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How blockchain will transform the modern supply chain

Introduction

Complex supply chains require trust

Contemporary supply chains have opened up a world of connected commerce far beyond what previous generations imagined possible. But with this comes unprecedented complexity as multiple parties must cooperate to move goods around the globe. They face new challenges of maintaining visibility into origin, authenticity, and asset handling as they cross organizational boundaries.

Retailers and manufacturers place a great deal of trust in their upstream suppliers, distributors, and transportation providers. The quality of their end-customer experiences depends on other organizations' ability to transfer the right assets, to the right place, at the right time, in the right manner. And if anything were to go wrong, they must quickly ascertain both the potential end-customer exposure and the fault point in their supply chain.

Traditional methods for managing shared processes – such as manual inspections, after-the-fact audits, and record reconciliation – are expensive, time-consuming, and error-prone, levying a "trust tax" on all parties. Modern supply chains demand a better solution.

Create trust through blockchain

Blockchain technology is uniquely positioned to help create trust, transparency, and accountability between many parties in supply chain scenarios. Blockchain is a secure, shared, distributed ledger. It can act as a shared data layer to enable multiple parties to track the status of an asset as it moves across a custodial chain and share information on its provenance and handling in a secure and transparent way.

A 2017 report found that 408 organizations from 64 countries were facing consistent supply chain visibility challenges:

69% do not have full visibility into their supply chains

65% experienced at least one supply chain disruption

41% still rely on Excel spreadsheets to keep track of supply chain disruptions

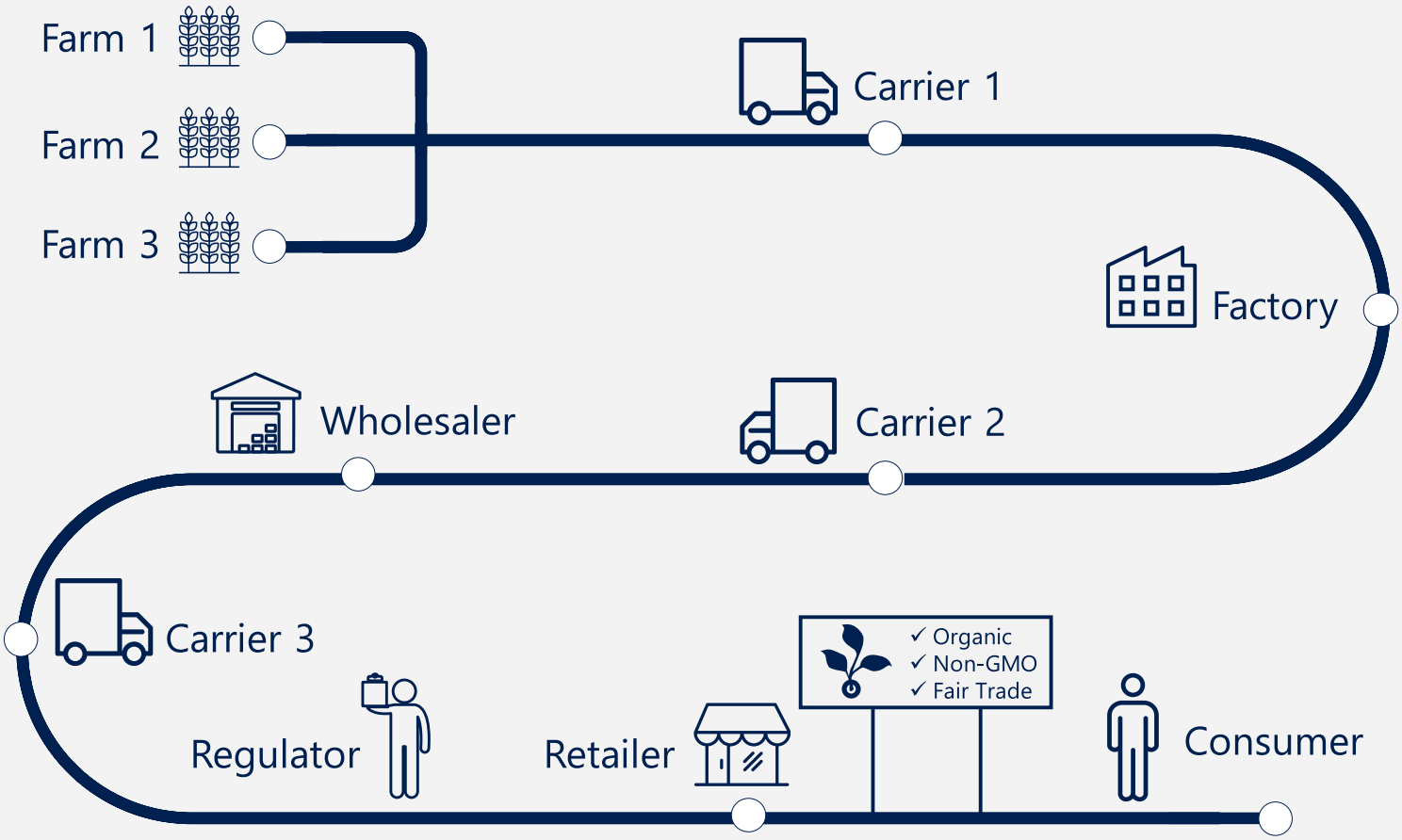
While blockchain has gained early recognition for its uses in the financial world, it also offers tremendous potential in supply chain scenarios. When used in combination with sensor technologies such as IoT and RFID, blockchain promises network participants unprecedented visibility into even the most complex supply chains. Blockchain also enables parties to set up pre-arranged "smart contracts" that can be used to automatically trigger compensation or fines based on compliance with agreed-upon rules for the farming, manufacturing, and transportation of goods.

