# **CS6290 Project2 Report**

In this experiment, I need to find the best configuration for different traces. My strategy is to run most of the configurations within the configuration space and record the data in a CSV table. The obtained data will be sorted in descending order of IPC, prioritizing the highest IPC. For configurations with the similar IPC, the one with a higher average hardware utilization rate is chosen.

# Deepsjeng531\_2M

This is the top 30 configuration combinations I have recorded:

As can be seen, the highest IPC is obtained when using the Yeh-Patt Predictor with h=12, p=15, fetch width=8, numbers of entries per FU=8, ALU=4, MUL=4, and LSU=2. However, it can be observed that the IPCs of the top ten configurations are very close, but they have different average utilizations of the dispatch queue. Among the top twenty, the highest utilization rate is 31%, and an IPC of 1.8345 is achieved.

Therefore, the configuration we chose is:

Yeh-Patt Predictor, h=12, p=15, fetch width=8, numbers of entries per fu = 4, alu = 4, mul = 3, lsu = 2

ranch Pridictor	H	P	fetch width	numbers of entries per fu	alu fu	mul fu	lsu fu	branch misprediction	dispatch queue avg	cycles	ipc
2	12	15	8	8	4	4	2	22552	17. 259162	1078119	1.855083
2	12	15	8	8	4	3	2	22550	18. 888703	1079465	1.85277
2	12	15	8	7	4	4	2	22551	19. 372487	1079554	1.852617
2	12	15	8	8	4	2	2	22550	20. 867042	1080420	1.851132
2	12	15	8	7	4	3	2	22551	21. 125238	1080463	1.851058
2	12	15	8	6	4	4	2	22550	21. 966468	1080904	1.850303
2	12	15	8	7	4	2	2	22552	23. 188443	1081351	1.84953
2	12	15	8	6	4	3	2	22550	23. 840688	1081663	1.84900
2	12	15	8	5	4	4	2	22552	25. 233478	1082757	1.84713
2	12	15	8	6	4	2	2	22552	25. 988586	1083236	1.8463
2	12	15	8	5	4	3	2	22555	27. 202487	1084256	1.84458
2	12	15	8	4	4	4	2	22554	29. 594541	1086826	1.84022
2	12	15	8	5	4	2	2	22554	29. 594541	1086826	1.84022
2	11	14	8	8	4	4	2	23472	15. 885993	1089048	1.83646
2	12	15	8	4	4	3	2	22557	31. 840332	1090203	1.83452
2	11	14	8	8	4	3	2	23471	17. 422843	1090268	1.83441
2	11	14	8	7	4	4	2	23472	17. 878163	1090381	1.83422
2	11	14	8	8	4	2	2	23470	19. 277394	1091101	1.83301
2	11	14	8	7	4	3	2	23470	19. 52458	1091159	1.83291
2	11	14	8	6	4	4	2	23469	20. 319728	1091548	1.8322
2	11	14	8	7	4	2	2	23468	21. 512796	1091912	1.83164
2	11	14	8	6	4	3	2	23465	22. 146689	1092159	1.83123
2	11	14	8	5	4	4	2	23466	23. 470953	1093182	1.82952
2	11	14	8	6	4	2	2	23465	24. 189187	1093604	1.82881
2	12	15	8	4	4	2	2	22558	34. 356859	1093946	1.82824
2	11	14	8	5	4	3	2	23467	25. 347995	1094540	1.82725
2	11	14	8	4	4	4	2	23464	27. 683862	1096854	1.82339
2	11	14	8	5	4	2	2	23464	27. 683862	1096854	1.82339
2	11	14	8	4	4	3	2	23465	29. 883288	1100016	1.81815
2	11	14	8	4	4	2	2	23465	32. 340838	1103549	1.81233
2			8	8	3	3	2	22543	23. 329809	1105514	1.80911
2			8	7	3	3	2	22543	25. 754673	1107196	1.80636
2			8	8	3	2	2	22543	25. 754647	1107196	1.80636
2			8	7	3	2	2	22545	28. 156724	1108503	1.80423
2			8	6	3	3	2	22545	28, 548166	1108775	1. 80379
2			8	6	3	2	2	22545	31. 077389	1111275	1. 79973

#### Leela541 2M

Regarding this trace, it can be seen that the highest IPC can reach 2.278893 when using: Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=8, ALU=4, MUL=4, and LSU=2. However, the IPCs of the top twenty configurations are all very close, so we need to look for configurations with high hardware utilization rates. It can be observed that the utilization of the dispatch queue reaches up to 20.27 in the top twenty, while maintaining an IPC of 2.2708.

