Border Router and WSN Gateway

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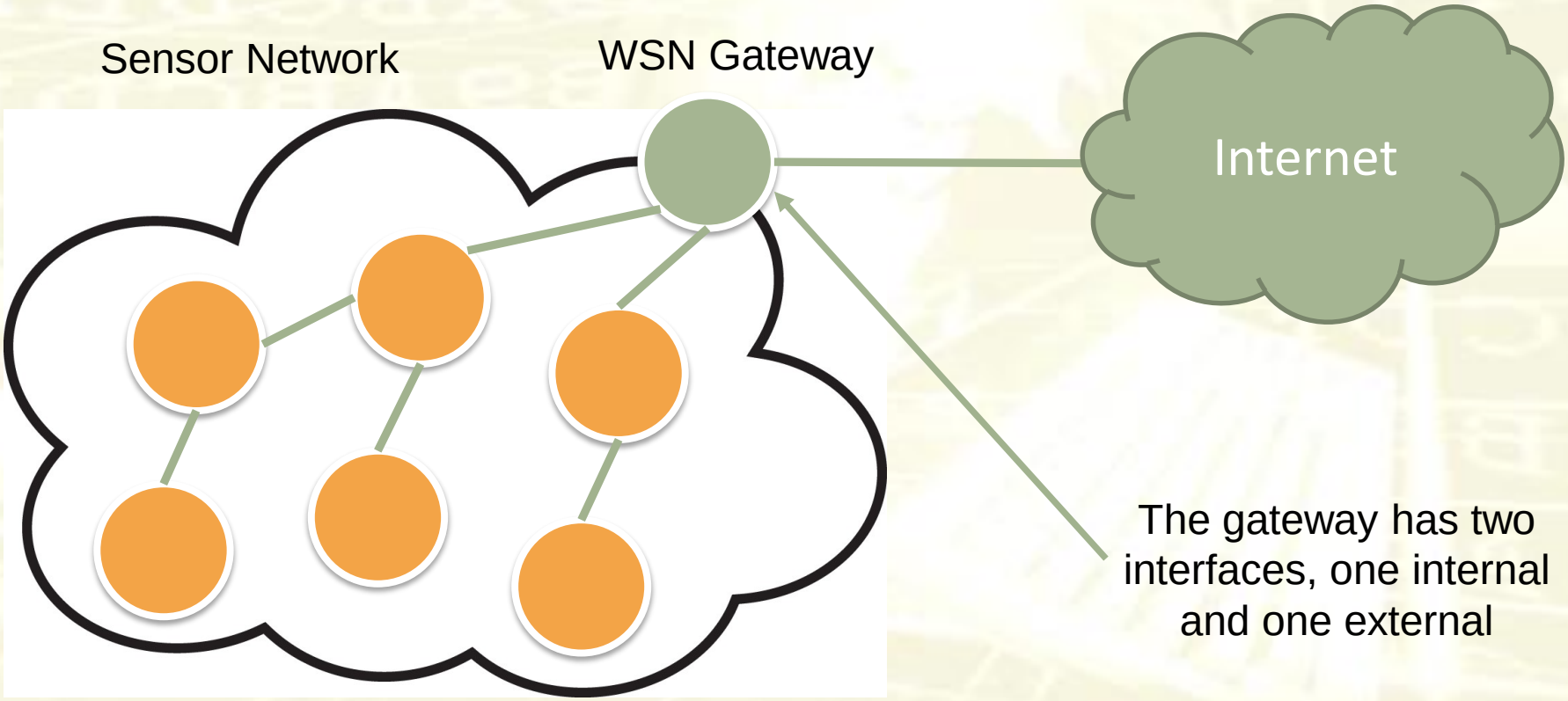
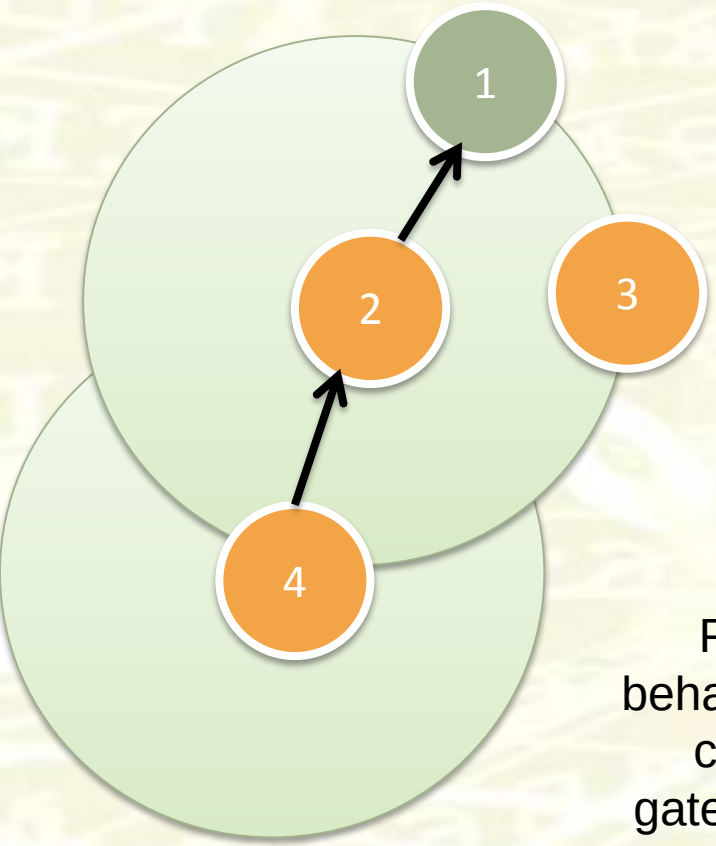
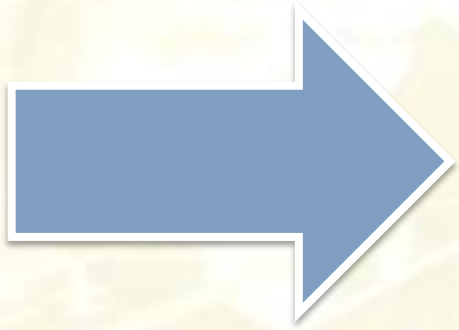
Reaching sensors from anywhere

