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Long journey of Ruby standard library.

Hiroshi SHIBATA @hsbt
2024/05/15 RubyKaigi 2024

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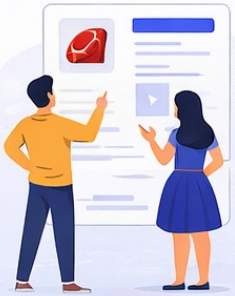

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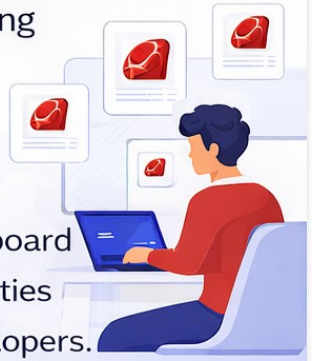

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Hiroshi SHIBATA

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Ruby core team

RubyGems/Bundler te

Technical fellow at ANDPAD

https://hsbt.org

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Service Summary

Cloud-based Project Management Software

Office

Sales / Site Supervisor / Architect
Office worker / Managerial position

Construction-site

Carpenter / Vendor
Manufacturer / Distribution

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Producsts powered by Ruby

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Introduction of ANDPAD

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History of standard libraries

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How load Ruby code from outside of Ruby core?

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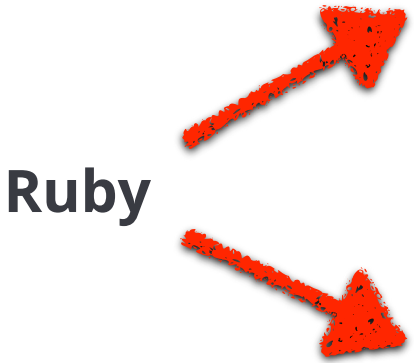
Classification of Ruby core library



Embedded Class

- String
- Time
- ...

Standard Library

- URI
- JSON
- RSS
- ...

Pure Ruby Library

- URI
- FileUtils
- ...

C extension Library

- JSON
- OpenSSL
- ...

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History for rubygems and related services

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- 2003: Launch raa.ruby-lang.org and rubyforge.org
- 2004: RubyGems is released
- 2007: Ruby 1.9.0 is released with RubyGems 1.3
- 2009: Closed gems.github.com
- 2009: Transition gemcutter.org and gems.rubyforge.org to rubygems.org
- 2012-13: gemcutter utility has been merged into rubygems
- 2013: Closed raa.ruby-lang.org
- 2014: Closed rubyforge.org
- 2014-: rubygems.org is canonical library repository for the Ruby languag

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History of library volume for Ruby language

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We bundled a lot of library at Ruby 1.8 because we don't ha

rubygems.org yet.

	Ruby 1.6	Ruby 1.8	Ruby 2.7	Ruby 3.3
Pure Ruby	63	104	65	56
C extensions	15	26	34	29

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Classification of Standard library in 2024

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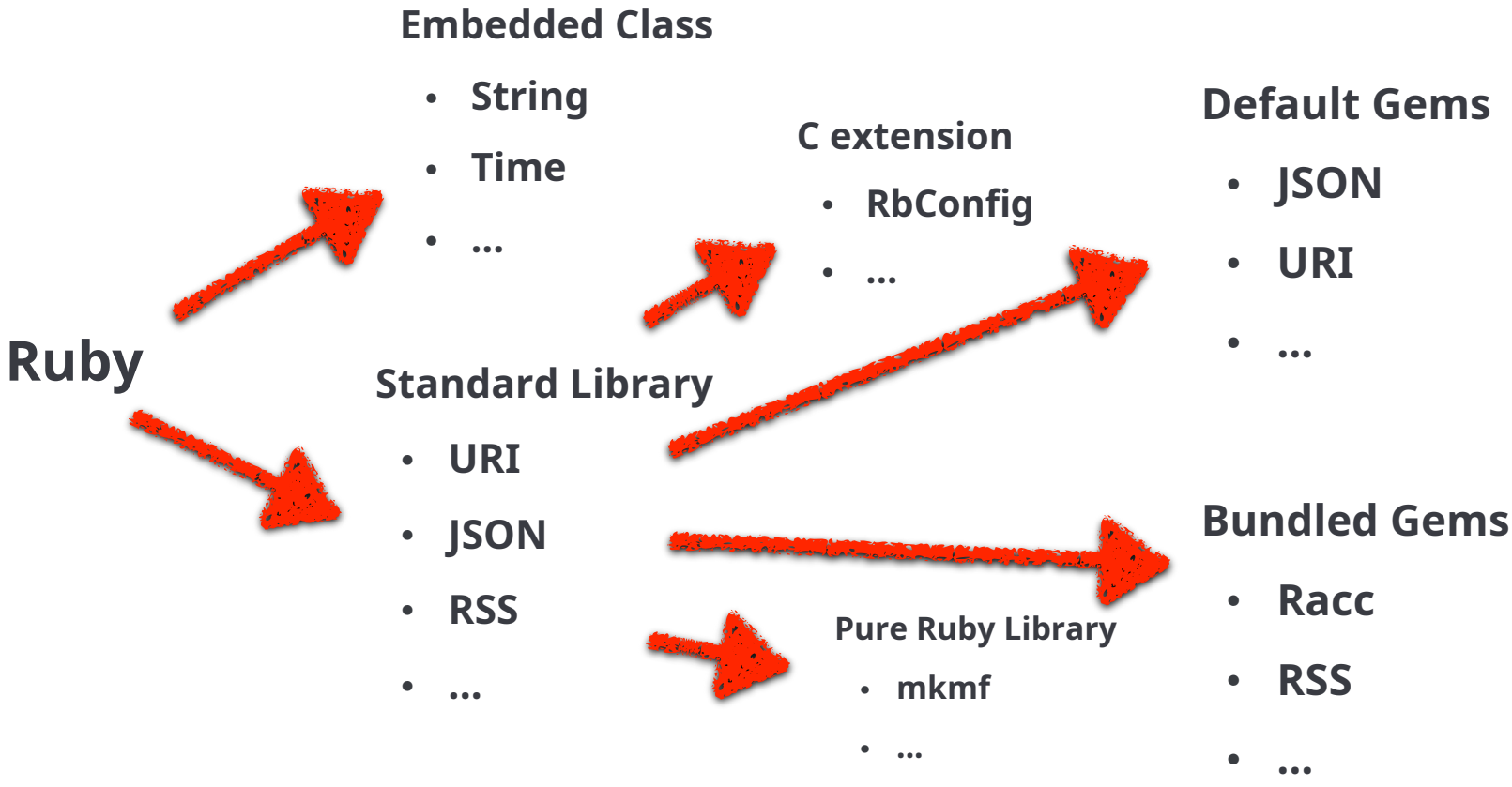

