

## Compiler Design Homework 6 & 7

### Due Week 8, Week 9 and Week 10

Read Louden Section on “The Source Code Optimizer” on pages 10-11 and Chapter Chapters 8.0-8.1.1 (LLVM IR is Three-Address code) and 8.9.0 – 8.9.2

**READ** [Kaleidoscope Tutorial](#) Ch. 3.4 and Ch. 5 – 6

**READ** [LLVM Loop Terminology \(and Canonical Forms\)](#)

- Review earlier assigned readings as necessary for exam

### Prepare a sheet of notes for Mid-Term Exam

- One (8.5x11) page of notes, (you may use both sides)
- Handwritten in your own hand
- To be handed in on Week 7 after (with) the exam

**Due in class on Week 7**

**No Software Homework will be assigned or due for Week 7 Class**

**Midterm Exam in Week 7 class.** You will have two hours for the exam. It will cover the Overview and Front End topics up to LLVM IR. We will stop after the **definition** of SSA and Basic Blocks (BB). The midterm exam will **NOT** cover the details of IR syntax or Optimization. but there will be a question or two about the Preprocessor presentation which will be given before the Midterm Exam.

Do the electronic **midterm course evaluation** at home after the Midterm Exam.

### Spreadsheet Project (Week 9)

- Add **JIT support** to your spreadsheet (like Kaleidoscope).
- Convert the IR to executable code using the JIT and store it in the Cell node.
- Call the executable code in your spreadsheet.
- Submit a zip of the **code**, the **output** and **readme** as usual to **Blackboard before Week 9 class.**

### Optimizer Pass Research and Presentation (Week 8)

- Select two of the LLVM Optimizations from the list in class.
- **Due W8** produce Readable IR files (.ll) that demonstrate the **before** and **after** state of the IR for each of your selected optimizations. (I recommend using the Opt executable for this.) If printed diagrams are available that help demonstrate an optimization they should also be included.
- Submit a zip file containing a **readme file** and the **readable IR before and after files** and **any diagrams**. Be sure to **identify which files go with which optimization.**

## **Optimizer Pass Research and Presentation (Week 9)**

- **Due W9** produce a short research paper for each selected optimization. Your paper will be shared with everyone in the class. So make it presentable.
- You must include:
  - **The title of the optimization**
  - **The full description of the title of the optimization**
  - **The optimization's pass category**
  - **An explanation of the optimization**
  - **Your before and after code demonstrating the optimization**
  - **Any diagrams that demonstrate the optimization**
  - **A list of any Analysis Passes that must be run and available before the pass**
  - **A list of the Analysis Passes that are invalidated**
  - **A list of the Analysis Passes that are preserved**
  - **A list of the references that you used**
- Submit a final **draft** of your paper as a **.doc (not .docx)** or a **PDF** to **Blackboard** before the **Week 9** class.

## **Optimizer Pass Research and Presentation (Due Week 10 for some Week 9)**

- You should incorporate my comments and prepare a final paper to distribute to myself and your classmates ( preferably a day or two) before the **Week 10** class.
- Prepare a PowerPoint presentation for each optimization selected to be given in the Week 10 class. Each presentation should be 15 to 20 minutes and should include the points described for the paper especially the information about the Analysis Passes. Expect to have a little Q&A time.

**Be Prepared to present your research in class on Week 10. You will have 15 to 20 minutes for each presentation. Submit the PowerPoint files to Blackboard.**

**Let me know by email if you are comfortable doing one of your presentations in Week 9. (The Spreadsheet JIT due date will be set back a week for those who do this.)**