ECE 4930 Course Project

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Introduction

- We will discuss:
  - Research questions
  - Resources
  - Methodology
  - Results
  - Challenges
  - Questions raised
  - Future work

Research Questions

- What are the raw number of single and double bit-flip errors encountered in the logs?
- What is the overall MTBF of the system (with given logs)
- What is the MTBF of each phase?
- What is the best way to parse this data?
- Are some nodes/GPUs more reliable than others? If so, which ones?

Resources

- Palmetto log files
- Python3
- Pandas
- Excel

Methodology

- Traverse the file hierarchy within Python script (‘os’ library)
- Extract relevant data from logs and store in a Pandas dataframe so it’s easier to work with
- Export dataframe as a .CSV
- Perform analysis and graphing in Excel

Results

	Single Bit	*Double Bit*
Device Memory	84057	193
Register File	35	0
L1 Cache	58	0
L2 Cache	17664526616	0
Texture Memory	0	0
Texture Shared	0	0
CBU	0	0
Total	**17664610766**	**193**

Results

Overall MTBF

$$\frac{total\ hours\ represented\ in\ logs}{total\ failures} = \frac{3840}{755} = 5.086\ hours$$

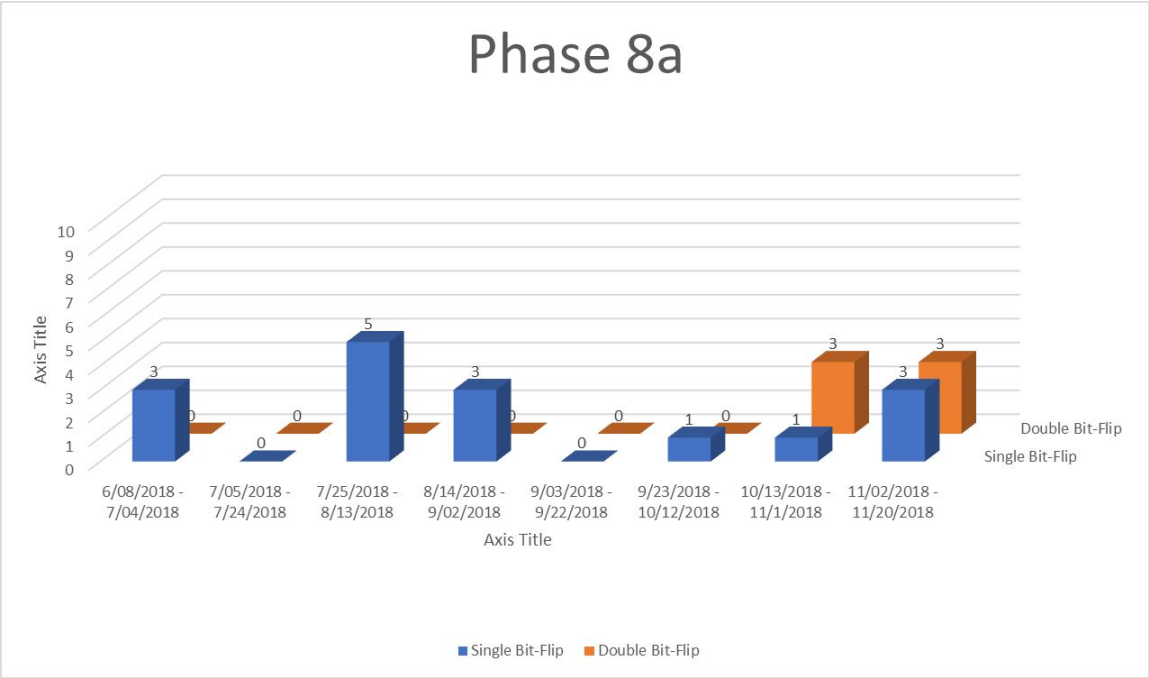
Results

MTBF by Phase

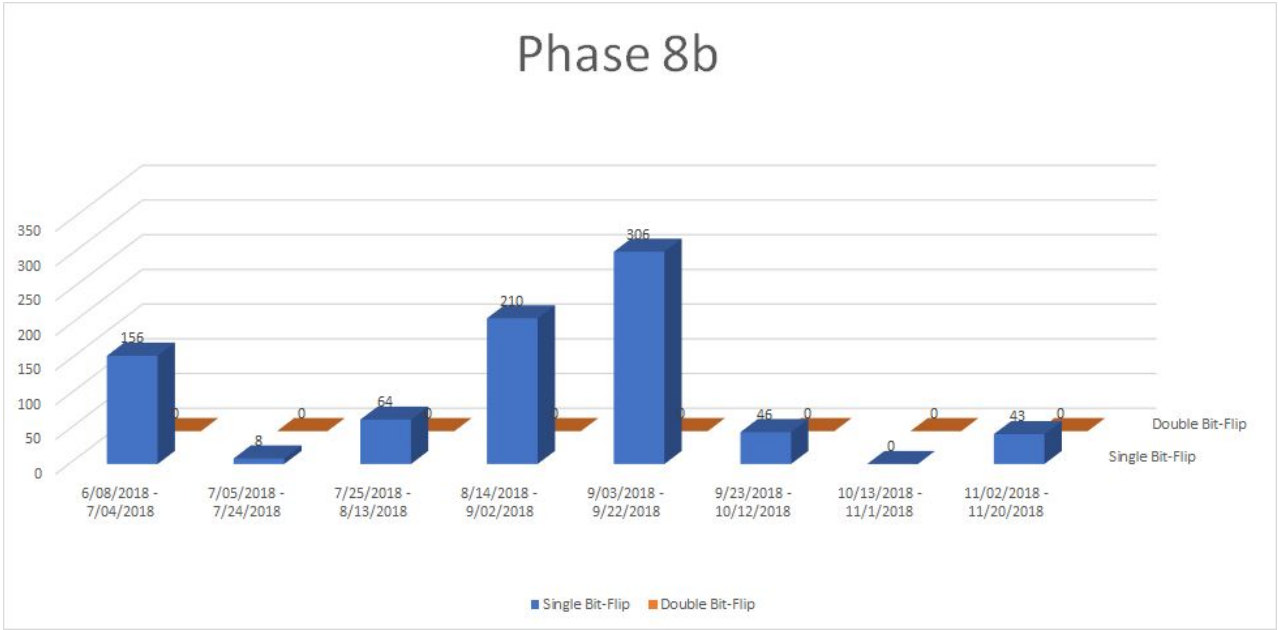
- *phase08a:* 320 hours
- *phase08b:* 10 hours
- *phase 16:* 46.829 hours
- *phase17:* 69.818 hours
- *phase 18b:* 17.297

* all phases not shown did not experience any failures in the timeframe represented in the logs

Results


Phase 8a
Axis Title
10
9
8
7
6
5
4
3
2
1
0
3
0
0
0
5
0
3
0
0
0
1
0
1
3
3
3
6/08/2018 - 7/04/2018
7/05/2018 - 7/24/2018
7/25/2018 - 8/13/2018
8/14/2018 - 9/02/2018
9/03/2018 - 9/22/2018
9/23/2018 - 10/12/2018
10/13/2018 - 11/1/2018
11/02/2018 - 11/20/2018
Axis Title
Double Bit-Flip
Single Bit-Flip
Single Bit-Flip
Double Bit-Flip

