Hardware assisted Cache Prefetching Techniques

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ABSTRACT

This document is intended to serve as a sample for submissions to the 52nd International Symposium on Microarchitecture (MICRO), 2019. We provide some guidelines that authors should follow when submitting papers to the conference. This format is derived from the ACM sig-alternate.cls file, and is used with an objective of keeping the submission version similar to the camera-ready version.

1. INTRODUCTION

This document provides instructions for submitting papers to the 52^{nd} International Symposium on Microarchitecture (MICRO), 2019. In an effort to respect the efforts of reviewers and in the interest of fairness to all prospective authors, we request that all submissions to MICRO 2019 follow the formatting and submission rules detailed below. Submissions that violate these instructions may not be reviewed, at the discretion of the program chairs, in order to maintain a review process that is fair to all potential authors. This document is itself formatted using the MICRO-52 submission format. The content of this document mirrors that of the submission instructions that appear on the conference website. All questions regarding paper formatting and submission should be directed to the program chairs.

1.1 Format Highlights

- Paper must be submitted in printable PDF format.
- Text must be in a minimum 10pt font, see Table **??**.
- Papers must be at most 11 pages, not including references.
- No page limit for references.
- Each reference must specify *all* authors (no *et al.*).
- Authors of *all* accepted papers will be required to give a lightning presentation (about 90s) and a poster in addition to the regular conference talk.

1.2 Paper Evaluation Objectives

The committee will make every effort to judge each submitted paper on its own merits. There will be no target acceptance rate. We expect to accept a wide range of papers with appropriate expectations for evaluation—while papers that build on significant past work with strong evaluations are valuable, papers that open new areas with less rigorous evaluation are equally welcome and especially encouraged.

*Both authors contributed equally to this research.

2. PAPER PREPARATION INSTRUCTION

2.1 Paper Formatting

Papers must be submitted in printable PDF format and should contain a *maximum of 11 pages* of single-spaced two-column text, **not including references**. You may include any number of pages for references, but see below for more instructions. If you are using LaTeX [1] to typeset your paper, then we suggest that you use the template here: LaTeX Template. This document was prepared with that template. If you use a different software package to typeset your paper, then please adhere to the guidelines given in Table 1.

Please ensure that you include page numbers with your submission. This makes it easier for the reviewers to refer to different parts of your paper when they provide comments. Please ensure that your submission has a banner at the top of the title page, similar to this document, which contains the submission number and the notice of confidentiality. If using the template, just replace XXX with your submission number.

2.2 Content

Reviewing will be *double blind* (no author list); therefore, please do not include any author names on any submitted documents except in the space provided on the submission form. You must also ensure that the metadata included in the PDF does not give away the authors. If you are improving upon your prior work, refer to your prior work in the third person and include a full citation for the work in the bibliography. For example, if you are building on *your own* prior work in the papers [2, 3, 4], you would say something like: "While the authors of [2, 3, 4] did X, Y, and Z, this paper additionally does W, and is therefore much better." Do NOT omit or anonymize references for blind review. There is one exception to this for your own prior work that appeared in IEEE CAL, arXiv, workshops without archived proceedings, etc. as discussed later in this document.

Figures and Tables: Ensure that the figures and tables are legible. Please also ensure that you refer to your figures in the main text. Many reviewers print the papers in gray-scale. Therefore, if you use colors for your figures, ensure that the different colors are highly distinguishable in gray-scale.

References: There is no length limit for references. *Each reference must explicitly list all authors of the paper. Papers not meeting this requirement will be rejected.* Authors of NSF proposals should be familiar with this requirement. Knowing all authors of related work will help find the best reviewers. Since there is no length limit for the number of pages used for references, there is no need to save space here.

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.721404	3463564	1295	775	1127	0	1127
berti	0.724420	3467440	1740	1514	1677	773	2094
bingo	0.723568	3464970	2041	2539	1780	191	1780
bouquet	0.724167	3763072	8495	15640	3044	4	3043
enhancing	0.724053	3944527	3068	3590	1937	365	2105
multi-lop	0.724172	3463453	6138	7066	2290	144	2290
pangloss	0.725891	6345629	10952	62260	5619	461	5218
sangam	0.723502	4109283	9378	13329	2484	5	2482
sangam++	0.723634	4201868	6061	9917	2070	1	2070
t-skid	0.724139	3462766	10278	13250	2224	512	2625

Table 1: Simulations for 600.perlbench_s-210B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.355704	2996628	160748	81106	80698	348	80686
berti	0.422283	3115451	161893	181160	82795	74870	84279
bingo	0.421141	3112616	165382	91686	86947	685	86738
bouquet	0.422258	6003627	172604	622669	86873	597	86615
enhancing	0.422416	4147074	163941	248417	88226	1943	88537
multi-lop	0.422770	3115956	178728	93118	87134	639	86996
pangloss	0.423223	9605604	182059	926530	98763	1000	98106
sangam	0.422806	3887636	176443	241739	93460	806	92995
sangam++	0.422716	3767675	172425	240000	89570	468	89442
t-skid	0.422620	3116929	169880	222740	84168	606250	88883

