256.bzip2, ref.program

Datasets profile vs. Reference Dataset

The following are the profiles for the 256.bzip2, ref.program benchmark. For more details about our profile development and dataset reduction methodology, refer to the paper by AJ KleinOsowski and David J. Lilja, "MinneSPEC: A New SPEC Benchmark Workload for Simulation−Based Computer Architecture Research", Computer Architecture Letters,Volume 1, June 2002. This paper is available in electronic form at http://www.arctic.umn.edu/~lilja/minnespec/index.html

http:// www.arctic.umn.edu

Function level execution profile at optimization level O0

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small (SmRed) reduced input sets are not available for this benchmark. This data was gathered with the gprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, and LgRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
generateMTFValues	16.74	1.17	14.48	44.09	44.68	14.87	0.21
sendMTFValues	12.72	52.29	123.10	9.15	1.00	12.35	0.01
getAndMoveToFrontDecode	11.71	7.87	1.26	20.40	6.45	10.77	0.08
sortIt	9.84		9.84	6.24	1.32	10.44	0.04
internal_mcount	9.40	9.67	0.01	4.51	2.54	9.26	0.00
qSort3	8.05		8.05	0.10	7.85	7.97	0.00
fullGtU	7.05	1.87	3.81	1.04	5.12	9.20	0.66
undoReversibleTransformation_fast	4.98	3.58	0.39	3.27	0.59	5.39	0.03
spec_getc	4.16		4.16	2.35	0.79	3.25	0.20
simpleSort	3.25		3.25	1.51	0.93	3.98	0.16
spec_putc	2.42		2.42	1.51	0.34	2.02	0.07
getRLEpair	2.18	0.00	2.18	1.01	0.63	2.41	0.02
spec_ungetc	1.51		1.51	0.91	0.24	1.23	0.05
loadAndRLEsource	1.41	0.00	1.41	0.68	0.38	1.57	0.02
bsW	1.15	0.00	1.15	1.24	0.01	1.63	0.20
bsR	1.10		1.10	1.15	0.00	1.01	0.01
vswap	0.76	0.00	0.76	0.00	0.76	0.79	0.00
doReversibleTransformation	0.43		0.43	0.28	0.05	0.56	0.04
hbMakeCodeLengths	0.40	13.57	433.62	0.15	0.16	0.51	0.03
_mcount	0.34	0.58	0.17	0.23	0.04	0.45	0.04
spec_init	0.10		0.10	0.04	0.04	0.00	0.10
memset	0.07		0.07	0.05	0.01	0.06	0.00
med3	0.06		0.06	0.00	0.06	0.06	0.00
recvDecodingTables	0.05	4.44	385.44	0.05	0.00	0.06	0.00
memcpy	0.04	0.00	0.04	0.00	0.04	0.00	0.04
hbCreateDecodeTables	0.02	2.75	372.65	0.00	0.02	0.00	0.02
hbAssignCodes	0.01	0.06	0.25	0.01	0.00	0.00	0.01
_brk_unlocked	0.01		0.01		0.01	0.11	1.00
main	0.01		0.01	0.00	0.01	0.00	0.01
Sum	99.97	97.85	1371.72	99.97	74.06	99.95	3.04
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (29 entries) = 37.916

