

Exercise: Batch Tracing

Exercise Description

- Michelle works at a brewery and is tasked to keep track of which ingredients were used for which batch of beverage. For example:
 - Spring water from a local source
 - Hops from farmer Kurt
 - Malt from another local farmer Joseph
 - ...
 - ...
- Michelle's company also wants to enable their customers to look up the origins of their ingredients for every bottle.
- It shall be possible for Michelle to track the information and for customers to look it up.
- **Bonus 1:** From releasing a bottle after production to selling it to the customer the bottle is shipped through various distribution stations. The brewery is interested in keeping track of this intermediate stations.
- **Bonus 2:** To simplify tracing of large amounts of bottles, the brewery additionally wants to track beer crates and propagate updates to them to the bottles automatically.
- **Bonus 3:** For a new market the company decides to sell the bottles in six packs instead of in crates. After the crates left the brewery and arrived at the shipping center the shipping center needs to be able to re-aggregate bottles from crates into six packs. Six packs shall still be able to be traced just like crates.

Technical description / Implementation hints:

A smart contract is required where authorised parties can instantiate bottle tags. These tags must be able to be given a set of properties that hold information about the ingredients and their origins. Tracing data should be publicly accessible. Possible ways to achieve this include:

- Storing the data directly in the contract
- Storing lookup values in the contract (e.g. urls)
- Storing the data in an IPFS along side the contract

With Hyperledger storing the data in the contract makes it unaccessible to the public, so some other solution has to be found to make it accessible to customers.

Bonus 1: Define properties that hold information about stations the bottles were distributed through. Ensure that data consistency is kept (e.g. cannot alter or delete history, only allow appends to it, ...). Only approved parties (distributors) shall be allowed to append to the history.

Bonus 2: Add the ability to track crates that contain 20 bottles. Updates (e.g. tracking positions) to the crates shall be propagated to the bottles.

Bonus 3: Redefine crates to be a general aggregate and add functions that allow to alter aggregates (while maintaining the respective history of aggregates and bottles).