OoO Execution

I Values Record Table

Val 1: Number of seconds simulated
Val 2: Number of cycles rename is blocking
Val 3: Number of integer rename lookups
Val 4: Instruction Issue Rate
Val 5: Idle cycles from register renaming
Val 6: Number of times rename has blocked due to ROB full
Val 7: Cache miss rates

ROB Entries	IQ Entries	Phys IntRegs	Val 1	Val 2	Val 3	Val 4	Val 5	Val 6	Val 7
4	64	4	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		16	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		64	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		256	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
	256	4	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		16	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		64	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		256	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
	1024	4	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		16	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		64	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
		256	0.017680	20572621	26642180	0.571123	197486	12037005	0.014235
16	64	4	0.010481	6182079	26643964	0.963466	1348251	23	0.018976
		16	0.006323	4475745	26647514	1.597168	1268734	4581376	0.031023
		64	0.006323	4475742	26647514	1.597168	1268734	4581376	0.031023
		256	0.006323	4475742	26647514	1.597168	1268734	4581376	0.031023
	256	4	0.010481	6182079	26643964	0.963466	1348251	23	0.018976
		16	0.006323	4475745	26647515	1.597168	1268735	4581376	0.031023
		64	0.006323	4475742	26647515	1.597168	1268735	4581376	0.031023
		256	0.006323	4475742	26647515	1.597168	1268735	4581376	0.031023
	1024	4	0.010481	6182079	26643964	0.963466	1348251	23	0.018976
		16	0.006323	4475745	26647515	1.597168	1268735	4581376	0.031023
		64	0.006323	4475742	26647515	1.597168	1268735	4581376	0.031023
		256	0.006323	4475742	26647515	1.597168	1268735	4581376	0.031023
64	64	4	0.010481	6181852	26643995	0.963467	1348438	0	0.018976
		16	0.004983	822738	26651364	2.026954	1557498	1	0.036404
		64	0.004696	1039037	26653136	2.150888	1537617	76	0.036425
		256	0.004696	1039037	26653136	2.150888	1537617	76	0.036425

	256	4	0.010479	6172943	26644027	0.963641	1348678	0	0.018978
		16	0.004909	738596	26651743	2.057407	1557434	3	0.036827
		64	0.003847	929162	26658242	2.625561	2370289	1033534	0.049939
		256	0.003847	929162	26658242	2.625561	2370289	1033534	0.049939
	1024	4	0.010479	6172943	26644027	0.963641	1348678	0	0.018978
		16	0.004909	738596	26651743	2.057407	1557434	3	0.036827
		64	0.003847	929162	26658242	2.625561	2370289	1033534	0.049939
		256	0.003847	929162	26658242	2.625561	2370289	1033534	0.049939
256	64	4	0.010481	6181852	26643995	0.963467	1348438	0	0.018976
		16	0.004983	821802	26651377	2.026953	1558164	0	0.036401
		64	0.004696	1038917	26653211	2.150893	1537647	0	0.036426
		256	0.004696	1038917	26653211	2.150893	1537647	0	0.036426
	256	4	0.010479	6172943	26644027	0.963641	1348678	0	0.018978
		16	0.004909	738486	26651809	2.057396	1557477	0	0.036827
		64	0.003756	109685	26661032	2.689577	2531888	0	0.052124
		256	0.003729	76759	26666495	2.708983	2583624	323691	0.052633
	1024	4	0.010479	6172943	26644027	0.963641	1348678	0	0.018978
		16	0.004909	738486	26651809	2.057396	1557477	0	0.036827
		64	0.003756	109685	26661032	2.689577	2531888	0	0.052124
		256	0.003729	76759	26666495	2.708983	2583624	323691	0.052633

II Data Visualization

We can choose Number of cycles rename is blocking and Instruction Issue Rate to evaluate the impact of three parameters. For the parameter space is 3D, we can plot two 3D plots for each metric to compare the impact of three parameters.

1. Number of cycles rename is blocking:

Firstly, plot number of ROB Entries vs Num-Phys-Int-Regs. For different IQ Entries, ROB Entries vs Num-Phys-Int-Regs plots look the same, so I just show the plot with IQ Entries equals to 64 here (Figure. 1). We can see that both ROB-Entries and Num-Phys-Int-Regs have impact on the value. With higher ROB Entries or Phys-int-regs, we have lower amount of cycles rename is blocking. Moreover, the plot tells us ROB-Entries has greater impact on it.

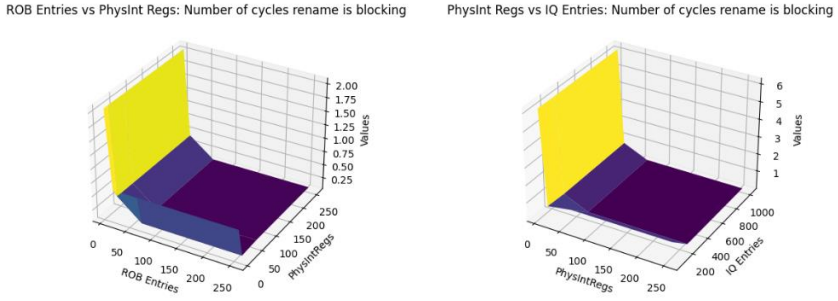

Figure. 1 Figure. 2

Then we can compare the impact of Num-Phys-Int-Regs and IQ Entries, for we've know that ROB Entries has significant impact on the value. Figure. 2 is a Phys-int-regs vs IQ Entries plot. From Figure. 2, we know that Phys-int-regs has greater impact on the value than IQ Entries.

2. Instruction Issue Rate

Same as the last two plots, we can see in Figure. 3 that both ROB Entries and Num-Phys-Int-Regs have significant impact on the value (higher value of parameters, higher value of Instruction Issue Rate). And as shown in Figure. 4, IQ Entries also has impact on Instruction Issue Rate.

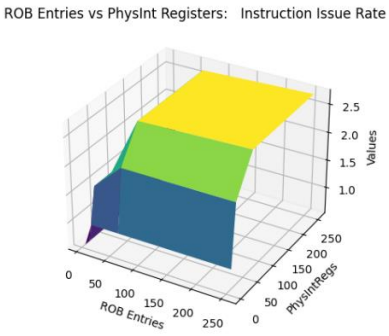

Figure. 3

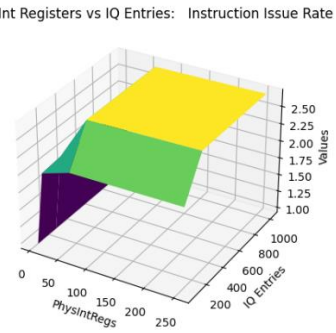

Figure. 4

III Conclusions

1. Number of cycles rename is blocking will increase due to lack of resources (ROB or physical registers). So this value is highly depends on number of ROB entries and physical registers. With enough ROB and Phys-Regs, the rename blocking cycles will be lower.
2. Instruction Issue Rate is influenced by a lot of aspects, all three parameters (related to ROB, physical registers and IQ) will have impact on it. With more resources, Instruction Issue Rate will be higher.