

Liquidshop 4

A look back & forth

Romain Beauxis, May 26, 2024

Le Programme

Le Programme

- General Updates

Le Programme

- General Updates
- What happened since liquidshop 3?

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- Remaining liquidsoap 2.3.x roadmap

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- General Updates
- What happened since liquidshop 3?
- Remaining liquidsoap 2.3.x roadmap
- Questions?

From the archive: Liquidsoap 2.3.x roadmap

- Update the liquidsoap book
- Rewrite the streaming loop
- Rewrite the clock implementation
- Take advantage of OCaml 5 concurrency
- Proper module support
- Address standard library performance issues
- Add developer tooling: linter/prettier, syntax highlighting, etc.

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Developer Tooling

Developer Tooling

- Prettier: formatting

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- Prettier: formatting
- Tree-sitter/code-mirror: syntax highlighting

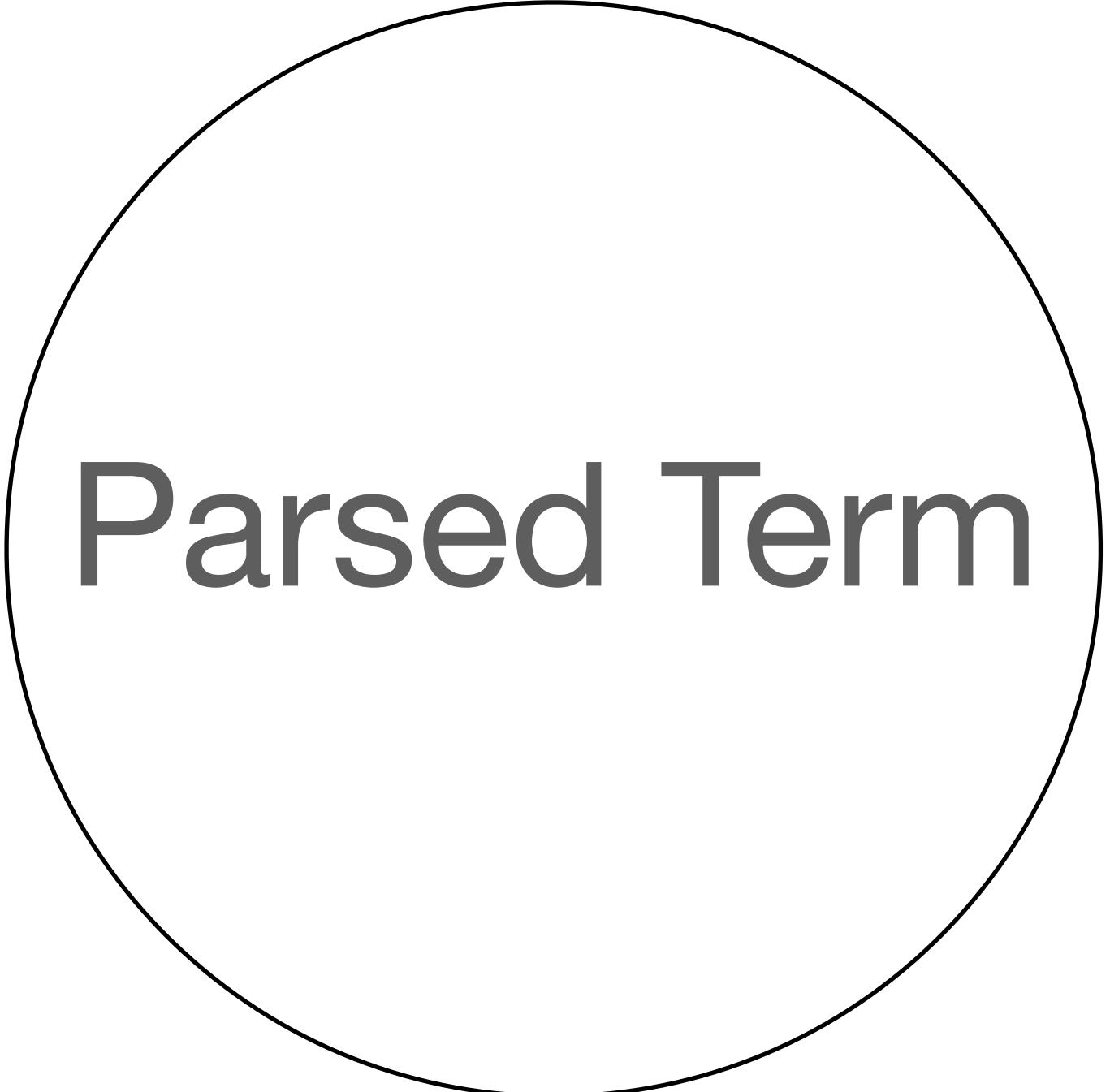
Developer Tooling

- Prettier: formatting
- Tree-sitter/code-mirror: syntax highlighting
- VSCode: syntax highlighting/formatting

Developer Tooling

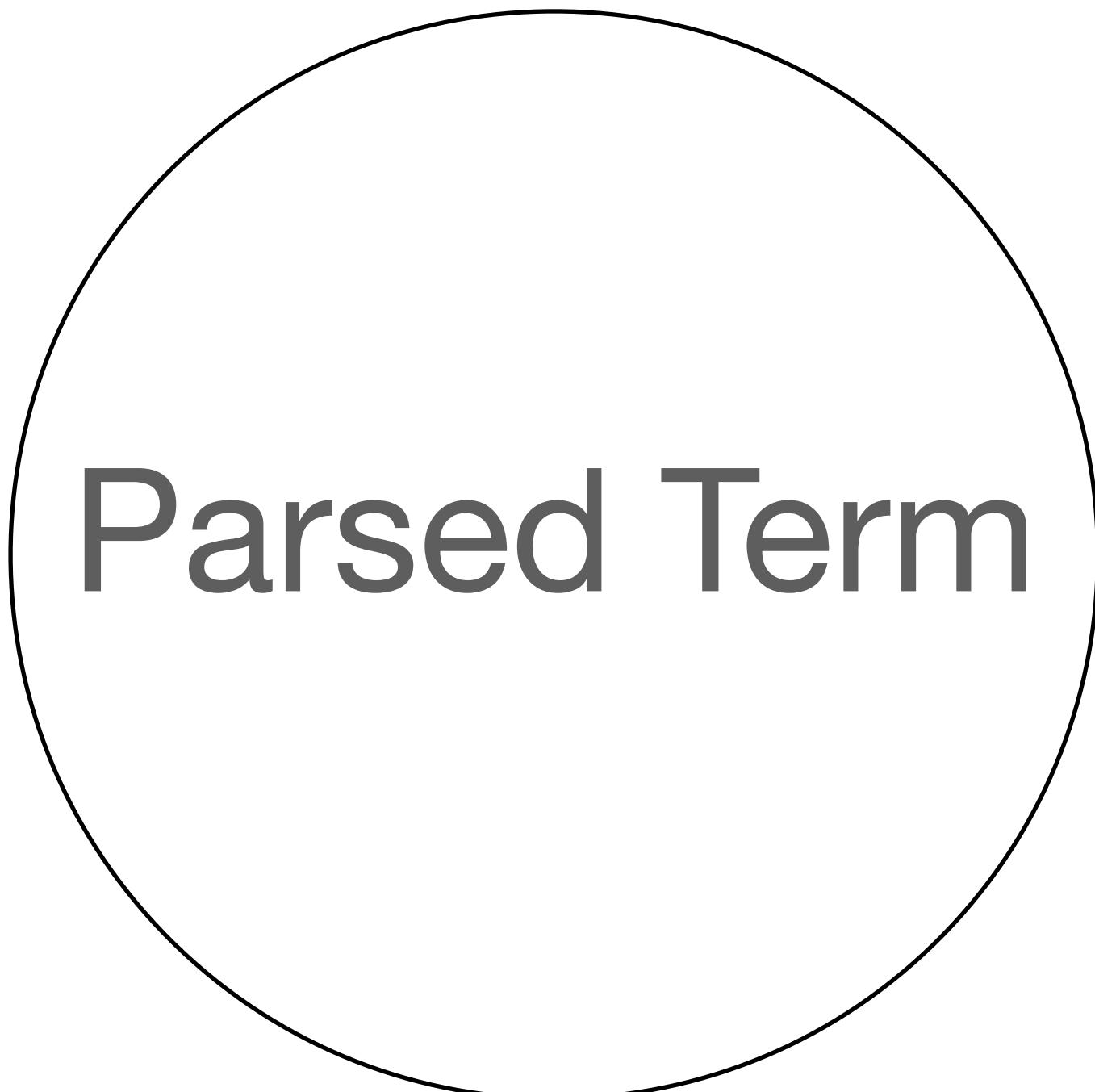
- Prettier: formatting
- Tree-sitter/code-mirror: syntax highlighting
- VSCode: syntax highlighting/formatting
- Github: syntax highlighting/code identification

Prettier



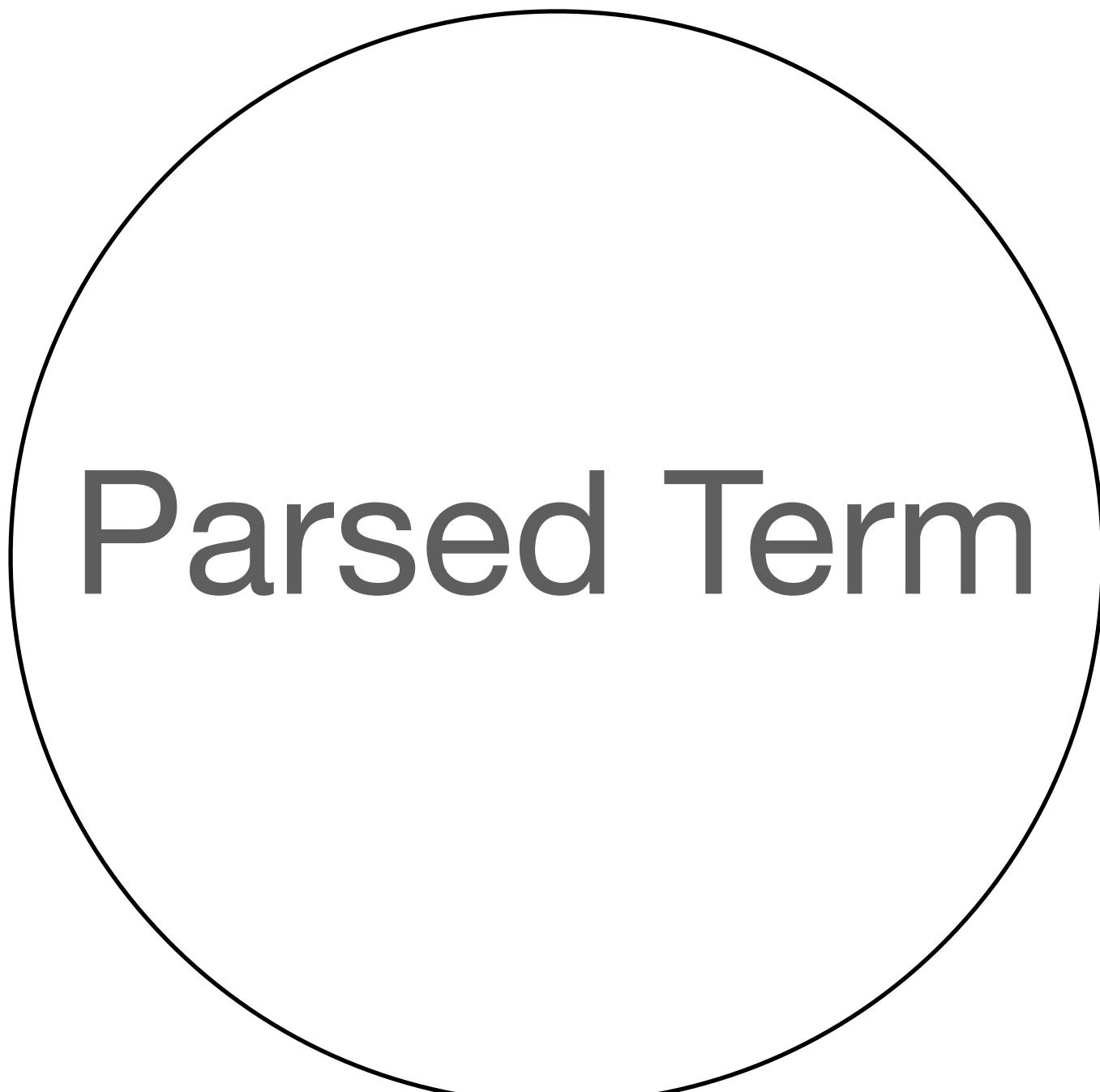
Parsed Term

Prettier



```
list.add(x, 1)
```

Prettier



```
list.add(x, l)
```

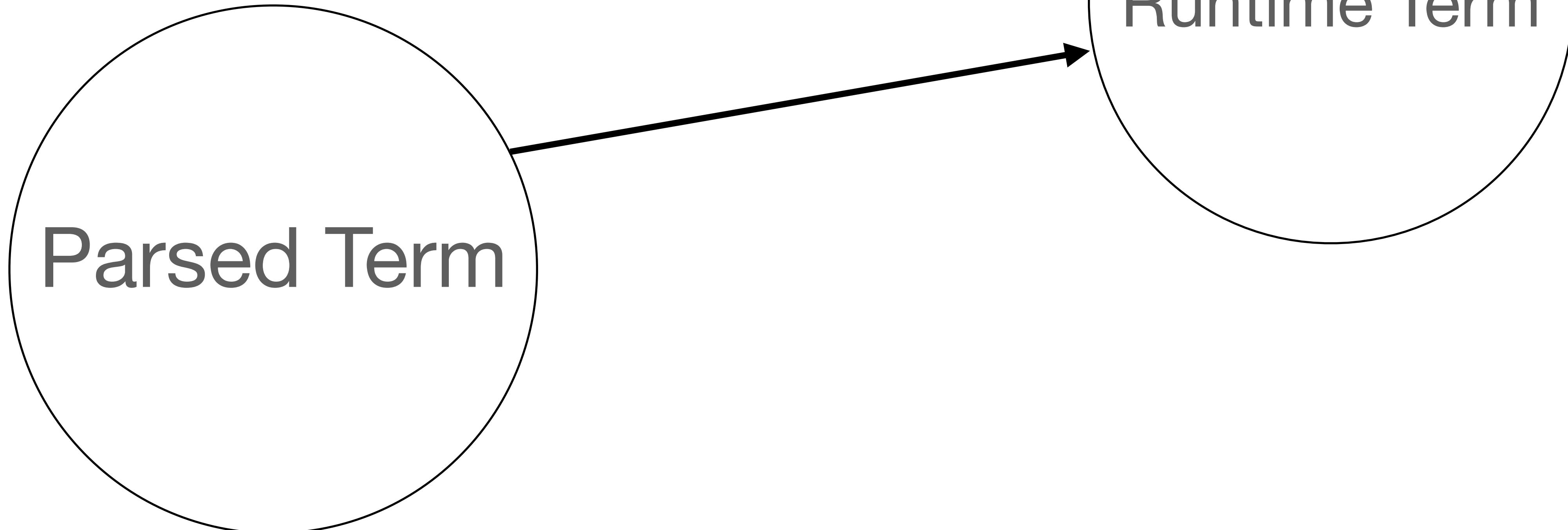
```
`App
(`Invoke {
  invoked = `Var "list";
  meth = "add"
},
[("", `Var "x"); ("", `Var "l")] )
```

Prettier

Parsed Term

```
(* These terms are reduced at runtime *)
and parsed_ast =
  [ `If of _if
  | `Inline_if of _if
  | `If_def of if_def
  | `If_version of if_version
  | `If_encoder of if_encoder
  | `While of _while
  | `For of _for
  | `Iterable_for of iterable_for
  | `List of list_el list
  | `Try of _try
  | `Regexp of string * char list
  | `Time_interval of time_el * time_el
  | `Time of time_el
  | `Def of _let * t
  | `Let of _let * t
  | `Binding of let+ * +
```