Table 2: Simulations for 602.gcc_s-734B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.935050	1619891	105	0	105	0	105
berti	0.935194	1619906	108	11	111	20	112
bingo	0.935196	1619890	105	17	105	0	105
bouquet	0.935198	3025054	178	65	184	0	184
enhancing	0.935204	2494996	114	21	126	2	124
multi-lop	0.935196	1619890	105	17	105	0	105
pangloss	0.935197	3007714	99	150	122	0	122
sangam	0.935236	1954999	138	92	143	0	143
sangam++	0.935235	1740826	116	58	125	0	125
t-skid	0.935240	1619945	134	1	134	21	135

Table 3: Simulations for 603.bwaves_s-3699B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.267712	3421585	390201	174925	265993	162896	129592
berti	0.286801	3576554	449798	301672	321994	371265	213974
bingo	0.283072	3611876	427718	338111	550201	375566	227483
bouquet	0.286180	4436481	647587	525831	481662	320816	196235
enhancing	0.284624	4253911	432309	304028	337909	319347	199971
multi-lop	0.250247	3512406	920650	422970	881435	398343	534455
pangloss	0.273842	6476745	452745	944078	684658	386246	337199
sangam	0.284011	4100202	695482	395574	487392	322072	201243
sangam++	0.284519	4718624	704218	378462	482529	319614	199092
t-skid	0.277389	3489169	1054759	565866	570901	373804	303798

Table 4: Simulations for 605.mcf_s-665B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	1.057070	3134933	733458	1009844	48612	27890	26476
berti	1.177460	3353534	857270	1576833	53780	79009	26660
bingo	1.191910	3358693	855668	1893787	49835	29340	26537
bouquet	1.179050	4511672	1205028	2421986	47541	26714	26645
enhancing	1.173930	3498508	840396	2185462	96065	80639	26415
multi-lop	1.181610	3132349	785964	1973532	49309	28757	26638
pangloss	1.178660	4412782	1234810	4174729	66016	45118	26884
sangam	1.181860	3791116	1407059	2765004	48971	28171	26640
sangam++	1.189040	3912732	1265340	2180934	57317	36434	26681
t-skid	1.211010	3492346	1168168	2056436	44601	154783	26716

Table 5: Simulations for 607.cactuBSSN_s-2421B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.438254	1993459	774713	961711	470311	353067	469523
berti	0.520927	1674338	774698	1018971	470298	394481	469514
bingo	0.502995	1634494	774704	975394	470313	353990	469515
bouquet	0.516328	2113440	775294	1048624	470335	353084	469511
enhancing	0.513609	2252507	777984	1014799	470636	354393	469597
multi-lop	0.499519	1711843	803431	1007991	470439	357389	469545
pangloss	0.524830	2455587	777143	1450705	470907	353608	469687
sangam	0.522266	1633473	775093	1081409	470606	353303	469607
sangam++	0.518093	1588855	783654	1035028	471097	353809	469725
t-skid	0.502912	1690596	783909	973361	470323	357201	469517

Table 6: Simulations for 619.lbm_s-4268B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.242485	4172615	180018	156388	117362	84361	91150
berti	0.251495	4327688	227331	193644	204199	191764	215308
bingo	0.253927	4284691	250884	273172	272765	159495	193242
bouquet	0.247397	5446654	364952	297310	316955	155018	233276
enhancing	0.249334	5015560	238219	249145	235453	163999	202453
multi-lop	0.247704	4221970	309512	250849	189916	129821	139147
pangloss	0.243728	9451386	448942	1007370	883232	271503	691358
sangam	0.247069	5024456	339731	242132	233001	128605	171358
sangam++	0.247377	5335927	327819	257063	248198	129188	187171
t-skid	0.246158	4217158	641534	382075	381409	174631	328258

Table 7: Simulations for 620.omnetpp_s-874B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.561930	1778689	518	21	773	0	773
berti	0.562665	1778988	524	215	807	245	862
bingo	0.562553	1778771	518	303	827	21	827
bouquet	0.562546	1853275	614	377	950	0	950
enhancing	0.562703	2282538	599	377	983	96	1006
multi-lop	0.562553	1778771	518	303	827	21	827
pangloss	0.562800	2570612	616	3899	1387	0	1387
sangam	0.562616	1938468	720	595	1047	0	1047
sangam++	0.562717	2239409	726	759	1058	0	1058
t-skid	0.562657	1779014	604	140	852	771	1006

