

MEDRIA Technologies

Farmers' requests for new skilled services

The agricultural world and its challenges

Since 1950 up to today, the last agricultural revolution brought intensive and selective agriculture.

The next revolution will be driven by two major developments :

- The sustainable development and mastery of performance and size of farms, concerned about quality and ethics, with an environmentally intensive production and lower actual production costs;
- The integration of technologies (ICTs) of data acquisition, analysis and communication for monitoring, steering of livestock, the identification and selection of animals : phenotyping and genotyping.

ICTs in breeding, for what services?

To meet the social expectations of the breeder:

- To reduce penalties when the herd size increases
- To enable him to leave when his aspirations and family push him out
- To give him the serenity and comfort in everyday life

To further develop the performance of the farm:

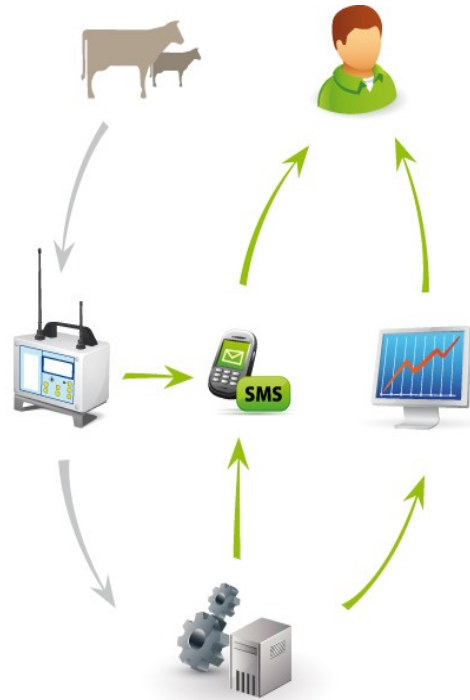
- Early detection of livestock events and incidents
- Mastering productivity through appropriate actions, carried out at the right time
- Reduce the loss of animal products, non-quality and cost of health
- Improve the economic results in production and breeding

To support the development of services and their businesses:

- Allowing external services and advice based on animal data

The ICTs in agriculture for what?

To make possible the connection of animals to the information systems of farmers and professionals who accompany:



To measure, collect, store, analyze and disseminate real-time information on mobile devices and Web Services.

The ICTs services in breeding, how it works?

It all starts with data acquisition:

The sensors continuously perform data acquisition on animals to feed the analysis services for early detection of health events and reproductive problems of animals.

The SMS and the follow-up by Web Services provide the comfort, simplicity and serenity to farmers and help them to cope better with their day to day business.

Sensors and telecom technologies create the link in breeding:

- Between animals and the information systems of farmers: their mobile phone by SMS and PC connected to the Internet;
- Between the associates and their services providers by consulting the zootechnical data and health online to consolidate their analysis.

