

Project Proposal – Smart Farming for Cattle Monitoring

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OVERVIEW

This document is submitted as an interim submission of CA project of the Distributed Systems module on the Higher Diploma in Computing specializing in Software Development delivered by Yasantha Samarawickrama.

Domain description

You should best describe the overall purpose of the service, explain the functionalities within each service and overall contribution of the service to the application.

[200 words]

The proposed service focusses on the automatization of livestock monitoring particularly within the cattle business. The service will ensure that shed and grazing trends and data are continuously monitored, and adjustments are made accordingly particularly to ensure optimized dairy output with minimal losses.

This includes the continuous data collection of the cattle's shed conditions including, temperature, humidity, ammonia level, water quality/quantity, cattle weight via sensors installed within the sheds. The systems will respond automatically to any unwanted environmental changes within the shed or the residing livestock. This will ensure a comfortable environment for the livestock and prevent possible diseases to spread.

Apart from the internal monitoring, remote monitoring for grazing operations will be provided as well. Each animal will be equipped with a tag to track their location when grazing. This will allow farmers to track their livestock from any location with IoT devices. Mitigation technologies are in place as well to bring lost animals back to the herd with advanced geo-fencing, and noise/light stimulation. This will improve the security of livestock assets by reducing theft and lost animals.

In addition to the monitoring services provided, the user also has the possibility to receive continuous news alerts including weather alerts, regular product & maintenance updates, relevant regulation changes, statistics, etc.

In conclusion, the provided service will vastly increase the visibility into the environmental factors influencing the livestock's well-being and should have a significant impact on the increase of output quality/quantity as well as combat livestock loss due to grazing incidents or diseases.

Service definition and RPC

You should explain in detail, with example the request and response for each functionality within the service. Explain in detail the parameters

[300 words]

In total three services are implemented here to help with livestock monitoring within the application.

Cattle Shed Monitoring – Client-side GRPC

Environmental factors within the cow sheds are measured via sensors and sent to the server via client-side streaming to the respective server on regular intervals throughout the day. The exact parameters to be passed to the server are:

- Shed temperature,
- Shed humidity level,
- Ammonia level,
- Water quality & quantity,
- Cattle weight

At the end of the day the server will analyze the data stream and take relevant actions if necessary. Those actions include, increasing/decreasing the shed's temperature, activate dehumidifier/humidifier within the sheds, add/purify water, adjust food for the next day to include diet with less crude protein, to decrease ammonia levels or alert farmer if strong anomalies are detected.

Grazing Monitoring – Bidirectional GRPC

Satellite technology is used to track the activity of cattle livestock during their grazing period. Due to an individual tag added to each cow, a continuous stream of data is sent from each cattle tag to the sever. The parameters include:

- Movement update
- Cattle heartbeat
- Inactivity alerts

The server will respond in real time based on established geo-fencing and environment stability data and should there be any anomalies e.g. one cow got lost or went to a dangerous area with poisonous weeds, then the herd will be guided to a safe grazing spot via advanced fencing technology activated by the server response. The lost livestock will be guided back to the herd via noise/light stimulation as a server response and once the herd is complete again, the regular grazing practices can resume.

Industry & Product Alerts – Server-side GRPC

In addition to that the user is also able to subscribe to regular industry and product alerts directly within the application. This will provide daily updates from the server on:

- Weather alerts,
- Regular product & maintenance updates,
- Cattle regulation changes,
- Statistics, etc.

The user will get this stream of data automatically from the server on a regular basis once they click on subscribing to daily news alerts. The stream of data will end once the user unsubscribes.