I've written a patch to collect most symbols.

**PATCH:** [https://github.com/authorNari/ruby/compare/4a91fb7a45f0e3c...symbol_gc.patch](https://github.com/authorNari/ruby/compare/4a91fb7a45f0e3c...symbol_gc.patch)

### Summary
- Most symbols in Ruby level are GC-able (generated by `#to_sym`, `#intern`, etc..)
- Exclude a symbol which is translated ID in C-level from GC-able symbols
- Keep Ruby’s C extension compatibility
- Pass make test-all

### Benchmark
A benchmark program is here.

```
obj = Object.new
100_000.times do |i|
  obj.respond_to?("sym#{i}".to_sym)
end
GC.start
puts "symbol : #{Symbol.all_symbols.size}"
```

```
% time RBENV_VERSION=ruby-r45059 ruby -v /tmp/a.rb
ruby 2.2.0dev (2014-02-20 trunk 45059) [x86_64-linux]
symbol : 102416
0.24s user 0.01s system 91% cpu 0.272 total

% time RBENV_VERSION=symgc ruby -v /tmp/a.rb
ruby 2.2.0dev (2014-02-20 trunk 45059) [x86_64-linux]
symbol : 2833
0.21s user 0.01s system 90% cpu 0.247 total
```

The total number of symbols is declined.
The total time of symgc version is improved because Full GC pressure has been reduced.

The result of make benchmark.

[https://gist.github.com/authorNari/9359704](https://gist.github.com/authorNari/9359704)

There is no significant slowdown.

(I would welcome to try an additional benchmark and report)

### Implementation Detail
I classify Dynamic symbol and Static symbol.

- Static symbol
  - Generated by `rb_intern()`
  - A sequential unique number as in the past.
  - Not GC-able
LSB = 1
Reserved IDs(147 and below) are exceptional cases

- Dynamic symbol
  - Generated by #to_sym, #intern in Ruby level
  - RVALUE
  - GC-able
  - LSB = 0
  - Pin down a dynamic symbol when it translate to ID (e.g. SYM2ID, rb_intern).
  - Pinned dynamic symbols are never collected.
  - I'd like to include ID in GC’s roots only CRuby internal in order to reduce pinned dynamic symbols.

Please read the patch if you want to know more information.

Acknowledgment

The idea of this symbol GC is invented by Sasada Koichi in Heroku, inc. Thank you.

-- ja --
RubyレベルのシンボルをGC対象にするパッチを書きました。
https://github.com/authorNari/ruby/compare/4a91fb7a45f0e3c...symbol_gc

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総シンボル数が減少していることがわかる。
シンボル数の現象でFull GCのプレッシャーが削減されたことにより、symgcの速度が向上した。
make benchmark
https://gist.github.com/authorNari/9359704

(上記以外の追試を歓迎します)
symbolをstatic symbolとdynamic symbolに分類。

- static symbol
  - rb_iternで生成
  - 連番の一意な数値
  - GC非対象
  - 下位1ビットにフラグとして1を立てる
  - 147以下の予約済みIDは例外ケース

- dynamic symbol
  - Rubyレベルの#to_sym,#internで生成
  - RVALUEとして生成
  - GC対象
  - 下位1ビットは0
  - CレベルでID変換(SYM2IDなど)された場合、pindownし、GCで解放される
  - Ruby側でID変換(SYM2ID)のpindownをしたい

その他の詳細はパッチを読んでもらえると…。

謝辞
シンボルGCのアイデアはHeroku社のささだこういち様によるものです。ありがとうございます。

Associated revisions
Revision 90b70738 - 03/26/2014 04:57 AM - nari

- parse.y: support Symbol GC. [ruby-trunk Feature #9634]
  See this ticket about Symbol GC.

- include/ruby/ruby.h:
  Declare few functions.
  - rb_sym2id: almost same as old SYM2ID but support dynamic symbols.
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- gc.c: declare RSymbol. support T_SYMBOL.

- internal.h: Declare few functions.
  - rb_gc_free_dsym: free up a dynamic symbol. GC call this function at a sweep phase.
  - rb_str_dynamic_intern: convert a string to a dynamic symbol.
  - rb_check_id_without_pindown: not pinning function.
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git-svn-id: svn+ssh://ci.ruby-lang.org/ruby/trunk@45426 b2dd03c8-39d4-4d8f-98ff-823fe69b080e

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## History

### #1 - 03/13/2014 09:41 AM - rosenfeld (Rodrigo Rosenfeld Rosas)

Wow, great work! Congrats :-)

### #2 - 03/13/2014 02:20 PM - ktsj (Kazuki Tsujimoto)

- File test-all_segfault.log added

make test-all sometimes causes segmentation fault.
I attached the backtrace log.

### #3 - 03/14/2014 05:02 AM - authorNari (Narihiro Nakamura)

- Description updated
Kazuki Tsujimoto wrote:

make test-all sometimes causes segmentation fault. I attached the backtrace log.

Thank you! I fixed it and rebased.
https://github.com/authorNari/ruby/commit/9cd060aab6ca9cf55971b8d8881b30f0204f71be
https://github.com/authorNari/ruby/compare/4a91fb7a45f0e3c...symbol_gc

Cool! I benchmarked your original version and it didn't notice obvious regressions.

I noticed rb_check_id_without_pindown still takes a volatile arg. Is this for GC-safety? Can we encourage RB_GC_GUARD instead for new APIs? volatile is not always enough, and tends to generate bad code. I realize this was probably for consistency with the old rb_check_id function.

Narihiro Nakamura wrote:

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New symbol_gc branch works fine. Thanks!

Eric Wong wrote:

volatile is not always enough, and tends to generate bad code.

It make sense for me.
I've removed the volatile declaration of rb_check_id_without_pindown.
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Anonymous wrote:

- Status changed from Open to Closed
- % Done changed from 0 to 100

Applied in changeset r45426.

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**Files**

<table>
<thead>
<tr>
<th>File</th>
<th>Size</th>
<th>Date</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>test-all_segfault.log</td>
<td>10 KB</td>
<td>03/13/2014</td>
<td>ktsj (Kazuki Tsujimoto)</td>
</tr>
</tbody>
</table>