Prettier



Prettier

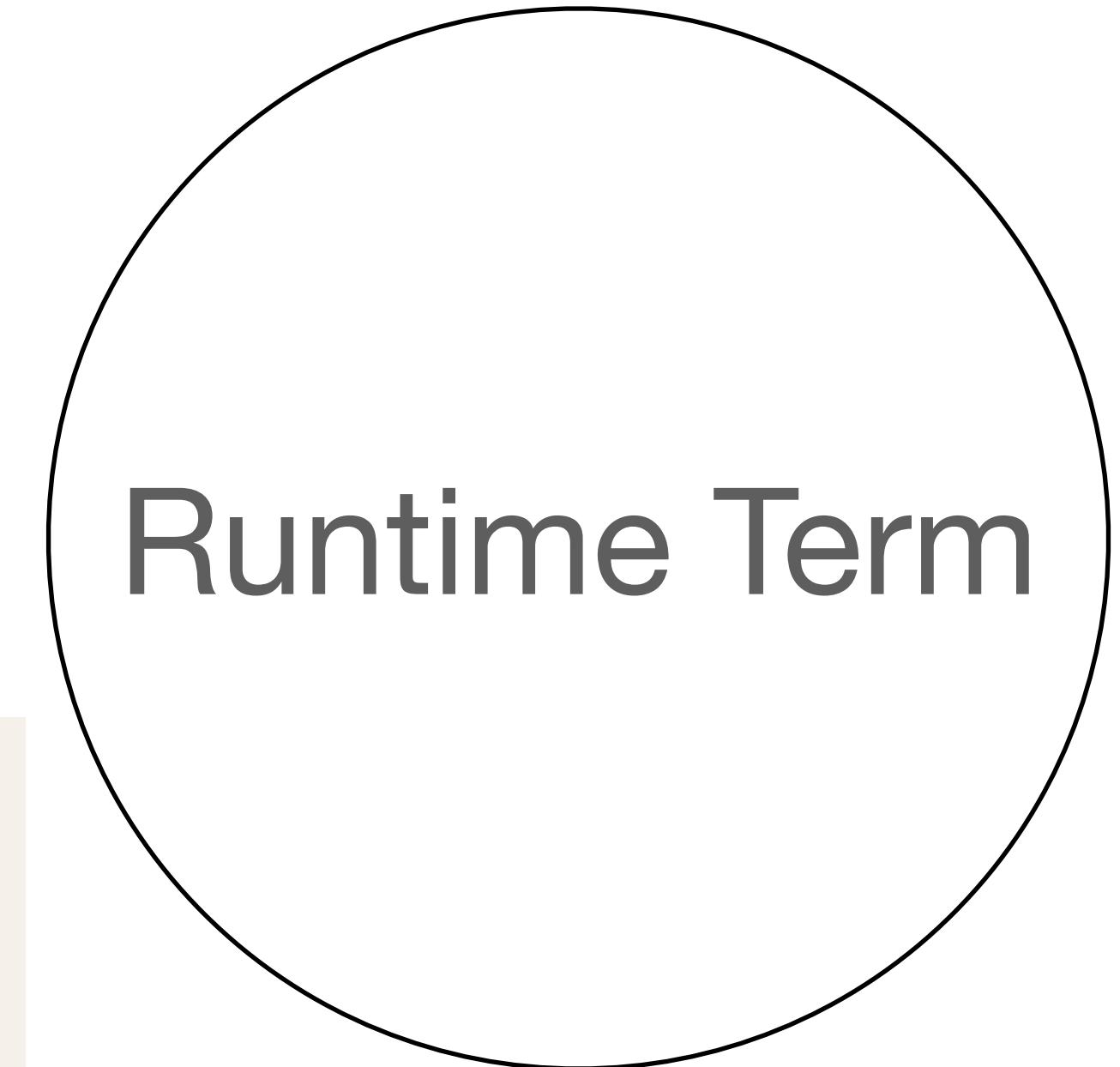
```
type 'a common_ast =
  [ `Custom of custom_term
  | `Tuple of 'a list
  | `Null
  | `Open of 'a * 'a
  | `Var of string
  | `Seq of 'a * 'a ]
[@@deriving hash]
```

Runtime Term

```
type 'a runtime_ast =
  [ `Int of int
  | `Float of float
  | `String of string
  | `Bool of bool
  | `Let of 'a let_t
  | `List of 'a list
  | `Cast of 'a * Type.t
  | `App of 'a * (string * 'a) list
  | `Invoke of 'a invoke
  | `Encoder of 'a encoder
  | `Fun of ('a, Type.t) func ]
```

Prettier

```
| `String_interpolation (sep, l) ->
let l =
  List.map
    (function
      | `String s -> `Term (mk_parsed ~pos (`String (sep, s)))
      | `Term tm ->
        `Term
          (mk_parsed ~pos
            (`App (mk_parsed ~pos (`Var "string"), [`Term ("", tm)]))))
l
in
let op =
  mk_parsed ~pos
    (`Invoke
      {
        invoked = mk_parsed ~pos (`Var "string");
        meth = `String "concat";
        optional = false;
      })
in
to_ast ~env ~pos (`App (op, [`Term ("", mk_parsed ~pos (`List l))]))
```



Prettier

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let l =
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      | `String s -> `Term (mk_parsed ~pos (`String (sep, s)))
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```

Runtime Term

```
"#{mpcdec} #{process.quote(f)} -"
```

Prettier

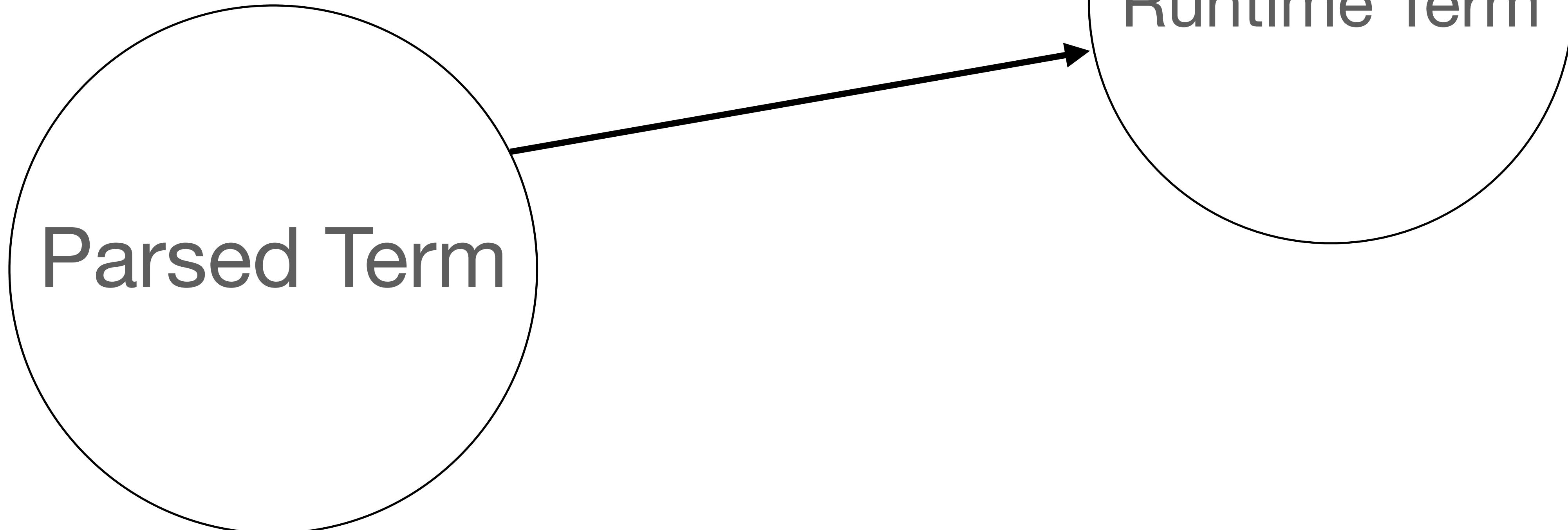
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Runtime Term

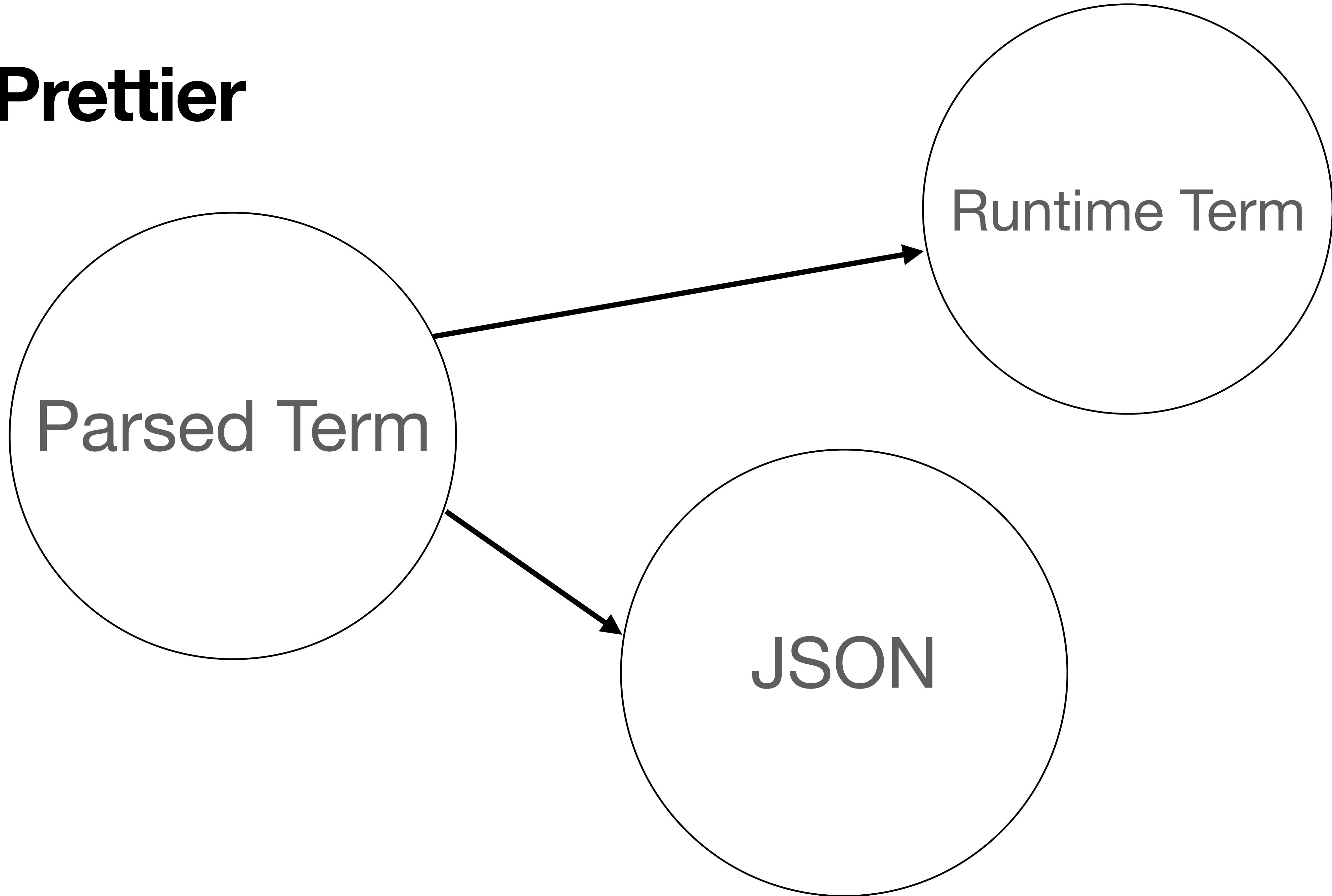
```
"#{mpcdec} #{process.quote(f)} -"
```

```
string.concat(
  [
    string(mpcdec),
    " ",
    string(process.quote(f)),
    "- "
  ]
)
```

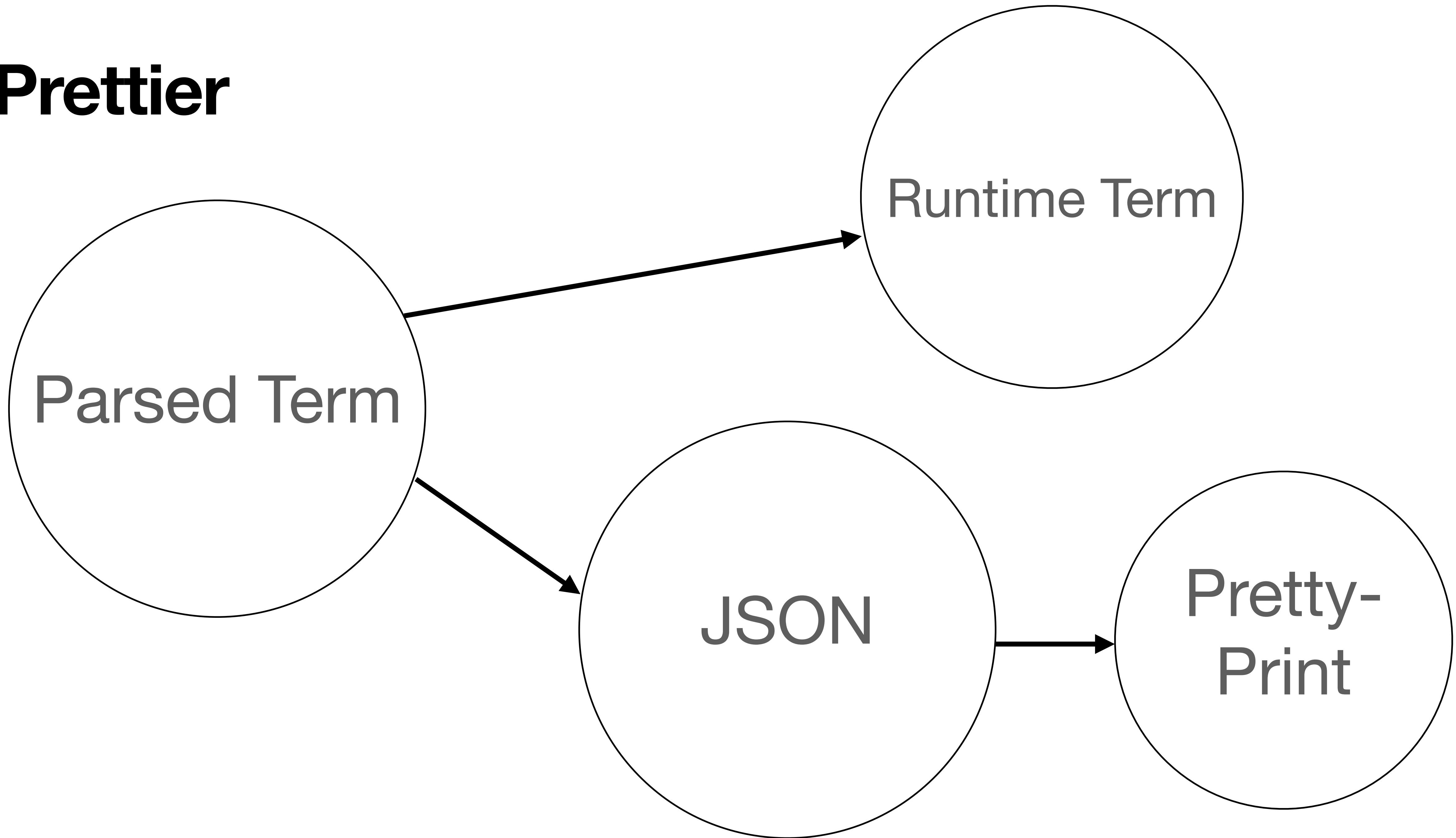
Prettier



Prettier



Prettier



Prettier

liquidsoap-prettier

1.5.3 • Public • Published 7 days ago

Readme

Code

Beta

4 Dependencies

0 Dependents

10 Versions

Settings

Liquidsoap prettier

This package provides a **Prettier** plugin for liquidsoap code as well as a `liquidsoap-prettier` binary for formatting liquidsoap scripts.

Installation

liquidsoap-prettier

The `liquidsoap-prettier` command-line utility should be installed with this package and should be available following the usual node package binary conventions.

It works as follows:

```
$ liquidsoap-prettier [-w|--write] path/to/file.liq "path/with/glob/pattern"
```

Prettier plugin

The package also provides a prettier plugin which can be used to add liquidsoap script parsing to your project. To enable, you need a local `package.json`.

