Prism

Ruby World 2023

Kevin Newton

What is prism?

Overview

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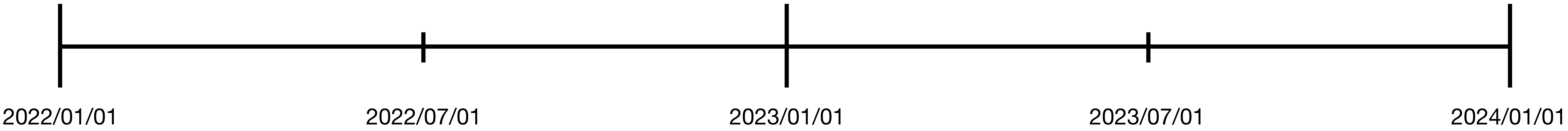
- Error tolerance - must be able to recover from errors and continue parsing
- Portability - must be able to be run from any ruby platform
- Performance - must be as fast and memory efficient as possible

Timeline



2022/01/01

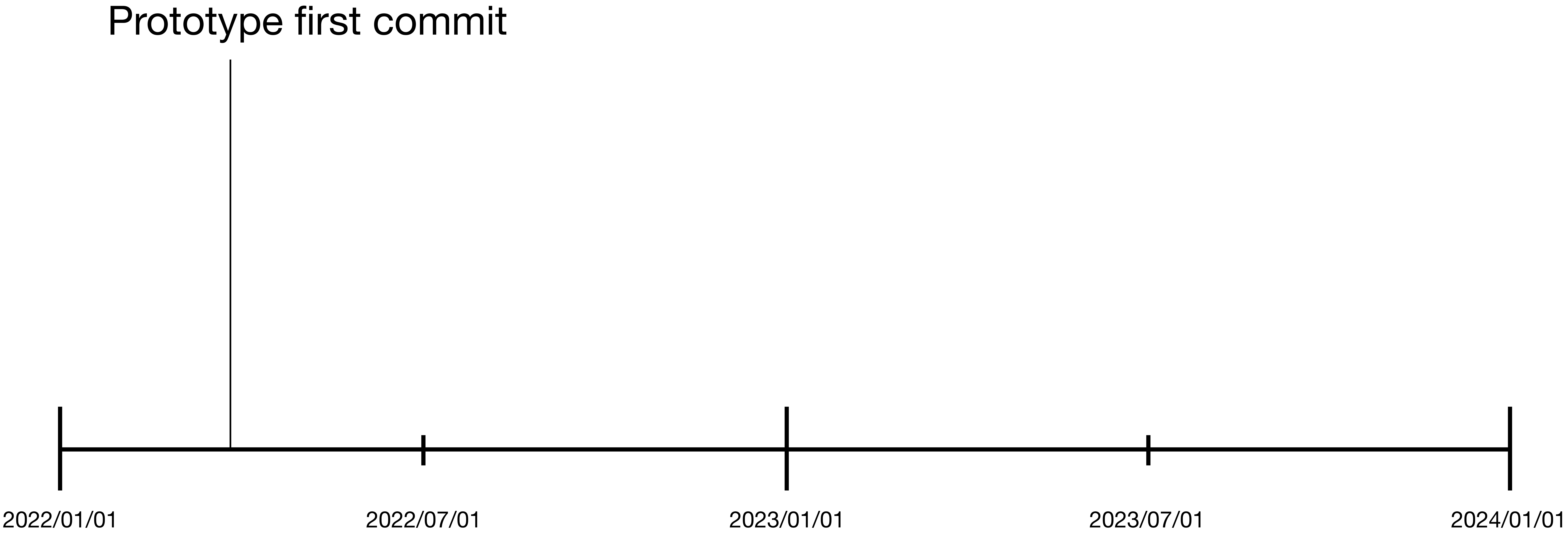
2022/07/01

2023/01/01

2023/07/01

2024/01/01

Timeline



Prototype first commit

2022/01/01

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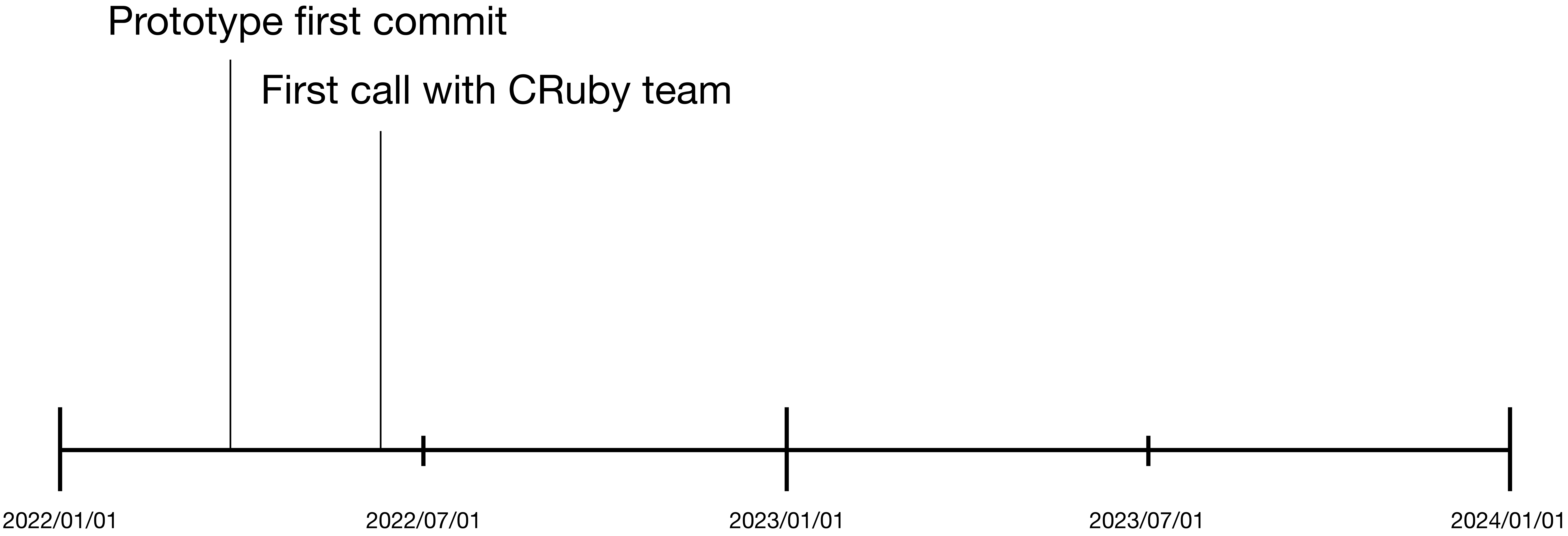

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First call with CRuby team

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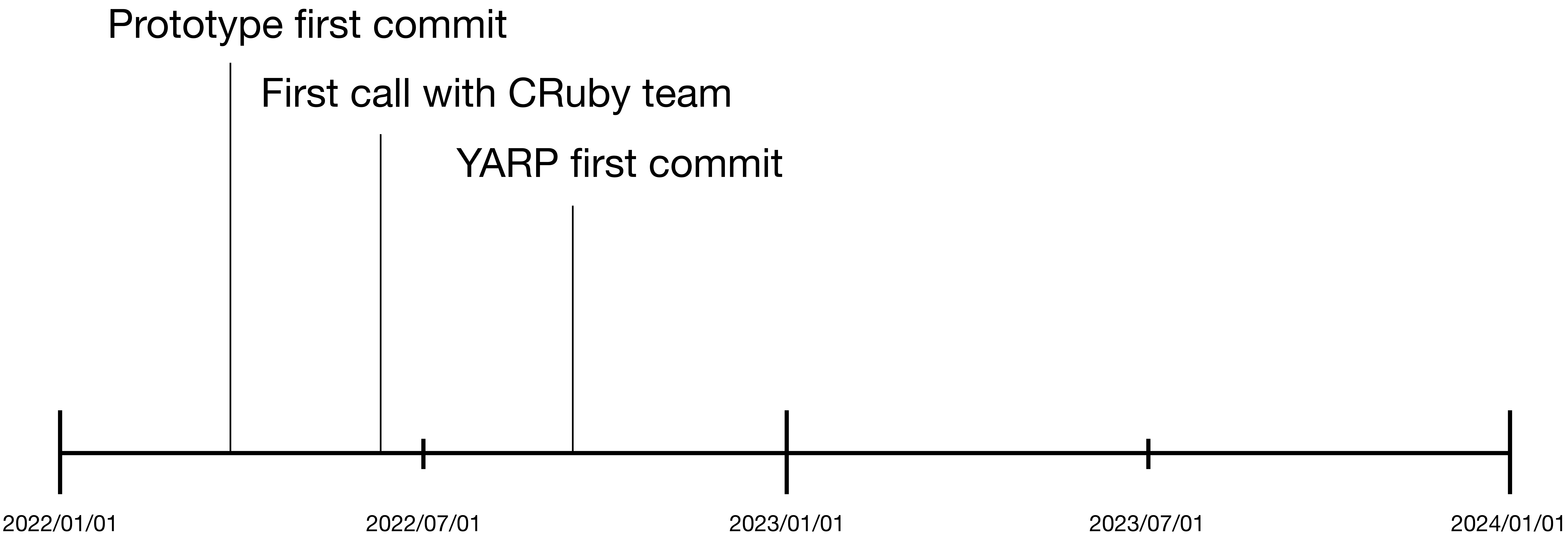

