DEPARTMENT OF
PRIMARY INDUSTRIES

Remote Monitoring of Livestock Wireless and the Wii – Improving Livestock Welfare

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The Place To Be

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Outline

Wireless Technologies

Active Sensing of Animal Welfare

Passive Sensing of Animal Welfare

Wireless Technologies

Good Features

- *ease of deployment*
- *ease of use*
- *real or near-real time*
- *rapidly evolving*

Disadvantages

- *cost*
- *range and interference*
- *rapidly evolving*

Types of Wireless Technologies

Short Range (cm – 1 km)

- *Low power, moderate to high data flow*
- *WiFi, bluetooth, Zigbee/Mesh*

Long Range (1 km to 20+ km)

- *High power, low data flow*
- *UHF cell call, UHF digital*

Global

- *Satellite – no data, restricted*
- *Mobile phone network*
- *Really a network of Short Range*
- *Moderate power, high data flow*

Outline

Wireless Technologies

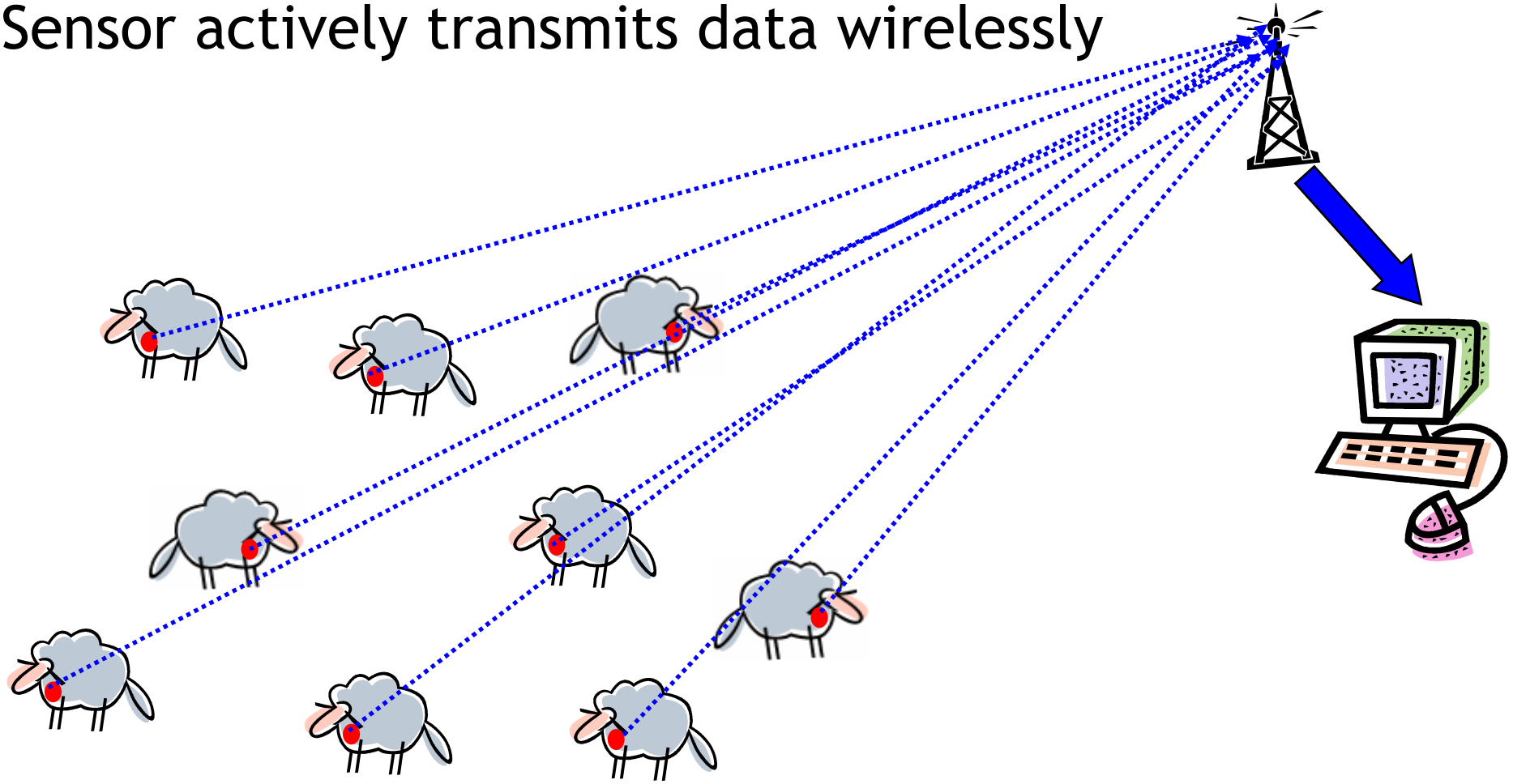
