iDDEN: An international perspective

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Abstract

Dairy industries worldwide are facing many of the same challenges: fewer and larger dairy farms, more investment in on-farm technology and significant industry demand for the efficient collection, exchange and integration of this data. The on-farm technology choices traditionally available from a few brand name equipment manufacturers is now being crowded with a growing number of start up sensor and technology companies and increasing market penetration of herd management software companies. The ability to effectively move and manage data with a growing number of suppliers and lack of industry standardization has created an increasingly inefficient process. As well, equipment manufacturers are continually pressured to meet the data interface demands of multiple (national) organizations and this detracts from their primary objectives of developing innovative milking and herd management technologies.

To address this increasingly costly issue, seven farmer owned organizations have collaborated in the establishment of a unified international dairy data exchange network partnership (iDDEN GmbH). Together the organizations represent about 20 million dairy cows on 200,000 dairy farms in 13 countries on three continents. The objective of the partnership is a critical mass of organizations that will coordinate unified data exchange and integration with dairy equipment manufacturers and other entities involved in herd management. Given our intent to integrate ICAR-ADE (Animal Data Exchange) standards wherever possible, we have started work with three initial manufacturers given their intent to switch to the ADE standards. Once completed, we will continue with the addition of manufacturers and then expand the geographic service regions. The end goal is to provide global access for other organizations while retaining leadership by a farmer- led organization.

iDDEN purchased the former NCDX data exchange system used in the Nordic countries and is currently adding a connection to cloud-based data repositories. In principle the newer data exchange technologies (JSON-REST) using ICAR-ADE standards will be implemented where possible and available. The objective is to create a standard process for parties involved in data exchange being milk recording, genetic evaluation, or other groups.

As it relates to data governance, the data will be real-time transfer and no data would be stored or retained by iDDEN. As well, appropriate authentication will be required by the farm and the end user to ensure that only approved parties will have access to farm data – either direct or via cloud connections where available. Other than data transfer security, the data governance issues of privacy and ownership will remain the responsibility of the organizations and farms using the exchange service.

Keywords: Dairy cattle data, data exchange, international cooperation, dairy cattle data.

The company and motivation

iDDEN GmbH was founded in May 2020 and brought together a group of organizations interested in data exchange that were seeking the opportunity to do so with less effort and reduced cost due to standardization and reuse of existing solutions.

The founding members are listed in Table 1 below to show the worldwide collaboration. However, more than these founding members benefit from using the iDDEN system as a platform for data exchange, all strategic partners and other customers will also be able to exchange data more easily with more potential partners in future.

The number of farms, herds and cows managed by these founding members are shown in Figure 1 “Potential of iDDEN” below. These high numbers of potential resources for data exchange will drive a lot of momentum to manufacturers of milking equipment and other on-farm systems to take the opportunity to be involved in the iDDEN data exchange.

Vision and design goals

The vision of iDDEN is to be the worldwide accepted standard platform for data exchange of dairy related data. To achieve this, iDDEN acquired the NCDX system of the Nordic countries developed by Mtech, Finland. Based on this foundation iDDEN will evolve the capabilities of the system and implement the standards developed by the ICAR-ADE working group.

Table 1. Founding members of iDDEN GmbH.

Shareholder	Designated area responsibilities
CRV Holding B.V.	The Netherlands and Belgium
DataGene Ltd.	Australia
Lactanet Canada	Canada
NDHIA Inc.	USA
NCDX ApS	Denmark, Iceland, Finland, Norway, Sweden
RDV GmbH	Austria, Germany
VIT w.V.	Germany, Luxemburg

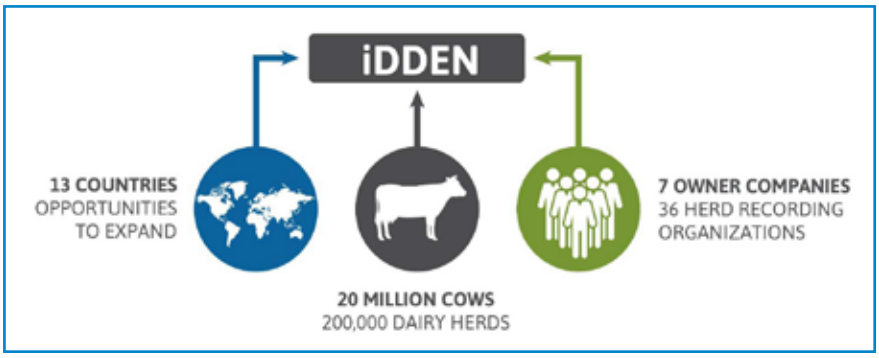

Figure 1. Potential of iDDEN.

