



Vrije
Universiteit
Brussel

Introduction to wireless sensor networks

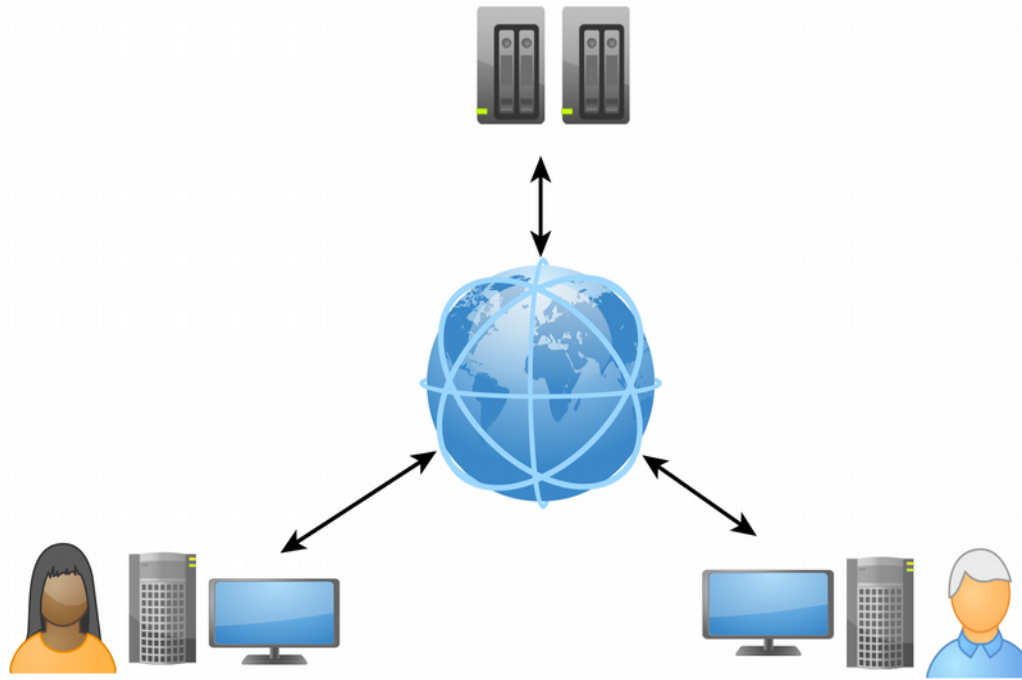
With

6LoWPAN and Contiki

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COST AAPELE
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Telecom



Several devices “talk” to each other (e.g. webbrowser with remote server)

Here: embedded sensor devices with a remote application.

Communication model – OSI

	Layer	Function/Examples
Application Layers	7: Application	Webbrowsers (i.e. HTTP)
	6: Presentation	Manages independance of data representation (e.g. encryption)
	5: Session	Manages session between local and remote application (e.g. RPC)
Packet Layers	4: Transport	UDP, TCP
	3: Network	Addressing, routing (e.g. IP)
MAC Layers	2: Data Link	Medium Access Control
	1: Physical	Wireless, wires, optics

