HW2 - Branch Predictor

TAs: **M11007428 林哲旭**
M11007423 葉亭妤
M11007419 林書弘
M11007429 卓躍

Introduction

- In this assignment, you are going to evaluate the effectiveness of a few simple branch prediction schemes

- For each branch prediction scheme, you need to write a program that reads in the given branch trace and simulates the scheme to report the prediction accuracy

- $accuracy = \frac{\#\ correctly\ predicted\ branches}{\#\ branches}$

Branch Trace

- Each line shows one branch instruction
  - The first field: the address of the branch instruction
  - The second field: the character "T" or "N" for branch taken or not taken.
- E.g.:

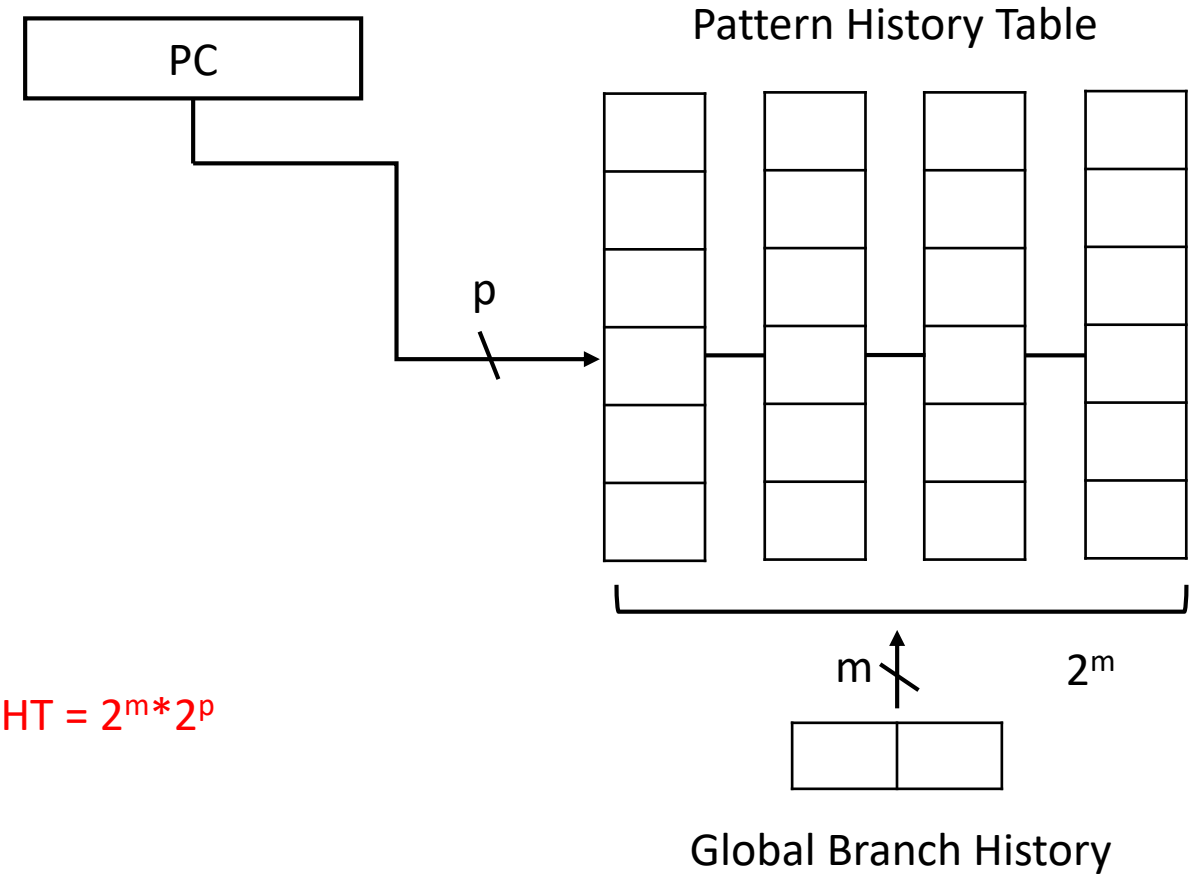
  3086629576 T

  3086629604 T

  3086629599 N

  3086629604 T

Task 1: Two-Level Global Branch Predictor (Correlating Branch Predictor)



