

KARPINE

SOLUTION OUTLINE

RFID BASED TRACKING SYSTEM



KARPINE BLOCKCHAIN TRACK & TRACE SOLUTION

CONNECTED SUPPLYCHAIN

TECHNOLOGY

The solution will be implemented with a mix of RFID, QRCode and blockchain systems to build a cost-effective track & trace system. Inexpensive passive RFID tags are coupled with a desktop RFID reader, a hand held RFID reader and a group of fixed RFID readers running at UHF frequency and EPC Class1 Gen 2 compliant.



DIGITAL TWINS

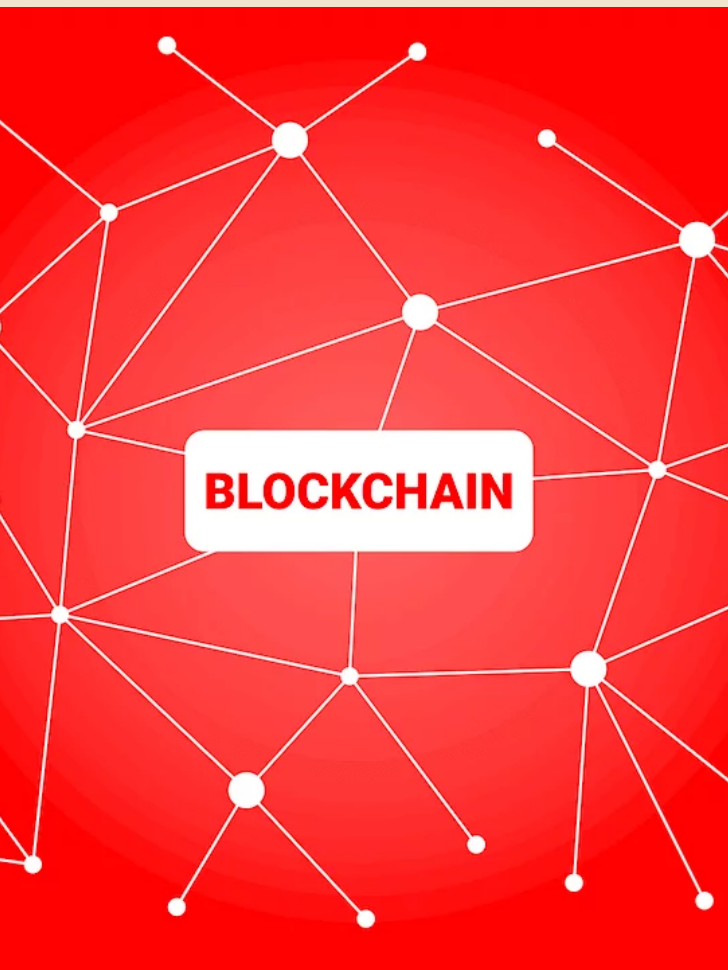
A digital twin is a digital representation of a real-world entity or system. Creating a digital twin will enable us to track the item in the digital world with ease and take actions when required on the physical item.

The system is built on EPCIS specifications. All actions are stored in the system as events in 4 dimensions - "What, Where, When and Why" for the following 6 major pillars

- Commission: Item has originated or entered into the system.
- Transformation: Item has changed into an irreversible format.
- Aggregation: Grouping of items into larger batches.
- Disaggregation: Ungrouping of batches to make smaller units.
- Observation: Item movements or behaviors are observed.
- Decommission: Item is destroyed or moved out of the system.

THE WHY

RFID'S & BLOCKCHAIN GO LONG WAY...



Since the second world war, RFID's have evolved into different forms over the years. The usages have been taking various shapes and forms. Technological evolution has brought more accuracy to the systems at a lower cost.