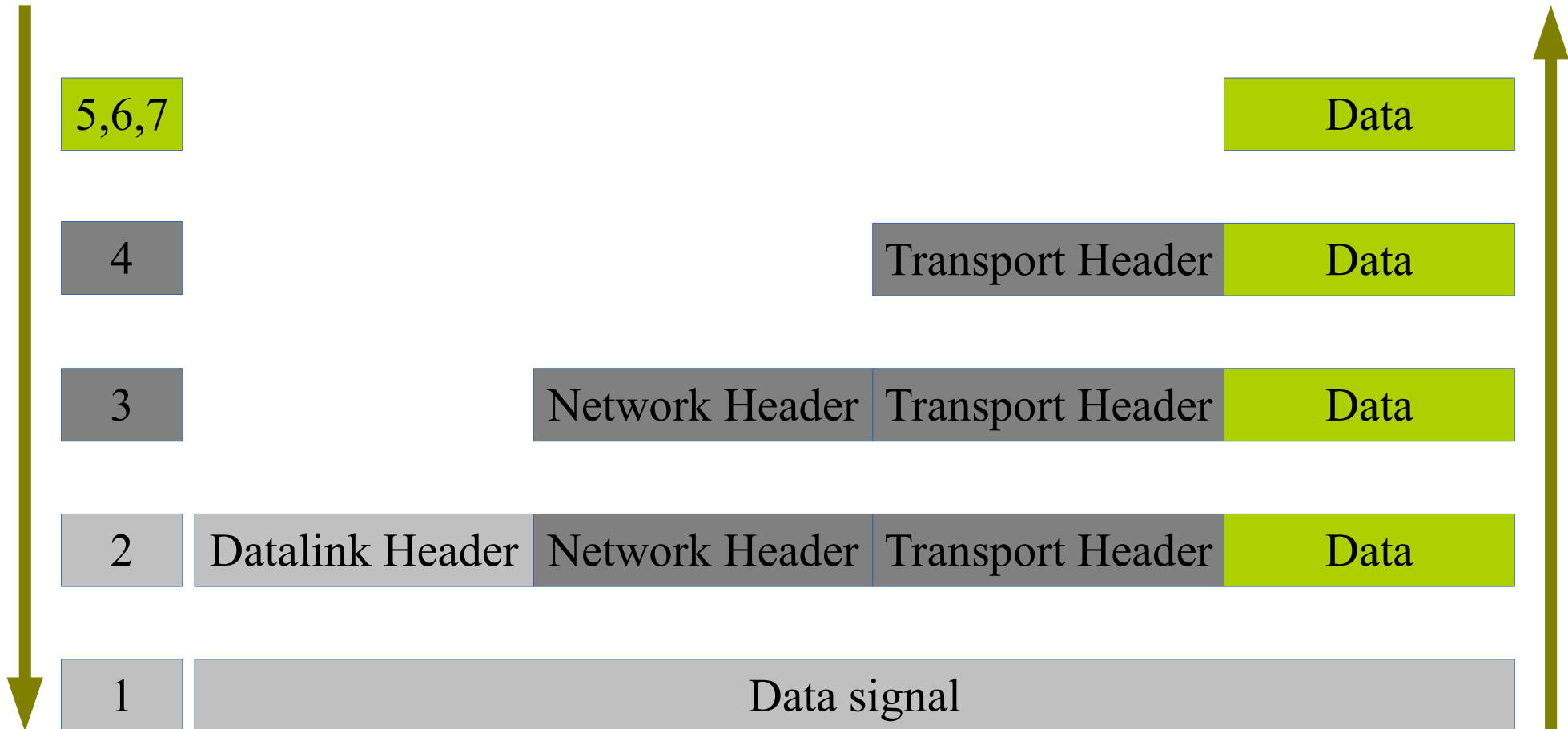
Communication model – OSI

Sender

Packet encapsulation

Receiver

Packet decapsulation



Wired vs. Wireless communication

Wired communication

Reliable communication

Infrastructure

Gbps speed possible

Wireless communication

Unreliable communication

No wires during deployment

Mbps speed possible

Interceptable by other devices

UDP vs. TCP

User Datagram Protocol: connectionless datatransmission
(no overhead)

Transmission Control Protocol: connection oriented
datatransmission (overhead)

