

Supply Chain Visibility for the Cannabis Industry using Blockchain

Multichain Ventures (Tokes Platform) Proposal for RFP # 7598824 - Blockchain Technology - Proof of Concept

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Abstract

As required protocols for tagging, tracking, testing, transporting, and security of legal cannabis products vary state to state, it will inevitably be necessary for standardization to occur for interstate transport of cannabis goods under Federal legalization. The GS1.org international standard for supply chain management; Electronic Product Code Information Services (EPCIS), provides a globally adopted standard framework for tracking products as they move from point of origin to the consumer. Multichain Ventures is developing the EPCIS compliant “EDEN Blockchain” with cannabis data in mind, in order to provide an immutable, decentralized ledger that will serve legal cannabis markets today and through the regulatory changes of the coming decades. Further, reliance on centralized data stores for cannabis tracking data has resulted in several notable and disastrous data breaches. EDEN Blockchain can serve to inoculate states from these potential breaches, while increasing the supply chain visibility of cannabis data, reducing grey market diversion, and ensuring taxation. This overview document outlines the general data structure, input, and query aspects of the EDEN Blockchain, and discusses the scalable, high-availability software deployment architecture leveraged for these systems.

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Team Summary

Tokes core team on this project are as follows - all resumes with relevant experience can be found in Appendix A.

Michael Wagner - CEO
Gabriel Allred, Ph.D - CCO
Michal Mikolajczyk - CIO
Jacob Floyd - CTO
Danny Floyd - CXO
Eugene Lopin - Project Management

Company Summary

Launched in 2016, the [Tokes Platform](#) is a blockchain focused company building software solutions for merchant adoption of cryptocurrency and data provenance of supply chains. This includes, but is not limited to, point of sale processing software, ecommerce storefronts, mobile applications, Platform as a Service (PaaS), and Blockchain as a Service (BaaS). Initially, the platform was developed for the legal cannabis industry as a solution to the cash-only problem caused by federal prohibition resulting in banking restrictions. To solve this issue, the company created a tokenized payment solution known as Tokes (TKS) with native consumer mobile apps, merchant point of sale software, and ecommerce modules to transact in the token. While the cannabis vertical and tokenized payments are still Tokes' core focus, the services now provided by the platform extend past tokenization and cryptocurrency. Within the cannabis industry, blockchain provides utility for more than payments, as ensuring the provenance and transparency of cannabis production data from seed-to-sale is not only a preferred scenario for consumers but regulated by state agencies. In building robust infrastructure for tokenized payments and blockchain based data storage, the Tokes Platform now has an ecosystem of offerings that extend well beyond the cannabis space and can be utilized to serve supply chains in any industry vertical.

Additionally, in building our suite of software, the Tokes Platform now has "high availability" deployment environments – infrastructure that can be sold or utilized by startups in and out of the blockchain space. This byproduct of Tokes development has spun off into a new service

called *Reli* (<http://reli.cloud>), short for reliable, which is a multicloud platform built upon Kubernetes and Istio with cloud native software as a service and blockchain features.

Client References

Theracann International (<http://theracann.solutions>) 2017 - present

The Tokes Platform has an ongoing development partnership to integrate the EDEN Blockchain, discussed in detail below, with Theracann's [ETCH Biotrace](#) system for seed to sale tracking of cannabis. Tokes' engagement with Theracann initially began when the team designed an extensive overhaul of the user interface (UI) for Theracann's ERP (seed-to-sale) solution known as OS2.

Contact: Jason Warnock

jwarnock@theracanncorp.com

1.403.818.4249

1925 18 Ave NE #115, Calgary, AB T2E 7T8, Canada

Cannabis Hemp Exchange (CHEX; <http://thechex.com>) 2017 - present

CHEX initially engaged with Tokes when integrating TKS as a native token within the CHEX platform. In order to do this, Tokes produced a conversion tool for users to exchange CHEX ERC20 tokens for the Waves based TKS token. Tokes is now a development partner with CHEX.

Contact: Eugene Lopin

eug@thechex.com

1.718.938.0508

90 Sullivan Pl, 3E, Brooklyn NY 11225

Work Proposal

State legislation mandating specific protocols around tagging, tracking, testing, transporting, and security of cannabis products varies state to state. Operators within the industry must contract with multiple entities to ensure full compliance of various state laws, increasing overhead costs. In the process, cannabis businesses are required to utilize several, non-integrated legacy systems to meet state standards. Additionally, reliance on centralized storage systems for this data has previously resulted in disastrous outcomes (relevant articles via [MJBizDaily](#) and [LAWeekly](#)) and many of the current systems states utilize for cannabis data management suffer from [poor latency and even poorer user experience](#).

Leveraging blockchain to decentralize the storage of cannabis data serves several purposes. Blockchain produces an immutable append-only ledger storing the history of every step of a product's lifecycle. Centralized repositories can be easily altered, with data vulnerabilities to bad actors wanting to move cannabis in or out of a geofenced sales area. It is hard enough to track the flow of grey market goods in or out of a regulated market; even harder if the data entries established to track these goods can be altered at a fundamental level. With a blockchain based solution, all supply chain data logged to the blockchain remains. That is, batches of goods cannot be removed from the history of the ledger, or past inventory amounts cannot be altered to make current inventory levels reconcile with old records. This does not mean inventory states cannot be changed or updated, but rather, the initial entries remain - such that if product levels on a crop or batch are affected by an adverse event, that event must be noted with the data amendment to the inventory. Fundamentally, this type of protocol and data structure paired together serve to produce an ecosystem that ensures state agencies are able to track and subsequently tax the product at all sales points. Additionally, this produces a provenance of history around the cannabis data that serves to deliver to the end user, whether medical or recreational, sound quality control around the products they are consuming, preventing grey market goods from bypassing rigorous testing standards of regulated markets.

The good news about the current state of supply chain visibility is that an international standard already exists for tracking the movement of objects through supply chains. The international standard for supply chain management; Electronic Product Code Information Services (EPCIS), provides a framework for tracking objects as they move from point of origin to the consumer. This standard makes it possible for an electronics manufacturer in China to transmit the appropriate data to the container shipment company providing transport of the goods to the U.S., through the receiving port, to warehouses, inevitably to a retailer's back of house and into the hands of a consumer. Currently the legal cannabis industry has no such Federal standardization in place, with each state jurisdiction dictating the data points within that geographic market. Upcoming data structures need to utilize standardized business vocabulary in order to make the data more interoperable for inevitable Federal decriminalization of cannabis and data structures will need to be put into place for the eventual interstate transport of cannabis goods.

With this in mind, the Tokes Platform is developing the EDEN Blockchain, using the already well established EPCIS framework, and putting it on the blockchain for redundancy of the data storage, ensuring single points of failure will not be catastrophic to businesses and regulators. Despite the standardized nature of EPCIS, building within this framework does not inhibit the ability to deploy within a regulatory environment with specific reporting variables. Further, the

nature of this data structure uniquely positions the Tokes Platform EDEN Blockchain to facilitate communication between jurisdictions, when the legal framework allows for interstate transport of cannabis products. It is important to note that the EPCIS Blockchain is not a seed-to-sale software system, but rather a data layer that can immutably log the data from existing seed-to-sale systems and provide a standardized backbone to reduce business reliance on multiple reporting systems. While currently, tools are being developed by Tokes to better visualize the flow of products logged to the EDEN Blockchain, particularly for auditors or regulators, it is important that our system integrates with well established seed-to-sale systems via API integrations in order to garner better market adoption.

Technical Approach

Rather than reinvent the wheel by entering the market as a competing front-end software provider, Tokes aims to strengthen the provenance, security, and immutability within the existing EPCIS infrastructure via EDEN. The EDEN Blockchain is fundamentally front-end software agnostic, designed to integrate with existing enterprise and legacy tracking systems. EPCIS data is stored as “objects” representing typically physical items, such as products, logistic units, or documents. These objects are tied to “events” which are tagged with a detailed set of descriptors for the object including: “what” – the description of the object, “when” – the date and time that the event related to the object took place, “where” – the location where the event occurred and where the object is expected to be following this event, and “why” – the business step taking place (e.g., shipping or receiving) along with the state of the object (e.g., active, damaged, etc.). Additionally, there are many different event types and modifiers to these basic descriptors. This data is all entered via a capture interface that inputs object information via RFID tags, QR, or bar codes, which is then logged to the blockchain. Subsequently, a query interface - a front end software system - facilitates retrieval and visualization of the data for both auditors and business stakeholders.

To produce a data structure around this event data with the EDEN Blockchain, Tokes is leveraging two well established pieces of blockchain technology for the EDEN deployment - the [Ethereum](#) network coupled with the [Origin Trail](#) protocol for supply chain management. The current proof of concept of the EDEN Blockchain leverages the open, public protocols of both Ethereum and Origin Trail, however, in a potentially more refined solution, a private deployment of nodes can be established in order to ensure the scalability of the network.

