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Interim technical report ☐

Final report ☒

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Project's Final Technical Report		



This “**Blockchains for Coldchains (BC4CC)**” project addressed two critical items for the success of blockchains in general and particularly modum.io’s market targets at trusted ecosystems of sensitive goods: (a) the open usability of blockchain and (b) a blockchain-agnostic framework.

During the past year the blockchain technology still had developed at a rapid pace, however, the role of blockchains in certain applications has reached a much better understanding of advantages and drawbacks. Thus, the efficiency of processes supported by IT solutions, in principle blockchains, too, is still the key for successfully operated companies. Therefore, the BC4CC work revealed very clearly that a higher level and abstract determination of blockchain characteristics as well as a possible selection of one of these many blockchains in place can provide a useful interface to modern, distributed applications. However, it has to be stated that the very basic distinction of private vs. public data to be persisted remains the main decision criteria. This means that the role of distributed ledgers in basically all private settings for data becomes immanent, and that public blockchains tend to reside more on the cryptographic currency and fintech application domain.

Industrial work and its success are based on standards, especially open standards these days. Therefore, the BC4CC approach on the **Policy-based Blockchain Agnostic Framework** now has reached the status of a practical interconnection of different blockchains as well as their configuration and operation. As reported during the intermediate report, a detailed set of requirements, their analysis, and investigations from an application point of view had been performed in the past on which the completion of the Policy-based Blockchain Agnostic Framework and its prototypical implementation had been based upon. The operations of the respective functionality, the selection algorithm, the configuration interface, and their use in dedicated use cases indicate very clearly that measurable benefits have been reached, including the BC4CC approach on the **open Application Programming Interface (API) specification**, which is now accessible at the URL: <https://bc4cc.ddns.net/>. This software system now contains 7 cross-chain communication add-ons to existing blockchains, especially, Bitcoin, Ethereum, Stellar, EOS, IOTA, Hyperledger, and Multichain, for which the respective development now supports the use of blockchain architectures from different blockchain providers. Therefore, the interoperability of different blockchain systems had been reached with by the employment of a Notary scheme that abstracts the BC interaction and removes the dependency on a single blockchain, allowing data to be stored and retrieved from different blockchains in a seamless manner. This means that all next steps as indicated within the intermediate report were followed according to the plan for 2019 and early 2020.

The overall **output of BC4CC** resulted overall in the complete open API specification, available at <https://bc4cc.ddns.net/> and the documentation at <https://documenter.getpostman.com/view/6990415/S17oyqar?version=latest>, a research and scientific paper based on work from 2018 on “Toward a Policy-based Blockchain Agnostic Framework”, published at the IFIP/IEEE Integrated Management Symposium (IM 2019) in Washington, U.S.A. (May 2019), a second research and scientific paper based on work from 2019 at the 44th IEEE Conference on Local Computer Networks (LCN 2019), October 14-17, 2019 in Osnabrück, Germany, on “Bifröst: a Modular Blockchain Interoperability API”, a third research and scientific paper based on work from 2019 to be published at the IEEE/IFIP Network Operations and Management Symposium (NOMS 2020), April 20-24, 2020, Budapest, Hungary on “PleBeuS: a Policy-based Blockchain Selection Framework”, and the whitepaper of work in 2019 on “Security Whitepaper for IoT-Enabled Hardware Temperature Logger”, which provides a blueprint on how data integrity can be achieved edge-to-chain. Finally, during the BC4CC project, the modum.io system migrated from a public blockchain-based approach to a consortia-based approach, while using the public blockchain for demonstration purposes. The benefits of the BC4CC project’s outcome have been shown within the demonstration system. BC4CC is, based on this approach, future-proof and enables modum.io and other providers to migrate quickly and easily toward public networks, if demanded by the industry or an application developer.

Attachments to this final technical report: all papers as referenced above (public material) and the detailed technical report of 88 pages with its two Annexes detailing all relevant developments as well as results are considered an inherent part of this final technical report.



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Place and date

Recipient's signature

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