DISCRETE EVENT SYSTEMS

Roger Wattenhofer
Winter 2004 / 2005
Organization Matters

• Lecture
  – Thu, 1-3, ETA F5
  – Roger Wattenhofer

• Exercises
  – Thus, 3-5, ETA F5
  – Thomas Moscibroda, Stefan Schmid

• Course Material
  – Check www.dcg.ethz.ch → courses
Course Overview

- Part 1: Theory of Coke Vending Machines
  - Automata and Languages
  - Discrete Event Systems (DES) Models

- Part 2: Theory of Standing in a Line
  - Stochastic Processes
  - Markov Chains, Queuing Theory
  - Average-Case Analysis of DES

- Part 3: Theory of Renting Skis
  - Online Algorithms
  - Worst-Case Analysis of DES

- Plus a few smaller parts
Some Comments

• **English vs. German** language

• **First-timer** for me: **On-the-fly** preparation of course material (sorry!)
  – Slides/material on web site before lecture…

• **Differences** to last year’s course
  – A bit less petri nets, a bit less systems
  – Maybe a bit more theoretical… (sorry again!?)
  – Still I adopted some slides from Lothar Thiele and Thomas Erlebach

• **EE vs. CS** students…
Motivation: Physics

• Science is often based on natural phenomena

• Laws of physics: mechanics, gravitation, electrodynamics

• Continuous variables for mass, velocity, power, etc.

• Can be solved by differential equations
Motivation: Discrete Events

• Some complex systems are not [primarily/only] continuous
  – Computer systems
  – Communication networks
  – Business processes (“workflow”)
  – Transportation systems
  – Software

• Instead systems are determined by discrete events
  – Telephone calls
  – Customers arrivals

• Many variables we are interested in are discrete
  – How many ...?

Discrete Event Systems – R. Wattenhofer
Motivation: Discrete Event Systems

- System models
  - Find the right level of detail to model a real system
  - “Make everything as simple as possible, but not simpler”

- Correctness verification
  - Formal specification
  - Testing
  - Simulation

- Analysis and Optimization
Literature

- **Part 1**
- **Part 2**
  - Thomas Schickinger, Angelika Steger: Diskrete Strukturen, Band 2. Springer, 2001. (Chapters 1, 2, and 4)
- **Part 3**
- Plus lots of research papers…