

**Scalability and Satisfiability of Quality-of-Information in Wireless Networks**

**Abstract:**

Quality of Information (QoI) provides a contextdependent measure of the utility that a network delivers to its users by incorporating non-traditional information attributes. Quickly and easily predicting performance and limitations of a network using QoI metrics is a valuable tool for network design. Even more useful is an understanding of how network components like topology, bandwidth, protocols, etc. impact these limitations. In this paper, we develop a QoI-based framework that can provide this understanding of limitations and impact by modeling the various contributors to delay in the network, including channel rate and contention, competing traffic flows, and multi-hop propagation effects, and relating them to QoI requirements, especially completeness and timeliness. Analysis shows that large tradeoffs exist between network parameters, such as QoI requirements, topology, and network size. Simulation results also provide evidence that the developed framework can estimate network limits with high accuracy. Finally, this work also introduces *scalably feasible QoI regions*, which provide upper bounds on QoI requirements that can be supported for certain network applications.

**Existing System:**

In many applications, however, the relationship between these metrics and the effectiveness of the network is highly non-linear. Therefore, having a framework to evaluate network scalability with respect to achievable *Quality of Information* (QoI) requirements is necessary.

Additionally, while theoretical, asymptotic analysis of individual network topologies, protocols, etc. is important, such analysis lacks the ability to quickly obtain an accurate estimate of a projected network’s abilities when these individual components are pieced together. Often, extensive simulation or

experimentation testbeds must be created to test proposed network setups, which is difficult and time-consuming.

**Proposed System:**

QoI is a multi-dimensional metric that can be defined for an application to give a more meaningful measure of the value of information. It consists of attributes such as timeliness, freshness, completeness, accuracy, precision, etc. For example, information that contributes to a decision-making process may only be useful if it arrives before the decision must be made, or it may have varying usefulness based on how similar or dissimilar it is to other data already collected.

The specific details of which attributes are considered and how they contribute to QoI is application-dependent. Chosen QoI metrics are stored as a vector associated with a data item. Here, as in, data is evaluated based on whether it satisfies all of the QoI requirements or not. We use this approach to establish the edges of QoI satisfiability for the vector of metrics, which defines the boundaries of maximum achievable QoI regions in the metric space.