Hardware/Software Co-Design of Embedded Systems
(ESE 566)
Fall 2002
Topic and Guidelines for Report 2

1 Goal

The goal of the second project is to develop and simulate the system-level description of an embedded application. VHDL, MATLAB or SystemC languages (SystemC preferably, as discussed in class) will be used to describe the system. Your task for the project includes:

- Understanding the specification
- Developing the specification algorithms
- Coding the algorithms using VHDL, MATLAB or SystemC
- Testing and simulating the specification

Testing and simulation of the specification are extremely important to assert the correctness of your design. Thus, your goal is not only in specifying the functionality of the system but also in designing a testbench for checking the correctness of the description. Your report must include *sufficient simulation evidence* to convince me (and you) that your specification is correct.

Please note that the specification you develop now will be used as a case study for your final project. Your final project will require performing the hardware/software co-design flow (1) for the application you specify now, and (2) one of the architectural elements (one reconfigurable architecture, one multimedia processor, one bus standard etc) you studied for Report 1. Failing in doing a good job now will also have a negative impact on your final project results.

2 Applications

You will pick one of the following applications as your case study.

- The *International Data Encryption Algorithm* - B. Schneier, *Other Block Ciphers*, Applied Cryptography, pp. 319-325, John Wiley, 1996.

- The *Automatic Target Recognition System* - K. Chia *et al*, "High-Performance Automatic Target Recognition Through Data-Specific VLSI", *IEEE Transactions on VLSI*, September, 1998.

- The MPEG algorithm.

3 Report

The report will include (at least) following sections:

- Introduction.
- Description of the functionality of your application.
- Organization of your specification, data structures, and algorithms.
- Description of the testbench.
- Simulation results and discussion of the results.
- Conclusions.
- References.

When specifying the system, keep in mind that the specification has to be used as an input for a codesign-tool that will explore different performance trade-offs. It is suggested (even though not required) that you develop several descriptions for the blocks that you consider to be the most important ones. As we discussed in class, the style of your specification is very important in influencing the architecture and performance of your implementation.

4 Grading

Grade = 40% completeness of the specification + 40% testing and simulation + 20% report.

Tentative due date: October 20 2002.