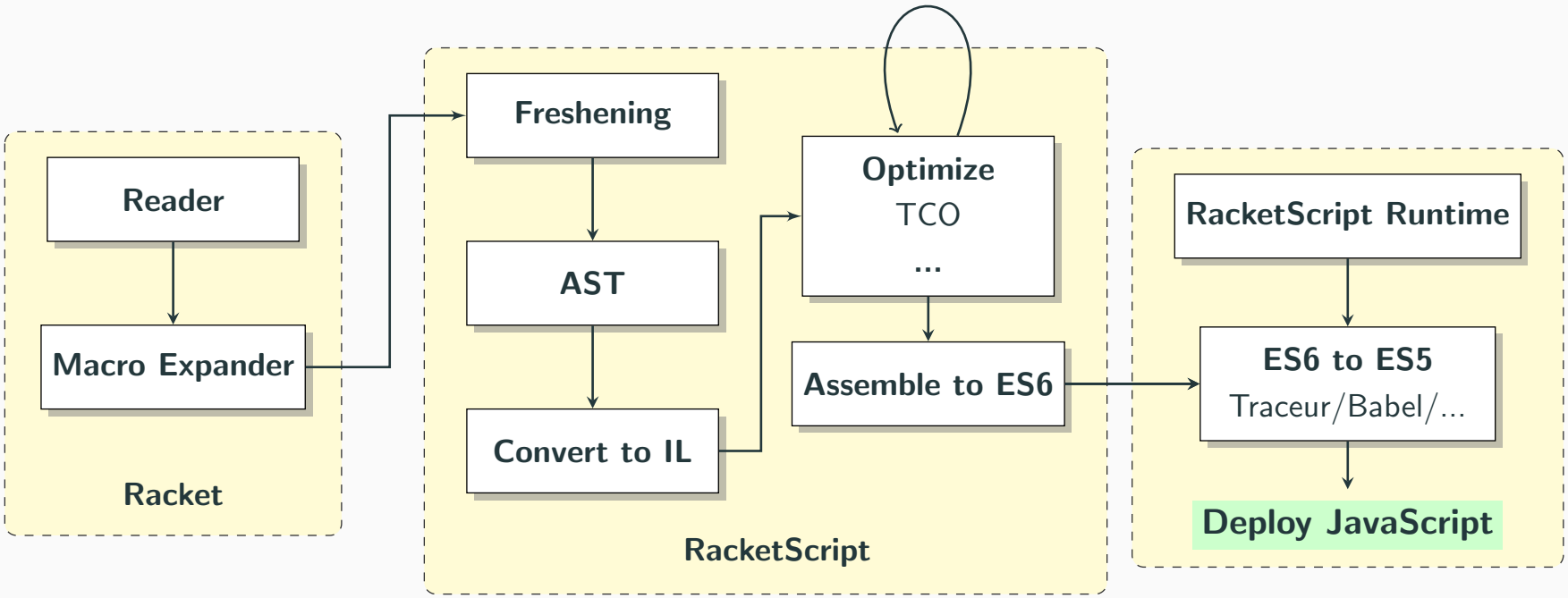
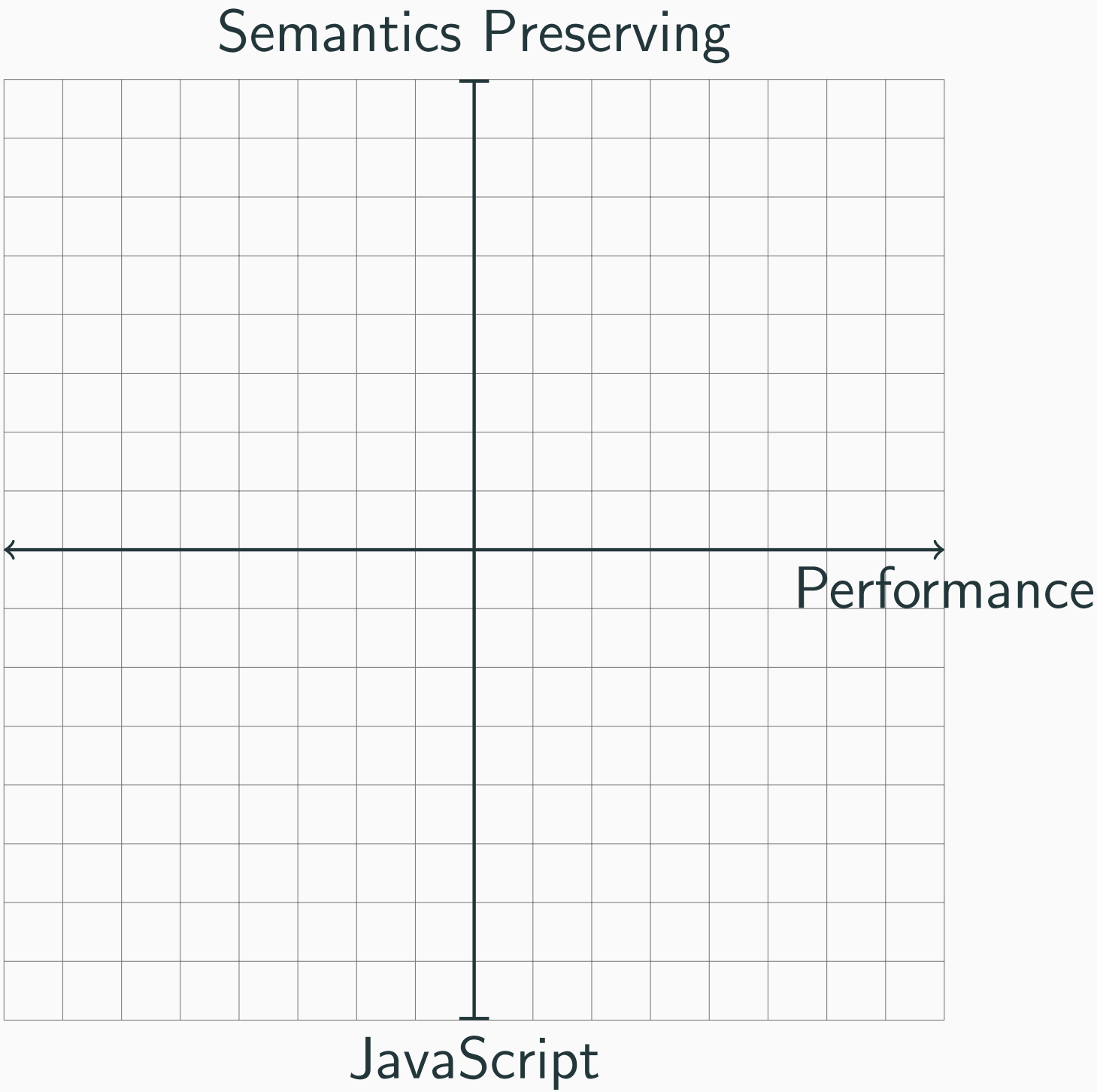
RacketScript

