

JLARC I-900 Subcommittee - Public Hearing (November 6, 2024) - Written Comments - Gregory Foster

Additional Context Around WSLCB and “Seed-to-Sale” Cannabis Traceability Systems

Introduction

I’m Gregory Foster with [Cannabis Observer](#). My organization has observed and reported on cannabis policymaking in Washington state since 2018. We attend every public meeting of the Washington State Liquor and Cannabis Board (WSLCB) as well as other agencies which have cannabis authorities, and track cannabis-related legislative and executive activity. I am not a cannabis licensee and have no stake in any licensed business.

I have a background in Computer Science, and recognized that an independent perspective could be of value in the traceability conversation. **I addressed the JLARC I-900 Subcommittee during the public hearing held on the previous report** by the State Auditor (WA SAO) in [September 2018](#) during which I offered caveats and suggestions for ways to optimize the desired automated alerts.

Today, I’d like to provide **subsequent historical context which may prove helpful**, and offer **suggestions for the path forward**.

Missing Context: WSLCB Stakeholder Work Groups

The new audit and report rightfully focused on the challenges WSLCB leadership and staff have encountered over the years implementing cannabis product traceability regimes, as well as their troubled relationships with traceability software platform vendors. **Little mention was made of two other groups integral to this dynamic: the regulated community (licensees) and third-party software integrators (integrators)** who build applications that licensees use to conduct business and work with traceability software platforms or data reporting interfaces like the one operated by WSLCB staff.

In the years preceding and following the first WA SAO report, **licensees and integrators were directly and deeply engaged in the traceability conversation, helping clarify requirements and offering user perspectives**. Those interactions were formally organized by agency staff through three different bodies, all of which I participated in. See Appendix A for an augmented

version of the auditor's "*Timeline of Cannabis Data Tracking Systems*" which situates these work groups in relation to listed events.

- [WSLCB Traceability Advisory Committee](#) - This committee convened between January 2017 and August 2019 to assist the transition from BioTrack to MJ Freeway [Leaf Data Systems](#). It was composed of agency staff, traceability software vendor representatives, industry stakeholders, a representative from the Washington State Office of the Chief Information Officer (WA OCIO), and a quality assurance vendor. The committee met throughout the transition and well into the rocky start of operations by MJ Freeway. Long after it had become apparent to the regulated community that the new vendor was not up to the job, participation waned and the committee was disbanded.
- [WSLCB Traceability 2.0 Work Group \(T2.0 WG\)](#) - A smaller work group was convened between September 2019 and March 2021 composed of industry stakeholders and agency staff who vetted the next generation of cannabis supply chain surveillance in Washington state. **This group was explicitly convened to help WSLCB staff figure out what to do next as the vendor relationship with MJ Freeway deteriorated.** Stakeholders educated agency staff about the limitations of first generation traceability platforms and offered recommendations. In the final meeting of the work group, staff relayed the decision of agency leadership to update the interim 2017 Contingency Reporting System framework (CRS), rebranding it as the [Cannabis Central Reporting System](#) (CCRS). The decision to go the CCRS route obscured the good faith work and productive collaboration between the agency and its regulated community which occurred in the T2.0 WG. It was a turning point.
- [WSLCB Integrator Work Sessions](#) - Beginning before 2018, work sessions convened agency technical staff and integrators who were preparing to interface their software applications with Leaf Data Systems. MJ Freeway representatives were sometimes present on the calls. The sessions were halted by agency staff in June 2021 after the decision to go the CCRS route, eliminating an opportunity to receive feedback from primary system users as CCRS was developed for deployment later that year.

As the State auditors found, **the decision made in March 2021 to go the CCRS route had substantial ramifications** for the future of cannabis data reporting and analysis in Washington state. The decision also correlates with a significant turnover of senior leadership and staff within the agency, contributing to a loss of institutional knowledge which the auditors flagged.

WSLCB Leadership and Staff Turnover

- **Deputy Director Megan Duffy** joined the agency in early 2019 during the transition to MJ Freeway and was an executive sponsor of the T2.0 WG. She announced her appointment by the Governor out of WSLCB in mid-March 2021 coincident with the decision to go with CCRS. She transferred in mid-April and the Deputy Director role remained unfilled until June 2021.
- **CIO Mary Mueller** was also an executive sponsor of the T2.0 WG. She announced her resignation coincident with the decision to go the CCRS route in March 2021.

