Ad Hoc and Sensor Networks Exercise 4

Sensor Network programming

TinyOS exercise

- Sensor network programming in a nutshell
  - Read a tutorial
  - Solve two (simple) tasks on real hardware
  - Lab-style exercise
    - Teams of two to three students are ideal
    - Two parallel lab working places are available
    - Reservation system on the course website
  - Expected time needed for all tasks: 3-4 hours
  - Mandatory to get the testat without taking the exam

Tutorial

- Carefully read the tutorial on the TinyOS website
  - http://www.tinyos.net/tinyos-1.x/doc/tutorial/index.html
  - Ignore instructions about setting up the system, flashing applications, simulation, and data ROM access
- The tutorial contains several exercise tasks: Think about them but do not write code
- We use an Eclipse plug-in to develop the applications which is not mentioned in the tutorial

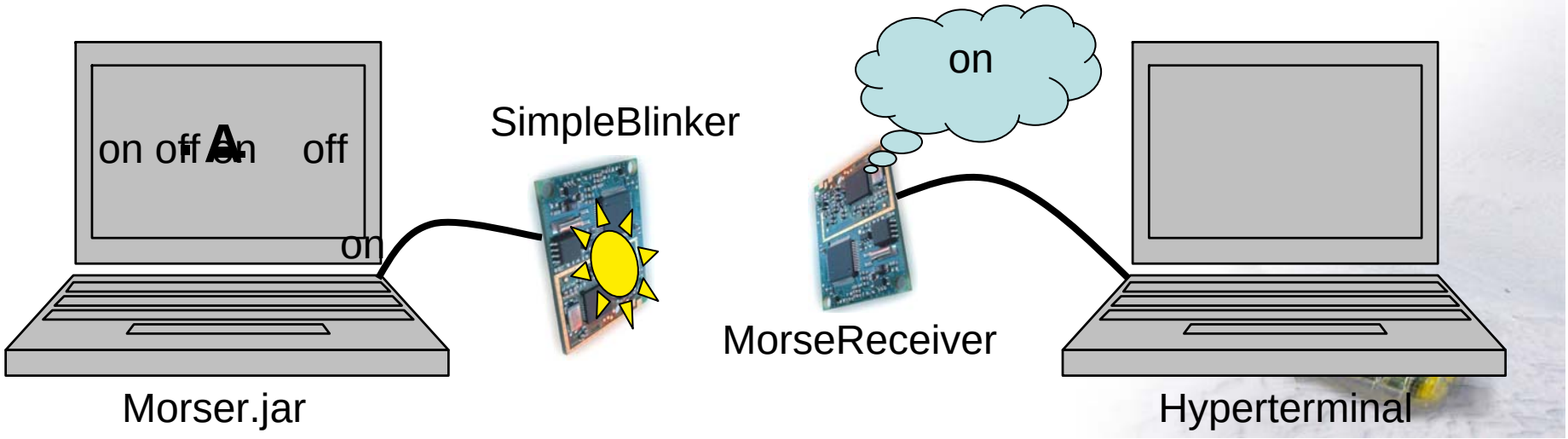
Exercise 1

- **Exchange of a sensor reading**
  - Two sensor nodes are u… k
  - One node periodically sa… its light sensor and broadcasts the reading over its radio
  - The other node listens for radio messages and signals if it is getting brighter or darker
    - Brighter -> The green LED of the receiver is set
    - Darker -> The red LED of the receiver is set
    - No significant change -> The yellow LED is set

What exactly do we get from the sensor?

