

Blockchain Opportunities for SMEs in North West Europe

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Interreg 
North-West Europe
Blockstart



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Foreword



Blockchain technology provides a digital ledger of transactions, that allows for peer-to-peer transfer of value and notarization of information, without the need for a trusted third party. It has become popular by the rise of well-known cryptocurrencies like bitcoin and ether, but as a technology it can add a lot of value to many inter-company processes in various industries.

The biggest invention of the technology is enabling peer-to-peer value transfers without the risk of double-spending (spending the same digital asset twice). This is extremely important in many value chains, where information (or value) is tracked and shared within a larger network of parties (e.g. a supply chain). With the rapid wave of digitization in many industries, peer-to-peer (reliable) data sharing becomes imperative to stay in line with the demands of customers (and regulators). Often used intermediaries make data sharing cumbersome and require a level of trust, unwanted in high competitive and global markets.

Setting up a blockchain infrastructure to support peer-to-peer data sharing, requires significant upfront capital, knowledge and understanding of the technology, a sustainable business model and a clear view on the relevant existing and upcoming legislation. Besides bad publicity due to undesirable behaviour of some players in the broader crypto market (money laundering, scams), these barriers need to be overcome before a broader adoption will take place.

As such a data sharing infrastructure basically acts as a utility (just like electricity or the internet), an important role is played by the government (national and European). Not only they must come up with clear regulations, they should also encourage collaboration (and further innovation) by mandating sharing of information contributing to common goals, like SDGs, GHG emission reduction, patient and food safety, etc. Finally, we see an enormous opportunity to further integrate the financial and information flows in many processes, by using digital currencies. This would eliminate multiple intermediaries, shorten settlement times and lower transaction fees.

Victor van der Hulst,

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Introduction: Blockchain adoption for SMEs in North West Europe

Compared to past technological innovations that disrupted the global economy (i.e. the advent of computers, the internet, smart phones etc.) blockchain has yet to show its full impact. Nevertheless, many experts see its potential as huge, and the use cases numerous.

Blockchain has the potential to become for value sharing, what the internet became for information sharing. While some large corporations and global financial firms are beginning to incorporate blockchain technology within their products, it's key that SMEs also exploit this new technology to stay competitive.

The following paper will explore the opportunities and use cases for blockchain implementation within SMEs.

Today, over 30 billion devices are interconnected within the IoT (Internet of Things), and that number is expected to double by 2025 - providing ample opportunity for blockchain solutions.

Compared to an IT system where all networks are incorporated in one company or under one organisation, blockchain seeks to share that control with all members of the system, ultimately decentralising the ownership of the value that is being shared.

However, for many people, the innovation that blockchain could foster appears abstract. In particular, blockchain has yet to demonstrate its full potential outside of the financial sector, outside of large companies, and outside the most well known application of cryptocurrencies such as Bitcoin. This paper will explore the opportunities for SMEs who wish to implement blockchain to enhance their business models. It will describe the general functioning and benefits of blockchain, and outline specific use cases that arise in the agribusiness, healthcare, and logistics fields.

Closing the paper, a case study illustrates an analysis of Open Dairy, an SME in the agrofood sector, demonstrating an assessment of blockchain readiness and how the technology could be used to solve various challenges within Open Dairy. This analysis is drawn from findings from the EU funded project "Blockstart", which supports over thirty SMEs across north-west Europe to explore how they may benefit from blockchain, and to disseminate the learnings broadly.

Ultimately, this paper aims to provide inspiration and recommendations for SMEs and potential investors who either seek to invest in blockchain use cases or adopt it within their own business model.

Blockstart: Blockchain Support for SMEs

- This brief draws on the lessons discovered during the EU funded Blockstart Interreg project
- Blockstart aims to help SMEs understand and test blockchain for their businesses through a free training and support programme
- The support programme consists of business courses, blockchain courses and more in-depth tailored made courses provided by blockchain service providers
- Blockstart supports SMEs in the fields of healthcare, logistics and agribusiness
- The project is funded by the Interreg North-West Europe programme and consists of 8 partners from 5 countries:
 - 1) Netherlands
 - 2) Belgium
 - 3) France
 - 4) Germany
 - 5) United Kingdom



- The project is currently supporting more than thirty SMEs (in different stages of the project)
- Project Duration: Sept. 2019 – Mar. 2023
- Total budget: 4,9 million €
- Funding from Interreg NWE: 2,9 million €
- Only three other similar projects exist in Europe
- Find more information at : www.blockstartproject.eu



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About Blockchain: Why is it important for SMEs ?