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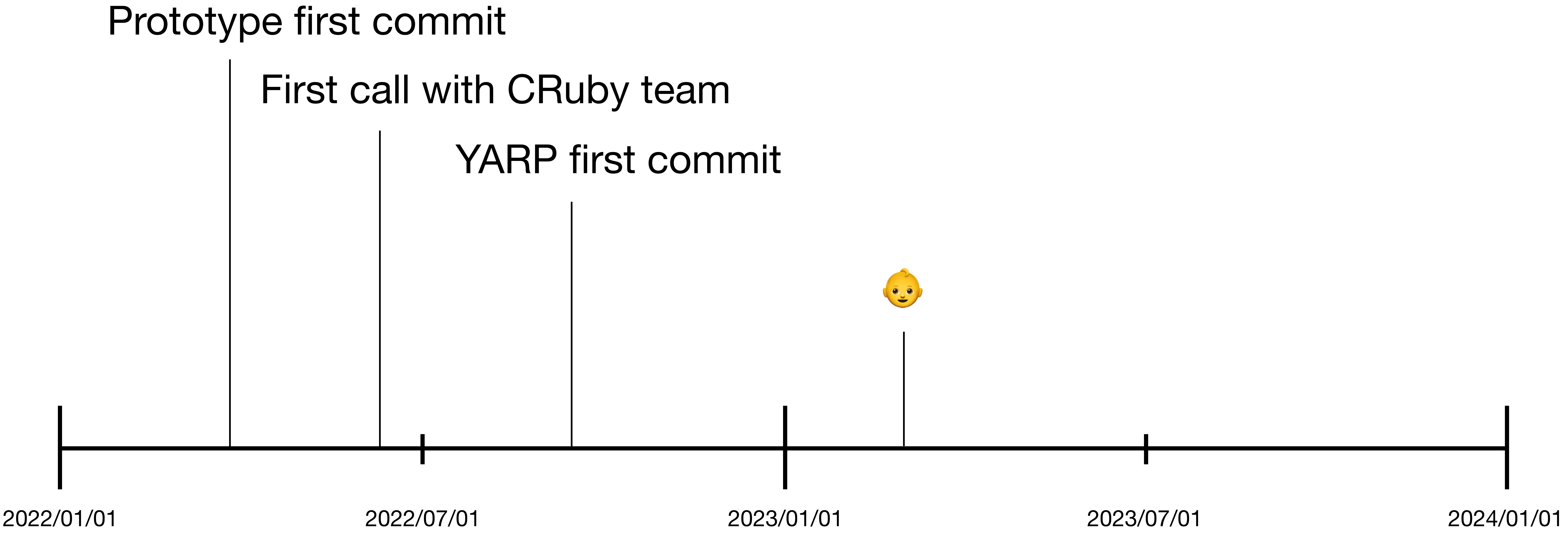

