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Architecting a scalable e-election system using Blockchain technologies

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The ability to vote in state elections represents a basic right and expressing the vote is a civic obligation. However, the pandemics of COVID-19 showed us how such a simple process for a citizen may have multiple implications and impose indirect barriers in expressing the electoral options. The risk of getting in contact with the virus, social distancing, or the reduced number of electors in the voting centre made the classical voting method infeasible in times of crisis. Therefore, a new opportunity appears in the market, anticipated since 2016 by the Eurobarometer - the need to provide a way to vote over the Internet. Currently, in the European Union, only Estonia can provide citizens with such services and only nine states allow voting through the postal services. To overcome the current situation, we propose an architecture of a highly scalable e-election system implemented over the blockchain technology. The aim of the project is to provide a general viable solution and to reduce the time to market, as a quick response to the current situation. The latter aspect is ensured by Hyperledger Fabric, a permissioned, highly customizable, and integration-focused blockchain implementation with consistent impact in key and complex industries like supply-chain, finance, or healthcare. The current paper elaborates a concept architecture and a corresponding design view with Hyperledger Fabric. Furthermore, it brings a qualitative solution evaluation covering security aspects (e.g., resilience to Sybil Attack) and performance measurements (block sizing, state database performance). In contrast to other existing platforms, we match together blockchain with a simple but tamper-proof, well distributed, and highly isolated architectural view.

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