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What are default and bundled gems?

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What's Default gems

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- The Ruby core team released "Default gems" to the rubygem
  - You can install standard libraries of Ruby via RubyGems.
  - Default gems are openssl, psych, json, etc... You can see default gems at https://stdgems.org/
- Rubygems have a detection method for default gems.

```
>> require 'rss'
=> true
>> Gem.loaded_specs["rss"].default_gem?
=> false
>> require 'openssl'
=> true
>> Gem.loaded_specs["openssl"].default_gem?
=> true
```

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How develop the default gems

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Default gems repository is located under the https://github.com/ruby

ruby/* repositories can develop bundler and rake same as your application.

```
$ bundle install
$ rake test
```

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sync_default_gems.rb

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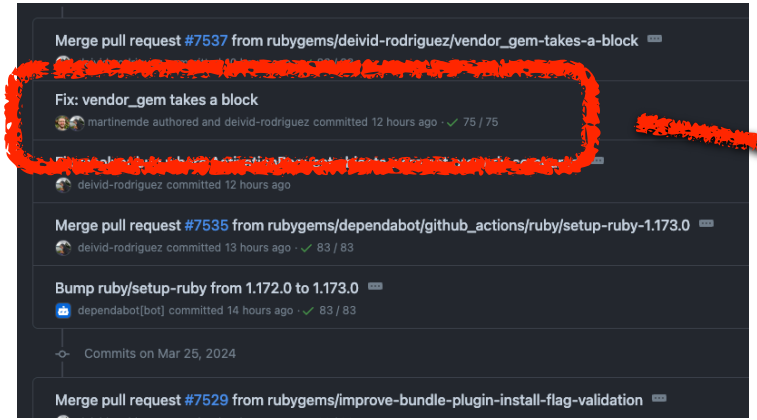
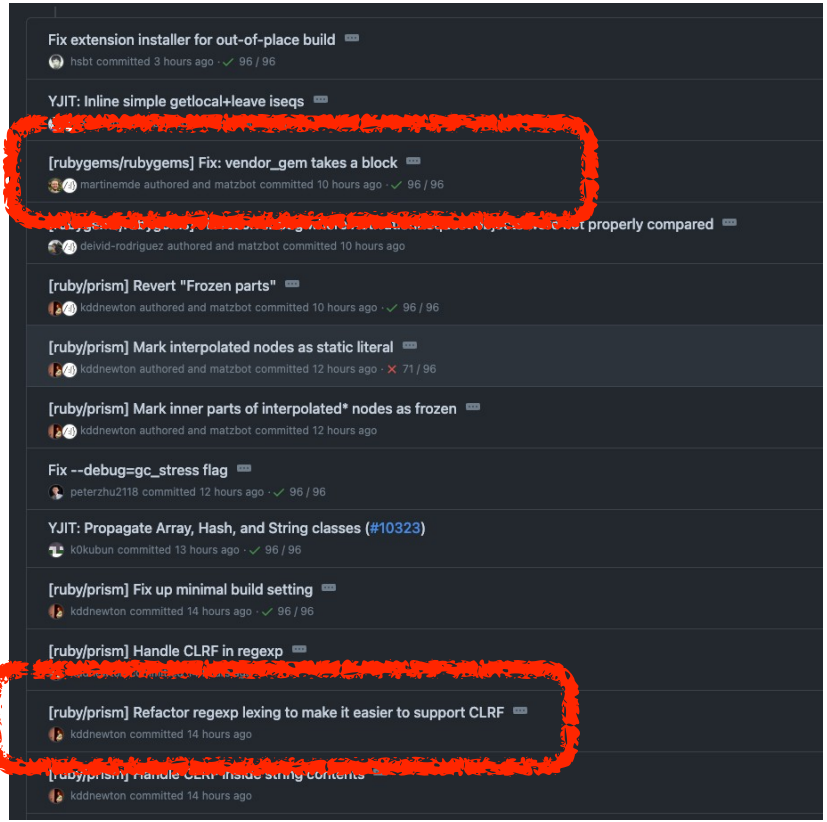
rubygems/rubygems



