

# EECS 298: System-on-Chip Description and Modeling Lecture 9

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## Lecture 9: Overview

- Modeling with SystemC SLDL
  - SystemC Overview
  - Introduction to SystemC
    - Presentation by Stuart Swan, Cadence
  - SystemC 2.0 Tutorial
    - Presentation by Thorsten Groetker, Synopsys
- Homework Assignment 3
  - Discussion

## SystemC Overview

- Goals
  - Common C++ Modeling Platform
    - System Level Design
    - HW/SW Codesign
    - RTL
  - Seamless Co-Simulation of HW and SW
  - IP Reuse
  - Free licensing, Open Source
  - De-facto Standard
- Open SystemC Initiative (OSCI)
  - Consortium of many EDA companies
    - Synopsys, Cadence, CoWare, Frontier, ...
  - Open Community (very large!)

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## SystemC Overview

- Language
  - C++ class library (layered SW architecture)
  - Hierarchy of Modules connected by Ports
  - Communication via Interfaces and Channels
  - Discrete-Event Simulation
- Methodology
  - Untimed Model
  - Transaction-level Model
  - Bus-functional Model
  - Cycle-accurate Model

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## Introduction to SystemC

- Presentation by Stuart Swan, Cadence, 2002
  - Goals and Requirements
  - History and Organization
  - Versions, Contents, Coverage
  - Language Architecture
  - Modeling, Models of Computation, Examples
  - Communication Refinement
  - Outlook

## SystemC 2.0 Tutorial

- Presentation by Thorsten Groetker, Synopsys, 2001
  - Motivation
  - Models of Computation
  - Model of Time
  - Communication, Interfaces and Channels
  - Platform Modeling
  - Transaction-level Model, Examples
  - Benefits
  - Summary

## 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`

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## 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.

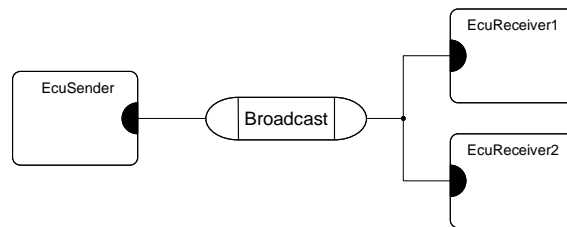
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## Homework Assignment 3: Discussion

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



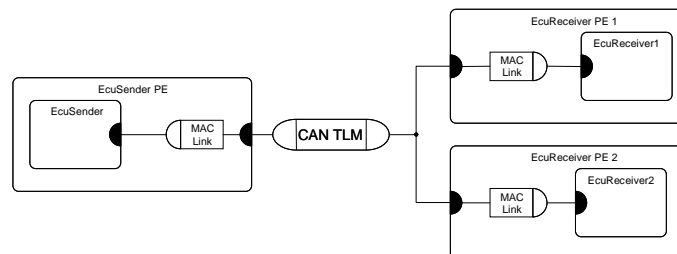
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## Homework Assignment 3: Discussion

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



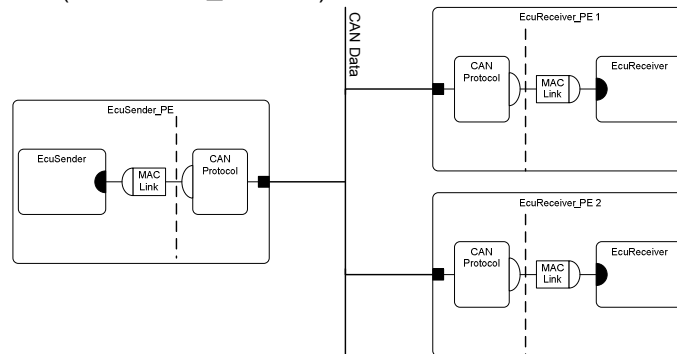
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## Homework Assignment 3: Discussion

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



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## 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 8, 2006, 11:59pm
  - Email to `doemer@uci.edu`

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