Table 8: Simulations for 621.wrf_s-575B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.427485	2026532	395789	420292	23356	21180	14786
berti	0.435614	2213948	424961	453312	32515	46516	18917
bingo	0.428859	2213400	450003	687700	128946	152691	17719
bouquet	0.419142	3809840	583190	672428	128227	107635	35835
enhancing	0.396017	3674723	645820	711995	659381	791433	29146
multi-lop	0.404957	2068098	1087320	977404	390961	448675	25951
pangloss	0.380342	5122842	841083	2203876	1717845	1678691	58756
sangam	0.418082	2664730	725616	783375	185671	180534	21225
sangam++	0.408025	2671411	862068	927646	664528	660136	23216
t-skid	0.407938	2127583	1027852	639400	523762	603201	57026

Table 9: Simulations for 623.xalancbmk_s-700B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	1.36457	1430283	4372	535	3925	0	3925
berti	1.39697	1436172	4943	3020	4304	2961	4574
bingo	1.38387	1433800	4994	6328	4720	1317	4720
bouquet	1.39189	2024099	7800	7440	4586	1	4586
enhancing	1.39224	1705964	5648	5210	4934	5210	4934
multi-lop	1.40286	1433621	7987	4185	4847	11	4847
pangloss	1.39454	2380516	9400	28146	5608	9	5608
sangam	1.39214	1843003	8515	7142	4559	0	4559
sangam++	1.38478	1824785	6603	3845	4440	0	4440
t-skid	1.39769	1433269	8328	4720	4454	503	4492

Table 10: Simulations for 625.x264_s-18B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.773241	1612735	101341	108812	79371	83130	73597
berti	0.788991	1634974	103068	115994	80606	88068	75319
bingo	0.783611	1625861	102268	122178	80763	84947	74527
bouquet	0.788550	1862433	107539	149807	81684	85131	75176
enhancing	0.788917	1869135	102963	127686	81594	85832	75393
multi-lop	0.786623	1631295	115825	128443	83179	87384	75413
pangloss	0.789953	3432313	111407	273304	90323	92737	78436
sangam	0.787657	2157495	108952	142997	82336	85768	75352
sangam++	0.789852	2161526	108228	146644	82937	86245	75805
t-skid	0.790094	1633363	109410	140537	80913	90579	75365

Table 11: Simulations for 627.cam4_s-573B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	1.02064	1809231	202698	207082	86880	88261	30693
berti	1.27505	2045125	212771	279920	101270	149539	33652
bingo	1.27064	2026872	212179	270419	102891	111936	31746
bouquet	1.29122	2867424	230962	536077	110219	113160	32298
enhancing	1.29066	2682170	217698	376957	118681	128001	33023
multi-lop	1.29865	2037988	303689	288436	123263	133508	33022
pangloss	1.30125	4318091	249016	1089876	157160	161617	35090
sangam	1.30173	2986883	257589	482623	129729	133970	33225
sangam++	1.30148	2953628	254919	473970	124098	127978	33164
t-skid	1.28837	2017544	231862	428674	98321	217736	32648

Table 12: Simulations for 628.pop2_s-17B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.529114	3008244	6390	15415	3180	36	3179
berti	0.530686	3033998	9013	20461	3732	783	5210
bingo	0.530478	3025837	9015	27819	4708	253	4700
bouquet	0.530571	3900964	41525	63846	8694	843	8597
enhancing	0.530636	3935834	14397	29660	8605	1230	9344
multi-lop	0.530507	3008975	13294	34447	7381	675	7337
pangloss	0.530895	5319383	30966	176206	27390	3710	25491
sangam	0.530713	3919008	31275	51880	9233	870	9130
sangam++	0.530751	3979104	31837	51683	10281	1023	10141
t-skid	0.530539	3006854	48002	54607	12420	1849	13236

Table 13: Simulations for 631.deepsjeng_s-928B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	2.26129	422187	89012	88764	391	0	391
berti	2.49089	534258	90386	155933	309	272	310
bingo	2.47264	526210	91341	107566	446	3	443
bouquet	2.48263	1203541	122549	408491	3338	2948	395
enhancing	2.34682	605646	100898	228194	1799	973	860
multi-lop	2.39248	488087	105934	139022	464	0	464
pangloss	2.49000	2180427	104249	1044432	7739	6758	981
sangam	2.48965	650698	136183	303274	7103	5176	1927
sangam++	2.49188	611616	105330	310406	577	1	576
t-skid	2.49203	535261	102574	438901	1214	36255	1611

