

Advanced Beer

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Overview



3 Factories

1 Central Office

1 Resource Distribution Center

Factories communicate with the central office which is controlling resource delivery from storage to the production.

Main sites

Central Office (CO)

- Keeps track of production and stock in each factory
- Holds the main data center which is running the ERP system
- Receives client orders
- Coordinates ordering and transport of primary resources/materials
- Coordinates the delivery of the final product to customers
- Holds all historic data collected in order to facilitate methods to optimize production over time (demand/supply models, predictive maintenances, general data science stuff)

Factory (F)

- Specialized in one different products
- Monitors and controls production
- Receives orders from the main office, and reports on current state of production and storage

Resource Distribution Center (RDC)

- Acquires primary resources/material
- Performs quality control
- Sends resources to factories

Orders and Stock

The CO is controlling the production, but is ‘outsourcing’ the acquisition and transport of primary resources to the RDC.

The RDC receives the order to acquire X amount of resources and deliver it to a specific factory.

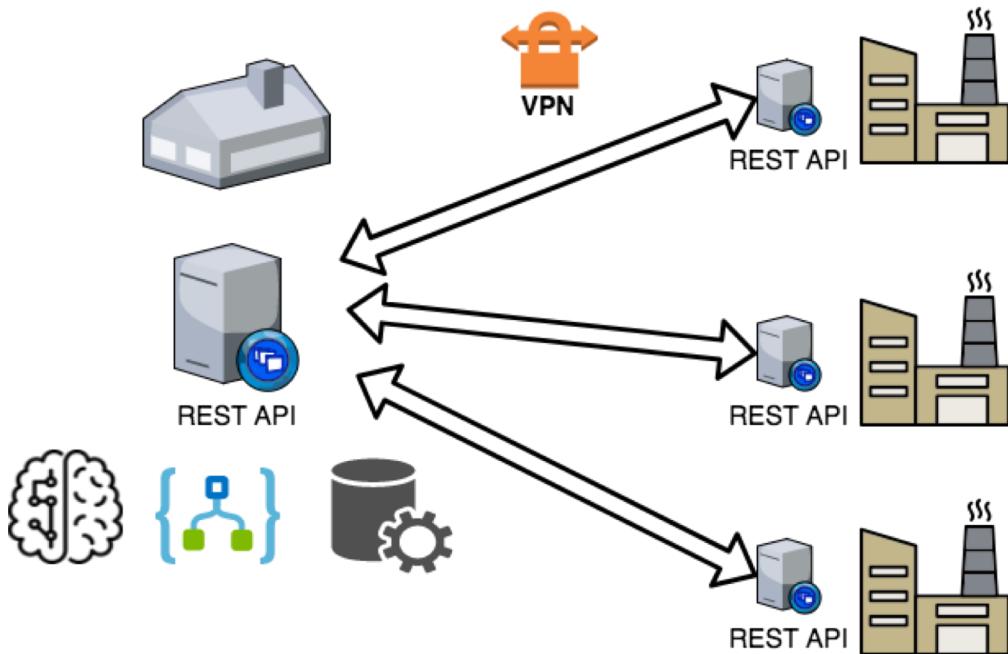
RDC selects suppliers based on price and quality, and performs quality control on incoming goods. It keeps a minimal depot (enough for 24h) of processed goods that are ready for shipping.

Quality control is evaluating goods is automated using computer vision and traditional sensors. Goods are classified by quality, and packed into units that are tracked throughout the production process.

Resources are transported by truck to the different factories (assuming delivery times 8-10h)

Each factory has its own limited storage (enough for 24h)

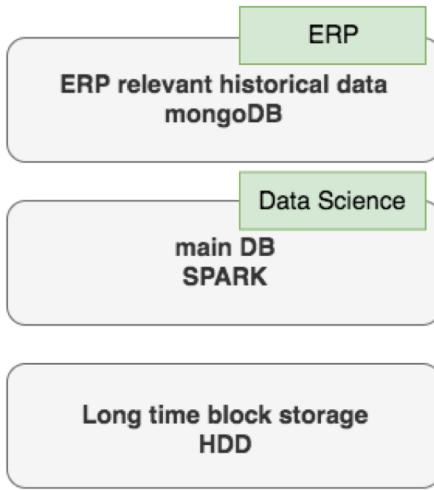
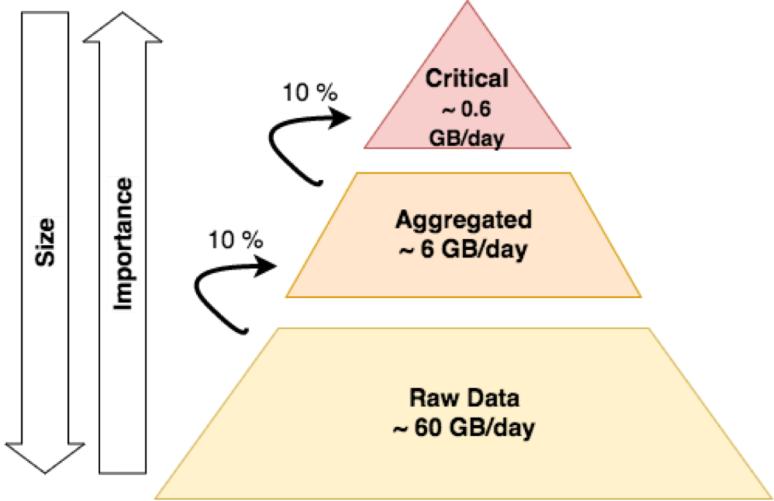
Communication between Central office and factories



