Current Projects at the Distributed Systems/Operating Systems Group

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Outline

Members and Figures

Projects
  Reflex
  Tandem
  Cocos
• 1 Professor
• 4 PhD students, 2 funded by projects
• currently 9 bachelor/masterthesis
• varying numbers of students employed in teaching
• 4 - 6 lectures each semester
Projects

- Reflex - Realtime Event Flow Executive
- Tandem
- Cocos - COordinated COmmunicating Sensors
Reflex

- Operating system for embedded systems and sensor nodes
- Uses the Event-Flow paradigm
- Static real time analysis
- Basis for Cocos and Tandem
- Seat monitoring
- House control system
The Event Flow Paradigm

- AD Converter
  - adc handle
  - start sample
  - Application logic
  - threshold control
  - Packet reception
  - Serial interface
  - tx start
  - tx handler
  - rx handler

- Timer
  - tick handle

- Components:
  - Platform independent component
  - Platform dependend component
  - Activity
  - Interrupt handler
  - Event buffer
  - Modul output
  - Interrupt
  - Event channel
  - Association
Projects  Reflex

House Control System (1)

1: oil burner
2: wood kiln
3: solar collector
4: heater
5-6: water reservoire
7-a: pumps
b-i: doors & gates

m: light sensor
n-p: light
q: siren
r: doghouse with heater
House Control System (2)
Projects  Tandem

Tandem

- Funded by german ministry for education and research
- Design of ultra low power sensor node
- Collaboration with IHP Frankfurt
- Operating system support
- Power management
Cocos

Middleware for Sensor Networks

Architecture

- sensor net control
- coordination spaces
- remote objects
- communication protocols
- scheduling & event handling

APPLICATION

COCOS

CHIPS

COPRA

REFLEX
COCOS Protocols

- IMPACT [1]
- MLMAC [4], MLMAC-UL [5]
- Multi Network Routing [7], Buckshot Routing [6]
- Coordination Spaces [2, 3]
A Link Graph
Unidirectional Links

- Treated as exception and ignored in many protocols
- Often have longer reach
- Increase network connectivity

[Diagram with nodes labeled as Sink and Sensor node, arrows indicating bidirectional and unidirectional links.]

[8]
Buckshot Routing

node without communication

node with communication

Node on route

Node has Linkerror

Packet
Questions?
References

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V. Turau.
The heathland experiment: Results and experiences, presentation.