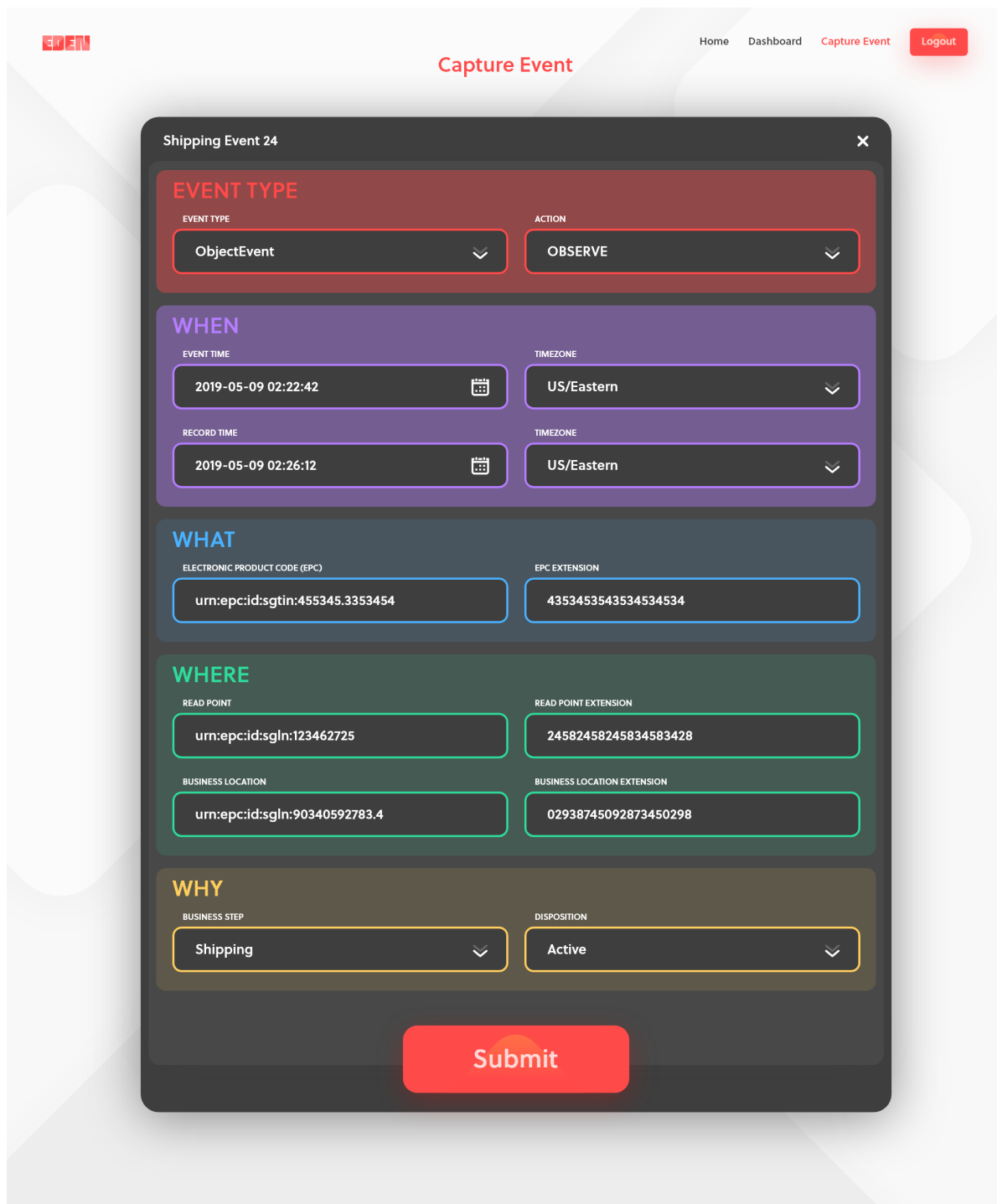
Data Capture Interface and Data Store

These events and variables around the events are logged via off-chain hosted EDEN capture interfaces - specifically the EDEN API, via XML files, or manual entry (see Figure 1 for a manual entry interface). These events must be formatted leveraging the EPCIS core business vocabulary (CBV; see Appendix B for details on EPCIS CBV) with the requisite variables around events (e.g., What, When, Where, Why). Additional data points specific to the industry vertical (i.e., cannabis) can be appended to the CBV to meet state standards around cannabis (e.g., product information, strain data, testing data, sales data, customer data). The nature of the API allows for seamless integration with existing IoT monitors and data capture devices. See Figure 2 for a process flow of data from entry to retrieval.

When new data is sent to the network, an initial format check is performed for both syntactic and semantic errors. If an error is found, it is reported back to the sender via a web service response. After this initial check, the data set is converted to graph form in the database, which is uniquely identified via product and batch identifiers. The receiving node then attempts to propagate the new graph data to the network via the distribution protocol. As network nodes receive the data, it is merged into the master graph of the product supply chain, while being validated through network consensus on the blockchain layer.

This blockchain layer serves as a secondary store of the data, as conventional centralized data structures are still required for the ERPs that EDEN will interface with.

Figure 1. EDEN manual capture interface demonstrating the basic EPCIS dimensions - in real world deployments these entries will largely be automatically generated from within the businesses ERP or captured via IoT devices.

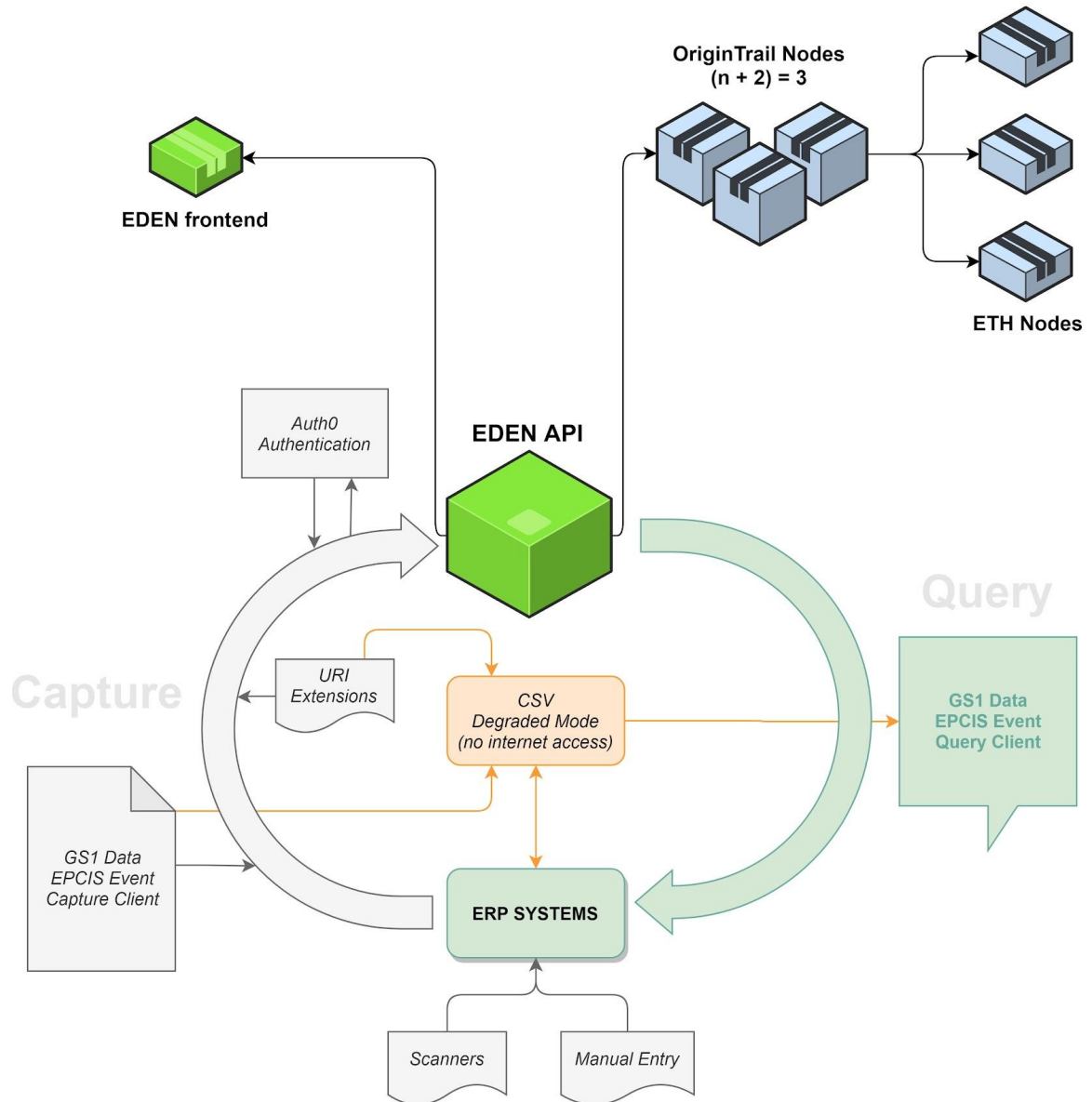


The screenshot shows the 'Capture Event' interface for 'Shipping Event 24'. The form is organized into five color-coded sections: 'EVENT TYPE' (red), 'WHEN' (purple), 'WHAT' (blue), 'WHERE' (green), and 'WHY' (brown). Each section contains specific fields for event data, with dropdown menus for categorical fields and text inputs for alphanumeric codes. A large red 'Submit' button is located at the bottom of the form.

Section	Field	Value
EVENT TYPE	EVENT TYPE	ObjectEvent
	ACTION	OBSERVE
WHEN	EVENT TIME	2019-05-09 02:22:42
	TIMEZONE	US/Eastern
	RECORD TIME	2019-05-09 02:26:12
	TIMEZONE	US/Eastern
WHAT	ELECTRONIC PRODUCT CODE (EPC)	urn:epc:id:sgtin:455345.3353454
	EPC EXTENSION	4353453543534534534
WHERE	READ POINT	urn:epc:id:sgln:123462725
	READ POINT EXTENSION	24582458245834583428
	BUSINESS LOCATION	urn:epc:id:sgln:90340592783.4
	BUSINESS LOCATION EXTENSION	02938745092873450298
WHY	BUSINESS STEP	Shipping
	DISPOSITION	Active

Submit

Figure 2. Diagram of EDEN infrastructure and data flow between platforms.