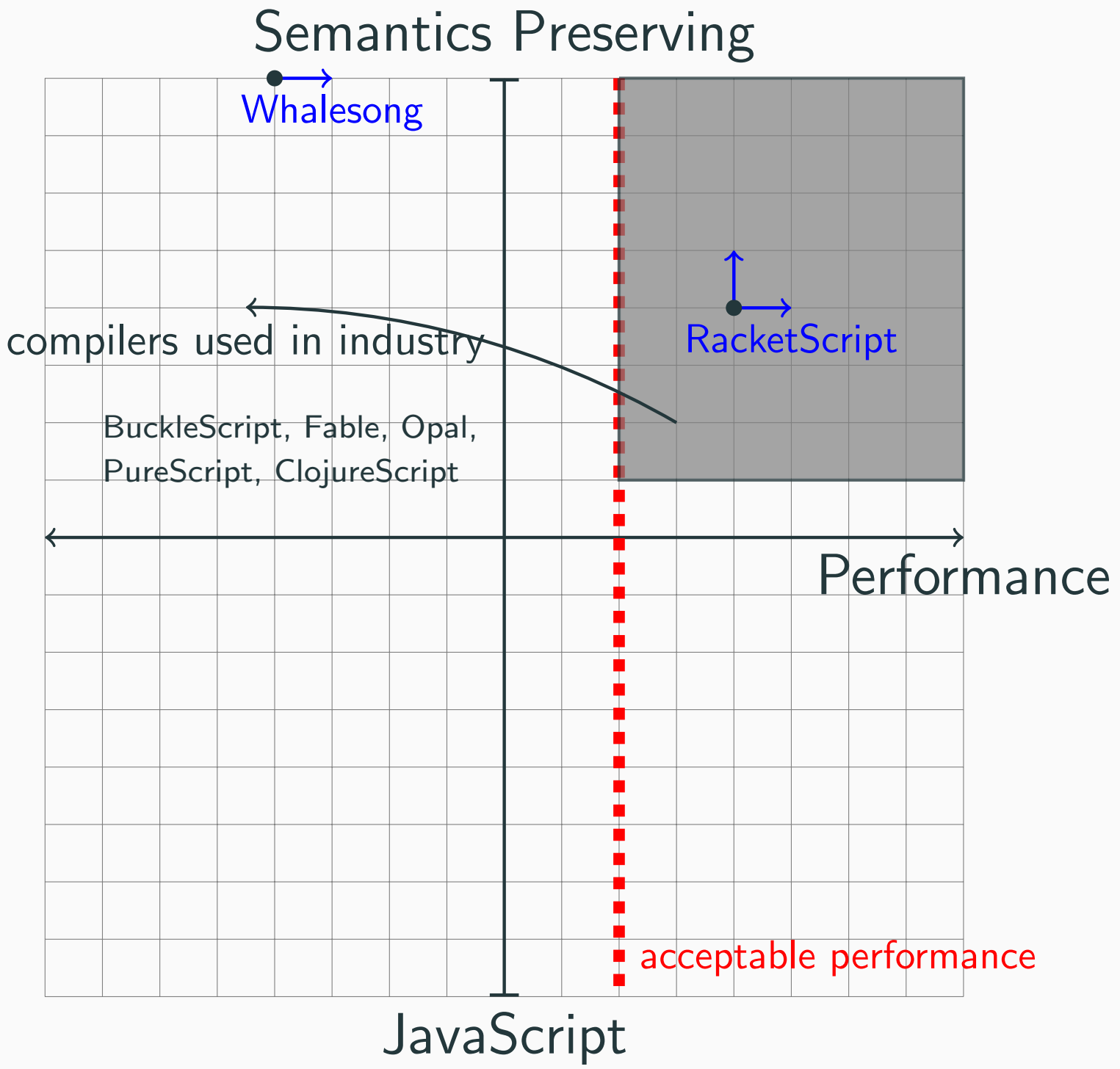
Vishesh Yadav

RacketScript compiler: a big picture view



Demo


Semantics Preserving
Performance
JavaScript


Semantics Preserving
Whalesong
RacketScript
compilers used in industry
BuckleScript, Fable, Opal,
PureScript, ClojureScript
Performance
acceptable performance
JavaScript

```
var _105545=function(M){if(--M.cbt<0){throw _105545;}
M.c.push(new RT.CallFrame(_105547,M.p)); M.addPrompt(RT.DEFAULT_CONTINUATION_PROMPT
M.c.push(new RT.Frame());
M.c[M.c.length-1].pendingApplyValuesProc=M.e[M.e.length-1][4][0][M.e[M.e.length-1][
M.p=M.e[M.e.length-1][3][0][M.e[M.e.length-1][3][1]];
M.a=0;
RT.checkClosureAndArity(M);
M.c.push(new RT.CallFrame(_105551,M.p));
return((M.p).label)(M);};

var _105543=function(M){if(--M.cbt<0){throw _105543;}
M.c.push(new RT.CallFrame(_105545,M.p));
M.addPrompt(RT.DEFAULT_CONTINUATION_PROMPT_TAG,false,M.e.length);
M.v=new RT.Closure(_105521,1,[M.e[M.e.length-1]],"factorial");
M.e[M.e.length-1][0]=M.v;
M.v=RT.VOID;
M.p=M.c[M.c.length-1].label;
M.c.pop();
return(M.p)(M);};

var _105524=function(M){if(--M.cbt<0){throw _105524;}
M.mainModules.push("root/data/src/fF/fFA4j");
};