- The new and current CIO George Williams was internally promoted after having joined the agency as a senior IT leader in January 2020 during the MJ Freeway transition.
- **Board Chair David Postman** joined the agency in March 2021. During [his first caucus meeting on March 16th](#), he and the other board members were publicly briefed on the CCRS decision.
- Former **Enforcement Chief Justin Nordhorn** was an active member of the T2.0 WG. He transferred horizontally to become the WSLCB Director of Policy and External Affairs in March 2021. He retains knowledge of the entire history of the implementation of 502 and traceability in WA at the highest levels in the agency.
- Coincident with the arrival of **Director William Lukela** in July 2023 from the [Colorado Marijuana Enforcement Division](#) where the [Metrc traceability platform](#) was [developed beginning in 2011](#), WSLCB staff issued [RFI K1783](#) *“to solicit information regarding cost and capability of vendors to provide a long-term cannabis reporting and traceability solution to replace our current, contingency reporting system. We will be using this information to prepare a decision package for funding.”*

The contention that institutional knowledge has been lost because senior leaders and staff have left the agency is true. **It also appears to be true that the agency lost some senior leaders and staff because of the decision to go the CCRS route.**

Mitigating this loss of institutional knowledge, Cannabis Observer was present at all of the T2.0 WG meetings as well as many of the Traceability Advisory Committee meetings and Integrator Work Sessions. We archived every meeting, presentation, and recommendation including creation of continuous audio recordings of the proceedings. **I encourage State officials to leverage the resources we have gathered and made publicly available to help navigate a path forward.**

A Fourth Turning?

As interest within and outside WSLCB is cultivated to move beyond CCRS—marking a fourth turning of the traceability wheel in Washington state—agency staff are seeking input from the regulated community through surveys and direct conversations with selected stakeholders. I suspect they may be hearing the same things which have been said many times before. **Here are some critical themes which stakeholders presented during the formally organized work groups.**

Operation vs. Regulation

By requiring regulated communities to utilize a centralized traceability platform like BioTrack, MJ Freeway, or Metrc, regulators become problematically intertwined in the operation of regulated markets. These platforms do not mediate the sale of cannabis products between licensees, but they do mediate the exchange of structured information about sales and analytical testing. They document the transformation of raw materials into interim and

finished products. Traceability platforms are in many ways indistinguishable from—or duplicative of—inventory management systems used by businesses where the items, product transformations, and intra-market transfers are objects of surveillance by State regulators.

These platforms become central to the smooth operation of regulated markets by standardizing and automating the exchange of information between participants. By requiring their use, regulators take on the responsibility of provisioning a mission critical environment to facilitate the operation of a closed market, blurring the line between operator and regulator. This is in contrast to data reporting interfaces like CCRS which create regulatory obligations which are separate from critical business operations.

Problems with the centralized traceability approach become self-evident when vendors fail to meet their commitments or their technological platforms fail.

- **In late 2017, MJ Freeway was unprepared to launch Leaf Data Systems in Washington** before the end of the BioTrack contract.
 - **WSLCB staff responded by standing up the CRS and requiring licensees to upload unvalidated data files**, a significant technical regression which sowed panic and disrupted marketplace operations.
 - The negative impacts of this change would have been much greater without BioTrack’s continued assistance—basically continuing to operate their traceability platform outside of a contract with the State—which enabled licensees to continue to transfer data between one another and automated report uploads to meet the State’s new data reporting requirements.
- **Once launched, Leaf Data Systems catastrophically failed repeatedly bringing many businesses to a halt** and requiring the regulated community to adapt to a fault-prone business environment outside of their control.
 - The first few times this occurred, **retail transactions on point of sale systems which were synchronized with Leaf were impossible**, impacting businesses, consumers, and State tax revenue.
 - **In response to this uncertainty, integrators built asynchronous failsafe systems** to support offline storage and replay of transaction reporting to Leaf.
 - **Repeated failures prompted calls for the State and MJ Freeway to “get out of the middle” of business operations.**
- **Leaf Data Systems centralized provision of unique identifiers and system failures halted labeling of cannabis products**, prompting reconsideration of this central feature of traceability regimes.
 - **“Seed-to-sale” traceability is accomplished by provisioning and linking unique identifiers for every item in a supply chain.** That information is digitally tracked in a traceability platform while the actual products are physically labeled. Presuming rigorous compliance, the list of finished products created from any plant or interim product should be traceable through the network of linkages between unique identifiers, and vice-versa.

