

Ruby - Feature #15902

Add a specialized instruction for `.nil?`

06/05/2019 04:28 PM - tenderlovmaking (Aaron Patterson)

Status:Closed Priority:Normal Assignee: Target version:	
Description I'd like to add a specialized instruction for <code>.nil?</code>. We have specialized instructions for <code>.length</code> and <code>.empty?</code>, and surprisingly our application also calls <code>.nil?</code> a lot: <pre>[aaron@TC ~/g/github (gc-boot-stats)]\$ git grep '.empty?' wc -l 2553 [aaron@TC ~/g/github (gc-boot-stats)]\$ git grep '.length' wc -l 3975 [aaron@TC ~/g/github (gc-boot-stats)]\$ git grep '.nil?' wc -l 3117</pre> I'm not sure how hot any of the <code>.nil?</code> callsites are, but I think this instruction will speed up most of them. I tried two benchmark runners: Benchmark/ips <pre>require "benchmark/ips" class Niller def nil?; true; end end not_nil = Object.new xnil = nil niller = Niller.new Benchmark.ips do x x.report("nil?") { xnil.nil? } x.report("not nil") { not_nil.nil? } x.report("niller") { niller.nil? } end</pre> Results On Ruby master: <pre>[aaron@TC ~/g/ruby (master)]\$./ruby compil.rb Warming up ----- nil? 429.195k i/100ms not nil 437.889k i/100ms niller 437.935k i/100ms Calculating ----- nil? 20.166M (± 8.1%) i/s - 100.002M in 5.002794s not nil 20.046M (± 7.6%) i/s - 99.839M in 5.020086s niller 22.467M (± 6.1%) i/s - 112.111M in 5.013817s [aaron@TC ~/g/ruby (master)]\$./ruby compil.rb Warming up ----- nil? 449.660k i/100ms not nil 433.836k i/100ms niller 443.073k i/100ms Calculating ----- nil? 19.997M (± 8.8%) i/s - 99.375M in 5.020458s not nil 20.529M (± 7.0%) i/s - 102.385M in 5.020689s</pre>	

```

niller      21.796M (± 8.0%) i/s -    108.110M in    5.002300s
[aaron@TC ~/g/ruby (master)]$ ./ruby compil.rb
Warming up -----
      nil?      402.119k i/100ms
    not nil     438.968k i/100ms
      niller     398.226k i/100ms
Calculating -----
      nil?      20.050M (±12.2%) i/s -    98.519M in    5.008817s
    not nil     20.614M (± 8.0%) i/s -   102.280M in    5.004531s
      niller     22.223M (± 8.8%) i/s -   110.309M in    5.013106s

```

On this patch:

```

[aaron@TC ~/g/ruby (specialized-nilp)]$ ./ruby compil.rb
Warming up -----
      nil?      468.371k i/100ms
    not nil     456.517k i/100ms
      niller     454.981k i/100ms
Calculating -----
      nil?      27.849M (± 7.8%) i/s -   138.169M in    5.001730s
    not nil     26.417M (± 8.7%) i/s -   131.020M in    5.011674s
      niller     21.561M (± 7.5%) i/s -   107.376M in    5.018113s
[aaron@TC ~/g/ruby (specialized-nilp)]$ ./ruby compil.rb
Warming up -----
      nil?      477.259k i/100ms
    not nil     428.712k i/100ms
      niller     446.109k i/100ms
Calculating -----
      nil?      28.071M (± 7.3%) i/s -   139.837M in    5.016590s
    not nil     25.789M (±12.9%) i/s -   126.470M in    5.011144s
      niller     20.002M (±12.2%) i/s -    98.144M in    5.001737s
[aaron@TC ~/g/ruby (specialized-nilp)]$ ./ruby compil.rb
Warming up -----
      nil?      467.676k i/100ms
    not nil     445.791k i/100ms
      niller     415.024k i/100ms
Calculating -----
      nil?      26.907M (± 8.0%) i/s -   133.755M in    5.013915s
    not nil     25.319M (± 7.9%) i/s -   125.713M in    5.007758s
      niller     19.569M (±11.8%) i/s -    96.286M in    5.008533s

```

According to benchmark/ips, it's about 27% faster when the object is nil or a regular object. When it's an object that implements .nil?, I think it might be slower but it's hard to tell.