High data-rate measurement of vital parameters

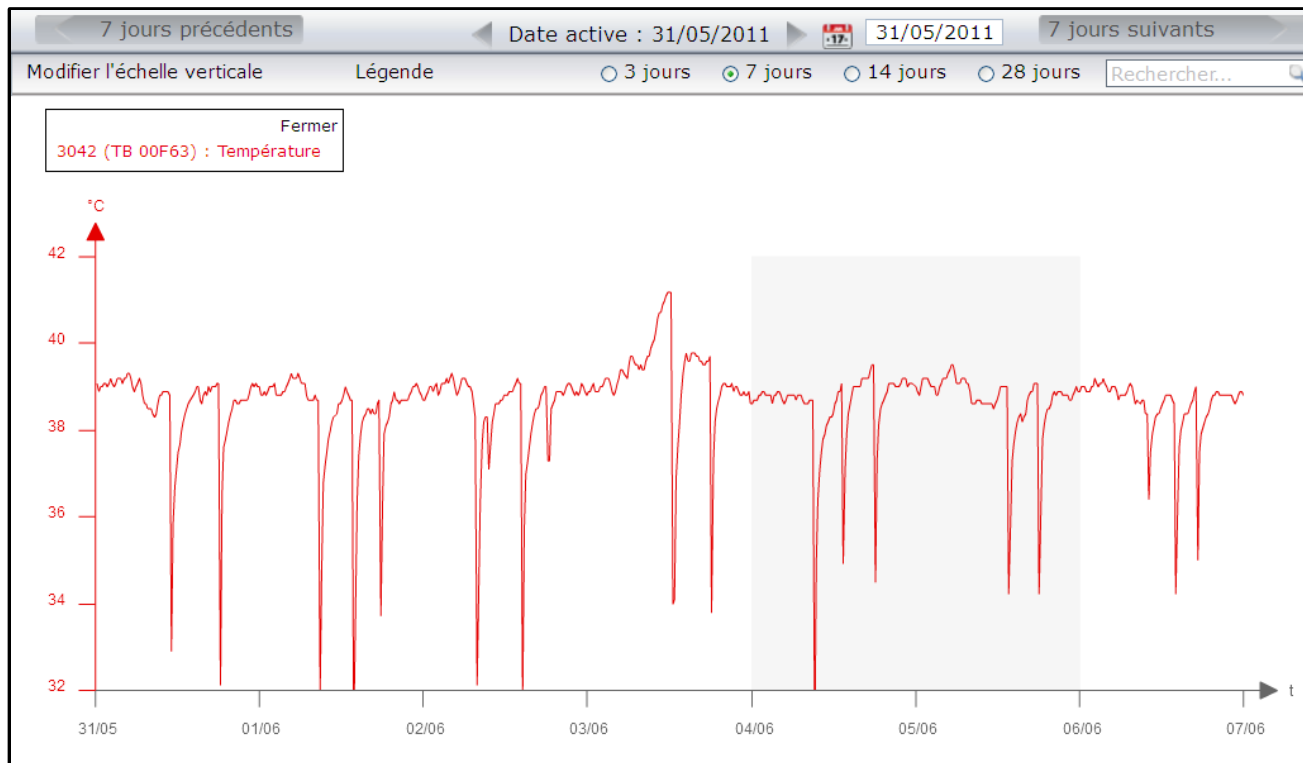
Sensors	Vital parameters	Data-rate	Services
Vaginal thermometer	Body temperature	1 measure / 15 minutes	Vel'Phone
Axel accelerometer	Ethology on collar	9 measures / 5 minutes	HeatPhone
ThermoBolus	Reticulum temperature	1 measures / 5 minutes	Health
MicroBolus	Reticulum temperature	1 measures / 5 minutes	Health
CardioBolus	Reticulum temperature	3 measures / 5 minutes	Health sept. 2012
	Heart rate		
	reticulum contraction		
Electronic weighing	Weight	≥ 2 measures / day	sept. 2012

The high data-rate monitoring values information and small signals carried on the time axis to identify abnormal changes.

Vital parameters processing

Composite vital parameters are decoded to isolate the three components of metabolic, physiological and health signals.

They are then segmented to follow the evolutions of the different phases of activity of distinctive ways: phase separation.



Reticulum temperature : drinks, circadian cycle and hyperthermia

Services based on the monitoring of animals

Communication alerts to the farmer:

- on mobile by SMS
- at his office by the DWS (Daily Web Services) available through the Internet

Services	Communication delays
Calving detection: Vel'Phone	Within the hour
Heat detection: HeatPhone	During the day
Health events detection	Within 1 to 3 days
Disorders of feeding and rumination	Within the week
Weight change	During the day

Daily Web Services®

Farm scoreboard accessible anywhere via the Internet

The screenshot displays the Medria ELEVAGE web application interface. At the top, there is a navigation bar with icons for 'Accueil', 'Événements', 'Agenda', 'Mesures', 'Animaux', 'Équipements', and 'Mon compte'. A 'Logout' button is also present. Below the navigation bar, a status bar indicates the user is connected to 'GAEC LASSAUSSE' and provides a link to 'Choisir l'exploitation'. The main content area is divided into three columns: 'Vel'Phone', 'HeatPhone', and 'Zootek'. Each column contains a table of data. The 'Vel'Phone' column shows three rows of data with status 'Non lu(s) : 2 / - de 24h : 0', 'Non lu(s) : 5 / - de 24h : 0', and 'Non lu(s) : 5 / - de 24h : 0'. The 'HeatPhone' column shows three rows of data with status 'Non lu(s) : 12 / - de 24h : 0', 'Non lu(s) : 8 / - de 24h : 0', and 'Non lu(s) : 1 / - de 24h : 0'. The 'Zootek' column shows three rows of data with status 'Non lu(s) : 0 / - de 24h : 0', 'Non lu(s) : 0 / - de 24h : 0', and 'Non lu(s) : 0 / - de 24h : 0'. Below the data tables, there are sections for 'Mes favoris' and 'Informations système'. At the bottom, a footer contains links for 'Contact', 'Informations légales', 'Marques', and 'Déclaration de confidentialité', along with a status 'Capteur(s) non associé(s) : 3' and a button 'Associer capteur/animal'.