Install

```
> npm i liquidsoap-prettier
```



Weekly Downloads

97



Version

1.5.3

License

ISC

Unpacked Size

20 MB

Total Files

12

Last publish

7 days ago

Collaborators



Prettier

[formatter.nvim](#) / [lua](#) / [formatter](#) / [filetypes](#) / [liquidsoap.lua](#) 



toots Add formatter for liquidsoap script. ([#296](#))

Code

Blame

11 lines (9 loc) · 151 Bytes

```
1 local M = {}
2
3 ▼ function M.liquidsoap_prettier()
4     return {
5         exe = "liquidsoap-prettier",
6         args = {"--write"},
7         stdin = false
8     }
9 end
10
11 return M
```

Prettier

formatter.nvim / lua / formatter / filetypes / **liquidsoap.lua**



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Blame

11 lines (9 loc) · 151 Bytes

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1 local M = {}
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5     return {
6         exe = "liquidsoap-prettier",
7         args = {"--write"},
8         stdin = false
9     }
10
11 return M
```

Add support for your favorite editor!

Tree-sitter



[GitHub repository](#) ↗

[Introduction](#)

[Language Bindings](#)

[Parsers](#)

[Talks on Tree-sitter](#)

[Underlying Research](#)

[Using Parsers](#)

Introduction

Tree-sitter is a parser generator tool and an incremental parsing library. It can build a concrete syntax tree for a source file and efficiently update the syntax tree as the source file is edited. Tree-sitter aims to be:

- **General** enough to parse any programming language
- **Fast** enough to parse on every keystroke in a text editor
- **Robust** enough to provide useful results even in the presence of syntax errors
- **Dependency-free** so that the runtime library (which is written in pure [C](#) ↗) can be embedded in any application

Language Bindings

There are currently bindings that allow Tree-sitter to be used from the following languages:

- [C#](#) ↗
- [Go](#) ↗
- [Guile](#) ↗

Tree-sitter

```
_expr: $ =>
  choice(
    $.include,
    $.if_def,
    $.if_encoder,
    $.if_version,
    $.coerce,
    $.parens,
    $.integer,
    $.not,
    $.bool,
    $.float,
    $.minus,
    $.string,
    $.var,
```

Tree-sitter

```
_expr: $ =>
  choice(
    $.include,
    $.if_def,
    $.if_encoder,
    $.if_version,
    $.coerce,
    $.parens,
    $.integer,
    $.not,
    $.bool,
    $.float,
    $.minus,
    $.string,
    $.var,
```

```
if_def: $ =>
  seq(
    choice("%ifdef", "%ifndef"),
    choice($.var, $.subfield),
    $_exprs,
    optional(seq("%else", $_exprs)),
    "%endif",
  ),
  if_encoder: $ =>
  seq(
    choice("%ifencoder", "%ifnencoder"),
    $.encoder,
    $_exprs,
    optional(seq("%else", $_exprs)),
    "%endif",
  ),
```

Tree-sitter

```
(source_file ; [0, 0] - [75, 0]
  (if_def ; [0, 0] - [14, 6]
    (var) ; [0, 7] - [0, 18]
    (comment) ; [1, 0] - [3, 18]
  (def ; [4, 0] - [13, 3]
    defined: (subfield ; [4, 4] - [4, 19]
      (var) ; [4, 4] - [4, 15]
      (method)) ; [4, 16] - [4, 19]
    arguments: (arglist ; [4, 19] - [4, 35]
      (labeled_argument ; [4, 20] - [4, 31]
        label: (var) ; [4, 21] - [4, 28]
        (string)) ; [4, 29] - [4, 31]
      (anonymous_argument ; [4, 33] - [4, 34]
        (var))) ; [4, 33] - [4, 34]
    (definition ; [5, 2] - [12, 5]
      (binding ; [5, 2] - [5, 21]
        defined: (var) ; [5, 2] - [5, 6]
        (definition ; [5, 8] - [5, 21]
          (app ; [5, 8] - [5, 21]
            name: (var)))) ; [5, 8] - [5, 19]
      (if ; [6, 2] - [12, 5]
        (if_condition ; [7, 4] - [7, 30]
          (not ; [7, 4] - [7, 30]
            (invoke ; [7, 8] - [7, 30]
              (invoke ; [7, 8] - [7, 18]
                (var) ; [7, 8] - [7, 12]
                (method)) ; [7, 13] - [7, 18]
```

Syntax tree for src/libs/utils.liq

:InspectTree

```
%ifdef environment
# Get the value of an environment variable.
# Returns `default` if the variable is not set.
# @category System
def environment.get(~default="", s) =
  env = environment()
  if
    not list.assoc.mem(s, env)
  then
    default
  else
    list.assoc(default=default, s, env)
  end
end
%endif

# Split the arguments of an url of the form `arg=bar&arg2
into
# `[(("arg","bar"),("arg2","bar2"))]`. The returned strings
coded (see
# `url.decode`).
# @category String
# @param args Argument string to split.
def url.split_args(args) =
  def f(x) =
    ret = r=/./split(x)
    arg = url.decode(list.nth(default="", ret, 0))
    if
```

Top src/libs/utils.liq

2,1

Tree-sitter

```
(source_file ; [0, 0] - [3, 0]                                x."foo" + 1
  (var) ; [0, 0] - [0, 1]
  ┌ (ERROR) ; [0, 1] - [0, 2]                                print("bla")
  (infix ; [0, 2] - [0, 11]
    (string) ; [0, 2] - [0, 7]
    (op) ; [0, 8] - [0, 9]
    (integer)) ; [0, 10] - [0, 11]
  (app ; [2, 0] - [2, 12]
    name: (var) ; [2, 0] - [2, 5]
    (anonymous_arg ; [2, 6] - [2, 11]
      (string)))) ; [2, 6] - [2, 11]
```

Live Demo!

Lezer

- Rince, repeat
- Used by code-mirror
- Used by AzuraCast!

Lezer

```
expr {  
    Include |  
    IfDef |  
    IfEncoder |  
    IfVersion |  
    Coerce |  
    Parens |  
    Integer |  
    Not |  
    Bool |
```

Lezer

```
expr {  
    Include |  
    IfDef |  
    IfEncoder |  
    IfVersion |  
    Coerce |  
    Parens |  
    Integer |  
    Not |  
    Bool |
```

```
IfDef {  
    (kw<%ifdef"> | kw<%ifndef">)  
    (Var | Subfield)  
    exprs  
    (kw<%else"> exprs)? kw<%endif">  
}
```

Lezer

Liquidsoap playground

```
1 # ✨ Welcome to liquidsoap's online interpreter! ✨
2 # 🤖 Language version: 2.3.0+git@958c6ef30
3 # Write your code here:
4
5 def url.split_args(args) =
6     def f(x) =
7         ret = r/.split(x)
8         arg = url.decode(list.nth(default="", ret, 0))
9         val = url.decode(list.nth(default="", ret, 1))
10        (arg, val)
11    end
12
13    l = r/&/.split(args)
14    list.map(f, l)
15 end
```

VSCode

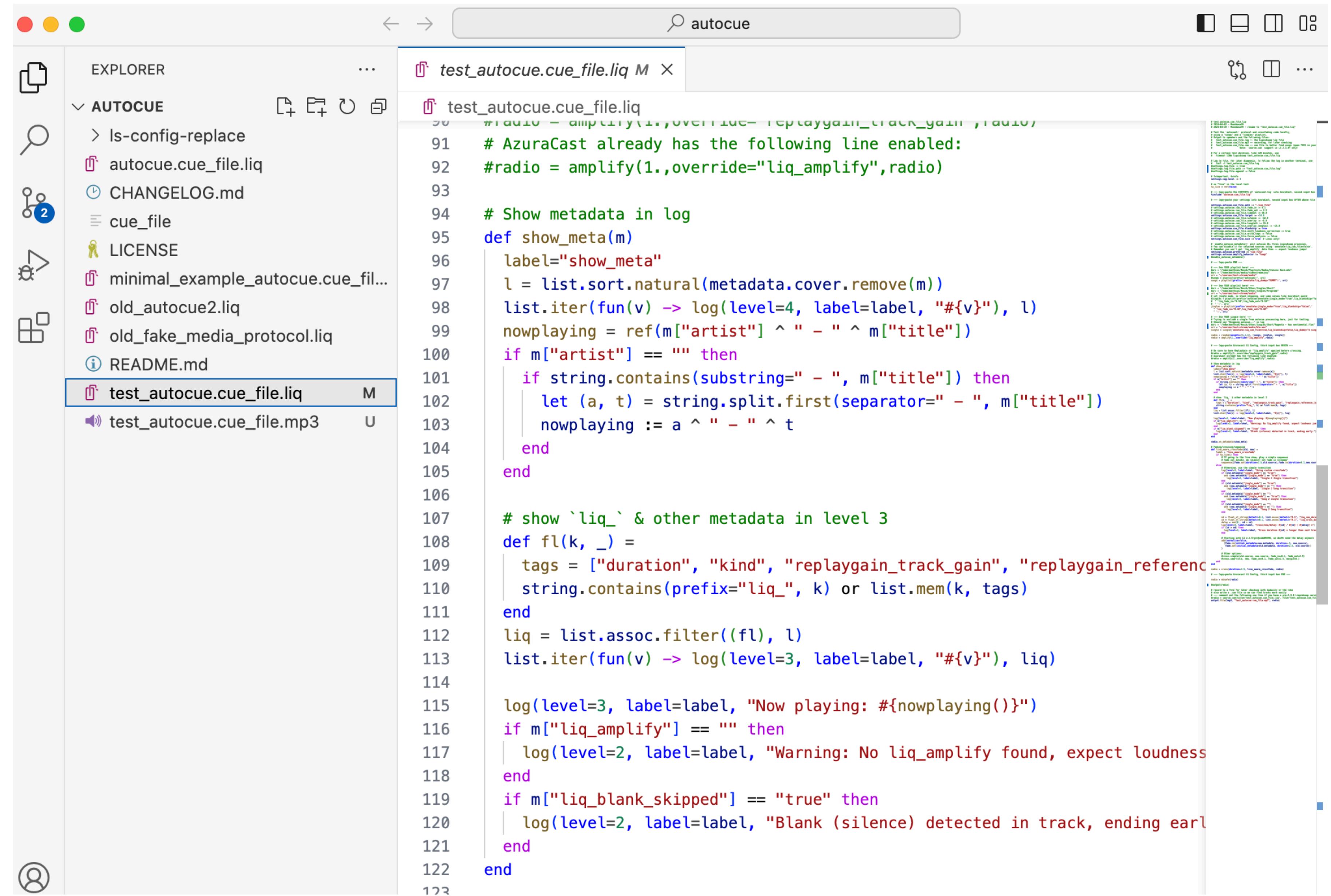
- Rince, repeat
- Used by a lot of programmers
- Regexp-based grammar

VSCode

```
150      ,
137      "expressions": {
138        "patterns": [
139          {
140            "comment": "inline if",
141            "begin": "(\\?)(?!\\.\\.)",
142            "end": "(:",
143            "beginCaptures": { "1": { "name": "keyword.control.liquidsoap" } },
144            "endCaptures": { "1": { "name": "keyword.control.liquidsoap" } },
145            "patterns": [{ "include": "#expressions" }]
146          },
147          {
148            "comment": "if",
149            "begin": "\\b(if)\\b",
150            "end": "\\b(end)\\b",
151            "beginCaptures": { "1": { "name": "keyword.control.liquidsoap" } },
152            "endCaptures": { "1": { "name": "keyword.control.liquidsoap" } },
153            "patterns": [
154              {
155                "match": "\\b(then|else|elsif)\\b",
156                "name": "keyword.control.liquidsoap"
157              },
158              { "include": "$self" }
159            ]
160          },

```

VSCode