Benchmark-driver

I added a benchmark driver file:

```

prelude: |
  class Niller; def nil?; true; end; end
  xnil, notnil = nil, Object.new
  niller = Niller.new
benchmark:
  - xnil.nil?
  - notnil.nil?
  - niller.nil?
loop_count: 10000000

```

Results (tested against master @ c9b74f9fd95113df903fc34cc1d6ec3fb3160c85)

```

[aaron@TC ~/g/ruby (specialized-nilp)]$ make benchmark ARGS=benchmark/nil_p.yml
./revision.h unchanged
/Users/aaron/.rbenv/shims/ruby --disable=gems -rrubygems -I./benchmark/lib ./benchmark/benchmark-driver/exe/benchmark-driver \
--executables="compare-ruby::/Users/aaron/.rbenv/shims/ruby --disable=gems -I.ext/common --disable-gem" \

```

```

--executables="built-ruby:../miniruby -I./lib -I. -I.ext/common ./tool/runruby.rb --
extout=.ext -- --disable-gems --disable-gem" \
benchmark/nil_p.yml
Calculating -----
               compare-ruby  built-ruby
      xnil.nil?      68.825M    405.121M i/s -    10.000M times in 0.145296s 0.024684s
    notnil.nil?     66.357M    267.874M i/s -    10.000M times in 0.150700s 0.037331s
    niller.nil?     110.273M    123.089M i/s -    10.000M times in 0.090684s 0.081242s

Comparison:
               xnil.nil?
      built-ruby: 405120725.0 i/s
    compare-ruby: 68825019.2 i/s - 5.89x  slower

               notnil.nil?
      built-ruby: 267873885.2 i/s
    compare-ruby: 66357000.6 i/s - 4.04x  slower

               niller.nil?
      built-ruby: 123089042.6 i/s
    compare-ruby: 110273035.8 i/s - 1.12x  slower

[aaron@TC ~/g/ruby (specialized-nilp)]$ make benchmark ARGS=benchmark/nil_p.yml
./revision.h unchanged
/Users/aaron/.rbenv/shims/ruby --disable=gems -rrubygems -I./benchmark/lib ./benchmark/benchmark-d
river/exe/benchmark-driver \
--executables="compare-ruby:~/Users/aaron/.rbenv/shims/ruby --disable=gems -I.ext/com
mon --disable-gem" \
--executables="built-ruby:../miniruby -I./lib -I. -I.ext/common ./tool/runruby.rb --
extout=.ext -- --disable-gems --disable-gem" \
benchmark/nil_p.yml
Calculating -----
               compare-ruby  built-ruby
      xnil.nil?      45.083M    360.998M i/s -    10.000M times in 0.221811s 0.027701s
    notnil.nil?     69.558M    271.054M i/s -    10.000M times in 0.143765s 0.036893s
    niller.nil?     115.423M     79.667M i/s -    10.000M times in 0.086638s 0.125523s

Comparison:
               xnil.nil?
      built-ruby: 360997801.1 i/s
    compare-ruby: 45083426.9 i/s - 8.01x  slower

               notnil.nil?
      built-ruby: 271054130.3 i/s
    compare-ruby: 69557959.1 i/s - 3.90x  slower

               niller.nil?
    compare-ruby: 115422793.6 i/s
      built-ruby: 79666674.5 i/s - 1.45x  slower

I think there is too much noise for the third case.

I'm not happy about making rb_false non-static, but I'm not sure how else to do this patch.

What do you think?

```

History

#1 - 06/05/2019 04:55 PM - Eregon (Benoit Daloze)

FWIW, we already inline nil? in the AST for TruffleRuby:

<https://github.com/oracle/truffleruby/commit/57628008#diff-09677670ed37ee212c217374c6468718>

Makes sense since it's such a small operation and it's frequently used.

