

# Comment on “Problema dos Generais Bizantinos”

Rocha Ana, Rodrigues Artur, Morelli Jean, *Correia Ricardo, Cruz Rúben*

**Abstract**— “Problemas dos Generais Bizantinos” is a paper with a rich literature review related to distributed systems and cloud computing but lacks some exploration on the main topic which is about the Byzantine Faults Tolerance algorithm introduced by Barbara Liskov and Miguel Castro in the late 90s. We believe that has potential although it is necessary some overall structuration and objectives should be clarified to organize the topics necessary to answer them. Despite of that, it's an interesting article and the exploration of this algorithm in Blockchain was an interesting read.

## 1 INTRODUCTION

This paper will comment on the article “Problema dos Generais Bizantinos” written by Francisco Quinteiro, Lucas de Blanco, Otávio Andrade and Rita Martins. Said article focuses on Byzantine faults, a paradigm of large distributed systems, exploring what this fault consists of, presenting prevention mechanisms and real-life examples of when such fault occurred. Overall, we believe that the commented article has potential and scientific impact, since the mechanism to manage Byzantine faults is being applied in some hot topics of our everyday lives, like blockchain and cryptocurrency, but lacks some structural organization and leaves some questions to be answered, this opinion will be promptly justified and discussed throughout this paper.

## 2 EVALUATION

This article, we believe, provides sufficient, border lining on excessive, background to understand the topic in study, Byzantine faults, introducing concepts like concurrent computation, distributed systems, and their faults, briefly introducing Byzantine faults, before exploring this topic in more detail.

Starting by the introduction to this paper the examples used are not easy to understand, like “Quadrado Magico” and “cadeira de GRS”.

A topic that appears to be missing is in section 2.3, throughout this section a concept called structured sequential programming is mentioned, but never properly introduced, so a brief introduction to this concept would allow for better comprehension of this section. Some research into the given topic has also revealed that this article only explores Byzantine

faults when all generals can communicate directly with each other, and yet there is the possibility that such assumption is simply false in the real world [1], as such the practical significance of the article would increase as result of the addition of this missing topic. Another missing aspect that would boost the practical significance would be if the article presented the practical implementation of the concepts presented helping to bridge the gap between the given solutions in terms of the Byzantine generals abstraction and in terms of computing systems.

As for the main topic of the article we believe it's not properly delved upon has some important explanations for certain affirmations that go unmentioned, for example in sections 3.1 and 3.2 is mentioned that the detection of Byzantine faults by oral messages and signed messages can only be detected if  $2/3$  of the generals are loyal for oral messages or  $2m+1$  generals where there are  $m$  traitors for signed messages without giving proper justification forcing the reader to read the source of this statement, but considering the scope of the article at the very least a brief justification should have been given, leaving the more in depth justification for the sources. Also, in the same sections, the lack of pseudo code of these two ways to detect Byzantine faults make the understanding of the presented algorithms unclear, for example in oral messages what is the commander, do the lieutenants send the received message to the other lieutenants, these are questions that are answered by reading the given reference but should have been included in the article, as the lack of it reduces the clarity of how the faults are detected. This also includes the figures that were presented without any refence or proper legend in order to explain how the algorithm works on those two examples.

One of the main weaknesses we found in the article was its introduction and abstract, as they do not inform the reader what is the main purpose and results found or even the topics relating Byzantine faults that will be explored in the article, only mentioning that the focus of the paper are such faults and over emphasizing the introductory topics that will be introduced at the start of the article as part of the introduction of the topic in study, if the explored topics were more properly expressed the quality of the article would increase as a reader would immediately know the contents of the article, aiding in the decision the read the full paper. Another weak aspect of the article is its grammatical errors, as they are sprinkled throughout the article, they thankfully do not hinder the

- R. Ana is with the Faculty of Sciences and Technology, University of Algarve, Portugal. E-mail: [a63971@ualg.pt](mailto:a63971@ualg.pt)
- R. Artur is with the Faculty of Sciences and Technology, University of Algarve, Portugal. E-mail: [a63971@ualg.pt](mailto:a63971@ualg.pt)
- Morelli. Jean is with the Faculty of Sciences and Technology, University of Algarve, Portugal. E-mail: [a64014@ualg.pt](mailto:a64014@ualg.pt)
- C. Ricardo is with the Faculty of Sciences and Technology, University of Algarve, Portugal. E-mail: [a64007@ualg.pt](mailto:a64007@ualg.pt)
- C. Ruben is with the Faculty of Sciences and Technology, University of Algarve, Portugal. E-mail: [a64591@ualg.pt](mailto:a64591@ualg.pt)

understanding of the article.

There's some confusion terminology, namely regarding the definition of failure ("falha") and fault ("falta") that should be taken into account.

