Evolution of the Quality of Service (QOS) Parameters for the Short Message Service (SMS): Review Paper

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Abstract
The widespread usage of SMS services in cellular systems and increasing number of service providers necessitates concerning of SMS QoS in these systems. This paper proposed six groups of telecommunication QoS and SMS QoS studies, groups are classified according to the objective, the objective of each group is as follows: group A QoS definitions, parameters and parameters computations, group B Telecommunication QoS monitoring systems, group C Setting target values of telecommunication QoS parameters, group D Non-utilization QoS of ICT services, group E Improving SMS QoS and group F Measurements of SMS QoS parameters. A number of SMS QoS studies conducted since 2003 and appeared in literature are fully assessed.

I. INTRODUCTION
The increasing penetration of mobile networks is due to its ability of offering services during subscribers roaming. Telecommunication QoS organizes the relationships between telecommunication companies, service providers, regulators and subscribers. It determines the quality limit of the provided services. ITU defined QoS as degree of user satisfaction[10]. Short Message Service (SMS) is the most popular service in mobile systems for:
- It is low fee service.
- Every subscriber to a mobile network that supports SMS can be reached via SMS.
- There is an increasing number of SMS applications (value added SMS-based service or premium services).

Fig(I-1) below illustrates that the global number of SMS in 2016 is expected to be 9 billion messages, till 2016 SMS penetration is superior over IMS [20].

There are many factors affecting SMS QoS:-
1) High revenue is the main goal of service providers, so they conducting services like SMS with low cost and low quality.
2) Subscribers have no ability to select the adequate service provider.
3) System subscribers are not aware about their rights.

According to the factors mentioned above, it is the high time that governments take serious effort for monitoring service providers performance, publish reports explaining the results of monitoring and apply obligations against service provider which introduced performance less than the specified level.
Table (1-1) below shows Nineteen studies in the area of telecommunication and SMS QoS are classified to six groups according to the most common features, which may be objectives or methodologies or other common features.

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II. ROUP A Telecommunication QoS definitions, parameters and parameters computations

The main issue of this category is the Telecommunication QoS definitions, parameters and parameters computations, which is composed of studies [1],[2],[3] and [4]. [1] Established a uniform approach to QoS across ITU-T and eliminate the confusion resulting from different frame work and inconsistent definitions, and Defined telecommunication QoS from four points of view:- 1) QoS offered by provider. 2) Customer’s QoS requirements. 3) QoS achieved by provider. 4) QoS perceived by customer.

In [2] QoS parameters are classified as follows: 1) Service independent QoS parameters. 2) Direct services QoS parameters. 3) Store and Forward services QoS parameters. Also [2] and [4] proposed QoS parameters model, [2] and [3] proposed four SMS QoS parameters: a) SMS Service Non-Accessibility MO, b) SMS Access Delay MO, c) SMS Completion Failure Ratio, d) SMS End-to-End Delivery Time, however for computing SMS successful attempts in [3] and [4], the equation does not consider the dropped notifications between receiver and SMS centre and between SMS centre and sender.

ETSI document is main reference of [3] and [4], [4] proposed six SMS QoS parameters:
a) Service Accessibility SMS MO
b) Service Accessibility SMS MT
c) Access delay SMS MO
d) Access delay SMS MT
e) End-to-End Delivery Time for SMS MO
f) End-to-End Delivery Time for SMS MT.

In [4] all defined QoS parameters and their definitions are on field measurements, that indicates the measurements were made from customer point of view[Full end-end perspective].

III. OUP B. Telecommunication QoS monitoring systems

[5] Proposed Global Roamer System which monitor and measure QoS during international Roaming. Comparisons QoS of SMS and basic call for international routes between Malysia and (USA, Pakistan and South Africa) is the main advantage of this study. The methodology of the Gloabal Roamer monitoring system based on test calls and test SMS messages.

Describing the implementation procedures for measuring the quality of SMS, voice and data roaming services end-to-end is the main issue of study [6], it introduced table of results of monitor and measurement of many services parameters by many monitoring systems (end-to-end active testing, SS7 monitoring and camel), the monitoring is done by Roaming Hubbing Provider, HPMN and VPMN. The contribution of this study can be summarized as providing QoS improvement by proper monitoring it.2) The document helps the user or SP or vendor to select the better method to measure specific parameter at specific condition.