Therefore, the configuration we choose is the one has high ipc and high hardware utilization:

Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=6, ALU=4, MUL=2, and LSU=2.

2 11 14 8 8 8 4 4 2 31153 15.569605 877619 2.2788 2 11 14 8 8 7 4 4 2 31153 15.085455 87777 2.2784 2 11 14 8 8 7 4 4 2 31154 16.13792 877848 2.27852 2 11 14 8 8 7 4 3 2 31154 16.0342 877848 2.27852 2 11 14 8 8 6 4 3 2 31154 16.0402 87784 2.27802 2 11 14 8 8 6 6 4 4 2 31153 16.089417 878406 2.27862 2 11 14 8 8 6 6 4 4 2 31153 17.91274 878428 2.27872 2 12 15 8 8 8 4 4 2 2 31153 17.91274 878428 2.27872 2 12 15 8 8 8 4 4 2 2 31159 13.526393 878466 2.27873 2 12 15 8 8 8 4 4 2 2 31159 15.03864 878612 2.27861 2 12 15 8 8 8 4 2 2 31119 15.03864 878612 2.27861 2 12 15 8 8 8 4 2 2 31119 15.03864 878612 2.27861 2 12 15 8 8 8 4 2 2 31119 15.03864 878612 2.27861 2 12 15 8 8 8 4 2 2 31119 16.138627 878677 2.27862 2 12 15 8 8 8 4 2 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 8 4 3 2 31119 16.03865 87871 2.27860 2 12 15 8 8 6 4 4 2 31119 17.90664 878272 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878272 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878272 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878272 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878227 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878227 2.27472 2 12 15 8 6 6 4 2 2 31119 17.90664 878227 2.27472 2 12 15 8 6 6 4 2 2 31119 19.03007 888212 2.27665 2 11 14 8 8 6 6 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 3 3119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 888517 2.25866 2 11 14 8 8 4 4 2 2 31119 2.33650 88912 2.27673 2 12 15 8 8 4 4 2 2 31119 2.33650 88912 2.27673 2 12 15 8 8 4 4 2 2 31119 2.33650 889212 2.27673 2 12 15 8 8 4 4 2 2 31119 2.33650 889212 2.29673 2 12 15	Branch Pridictor H	P	fetch width	numbers of entries per fu	alu fu	mul fu	lsu fu	branch misprediction	dispatch queue avg	cycles	ipc
2 11 14       8       8       4       2       2       31154       16,33792       877848 2,27825         2 11 14       8       8       8       7       4       3       2       31154       16,34342       877894 2,27815         2 11 14       8       8       8       4       3       2       31153       16,999417       878408 2,27867         2 11 14       8       6       4       4       2       31153       16,999417       878408 2,27867         2 12 15       8       8       4       4       2       31153       16,999417       878406 2,27867         2 12 15       8       8       4       4       2       31119       13,526393       878456 2,2767         2 12 15       8       8       4       4       2       31119       13,526393       878456 2,2767         2 12 15       8       8       7       4       4       2       31119       13,526393       878456 2,2767         2 12 15       8       7       4       4       2       31119       13,526393       878456 2,2767         2 12 15       8       8       4       2       31119       16,342635	2 11	14	8	8	4	4	2	31153	13. 569605	877619	2. 278893
2 11 14         8         7         4         3         2         31154         16.34342         877894         2.27817           2 11 14         8         8         4         3         2         31154         14.706402         877894         2.27867           2 11 14         8         6         4         4         2         31153         16.989417         878402         2.27687           2 11 14         8         6         4         4         2         31153         17.912754         878428         2.2767           2 12 15         8         8         4         4         2         31119         13.526393         878456         2.2767           2 11 14         8         6         4         3         2         31119         15.03664         878612         2.2763           2 12 15         8         7         4         4         2         31119         16.03664         87817         2.2760           2 12 15         8         8         4         2         31119         16.34625         87817         2.2760           2 12 15         8         8         4         3         2         31119         16.346	2 11	14	8	7	4	4	2	31153	15. 085455	877787	2.278457
2 11 14         8         8         4         3         2         31154         14.706402         877941         2.27805           2 11 14         8         6         4         4         2         31153         10.989417         878408         2.27675           2 12 15         8         8         4         4         2         31119         13.52639         878456         2.27671           2 12 15         8         8         4         4         2         31119         13.52639         878456         2.27672           2 12 15         8         8         4         4         2         31119         15.036864         878612         2.27631           2 12 15         8         8         4         2         31119         16.138867         878677         2.27631           2 12 15         8         8         4         2         31119         16.38667         878677         2.27631           2 12 15         8         8         4         2         31119         16.466041         878710         2.27631           2 12 15         8         6         4         4         2         31119         16.97441         879272 <td>2 11</td> <td>14</td> <td>8</td> <td>8</td> <td>4</td> <td>2</td> <td>2</td> <td>31154</td> <td>16. 13792</td> <td>877848</td> <td>2. 278299</td>	2 11	14	8	8	4	2	2	31154	16. 13792	877848	2. 278299