ruby/ruby



ruby/prism

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What's Bundled gems

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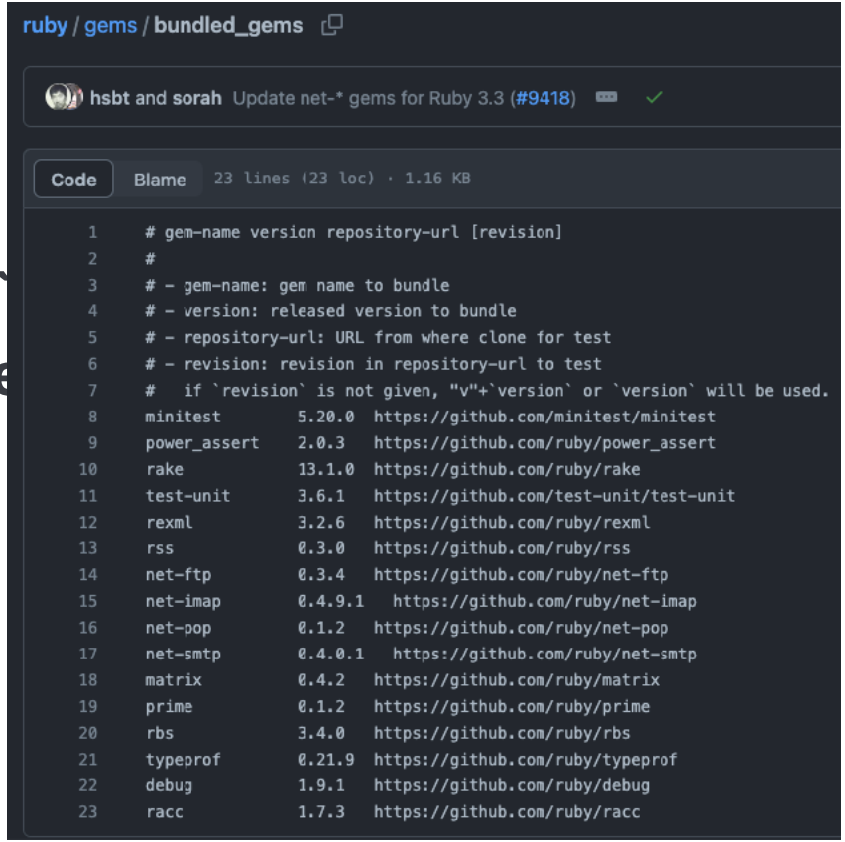
- We bundled *.gem and unpacked files to tarball package for Bundled gems with `gems/bundled_gems` in ruby/ruby repository like this:
- `make install` installed Bundled gem your box.



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Why we need to default gems and bundled gems?

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Security

CVE-2024-27282: Arbitrary memory address read vulnerability with Regex search

We have released the Ruby version 3.0.7, 3.1.5, 3.2.4 and 3.3.1 that have a security fix for an arbitrary memory address read vulnerability in Regex search. This vulnerability has been assigned the CVE identifier CVE-2024-27282.

Continue Reading...

Posted by hsbt on 23 Apr 2024

CVE-2024-27281: RCE vulnerability with .rdoc_options in RDoc

We have released the RDoc gem version 6.3.4.1, 6.4.1.1, 6.5.1.1 and 6.6.3.1 [illegible] has been assigned the CVE identifier CVE-2024-27281.

Continue Reading...

