Introduction

Go is fully supported on Linux and Darwin. Any Go program that you can compile for x86/x86_64 should work on Arm. Besides Linux and Darwin, Go is also experimentally supported on FreeBSD, OpenBSD and NetBSD.

Supported architectures

Go supports the following ARM architectural families.

Architecture	Status	GOARM value	GOARCH value
ARMv4 and below	not supported	n/a	n/a
ARMv5	supported	GOARM=5	GOARCH=arm
ARMv6	supported	GOARM=6	GOARCH=arm
ARMv7	supported	GOARM=7	GOARCH=arm
ARMv8	supported	n/a	GOARCH=arm64

Starting from Go 1.1, the appropriate GOARM value will be chosen if you compile the program from source on the target machine. In cross compilation situations, it is recommended that you always set an appropriate GOARM value along with GOARCH.

Supported operating systems

- ARM on Linux. You must run an EABI kernel. These are generally known as `armel` for softfloat (compatible with ARMv5) or `armhf` for hardware floating point (ARMv6 and above).
- ARM on Darwin: ARMv7 is required.
- ARM on FreeBSD, OpenBSD, and NetBSD: ARMv6K or above is required.

Recommended Go version

Go has a mature support for ARM systems; so, just like for other architectures, use the latest stable version (eg: Go 1.15 at the time of writing).

Tips and tricks

/tmp and tmpfs

The `go` build tool uses `/tmp` when compiling and testing, this can cause heavy wear and tear if `/tmp` lives on your SD card. To minimise this effect, either `export TMPDIR` to somewhere that lives on another filesystem. Alternatively if you have lots of physical memory you can mount a swap backed tmpfs filesystem on /tmp by adding this line to `/etc/fstab`

```
tmpfs /tmp tmpfs nodev,nosuid,mode=1777 0 0
```

Swap

Building Go from source requires at least 256mb of RAM. Running the tests requires at least 256mb of memory and at least 512mb of swap space.

Test failures due to resource starvation

The runtime tests create many native operating system threads which at the default of 8mb per thread can exhaust an ARM system with 32bit user mode address space (especially on multicore ARM systems such as the Raspberry PI 2). To prevent the runtime test from failing you may need lower the thread stack limit:

```
% ulimit -s 1024     # set the thread stack limit to 1mb
% ulimit -s          # check that it worked
1024
```

See Dave Cheney's blog post about building Go on Raspberry Pi for details.

Build failures due to lack of memory

The Go tool will try to keep all your cpu cores busy when installing packages (during make.bash), this is normally preferable on PCs where memory is abundant. However, some powerful multicore ARM machines don't have enough memory to support parallel builds utilizing all available cores, and you can work around that by using the `taskset(1)` utility to limit Go to only use one core without resorting to swaps.

```
taskset 1 ./make.bash # use 3 if you want to use two cores
```

Note: the 1 here is a bitmask for cpu affinity and it's not the number of cpu cores you're willing to use, please refer to `taskset(1)` manual for details.

Known issues

Lack of floating point hardware on ARMv5

The major issue with ARMv5 is the lack of floating point support in common ARMv5 hardware[†]. When compiled with the GOARM=5 environment variable, the 5l linker will insert a call to `_sfloat` before any block of floating point instructions to branch into the floating point emulator. This means that binaries produced with a Go installation that was compiled with soft float support will work on all supported architectures, but builds compiled without soft floating point support will not work on ARMv5.

[†] This isn't strictly true, there exist ARMv5 implementations which have VFP1 floating point. However the compiler doesn't support VFP1 yet.

html/template and test/nilptr.go test fail on HTC Android

html/template test and test/nilptr.go is known to fail on HTC's Android kernels (ref), because the kernel will kill the application after 10 segfaults.

Potential kernel bug in 2.6.32-5-kirkwood on QNAP 219P

See Issue 5466 for details. Updating to 3.2.0-4-kirkwood solved the issue.

Success stories

ARM hardware comes in a myriad of shapes and sizes. If you've had a success story building and running Go on your Arm system, please detail your results here.

Netgear Stora

Architecture: ARMv5

Operating System: Debian Sid

The Netgear Stora is an ARMv5 (Marvell Kirkwood) platform. I flashed mine with a Debian Sid distribution and it was, until Go1, a solid platform for Go development. The main drawback is the Stora only has 128mb of ram, which is not quite enough to run ./all.bash as 5l can use more than 100mb of ram when linking some commands.

Instructions for installing Debian on your Stora can be found on the OpenStora website, http://www.openstora.com/wiki/index.php?title=How_to_install_Debian_Linux_on_NETGEAR_Stora.

> *-- dave cheney*

Qnap TS-119P II

Architecture: ARMv5

Operating System: Debian Squeeze

The Qnap TS series of NASs are excellent hackable little linux hosts. The TS-11P9 II is a 2Ghz Marvell Kirkwood ARMv5 processor with 512mb of ram and a single SATA drive bay.

The kirkwood platform is supported by the native debian installer. http://www.cyrius.com/debian/kirkwood/qnap/ts-119/install.html

> *-- dave cheney*

Pandaboard

Architecture: ARMv7

Operating System: Ubuntu 12.04LTS (armhf)

The Pandaboard is a dual core ARMv7 development board based on the Texas Instruments OMAP4 SoC platform. I run ubuntu 12.04 LTS server on mine, which is an excellent distribution for Arm development. The Pandaboard has a gig of ram which makes it excellent for development and benchmarking.

Instructions and SD card image can be found on on the Ubuntu wiki, https://wiki.ubuntu.com/ARM/Server/Install#Installing_pre-installed_OMAP4_Precise_.2812.04.29_Server_Images.

> *-- dave cheney*

BeagleBone

Architecture: ARMv7 single core, Cortex-A8, 256MB RAM, 720 MHz

Operating System: Angstrom Linux

BeagleBone is similar to Beagleboard, but without the video components. Angstrom is a very small Linux distribution for ARM based systems. It is built on top of Yocto and OpenEmbedded with additional tools and recipes to make it even easier to build a distribution. You can think of Angstrom as Ubuntu and OpenEmbedded/Yocto as Debian. Angstrom is very light weight and fast compared to Ubuntu. It uses systemd instead of the sys5 scripts which help give you a very fast boot time of a few seconds.

BeagleBone is probably faster than a RasberryPI because of it's newer Cortex-A8 dual-issue superscalar architecture, but the PI has the GPU which theoretically could be used with something like OpenCL to really run circles around the BeagleBone. However, for embedded applications the BeagleBone is easier to work with because it is ready out of the box with GPIO connections.

I've cross compiled for ARM with 5g from a Mac and so far I haven't run into any problems. You can build on the BeagleBone, but cross compiling with Go is so easy that it is better to save wear and tear on the flash drive and just compile somewhere else.

> *-- hans stimer*

Zyxel NSA 310

Architecture: ARM5 Platform: Debian Wheeze

Successfuly built default branch, going to write fan control daemon for this device in golang.

Raspberry Pi

- Building Go 1.5 on the Raspberry Pi - Dave Cheney

Architecture: ARM1176JZFS, with floating point, running at 700Mhz

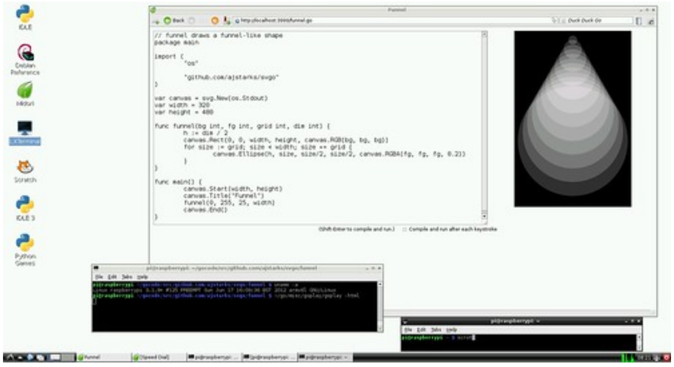
Operating System: Debian Wheezy beta distribution (http://www.raspberrypi.org/archives/1435) reported as:

```
Linux raspberrypi 3.1.9+ #125 PREEMPT Sun Jun 17 16:09:36 BST 2012 armv6l GNU/Linux
```

Memory Split: the Pi shares its 256mb of memory between the CPU and the GPU. You should allocate as much memory as possible to the CPU for a successful compilation. The configuration for the memory split is stored on your SD card. This link has a script to adjust the configuration, http://sirlagz.net/?p=445.

Go version weekly.2012-03-27 +645947213cac, with timeout and GOARM 7 patches http://codereview.appspot.com/5987063/) builds with 2 test failures: encoding/gob fails with out of memory, and fmt fails the NaN test.

Successfully installed and run SVGo via go get github.com/ajstarks/svgo, tested with goplay:



```
// funnel draws a funnel-like shape
package main

import (
	"os"

	"github.com/ajstarks/svgo"
)

var canvas = svg.New(os.Stdout)
var width = 320
var height = 480

func funnel(bg int, fg int, grid int, dim int) {
	h := dim / 2
	canvas.Rect(0, 0, width, height, canvas.RGB(bg, bg, bg))
	for size := grid; size < width; size += grid {
		canvas.Ellipse(h, size, size/2, size/2, canvas.RGBA(fg, fg, fg, 0.2))
	}
}

func main() {
	canvas.Start(width, height)
	canvas.Title("Funnel")
	funnel(0, 255, 25, width)
	canvas.End()
}
```

```
pi@raspberrypi ~/gocode/src/github.com/ajstarks/svgo/funnel $ uname -a
Linux raspberrypi 3.1.9+ #125 PREEMPT Sun Jun 17 16:09:36 BST 2012 armv6l GNU/Linux
pi@raspberrypi ~/gocode/src/github.com/ajstarks/svgo/funnel $ ~/go/misc/goplay/goplay -html
```

```
pi@raspberrypi ~ $ scrot
```

Division benchmark via http://codereview.appspot.com/6258067:

```
$ cd $GOROOT/src/pkg/runtime
$ go test -test.bench=BenchmarkUint


BenchmarkUint32Div7      5000000               547 ns/op
BenchmarkUint32Div37     5000000               547 ns/op
BenchmarkUint32Div123    5000000               547 ns/op
BenchmarkUint32Div763    5000000               547 ns/op
BenchmarkUint32Div1247   5000000               547 ns/op
BenchmarkUint32Div9305   5000000               547 ns/op
BenchmarkUint32Div13307  5000000               547 ns/op
BenchmarkUint32Div52513  5000000               547 ns/op
BenchmarkUint32Div60978747       5000000               547 ns/op
BenchmarkUint32Div106956295      5000000               547 ns/op
BenchmarkUint32Mod7      5000000               547 ns/op
BenchmarkUint32Mod37     5000000               547 ns/op
BenchmarkUint32Mod123    5000000               547 ns/op
BenchmarkUint32Mod763    5000000               547 ns/op
BenchmarkUint32Mod1247   5000000               547 ns/op
BenchmarkUint32Mod9305   5000000               547 ns/op
BenchmarkUint32Mod13307  5000000               547 ns/op
BenchmarkUint32Mod52513  5000000               547 ns/op
BenchmarkUint32Mod60978747       5000000               547 ns/op
BenchmarkUint32Mod106956295      5000000               547 ns/op
```

