COL788: Advanced Topics in Embedded Computing

Lecture 16 – Embedded OS (Cont.)

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Tiny OS

- Low power wireless communication devices
  - Particularly wireless networked sensors
- Physical limitations
  - Computation ability
  - Memory
  - Power supply
  - High-level concurrency

Details

- An event-based operating system designed for wireless networked sensors.
- Designed to support concurrency-intensive operations required by networked sensors with minimal hardware requirements.
- C and Assembly languages
- Source code size: 500KB, 16KB commented lines

Different from Traditional OS

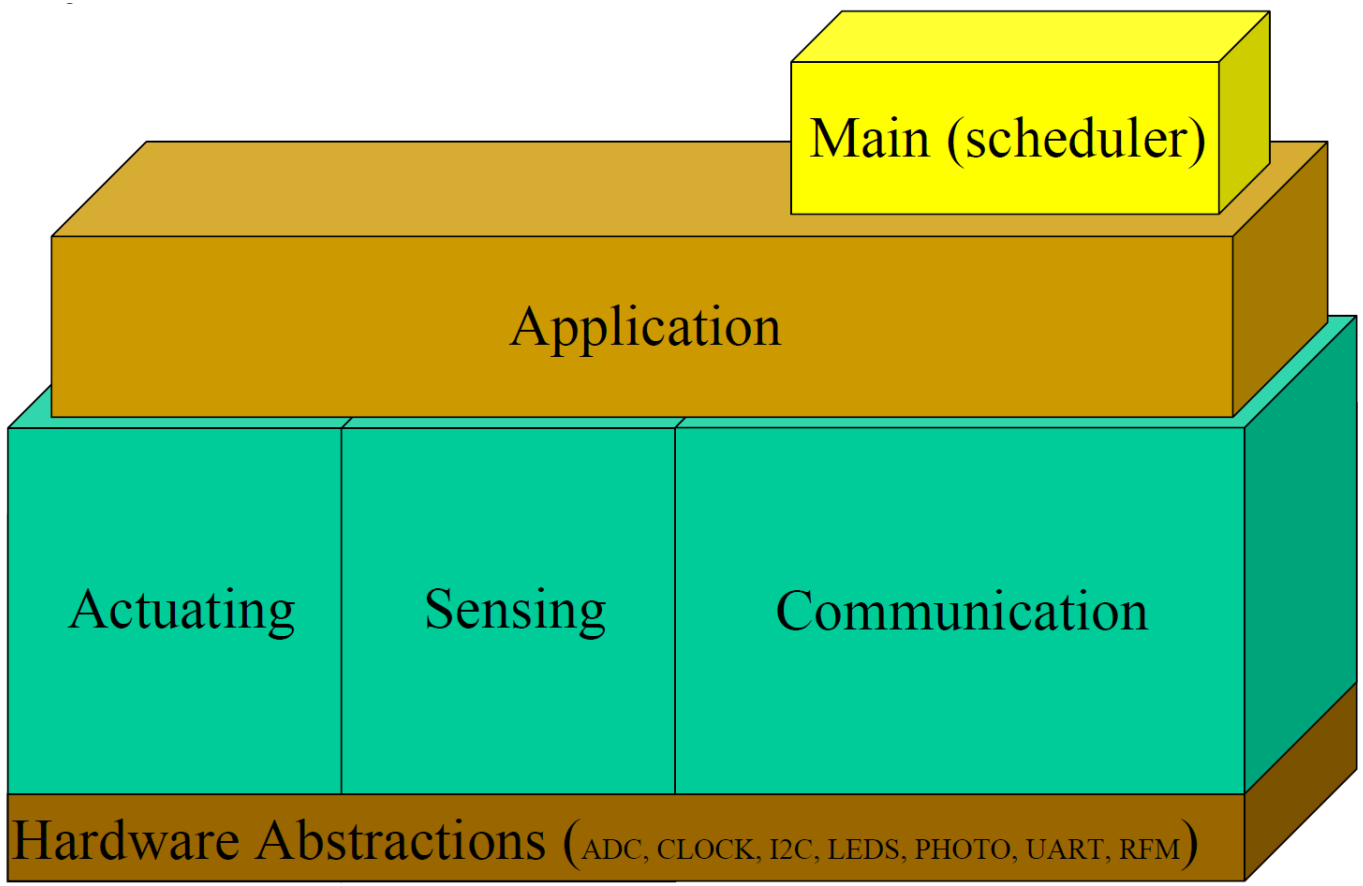
- Special purpose (not general purpose)
- Resource constraint
  - 4MHz ATMEL 8535 8bit MCU
  - 512 byte RAM and 8K Flash
- No dedicated I/O controller (missed deadline means loss data)
- One program at one time (no multi-programming)
- Thin-threads (tasks)