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2         11         14         8         5         4         4         2         31154         19.614177         879991         2.27278           2         11         14         8         6         4         2         2         31154         20.274538         880729         2.27063           2         12         15         8         6         4         2         31119         19.634007         80812         2.27063           2         12         15         8         6         4         2         31119         20.301048         881513         2.26882           2         11         14         8         5         4         3         2         31152         21.331385         882571         2.26862           2         12         15         8         5         4         3         2         31159         21.331385         882571         2.26616           2         12         15         8         5         4         3         2         31154         23.316896         885471         2.2662           2         11         14         8         4         4         4         2         31154	2 12	15	8	7	4	2	2	31119	17. 90664	879227	2.274725
2       11       14       8       6       4       2       2       31154       20.274538       880729       2.27084         2       12       15       8       5       4       4       2       31119       19.634007       880812       2.27084         2       12       15       8       6       4       2       2       31119       20.301048       881513       2.26882         2       11       14       8       5       4       3       2       31152       21.331385       882571       2.26862         2       12       15       8       5       4       3       2       31119       21.320655       88346       2.26386         2       11       14       8       4       4       4       2       31154       23.31696       885471       2.25866         2       11       14       8       5       4       2       2       31154       23.356767       885661       2.25866         2       11       14       8       5       4       2       2       31119       23.345092       886191       2.25677         2       12 <t< td=""><td>2 12</td><td>15</td><td>8</td><td>6</td><td>4</td><td>3</td><td>2</td><td>31119</td><td>18. 444624</td><td></td><td></td></t<>	2 12	15	8	6	4	3	2	31119	18. 444624		
2       12       15       8       5       4       4       2       31119       19.634007       880812       2.27063         2       12       15       8       6       4       2       2       31119       20.301048       881513       2.26862         2       11       14       8       5       4       3       2       31152       21.331385       882571       2.26610         2       12       15       8       5       4       3       2       31119       21.320655       883462       2.26386         2       11       14       8       4       4       4       2       31154       23.316896       885471       2.25868         2       11       14       8       4       4       4       2       31154       23.316896       885471       2.25868         2       11       14       8       5       4       2       2       31154       23.356767       885661       2.25677         2       12       15       8       4       4       4       2       31119       23.345092       886912       2.25677         2       12	2 11	14	8	5	4	4	2	31154	19. 614177	879991	2. 272751
2       12       15       8       6       4       2       2       31119       20.301048       881513       2.26882         2       11       14       8       5       4       3       2       31152       21.331355       882571       2.26382         2       12       15       8       5       4       3       2       31119       21.32655       883462       2.26382         2       11       14       8       4       4       4       2       31154       23.316996       885471       2.25862         2       11       14       8       5       4       2       31154       23.356767       885661       2.25682         2       12       15       8       4       4       4       2       31119       23.35692       885612       2.256382         2       12       15       8       4       4       4       2       31119       23.345092       886219       2.256382         2       12       15       8       5       5       4       2       2       31119       23.38716       886399       2.25632         2       12       <	2 11	14	8	6	4	2	2	31154	20. 274538	880729	2. 270846
2 11 14       8       5       4       3       2       31152       21.331385       882571       2.26610         2 12 15       8       5       4       3       2       31119       21.320655       883446       2.26386         2 11 14       8       4       4       4       2       31154       23.316896       885471       2.25866         2 11 14       8       5       4       2       2       31154       23.346092       88619       2.2586         2 12 15       8       4       4       4       2       31119       23.345092       886219       2.2567         2 12 15       8       5       4       2       2       31119       23.345092       886219       2.2567         2 12 15       8       5       4       4       2       31119       23.345092       886219       2.2567         2 12 15       8       5       4       4       2       2       31119       23.345092       886219       2.2563         2 12 15       8       5       4       4       2       2       31119       23.345092       886219       2.24661         2 12 15       8<	2 12	15	8	5	4	4	2	31119	19. 634007	880812	2.270632