Running the hardware floating point distribution, Raspbian "pisces" (http://www.raspbian.org/PiscesImages) and applying the patches in https://gist.github.com/3116118, here are the results of the Eleanor McHugh gospeed benchmark:

```
raspbian@pisces:~/gowork/src/github.com/feyeleanor/gospeed$ uname -a
Linux pisces 3.1.9+ #171 PREEMPT Tue Jul 17 01:08:22 BST 2012 armv6l GNU/Linux
raspbian@pisces:~/gowork/src/github.com/feyeleanor/gospeed$ go test -test.bench=".*"
PASS
BenchmarkBaselineCastInt32ToInt 100000000               13.5 ns/op
BenchmarkBaselineCastIntToInt32 100000000               13.5 ns/op
BenchmarkBaselineCastInt64ToUint64      100000000               17.8 ns/op
BenchmarkBaselineCastUint64ToInt64      100000000               17.2 ns/op
BenchmarkBaselineVariableGet    100000000               13.4 ns/op
BenchmarkBaselineVariableSet    100000000               22.4 ns/op
BenchmarkBaselineVariableGetInterface   100000000               13.5 ns/op
```

```
BenchmarkBaselineVariableSetInterface   50000000                31.3 ns/op
BenchmarkBaselineVariableIncrement      100000000               23.9 ns/op
BenchmarkBaselineVariableDecrement      100000000               23.9 ns/op
BenchmarkBaselineFieldGet       100000000               13.5 ns/op
BenchmarkBaselineFieldSet       100000000               20.9 ns/op
BenchmarkBaselineSliceGet       50000000                32.9 ns/op
BenchmarkBaselineSliceSet       50000000                34.5 ns/op
BenchmarkBaselineMapIntGet       1000000              1448 ns/op
BenchmarkBaselineMapIntSet       1000000              1968 ns/op
BenchmarkBaselineMapStringGet    1000000              1119 ns/op
BenchmarkBaselineMapStringSet    1000000              1675 ns/op
BenchmarkBaselineIf     100000000               15.0 ns/op
BenchmarkBaselineIfElse 100000000               15.0 ns/op
BenchmarkBaselineSwitchDefault  100000000               13.5 ns/op
BenchmarkBaselineSwitchOneCase  100000000               15.0 ns/op
BenchmarkBaselineSwitchTwoCases 100000000               18.0 ns/op
BenchmarkBaselineSwitchTwoCasesFallthrough      100000000               18.0 ns/op
BenchmarkBaselineForLoopIteration       50000000                42.0 ns/op
BenchmarkBaselineForReverseLoopIteration        50000000                36.0 ns/op
BenchmarkBaselineForRange       20000000                80.9 ns/op
BenchmarkBaselineForSliceLength 50000000                39.0 ns/op
BenchmarkBaselineForReverseSliceLength  50000000                36.0 ns/op
BenchmarkBaselineForLoopIteration10     20000000               119 ns/op
BenchmarkBaselineForReverseLoopIteration10      20000000                92.9 ns/op
BenchmarkBaselineForRange10     10000000               215 ns/op
BenchmarkBaselineForSliceLength10       20000000               109 ns/op
BenchmarkBaselineForReverseSliceLength10        20000000                92.9 ns/op
BenchmarkBaselineForLoopIteration100     2000000               929 ns/op
BenchmarkBaselineForReverseLoopIteration100      5000000               700 ns/op
BenchmarkBaselineForRange100     1000000              1567 ns/op
BenchmarkBaselineForSliceLength100       2000000               853 ns/op
BenchmarkBaselineForReverseSliceLength100        5000000               700 ns/op
BenchmarkBaselineForLoopIteration10000     10000            106006 ns/op
BenchmarkBaselineForReverseLoopIteration10000      50000             67480 ns/op
BenchmarkBaselineForRange10000     10000            153841 ns/op
BenchmarkBaselineForSliceLength10000       20000             85735 ns/op
BenchmarkBaselineForReverseSliceLength10000        50000             69461 ns/op
BenchmarkBaselineMakeChannelBoolUnbuffered        200000             10162 ns/op
BenchmarkBaselineMakeChannelBool1         200000             12517 ns/op
BenchmarkBaselineMakeChannelBool10        200000             12521 ns/op
BenchmarkBaselineMakeChannelStringUnbuffered      500000             10369 ns/op
BenchmarkBaselineMakeChannelString1       200000             12576 ns/op
BenchmarkBaselineMakeChannelString10      100000             22358 ns/op
BenchmarkBaselineGo        50000            367593 ns/op
BenchmarkBaselineFunctionCall   50000000                57.0 ns/op
BenchmarkBaselineFunctionCallArg        20000000                81.0 ns/op
BenchmarkBaselineFunctionCall5VarArgs     500000              6852 ns/op
BenchmarkBaselineFunctionCallInt        50000000                60.3 ns/op
BenchmarkBaselineFunctionCall5VarInts    1000000              3185 ns/op
BenchmarkBaselineFunctionCallWithDefer   1000000              2330 ns/op
BenchmarkBaselineFunctionCallPanicRecover         500000              6222 ns/op
BenchmarkBaselineMethodCallDirect       20000000                83.8 ns/op
BenchmarkBaselineMethodCallDirect1Arg   20000000               106 ns/op
BenchmarkBaselineMethodCallDirect1Int   20000000                85.2 ns/op
BenchmarkBaselineMethodCallDirect5Args   5000000               368 ns/op
BenchmarkBaselineMethodCallDirect5Ints  10000000               233 ns/op
BenchmarkBaselineMethodCallIndirect     100000000               18.0 ns/op
BenchmarkBaselineMethodCallIndirect1Arg 50000000                42.0 ns/op
BenchmarkBaselineMethodCallIndirect1Int 100000000               19.5 ns/op
BenchmarkBaselineMethodCallIndirect5Args         5000000               309 ns/op
BenchmarkBaselineMethodCallIndirect5Ints        10000000               168 ns/op
BenchmarkBaselineTypeAssertion  10000000               218 ns/op
BenchmarkBaselineTypeAssertionEmptyInterface    20000000               106 ns/op
BenchmarkBaselineTypeAssertionInterface1         5000000               576 ns/op
BenchmarkBaselineTypeAssertionInterface2         5000000               579 ns/op
BenchmarkBaselineTypeReflectPrimitiveToValue     5000000               425 ns/op
BenchmarkBaselineTypeReflectSliceToValue         1000000              3218 ns/op
BenchmarkBaselineTypeReflectStructToValue         500000              4760 ns/op
BenchmarkBaselineTypeCheck      10000000               189 ns/op
BenchmarkBaselineTypeCheckEmptyInterface        20000000                93.1 ns/op
BenchmarkBaselineTypeCheckInterface1     5000000               511 ns/op
BenchmarkBaselineTypeCheckInterface2     5000000               516 ns/op
BenchmarkBaselineTypeSwitchOneCase      10000000               262 ns/op
BenchmarkBaselineTypeSwitchBasicTypesCase       10000000               295 ns/op
BenchmarkBaselineTypeSwitchEmptyInterface       10000000               163 ns/op
BenchmarkBaselineTypeSwitchInterface1    5000000               588 ns/op
BenchmarkBaselineTypeSwitchInterface2    5000000               602 ns/op
BenchmarkBaselineNewStructureLiteral    20000000                84.0 ns/op
```

```
BenchmarkBaselineNewStructure   20000000               127 ns/op
BenchmarkBaselineNewSliceLiteral        50000000                54.2 ns/op
BenchmarkBaselineNewSlice        1000000              3124 ns/op
BenchmarkBaselineNewMapLiteralIntToInt    500000              9083 ns/op
BenchmarkBaselineNewMapLiteralIntToInterface      500000              9807 ns/op
BenchmarkBaselineNewMapLiteralStringToInt         500000              9792 ns/op
BenchmarkBaselineNewMapLiteralStringToInterface   500000             10595 ns/op
BenchmarkBaselineNewMapLiteralIntToInt2Item       200000             14265 ns/op
BenchmarkBaselineNewMapLiteralIntToInterface2Item         200000             14669 ns/op
BenchmarkBaselineNewMapLiteralStringToInt2Item    200000             14025 ns/op
BenchmarkBaselineNewMapLiteralStringToInterface2Item      200000             15086 ns/op
BenchmarkBaselineNewMapIntToInt   500000              9025 ns/op
BenchmarkBaselineNewMapIntToInterface     500000              9753 ns/op
BenchmarkBaselineNewMapStringToInt        500000              9740 ns/op
BenchmarkBaselineNewMapStringToInterface          500000             10486 ns/op
BenchmarkBaselineSliceCopy       5000000               300 ns/op
BenchmarkBaselineNewSliceAppendElement1  1000000              3318 ns/op
BenchmarkBaselineNewSliceAppendElement10         1000000              5174 ns/op
ok      github.com/feyeleanor/gospeed   417.296s
```

