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                          DCOSS 2015 Review #21A  
                     Updated 3 Apr 2015 12:07:06pm EDT  
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   Paper #21: Scalability and Satisfiability of Quality-of-Information in  
              Wireless Networks  
---------------------------------------------------------------------------  
  
                      Overall merit: 3. Weak accept  
                 Reviewer expertise: 3. Knowledgeable  
  
                         ===== Paper summary =====  
  
The paper concerns considering "Quality of Information" (QoI) as non-traditional, yet useful metric for providing evaluation of network performance. In particular, the framework proposed in this paper attempts at giving quantifiable information on scalability and QoI satisfiability, as well as timeliness. The framework is then used to compare protocols, network topologies, traffic models, in a new way, i.e., beyond the too network-centric notions of throughput and latency. The framework usefulness is demonstrated by comparing its output to ns3-based simulations. The paper terminates by introducing the concept of scalably feasible QoI region, aimed at determining the QoI capacity of a given network scenario.  
  
                           ===== Strengths =====  
  
I believe the novelty is the major strength of this paper.  
  
                          ===== Weaknesses =====  
  
Paper organization could be better.  
  
                     ===== Comments for authors =====  
  
Although the concept of QoI (or the similar one of value of information) is not new, this paper stresses the importance of "gnostic" networking by moving the focus of network performance investigation on the usefulness and perceived important of information to the user. Besides the many work on the topic cited in the paper, this attention to information as a metric was started by works by Bisdikian et al. and more recently by Boloni, Turgut et al. for underwater networking (paper at Infocom 2014).  
The paper is definitely interesting and deserves publication. Some minor fix that the authors might want to consider include the fact that, for instance, image collection is mentioned for the first time in the related work section, and one does not really immediately understand why it is there. Section III explains why it is used (motivating example---It actually takes quite a portion of the paper without being an actual contribution). Perhaps it can be mentioned more clearly in the Introduction.  
The References section has some typos (missing spaces or "."), easily amendable.  
  
Suitable as work in progress paper?: 2. No  
  
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                          DCOSS 2015 Review #21B  
                     Updated 24 Mar 2015 9:48:19pm EDT  
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   Paper #21: Scalability and Satisfiability of Quality-of-Information in  
              Wireless Networks  
---------------------------------------------------------------------------  
  
                      Overall merit: 3. Weak accept  
                 Reviewer expertise: 2. Some familiarity  
  
                         ===== Paper summary =====  
  
The paper presented an investigation into the design of quality of information (QoI) based framework. The problem mentioned by this paper is useful and practical, since effective design and analysis of a wireless network requires the ability to understand how the network’s parameters impact the limitations with respect to QoI and scalability. The author developed a framework that can be used to give approximation of QoI and network limits. Further, the concept of scalably feasible QoI regions was introduced. Experimental simulations were conducted to demonstrate the accuracy of the given algorithm.  
  
                           ===== Strengths =====  
  
1. The author developed a framework that can be used to provide approximate values of QoI and network size limits for a specific network.  
2. The accuracy of the proposed framework was validated by comparing analytical results with simulations performed in the ns3 network simulator.  
3. The concept of scalably feasible QoI regions was proposed, which refers to the region in which all sets of QoI pairs can be supported with the given network signature.  
4. The proof of traffic factor for grid network is clear.  
  
                          ===== Weaknesses =====  
  
1. In the section of QoI Scalability, the author introduced the concept of delay factor (DF) to account for the multi-hop propagation delay. The method for computing DF was exemplified in a specific network. DF is an important factor to estimate the timeliness requirement. I think the author should discuss how estimate DF in a general network and the author should give a formula for estimation DF.  
  
2. In the section of Validation, the experiment configuration and the simulation environment should be present in more details, which is helpful to convince the effectiveness of the proposed method.  
  
                     ===== Comments for authors =====  
  
There are syntax errors. For example, the third paragraph right column on page 1 “Given a certain QoI that is desired by users of a network, what is the the maximum number of nodes that the network can support?”.  I think the presentation of this paper should be double checked before publish.  
  