Table 14: Simulations for 638.imagick_s-10316B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.369288	3263154	19618	22009	1291	6	1287
berti	0.371077	3282503	25813	32798	2306	1310	2755
bingo	0.371513	3286261	23254	40362	2799	402	2619
bouquet	0.371227	4302682	42882	84333	2854	136	2737
enhancing	0.370421	4151737	21942	38614	2700	838	2657
multi-lop	0.371116	3268073	55744	87973	3316	318	3097
pangloss	0.371313	7534037	41562	229544	10054	5640	4657
sangam	0.371310	4125124	49544	101951	4031	715	3361
sangam++	0.371387	4022092	48347	84411	3437	310	3152
t-skid	0.371318	3271939	57787	66885	3878	616	3776

Table 15: Simulations for 641.leela_s-800B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.676815	3165561	43265	56197	2268	0	2268
berti	0.686767	3224462	44370	66095	2378	1972	2424
bingo	0.686397	3232734	45042	65183	2533	31	2533
bouquet	0.687080	3538250	48350	201553	2584	0	2584
enhancing	0.686753	3837642	46900	108024	2710	85	2712
multi-lop	0.687113	3207553	69158	83415	2478	25	2478
pangloss	0.687278	6426537	51661	456582	2902	9	2893
sangam	0.687154	4223878	50350	162423	2663	0	2663
sangam++	0.687119	4277947	49786	156189	2605	0	2605
t-skid	0.686980	3207350	52553	173572	2334	18759	2587

Table 16: Simulations for 644.nab_s-5853B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	1.61182	2626773	60	0	60	0	60
berti	1.61202	2626804	65	10	64	10	65
bingo	1.61185	2626774	60	8	61	6	61
bouquet	1.61215	3745616	73	21	72	0	72
enhancing	1.61206	3668490	66	14	62	2	62
multi-lop	1.61185	2626774	60	8	61	6	61
pangloss	1.61216	3317021	67	145	37	0	37
sangam	1.61211	3313354	100	49	105	0	105
sangam++	1.61216	3364093	68	65	72	0	72
t-skid	1.61217	2626876	71	0	71	0	72

Table 17: Simulations for 648.exchange2_s-1699B.champsimtrace

Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.599924	1859436	132339	132342	87845	87690	87805
berti	1.44999	2068843	132585	239551	87929	102068	87880
bingo	1.41465	2066274	133381	134556	87955	87757	87870
bouquet	1.46373	3359113	132848	431927	87969	87736	87886
enhancing	1.45905	2726912	132786	272098	88220	88415	87995
multi-lop	1.46326	2072321	135646	135475	88261	87966	87984
pangloss	1.46372	5227275	134068	1244341	88918	88415	88256
sangam	1.46438	2346062	134202	280350	88399	88089	87987
sangam++	1.46455	2414483	134142	290754	88442	88115	87981
t-skid	1.44433	2067766	134534	220999	87928	150336	87912

Table 18: Simulations for 649.fotonik3d_s-1176B.champsimtrace

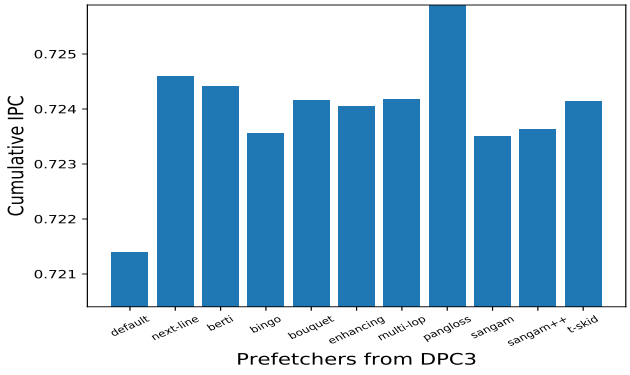
Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	1.04191	1680278	603	231	603	0	603
berti	1.04486	1681894	608	540	612	335	612
bingo	1.04480	1681756	591	241	595	0	595
bouquet	1.04486	1935436	706	1547	698	0	698
enhancing	1.04485	2231070	610	616	611	9	610
multi-lop	1.04475	1681607	815	494	720	0	720
pangloss	1.04483	3735654	628	4232	642	0	642
sangam	1.04487	2007179	615	1070	611	0	611
sangam++	1.04487	1900881	614	971	615	0	615
t-skid	1.04486	1681849	675	566	617	2805	629