The CO contains a data center that is running a ERP system.

CO is communicating with the different factories over public telecommunications networks. This communication is encrypted via point to point VPN connections, and by https secured REST interfaces.

Central Data Storage



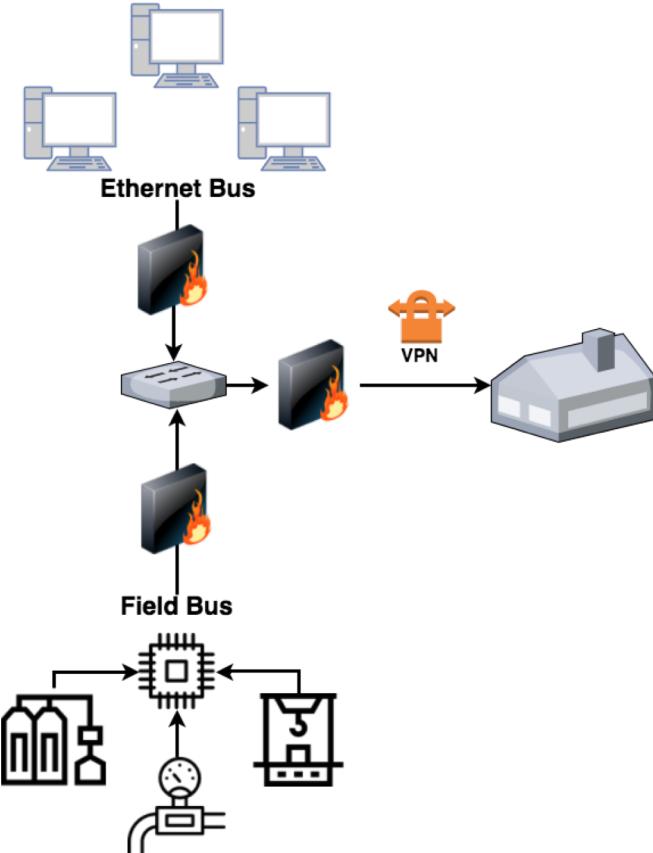
Raw data is delivered physically from each factory once a week

Raw data is processed and aggregated providing two access points

Critical: Used by the ERP system containing historical data

Aggregated: Used for all kind of BI related Data Analysis tasks (supply demand/modeling, predictive maintenance, ...)

Communication Networks



Three isolated networks with different technologies and security policies

General IT

Ethernet Bus providing infrastructure for general IT requirements (time tracking, file storage, telecommunication)

Factory control network

Field bus system (AI-i) used by sensors, actors, PLC's, HMI's
Monitoring and logging system

External Network connection

Use of public network infrastructure (GSM, cable)
encrypted by p2p VPN.