Vel'Phone	HeatPhone	Zootek
Non lu(s) : 2 / - de 24h : 0	Non lu(s) : 12 / - de 24h : 0	Non lu(s) : 0 / - de 24h : 0
Non lu(s) : 5 / - de 24h : 0	Non lu(s) : 8 / - de 24h : 0	Non lu(s) : 0 / - de 24h : 0
Non lu(s) : 5 / - de 24h : 0	Non lu(s) : 1 / - de 24h : 0	Non lu(s) : 0 / - de 24h : 0

Vel'Phone®



Placed in the vaginal canal 7 days before the end of gestation, the thermometer measures and continuously transmits the temperature to the radio base radio with an accuracy of $\pm 0.1^{\circ}\text{C}$.

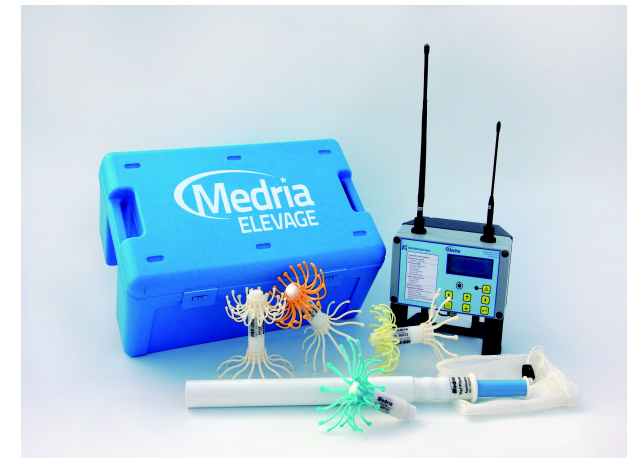
It runs over 6 years in total autonomy, stores the records of 30 days and communicates with the radio base within a distance of over 200 meters.

The Vel'Phone informs the breeder by SMS: temperature readings, prediction of calving, detection of the expulsion of the amniotic sac.