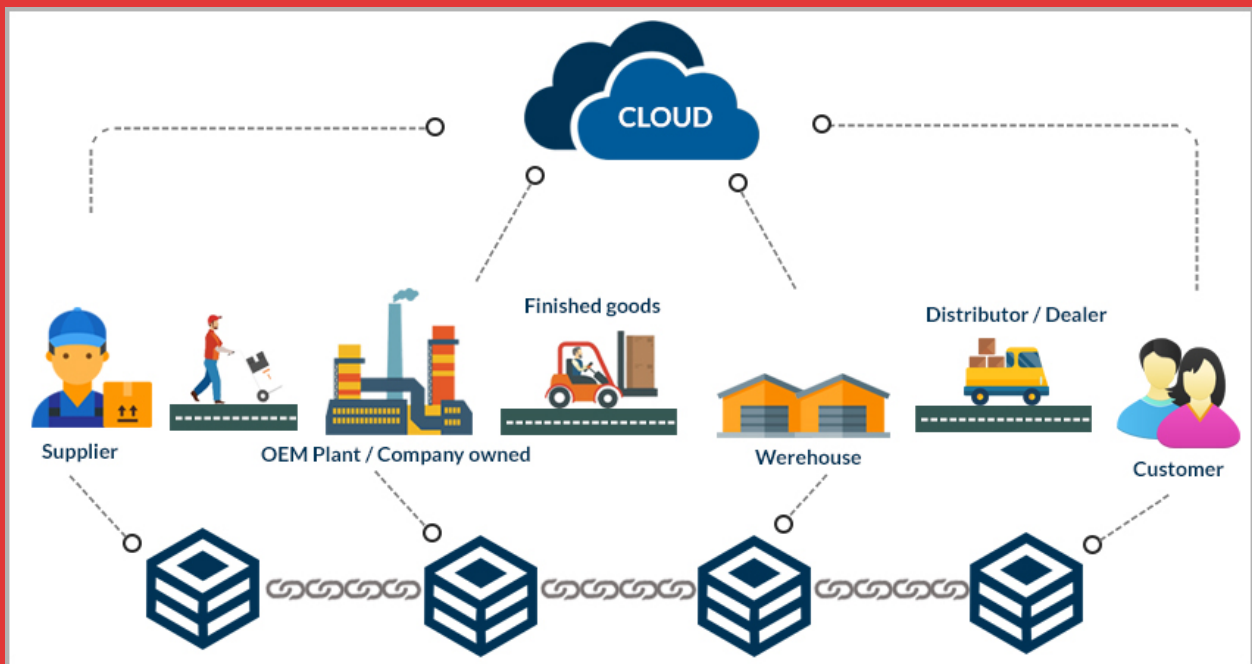
Realtime Location Systems has been an obsession in the industry and have been coming with massive budgets with minimal accuracies. However recent technologies have made it possible to solve complex algorithms with ease to identify the location of the product. Today there are RFID readers which could throw 56 beams in one shot to calculate the location of the item to an accuracy of up to 0.5M.

Adding blockchain as a backend engine to the system will allow the data stored in the system to be signed with the digital identity of the related parties of the transaction. This will remove the need for the verification of data stored in the system.

HOW IT WORKS

MAGIC RECIPE

CHAIN OF OWNERSHIP



TRANSPERENCY WITH AN IMMUTABLE OWNERSHIP LEDGER

MICROSERVIES ARCHITECTURE FOR EASY PLUG AND PLAY

SETUP & CONFIG

01

Each location to be tracked is divided into a Zone. Each zone will have numbering and necessary fixed UHF RFID readers are mounted. Locations will have storage units.

02

Each storage unit called a Stage will be divided into multiple rows and each row will have multiple columns. Each storage unit will have an addressing scheme like "ST-001-003-006" Individual level units are called bins.

03

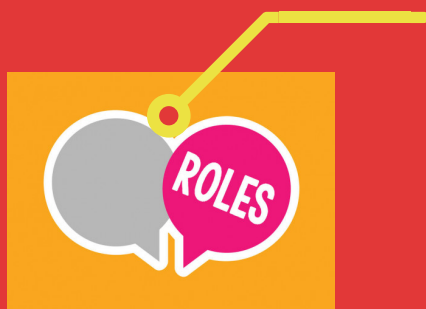
Each bin will have an RFID sticker which maps its location in the system to its Unique ID. Item location is based on bin nos.
For E.g.: Item x is in Location 02 at bin ST-004-002-001

WHAT'S NEEDED?

- 1) Inward zone will have a desktop along with a thermal printer & a desktop RFID reader
- 2) A handheld RFID reader for audit purposes
- 3) A collection of fixed RFID readers based on the number of locations and area
- 4) Epoxy RFID stickers for each bin
- 5) RFID stickers & thermal labels for attaching to the items.
- 6) Alert buzzer/lights mechanism to alert any unchecked items getting moved out. [Optional]
- 7) Wifi / Lan connectivity across the locations.

