CS2610 LAB 6 REPORT

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We have used a USIMM simulator to get the analyse the DRAM row buffer management policy

**Open-Page policy**:

In this policy we keep the row in the sense amplifiers until a row miss occurs.

This policy is suitable when the row misses are low in number.

Up on a memory-request:

(1) it issues a pre command if there is row miss

(2) followed by an act command

(3) followed by a read/write command

**Closed-Page policy**:

In this policy we bring the row in the sense amplifiers irrespective of whether there will be a row miss occurs.

This policy is suitable when the row misses are high in number.

Up on a memory-request:

(1) It issues an act command to bring the row in to sense amplifier

(2) followed by a read/write command

(3) followed by pre command to bring the row back from sense amplifiers

**Adaptive-Page policy**:

In this policy we use both the Open and Closed-Page policies efficiently to reduce the number of cycles

We maintain a counter to see whether the policy we are using is beneficial or not:

1. If we are implementing the Open-Page policy then we know that this policy is suitable only when the row misses are low in number. So, we increase the counter when we incur a row miss and if it reaches a specific threshold then we will change to Closed-Page policy as row hit rate is low.
2. If we are implementing the Closed-Page policy then we know that this policy is suitable only when the row misses are high in number. So, we decrease the counter when we incur a row hit and if it reaches a specific threshold then we will change to Open-Page policy as row hit rate is good.

**Data from simulation:**

For the test case run for 1 channel configuration and 2Gb x4 device:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Page policy implemented** | Number of cycles | Write latency | Read latency | Energy delay product | Read Page hit rate |
| Open-Page Policy | 417482312 | 2030.66670 | 211.91675 | 0.4146793 | 0.59957 |
| Closed-Page Policy | 413315040 | 1976.14721 | 202.41503 | 0.4062474 | 0.48459 |
| Adaptive-Page policy | 412575144 | 1966.53211 | 203.02516 | 0.4048680 | 0.53670 |

For the test case run for 4 channel configuration and 4Gb x8 octa core device:

For channel 0:

|  |  |  |  |
| --- | --- | --- | --- |
| **Page policy implemented** | Number of cycles  (for 4 channels) | Write latency | Read latency |
| Open-Page Policy | 421758733 | 2320.80973 | 276.96952 |
| Closed-Page Policy | 392935533 | 2068.62491 | 247.90147 |
| Adaptive-Page policy | 393592001 | 2068.54664 | 248.52445 |

For channel 1:

|  |  |  |  |
| --- | --- | --- | --- |
| **Page policy implemented** | Number of cycles  (For 4 channels) | Write latency | Read latency |
| Open-Page Policy | 421758733 | 2203.70645 | 243.96357 |
| Closed-Page Policy | 392935533 | 1936.11771 | 217.12812 |
| Adaptive-Page policy | 393592001 | 1934.41578 | 217.77341 |

For channel 2:

|  |  |  |  |
| --- | --- | --- | --- |
| **Page policy implemented** | Number of cycles  (for 4 channels) | Write latency | Read latency |
| Open-Page Policy | 421758733 | 2331.91638 | 263.24100 |
| Closed-Page Policy | 392935533 | 2075.24003 | 237.26343 |
| Adaptive-Page policy | 393592001 | 2076.75213 | 238.00515 |

For channel 3:

|  |  |  |  |
| --- | --- | --- | --- |
| **Page policy implemented** | Number of cycles  (for 4 channels) | Write latency | Read latency |
| Open-Page Policy | 421758733 | 2170.54100 | 243.33794 |
| Closed-Page Policy | 392935533 | 1903.02557 | 216.93634 |
| Adaptive-Page policy | 393592001 | 1899.81074 | 217.09840 |

**Observations:**

We can observe that the no of cycle in Adaptive-Page policy is less than the Open-Page policy because the hit rate is hardly 1 % so the Open-Page policy gives more no of cycles.

As the row miss rate is high Closed-Page policy perform better than Open-Page policy

As the Adaptive-Page policy must have implemented Closed-Page policy mostly as its number of total cycles are close to that of Closed-Page policy.

In most of the cases the order of total number of cycles is:

**Open-Page policy > Adaptive-Page policy > Closed-Page policy**

**Dependence of Open/Closed-Page implementation on addressing mode:**

For the test case run for 4 channel configuration and 4Gb x8 octa core device:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Page policy implemented** | **Number of cycles for addressing mode ‘0’** | **Number of cycles for addressing mode ‘1’** | **Time taken for addressing mode’0’** | **Time taken for addressing mode’1’** |
| **Open-Page Policy** | 421758733 | 426162773 | 2951078804 | 3022494523 |
| **Closed-Page policy** | 392935533 | 414848792 | 2789193960 | 2960232774 |

While accessing the address in addressing mode ‘1’ we read the column number faster than the addressing mode ‘0’ which will be beneficial for Closed-Page policy. So Closed-Page policy will perform well in addressing mode ‘1’ and Open-Page policy will perform well in addressing mode ‘0’.

**Observations:**

Time taken has been improved for Open-Page policy in addressing mode ‘0’

Number of cycles improved for Closed-Page policy in addressing mode ’1’