Function level execution profile at optimization level O1

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small (SmRed) reduced input sets are not available for this benchmark. This data was gathered with the gprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, and LgRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
internal_mcount	25.12	11.64	7.23	17.63	2.23	25.18	0.00
getAndMoveToFrontDecode	10.85	11.99	0.12	21.30	10.06	11.43	0.03
sortIt	8.80	7.69	0.14	9.56	0.07	9.70	0.09
generateMTFValues	8.13	10.81	0.88	21.82	23.05	7.38	0.07
undoReversibleTransformation_fast	7.46	4.42	1.24	6.45	0.14	7.96	0.03
sendMTFValues	5.92	3.74	0.80	5.20	0.09	5.50	0.03
spec_getc	5.90	2.78	1.65	3.51	0.97	4.92	0.16
qSort3	5.54	0.22	5.11	0.08	5.38	6.08	0.05
fullGtU	5.01	38.51	224.00	1.57	2.36	5.35	0.02
spec_putc	3.04	1.48	0.80	2.90	0.01	1.45	0.83
simpleSort	2.56	1.12	0.81	1.69	0.30	2.32	0.02
getRLEpair	2.07	0.82	0.75	1.13	0.43	2.60	0.14
spec_ungetc	2.06	0.86	0.70	1.33	0.26	1.45	0.18
bsW	1.91	1.20	0.26	1.37	0.15	1.45	0.11
bsR	1.54	0.96	0.22	2.22	0.30	1.30	0.04
loadAndRLEsource	1.31	0.54	0.45	0.65	0.33	2.03	0.40
_mcount	0.98	0.46	0.28	0.56	0.18	1.01	0.00
doReversibleTransformation	0.47	0.18	0.18	0.48	0.00	1.01	0.62
vswap	0.36	0.01	0.34	0.00	0.36	0.58	0.13
hbMakeCodeLengths	0.26	0.04	0.19	0.16	0.04	0.43	0.11
spec_init	0.24	0.07	0.12	0.12	0.06	0.00	0.24
memset	0.19	0.09	0.05	0.16	0.00	0.29	0.05
memcpy	0.11	0.03	0.06	0.00	0.11	0.00	0.11
med3	0.07	0.01	0.05	0.00	0.07	0.14	0.07
_brk_unlocked	0.04	0.04	0.00	0.04	0.00	0.29	1.56
recvDecodingTables	0.03	0.02	0.00	0.00	0.03	0.00	0.03
main	0.01	0.01	0.00	0.00	0.01	0.00	0.01
hbAssignCodes	0.01	0.00	0.01	0.00	0.01	0.00	0.01
_libc_read	0.01	0.01	0.00	0.04	0.09	0.00	0.01
Sum	100.00	99.75	246.46	99.97	47.09	99.85	5.17
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (29 entries) = 37.916

Function level execution profile at optimization level O2

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small (SmRed) reduced input sets are not available for this benchmark. This data was gathered with the gprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, and LgRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
internal_mcount	24.63	11.40	7.11	17.83	1.88	25.38	0.02
generateMTFValues	9.65	13.26	1.35	27.28	32.21	8.86	0.06
getAndMoveToFrontDecode	9.54	9.69	0.00	15.42	3.62	10.06	0.03
sortIt	8.83	7.99	0.08	10.03	0.16	10.06	0.17
undoReversibleTransformation_fast	7.27	4.36	1.16	6.34	0.12	7.21	0.00
fullGtU	5.73	39.33	197.03	2.32	2.03	4.65	0.20
qSort3	5.73	0.18	5.38	0.08	5.57	6.91	0.24
sendMTFValues	5.29	3.35	0.71	4.89	0.03	4.95	0.02
spec_getc	5.12	2.44	1.40	3.81	0.34	3.90	0.29
spec_putc	3.20	1.53	0.87	2.16	0.34	3.60	0.05
simpleSort	2.89	0.89	1.38	1.45	0.72	3.45	0.11
getRLEpair	2.52	0.88	1.07	1.29	0.60	1.80	0.21
spec_ungetc	2.04	0.72	0.85	1.24	0.31	1.50	0.14
_mcount	1.73	0.90	0.40	1.12	0.22	1.50	0.03
bsW	1.48	1.01	0.15	1.91	0.12	1.20	0.05
bsR	1.35	0.78	0.24	1.20	0.02	1.50	0.02
loadAndRLEsource	1.34	0.57	0.44	0.83	0.19	1.95	0.28
doReversibleTransformation	0.38	0.14	0.15	0.25	0.04	0.45	0.01
vswap	0.32	0.01	0.30	0.00	0.32	0.15	0.09
spec_init	0.27	0.07	0.15	0.04	0.20	0.00	0.27
hbMakeCodeLengths	0.25	0.07	0.13	0.12	0.07	0.30	0.01
memset	0.20	0.09	0.06	0.17	0.00	0.15	0.01
memcpy	0.11	0.03	0.06	0.00	0.11	0.00	0.11
med3	0.05	0.01	0.03	0.00	0.05	0.15	0.20
recvDecodingTables	0.03	0.01	0.01	0.04	0.00	0.00	0.03
_brk_unlocked	0.02	0.04	0.02	0.12	0.50	0.30	3.92
main	0.01	0.00	0.01	0.00	0.01	0.00	0.01
__open	0.01	0.01	0.00	0.00	0.01	0.00	0.01
hbCreateDecodeTables	0.01	0.00	0.01	0.00	0.01	0.00	0.01
hbAssignCodes	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Sum	100.01	99.76	220.57	99.94	49.81	99.98	6.63
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (30 entries) = 39.088