Blockchain in action

Curious what a blockchain-empowered supply chain really looks like?

Let's take a snapshot of a food supply chain. It's key to maintain transparency and efficiency between numerous farmers, manufacturers, retailers, transporters, and more.

And at the end of the supply chain, customers want assurance that their food will be consistent, high-quality, and is legitimately sourced from providers they want to buy from (such as organic or fair trade farmers).



Microsoft is building blockchain solutions that can attest everything from ingredient origin and farming techniques, to finished product movement and storage conditions from farm to fork.

Let's explore how blockchain is transforming this complex supply chain through:

- Provenance attestations
- Environmental monitoring
- Dispute resolution

Provenance attestations

Confidence in the provenance of a product and its component parts

Current state

Consumers are increasingly concerned about where their products are coming from and how they are being produced. Fair-trade, conflict-free, non-GMO, and organic certifications are highly sought-after and carry the risk of being faked. Counterfeit products, especially in food and pharmaceuticals, could be dangerous for consumers and disastrous for brands that are discovered selling them.

In the news:

New Zealand's popular organic Manuka honey is **frequently counterfeited**, necessitating stringent authenticity tests to retain consumer confidence

1 in 10 medical products circulating in low- and middle-income countries is either substandard or falsified

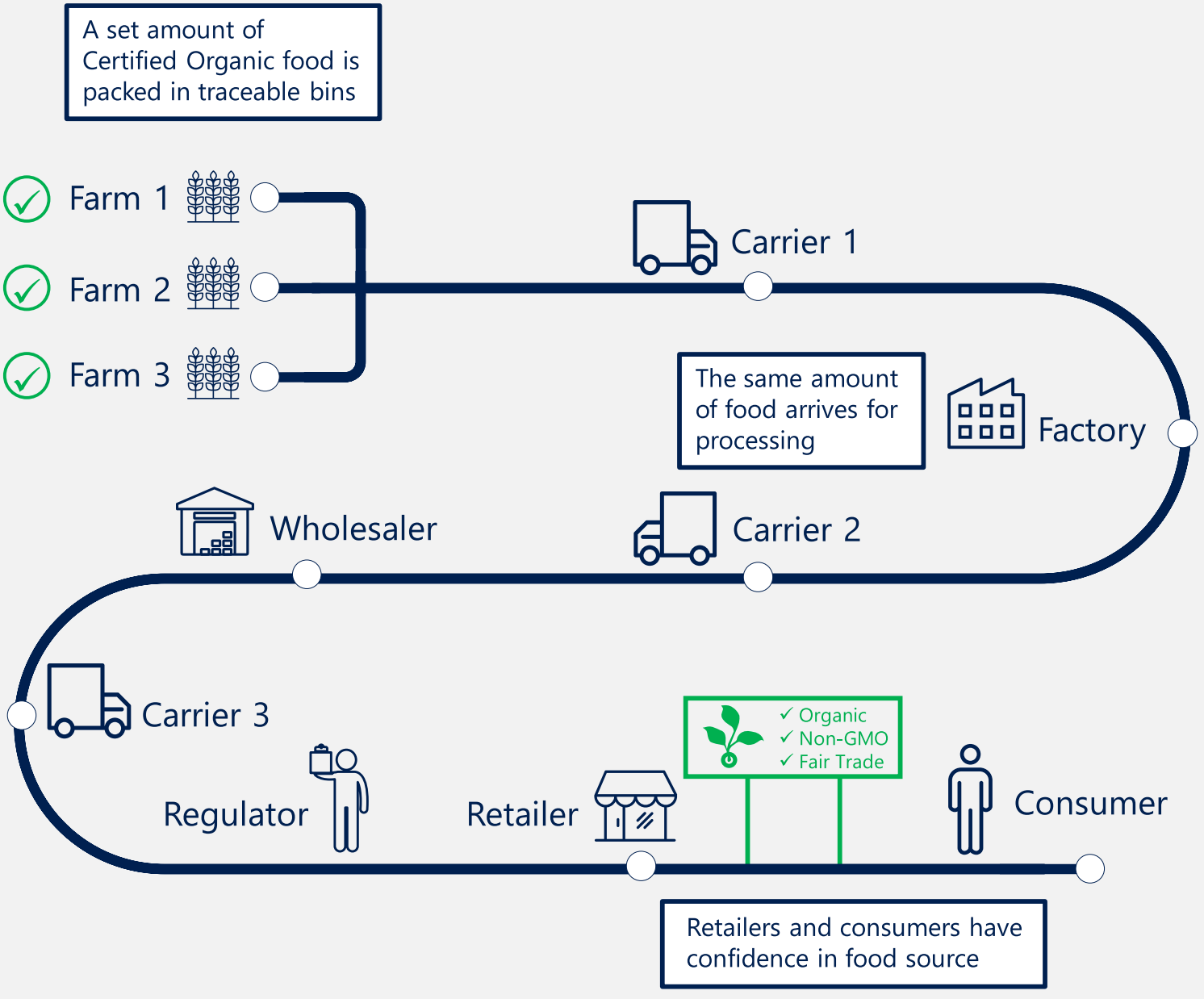
Future state

Tracing product inputs and attesting production techniques on the blockchain creates an immutable record of asset provenance. Organizations can author smart contracts stipulating what must be performed by upstream participants before they take action on or custody of a product, and the entire record can be shown to discerning end customers to prove the veracity of product claims.

Supplier benefit	Retailer benefit	Consumer benefit
Recognition and market advantage for certifiable, ethical sourcing practices	Decreased risk of counterfeit products and increased brand loyalty from consumers due to ability to accurately attest asset provenance	Increased confidence in products; increased ability to discern between brands based on alignment with values

Blockchain in action:
Provenance attestations

Organizations can trace products from the strip of land they're grown on through to the delivery at retail. Farmers who have earned certifications (e.g. Certified Organic) use bags or bins specifically allocated to them with labels and sensors that can be tracked along the supply chain. A set amount of food produced by the organic farmer is expected at each stop along the supply chain, preventing non-organic food from fraudulently entering in. As a result, farmers are sure to get credit for their farming practices, and consumers get insight and confidence in the products they're purchasing.



