# Accelerating Scalable Traceability:

The Power of the Open-Source Traceability Driver

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Food systems today face growing demands for end-to-end traceability, driven by investors seeking transparency, customers expecting product authenticity, regulators enforcing compliance, and industry commitments aiming to improve sustainability and supply chain integrity. These pressures highlight the critical need for reliable, interoperable traceability solutions that can span the entire food value chain.

Achieving this level of traceability requires adherence to established industry standards such as the Global Dialogue on Seafood Traceability (GDST) and others based on GS1's EPCIS. These standards provide a common language and framework for data sharing across diverse systems and stakeholders, ensuring that traceability information is accurate, consistent, and interoperable.

While the process may not always be technically difficult, the importance of ensuring data is properly formatted, standardized, and compliant is paramount. Organizations often need to invest considerable time and resources to ensure that their data systems are aligned with these standards, which can create barriers to achieving full interoperable traceability.

Recognizing this challenge, the Global Food Traceability Center (GFTC) identified the need for a solution that would help organizations navigate the complexities of industry standards more easily. The Traceability Driver was developed as an open-source tool to help organizations meet these industry standards quickly and cost-effectively, reflecting the GFTC's vision of a fully traceable food system enabled by interoperable digital solutions accessible to all.

Supporting GFTC's efforts to engage food system stakeholders through applied research, capacity building, advocacy, system design, and implementation. The Traceability Driver automates the transformation of traceability data into compliant formats and includes a fully functional, pre-built API for seamless data sharing. This reduces the effort required to achieve compliance and helps organizations focus on their core operations, while ensuring that they remain aligned with crucial industry standards.

# Koltiva's Case Study: Leveraging the Traceability Driver for Efficient GDST Capability

As part of the Traceability Driver's development and testing, Koltiva, a global traceability technology solution provider, volunteered to beta test the tool with their system in order to successfully pass the GDST's First Mile Aquaculture Capability Test using the driver. The Traceability Driver is designed to simplify and accelerate the process of sending traceability data by automating data transformation and ensuring compliance with industry standards. This case study examines Koltiva's experience with the Traceability Driver, evaluating the process and outcomes of their implementation. By sharing their insights, this case study aims to highlight the benefits and challenges experienced during the pilot phase, showcasing how the Traceability Driver helped Koltiva streamline their path to GDST capability while overcoming the barriers of complex data integration.

## Background

Before implementing the Traceability Driver, Koltiva faced a significant, but not uncommon, challenge in aligning their traceability data with GDST and EPCIS standards. While Koltiva's system was already capturing traceability data, they struggled to meet the specific formatting and data transformation requirements needed for GDST capability. The key barrier was the complexity of understanding and implementing the EPCIS standard within their system. They also faced time and resource constraints, which made managing this transformation manually difficult without additional technical support.