256.bzip2, ref.program

Function level execution profile at optimization level O3

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small (SmRed) reduced input sets are not available for this benchmark. This data was gathered with the gprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, and LgRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
internal_mcount	22.43	9.75	7.17	14.53	2.78	23.24	0.03
getAndMoveToFrontDecode	10.95	10.47	0.02	16.83	3.16	9.98	0.09
generateMTFValues	10.08	13.53	1.18	29.15	36.08	9.05	0.11
sortIt	9.61	8.13	0.23	10.78	0.14	11.08	0.22
undoReversibleTransformation_fast	7.41	4.09	1.49	6.93	0.03	6.71	0.07
qSort3	6.79	0.19	6.42	0.31	6.18	7.64	0.11
sendMTFValues	6.65	3.96	1.09	6.18	0.03	5.77	0.12
spec_getc	6.20	2.85	1.81	4.02	0.77	5.62	0.05
fullGtU	5.00	40.26	248.65	1.46	2.51	5.62	0.08
spec_putc	3.12	1.55	0.79	2.92	0.01	3.12	0.00
simpleSort	2.73	1.01	1.08	1.55	0.51	2.18	0.11
getRLEpair	2.21	1.00	0.66	1.19	0.47	3.12	0.37
spec_ungetc	2.10	1.02	0.56	1.24	0.35	2.65	0.14
loadAndRLEsource	1.72	0.65	0.67	0.75	0.55	1.25	0.13
_mcount	1.54	0.69	0.47	1.28	0.04	1.40	0.01
doReversibleTransformation	0.41	0.40	0.00	0.31	0.02	0.62	0.11
hbMakeCodeLengths	0.28	0.16	0.05	0.04	0.21	0.31	0.00
spec_init	0.28	0.07	0.16	0.04	0.21	0.00	0.28
memset	0.21	0.10	0.06	0.18	0.00	0.16	0.01
memcpy	0.16	0.04	0.09	0.00	0.16	0.00	0.16
recvDecodingTables	0.06	0.02	0.03	0.13	0.08	0.16	0.17
__open	0.02	0.04	0.02	0.00	0.02	0.00	0.02
hbCreateDecodeTables	0.02	0.00	0.02	0.00	0.02	0.00	0.02
main	0.01	0.00	0.01	0.00	0.01	0.00	0.01
_brk_unlocked	0.01	0.01	0.00	0.13	1.44	0.31	9.00
Sum	100.00	99.99	272.71	99.95	55.79	99.99	11.42
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (25 entries) = 33.196

Instruction Mix profile at optimization level O0

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small reduced (SmRed) datasets are not available for this benchmark. This data was gathered with the sim−profile simulator from the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, and LgRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

256.bzip

O0 program Inst type	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
load	31.71	36.97	0.87	32.41	0.02	31.86	0.00
store	10.93	13.26	0.50	13.34	0.53	10.84	0.00
unconditional branch	3.76	2.20	0.65	3.72	0.00	3.68	0.00
conditional branch	4.39	4.90	0.06	3.89	0.06	4.44	0.00
int computation	49.21	42.66	0.87	46.64	0.13	49.18	0.00
fp computation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	99.99	2.95	100.00	0.74	100.00	0.00
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level O1

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small reduced (SmRed) datasets are not available for this benchmark. This data was gathered with the sim−profile simulator from the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, and LgRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

256.bzip

O1 program Inst type	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
load	21.14	23.19	0.20	20.49	0.02	21.17	0.00
store	9.81	7.68	0.46	14.09	1.87	9.47	0.01
unconditional branch	2.63	0.77	1.32	1.15	0.83	2.62	0.00
conditional branch	10.51	13.30	0.74	10.33	0.00	10.65	0.00
int computation	55.91	55.05	0.01	53.93	0.07	56.09	0.00
fp computation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	99.99	2.73	99.99	2.79	100.00	0.01
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level O2

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small reduced (SmRed) datasets are not available for this benchmark. This data was gathered with the sim−profile simulator from the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, and LgRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

256.bzip

O2 program

Inst type	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
load	21.20	23.37	0.22	20.62	0.02	21.27	0.00
store	10.39	8.00	0.55	15.32	2.34	10.00	0.01
unconditional branch	2.69	0.80	1.33	1.25	0.77	2.69	0.00
conditional branch	11.09	13.84	0.68	11.23	0.00	11.21	0.00
int computation	54.63	53.99	0.01	51.58	0.17	54.83	0.00
fp computation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	100.00	2.79	100.00	3.30	100.00	0.02
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level O3