- **When MJ Freeway failed, these unique identifiers could not be provisioned.** Production, processing, and retail operations were halted or delayed, staff were left idle, and businesses suffered.
- The centrality of unique identifiers to the vision of complete traceability of regulated markets was highlighted in the State Auditor's new report (p. 20), whose authors **raised public health concerns in the event of product recalls** should the network of linkages between plant and finished product be inefficient to reconstruct or irreproducible.
- The T2.0 WG brought these same concerns to the agency, researched options, and [formally recommended use of an algorithm](#) to **provision unique identifiers in a decentralized, yet coherent way** (attached as appendix B).
- **When it came time for WSLCB staff to define the requirement for unique identifiers in CCRS, they allowed licensees to report using any system of unique identifiers** within the context of their own business - disregarding concerns expressed by their own staff within the T2.0 WG.

Does WSLCB Really Need Realtime Data?

State auditors emphasized a concern that *“Enforcement officers lack real-time tracking information”* with CCRS. **This topic was discussed at length during the T2.0 WG, leading to a consensus that real-time data reporting was not strictly necessary, except perhaps for transportation manifests.** Yet even that requirement was revealed to be a “nice to have.”

- **MJ Freeway never built a required realtime data integration for the Washington State Patrol (WSP).**
 - The contract with MJ Freeway required the construction of a realtime data integration with WSP systems so officers in the field could query the traceability platform **to retrieve transportation manifests in the event of encountering licensees or licensed transporters** carrying more cannabis than individuals are authorized to possess.
 - During the T2.0 WG meetings, WSLCB staff revealed that this software linkage was never built by MJ Freeway. Furthermore, WSLCB officials said that **WSP staff never raised a concern about the absence of the promised integration.**
- T2.0 WG members and agency staff agreed that **asynchronous data reporting would be sufficient** for most purposes.
 - WSLCB Enforcement leadership participated in many T2.0 WG meetings, and **did not emphasize the importance of realtime data for agency enforcement operations.**
 - [Special handling for transportation manifests](#) was still required in CCRS.
- **If realtime data is desired, CCRS has to be redeveloped to provide an API interface.**
 - CCRS is an asynchronous data reporting system with a policy requirement that licensees upload data at least weekly.

- If the agency intends to mandate use of integrator software systems that actively update CCRS in realtime, an API interface which provides immediate responses with the status of requests made of the system is **a necessity**.

Security Theater That Punishes Good Actors

When the Cole Memorandum was issued, Washington and Colorado sought technological means to meet the unequivocal federal recommendation to prevent diversion and keep cannabis products out of the hands of children. Exactly how an idealistic, technocratic vision of absolute “seed-to-sale” traceability was packaged and sold to meet these requirements in those early days remains unknown to me, especially as systems custom fit for regulated State cannabis markets did not exist. **Washington went with BioTrack and Colorado selected Franwell Metrc**, and both states worked hand-in-hand with those vendors for years to define and build their platforms.

We have been told the promised benefits of traceability platforms can only be achieved after accepting significant costs to the State, the regulated community, and software integrators. Vendors differentiate themselves by altering the balance of costs between those customers.

Unfortunately, the fundamental purpose of these systems can be undercut by bad actors who simply choose not to report.

- **An unspoken presumption of “seed-to-sale” traceability is that licensees will voluntarily comply with data entry requirements.**
 - Absolute visibility into the cannabis marketplace—the goal of knowing where every cannabis product is in the state at any time—**can only be achieved with absolute compliance** to data entry requirements.
 - **Strict requirements create costs for businesses.** Aside from integrator software subscriptions, staff must be trained to incorporate the traceability regime into most facets of operations. Many businesses which can afford to do so hire dedicated staff whose only purpose is keeping the business compliant with reporting requirements. Meeting this goal has very real impacts on every licensee, and **disproportionately impacts smaller businesses and new entrants.**
 - **People are not robots and even robots make mistakes.** Computer scientists have long recognized that the integrity of any system of data and analysis can be compromised by erroneous input (“garbage in, garbage out”). As the auditors pointed out, a critical fault of CCRS is the dearth of feedback about input data and the inability to easily correct mistakes.
- **Unfortunately, any traceability system can be compromised quite simply: bad actors don’t have to enter all the data required for oversight.**
 - If plants are headed out the back door, criminals can elect not to create a data trail for officials to notice or automated alerts to flag for investigation. **If a physical cannabis plant doesn’t have a virtual representation in the**

