PFT Pilot Program Proposal

Receipt-Verified TLC: A Downstream Confirmation Approach

Leveraging Downstream Receipt Scanning and Cross-System
Data Sharing to Close Distributor Outbound Lot Code Gaps Under FSMA 204

Submitted for Discussion
Partnership for Food Traceability (PFT)
TLC and TLCS Flexibility Pilot Program

Proposed by: Starfish Technology Inc.
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Executive Summary

This proposal introduces a pilot concept for the PFT TLC/TLCS Flexibility Pilot Program that addresses one of the most persistent challenges in FSMA 204 implementation: the operational difficulty distributors face in scanning individual lot codes on outbound shipments.

The core idea: Rather than requiring distributors to definitively capture every TLC at the point of outbound shipment, this pilot would test a ***receipt-verified TLC methodology*** in which downstream recipients who already scan products on receipt share the confirmed lot code information back to their upstream supplier (the distributor). This creates a closed-loop verification mechanism that leverages existing receiving practices to fill the distributor's outbound TLC gap.

According to the Convenience Distribution Association (CDA), approximately 25% of convenience store operators already perform lot-level scanning at the point of receipt. This figure represents one of the less technology-intensive segments of the food supply chain; scanning adoption among grocery retailers, club and warehouse stores, large foodservice distributors receiving from upstream suppliers, and secondary processors and fresh-cut operations is expected to be materially higher given their greater investment in receiving infrastructure and existing EDI capabilities. This provides a meaningful and growing starting population for testing this approach. Additionally, where electronic data exchange infrastructure already exists—such as Purchase Orders and Advanced Shipping Notices (ASNs)—these records can be linked to receipt-verified TLC data to further enrich and validate the traceability chain.

Building on PFT's Interoperability Pilot: The foundational principles behind this approach have already been proven. PFT's first pilot—the Cucumber Interoperability Pilot—demonstrated that multiple independent technology solution providers can exchange GS1-aligned traceability data across organizational and system boundaries in a way that satisfies FSMA 204 expectations. That pilot confirmed that ASN-based data exchange and modern APIs can significantly reduce friction compared to paper-based or manual systems, and that interoperable networks of platforms can deliver coherent, end-to-end traceability views. The receipt-verified TLC approach applies these proven data-sharing foundations to a specific, high-impact use case: the distributor outbound TLC gap.

Status: This proposal is being shared with PFT to solicit feedback on the concept and gauge interest from potential participants. Starfish Technology does not yet have committed pilot participants, but believes this approach warrants discussion given its potential to offer a practical, scalable compliance pathway for a large segment of the supply chain.

Problem Statement

FSMA 204 requires the capture and sharing of Traceability Lot Codes (TLCs) and Traceability Lot Code Sources (TLCS) at each Critical Tracking Event, including shipping. However, current operational realities at the distribution level present significant barriers to compliance:

- **Outbound lot scanning is operationally prohibitive for most distributors.** Distributors ship thousands of cases daily across mixed-lot pallets. Scanning every case at the outbound dock requires either expensive automation infrastructure (scanning tunnels, fixed-mount readers) or significant additional labor with handheld scanners—both of which introduce cost and throughput challenges.
- **Existing flexible methods rely on forward-looking estimation.** The calculated/inferred, range, and probabilistic TLC methods described in PFT's draft parameters document all attempt to determine TLCs at the point of shipment based on WMS data and inventory rotation logic. While valuable, these methods carry inherent accuracy limitations and require significant system investment to implement.
- **Downstream receipt data is underutilized.** A meaningful percentage of recipients (retailers, foodservice operators, secondary processors) already scan incoming product at the receiving dock to verify orders against Purchase Orders and ASNs. This data—which includes the actual TLCs physically received—is not currently shared back upstream, representing a missed opportunity to close the traceability loop.
- **The rule itself anticipates bidirectional data flow.** FSMA 204 establishes that both the shipper and receiver have recordkeeping obligations at their respective CTEs. The receipt-verified approach aligns with the rule's framework by leveraging the receiver's CTE data to strengthen the shipper's records.

