CS698T
Wireless Networks: Principles and Practice

Topic 12
TinyOS

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http://www.cse.iitk.ac.in/users/braman/courses/wless-spring2007/

TinyOS

- Reference: "The Emergence of Networking Abstractions and Techniques in TinyOS", Philip Levis, Sam Madden, David Gay, Joseph Polastre, Robert Szewczyk, Alec Woo, Eric Brewer, and David Culler, NSDI 2004.
  - Section-2
- More related to embedded computing than wireless
- Necessary for projects

TinyOS Goals

- An "operating-system" for embedded sensor nodes
- Different requirements for such platforms
  - Should be designed for current & future hardware
  - Cater to a wide variety of applications
  - Limited resources: memory, power
  - Concurrency-intensive operation: data driven

TinyOS Design Overview (1 of 2)

- Modular framework:
  - A set of software components and interfaces
  - No strict definition of system/user boundary
- Issues addressed by this approach:
  - Adaptation to heterogeneous hardware
    - Reuse of software
  - Adaptation to different application requirements
    - Put together required software components
  - Memory resource constraints
    - Use only the required components

TinyOS Design Overview (2 of 2)

- Event-driven concurrency model:
  - Hardware events and software tasks
- Issues addressed by this approach:
  - Requirement for concurrency
    - Event-driven model is natural: no blocking or polling
  - Limited memory
    - Many concurrent tasks using just one stack
  - Power savings
    - No tasks ==> sleep

TinyOS Design

- Interface: a set of *commands* and *events*
  - Command: sub-routine to perform some action
  - Event: completion of request, or external trigger
    - Can be bound to a hardware interrupt
- Component:
  - *Provides* a set of interfaces (used by others)
  - *Uses* a set of interfaces (provided by others)
- An application "wire s"t ogether the interfaces of a set of components

Blink: An Example TinyOS Appln.

- Split into Blink.nc & BlinkM.nc
- BlinkM.nc:
  - The module: the actual implementation
- Blink.nc:
  - The configuration: the “wiring-up”of i nterfaces
- Other examples: CountLeds, CountSend, CountReceive