

ABSTRAK

Keaslian sertifikat menjadi hal yang sangat penting dalam dunia pendidikan dan profesional. Dalam praktiknya, proses verifikasi sertifikat di institusi seperti Pendidikan Profesi Guru (PPG) masih menghadapi tantangan efisiensi, di mana konfirmasi langsung kepada pihak penerbit seringkali tetap diperlukan untuk memastikan integritas data dokumen sertifikat. Penelitian ini merancang sistem verifikasi sertifikat PPG berbasis *blockchain* menggunakan metode *Prototype* dengan mengintegrasikan teknologi *Hyperledger Fabric* dan *InterPlanetary File System* (IPFS). Integritas data dijamin melalui *Membership Service Provider* (MSP) beridentitas digital X.509 untuk memastikan transparansi dan keterlacakan setiap transaksi. Sistem dievaluasi melalui pengujian *smart contract*, ketersediaan data saat *node failure*, serta uji kinerja pada beban 10, 25, dan 50 transaksi. Hasil pengujian menunjukkan performa pembacaan (*read*) yang responsif dengan rata-rata *latency* 164,56 hingga 184,23 ms dan *throughput* 5,42 hingga 6,07 TPS. Sementara itu, proses penulisan (*write*) mencatatkan *latency* 4.396,11 hingga 4.970,31 ms dengan *throughput* 0,201 hingga 0,227 TPS. Implementasi ini terbukti mampu mengurangi risiko *single point of failure*, serta mampu menjamin integritas dan transparansi data sertifikat.

Kata Kunci: *Blockchain, Hyperledger Fabric, IPFS, Sertifikat Pendidik.*

ABSTRACT

The authenticity of certificates is of utmost importance in the worlds of education and professional practice. In practice, the certificate verification process at institutions such as the Teacher Professional Education (PPG) program still faces efficiency challenges, as direct confirmation from the issuing authority is often still required to ensure the integrity of the certificate data. This study designs a blockchain-based PPG certificate verification system using the Prototype method by integrating Hyperledger Fabric and the InterPlanetary File System (IPFS). Data integrity is guaranteed through a Membership Service Provider (MSP) with X.509 digital identity to ensure transparency and traceability of every transaction. The system was evaluated through smart contract testing, data availability during node failure, and performance testing under loads of 10, 25, and 50 transactions. The test results showed responsive read performance with an average latency of 164.56 to 184.23 ms and a throughput of 5.42 to 6.07 TPS. Meanwhile, the write process recorded a latency of 4,396.11 to 4,970.31 ms with a throughput of 0.201 to 0.227 TPS. This implementation has proven capable of reducing the risk of a single point of failure, as well as ensuring the integrity and transparency of certificate data.

Key Word: Blockchain, Hyperledger Fabric, IPFS, Sertifikat Pendidik.