Advantages of proposed architecture

1. All changes to the state (storage) of the EDEN repositories are stored in an immutable ledger. Every transaction (i.e., state change) is recorded. This is resilience on the platform-layer.

2. In addition, the event data in the EDEN repository, essentially the *event log*, is designed so that it cannot be updated or deleted. This is dapp-layer resilience. The data added remains on the blockchain forever.
3. The data is stored in an ISO compliant global standard by GS1.
4. With the "stage 2" addition of *extensions* (miscellaneous information) to the events, the industry will be able to take advantage of key performance indicators (KPIs) and associated information to look for optimization opportunities and to further improve upon best practices.
5. Monitoring of the EDEN repositories is possible. Integrations with other systems to enhance business efficiency such as automating payments upon event occurrence, is foreseeable.
6. Permissions for EDEN instances can be controlled at instantiation, and depending on the initial setting, also later, on the dapp-layer, both on-chain and off-chain, and also using authorization servers.
7. Private instances are also possible on private Ethereum network deployments.
8. On the public Ethereum network, confidential data can be stored off-chain with only a reference hash to assess integrity with the source. On private implementations, data can be privately stored on the blockchain, accessible only by appointed parties.
9. By leveraging open source software, the project will benefit from:
 - a. Community contributors, likely including groups from corporations
 - b. Global support to develop, upgrade and expand the software
 - c. Security audits
 - d. Custom implementations
 - e. Custom extensions

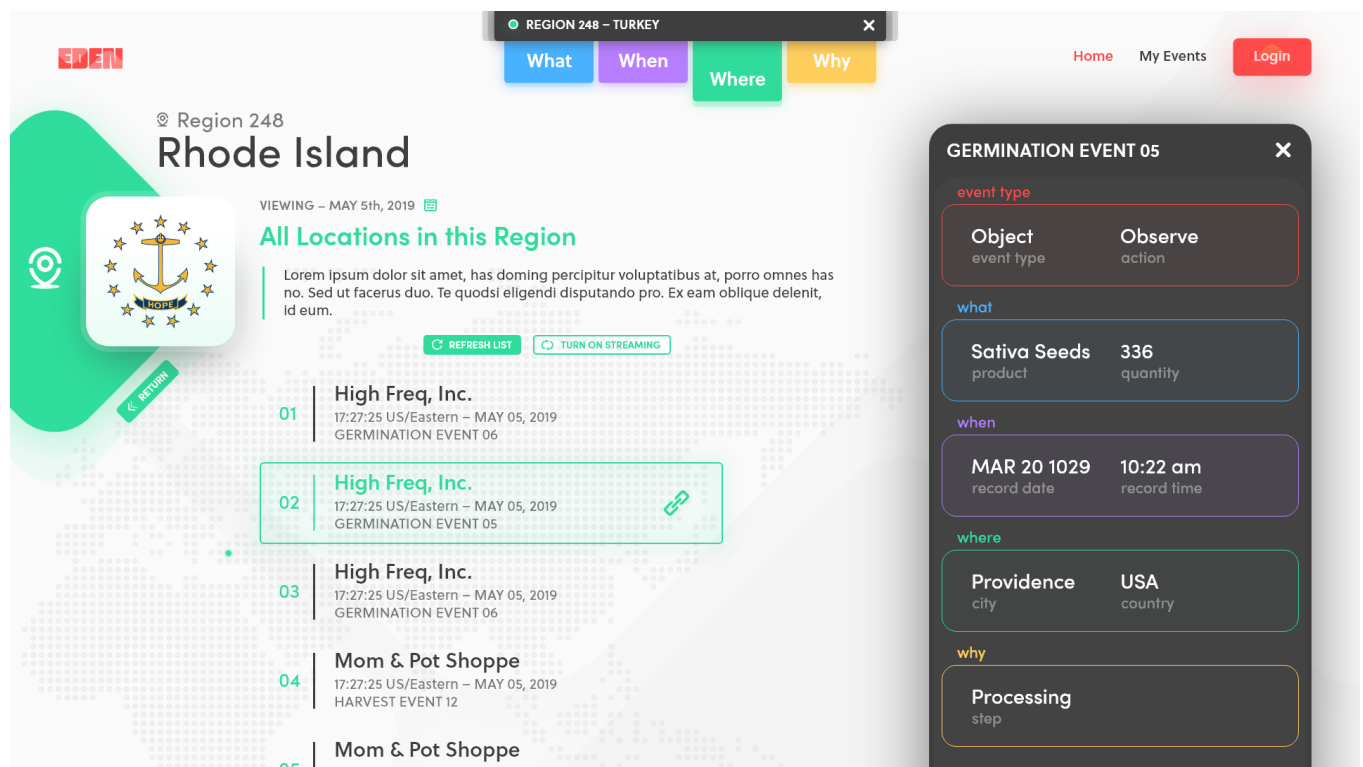
To provide added features, data capture and query applications can be extended with modules which deliver additional functionality for the users of a specific EDEN instance:

- User/Customer authentication (including KYC and AML services)
- Industry-wide event lists, supply chain maps, guides
- Consortium-specific implementations
- Market specific Core Business Vocabularies
- Support for sensors and edge devices, capturing data from Trusted Execution Environments (TEE)
- Visualisation tools
- Tracking applications

Query interface

The query interface for EDEN Blockchain is a work in progress that will serve primarily as a tool for auditors and business stakeholders to visualize the timeline of events and changes around products and materials within the supply chain. As events within the EPCIS standard are multidimensional (e.g., What, Where, When, and Why) - it is necessary to build query tools that capture the flow of goods from multiple points of view. For example; an auditor might want to assess the events around products at a single cultivator, or on a more macro level, assess the regional production within the entire state of Rhode Island - both instances here fall under the “Where” dimension. Additionally, the system allows for particularly granular visualization of data, like a single vegetation room in a multi-warehouse cultivation facility. See Figures 3, 4, 5, 6, and 7 for examples of the Query Interface for the “Where” dimension.

Figure 3. UI design for “Where” dimension of EPCIS data - examining particular business events within a region.



Figures 4 and 5. UI design for “Where” dimension of EPCIS data - examining a flow of events within a single facility of an entity, and a summary description of the event types in that facility.

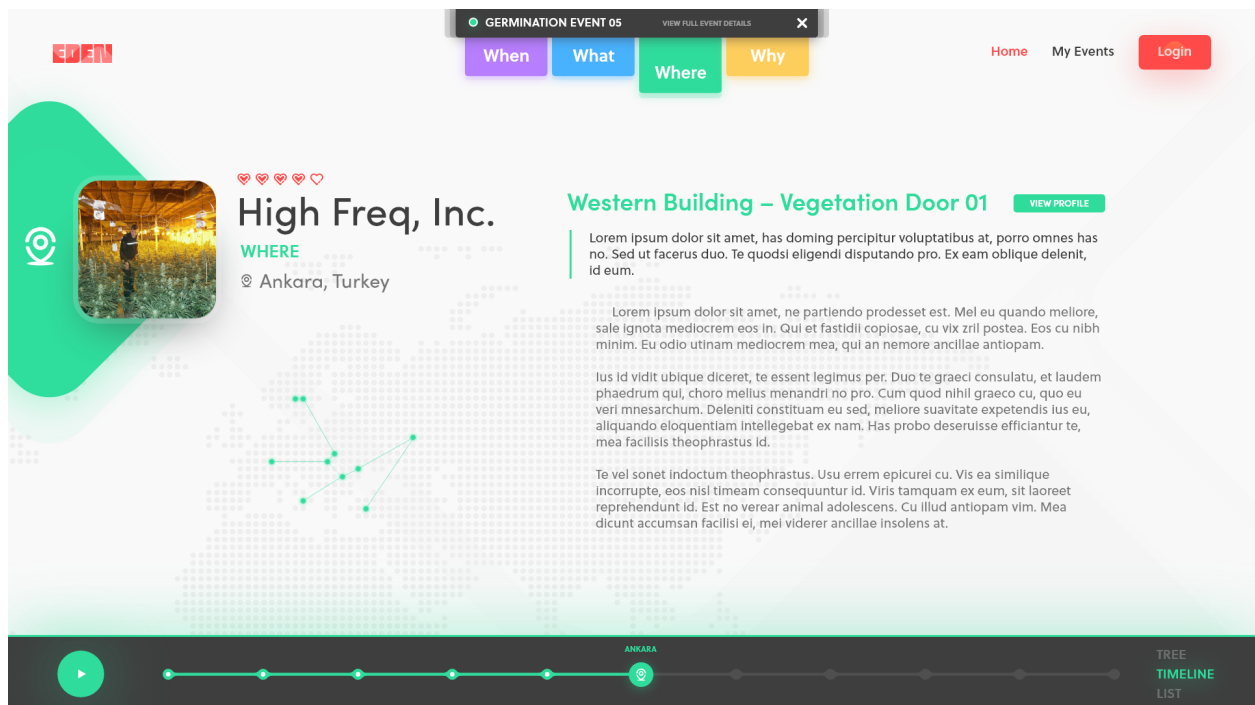
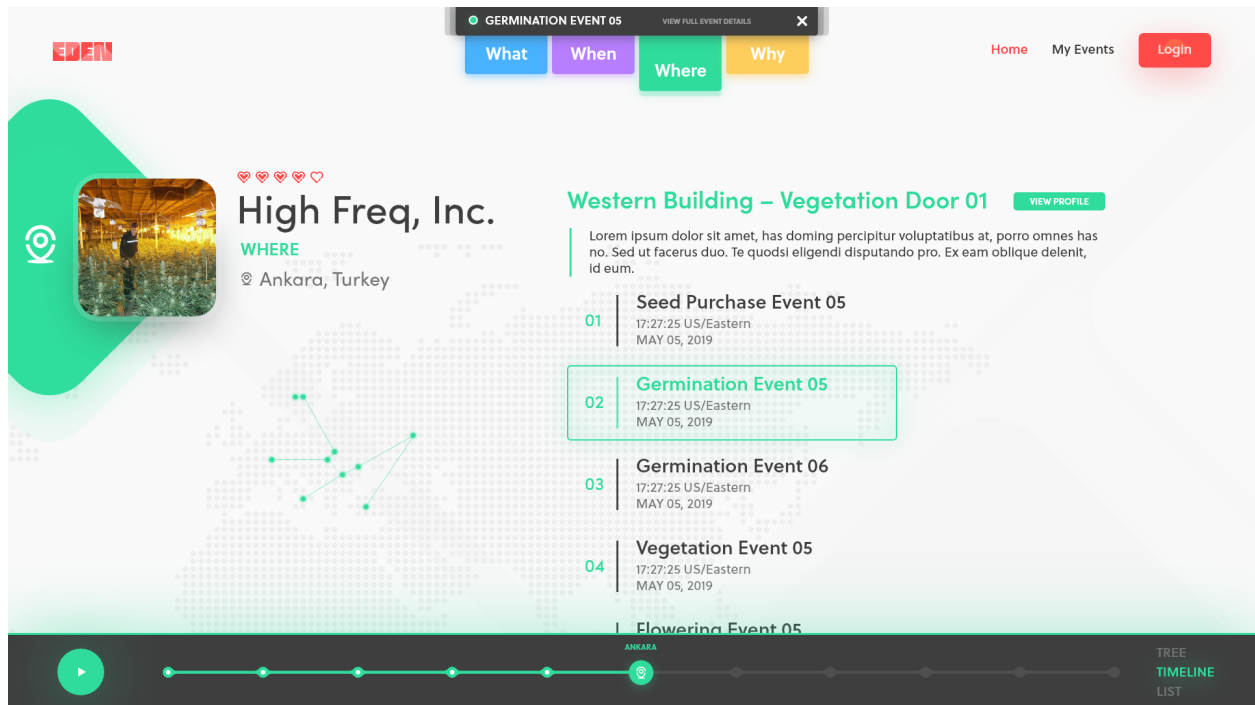


