**CMSC 180 – Introduction to Parallel Computing**

2nd Semester AY 2023-2024

A Reaction Paper to Synchronization of Ad Hoc Clock Networks

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**1. Introduction**

Clock synchronization is important for many distributed systems because it helps keep everything accurate across multiple processors (Simons, 2005). In traditional network architectures, protocols like Network Time Protocol (NTP) create a hierarchy where devices synchronize with designated time servers (Mills, 1991). However, ad hoc networks, which have dynamic network topologies and no fixed base stations (Ramanathan & Redi, 2002), pose challenges for traditional synchronization methods.

The paper entitled “Synchronization of ad hoc Clock Networks” by Pabico (2015) proposed a peer-to-peer protocol that uses graph theory and circulant graphs with jumps to achieve efficient clock synchronization.

**2. Reaction**

The paper presented a peer-to-peer protocol for synchronizing clocks in an ad hoc network. The protocol used graph theory and utilized circulant graphs with jumps. The clocks in the network communicate with each other to exchange time readings and adjust their clocks based on the collected data.

The protocol achieved a time complexity of O(log N), where N is the number of timepieces synchronizing, which is an improvement over NTP that has a time complexity of O(N). This is achieved using a recursive doubling technique.

The protocol has a lot of potential benefits. It can make clock synchronization more accurate and timely in various applications. The improved time complexity makes the protocol more scalable and efficient for large networks compared to NTP. However, some limitations and questions need to be addressed. The paper mentioned that the space complexity of the protocol could still be optimized.

**3. Conclusions**

The paper showed a new way to synchronize clocks in ad hoc networks. The protocol is a lot more efficient compared to traditional methods. While further exploration is needed to optimize space complexity, the research paves the way for more accurate and scalable time synchronization in various applications relying on ad hoc networks.

**4. References**

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