Posted by hsbt on 21 Mar 2024

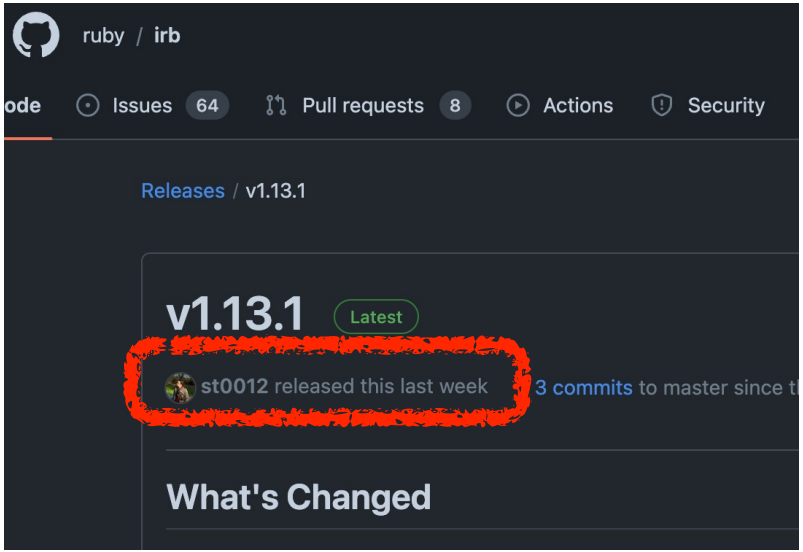
CVE-2024-27280: Buffer overread vulnerability in StringIO

We have released the StringIO gem version 3.0.1.1 and 3.0.1.2 that have a [illegible] has been assigned the CVE identifier CVE-2024-27280.

Continue Reading...

Posted by hsbt on 21 Mar 2024

Sustainability



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New feature of Ruby 3.3 For RubyGems/Bundler

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The major problem for the bundled gems

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If you use Bundler, you need to add the bundled gems into your Gem

```
source "https://rubygems.org"

gem “rss”       # You need to this because rss is bundled gems
# gem "openssl"  # You can load openssl without this line

gem "bigdecimal" # You need to this always after Ruby 3.4
...
```

I need to consider to transition and migration plan for this.
But I have no idea yet. Maybe, I will add the some mechanism to Bun
to care about this.

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Warning feature of bundled gems

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- I added warning feature about bu gems.
- You can see how handle bundled like this.

```
$ cat -p Gemfile
source "https://rubygems.org"

gem "rss"

$ bundle exec irb
>> require "csv"
(irb):1: warning: csv which will no longer be part of
the default gems since Ruby 3.4.0. Add csv to your
Gemfile or gemspec.
=> true
```

```
module Gem::BUNDLED_GEMS
  SINCE = {
    "rexml" => "3.0.0",
    "rss" => "3.0.0",
    "webrick" => "3.0.0",
    "matrix" => "3.1.0",
    "net-ftp" => "3.1.0",
    "net-imap" => "3.1.0",
    "net-pop" => "3.1.0",
    "net-smtp" => "3.1.0",
    "prime" => "3.1.0",
    "abbrev" => "3.4.0",
    "base64" => "3.4.0",
    "bigdecimal" => "3.4.0",
    "csv" => "3.4.0",
    "drb" => "3.4.0",
    "getoptlong" => "3.4.0",
    "mutex_m" => "3.4.0",
    "nkf" => "3.4.0",
    "observer" => "3.4.0",
    "racc" => "3.4.0",
    "resolv-replace" => "3.4.0",
    "rinda" => "3.4.0",
    "syslog" => "3.4.0",
  }.freeze
```

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How extend require in your use case?

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```
def replace_require(specs)
  return if [::Kernel.singleton_class, ::Kernel].any? {|klass| klass.respond_to?(:no_warning_require) }

  [::Kernel.singleton_class, ::Kernel].each do |kernel_class|
    kernel_class.send(:alias_method, :no_warning_require, :require)
    kernel_class.send(:define_method, :require) do |name|
      if message = ::Gem::BUNDLED_GEMS.warning?(name, specs: specs)
        warn message, :uplevel => 1
      end
      kernel_class.send(:no_warning_require, name)
    end
    if kernel_class == ::Kernel
      kernel_class.send(:private, :require)
    else
      kernel_class.send(:public, :require)
    end
  end
end
```

We easily extend `require` like this. I only enabled this extensio

the bundler. I added this to monkey patch collection of bundle

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Example case

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```
require "bundler/inline"

gemfile do
  source "https://rubygems.org"
end

require "mutex_m"
require "rss"
```

You can see these warning with th

example Gemfile.

```
test_warn_bundled_gems.rb:7: warning: mutex_m was loaded from the standard
library, but will no longer be part of the default gems since Ruby 3.4.0. Add
mutex_m to your Gemfile or gemspec.

test_warn_bundled_gems.rb:8: warning: rss was loaded from the standard
library, but is not part of the default gems since Ruby 3.0.0. Add rss to
your Gemfile or gemspec.
/Users/hsbt/.local/share/rbenv/versions/3.3.0-dev/lib/ruby/3.3.0/
bundled_gems.rb:74:in `require': cannot load such file -- rss (LoadError)
```

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Example case

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```ruby
require "bundler/inline"

gemfile do
  source "https://rubygems.org"
  gem "activesupport", "7.0.7.2"
end

require "active_support/all"
```

We also care dependencies from ge

like rails.