Figure 6. UI design of a wireframe visual flow of events at a particular “Read Point” within an entity.

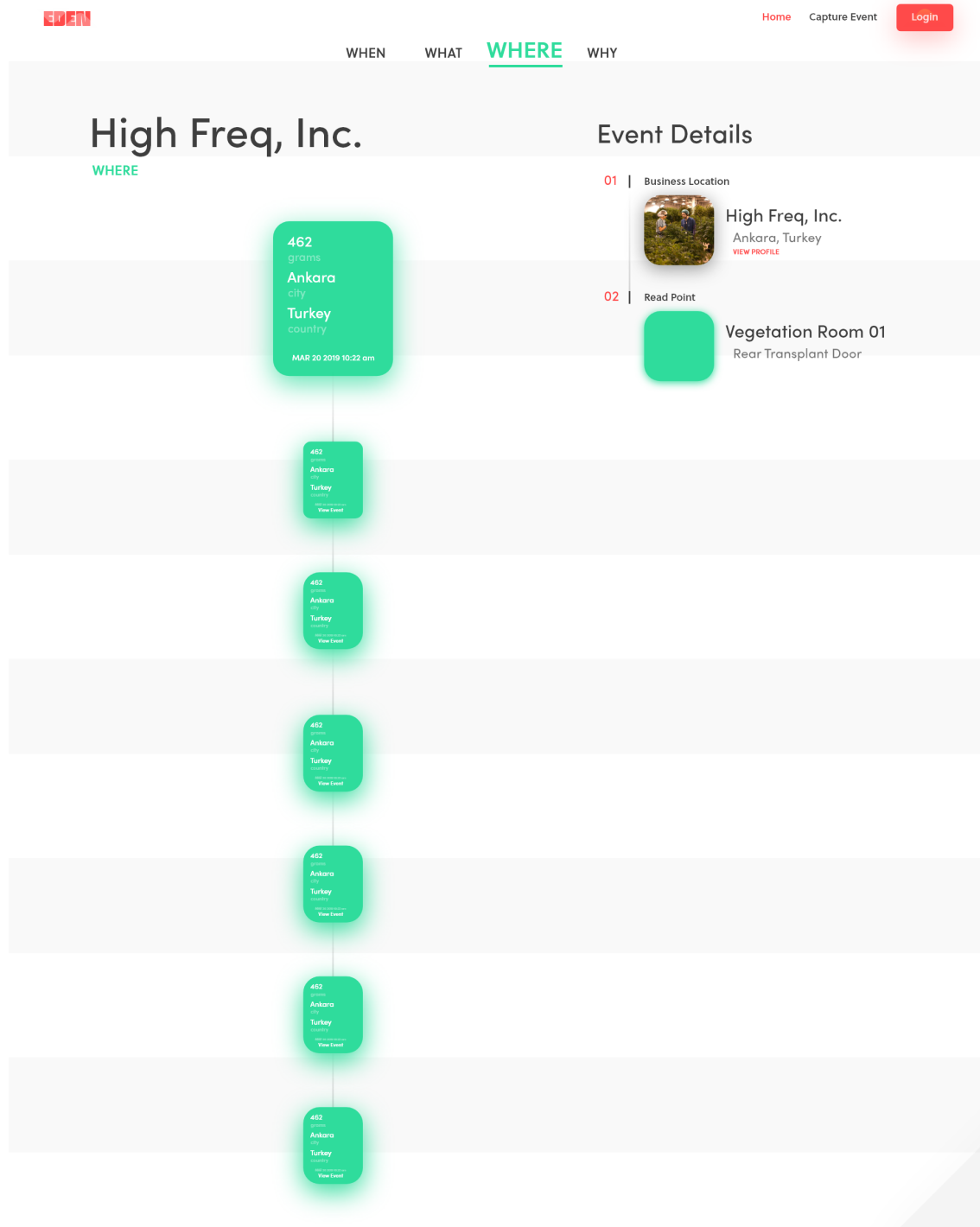
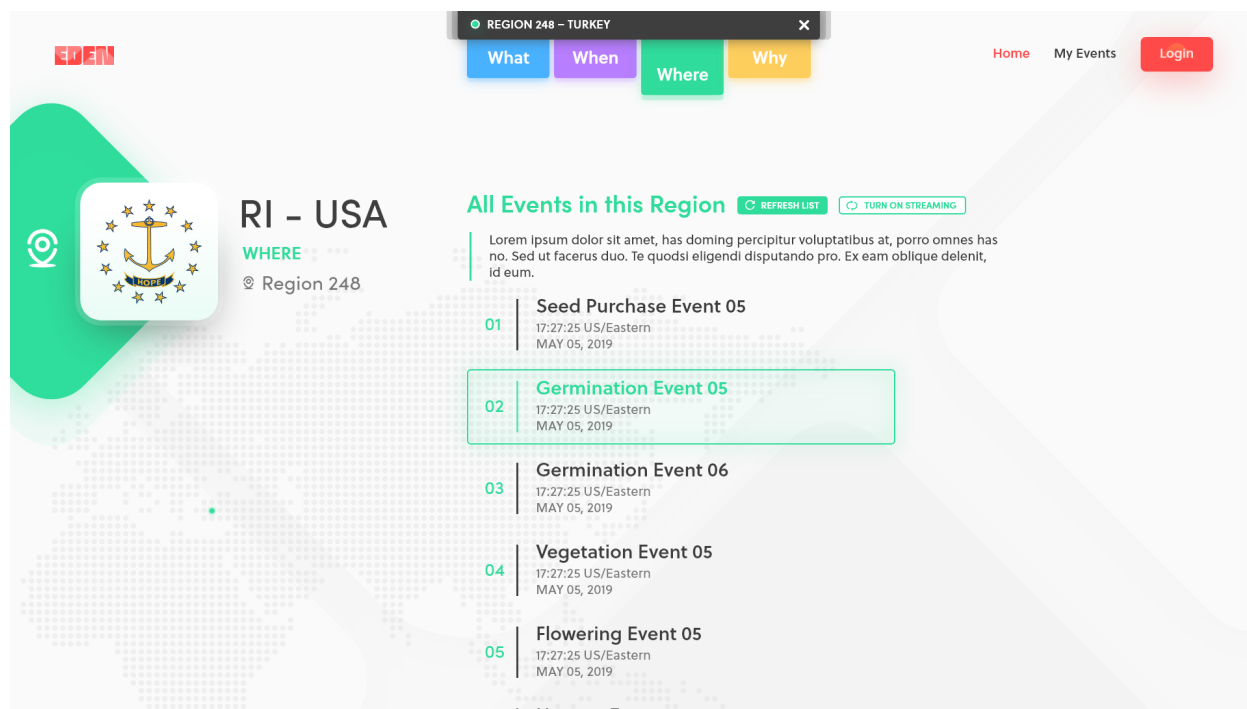


Figure 7. UI design for “Where” dimension of EPCIS data - viewing a flow of events within a geographic region - in this instance, Rhode Island



The “What” dimension of the Query Interface will summarize particular products or materials within regional supply chains, restricted by date range if desired. Summaries in the case of cannabis might include: total grams produced, total plants grown, total raw material processed into extract, or sales data over a period (see Figure 8 for an example of the “What” dimension). Similarly, the “When” dimension will facilitate a visual flow of event data restricted by date range, and the “Why” will disambiguate event causes (e.g., maturation of a crop from vegetation to flower, harvests, wholesale distribution, raw material processing into extract, etc.).

