CSci 8801
Advanced Software Engineering

Mats Heimdahl
Professor, Director of UMSEC
Critical Systems Research Group
Department of Computer Science and Engineering
University of Minnesota
4-192 EE/CS; 200 Union Street SE
Minneapolis, MN 55455

Topics for Today

• Course overview
  • Instructor and teaching model
  • Introduction
  • What you should already know
• What to expect
  • Assignments
• Questions

Prerequisites

• You ought to have an introductory software engineering class
  • CSci 4081, CSci 5801, or old CSci 5180
• Some background in discrete mathematics
• Interest in learning things that are more advanced than what is industry practice
  • What you learn here you may not be able to use when you get a job
  • But, you can be part of changing the world

Learning Modes

Homepage
Assignments and Grading

- Homework assignment
- Student presentations
- Semester projects
  - A research proposal

Syllabus and Schedule

- Review syllabus
- Review schedule
  - Schedule is still under development
  - Topics will just take the time it takes

Lecture Plan

- Requirements engineering
  - 2 weeks
- Formal modeling
  - X weeks
- Analysis techniques
  - Y weeks
- Testing
  - Z weeks

Questions?

Introduce yourselves

Domain of Concern

How we Develop Software

Test
Model-Based Development

- Visualization
- Analysis
- Testing
- Prototyping
- Specification Model
- Code
- Properties

Model-Based Development Tools

- Commercial Products
  - Esterel Studio and SCADE Studio from Esterel Technologies
  - SpecTRM from Safeware Engineering
  - Rhapsody from I-Logix
  - Simulink and Stateflow from Mathworks Inc.
  - Rose Real-Time from Rational
  - Etc. Etc.

Research Tools (many):

- RSML-e
- Nimbus
- Simulations of environment
- RSML Formal Models (~20 running concurrently)

How we Will Develop Software

- Concept Formulation
- Requirements
- Analysis
- Specification Model
- Implementation
- Integration
- System Test
- Unit Test
- Code
- Time

ROI with Model Based Development

Source: Esterel Technologies

A Simplified Development Model

- Requirements and Specification
- System Test
- Code
- Unit Test
- Time
Benefits of SCADE™: From V to Y Cycle

- Manual coding
- Use of a "regular" automatic code generator
- Use of the qualifiable code generator as a verification tool
- Use of the qualifiable code generator as a development tool
- Use of proof technology

Source: Esterel Technologies

Ongoing Research

Problems…

Perfection is Not Necessary

We Have Learned