On the other hand a strength of the article in question is how it gives a good understanding on why creating systems that are tolerant to these types of faults by presenting two real life examples of where such faults can or did happen, having chosen them on basis of its drastic consequences.

In our opinion this paper is somewhat disorganized, as for example halfway in the section 1.1 the definition of a distribution system is given, this should have been moved to the section 2.1 which is dedicated for distributed systems, also some sections we believe should appear earlier than they appear in the paper, specifically section 2.3 should appear before section 2.1, as to first introduce what is concurrency and afterwards introducing distributed systems. Another issue of the organization is the seemingly senseless placement of the topic "Computação em Nuvem e Computação em Grid", section 5, as this placed at the end of the article without any specified connection with the previous topic, this should have been touched upon in the background sections.

In terms of references and their subsequent citations, we believe that they are a bit lacking, in the sense that it's not very diverse, having sets of section that only have one citation to a single reference and these sections in said set all use the same reference, and some other entire sections go without a single reference where the presence of a citation would be appreciated for further exploration of the presented topic.

### 3 COMPLIANCE WITH AUTHOR GUIDELINES

Regarding the compliance with author guidelines, the size of the article and the letter size is in compliance with IEEE's regular paper for Transactions on Parallel and Distributed Systems, this being the selected format of this paper, but when it comes to line spacing it is noticeably overly spaced, as well as the spacing between paragraphs is also excessive [2]. The use of an indent in the first paragraph of each section is also not in compliance with the previously specified format, this indentation should be only used in subsequent paragraphs of the section but not the first [2], and the introductory paragraph should have a drop cap [2] which is lacking in this article. Another aspect that is not in compliance with the author guidelines is the use of multiple citations, wherein they are not separated by commas, for example in the third page at the end of the second paragraph they have the citations in the following format "[1] [3]" but it should be "[1], [3]" [2] and the formatting of the references leaves much to be desired, as none follow their corresponding format according to IEEE Computer Society's style for reference formatting [2]. There is also a lack of the Abstract tag at the start of the article's abstract and the keywords used in the Index Terms section are also incorrect as they are not present in the taxonomy (<http://www.computer.org/mc/keywords/keywords.htm>) [2].

### 4 GRADING

In this section we will grade individually some pertinent aspects of the article, considering a grading scale that goes from 1 to 10, where 1 means poor and 10 excellent, as such we present the following gradings:

1. Theoretical or practical significance. 5
2. Organization of article. 6
3. Clarity of presentation. 6
4. Adequacy of background. 6
5. Adequacy of literature review. 6
6. Appropriate approach. 5
7. Adequacy of analysis of issues. 5

### 5 HELPFUL HINTS

In the future it would be productive to explore other industries or platforms that uses Byzantine Fault Tolerance algorithms and compare their approach in terms of performance analysis.

A couple of questions were left unanswered in this article such as why the detection of Byzantine faults on oral messages were only possible if more  $2m + 1$  generals, with  $m$  traitors, to be possible to detect these faults in the signed messages approach. Another question is how these approaches truly offer the ability to detect Byzantine faults, specifically the oral messages approach, these questions are raised mainly by the lack of clarity on how the algorithms behind these approaches work. Other unanswered questions are in what way the introduction of proof of work (Pow) in bitcoin solve the Byzantine faults problem, meaning, how does this Pow work, and what type of byzantine fault tolerance mechanisms they offer, this question is further exacerbated by the lack of citation to the source of this information, although it being present in the references, leaving the reader clueless as to where to go to research into this question.

### 6 CONCLUSION

In conclusion, considering the previously presented grading scale, that goes from 1, which means poor, to 10, meaning excellent, we believe that a fair grade for the article "Problema dos Generais Bizantinos" is a 5, we give out this grade because of the over emphasizing of the introduction and the lack of depth of the main topic proposed for the article, also its somewhat disorganized nature and failure to comply with most of IEEE guidelines makes it impossible to give a higher score.

### REFERENCES

- [1] R. Dolev, Danny and Lamport, Leslie and Pease, Marshall and Shostak, "The Byzantine Generals," in *Concurrency control and reliability in distributed systems*, 1987, pp. 348--369.
- [2] "Author Information - IEEE Transactions on Parallel and Distributed Systems | IEEE Computer Society Digital Library." [Online]. Available: [https://www.computer.org/csdl/journal/td/write-for-us/15085?title=Author Information&periodical=IEEE Transactions on Parallel %26 Distributed Systems](https://www.computer.org/csdl/journal/td/write-for-us/15085?title=Author%20Information&periodical=IEEE%20Transactions%20on%20Parallel%20Distributed%20Systems). [Accessed: 11-May-2021].