traceability platform, would officials know it existed at all? This scenario was raised during the T2.0 WG meetings and participants—including WSLCB staff—agreed it was plausible.

- WSLCB Enforcement and Education officers aim to conduct licensed premise checks annually and respond to complaints, during which untagged plants and products may be noticed. Failure to comply with traceability requirements remains a serious violation. **This hypothetical is intended to encourage moderation of faith in this approach**, recognition of limits, and re-evaluation of benefits/costs.
- Meanwhile, **the vast majority of licensees are good actors who are effectively penalized** for responsibly meeting strict and arguably unreasonable demands for regulatory oversight.
 - **If the primary goal of traceability platforms to prevent diversion and keep products out of the hands of children can be undermined by simply not reporting, what is the point** of imposing such an expensive, disruptive, and ineffective technological regime on the regulated community? Why put agency leadership and staff through that again? Why spend so much taxpayer money on an illusion of safety?
 - This is akin to the requirement for licensed premises to be covered by expensive security cameras - yet no one reviews the footage except in the event of a robbery.

Throughout the T2.0 WG meetings, licensees argued for scaling back required surveillance to the minimum amount of information WSLCB staff need to ensure public safety and public health. WSLCB staff responded by reviewing and defining required information. Licensees also argued for a periodic data reporting regime rather than a realtime surveillance system. And the final recommendations of the work group compiled by WSLCB staff did envision a more moderate approach - albeit one more rigorous than CCRS.

Recommendations

In closing, I'd like to suggest **three recommendations in accordance with the State Auditor's recognition that CCRS is here to stay** for the foreseeable future.

#1: Convert CCRS file upload data intake to a contemporary API

- **Data is currently uploaded to CCRS in a prescribed file format**, with little feedback offered on the validity of the input or the integrity of the upload process. An email is later sent which can be delayed. Software integrators have had to build custom solutions to handle the bespoke asynchronous and multi-protocol structure of this interaction.
- Regardless of the legitimacy of the perceived need for realtime data, **there cannot be realtime information without a realtime API**. It is frankly trivial to build an API or even generate one from well defined specifications - although I recognize that building and securely deploying any software within State government is inherently not trivial.

Rigorous data validation like the State Auditor recommends can be incorporated and users can get immediate feedback on the status of every request.

- A write-only API would reproduce the current problems licensees encounter with subsequently inaccessible uploaded data. **Creation of a read API (which is easier to build than a write API)** would enable users to query WSLCB for the status of historical data. Amendments can then be made if necessary by overwriting or updating records. Any necessary constraints around that capability can be encoded in the API.

#2: Leverage and incorporate the [WA Cannabis Integrators Alliance data schemas](#)