-- anthony starks

Raspberry Pi 2

- Building Go 1.5 on the Raspberry Pi - Dave Cheney

```
go version
go version devel +07f9c25 Wed Dec 9 21:25:05 2015 +0000 linux/arm

$ go test -timeout 20m -v -bench=Benchmark -run=X
PASS
BenchmarkAppend-4                        3000000           402 ns/op
BenchmarkAppendGrowByte-4                     50      27296836 ns/op
BenchmarkAppendGrowString-4                    1    1277592542 ns/op
BenchmarkAppend1Byte-4                  20000000            75.6 ns/op
BenchmarkAppend4Bytes-4                 20000000            88.2 ns/op
BenchmarkAppend7Bytes-4                 20000000           103 ns/op
BenchmarkAppend8Bytes-4                 20000000            89.1 ns/op
BenchmarkAppend15Bytes-4                20000000           109 ns/op
BenchmarkAppend16Bytes-4                20000000            94.5 ns/op
BenchmarkAppend32Bytes-4                20000000            91.4 ns/op
BenchmarkAppendStr1Byte-4               20000000            73.9 ns/op
BenchmarkAppendStr4Bytes-4              20000000            84.7 ns/op
BenchmarkAppendStr8Bytes-4              20000000            88.7 ns/op
BenchmarkAppendStr16Bytes-4             20000000            94.5 ns/op
BenchmarkAppendStr32Bytes-4             20000000            91.3 ns/op
BenchmarkAppendSpecialCase-4             2000000           675 ns/op
BenchmarkCopy1Byte-4                    20000000           109 ns/op       9.13 MB/s
BenchmarkCopy2Byte-4                    20000000           112 ns/op      17.77 MB/s
BenchmarkCopy4Byte-4                    10000000           120 ns/op      33.26 MB/s
BenchmarkCopy8Byte-4                    10000000           122 ns/op      65.32 MB/s
BenchmarkCopy12Byte-4                   10000000           126 ns/op      94.82 MB/s
BenchmarkCopy16Byte-4                   10000000           129 ns/op     123.60 MB/s
BenchmarkCopy32Byte-4                   10000000           126 ns/op     252.60 MB/s
BenchmarkCopy128Byte-4                  10000000           162 ns/op     786.76 MB/s
BenchmarkCopy1024Byte-4                  3000000           479 ns/op    2134.17 MB/s
BenchmarkCopy1String-4                  20000000           100 ns/op       9.98 MB/s
BenchmarkCopy2String-4                  20000000           104 ns/op      19.19 MB/s
BenchmarkCopy4String-4                  20000000           111 ns/op      35.86 MB/s
BenchmarkCopy8String-4                  20000000           114 ns/op      70.02 MB/s
BenchmarkCopy12String-4                 20000000           116 ns/op     103.17 MB/s
BenchmarkCopy16String-4                 10000000           120 ns/op     132.69 MB/s
BenchmarkCopy32String-4                 20000000           116 ns/op     273.77 MB/s
BenchmarkCopy128String-4                10000000           150 ns/op     851.31 MB/s
BenchmarkCopy1024String-4                3000000           472 ns/op    2167.03 MB/s
BenchmarkChanNonblocking-4              20000000            77.7 ns/op
BenchmarkSelectUncontended-4             2000000           780 ns/op
BenchmarkSelectSyncContended-4            100000         15094 ns/op
BenchmarkSelectAsyncContended-4           500000          2569 ns/op
BenchmarkSelectNonblock-4               10000000           226 ns/op
BenchmarkChanUncontended-4                 50000         26993 ns/op
BenchmarkChanContended-4                   10000        111382 ns/op
BenchmarkChanSync-4                       300000          3994 ns/op
BenchmarkChanProdCons0-4                  500000          3100 ns/op
BenchmarkChanProdCons10-4                1000000          2099 ns/op
BenchmarkChanProdCons100-4               1000000          1342 ns/op
BenchmarkChanProdConsWork0-4              500000          3071 ns/op
BenchmarkChanProdConsWork10-4             500000          2332 ns/op
```

```
BenchmarkChanProdConsWork100-4           1000000          1382 ns/op
BenchmarkSelectProdCons-4                 300000          5015 ns/op
BenchmarkChanCreation-4                  2000000           629 ns/op
BenchmarkChanSem-4                       1000000          1116 ns/op
BenchmarkChanPopular-4                       200       7597153 ns/op
BenchmarkCallClosure-4                  30000000            43.5 ns/op
BenchmarkCallClosure1-4                 30000000            49.0 ns/op
BenchmarkCallClosure2-4                  5000000           323 ns/op
BenchmarkCallClosure3-4                  5000000           318 ns/op
BenchmarkCallClosure4-4                  5000000           324 ns/op
BenchmarkComplex128DivNormal-4           3000000           488 ns/op
BenchmarkComplex128DivNisNaN-4           5000000           375 ns/op
BenchmarkComplex128DivDisNaN-4           5000000           362 ns/op
BenchmarkComplex128DivNisInf-4           5000000           289 ns/op
BenchmarkComplex128DivDisInf-4           5000000           273 ns/op
BenchmarkSetTypePtr-4                   20000000            85.1 ns/op    46.98 MB/s
BenchmarkSetTypePtr8-4                  10000000           169 ns/op     189.14 MB/s
BenchmarkSetTypePtr16-4                 10000000           213 ns/op     299.83 MB/s
BenchmarkSetTypePtr32-4                  5000000           297 ns/op     429.62 MB/s
BenchmarkSetTypePtr64-4                  3000000           462 ns/op     553.72 MB/s
BenchmarkSetTypePtr126-4                 2000000           791 ns/op     636.59 MB/s
BenchmarkSetTypePtr128-4                 2000000           777 ns/op     658.60 MB/s
BenchmarkSetTypePtrSlice-4                200000          6208 ns/op     659.75 MB/s
BenchmarkSetTypeNode1-4                 10000000           160 ns/op      74.86 MB/s
BenchmarkSetTypeNode1Slice-4             1000000          1076 ns/op     356.60 MB/s
BenchmarkSetTypeNode8-4                 10000000           221 ns/op     180.94 MB/s
BenchmarkSetTypeNode8Slice-4             1000000          2359 ns/op     542.53 MB/s
BenchmarkSetTypeNode64-4                 3000000           506 ns/op     521.63 MB/s
BenchmarkSetTypeNode64Slice-4             100000         12992 ns/op     650.22 MB/s
BenchmarkSetTypeNode64Dead-4             5000000           308 ns/op     856.90 MB/s
BenchmarkSetTypeNode64DeadSlice-4         200000         11506 ns/op     734.21 MB/s
BenchmarkSetTypeNode124-4                2000000           799 ns/op     630.27 MB/s
BenchmarkSetTypeNode124Slice-4            100000         23306 ns/op     692.00 MB/s
BenchmarkSetTypeNode126-4                2000000           776 ns/op     659.33 MB/s
BenchmarkSetTypeNode126Slice-4            100000         21520 ns/op     761.31 MB/s
BenchmarkSetTypeNode128-4                2000000           850 ns/op     611.35 MB/s
BenchmarkSetTypeNode128Slice-4             50000         24122 ns/op     689.81 MB/s
BenchmarkSetTypeNode130-4                2000000           827 ns/op     638.06 MB/s
BenchmarkSetTypeNode130Slice-4             50000         24322 ns/op     694.67 MB/s
BenchmarkSetTypeNode1024-4                300000          5655 ns/op     725.66 MB/s
BenchmarkSetTypeNode1024Slice-4            10000        183602 ns/op     715.28 MB/s
BenchmarkAllocation-4                      10000        166825 ns/op
BenchmarkHash5-4                        10000000           217 ns/op      23.02 MB/s
BenchmarkHash16-4                        5000000           289 ns/op      55.18 MB/s
BenchmarkHash64-4                        2000000           770 ns/op      83.10 MB/s
BenchmarkHash1024-4                       200000          9442 ns/op     108.44 MB/s
BenchmarkHash65536-4                        2000        600452 ns/op     109.14 MB/s
BenchmarkEqEfaceConcrete-4              20000000            79.1 ns/op
BenchmarkEqIfaceConcrete-4              20000000            77.0 ns/op
BenchmarkNeEfaceConcrete-4              20000000            80.0 ns/op
BenchmarkNeIfaceConcrete-4              20000000            77.7 ns/op
BenchmarkConvT2ESmall-4                  5000000           362 ns/op
BenchmarkConvT2EUintptr-4                5000000           394 ns/op
BenchmarkConvT2ELarge-4                  3000000           457 ns/op
BenchmarkConvT2ISmall-4                  3000000           482 ns/op
BenchmarkConvT2IUintptr-4                3000000           524 ns/op
BenchmarkConvT2ILarge-4                  3000000           600 ns/op
BenchmarkConvI2E-4                      20000000            60.5 ns/op
BenchmarkConvI2I-4                       5000000           302 ns/op
BenchmarkAssertE2T-4                    10000000           121 ns/op
BenchmarkAssertE2TLarge-4               10000000           131 ns/op
BenchmarkAssertE2I-4                     5000000           329 ns/op
BenchmarkAssertI2T-4                    10000000           125 ns/op
BenchmarkAssertI2I-4                     5000000           328 ns/op
BenchmarkAssertI2E-4                    20000000            84.6 ns/op
BenchmarkAssertE2E-4                    50000000            32.5 ns/op
BenchmarkAssertE2T2-4                   10000000           129 ns/op
BenchmarkAssertE2T2Blank-4              100000000           18.0 ns/op
BenchmarkAssertI2E2-4                   20000000            91.2 ns/op
BenchmarkAssertI2E2Blank-4              100000000           16.7 ns/op
BenchmarkAssertE2E2-4                   10000000           159 ns/op
BenchmarkAssertE2E2Blank-4              100000000           16.8 ns/op
BenchmarkMalloc8-4                       5000000           317 ns/op
BenchmarkMalloc16-4                      3000000           485 ns/op
BenchmarkMallocTypeInfo8-4               3000000           587 ns/op
BenchmarkMallocTypeInfo16-4              2000000           661 ns/op
BenchmarkMallocLargeStruct-4              500000          3205 ns/op
BenchmarkGoroutineSelect-4                   100      18605318 ns/op
```

```
BenchmarkGoroutineBlocking-4                 100      17222169 ns/op
BenchmarkGoroutineForRange-4                 100      19092854 ns/op
BenchmarkGoroutineIdle-4                     100      12554944 ns/op
BenchmarkMapPop100-4                        5000        270721 ns/op
BenchmarkMapPop1000-4                        300       4674884 ns/op
BenchmarkMapPop10000-4                        10     110070793 ns/op
BenchmarkHashStringSpeed-4               3000000           400 ns/op
BenchmarkHashBytesSpeed-4                2000000           709 ns/op
BenchmarkHashInt32Speed-4                5000000           305 ns/op
BenchmarkHashInt64Speed-4                5000000           349 ns/op
BenchmarkHashStringArraySpeed-4          2000000           911 ns/op
BenchmarkMegMap-4                        5000000           367 ns/op
BenchmarkMegOneMap-4                     5000000           311 ns/op
BenchmarkMegEqMap-4                          100      10147332 ns/op
BenchmarkMegEmptyMap-4                  10000000           138 ns/op
BenchmarkSmallStrMap-4                   5000000           367 ns/op
BenchmarkMapStringKeysEight_16-4         5000000           395 ns/op
BenchmarkMapStringKeysEight_32-4         5000000           378 ns/op
BenchmarkMapStringKeysEight_64-4         5000000           378 ns/op
BenchmarkMapStringKeysEight_1M-4         5000000           376 ns/op
BenchmarkIntMap-4                       10000000           198 ns/op
BenchmarkRepeatedLookupStrMapKey32-4     2000000           799 ns/op
BenchmarkRepeatedLookupStrMapKey1M-4         100      10023558 ns/op
BenchmarkNewEmptyMap-4                   2000000           841 ns/op           0 B/op           0 allocs/op
BenchmarkNewSmallMap-4                   1000000          2357 ns/op           0 B/op           0 allocs/op
BenchmarkMapIter-4                       1000000          2132 ns/op
BenchmarkMapIterEmpty-4                 20000000           107 ns/op
BenchmarkSameLengthMap-4                20000000           111 ns/op
BenchmarkBigKeyMap-4                     2000000           727 ns/op
BenchmarkBigValMap-4                     2000000           754 ns/op
BenchmarkSmallKeyMap-4                   5000000           296 ns/op
BenchmarkComplexAlgMap-4                 1000000          1786 ns/op
BenchmarkMemmove0-4                     30000000            47.7 ns/op
BenchmarkMemmove1-4                     30000000            50.2 ns/op    19.93 MB/s
BenchmarkMemmove2-4                     30000000            53.7 ns/op    37.28 MB/s
BenchmarkMemmove3-4                     30000000            56.9 ns/op    52.76 MB/s
BenchmarkMemmove4-4                     20000000            61.1 ns/op    65.42 MB/s
BenchmarkMemmove5-4                     20000000            75.8 ns/op    65.95 MB/s
BenchmarkMemmove6-4                     20000000            79.2 ns/op    75.80 MB/s
BenchmarkMemmove7-4                     20000000            82.5 ns/op    84.84 MB/s
BenchmarkMemmove8-4                     20000000            64.8 ns/op   123.37 MB/s
BenchmarkMemmove9-4                     20000000            67.1 ns/op   134.16 MB/s
BenchmarkMemmove10-4                    20000000            76.4 ns/op   130.87 MB/s
BenchmarkMemmove11-4                    20000000            81.3 ns/op   135.30 MB/s
BenchmarkMemmove12-4                    20000000            66.8 ns/op   179.68 MB/s
BenchmarkMemmove13-4                    20000000            70.6 ns/op   184.23 MB/s
BenchmarkMemmove14-4                    20000000            75.2 ns/op   186.19 MB/s
BenchmarkMemmove15-4                    20000000            79.5 ns/op   188.74 MB/s
BenchmarkMemmove16-4                    20000000            71.8 ns/op   222.73 MB/s
BenchmarkMemmove32-4                    20000000            68.3 ns/op   468.52 MB/s
BenchmarkMemmove64-4                    20000000            79.2 ns/op   808.35 MB/s
BenchmarkMemmove128-4                   20000000           101 ns/op    1256.13 MB/s
BenchmarkMemmove256-4                   10000000           145 ns/op    1755.64 MB/s
BenchmarkMemmove512-4                    5000000           244 ns/op    2095.34 MB/s
BenchmarkMemmove1024-4                   3000000           475 ns/op    2153.54 MB/s
BenchmarkMemmove2048-4                   2000000           883 ns/op    2317.95 MB/s
BenchmarkMemmove4096-4                   1000000          1809 ns/op    2262.99 MB/s
BenchmarkMemmoveUnaligned0-4            30000000            58.1 ns/op
BenchmarkMemmoveUnaligned1-4            20000000            63.3 ns/op    15.81 MB/s
BenchmarkMemmoveUnaligned2-4            20000000            66.6 ns/op    30.04 MB/s
BenchmarkMemmoveUnaligned3-4            20000000            69.9 ns/op    42.89 MB/s
BenchmarkMemmoveUnaligned4-4            20000000            95.6 ns/op    41.85 MB/s
BenchmarkMemmoveUnaligned5-4            20000000            98.6 ns/op    50.73 MB/s
BenchmarkMemmoveUnaligned6-4            20000000            99.9 ns/op    60.08 MB/s
BenchmarkMemmoveUnaligned7-4            20000000           101 ns/op      68.77 MB/s
BenchmarkMemmoveUnaligned8-4            20000000           108 ns/op      73.58 MB/s
BenchmarkMemmoveUnaligned9-4            20000000           112 ns/op      79.90 MB/s
BenchmarkMemmoveUnaligned10-4           10000000           126 ns/op      79.18 MB/s
BenchmarkMemmoveUnaligned11-4           10000000           128 ns/op      85.32 MB/s
BenchmarkMemmoveUnaligned12-4           10000000           132 ns/op      90.67 MB/s
BenchmarkMemmoveUnaligned13-4           10000000           125 ns/op     103.51 MB/s
BenchmarkMemmoveUnaligned14-4           10000000           132 ns/op     105.50 MB/s
BenchmarkMemmoveUnaligned15-4           10000000           138 ns/op     108.38 MB/s
BenchmarkMemmoveUnaligned16-4           10000000           141 ns/op     112.89 MB/s
BenchmarkMemmoveUnaligned32-4           10000000           154 ns/op     207.69 MB/s
BenchmarkMemmoveUnaligned64-4           10000000           211 ns/op     303.20 MB/s
BenchmarkMemmoveUnaligned128-4           5000000           318 ns/op     401.47 MB/s
BenchmarkMemmoveUnaligned256-4           3000000           436 ns/op     586.76 MB/s
```

```
BenchmarkMemmoveUnaligned512-4           2000000           722 ns/op     708.50 MB/s
BenchmarkMemmoveUnaligned1024-4          1000000          1296 ns/op     789.56 MB/s
BenchmarkMemmoveUnaligned2048-4           500000          2576 ns/op     794.83 MB/s
BenchmarkMemmoveUnaligned4096-4           300000          4999 ns/op     819.32 MB/s
BenchmarkMemclr5-4                      20000000            77.1 ns/op    64.82 MB/s
BenchmarkMemclr16-4                     20000000            96.3 ns/op   166.15 MB/s
BenchmarkMemclr64-4                     20000000            85.0 ns/op   753.23 MB/s
BenchmarkMemclr256-4                    10000000           125 ns/op    2040.75 MB/s
BenchmarkMemclr4096-4                    1000000          1662 ns/op    2464.13 MB/s
BenchmarkMemclr65536-4                     30000         50428 ns/op    1299.58 MB/s
BenchmarkMemclr1M-4                         2000        875472 ns/op    1197.73 MB/s
BenchmarkMemclr4M-4                          500       3529939 ns/op    1188.21 MB/s
BenchmarkMemclr8M-4                          200       7088731 ns/op    1183.37 MB/s
BenchmarkMemclr16M-4                         100      14275180 ns/op    1175.27 MB/s
BenchmarkMemclr64M-4                          20      59343321 ns/op    1130.86 MB/s
BenchmarkGoMemclr5-4                    20000000            61.4 ns/op    81.44 MB/s
BenchmarkGoMemclr16-4                   20000000            81.7 ns/op   195.78 MB/s
BenchmarkGoMemclr64-4                   20000000            69.8 ns/op   917.14 MB/s
BenchmarkGoMemclr256-4                  20000000           109 ns/op    2339.84 MB/s
BenchmarkClearFat8-4                    200000000            7.84 ns/op
BenchmarkClearFat12-4                   200000000            8.93 ns/op
BenchmarkClearFat16-4                   100000000           10.1 ns/op
BenchmarkClearFat24-4                   100000000           12.3 ns/op
BenchmarkClearFat32-4                   100000000           14.5 ns/op
BenchmarkClearFat40-4                   30000000            52.4 ns/op
BenchmarkClearFat48-4                   20000000            60.3 ns/op
BenchmarkClearFat56-4                   20000000            65.9 ns/op
BenchmarkClearFat64-4                   20000000            73.8 ns/op
BenchmarkClearFat128-4                  10000000           126 ns/op
BenchmarkClearFat256-4                  10000000           234 ns/op
BenchmarkClearFat512-4                   3000000           448 ns/op
BenchmarkClearFat1024-4                  2000000           872 ns/op
BenchmarkCopyFat8-4                     200000000            6.72 ns/op
BenchmarkCopyFat12-4                    200000000            7.80 ns/op
BenchmarkCopyFat16-4                    200000000            8.93 ns/op
BenchmarkCopyFat24-4                    100000000           11.2 ns/op
BenchmarkCopyFat32-4                    100000000           17.9 ns/op
BenchmarkCopyFat64-4                    20000000            75.0 ns/op
BenchmarkCopyFat128-4                   10000000           128 ns/op
BenchmarkCopyFat256-4                   10000000           236 ns/op
BenchmarkCopyFat512-4                    3000000           449 ns/op
BenchmarkCopyFat1024-4                   2000000           879 ns/op
BenchmarkFinalizer-4                         500       3830391 ns/op
BenchmarkFinalizerRun-4                   200000          6697 ns/op
BenchmarkSyscall-4                       5000000           296 ns/op
BenchmarkSyscallWork-4                   3000000           551 ns/op
BenchmarkSyscallExcess-4                 5000000           296 ns/op
BenchmarkSyscallExcessWork-4             3000000           552 ns/op
BenchmarkPingPongHog-4                    100000         13315 ns/op
BenchmarkStackGrowth-4                    500000          2461 ns/op
BenchmarkStackGrowthDeep-4                  2000       1028254 ns/op
BenchmarkCreateGoroutines-4               500000          2722 ns/op
BenchmarkCreateGoroutinesParallel-4      2000000           649 ns/op
BenchmarkCreateGoroutinesCapture-4        100000         21739 ns/op          16 B/op          1 allocs/op
BenchmarkClosureCall-4                  30000000            48.0 ns/op
BenchmarkMatmult-4                      50000000            40.3 ns/op
BenchmarkIfaceCmp100-4                    500000          2369 ns/op
BenchmarkIfaceCmpNil100-4                 500000          2475 ns/op
BenchmarkDefer-4                         1000000          1203 ns/op
BenchmarkDefer10-4                       1000000          1089 ns/op
BenchmarkDeferMany-4                     1000000          2045 ns/op
BenchmarkStackCopy-4                           1    2767373639 ns/op
BenchmarkCompareStringEqual-4           10000000           140 ns/op
BenchmarkCompareStringIdentical-4       30000000            41.4 ns/op
BenchmarkCompareStringSameLength-4      20000000            92.0 ns/op
BenchmarkCompareStringDifferentLength-4 100000000           13.4 ns/op
BenchmarkCompareStringBigUnaligned-4         100      11917034 ns/op      87.99 MB/s
BenchmarkCompareStringBig-4                  200      10163432 ns/op     103.17 MB/s
BenchmarkRuneIterate-4                    500000          3969 ns/op
BenchmarkRuneIterate2-4                   500000          3947 ns/op
BenchmarkUint32Div7-4                   20000000           102 ns/op
BenchmarkUint32Div37-4                  20000000           102 ns/op
BenchmarkUint32Div123-4                 20000000           102 ns/op
BenchmarkUint32Div763-4                 20000000           102 ns/op
BenchmarkUint32Div1247-4                20000000           102 ns/op
BenchmarkUint32Div9305-4                20000000           102 ns/op
BenchmarkUint32Div13307-4               20000000           102 ns/op
BenchmarkUint32Div52513-4               20000000           103 ns/op
```

```
BenchmarkUint32Div60978747-4            20000000            98.7 ns/op
BenchmarkUint32Div106956295-4           20000000           100.0 ns/op
BenchmarkUint32Mod7-4                   20000000           102 ns/op
BenchmarkUint32Mod37-4                  20000000           102 ns/op
BenchmarkUint32Mod123-4                 20000000           102 ns/op
BenchmarkUint32Mod763-4                 20000000           103 ns/op
BenchmarkUint32Mod1247-4                20000000           103 ns/op
BenchmarkUint32Mod9305-4                20000000           102 ns/op
BenchmarkUint32Mod13307-4               20000000           102 ns/op
BenchmarkUint32Mod52513-4               20000000           103 ns/op
BenchmarkUint32Mod60978747-4            20000000           100 ns/op
BenchmarkUint32Mod106956295-4           20000000           100 ns/op
ok      runtime 562.289s
```

