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Project 3 System Analysis

System 1: Light Processes

This first system uses 4 cores to begin with, has [5,20] execution cycles per process, 3 priority levels, and a simulation length of 100,000. When finding the optimal load for this system, the first simulation used 0.1 as the minimum load, 0.5 as the maximum, and 0.1 as the step value. It returned the following results:

Load	Idle	Completed	Processed Wait	Unprocessed	Exe. Needed	Unpr. Wait	Unpr. Max Wait
0.1	275775	10003	9999	0	0	0	0
0.2	149365	20003	20001	1	10	1	1
0.3	25495	30003	104042	1	6	1	1
0.4	0	31960	160478090	8044	99981	242423310	24993
0.5	0	32025	69277113	17979	223954	832636079	55982

The system changes from having idle time to having none between load sizes 0.3 and 0.4, so my next simulation used 0.3 as the minimum load and 0.4 as the maximum with a step value of 0.01 and returned the following results:

Load	Idle	Completed	Processed Wait	Unprocessed	Exe. Needed	Unpr. Wait	Unpr. Max Wait
0.3	25709	30002	106926	1	20	7	1
0.31	13476	31003	198843	1	9	1	4
0.32	1591	32000	1094762	4	51	124	12
0.33	0	32005	44358975	999	12514	4433201	3133
0.34	6	31977	83062809	2027	25243	17659215	6311
0.35	12	32018	111855619	2986	37359	38476047	9342
0.36	5	31981	135526723	4023	50028	67452896	12509
0.37	0	32021	145727998	4983	62241	102469063	15561
0.38	0	32083	158885051	5921	74306	138328130	18574
0.39	1	32078	156702627	6926	86677	188069363	21674

The same change occurs but narrowed down between 0.32 and 0.33, leaving the optimal system load at about 0.32 new processes per cycle.

The same test for the same system but with 8, 16, 32, and 64 cores resulted in the following tables:

8 Cores:

Load	Idle	Completed	Processed Wait	Unprocessed	Exe. Needed	Unpr. Wait	Unpr. Max Wait
0.64	755	63973	4538697	35	370	3051	43
0.641	693	64091	2990118	17	206	487	26
0.642	522	64004	9323421	204	2547	93947	321
0.643	405	64000	15290250	308	3679	193078	461
0.644	321	64047	20476119	361	4514	290403	564
0.645	285	64010	23275186	498	6240	571495	783
0.646	118	64105	23130535	503	6372	607606	799
0.647	0	64019	31986106	689	8423	1017649	1054
0.648	0	63967	43165522	841	10530	1596524	1315
0.649	0	63991	45486835	917	11473	2025113	1431
0.65	0	63830	54715914	1178	14830	3180749	1851

16 Cores:

Load	Idle	Completed	Processed Wait	Unprocessed	Exe. Needed	Unpr. Wait	Unpr. Max Wait
1.2	99710	120014	180865	1	15	1	1
1.21	86178	121012	200446	3	41	9	2
1.22	74069	122013	215268	2	26	3	1
1.23	62074	123007	251106	8	104	46	7
1.24	49072	124014	292674	2	26	2	5
1.25	33683	125013	417245	3	42	9	2
1.26	26360	126012	485123	4	41	10	4
1.27	14731	127007	774625	9	129	94	10
1.28	1408	127802	9098020	214	2633	54387	166
1.29	0	128141	35912846	875	11127	871985	698
1.3	0	128233	84058679	1783	22178	3634720	1385

32 Cores:

2.5	79286	250028	453330	4	46	5	3
2.51	61666	250984	543527	47	624	1077	18
2.52	55034	252025	562238	6	80	21	3
2.53	38351	253011	743019	20	240	196	7
2.54	27010	254025	922733	6	74	18	3
2.55	16299	255025	1324929	6	76	12	3
2.56	2974	255988	6864878	43	519	1213	16
2.57	0	255738	66163850	1293	16316	1028285	511
2.58	0	255946	108224247	2085	26138	2456777	817
2.59	0	255757	160083405	3274	40735	6208532	1274
2.6	0	255805	196840235	4226	53603	10181629	1677

64 Cores:

Load	Idle	Completed	Processed Wait	Unprocessed	Exe. Needed	Unpr. Wait	Unpr. Max Wait
5.1	24836	510058	2092335	5	59	5	1
5.11	14818	511035	3124355	28	387	163	7
5.12	2040	511914	10168918	149	2043	6318	31
5.13	427	511968	45421280	1095	13820	361357	216
5.14	0	512293	90979852	1770	22077	884285	346
5.15	0	511921	156936561	3142	39258	2800821	613
5.16	0	512179	173062579	3884	48369	4568432	756
5.17	0	512067	224492155	4996	62775	7248182	980
5.18	0	512283	288782790	5780	72391	9786954	1132
5.19	0	512078	325661716	6985	87580	14035009	1369

Doubling the core count does appear to create a trend of the optimal load size approximately doubling as well given these results.