Additionally, discrete summaries of events can be viewed in the dashboard independent of the four dimension views (see Figure 9). Larger macro-view summaries for data visualization can also be visualized for both larger geographic areas (Figure 10) and for the flow of an object through different events (Figure 11).

Figure 8. UI design for “What” dimension of EPCIS data - viewing goods and materials with summaries of event data.

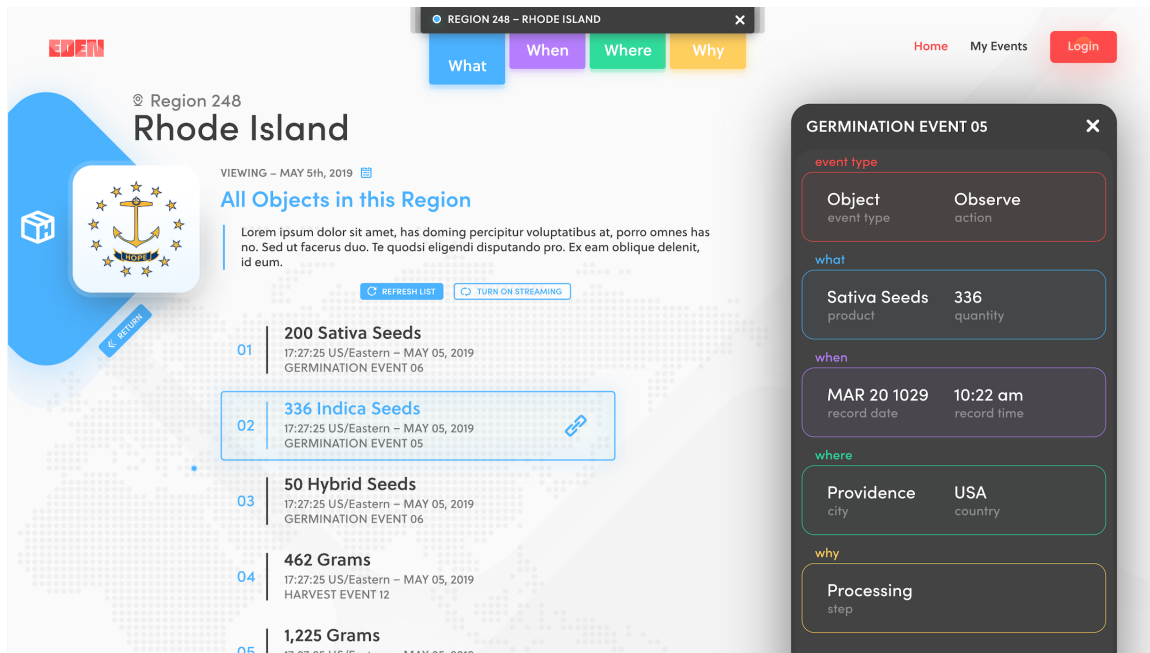


Figure 9. UI design for summary of discreet EPCIS events

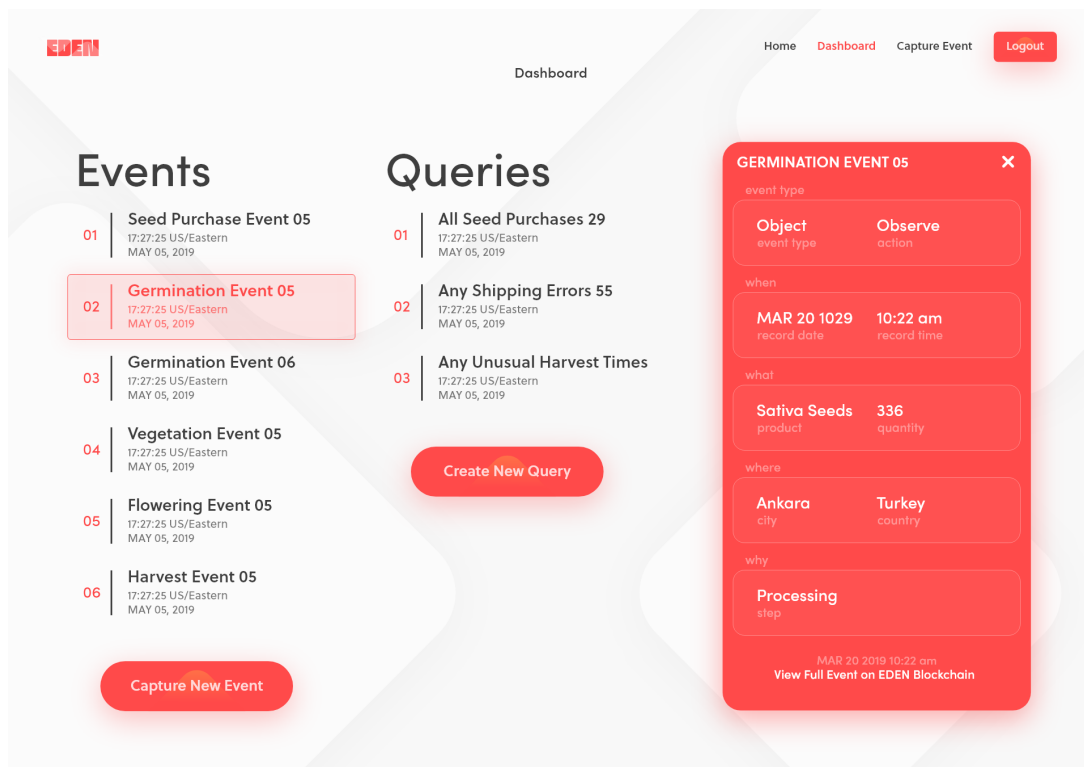


Figure 10. UI design for monitoring visualization of events within the network. This can also be designed for a more restricted area (i.e., for a single country, state, county, or city).