# The Implementation Process

Koltiva volunteered to participate in the beta testing of the Traceability Driver to evaluate its effectiveness in simplifying the alignment of their system with the GDST standard. Compared to their original approach, which involved manually adapting their system to the GS1 EPCIS standard, integrating the Traceability Driver into their existing infrastructure was relatively smooth and less resource intensive.
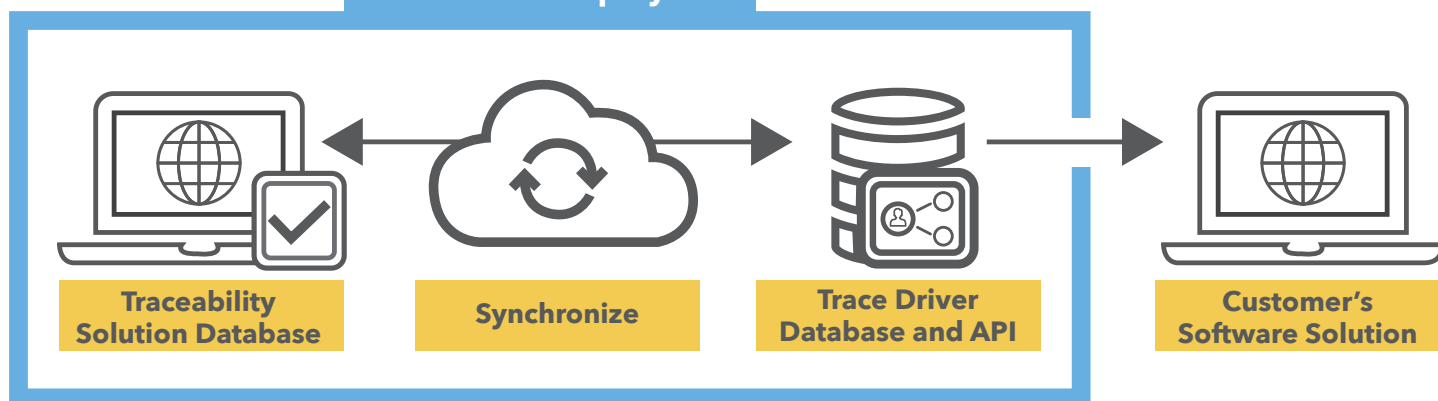
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> Overall, the process took us about a month, including installing the Traceability Driver, clarifying the mapping file structure, and resolving some access token errors during the Capability Test. However, we had many other projects and tasks ongoing that limited our ability to focus on this full-time. The **installation of the Traceability Driver was simple** and took only a few hours to deploy on our servers.
>
> **Muhammad Iqbal, Infrastructure Manager**

This experience highlights the efficiency of the Traceability Driver in accelerating compliance efforts, even when priorities may not be aligned internally.

**EPCIS**, which stands for Electronic Product Code Information Services, represents GS1's standardized method for tracking supply chain events. It sets common rules and formats for recording and sharing information about what happens to products—covering the who, what, when, why, and where—throughout their journey. Being an open standard, EPCIS also provides shared application programming interfaces (APIs) that help different digital systems exchange data smoothly. This shared language and structure make it easier for supply chain partners to connect their diverse systems and work together effectively.

**Local Secure Deployment**

Traceability Solution Database → Synchronize → Trace Driver Database and API → Customer's Software Solution

The main delays were related to fine-tuning the instructions that tell the system how to match and organize their existing data with the requirements of the traceability standard. This process needed extra guidance and support, but the actual installation and setup of the tool itself was quick and easy.

## Flexibility and Customization

The Traceability Driver proved highly flexible in working with Koltiva's existing database and traceability processes. Koltiva was able to map their own data fields to the GDST standard without needing to overhaul their database. Since Koltiva uses MySQL—a widely used and reliable database system supported by the Traceability Driver—the integration was seamless. This allowed them to maintain their current infrastructure while adopting GDST-compliant processes with ease.

## Time Savings and Efficiency

One of the most significant benefits Koltiva experienced was the reduction in development time. Before using the Traceability Driver, they had planned

to build a custom data transformation layer, which would have taken 3–4 months to develop. With the Traceability Driver, they completed the implementation and passed the GDST Capability Test in just about a month, saving 60% of the estimated development time. This time savings allowed Koltiva to avoid the need for additional hires, such as a backend engineer, that would have been necessary to support their initial approach.

> " We estimate a **60% reduction in development time**, rather than the initial planned 3-4 months to build and develop our own APIs and reformat our data, we were able to complete installation of the driver and pass the test within about a months' time. We also avoided the need to hire an additional backend engineer that would have helped us fill the manpower gap.
>
> **Ryan Andriawan, Engineering Manager**

Originally, Koltiva had planned to allocate significant resources to align their system with GDST. However, the Traceability Driver allowed them to achieve GDST capability in a fraction of the time, significantly reducing the staff and time required to meet compliance.

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# Experience with the GDST Capability Test

Koltiva's experience with the GDST Capability Test was largely positive, with the Traceability Driver enabling them to generate GDST-compliant data packets that passed the test with minimal adjustments. The driver helped them easily standardize the Key Data Elements (KDEs) and transform their data into a format that met GDST requirements.

# Results and Benefits

Implementing the Traceability Driver resulted in significant improvements for Koltiva, including:

Time Savings: A 60% reduction in the time it would have taken to build their own system for GDST capability.