Exercise 2

- **Optical Communication using Morse Codes**
  - Sender
    - Sensor node connected to the pc over a serial connection
    - Controlled by a (provided) java application
    - LEDs are toggled on/off to transmit Morse signals
  - Receiver
    - Sensor node sampling its light sensor. Detects and decodes Morse signals
    - Connected to a pc over a serial connection. On the pc the Hyperterminal is used for output



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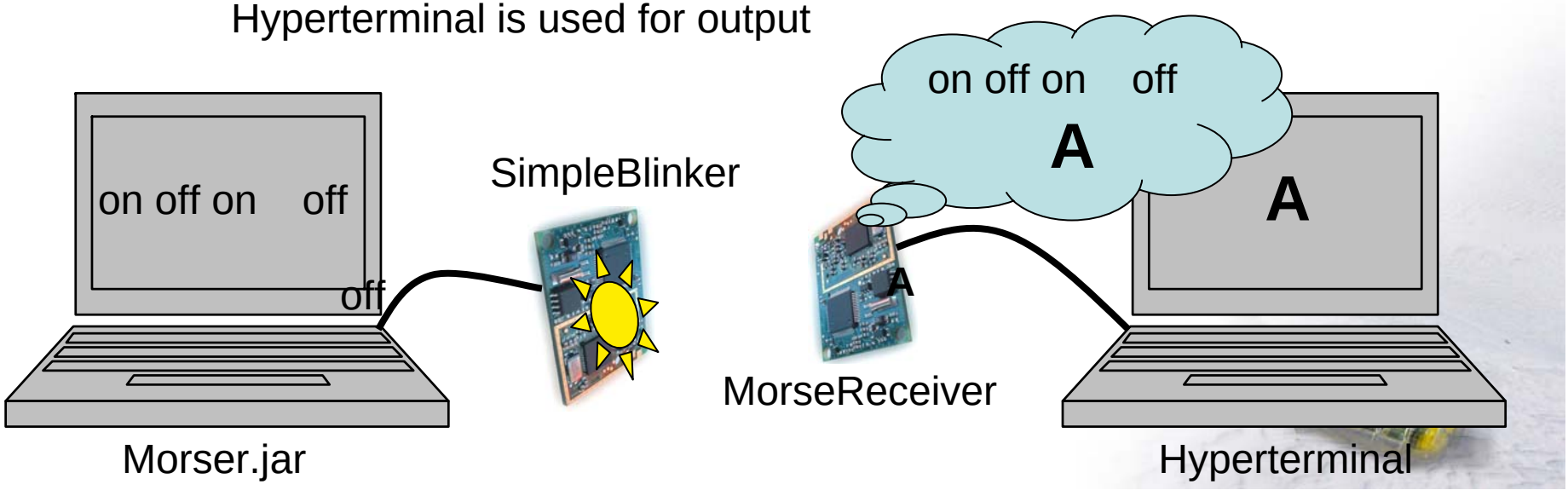

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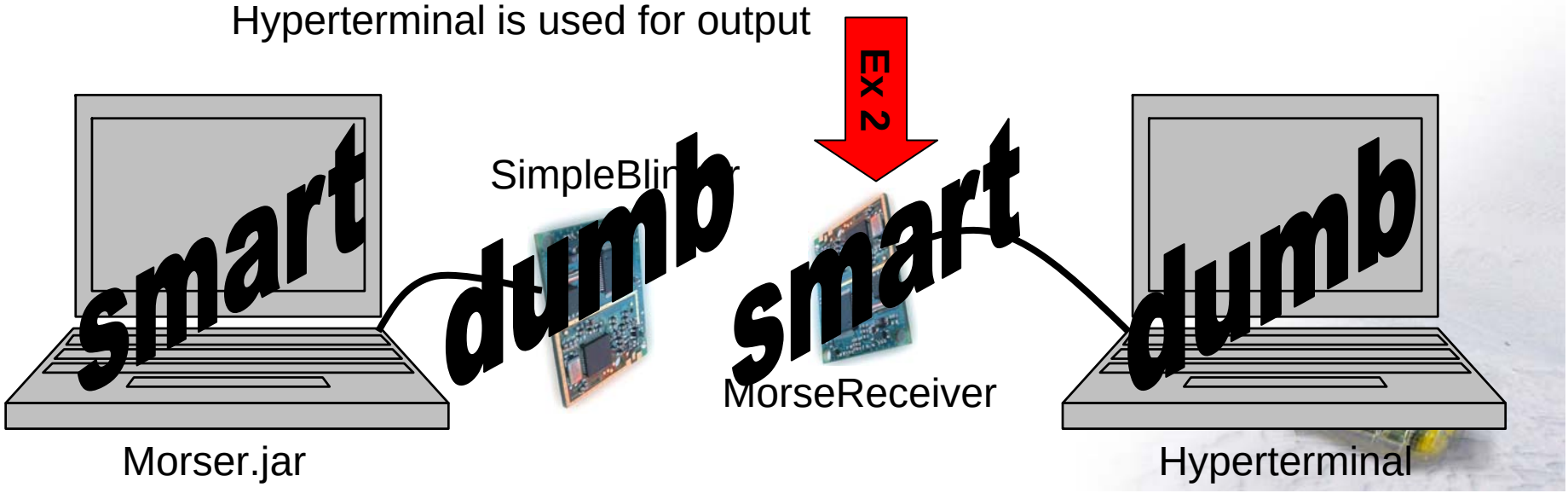


