# Lab4 : Architecture Lab
# - PIPE Implementations

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# Overview

**In this lab,**

- You will learn about the design and implementation of pipelined Y86-64 processor

**Lab3 : Part A & B → done!**

**Lab4 : Part C : Pipelined Implementation (Lectures 11-14)**

- Optimize the performance of **ncopy**

# Configuration

## A Linux environment

- with flex and bison (installed on Martini)
- Martini recommended, but not necessary
- Mac users, there might be unknown issues

## Download Lab4.tar from eTL

```
$> tar xvf Lab4.tar
$> cd sim
$> make
```

# Part C : Pipelined Implementation

## Your Task : Optimize ncopy program

- Working directory : sim/pipe
- File to modify and submit : **pipe-full.hcl, ncopy.ys**
- Other versions of implementations
  - pipe-std.hcl : standard version
  - pipe-broken.hcl : doesn't control any hazard
- To test **ncopy.ys** :

```
$> cd sim/pipe
$> make          // test with standard PIPE simulator
    // 'make VERSION=full' to test with your simulator
$> ./correctness.pl
```

- To test your **PIPE simulator** :

```
$> cd sim/pipe
$> make  VERSION=full
$> psim ../y86-code/you_want_to_execute.yo
```

# Part C : Pipelined Implementation

## Verify your PIPE simulator

- First, prepare your version of simulator
- To run the **benchmark** programs :

```
$> cd sim/y86-code
$> make testpsim
```

- To run the **regression** test :

```
$> cd sim/ptest
$> make SIM= ../pipe/psim TFLAGS=-i
```

## Check the performance of ncopy

```
$> ./benchmark.pl
```

- See archlab.pdf for other helpers (*sdriver, ldriver, check-len.pl*)
- Loop unrolling (Section 5.8) will be helpful

# Submission Guideline

**Zip your files into `Lab4.tar`**

```
$> tar cvf Lab4.tar sim/pipe/pipe-full.hcl \
   sim/pipe/ncopy.ys
```

**Submit `Lab4.tar` on eTL**

**Due Date: Nov 22 (Thu) 11:59PM**

- Cut-off Date : Nov 25 (Sun) 11:59PM

**Late penalties will be applied independently**

# Grading Policy

## Part C : 100 points

- Correctness
  - PIPE simulator : 25 points (benchmarks and regression tests)
  - ncopy program : 25 points for passing `correctness.pl`
- Performance
  - 50 points by the result of `benchmark.pl` (0 point if not correct)

## Check `archlab.pdf` for more details

# Grading Policy

## Late submission penalty

- ~ 24 hrs: -20% of maximum score
- ~ 48 hrs: -40% of maximum score
- ~ 72 hrs: -60% of maximum score
- 72 hrs ~: cut-off (no more submission)
- Grace Days: no late penalties up to 3 days through this semester (automatically applied to HW #1 through #5)

## Plagiarism

- 0 for all assignments (worth of 35% of total grade!)
- We may use a plagiarism detector program over your codes
- OK to discuss ideas, but never share your codes in any form

# Q&A

**Thank you for paying attention.**