Active Sensing of Animal Welfare

Passive Sensing of Animal Welfare

Active Sensing of Animal Welfare

Sensor actively measures something

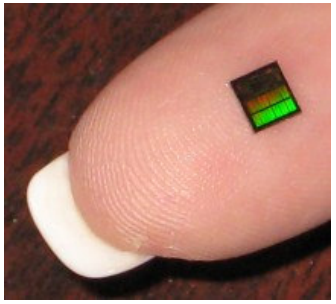
Sensor actively transmits data wirelessly



Sensor Node

Requires wireless and sensors that are:

- *cheap*
- *small*
- *low power*



eg DOT™

- *computing, wireless, ID, sensing on a chip*
- *requires battery and antenna*

eg Temperature (thermistors)

- *fever, chilling*
- *some problems with attachment*

The Problem of Power

It requires power to collect information

It requires lots of power to transmit information

Power COSTS - and affects

- *size*
- *complexity*
- *robustness*
- *cost*

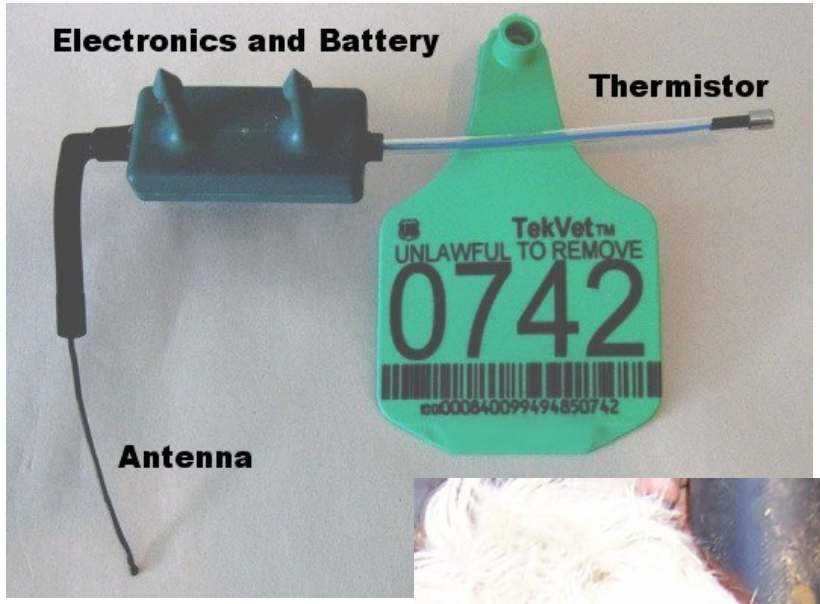
Profound limitations on livestock applications

- *duration*
- *range*
- *species*

As yet, no commercial systems with wireless sensor on the animal

TekVet

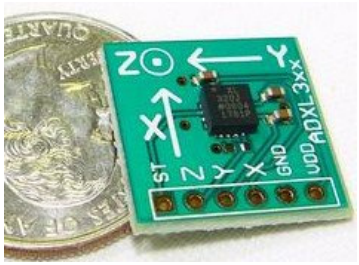
US startup approaching commercialisation



Wii on a sheep

Movement (accelerometers)

