

Blockchain mechanism with Byzantine fault tolerance consensus for Internet of Drones services

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Abstract

The increasing number of drones brings various issues like security risks, increasing air traffic, misuse or crash of drones, and so on. Blockchain can provide the solution to mitigate these problems of drones. Hence, in this article, we have presented the Blockchain of Drones (BCoD), a conceptual approach of collaboration between blockchain and IoD to make drones advantageous through blockchain properties. But the main challenge for adopting blockchain is scalability as consensus in blockchain relies on the message communications by replicated nodes to attain flexibility against faulty nodes. Considering this, we present an advanced byzantine fault tolerance (ABFT) consensus for drone-based applications. This protocol provides scalability with minimum cost and resources for achieving general agreement. It uses only $f + 1$ resources in normal case and $2f + 1$ resources in faulty case with $O(n)$ communication complexity. The systematic analysis and evaluation show that the ABFT improves the performance of the system for a wide range of networks compared with existing BFT systems.

1 | INTRODUCTION

The unification of drones and the Internet of Things (IoT) has evolved as the Internet of Drones (IoD) technology which recently becomes imperative due to the proliferation of drone-based military applications and civilian services. The Internet of Drones (IoD) is defined as the architecture devised essentially for serving regulated approach to controlled airspace for unmanned aerial vehicles (UAVs),¹ generally mentioned as drones.² Recent advancements in drone technology are providing a leading platform for new research and innovation due to their adaptability and feasibility of providing services in the extensive area of applications such as search and rescue, control and monitoring,³ security, on-demand shipping, and delivery, the field of agriculture,⁴ safety surveillance, and so on.⁵ Among these services, drones are crucially required in the delivery of packages like medicines, foods, and critical facilities for recovery services in emergency management cases such as natural disasters, attacks, and collisions, in addition to human safety requirement.⁶ The delivery by human service from the source to destination is frequently the utmost cost-intensive because of organizing workforce requirements and paths to confirm as numerous packages reach their endpoints as fast as probable can be a logistical ordeal. In case of delivery through drones are very cost-effective and also guarantees every delivery promptly with safety and rapidly to the accurate destination.⁷

The concept of drones existed for a long period, however, it gained acceptance to use only in recent times. The regulations issued by FAA (Federal Aviation Administration) in 2016 have allowed the use of commercial drones for delivery

Abbreviations: BCoD, Blockchain of Drones; BFT, byzantine fault tolerance; IoD, Internet of Drones.