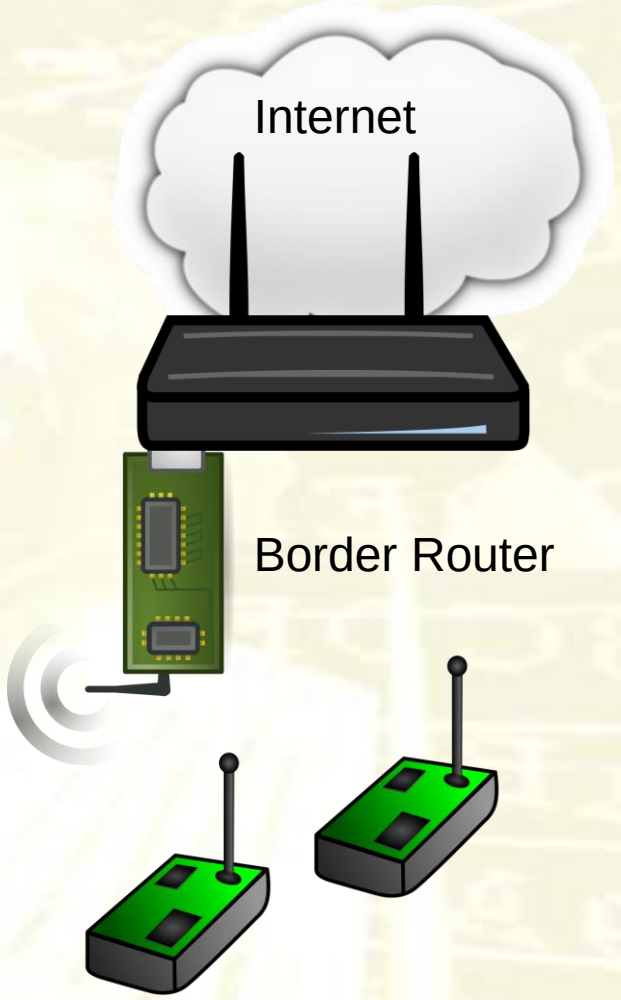
In order to connect a WSN to other networks or the Internet a Gateway
Is usually employed



