32KB L-TAGE Branch Predictor

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- Tage predictor:
  - 12 TAGE tables, 1 bimodal table
  - Each table has from 2^9 to 2^11 entries
  - Entries are sized from 7 to 15 tag bits, 3 pred bits
  - Entries are accessed by XORing PC and history bits (from 5 to 640 history bits)
  - Total size: 237.5KB
- Loop Predictor:
  - 512 entries
  - 14 bit tag, 28 other bits
  - Counter checks to see if the current PC is a loop branch
- Clock:
  - A clock resets the usefulness of all tables every 2^20 branches. This helps limit conflicts between branches that are very far apart.

Results

- Final AMEAN: 3.647
- Optimizations from the original paper:
  - Clock updates every 2^20 bits, instead of 2^18
  - History sizes were updated
  - Loop predictor max age increased from 32 to 256
  - Loop predictor total size decreased from 1024 to 512
  - Bimodal table decreased from 2^14 to 2^13 entries
  - Bimodal table prediction bits increased to 2 bits for all

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jayson@jayson-ThinkPad-T470:~/Code/CSE6421BranchPrediction/bpc6421AU17/scripts$
./getdata.pl -d ../results/LTAGE/

ResultDirs ==>          results/LTAGE/

LONG-SPEC2K6-00                 1.825
LONG-SPEC2K6-01                 7.770
LONG-SPEC2K6-02                 0.596
LONG-SPEC2K6-03                 0.819
LONG-SPEC2K6-04                 8.912
LONG-SPEC2K6-05                 5.129
LONG-SPEC2K6-06                 0.663
LONG-SPEC2K6-07                 9.454
LONG-SPEC2K6-08                 0.742
LONG-SPEC2K6-09                 4.023
SHORT-FP-1                      1.442
SHORT-FP-2                      0.753
SHORT-FP-3                      0.031
SHORT-INT-1                     0.331
SHORT-INT-2                     6.004
SHORT-INT-3                     7.695
SHORT-MM-1                      7.874
SHORT-MM-2                      9.613
SHORT-MM-3                      0.119
SHORT-SERV-1                    1.403
SHORT-SERV-2                    1.415
SHORT-SERV-3                    3.630

AMEAN                           3.647
```

Sources: L-TAGE: https://www.jilp.org/vol9/v9paper6.pdf
L-TAGE: https://www.irisa.fr/caps/people/seznec/L-TAGE.pdf
PPM: https://www.jilp.org/vol7/v7paper10.pdf