2       12       15       8       5       4       3       2       31119       21.32065       883446       2.26386         2       11       14       8       4       4       4       2       31154       23.316896       885471       2.2586         2       11       14       8       5       4       2       2       31154       23.356767       885661       2.2586         2       12       15       8       4       4       4       2       31119       23.347092       886619       2.2567         2       12       15       8       5       4       2       2       31119       23.347092       886619       2.2567         2       12       15       8       5       4       2       2       31119       23.347092       886199       2.2563         2       11       14       8       4       4       3       2       31119       23.34716       886399       2.2563         2       12       15       8       4       4       3       2       31119       25.123666       889412       2.24867         2       11       14 </td <td>2 12</td> <td>15</td> <td>8</td> <td>6</td> <td>4</td> <td>2</td> <td>2</td> <td>31119</td> <td>20. 301048</td> <td>881513</td> <td>2.268826</td>	2 12	15	8	6	4	2	2	31119	20. 301048	881513	2.268826
2       11       14       8       4       4       4       2       31154       23.31686       885471       2.25868         2       11       14       8       5       4       2       2       31154       23.31686       885471       2.25868         2       12       15       8       4       4       4       2       31119       23.345092       886919       2.25677         2       12       15       8       5       4       2       2       31119       23.38716       886999       2.2567         2       11       14       8       4       4       2       2       31119       23.38716       886919       2.24867         2       12       15       8       4       4       4       3       2       31119       23.38716       886919       2.24867         2       12       15       8       4       4       3       2       31119       25.123686       889412       2.24867         2       11       14       8       4       4       2       2       31150       27.34648       894187       2.23666         2       12 </td <td>2 11</td> <td>14</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>31152</td> <td>21. 331385</td> <td>882571</td> <td>2. 266107</td>	2 11	14	8	5	4	3	2	31152	21. 331385	882571	2. 266107
2       11       14       8       5       4       2       2       31154       23.356767       885661       2.258         2       12       15       8       4       4       4       2       31119       23.34502       886219       2.2567         2       12       15       8       5       4       2       2       31119       23.38716       86639       2.2563         2       11       14       8       4       4       3       2       31152       25.123666       889412       2.24867         2       12       15       8       4       4       3       2       31119       25.123943       890060       2.2470         2       11       14       8       4       4       2       2       31150       27.34648       894187       2.2366         2       12       15       8       4       4       2       2       31119       27.33527       89491       2.23678         2       12       15       8       4       4       2       2       31119       27.33527       89491       2.23678         2       11       14	2 12	15	8	5	4	3	2	31119	21. 320655	883446	2. 263862
2 12 15       8       4       4       4       2       31119       23.345092       886219       2.25677         2 12 15       8       5       4       2       2       31119       23.38716       886399       2.2563         2 11 14       8       4       4       3       2       31152       25.12366       889412       2.2466         2 12 15       8       4       4       3       2       31119       25.123943       890060       2.2470         2 11 14       8       4       4       2       2       31150       27.34648       894187       2.23666         2 12 15       8       4       4       2       2       31119       27.335927       894941       2.23478         2 11 14       8       8       3       3       2       31151       17.902243       905439       2.20867         2 12 15       8       8       8       3       3       2       31114       17.802243       905439       2.20867         2 12 15       8       8       8       3       3       2       31114       17.802243       905439       2.20568         2 12 15       8<	2 11	14	8	4	4	4	2	31154	23. 316896	885471	2. 258685
2       12       15       8       5       4       2       2       31119       23.38716       886399       2.2563         2       11       14       8       4       4       3       2       31152       25.12366       889412       2.2476         2       12       15       8       4       4       3       2       31119       25.123943       890060       2.2470         2       11       14       8       4       4       2       2       31150       27.34648       894187       2.23666         2       12       15       8       4       4       2       2       31119       27.335927       894941       2.23476         2       12       15       8       4       4       2       2       31119       27.335927       894941       2.23476         2       11       14       8       8       3       3       2       31119       17.902243       905499       2.20887         2       12       15       8       8       3       3       2       31114       17.80264       906209       2.20686         2       11       14<	2 11	14	8	5	4	2	2	31154	23. 356767	885661	2. 2582
