IMPROVED BYZANTINE FAULT TOLERANCE TWO PHASE COMMIT PROTOCOL

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Abstract: A distributed transaction is usually accessing a database which is distributed (shared) to many computer systems. One of the benefits of distributed transactions used in an application is it update the data in distributed manner. Practically providing such applications with secured distributed environment is difficult due to the multiple failures. In the existing work, the Two-Phase Validation Commit protocol is used to provide a better transaction without any failure and thus also maintains the data integrity. However this protocol also lacks to prevent from the byzantine failure. In order to overcome this problem, in this work Improved Byzantine Fault Tolerance Two Phase Commit Protocol is proposed which aims to provide the better secured transaction and also aims to achieve the data integrity. Thus the experimental results of our work prove that the proposed work provided better secured transaction than the existing approach.

Keywords: distributed transaction, Two-Phase Commit Protocol, data Integrity, byzantine failure.

I. INTRODUCTION

The distributed database systems consist of data in a distributed manner over several locations and there may have duplicated data which leads to the more storage space necessity. Many replicated copies are presented all over the network. But at the same time, it should maintain the ACID properties (Bidyut Biman Sarkar and Nabendu Chaki, 2010) of distributed transaction which ensure the reliability of the transaction. Most importantly atomicity is the significant property in which the transaction aborts when any single operation fails otherwise it commits when all the operations are successful. The Transaction Processing Monitor (TPM) is a node in the network which acts an intermediate for distributed transactions. This TPM (Ghazi Alkhatib and Ronny S. Labban, 2014) provide the distributed commit service to all the distributed system in connection. Basically the distributed transaction may be interrupting when any failure occur. Either the client is not reachable or the server or the connection is not consistent.

Traditionally, this commit service to all the distributed system is done using the two phase commit protocol to overcome such failures. This protocol works in manner containing a coordinator and numerous participants. The participant who wants to do some operation in the distributed environment requests the coordinator. In turn the coordinator accepts the request and sent commit request to the entire participants who are registered with it. Once all the participants respond positively to the coordinator, then the commit message will be send to the participant and the initiator will use the resource in the distributed environment. If the coordinator did not get any of the respond back or any negative respond, then the permission will not give to the initiated participants to use the distributed resource.

The two phase protocol is efficient in preventing against the normal failure until the byzantine failure occurs. To overcome this failure and to maintain the data integrity in the
distributed resources, the proposed Improved Byzantine Fault Tolerance Two Phase Commit Protocol is implemented in the distributed environment to provide secured data transaction and achieves the data integrity.

II. RELATED WORK

In (Marian K. Iskander, et al., 2014), proposed a Distributed transactional database frameworks conveyed over cloud servers, elements collaborate to structure evidences of approvals that are advocated by accumulations of affirmed accreditations. These evidences and qualifications may be assessed and gathered over expanded time periods under the danger of having the hidden approval approaches or the client accreditations being in conflicting states. It in this manner gets to be workable for approach based approval frameworks to settle on hazardous choices that may debilitate delicate assets. In this paper, we underline the problem of the issue. We then characterize the idea of trusted transactions when managing evidences of approval.

The author (Giannotti F, et al., 2010) proposed Privacy; they say keep information about me from being available to others. This doesn't match the dictionary definition (Webster's), freedom from unauthorized intrusion. It is this intrusion, or use of personal data in a way that negatively impacts someone's life, that causes concern. As long as data is not misused, most people do not feel their privacy has been violated. The problem is that once information is released, it may be impossible to prevent misuse. Utilizing this distinction, it is clear that a data mining project won't enable the personal information misuse.

The paper (Molloy I, et al., 2009) proposed Data mining technology has emerged as a means of identifying patterns and trends from large quantities of data. Data mining and data warehousing go hand-in-hand: most tools operate by gathering all data into a central site, then running an algorithm against that data. However, privacy concerns can prevent building a centralized warehouse – data may be distributed among several custodians, none of which are allowed to transfer their data to another site. Computing association rules within such a scenario. We can compute the global support and confidence of an association rule \( AB \to C \) knowing only the local supports of \( AB \) and \( ABC \), and the size of each database.

According to (Qiu K, et al., 2008) proposed frequently prohibited by legal obligations or commercial concerns. Such restrictions usually do not apply to cumulative statistics of the data. Thus, the data owners usually do not object to having a trusted third party (such as a federal agency) collect and publish these cumulative statistics, provided that they cannot be manipulated to obtain information about a specific record or a specific data source. Trusted third parties are, however, difficult to find, and the procedure involved is necessarily complicated and inefficient. This scenario is most evident in the health maintenance business.