What is Blockchain?

To understand why blockchain can be useful for SMEs, first, we need to understand the underlying characteristics and functioning of blockchain itself. Blockchain is a distributed database, in which data is stored and accessible to all participants of the database.

Each participant has equal access to the data. This data is stored in “blocks”, created by the participants of the network. The participants create the blocks, but they must also validate the information before the data can be stored in the blocks.

Once the information is validated and stored, a permanent record of this data is saved in the network, and the record cannot be changed due to the network’s cryptographic nature. This entire process is decided by a “consensus mechanism”, which sets the rules of engagement in the network. Therefore, blockchain consists of multiple blocks of validated, permanent data, connected in a chain, and for a block to be added to the blockchain, four things must happen:

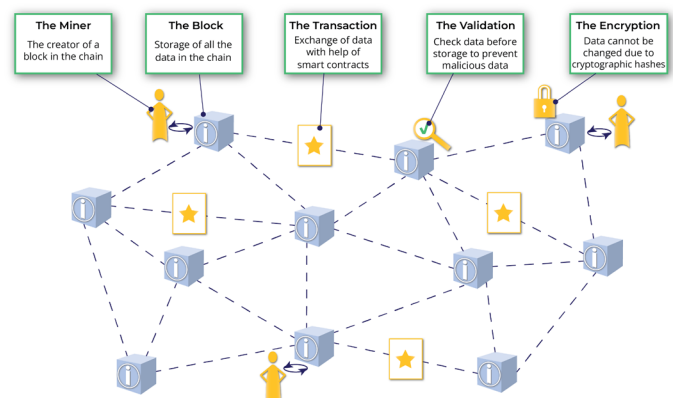
- A transaction must occur.
- The transaction must be verified. Normally this is done by a third party, however, with blockchain that job is left up to a network of computers.
- The transaction must be stored in a block. The “information” relating to that transaction, such as the amount, the digital signature, and user information will be stored in a block.
- Once a block’s transaction has been verified, it is given a unique identifying

code called a “hash”. The block is also given the hash of the most recent block added to the blockchain. When the new block is added to the blockchain, it becomes available for everyone in that blockchain to access.

The potential impact on the economy is vast. Rather than data stored in separate systems, blockchain provides the capacity to store and transfer value within one integrated platform. This reduces the need to constantly export and reconcile data between IT systems.

The platform makes it possible to audit-trail activities, securing the ownership of data. In other words, blockchain increases the availability of data through value sharing, whilst safeguarding the transfer of data.

Data stored within the blockchain is also more secure and private. In the example of medical data, the patient data isn’t stored on the blockchain network itself, which could threaten privacy, but in a normal, secure, database. A hash of the data is stored on the blockchain and used as a link to the actual data, which also proves the data’s integrity.



Blockchain: Equal data access

The Impact

The realisation of secure value sharing will have a significant impact on the economy, with Gartner forecasting that the value-added of blockchain will grow to slightly more than \$176 billion by 2025, eventually exceeding \$3.1 trillion by 2030.

The impact will be particularly noticeable within sectors which require trust and which can incorporate increased automation, such as logistics, healthcare, and agribusiness. Some key features of the potential for value sharing within blockchain include:

- **Immutability:** data cannot be changed or altered once in the platform.
- **Security:** stored value is more secure due to enhanced cryptographic capabilities.
- **Decentralisation:** no central governing body or single governing entity.
- **Consensus:** validation of the data without the need of a central authority.
- **Rapidity:** direct settlements and fast transactions increase real-life use.

Public vs Private Blockchains

Although the value can be stored, secured, and transferred, the utility of the data, the way in which value is stored and transferred, and the processes which define how this takes place, are decided by the consensus mechanism. This mechanism differs depending on the end-use or the parties involved. The main different types of blockchains are:

1. Public blockchain:

Mostly decentralised and does not have a single entity which controls the network. Examples of a public blockchain include the cryptocurrencies Bitcoin and Ethereum.