```
/Users/hsbt/.local/share/gem/gems/activesupport-7.0.7.2/lib/
active_support/core_ext/big_decimal/conversions.rb:3: warning:
bigdecimal was loaded from the standard library, but will no longer
be part of the default gems since Ruby 3.4.0. Add bigdecimal to
your Gemfile or gemspec. Also contact author of
activesupport-7.0.7.2 to add bigdecimal into its gemspec.
```

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Issue with bootsnap and Zeitwerk

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- I detect caller by `caller_locations` like this.

```
.../lib/ruby/3.3.0+0/bundled_gems.rb:90:in `warning?'
.../lib/ruby/3.3.0+0/bundler/rubygems_integration.rb:247:in `block (2 levels) in
replace_require'
.../gem/gems/activesupport-7.0.7.2/lib/active_support/core_ext/big_decimal/conversions.rb
```

- Bootsnap and Zeitwerk also extend `require`
  - We can't detect that because `caller_locations` is differe

```
.../lib/ruby/3.3.0+0/bundled_gems.rb:90:in `warning?'
.../lib/ruby/3.3.0+0/bundler/rubygems_integration.rb:247:in `block (2 levels) in
replace_require'
.../gems/bootsnap-1.17.0/lib/bootsnap/load_path_cache/core_ext/kernel_require.rb:32:in
`require'"
.../gem/gems/activesupport-7.0.7.2/lib/active_support/core_ext/big_decimal/conversions.rb
```

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Issue with bootsnap and Zeitwerk

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- **Bootsnap expand require path to full path.**

```
require "csv"
```

```
require "/Users/hsbt/.local/share/rbenv/versions/3.3.0-dev/lib/ruby/3.3.0/csv"
```

```
require "syslog"
```

```
require "/Users/hsbt/.local/share/rbenv/versions/3.3.0-dev/lib/ruby/3.3.0/
arm64-darwin23/syslog"
```

- **I and byroot, fxn fixed these issues at ruby master.**
  - **We will backport them to Ruby 3.3.2. Stay tuned** 🙏

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Future of standard libraries at Ruby 3.4 and 3.5

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Migration of the bundled gems

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Transition status of default/bundled gems

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We will reduce Standard Library and extract them to default and bu

	Ruby 2.7	Ruby 3.3	Ruby 3.4	Ruby 3.5
Standard Library	51	18	18	18
Default gems	48	67	55	45(?)
Bundled gems	6	16	28	38(?)

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How extract default gems

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- Drop dependencies across default gems
- We need to consider C extension like bigdecimal.
  - After extracting bigdecimal as bundled gems, you need to compile that in any place.
  - Some of poeple don't have build toolchain in their prod environment...

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Other notable feature of Ruby 3.3 and RubyGems/Bundler

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What are notable features from 2023

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- Changes of Standard libraries
  - readline-ext is retired
  - racc is now bundled gems
- Changes of RubyGems and Bundler
  - Generate checksums
    - You can see them with `CHECKS
      section into your lockfile manua
  - Bugfix🐛

Gemfile.lock

```
rspec-mocks (~> 3.12)
test-unit (~> 3.0)        You, 4 years ago via PR #3141
turbo_tests (~> 2.1)
uri (~> 0.13.0)
webrick (~> 1.6)

CHECKSUMS
diff-tes (1.5.1) sha256=273223dfb40685548436d32b4733aa67
kramdown (2.4.0) sha256=b62e5bcbd6ea20c7a6730ebbb2a10723
kramdown-parser-gfm (1.1.0) sha256=fb39745516427d2988543
mini_portile2 (2.8.5) sha256=7a37db8ae758086c3c3ac3a59c0
mustache (1.1.1) sha256=90891fdd50b53919ca334c8c1031eada
nokogiri (1.16.2) sha256=68922ee5cde27497d995c46f2821957
nokogiri (1.16.2-arm64-darwin) sha256=c957226c8e36b31be6
nokogiri (1.16.2-java) sha256=122652bfc338cd8a54a692ac03
nokogiri (1.16.2-x64-mingw-ucrt) sha256=7344b5072ca69fc5
nokogiri (1.16.2-x86_64-darwin) sha256=5def799e5f139f21a
nokogiri (1.16.2-x86_64-linux) sha256=5b146240ac6ec6c40f
nronn (0.11.1) sha256=60305c7a42dcaf6bdd33210993a7e38087
parallel (1.24.0) sha256=5bf38efb9b37865f8e93d7a762727f8
parallel_tests (3.8.1) sha256=c781c0910be3b489411f24e3a3
power_assert (2.0.3) sha256=cd5e13c267370427c9804ce6a579
racc (1.7.3) sha256=b785ab8a30ec43bce073c51dbbe791fd2700
```

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- `bundle gem` introduced `sig` directory for rbs
- We migrate rbs files to bundled gems from rbs gem