```
test_autocue.cue_file.liq M X
test_autocue.cue_file.liq
  90  #radio = amplify(1.,override="replaygain_track_gain",radio)
  91  # AzuraCast already has the following line enabled:
  92  #radio = amplify(1.,override="liq_amplify",radio)
  93
  94  # Show metadata in log
  95  def show_meta(m)
  96    label="show_meta"
  97    l = list.sort.natural(metadata.cover.remove(m))
  98    list.iter(fun(v) -> log(level=4, label=label, "#{v}"), l)
  99    nowplaying = ref(m["artist"] ^ " - " ^ m["title"])
100    if m["artist"] == "" then
101      if string.contains(substring=" - ", m["title"]) then
102        let (a, t) = string.split.first(separator=" - ", m["title"])
103        nowplaying := a ^ " - " ^ t
104      end
105    end
106
107    # show `liq_` & other metadata in level 3
108    def fl(k, _)=
109      tags = ["duration", "kind", "replaygain_track_gain", "replaygain_reference"]
110      string.contains(prefix="liq_", k) or list.mem(k, tags)
111    end
112    liq = list.assoc.filter((fl), l)
113    list.iter(fun(v) -> log(level=3, label=label, "#{v}"), liq)
114
115    log(level=3, label=label, "Now playing: #{nowplaying()}")
116    if m["liq_amplify"] == "" then
117      log(level=2, label=label, "Warning: No liq_amplify found, expect loudness")
118    end
119    if m["liq_blank_skipped"] == "true" then
120      log(level=2, label=label, "Blank (silence) detected in track, ending early")
121    end
122  end
123
```

Github

- Rince, repeat
- Syntax Highlighting
- Regexp-based grammar

Github

github-linguist / linguist

Type to search

Code Issues 140 Pull requests 64 Discussions Actions Security Insights

Add language: liquidsoap #6565

Open toots wants to merge 1 commit into `github-linguist:master` from `toots:master`

Conversation 4 Commits 1 Checks 0 Files changed 10

 toots commented on Oct 5, 2023

Description

This PR adds support for the liquidsoap language. The language has been existing since ~2005 and is widely used to run media streaming applications. Although its original scope is specialized, the language itself is a general-purpose scripting language that is functional and statically typed with inferred types.

Checklist:

I am adding a new language.

- The extension of the new language is used in hundreds of repositories on GitHub.com.
 - Search results for each extension:
 - https://github.com/search?type=code&q=NOT+is%3Afork+path%3A*.liq

I have included a real-world usage sample for all extensions added in this PR:

- Sample source(s):
 - liquidsoap standard library: <https://github.com/savonet/liquidsoap/tree/main/src/libs>

