Dhrystone Benchmark Results On PCs

Windows PC Results	Linux Results	Android Results
Raspberry Pi Results	DOS and OS/2 Results	

Description

The Dhrystone "C" benchmark provides a measure of integer performance (no floating point instructions). It became the key standard benchmark from 1984, with the growth of Unix systems. The first version was produced by Reinhold P. Weicker in ADA and translated to "C" by Rick Richardson.

Two versions are available - Dhrystone versions 1.1 and 2.1. The second version was produced to avoid over-optimisation problems encountered with version 1. Although it is recommended that advanced optimisation levels should be avoided with the latter, it is clear from published results that the recommendation is usually ignored.

This document contains results of optimised and non-optimised versions of Dhrystone 1 and 2 on PCs. The pre-compiled benchmarks can be found in BenchNT.zip which also contains the source codes, providing further explanatory comments. DOS versions are available in DosTests.zip, some to run via OS/2 in OS2Tests.zip and a 16 bit version in cb16bit.zip. Then there is My Main Page for other PC benchmarks and results.

Original versions of the benchmark gave performance ratings in terms of Dhrystones per second. This was later changed to VAX MIPS by dividing Dhrystones per second by 1757, the DEC VAX 11/780 result.

Dhrystone Reference - Reinhold P. Weicker, CACM Vol 27, No 10, 10/84,pg.1013

Results

The following is a sample of results. Performance tends to be proportional to CPU MHz for a given type of processor. Details of cache sizes and range of CPU MHz can be found in CPUSpeed.htm. Results include those from DOS and Windows compilations that produce very similar speed measurements. OS/2 and 16 bit results are included at the bottom of the table.

Later results are for new optimised compilations via Microsoft 32 bit and 64 bit compilers, the latter with integer variables declared as 32 and 64 bits. Results for 32 bit integers show that 64 bit compilations are up to 56% faster than the 32 bit versions. Much of the gain appears to be due to a different translation of the C source code but, with twice as many registers available for optimisation at 64 bits, there could be some performance improvement. Regarding 64 bit compilations, the versions using 64 bit integers were both slower than with 32 bit integers. by 27% in one case. This might be due to the higher volume of data from cache with 64 bit words but limited compilations were inconclusive when some of the code was omitted. The EXE files can be found in Win64.zip and C/C++ source code in NewSource.zip.

Results from compilations, following others for 32 bit and 64 bit tests, are from a later Microsoft compiler, with samples that include an Intel Atom based tablet, using Windows 10.

Other results are for the same code ported to 32-Bit and 64-Bit Linux using the supplied GCC compiler (all free software) - see linux benchmarks.htm and download benchmark execution files, source code, compile and run instructions in classic_benchmarks.tar.gz. Using Windows the file downloaded wrongly as classic_benchmarks.tar.tar but was fine when renamed classic_benchmarks.tar.gz. Results are shown separately below.

Later conversions were varieties to run on Android tablets and phones on ARM CPUs. These use a Java front end for starting and displaying results, with the compiled C code for calculations. Download Dhrystone2.apk and Dhrystone2i.apk see android benchmarks.htm, Android Native ARM-Intel Benchmarks.htm and Android 64 Bit Benchmarks.htm also results here.

Latest benchmark was compiled and run on a Raspberry Pi that uses ARM CPUs and Linux. See Raspberry Pi Benchmarks.htm and download from Raspberry_Pi_Benchmarks.zip. Then updated (2015), inculding Raspberry Pi 2, exising benchmarks and new version from a later compiler. Raspberry Pi 3 results were added in 2016. The results are also here. Benchmarks and source codes for 64 bit Linux are in Rpi3-64-Bit-Benchmarks.tar.gz.

CPU	MHz	Dhry1 Opt VAX MIPS	Dhry1 NoOpt VAX MIPS	Dhry2 Opt VAX MIPS	Dhry2 NoOpt VAX MIPS
AMD 80386	40	17.5	4.32	13.7	4.53
IBM 486D2	50	26.6	7.89	22.4	7.89
80486 DX2	66	45.1	12.0	35.3	12.4
IBM 486BL	100	53.9	12.0	40.9	11.8
AMD 5X86	133	84.5	9.37	84.5	9.42