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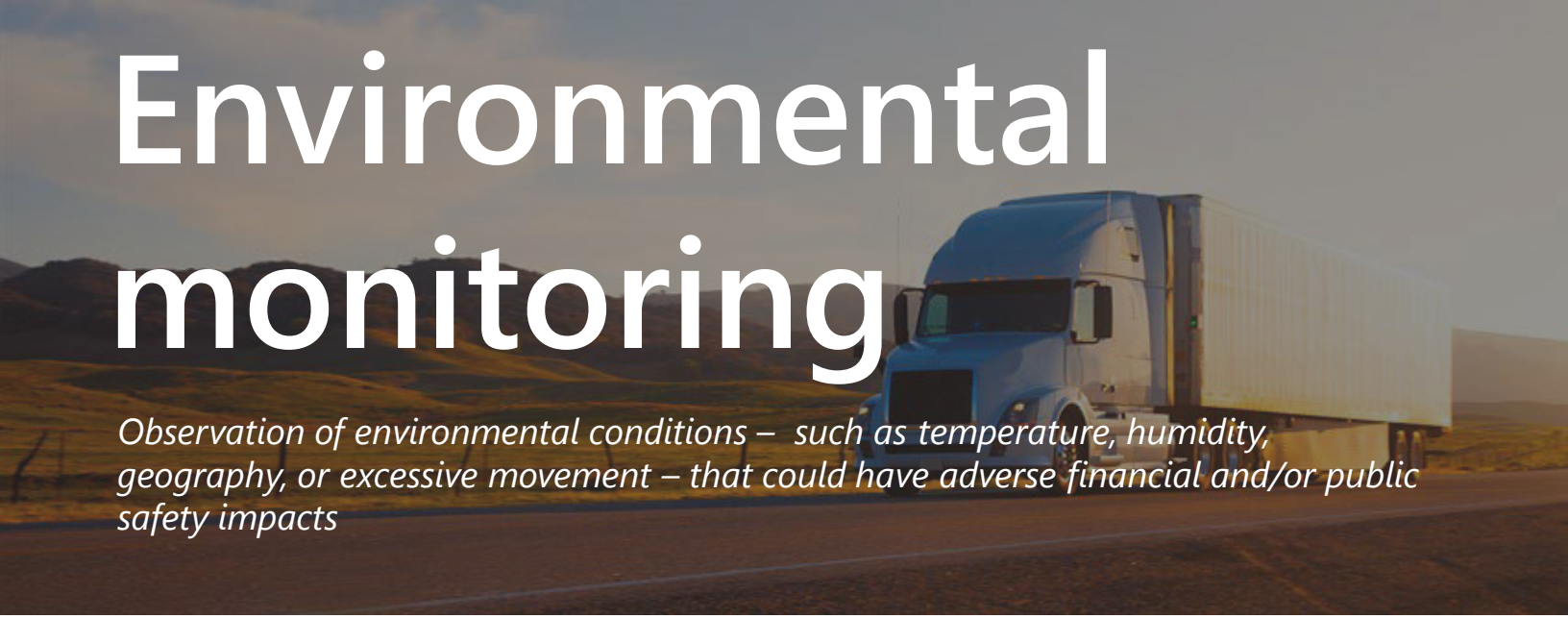


Environmental monitoring

Observation of environmental conditions – such as temperature, humidity, geography, or excessive movement – that could have adverse financial and/or public safety impacts

Current state

Maintaining the quality and safety of goods requires ensuring that every party in a supply chain transports products in the right conditions. This is especially important when transporting food and pharmaceuticals: if goods are not kept at the right temperature or humidity, there are risks to consumer safety and permanent brand damage.