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train.compressed, test.random, and lgred.program datasets as compared to the full SPEC reference datasets. Note: the medium (MdRed) and small reduced (SmRed) datasets are not available for this benchmark. This data was gathered with the sim−profile simulator from the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, and LgRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, and LgRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

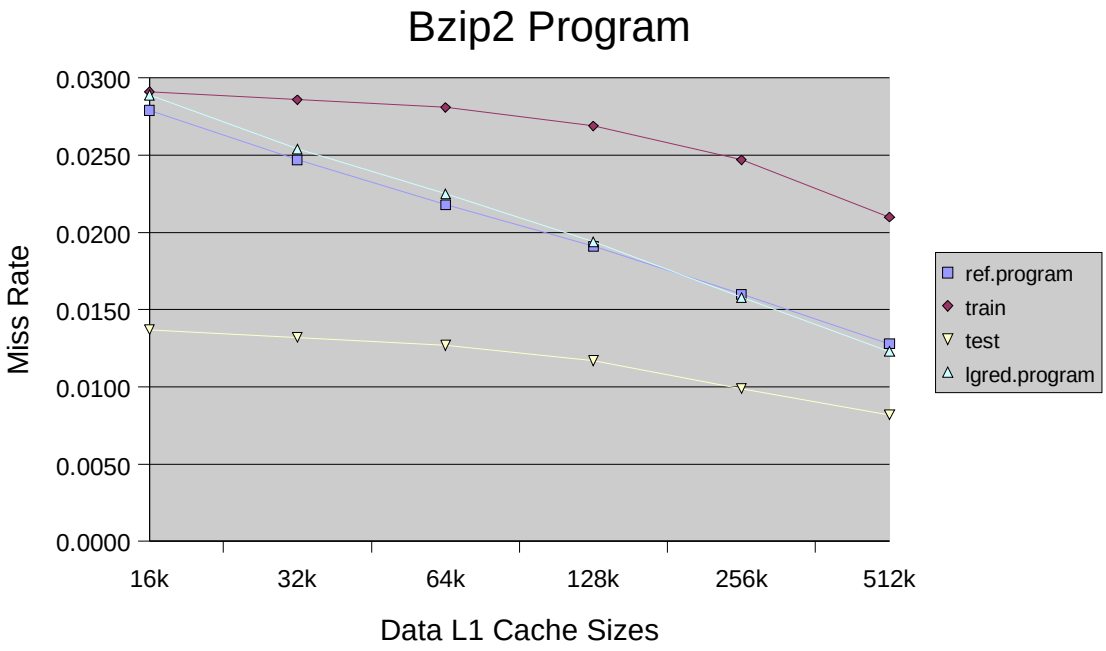
256.bzip

O3 program Inst type	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi
load	21.22	23.40	0.22	20.67	0.01	21.29	0.00
store	10.10	7.85	0.50	15.20	2.58	9.71	0.02
unconditional branch	2.45	0.68	1.28	1.07	0.78	2.45	0.00
conditional branch	11.34	13.97	0.61	11.41	0.00	11.46	0.00
int computation	54.89	54.09	0.01	51.65	0.19	55.09	0.00
fp computation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	99.99	2.63	100.00	3.56	100.00	0.02
	Ref Program	Train Compressed	Train Chi	Test Random	Test Chi	LgRed Program	LgRed Chi

90% Confidence level (7 entries) = 10.645

Cache profile

The following chart shows level 1 data cache miss rates for the ref.program, train.compressed, test.random, and lgred.program datasets. Note: the medium (MdRed) and small (SmRed) reduced datasets are not available for this benchmark. This data was gathered with the sim−cache simulator from the SimpleScalar suite. Miss rate is stated as the ratio of level 1 misses to total level 1 accesses.



256.bzip2, ref.program

Instruction Counts for all Datasets

The following table shows the instruction counts and estimated simulation time for the reference (Ref.program), train.compressed, test.randome, and lgred.program datasets. Note: the medium (MdRed) and small (SmRed) reduced datasets are not available for this benchmark. Instruction counts are from the simulated benchmark, compiled at optimization level O0 and run with each input dataset. Estimated simulation times are calculated using a 45,000 instructions per second factor. This factor was determined by observing the simulation rate of a simulator similar to sim−outorder, run on a machine similar to the SPEC 2000 reference machine (a 333 Mhz Sparc).

	Ref.program	Train.compressed	Test.random	LgRed.program
Instruction Count (in millions)	236675	159946	26312	5053
Simulation Time (in hours)	1461.0	987.3	162.4	31.2