2     11     14     8     4     4     3     2     31152     25.12368     889412     2.24867       2     12     15     8     4     4     3     2     31119     25.123943     890060     2.2476       2     11     14     8     4     4     2     2     31150     27.34648     894187     2.23666       2     12     15     8     4     4     2     2     31119     27.335927     894941     2.23478       2     11     14     8     8     3     3     2     31151     17.902243     90549     2.20887       2     12     15     8     8     3     3     2     31114     17.802243     90549     2.20887       2     12     15     8     8     3     3     2     31114     17.902243     90549     2.20568       2     11     14     8     7     3     3     2     31114     17.90243     906748     2.20568       2     11     14     8     7     3     3     2     31149     19.73673     906768     2.20568       2     12     15     8	2 12	15	8	4	4	4	2	31119	23. 345092	886219	2. 256779
2     12     15     8     4     4     3     2     31119     25.123943     890060     2.2470       2     11     14     8     4     4     2     2     31150     27.346468     894187     2.23678       2     12     15     8     4     4     2     2     31119     27.335927     894941     2.23478       2     11     14     8     8     3     3     2     31151     17.902243     905499     2.20887       2     12     15     8     8     3     3     2     31114     17.888672     906209     2.20698       2     11     14     8     7     3     3     2     31149     19.726745     906748     2.20566       2     12     15     8     8     3     2     31149     19.73073     906766     2.20564       2     12     15     8     7     3     3     2     31149     19.73073     906766     2.20566       2     12     15     8     7     3     3     2     31149     19.73073     906766     2.20569       2     12     15     8     7	2 12	15	8	5	4	2	2	31119	23. 38716	886399	2. 25632
2     11     14     8     4     4     2     2     31150     27.346468     894187     2.23666       2     12     15     8     4     4     2     2     31119     27.335927     894941     2.23478       2     11     14     8     8     3     3     2     31151     17.902243     905439     2.20868       2     12     15     8     8     3     3     2     31114     17.888672     906209     2.20698       2     11     14     8     7     3     3     2     31149     19.726745     906765     2.20566       2     12     15     8     7     3     3     2     31149     19.73073     906766     2.20566       2     12     15     8     7     3     3     2     31141     19.699546     907596     2.20362	2 11	14	8	4	4	3	2	31152	25. 123686	889412	2. 248677
2     12     15     8     4     4     2     2     31119     27.335927     894941     2.23478       2     11     14     8     8     3     3     2     31151     17.902243     905439     2.20887       2     12     15     8     8     3     3     2     31114     17.888672     906209     2.20568       2     11     14     8     7     3     3     2     31149     19.726745     906748     2.20568       2     11     14     8     8     3     2     2     31149     19.73073     906766     2.20568       2     12     15     8     7     3     3     2     31149     19.73073     906766     2.20568       2     12     15     8     7     3     3     2     31149     19.69954     907596     2.20362	2 12	15	8	4	4	3	2	31119	25. 123943	890060	2. 24704
2     11     14     8     8     3     3     2     31151     17.902243     905439     2.20887       2     12     15     8     8     3     3     2     31114     17.888672     906209     2.20698       2     11     14     8     7     3     3     2     31149     19.726745     906748     2.20568       2     11     14     8     8     3     2     2     31149     19.73073     906766     2.20564       2     12     15     8     7     3     3     2     31114     19.699546     907596     2.20362	2 11	14	8	4	4	2	2	31150	27. 346468	894187	2. 236669
2     12     15     8     8     3     3     2     31114     17.888672     906209     2.20698       2     11     14     8     7     3     3     2     31149     19.726745     906748     2.20568       2     11     14     8     8     3     2     2     31149     19.73073     906766     2.20564       2     12     15     8     7     3     3     2     31114     19.699546     907596     2.20362	2 12	15	8	4	4	2	2	31119	27. 335927	894941	2. 234784
2     11     14     8     7     3     3     2     31149     19.726745     906748     2.20568       2     11     14     8     8     3     2     2     31149     19.73073     906766     2.20564       2     12     15     8     7     3     3     2     31114     19.699546     907596     2.20362	2 11	14	8	8	3	3	2	31151	17. 902243	905439	2.208873
2     11     14     8     8     3     2     2     31149     19.73073     906766     2.20564       2     12     15     8     7     3     3     2     31114     19.699546     907596     2.20362	2 12	15	8	8	3	3	2	31114	17. 888672	906209	2.206996
2 12 15 8 7 3 3 2 31114 19.699546 907596 2.20362	2 11	14	8	7	3	3	2	31149	19. 726745	906748	2.205684
	2 11	14	8	8	3	2	2	31149	19. 73073	906766	2.205641
2 12 15 8 8 3 2 2 31114 19.705232 907601 2.20361	2 12	15	8	7	3	3	2	31114	19. 699546	907596	2. 203624
	2 12	15	8	8	3	2	2	31114	19. 705232	907601	2. 203611

