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**Interactive
comment**

Interactive comment on "Automated observatory in Antarctica: real-time data transfer on constrained networks in practice" *by* Stephan Bracke et al.

Anonymous Referee #3

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1   General remarks

The paper addresses the topic of (near) real-time (NRT) data transfer of typical data acquired at a magnetic observatory and discusses challenges and solutions for NRT data transfer from a remote location. The authors discuss the subject applied to the Princess Elisabeth station in Antarctica. In the introduction, the authors present the history, location, and basic operational setup of this research station along with the resulting challenges with respect to operating a magnetic observatory at this location. In the second section of the paper, a definition of NRT data transfer is given, and an overview of traditional data transfer protocols is presented. Subsequently, the authors

discuss possible modern alternative protocols for NRT data transfer. The third section describes the favored MQTT protocol, and the paper concludes with a section on experiences with MQTT and an outlook describing alternative, modern protocols.

NRT data transfer is a recent topic in the operation of magnetic observatories, in particular with respect to space weather and industrial (oil industry) applications. The paper gives an overview of possible solutions, and describes the approach used by the Observatory of Dourbes. In my opinion, this paper will serve as a valuable reference and as a good example how to implement NRT data transfer at a remote observatory. Therefore, I support publication of this article in GI with minor revisions.

Besides the comments of the previous reviewers, in particular the lack of citations, and the lack of detail on the implementation, I have two major suggestions:

First, the language of the paper is often very informal, and sometimes grammatically incorrect. I would strongly recommend to carefully review the grammar and language of the paper. Some exemplary suggestions are given below.

Also, I would suggest to restructure the paper as follows: The first section (Introduction) should not focus on the history and setup of the observatory, but rather introduce the topic as suggested by the title: "real-time data transfer in constrained networks". For example, the definition of near real-time (NRT) (p.2,l.26ff.) should be given in the introduction, and the necessity for NRT at magnetic observatories should be discussed. Also, some examples on previous approaches could be moved to the introduction (p.3, l11-24). Although the application to the observatory should be mentioned in the introduction, I would move the detailed description to section 4, which I would rename "Application to an automated observatory in Antarctica".

2 Comments on the content of the individual sections

2.1 Introduction

- p.1.l.19: Are six digits the real accuracy for GPS (0.11 m)?

- p.1,l.28: Why is a radome used? Any particular reason?

- p.2,l.7: What temperature range are the "extreme temperatures"?

- p.2,l11: ARM processors are primarily used in smartphones, so I guess that's the reason why they are so cheap, and why they are used in Raspberry Pi.

- p.2,l16: Do you use the rugged version? What is its recommended temperature range?

- p.2,l19: Some more details on the self-written software would be appreciated, e.g. are you using GPS time stamps from LEMI/GSM or a separate GPS? What programming language was used? How does the software collaborate with MQTT publisher, e.g. what is the interface to MQTT? Apart from that: If you used the mentioned proprietary file-based windows software of LEMI and GSM, how would you use MQTT in this case –> reading from the file? This might be interesting for Windows users.

2.2 Towards real time data transfer

- p.2, l.28: Is this your definition or cited, please specify and cite, if applicable.

- p.3,l.4: Is the delay of 0.3s due to the used datalogging software, or inherent in the LEMI? How did you measure or get this number?

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- p.4,l. 16: What does +/- 30 bytes mean here? Does it mean about 30 bytes or XXX bytes +/- 30 bytes?

- p.4 bottom: Shortly describe the exact meaning of "Internet of Things"

2.3 MQTT explained

Generally, I would be interested in more details how MQTT can collaborate with existing datalogging software at magnetic observatories, in particular as such software is traditionally based on files. Also, how do you send data to the MQTT publisher in your setting? Such a description may be added to Section 4 as suggested above.

- p.6,l.9-11: I don' understand what "decoupled" means here. You say "a publisher [...] to receive messages." I thought that the subscriber receives messages?

- p.6, l.13: Is there any special meaning of the dashes? E.g., could you subscribe to myhome/floor/room and obtain all sub-messages under this tag?

- p.6,l.16: Are there any security measures, i.e. how is it avoided that everybody on the web can subscribe to your messages?

- p.6, l.17: "are most of the time programs": Except programs, what kind of publishers and subscribers can exist?

- p.6, l.24: How is the description of the data linked to the message? URL? Or is metadata also transferred?

- p.6, l.22: Here, it is not yet clear what the role of the broker is (-> refer to next subsection).

- p.7: Mention which QOS you use and why (can go to section 4).

2.4 Experiences after one year of data flow

- p.7, l.23: Setup of MQTT? Please specify what you mean by "setup" here.

- p.7, l.28: Please describe in more detail how MQTT is embedded in your system. For example, you should mention that you use MQTT.js (I assume), and very shortly mention how node.js works. This is related to my general comment in "3) MQTT explained".

- p.7,l.28: You mention that you never close an mqtt connection. However, as I understand it is automatically closed after not receiving messages for the keep alive interval. Please clarify.

- p.8,l.8: You could mention how these 300 ms would compare with fastest feasible rsync / ftp.

- p.8,l.9 After re-establishment of a closed conenction, does MQTT or your program decide when and how data in the memory queue is sent ?

2.5 Conclusions

- p.8, l.21f: Does any of these protocols have advantages over MQTT for the described application in Antarctica?

- p.8, l.27: What do you mean by "this" ?

3   Some exemplary comments how to improve language

3.1   Abstract and Introduction

- p.1,l.6: Also valid for the remaining paper: Avoid the word "scientists". Better here: In 2013, a project was started by the geophysical data centre at Dourbes to install.....

- p.2,l.9: ... is to [transfer] real-time .... every second [to] Belgium

- p.2,l.12: avoid phrases like "you fight", better: Traditional file transfer protocols (for instance ....) show severe limitations when it comes to real-time data transfer.

- p.2, l.13: Try to remove unnecessary words, like: "on that moment". Another example is p.2,l.28: "and by doing so guaranteeing" can be replaced by "such". Please carefully check for more examples throughout the paper.

- p.2, l.23-26: This sentence is long and a bit confusing.

3.2   Towards real time data transfer

- p.3,l.12: "The one that got our attention is ..." –> "We decided to use...". Try to simplify phrases throughout the paper.

- p.3,l.13: Another example: "...but unlike the latter it is more..." –> "...but is rather..."

- p.3,l.21+22: As we can see –> As shown....

- p.3,l.3: our ARM –> the ARM

- p.3, l.7: "...word will not be possible and to be correct we should always talk..." –> "word is not possible and we should better talk...."

- p.3, l.11: "When we look at the way data transfer is done in the magnetic data collection projects we mostly fall back to file transfer" –> "Usually, magnetic data collection projects use file transfer protocols."

- p.3,l.27+28: "If we need to find....world has to offer": Very informal and a bit confusing. Please rephrase.

- p.4, l.21+22: The phrase: "The days were there were .... are definitely over". may be deleted and "For example," added at beginning of following sentence.

- p.4,l.23+24: "Millions....over the internet" may be removed.

- p.4,l.24: explosion –> increase

- p.5, table: Table number and description are missing.

3.3   MQTT explained

- p.5,l.27: "Message Queue Telemetry is not new. It was designed...." –> "Message Queue Telemetry was designed".

- p.6, l.2: "In 2011,....seconds. What makes....us that in 2013 IBM...." may be replaced by "In 2013, IBM...."

- p.6,l.28: Please rephrase "Also here....available"

- p.7,l.6: Usage of "Ok" is very informal. Better: "is acceptable"