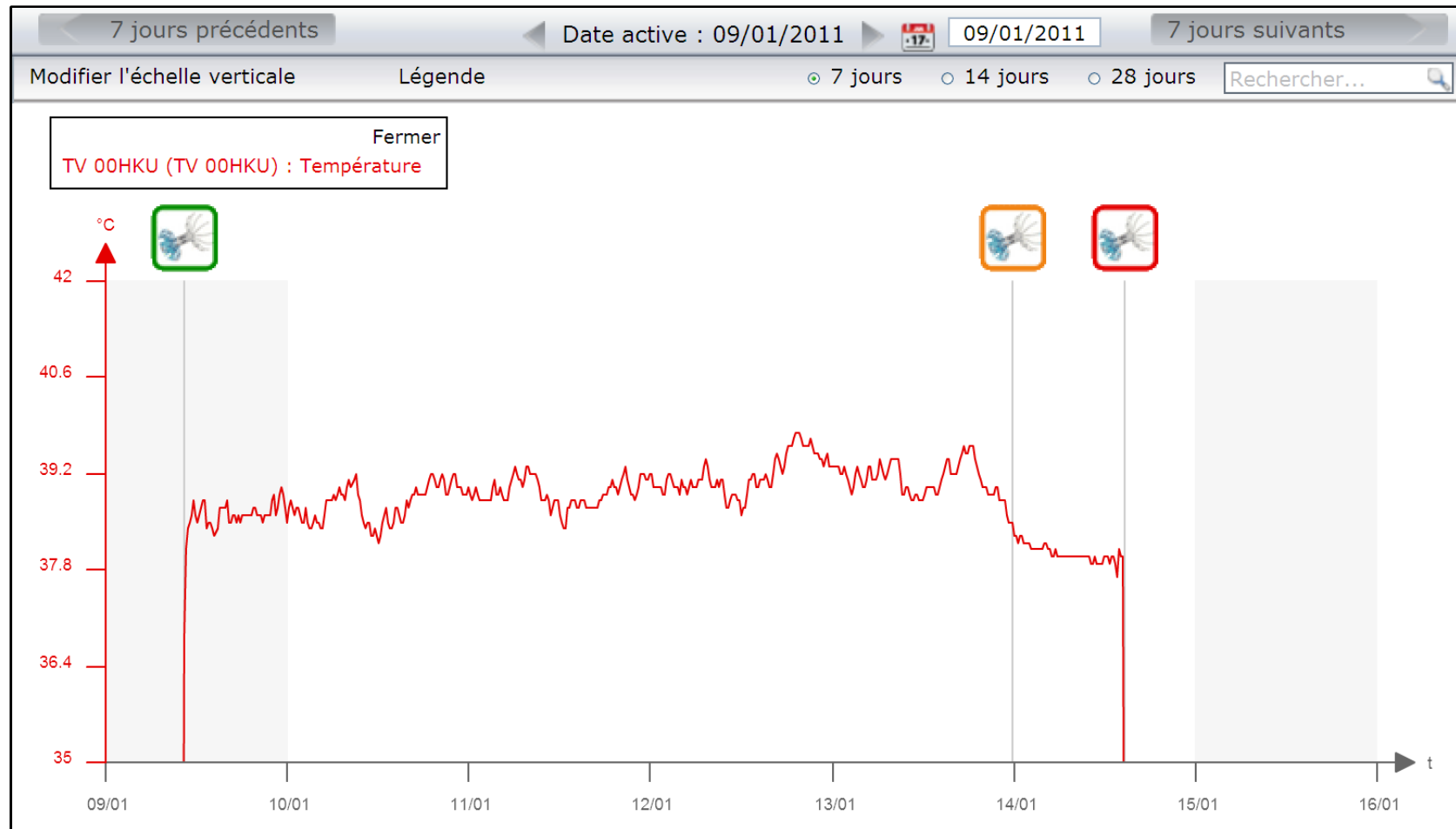
CYCLE D'UTILISATION DU VEL'PHONE®



*Dès l'activation du thermomètre le relevé des températures des animaux est envoyé par SMS 1 à 2 fois par jour aux heures choisies.



Proximity with animals to follow the difficult calving



Vaginal temperature curve

HeatPhone®



The sensor Axcel®, 3-axis accelerometer mounted on the collar of the animal, measures and records every 5 minutes 9 statistical reports of the activity: tilts, vertical and lateral accelerations.

It runs over 6 years in total autonomy, stores the records of 7 days and communicates with the radio base within a distance of over 200 meters.

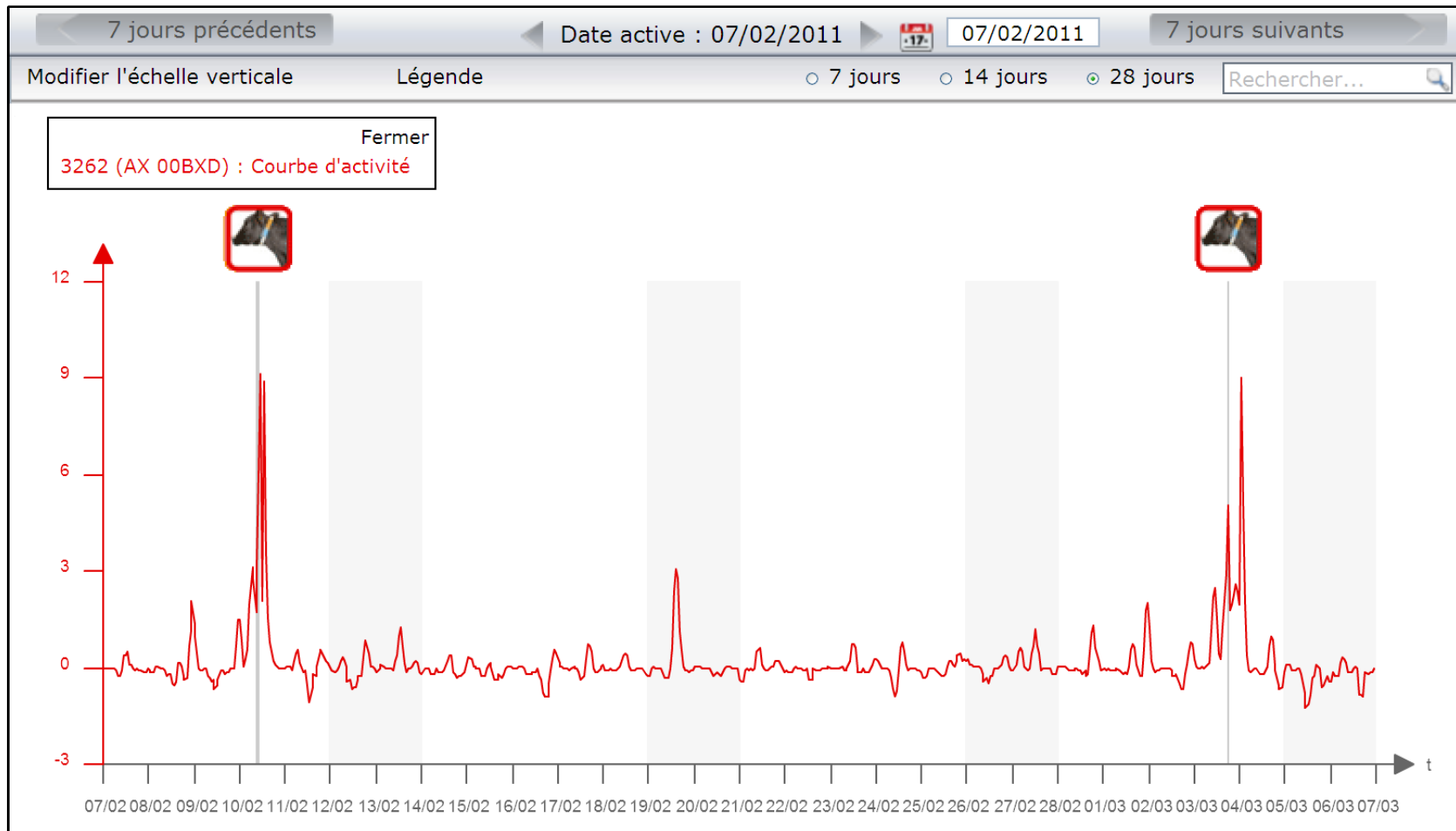
The HeatPhone® detects heat of heifers, dairy and beef cows.
The farmer is informed by SMS and by DWS via the Internet.