Table 19: Simulations for 654.roms_s-842B.champsimtrace

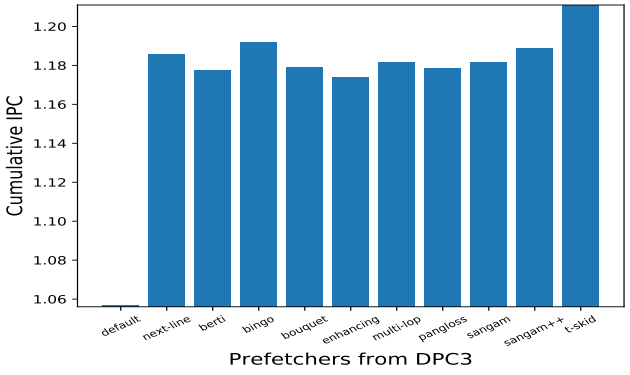
Prefetchers	IPC	L1D		L2C		LLC	
		Hits	*Misses*	*Hits*	*Misses*	*Hits*	*Misses*
default	0.758470	1679541	46393	64038	18390	10798	16183
berti	0.785037	1706907	53603	75945	21569	20112	26419
bingo	0.783408	1703705	59659	108925	51878	31873	36781
bouquet	0.785740	2040422	103868	143862	50337	30340	34822
enhancing	0.781891	2058685	53562	81779	24222	19597	25991
multi-lop	0.779525	1684052	54062	91135	33212	21455	25379
pangloss	0.780476	2388990	85689	297676	141142	67872	93086
sangam	0.787773	2083298	130574	168477	80168	44202	51889
sangam++	0.788157	2124020	104811	152563	56142	32762	37897
t-skid	0.784730	1683922	151607	153116	51677	34700	40239