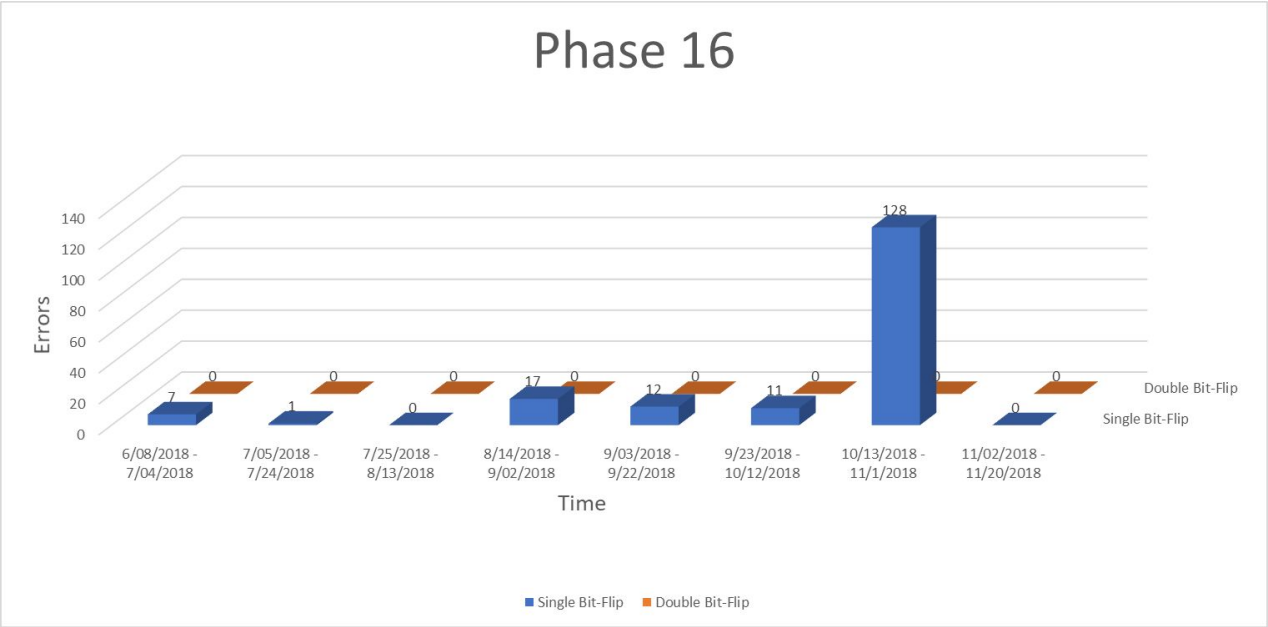
Results


Phase 8b
350
300
250
200
150
100
50
0
156
0
8
0
64
0
210
0
306
0
46
0
0
0
43
0
6/08/2018 - 7/04/2018
7/05/2018 - 7/24/2018
7/25/2018 - 8/13/2018
8/14/2018 - 9/02/2018
9/03/2018 - 9/22/2018
9/23/2018 - 10/12/2018
10/13/2018 - 11/1/2018
11/02/2018 - 11/20/2018
Double Bit-Flip
Single Bit-Flip
Single Bit-Flip
Double Bit-Flip