Gateway implementation

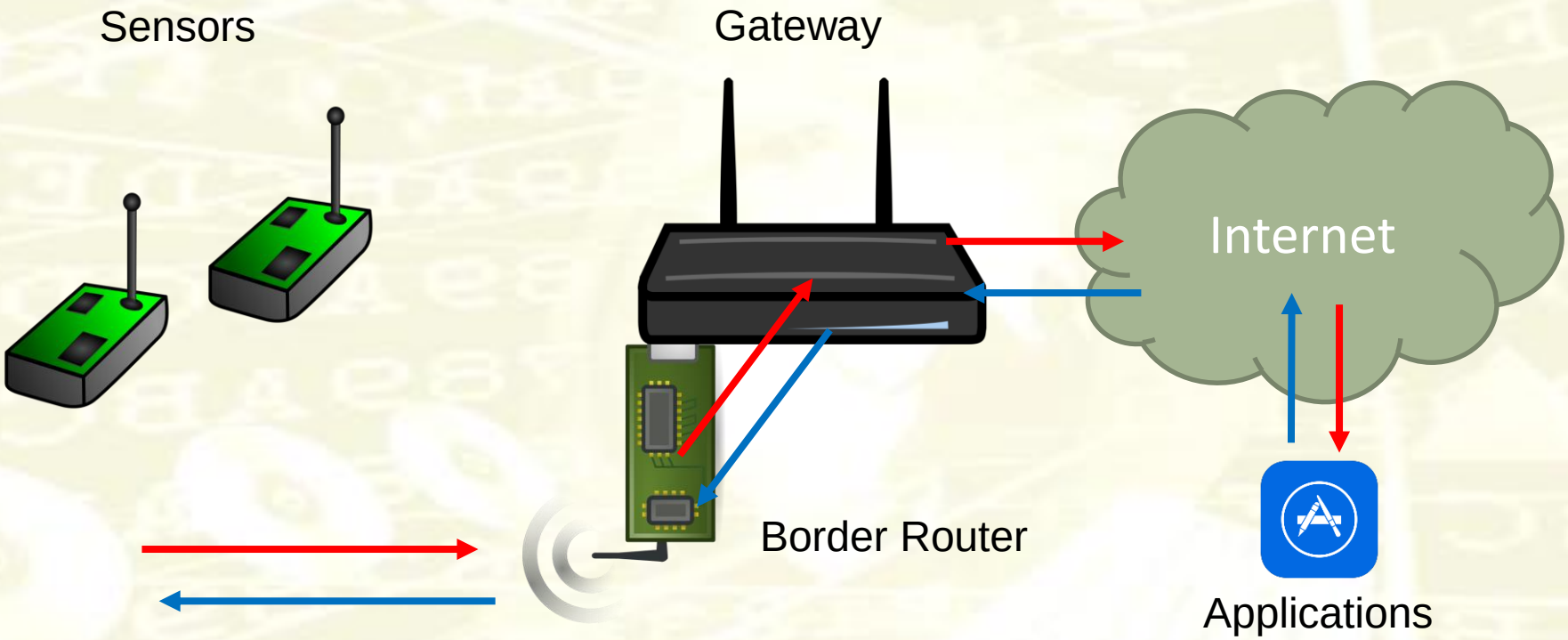






Program one mote to behave as border router and connect the mote to a gateway (e.g. a laptop) that is connected to external networks