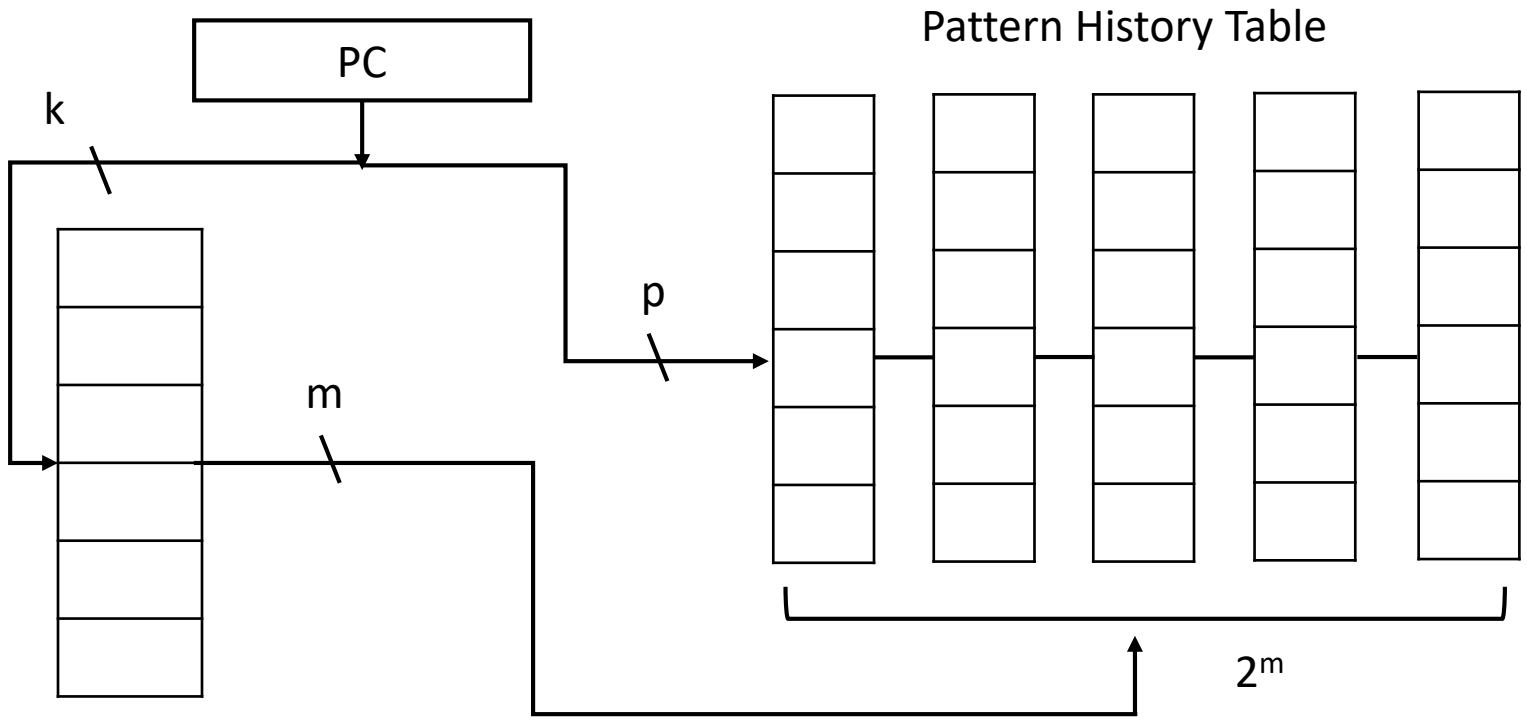
entries in PHT = $2^m * 2^p$

Task 1: Two-Level Global Branch Predictor (Correlating Branch Predictor)

- Assume that there are 1K (1024) entries in the Pattern History Table with a 2-bit predictor per entry
  - A) Implement a (2, 2) predictor
  - B) Repeat A) with various sizes of Global Branch History
    - m = 4, 6, and 8
- Note
  - Index size in Branch address (p) varies with respect to various m
    - $2^m * 2^p = 1024$
  - Suppose each predictor has an initial state of "Strongly Taken"
  - Tabulate your results and analyze how m and p affect prediction accuracy in the delivered report
    - Fix the entry count in PHT (i.e., m+p=10)
    - You may need to conduct more combinations of m and p

Task 2: Two-Level Local Branch Predictor

entries in PHT = $2^m * 2^p$



Local Branch History Table

LBHT size = $2^k * m$

Task 2: Two-Level Local Branch Predictor

- Assume that there are 1K (1024) entries in the Pattern History Table with a 2-bit predictor per entry
  - A) Implement a two-level local branch predictor with k=5, m=2, and p=8
  - B) Repeat A) with the following various configurations
    - k=5, m=2, and p=8
    - k=4, m=4, and p=6
    - k=3, m=8, and p=2
- Note
  - Suppose each predictor has an initial state of "Strongly Taken"
  - Tabulate your results and analyze how k, m, and p affect prediction accuracy in the delivered report
    - Fix the LBHT size (i.e., 2^k*m=64) and the entry count in PHT (i.e., m+p=10)
    - You may need to conduct more combinations of k, m, and p

Delivery & Deadline

- You need to deliver a zip/tar file including the following items
  - Source code
  - Report of the tabulated results

- Deadline: End of 2022/12/5 (Mon). No late delivery is allowed