In the news:

Every year, **200 million tons** of food spoil before reaching market, due in large part to insufficient cold transport technology

In 2017, The Guardian found evidence that the UK's top chicken supplier had tampered with food safety records, leading consumers to buy **expired chicken**

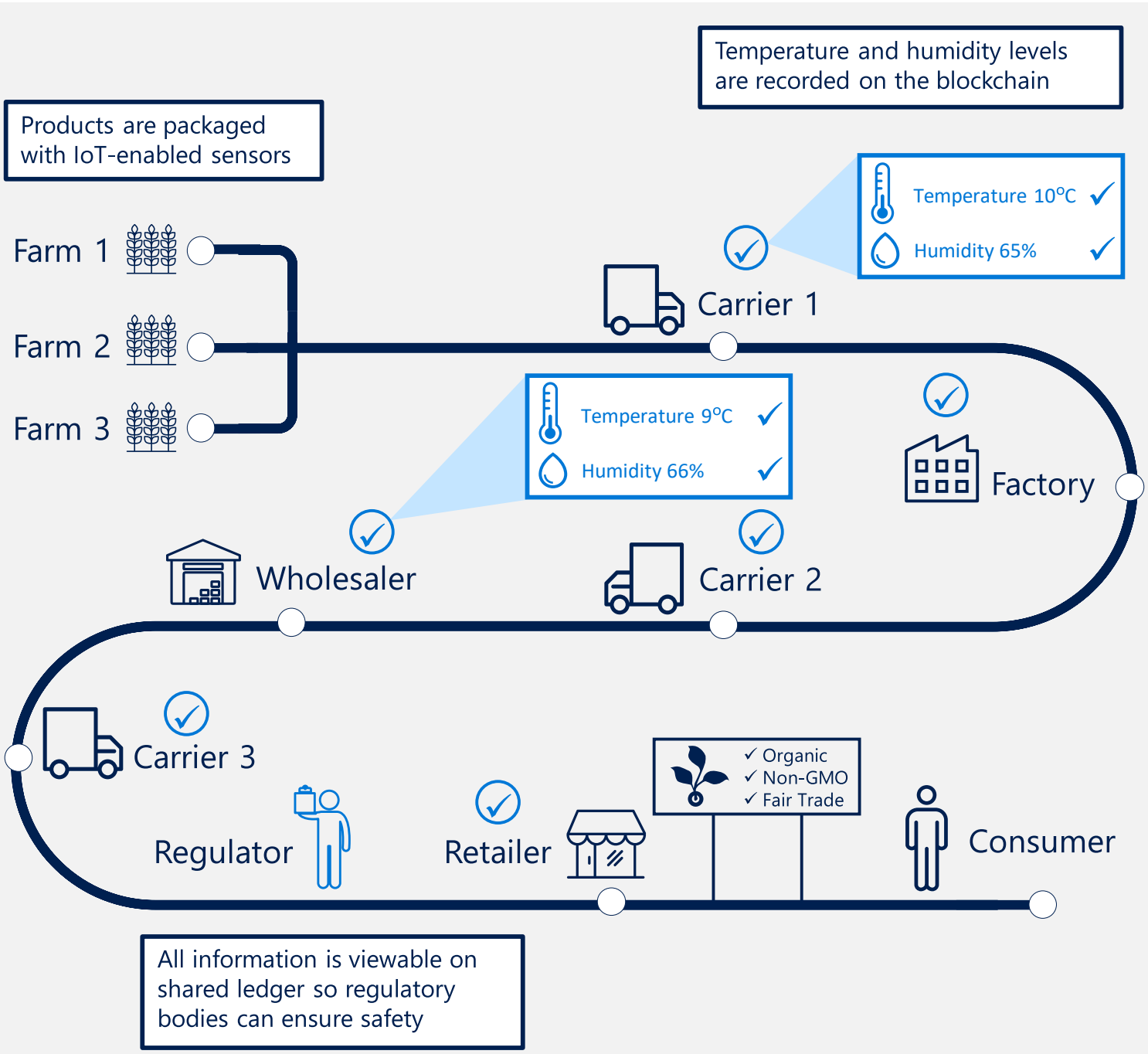
Future state

Combining blockchain technology with IoT sensors, RFID tags, and other monitoring technology enables each party in a supply chain to ensure that products are being kept in agreed-upon conditions and empowers participants to identify and remedy mistakes in real time.