# Xz557\_2M:

Regarding this trace, it can be seen that the highest IPC can reach 1.068267 when using: Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=4, ALU=4, MUL=2, and LSU=2. At the same time, this configuration ensures a high hardware utilization rate.

Therefore, the configuration we have chosen is:

Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=4, ALU=4, MUL=2, and LSU=2.

				numbers of entries per fu	alu fu	ı mul						
	11		8	4	4	4	2	2	1234	239. 546832		
2	11	14	8	4	4	1	3	2	1234	239. 158282	1872192	1.06826
	11		8	4	4	4	4	2	1234	238. 787245	1872192	1.06826
2	11	14	8	5	4	1	2	2	1234	238. 787245	1872192	1.06826
2	11	14	8	5	4	4	3	2	1234	238. 347898	1872192	1.06826
2	11	14	8	5		1	4	2	1234	237. 935475	1872192	1.06826
2	11	14	8	6	4	4	2	2	1234	238. 099204	1872192	1.0682
2	11	14	8	6	4	4	3	2	1234	237. 621464	1872192	1.0682
2	11	14	8	6	4	1	4	2	1234	237. 166767	1872192	1.0682
2	11	14	8	7	4	4	2	2	1234	237. 469045	1872192	1.0682
2	11	14	8	7	4	1	3	2	1234	236. 941981	1872192	1.0682
2	11	14	8	7	4	4	4	2	1234	236. 419832	1872192	1.0682
2	11	14	8	8	4	4	2	2	1234	236. 866839	1872192	1.0682
2	11	14	8	8	4	4	3	2	1234	236. 271257	1872192	1.0682
2	11	14	8	8	4	1	4	2	1234	235. 682512	1872192	1.0682
2	12	15	8	4	4	1	2	2	1236	239. 545007	1872202	1.0682
2	12	15	8	4	4	4	3	2	1236	239. 15646	1872202	1.0682
2	12	15	8	4	4	1	4	2	1236	238. 785424	1872202	1.0682
2	12	15	8	5	4	4	2	2	1236	238. 785424	1872202	1.0682
2	12	15	8	5	4	4	3	2	1236	238. 34608	1872202	1.0682
2	12	15	8	5	4	4	4	2	1236	237. 933659	1872202	1.0682
2	12	15	8	6	4	4	2	2	1236	238. 097387	1872202	1.0682
2	12	15	8	6	4	1	3	2	1236	237. 619649	1872202	1.0682
2	12	15	8	6	2	4	4	2	1236	237. 164955	1872202	1.0682
2	12	15	8	7	4	1	2	2	1236	237. 467232	1872202	1.0682
2	12	15	8	7	2	4	3	2	1236	236. 940171	1872202	1.0682
2	12	15	8	7	4	1	4	2	1236	236. 418025	1872202	1.0682
2	12	15	8	8	4	4	2	2	1236	236. 865029	1872202	1.0682
2	12	15	8	8	4	1	3	2	1236	236. 26945	1872202	1.0682
2	12	15	8	8	4	1	4	2	1236	235. 680708	1872202	1.0682
2	11	14	8	4	:	3	2	2	1234	239. 739376	1875389	1.0664
2	11	14	8	4		3	3	2	1234	239. 331015	1875389	1.0664
	11		8	5		3	2	2	1234	239. 039671		
	11		8	5		3	3	2	1234	238, 568461		
	11		8	6		3	2	2	1234	238, 388376		
	11		8	6		3	3	2	1234	237, 864782		

