions, agreeable systems administration ability and conjunction, dynamic and adaptable usage of remote range, and so on.

The aim of this Special Issue is to provide a forum for the latest research and advances in the field of RATs for beyond 5G wireless networks.

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