Operator Control and Monitoring Systems

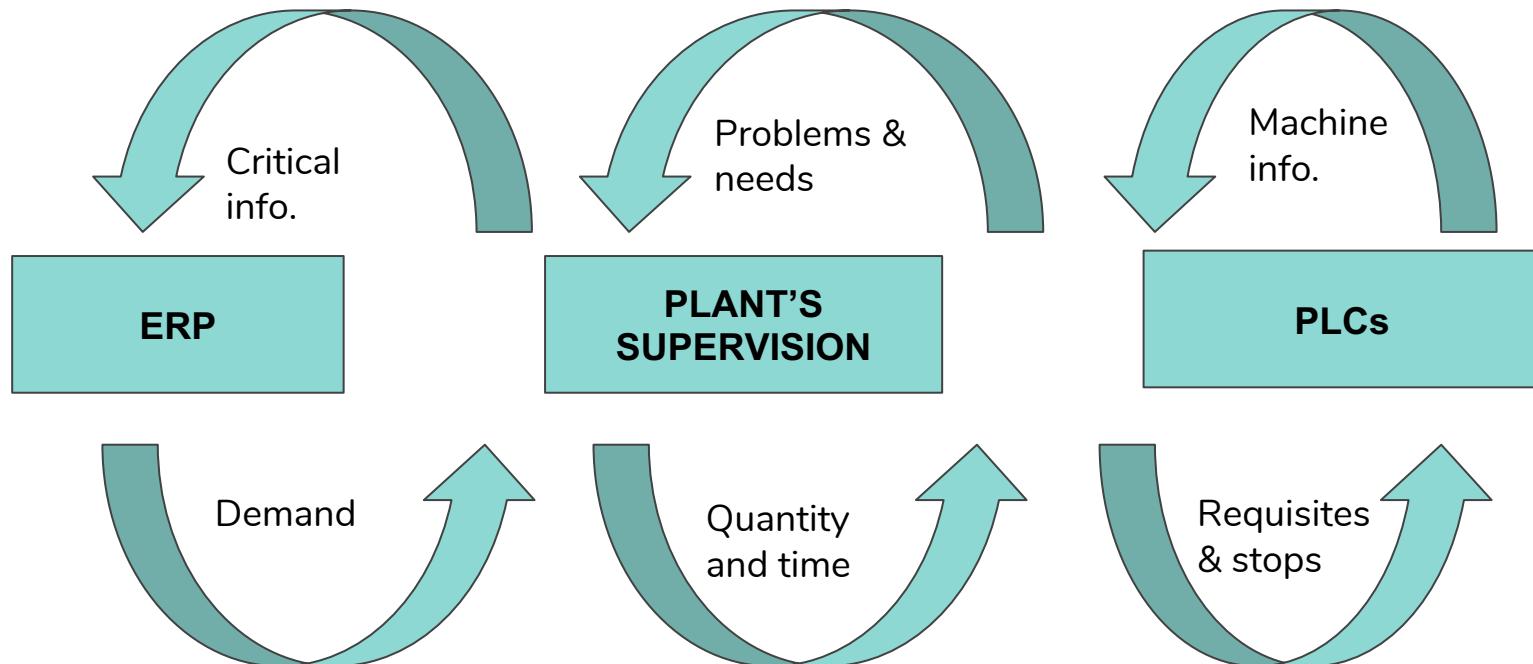


Using the AS-i Bus for communication between sensors, actors and PLC components.

Controlled with SIMATIC S7

Monitoring and Visualization with WinCC

Information flow





Beer boiling process



The large cans work together in groups of three, to make it easier to identify errors in the fermentation phase.

- Temperature sensor Ds18b20.
- PH sensor HI 99151.
- Countdown dispositivo, 90'.
- Scale on the floor, counts the total weight before boiling process.

The PLC of each group sends to the next phase's machines the PH and weight measured, once it is cold enough.



Fermentation process

1. Transfer: controlled by pressure sensors in real time.
2. Bombs: also pressure sensors, in the tubes. Scale on the floor.
3. Yeast: calculate the weight.
4. General parameters:
 - a. Temperature: Ds18b20.
 - b. O₂ quantity:
 - i. Liquid: InPro 6950 & Transmitter M700
 - ii. Gaseous: InPro 6950 with gas membrane & transmitter M700.
 - c. PH: HI 99151.
 - d. Measure the final weight to calculate the degree of alcohol.



Filtering and pre filling processes

Circular circuit managed by the PLC. Other parameters measured:

- Pressure of entrance and exit: digital Bourdon tube.
- Amount of traces: X-rays.
- Temperature: Ds18b20.

The prefill tank's weight is measured and contrasted with the last to detect leaks and keep track of the exact volume of beer.



Mixing process

- Galicia's lemon beer: the amount of lemon juice is proportional to the one of beer measured before.
- General additives:
 - Lactose.
 - Dextrose.
 - Sulfites.
- The ingredients added at this phase are introduced in the beer according to the amount of beer.



Bottling process

- Controlling the filling:
 - Quantity of bottles and barrels: the calculated to supply the total demand.
 - Performance: individual weighing of the recipients, once filled.
- Controlling the capping machine:
 - Counting: image recognition system detects if the cap is well put.
 - Checking: bipartite mould with the proper form checks whether it is well closed or not.
 - Performance: real time calculation of successfully capped cans per period.
- Controlling the label, using for both situations image recognition:
 - By set: cameras at the end of the production chain check if the previously labeled packs have the right QR code.
 - By can: cameras check if the cans are labeled.



Tracking

- Stock identified by QR codes.
- EAP knows all the information of the product by reading this code.
- The sets are conserved in special conservation rooms, ordered by customer's identifications.
- Important parameters are continuously measured, such as:
 - Temperature.
 - Humidity.



Thank you for your attention!

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