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👶

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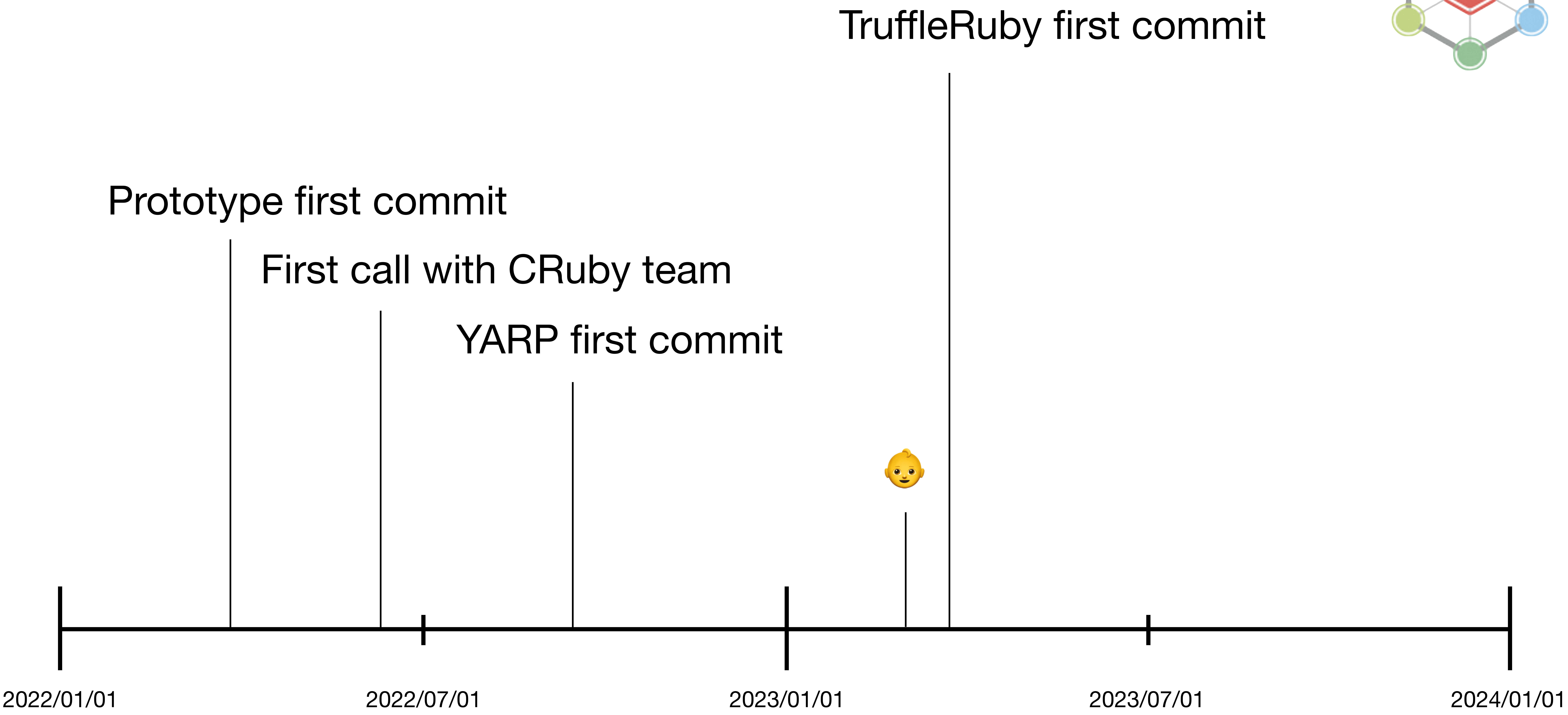

TruffleRuby first commit

Prototype first commit

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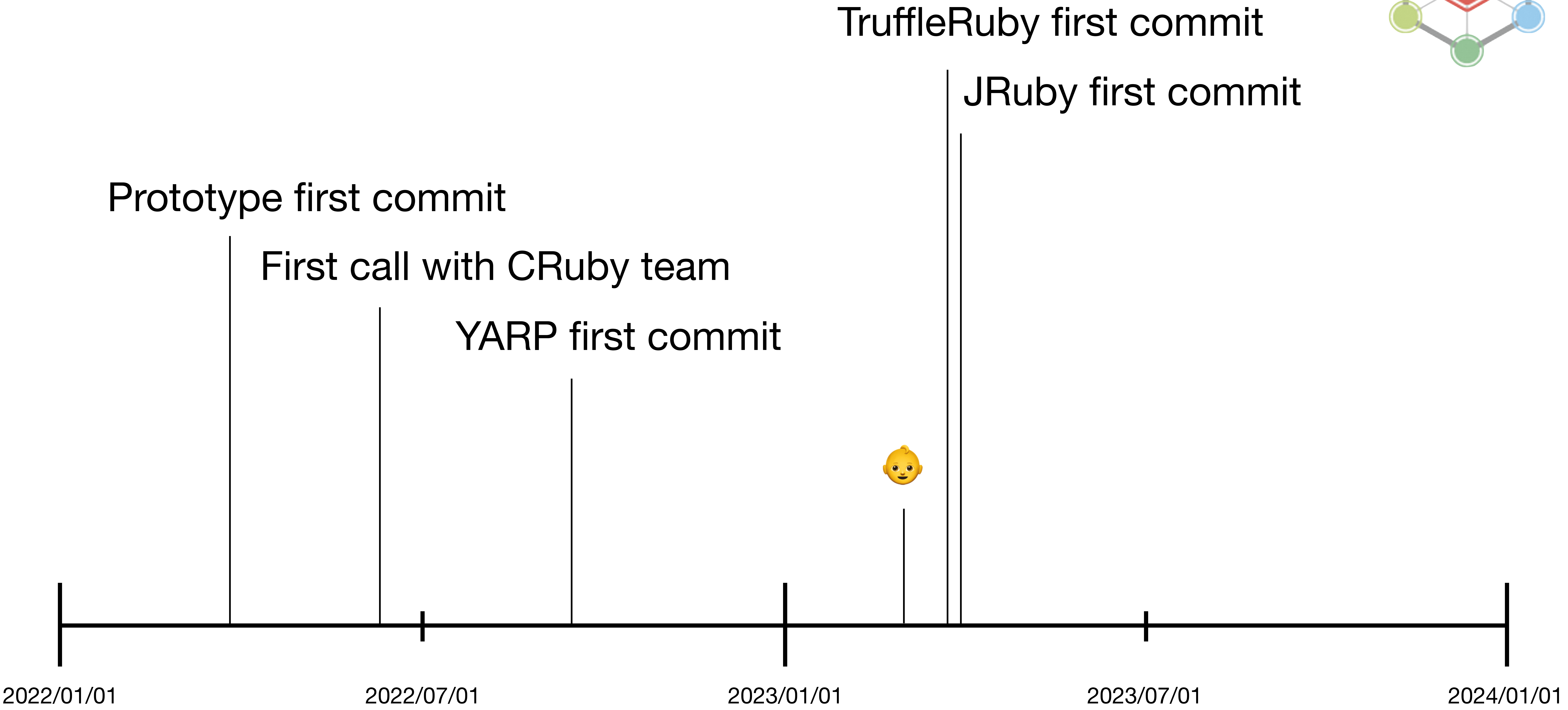