Supplier benefit	Retailer benefit	Consumer benefit
Real-time visibility into product handling and a high-assurance audit log to ensure contract conditions have been fulfilled	Consumer and brand protection; more efficient process for finding fault points and enforcing contractual penalties.	Increased assurance of the safety and quality of goods

Blockchain in action:
Environmental monitoring

Organizations can ensure quality and safety of food along the supply chain by monitoring key criteria, such as temperature and humidity levels. This is made possible by packing products with IoT-enabled sensors that send temperature and humidity data at various points along the supply chain, which are recorded on the blockchain. The shared ledger can be viewed by carriers, factories, wholesalers, retailers, and regulators.



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Dispute resolution

Attestable audits of activity that can be used to inform decisions such as billing, contract fulfillment, licensing, fines, or recalls

Current state

In a complex supply chain, things inevitably won't always go as planned – but when supply chain disputes do occur, it's critical to resolve them quickly and transparently. When a member of the supply chain fails to deliver assets on-time and in-full, or if the quality of assets have been compromised en route, they will likely have to deal with fines – and look-back auditing in order to identify fault is both error prone and costly.

In the news:

Walmart is tightening **on-time in-full enforcement** in Spring 2018, implementing fines for suppliers who do not deliver at least 85% of their shipments on time

After months of investigation, Chipotle and the CDC were unable to definitively identify the source of the infamous **E. coli outbreak**

Future state

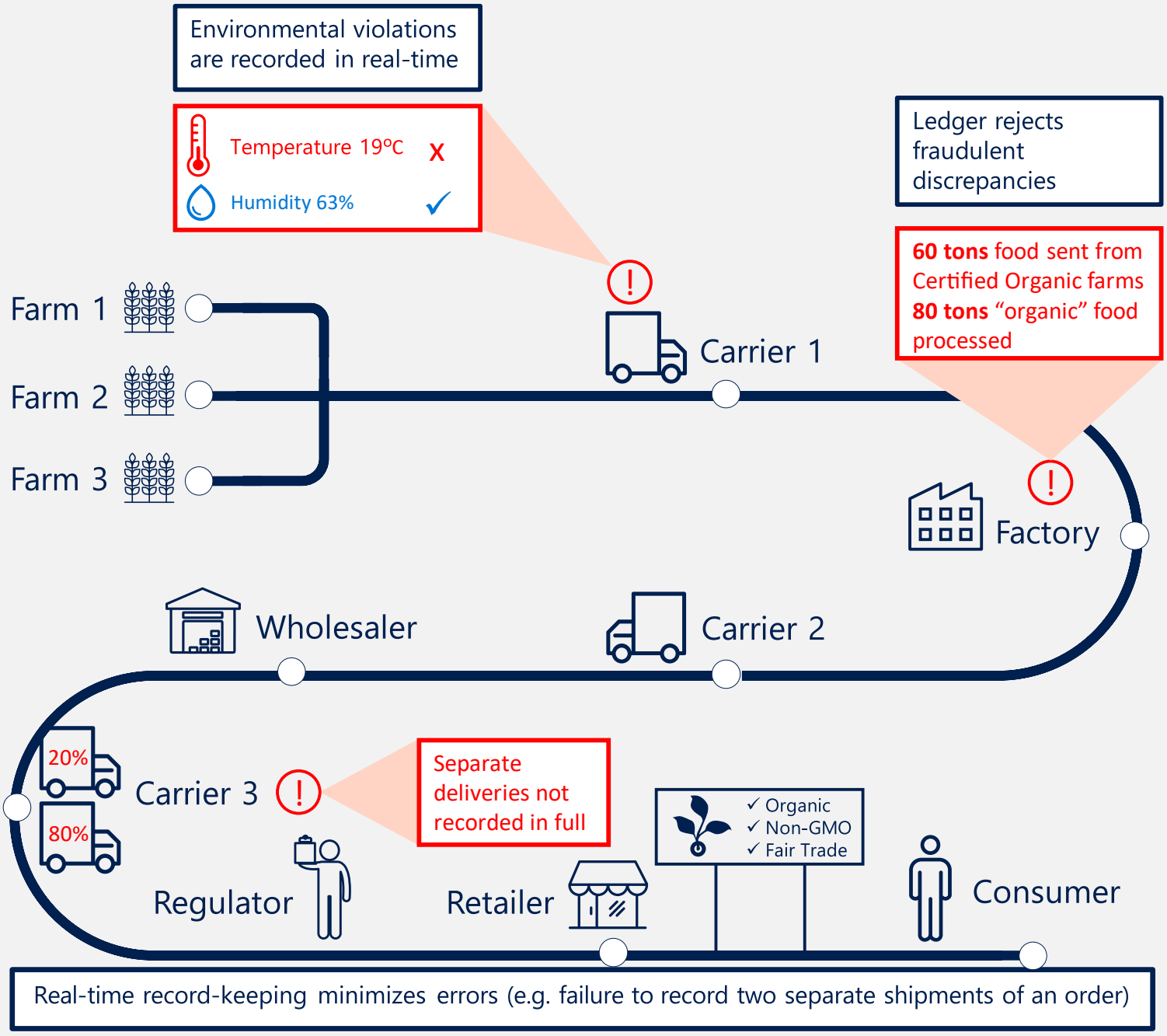
Using blockchain to record asset provenance, environmental conditions, and transfers in real-time removes ambiguity and increases accountability. Faster and more transparent record-keeping means that disputes can be resolved in a fraction of the time.