- **Pros:** Public blockchains are completely transparent, which is great for building

trust in the blockchain. It also incentivizes participants to participate in the network by rewarding cryptocurrency for work done on the blockchain.

- **Cons:** Organisations who are looking to have some semblance of control over their blockchain will not find public blockchain to be an efficient solution. There are also issues relating to energy consumption, transaction fees, and the centralised nature of the network.

2. Private blockchain:

Includes access control, which restricts who can participate in the network. One or more entities control the network, so transactions rely on third parties. In a private blockchain, only the entities participating in a transaction will be able to access it. Hyperledger Fabric of Linux Foundation is an example of a private blockchain.

- **Pros:** Private blockchain networks allow control for administrators, and lets them be more selective with who gets access to the network.
- **Cons:** Unlike public blockchain, there isn't any similar incentive in private networks to have users grow the network. The main goal is not to have more people join the network and maintain it, as it is up to the managing authority of the private blockchain network to do so. As a private blockchain is run by a single, central authority, you could argue that blockchain doesn't offer added value compared to a traditional database.

3. Hybrid blockchain:

Aims to fuse the different features from public and private blockchain systems, ensuring that companies can work with their stakeholders optimally. Dragonchain is an example of a hybrid blockchain (and a tool used to set up hybrid blockchain networks). TradeLens (Maersk/IBM) is an example of a running hybrid network (built with Hyperledger Fabric).

- **Pros:** It combines the best (or worst, depending on your perspective) parts of private and public blockchain. Hybrid blockchains can be as selective or open as they want, feeding into how much they want to incentivize users on the network.
- **Cons:** Not everyone is in a position to be able to implement hybrid blockchain, at least not efficiently. Public blockchain is more affordable and open for most people and organisations. Hybrid blockchains also introduce business model and governance challenges.

Smart Contracts

A smart contract is a code that runs “on top of the blockchain” to facilitate, execute and enforce an agreement between untrusted parties without the involvement of a trusted third party (this is extremely pertinent when exchanging anything which has tangible asset value such as a properties, money, shares of a company etc.).

The contract’s state comprises the “storage” and the “balance” of the contract. The state of the contract is stored on the blockchain and it is updated each time the contract is invoked. The added value of a smart contract is that it automatically executes the terms of an agreement once the specified conditions are met.

Smart contracts work on the “If-Then” principle - for example, if I send a certain amount in Ether, then you receive this specific value. Smart contract must be deterministic because each network node should be able to produce the same result when the same input is given for a method.

The Potential Impact on SMEs

Blockchain can address major challenges, and smaller organisations have the agility to implement it. The characteristics of the technology, like traceability, accountability, transfer of ownership, compliance by design, privacy by design and distribution of resources, present a real opportunity for

SMEs. In particular, SMEs could benefit from decentralising data ownership, safeguarding data, and tracking it across large value chains. This could result in decreased costs and risks, increased security, trust and transparency, and increased efficiency. In general, the main opportunities for SMEs include:

1. **The removal of an intermediary (when dealing with transactions):** This could also lead to a reduction in costs, due to decreased operational costs.
2. **The reduction of mistrust:** With smart contracts platforms can be created where peers do not need to trust each other and secure value transactions can be made even if peers have no previous trading record.
3. **The tracing of assets:** One asset can be represented digitally and traced. For example, this could be used to demonstrate that an SME is complying with fair trade principles.

However, implementing blockchain is complex, and SME adoption and investment remains slower than expected. Part of the challenge is sector: only certain sectors (such as healthcare, agrofood and logistics) are likely to comply with the prerequisites needed to successfully implement a blockchain network.

A second challenge is the requirement for an ecosystem: as blockchain is inherently a shared network, SMEs wishing to adopt the technology need to foster an ecosystem of participants throughout their supply chain, and onboarding stakeholders in a blockchain network can be challenging and costly for a small entity. Additionally, SMEs often don’t have capacity or position of power and influence amongst a network to invest in these solutions by themselves.

Finally, SME’s frequently don’t have the technical maturity and expertise - requiring additional support and training in digital literacy to implement blockchain.

- 4. Supply chain coordination:** The immutability and visibility of information could be used to improve trust and coordination among agrofood supply chain actors. Smart contracts can automate and simplify transactions.