The sensor Axcel® performs the monitoring of feeding behavior, the time of ingestion and rumination for the early detection of health disorders, and the mastery of performance.

CYCLE D'UTILISATION DU HEATPHONE®



Permanent monitoring for heat detection



Activity curve with two heats

ThermoBolus® and MicroBolus®



Swallowed by the ruminant, it stays for life in the reticulum.

The ThermoBolus® measures the temperature of large ruminants with an accuracy of $\pm 0.1^{\circ}\text{C}$.

It runs over 8 years in total autonomy, stores the records of 30 days and communicates with the radio base within a distance of over 200 meters.

The MicroBolus® measures the temperature of small ruminants and young cattle with an accuracy of $\pm 0.1^{\circ}\text{C}$.

It runs over 3 years in total autonomy, stores the records of 30 days and communicates with the radio base within a distance of over 50 meters.

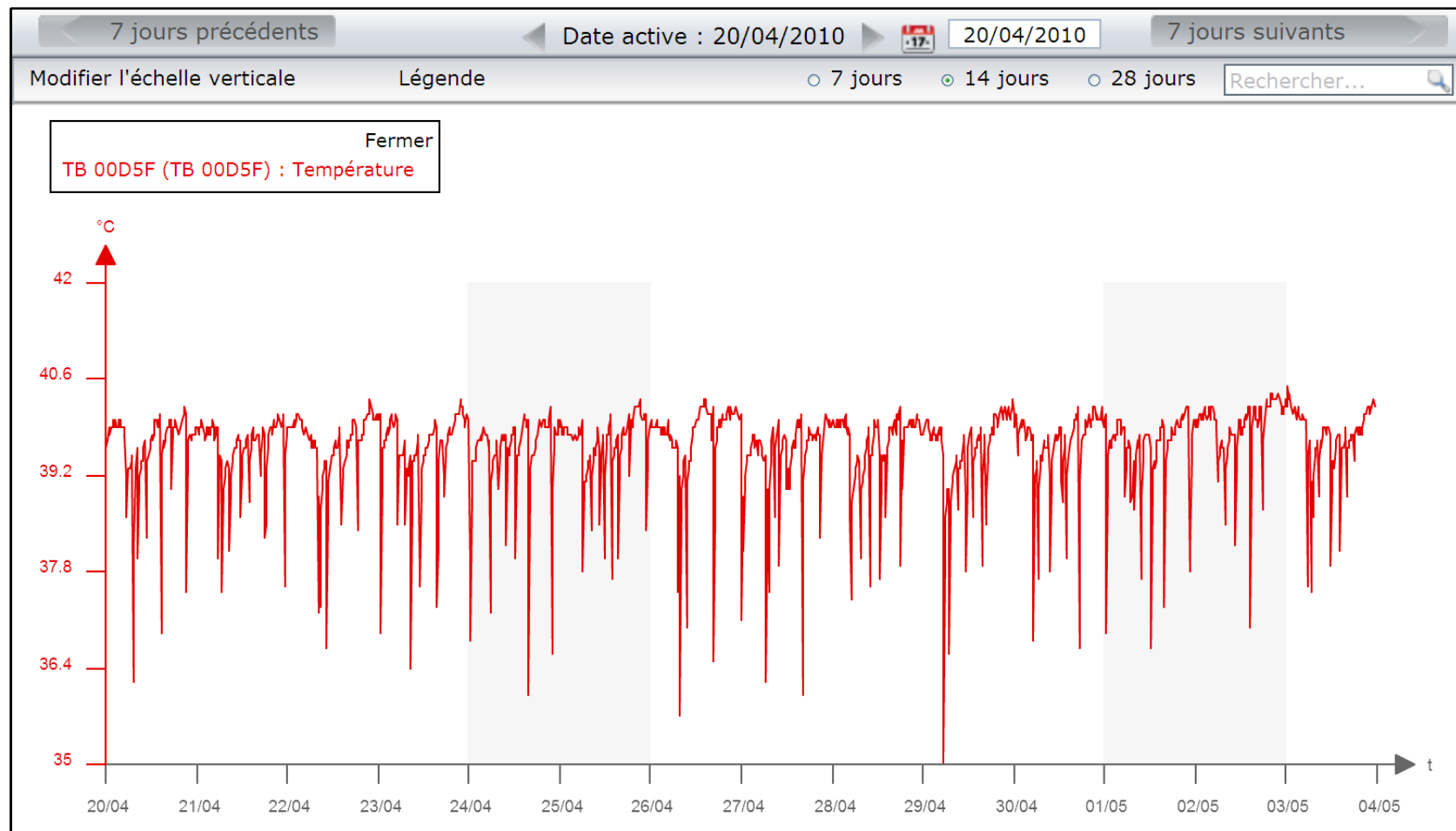
Operated by the DWS, the bolus realises the monitoring of animals to detect:

- The health disorders: postpartum clinical mastitis ...
- The events of reproduction.



ThermoBolus® and MicroBolus®

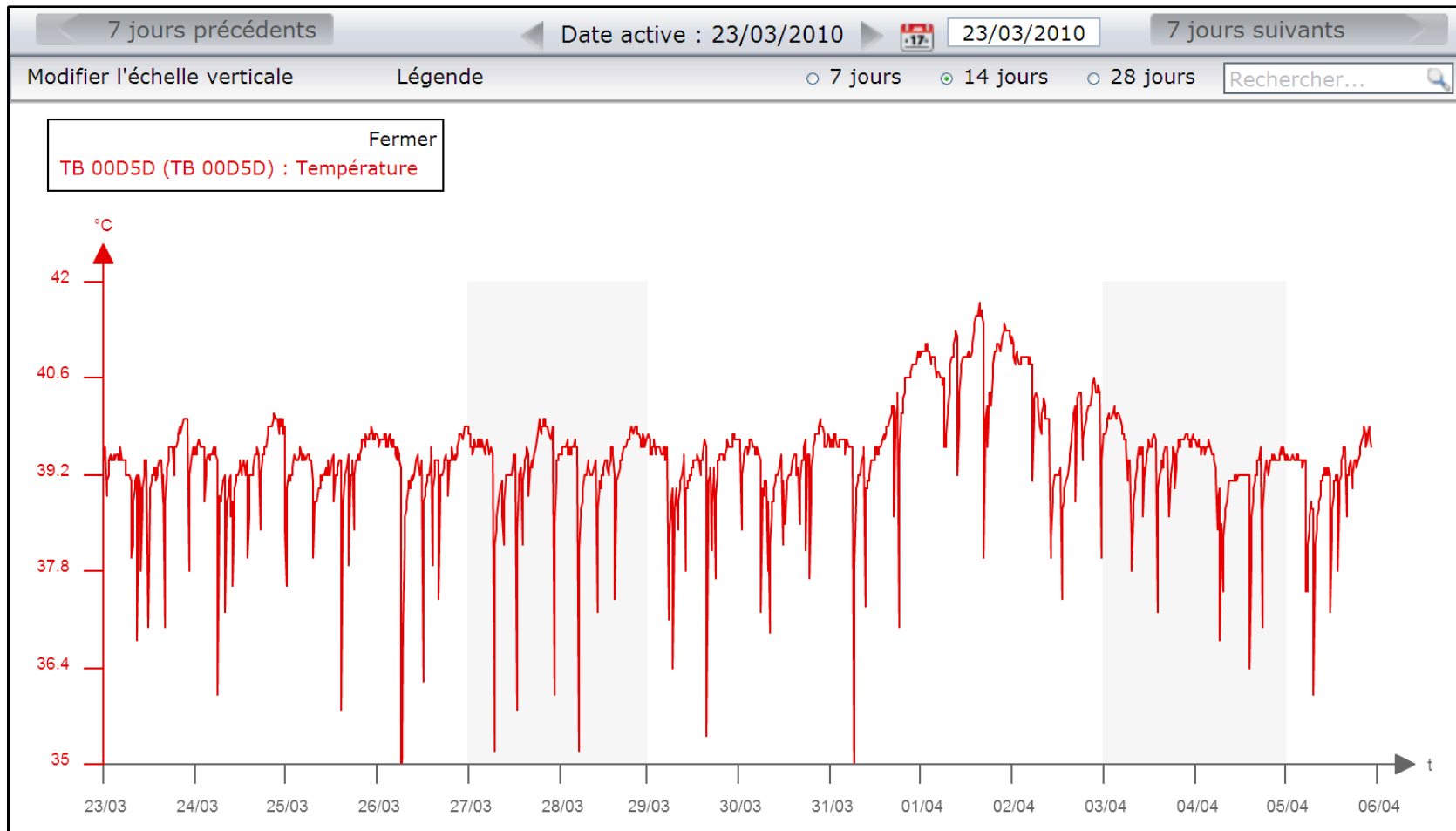
Monitoring for early detection of health disorders