- *very low power*
- *small*
- *easy to attach*



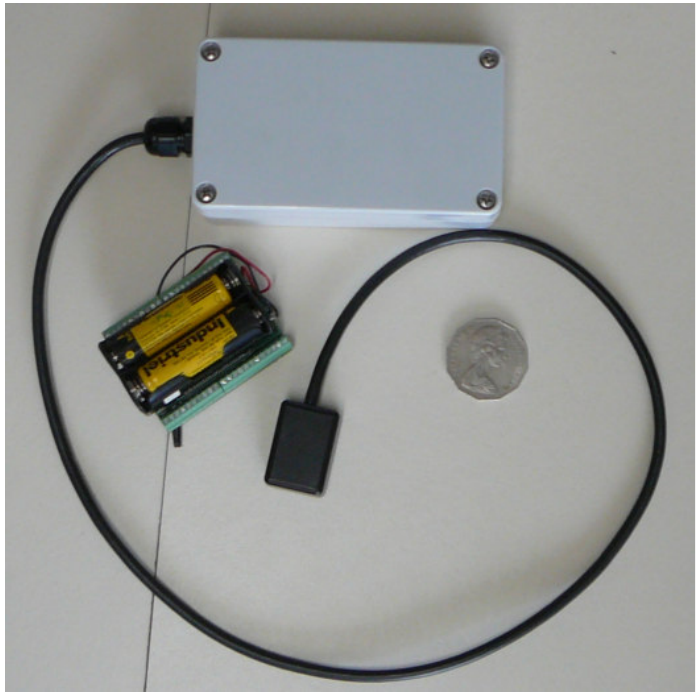
Measures

- *acceleration in three dimensions*
- *orientation*
- *activity*
- *gait*

Wii on a sheep

Can we monitor sheep behaviour using accelerometers?

- *Initial version uses "off the shelf" components*
- *Simple modifications would reduce size by 10*
- *Accelerometer unit and separate wireless unit*
- *Range about 50 m*
- *Just deploying prototypes*



Wii on a sheep

Wii on a sheep

Outline

Wireless Technologies

Active Sensing of Animal Welfare

Passive Sensing of Animal Welfare

Passive Sensing of Animal Welfare

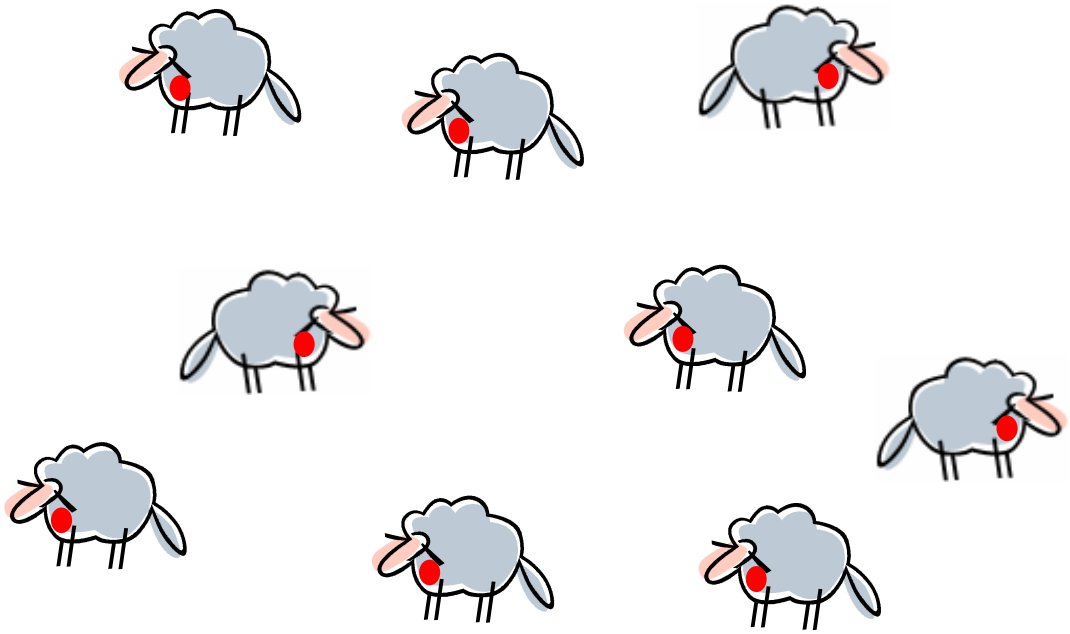
Active sensing
- high cost, power, complexity