Model

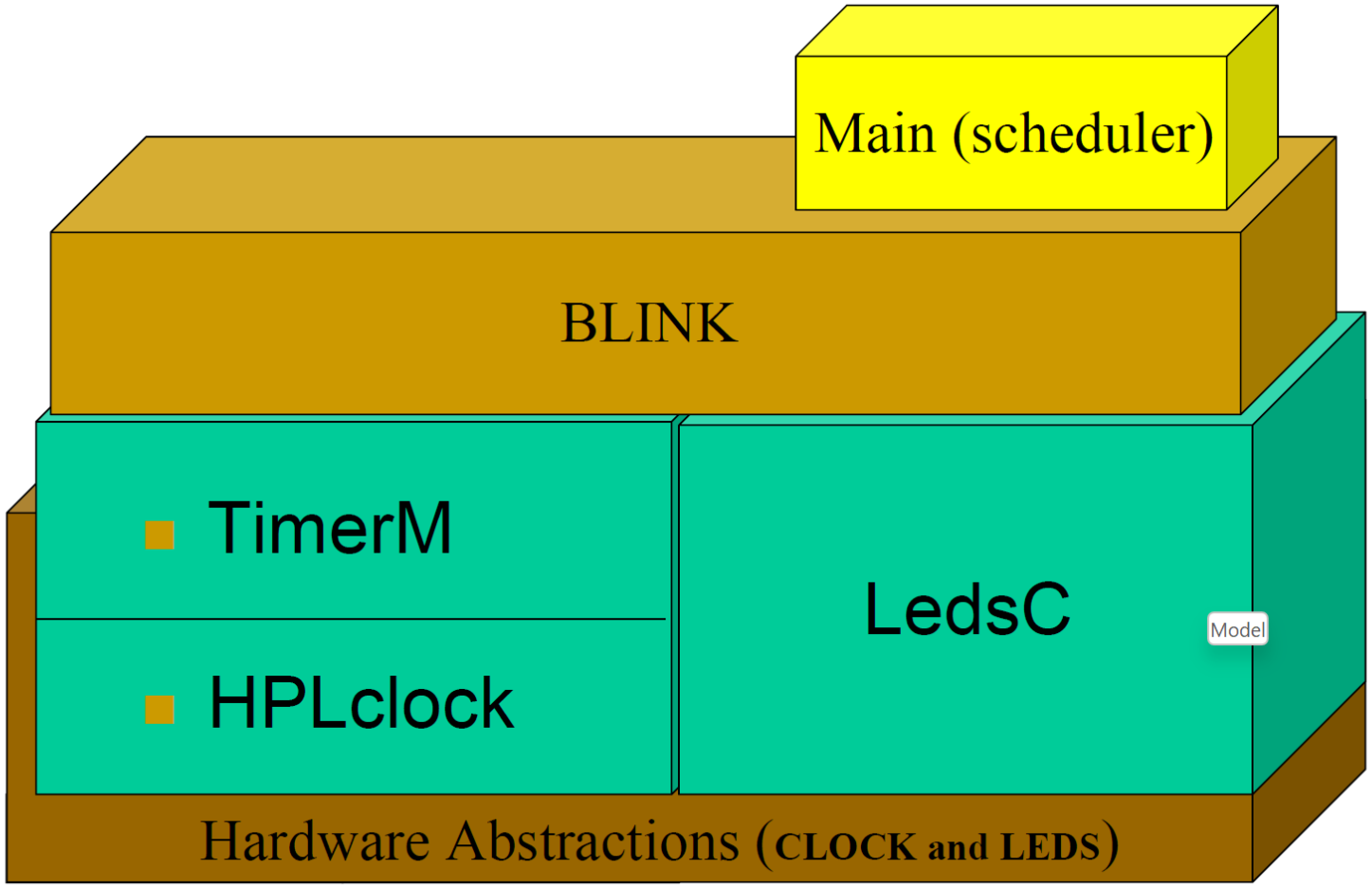
- Component-based model (modularity)
  - Simple functions are incorporated in components with clean interfaces
  - Complex functions can be implemented by composing components

- Event-based model
  - Interact with outside by events (no command shell)
  - There are two kinds of events for TinyOS:
    - External events: Clock events and message events;
    - Internal events triggered by external events

Structure


Main (scheduler)
Application
Actuating
Sensing
Communication
Hardware Abstractions (ADC, CLOCK, I2C, LEDS, PHOTO, UART, RFM)

Example


Main (scheduler)
BLINK
TimerM
HPLclock
LedsC
Model
Hardware Abstractions (CLOCK and LEDS)

What’s Next?

- Lecture 17
  - September 19, Monday, 11 am – 12 pm