Wireless Sensornetworks

Network of smart devices

Collaborate with other nodes in the network

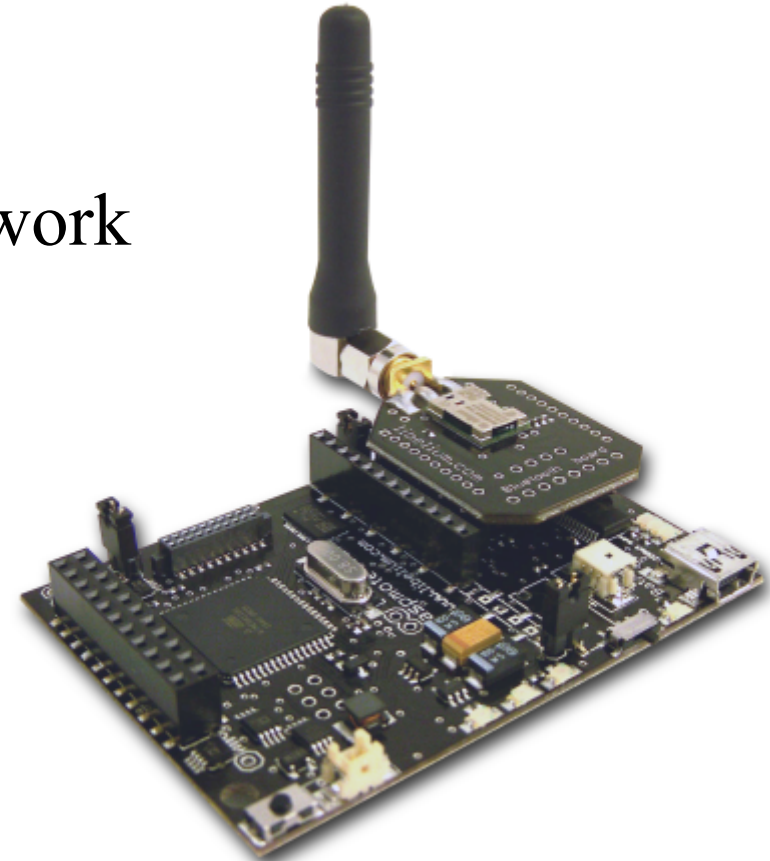
Small devices

Equiped with sensors/actuators

Mostly battery powered

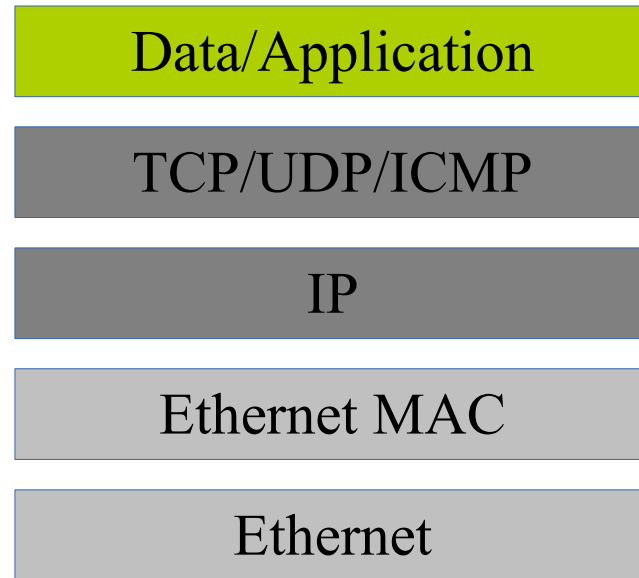
Use a embedded communication protocol Smart device from Libelium