Github



lildude requested changes on Oct 5, 2023

[View reviewed changes](#)

lildude left a comment

Member

...

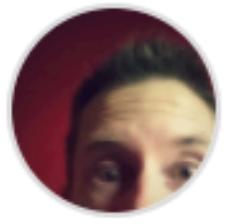
Given its age, usage is surprisingly low in GitHub at the moment, but that could be due to old inactive repos that haven't been indexed yet (the new search will get to them one day).

Other than the suggestion, your three samples suppressed in the diff are too big (probably because of the extensive comments). Please replace these with smaller yet diverse samples with fewer comments.

As popularity isn't sufficient for inclusion right now, I'll label it as such and will review popularity with each release.



Github



lildude requested changes on Oct 5, 2023

[View reviewed changes](#)

lildude left a comment

Member

...

Given its age, usage is surprisingly low in GitHub at the moment. It has not been indexed yet (the new search feature).

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As popularity isn't sufficient for inclusion right now, I'll label it as such and will review popularity with each release.



Please commit your script files to GitHub!

More..?

- Discord: highlight.js
- Linting?
- What else?
- Community help!

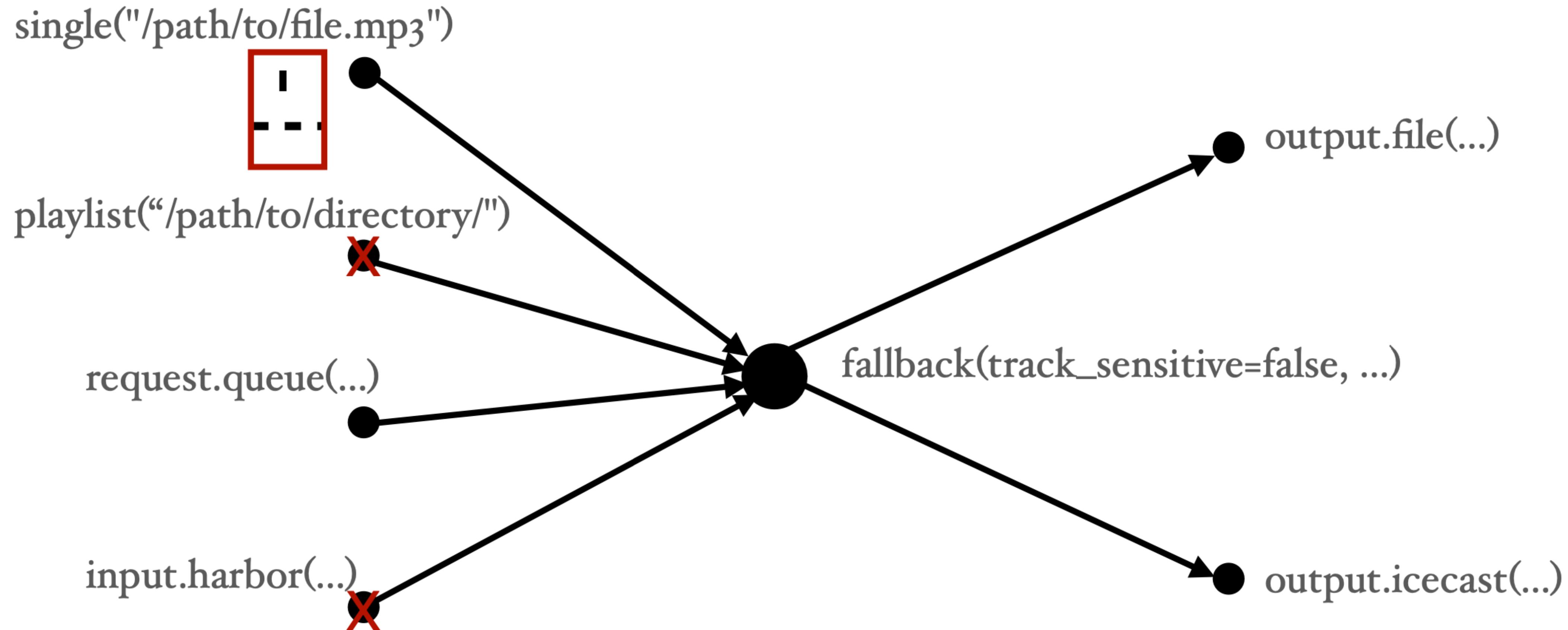
Liquidsoap 2.3.x internal changes

- Streaming loop
- Clocks

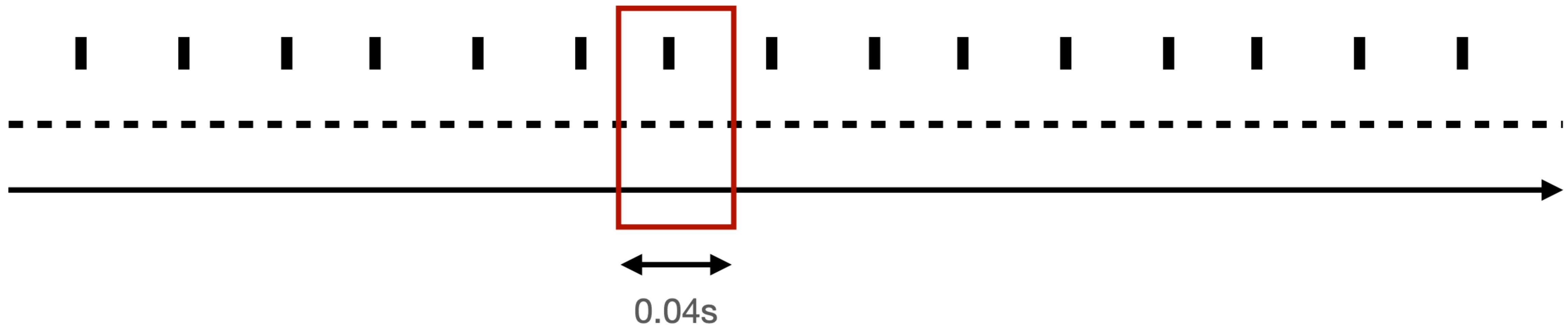
Streaming Loop

- Replaced a pre-allocated shared frame model with a extensible content frame
- Huge cleanup in application logic
- Better integration with external tools (e.g. FFmpeg)

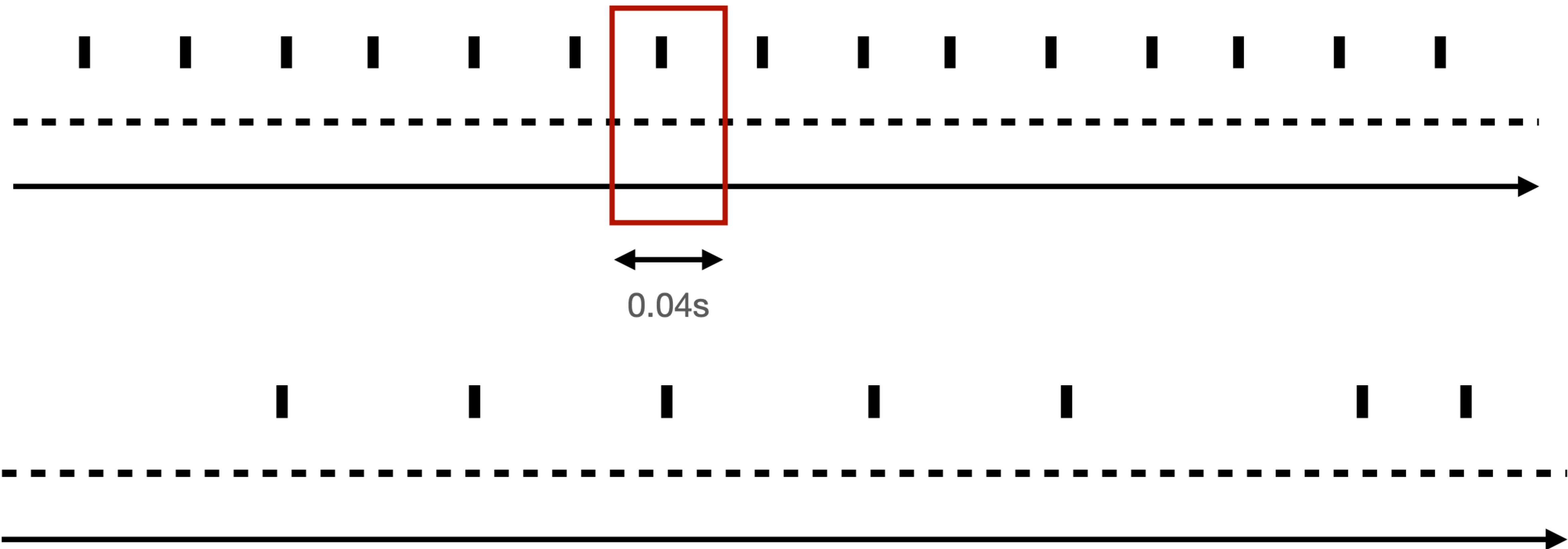
Streaming Loop



Streaming Loop



Streaming Loop

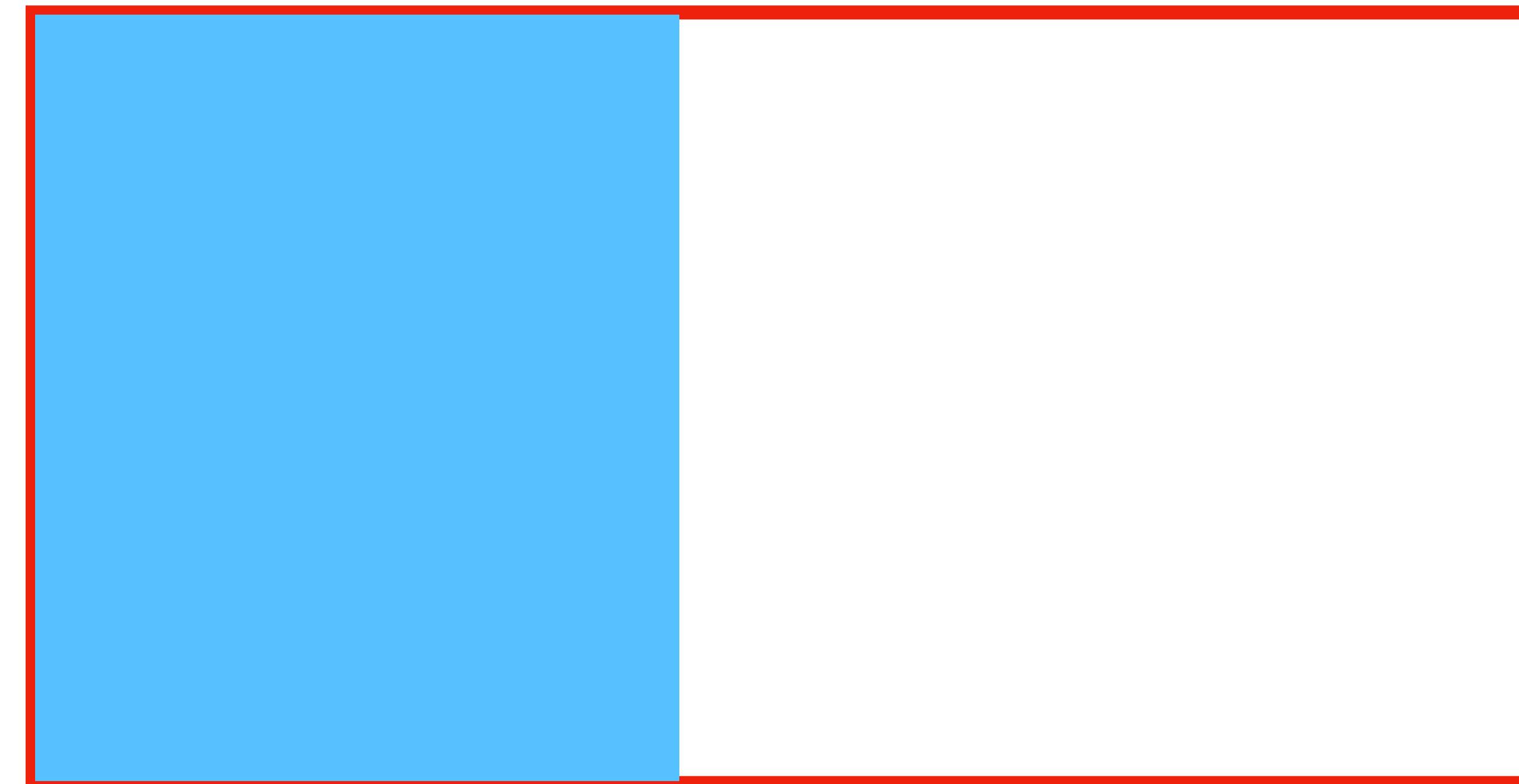


Streaming Loop



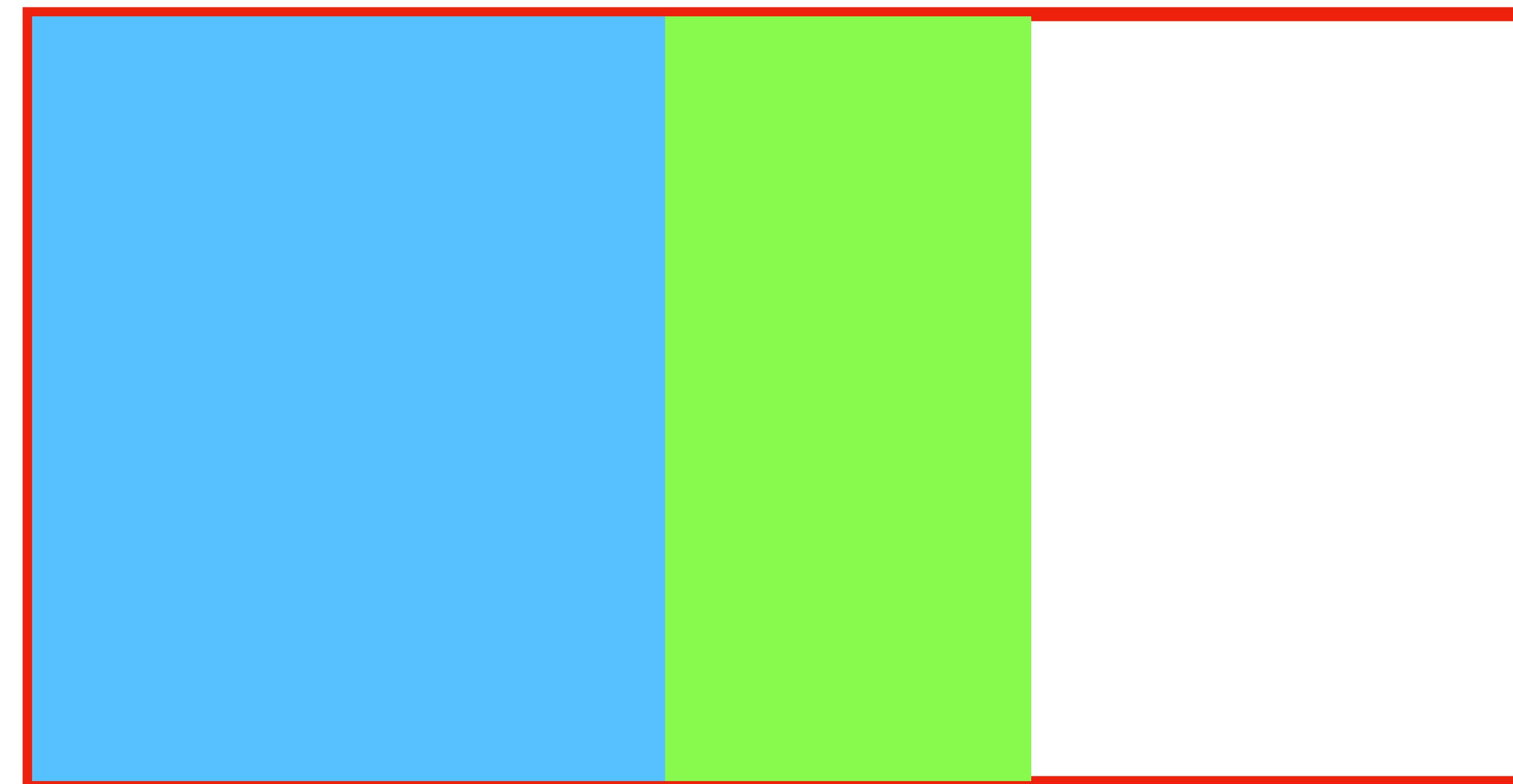
0.04s

Streaming Loop



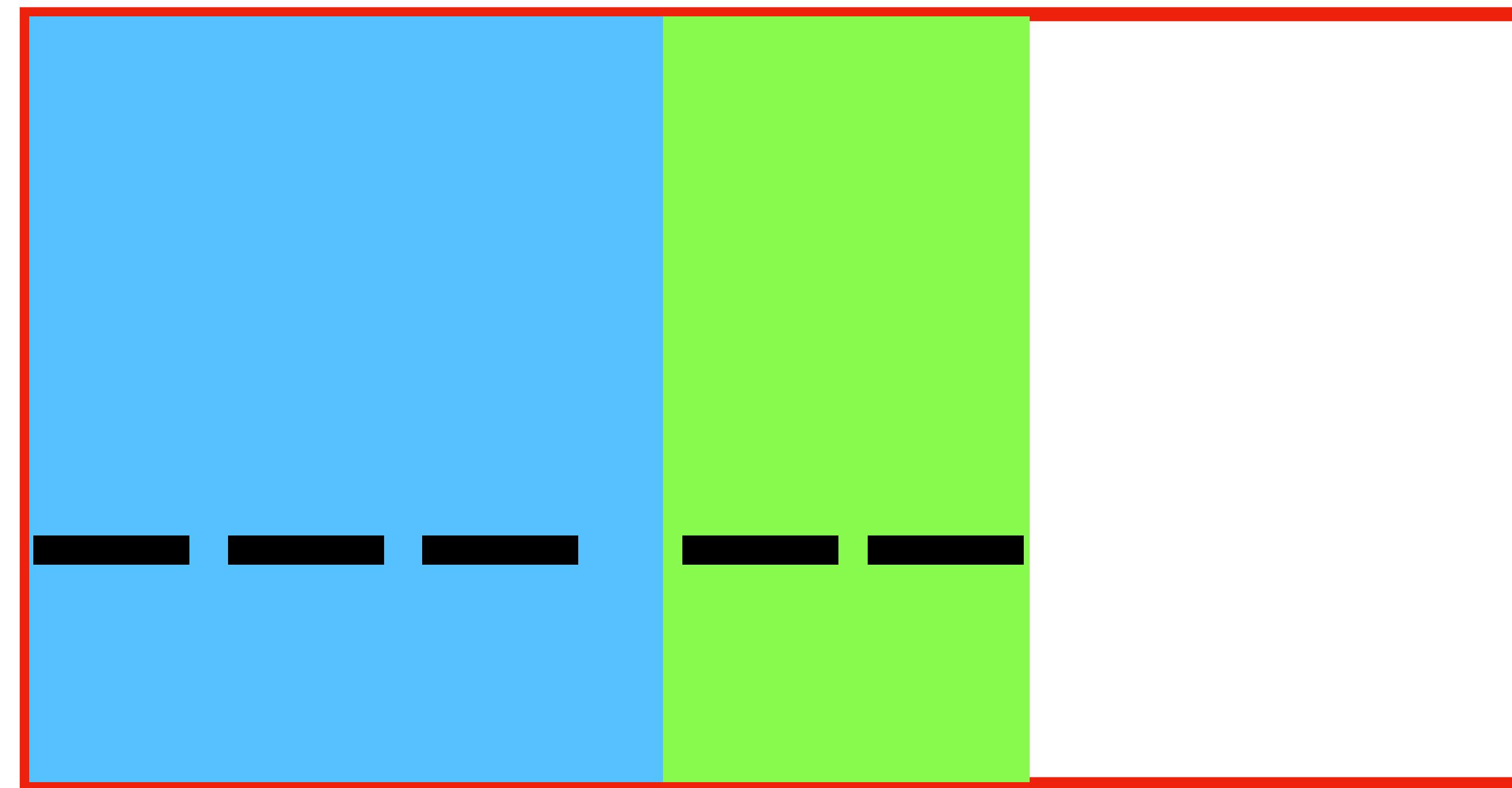
0.04s

Streaming Loop



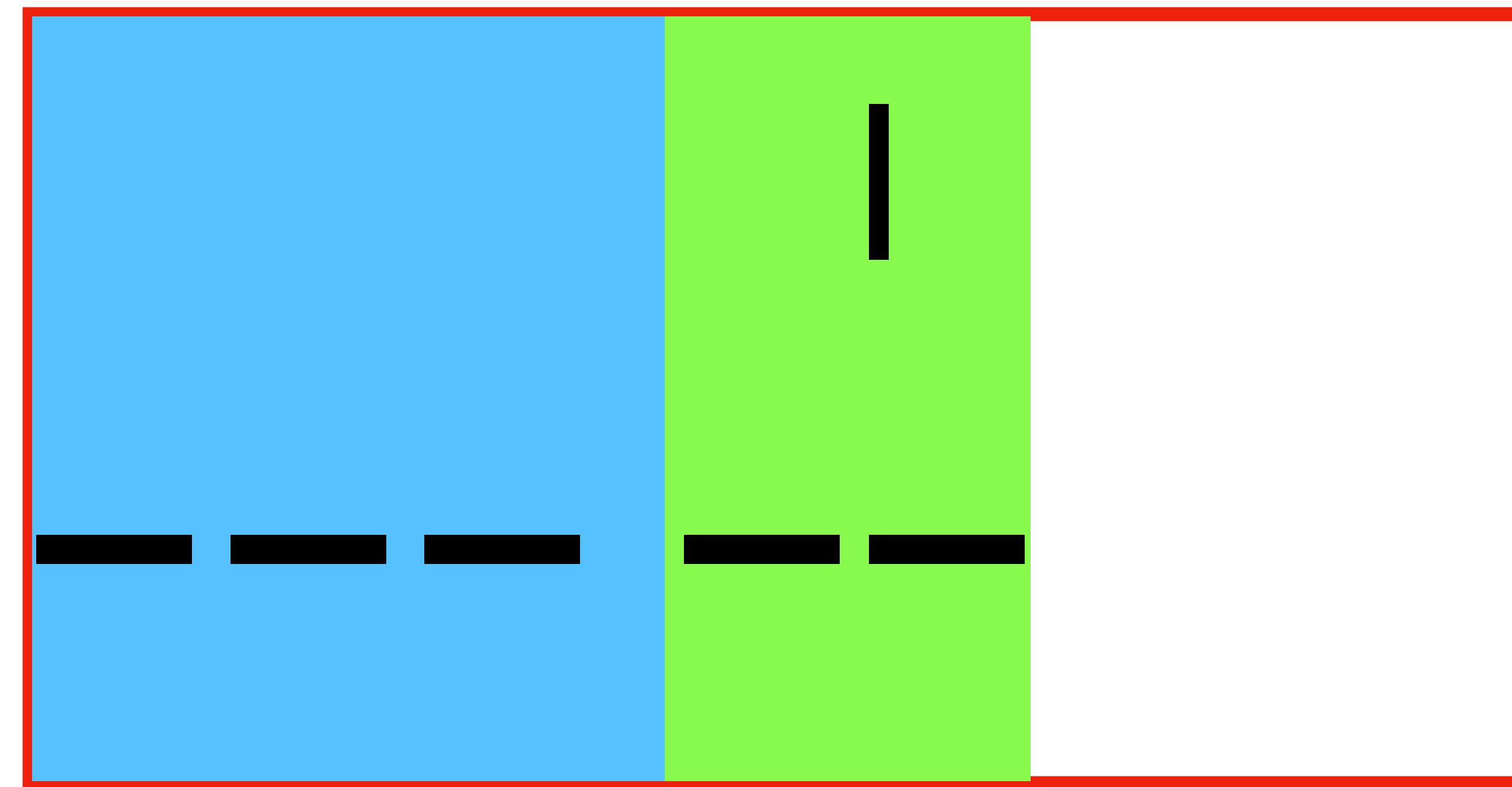
0.04s

Streaming Loop



0.04s

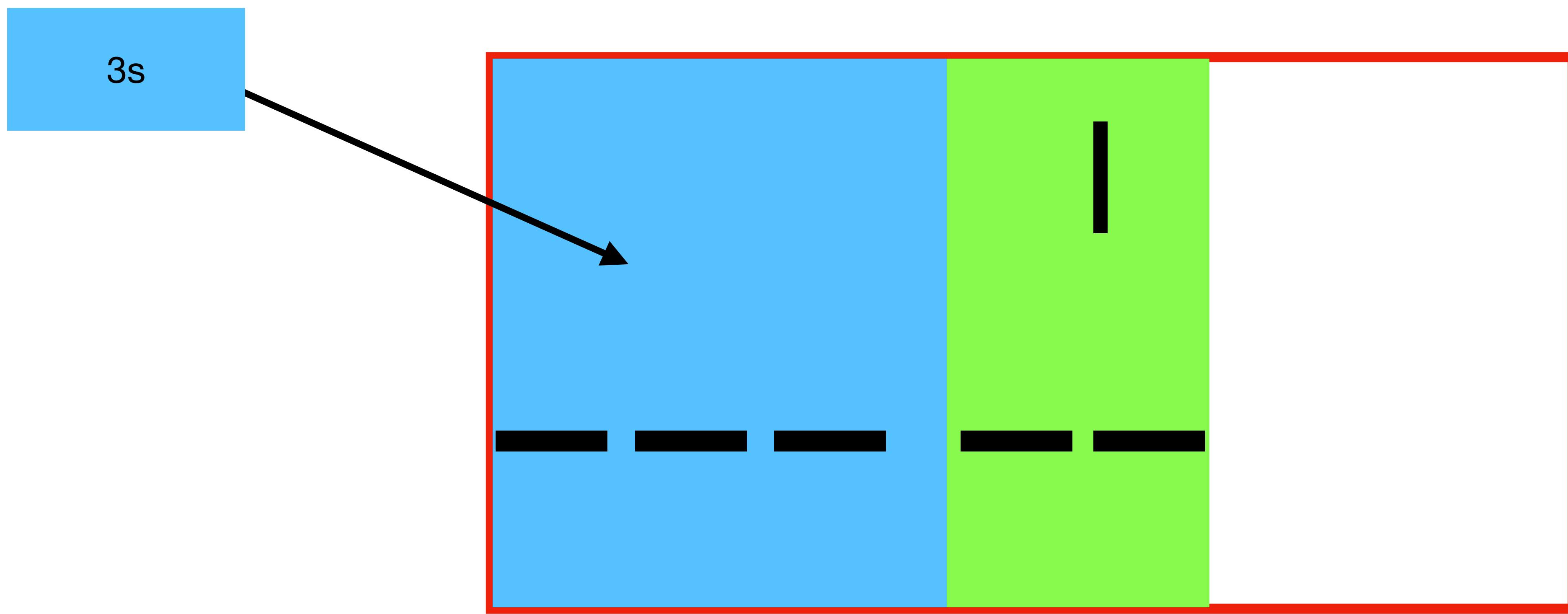
Streaming Loop



0.04s

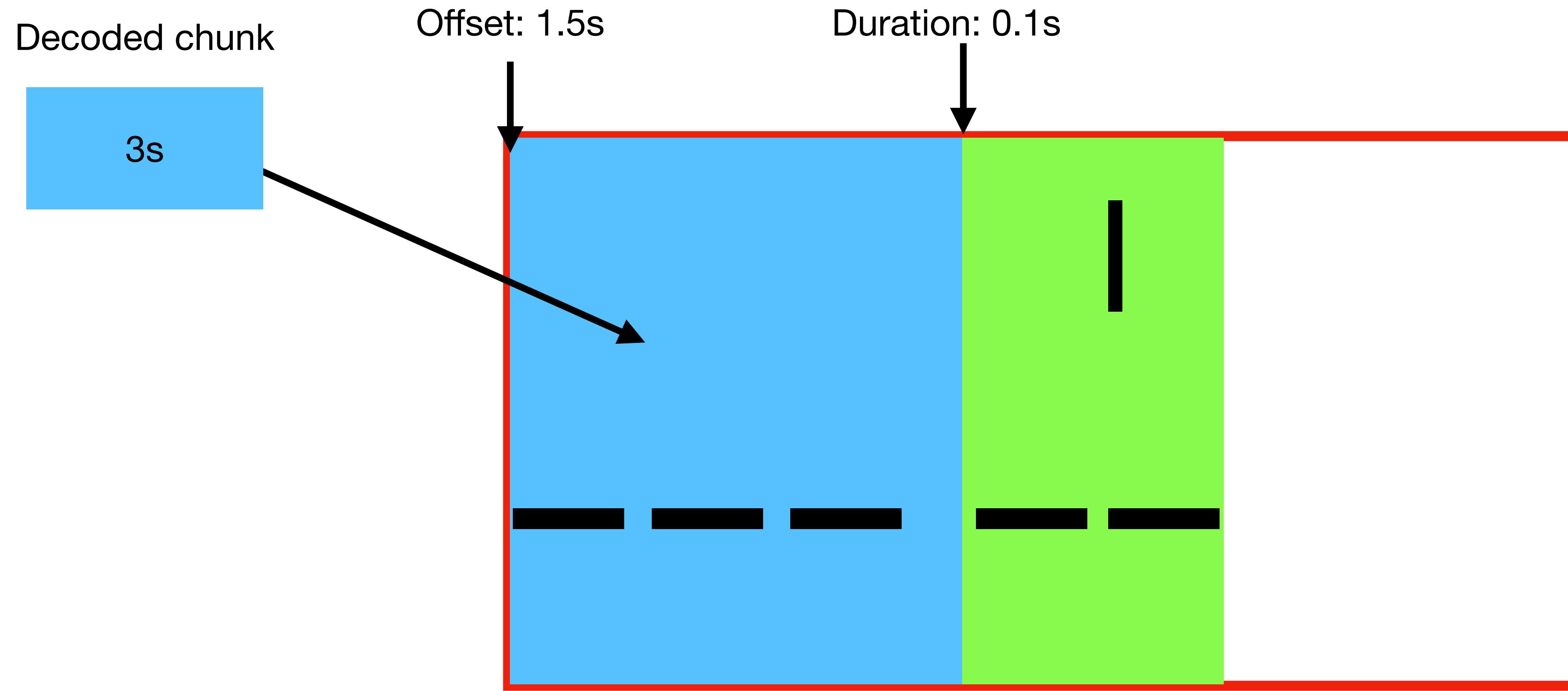
Streaming Loop

Decoded chunk



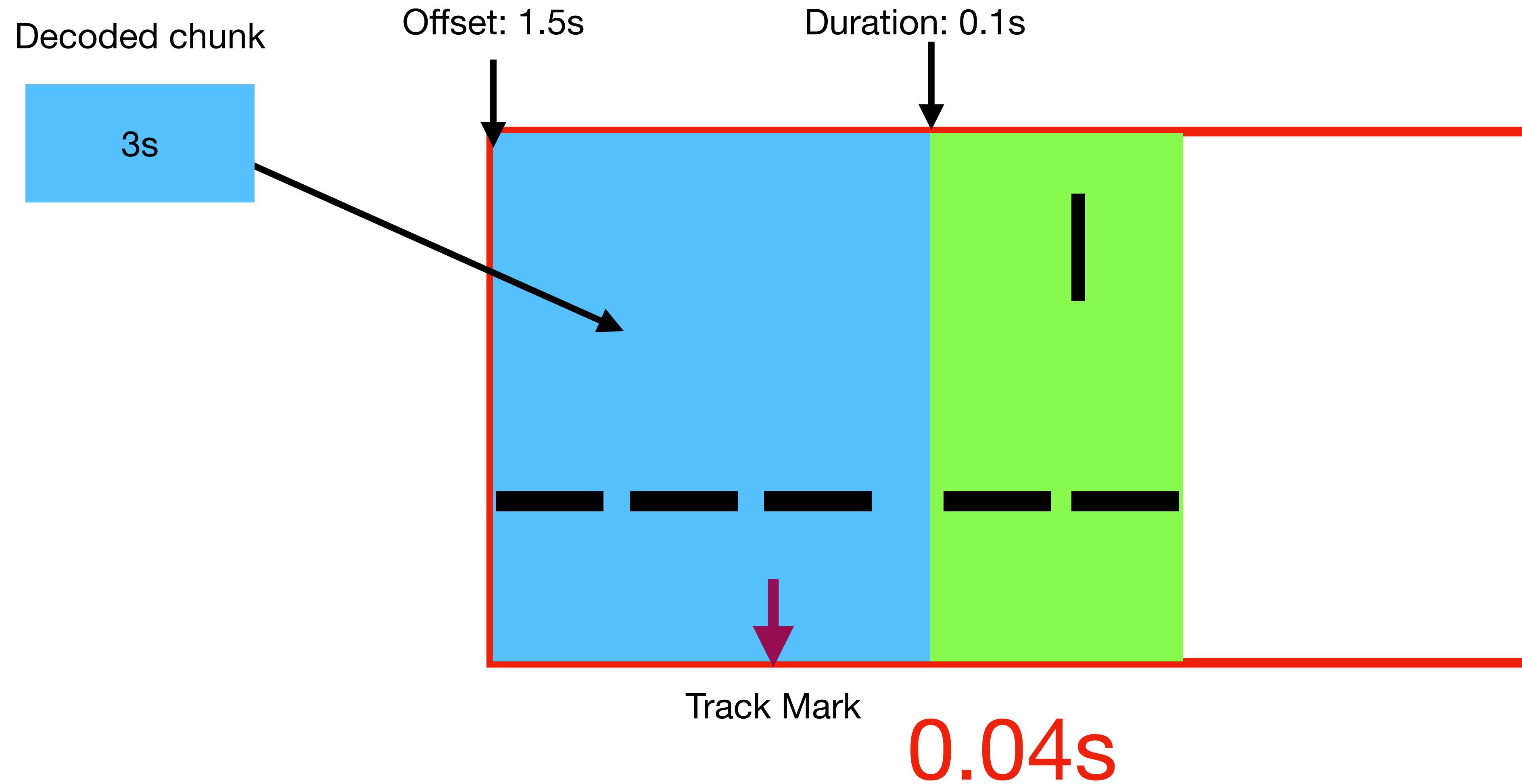
0.04s

Streaming Loop

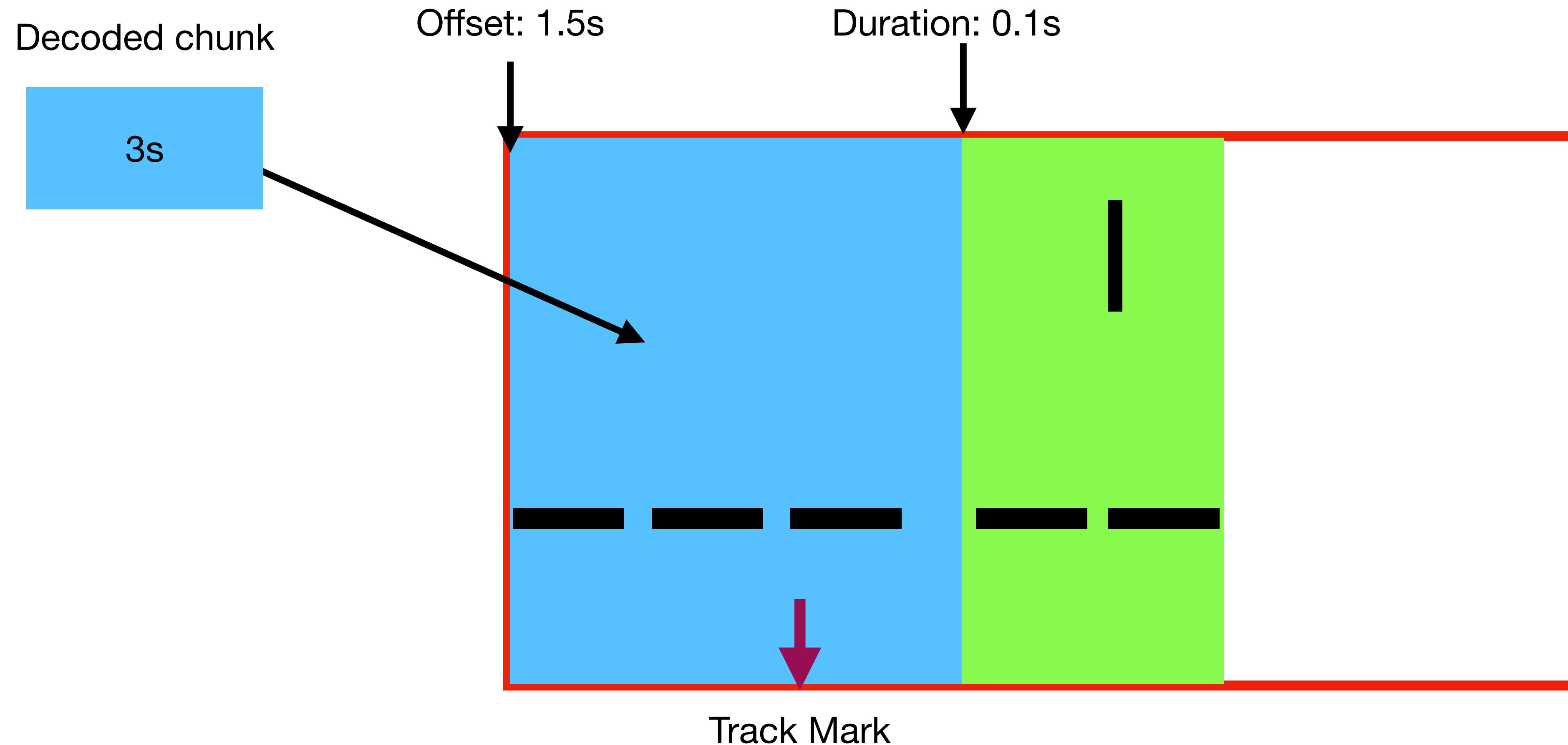


0.04s

Streaming Loop



Streaming Loop



No more bugs with breaks vs. track marks!

Clocks

- Reworked the internal logic to share code
- Cleanup original implementation assumptions that turned out unused
- Rationalize and expose clocks
- Self-sync? Clock safe?
- Expose better tools w.r.t. clocks
- Future: let user run their own clock in the script?

Clocks