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JRuby first commit

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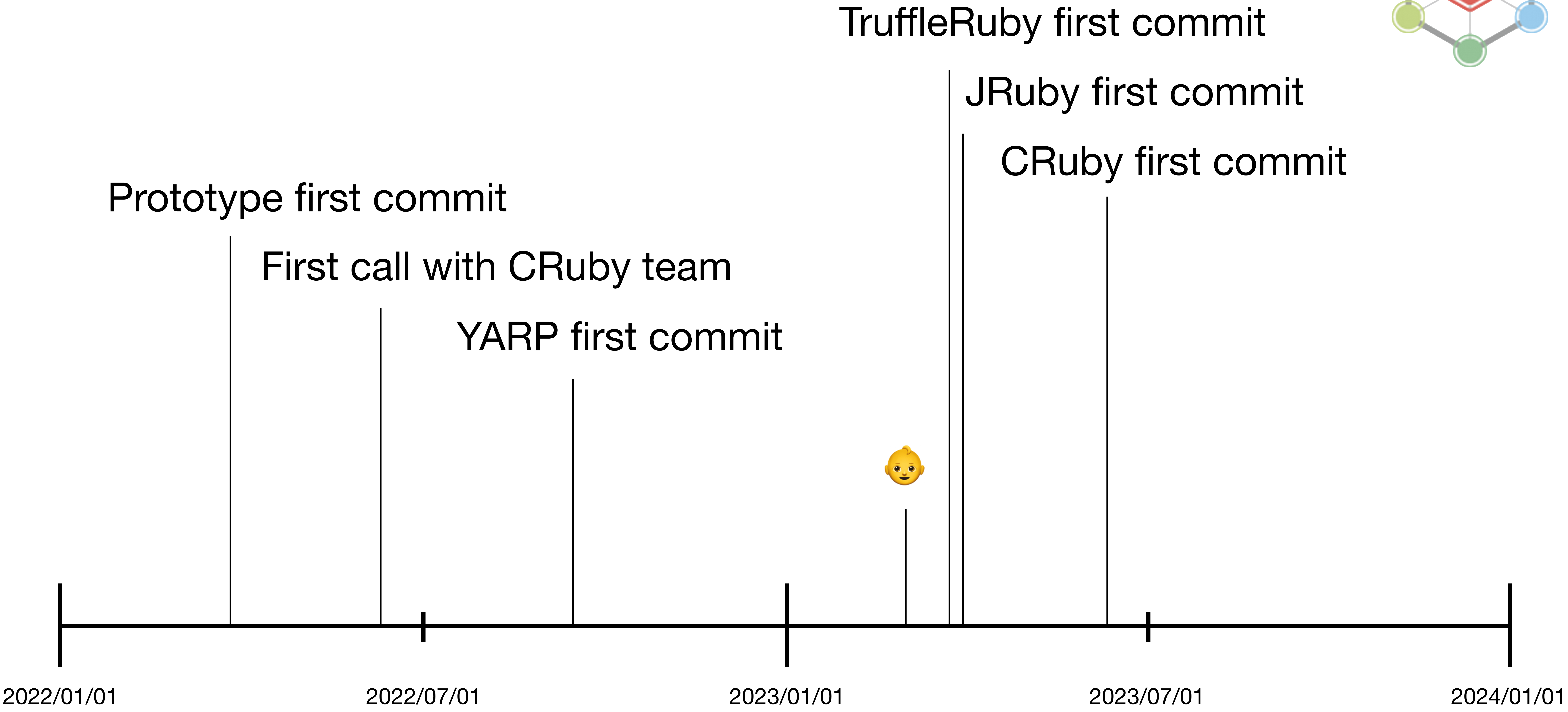

