Welcome to SENG 480B / CSC 485B / CSC 586B Self-Adaptive and Self-Managing Systems

Dr. Hausi A. Müller
Professor
Department of Computer Science
University of Victoria

http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
http://courses.seng.uvic.ca/courses/2013/summer/csc/485b
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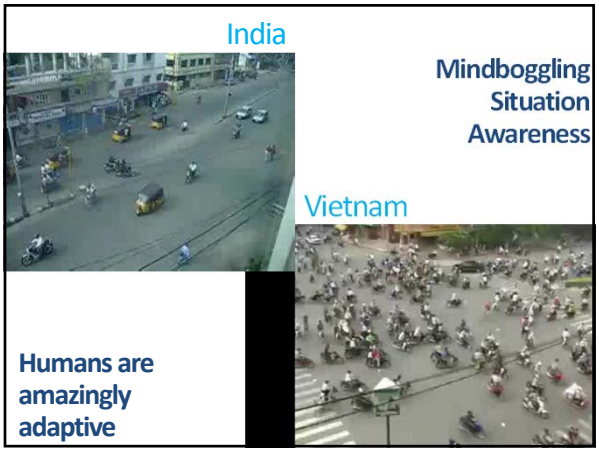
Self-Adaptive Systems (SAS)

- A SAS can alter its behaviour at runtime (on the fly) in response to its perception of
  - its environment
  - its own state

  by adapting itself
- SAS abilities
  - Assess its own behaviour
  - Observe its context or environment
  - Adapt without shut down

- Oreizy, et al.: An Architecture-Based Approach to Self-Adaptive Software, *IEEE Intelligent Systems*, pp. 54-62 (1999)
- MacManus: Why Software is More Important Than Sensors in the Internet of Things, ReadWriteWeb (2010)



First Class Participation Assignment

- Form groups of 2-4 people and discuss the following
- Define the SASs in the traffic examples
  - What is the environment of each SAS?
  - What is its own state and how does it change?
- From your own experience
  - What are your own abilities to handle such situations?
  - What environmental context and what of your own context is used in such a situation?
  - How do you actually adapt in such a situation?

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Course Description

- The simultaneous explosion of information and integration of technology and the continuous evolution from software intensive systems to systems of systems to ultra-large-scale (ULS) systems requires new and innovative approaches for building, running and managing software systems.
- A consequence of this continuous evolution is that software systems must become more versatile, flexible, resilient, dependable, robust, continuously available, energy-efficient, recoverable, customizable, self-healing, configurable, or self-optimizing by adapting to changing contexts and environments.

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Course Description

- One of the most promising approaches to achieving such properties is to equip software systems with self-adaptation and self-managing mechanisms.
- The topic of self-adaptive and self-managing systems has been studied in a variety of application areas, including autonomic computing, robotics, control systems, programming languages, software architectures, fault-tolerant computing, and biological computing.
- In this course, we focus on the software engineering aspects, including the methods, architectures, algorithms, techniques and tools support self-adaptive and self-managing behavior and exciting application areas, including autonomic computing and ULS systems.

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Course Web Sites

- Course outline
  - Undergraduate students
    - http://courses.seng.engr.uvic.ca/courses/2010/spring/seng/480b
    - http://courses.seng.uvic.ca/courses/2013/summer/seng/480b
  - Graduate students
    - http://courses.seng.uvic.ca/courses/2013/summer/csc/586b
- Course websites
  - http://www.rigiresearch.com/courses/sas
  - Syllabus
  - Lecture slides (pdf)
  - Assignments
  - Materials for reading assignments
  - Everything else you need to know about the course

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Syllabus Overview

- Dynamical software-intensive systems (1 week)
- ULS systems (2 weeks)
  - Reading Assignment Sections 1-3 of ULS Book
- Feedback control of computing systems (2 weeks)
  - Reading Assignment Hellerstein book/paper
- Autonomic systems (2 weeks)
  - Reading Assignment IBM Autonomic Blueprint & Kephart
- Self-adaptive systems (4 weeks)
  - Reading Assignment SE for Self-Adaptive Systems I & II

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Prerequisites and Related Courses

- Prerequisites (ideally, but not required)
  - SENG 371 Software Evolution
  - ELEC 360 Control Theory and Systems
  - Basics of software life cycle
  - Basics of software architecture

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Optional Textbooks Great Resources

- Northrop, et al.: Ultra-Large-Scale Systems. The Software Challenge of the Future. Software Engineering Institute, Carnegie Mellon University, 134 pages ISBN 0-9786956-0-7 (2006) http://www.sei.cmu.edu/uls
- Hellerstein, Diao, Parekh, Tilbury: Feedback Control of Computing Systems. John Wiley & Sons (2004)
- Kephart, Chess: The Vision of Autonomic Computing. IEEE Computer 36(1):41-50 (2003)
- IBM Corp.: An Architectural Blueprint for Autonomic Computing, Fourth Edition (2006) http://people.cs.kuleuven.be/~danny.weyns/csds/IBM06.pdf

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Optional Textbooks Great Resources

- de Lemos, Giese, Müller, Shaw (Eds.): Software Engineering for Self-Adaptive Systems II, LNCS 7475, Springer (2013) http://link.springer.com/book/10.1007/978-3-642-35813-5/page/1#
- H.C. Cheng, R. de Lemos, P. Inverardi, J. Magee (Eds.): Software Engineering for Self-Adaptive Systems, LNCS 5525, Springer (2009) http://www.springer.com/computer/swe/book/978-3-642-02160-2
- More resources on course website

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Assignments

- Reading assignment
  - ULS Book Section 1-3 on-line at
  - http://www.sei.cmu.edu/uls/the_report.html
- Assignment 1
  - A1 will be posted by Monday

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Deadlines

- Assignment 1
  - Thu, May 30 due
- Assignment 2
  - Thu, Jun 20 due
- Assignment 3
  - Thu, Jul 11 due
- Assignment 4
  - Thu, Jul 25 due
- Breaks
  - Reading Jun 4-11
  - Reading July 2
- Midterm
  - Fri, Jun 28
  - In class, closed books, closed notes
- Final
  - Aug 2013 to be scheduled by university
  - 3 hours, closed books, closed notes

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Course Requirements

- Undergraduate students
  - Assignments 48%
  - Midterm 12%
  - Final 30%
  - Class participation 10%
- Graduate students
  - Assignments 36%
  - Position paper 6%
  - Presentation 6%
  - Midterm 12%
  - Final 30%
  - Class participation 10%
- All materials discussed in class are required for the midterm and final examinations
- Passing the final exam is not required to pass the course, but of course highly recommended

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What Is Class Participation?

- Students should be prepared to **speak** in class—it is completely acceptable, indeed encouraged, for students to give a mini-presentation on a relevant subject
- Class participation does not just mean signing in—attendance will be taken regularly
- Class participation means speaking up in class, both with questions and answers
- Note that 10% class participation corresponds to a full letter grade (up or down)

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Questions?

- Organization of the course?
- Evaluation scheme?

- Study course web site carefully
- Visit course web site regularly
  - Web site and materials will change almost daily
- Other questions?!?

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Keep in mind …

- **Ask questions at any time ☺ !! ☺**
- **Let's make this a truly interactive course!!!**
- **Take full advantage of this opportunity to work on your communication skills ☺ !! ☺**

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