Example: Open Food Chain

Open Food Chain is an industry-owned public blockchain that connects consumers from farm to fork. Open Food Chain (OFC) uses blockchain to help consumers gain transparency and trust in the products they buy, and help businesses raise efficiency, combat fraud and guarantee food safety.

The largest implementation of OFC to date is in the juice industry, with JuicyChain connecting over 50 different partners in the supply chain. JuicyChain is a blockchain-traceability platform that improves transparency, accelerates the uptake of sustainable juice volumes and supports customer and consumer-facing communication on sustainable juice.

The goal for OFC is to improve industry standards, simplify supply chains, and increase food transparency worldwide.

Blockchain in Logistics: Efficiency and Cost-reduction

In the logistics industry, blockchain could increase efficiency, reduce costs, and improve trust by creating an encrypted digital record to track goods at every stage of the supply chain. This would highlight any irregularities that could disrupt the shipment. Processes could also be automated and easier verification of goods could be enabled, reducing paperwork and supporting end-to-end traceability.

- 1. Supply chain transparency:** Blockchain provides end-to-end transparency, integrating data from all the participants to monitor performance, confirm provenance and increase real-time visibility of logistics.

- 2. Security enhancement:** Blockchain could allow the authentication of data and documents through encrypted platforms for exchanging data and documents. It could improve fraud detection since all transactions are visible and immutable, and prevent theft by requiring and tracking detailed information when picking up products.
- 3. Reduced complexity:** Blockchain allows the elimination of intermediaries by bringing trust in the ecosystem and enabling peer-to-peer models. Additionally, smart contracts can increase the level of automation within processes such as payments, transfer of ownership, settlement of tariffs or cargo checks.
- 4. Operational efficiencies:** This could look like improving compliance by combining Blockchain with Electronic Logging Devices to send data about driving behaviour to platforms in real time, or reducing transaction cost through consensus validation and avoiding the repetition of transactions and process errors.

Example: Naviporta (Port of Rotterdam)

Naviporta runs an open and neutral platform to make the flow of goods, information, and finances through ports more efficient. By using blockchain, Naviporta makes the digitally trusted and secure exchanging of assets and information possible.

Companies and authorities involved have real-time access to the correct, validated information, and can see the progress of containers in real-time with end-to-end visibility.

Naviporta provides a digital notary to enable an immutable record of what has been done by whom and to notarise shipping documents like eCMR, bill-of-lading or letter of credit, improving trust and efficiency. The visibility of transaction records and documents is tightly controlled by blockchain, permitting sharing only among entrusted and authorised parties.

Case Study Analysis: Understanding the Potential for Blockchain in Open Dairy

The Blockstart project supports over thirty SMEs across NWE. All the SMEs receive business, financial, and technical support to understand if and how blockchain may benefit them.

The following case study demonstrates a feasibility study used to evaluate the blockchain use case for Open Dairy. The case study will focus on the SMEs and provide an understanding of the following questions:

- What is the focus of the SME?
- Who are the main stakeholders?
- What is the problem that needs to be solved?
- How is blockchain relevant?

What is the SMEs focus?

Open Dairy provides a business-to-business marketplace for trade of dairy commodities such as skimmed milk powder, butter, cheese, etc. Open Dairy's open and independent marketplace connects global sellers and buyers of dairy products, as well as financiers to accelerate trade.

The demand for international trade stems from the climate and seasonal nature of milk production. The international nature of this trade makes finding trading partners difficult, transportation complex, financing expensive and generates significant paperwork (relating to food safety, provenance of products and import duties etc.).

The marketplace itself helps to solve the problems regarding difficulty finding trading partners. But it doesn't address the other problems - as such, Open Dairy requested support from Blockstart to look into applicability and usefulness of blockchain technology to address these challenges.



Who are the main stakeholders?

Open Dairy aims to optimally balance the interest of all parties involved. Value is generated by ensuring the platform is attractive to users and thus increasing its use. The company value chain includes a variety of stakeholders with different needs. There is a shared interest between all parties to drive down costs and raise efficiency in the supply chain. However, the ideal route to achieve this differs from party to party:

- **Buyers:** Buyers want greater insight into product range, arrival date of shipments and access to highly accurate shipment metrics.
- **Sellers:** Sellers want to reduce manual labour, and related human error, and increase insight into the needs of potential buyers. However, implementing automatization in the current supply chain is difficult, because of great disparity in the way data is handled between actors.