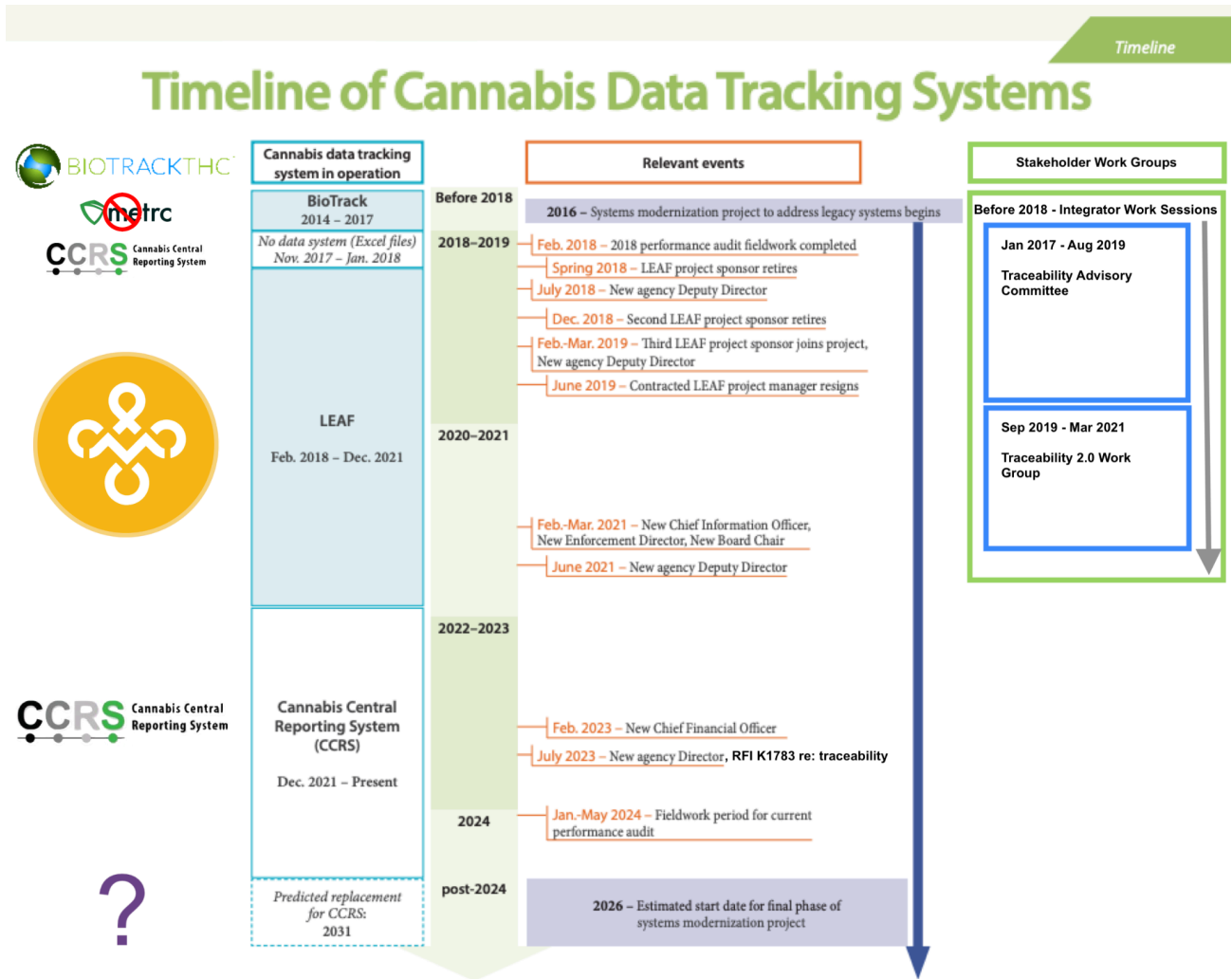
- **When WSLCB staff made the decision to go with CCRS, they rescinded their previously assumed operational responsibility to mediate normalized data transfers between licensees.** The centralized database operation in traceability platforms to move descriptive data about product X from licensee Y to licensee Z no longer existed.
- **In response, WA licensees and software integrators co-created shared, open standards for data exchange between their systems.**
 - [Transfer Data Schema](#)
 - [Lab Result Schema](#)
 - And additional definitional frameworks to establish shared meaning
- **Now, files and data streams containing this information are actively transferred between licensees and their mediating software platforms in the Washington cannabis market every day. WSLCB could be a participant in this network** to more quickly begin gathering valid data in a well structured and proven format custom fit for the Washington cannabis marketplace.
- **The Washington State Department of Health could also leverage this information by collecting and publishing analytical lab test results** to prove that products marked as medically compliant have undergone required additional testing. A publicly accessible repository of analytical test results would be of great benefit for consumers, regulators, and researchers.

#3: Investigate why Metrc wasn't awarded the traceability contract in 2017

- It may be worth requesting a **retrospective examination of the internal and external reasons why Metrc was named the apparently successful bidder to replace BioTrack in 2017, but was subsequently not awarded the contract.**
- Additionally, it may be helpful to **compare and contrast how investigation of criminal behavior *vis-a-vis* traceability data has played out in Metrc states.** While no state legal cannabis market will offer an apples-to-apples comparison to Washington, it may prove helpful to evaluate whether use of Metrc measurably moved states closer to the promise of "seed-to-sale" traceability platforms to prevent diversion and keep cannabis out of the hands of children.