Raspberry Pi Zero

Architecture: 1 GHz ARM1176JZF-S, running at 700Mhz; 512MB RAM

Operating System: Raspbian Jessie

```
$ go version
go version devel +5c24832 Sat Dec 5 00:10:40 2015 +0000 linux/arm

$ go test -timeout 20m -v -bench=Benchmark -run=X
PASS
BenchmarkAppend                        3000000         518 ns/op
BenchmarkAppendGrowByte                     20    95720661 ns/op
BenchmarkAppendGrowString                    1  2232033275 ns/op
BenchmarkAppend1Byte                  20000000          99.0 ns/op
BenchmarkAppend4Bytes                 10000000         120 ns/op
BenchmarkAppend7Bytes                 10000000         155 ns/op
BenchmarkAppend8Bytes                 10000000         132 ns/op
BenchmarkAppend15Bytes                10000000         162 ns/op
BenchmarkAppend16Bytes                10000000         134 ns/op
BenchmarkAppend32Bytes                10000000         121 ns/op
BenchmarkAppendStr1Byte               20000000          97.0 ns/op
BenchmarkAppendStr4Bytes              10000000         118 ns/op
BenchmarkAppendStr8Bytes              10000000         129 ns/op
BenchmarkAppendStr16Bytes             10000000         132 ns/op
BenchmarkAppendStr32Bytes             10000000         121 ns/op
BenchmarkAppendSpecialCase             2000000         791 ns/op
BenchmarkCopy1Byte                    10000000         132 ns/op     7.54 MB/s
BenchmarkCopy2Byte                    10000000         144 ns/op    13.81 MB/s
BenchmarkCopy4Byte                    10000000         153 ns/op    26.12 MB/s
BenchmarkCopy8Byte                    10000000         164 ns/op    48.51 MB/s
BenchmarkCopy12Byte                   10000000         162 ns/op    74.03 MB/s
BenchmarkCopy16Byte                   10000000         167 ns/op    95.63 MB/s
BenchmarkCopy32Byte                   10000000         155 ns/op   205.20 MB/s
BenchmarkCopy128Byte                  10000000         192 ns/op   664.06 MB/s
BenchmarkCopy1024Byte                  2000000         689 ns/op  1484.28 MB/s
BenchmarkCopy1String                  10000000         120 ns/op     8.27 MB/s
BenchmarkCopy2String                  10000000         134 ns/op    14.85 MB/s
BenchmarkCopy4String                  10000000         142 ns/op    28.01 MB/s
BenchmarkCopy8String                  10000000         154 ns/op    51.81 MB/s
BenchmarkCopy12String                 10000000         151 ns/op    79.01 MB/s
BenchmarkCopy16String                 10000000         157 ns/op   101.82 MB/s
BenchmarkCopy32String                 10000000         145 ns/op   219.52 MB/s
BenchmarkCopy128String                10000000         182 ns/op   700.88 MB/s
BenchmarkCopy1024String                2000000         976 ns/op  1048.87 MB/s
BenchmarkChanNonblocking               5000000         246 ns/op
BenchmarkSelectUncontended              500000        3610 ns/op
BenchmarkSelectSyncContended            100000       18957 ns/op
BenchmarkSelectAsyncContended           500000        3614 ns/op
BenchmarkSelectNonblock                2000000         814 ns/op
BenchmarkChanUncontended                 10000      135820 ns/op
BenchmarkChanContended                   10000      133122 ns/op
BenchmarkChanSync                       200000        5870 ns/op
BenchmarkChanProdCons0                  200000        5899 ns/op
BenchmarkChanProdCons10                 500000        2138 ns/op
BenchmarkChanProdCons100               1000000        1557 ns/op
BenchmarkChanProdConsWork0              200000        8948 ns/op
BenchmarkChanProdConsWork10             300000        5043 ns/op
BenchmarkChanProdConsWork100            300000        4498 ns/op
BenchmarkSelectProdCons                 200000       10818 ns/op
BenchmarkChanCreation                   500000        3187 ns/op
BenchmarkChanSem                       1000000        1266 ns/op
BenchmarkChanPopular                       100    14315946 ns/op
BenchmarkCallClosure                  30000000          50.0 ns/op
```

```
BenchmarkCallClosure1                 30000000          56.3 ns/op
BenchmarkCallClosure2                  3000000         512 ns/op
BenchmarkCallClosure3                  3000000         503 ns/op
BenchmarkCallClosure4                  3000000         512 ns/op
BenchmarkComplex128DivNormal           2000000         735 ns/op
BenchmarkComplex128DivNisNaN            200000        6001 ns/op
BenchmarkComplex128DivDisNaN            200000        5992 ns/op
BenchmarkComplex128DivNisInf           5000000         390 ns/op
BenchmarkComplex128DivDisInf           5000000         375 ns/op
BenchmarkSetTypePtr                   10000000         119 ns/op    33.43 MB/s
BenchmarkSetTypePtr8                  10000000         227 ns/op   140.89 MB/s
BenchmarkSetTypePtr16                  5000000         285 ns/op   224.30 MB/s
BenchmarkSetTypePtr32                  5000000         388 ns/op   329.65 MB/s
BenchmarkSetTypePtr64                  3000000         591 ns/op   432.77 MB/s
BenchmarkSetTypePtr126                 1000000        1021 ns/op   493.46 MB/s
BenchmarkSetTypePtr128                 1000000        1003 ns/op   510.46 MB/s
BenchmarkSetTypePtrSlice                200000        7427 ns/op   551.43 MB/s
BenchmarkSetTypeNode1                 10000000         217 ns/op    55.20 MB/s
BenchmarkSetTypeNode1Slice             1000000        1284 ns/op   299.03 MB/s
BenchmarkSetTypeNode8                  5000000         277 ns/op   144.17 MB/s
BenchmarkSetTypeNode8Slice              500000        2825 ns/op   453.02 MB/s
BenchmarkSetTypeNode64                 2000000         661 ns/op   398.89 MB/s
BenchmarkSetTypeNode64Slice             100000       15531 ns/op   543.92 MB/s
BenchmarkSetTypeNode64Dead             5000000         382 ns/op   689.66 MB/s
BenchmarkSetTypeNode64DeadSlice         100000       13252 ns/op   637.46 MB/s
BenchmarkSetTypeNode124                1000000        1017 ns/op   495.27 MB/s
BenchmarkSetTypeNode124Slice             50000       28139 ns/op   573.14 MB/s
BenchmarkSetTypeNode126                2000000        1001 ns/op   511.10 MB/s
BenchmarkSetTypeNode126Slice             50000       26535 ns/op   617.43 MB/s
BenchmarkSetTypeNode128                1000000        1087 ns/op   478.22 MB/s
BenchmarkSetTypeNode128Slice             50000       29166 ns/op   570.52 MB/s
BenchmarkSetTypeNode130                1000000        1067 ns/op   494.83 MB/s
BenchmarkSetTypeNode130Slice             50000       29691 ns/op   569.04 MB/s
BenchmarkSetTypeNode1024                200000        7155 ns/op   573.51 MB/s
BenchmarkSetTypeNode1024Slice             5000      224292 ns/op   585.52 MB/s
BenchmarkAllocation                       2000      957094 ns/op
BenchmarkHash5                         5000000         349 ns/op    14.29 MB/s
BenchmarkHash16                        3000000         436 ns/op    36.66 MB/s
BenchmarkHash64                        1000000        1007 ns/op    63.49 MB/s
BenchmarkHash1024                       200000       11267 ns/op    90.88 MB/s
BenchmarkHash65536                        2000      797741 ns/op    82.15 MB/s
BenchmarkEqEfaceConcrete              20000000         111 ns/op
BenchmarkEqIfaceConcrete              20000000         106 ns/op
BenchmarkNeEfaceConcrete              20000000         111 ns/op
BenchmarkNeIfaceConcrete              20000000         106 ns/op
BenchmarkConvT2ESmall                  3000000         561 ns/op
BenchmarkConvT2EUintptr                2000000         599 ns/op
BenchmarkConvT2ELarge                  2000000         767 ns/op
BenchmarkConvT2ISmall                  2000000         724 ns/op
BenchmarkConvT2IUintptr                2000000         750 ns/op
BenchmarkConvT2ILarge                  2000000         907 ns/op
BenchmarkConvI2E                      20000000          76.7 ns/op
BenchmarkConvI2I                       3000000         425 ns/op
BenchmarkAssertE2T                    10000000         176 ns/op
BenchmarkAssertE2TLarge               10000000         189 ns/op
BenchmarkAssertE2I                     3000000         455 ns/op
BenchmarkAssertI2T                    10000000         176 ns/op
BenchmarkAssertI2I                     3000000         451 ns/op
BenchmarkAssertI2E                    20000000         109 ns/op
BenchmarkAssertE2E                    30000000          40.7 ns/op
BenchmarkAssertE2T2                   10000000         180 ns/op
BenchmarkAssertE2T2Blank              50000000          22.8 ns/op
BenchmarkAssertI2E2                   20000000         117 ns/op
BenchmarkAssertI2E2Blank              100000000         21.7 ns/op
BenchmarkAssertE2E2                   10000000         231 ns/op
BenchmarkAssertE2E2Blank              100000000         21.8 ns/op
BenchmarkMalloc8                       3000000         507 ns/op
BenchmarkMalloc16                      2000000         848 ns/op
BenchmarkMallocTypeInfo8               2000000        1012 ns/op
BenchmarkMallocTypeInfo16              1000000        1168 ns/op
BenchmarkMallocLargeStruct              500000        4823 ns/op
BenchmarkGoroutineSelect                    20    76172338 ns/op
BenchmarkGoroutineBlocking                  20    63469806 ns/op
BenchmarkGoroutineForRange                  20    64107650 ns/op
BenchmarkGoroutineIdle                      20    60844381 ns/op
BenchmarkMapPop100                        3000      409498 ns/op
BenchmarkMapPop1000                        200     7783817 ns/op
BenchmarkMapPop10000                        10   170736704 ns/op
```

```
BenchmarkHashStringSpeed               3000000         541 ns/op
BenchmarkHashBytesSpeed                1000000        1157 ns/op
BenchmarkHashInt32Speed                5000000         371 ns/op
BenchmarkHashInt64Speed                3000000         427 ns/op
BenchmarkHashStringArraySpeed          1000000        1417 ns/op
BenchmarkMegMap                        3000000         404 ns/op
BenchmarkMegOneMap                     5000000         346 ns/op
BenchmarkMegEqMap                          100    16663414 ns/op
BenchmarkMegEmptyMap                  10000000         160 ns/op
BenchmarkSmallStrMap                   3000000         415 ns/op
BenchmarkMapStringKeysEight_16         3000000         417 ns/op
BenchmarkMapStringKeysEight_32         3000000         420 ns/op
BenchmarkMapStringKeysEight_64         3000000         420 ns/op
BenchmarkMapStringKeysEight_1M         3000000         419 ns/op
BenchmarkIntMap                       10000000         220 ns/op
BenchmarkRepeatedLookupStrMapKey32     1000000        1015 ns/op
BenchmarkRepeatedLookupStrMapKey1M         100    15652033 ns/op
BenchmarkNewEmptyMap                   1000000        1395 ns/op        0 B/op        0 allocs/op
BenchmarkNewSmallMap                    300000        3368 ns/op        0 B/op        0 allocs/op
BenchmarkMapIter                        500000        2947 ns/op
BenchmarkMapIterEmpty                 20000000         163 ns/op
BenchmarkSameLengthMap                10000000         133 ns/op
BenchmarkBigKeyMap                     2000000         899 ns/op
BenchmarkBigValMap                     2000000         922 ns/op
BenchmarkSmallKeyMap                   3000000         402 ns/op
BenchmarkComplexAlgMap                 1000000        2003 ns/op
BenchmarkMemmove0                     20000000          61.4 ns/op
BenchmarkMemmove1                     20000000          76.6 ns/op    13.05 MB/s
BenchmarkMemmove2                     20000000          86.3 ns/op    23.18 MB/s
BenchmarkMemmove3                     20000000          83.7 ns/op    35.83 MB/s
BenchmarkMemmove4                     20000000          88.0 ns/op    45.48 MB/s
BenchmarkMemmove5                     20000000         110 ns/op    45.37 MB/s
BenchmarkMemmove6                     20000000         115 ns/op    51.99 MB/s
BenchmarkMemmove7                     10000000         123 ns/op    56.89 MB/s
BenchmarkMemmove8                     20000000          99.5 ns/op    80.44 MB/s
BenchmarkMemmove9                     20000000         112 ns/op    79.76 MB/s
BenchmarkMemmove10                    10000000         125 ns/op    79.48 MB/s
BenchmarkMemmove11                    10000000         125 ns/op    87.84 MB/s
BenchmarkMemmove12                    20000000          96.9 ns/op   123.87 MB/s
BenchmarkMemmove13                    20000000         110 ns/op   117.83 MB/s
BenchmarkMemmove14                    10000000         123 ns/op   113.65 MB/s
BenchmarkMemmove15                    10000000         122 ns/op   122.30 MB/s
BenchmarkMemmove16                    20000000         101 ns/op   156.89 MB/s
BenchmarkMemmove32                    20000000          90.8 ns/op   352.44 MB/s
BenchmarkMemmove64                    20000000         108 ns/op   588.34 MB/s
BenchmarkMemmove128                   10000000         127 ns/op  1001.83 MB/s
BenchmarkMemmove256                   10000000         178 ns/op  1436.19 MB/s
BenchmarkMemmove512                    5000000         326 ns/op  1569.07 MB/s
BenchmarkMemmove1024                   2000000         631 ns/op  1620.84 MB/s
BenchmarkMemmove2048                   1000000        1251 ns/op  1636.60 MB/s
BenchmarkMemmove4096                    500000        2499 ns/op  1638.97 MB/s
BenchmarkMemmoveUnaligned0            20000000          72.5 ns/op
BenchmarkMemmoveUnaligned1            20000000          87.8 ns/op    11.39 MB/s
BenchmarkMemmoveUnaligned2            20000000          99.4 ns/op    20.12 MB/s
BenchmarkMemmoveUnaligned3            20000000          96.9 ns/op    30.96 MB/s
BenchmarkMemmoveUnaligned4            10000000         135 ns/op    29.44 MB/s
BenchmarkMemmoveUnaligned5            10000000         147 ns/op    33.90 MB/s
BenchmarkMemmoveUnaligned6            10000000         146 ns/op    41.09 MB/s
BenchmarkMemmoveUnaligned7            10000000         151 ns/op    46.27 MB/s
BenchmarkMemmoveUnaligned8            10000000         156 ns/op    51.22 MB/s
BenchmarkMemmoveUnaligned9            10000000         161 ns/op    55.82 MB/s
BenchmarkMemmoveUnaligned10           10000000         166 ns/op    60.09 MB/s
BenchmarkMemmoveUnaligned11           10000000         171 ns/op    64.17 MB/s
BenchmarkMemmoveUnaligned12           10000000         177 ns/op    67.79 MB/s
BenchmarkMemmoveUnaligned13           10000000         181 ns/op    71.60 MB/s
BenchmarkMemmoveUnaligned14           10000000         189 ns/op    74.03 MB/s
BenchmarkMemmoveUnaligned15           10000000         196 ns/op    76.30 MB/s
BenchmarkMemmoveUnaligned16           10000000         200 ns/op    79.91 MB/s
BenchmarkMemmoveUnaligned32           10000000         221 ns/op   144.64 MB/s
BenchmarkMemmoveUnaligned64            5000000         290 ns/op   220.16 MB/s
BenchmarkMemmoveUnaligned128           3000000         413 ns/op   309.84 MB/s
BenchmarkMemmoveUnaligned256           2000000         766 ns/op   334.16 MB/s
BenchmarkMemmoveUnaligned512           2000000         925 ns/op   553.13 MB/s
BenchmarkMemmoveUnaligned1024           500000        2747 ns/op   372.66 MB/s
BenchmarkMemmoveUnaligned2048           500000        3180 ns/op   643.85 MB/s
BenchmarkMemmoveUnaligned4096           200000        6206 ns/op   659.99 MB/s
BenchmarkMemclr5                      20000000         105 ns/op    47.53 MB/s
BenchmarkMemclr16                     20000000         110 ns/op   144.77 MB/s
```

```
BenchmarkMemclr64                     10000000         125 ns/op   511.58 MB/s
BenchmarkMemclr256                    10000000         182 ns/op  1402.34 MB/s
BenchmarkMemclr4096                     500000        2489 ns/op  1645.22 MB/s
BenchmarkMemclr65536                     50000       39883 ns/op  1643.18 MB/s
BenchmarkMemclr1M                         2000      636812 ns/op  1646.60 MB/s
BenchmarkMemclr4M                          500     2549362 ns/op  1645.24 MB/s
BenchmarkMemclr8M                          300     5162451 ns/op  1624.93 MB/s
BenchmarkMemclr16M                         200    10300878 ns/op  1628.72 MB/s
BenchmarkMemclr64M                          30    42801198 ns/op  1567.92 MB/s
BenchmarkGoMemclr5                    20000000          73.5 ns/op    67.99 MB/s
BenchmarkGoMemclr16                   20000000          85.9 ns/op   186.24 MB/s
BenchmarkGoMemclr64                   20000000          87.8 ns/op   729.24 MB/s
BenchmarkGoMemclr256                  10000000         160 ns/op  1591.97 MB/s
BenchmarkClearFat8                    100000000         15.6 ns/op
BenchmarkClearFat12                   100000000         27.5 ns/op
BenchmarkClearFat16                   100000000         32.4 ns/op
BenchmarkClearFat24                   50000000          57.0 ns/op
BenchmarkClearFat32                   50000000          80.5 ns/op
BenchmarkClearFat40                   30000000          77.5 ns/op
BenchmarkClearFat48                   30000000         105 ns/op
BenchmarkClearFat56                   20000000          87.1 ns/op
BenchmarkClearFat64                   20000000         137 ns/op
BenchmarkClearFat128                  20000000         278 ns/op
BenchmarkClearFat256                   5000000         537 ns/op
BenchmarkClearFat512                   2000000        1293 ns/op
BenchmarkClearFat1024                  1000000        2545 ns/op
BenchmarkCopyFat8                     100000000         12.2 ns/op
BenchmarkCopyFat12                    100000000         20.3 ns/op
BenchmarkCopyFat16                    100000000         34.3 ns/op
BenchmarkCopyFat24                    50000000          27.7 ns/op
BenchmarkCopyFat32                    50000000          25.4 ns/op
BenchmarkCopyFat64                    20000000         135 ns/op
BenchmarkCopyFat128                   10000000         299 ns/op
BenchmarkCopyFat256                    2000000         571 ns/op
BenchmarkCopyFat512                    1000000        1218 ns/op
BenchmarkCopyFat1024                    500000        2665 ns/op
BenchmarkFinalizer                          50    20313669 ns/op
BenchmarkFinalizerRun                    30000       49987 ns/op
BenchmarkSyscall                       1000000        1625 ns/op
BenchmarkSyscallWork                    500000        2668 ns/op
BenchmarkSyscallExcess                 1000000        1613 ns/op
BenchmarkSyscallExcessWork              500000        2658 ns/op
BenchmarkPingPongHog                    100000       20539 ns/op
BenchmarkStackGrowth                     50000       28473 ns/op
BenchmarkStackGrowthDeep                   500     2845263 ns/op
BenchmarkCreateGoroutines               300000        4297 ns/op
BenchmarkCreateGoroutinesParallel       300000        4300 ns/op
BenchmarkCreateGoroutinesCapture         50000       33218 ns/op        16 B/op        1 allocs/op
BenchmarkClosureCall                  30000000          55.1 ns/op
BenchmarkMatmult                      10000000         196 ns/op
BenchmarkIfaceCmp100                    500000        2672 ns/op
BenchmarkIfaceCmpNil100                 500000        2982 ns/op
BenchmarkDefer                         1000000        1819 ns/op
BenchmarkDefer10                       1000000        1478 ns/op
BenchmarkDeferMany                      500000        3464 ns/op
BenchmarkStackCopy                           1  3714828065 ns/op
BenchmarkCompareStringEqual           10000000         160 ns/op
BenchmarkCompareStringIdentical       30000000          54.1 ns/op
BenchmarkCompareStringSameLength      20000000         111 ns/op
BenchmarkCompareStringDifferentLength 100000000         16.3 ns/op
BenchmarkCompareStringBigUnaligned         100    16695582 ns/op    62.81 MB/s
BenchmarkCompareStringBig                  100    17208318 ns/op    60.93 MB/s
BenchmarkRuneIterate                    300000        5159 ns/op
BenchmarkRuneIterate2                   300000        5158 ns/op
BenchmarkUint32Div7                   10000000         144 ns/op
BenchmarkUint32Div37                  10000000         144 ns/op
BenchmarkUint32Div123                 10000000         144 ns/op
BenchmarkUint32Div763                 10000000         148 ns/op
BenchmarkUint32Div1247                10000000         144 ns/op
BenchmarkUint32Div9305                10000000         144 ns/op
BenchmarkUint32Div13307               10000000         144 ns/op
BenchmarkUint32Div52513               10000000         144 ns/op
BenchmarkUint32Div60978747            10000000         131 ns/op
BenchmarkUint32Div106956295           10000000         131 ns/op
BenchmarkUint32Mod7                   10000000         144 ns/op
BenchmarkUint32Mod37                  10000000         144 ns/op
BenchmarkUint32Mod123                 10000000         144 ns/op
BenchmarkUint32Mod763                 10000000         144 ns/op
```

```
BenchmarkUint32Mod1247                10000000         144 ns/op
BenchmarkUint32Mod9305                10000000         144 ns/op
BenchmarkUint32Mod13307               10000000         144 ns/op
BenchmarkUint32Mod52513               10000000         144 ns/op
BenchmarkUint32Mod60978747            10000000         131 ns/op
BenchmarkUint32Mod106956295           10000000         131 ns/op
ok      runtime 566.969s
```