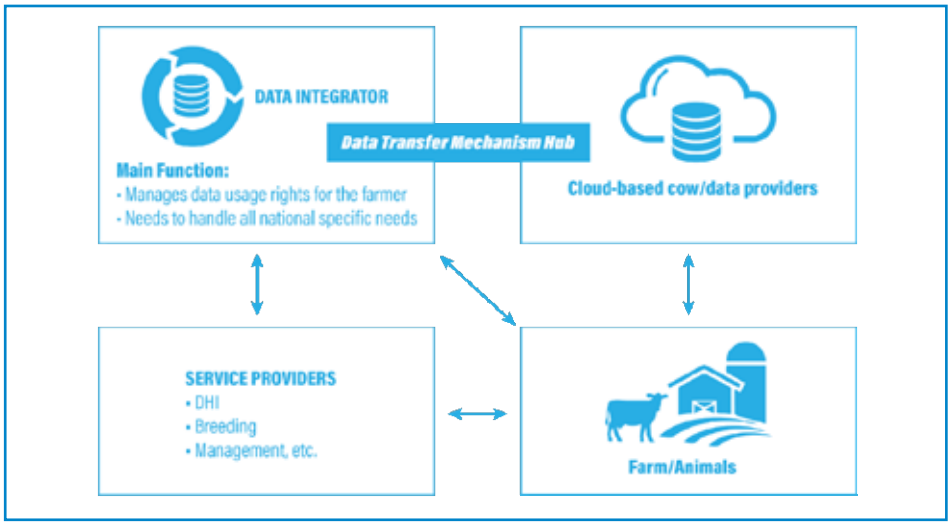

Figure 2. Schematic of data flow between on-farm data and other (central) data.

The future of data exchange between data integrators (like Milk Recording Organizations (MROs)), Original Equipment Manufacturers (OEMs), and other on-farm systems or service providers on behalf of farmers is shown in Figure 2.

The design goals for the iDDEN system are as follows:

- **Reuse as much as possible**

  By building the iDDEN system on the infrastructure of the already established NCDX system, it will utilize the well-tested and working functionality of the original NCDX system.

  Since all partners currently operate some kind of rights and mandates checking system, it was decided to use these services also in the iDDEN system for authentication and authorization purposes.

- **Standardize as much as possible**

  The iDDEN system will work on well-established open standards like web services using the JSON/REST approach.

  As messages it will use those defined by the ICAR-ADE working group. This is an open-source development for standardization of animal data. Therefore, it will be suitable for a wide range of partners and provide a stable set of messages for communication with all potential partners in the future.

- **Integrate only once**

  Using a Hub architecture, all partners will only need to implement “one” interface communicating directly with the iDDEN system. All routing and transforming (if needed) will be handled inside the Hub. It will be possible to enhance the system ith local specialties, but these should be avoided wherever possible.

Roles and architecture

Within the iDDEN system there are four different roles defined for systems involved in data exchange. These roles are listed and described in Table 2 below.

All three external roles can act as active or passive partners in the data exchange via the iDDEN Hub. Active means that the partner is initiating the conversation against the Hub. It will either request data from another partner using a 'GET' request or it could also send data using a 'POST' request. From a client/server architectural point of view this will be the client part. The passive partner will listen for requests and either send the requested data or accept the data sent from the active partner and store it in their database system. This will be the server part in data exchange.

Table 2. Roles defined in iDDEN.

Role	Description
FMS	Farm Management System - This can be any software running on the farm which is involved in data exchange. It could be a herd management software or a milking system (robot, parlour, etc.) system or any analytic software.
Cloud	Cloud provider – This is the central cloud system of software running on the farm. It gets some data directly from the FMS.
Data Integrator	Data Integrator – This is the role of the iDDEN participant parties. It can be an MRO (Milk Recording Organization) or any other data integration system.
Hub	The iDDEN system responsible for routing and transformation of data.

Security considerations

By using the established authentication and authorization services from each partner providing data, the partners have to ensure the right of the requesting partner to access the data in question. Therefore, they need the consent of the farm to share the data with other partners.

Each partner system will be identified by an iDDEN-ID. These are assigned by iDDEN during the registration of each organization to the iDDEN program. Alongside with this iDDEN-ID also an iDDEN-API-Key will be provided. These credentials will be used to authenticate against the Hub system before it will forward the request to the target partner.