Table 20: Simulations for 657.xz_s-3167B.champsimtrace

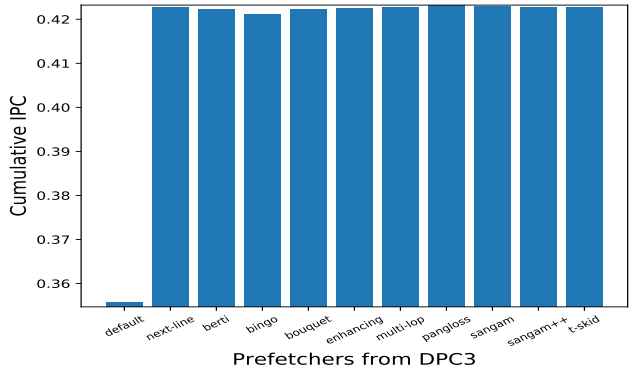
Benchmark: 600.perlbench_s-210B



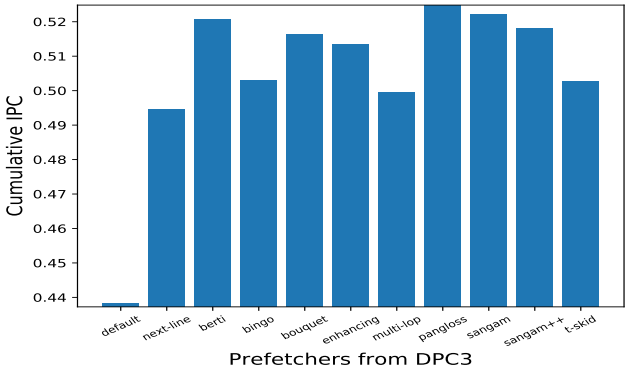
Benchmark: 607.cactuBSSN_s-2421B



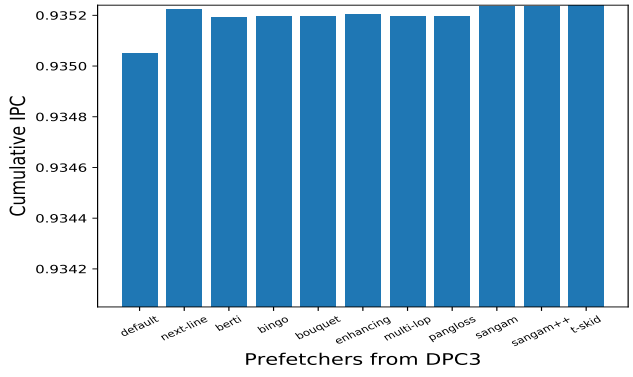
Benchmark: 602.gcc_s-734B



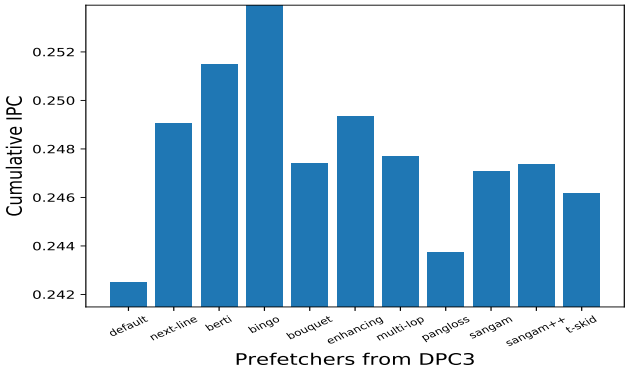
Benchmark: 619.lbm_s-4268B



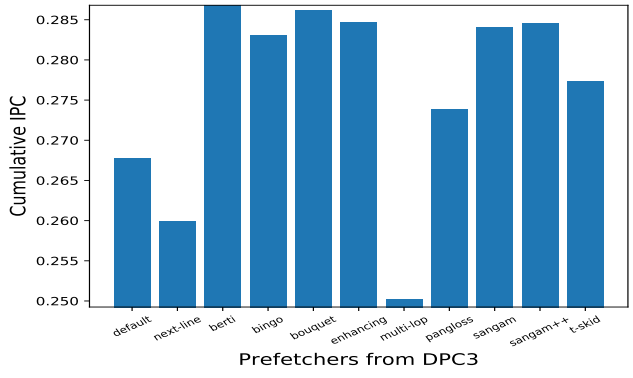
Benchmark: 603.bwaves_s-3699B



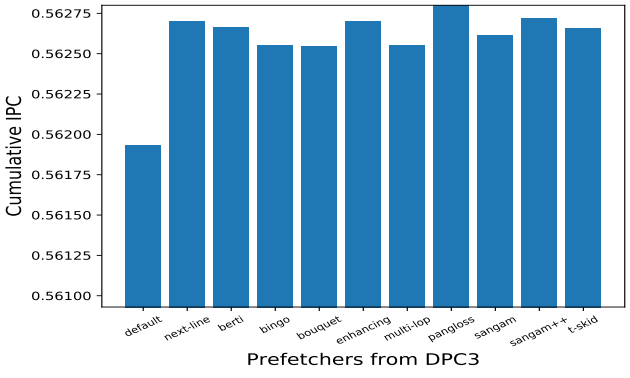
Benchmark: 620.omnetpp_s-874B

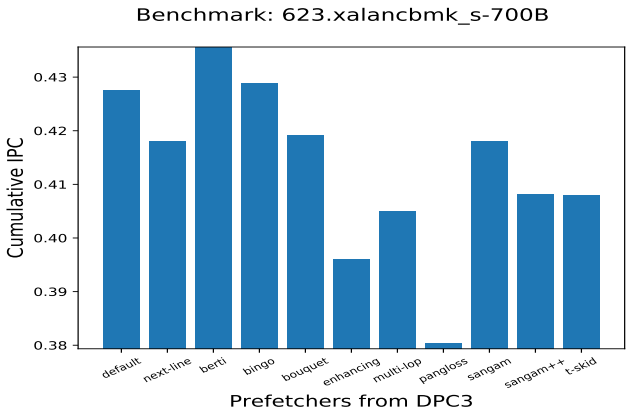


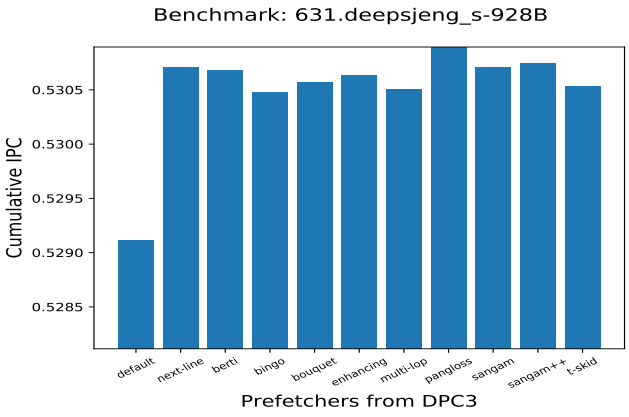
Benchmark: 605.mcf_s-665B

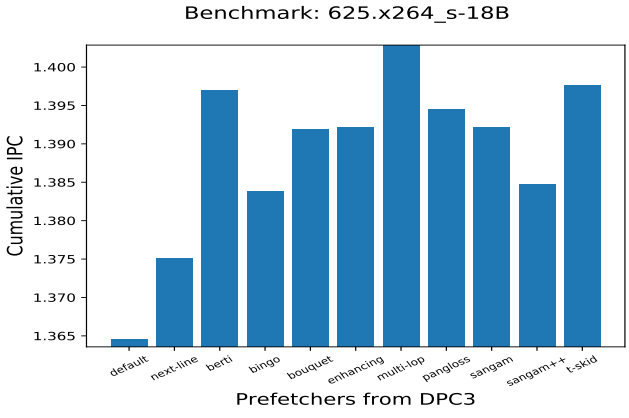