Suitable as work in progress paper?: 1. Yes  
  
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                          DCOSS 2015 Review #21C  
                     Updated 26 Mar 2015 5:15:41pm EDT  
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   Paper #21: Scalability and Satisfiability of Quality-of-Information in  
              Wireless Networks  
---------------------------------------------------------------------------  
  
                      Overall merit: 2. Weak reject  
                 Reviewer expertise: 3. Knowledgeable  
  
                         ===== Paper summary =====  
  
This paper proposes a tuple as a model for a quality-of-information (QoI) metric consisting of timeliness and completeness, i.e., data must arrive by a certain time for it to actually be useful for the application.  To evaluate QoI, topologies are set up, and image selection algorithms are proposed, along with how to measure similarity (and dissimilarity). A framework for evaluating QoI considering various factors such as the channel, traffic, delay, and average path length is proposed.  Then using the framework, applied to the image selection algorithms, the scalability of QoI for three topologies (a line, a clique, and a grid) is considered.  From this the notion of a QoI feasible region is developed.  
  
                           ===== Strengths =====  
  
The QoI metric proposed is the very best part of the paper.  I agree that throughput, by itself, is insufficient to judge whether the data transmitted is useful to an application.  
  
                          ===== Weaknesses =====  
  
What really bothers me is that the authors appear not to be aware of work in designed experiments (DOE) and response surface methodology (RSM) that can do essentially what they are proposing.  For me, this really kills the paper.  The authors cite a \*lot\* of their own work so, to me, the work is a little insular.  
  
                     ===== Comments for authors =====  
  
I suggest the authors familiarize themselves the field of designed experiments, and in particular response surface methodology (RSM). It is highly related to the work you have done.  Not only that, RSM will \*give\* a response surface (something like your Fig. 10) \*AND\* also equations that you had to derive by hand.  You can define more than one response for the technique, just as you have done with your QoI metric.  So I don't really see the new contribution of your work when I could have gone out and used RSM to do essentially the same thing.  It works with data from simulation, or data collected from experimentation with a real system.  It does have some limitations (i.e., it can't consider all that many factors at once) but then I don't think you can either, so I don't view it as a weakness specifically of RSM over your approach.  It can even deal with more general topologies than you can.  
  
In VIII, you "believe" the framework you have proposed can be applied to more complex, irregular network topologies, but actually, I am pretty skeptical about it.  
  
Of course your paper is quite well written, but I really view its novelty as very low. A few typos:  
1) Page 2, III.A, "and two the" to "and two that".  
2) In general, if you write a complete sentence inside parentheses, it should include a period, e.g., page 5, "(We discuss... in Section VIII.)" -- add the period \*inside\* the ().  There are at least two instances that need correction.  
  
Suitable as work in progress paper?: 2. No  
  
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                          DCOSS 2015 Review #21D  
                     Updated 30 Mar 2015 7:19:30am EDT  
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   Paper #21: Scalability and Satisfiability of Quality-of-Information in  
              Wireless Networks  
---------------------------------------------------------------------------  
  
                      Overall merit: 2. Weak reject  
                 Reviewer expertise: 2. Some familiarity  
  
                         ===== Paper summary =====  
  
The study of network scalability and performance limitations is an important issue in the literature. This paper adopts the concept of QoI, including a number of attributes such as completeness, diversity, timeliness, etc., and proposes a general framework for quick identification of the limitations in a wireless network for supporting certain levels of QoI.  The proposed work models the relationship between the amount of network flows and completeness/timeliness QoI. With the model, given the QoI requirements, the maximum amount of network flows can be identified. This information can be used for protocol design, network deployment, etc.  
  
                           ===== Strengths =====  
  
1. Compared with existing works, the QoI metric allows for more flexible scalability and performance study.  
2. The study on the problem of image selection is quite comprehensive.  
  
                          ===== Weaknesses =====  
  
1. The novelty is limited. Some existing works have been done to achieve similar goal such as [14]. The main difference is the consideration of the entire network's information. However, it does not theoretically guarantee better performance than [14], making this difference a trivial improvement.  
2. Only three ideal network topologies are considered. However, in practice, the network topologies can be far more complex, posing significant challenge to the modeling of the framework.  
3. The rationale of the definition of completeness is unclear. For instance, in III.A.1), the completeness is defined as the sum of image similarities. This factor greatly depends on the searching algorithm and the image data bases on each node. The network limitations can be identified only when all nodes' searching results are collected. However, if all these measurements are done, the power of the modeling becomes trivial.  
4. When modeling the timeliness, the sources and destinations are assumed randomly distributed. However, considering that the completeness of each different node is different, for a given source node, only a set of nodes can be selected as destination. The randomness here assumes that all nodes can meet the completeness requirement, which is unreasonable.  
  
Suitable as work in progress paper?: 1. Yes