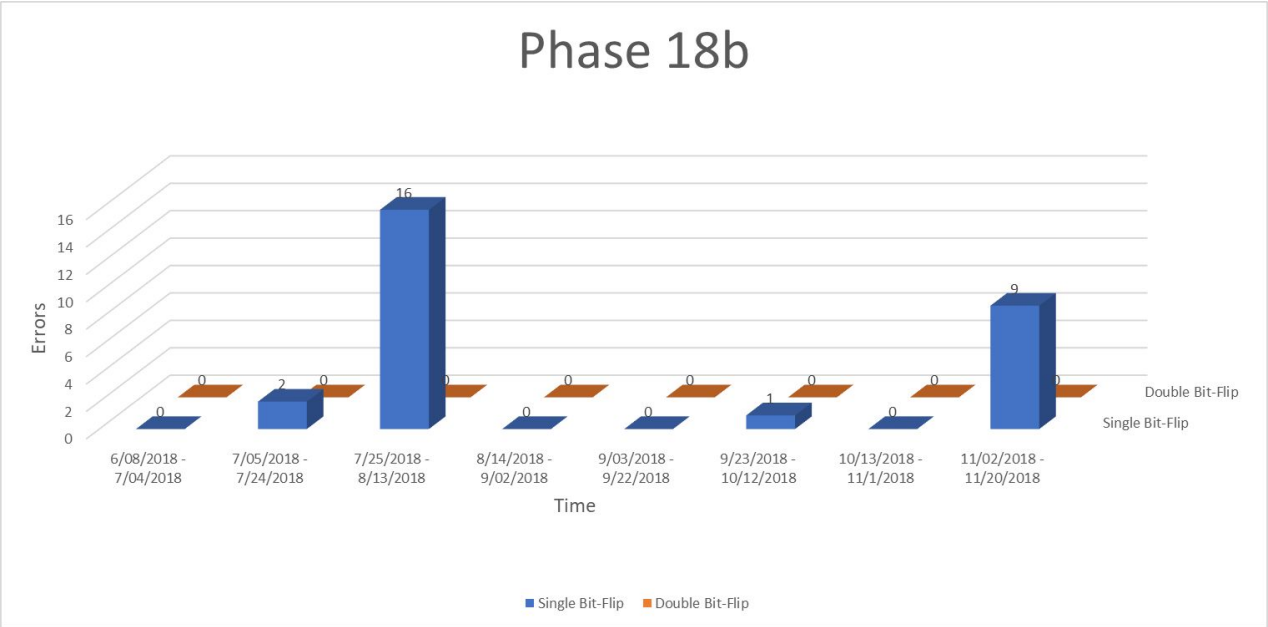
Results


Phase 15
Errors
100
90
80
70
60
50
40
30
20
10
0
1
0
0
0
0
0
0
0
0
0
0
0
0
0
100
0
0
0
Double Bit-Flip
Single Bit-Flip
6/08/2018 - 7/04/2018
7/05/2018 - 7/24/2018
7/25/2018 - 8/13/2018
8/14/2018 - 9/02/2018
9/03/2018 - 9/22/2018
9/23/2018 - 10/12/2018
10/13/2018 - 11/1/2018
11/02/2018 - 11/20/2018
Time
Single Bit-Flip
Double Bit-Flip

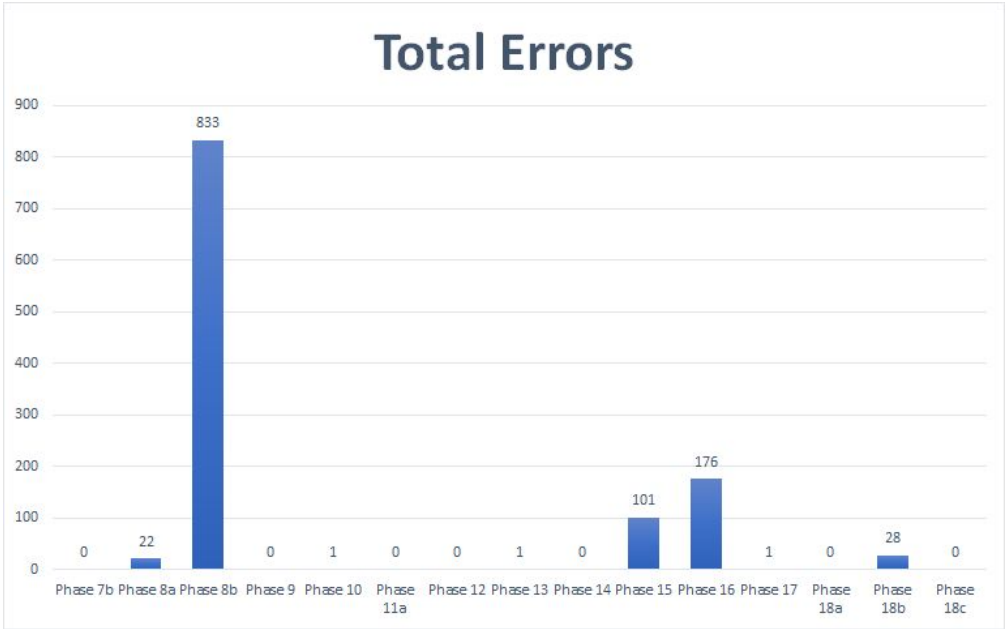
Results


Phase 16
Errors
140
120
100
80
60
40
20
0
7
0
1
0
0
0
17
0
12
0
11
0
128
0
0
0
6/08/2018 - 7/04/2018
7/05/2018 - 7/24/2018
7/25/2018 - 8/13/2018
8/14/2018 - 9/02/2018
9/03/2018 - 9/22/2018
9/23/2018 - 10/12/2018
10/13/2018 - 11/1/2018
11/02/2018 - 11/20/2018
Time
Double Bit-Flip
Single Bit-Flip
Single Bit-Flip
Double Bit-Flip