The same iDDEN-ID will be used to authenticate against any authentication service from any other data delivering partner. For obvious security reasons this login must be done outside the Hub before any communication via the Hub. The token delivered in this step could be used in a full session of data exchange with this partner over a serial of requests.

In the case of Farm Management Software (FMS), it will use the credentials of the farm where the software is running to authenticate against the data delivering service. This is because the same FMS system is running on several farm locations and therefore the partner providing data needs to know which instance is requesting data to ensure the confidentiality of the data.

Examples of data exchange

To show the steps involved in data exchange via the iDDEN Hub two scenarios are shown below. The first one (Figure 3) is a 'GET' request from an FMS system to acquire data from an MRO for a specific farm.

The second example (Figure 4) shows how an MRO sends data to an OEM cloud via a 'POST' request.

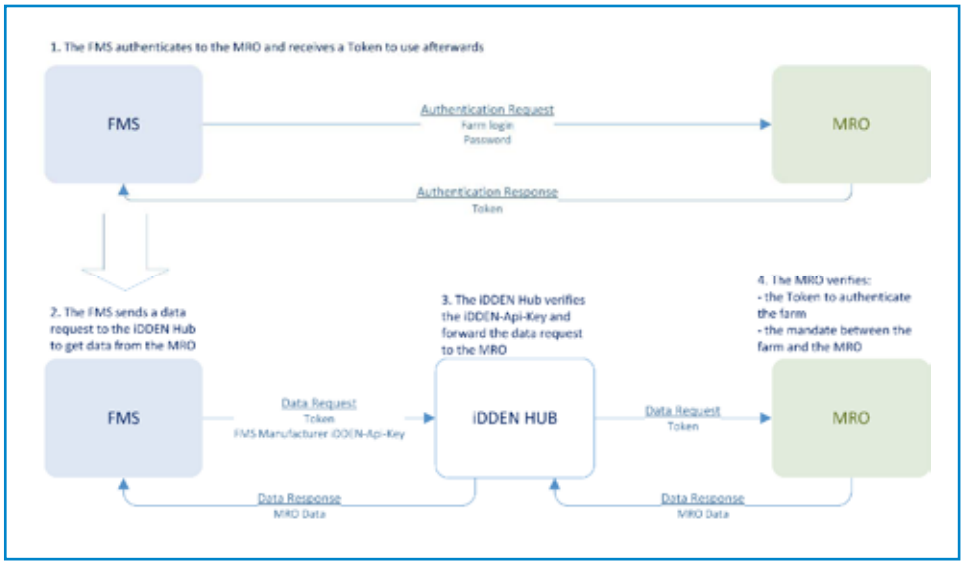

Figure 3. Get data from MRO to FMS.

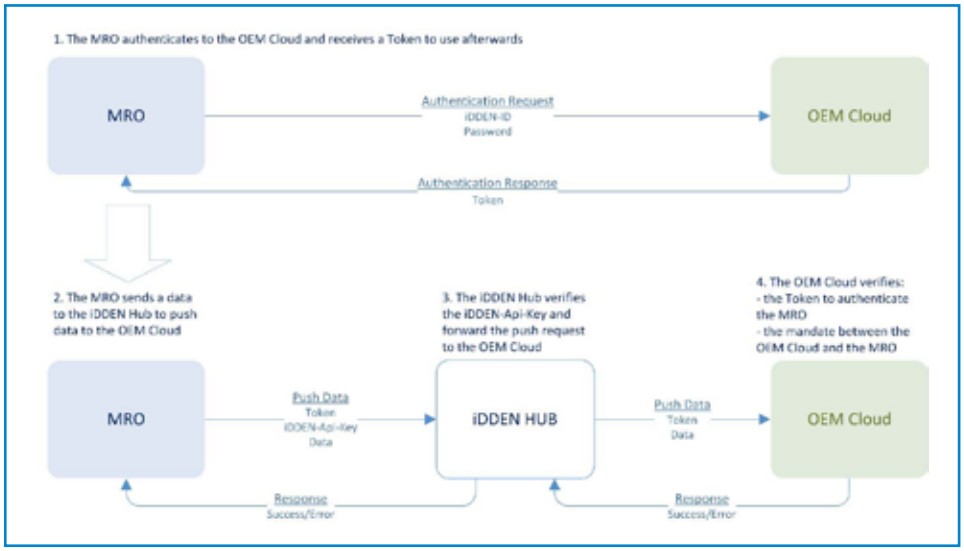

Figure 4. Send data from MRO to OEM Cloud.

List of references

ICAR-ADE project on GitHub: *https://github.com/adewg/ICAR*

iDDEN Homepage: *https://www.idden.org/*