Proposed Pilot Methodology

Concept: Receipt-Verified TLC

The Receipt-Verified TLC method introduces a fifth approach to the flexible TLC methodology framework, complementing the Definitive, Calculated/Inferred, Range, and Probabilistic methods already identified by PFT. It works as follows:

Step	Description
1	**Distributor ships product with available data.** At the shipping CTE, the distributor records all KDEs it can currently capture (product ID, quantity, ship date, ship-to location, PO reference) and, where possible, a calculated or range-based TLC using its WMS. The shipment includes an ASN or equivalent shipping document.
2	**Recipient scans product at receiving dock.** The downstream recipient performs their normal receiving process, which includes scanning case-level barcodes (GS1-128, 2D Data Matrix, or QR codes) that encode TLC information (GTIN + lot code + date). This scanning is already performed by the recipient for their own receiving CTE compliance and/or operational quality checks.
3	**Receipt data is shared back to the distributor.** The confirmed TLC data captured at receipt is transmitted back to the distributor via an electronic mechanism, such as a Receipt Confirmation (EDI 861), an EPCIS Receiving Event, a shared traceability platform, or an API-based data exchange. This data is linked to the original PO and/or ASN for matching.
4	**Distributor reconciles and updates shipping records.** The distributor matches receipt-confirmed TLCs against the original shipment record (by PO, ASN, or shipment ID). The distributor's shipping CTE records are enriched with the verified TLC data, replacing or validating any estimated TLCs.
5	**Verified traceability chain is established.** The result is a closed-loop traceability record where the distributor's shipping CTE TLC data is confirmed by the recipient's receiving CTE data, linked through common transaction identifiers (PO, ASN, shipment ID).

Data Linkage Architecture

Today, most distributor-to-recipient transactions already include some form of electronic documentation—Purchase Orders, ASNs, invoices—but these records typically lack lot-level traceability data. The receipt-verified TLC method fills this gap by linking confirmed lot codes from the receiving dock back to these existing transaction records, enriching them with the TLC data that FSMA 204 requires without rebuilding the transaction infrastructure from scratch.

The pilot would test the following data linkage pathways:

- **ASN-to-Receipt Matching:** Most distributor ASNs (EDI 856) include product, quantity, and shipment-level detail but do not yet include lot-level TLC data. The recipient's receiving scan captures the TLCs that are missing from the ASN, and these confirmed lot codes can be matched at the line-item level back to the original ASN—closing the lot-level gap without requiring changes to the distributor's outbound scanning workflow.

- **PO-to-Receipt Matching:** Where ASN infrastructure is not yet in place, Purchase Orders (EDI 850) provide an alternative transaction-level anchor. POs specify what was ordered; receipt confirmations tied to PO line items establish which TLCs were actually delivered against those orders, creating an auditable lot-level link where none previously existed.
- **EPCIS Event Pairing:** For trading partners with EPCIS capabilities, the shipper's Shipping Event and the receiver's Receiving Event can be paired by business transaction identifiers, with the receiving event providing the definitive TLC data.
- **Platform-Based Exchange:** Data-sharing platforms and traceability networks can serve as the exchange mechanism, normalizing heterogeneous data formats across trading partners' systems and providing a shared, auditable record accessible to both parties. This approach reduces the need for point-to-point integrations between individual trading partners.

Alignment with PFT Framework

Building on PFT's Interoperability Pilot

This proposal builds directly on the findings and proven foundations of PFT's first pilot—the Cucumber Interoperability Pilot—which tested whether multiple independent technology solution providers could exchange GS1-aligned traceability data across organizational and system boundaries in a way that meets FSMA 204 expectations.

That pilot demonstrated several key principles that are foundational to the receipt-verified TLC approach:

- **Interoperability is achievable.** Three independent solution providers (Kezzler, Starfish, and PeerLedger) successfully exchanged CTE and KDE data across a simulated cucumber supply chain—from farm through packing, processing, distribution, and retail—using GS1-compliant identifiers and API-based data sharing.
- **ASN-based data exchange works.** The pilot confirmed that ASNs and modern APIs can significantly reduce friction compared to paper-based or manual data capture, providing a reliable mechanism for moving traceability data between systems.
- **End-to-end traceability views can be assembled across platforms.** A key outcome was the ability to assemble coherent traceability views across the three participating platforms and generate electronically sortable record sets that show, for a given retail unit or lot, the complete upstream path and associated CTEs.
- **Master data alignment and data translation are solvable challenges.** The pilot surfaced important practical lessons about lot identifier creation timing, the need for translation layers between operational event models and FSMA 204 reporting formats, and the importance of permissioning frameworks—all of which have been incorporated into the design of this proposal.

The receipt-verified TLC pilot takes these proven interoperability foundations and applies them to a specific, high-impact use case: using downstream receipt data to fill the distributor outbound TLC gap. Where the interoperability pilot asked “can multiple platforms exchange traceability data?”, this pilot asks “can that same data exchange be structured as a repeatable methodology for closing compliance gaps at the distributor level?”