```
s = input.http("http://wwoz-sc.streamguys1.com/wwoz-hi.mp3")  
output.ao(fallible=true, s)
```

Clocks

```
L0L4/00/20 14.23.04 >>> L00 L0D
```

```
Fatal error: exception At ./src/libs/extra/telnet.liq, line 204, char 6-40:  
  s = input.http(%argsof(input.http), s)
```

Error 17: clock generic has multiple synchronization sources. Do you need to set self_sync=false?

Sync sources:

```
source(id=input.http) from source input.http  
ao from source ao
```

Stack traces:

```
clock generic:  
at ./src/libs/extra/telnet.liq, line 204, char 6-40  
at /tmp/ao.liq, line 1, char 4-60
```

input.http:

```
at ./src/libs/extra/telnet.liq, line 204, char 6-40  
at /tmp/ao.liq, line 1, char 4-60
```

ao:

```
at /tmp/ao.liq, line 3, char 0-27
```

Live Demo!

OCaml 5 and multi-core support

OCaml 5 and multi-core support

The screenshot shows a GitHub issue page for the repository `ocaml / ocaml`. The page title is "Regression with default GC settings between 4.14.2 and 5.1.1 #13123". The issue was opened by `toots` on April 25, 2023, with 7 comments. The main content of the comment from `toots` discusses memory usage and provides a liquidsoap script example.

toots commented on Apr 25

Hi!

We're in the process of switching `liquidsoap` to OCaml 5.1.1 and we've noticed some pretty severe regressions with the garbage collector.

I'm still testing and need to confirm whether or not we can get comparable memory/CPU usage than with 4.14 but I'd like to report a first, very simple case.

This liquidsoap script:

```
output.dummy(blank())
```

Is basically a runtime loop creating a `float array array` (ocaml native) of `0.04s` of blank PCM audio every `0.04` and discarding it. No C code, only OCaml.

With 4.14, the memory footprint looks like this:

Assignees
No one assigned

Labels
None yet

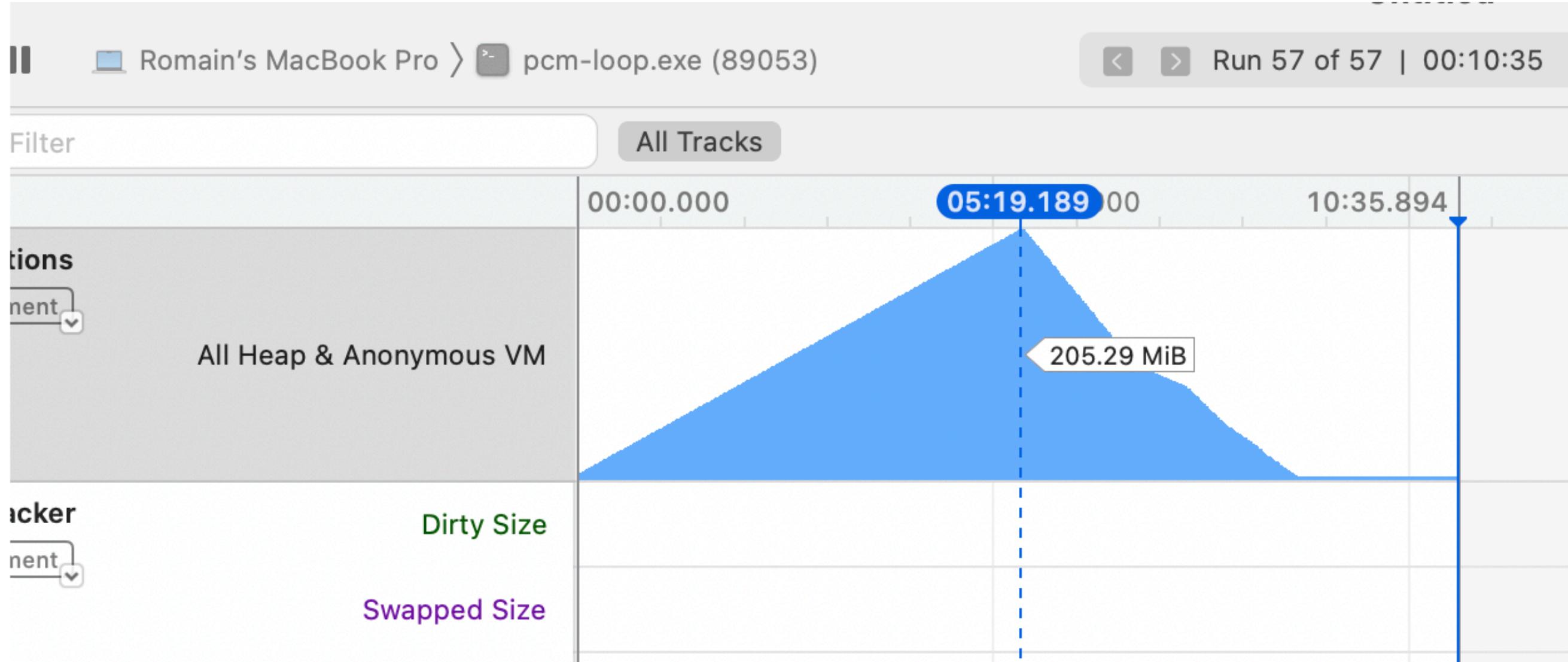
Projects
None yet

Milestone
No milestone

Development
No branches or pull re

OCaml 5 and multi-core support

Memory consumption:



Woof!

Looks like I can see the following:

- The GC is kinda doing what it needs to do in my previous example: keep a ratio of the live memory, here, about 65Mo out of the ~40Mo of allocated memory. It's the spirit of it but this is neither what 4.14 was effectively doing and, frankly, not a great experience when you work with an app that has large amount of permanently allocated memory and short amount of transitory memory.

OCaml 5 and multi-core support



toots commented on [1a262d4](#) 3 weeks ago

Member Author ...

Thanks!



vitoyucepi commented on [1a262d4](#) 3 weeks ago • edited

Collaborator ...

And here's a comparison between 5.1.1 and 4.14.2.

The script consists only of metrics and a sine stream to icecast using libopus.

[ac425d0](#)

Use local time Enable query history Enable autocomplete Enable highlighting Enable linter

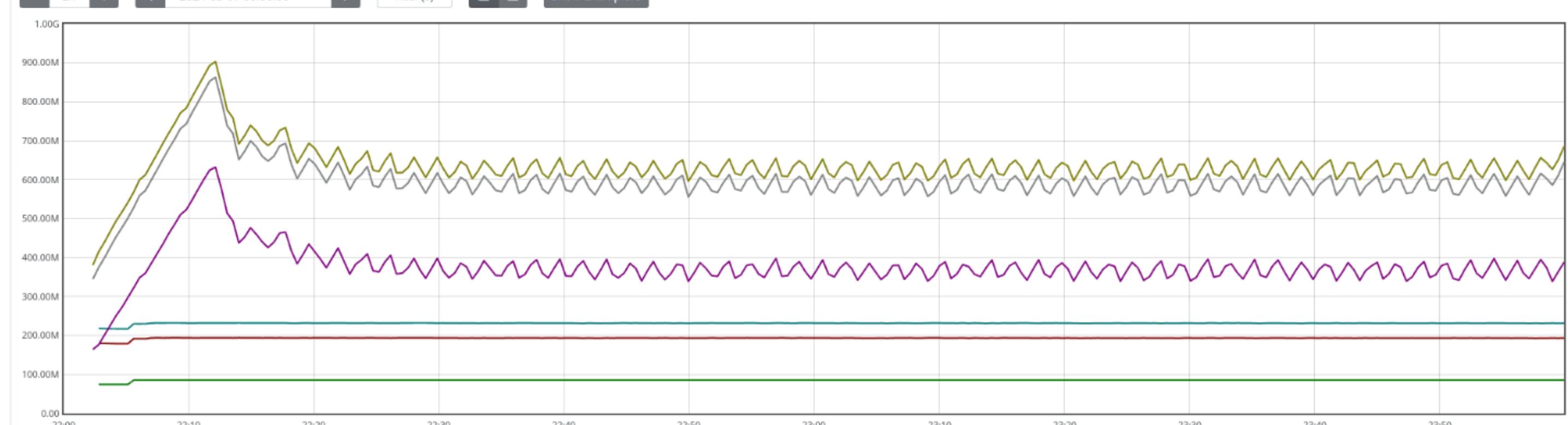
liquidsoap_process_memory_bytes{type=~"physical|private|managed"}

Execute

Load time: 18ms Resolution: 28s Result series: 6

Table Graph

- 2h + < 2024-05-07 00:00:00 > Res. (s) Show Exemplars



OCaml 5 and multi-core support

- New memory management model not mature enough
- Unsure exactly how to leverage multi-core support
- Multi-processes vs. single script
- Seems more opportunistic to optimize existing memory and CPU usage!

Optimizations

Optimizations

- High memory usage from the standard library
- High CPU usage due to language complexity at runtime

Reduce CPU usage at runtime

Reduce CPU usage at runtime

Parse Script

```
list.add(x, 1)
```

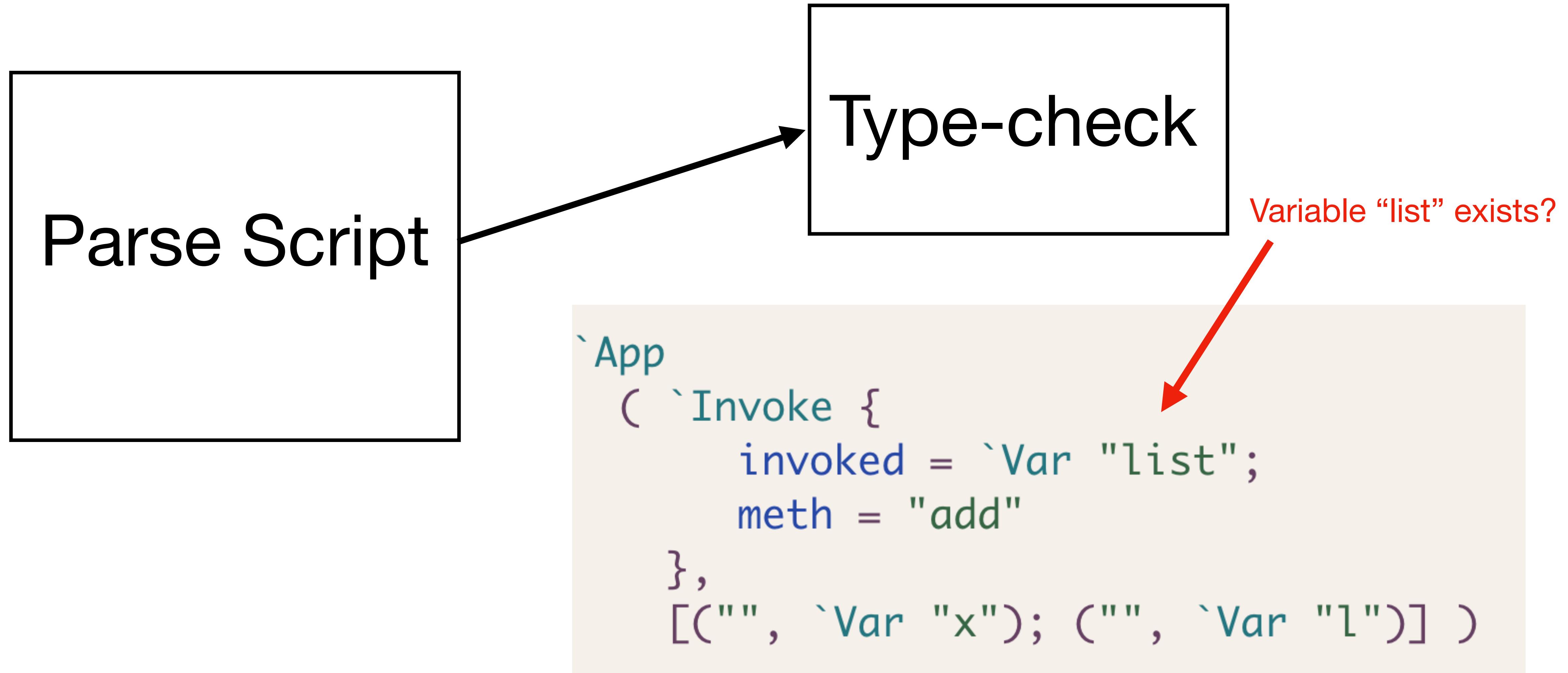
Reduce CPU usage at runtime

Parse Script

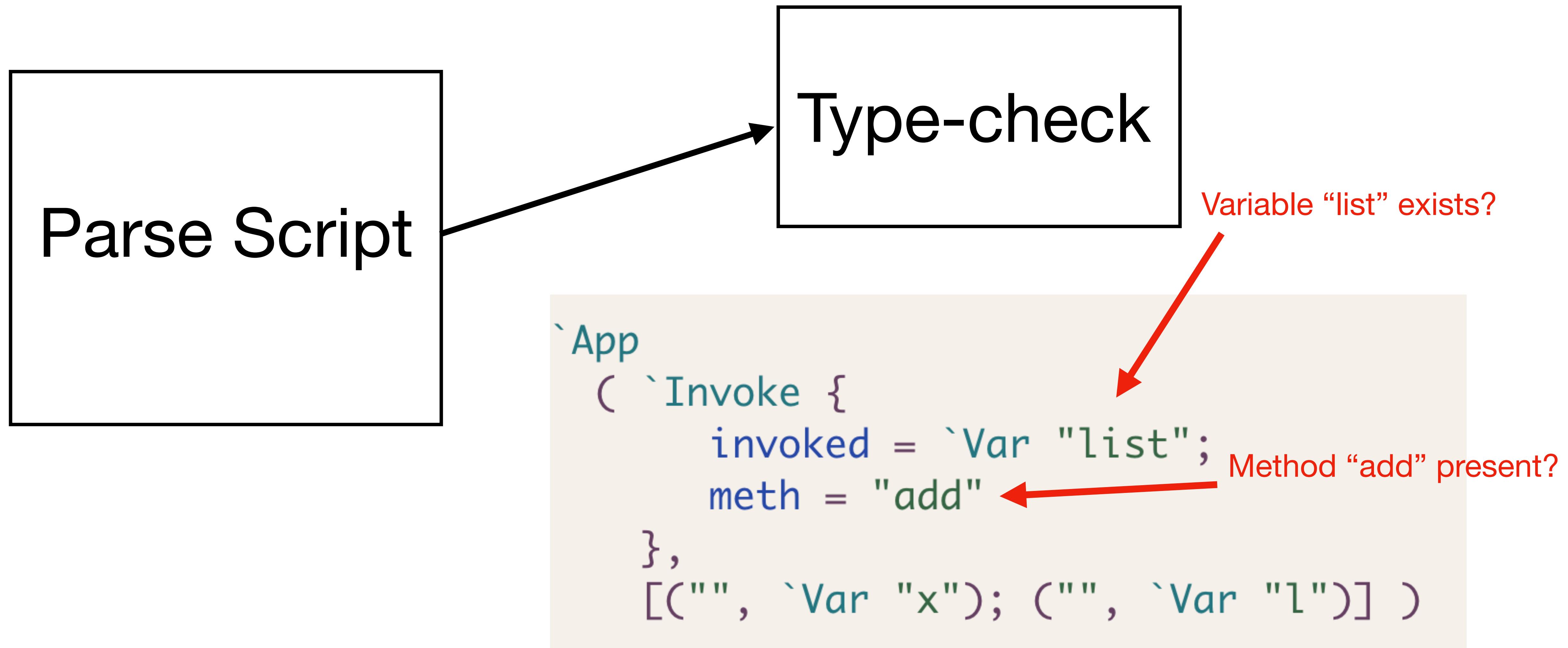
```
list.add(x, l)

