

Analysis of publications on applications of blockchain technology

INSE 6120 Cryptographic protocols and Network Security

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# Introduction

In this project report we will analyze a number of publications/projects that use blockchain technology as the underlying technology, the way we have decided to do this is to have each member conduct research on different fields in which blockchain technology was applied. More specifically these fields will be:

# Literature Review

## Military

**Military Blockchain for Supply Chain Management [1]**

In this article the authors describe the importance of supply chain management, especially in military parts transportation. The article begins with a simple explanation of what supply chain management (SCM) is and what blockchain is and how both can be integrated. Supply chain management, as described in the publication is the process of production and distribution, it is a system in which we ensure the transportation of raw materials from a supplier until it is delivered to the end customer as a final product. In the middle of it all the raw materials have been presumably processed into parts and those parts put together to create the final product.

The publication also mentions issues pertaining to SCM, especially in the vein of counterfeiting, incompetence, missed parts, etc... along with this it mentions the unreliability of keeping track of issues like these with normal SCM systems, this can be addressed with the traceability that Blockchain technology provides. It would enable anyone to track an error back to its source due to its meticulous nature which will be explained soon.

Blockchain technology as described in its essence is a decentralized ledger of transactions built into a network, transactions are conducted over the network using whichever protocols the network implements and saves this transaction on a “chain” and it is saved on every machine in the network, normally referred to as “nodes”. As the transactions go through every node the system facilitates the recording of each state of this transaction. You can figure out how this kind of system is virtually impenetrable to counterfeiting as each node would have to be verified for something within the transaction to be edited.

Only few military defense are exploring the need for blockchain technology due to the tech’s secure nature, according to the article there are seven possible cases for blockchain technology to be applied for military defense:

1. Tracing Defense Shipments and Contracts.
2. Secure government and battlefield messaging.
3. Cyber warfare preparedness.
4. Preventing data theft.
5. Protecting weapons systems.
6. Military additive manufacturing.
7. NATO applications.

The publication will focus mainly on the 1st application, in the case for military SCM, it is a complex matter, unlike privatized SCM.

The proposed framework in the paper is for Navy defense shipments, even though it is called the Navy it does not handle only sea operations, therefore Navy shipments need to be put under a good amount of scrutiny and need to be ready when needed. In the case of managing part transportation for ships for example, parts need to be genuine to ensure the assets are functioning properly, and constant contact needs to be made to suppliers to assure punctual deliveries as delays will affect the overall vessel completion, that’s why traceability is an important part of this SCM.

Diagram

Description automatically generated

Figure 1: Blockchain recommendation for the Navy SCM

The above figure is the proposed blockchain adaptation to the Navy SCM, As you can see it includes three parties that need to keep communication constant, the supplier which sends the parts/raw materials, the traceability provider which keeps track of each shipment made as well as how long each shipment remains in each branch, and finally the destination or in this case it is named “Depot in RNM”. This proposed project will be closed off only to the military to prevent outside interference, communication will be encrypted within the blockchain, and a ledger will be produced to keep track of all shipments, and a Navy depot known as “West Fleet Supply Depot” will act as an appraiser to assure the authenticity and functionality of the parts.

This specific blockchain like all others keeps a ledger at each node that gets updated with each transaction, but uniquely it allows the navy depot to give read, write, and delete, it is applicable here due to the sensitive nature of military information. When a new transaction happens the node at which this transaction occurs produces a proof of work document and broadcasts it to all other nodes, the other nodes will verify the information and validate the transaction, once it has been validated it will be written into the blockchain.

The publication concludes by reiterating how this kind of SCM will have genuineness in its dealings and it is secure due to all nodes being involved in the information exchange, the author then emphasizes how this should provide a good motivation for integrating blockchain technology into military SCMs.

[1]: Rahayu, Syarifah Bahiyah, et al. Military Blockchain for Supply Chain Management - JESOC. <https://www.jesoc.com/wp-content/uploads/2019/08/KC13_015.pdf>.