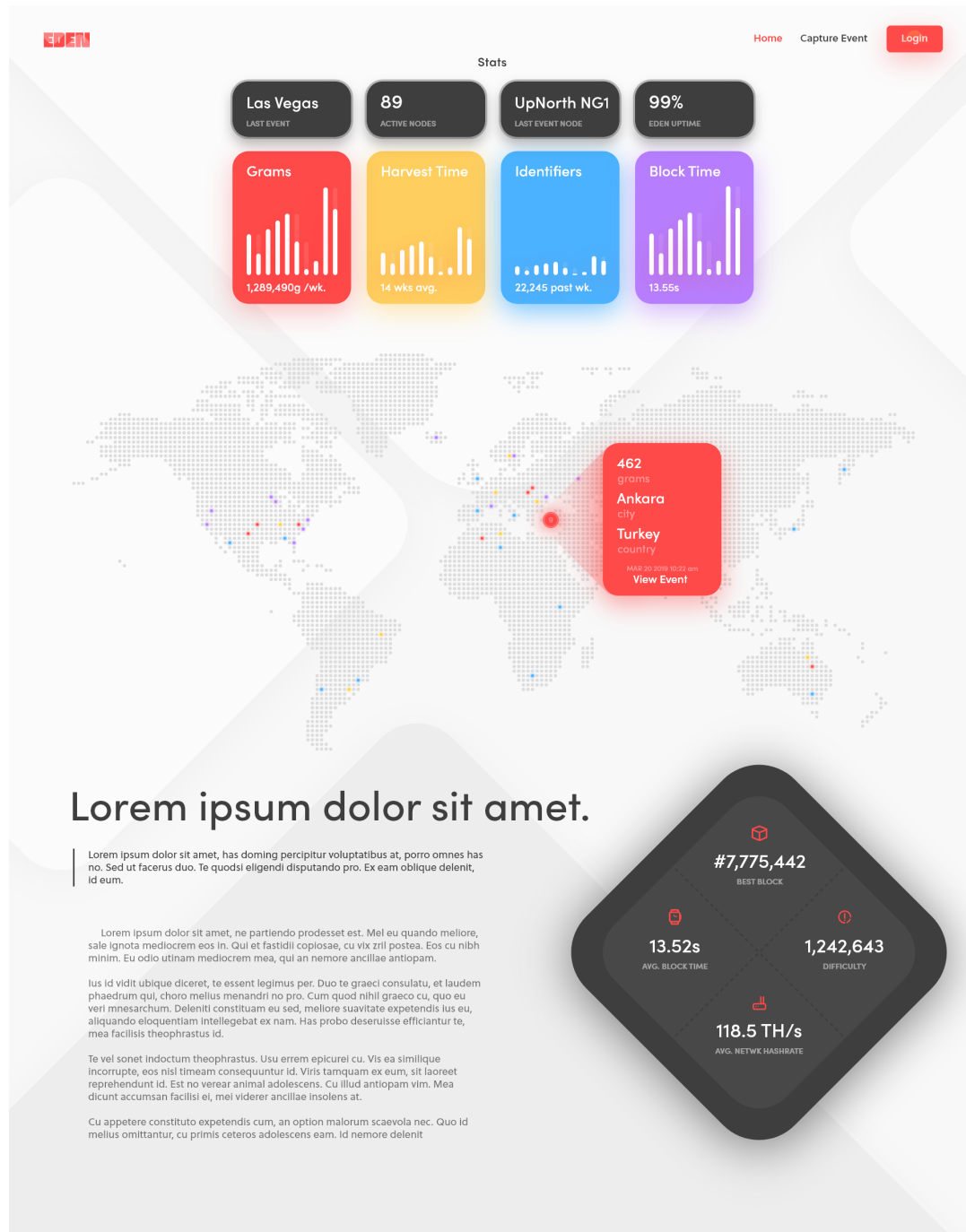
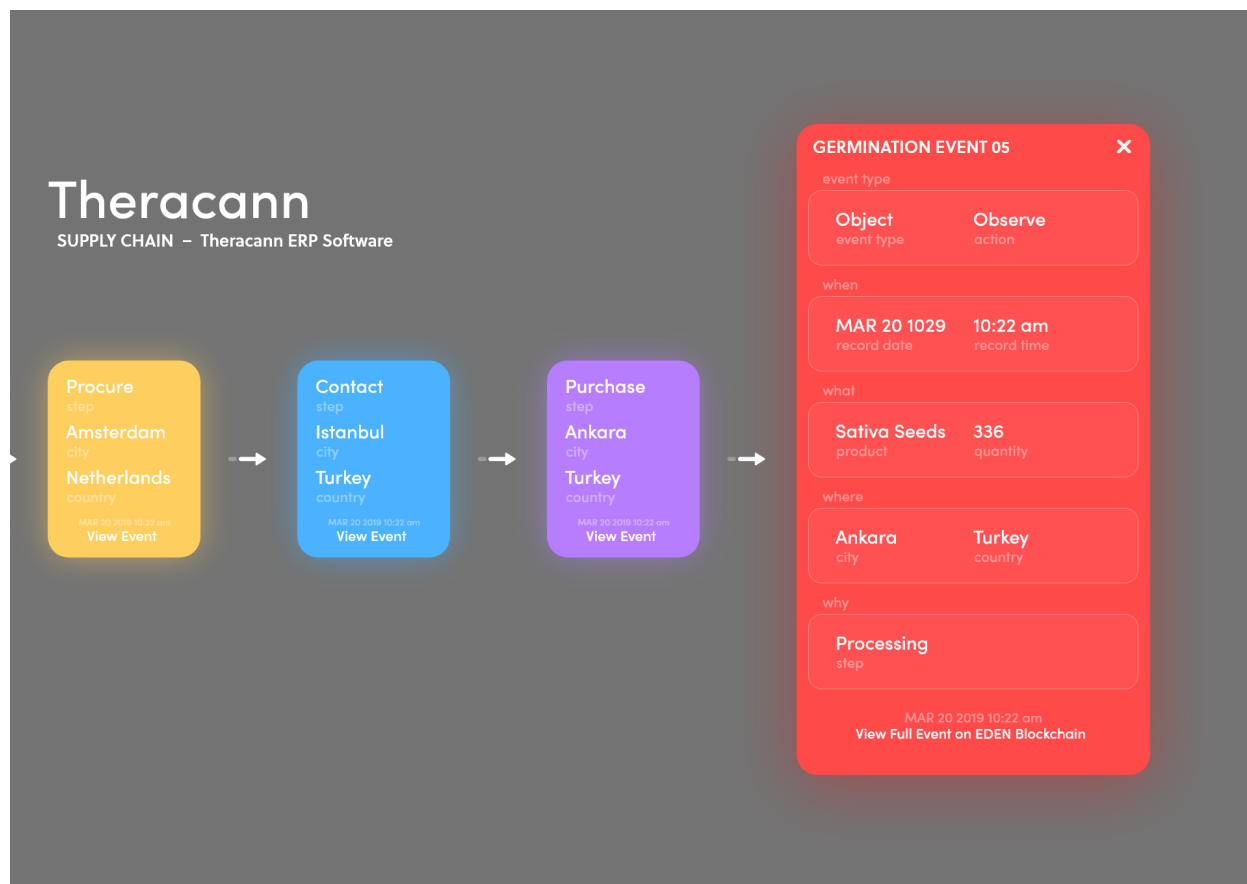


Figure 11. UI design for the flow of an object through different events



Additional tools for data visualization of the Query Interface are still in development. Options to export your data to visualization tools like [Domo](#) or [Tableau](#) will also be featured.

Current Deployment Integrations

The first designed use case for the EDEN Blockchain is for a deployment with our partners at [Theracann International](#). Theracann has produced a spray system which tags cannabis at a more fundamental level with molecular biomarkers. The purpose here is to ensure the origin of cannabis products within a supply chain - preventing grey market goods from introduction into a supply chain. For example, by tagging a plant with the biomarker, the consumer can be sure that the product they are purchasing came from a licensed cultivator, rather than an illicit grow, tagged erroneously, slipping past testing requirements and taxation. By combining this innovation with the EDEN Blockchain, there now exists a solution to the “[garbage in, garbage out](#)” (GIGO) problem inherent to supply chain tracking. Issues relating to diversion, corporate

and product insurance, quality assurance, law enforcement, fraud detection, and consumer protection are ever prevalent in many current licensed countries. ETCH data logged to a distributed ledger solves many of the persistent headaches within the cannabis industry, and only costs pennies per gram to implement.

ETCH BioTrace uses non-GMO biomarkers which are certified as Generally Recognized As Safe (GRAS) and have no impact on human health or other organisms. The biomarkers are made of inert material which is destroyed in high temperatures (combustion) or consumed. These biomarkers cannot be used to trace consumption and do not persist into blood, urine or other human tissue.

The data from ETCH is fed from IoT sensors to integrated control software which subsequently interfaces with the EDEN API to log ETCH data to the blockchain. Similar integrations can be made with existing IoT infrastructure and data capture points.

Scalability and Security

Events that occur on the supply chain will be transacted onto the blockchain via our high-availability application infrastructure. Tokes runs multiple redundant servers (via [Reli](#)) on a reliable multi-node Kubernetes cluster. Supply chain events can be recorded directly to the blockchain via separate nodes, meaning if nodes run by our network are down, the global Origin Trail network can still receive inputs from entities using EDEN - with our nodes receiving the data from other global nodes once back online. The time it takes for the supply chain event data to be confirmed on the blockchain will be dependent on the levels of Ethereum network congestion. On average, transactions will be confirmed within 15 seconds. However, on a private network deployment, these transaction times can be reduced. Although the intention is to be online indefinitely, our availability is only expected to exceed 99.8% of the time. The architecture diagram in Appendix C visualizes the ecosystem of applications and microservices within our Kubernetes cluster.

The nodes responsible for transcribing supply chain events to the blockchain require multiple secured keys to perform a valid request. The signatures used to validate transactions are stored within the configuration of the node, but the multi-faceted access control keeps the functions it performs secure to our system.

Supply chain event data is contained within private networks and accessible only through interface tools provided by Tokes. If a malicious party managed to gain access to an interface,

then the activity of a user might be attainable in real time, compromising the supply chain data. Additionally, access to supply chain event data is reliant on our services being online and reachable or the user would have to resort to building their own blockchain interfacing infrastructure to transcribe or read events.

To curb potential threats across all our services, the Tokes Platform engages in regular security audits with the firm [Independent Security Evaluators](#) on a continuing basis.

Appendix

Appendix A: Team Resumes

Michael Wagner

Professional Summary:

- Background in wealth management and securities analysis
- Passed all three Chartered Financial Analyst (CFA) Exams
- Working with cryptocurrency and blockchain since 2013
- Extensive experience in blockchain node deployment and hardware architecture

Professional Experience:

Multichain Ventures, Las Vegas, NV - 2016 to Present

Chief Executive Officer

- Development of Business Strategy
- Market Assessment and Product Design
- Management business initiatives and development timelines
- General business development efforts
- Building strategic partnerships and mergers
- Treasury management and capital raising (over \$3.5 million in funds raised over two years)

BlockDrop, San Francisco, CA - 2018 to Present

Advisor

- Business strategy and management consultation
- Financial structuring advising

Medical Kiwi, New Zealand - 2019 to Present

Advisor

- Business strategy and management consultation
- Financial structuring advising

Arista Wealth Management, Las Vegas, NV - 2016

- Portfolio Construction & Portfolio Manager
- Securities Analysis, Risk Management, Behavioral Analysis, Client Relationship Management

United Capital, Las Vegas, NV - 2014 to 2016

- Portfolio Construction & Portfolio Manager
- Securities Analysis, Risk Management, Behavioral Analysis, Client Relationship Management

Investment Counsel Company, Las Vegas, NV - 2013

- Portfolio Construction & Portfolio Manager
- Securities Analysis, Risk Management, Behavioral Analysis, Client Relationship Management

Education:

- Bachelor's in Entrepreneurial Finance, University of Nevada Las Vegas, 2009

Gabriel Allred, Ph.D.