`App
(`Invoke {
    invoked = `Var "list";
    meth = "add"
},
[("", `Var "x"); ("", `Var "l")] )
```

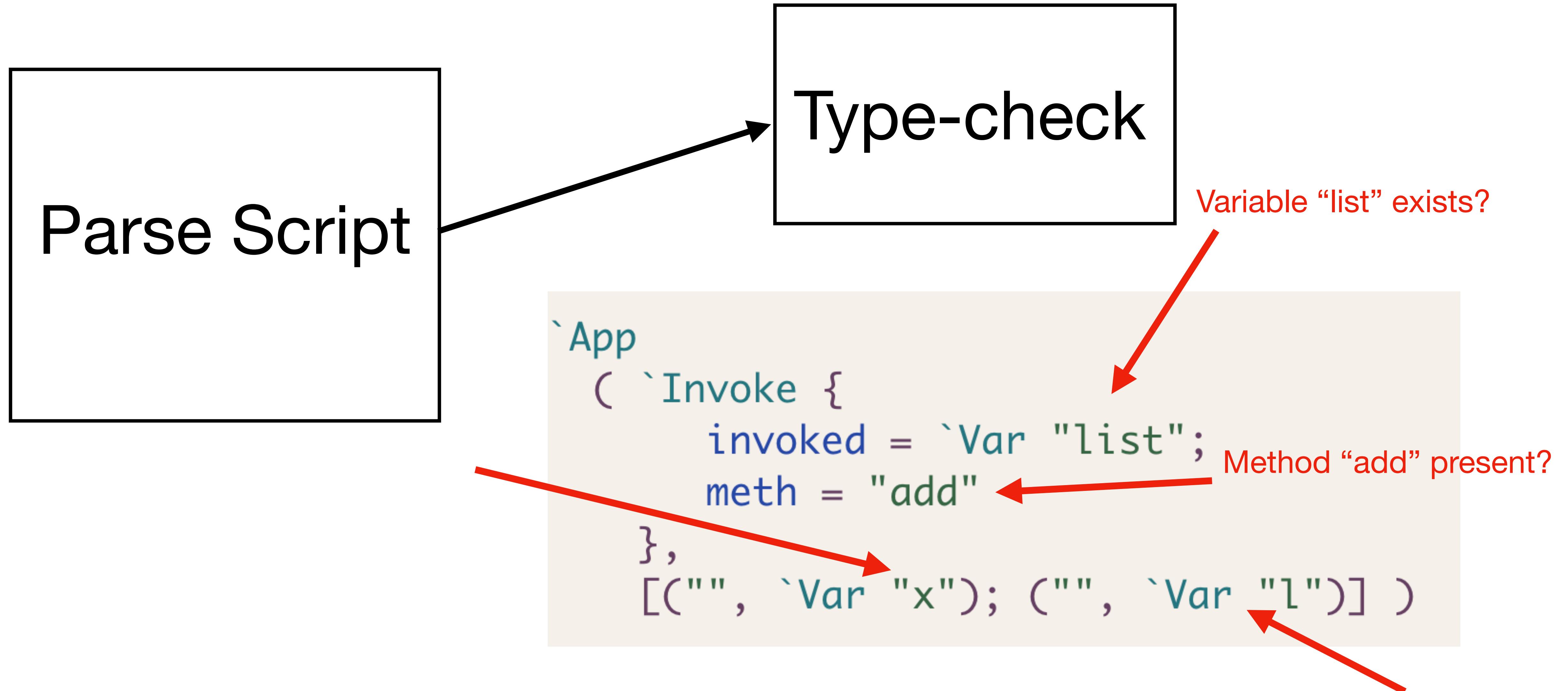
Reduce CPU usage at runtime



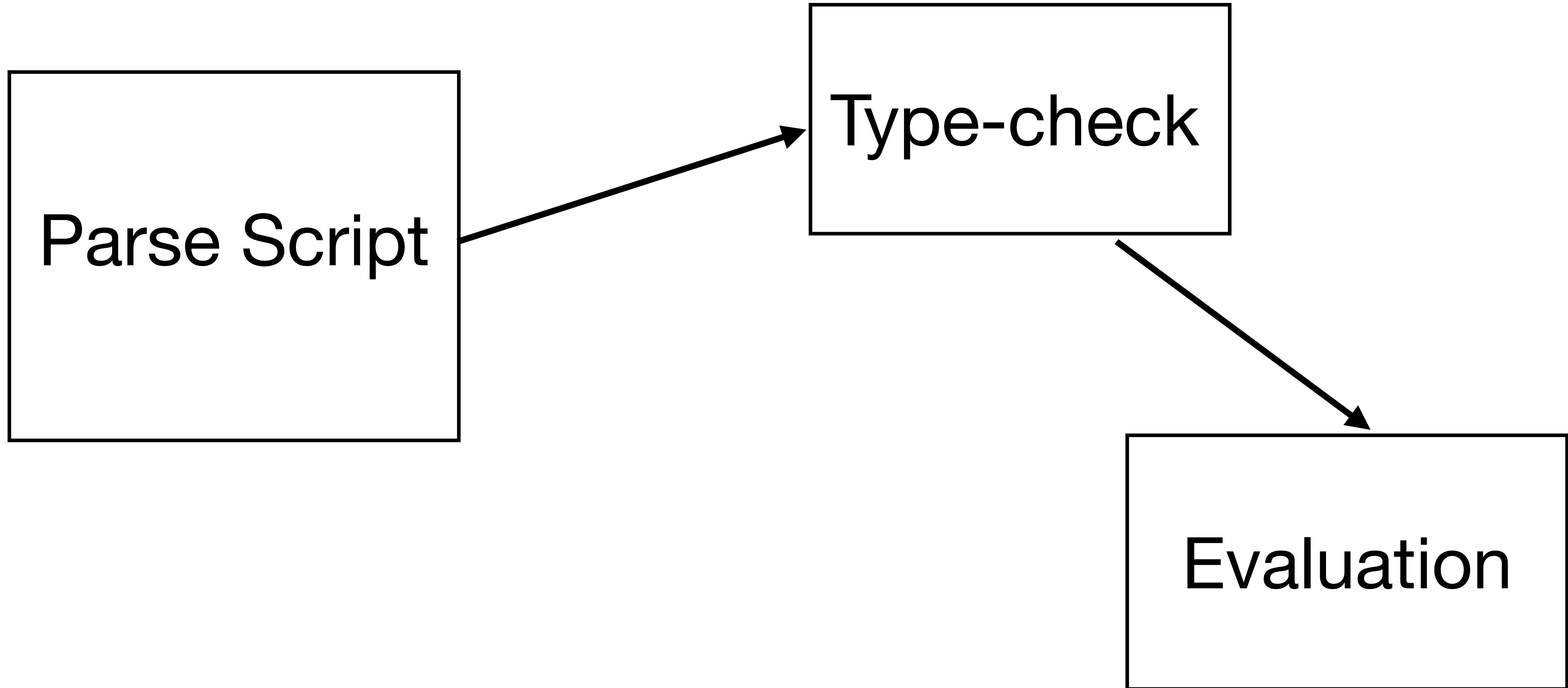
Reduce CPU usage at runtime



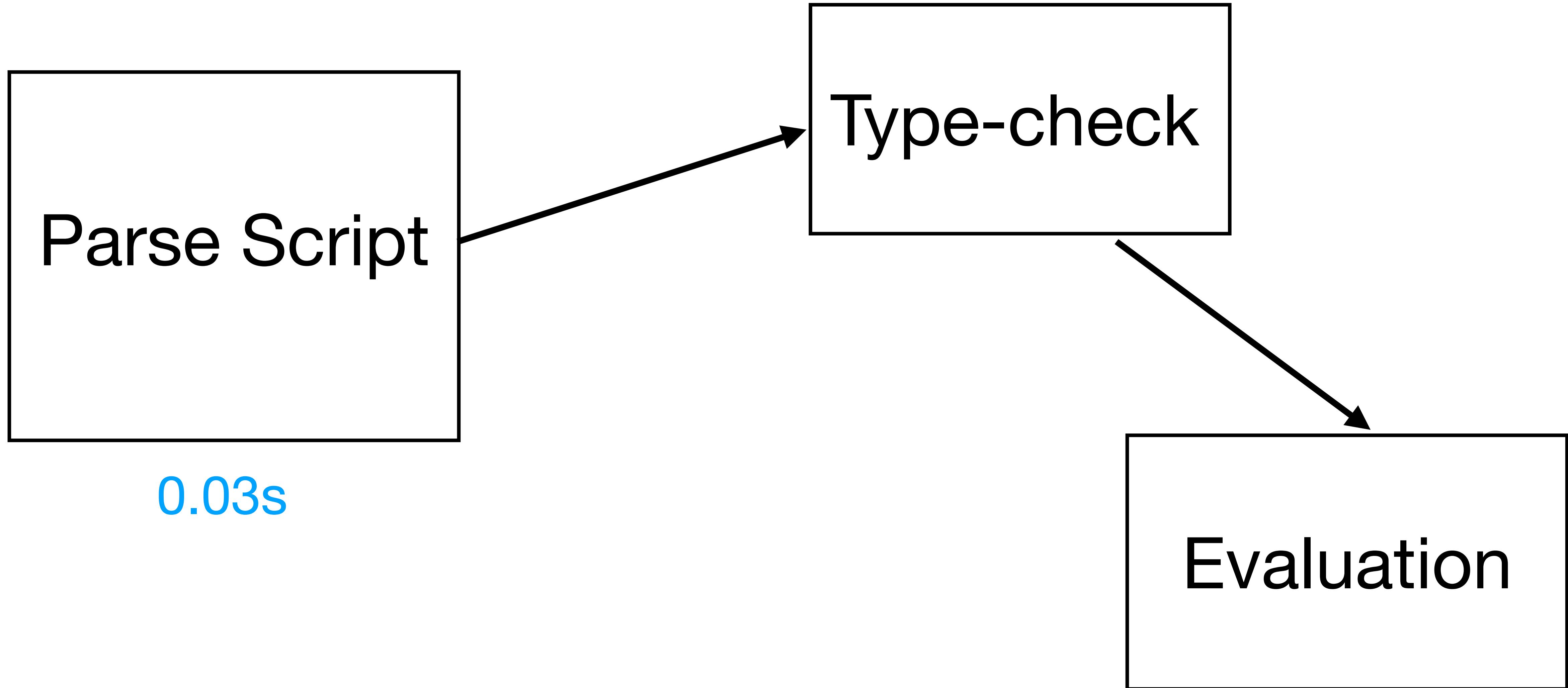
Reduce CPU usage at runtime



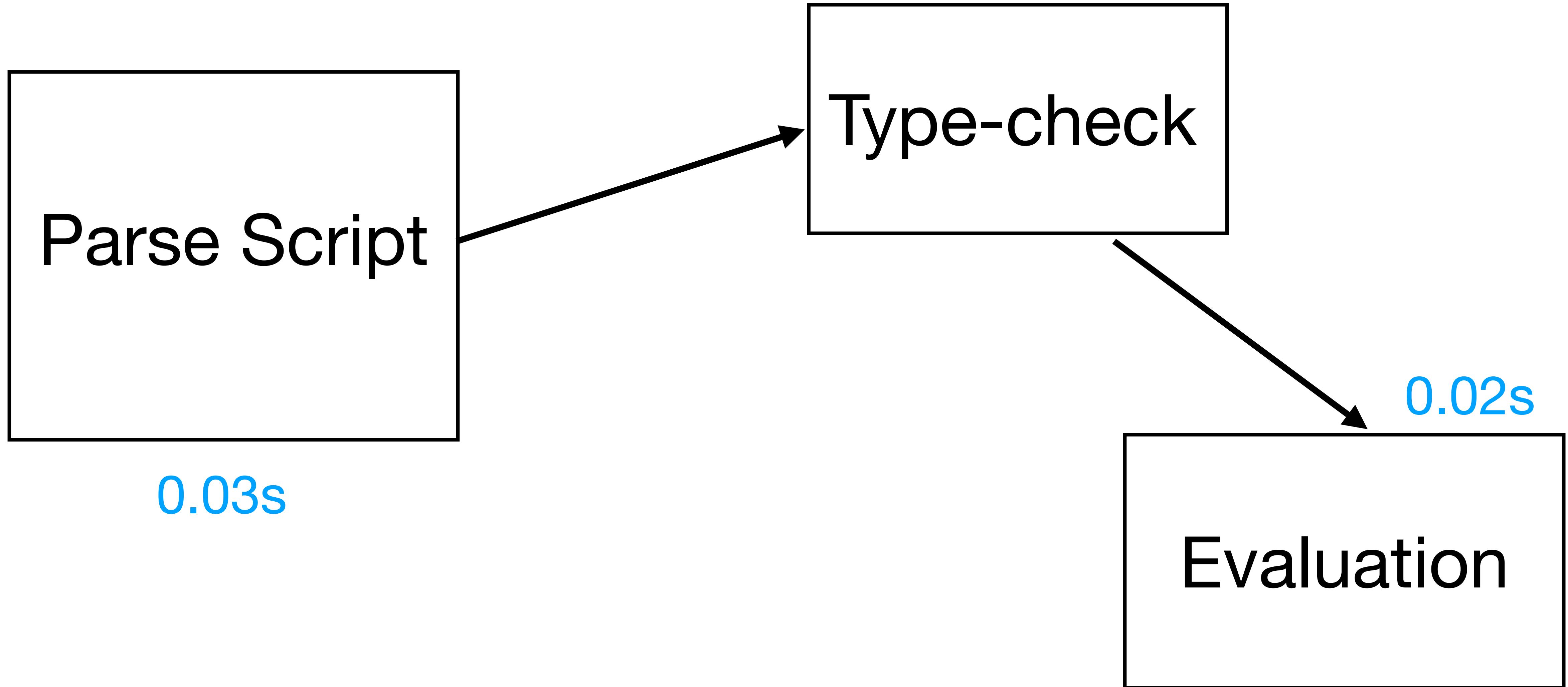
Reduce CPU usage at runtime



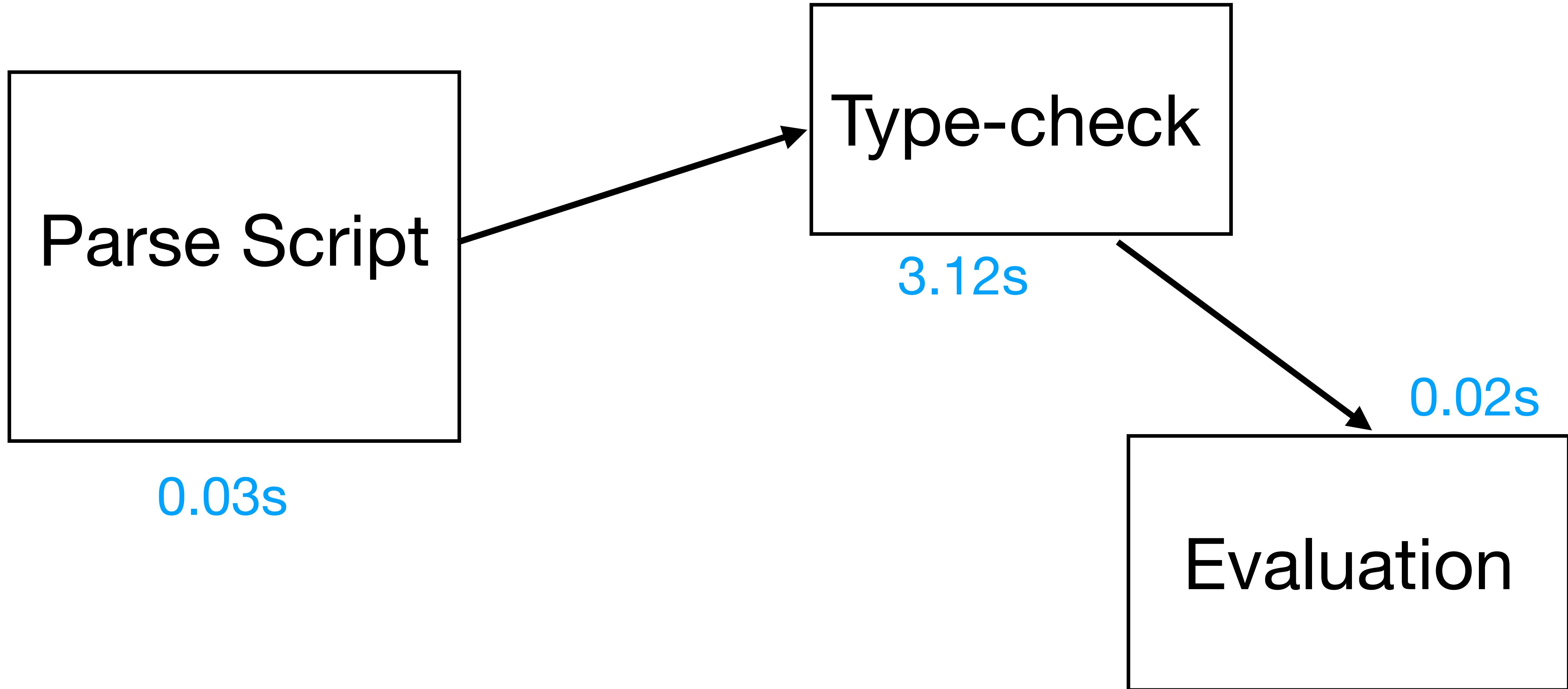
Reduce CPU usage at runtime



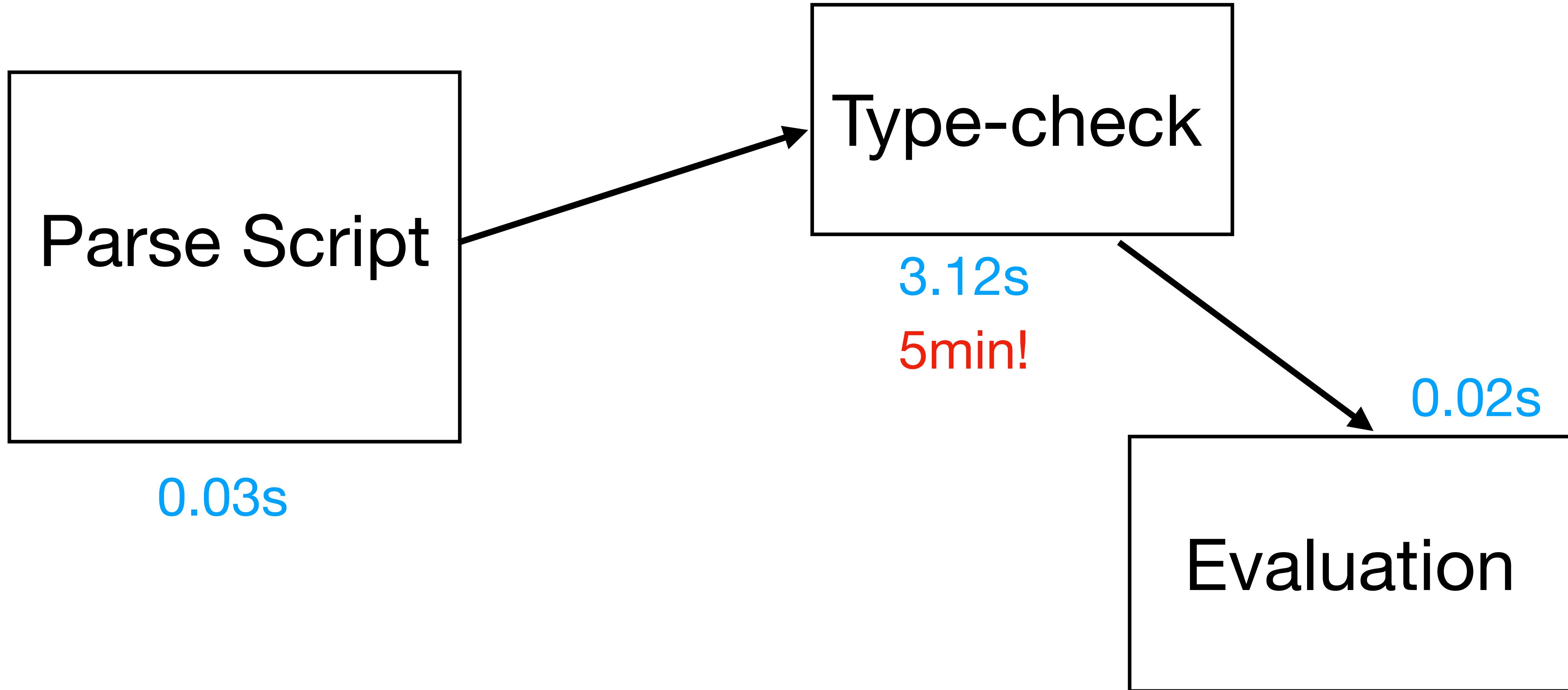
Reduce CPU usage at runtime



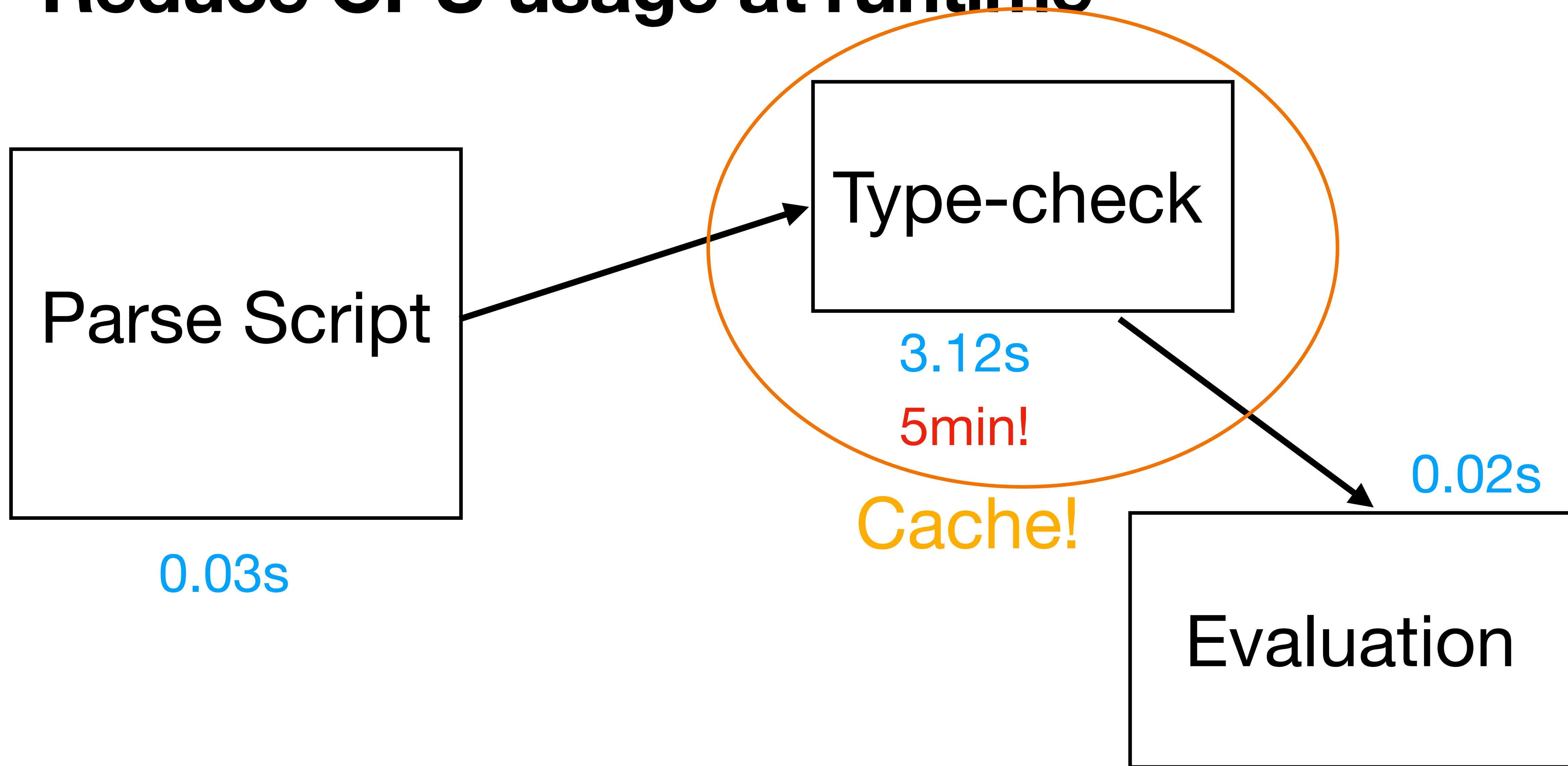
Reduce CPU usage at runtime



Reduce CPU usage at runtime



Reduce CPU usage at runtime



Reduce CPU usage at runtime

Cache terms #3924

[Open](#) toots wants to merge 2 commits into [main](#) from [cache-term](#) 

Conversation 0 Commits 2 Checks 26 Files changed 58

 toots commented last week • edited  ...

This PR introduces a cache for running scripts!

Functionality

During the first execution, the script is parsed, type checked and evaluated. On second and any following execution, a cache of the script is used, reducing the typechecking phase by a 100x factor!

First execution (m3 macbook):