Increasing QoS/QoE of IP-Based platforms to regionally agreed standard is the objective of study [7], it introduced measurement objectives and methodologies for performance and quality, including appropriate reference network model and proposed information about building blocks to form of QoS and their mechanisms. The study introduced common understanding about NP, QoS, QoE and SLA and their relationships.

IV. GROUP C Setting target values of telecommunication QoS parameters.

Studies [8] and [9] are in the area of setting target values of telecommunication QoS parameters. [8] focusing setting target values of parameters govern end user satisfaction, it identified eight distinct categories of Telecommunication QoS, the model of categories is based on end-to-end user perception.

The categories (performance targets) provide indications of the upper and lower boundaries for applications to be perceived as essentially acceptable to the user and determines whether a bearer channel qualified to carry agiven application’s data.

Reference values of parameters relevant to time are specified for telephone, SMS, MMS and data services by study [9], which proposed classification of measurement environments.

V. GROUP D Non-utilization QoS of ICT services

Recommendation ITU-T E803 is the main reference of studies in this category. The area of Non-Utilization Telecommunications QoS is the main issue of [10],[11] and [12]. [10] only focusing non-utilization stage of telecommunication QoS and lists 88 parameters over the product life cycle of ICT service. The study provides: 1) Enable customers and users of ICT services to compare performance of service providers of ICT services. 2) QoS performance on non-utilization stages can benefit customers, regulator, stakeholders and service providers to monitor performance levels for the benefit of the customer and ICT industry.


VI. GROUP E The improving of SMS QoS.

SMS QoS improvement is the contribution of all studies in this category. An efficient SMS transmission in cellular Network using Load Adaptive Multi Access with Collision Avoidance protocol (LAMA/CA) is the objective of study [13] in which Channel access probability depend on channel load (LAMA). Authors in [13] Introducing Backoff mechanism which prevents SMS messages from blocking the signal channel and overpcketing packet loss due to delay exceeding life time of the message, but channel utilization is limited due to the restricted transmission at the beginning of the time slot. Improvement of SMS QoS- based buffer optimization is the objective of [14] and [15]. In study [14] the optimization is performed on line, as a result, the approach can be used to continuously adjust the buffer size, but the study derive sensitivity estimates which might not always deliver accurate performance estimates for a “real” discrete-event system. The authors in [15] considering QoS requirements to the new and forward messages and design an optimal buffering scheme for SMS transfer in GPRS/UMTS Networks, however they Considering the system is homogeneous GPRS/UMTS SMS Networks.
The study introduced the target of SMS centre. The study not considered unsuccessful transmission attempts.

Authors in [17] proposed a Reconfigurable QoS Monitoring Framework for Professional Short Message Services in GSM Networks, the study contributes:

1. Assessment and analysis of SMS QoS in the signaling domain, and proposing the appropriate parameters.
2. System framework for SMS QoS monitoring, alerting and reconfiguring an SMS centre.
3. Improves SMS QoS level and reduces the efforts of SMS centre.
4. Reduces packet loss due to inadequate received signal quality, but modifications of many SMS parameters are must be because they are unknown or can not be obtained at SMS centre.

A quantitative Analysis of the quality of service of SMS in Philippines is proposed by authors of study [18], the study introduced

1. Considering the unsuccessful sending attempts.

2. completion rate given more weight by cubing it instead of squaring at previous equations.
3. The first measurements of SMS QoS provided by the three carriers in Philippines.
4. Comparison between the QoS of the three carriers in Philippine.

Evaluation Procedure for QoS of SMS. International SMSRoute analysis is the main issues of thesis [19], in which the author introduced QoS evaluation for international SMS traffic according to correctness of the delivered messages. This thesis suggests a method of quality of service (QoS) assessment for international SMS service which combines two types of tests, end-to-end delay measurements and various verification tests. To become a worldwide premium service, service provider can sign contract with one or more SMS gateway provider instead of owning SMS centre, on the other hand sending packet pairs in different rates can’t fully explain fluctuation of the network traffic flow.

Note:-


VIII. Conclusion

- In general and from the groups implemented it was found that most of SMS QoS studies are concerned the evaluation of QoS parameters.
- The area of messaging QoS research is now mature in multimedia applications but still there is need of improving and monitoring SMS QoS due to its widespread.
- Setting target values for SMS QoS parameters is necessary for improving and monitoring SMS QoS.

References


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