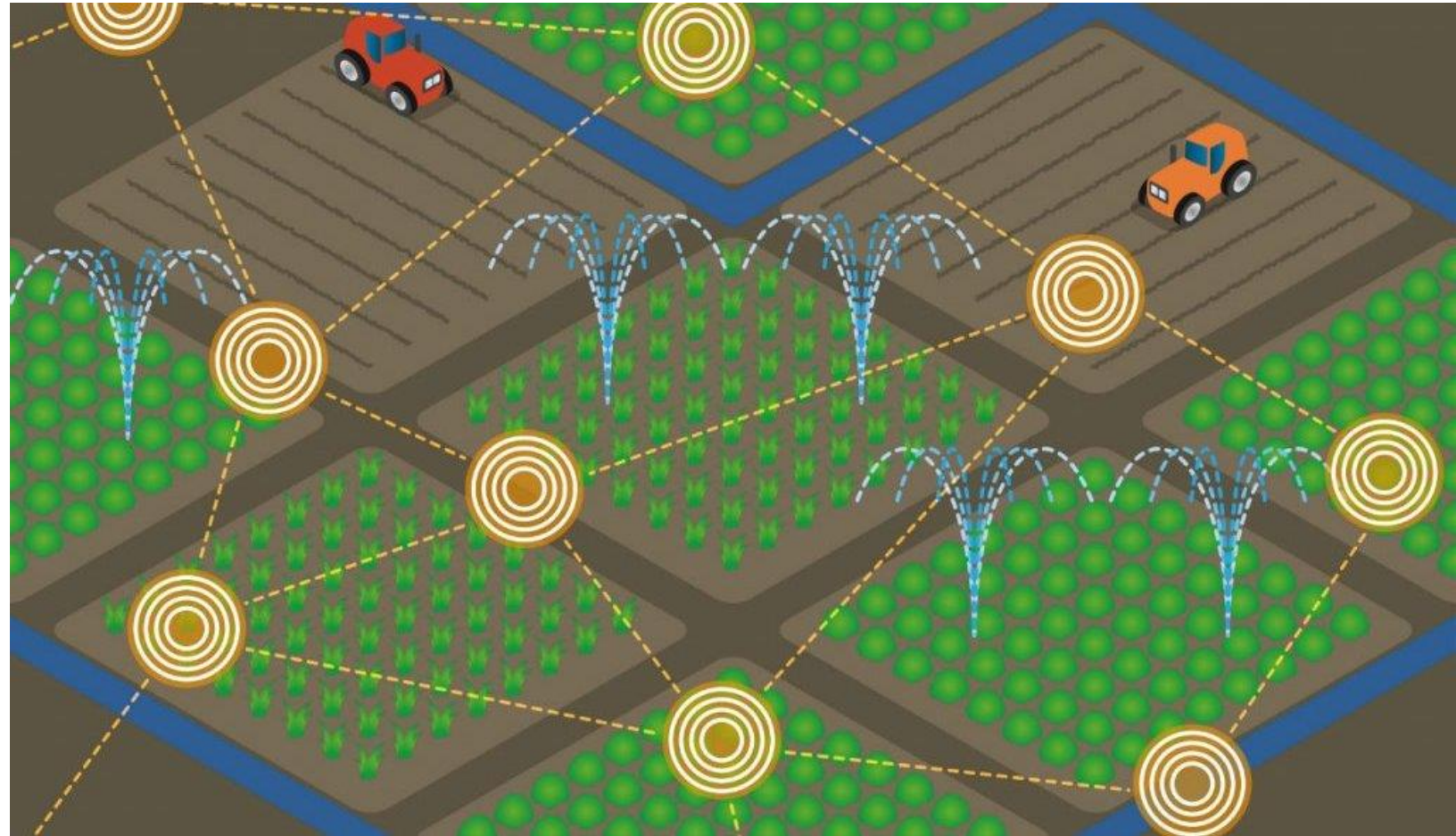# Precision Agriculture

Project
Networked Embedded Systems – W17/18
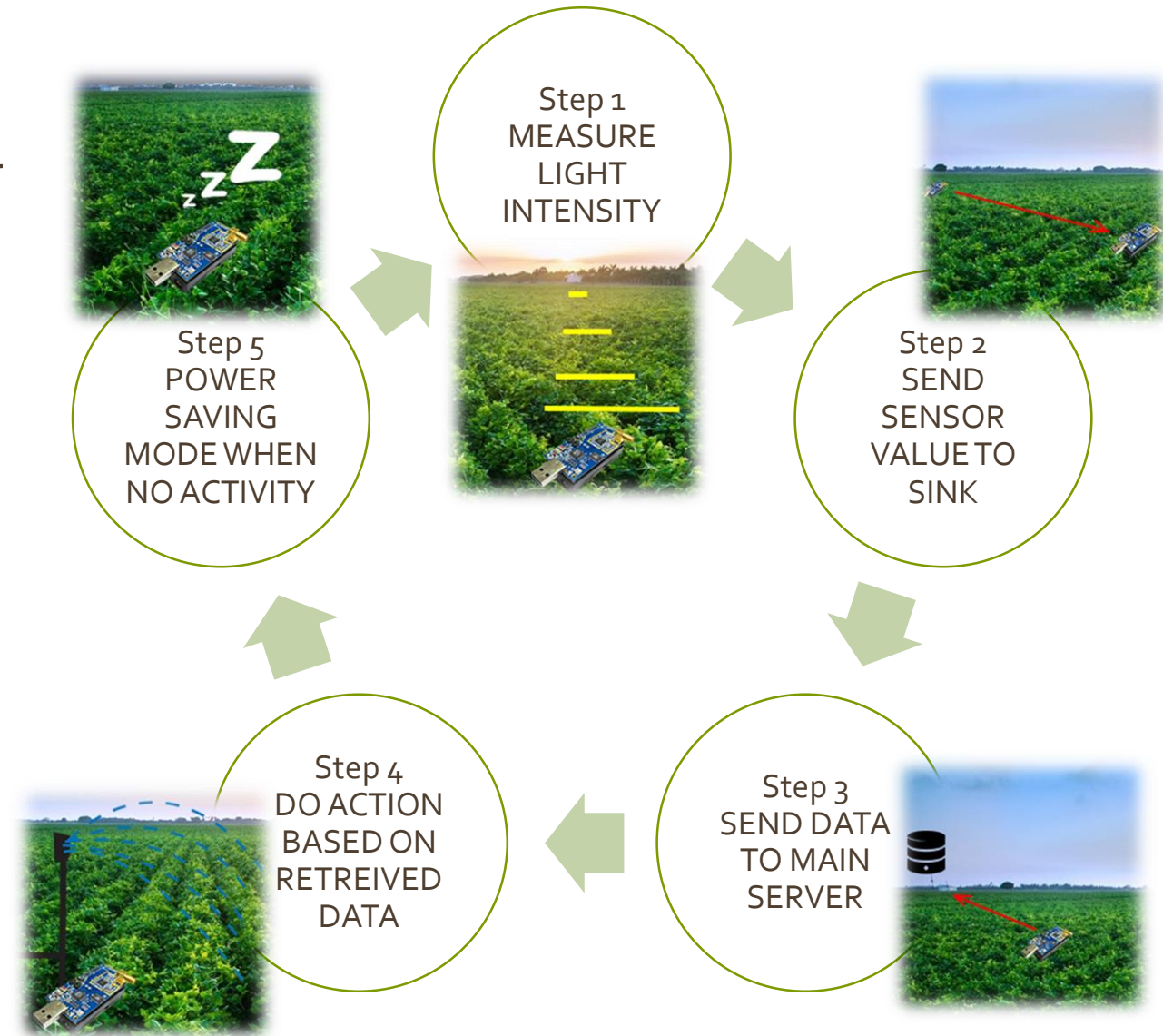A.Cerullo, V.Šafran

Project goal

Implement an energy conserving way of monitoring incident sunshine on a patch of land, reporting whether some patches receive less sunlight than others.

