Raising Programming Abstractions
In
Wireless Sensor Networks

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The PhysicalNet

- Networks of networks via the Internet
  - WSN
  - Home appliances (networks)

- Sensors and Actuators (going physical)

- Mobile Devices

- Each WSN may be multi-user, multi-application

SN and Ubicomp

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System Architecture

Nodes

Local Transport Protocol

Internet

Server

Nodes

Local Transport Protocol

Programming Station

Information about Services, Interfaces Location
System Architecture

- High level Programming Language
- EXE
- Internet
- High Level Virtual Machine
- Server
- Local Transport Protocol
- Low Level Virtual Machine
- Nodes
- High Level Virtual Machine
- Local Transport Protocol
- Low Level Virtual Machine
- Nodes
System Architecture

Programming Station

Internet

Server

Local Transport Protocol

Nodes

Server

Local Transport Protocol

Nodes

Responsible for Resource management User access rights
Programming Abstractions

• Object based (home, car, office, bear, …)

• Node class
  - Constructors
    • Closest to location
    • Closest to another node
    • Random node in region
    • Exact node

• Spatial-Temporal Abstractions
  - Variables (with history)
Programming Abstractions

- Services (API)
  - Discovery tool
  - Compose

- Bundles (must handle mobility)
  - Collections of nodes
  - All nodes in area (current)
  - Subset of another bundle
  - Merge, split etc. bundles
  - At least 5 motes for sensor fusion
Programming Abstractions

• Event-Action Chains
  - **One system:** When Jack is home start the music and turn on lights near him
  
  - **Across Systems:** If system A detects an intruder tell system B to turn on lights and alert Jack (wherever he is) by the closest appropriate device
GUI

• Distribute Applications
• Monitor Applications
• Run simulator (debugging)
• Resource and service discovery
• ...

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Lesson

• Globally Virtual, Locally Physical

• New, special purpose language not likely to succeed

• Build upon Java
  - Libraries
  - Middleware
  - Virtual machines
  - Monitoring and Debugging