Gateway implementation



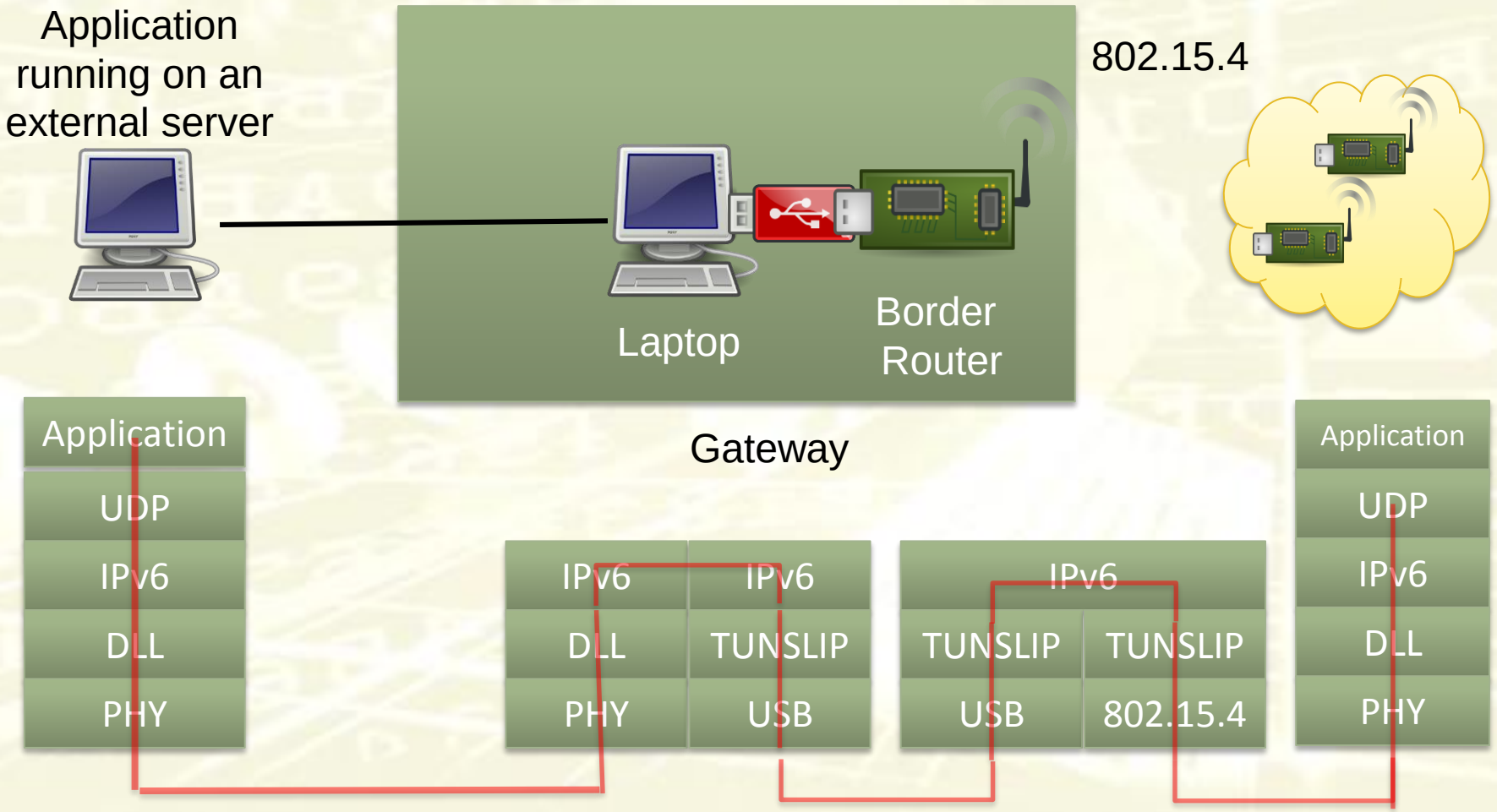
Data received by the border router will be forwarded to the gateway through the serial connection over USB. The laptop will forward data to external networks to reach applications. In the same way external applications can reach sensors through the Internet. *The mote behave as a wireless card from the point of view of the gateway.*

tunslip6

- In order to connect the mote to a laptop as it was an IEEE 802.15.4 transceiver the *tunslip* program is required
- The tunslip6 creates a virtual interface (called tun0) which is bridged to the mote
- The interface will have an IPv6 address (aaaa::1) and can be used by applications to send/receive data to/from the WSN
- The border router will use the prefix (aaaa) as global IPv6 prefix. This will be forwarded and installed in the overall WSN in order to assign sensors a global IPv6 address which can be used for external communications

tunslip6

The stack looks like the following:



Set up on real motes

- Deploy a border router
  - examples/ipv6/rpl-border-router/border-router.c
  - Remember to change the channel if you set the channel on your project
- Use the tunslip6:
  - cd examples/ipv6/rpl-border-router/
  - Connect the mote to USB
  - make TARGET=z1 border-router.upload
  - make connect-router

BORDER ROUTER MUST BE CONNECTED TO /dev/ttyUSB0

Set up in cooja

Border Router has to be the first to be deployed!!

- Deploy a border router
  - examples/ipv6/rpl-border-router/border-router.c
- Add the socket on the border router
  - Tools -> Serial Socket (SERVER) -> Z1 1
- Deploy motes which will get the global IPv6 from the border router
- Use the tunslip6:
  - cd examples/ipv6/rpl-border-router/
  - make connect-router-cooja

Do it!!

- Set up a WSN with a border-router (which is also the RPL root node), an UDP Receiver and an UDP Sender.
- Try to ping all the motes:
  - E.g. ping6 aaaa::c30c:0:0:1
- The border router has its own IPv6 address shown when the tunslip is launched
  - Try to open a web browser to see what the border router shows

Simple Java App

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Motivation

- Border router allows applications to access motes using their global addresses
- Next question: how to write an application that accesses data generated by sensors from applications?
- A simple UDP socket can be used from applications to interact with the sensors

Do IT!!

- Write a Java program that send a message to an UDP application and then print the response
- Use as example: https://systembash.com/a-simple-java-udp-server-and-udp-client/
- Modify accordingly the rpl-node.c code to receive UDP packets and reply with a message

Limitation

- How to discover information available on each sensor?
- How to ask for a specific piece of information? (e.g. temperature, rather than position?)
- How to encode the information?

- **With this simple UDP solution the implementation of these functionalities are left to the programmer**
  - **Different solutions**
  - **No interoperability**