Appendix A

Augmented “Timeline of Cannabis Data Tracking Systems”



Appendix B

WSLCB - Traceability 2.0 Work Group - GUID Subcommittee (November 27, 2019) - Recommendations

Executive Summary

The Washington State Liquor and Cannabis Board (WSLCB) Traceability 2.0 Work Group's unofficial Globally Unique Identifier (GUID) Subcommittee recommends that **any future traceability system utilized by the State of Washington adopt decentralized generation of cannabis product traceability identifiers based on the [Universally Unique Lexicographically Sortable Identifier](#) (ULID) specification.**

Context For Recommendations

- The locus of discussion about the future of cannabis traceability and supply chain transparency in Washington state has shifted to the relatively new WSLCB Traceability 2.0 external work group. This work group has met twice, on [September 24th](#) and [November 4th](#). The work group has begun helping the State consider revising and scaling back requirements for supply chain awareness and reporting.
- One of the subjects of discussion at the November 4th meeting was the generation of GUIDs to reliably identify objects in the cannabis supply chain. While [the format of those identifiers](#) has been at issue, a more fundamental concern is defining who is responsible for provisioning identifiers: licensees or the State (or the State's vendor). Conversation revealed mixed sentiments within WSLCB which could not be resolved within the context of the November 4th meeting.
- Work group member Gregory Foster volunteered to organize an informal subcommittee to identify and address the State's concerns which motivate consideration of centrally provisioned GUIDs, and rank recommended GUID algorithms. The subcommittee's goal was to provide written recommendations for the Traceability 2.0 work group's consideration prior to its next meeting on December 9th.
- The subcommittee convened on Wednesday November 27th [[agenda, collaborative notes, and resources](#)]. Participants included representatives of third-party software providers recruited from the Traceability 2.0 work group, the Integrator Work Sessions, and beyond Washington state. A technical representative from WSLCB provided agency

perspective. After facilitated discussion, the subcommittee agreed on draft recommendations.

- The draft recommendations were subsequently compiled and elaborated upon in the current document. Subcommittee participants were provided with an opportunity to review, comment, and suggest changes.
- The subcommittee presented its draft recommendations during the WSLCB Integrator Work Session on December 5th. Feedback from the wider community of third-party software providers was incorporated into the final recommendations.
- WSLCB Traceability 2.0 work group members were provided with the final recommendations on Friday December 6th for consideration prior to their next meeting on Monday December 9th.

Recommendations

Network Architecture

The subcommittee considered potential network architectures which would structure responsibility for generation of cannabis product traceability identifiers and **recommended adopting a network architecture that would support decentralized identifier generation.**

- **Centralized, State Managed.** In this scenario, the state itself would operate infrastructure which would provision identifiers.
- **Centralized, State Approved Vendor.** In this scenario, the state would contract with a vendor and delegate responsibility to provision identifiers. This is the current network architecture realized by MJ Freeway and all established state traceability vendors.
- **Decentralized, State Approved Third-Party Software Providers.** In this scenario, the state delegates responsibility for provisioning identifiers to approved third-party software providers (integrators).
- **Decentralized, Generation at Edge Nodes.** In this scenario, network participants are empowered to autonomously generate traceability identifiers at the edges of the network without dependence on the state, an approved vendor, or third-party software providers.

Subcommittee participants were **opposed to entrusting the state to operate infrastructure to centrally provision identifiers** in near-realtime. Participants were less opposed to state management of batched provisioning of identifiers.

Subcommittee participants were **generally opposed to entrusting a vendor to operate infrastructure to centrally provision identifiers.** There was some confidence that a vendor or organization could be identified to operate centralized infrastructure. However, concerns about industry-wide outages were legitimized after repeated failures of a vendor-managed centralized network architecture. Subcommittee participants were also leery of rent-seeking by approved vendors (e.g. Metrc RFID tags, and other pay-to-play traceability architectures).

