

REACHING AN AGREEMENT UNDER WORMHOLE NETWORKS WITHIN DUAL FAILURE COMPONENT

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Received September 2008; revised February 2009

ABSTRACT. *A wormhole network is a system that is trending towards a distributed system that provides asynchronous transfer capabilities. It is essential to increase the capability of the fault-tolerance and reliability of a wormhole network, to cope with the influence of faulty components and to reach a common agreement in the presence of faults before performing certain tasks. However, the Byzantine Agreement (BA) problem is a fundamental problem in fault-tolerant distributed systems. In this study, a protocol for achieving the task of agreement between nodes in a wormhole network is proposed. The proposed protocol is referred to as the Wormhole Agreement Protocol (WAP). In this study, it is demonstrated to make each correct node reach an agreement and to cope with the influence from faulty components in a wormhole network.*

Keywords: Byzantine agreement, Distributed system, Fault-tolerance, Wormhole network

1. **Introduction.** In recent years, super computers have become quite popular [10]. A super computer leads the world in terms of processing capacity at the time of the computers introduction, particularly in the speed of calculation. As examples of super computer systems, there are the ones that are used for genetic engineering data processing, weather prediction and radar data processing [10]. A greater number of applications are being applied to super computers. In which, the creation of efficient message routing is a critical issue to improve the performance. However, there are many routing techniques for super computers and the main routing technique for super computers is wormhole routing [10]. In order to provide a reliable environment in a wormhole routing network, a mechanism that allows a set of nodes to agree on an agreement value is required [7]. The Byzantine Agreement (BA) problem [2,6,12-17] is one of the most fundamental problems in which an agreement value is reached in a distributed system.

The traditional BA problem, which was first defined by Lamport *et al.* [6], makes the following assumptions: (1) There are n nodes in a distributed system; where n is a constant and $n \geq 4$. (2) Each node can communicate with each other through a reliable fully connected network. (3) One or more of the nodes might fail, so the faulty nodes may transmit an incorrect message(s) to other nodes. (4) After the message exchange, all correct nodes should reach a common agreement, if and only if the number of faulty nodes is less than one-third of the total number of nodes in the network. (5) Only the faulty nodes are considered. Based on these assumptions, the BA requirement can be satisfied when the following constraints are met:

Agreement: All correct nodes agree on a common decision value.