Pentium	75	112	19.3	87.1	18.9
Cyrix P150	120	175	27.9	160	28.3
Pentium	100	169	31.8	122	32.2
Cyrix PP166	133	219	38.4	180	39.8
IBM 6x86	150	234	44.1	188	43.9
Pentium	133	239	38.3	181	39.0
Pentium	166	270	43.6	189	43.9
Cyrix PR233	188	286	46.4	232	45.8
Pentium	200	353	47.4	269	48.1
Pentium MMX	200	352	51.4	276	51.0
AMD K6	200	349	43.1	289	43.3
Pentium Pro	200	373	92.4	312	91.9
Celeron A	300	553	133	484	136
Pentium II	300	544	132	477	136
AMD K62	500	778	77.8	606	76.8
AMD K63	450	804	76.3	645	77.4
Pentium II	450	813	199	713	204
Celeron A	450	828	198	720	202
Pentium III	450	846	197	722	203
Pentium III	600	1105	263	959	270
Athlon	600	1316	321	942	316
Duron	600	1382	350	999	349
Pentium III	1000	1858	461	1595	465
PIII Tualatin	1200	2205	546	1907	571
Pentium 4	1700	2262	239	1843	242
Athlon Tbird	1000	2282	634	1659	602
Duron	1000	2288	576	1674	587
Celeron M	1295	2440	640	2273	645
Atom	1600	2462	717	1828	728
Pentium 4	1900	2593	261	2003	269
Atom	1666	2600	772	1948	780
P4 Xeon	2200	3028	300	2265	309
Atom Z8300	1840	3203	904	2686	927
Athlon 4	1600	3707	956	2830	1004
Pentium M	1862	4082	954	3933	975
Ath4 Barton	1800	4181	1061	3172	1099
Pentium 4E	3000	4379	566	3553	566
Athlon XP	2080	4826	1228	3700	1312
Turion 64 M	1900	4972	1186	3742	1150
Pentium 4	3066	5052	432	4012	434
Opteron	1991	5077	1268	3985	1223
Core 2 Duo M	1830	5379	892	4952	966
Athlon XP	2338	5433	1400	4160	1482
Athlon 64	2150	5658	1312	4288	1355
Pentium 4	3678	5787	511	4227	480
Athlon 64	2211	5798	1348	4462	1312
Celeron C2 M	2000	5804	932	5275	1050
Core 2 Duo 1 CP	2400	7145	1198	6446	1251
Core i5 2467M	@@@@	8338	1183	4752	1148
Phenom II 1 CP	3000	9462	2250	7615	2253
Core i7 930	****	9826	1662	8684	1661
Core i7 860	####	10094	1789	9978	1847
Core i7 3930K	&&&&	13871	1960	11197	1972
Core i7 4820K	$$$1	14136	1958	11867	1981
Core i7 4820K	$$$2	14776	2006	11978	2014
Core i7 3930K	OC	17269	2444	13877	2432

Rated as 2800 MHz but running at up to 3460 MHz using Turbo Boost
**** Rated as 2800 MHz but running at up to 3066 MHz using Turbo Boost
@@@@ Rated as 1600 MHz running at up to 2300 MHz using Turbo Boost
&&&& Rated as 3200 MHz but running at up to 3800 MHz, OC OverClocked ~4730 MHz
$$$1 Rated as 3700 MHz but running at up to 3900 MHz, using Turbo Boost
$$$2 Performance not Balanced Power Setting for 3900 MHz
M = Mobile CPU

To Start

CPU		MHz	Dhry1 Opt VAX MIPS	Dhry1 NoOpt VAX MIPS	Dhry2 Opt VAX MIPS	Dhry2 NoOpt VAX MIPS
Later Results 32 and 64 Bit MS Compilers						
Pentium 4	32b1	1900	2613		1795	
Athlon 64	32b1	2211	6104		3720	
Athlon 64	64b1	2211	8668		5214	
Athlon 64	64b2	2211	8549		4654	
Core 2 Duo	32b1	2400	8094		5476	
Core 2 Duo	64b1	2400	12600		8550	

Core 2 Duo	64b2	2400	11726	6248
Core i7	64b1	&&&&	33048	18355
Core i7	64b2	&&&&	27873	15753
Core i7	32b1	$$$1	15470	10302
Core i7	64b1	$$$1	27113	15580
Core i7	64b2	$$$1	22362	13279
Core i7	32b1	$$$2	15587	10347
Core i7	64b1	$$$2	29291	15756
Core i7	64b2	$$$2	23652	13364
Phenom II	32b1	3000	9768	6006
Phenom II	64b1	3000	9862	6878
Phenom II	64b2	3000	11837	8006

b1 = 32 bit integers, b2 = 64 bit integers
&&&& overclocked i7-3930K see above
$$$1 Turbo Boost < 3900 MHz see above
$$$2 Turbo Boost at 3900 MHz see above

Later MS Compilers Version 18.00

Atom Z8300	32b1	1840		3044
Atom Z8300	64b1	1840		3201
Core 2 Mob	32b1	1830		4546
Core 2 Duo	32b1	2400		6587
Core 2 Duo	64b1	2400		5946
Core i7	32b1	$$$1		12090
Core i7	64b1	$$$1		11686
Phenom II	32b1	3000		7321
Phenom II	64b1	3000		8137