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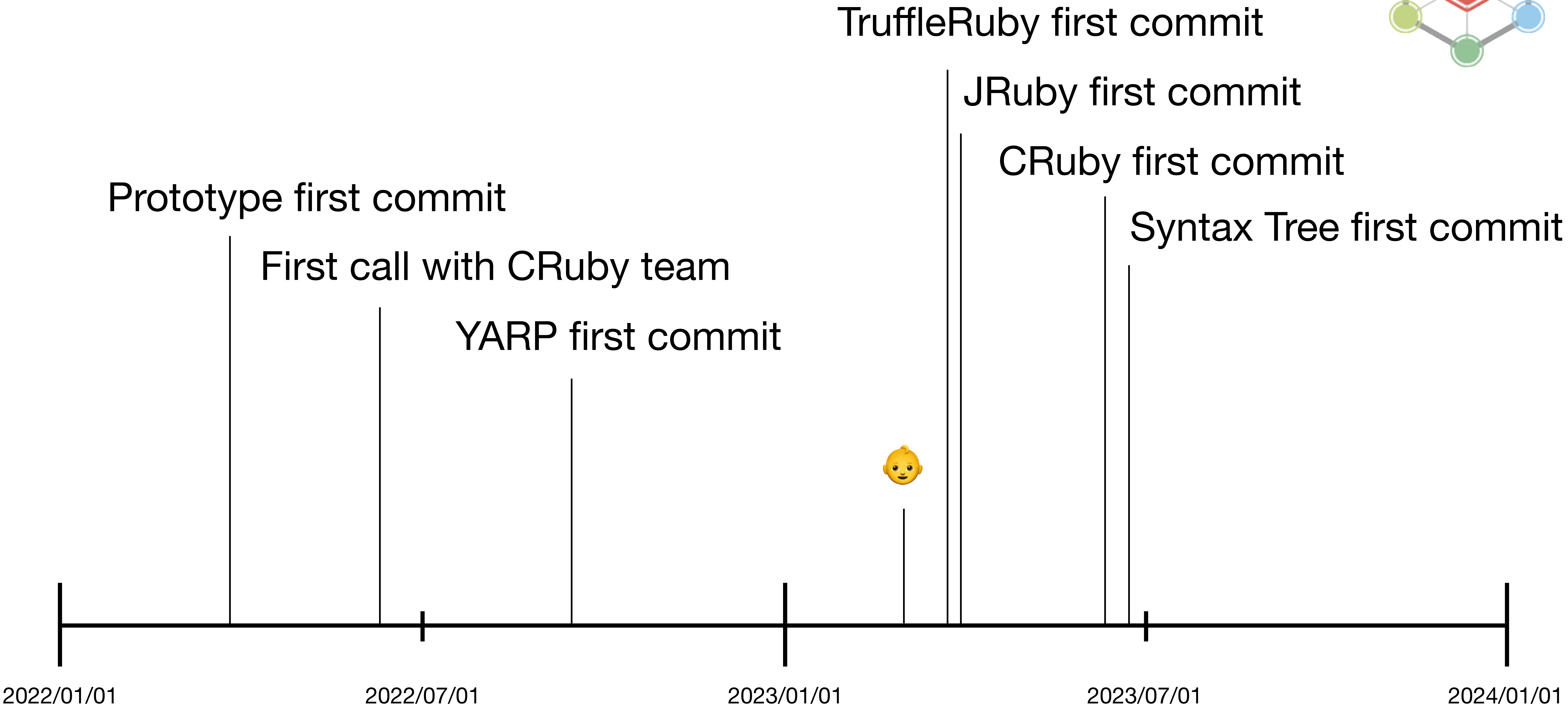