```
39 [startup:3] FFmpeg bitstream filters registered
39 [startup:3] Liquidsoap binary changed: cache
39 [startup:3] Cache retrieval: 0.03s
39 [startup:3] Typechecking: 2.56s
39 [startup:3] Evaluation: 0.01s
39 [clock:3] Starting clock generic with 2 s
```

Second execution:

```
43 [startup:3] FFmpeg bitstream filters registered
43 [startup:3] Loading script from cache!
43 [startup:3] Cache retrieval: 0.03s
43 [startup:3] Evaluation: 0.01s
43 [clock:3] Starting clock generic with 2 s
```

This will greatly improve runtime performances for most users. We have had reports of startup time taking up to 5 minutes

Reduce memory usage

- Compiling phase
- Propagation of variables

Reduce memory usage

- Compiling phase
- Propagation of variables

```
list.add(x, l)
```

Reduce memory usage

- Compiling phase
- Propagation of variables

```
# list;;
- :
{
  add : 'a.('a, ['a]) -> ['a],
  append : 'a.(['a], ['a]) -> ['a],
  assoc : 'a.'b.((?default : 'a?, 'b, ['b * 'a]) -> 'a)
.{
  filter : 'c.'d.(((c, 'd) -> bool), ['c * 'd]) -> ['c * 'd],
  filter_map : 'c.'d.'e.(((c, 'd) -> 'e?), ['c * 'd]) -> ['e],
  mem : 'c.'d.('c, ['c * 'd]) -> bool,
  nullable : 'c.'d.('c, ['c * 'd?]) -> 'd?,
  remove : 'c.'d.((c, ['c * 'd]) -> ['c * 'd])
  .{all : 'e.'f.('e, ['e * 'f]) -> ['e * 'f]
}
},
case : 'a.'b.(['a], 'b, ((('a, ['a]) -> 'b)) -> 'b,
cons : 'a.('a, ['a]) -> ['a],
dcase : 'a.'b.(['a], (() -> 'b), ((('a, ['a]) -> 'b)) -> 'b,
exists : 'a.(((a) -> bool), ['a]) -> bool,
filter : 'a.((?remove : ((a) -> unit), ((a) -> bool), ['a]) -> ['a],
filter_map : 'a.'b.(((a) -> 'b?), ['a]) -> ['b],
find : 'a.((?default : 'a?, ((a) -> bool), ['a]) -> 'a,
flatten : 'a.([['a]]) -> ['a],
fold : 'a.'b.(((('a, 'b) -> 'a), 'a, ['b]) -> 'a)
  .{right : 'c.'d.(((c, 'd) -> 'd), 'd, ['c]) -> 'd
},
for_all : 'a.(((a) -> bool), ['a]) -> bool,
hd : 'a.((?default : 'a?, ['a]) -> 'a,
ind : 'a.'b.(['a], 'b, ((('a, ['a], 'b) -> 'b)) -> 'b,
index : 'a.(((a) -> bool), ['a]) -> int,
indexed : 'a.([['a]) -> [int * 'a],
init : 'a.(int, ((int) -> 'a)) -> ['a],
insert : 'a.(int, 'a, ['a]) -> ['a],
is_empty : 'a.([['a]) -> bool,
iter : 'a.(((a) -> unit), ['a]) -> unit,
iterator : 'a.([['a?]) -> () -> 'a?,
iteri : 'a.(((int, 'a) -> unit), ['a]) -> unit,
last : 'a.((?default : 'a?, ['a]) -> 'a,
length : 'a.([['a]) -> int,
make : 'a.(int, 'a) -> ['a],
map : 'a.'b.(((('a) -> 'b), ['a]) -> ['b])
  .{right : 'c.'d.(((c) -> 'd), ['c]) -> ['d]
},
mapi : 'a.'b.(((int, 'a) -> 'b), ['a]) -> ['b],
mem : 'a.('a, ['a]) -> bool,
nth : 'a.((?default : 'a?, ['a], int) -> 'a,
pick : 'a.((?default : 'a?, ['a]) -> 'a,
prefix : 'a.(int, ['a]) -> ['a],
remove : 'a.('a, ['a]) -> ['a],
rev : 'a.([['a]) -> ['a],
shuffle : 'a.([['a]) -> ['a],
sort : 'a.(((('a, 'a) -> int), ['a]) -> ['a])
  .{natural : 'b.(['b]) -> ['b]
},
tl : 'a.([['a]) -> ['a]
```

Reduce memory usage

- Compiling phase
- Propagation of variables
- Only keep in memory what your script is using

Other improvements

Other improvements

- Autocue

Other improvements

- Autocue
- Cover manager, video canvas

Other improvements

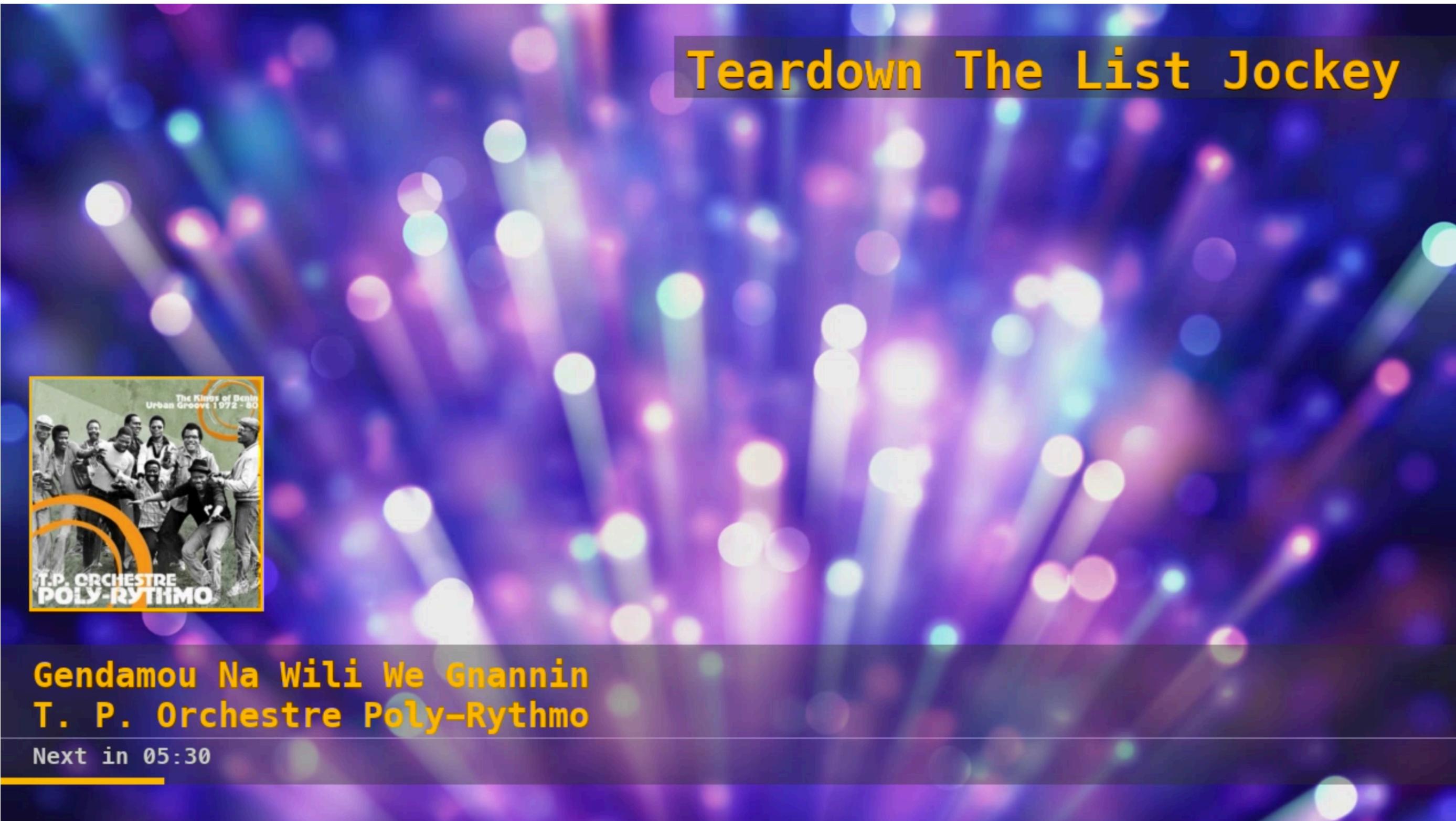
- Autocue
- Cover manager, video canvas

```
let {px, vw, vh, rem, width, height} = video.canvas.virtual_10k.actual_720p
video.frame.width := width
video.frame.height := height

background =
  video.add_rectangle(
    color=0x333333,
    alpha=0.4,
    x=4609 @ px,
    y=234 @ px,
    width=5468 @ px,
    height=429 @ px,
    background
  )
```

Other improvements

- Autocue
- Cover manager, video canvas



Other improvements

- Autocue
- Cover manager, video canvas



Video Canvas and AI

Posted on February 10, 2024

Liquidsoap did not make it to FOSDEM this year, unfortunately. We had a nice example of advanced video use to present so here it is!

The code presented in this article is available here: <https://github.com/savonet/ai-radio>

The setup

We are looking at a cleaned-up version of a code that has been contributed by several

Other improvements

- Autocue
- Cover manager, video canvas
- Lots that are missing here!

Liquidsoap 2.3.x release?

Soon!



- Autocue backport
- Memory optimizations
- Performance and regression

Questions?