Performance Evaluation

Chapter 0
Preamble

- Who are we?
- Research and teaching at „Fachgebiet Telematik/Rechnernetze“
- Course topics
- Resources

http://www.tu-ilmenau.de/telematik/leistungsbewertung

Who are we?

- Fachgebiet „Telematik/Rechnernetze“
  - Prof. Dr.-Ing. Günter Schäfer
guenterschaefer@tu-ilmenau.de
  - Web page: http://www.tu-ilmenau.de/telematik

- Teaching (WS 2013/2014):
  - VL Algorithmen und Programmierung für Informatiker
  - VL Netzalgorithmen
  - VL Network Security
  - VL Leistungsbewertung
  - VL Telematik 2
  - Projektseminar Simulative Evaluation von Internet Protokollfunktionen
  - Hauptseminar Telematik
Main Research Topics (of your Lecturer :o)

- In general: architectures and protocols of communication systems
  - Structure, design, performance evaluation, implementation, …
  - For all types of communication: computer networks, voice communication, data & multimedia content, technical communication (control devices)
  - Special focus on security issues

- More specifically:
  - Security requirements of communication services
    - Authenticity, integrity, confidentiality of peer entities and exchanged data
  - Security aspects of protocol mechanisms
    - What side “security relevant” side-effects are introduced by specific mechanisms?
  - How to protect communication infrastructures
    - Main issue: How to ensure availability of systems and offered services?

Topics of “Performance Evaluation”

- Part 1 – Simulation
  - General Introduction to performance analysis
  - Introduction to Discrete Event Simulation
  - Simulating a queue
  - A more elaborated queuing system
  - Short probability primer & Obtaining data from simulations
  - OMNeT++: A tool for simulation programming

- Part 2 – Analytical Performance Evaluation
  - Mathematical basics
  - Basics of traffic theory
  - Markov processes and elementary queuing systems
  - Networks of queues

- Part 3 – Evaluation of Complex Systems
  - Basics of analysis of variances (ANOVA)
If you would like to get a “hands-on” experience...

- There is an additional course – entitled “Simulative Evaluation of Protocol Functions” (project seminar, 4 SWS) – which is designed to give you a “hands-on” experience with network protocol functions and simulation studies:
  - Introduces a simulation environment and lets you add protocol functionality
  - Studied protocol functions: forwarding, routing, (interface queues), connection setup, error-, flow- and congestion control
  - Requires good programming skills
  - Knowledge of C++ is an asset (but not a pre-requisite)
  - Allows you to obtain in-depth knowledge of topics covered in Telematics I and the techniques and art of simulation studies – because afterwards “you did it” :o)

- Inscription and welcome lecture will take place summer semester =/

http://www.tu-ilmenau.de/telematik/simpro

Example: Evaluation of TCP Congestion Control
Formalities – Resources

- Slides are/will be available on the web site
- There will be no script;
  - Secondary literature is sometimes beneficial (and will be cited)
- To give due credit where credit is due:
  - Most slides of the first part of the lecture is selected from a course developed by Prof. Dr. Holger Karl, Universität Paderborn
  - In some chapters, material has been added from other sources as well (i.e. slides from Dr. A. Willig, Prof. Dr.-Ing. Adam Wolisz)
  - Second part of the course: based on slides of Dr.-Ing. Werner Horn
  - Many thanks in advance to everybody, who contributed material that may be adopted during the course of this class

Formalities – Some Books Recommendations


- General book on simulation, both excellent overview and in-depth treatment. Not oriented towards a single problem area.
- If you want to buy only one book, get this one. Expensive, though.
- Main source for the first part of this course!
Literature


- Very good book on performance analysis in general
- Treats simulation as well as mathematical tools (queuing theory) and experimental design
- Examples heavily focus on computer systems and their architecture.
- The treatment of simulation is not as thorough as in [LK00], but also very good.


Homepage for the simulation tool recommended in this class. Contains the manual in an online version, also links to other web sites relevant to this simulation tool.


Good book on C++, yet not for the faint of heart. :) If you have mastered it, you have probably understood C++ quite well. Make sure you read a recent edition, though – old versions to not match the current language definition.


A C++ textbook for readers with knowledge of the Java programming language.