To Start

,B.32 Bit and 64 Bit Linux Results from Ubuntu GCC

CPU		OS	MHz	Dhry1 Opt VAX MIPS	Dhry1 NoOpt VAX MIPS	Dhry2 Opt VAX MIPS	Dhry2 NoOpt VAX MIPS
Atom N455	32b	Ub	1666	5485	1198	2055	1194
Atom N455	64b	Ub	1666	5926	1065	2704	1098
Core 2 Mob	32b	Ub	1830	9876	2602	4833	2584
Core 2 Mob	64b	Ub	1830	15382	2265	8241	2502
Athlon 64	32b	Ub	2211	9034	2286	4580	2347
Athlon 64	64b	Ub	2211	14783	2243	6873	2580
Core 2 Duo	32b	Ub	2400	13599	3428	5852	3348
Core 2 Duo	64b	Ub	2400	18738	3643	12265	3288
Phenom II	32b	Ub	3000	13406	3368	6676	3470
Phenom II	64b	Ub	3000	21996	3908	11982	3826
Phenom II	64b	Fe	3000	21841	3882	12000	3798
Core i7 930	64b	Ub	****	24396	5361	16435	5302
Core i7 4820K	32b	Ub	$$$1	29277	7108	16356	7478
Core i7 4820K	64b	Ub	$$$1	32659	8436	23607	8481

Ub = Ubuntu Linux, Fe = Fedora Linux
**** Rated as 2800 MHz but running at up to 3066 MHz using Turbo Boost
$$$1 Rated as 3700 MHz but running at up to 3900 MHz, using Turbo Boost

To Start

Android Results Compiled By Native Development Kit
Also results for Raspberry Pi & Linux

System	ARM	MHz	Android	Opt Vax MIPS	NoOpt Vax MIPS
T5	MIPS CPU	1000	4.0.1	56 E	
T1	926EJ	800	2.2	356	196
T2	v7-A9	800	2.3.4	962	458

P13	v7-A9	1200	4.1.2	1491	
T7	v7-A9	1300a	4.1.2	1610	810
T4	v7-A9	1500a	4.0.3	1650	786
P11	v7-A9v3	1400	4.0.4	1937	866
T11*I	v7-A15	2000b	4.2.2	2533	
T11	v7-A15	2000b	4.2.2	3189	1504
T21*I	QU-800	2150	4.4.3	3319	
T21	QU-800	2150	4.4.3	3854	1628
A1*C	Z3745	1866	4.4.2	1840	1310
A1*I	Z3745	1866	4.4.2	2451	
A1*I	Z8300	1840	5.1.1	2430	
ARM	v8-A53	1300	5.0.2	1683	
ARM*I	v8-A53	1300	5.0.2	1423	
ARM*I	v8-A53	1300	5.1	1493	
ARM*I	v8-A53	1500	6.0.1	1649	
R1=Atom	Z8300	1840	6.0.1	2390	
R2	Core i7	3900	6.0.1	10489	
64 Bit Version					
ARM	v8-A53*I	1300	5.0.2	2569	
ARM	v8-A53*I	1300	5.1	2658	
R1=Atom	Z8300	1840	6.0.1	3769	
R2	Core i7	3900	6.0.1	17003	

System - T = Tablet, P = Phone, E = Emulator?
a running at 1500, b at 1700
*I Atom Native Intel/ARM version
*C Atom using Intel to ARM conversion
QU = Qualcomm CPU
R1, R2 Android via REMIX for PC

Raspberry Pi		**Linux**		
ARM	1176	700	3.6.11	847
ARM	1176	1000	3.6.11	1226
Raspberry Pi 2				
ARM V7A		900	3.18.5	1538
ARM v7A		1000	3.18.5	1694
gcc 4.8				
ARM V7A		900	3.18.5	1667
ARM V7A		1000	3.18.5	1852
Raspberry Pi 3, 32 Bit				
ARM v8-A53		1200	4.1.19	2201
gcc 4.8				
ARM v8-A53		1200	4.1.19	2469
Raspberry Pi 3, 64 Bit				
OpenSuse				
ARM v8-A53		1200	4.4.36	3536
Gentoo				
ARM v8-A53		1200	4.10.0	3475

NOTE: ARM's own results are much faster than these
- different compiler and optimisation?

To Start

16 Bit Results

CPU	MHz	Dhry1 Opt VAX MIPS	Dhry1 NoOpt VAX MIPS	Dhry2 Opt VAX MIPS	Dhry2 NoOpt VAX MIPS
80486 DX2	66	29	14	18	8
Pentium	100	89	41	78	42
Pentium Pro	200	176	95	164	94
Celeron M	1295	705			
Pentium 4E	3000	754			
Athlon 4	2080	1256			
Core i7 4820K	3700	1832			

OS/2 Results

80486	75	37	9	35	9
IBM 80486BL	100	54	12	41	12
80486 DX2	66	59	12	48	12
Cyrix P150	120	175	28	160	28
Pentium Pro	150	276	53	218	52
Pentium Pro	166	307	59	242	57
Pentium Pro	200	362	69	285	67

To Start

 **Roy Longbottom February 2017**

The Internet Home for my PC Benchmarks is via the link
Roy Longbottom's PC Benchmark Collection