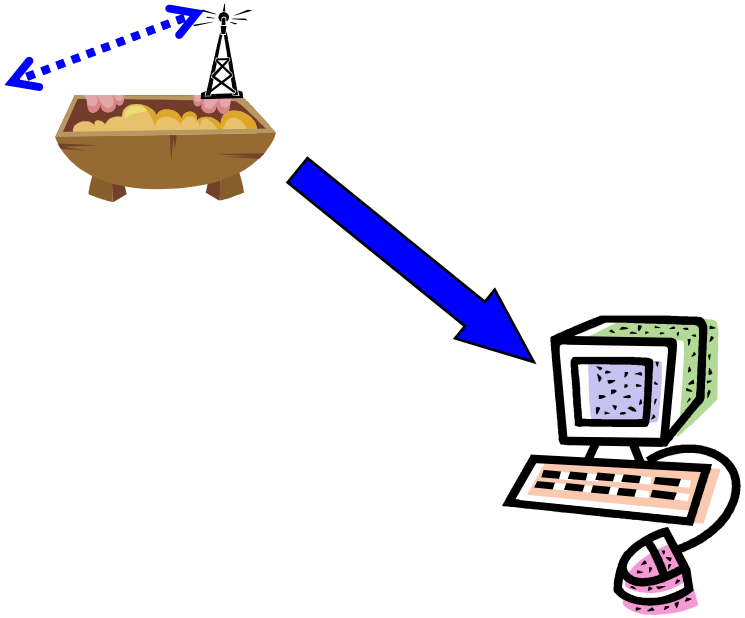
Passive sensing (ID only)
- low cost, power, complexity

Passive Sensing of Animal Welfare

Active sensing
- high cost, power, complexity

Passive sensing
- ‘measures’ ID only
- does not initiate wireless





Measurement of Feeding Behaviour

Funded by the Pork CRC

Directed to measuring feed consumption

Welfare?

- *feeding behaviour a leading health indicator*

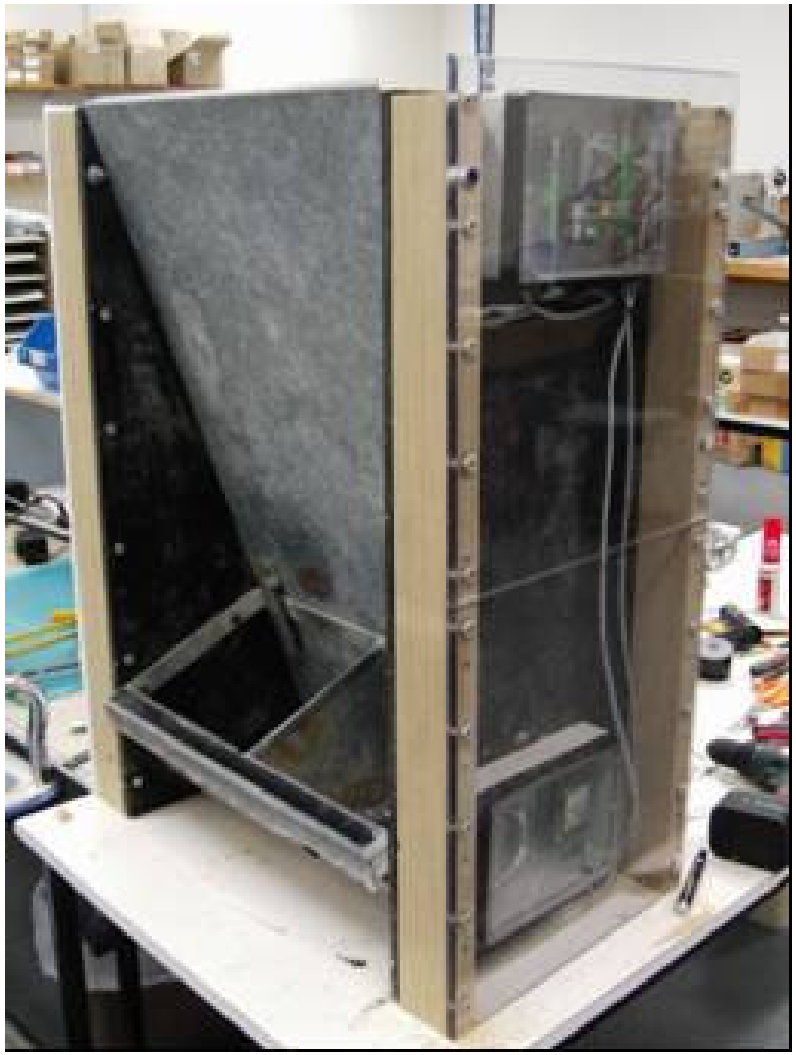
Use **R**adio **F**requency **ID**entification technology

