Identifying core skills required for the digital economy: Internet of Things

Prof. Dr. Anna Förster
Sustainable Communication Networks
University of Bremen
Germany
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Core Questions

- What is the Internet of Things?
- How to teach it?
- How to ensure long-lasting skills?
What is the Internet of Things?
Why is it different?

- Deep scientific knowledge against widespread application skills
- Very short living technologies and trends
- No new science, a combination of:
  - Systems (hardware)
  - Software engineering
  - AI and data science
  - Security
  - Human-computer interaction
- Impossible to teach them all – how to manage the balance?
Core skills

1. Deep systems understanding
2. Ability to grasp new systems / programming languages and systems quickly
3. Awareness for security, privacy and human-computer interaction
4. “Learn to learn”
Internet of Things at UB

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Lectures on main scientific topics (computer networking, security, protocol concepts, energy efficiency, energy harvesting, etc.)
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Practical labs with various hardware platforms, network technologies and programming languages

Arduino IDE
Contiki OS
Linux

- Microcontroller
- Radio transceiver
- Sensor(s)
- External memory
- Battery
- Serial adapter
Internet of Things at UB

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Exercises on quick reflection and “what are the 10 differences?”
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Project competition with these points as evaluation criteria

**Fast Communication between Workplaces**

**Design of a sensor-based communication Box**

**Problem:** Communication between Workplaces for recurring questions like break time in company.

**Approach:** Design of a sensor-based communication device as transceiver for Coffee- or Lunch-request or response to a request.

**Idea:**
- Sensor nodes, which are contacted over a Access Point.
- Protocol Type is a UDP/IPv4-Protocol.
- If a sensor is not connected to the AP the LED shows an error.

**Complete wiring of one Box Including:**
- One Pretzelboard
- One Shift Register
- One four 7-Segment LED
- 2 Buttons
- many wires and resistors

**Flow Diagram of the Communication System**

**Sketch of the 3D-printed Box for one Communication device**
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Documentation and help search on the Internet
Own project ideas with self-researched systems and architectures
Some advise for teachers …

- Large one-time preparation effort, small recurring effort
- Design labs independently to easily exchange later
- Interactive sessions and labs are more effective than lectures!
Take away

- Flexible study programs with focus on hands-on experience
- Rather broad skill and knowledge spread
- Teach how to learn alone and where to find expertise and new knowledge
- Life-long learning