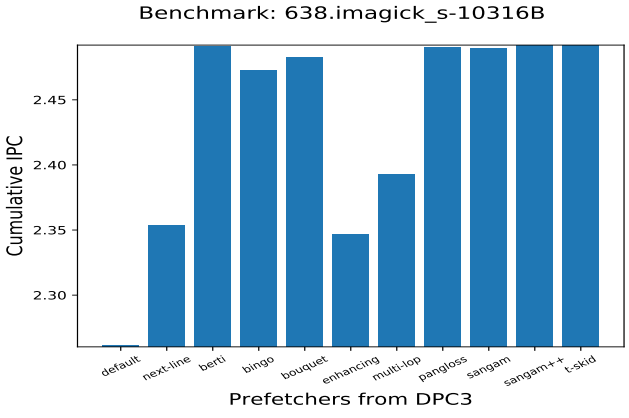
Benchmark: 621.wrf_s-575B

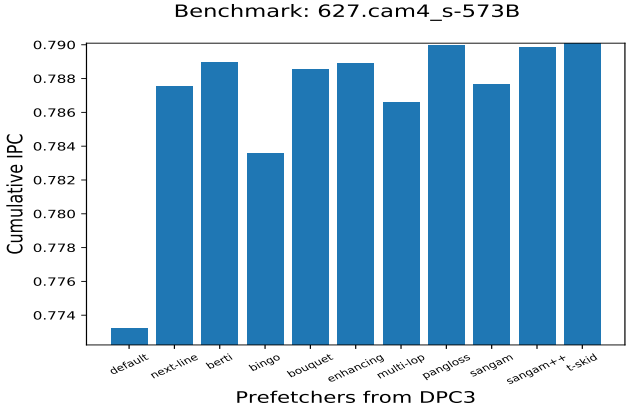


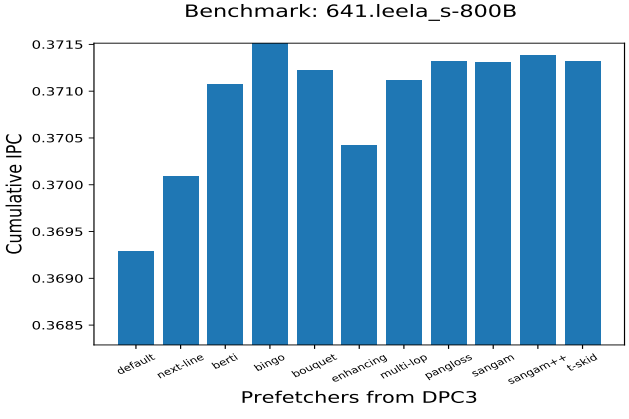

Benchmark: 623.xalancbmk_s-700B
Cumulative IPC
0.43
0.42
0.41
0.40
0.39
0.38
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3

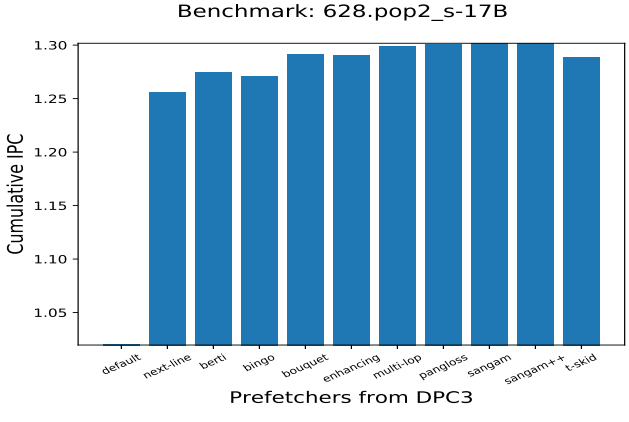

Benchmark: 631.deepsjeng_s-928B
Cumulative IPC
0.5305
0.5300
0.5295
0.5290
0.5285
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3

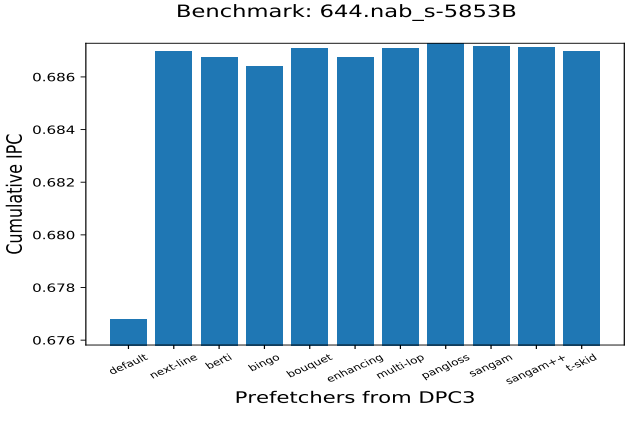

Benchmark: 625.x264_s-18B
Cumulative IPC
1.400
1.395
1.390
1.385
1.380
1.375
1.370
1.365
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3