Curve of the temperature in reticulum

ThermoBolus® and MicroBolus®

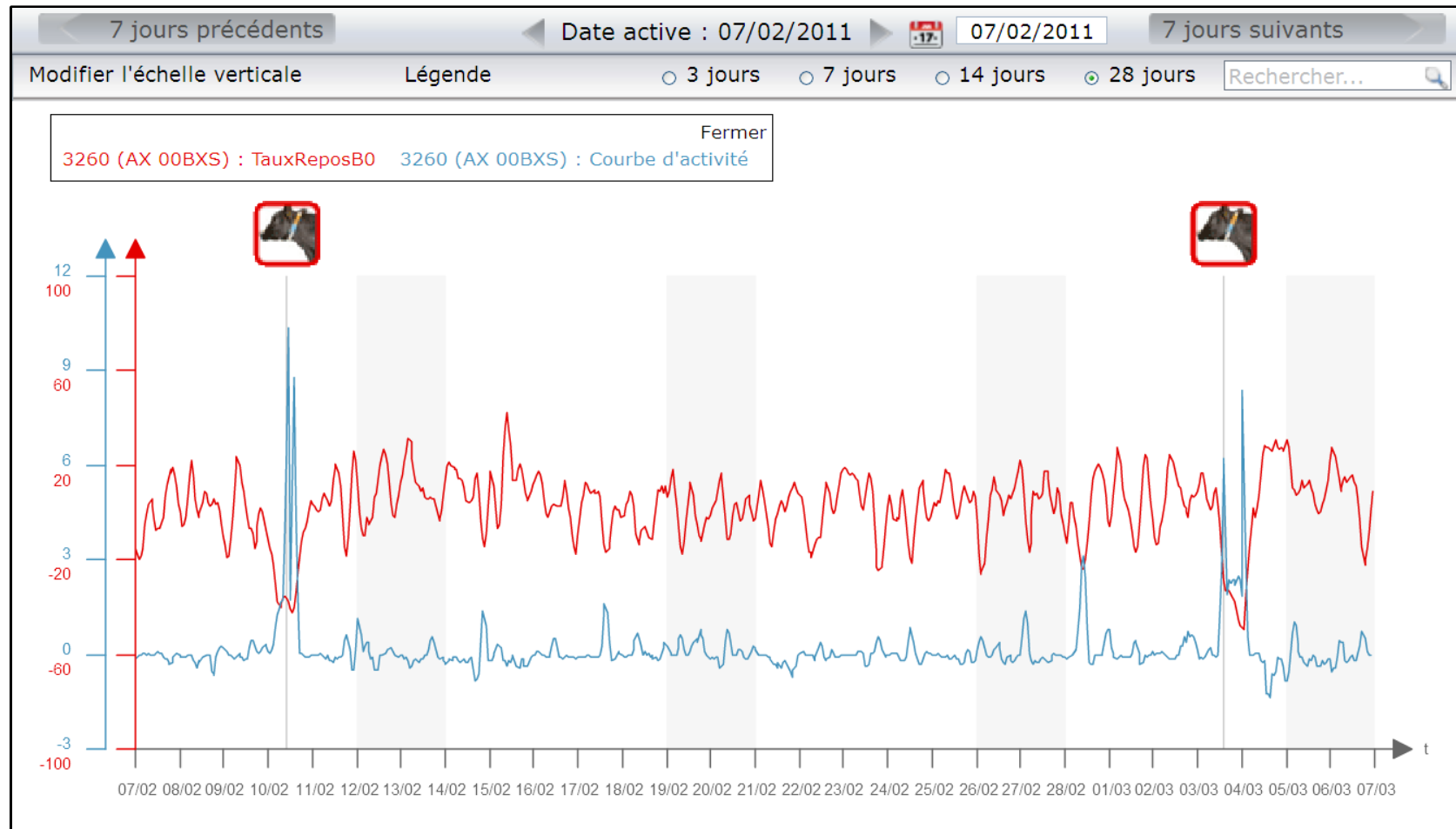
Monitoring for early detection of health disorders