#### Mcf505

Regarding this trace, it can be observed that the highest IPC can reach 1.278557 when using: Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=8, ALU=4, MUL=3, and LSU=2. This configuration also ensures a high hardware utilization rate, being 100 cycles faster compared to the second one. Therefore, the configuration we have chosen is: Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=8, ALU=4, MUL=3, and LSU=2.

		P		numbers of entries per fu						cycles	ipc
2	11		8	8		3	2		68. 274644		1. 278557
2			8	8		4	2		65. 997914		1. 278453
2			8	7	4	4	2	31253	68. 631002		1. 278368
2			8	8	4	2	2	31250	70. 483907		1. 278284
2			8	7	4	3	2	31251	70. 778209		1. 278244
2			8	6	4	4	2	31257	71. 636369		1. 278097
2			8	7	4	2	2	31257	72. 938068	1564965	1. 277984
2	11		8	6	4	2	2	31252	75. 87702		1. 277951
2		14	8	6	4	3	2	31255	73. 655824	1565011	1. 277946
2	11		8	5		4	2	31255	75. 072104		1. 277852
2	11		8	5	4	3	2	31253	77. 010611	1565241	1. 277759
2		15	8	8	4	3	2	31672	68. 332191	1565354	1. 277666
2		15	8	8	4	4	2	31676	65. 946678	1565590	1. 277474
2	12	15	8	7	4	4	2	31679	68. 354002	1565707	1. 277378
2		15	8	8	4	2	2	31676	70. 257194	1565738	1. 277353
2	11	14	8	4	4	4	2	31256	78. 930944	1565767	1. 277329
2	11	14	8	5	4	2	2	31256	78. 930944	1565767	1. 277329
2	12	15	8	7	4	3	2	31677	70. 541991	1565788	1. 277312
2	12	15	8	6	4	4	2	31682	71. 417163	1565964	1. 277169
2	12	15	8	7	4	2	2	31682	72. 744305	1566100	1. 277058
2	12	15	8	6	4	2	2	31675	75. 752948	1566102	1. 277056
2	12	15	8	6	4	3	2	31679	73. 534833	1566146	1. 27702
2	12	15	8	5	4	4	2	31675	75. 02176	1566235	1. 276948
2	12	15	8	5	4	3	2	31674	76. 91631	1566422	1. 276798
2	12	15	8	4	4	4	2	31679	78. 830413	1566933	1. 276379
2	12	15	8	5	4	2	2	31679	78. 830413	1566933	1. 276379
2	11	14	8	4	4	3	2	31254	80. 752992	1568859	1. 274812
2	12	15	8	4	4	3	2	31672	80. 821993	1569901	1. 273966
2	11	14	8	4	4	2	2	31260	82. 261654	1571214	1. 272901
2	12	15	8	4	4	2	2	31686	81. 976705	1572492	1. 271867
2	12	15	4	8	4	2	2	31495	37. 323704	1575635	1. 26933
2	12	15	4	8	4	3	2	31496	36. 605469	1575638	1. 269327
2			4	7	4	4	2	31496	36. 759278		1. 269312
2		15	4	7	4	2	2	31490	38. 328355	1575661	1. 269309
2			4	7	4	3	2	31495	37. 427619	1575689	1. 269286
2		15	4	8	4	4	2	31497	35. 957299		1. 269284
9	11		4	8	4	3	2		36, 759571		1. 269274