ODROID-X

Architecture: ARMv7 quad-core Cortex-A9 (Samsung Exynos 4412 1.4GHz), 1GB RAM, Mali graphics (untested).

Operating System: Archlinux ARM

Go pre-1.1 compiles out of the box. The four cores make it particularly suited to Go multi-threaded programs. An ODROID-X2 is coming (Nov 2012) with more RAM.

-- *Rémy Oudompheng*

BananaPi

BananaPi has a few enhanced hardware components compare with Raspberry Pi.

Architecture	Comments
Allwinner A20(ARM Cortex-A7 Dual-core, 1GHz, Mali400MP2 GPU)	tbc
eSATA	No worry to wear out your root SD Card
Onboard Microphone	tbc
1G Etherenet	tbc
1G RAM	tbc
Reset Switch	To reset the board ?
Power Switch	To power cycle the board ?

```
root@bpi01:/data/go13/src# cat ./buildgo.bash
#!/bin/bash
# use 1 CPU to avoid out of memory compilation issue.
time taskset 2 ./make.bash

root@bpi01:/data/go13/src# ./buildgo.bash

<snipped>

Installed Go for linux/arm in /data/go1.3
Installed commands in /data/go1.3/bin

real    9m9.222s
user    8m18.960s
sys     0m40.920s
root@bpi01:/data/go1.3/src#
```

--*T.J. Yang*

AppliedMicro X-Gene (ARMv8)

Architecture: ARMv8 (64-bit) 8-core, 2.4GHz, 16GB RAM

Operating Systems: Linux, Fedora 21

You will need to cross-compile a toolchain using bootstrap.bash. After you copy it to the arm64 system and set `GOROOT_BOOTSTRAP`, you can build go natively.

96Boards HiKey (ARMv8)

Architecture: ARMv8 (64-bit) 8-core, 1.2GHz, 1GB RAM

Operating System: Linux (Linaro)

Go Version: 1.5Beta1

Special Notes: Enable a swap partition (<=1GB is fine). Build process is CPU-intensive and may cause the internal 90C temperature threshold to be exceeded - keep the HiKey cool during the build.

As mentioned above, use bootstrap.sh (e.g. on Ubuntu AMD64) for ARM64, then transfer over the bootstrap tbx file, untar it, and use it as GOROOT_BOOTSTRAP. Check out the Go sources into a separate GOROOT, and build.

--*Andrew Cencini* (andrew@vapor.io)

Scaleway C1 Server

Architecture: armv7l

Operating System: Debian 8.2 (armhf)

Go Version: 1.5

The Scaleway C1 Server is a dedicated ARM server with 2GiB RAM using a SAN for storage.

I used the following guide: Building Go 1.5 on the Raspberry Pi

_--Laurent Debacker

Jetson Nano

Jetson Nano™ from NVIDIA® is a high performance low-power single board computer built for edge Artificial Intelligence computing. It has Quad-core ARM57 based CPU clocked at 1.43 Ghz, 128-core Maxwell based GPU and 4GB of LPDDR4 memory with 25.6 GB/s bandwidth.

Architecture: ARMv8-A

Operating System: Jetson Nano Developer Kit (Ubuntu 18.04 LTS) with JetPack 4.2

Kernel: I'm using a custom compiled official kernel with patch for enabling Zswap and having the root file system in a USB SSD. The procedure for doing this is detailed in Syonyk's blog.

```
abishek@Titan:~$ uname -a
Linux Titan 4.9.140 #1 SMP PREEMPT Thu May 23 01:33:05 IST 2019 aarch64 aarch64 aarch64 GNU/Linux
```

Go Version:

```
abishek@Titan:~$ go version
go version go1.12.5 linux/arm64
```

I used the ARMv8 version from Other Ports section of official downloads. I set the following system wide environment variables in /etc/environment.

```
GOROOT="/usr/local/go"
GOPATH="/home/abishek/Developer/go/packages"
PATH="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/usr/local/go/bin:/home/abishek/Devel

LANG="en_IN"
```

Benchmarks:

HW configuration : 5V 4A power via DC barrel jack. Noctua 40mm PWM fan. Samsung 840 EVO 120 GB SSD.

SW configuration : Headless. Zswap. 12 GB swap partition.

Simple benchmark.

```
abishek@Titan:~$ cd $GOROOT/src/runtime
$ go test -test.bench=BenchmarkUint
PASS
ok      runtime         329.992s
```

