Ruby master - Bug #4443
odd evaluation order in a multiple assignment
02/24/2011 11:28 PM - mame (Yusuke Endoh)

遠藤です。core に投げてしまったようなので登録し直し。
Ruby は左から右に評価が進むと信じていたのですが、多重代入で裏切られました。

def foo
  p :foo
  []
end
def bar
  p :bar
end

x, foo[0] = bar, 0

bar より foo が左にあるので、:foo、:bar の順に出力されることを期待するのですが、なんと :bar、:foo になります。

具体的に何が困るかというと、例えば
obj, obj.foo = obj.foo, obj

swap を期待するわけですが、そうなりません。こういうコードは実際に、木の回転などを実装するときにしばしば書きたくなります。この挙動に気がついたのも splay tree を実装していたときでした。こんなの:

t.left, t.left.right, t = t.left.right, t, t.left

IRC で話したら「それで普通」みたいな反応もありましたが、
foo[0] = bar

... Yusuke Endoh mame@tsg.ne.jp

Related issues:
Related to Ruby master - Bug #15928: Constant declaration does not conform to... Closed
Is duplicate of Ruby master - Bug #4440: odd evaluation order in a multiple a... Closed 02/24/2011

Associated revisions
Revision 50c54d40 - 04/21/2021 05:49 PM - jeremyevans (Jeremy Evans)
Evaluate multiple assignment left hand side before right hand side

In regular assignment, Ruby evaluates the left hand side before the right hand side. For example:

foo[0] = bar

Calls foo, then bar, then []= on the result of foo.

Previously, multiple assignment didn't work this way. If you did:
Ruby would previously call bar, then baz, then abc, then
def= on the result of abc, then foo, then []= on the
result of foo.

This change makes multiple assignment similar to single assignment,
changing the evaluation order of the above multiple assignment code
to calling abc, then foo, then bar, then baz, then def= on
the result of abc, then []= on the result of foo.

Implementing this is challenging with the stack-based virtual machine.
We need to keep track of all of the left hand side attribute setter
receivers and setter arguments, and then keep track of the stack level
while handling the assignment processing, so we can issue the
appropriate topn instructions to get the receiver. Here’s an example
of how the multiple assignment is executed, showing the stack and
instructions:

```
self            # putself
abc             # send
abc, self       # putself
abc, foo        # send
abc, foo, 0     # putobject 0
abc, foo, 0, [bar, baz] # evaluate RHS
abc, foo, 0, [bar, baz], baz, bar # expandarray
abc, foo, 0, [bar, baz], baz, bar, abc # topn 5
abc, foo, 0, [bar, baz], baz, def=  # swap
abc, foo, 0, [bar, baz], baz, def=  # send
abc, foo, 0, [bar, baz], baz     # pop
abc, foo, 0, [bar, baz], baz, foo # topn 3
abc, foo, 0, [bar, baz], baz, foo, 0 # topn 3
abc, foo, 0, [bar, baz], baz, foo, 0, baz # topn 2
abc, foo, 0, [bar, baz], baz, [bar, baz] # topn 1
abc, foo, 0, [bar, baz], baz, [bar, baz] # send
abc, foo, 0, [bar, baz]         # pop
[bar, baz], foo, 0, [bar, baz] # setn 3
[bar, baz], foo, 0             # pop
[bar, baz]                    # pop
```

As multiple assignment must deal with splats, post args, and any level
of nesting, it gets quite a bit more complex than this in non-trivial
cases. To handle this, struct masgn_state is added to keep
track of the overall state of the mass assignment, which stores a linked
list of struct masgn_attrasgn, one for each assigned attribute.

This adds a new optimization that replaces a topn 1/pop instruction
combination with a single swap instruction for multiple assignment
to non-aref attributes.

This new approach isn’t compatible with one of the optimizations
previously used, in the case where the multiple assignment return value
was not needed, there was no lhs splat, and one of the left hand side
used an attribute setter. This removes that optimization. Removing
the optimization allowed for removing the POP_ELEMENT and adjust_stack
functions.

This adds a benchmark to measure how much slower multiple
assignment is with the correct evaluation order.

This benchmark shows:

- 4-9% decrease for attribute sets
- 14-23% decrease for array member sets
- Basically same speed for local variable sets

Importantly, it shows no significant difference between the popped
(where return value of the multiple assignment is not needed) and
popped (where return value of the multiple assignment is needed)
cases for attribute and array member sets. This indicates the
previous optimization, which was dropped in the evaluation
order fix and only affected the popped case, is not important to
performance.
Fixes [Bug #4443]

History

#1 - 03/26/2011 10:25 PM - shyouhei (Shyouhei Urabe)
- Status changed from Open to Assigned

#2 - 06/11/2011 03:49 PM - ko1 (Koichi Sasada)

#3 - 06/11/2011 04:04 PM - mame (Yusuke Endoh)
http://redmine.ruby-lang.org/issues/4440