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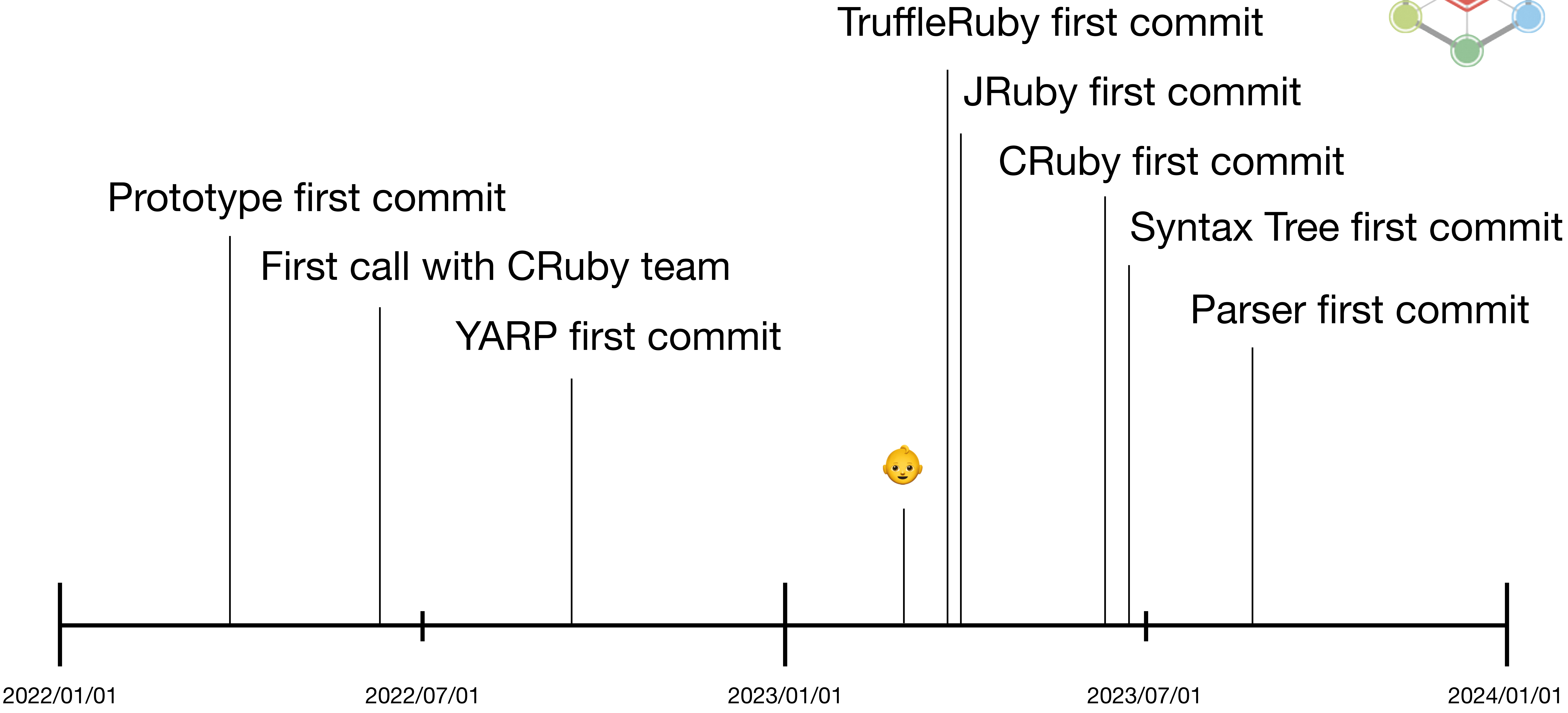

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Syntax Tree first commit

Parser first commit

Rename to prism

2022/01/01

2022/07/01

2023/01/01

2023/07/01

2024/01/01

How was it built?

Design

Design

Approach

Design

Approach

- Comparative analysis with existing trees

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- Comparative analysis with existing trees
- "Semantic" versus "syntactic" trees

Design

Approach

- Comparative analysis with existing trees
- "Semantic" versus "syntactic" trees
- Provide for all consumers

Design

Implementations

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- Make compilation as simple as possible

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- Never have to check child to compile current node

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Implementations

- Make compilation as simple as possible
- Never have to check child to compile current node
- Cover as much common functionality as possible

Design

Tooling

Design

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- Named fields and known types

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Tooling

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- Nodes with enough information to round-trip

Design

Tooling

- Named fields and known types
- Nodes with enough information to round-trip
- Location information for as much as possible

Design

Maintenance

Design

Maintenance

- Template as much as possible

Design

Maintenance

- Template as much as possible
- Provide as much documentation as possible

Design

Maintenance

- Template as much as possible
- Provide as much documentation as possible
- Build up as big of a test suite as possible

Challenges

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- Escaping - required to properly find string-like terminators

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- Regular expressions - required because of named capture groups
- Encoding support - required to properly find string-like terminators
- Heredocs - very complicated semantics, can be almost anywhere in source

Testing

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- Lexer testing - testing against ripper lex

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- Snapshot testing - protect from regressions, check parser structure

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- Brute-force testing - all escape sequences in all contexts
- Fuzzing - random input, check for crashes
- Grammar-based fuzzing - random input, check for crashes and parse errors

Integrations

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- C - CRuby, Sorbet, Artichoke, Natalie, C/C++/Rust/Zig tooling

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- Ruby - Natalie, tooling

Integrations

- C - CRuby, Sorbet, Artichoke, Natalie, C/C++/Rust/Zig tooling
- Ruby - Natalie, tooling
- Serialization - JRuby, TruffleRuby, JavaScript tooling

Why build this?

