EECS 298: System-on-Chip Description and Modeling Lecture 10

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Lecture 10: Overview

- Course Administration
  - Final course evaluation
- Unified Modeling Language (UML)
  - Overview
  - Online resources
- Homework Assignment 3
  - Discussion
- Homework Assignment 4
  - Final Report

Course Administration

- Final Course Evaluation
  - 8th through 10th week
  - Mar. 3, 2006 through Mar. 19, 2006, 11:00pm
  - Online via EEE Evaluation application
- Feedback from students to instructors
  - Voluntary
  - Completely anonymous!
  - Very valuable!
- Help to improve this class!
  - Currently only 3 out of 7 respondents
  - Only 2 more days left to respond

Unified Modeling Language (UML)

- Status
  - UML 2.0 Superstructure
  - developed and maintained by OMG (Object Management Group)
- Goals
  - Raising the Level of Abstraction
  - Modeling of software applications
    - before coding
  - Specification of software architecture
  - High-level description of software architecture to enable
    - scalability
    - security
    - robustness
    - maintenance
    - extendability
    - code reuse
  - Model Driven Architecture (MDA)

Unified Modeling Language (UML)

- What is UML?
  - 13 Standard Diagrams
    - Specification
    - Design
    - Documentation
  - Graphical Representation of
    - Software architecture
    - Software structure
    - Software behavior
    - Object relations
    - ...
  - Not executable!
  - Tools available
    - Graphical capture
    - Editing
    - Code generation

Unified Modeling Language (UML)

- UML Standard Diagrams
  - Structure Diagrams
    - Class Diagram
    - Object Diagram
    - Component Diagram
    - Composite Structure Diagram
    - Package Diagram
    - Deployment Diagram
  - Behavior Diagrams
    - Use Case Diagram
    - Activity Diagram
    - State Machine Diagram
  - Interaction Diagrams
    - Sequence Diagram
    - Communication Diagram
    - Timing Diagram
    - Interaction Overview Diagram

Unified Modeling Language (UML)

- UML Resources
  - Online Documents
    - Object Management Group (OMG)
      - **`www.uml.org`**
  - Online Tutorial
    - Borland's UML Tutorial
      - **`bdn.borland.com`**
  - Talk at UCI in 2004
    - Dr. Wolfgang Mueller, C-LAB, Paderborn, Germany
      - **`UML.pdf`**

Homework Assignment 3: Discussion

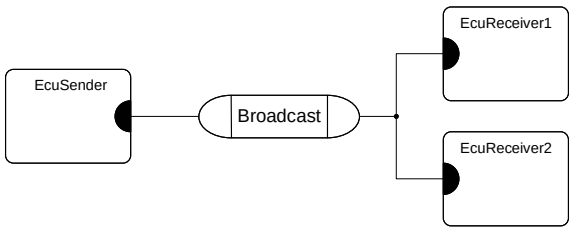
- Task
  - Communication refinement of chosen ECU
    - Transaction Level Model (TLM)
    - Bus Functional Model (BFM)
- Components
  - Controller Area Network (CAN) Bus
    - provided SpecC models
      - TLM (file **`canEcu_tlm.sc`**)
      - BFM (file **`canEcu_bfm.sc`**)
    - see file **`/home/eecs298w06/canEcu.tar.gz`** on server **`epsilon.eecs.uci.edu`**

Homework Assignment 3: Discussion

- Controller Area Network (CAN) Bus
  - Properties
    - Standard bus used in automotive industry (Bosch GmbH)
    - Serial, multi-master, broadcast communication protocol
    - Collision-avoidance arbitration (fixed priorities)
    - Built-in synchronization and error detection
    - Single wire protocol (pull-down mechanism)
  - Modeling in SpecC
    - G. Schirner, R. Dömer:
      "Abstract Communication Modeling: A Case Study Using the CAN Automotive Bus",
      IESS, August 2005.

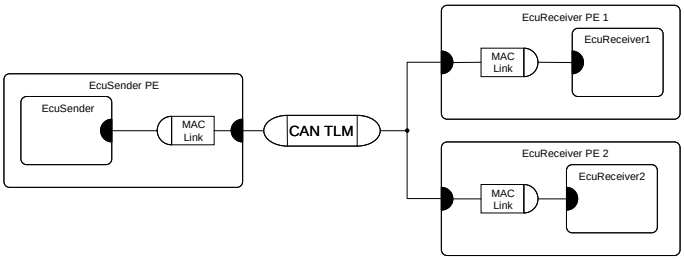
Homework Assignment 3: Discussion

- Controller Area Network (CAN) Bus
  - Example
    - Abstract communication model
      (specification model)



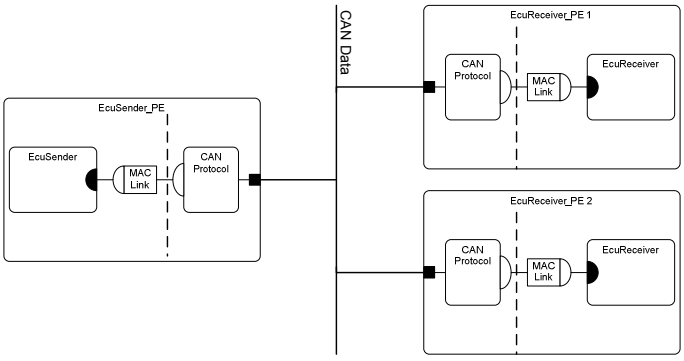
Homework Assignment 3: Discussion

- Controller Area Network (CAN) Bus
  - Example
    - Transaction level model (file **`canEcu_tlm.sc`**)



Homework Assignment 3: Discussion

- Controller Area Network (CAN) Bus
  - Example
    - Bus-functional model (file **`canEcu_bfm.sc`**)



Homework Assignment 3: Discussion

- Deliverables
  - Documentation
    - Schematic view of refined ECU models
    - Brief (!) description of functionality (in English)
    - e.g. **`FloorDoor_TLM.pdf`**, **`FloorDoor_BFM.pdf`**
  - Refined ECU models in proper test bench
    - SpecC source code
    - e.g. **`FloorDoor_TLM.sc`**, **`FloorDoor_BFM.sc`**
  - Successful simulation run
    - e.g. **`FloorDoor_TLM.log`**, **`FloorDoor_BFM.log`**
- Due
  - March 15, 2006, 11:59pm
  - Email to **`doemer@uci.edu`**

Homework Assignment 4

- Final Project Report
  - Modeling of an Elevator Control Unit
    - Specification Model
    - Transaction Level Model
    - Bus Functional Model
  - Summary
    - Specification
    - Validation
    - Refinement
  - Conclusion
    - Lessons learned in this course

Homework Assignment 4

- Contents
  1. Title page
  2. Introduction to SoC Modeling
     1. SoC design flow
     2. SoC specification
     3. SoC exploration
  3. Specification Model
     1. Design example
     2. Schematic view
     3. Description
  4. Transaction Level Model
     1. Schematic view
     2. Description

Homework Assignment 4

- Contents
  5. Bus Functional Model
     1. Schematic view
     2. Description
  6. Conclusion
     1. Summary
     2. Lessons learned
  7. References
  8. Appendix
     1. Specification Model in SpecC
     2. Transaction Level Model in SpecC
     3. Bus Functional Model in SpecC

Homework Assignment 4

- Deliverables
  - Final Project Report
    - e.g. **`FloorDoor_ECU.pdf`**
  - Hardcopy in class
  - Electronic copy by email to **`doemer@uci.edu`**
- Due
  - March 24, 2006, 10:00am