Cost Savings: Koltiva avoided the additional cost of hiring extra engineers to handle the data transformation and integration.

Operational Efficiency: The Traceability Driver automated the transformation of traceability data, reducing the manual effort required and making the process much more efficient.

GDST Capability: Koltiva achieved GDST capability in a month, significantly faster than their original plan.

# Key Learnings

While the beta test was a success, demonstrating the Traceability Driver's ability to simplify and accelerate GDST capability, Koltiva's feedback also highlighted opportunities for improvement. The tool already significantly reduces implementation time and effort, but there were areas that required additional support during the pilot.

Some challenges arose around documentation clarity and mapping file preparation, which required direct support from GFTC to diagnose and resolve mapping errors. This valuable feedback became an important learning opportunity for GFTC, leading to efforts to improve and expand documentation and create clearer sample mapping files. These updates aim to better support future users of the Traceability Driver, further reducing the implementation requirements and need for external assistance.

Koltiva's insights have been instrumental in guiding ongoing enhancements, and GFTC remains committed to continuously supporting and improving the Traceability Driver as adoption grows. This ongoing commitment will help ensure the tool evolves into a highly scalable, user-friendly solution that effectively meets the diverse needs of organizations striving for traceability interoperability. Key areas targeted for improvement include adding mapping file validation to catch errors earlier in the process, providing clearer and more detailed technical documentation, supplying additional



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example mapping files for diverse scenarios, and enhancing logging and error reporting to enable faster troubleshooting.

## Closing the Loop: Simplifying Compliance with the Traceability Driver

The Traceability Driver proved to be an effective solution for Koltiva, enabling them to meet GDST capability in a fraction of the time and cost compared to their original plan. By simplifying the process of aligning their traceability data with GDST standards, Koltiva was able to reduce complexity, save valuable development resources, and pass the GDST Capability Test with minimal adjustments.

This case study demonstrates how the Traceability Driver can streamline the process of achieving GDST capability, enabling companies to focus on their core operations while ensuring interoperability across the supply chain.

## Future Potential

The Traceability Driver's potential extends far beyond the seafood industry. Designed to be adaptable and scalable, it can be customized for other commodities that follow EPCIS-based standards, making it a versatile solution for diverse traceability challenges across multiple supply chains. By leveraging established industry standards, tools like the Traceability Driver enable scalable, open-source solutions that are critical for achieving true end-to-end interoperability.

Without interoperable standards and tools that facilitate seamless data exchange, end-to-end traceability across complex global supply chains would be unattainable. As adoption and implementation of traceability standards like GDST

and EPCIS accelerate worldwide, open-source tools such as the Traceability Driver will become increasingly essential for organizations to efficiently meet compliance and foster traceability.

Initiatives, such as the Indonesian government's efforts to align its national seafood traceability system with the GDST standard, exemplify the growing momentum for traceability standardization. Similarly, other commodities supported by global efforts, including those championed by the United Nations Global Compact (UNGC), can leverage tools like the Traceability Driver to advance their traceability goals and drive scalable, interoperable solutions.

GFTC is committed to continuing the development and enhancement of the Traceability Driver, along with other open-source tools, ensuring it remains a robust, user-friendly, and adaptable solution that supports the evolving needs of industries striving for traceable supply chains worldwide.

## Acknowledgements

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# About Koltiva

Offering human-centered technology and boots-on-the-ground solutions that digitize agribusinesses and help smallholder producers transition to sustainable practices and traceable sourcing, KOLTIVA is recognized as the leading global sustainable agriculture and supply chain traceability startup.
As a global technology provider, it constructs ethical, transparent, and sustainable supply chains, assisting enterprises in fortifying their resilience and transparency. The company helps businesses, and their suppliers comply with ever-changing regulations and consumer demands worldwide with traceability solutions. Operating in more than 94 countries and fortified by a network of customer support offices in 21 countries, KOLTIVA is committed in supporting over 19,000 enterprises in establishing transparent and robust supply chains while empower ring over 1,900,000 producers to increase their annual income.