#2 - 07/19/2019 05:09 PM - tenderlovmaking (Aaron Patterson)

I applied this optimization and tested against our application while logging instructions:

```

> insn_info[order(insn_info$Count),]
  Instruction      Count
94      reverse         1
95  opt_newarray_max     49
93      setblockparam    54
92  opt_call_c_function  60
22      opt_aset_with   302
78      setglobal       417
39      setclassvariable 441
87      opt_div         597
88      once           1263
91      branchnil       1357
52  opt_regexpmatch1    1386
53      duphash         1513
76      getglobal       1538
58      topn            1607
56      opt_and         2129
89      opt_or          2344
86      opt_mult        2859
46      toregexp        11460
28      definesmethod   11880
20      setconstant     12930
81      intern          19087
5      defineclass      32953
55      opt_mod         33719
24  opt_aref_with       36994
80      throw          44954
35      duparray        53448
96      setlocal        58770
30      getspecial      63765
69      opt_length      74235
77      newrange        77459
71      opt_size        98244
15      definemethod   104818
42      tostring        124320
70      opt_gt          130296
74      concatarray    133235
48  getclassvariable    143407
34      opt_str_freeze  192432
68  opt_regexpmatch2    272036
90      checkkeyword    279475
44      freezestring    290999
14  putspecialobject    338706
43      concatstrings   344539
18      putstring       435151
45      getblockparam   455764
64      expandarray     490262
41      checktype       541355
21      newhash         698166
63      opt_neq         764259
57      swap           1146326
66      opt_ge          1283820
73      opt_le          1345993
51      opt_nil_p       1536827
72      opt_minus       1598463
67      invokeblock     1614973
79  getblockparamproxy  1675137
82      getlocal        1799493
38      opt_ltl_t       1888635
65      splatarray      1971596
83  opt_case_dispatch  2049897
85      setlocal_WC_1    2062346
50      invokesuper     2153631
84      opt_lt          2229708
3  opt_setinlinecache   2422345
54      opt_plus        2803688
60      opt_empty_p     2820474
27      opt_aset        3204087
47  putobject_INT2FIX_0_ 3790567
75      adjuststack     3924393
31      opt_not         3986585
2      getconstant      4722342
62      jump           4781094
49      dupn            4854287
37  setinstancevariable 5385254

```

61	checkmatch	5448507
36	newarray	5539621
26	setn	6319773
59	putobject_INT2FIX_1_	9551850
16	defined	10071630
32	getlocal_WC_1	15007475
29	opt_eq	16058544
10	send	16372975
9	putobject	20392124
4	putnil	26095091
19	branchif	30425098
33	opt_aref	31976718
1	opt_getinlinecache	32302934
40	getinstancevariable	34616623
13	pop	36429507
7	setlocal_WC_0	39844133
23	dup	41106221
11	nop	51714288
8	putself	56476479
17	branchunless	62428811
12	leave	86843816
6	opt_send_without_block	147141336
25	getlocal_WC_0	213198244

Our application boot process executes this instruction 1.5mil times:

```
> insn_info[which(insn_info$Instruction == "opt_nil_p"),]
  Instruction Count
51  opt_nil_p 1536827
>
```

I think this is a useful instruction, so I'd like to apply the patch. :)

#3 - 07/30/2019 07:45 AM - ko1 (Koichi Sasada)

All right, go ahead.

#4 - 07/31/2019 11:26 PM - tenderlovmaking (Aaron Patterson)

- Status changed from Open to Closed

I pushed this as 9faef3113fb4331524b81ba73005ba13fa0ef6c6

We found it decreased our app boot time by ~1.8 seconds (which is not large percentage wise, but definitely measurable). I tested by booting our app in production mode 50 times with and without the patch.

Here is a graph of the results:

62253666-7da11900-b3ab-11e9-8c16-5b39b6a04d82.png
Again with Y at 0:

62253946-5d258e80-b3ac-11e9-852f-f6fd39e152c3.png

#5 - 08/27/2019 07:50 AM - ned (Ned Hadzo)

This was reverted, right? <https://github.com/ruby/ruby/commit/a0980f2446c0db735b8ffeb37e241370c458a626>

#6 - 08/27/2019 11:33 AM - mame (Yusuke Endoh)

ned (Ned Hadzo) wrote:

This was reverted, right? <https://github.com/ruby/ruby/commit/a0980f2446c0db735b8ffeb37e241370c458a626>

It has been re-introduced. The Mojave issue was also fixed.

Files

0001-Add-a-specialized-instruction-for-.nil-calls.patch	7.13 KB	06/05/2019	tenderlovmaking (Aaron Patterson)
---	---------	------------	-----------------------------------