#### **nab544**

Regarding this trace, it can be seen that the highest IPC can reach 1.785266 when using: Yeh-Patt Predictor with h=11, p=14, fetch width=8, numbers of entries per FU=8, ALU=4, MUL=4, and LSU=2. Compared to the second-place configuration, it is faster by 25 cycles. Therefore, the configuration we have chosen is: Yeh-Patt Predictor with h=11, p=14, fetch width=8,

# numbers of entries per FU=8, ALU=4, MUL=4, and LSU=2.

Branch Pridictor		P		numbers of entries per fu		mul :		lsu fu	branch misprediction			ipc
2	11	14	8	8	4		4	2	35697	7. 315669	1120281	1. 78526
2	11	14	8	7	4		4	2	35697	7. 847424	1120306	1. 78522
2	11	14	8	8	4		3	2	35697	7. 723636	1120307	1.78522
2	11	14	8	7	4		3	2	35697	8. 357288	1120311	1. 78521
2	11	14	8	6	4		3	2	35697	9. 277177	1120332	1.78518
2	11	14	8	6	4		4	2	35698	8. 625662	1120332	1. 78518
2	11	14	8	5	4		4	2	35697	9. 831445	1120359	1.78514
2	11	14	8	8	4		2	2	35697	8. 275564	1120376	1.78511
2	11	14	8	7	4		2	2	35698	9. 037813	1120407	1.78506
2	11	14	8	6	4		2	2	35697	10. 147465	1120466	1.78497
2	11	14	8	5	4		3	2	35694	10. 687956	1120640	1.78469
2	11	14	8	4	4		4	2	35695	11. 735936	1120893	1.78429
2	11	14	8	5	4		2	2	35695	11. 73636	1120957	1.7841
2	11	14	8	4	4		3	2	35693	12. 764888	1120984	1.78414
2	11	14	8	4	4		2	2	35693	14. 012265	1121337	1.78358
2	12	15	8	8	4		4	2	36068	7. 499461	1123000	1.78094
2	12	15	8	8	4		3	2	36068	7. 929716	1123023	1. 78090
2	12	15	8	7	4		4	2	36069	8. 059166	1123031	1. 78089
2	12	15	8	7	4		3	2	36069	8. 590324	1123035	1. 78088
2	12	15	8	6	4		4	2	36070	8. 868616	1123057	1. 78085
2	12	15	8	6	4		3	2	36069	9. 540485	1123067	1.78083
2	12	15	8	5	4		4	2	36069	10. 107231	1123096	1. 78079
2	12	15	8	8	4		2	2	36069	8. 505379	1123108	1.78077
2	12	15	8	7	4		2	2	36070	9. 294136	1123149	1. 78070
2	12	15	8	6	4		2	2	36069	10. 428684	1123216	1. 78060
2	12	15	8	5	4		3	2	36069	10. 975596	1123421	1. 78027
2	12	15	8	4	4		4	2	36071	12. 033713	1123705	1.77982
2	12	15	8	5	4		2	2	36071	12. 03412	1123777	1. 77971
2	12	15	8	4	4		3	2	36071	13. 071185	1123847	1. 77960
2	12	15	8	4	4		2	2	36072	14. 326276	1124197	1. 77904
2	11	14	8	8	3		3	2	35724	8. 220446	1143002	1. 74977
2	11	14	8	7	3		3	2	35723	9. 028828	1143008	1. 74976
2	11	14	8	6	3		3	2	35723	10. 182722	1143022	1. 74974
2	11	14	8	8	3		2	2	35723	9. 02936	1143073	1. 7496
2	11	14	8	7	3		2	2	35723	10, 015364		1. 74958
2	11	14	8	6	3		2	2	35724	11. 360308	1143193	1. 74948
2	11	14	8	5	3		3	2	35724	11. 821494		1, 74938