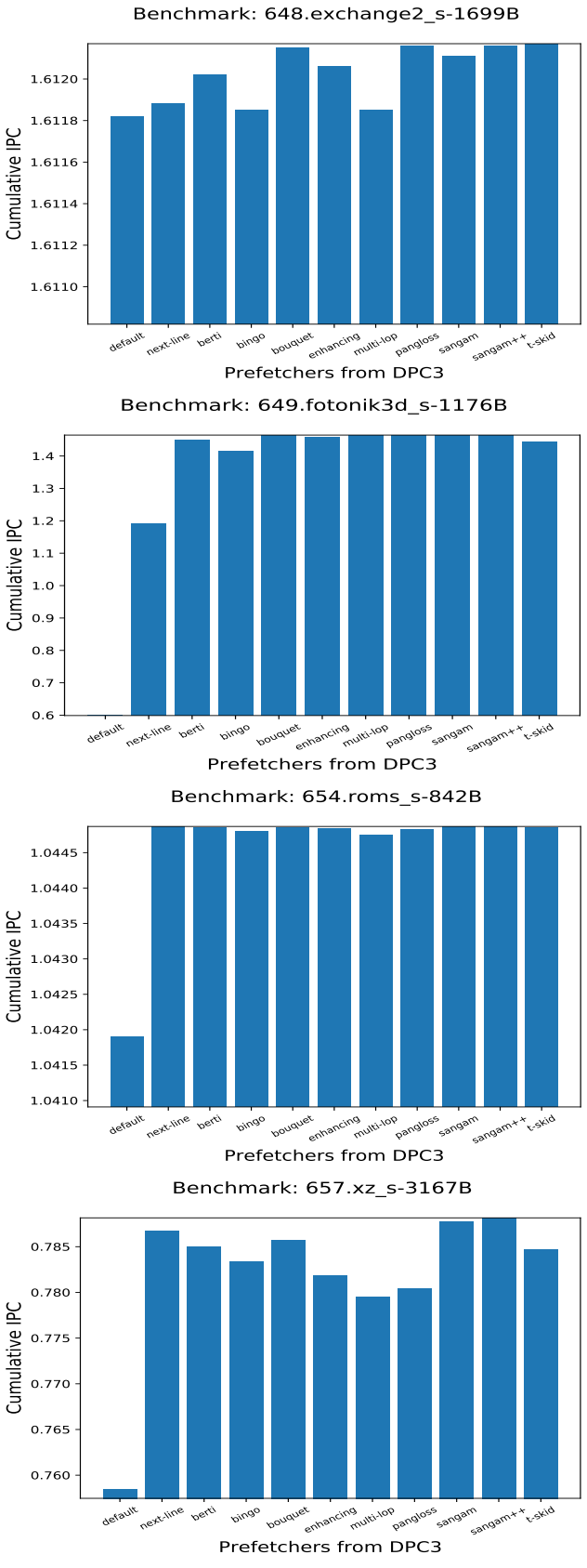

Benchmark: 638.imagick_s-10316B
Cumulative IPC
2.45
2.40
2.35
2.30
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3


Benchmark: 627.cam4_s-573B
Cumulative IPC
0.790
0.788
0.786
0.784
0.782
0.780
0.778
0.776
0.774
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3


Benchmark: 641.leela_s-800B
Cumulative IPC
0.3715
0.3710
0.3705
0.3700
0.3695
0.3690
0.3685
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3


Benchmark: 628.pop2_s-17B
Cumulative IPC
1.30
1.25
1.20
1.15
1.10
1.05
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3


Benchmark: 644.nab_s-5853B
Cumulative IPC
0.686
0.684
0.682
0.680
0.678
0.676
default
next-line
berti
bingo
bouquet
enhancing
multi-lop
pangloss
sangam
sangam++
t-skid
Prefetchers from DPC3



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   - co-PIs on accepted/rejected/pending grant proposals.
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Acknowledgements

This document is derived from previous conferences, in particular MICRO 2013, ASPLOS 2015, MICRO 2015, MICRO 2016, MICRO 2017, and MICRO 2018.

3. REFERENCES

[1] L. Lamport, *LaTeX: A Document Preparation System*, 2nd ed. Reading, Massachusetts: Addison-Wesley, 1994.

[2] F. Lastname1 and F. Lastname2, "A very nice paper to cite," in *Proceedings of the 49th Annual IEEE/ACM International Symposium on Microarchitecture*, 2016.

[3] F. Lastname1, F. Lastname2, and F. Lastname3, "Another very nice paper to cite," in *Proceedings of the 48th Annual IEEE/ACM International Symposium on Microarchitecture*, 2015.

[4] F. Lastname1, F. Lastname2, F. Lastname3, F. Lastname4, F. Lastname5, F. Lastname6, F. Lastname7, F. Lastname8, F. Lastname9, F. Lastname10, F. Lastname11, and F. Lastname12, "Yet another very nice paper to cite, with many author names all spelled out," in *Proceedings of the 38th Annual International Symposium on Computer Architecture*, 2011.