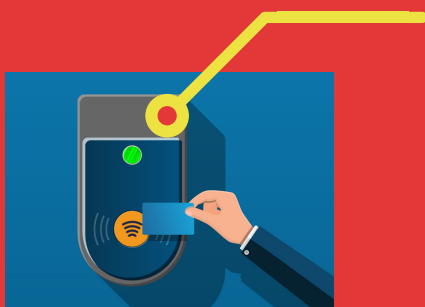
STEP 1

ACCOUNT MANAGEMENT



Roles: Different roles can have different usage rights of the system. Roles management will allow the admin to create various roles and assign rights for each role.

Users: Each employee will be given a user login to access the track & trace system. This login will work both on the android / ios app as well as the web portal.



RFID Employee Mapping: Employee RFID unique identifier (if already have RFID employee cards the ID is picked from it else each employee will be issued a low-cost RFID based ID card) will be registered in the system.

STEP TWO

CATALOG

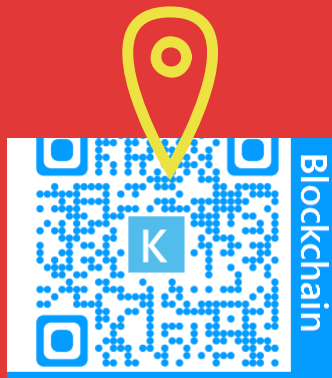


Before goods arrive at the warehouse, prepare a catalog of each SKU with relevant images, descriptions, EAN, code, sizes, etc. Each item will be assigned a Unique Id. This helps us to map the reports, RFID scans to the relevant products.

STEP THREE

INWARDING

CREATE A DIGITAL TWIN FOR EACH PRODUCT BY ATTACHING A QR CODE TO AVOID ANY HUMAN ERRORS



DIGITAL TWIN

1. Pick the item to be inwarded.
2. Select the product from catalog in the system
3. Generate a QR Code
4. Attach the QR Code to the RFID sticker
5. Scan the RFID sticker with a desktop RFID reader to map the product with RFID.
6. Attach the RFID sticker to the item.



BINS MAPPING

1. Pick the "RFID attached item" and scan the RFID with a handheld RFID scanner.
2. Select the bin where the item needs to be placed and scan the bin RFID.
3. The item is now mapped to the bin location.



REPORTS

Instantly generate reports to get insights into items inwarded and their respective locations.

STEP 4

OUTWARD



1) Android / ios App with employee login. Anyone who is checking out an item from the bin has to scan the QRCode so that item ownership is with him.



2) Inventory management system will be automatically updated.



3) If an attempt is made to take an item from a location without checking out from the app, the RFID fixed reader in the location will check for an item that is moved if it's been checked out and raise an alert/alarm.



4) Daily reports will be generated with a list of checked-out items along with their location generated from RFID readers.



5) Lost & Found area to be marked as a separate area where all employees will drop the missing/untraceable goods or checked out goods/return goods which have to be inwarded back to bins as a one-time activity in a day and the usual inward process has to be followed.

STEP 5:

WEEKLY / MONTHLY AUDIT



All bins are audited on a regular basis to ensure consistency in the system with a handheld RFID reader and a task list with any anomalies is generated.



Move Inventory: This feature will help to move wrongly located items to correct bins.



Mark as Found: Any orphan item can be scanned in the system to mark as found and place in the relevant bin.



Mark as Lost: Any physical items missing in the bins could be marked as lost. The items marked as lost can be searched with fixed RFID scanners once a day to identify the location.



Mark as Damage: Any item that has been damaged or whose RFID sticker is damaged could be marked as damaged so that either it will be disposed of or sent for the inward process for a new RFID sticker.

STEP 6

SALES, RETURNS & ORDERS



Online management of order book with sales orders which can be booked through a form that will populate data of the product from the catalog by scanning the QRCode on the product.

Goods moving out of the warehouse will pass through an exit point where the QRcode is scanned and relevant vendor details who are getting the delivery are entered as the current holder of the goods. Similarly, when goods are returned to the warehouse, the item could be marked as checked back in the system.



Item sale is recorded in the system once payment is received and the system will mark the lifecycle of the RFID tag as complete & destroyed to stop tracking this tag anymore.

REPORTS

BESPOKE AI/ML REPORTS ENGINE



A variety of reports could be generated which could vary from simple location reports to complex item location journey reports. As we are collecting data in a structured fashion several AI/ML-based reports could be generated based on the patterns of data.

- Unified dashboard with complete inventory listings & locations.
- Daily scan report with items that are checked out but not returned.
- Inward and Outward reports between any two given dates.
- Lost & Damaged Inventory reports.
- Individual Item Journey.
- Sales Reports.