Extensive benchmarks.

```
$ go test -test.bench=".*" -test.timeout="60m"
goos: linux
goarch: arm64
pkg: runtime
BenchmarkMakeChan/Byte-4                        10000000               219 ns/op
BenchmarkMakeChan/Int-4                          5000000               298 ns/op
BenchmarkMakeChan/Ptr-4                          3000000               452 ns/op
BenchmarkMakeChan/Struct/0-4                    10000000               196 ns/op
BenchmarkMakeChan/Struct/32-4                    3000000               519 ns/op
BenchmarkMakeChan/Struct/40-4                    3000000               592 ns/op
BenchmarkChanNonblocking-4                      200000000                7.93 ns/op
BenchmarkSelectUncontended-4                    10000000               124 ns/op
BenchmarkSelectSyncContended-4                    200000              7358 ns/op
BenchmarkSelectAsyncContended-4                  2000000               671 ns/op
BenchmarkSelectNonblock-4                       100000000               22.7 ns/op
BenchmarkChanUncontended-4                        200000              6956 ns/op
BenchmarkChanContended-4                           30000             51996 ns/op
BenchmarkChanSync-4                              1000000              1118 ns/op
BenchmarkChanSyncWork-4                           200000             11784 ns/op
BenchmarkChanProdCons0-4                         2000000               817 ns/op
BenchmarkChanProdCons10-4                        2000000               656 ns/op
BenchmarkChanProdCons100-4                       3000000               561 ns/op
BenchmarkChanProdConsWork0-4                     2000000               803 ns/op
BenchmarkChanProdConsWork10-4                    2000000               706 ns/op
BenchmarkChanProdConsWork100-4                   2000000               633 ns/op
BenchmarkSelectProdCons-4                        1000000              1411 ns/op
```

```
BenchmarkChanCreation-4                         10000000               206 ns/op
BenchmarkChanSem-4                               3000000               502 ns/op
BenchmarkChanPopular-4                              1000           1503920 ns/op
BenchmarkCallClosure-4                          200000000                6.54 ns/op
BenchmarkCallClosure1-4                         300000000                5.94 ns/op
BenchmarkCallClosure2-4                         20000000                72.0 ns/op
BenchmarkCallClosure3-4                         20000000                77.9 ns/op
BenchmarkCallClosure4-4                         20000000                74.6 ns/op
BenchmarkComplex128DivNormal-4                  20000000                72.3 ns/op
BenchmarkComplex128DivNisNaN-4                  30000000                47.0 ns/op
BenchmarkComplex128DivDisNaN-4                  20000000                67.6 ns/op
BenchmarkComplex128DivNisInf-4                  50000000                38.7 ns/op
BenchmarkComplex128DivDisInf-4                  20000000                79.3 ns/op
BenchmarkSetTypePtr-4                           200000000                8.54 ns/op      936.87 MB/s
BenchmarkSetTypePtr8-4                          50000000                37.2 ns/op      1720.14 MB/s
BenchmarkSetTypePtr16-4                         30000000                45.6 ns/op      2806.20 MB/s
BenchmarkSetTypePtr32-4                         20000000                60.4 ns/op      4236.17 MB/s
BenchmarkSetTypePtr64-4                         20000000               110 ns/op        4615.47 MB/s
BenchmarkSetTypePtr126-4                        10000000               171 ns/op        5892.51 MB/s
BenchmarkSetTypePtr128-4                        10000000               169 ns/op        6030.73 MB/s
BenchmarkSetTypePtrSlice-4                       1000000              1589 ns/op        5154.84 MB/s
BenchmarkSetTypeNode1-4                         50000000                33.7 ns/op       712.62 MB/s
BenchmarkSetTypeNode1Slice-4                    10000000               197 ns/op        3881.85 MB/s
BenchmarkSetTypeNode8-4                         30000000                42.1 ns/op      1899.69 MB/s
BenchmarkSetTypeNode8Slice-4                     3000000               558 ns/op        4584.96 MB/s
BenchmarkSetTypeNode64-4                        10000000               128 ns/op        4123.56 MB/s
BenchmarkSetTypeNode64Slice-4                     500000              2707 ns/op        6240.73 MB/s
BenchmarkSetTypeNode64Dead-4                    20000000                72.4 ns/op      7291.77 MB/s
BenchmarkSetTypeNode64DeadSlice-4                 500000              3203 ns/op        5274.16 MB/s
BenchmarkSetTypeNode124-4                       10000000               169 ns/op        5961.36 MB/s
BenchmarkSetTypeNode124Slice-4                    300000              4505 ns/op        7159.55 MB/s
BenchmarkSetTypeNode126-4                       10000000               171 ns/op        5971.04 MB/s
BenchmarkSetTypeNode126Slice-4                    300000              4430 ns/op        7395.67 MB/s
BenchmarkSetTypeNode128-4                       10000000               181 ns/op        5737.43 MB/s
BenchmarkSetTypeNode128Slice-4                    300000              4958 ns/op        6711.13 MB/s
BenchmarkSetTypeNode130-4                       10000000               183 ns/op        5764.99 MB/s
BenchmarkSetTypeNode130Slice-4                    300000              5092 ns/op        6635.64 MB/s
BenchmarkSetTypeNode1024-4                       1000000              1104 ns/op        7430.05 MB/s
BenchmarkSetTypeNode1024Slice-4                    50000             32624 ns/op        8050.89 MB/s
BenchmarkAllocation-4                              30000             42818 ns/op
BenchmarkReadMemStats-4                            50000             26260 ns/op
BenchmarkWriteBarrier-4                         20000000                59.5 ns/op
BenchmarkBulkWriteBarrier-4                     50000000                30.4 ns/op
BenchmarkScanStackNoLocals-4                          10         161375576 ns/op
BenchmarkHash5-4                                50000000                24.4 ns/op       205.24 MB/s
BenchmarkHash16-4                               100000000               22.9 ns/op      698.97 MB/s
BenchmarkHash64-4                               50000000                36.2 ns/op      1766.78 MB/s
BenchmarkHash1024-4                             10000000               144 ns/op        7062.29 MB/s
BenchmarkHash65536-4                              200000              7637 ns/op        8580.67 MB/s
BenchmarkAlignedLoad-4                          200000000                7.74 ns/op
BenchmarkUnalignedLoad-4                        200000000                7.72 ns/op
BenchmarkEqEfaceConcrete-4                      500000000                3.51 ns/op
BenchmarkEqIfaceConcrete-4                      500000000                3.86 ns/op
BenchmarkNeEfaceConcrete-4                      500000000                3.51 ns/op
BenchmarkNeIfaceConcrete-4                      500000000                3.86 ns/op
BenchmarkConvT2ESmall-4                         100000000               10.9 ns/op
BenchmarkConvT2EUintptr-4                       100000000               10.7 ns/op
BenchmarkConvT2ELarge-4                         20000000               119 ns/op
BenchmarkConvT2ISmall-4                         100000000               11.0 ns/op
BenchmarkConvT2IUintptr-4                       100000000               10.5 ns/op
BenchmarkConvT2ILarge-4                         20000000               118 ns/op
BenchmarkConvI2E-4                              300000000                5.43 ns/op
BenchmarkConvI2I-4                              30000000                52.5 ns/op
BenchmarkAssertE2T-4                            500000000                3.79 ns/op
BenchmarkAssertE2TLarge-4                       200000000                7.13 ns/op
BenchmarkAssertE2I-4                            30000000                53.3 ns/op
BenchmarkAssertI2T-4                            500000000                3.75 ns/op
BenchmarkAssertI2I-4                            30000000                54.0 ns/op
BenchmarkAssertI2E-4                            300000000                5.38 ns/op
BenchmarkAssertE2E-4                            300000000                4.91 ns/op
BenchmarkAssertE2T2-4                           300000000                4.91 ns/op
BenchmarkAssertE2T2Blank-4                      500000000                3.04 ns/op
BenchmarkAssertI2E2-4                           200000000                6.67 ns/op
BenchmarkAssertI2E2Blank-4                      500000000                3.04 ns/op
BenchmarkAssertE2E2-4                           200000000                6.32 ns/op
BenchmarkAssertE2E2Blank-4                      500000000                3.04 ns/op
BenchmarkConvT2Ezero/zero/16-4                  100000000               10.9 ns/op
BenchmarkConvT2Ezero/zero/32-4                  100000000               10.5 ns/op
```

```
BenchmarkConvT2Ezero/zero/64-4                  100000000               10.5 ns/op
BenchmarkConvT2Ezero/zero/str-4                 100000000               11.9 ns/op
BenchmarkConvT2Ezero/zero/slice-4               100000000               12.8 ns/op
BenchmarkConvT2Ezero/zero/big-4                  2000000               715 ns/op
BenchmarkConvT2Ezero/nonzero/16-4               30000000                52.6 ns/op
BenchmarkConvT2Ezero/nonzero/32-4               20000000                61.4 ns/op
BenchmarkConvT2Ezero/nonzero/64-4               20000000                73.1 ns/op
BenchmarkConvT2Ezero/nonzero/str-4              10000000               128 ns/op
BenchmarkConvT2Ezero/nonzero/slice-4            10000000               160 ns/op
BenchmarkConvT2Ezero/nonzero/big-4               2000000               722 ns/op
BenchmarkMalloc8-4                              20000000                67.4 ns/op
BenchmarkMalloc16-4                             20000000               102 ns/op
BenchmarkMallocTypeInfo8-4                      20000000                99.4 ns/op
BenchmarkMallocTypeInfo16-4                     20000000               119 ns/op
BenchmarkMallocLargeStruct-4                     1000000              1034 ns/op
BenchmarkGoroutineSelect-4                           200           5243015 ns/op
BenchmarkGoroutineBlocking-4                         200           6219647 ns/op
BenchmarkGoroutineForRange-4                         200           6146714 ns/op
BenchmarkGoroutineIdle-4                             500           2738542 ns/op
BenchmarkHashStringSpeed-4                      20000000                75.0 ns/op
BenchmarkHashBytesSpeed-4                       20000000               123 ns/op
BenchmarkHashInt32Speed-4                       30000000                64.2 ns/op
BenchmarkHashInt64Speed-4                       20000000                56.2 ns/op
BenchmarkHashStringArraySpeed-4                 10000000               175 ns/op
BenchmarkMegMap-4                               30000000                51.4 ns/op
BenchmarkMegOneMap-4                            100000000               21.8 ns/op
BenchmarkMegEqMap-4                                 5000            378562 ns/op
BenchmarkMegEmptyMap-4                          200000000                9.83 ns/op
BenchmarkSmallStrMap-4                          30000000                53.3 ns/op
BenchmarkMapStringKeysEight_16-4                30000000                48.8 ns/op
BenchmarkMapStringKeysEight_32-4                30000000                47.0 ns/op
BenchmarkMapStringKeysEight_64-4                30000000                47.0 ns/op
BenchmarkMapStringKeysEight_1M-4                30000000                47.3 ns/op
BenchmarkIntMap-4                               30000000                47.9 ns/op
BenchmarkMapFirst/1-4                           100000000               15.4 ns/op
BenchmarkMapFirst/2-4                           100000000               15.6 ns/op
BenchmarkMapFirst/3-4                           100000000               15.6 ns/op
BenchmarkMapFirst/4-4                           100000000               15.6 ns/op
BenchmarkMapFirst/5-4                           100000000               15.6 ns/op
BenchmarkMapFirst/6-4                           100000000               15.4 ns/op
BenchmarkMapFirst/7-4                           100000000               15.6 ns/op
BenchmarkMapFirst/8-4                           100000000               15.4 ns/op
BenchmarkMapFirst/9-4                           50000000                35.2 ns/op
BenchmarkMapFirst/10-4                          50000000                35.4 ns/op
BenchmarkMapFirst/11-4                          50000000                35.1 ns/op
BenchmarkMapFirst/12-4                          50000000                35.1 ns/op
BenchmarkMapFirst/13-4                          50000000                35.1 ns/op
BenchmarkMapFirst/14-4                          50000000                35.1 ns/op
BenchmarkMapFirst/15-4                          50000000                35.1 ns/op
BenchmarkMapFirst/16-4                          50000000                35.1 ns/op
BenchmarkMapMid/1-4                             100000000               16.1 ns/op
BenchmarkMapMid/2-4                             100000000               19.0 ns/op
BenchmarkMapMid/3-4                             100000000               19.1 ns/op
BenchmarkMapMid/4-4                             100000000               21.3 ns/op
BenchmarkMapMid/5-4                             100000000               21.1 ns/op
BenchmarkMapMid/6-4                             100000000               23.2 ns/op
BenchmarkMapMid/7-4                             100000000               23.2 ns/op
BenchmarkMapMid/8-4                             50000000                25.6 ns/op
BenchmarkMapMid/9-4                             30000000                40.0 ns/op
BenchmarkMapMid/10-4                            30000000                55.1 ns/op
BenchmarkMapMid/11-4                            30000000                46.0 ns/op
BenchmarkMapMid/12-4                            30000000                46.0 ns/op
BenchmarkMapMid/13-4                            30000000                46.0 ns/op
BenchmarkMapMid/14-4                            50000000                46.0 ns/op
BenchmarkMapMid/15-4                            30000000                40.0 ns/op
BenchmarkMapMid/16-4                            50000000                46.4 ns/op
BenchmarkMapLast/1-4                            100000000               16.1 ns/op
BenchmarkMapLast/2-4                            100000000               19.0 ns/op
BenchmarkMapLast/3-4                            100000000               21.1 ns/op
BenchmarkMapLast/4-4                            50000000                23.2 ns/op
BenchmarkMapLast/5-4                            50000000                25.3 ns/op
BenchmarkMapLast/6-4                            50000000                27.4 ns/op
BenchmarkMapLast/7-4                            50000000                29.6 ns/op
BenchmarkMapLast/8-4                            30000000                47.4 ns/op
BenchmarkMapLast/9-4                            30000000                52.1 ns/op
BenchmarkMapLast/10-4                           30000000                56.8 ns/op
BenchmarkMapLast/11-4                           30000000                56.9 ns/op
BenchmarkMapLast/12-4                           30000000                55.6 ns/op
```

```
BenchmarkMapLast/13-4                           20000000                55.1 ns/op
BenchmarkMapLast/14-4                           20000000                51.9 ns/op
BenchmarkMapLast/15-4                           30000000                48.4 ns/op
BenchmarkMapLast/16-4                           30000000                48.4 ns/op
BenchmarkMapCycle-4                             20000000                80.9 ns/op
BenchmarkRepeatedLookupStrMapKey32-4            20000000                76.9 ns/op
BenchmarkRepeatedLookupStrMapKey1M-4                5000            241809 ns/op
BenchmarkMakeMap/[Byte]Byte-4                    5000000               378 ns/op
BenchmarkMakeMap/[Int]Int-4                      3000000               586 ns/op
BenchmarkNewEmptyMap-4                          50000000                25.3 ns/op             0 B/op          0 allocs/op
BenchmarkNewSmallMap-4                          10000000               152 ns/op               0 B/op          0 allocs/op
BenchmarkMapIter-4                               5000000               323 ns/op
BenchmarkMapIterEmpty-4                         100000000               22.5 ns/op
BenchmarkSameLengthMap-4                        100000000               18.3 ns/op
BenchmarkBigKeyMap-4                            20000000                95.4 ns/op
BenchmarkBigValMap-4                            20000000                95.5 ns/op
BenchmarkSmallKeyMap-4                          20000000                66.7 ns/op
BenchmarkMapPopulate/1-4                        20000000                83.6 ns/op             0 B/op          0 allocs/op
BenchmarkMapPopulate/10-4                        1000000              1953 ns/op             179 B/op          1 allocs/op
BenchmarkMapPopulate/100-4                         50000             25432 ns/op            3252 B/op         15 allocs/op
BenchmarkMapPopulate/1000-4                         5000            279914 ns/op           49383 B/op         19 allocs/op
BenchmarkMapPopulate/10000-4                         500           2723038 ns/op          412217 B/op        163 allocs/op
BenchmarkMapPopulate/100000-4                         50          28713410 ns/op         3588881 B/op       3733 allocs/op
BenchmarkComplexAlgMap-4                        10000000               214 ns/op
BenchmarkGoMapClear/Reflexive/1-4               20000000               112 ns/op
BenchmarkGoMapClear/Reflexive/10-4              10000000               123 ns/op
BenchmarkGoMapClear/Reflexive/100-4              5000000               304 ns/op
BenchmarkGoMapClear/Reflexive/1000-4              300000              3735 ns/op
BenchmarkGoMapClear/Reflexive/10000-4              50000             34074 ns/op
BenchmarkGoMapClear/NonReflexive/1-4             5000000               379 ns/op
BenchmarkGoMapClear/NonReflexive/10-4            3000000               480 ns/op
BenchmarkGoMapClear/NonReflexive/100-4           1000000              1183 ns/op
BenchmarkGoMapClear/NonReflexive/1000-4           100000             13549 ns/op
BenchmarkGoMapClear/NonReflexive/10000-4           10000            117289 ns/op
BenchmarkMapStringConversion/32/simple-4        30000000                41.9 ns/op             0 B/op          0 allocs/op
BenchmarkMapStringConversion/32/struct-4        30000000                41.9 ns/op             0 B/op          0 allocs/op
BenchmarkMapStringConversion/32/array-4         30000000                41.8 ns/op             0 B/op          0 allocs/op
BenchmarkMapStringConversion/64/simple-4        30000000                46.3 ns/op             0 B/op          0 allocs/op
BenchmarkMapStringConversion/64/struct-4        30000000                46.3 ns/op             0 B/op          0 allocs/op
BenchmarkMapStringConversion/64/array-4         30000000                46.3 ns/op             0 B/op          0 allocs/op
BenchmarkMapPop100-4                               50000             36575 ns/op
BenchmarkMapPop1000-4                               3000            511995 ns/op
BenchmarkMapPop10000-4                               100          12112237 ns/op
BenchmarkMapAssign/Int32/256-4                  20000000                66.0 ns/op
BenchmarkMapAssign/Int32/65536-4                20000000                90.2 ns/op
BenchmarkMapAssign/Int64/256-4                  20000000                66.0 ns/op
BenchmarkMapAssign/Int64/65536-4                10000000               115 ns/op
BenchmarkMapAssign/Str/256-4                    20000000                79.9 ns/op
BenchmarkMapAssign/Str/65536-4                  10000000               186 ns/op
BenchmarkMapOperatorAssign/Int32/256-4          20000000                66.2 ns/op
BenchmarkMapOperatorAssign/Int32/65536-4        20000000                95.3 ns/op
BenchmarkMapOperatorAssign/Int64/256-4          20000000                66.7 ns/op
BenchmarkMapOperatorAssign/Int64/65536-4        10000000               138 ns/op
BenchmarkMapOperatorAssign/Str/256-4             1000000              5035 ns/op
BenchmarkMapOperatorAssign/Str/65536-4           3000000               682 ns/op
BenchmarkMapAppendAssign/Int32/256-4            20000000                96.4 ns/op            47 B/op          0 allocs/op
BenchmarkMapAppendAssign/Int32/65536-4           5000000               275 ns/op              28 B/op          0 allocs/op
BenchmarkMapAppendAssign/Int64/256-4            20000000                95.7 ns/op            47 B/op          0 allocs/op
BenchmarkMapAppendAssign/Int64/65536-4           5000000               293 ns/op              28 B/op          0 allocs/op
BenchmarkMapAppendAssign/Str/256-4              10000000               318 ns/op              93 B/op          0 allocs/op
BenchmarkMapAppendAssign/Str/65536-4             3000000               465 ns/op              48 B/op          0 allocs/op
BenchmarkMapDelete/Int32/100-4                  20000000               104 ns/op
BenchmarkMapDelete/Int32/1000-4                 20000000                77.8 ns/op
BenchmarkMapDelete/Int32/10000-4                20000000               103 ns/op
BenchmarkMapDelete/Int64/100-4                  20000000               103 ns/op
BenchmarkMapDelete/Int64/1000-4                 20000000                80.3 ns/op
BenchmarkMapDelete/Int64/10000-4                20000000               104 ns/op
BenchmarkMapDelete/Str/100-4                    10000000               124 ns/op
BenchmarkMapDelete/Str/1000-4                   20000000               117 ns/op
BenchmarkMapDelete/Str/10000-4                  10000000               126 ns/op
BenchmarkMemmove/0-4                            300000000                5.58 ns/op
BenchmarkMemmove/1-4                            100000000               13.5 ns/op        74.30 MB/s
BenchmarkMemmove/2-4                            100000000               13.5 ns/op       148.40 MB/s
BenchmarkMemmove/3-4                            100000000               13.3 ns/op       225.03 MB/s
BenchmarkMemmove/4-4                            100000000               13.3 ns/op       299.99 MB/s
BenchmarkMemmove/5-4                            100000000               13.3 ns/op       374.96 MB/s
BenchmarkMemmove/6-4                            100000000               13.5 ns/op       444.23 MB/s
BenchmarkMemmove/7-4                            100000000               13.4 ns/op       522.62 MB/s
```

```
BenchmarkMemmove/8-4                            100000000               13.3 ns/op       600.00 MB/s
BenchmarkMemmove/9-4                            100000000               13.4 ns/op       673.43 MB/s
BenchmarkMemmove/10-4                           100000000               13.3 ns/op       750.14 MB/s
BenchmarkMemmove/11-4                           100000000               13.3 ns/op       824.91 MB/s
BenchmarkMemmove/12-4                           100000000               13.3 ns/op       899.90 MB/s