```
class Prime
  include Enumerable
  include Singleton

(snip)

  def each(ubound = nil, generator =
EratosthenesGenerator.new, &block)
    generator.upper_bound = ubound
    generator.each(&block)
  end
```

```
class Prime
  include Singleton

  include Enumerable[Integer]

  extend Enumerable[Integer]
(...)
  def each: (?Integer? ubound, ?
PseudoPrimeGenerator generator) { (Integer) ->
void } -> void
          | (?Integer? ubound, ?
PseudoPrimeGenerator generator) ->
PseudoPrimeGenerator
```

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Cross-compilation Problem

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RubyGems will install C extension into the following directories.

```
RubyGems 3.4 and 3.5
* GEM_HOME/extensions/arm64-darwin-23/3.2.0-static/bigdecimal-3.1.6/bigdecimal.bundle
* GEM_HOME/gems/bigdecimal-3.1.6/lib/bigdecimal.bundle

< RubyGems 3.4
* GEM_HOME/gems/bigdecimal-3.1.6/ext/bigdecimal/bigdecimal.bundle
```

RubyGems added extension and lib directories to require_paths both. This means we can avoid to install C extension to under lib directory.

```
>> Gem.loaded_specs["bigdecimal"].require_paths
=> ["/Users/hsbt/.local/share/gem/extensions/arm64-darwin-23/3.3.0-static/bigdecimal-3.1.6", "lib"]
```

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We considered namespace feature with RubyGems and Bundler

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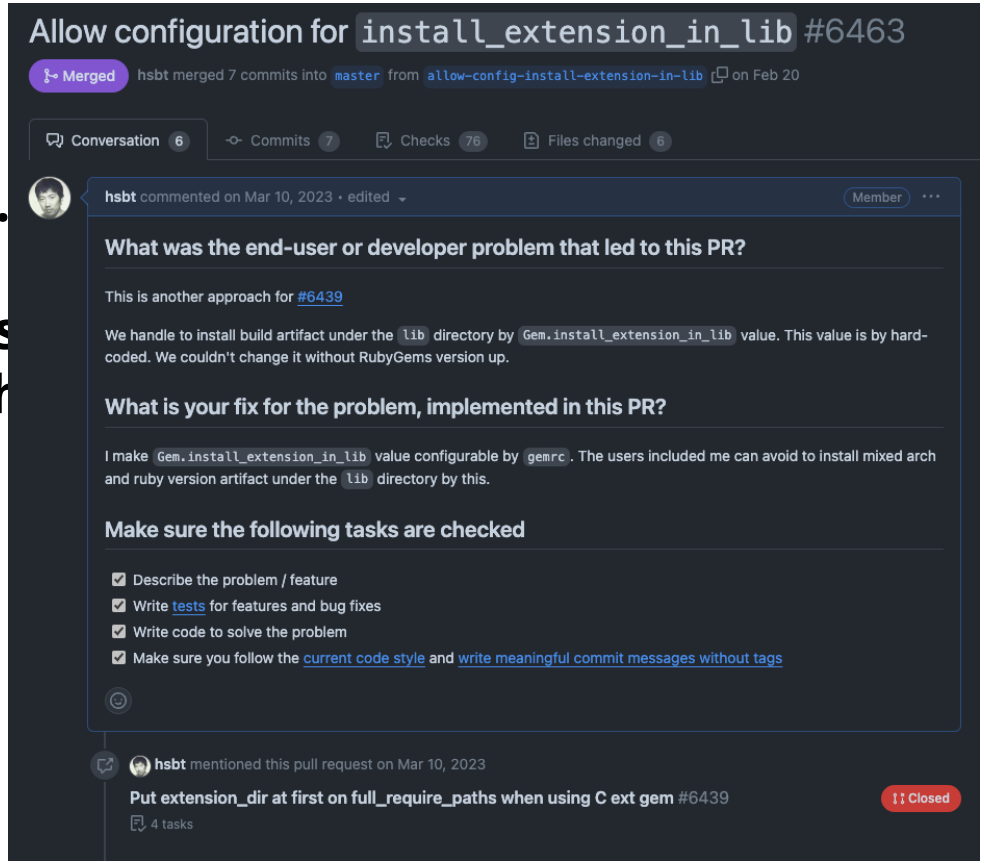
I already make it with opt-in configuration for RubyGems 3.

You can skip to install C extens
Under the `lib` directory like th