- matz よりりどき

優先順位は高くありませんが、直すべきだと思います。
とはいうものの、1.8のころからこうだったのですし、直すのが難しいのも確
かなのですが。

確か redmine 更新直後で、インターフェイスの違いにハマってチケット登録に失敗してしまったのでした。

--
Yusuke Endoh mame@tsg.ne.jp

#4 - 06/11/2011 10:29 PM - matz (Yukihiro Matsumoto)
- ruby -v changed from ruby 1.9.2p0 (2010-08-18 revision 29036) [i686-linux] to -

まつもと ゆきひろです

In message "Re: [ruby-dev:43724] [Ruby 1.9 - Bug #4443] odd evaluation order in a multiple assignment" on Sat, 11 Jun 2011 15:49:30 +0900, Koichi Sasada redmine@ruby-lang.org writes:

まつもとさん、こちらいかがでしょうか。
直せと言われたら私なのかなぁ。
すでに遠藤さんが指摘してくださいましたが、直せるものなら直し
たいと思ってます。

#5 - 06/11/2011 10:29 PM - matz (Yukihiro Matsumoto)

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#6 - 10/18/2011 09:16 AM - naruse (Yui NARUSE)
- Project changed from Ruby master to 14
- Target version deleted (3.0)

#7 - 10/23/2011 05:21 PM - naruse (Yui NARUSE)
- Project changed from 14 to Ruby master

#8 - 04/10/2012 06:35 PM - matz (Yukihiro Matsumoto)

Cから受け継いだ代入の評価順が「おかしい」のが原因である(本来は a → b と表記すべきか)を考
慮すると、むしろ foo[0] = bar :bar, :fooと動作するようにすべきでしょうか。
いや、単なる思いつきなのですが。

ちなみに今調べたら mruby は foo[0] = bar :bar, :fooと動作しますね。
まあ、それはそれでいいかなと思います。

ちなみに ISO とかの標準的にはどうなってるんでしょう?

--

Yusuke Endoh  mame@tsg.ne.jp

手元にあるJIS x3017のドラフトを見ると現状の評価順(多重代入の場合には右辺が先)が記述してありますね(11.4.2.4)。

どうしたもんだか。

- Assignee changed from matz (Yukihiro Matsumoto) to ko1 (Koichi Sasada)

It looks to be closed by mistake.

- Category set to core
- Target version set to 2.6

...feature 2.0  next minor

- Description updated

- Description updated

これバグなんだっけ？feature のような気もしますが。

2.0 には無理っぽいので、next minor にしておきます。

- Description updated

It has been closed by mistake.

- Status changed from Assigned to Closed
Evaluate multiple assignment left hand side before right hand side

In regular assignment, Ruby evaluates the left hand side before the right hand side. For example:

```ruby
foo[0] = bar
```

Calls `foo`, then `bar`, then `[]=` on the result of `foo`.

Previously, multiple assignment didn't work this way. If you did:

```ruby
abc.def, foo[0] = bar, baz
```

Ruby would previously call `bar`, then `baz`, then `abc`, then `def=` on the result of `abc`, then `foo`, then `[]=` on the result of `foo`.

This change makes multiple assignment similar to single assignment, changing the evaluation order of the above multiple assignment code to calling `abc`, then `foo`, then `bar`, then `baz`, then `def=` on the result of `abc`, then `[]=` on the result of `foo`.

Implementing this is challenging with the stack-based virtual machine. We need to keep track of all of the left hand side attribute setter receivers and setter arguments, and then keep track of the stack level while handling the assignment processing, so we can issue the appropriate `topn` instructions to get the receiver. Here's an example of how the multiple assignment is executed, showing the stack and instructions:

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abc, self     # putself
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abc, foo, 0, [bar, baz] # evaluate RHS
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abc, foo, 0, [bar, baz], baz, abc, bar # swap
abc, foo, 0, [bar, baz], baz, def= # send
abc, foo, 0, [bar, baz], baz # pop
abc, foo, 0, [bar, baz], baz, foo # topn 3
abc, foo, 0, [bar, baz], baz, foo, 0 # topn 3
abc, foo, 0, [bar, baz], baz, foo, 0, baz # topn 2
abc, foo, 0, [bar, baz], baz, []= # send
abc, foo, 0, [bar, baz], baz # pop
abc, foo, 0, [bar, baz] # pop
[bar, baz], foo, 0, [bar, baz] # setn 3
[bar, baz], foo, 0 # pop
[bar, baz], foo # pop
[bar, baz] # pop
```

As multiple assignment must deal with splats, post args, and any level of nesting, it gets quite a bit more complex than this in non-trivial cases. To handle this, struct `masgn_state` is added to keep track of the overall state of the mass assignment, which stores a linked list of struct `masgn_attrasgn`, one for each assigned attribute.

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Fixes [Bug #4443]

#21 - 05/05/2021 03:24 PM - Eregon (Benoit Daloze)
- Related to Bug #15928: Constant declaration does not conform to JIS 3017:2013 added

#22 - 05/05/2021 03:46 PM - Eregon (Benoit Daloze)
I wrote some concerns over this change in https://bugs.ruby-lang.org/issues/15928#note-10.
I think the previous semantics of multiple assignments are better for various reasons.
We could change single assignment order, always evaluate RHS first, like MRuby behaves, if consistency is wanted.