- **Forwarders:** Forwarders play a central role in in the supply chain, and large forwarders usually have good insight into their own transportation data, which could be of value for the other parties. Forwarders want faster and easier access to data from both the buyers and sellers.
- **Banks:** Banks want accurate data for their transactions. However, the exact data required differs between the two most common transaction methods: 1) the letter of credit (LC) and 2) export credit insurance (ECI). To grant a LC the bank requires in depth data regarding the freight, the buying and selling party, the forwarder and the buyer's bank. Because of the specificity of this data, it involves a substantial amount of manual gathering and verification and having access to accurate data is a prerequisite for initialising a transaction, without it nothing will happen. This grants the bank a powerful position within the supply chain (and is labour intensive, requiring a significant time investment).

What is the challenge?

Open Dairy's challenges are related to the lack of data security, the need for more efficient data flows, and more transparency to automatize the contracts. Open Dairy's current system, although well functioning, is susceptible to hacking and misleading or missing information. The system is vulnerable to human errors and lacks efficiency. The payment methods are also expensive and often superfluous. Furthermore, the system can be victim to buyers withholding payment until the delivery of the product.

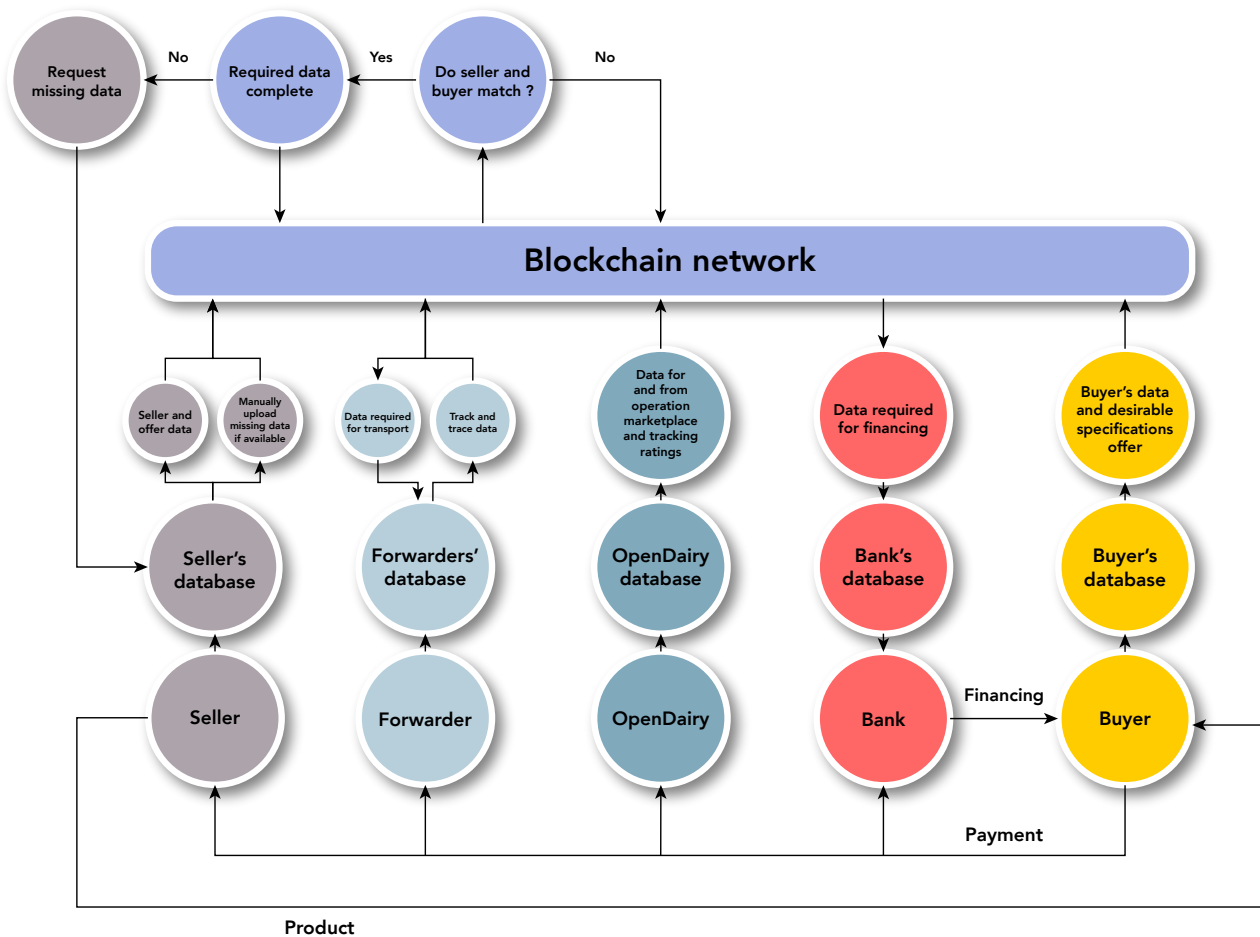
What is the use case for blockchain?