```
gem: "--no-document"
:install_extension_in_lib: false
gemsrc_use_ghq: true
```



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Separate vendored libraries with namespace

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Activation issue of default gems

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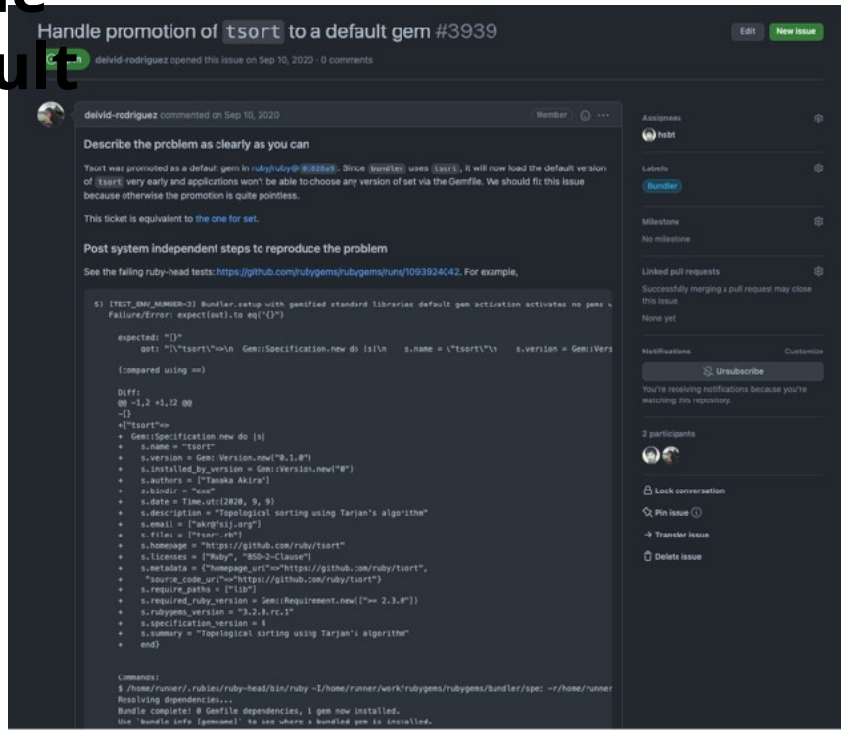
We still have a activation issue with RubyGems and the default gems like `json`.