Measures ‘presence’ of pig at feeder

- *duration of feeding*
- *pattern of feeding*

Feeder Design

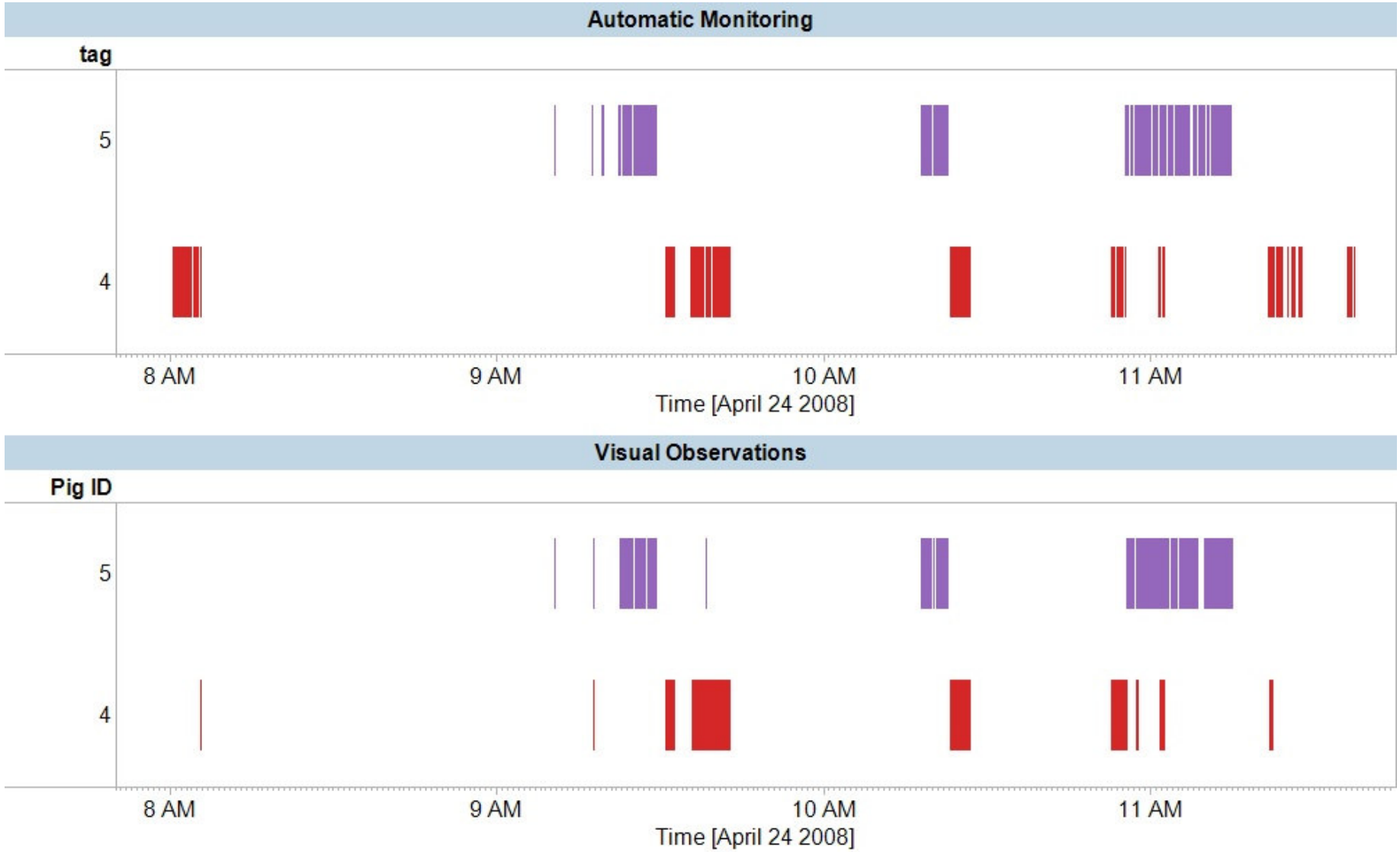
Modified feeder with RFID Antenna



Pigs have ID tag attached to the ear

Visual and RFID Measurements

Ten pigs, ten week study, RFID monitoring every 2 sec

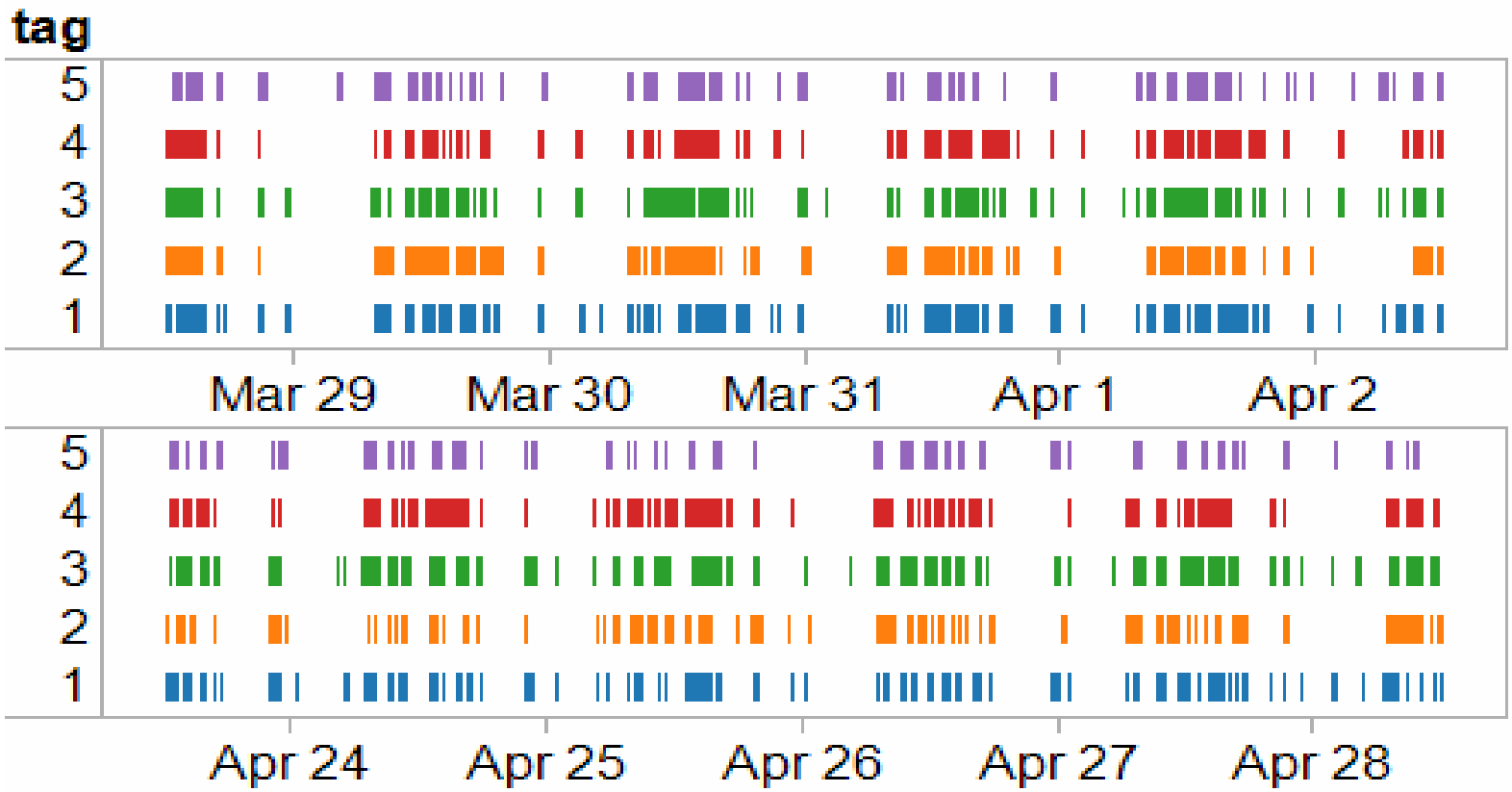


Changes in Feeding Behaviour

Ultimate aim is to categorise behaviour

Identify normal patterns

Alarm on outliers



Growsafe

US company, target is cattle feedlots

RFID read at waterpoints

Weight taken at waterpoints

Growth and drinking behaviour monitored

Medium-term Industry Prospects

Intensive industries

- *reasonable prospects*
- *infrastructure being created*
- *significant investment and education*
- *cost:benefit productivity drivers exist*

Extensive industries

- *significant technological hurdles*
- *highly variable production systems*
- *cost:benefit productivity drivers weak*