A Framework to Facilitate Network Operators to Provide Better Quality of Service in Mobile Networks

P. Calduwel Newton is serving as an Assistant Professor in Computer Science at Bishop Heber College, Tamil Nadu, India and also pursing Ph.D. in Computer Science at St.Joseph's College, Tamil Nadu, India.

Dr. L. Arockiam is serving as an Associate Professor and Research Advisor in Computer Science at St.Joseph's College, Tamil Nadu, India.

I. Motivation

The challenges that are involved in enhancing Quality of Service (QoS) can be classified into segment-level and network-level. The segment-level challenges are involved in local, national and international segments. The network-level challenges are involved in wired, wireless and mobile networks. The wireless and mobile networks are further classified into different types like infrastructure wireless network, infrastructure-less wireless network, mobile network with host mobility, mobile network with network mobility, etc. The data transfer between a sender and a receiver can happen via various types of networks which greatly influences QoS Experience (QoSE). The research shows that challenges in local segment are less, in national segment are medium and in international segment are high. Comparatively, providing Quality of Service (QoS) in wired network has low complexity, wireless network has medium complexity, mobile network with host mobility has high complexity and mobile network with network mobility has very high complexity. Our research question is that how better QoS can be provided in heterogeneous networks and proposes a framework to reduce QoS deterioration.

II. Contribution

The framework has three sub-systems as shown in Figure 1. They are, QoS Measurement Sub-system (QMS) to measure the services offered by network operators, QoS Prediction Sub-system (QPS) to identify reasons for QoS deterioration and QoS Enhancement Sub-system (QES) to improve QoS based on prediction. Based on the results from QMS, QPS can asses the reason for QoS deterioration and based on the assessment QES can trigger appropriate actions to reduce / eliminate QoS deterioration.

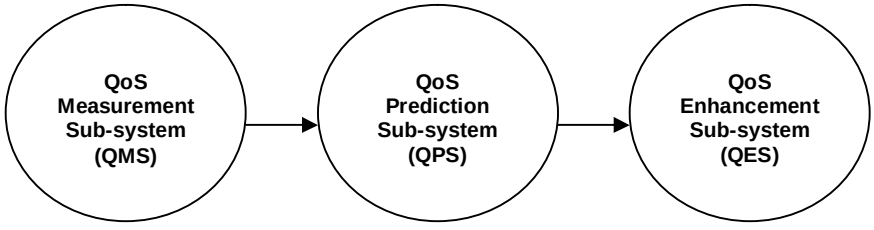

Figure 1: A QoS Framework

At present, only tools for QMS such as AT-Tester, Speedtest.net, etc. are available. There are no tools for QPS and QES. This delays the process of enhancing QoS which in turn leads to

customer dissatisfaction. If the tools for QPS and QES are developed, it can identify the reasons for QoS deterioration and take remedial measures for QoS enhancement automatically and very quickly without manual intervention. Hence, tools for QPS and QES are necessary.

III. Conclusion

At present, to enhance QoS more of manual intervention techniques are used which slow down the enhancement process. This research proposes a framework to use more machine intervention techniques to enhance QoS very quickly.

- Manual Intervention vs. Machine Intervention
  - Manual Intervention:
    - QoS deterioration can be reduced / eliminated by the people (customer / service provider / regulator)
    - Much of the tasks involved in QMS, QPS and QES are done manually
    - Consumes more resources like time, manpower, money, etc.
  - Machine Intervention:
    - QoS deterioration can be reduced / eliminated by the product (Hardware / Software)
    - Much of the tasks involved in QMS, QPS and QES are done using hardware and software
    - Results can be obtained quickly, repetitively and accurately compared to manual intervention

Table 1: Level of intervention at various stages

Stage(s)	Manual Intervention	Machine Intervention
Measurement	+++	+++
Assessment	+++	++
Improvement	+++	+

Legend: +++ Good, ++ Average, + Poor

IV. Policy Recommendations

- Provide light-weight QoSE measurement tool to be installed in customer side and in ISP's side
- Design and development of QoSE database at the service provider side to store measured data
- Design and development of machine learning tool to assess QoSE from the data available in the QoSE database
- Design and development of QoSE improvement tool to take remedial action against QoS deterioration
- Design and development of mechanism to update the QoSE assessment and improvement details to the regulator periodically