Professional Summary:

- Background in behavioral research and data sciences
- Ph.D. in experimental psychology with work in behavioral economics
- Working with cryptocurrency and blockchain since 2013

Professional Experience:**Multichain Ventures, Las Vegas, NV - 2016 to Present****Chief Communications Officer**

- Manages general messaging of all company communicate
- Development of brand strategy
- Oversees marketing efforts
- Oversees legislative efforts

University of Nevada, Las Vegas - 2012 to 2016

Researcher / Instructor

- Conducted behavioral research in the Mathematical Cognition Lab, including data collection, research design, statistical analysis, and write-up for publication
- Instructed Cognition, Research Methods, and Introductory Psychology courses

Air Force Research Labs 711th Human Performance Wing, Dayton, OH - 2016

Researcher

- Conducted applied research for the Human Performance at Wright Patterson Air Force Base. Included multiple studies applied to intelligence analyst performance and interface design.

The Nevada Institute for Children's Research and Policy, Las Vegas, NV - 2015

Researcher

- Conducted data collection, data analysis, and report creation for grant funded projects on childhood health factors that influenced public policy and legislation protecting children.

Education:

- Ph.D., University of Nevada Las Vegas, 2018 - Experimental Psychology (cognitive emphasis)
- Masters, University of Nevada Las Vegas, 2014 - Experimental Psychology (cognitive emphasis)
- Bachelors, University of Nevada Las Vegas, 2011 - Psychology / Anthropology

Jacob Floyd

Professional Summary:

- 10+ years of Mobile/Web Full-Stack Development, including blockchain development on Ethereum/Quorum, WAVES, Bitcoin, Litecoin, Dash
- Experience developing on Ethereum, Waves, Bitcoin Blockchains
- MongoDB, MySQL Databases
- Kubernetes, Docker, Microservice Architectures

- 60+ Published Code Repositories and 8,000+ Commits
- Author for 250,000+ App Store Downloads

Professional Experience:

Multichain Ventures, Colorado Springs, CO - 2018 to Present

Chief Technology Officer

- Developed **Tokes Platform**, a merchant processing software suite consisting of blockchain-based apps to facilitate digital currency transactions (Merchant Gateway POS, eCommerce, Mobile Wallet, Tokes Explorer) for the native Tokes (TKS) token and popular cryptocurrencies.
- Developing **EDEN**, a supply chain visibility platform that records the physical movement of goods through the supply chain on the blockchain, by integrating with business systems (ERP, POS, Government), and adhering to GS1.org global standards (EPCIS) for business communication.
- Developed **Reli.cloud**, a platform providing DevOps infrastructure and blockchain integration services for software development teams.

Cannabis Hemp Exchange (CHEX), Pueblo, CO - 2014 to 2018

Co-founder, Chief Technology Officer

- Developed full-service B2B commodity exchange and wholesale e-commerce platform (web & mobile) for the Cannabis & Hemp industry with comprehensive business/social features; agnostic for other commodity sectors.
- Developed smart contracts for Ethereum CHEX Token Initial Coin Offering (ICO), and subsequent merger with / conversion to Waves blockchain Tokes (TKS).

Foware Development Studio, Colorado Springs, CO - 2008 to 2014

Co-founder, Chief Technology Officer

- Shipped 20+ apps to iOS App Store & Google Play Store.
- Apps reached Top Grossing and Top Paid for several months.
- Apps peaked at #4 Worldwide Top Paid (Overall category).
- Water Your Body app peaked at #1 Worldwide Top Paid (Health & Fitness category). Featured Healthcare App on The Doctors On CBS.
- Developed full-service logistics & accounting platform for dry goods shipping industry (BubbaNet).

Education:

- Truckee Meadows Community College

Michal Mikołajczyk

Professional Summary:

- 9 years of Mobile/Web Full-Stack Software Development, including blockchain development on Ethereum/Quorum, Bitcoin
- Toptal Community Lead in Warsaw; managing community from a handful of freelancers to hundreds of active members, to hosting open events/workshops, organizing meetups, speaking at international conferences.
- Kubernetes, Docker, Microservice Architectures

Professional Experience:

Multichain Ventures, Warsaw, Poland - 2018 to Present

Chief Information Officer, Development Lead

- Developed Ethereum Track&Trace dapps for Supply Chain
- System Architecture for Tokes Platform, Eden (Blockchain), Reli.cloud
- Introduced Software Product Standards and Procedures
- Formed a Site Reliability Engineering Team
- Planning ICT strategy and orchestrating its execution.
- Defining and managing ICT policy and tactics, overseeing ICT operations.
- Participating in shaping the company's culture
- Coaching Software Engineering and Site Reliability Engineering Leads
- Hands-on leading engineering efforts in R&D for innovation

Viking Garage, Warsaw, Poland - 2017 to 2018

CEO, Lead Engineer

- Founded and bootstrapped the startup
- Released MVP within 3 months in Poland
- Google Launchpad Start 2017 Alumni
- Opened in ASEAN market in January 2018
- MaGIC GAP Accelerator 2018 Alumni

- Lead the open-source development
- Toptal Open-Source Grant 2017 <https://github.com/blockchain-IoT/Motoro>

Toptal, Warsaw, Poland - 2015 to Present

Senior Lead Engineer, Warsaw Community Leader, Mentor, Speaker

- Blockchain specialization @ Toptal and article author, blockchain open-source grant award
- Delivered multiple international projects for clients
 - Developed complete client-side code for <https://nowness.com>, which was nominated for Webby and won multiple other awards
 - Developed front/back end, setup DevOps infrastructure, and coordinated between different teams/leaders for Maxwell Health
- Published articles on JavaScript development, and received grants for open source projects
- Voluntary position, working closely with Toptal Core Team
- Helped build the Polish Toptal Community, from 5 members to 100+
- Organized 5 conferences, held 10+ meetups, welcome guided new Toptal members into Polish Community
- Speaker at Nomad City Conference in Las Palmas de Gran Canaria 2016

Trewebs, Warsaw, Poland - 2012 to 2017

Founder, Chief Technology Officer

- 50+ web development projects; Drupal development; Team building and lead

Education / Training:

- University of Warsaw, Master's in Psychology, 2005-2011
- 7 Certificates (edX) in Software Engineering, SaaS, Big Data, Machine Learning, AI

Language: English, Polish, Swedish, Norwegian, Danish

Danny Floyd

Professional Summary:

- 5 Years of Professional Blockchain Related Software Development Experience
- 17 Years of Professional Computer Graphics Industry Experience
- 13 Years of Professional Video Game Graphics, UI/UX and Development Experience
- 9 Years as Owner of Independent Software Development Studio
- Worked with Electronic Arts (EA), Westwood Studios, Mythic Entertainment, 3G Studios, 1047 Games, Foware and many Independent Software Clientele

Professional Experience:**Multichain Ventures**, St. Augustine, FL - 2018 to Present

Chief Experience Officer, Project Manager

- Developed **Tokes Platform**, a merchant processing software suite consisting of blockchain-based apps to facilitate digital currency transactions (Merchant Gateway POS, eCommerce, Mobile Wallet, Tokes Explorer) for the native Tokes (TKS) token and popular cryptocurrencies.
- Developing **EDEN**, a supply chain visibility platform that records the physical movement of goods through the supply chain on the blockchain, by integrating with business systems (ERP, POS, Government), and adhering to GS1.org global standards (EPCIS) for business communication.
- Developed **Reli.cloud**, a platform providing DevOps infrastructure and blockchain integration services for software development teams.

Cannabis Hemp Exchange (CHEX), Las Vegas, NV - 2014 to 2018

Co-founder, Chief Experience Officer

- Developed full-service B2B commodity exchange and wholesale e-commerce platform (web & mobile) for the Cannabis & Hemp industry with comprehensive business/social features; agnostic for other commodity sectors.
- Wrote White Paper for 2018 Initial Coin Offering (ICO) for the Ethereum CHEX Token Sale (currency for transactions on CHEX) on Ethereum blockchain.

Foware Development Studio, Las Vegas, NV - 2010 to Present

Co-founder, UX/Design Lead, Project Manager

- Shipped 20+ apps to iOS App Store & Google Play Store, and managed development resources.
- Apps reached Top Grossing and Top Paid for several months.

- Apps peaked at #4 Worldwide Top Paid (Overall category).
- Water Your Body app peaked at #1 Worldwide Top Paid (Health & Fitness category); featured Healthcare App on The Doctors On CBS.
- Developed full-service logistics & accounting platform for dry goods shipping industry (BubbaNet).

3G Studios, Reno, NV - 2008 to 2011

Lead Character Artist, Concept Artist, Art Director on Zombeat

- Character Art, Animation, Environment Art, Concept Artist, Art Direction
- Projects included: Jillian Michaels Fitness Ultimatum, Airborne Rangers, Zombeat, and more.

Electronic Arts (EA), Redwood Shores, CA - 2002 to 2007

Computer Artist I & III, Lead Character Artist, Assistant Art Director

- Character Art, Animation, Environment Art, Concept Artist
- Projects included: The Lord of the Rings, The Sims, Ultima & Warhammer Series, Earth & Beyond and more.

Education: College of Southern Nevada, Visual and Performing Arts, 2000-2003

Eugene Lopin

Professional Summary:

- 13 years of well-rounded software development product management, 2 comprehensive blockchain projects.
- 2-time founder of software business platforms, including blockchain coin offering and merger experience.
- Comprehensive software product and project management across all functions in corporate and entrepreneurial environments.