Furthermore, parties can use blockchain to create smart contracts in which compliance with preset terms automatically triggers compensation or fines. This will make dispute resolution hassles a thing of the past.

Supplier benefit	Retailer benefit	Consumer benefit
Ability to undeniably prove on-time and in-full delivery	Efficient dispute resolution when conditions are not met	Lower frequency of out-of-stock goods

Blockchain in action:
Dispute resolution

With an immutable blockchain audit log, organizations can more quickly and accurately resolve supply chain disputes. Members of the supply chain can set up smart contracts with one another, agreeing on sourcing, environmental conditions, and delivery timeline. If any of these conditions are violated, the smart contracts can immediately trigger fines, revoke payment, or pause production before affected products get to customers.



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Learn what blockchain can do for you

With the power to bring transparency and accountability to even the most complex supply chains, blockchain is poised to transform the way suppliers, retailers, and consumers interact with one another and their goods. In the near future, blockchain has the power to replace complicated, error prone processes – such as look-back auditing – with streamlined smart contracts. As the technology grows and matures, it will be used to open new doors for cross-organizational collaboration and enable new business models along the supply chain.

Get started with Microsoft today

Curious if blockchain is the right fit for you? Microsoft is uniquely positioned to advise organizations on how to leverage blockchain to meet their needs.

- Decades of **enterprise experience and relationships** mean that Microsoft has the expertise to make blockchain meet the needs of businesses – as well as help businesses identify other solutions in scenarios where blockchain is not the right fit.
- We take our **commitment to trust** seriously. Microsoft Azure has more security and compliance certifications than any other hyperscale cloud provider, and we ensure that your data remains in your control.
- We're bringing our **vision of democratizing technology** to blockchain. With Azure Blockchain, enterprises can simplify development with tools that enable developers to get started quickly and scale blockchain projects around shared business processes.
- Microsoft's blockchain offerings are built on our **open, trusted cloud platform** that works with the ledger of your choice and decreases time-to-value by integrating with existing systems of record.

To learn more visit azure.com/blockchain

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