Subcommittee participants were **generally supportive of entrusting state approved third-party software providers with decentralized generation of identifiers**. Assuming a well-defined algorithm was adopted, participants were confident integrators could provision identifiers.

Subcommittee participants were **generally supportive of decentralized identifier generation at edge nodes**. While the state might prefer the option to approve (and revoke) the authority of third-party software providers to generate identifiers, a well-defined algorithm could be deployed at the point of use. This would enable offline use cases and could position the current recommendation for wider adoption as a global standard for the cannabis industry compatible with export and import requirements across jurisdictions.

Identifier Qualities

The subcommittee discussed several different **qualities of potential traceability identifiers**.

Identifier Length

Subcommittee participants voiced concerns about the length of traceability identifiers. Participants noted traceability identifiers must be printable on small labels which are crowded with other requirements. Conversion of longer traceability identifiers to machine-readable graphical identifiers (e.g., barcodes) results in more complex representations which push the limits of printing hardware commonly in use by licensees in Washington state. Subcommittee participants were **generally supportive of shorter identifiers or identifiers with sufficient uniqueness in abbreviated representations**.

Identifier Metadata

Subcommittee participants discussed the merits of embedding metadata within traceability identifiers. The current traceability identifier format designed by MJ Freeway encodes substantial amounts of metadata in the text of the identifier itself (jurisdiction, license number, license type, object type, etc.) which has resulted in conflicts with WSLCB workflows (e.g., license number changes break traceability history and require workarounds). At one extreme, identifiers could serve the singular purpose of uniquely identifying a particular object in a system without consideration for human readability of those identifiers. MJ Freeway's identifiers exist near the other extreme, which preferences human interpretation of metadata in the identifiers. Examples reviewed from European Union (EU) traceability systems encode identifiers as [Data Matrix](#) machine-readable graphics accompanied by separate human-readable metadata sufficient to independently identify particular products. **Subcommittee participants were mixed in their support for embedding metadata in traceability identifiers**, preferencing the core function of uniquely identifying objects.

Identifier Standards

Subcommittee participants agreed that **selection of an identifier algorithm should preference standards** maintained by other organizations or well established in relevant domains, and widely accessible through existing code libraries in a variety of languages.

Graphical Identifiers

Subcommittee participants debated the application of graphical identifiers (e.g. QR Codes, Data Matrix, *et al*) to the problem space. At one extreme, it was asked if traceability identifiers could be entirely encoded within a graphical identifier as some U.S. Food and Drug Administration (FDA)¹ and EU traceability systems appear to accomplish. Subcommittee participants agreed that printing hardware commonly in use by licensees in Washington state recommended against mandating usage of two-dimensional graphical identifiers (e.g., QR Codes). An assumption was therefore made that any recommended identifier must be encodable in a one-dimensional graphic identifier (e.g., [Code 128 barcodes](#)).

Scope of Application

Subcommittee participants discussed establishing scope for usage of traceability identifiers. MJ Freeway GUIDs identify objects within cannabis supply chains which are not cannabis products (e.g., strains, rooms, users). Subcommittee participants were in favor of limiting the scope of traceability identifiers to cannabis products transiting the supply chain.

Identifier Algorithm - ULID

Subcommittee participants discussed several candidate algorithms for generation of traceability identifiers and recommended the adoption of identifiers based on the [Universally Unique Lexicographically Sortable Identifier \(ULID\) specification](#). This independent specification, championed by David Busby of WeedTraQR, received a consensus recommendation from the subcommittee.

¹ The FDA mandates Data Matrix symbols on final packages of controlled drugs and medical devices. And either 1D or 2D barcodes on homogeneous packages. The product's metadata, origin facility, and manufacturing date should be embedded within the data carrier.

See section 9(a)(i):

<https://www.fda.gov/drugs/drug-supply-chain-security-act-dscsa/title-ii-drug-quality-and-security-act>

And section 582(a)(9):

<https://legcounsel.house.gov/Comps/Federal%20Food,%20Drug,%20And%20Cosmetic%20Act.pdf>

Identifier Length

Identifiers generated using the ULID specification are 26 characters long.