Fractured ecosystem

Ruby parsers

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- ruby/ruby/parse.y

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- typedruby/typedruby, sorbet/sorbet

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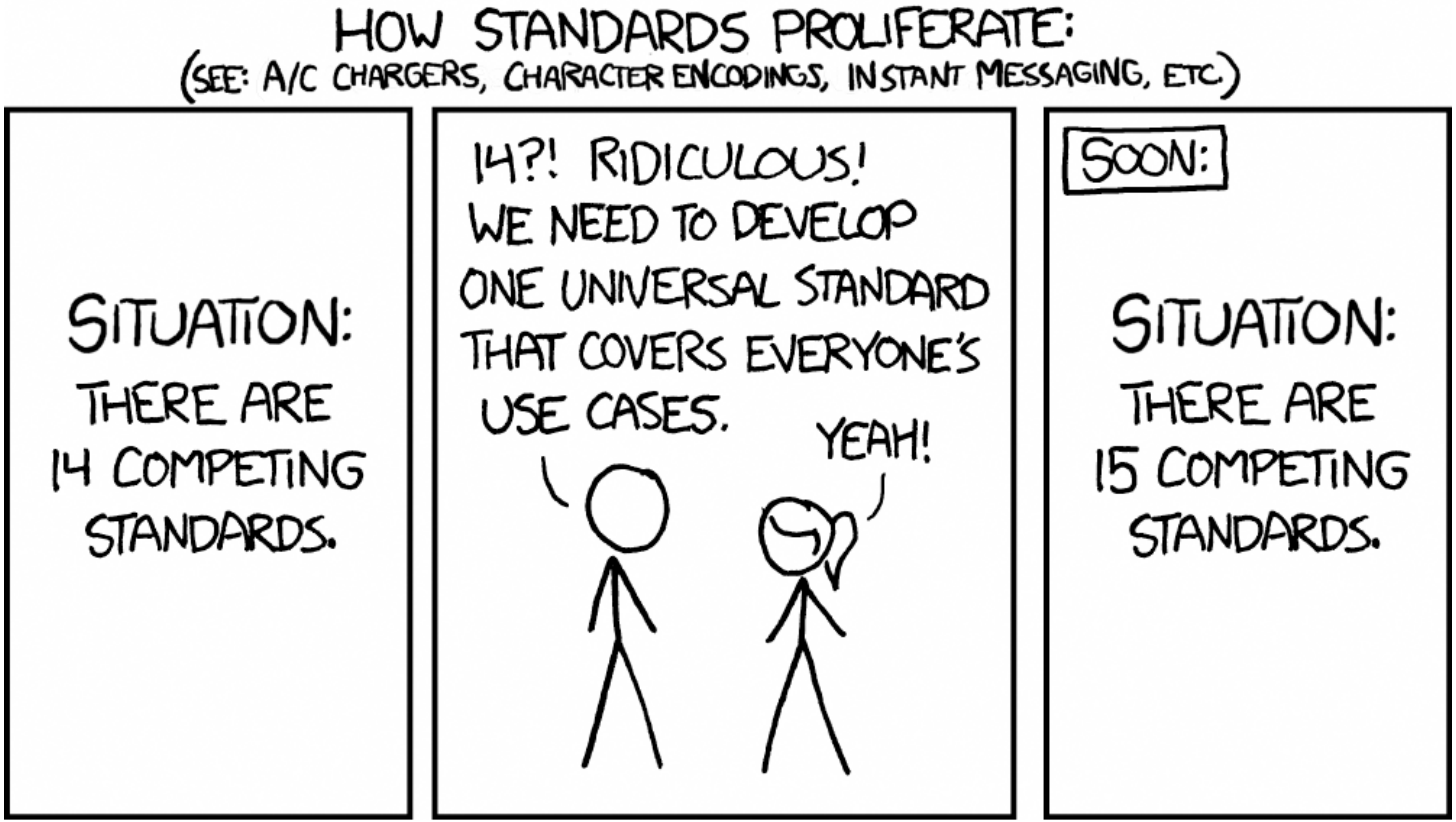
HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)
SITUATION: THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION: THERE ARE 15 COMPETING STANDARDS.

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ecosystem

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- None of this knowledge translates to contributing to CRuby

Maintenance burden

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- Very minor changes have very major consequences

Maintenance burden

- Every parser has to update every time new syntax is introduced
- Very minor changes have very major consequences
- Helping Ruby can inadvertently hurt Ruby tooling

What is the future of prism?

The future of prism

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- Improved error tolerance and messaging

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Thank you!