General Information

- Code Skeletons for both applications are provided
  - Exercise 1 only needs very little additional programming and should be solved by all groups
  - Exercise 2 is more challenging but is also more fun

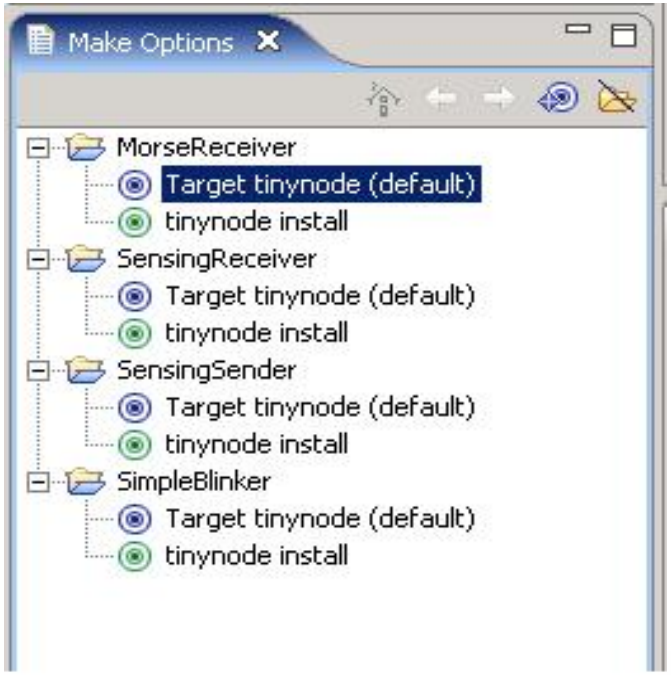
Hint: Exercise 1 may contain helpful code fragments

Setup

- The lab computers are preinstalled with all necessary tools and the exercise skeletons
- An Eclipse plug-in for TinyOS development is installed and configured. Check the following website for a quick start on how to use it: http://dcg.ethz.ch/projects/tos_ide/

Compiling

- For all Exercise applications two compile commands are defined.
  - `Target tinynode` is used to compile the application. The compiler output is directed to the Eclipse console
  - `tinynode install` is used to compile and flash the application to a sensor node



  - A popup asks for a **bsl** number. This is the identifier of the serial port the sensor node is attached to. The identifier count starts at 0. Therefore COM1 == 0, COM2 == 1, COM3 == 2

Final Remarks

- The lab is in the ETL building. Hardware and keys must be fetched in our office ETZ G64.1
- If you get stuck come back to ETZ G64.1 and ask for help
- A FAQ page will be linked from the course website and updated regularly