Professional Experience:

Multichain Ventures, Brooklyn, NY - 2018 to Present

Product Manager & Business Development

- Developed **Tokes Platform**, a merchant processing software suite consisting of blockchain-based apps to facilitate digital currency transactions (Merchant Gateway POS, eCommerce, Mobile Wallet, Tokes Explorer) for the native Tokes (TKS) token and popular cryptocurrencies.
- Developing **Eden**, a supply chain visibility platform that records the physical movement of goods through the supply chain on the blockchain, by integrating with business systems (ERP, POS, Government), and adhering to GS1.org global standards (EPCIS) for business communication.
- Gathered industry business requirements, documented product specifications, assessed GS1 standards for compliance, QA testing, business development (digital marketing, event marketing, relationship building).

Cannabis Hemp Exchange (CHEX), Brooklyn, NY - 2014 to 2018

Founder, Chief Executive Officer, Product Manager

- Developed blockchain-based B2B commodity exchange platform (web & mobile) with wholesale e-commerce for Cannabis & Hemp industry with comprehensive business/social features; agnostic for other commodity sectors.
- Gathered comprehensive Cannabis/Hemp industry requirements via relocation to Colorado and California.
- Product managed development, raised angel capital, attended and spoke at nationwide industry events, etc.
- Co-managed Initial Coin Offering for CHEX token sale on Ethereum, and subsequent token merger with Tokes (TKS) on WAVES blockchain.

Razorfish, New York, NY - 2013 to 2014

Senior Product Manager

- Ownership of product business requirements, specifications and workflow diagrams, scope management, and development of cross-platform responsive web and mobile applications.
- Clients included Mercedes-Benz, Total Wine & More, and EMC.
- Collaborated with human resources within the largest global full-service digital agency to deliver award-winning digital media, creative and technology solutions for clients.
- Product managed software development lifecycle in collaboration with PM, QA, UX/UI, technical architecture, engineers, content strategy, consumer insights, SEO and video production.

DOOR3 Business Applications, New York, NY - 2012 to 2013

Senior Product Manager

- Product managed cross-platform software development projects for agency clients.
- Clients included WWE, AethorStore and others.
- Developed community.wwe.com web/mobile application in Drupal. Best B2C Website finalist (Blue Drop Awards).

E*Trade Financial, Jersey City, NJ - 2012 to 2012**Product Manager**

- Product managed internal projects to implement anti-fraud technology solutions.
- Produced specifications for development of a comprehensive fraud database and internal integrations.
- Managed POC to assess vendor voice biometrics fraud detection solutions for call center environment
- Assisted retail FX trading platform implementation; included process modeling and test cases.

Chiron Business Solutions, New York, NY - 2008 to 2012**IT Business Analyst**

- Software development consulting for corporate clients.
- Full lifecycle implementation of legacy system upgrades; extensive requirements gathering, data modeling, requirements traceability.
- Translated disparate legacy system data into cohesive business intelligence; data analysis/warehousing.
- Authored product specifications; UML diagrams, data requirements, GUI requirements, business rules.
- Coordinated QA teams for unit, integration, system, regression and UAT testing.
- Performed root cause and GAP analysis, feasibility analysis.

CommercialDeals, Brooklyn, NY - 2006 to 2008**Co-Founder, Business & Product Manager**

- Managed development of web-based lead generation platform for commercial real estate finance.
- Managed offshore team to develop .NET based CMS platform.
- Authored requirements including user stories, data requirements, GUI and functional specifications.
- Business development; customer service; incorporated feedback into platform enhancements.

Campus Habitat, New York, NY - 2005 to 2006

Financial Manager

- Responsible for securing financing for commercial real estate acquisition and value-add projects.
- Secured \$40 million in debt/mezzanine financing for the acquisition/renovation of 6 nationwide properties.
- Managed timely loan origination, application (valuation analysis, cash flow modeling, due diligence package) and execution within property closing timelines.
- Worked closely with CEO, CIO and commercial lenders to secure favorable financing terms.

Education / Training:

- Chiron Training Center (IIBA endorsed), IT Business Analysis Course
- SUNY Binghamton University, BS Management 2005, FinanceMarketing dual concentration

Language: English, Russian

Appendix B: EPCIS Core Business Vocabulary (CBV) - from EPCIS and CBV Implementation Guideline (Feb. 2017) - available via https://www.gs1.org/docs/epc/EPCIS_Guideline.pdf

The Core Business Vocabulary (CBV) specifies various vocabulary elements and their values for use in conjunction with the EPCIS standard [EPCIS1.2], which defines mechanisms to exchange information both within and across organisation boundaries. The vocabulary identifiers and definitions are prescribed to ensure that all parties who exchange EPCIS data using the Core Business Vocabulary will have a common understanding of the semantic meaning of that data.

This CBV is intended to provide a basic capability that meets the above goal. In particular, this standard is designed to define vocabularies that are core to the EPCIS abstract data model and are applicable to a broad set of business scenarios common to many industries that have a desire or requirement to share data. It intends to provide a useful set of values and definitions that can be consistently understood by each party in the supply chain.

Additional end user requirements may be addressed by augmenting the vocabulary elements within with additional vocabulary elements defined for a particular industry or a set of users or a single user.

The CBV includes identifier syntax (URI structure) and specific vocabulary element values with their definitions for these Standard Vocabularies:

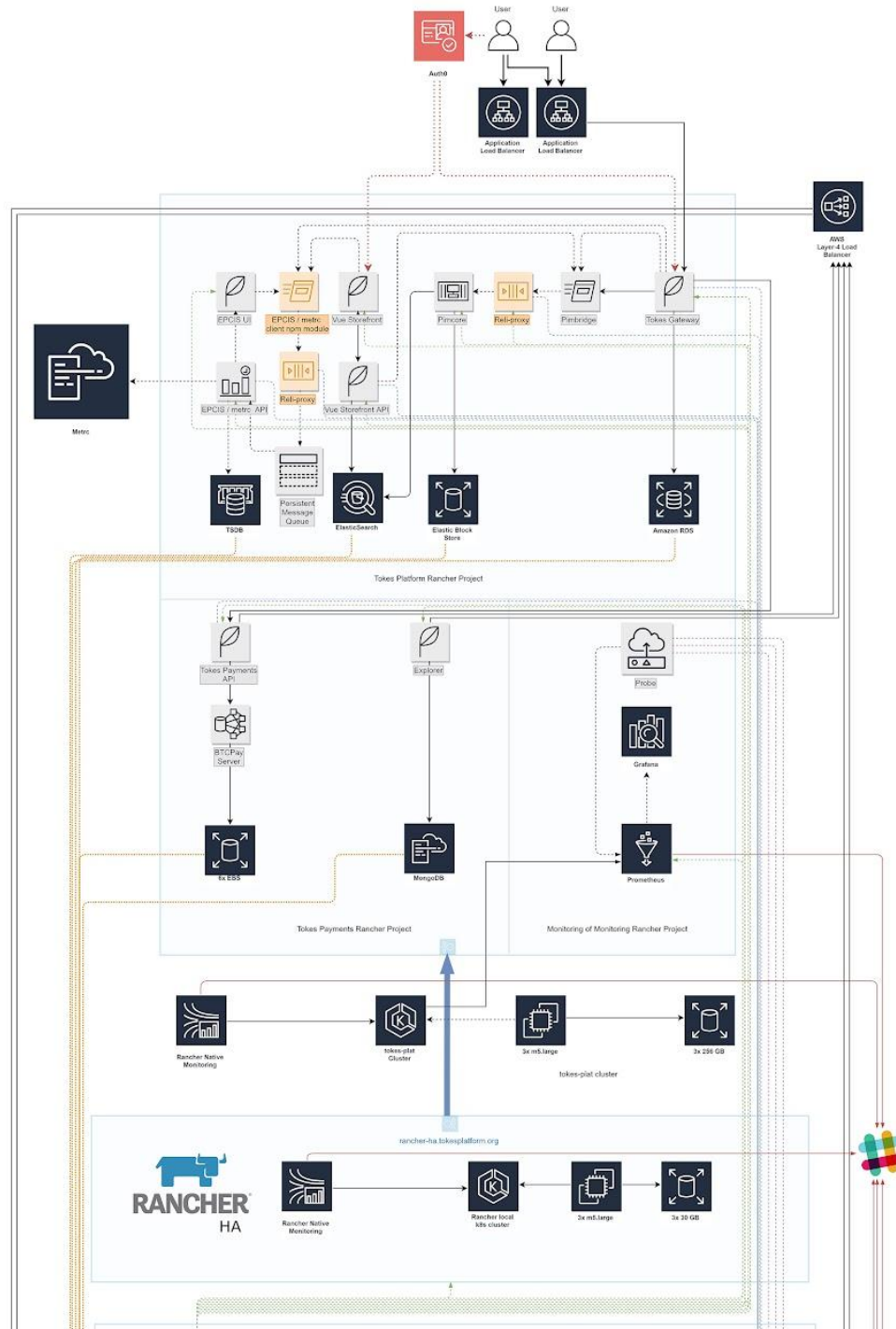
- Business step identifiers
- Disposition identifiers
- Business transaction types
- Source/Destination types
- Error reason identifiers

The CBV provides identifier syntax options for these User Vocabularies:

- Objects
- Locations
- Business transactions
- Source/Destination identifiers
- Transformation identifiers
- Event identifiers

The CBV provides Master Data Attributes and Values for describing Physical Locations, Parties, and Trade Items, including Trade Item master data attributes at the GTIN level, lot level, and instance level.

Appendix C: Architecture Diagram (see Tokes_Architecture_Diagram_Portrait.pdf on enclosed CD for larger digital version).





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