```
You have already activated timeout 0.3.1, but
your Gemfile requires timeout 0.3.2. Since
timeout is a default gem, you can either remove
your dependency on it or try updating to a
newer version of bundler that supports timeout
as a default gem.
```



How handle this problem?

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How handle activation problem?

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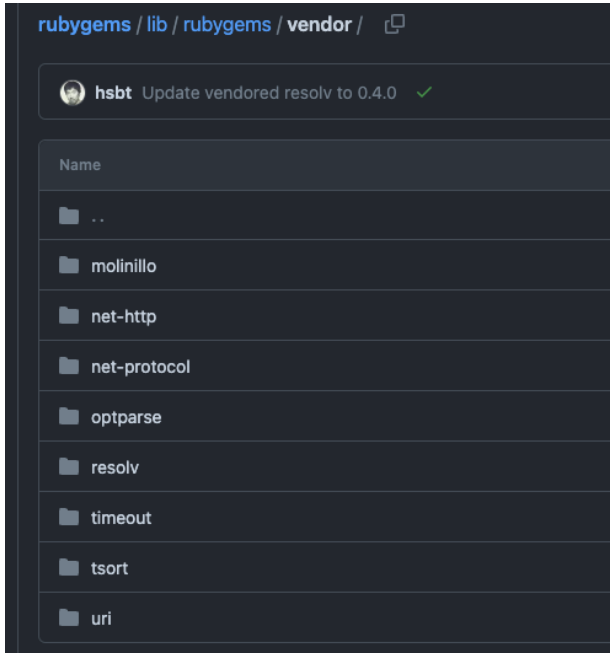
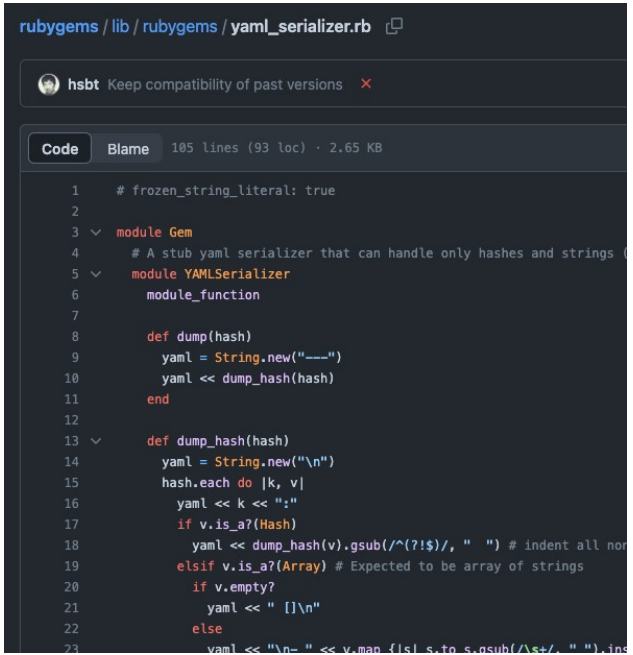
Vendoring approach when RubyGems rewrite default gems written by C uses only pure ruby libraries like URI extension to pure ruby code.





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We considered namespace feature with RubyGems and Bundler

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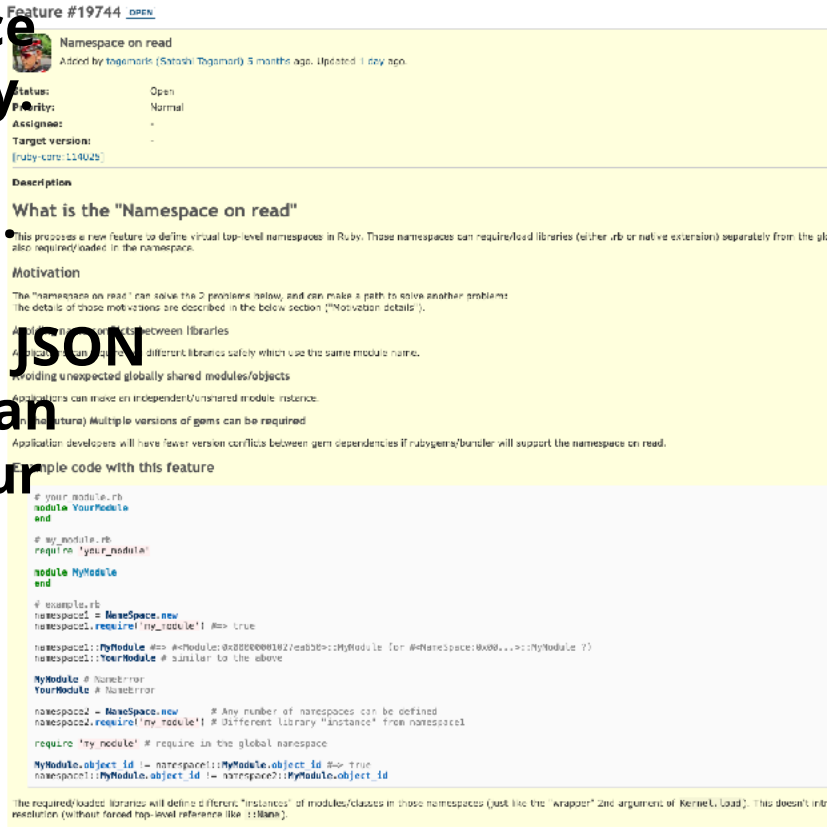
tagomoris-san proposed namespace feature for package system of Ruby.

It may help our activation problem.

Ex. RubyGems and Bundler will use JSON under only their namespace. You can activate any version of JSON on your application.



Feature #19744 OPEN

Namespace on read

Added by tagomoris (Satoshi Tagomori) 5 months ago. Updated 1 day ago.

Status: Open
Priority: Normal
Assignee:
Target version:
[ruby-core: 114025]

Description

What is the "Namespace on read"

This proposes a new feature to define virtual top-level namespaces in Ruby. Those namespaces can require/load libraries (either .rb or native extension) separately from the gl
also required/loaded in the namespace.

Motivation

The "namespace on read" can solve the 3 problems below, and can make a path to solve another problems.
The details of those motivations are described in the below section ("Motivation details").

Avoiding conflicts between libraries

Applications can require different libraries safely which use the same module name.

Avoiding unexpected globally shared modules/objects

Applications can make an independent/unshared module instance.

(In the future) Multiple versions of gems can be required

Application developers will have fewer version conflicts between gem dependencies if rubygems/bundler will support the namespace on read.

Example code with this feature

```
# your_module.rb
module YourModule
end

# my_module.rb
require 'your_module'

module MyModule
end

# example.rb
namespace1 = NameSpace.new
namespace1.require('my_module') #=> true

namespace1::MyModule #=> #<Module:0x00000001027eab58>::MyModule (or #<Namespace:0x00...>::MyModule ?)
namespace1::YourModule # similar to the above

MyModule # NameError
YourModule # NameError

namespace2 = NameSpace.new      # Any number of namespaces can be defined
namespace2.require('my_module') # Different library "instance" from namespace1

require 'my_module' # require in the global namespace

MyModule.object_id != namespace1::MyModule.object_id #=> true
namespace1::MyModule.object_id != namespace2::MyModule.object_id
```

The required/loaded libraries will define different "instances" of modules/classes in those namespaces (just like the "wrapper" 2nd argument of Kernel.load). This doesn't infl
resolution (without forced top-level reference like ::Name).

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Wrap up

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Conclusion

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- I talked about...
  - History of Libraries, RubyGems, Bundler and their featu
  - How handle default gems and bundled gems in Ruby 3.3
  - What happens Ruby 3.4 and 3.5

< Ruby is a programmer's best friend

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