New TracePoint events to support loading features

I propose the following new TracePoint events:

- **loaded** (invoked after `require/load`)
- **method_added** (invoked after method definition)

**Background**

Sometimes we need to hook loading iseq. For example, checking loading files and so on. Also we want to know what kind of methods are defined.

For both purpose, we can use some hook methods such as `Module#method_added` and so on. However, defining methods we can override this features. So that if we have two tools/libraries using this feature, they can be conflicted.

**Proposal**

Introduce new TracePoint events:

- **loaded** (invoked after `require/load`)
- **method_added** (invoked after method definition)

Also the following methods can be added:

- Active only loaded event:
  - `TracePoint#loaded_feature` returns feature name.
  - `TracePoint#loaded_iseq` returns RubyVM::InstructionSequence object (MRI only, internal feature)

**Optional proposal**

Add class_added alias name for class event.

**Associated revisions**

Revision 5ac990e8 - 12/06/2018 01:42 PM - ko1 (Koichi Sasada)

`script_compiled` TracePoint event [Feature #15287]

- `vm_trace.c`: add `script_compiled` event. This event invoked after script compiling and before evaluating compiled script. Also the following methods are added:

  `TracePoint#compiled_instruction_sequence` method to get compiled RubyVM::InstructionSequence instance.
  `TracePoint#compiled_eval_script` method to get compiled script (String) by `*eval` methods (return nil if compiling by file).

- `vm_trace.c (tracepoint_attr_raised_exception)`: 

Revision 66249 - 12/06/2018 01:42 PM - ko1 (Koichi Sasada)
script_compiled TracePoint event [Feature #15287]

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vm_trace.c (tracepoint_attr_raised_exception):

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vm_trace.c (tracepoint_attr_raised_exception):

Revision 7510 - 12/12/2018 03:45 PM - ko1 (Koichi Sasada)

- remove compiled_prefix. [Feature #15287]
  - vm_trace.c: remove compiled_prefix from the following methods:
    - compiled_eval_script
    - compiled_instruction_sequence [Feature #15287]

Revision 66364 - 12/12/2018 03:45 PM - ko1 (Koichi Sasada)

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Revision 66364 - 12/12/2018 03:45 PM - ko1 (Koichi Sasada)

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    - compiled_eval_script
    - compiled_instruction_sequence [Feature #15287]

History

#1 - 11/07/2018 08:15 AM - shevegen (Robert A. Heiler)
I love introspection, so .. \o/

#2 - 11/22/2018 08:02 AM - ko1 (Koichi Sasada)
I got Matz's approval except naming "loaded" because the name "loaded" can be after require/load. This proposal is just after compiling (iseq generation) and just before running loading code.

Other possibility:

- iseq_generated (iseq is internal name)
- script_compiled

We need good name...

#3 - 12/05/2018 07:24 AM - ko1 (Koichi Sasada)
Matz agreed about naming of "script_compiled".
If others especially English natives have ideas, please tell me.
If no, I'll commit "script_compiled" event some days later.

I'm reconsidering "method_added" event because there are several other points we change the class/module methods. We already has several hooks provided by method hook:

```ruby
rb_define_private_method(rb_cClass, "inherited", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "included", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "extended", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "prepended", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "method_added", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "method_removed", rb_obj_dummy, 1);
rb_define_private_method(rb_cModule, "method_undefined", rb_obj_dummy, 1);
```

Maybe other events we want to introduce. But (this is internal reason) we don't have enough bits to represent them.

There are several ideas:

- (1) add all events above (change internal)
- (2) add one event (extended, for example) and add new method to recognize which kind of extension Ruby did (for example, tp.extension_type #=> :undef)

Maybe we have no time to conclude this spec so I think it is difficult to introduce this feature (method_added) in Ruby 2.6.

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### #4 - 12/06/2018 01:42 PM - ko1 (Koichi Sasada)
- Status changed from Open to Closed

Applied in changeset `trunk|r66249`.

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script_compiled TracePoint event [Feature #15287]

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```

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### #5 - 12/10/2018 07:36 AM - ko1 (Koichi Sasada)

English naming question!

As I mentioned in commit log, I introduced the following two methods:

- TracePoint#compiled_instruction_sequence method to get compiled RubyVM::InstructionSequence instance.
- TracePoint#compiled_eval_script method to get compiled script (String) by *eval methods (return nil if compiling by file).

Matz agreed with TracePoint#compiled_instruction_sequence but has question about TracePoint#compiled_eval_script.

Both use prefix compiled_ but we use two meanings: iseq is the result of compilation and eval_script is source string. The result and the source.

Is it natural or do we have better name?

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### #6 - 12/10/2018 01:38 PM - Eregon (Benoit Daloze)

"compiled" for the source code seems unnatural.  How about #source_code or #source or #eval_script instead?

instruction_sequence already implies "compiled" so I think the prefix is not needed there too.

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### #7 - 12/10/2018 07:48 PM - tenderlovemaking (Aaron Patterson)

I agree with Eregon (Benoit Daloze). The user has to subscribe to the "compiled_script" event, so the fact that the script has been compiled is already known.

For example:

```
tp = TracePoint.new(:script_compiled) do |e|
```
When the tracepoint executes, we already know it's for a "compiled_script". So "compiled_eval_script" seems redundant. Just "eval_script", or "eval_source" seems good enough.

#8 - 12/10/2018 09:11 PM - ko1 (Koichi Sasada)
Eregon (Benoit Daloze) wrote:

How about #source_code or #source or #eval_script instead?

I named eval_script because we can not get source code other than *eval methods (not by require and load).

   instruction_sequence already implies "compiled" so I think the prefix is not needed there too

We can get ISeq only on compiled_script event. #instruction_sequence seems too general for me, and for example, I'm afraid that users can misused at call/return event (method's ISeq). This is why I named raised_exception, not exception (on raise event). Not value but returned_value (on return event).

But instruction_sequence and eval_script (eavaled_script?) can be enough long to detect specific methods for script_compiled.

#9 - 12/12/2018 05:52 AM - ko1 (Koichi Sasada)
Matz decided to remove compiled_prefix.
I'll commit it soon.

#10 - 12/27/2018 10:10 PM - Eregon (Benoit Daloze)
I wonder, what purpose do you envision for instruction_sequence?
It is of course MRI-specific (as documented), so I'm not sure how one would use it on other Ruby implementations.

   I named eval_script because we can not get source code other than *eval methods (not by require and load).

That would be a very useful feature though, and could maybe be created lazily when the method is called. It seems somewhat similar to https://github.com/jruby/jruby/issues/5206#issue-328885424, which also wants to be able to modify the source on the fly.

#11 - 02/06/2019 11:26 PM - Eregon (Benoit Daloze)
Eregon (Benoit Daloze) wrote:

   I wonder, what purpose do you envision for instruction_sequence?
It is of course MRI-specific (as documented), so I'm not sure how one would use it on other Ruby implementations.

Actually, I think it is suboptimal to have MRI-specific methods returning MRI-specific types (RubyVM::...) in a portable class like TracePoint. It means TracePoint cannot be supported completely on other Ruby implementations, because e.g., some method like TracePoint#instruction_sequence is MRI specific.