HEN Detection using RFID

OVERVIEW:

Monitoring poultry behaviour is an important basis nowadays, to understand the hen’s health and growth. Manual monitoring data is mostly unreliable and sophisticated these days. Leveraging the technologies like sensor data or data mining in these models for collecting data and for keeping track of hen’s health and count makes data reliable and improves the productivity specifically using RFID devices.

INTRODUCTION:

By combining radio frequency identification device (RFID) with a poultry health data, this paper utilized RFID technology to detect individual behaviour of hens by means of attaching tags to feet of the hens and disposing an weighing sensor under the feeder while they are eating. The weighing sensors performed automatic recognition of the hen based on the Unique Ids and recording when the foot tags worn by the hens were within the identification range and transmitted data to a reader in the form of electromagnetic waves. The reader uploaded the unique Ids and weight of the hen information to an information processing module. A decoder processed various information of these hens, such as weight, id multiple times in the day and the amount of food intake including other health information, which were transmitted to a computer terminal for storage.

RFID systems consist of a reader with a transponder (tag). There are two different RFID tags possible. Either they are active, meaning they have their own power source or they are passive. Passive tags do not have their own power source and have to be supplied with energy via electromagnetic field produced by the reader. Passive transponders or tags are available in three different RFID frequency ranges: Low frequency (LF), high frequency (HF) and ultrahigh frequency (UHF). The reading range of LF and HF systems is usually only a few centimetres. UHF tags, however, are often readable over distances of more than one meter. RFID is best suited for asset tracking and location in logistic functions.

Frequency Bands	Antenna	Data & Speed	Read Range	Usage
Low Frequency (LF) 125 kHz – 134 kHz	Induction Coil on Ferrite Core, or flat many turns	- Low Read Speeds - Small Amount of Data (16 bits)	Short to Medium 3-5 feet	- Access Control - Animal Tagging - Inventory Control - Car Immobilizer
High Frequency (HF) 13.56 MHz	Induction Coil flat 3-9 turns	Medium Read Speed Small to Medium amounts of data	Short 1-3 feet	- Smart Cards - Item or Case level tagging - Proximity Cards - Vicinity Cards
Very High Frequency (VHF) 433 MHz – Active Tags	Internal Custom Design	High Read Speed Large Amounts of Data	High 1-1000 feet	- Asset Tracking - Locationing - Container Tracking
Ultra High Frequency (UHF) 860 MHz – 960 MHz	Single or Double Dipole	High Read Speed Small to Medium amounts of data	Medium 1-30 feet	- Pallet or case level tagging - DOD & Walmart Mandates
Microwave Frequency 2.45 GHz & 5.4 GHz	Single Dipole	High Read Speeds Medium Amount of Data	High 1-300 feet	- Container Rail Car - Auto Toll Roads - Pallet Level Tracking

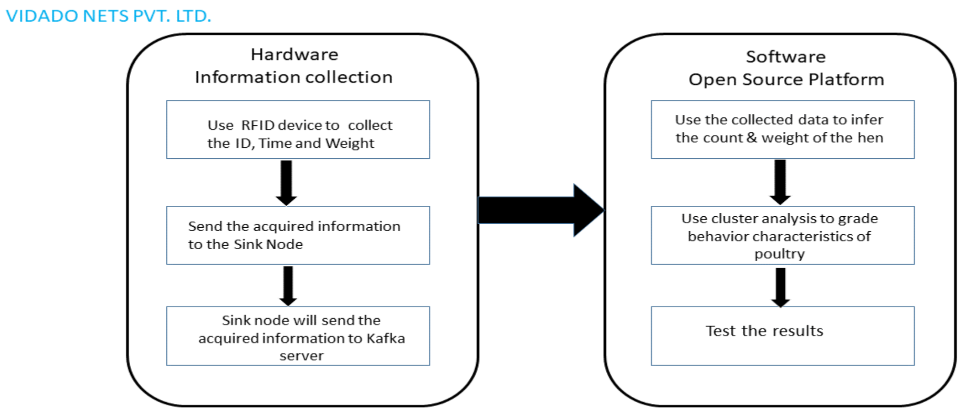
Feasibly, using Low Frequency RFIDs for the tagging of the hens for capturing data is a good source for utilizing Internet-Of-Things (IoT) and computing. RFID tag collectors are tied to hen’s feet which will be adjustable according to the phase of chick to hen’s growth. RFID’s can be reusable after the hen is grown enough for the purchase. The data of the previous RFID will be wiped out and hence can be reused for other new hens agin. Weighting sensors are used for collecting weight and kept in such a way that one hen can stand at a time.

In a large poultry, these data points are frequently collected from hundreds of RFID’s and weighting sensors. It is important to keep the data accuracy using RFID protocols. DASH7 is a wireless protocol used for active RFID tags. Compared to DASH7 is more scalable, has greater network coverage and greater data rates. It is not only a physical and MAC layer protocol but also includes IPv6 addressing for network layer. The protocol uses unique identifiers along with 16-bit network identifiers for addressing in the IOT network. The data is communicated using 255-byte long frames that include addresses, sensor data and multiple fields. These protocols are capable of aggregating the data points and ingesting them into the system.

Use of Kafka:

As, the data will be more and counting manually is not accurate, utilising Kafka streaming or batch processing for collecting data and processing it. IoT devices comprise of a variety of sensors capable of generating multiple data points, which are collected at a high frequency. These massive data sets are ingested into the data processing pipeline for storage, transformation, processing, querying, and analysis. Each data set consists of multiple data points representing specific metrics. For example, collecting RFID id's, counting, taking weight.

The gateway pushes the data set to an Apache Kafka cluster, where the data takes multiple paths. Data points that need to be monitored in real-time go through the hot path. In our scenario, it is important to track count and BMI in real-time to take corrective action. These data points may go through an Apache Storm and Apache Spark cluster for near real-time processing.



Irrespective of the path that the data points take, they need to be ingested into the system. Apache Kafka acts as the high-performance data ingestion layer dealing with massive amounts of data sets. The components of the data processing pipeline responsible for analytics become subscribers of Apache Kafka will lead to productivity.

Cost of the RFID setup:

The vast majority of RFID tags consist of an antenna and an integrated circuit (IC). Most RFID tags are low-cost passive tags, which take advantage of the reader-induced signal to supply power to the RFID chip. In this sense, printed electronics results in a good alternative to produce low-cost systems in large-scale production. Several examples are found of RFID tags developed with different printing techniques such as 3D-printing. In addition to cost savings, printed electronics produced are thin, wearable, and lightweight devices, as well as flexible systems by using malleable substrates. Hen detection tags are small in size and cost around INR 50 each. The recipients which reads the signals, costs around INR 200 each. The expense of the weight sensors for monitoring BMI's is around INR 600 per unit.

Conclusion:

Using open source technologies with low cost monitoring techniques, makes data processing and management easier and scalable. As discussed in the above architecture, the goal we want to achieve with the poultry data is faster and productivity is higher without any risk of loosing animals in the poultry firm.