Using the message paths to optimize trust in the networks

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INTRODUCTION

Distributed systems require protocols that allow nodes to trust the messages in the network, since there are always malicious and malfunctioning nodes.

Bracha's algorithm - exchanges messages of three types (Initial, Echo, Ready) to ensure that all trustworthy processes agree on the certain values [1]

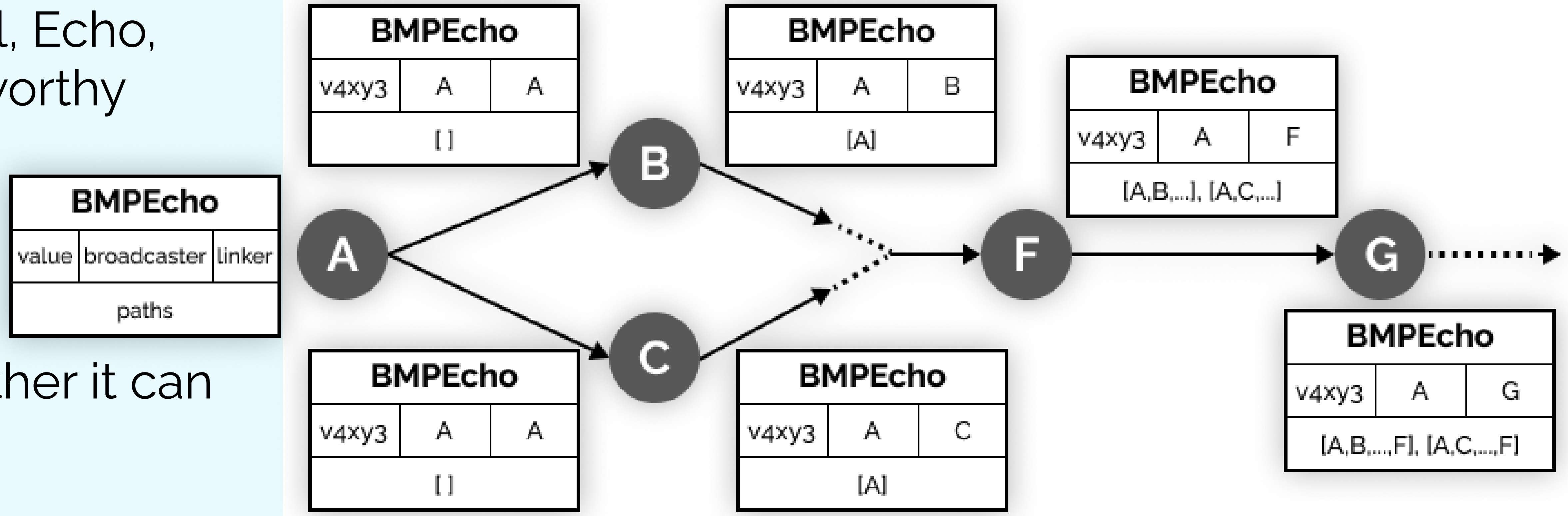
Dolev's algorithm - uses message paths to decide whether it can trust the message [2]

RESEARCH QUESTION

Is there an application for Bracha's algorithm implemented using message paths instead of message types?

METHOD & CONTRIBUTIONS

1. Construct the BMP algorithm, version of Bracha's that transmits a path that the message has crossed instead of the message type
2. Implement it in C++ for practical usages
3. Analyze its functionality and applicability



THE BMP ALGORITHM

Upon receiving a message

- Process received message paths
- Determine whether to accepts the value
- Determine whether to forward the message

OBSERVATIONS

- Handle lost messages in unstable networks
- Ability to trade latency for number of messages exchanged
- Single trusted message
- Deduce network trustworthiness
- Heavier messages

CONCLUSION

The BMP algorithm showed potential to outperform Bracha's algorithm in:

- networks with a low probability of transmitting a message
- networks where nodes have a system of trust.

Otherwise, Bracha's algorithm appears to be superior due to message size.

[1] Bracha, G., 1987. Asynchronous Byzantine agreement protocols. Information and Computation, 75(2), pp.130-143.
[2] Dolev, D., 1981, October. Unanimity in an unknown and unreliable environment. In 22nd Annual Symposium on Foundations of Computer Science (sfcs 1981) (pp. 159-168). IEEE.