BenchmarkMemmove/13-4                           100000000               13.5 ns/op       962.98 MB/s
BenchmarkMemmove/14-4                           100000000               13.4 ns/op      1046.19 MB/s
BenchmarkMemmove/15-4                           100000000               13.3 ns/op      1124.88 MB/s
BenchmarkMemmove/16-4                           100000000               13.5 ns/op      1188.13 MB/s
BenchmarkMemmove/32-4                           100000000               13.6 ns/op      2356.67 MB/s
BenchmarkMemmove/64-4                           100000000               16.3 ns/op      3924.55 MB/s
BenchmarkMemmove/128-4                          50000000                23.9 ns/op      5354.07 MB/s
BenchmarkMemmove/256-4                          50000000                35.2 ns/op      7280.74 MB/s
BenchmarkMemmove/512-4                          20000000                68.1 ns/op      7522.83 MB/s
BenchmarkMemmove/1024-4                         20000000               113 ns/op        9060.92 MB/s
BenchmarkMemmove/2048-4                         10000000               203 ns/op        10086.84 MB/s
BenchmarkMemmove/4096-4                          5000000               383 ns/op        10668.94 MB/s
BenchmarkMemmoveUnalignedDst/0-4                100000000               10.7 ns/op
BenchmarkMemmoveUnalignedDst/1-4                100000000               15.4 ns/op        64.75 MB/s
BenchmarkMemmoveUnalignedDst/2-4                100000000               14.0 ns/op       142.50 MB/s
BenchmarkMemmoveUnalignedDst/3-4                100000000               14.0 ns/op       213.78 MB/s
BenchmarkMemmoveUnalignedDst/4-4                100000000               14.5 ns/op       275.50 MB/s
BenchmarkMemmoveUnalignedDst/5-4                100000000               14.9 ns/op       335.56 MB/s
BenchmarkMemmoveUnalignedDst/6-4                100000000               14.7 ns/op       407.71 MB/s
BenchmarkMemmoveUnalignedDst/7-4                100000000               14.9 ns/op       468.79 MB/s
BenchmarkMemmoveUnalignedDst/8-4                100000000               14.5 ns/op       550.56 MB/s
BenchmarkMemmoveUnalignedDst/9-4                100000000               14.7 ns/op       611.60 MB/s
BenchmarkMemmoveUnalignedDst/10-4               100000000               15.0 ns/op       668.48 MB/s
BenchmarkMemmoveUnalignedDst/11-4               100000000               14.8 ns/op       744.55 MB/s
BenchmarkMemmoveUnalignedDst/12-4               100000000               15.1 ns/op       792.42 MB/s
BenchmarkMemmoveUnalignedDst/13-4               100000000               15.0 ns/op       866.28 MB/s
BenchmarkMemmoveUnalignedDst/14-4               100000000               14.9 ns/op       942.03 MB/s
BenchmarkMemmoveUnalignedDst/15-4               100000000               15.0 ns/op      1000.58 MB/s
BenchmarkMemmoveUnalignedDst/16-4               100000000               14.5 ns/op      1103.84 MB/s
BenchmarkMemmoveUnalignedDst/32-4               100000000               16.7 ns/op      1921.87 MB/s
BenchmarkMemmoveUnalignedDst/64-4               50000000                32.7 ns/op      1954.46 MB/s
BenchmarkMemmoveUnalignedDst/128-4              50000000                28.1 ns/op      4560.37 MB/s
BenchmarkMemmoveUnalignedDst/256-4              30000000                47.7 ns/op      5364.41 MB/s
BenchmarkMemmoveUnalignedDst/512-4              20000000                84.9 ns/op      6029.49 MB/s
BenchmarkMemmoveUnalignedDst/1024-4             10000000               156 ns/op        6552.17 MB/s
BenchmarkMemmoveUnalignedDst/2048-4              5000000               290 ns/op        7059.63 MB/s
BenchmarkMemmoveUnalignedDst/4096-4              3000000               561 ns/op        7296.37 MB/s
BenchmarkMemmoveUnalignedSrc/0-4                100000000               10.5 ns/op
BenchmarkMemmoveUnalignedSrc/1-4                100000000               15.6 ns/op        64.12 MB/s
BenchmarkMemmoveUnalignedSrc/2-4                100000000               14.0 ns/op       142.49 MB/s
BenchmarkMemmoveUnalignedSrc/3-4                100000000               14.2 ns/op       211.08 MB/s
BenchmarkMemmoveUnalignedSrc/4-4                100000000               13.9 ns/op       287.49 MB/s
BenchmarkMemmoveUnalignedSrc/5-4                100000000               13.6 ns/op       367.36 MB/s
BenchmarkMemmoveUnalignedSrc/6-4                100000000               13.9 ns/op       432.38 MB/s
BenchmarkMemmoveUnalignedSrc/7-4                100000000               13.6 ns/op       514.32 MB/s
BenchmarkMemmoveUnalignedSrc/8-4                100000000               13.8 ns/op       579.18 MB/s
BenchmarkMemmoveUnalignedSrc/9-4                100000000               14.0 ns/op       643.05 MB/s
BenchmarkMemmoveUnalignedSrc/10-4               100000000               14.0 ns/op       715.96 MB/s
BenchmarkMemmoveUnalignedSrc/11-4               100000000               13.8 ns/op       795.76 MB/s
BenchmarkMemmoveUnalignedSrc/12-4               100000000               14.0 ns/op       855.35 MB/s
BenchmarkMemmoveUnalignedSrc/13-4               100000000               14.0 ns/op       930.87 MB/s
BenchmarkMemmoveUnalignedSrc/14-4               100000000               14.0 ns/op       998.89 MB/s
BenchmarkMemmoveUnalignedSrc/15-4               100000000               14.0 ns/op      1072.50 MB/s
BenchmarkMemmoveUnalignedSrc/16-4               100000000               14.0 ns/op      1141.96 MB/s
BenchmarkMemmoveUnalignedSrc/32-4               100000000               15.4 ns/op      2072.73 MB/s
BenchmarkMemmoveUnalignedSrc/64-4               100000000               18.5 ns/op      3450.95 MB/s
BenchmarkMemmoveUnalignedSrc/128-4              50000000                25.6 ns/op      4996.57 MB/s
BenchmarkMemmoveUnalignedSrc/256-4              50000000                37.9 ns/op      6754.79 MB/s
BenchmarkMemmoveUnalignedSrc/512-4              20000000                74.0 ns/op      6919.73 MB/s
BenchmarkMemmoveUnalignedSrc/1024-4             20000000               119 ns/op        8554.12 MB/s
BenchmarkMemmoveUnalignedSrc/2048-4             10000000               206 ns/op        9940.15 MB/s
BenchmarkMemmoveUnalignedSrc/4096-4              5000000               385 ns/op        10629.02 MB/s
BenchmarkMemclr/5-4                             100000000               14.7 ns/op       339.27 MB/s
BenchmarkMemclr/16-4                            100000000               14.9 ns/op      1075.74 MB/s
BenchmarkMemclr/64-4                            100000000               20.0 ns/op      3192.24 MB/s
BenchmarkMemclr/256-4                           50000000                34.7 ns/op      7373.17 MB/s
BenchmarkMemclr/4096-4                           5000000               288 ns/op        14199.71 MB/s
BenchmarkMemclr/65536-4                           200000              5920 ns/op        11069.74 MB/s
BenchmarkMemclr/1M-4                               10000            119686 ns/op        8761.04 MB/s
BenchmarkMemclr/4M-4                                3000            492651 ns/op        8513.73 MB/s
BenchmarkMemclr/8M-4                                2000            978378 ns/op        8573.99 MB/s
BenchmarkMemclr/16M-4                               1000           1960626 ns/op        8557.07 MB/s
BenchmarkMemclr/64M-4                                200           7860433 ns/op        8537.55 MB/s
```

```
BenchmarkGoMemclr/5-4                           200000000                 8.66 ns/op      577.65 MB/s
BenchmarkGoMemclr/16-4                          200000000                 7.03 ns/op     2277.18 MB/s
BenchmarkGoMemclr/64-4                          100000000                13.3 ns/op      4810.16 MB/s
BenchmarkGoMemclr/256-4                         50000000                 31.5 ns/op      8122.27 MB/s
BenchmarkClearFat8-4                            2000000000                1.40 ns/op
BenchmarkClearFat12-4                           2000000000                1.40 ns/op
BenchmarkClearFat16-4                           2000000000                1.40 ns/op
BenchmarkClearFat24-4                           2000000000                1.40 ns/op
BenchmarkClearFat32-4                           2000000000                1.42 ns/op
BenchmarkClearFat40-4                           2000000000                1.40 ns/op
BenchmarkClearFat48-4                           2000000000                1.40 ns/op
BenchmarkClearFat56-4                           2000000000                1.40 ns/op
BenchmarkClearFat64-4                           2000000000                1.40 ns/op
BenchmarkClearFat128-4                          2000000000                1.40 ns/op
BenchmarkClearFat256-4                          2000000000                1.40 ns/op
BenchmarkClearFat512-4                          2000000000                1.40 ns/op
BenchmarkClearFat1024-4                         2000000000                1.42 ns/op
BenchmarkCopyFat8-4                             2000000000                1.40 ns/op
BenchmarkCopyFat12-4                            2000000000                1.40 ns/op
BenchmarkCopyFat16-4                            2000000000                1.40 ns/op
BenchmarkCopyFat24-4                            2000000000                1.40 ns/op
BenchmarkCopyFat32-4                            2000000000                1.40 ns/op
BenchmarkCopyFat64-4                            2000000000                1.40 ns/op
BenchmarkCopyFat128-4                           2000000000                1.42 ns/op
BenchmarkCopyFat256-4                           2000000000                1.41 ns/op
BenchmarkCopyFat512-4                           2000000000                1.40 ns/op
BenchmarkCopyFat520-4                           2000000000                1.40 ns/op
BenchmarkCopyFat1024-4                          2000000000                1.40 ns/op
BenchmarkIssue18740-4                             100000              14531 ns/op
BenchmarkFinalizer-4                                 500            2526732 ns/op
BenchmarkFinalizerRun-4                          1000000               2604 ns/op
BenchmarkSyscall-4                              20000000                 63.4 ns/op
BenchmarkSyscallWork-4                          20000000                 96.9 ns/op
BenchmarkSyscallExcess-4                        20000000                 63.4 ns/op
BenchmarkSyscallExcessWork-4                    20000000                 96.8 ns/op
BenchmarkPingPongHog-4                            500000               2889 ns/op
BenchmarkStackGrowth-4                          100000000                21.2 ns/op
BenchmarkStackGrowthDeep-4                        500000               2548 ns/op
BenchmarkCreateGoroutines-4                      1000000               1046 ns/op
BenchmarkCreateGoroutinesParallel-4             10000000                198 ns/op
BenchmarkCreateGoroutinesCapture-4                200000               8941 ns/op              16 B/op          1 allocs/op
BenchmarkClosureCall-4                          300000000                 5.80 ns/op
BenchmarkWakeupParallelSpinning/0s-4              100000              20843 ns/op
BenchmarkWakeupParallelSpinning/1µs-4              50000              23993 ns/op
BenchmarkWakeupParallelSpinning/2µs-4              50000              27880 ns/op
BenchmarkWakeupParallelSpinning/5µs-4              50000              37540 ns/op
BenchmarkWakeupParallelSpinning/10µs-4             30000              56729 ns/op
BenchmarkWakeupParallelSpinning/20µs-4             20000              96465 ns/op
BenchmarkWakeupParallelSpinning/50µs-4             10000             221160 ns/op
BenchmarkWakeupParallelSpinning/100µs-4             5000             359871 ns/op
BenchmarkWakeupParallelSyscall/0s-4                10000             321507 ns/op
BenchmarkWakeupParallelSyscall/1µs-4                5000             335555 ns/op
BenchmarkWakeupParallelSyscall/2µs-4                5000             346055 ns/op
BenchmarkWakeupParallelSyscall/5µs-4                5000             343007 ns/op
BenchmarkWakeupParallelSyscall/10µs-4               5000             386787 ns/op
BenchmarkWakeupParallelSyscall/20µs-4               5000             387292 ns/op
BenchmarkWakeupParallelSyscall/50µs-4               5000             556090 ns/op
BenchmarkWakeupParallelSyscall/100µs-4              3000             626904 ns/op
BenchmarkMatmult-4                              200000000                 9.45 ns/op
BenchmarkFastrand-4                             2000000000                1.65 ns/op
BenchmarkFastrandHashiter-4                     50000000                 32.3 ns/op
BenchmarkFastrandn/2-4                          200000000                 8.42 ns/op
BenchmarkFastrandn/3-4                          200000000                 8.43 ns/op
BenchmarkFastrandn/4-4                          200000000                 8.50 ns/op
BenchmarkFastrandn/5-4                          200000000                 8.42 ns/op
BenchmarkIfaceCmp100-4                           5000000                370 ns/op
BenchmarkIfaceCmpNil100-4                       10000000                203 ns/op
BenchmarkEfaceCmpDiff-4                          1000000               2052 ns/op
BenchmarkDefer-4                                 5000000                256 ns/op
BenchmarkDefer10-4                              10000000                230 ns/op
BenchmarkDeferMany-4                             3000000                489 ns/op
BenchmarkRWMutexUncontended-4                   20000000                112 ns/op
BenchmarkRWMutexWrite100-4                      10000000                197 ns/op
BenchmarkRWMutexWrite10-4                        1000000               1629 ns/op
BenchmarkRWMutexWorkWrite100-4                  10000000                221 ns/op
BenchmarkRWMutexWorkWrite10-4                    1000000               1314 ns/op
BenchmarkMakeSlice/Byte-4                       20000000                 60.2 ns/op
BenchmarkMakeSlice/Int16-4                      20000000                 73.2 ns/op
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```
BenchmarkMakeSlice/Int-4                        10000000               133 ns/op
BenchmarkMakeSlice/Ptr-4                        10000000               188 ns/op
BenchmarkMakeSlice/Struct/24-4                  10000000               200 ns/op
BenchmarkMakeSlice/Struct/32-4                  10000000               230 ns/op
BenchmarkMakeSlice/Struct/40-4                   5000000               262 ns/op
BenchmarkGrowSlice/Byte-4                       10000000               144 ns/op
BenchmarkGrowSlice/Int16-4                      10000000               204 ns/op
BenchmarkGrowSlice/Int-4                         5000000               245 ns/op
BenchmarkGrowSlice/Ptr-4                         5000000               365 ns/op
BenchmarkGrowSlice/Struct/24-4                   3000000               428 ns/op
BenchmarkGrowSlice/Struct/32-4                   3000000               486 ns/op
BenchmarkGrowSlice/Struct/40-4                   2000000               607 ns/op
BenchmarkExtendSlice/IntSlice-4                 10000000               165 ns/op
BenchmarkExtendSlice/PointerSlice-4             10000000               213 ns/op
BenchmarkExtendSlice/NoGrow-4                   100000000               15.4 ns/op
BenchmarkAppend-4                               30000000                56.2 ns/op
BenchmarkAppendGrowByte-4                            300           5560036 ns/op
BenchmarkAppendGrowString-4                            5         226765389 ns/op
BenchmarkAppendSlice/1Bytes-4                   100000000               12.6 ns/op
BenchmarkAppendSlice/4Bytes-4                   100000000               12.0 ns/op
BenchmarkAppendSlice/7Bytes-4                   100000000               11.9 ns/op
BenchmarkAppendSlice/8Bytes-4                   100000000               12.0 ns/op
BenchmarkAppendSlice/15Bytes-4                  100000000               11.9 ns/op
BenchmarkAppendSlice/16Bytes-4                  100000000               12.3 ns/op
BenchmarkAppendSlice/32Bytes-4                  100000000               12.6 ns/op
BenchmarkAppendSliceLarge/1024Bytes-4            1000000              1420 ns/op
BenchmarkAppendSliceLarge/4096Bytes-4             300000              4643 ns/op
BenchmarkAppendSliceLarge/16384Bytes-4            100000             13584 ns/op
BenchmarkAppendSliceLarge/65536Bytes-4             50000             32999 ns/op
BenchmarkAppendSliceLarge/262144Bytes-4            10000            120741 ns/op
BenchmarkAppendSliceLarge/1048576Bytes-4            2000            679068 ns/op
BenchmarkAppendStr/1Bytes-4                     100000000               13.5 ns/op
BenchmarkAppendStr/4Bytes-4                     100000000               11.9 ns/op
BenchmarkAppendStr/8Bytes-4                     100000000               11.9 ns/op
BenchmarkAppendStr/16Bytes-4                    100000000               12.6 ns/op
BenchmarkAppendStr/32Bytes-4                    100000000               14.4 ns/op
BenchmarkAppendSpecialCase-4                    20000000                85.0 ns/op
BenchmarkCopy/1Byte-4                           100000000               14.0 ns/op        71.25 MB/s
BenchmarkCopy/1String-4                         100000000               13.8 ns/op        72.29 MB/s
BenchmarkCopy/2Byte-4                           100000000               21.4 ns/op        93.67 MB/s
BenchmarkCopy/2String-4                         100000000               17.1 ns/op       117.24 MB/s
BenchmarkCopy/4Byte-4                           100000000               16.9 ns/op       237.34 MB/s
BenchmarkCopy/4String-4                         100000000               16.8 ns/op       237.50 MB/s
BenchmarkCopy/8Byte-4                           100000000               22.9 ns/op       348.61 MB/s
BenchmarkCopy/8String-4                         100000000               16.8 ns/op       475.00 MB/s
BenchmarkCopy/12Byte-4                          100000000               16.8 ns/op       712.43 MB/s
BenchmarkCopy/12String-4                        100000000               16.9 ns/op       712.04 MB/s
BenchmarkCopy/16Byte-4                          50000000                24.8 ns/op       646.37 MB/s
BenchmarkCopy/16String-4                        100000000               16.8 ns/op       949.90 MB/s
BenchmarkCopy/32Byte-4                          100000000               16.3 ns/op      1964.35 MB/s
BenchmarkCopy/32String-4                        100000000               16.4 ns/op      1956.17 MB/s
BenchmarkCopy/128Byte-4                         50000000                27.4 ns/op      4676.48 MB/s
BenchmarkCopy/128String-4                       50000000                27.4 ns/op      4676.64 MB/s
BenchmarkCopy/1024Byte-4                        20000000               113 ns/op        9005.87 MB/s
BenchmarkCopy/1024String-4                      20000000               113 ns/op        9004.83 MB/s
BenchmarkAppendInPlace/NoGrow/Byte-4             1000000              1352 ns/op
BenchmarkAppendInPlace/NoGrow/1Ptr-4              300000              4058 ns/op
BenchmarkAppendInPlace/NoGrow/2Ptr-4              200000              7520 ns/op
BenchmarkAppendInPlace/NoGrow/3Ptr-4              200000              8608 ns/op
BenchmarkAppendInPlace/NoGrow/4Ptr-4              100000             14133 ns/op
BenchmarkAppendInPlace/Grow/Byte-4               1000000              1076 ns/op
BenchmarkAppendInPlace/Grow/1Ptr-4               1000000              1074 ns/op
BenchmarkAppendInPlace/Grow/2Ptr-4               1000000              1449 ns/op
BenchmarkAppendInPlace/Grow/3Ptr-4               1000000              1841 ns/op
BenchmarkAppendInPlace/Grow/4Ptr-4               1000000              1983 ns/op
BenchmarkStackCopyPtr-4                                5         309390029 ns/op
BenchmarkStackCopy-4                                   5         297313618 ns/op
BenchmarkStackCopyNoCache-4                            2         518883532 ns/op
BenchmarkCompareStringEqual-4                   100000000               12.8 ns/op
BenchmarkCompareStringIdentical-4               100000000               11.9 ns/op
BenchmarkCompareStringSameLength-4              100000000               10.5 ns/op
BenchmarkCompareStringDifferentLength-4         2000000000               1.40 ns/op
BenchmarkCompareStringBigUnaligned-4                3000            430422 ns/op        2436.18 MB/s
BenchmarkCompareStringBig-4                         3000            428766 ns/op        2445.59 MB/s
BenchmarkConcatStringAndBytes-4                 20000000                78.6 ns/op
BenchmarkSliceByteToString/1-4                  100000000               16.9 ns/op
BenchmarkSliceByteToString/2-4                  20000000                65.6 ns/op
BenchmarkSliceByteToString/4-4                  20000000                73.4 ns/op
```

```
BenchmarkSliceByteToString/8-4                  20000000                88.1 ns/op
BenchmarkSliceByteToString/16-4                 10000000               122 ns/op
BenchmarkSliceByteToString/32-4                 10000000               139 ns/op
BenchmarkSliceByteToString/64-4                 10000000               186 ns/op
BenchmarkSliceByteToString/128-4                 5000000               281 ns/op
BenchmarkRuneCount/lenruneslice/ASCII-4         50000000                37.9 ns/op
BenchmarkRuneCount/lenruneslice/Japanese-4               5000000               263 ns/op
BenchmarkRuneCount/lenruneslice/MixedLength-4           10000000               232 ns/op
BenchmarkRuneCount/rangeloop/ASCII-4                    50000000                33.0 ns/op
BenchmarkRuneCount/rangeloop/Japanese-4                  5000000               260 ns/op
BenchmarkRuneCount/rangeloop/MixedLength-4              10000000               208 ns/op
BenchmarkRuneCount/utf8.RuneCountInString/ASCII-4       30000000                41.4 ns/op
BenchmarkRuneCount/utf8.RuneCountInString/Japanese-4            10000000               184 ns/op
BenchmarkRuneCount/utf8.RuneCountInString/MixedLength-4         10000000               218 ns/op
BenchmarkRuneIterate/range/ASCII-4                              50000000                29.5 ns/op
BenchmarkRuneIterate/range/Japanese-4                            5000000               246 ns/op
BenchmarkRuneIterate/range/MixedLength-4                        10000000               206 ns/op
BenchmarkRuneIterate/range1/ASCII-4                             50000000                29.5 ns/op
BenchmarkRuneIterate/range1/Japanese-4                           5000000               246 ns/op
BenchmarkRuneIterate/range1/MixedLength-4                       10000000               221 ns/op
BenchmarkRuneIterate/range2/ASCII-4                             50000000                29.5 ns/op
BenchmarkRuneIterate/range2/Japanese-4                           5000000               246 ns/op
BenchmarkRuneIterate/range2/MixedLength-4                       10000000               204 ns/op
BenchmarkArrayEqual-4                                           200000000                6.33 ns/op
BenchmarkClockVDSOAndFallbackPaths/vDSO-4                       10000000               195 ns/op
BenchmarkClockVDSOAndFallbackPaths/Fallback-4                    1000000              1936 ns/op
BenchmarkTimeNow-4                                              10000000               197 ns/op
PASS
ok      runtime         1331.420s
```