Curve of the temperature in reticulum

Behavioral analysis by phases separation

Selective monitoring of the activities, i.e. rest and heat



Curve of the behavior : **rest** and **heat**

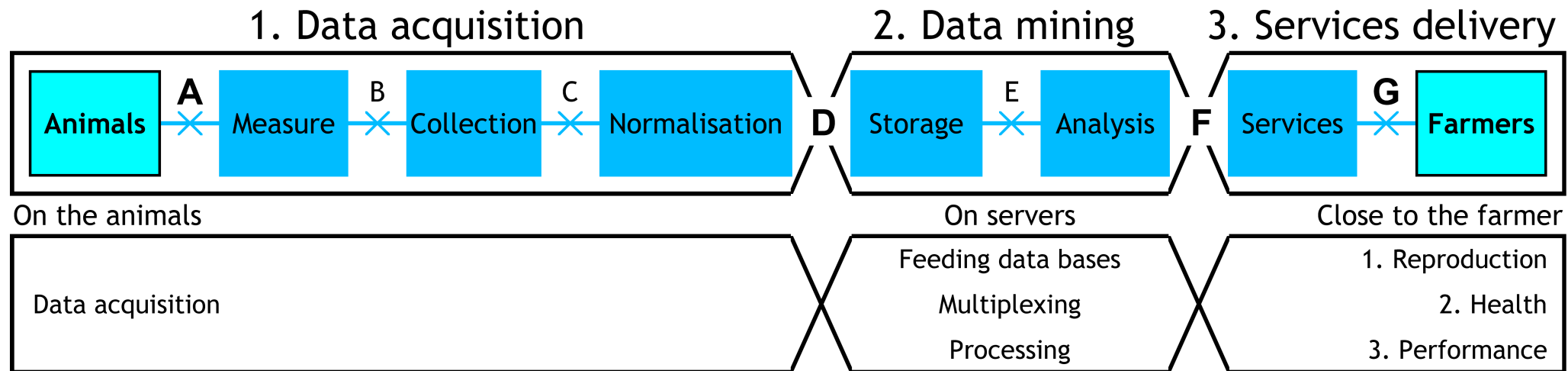
Features of the monitoring

The key features of the monitoring services are:

- Ultra-low consumption RFID sensors and infrastructure radio equipments.
- Technologies connected, accessible and maintainable over the Internet.
- Outsourced data storage to be accessible, multiplexed and secure.
- Processing chain and analysis which is longer and longer:
 - Data standardisation: standardisation work initiated
 - Data exchange between institutions: avoid double entries
 - Separation of the phases of activity: ethology - information on the time axis
 - Multiplexing of all data provided by the sensors on the farm
 - Combinatorial analysis and temporal digital tributaries
 - Managing messages in queues before communication
 - Very neat summary of SMS and indicators breeding

Monitoring of animals works in 3 steps.

1. The sensors measure the vital parameters of animals and the GPRS radio base transmits normalised data to the servers on the cloud.
2. The servers, analyse data, perform the detection and produce the messages to be sent via SMS or Web Services.
3. The Daily Web Services communicate messages and information in accordance with the farmer's wishes: modes, time information, distribution of roles between the partners.





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