- The first 10 characters encode a 48-bit integer Unix timestamp, providing sufficient space to generate valid identifiers until the year 10889 with millisecond precision. As these integer values ascend over time, ULIDs have the side effect of providing an implicit lexicographical sort order by timestamp which is convenient in many circumstances for both machines and people.
- The last 16 characters are randomly generated, creating a baseline potential of $1.21e+24$ unique ULIDs per millisecond. Some implementations encode metadata within these characters at the cost of shrinking the overall potential number space.

Concerns were raised about the length of these identifiers. A potential mediation was drawn from best practices in the [Git distributed version control system](#). Git commit identifiers are 40 characters long, but only the first few characters are generally needed to reference a particular commit. It was suggested that the first few characters of the ULID random segment could be printed on cannabis product labels to uniquely identify that particular product to both machines and people.

This approach would have the added benefit of ensuring one-dimensional barcodes could continue to be utilized while minimizing the number of traceability identifier characters displayed on the label. Furthermore, the ULID specification enhances human legibility of identifiers by utilizing [Douglas Crockford's base 32 notation](#) which is case-insensitive and excludes the often misinterpreted letters I, L, O, and U.

Identifier Metadata

ULIDs encode a Unix timestamp with millisecond accuracy and a protocol for avoiding identifier collisions in circumstances where the same machine generates more than one ULID per millisecond. As mentioned, this provides a useful implicit sort of ULIDs in relation to one another.

Subcommittee participants discussed the possibility of encoding metadata within the 16 random characters at the end of ULIDs (for example, designating a lot with "LT" followed by 14 random characters). While no particular metadata were suggested for encoding, the ability to do so strengthened this algorithm's candidacy.

Identifier Standards

The ULID specification is publicly maintained and has been [implemented in a wide variety of languages](#).

Agency Concerns

The subcommittee gathered agency concerns from WSLCB staff in advance of meeting and addressed each point.

Duplication of Identifiers

Subcommittee participants understood this concern to be motivated by two potential issues:

1. **Unintentional Duplication of Identifiers**, or “collisions.” The default ULID algorithm is designed to avoid independent generation of duplicate identifiers (collisions) and can generate $1.21e+24$ unique identifiers per millisecond. Unintentional duplication of identifiers should not be a concern, even with modification of the default algorithm to encode limited amounts of metadata.
2. **Intentional Duplication of Identifiers**, or fraud. If we assume bad actors are the exception rather than the rule, the introduction of duplicate identifiers in the data network should not only be recognizable but a useful flag for investigation by regulators. While the inversion of fraudulent products designed to mimic established brands had not yet become an issue in the Washington marketplace, the practice is known in other jurisdictions and sometimes rampant in other product verticals. Anticipation of this concern may recommend some method of signing data reported to WSLCB above the level of identifiers, such as cryptographic signatures.

Reuse of Tags

Subcommittee participants expressed some confusion about this concern, and agreed it was outside of the scope of the subcommittee’s charge.

Identifiers Created vs. Reported

Subcommittee participants understood this concern to be motivated by a desire to maintain awareness of every identifier in use in order to recognize identifiers which may visually mimic the identifier format but not correspond to cannabis products documented within the regulated marketplace.

One method to mitigate this concern is to require reporting of identifiers upon generation and application. A reporting window could be defined to facilitate offline use cases which would be enforceable given the timestamp encoded in all ULIDs.

Identifier Specification

The agency also voiced a desire for “a clear, documented taxonomy that all licensees must use.” The ULID specification provides a simple, well documented protocol for generation of identifiers.

Minimizing Barriers to Participation

Subcommittee participants also discussed challenges introduced for licensees who do not utilize third-party software providers for traceability reporting. Participants agreed that the ULID specification is simple enough to be encoded into a spreadsheet for manual generation of identifiers, or a module that could be hosted by WSLCB in their Drupal infrastructure.

Conclusion

The WSLCB Traceability 2.0 Work Group's unofficial GUID Subcommittee recommends that **any future traceability system utilized by the State of Washington adopt decentralized generation of cannabis product traceability identifiers based on the ULID specification.** While a variant of the ULID specification could be designed to encode metadata in the generated identifiers, this would necessitate additional specification by the agency and would likely compromise substantial benefits gained by utilizing an established public standard with numerous coding libraries. Concerns about the length of ULIDs can be mitigated by encouraging or requiring the usage of a sufficiently unique subset of identifier characters on cannabis product labels.