The blockchain solution for OpenDairy could operate in parallel to its Business-to-Business marketplace supply-chain network. This is much like a digital twin, which is a digital version of the process or supply chain and shows all the steps live as bytes. In this way, participants can easily

visualise and control all steps involved, removing contact moments, and reducing errors and time required. Blockchain could secure payments by proving that the purchased goods are actually there, at a specific time and in a recorded condition. If it has been agreed in advance in a smart contract that the requirements have been met, the payment will take place automatically. Another potential solution is to use a private Blockchain, specially made for OpenDairy. There are, for example, Enterprise-, Federated-, Permissioned- and Private blockchains available that keep data locked to certain participants or for a certain amount of time. Key advantages of implementing blockchain in this case include:

- **The decentralised network** works well for an international, dispersed group.
- **Transparent transactions** increase trust and speed up trade between participants
- **No intermediaries** (due to automated smart contracts) reduces costs, increases efficiencies and speed, and reduces the possibility of human error.
- **The trusted environment** is crucial to international trade.
- **Secure operations** (cryptographic keys protect every piece of data, with any corruption attempt immediately visible to the entire network) are key for the whole network, but especially useful for ensuring accuracy of data for banks.

While blockchain can solve many of the challenges that Open Dairy is facing, implementing the technology comes with its own challenges. Firstly, it will require change to the current system and traditional way of working. If Open Dairy were to establish a private blockchain, they run the risk of parties continuing to work with documents, who explicitly do not want to use the new techniques, as well as potential competitors who could adopt or imitate the system. While blockchain offers many advantages, implementation is not without challenges and barriers.



Conclusion

Blockchain is one of the most exciting innovations of our generation, however, the technology still needs to demonstrate its real-world value outside of cryptocurrencies and the financial sector.

This paper has drawn on the results of the Blockstart EU funded project to demonstrate numerous use cases within the healthcare, agrofood, and logistics sectors.

For healthcare, blockchain can ensure secure and private data sharing, improving access to patient data to generate more accurate insights into health.

In agrofood, blockchain could increase transparency and trust across the supply chain, improving the speed and reliability of sourcing information for specific products.

For logistics, blockchain can provide improved efficiency and cost-reductions, as an encrypted digital record offers security, streamlines supply chains, and increases traceability.

However, as the Open Dairy case study illustrates, in parallel to the benefits offered, there are also significant challenges to blockchain adoption.

Blockchain applications seem more pertinent for certain SMEs in certain sectors (e.g. healthcare, agrofood, and logistics, as per the focus of this report) but how would potential investors calculate their financial returns in a shared system? And how can institutions incentivize blockchain adoption?

For SMEs that want to adopt blockchain solutions, this is still very complex and “analysing” the financial returns can be more feasible than “calculating” them. Ultimately the opportunities from blockchain seem evident, but the maturity of the technology, players, investors, and the risk associated might not yet be convincing enough for SMEs to take that technological leap.

However, despite the challenges, there are actions within regulation, policy, finance, digital literacy and the SMEs themselves that can be taken to reduce these barriers and boost SME uptake of blockchain. We will be exploring these barriers and solutions in a following paper, which can be found on the Blockstart website.



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