--Abishek Muthian (@heavyinfo)

Apple silicon

Cross-compiling Go applications

Host/Build: macOS/x86_64 Target: macOS/arm64 On host machine:

Xcode: Install latest Xcode which supports Apple silicon

Go: Install go*.darwin-amd64.pkg (or build go from source) on macOS/x86_64

Set go executable in PATH

Export the following environment variables before cross compiling go apps for macOS/arm64

```
export SDK_NAME=macosx
export SDK_PATH=$(xcrun --show-sdk-path --sdk $SDK_NAME)
export CGO_ENABLED=1
export GOOS=darwin
export GOARCH=arm64
export CC="$(xcrun -sdk $SDK_PATH --find clang) -arch $GOARCH -isysroot $SDK_PATH"
export CFLAGS="-isysroot $SDK_PATH -arch $GOARCH -I$SDK_PATH/usr/include"
export LD_LIBRARY_PATH="$SDK_PATH/usr/lib"
export CGO_CFLAGS="-isysroot $SDK_PATH -arch $GOARCH"
export CGO_LDFLAGS="-isysroot $SDK_PATH -arch $GOARCH"
Compile the app as below:
$ GOOS=darwin GOARCH=arm64 go build <app>
```

Copy the generated arm64 executable to target machine (macOS/arm64) and run