Results

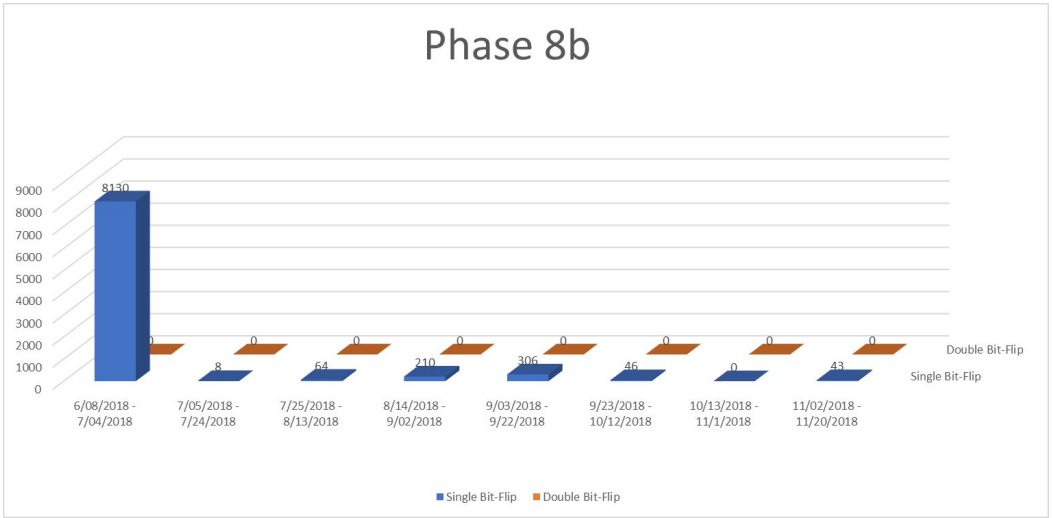

Phase 18b
Errors
0
2
4
6
8
10
12
14
16
0
0
2
0
16
0
0
0
0
0
0
0
1
0
0
0
9
0
6/08/2018 - 7/04/2018
7/05/2018 - 7/24/2018
7/25/2018 - 8/13/2018
8/14/2018 - 9/02/2018
9/03/2018 - 9/22/2018
9/23/2018 - 10/12/2018
10/13/2018 - 11/1/2018
11/02/2018 - 11/20/2018
Time
Double Bit-Flip
Single Bit-Flip
Single Bit-Flip
Double Bit-Flip

Results


Total Errors
900
800
700
600
500
400
300
200
100
0
0
22
833
0
1
0
0
1
0
101
176
1
0
28
0
Phase 7b
Phase 8a
Phase 8b
Phase 9
Phase 10
Phase 11a
Phase 12
Phase 13
Phase 14
Phase 15
Phase 16
Phase 17
Phase 18a
Phase 18b
Phase 18c

Discussion

- When we created the graphs we had spikes in the graph
- What did you think went wrong
- How did we fix it?



Observations

- Not many double bit flip errors overall
- More phases with no bit-flips than expected
- Phases with bit-flip spikes
- Phases with evenly distributed bit-flips
- Most bit flip errors occurred between 6/8 and 7/4

Challenges

- Understanding the filetree
  - Deciding how to store the data for each nodes data by phase or date
  - Understanding the aggregate vs. volatile metrics given and how to use them
- Verifying that our data is correct
  - Using the filetree system we implemented, our data was out of order(or in date, phase, node order mak
  - We found anomalous data while tracking the bit flips due to days when the system was down
    - When tracking the change it would cause major spikes in our analysis

Future Work

- Which nodes are the most reliable?
- How do GPUs factor into that?

Questions?