In (Wong W.K, et al., 2007) proposed Progress in scanner tag engineering has made it workable for retail associations to gather and store monstrous measures of offers information, alluded to as the wicker container information. A record in such information normally comprises of the transaction date and the things purchased in the transaction. Effective associations view such databases as essential bits of the promoting foundation. They are occupied with establishing data driven showcasing procedures, oversaw by database innovation, which empower advertisers to create and actualize altered advertising projects and methods. The Apriori and Aprioritid calculations we propose vary on a very basic level from the AIS and SETM calculations as far as which competitor thing sets are included a pass and in the way that those hopefuls are created.
The paper (Gilburd B, et al., 2005) the problem of outsourcing data mining tasks to a third party service provider has been studied in a number of recent papers. While outsourcing data mining has the potential of reducing the computation and software cost for the data owners, it is important that private information about the data is not disclosed to the service providers. The raw data and the mining results can both contain business intelligence of the organization and private information about customers of the organization and require protection from the service provider. Unfortunately, the current understanding of the potential privacy threats to outsourcing data mining and the needed privacy protection are still quite primitive.

In (Kantarcioglu M and Clifton C, 2004) proposed the knowledge models produced through data mining techniques are only as good as the accuracy of their input data. One source of data inaccuracy is when users deliberately provide wrong information. This is especially common with regard to customers who are asked to provide personal information on Web forms to e-commerce service providers. The compulsion for doing so may be the (perhaps well-founded) worry that the requested information may be misused by the service provider to harass the customer.

III. PROPOSED SYSTEM

The byzantine fault tolerance (Aldelir Fernando Luiz, et al., 2011) is the ability of the distributed system to overcome the byzantine faults. This is possible by duplicate (replica) the database and monitoring whether the same information is updated in all the replicated databases. This is possible using the two phase commit protocol and latter the problems from 2PC is resolved by the Byzantine Fault Tolerance Two Phase Commit Protocol in the existing system. But still the Byzantine faulty replicas become a major issue in the Byzantine Fault Tolerance Two Phase Commit Protocol. Hence to overcome this issue, the Improved Byzantine Fault Tolerance Two Phase Commit Protocol is implemented in the distributed environment to provide secured data transaction and achieves the data integrity.

![Fig 1 Architecture to Remove Byzantine Faulty Replicas](image)

Before the application starts, the coordinator is elected which is responsible for the updating information in the distributed database. Then all the participants in the distributed environment registered with the coordinator for the future communication. The architecture of the proposed Improved Byzantine Fault Tolerance Two Phase Commit Protocol for the distributed environment is shown in the figure.1.

A. First Phase

Initially the elected coordinator sends Begin_Commit request message to all the participants registered with it in the distributed environment and enters into the wait stage; remain idle for some time till all the participants respond to that request. The participants receive the request message and check their status. If the participants are
accessing any database in the distributed environment, then they will send the Vote_Abort (abort message) to the coordinator. If the participant is idle, then it will respond with the Vote_Commit (commit message) in return and enters into the ready state. Once the coordinator receives the commit message from all the participants, it proceeds with the second phase.

**B. Second Phase**

When the coordinator did not receive the commit message from a single participant, it will send the Global_Abort message to all other participants and the participants come out of the ready state. But once the coordinator receives the commit message from all the participants, it sends the Decide_to_Commit message to its Byzantine backup site. It means that the coordinator request the Byzantine backup site to record the operations in the distributed database. The Byzantine backup site sends the Recorded_Commit message to the coordinator saying that it is ready for recording.

**C. Third Phase**

If the coordinator did not receive any commit message for recording, then the coordinator send global abort message to all the participants. When the coordinator receives the commit message for recording from the Byzantine backup site, it sends the global commit message to all the participants. Finally the process of transaction in the distributed environment starts.

The proposed system has attain the advantage to eliminate the byzantine fault tolerance by integrating the Byzantine backup site with the coordinator which is not present in the existing Byzantine Fault Tolerance Two Phase Commit Protocol for distributed databases.

**IV. RESULT ANALYSIS**

The result analysis of the proposed Byzantine Fault Tolerance Two Phase Commit Protocol is compared with the existing Two Phase Commit Protocol in terms of cost and time.

*Fig2 Time Taken for Entire Transaction*

The time taken to implement and perform the entire transaction is depicted in the figure.2.

*Fig 3 Cost comparison*

The cost for implementing and processing the entire transaction by both the existing and proposed system is depicted in the figure.3. The figure shows that the proposed system consumes minimum cost than the existing system for implementing and processing the entire transaction using the proposed protocol in the distributed environment.
V. CONCLUSION

The proposed Improved Byzantine Fault Tolerance Two Phase Commit Protocol is used to provide a better transaction without any failure and thus also maintains the data integrity. The proposed system eliminate the Byzantine Agreement which in turn it uses the Byzantine Backup site which control the transaction in the distributed environment, maintain the database with consistency and provide the secured distributed transaction with data integrity. Finally the performance of the proposed system is evaluated by comparing it with the existing system. The result shows that the proposed system provides the distributed transaction in a secure manner with consistent data integrity.

REFERENCE