Relationship to Draft Flexible Method Parameters

The Receipt-Verified TLC method aligns with and extends the best practices identified in PFT’s Draft Parameters for Flexible Methods:

PFT Best Practice	Receipt-Verified TLC Alignment
Reliable inbound TLC data via electronic receipt (e.g., ASN)	Goes further: validates inbound data at the downstream receiving dock against physical product, not just electronic records
Well-controlled inventory management (FIFO/FEFO)	Compatible: receipt verification can validate that FIFO/FEFO calculations at the distributor were accurate by comparing estimated TLCs against confirmed TLCs
Documented methodology with validation processes	Receipt verification provides an independent validation mechanism—the recipient’s physical scan data serves as a real-world audit of the distributor’s calculated outputs
Accuracy comparable to a definitive method	Strongest alignment: receipt-verified TLCs are, by definition, definitive—they are the actual lot codes on the physical product as confirmed by scanning
Routine sampling/auditing for continuous improvement	The reconciliation process between estimated and confirmed TLCs generates ongoing accuracy metrics, creating a built-in continuous improvement feedback loop

Complementary to Existing Flexible Methods

Importantly, the Receipt-Verified TLC method is not a replacement for the calculated, range, or probabilistic approaches. It is a complementary verification layer that can:

- Serve as the primary TLC capture method for trading partner pairs where the recipient already scans on receipt
- Act as an accuracy validation mechanism for distributors using calculated/inferred TLCs, providing ongoing measurement of how well WMS-based estimates match actual receipts
- Enable a phased compliance pathway where distributors begin with estimated methods and progressively improve accuracy as more recipients participate in receipt data sharing

Proposed Pilot Design

Objectives

1. Demonstrate that receipt-verified TLC data can be reliably captured and shared back to the distributor/shipper within a defined timeframe
2. Validate that receipt-confirmed TLCs can be linked to original shipment records via PO, ASN, or other transaction identifiers
3. Measure the accuracy improvement over calculated/inferred methods by comparing estimated outbound TLCs against receipt-confirmed TLCs
4. Document the operational requirements, system modifications, and trading partner coordination needed for implementation
5. Assess scalability: what percentage of a distributor's outbound volume could be covered by receipt verification given current industry scanning adoption rates

Participant Profiles

The pilot would ideally involve the following participant types:

Role	Description	Key Contribution
Distributor(s)	Broadline or specialty distributors handling FTL products who currently struggle with outbound lot scanning	Shipping CTE data, WMS-calculated TLCs for comparison, reconciliation workflow testing
Recipient(s)	Grocery retailers, foodservice distributors (receiving from upstream), secondary processors, or other recipients who scan on receipt	Receiving CTE data with confirmed TLCs, receipt confirmation transmission
Technology Provider(s)	Traceability solution providers, scanning and data capture providers, and/or data-sharing technologies that facilitate electronic exchange of TLC data between trading partners	Data normalization, matching logic, cross-system exchange infrastructure, pilot analytics and reporting

Scope

- **Products:** FTL products commonly handled in distributor-to-retail/foodservice channels (e.g., fresh produce, fresh-cut fruits and vegetables, leafy greens, cheese)
- **Geography:** Regional scope determined by participating trading partner pairs
- **Duration:** 8–12 weeks of active data exchange, with 4 weeks of setup and 4 weeks of analysis/reporting

- **Volume:** Target a minimum of 500 shipment-receipt pairs across participating trading partners to generate statistically meaningful results

Scenarios to Test

1. **Standard single-lot shipment:** Distributor ships cases from a single TLC; recipient confirms the TLC on receipt
2. **Mixed-lot shipment:** Distributor ships a pallet containing cases from multiple TLCs; recipient scans and identifies each TLC, providing a definitive lot-level breakdown
3. **Cross-docking and direct-ship scenarios:** Testing receipt verification in scenarios where product moves quickly through distribution with minimal handling

Optional extension scenarios *(if pilot scope and participant capabilities allow):*

4. **Calculated TLC validation:** Distributor provides a calculated/inferred TLC on the ASN; recipient's receipt scan confirms whether the calculated TLC was correct, measuring method accuracy
5. **Range TLC narrowing:** Distributor provides a range of possible TLCs; recipient's scan confirms which specific TLC(s) were actually shipped, narrowing the range to a definitive answer

Key Metrics

Metric	What It Measures	Target
Receipt scan rate	% of received shipments where recipient captures case-level TLC data	Baseline measurement + improvement over pilot duration
Data return latency	Time between physical receipt and confirmed TLC data availability to distributor	< 24 hours for 90%+ of transactions
Match rate	% of receipt-confirmed TLCs that can be successfully matched to original shipment records (PO/ASN)	> 95% successful matching
Calculated TLC accuracy	% of distributor-estimated TLCs that match receipt-confirmed TLCs	Baseline measurement (informational)
Coverage rate	% of distributor's total outbound FTL volume that can be receipt-verified	Estimate scalability based on recipient participation rates

FDA Relevance and Regulatory Considerations

This pilot is directly relevant to FDA's upcoming May 9, 2026 deadline to provide industry stakeholders with recommendations for additional flexibilities satisfying the rule's lot-level tracking requirement. Key considerations for FDA:

- **Rule alignment:** FSMA 204 requires both shippers and receivers to maintain CTE records. The receipt-verified method leverages the receiver's already-required receiving CTE records to strengthen the shipper's records—working within the rule's existing framework rather than creating new obligations.
- **Data quality:** Receipt-verified TLCs are based on physical scanning of actual product, making them functionally equivalent to definitive TLCs. This addresses FDA's core goal of reliable lot-level traceability.
- **Practical scalability:** As more recipients adopt receiving-dock scanning (driven by their own FSMA 204 compliance needs), the coverage rate for receipt verification naturally increases without requiring additional investment from distributors.
- **Timing consideration:** Receipt verification introduces a brief time lag between the shipping event and TLC confirmation. The pilot would quantify this lag and assess whether it meets FDA's needs for timely traceability during outbreak investigations. Importantly, the distributor would still have estimated TLC data available immediately, with receipt verification providing confirmation within hours.
- **Collaborative compliance:** Rather than requiring every company to independently build comprehensive lot-scanning capabilities, this approach enables companies to leverage their trading partners' existing capabilities through electronic data sharing. This reduces the total compliance burden on the industry while potentially achieving higher data quality than methods that rely solely on estimation.

About the Proposer: Starfish Technology Inc.

The Cross-System Data Sharing Challenge

FSMA 204 compliance is fundamentally a data-sharing problem. Traceability data originates in grower pack systems, flows through manufacturer ERPs, passes through distributor WMS platforms, gets transmitted via EDI networks, and must ultimately reach retail and foodservice receiving systems—all of which speak different data languages, use different identifiers, and operate on different timelines. No single technology vendor or platform serves the entire chain.

This is the problem Starfish Technology was built to solve.

Why Starfish

Starfish Technology operates a supply chain data integration platform that serves as a trusted neutral layer for sharing traceability and compliance data across the food supply chain. With

connections to 80+ technology partners—including ERP systems, WMS platforms, EDI providers, traceability solutions, and food safety platforms—Starfish normalizes, routes, and reconciles data between systems that were never designed to talk to each other.

Key capabilities relevant to this pilot:

- **Cross-system data normalization:** Starfish translates between the data formats used by different trading partners and their technology systems, ensuring that a TLC captured in one system can be matched and reconciled in another—regardless of whether partners use GS1-128, EPCIS, EDI, CSV, or proprietary formats.
- **Trusted data exchange:** Starfish provides a neutral, auditable exchange layer where trading partners can share sensitive compliance data with confidence. Data provenance, timestamps, and chain-of-custody are maintained, critical for establishing that receipt-verified TLCs are reliable and verifiable.
- **Transaction matching and reconciliation:** Starfish's existing capabilities for linking POs, ASNs, invoices, and receipt confirmations across trading partner systems provide the foundation for matching receipt-confirmed TLCs back to original shipment records.
- **Network-ready scalability:** Because Starfish already connects across the supply chain ecosystem, adding receipt verification data flows does not require building new point-to-point integrations between individual trading partners. As more recipients participate, the network effect increases coverage without proportional increases in implementation effort.
- **Technology-agnostic approach:** Starfish works with each partner's existing systems rather than requiring adoption of a new platform, reducing barriers to participation and making the pilot accessible to companies of all sizes and technology maturity levels.

Starfish's Role in the Pilot

Starfish's role would focus on:

- Providing the trusted data exchange infrastructure for receipt-to-shipper TLC data transmission across disparate systems
- Normalizing data formats across participating trading partners' systems (ERP, WMS, EDI, traceability platforms) to enable seamless matching
- Developing and operating the reconciliation logic to link receipt-confirmed TLCs to original shipment records via PO, ASN, and shipment identifiers
- Maintaining an auditable data provenance trail to support compliance recordkeeping
- Collecting, analyzing, and reporting pilot metrics
- Contributing to the PFT pilot report and sharing findings to help inform industry-wide best practices

Requested Feedback and Next Steps

This proposal is being shared with PFT in support of the partnership's mission to coordinate pilots and share learnings that advance practical, interoperable traceability solutions. Starfish Technology welcomes feedback and is seeking to:

1. **Solicit PFT feedback** on the concept, methodology, and alignment with the broader TLC/TLCS Flexibility pilot program
2. **Gauge interest** from PFT members and their networks in participating as distributors, recipients, or technology partners
3. **Discuss timing** – given that this pilot would require participant recruitment, we'll need to dermine what track would be most appropriate
4. **Explore co-development** of the pilot design with PFT members who have experience with similar bilateral data exchange initiatives

Contact

For questions or to express interest in this pilot concept, please contact:

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PFT Pilot Program:
pftraceability.org