Some sensornetworks communicate with the outside world



6LoWPAN

IP/Ethernet stack



Application

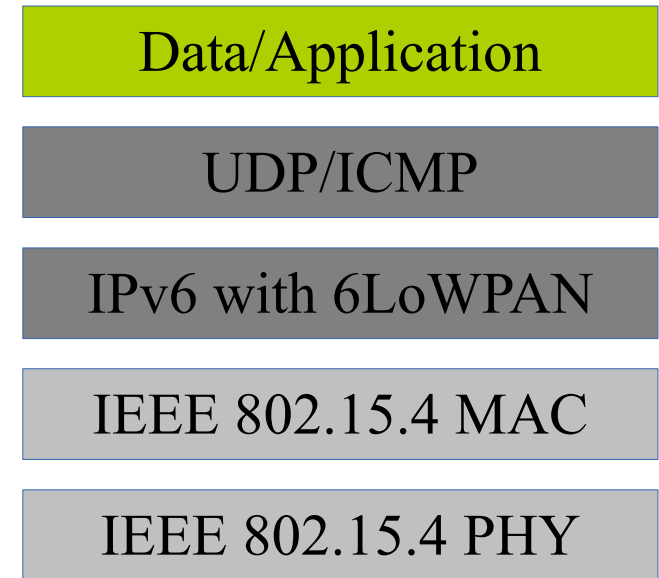
Transport

Network

Data Link

Physical

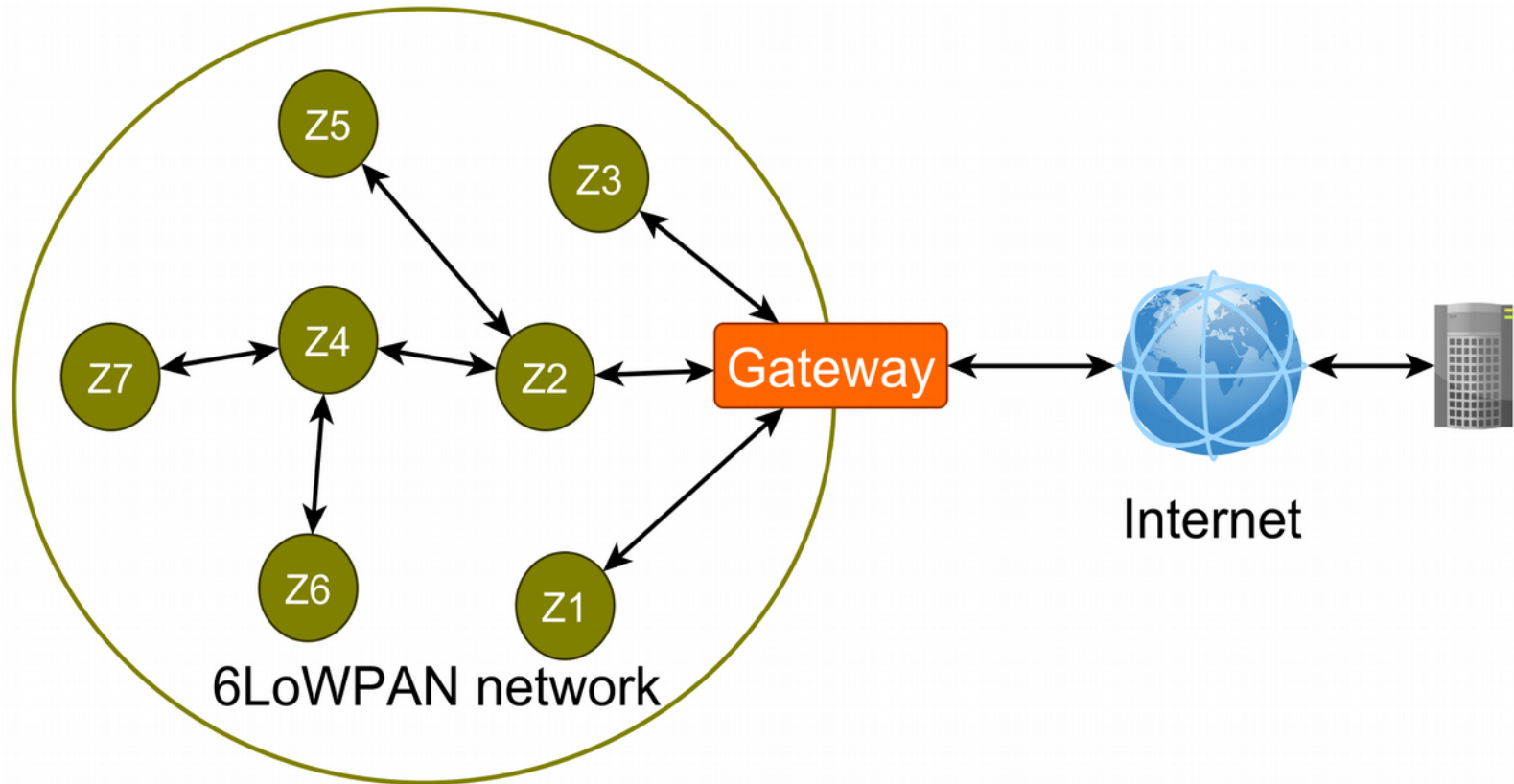
6LoWPAN stack



IPv6 protocol for embedded devices

Compression/decompression at layer 3 → designed for low power consumption

6LoWPAN Topology



IP-network: world wide network (internet)

Edge-router: gateway between sensornetwork and IP network

Embedded sensornetwork (Zx-nodes)

Zolertia Z1 & Contiki

Zolertia

92 kB of program flash

MSP430 microprocessor family

Digital (interruptable) IO capabilities

Contiki

Event driven OS

Targeted for small devices (Zolertia Z1)

6LoWPAN stack already included with UDP functionality

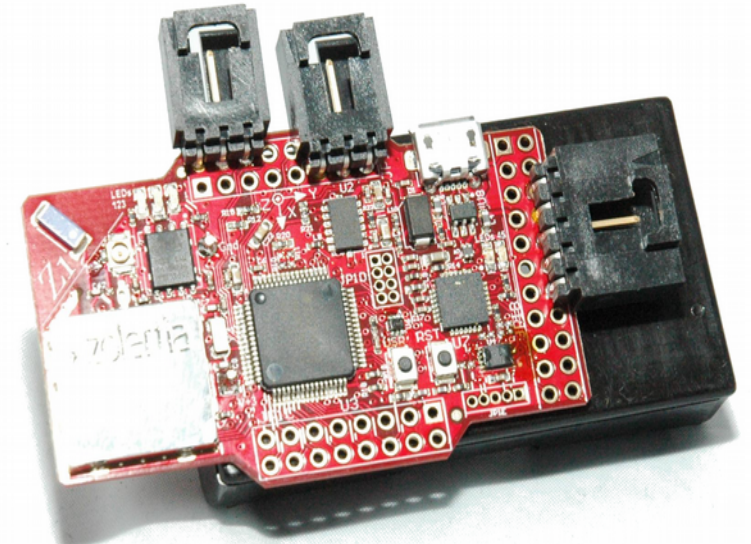


Image from the Zolertia website

Goals

Understand the principles of Contiki

Be able to program a node

Send packets from UDP-client to UDP-server (Contiki)

Send packets from sensornetwork to the outside world

Detect events (pushbutton) remotely

Send sensor readings to the remote server

Remote interaction with a sensor node (LED blink)