Additionally do actions based on measured data.

Work cycle

- measure light value with light sensor e.g. every hour or some random time

- if measured value is big enough to know that light source is present on some patch of land send that value to sink

- send data from sink to main server for future analysis

- based on retrieved sensor value make action, e.g. send less or more water to patch of land

- every mote go in power saving mode when no activities

Step 1
MEASURE LIGHT INTENSITY

Step 2
SEND SENSOR VALUE TO SINK

Step 3
SEND DATA TO MAIN SERVER

Step 4
DO ACTION BASED ON RETREIVED DATA

Step 5
POWER SAVING MODE WHEN NO ACTIVITY

Data collection

It is used principle of tree-based hop-by-hop reliable data collection that is part of the [Rime communication stack](#).

The *collect* module uses 2 channels; one for neighbor discovery and one for data packets.

In our example (corner sink) using *collect* library all motes (using same program) in network are sending data packets to sink (mote with different program that's collecting data).

Corner Sink   Center Sink   Edge Initiators

● SINK   ● DATA INITIATORS   ○ FORWARDERS
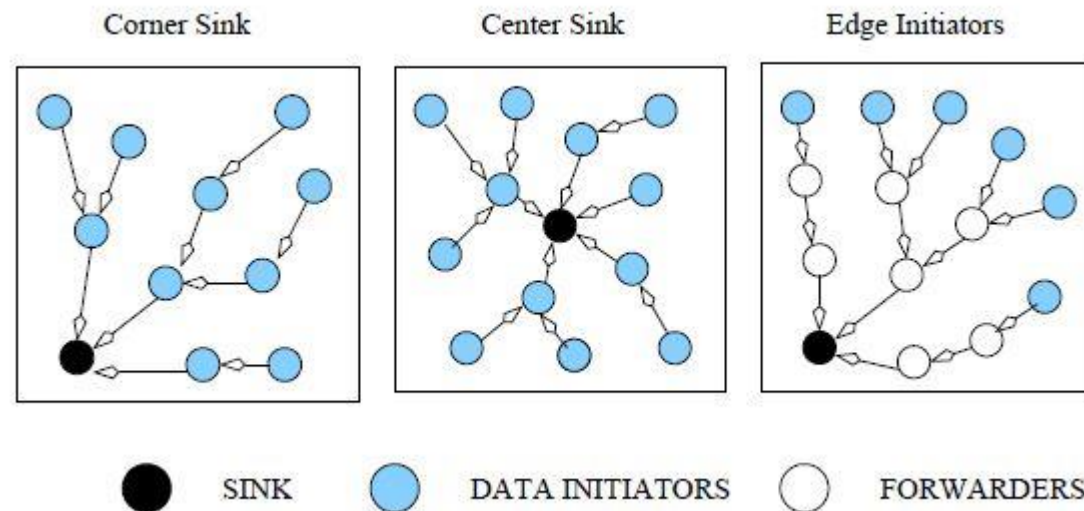
Simulation

Simulation of sensors network in Cooja with 7 + 1 mote, where mote 1 is sink and it is receiving data from all other motes (2-8).

Disadvantage in this approach is if the number of motes is large – sink overload. One of the solutions would be to use more than one sink for collecting data.

Light sensor values - actions table

- values may differ for other types of plants

- sink mote contain preprogrammed actions that are executed based on this table

Intensity	Action	Action ID
<= 10	POWER SAVE / SLEEP	1
> 10 and <= 100	SEND WATER	2
> 100 and <= 200	SEND MORE WATER	3
> 200	WARNING / VERY HOT	4

Tools

- Contiki OS v3.x
- Cooja Contiki Network Simulator

- Suitable for Moteiv Tmote Sky sensor motes
- Program written in C language

Contiki
The Open Source OS for the Internet of Things