var _105532=function(M){if(--M.cbt<0){throw _105532;}
M.p=M.e[M.e.length-2];
M.e[M.e.length-2]=M.v;
M.a=2;
RT.checkClosureAndArity(M);
M.e.splice(M.e.length-5,3);
M.c[M.c.length-1].p=M.p;
```

```
import * as $rjs_core from '../runtime/core.js';
import * as M0 from "../runtime/kernel.rkt.js";
var factorial = function(n1) {
  var loop2 = function(_n34, _a45) {
    lambda_start3: while (true) {
      let n3 = _n34;
      let a4 = _a45;
      if (M0.zero_p(n3)) {
        return a4;
      } else {
        _n34 = M0.sub1(n3);
        _a45 = n3 * a4;
        continue lambda_start3;
      }
    }
  };
  return loop2(n1, 1);
};
M0.call_with_values(function() {
  return M0.displayln(factorial(6));
```

RacketScript $\approx$ Racket $\Rightarrow$ JavaScript

Racket → JavaScript : Implemented Features

Data	Language	Approximates
Pair	Lexical Scope	Continuation Marks
List	Case Lambda	Parameters
Structure	Modules	Exceptions
Vector	Variadic Functions	Proper Tail Calls
Hash		
Box		
Equal/Eqv/Eq		

Not supported yet: Continuations, Numbers, Proper Tail Calls, Sub-modules, Contracts . . .

Demo

Evaluation (OLD!)

Program	Source Size		Compiled Size		Minified		TPS	FPS (CR)		FPS (FF)		Idle Time (FF)	
	WS	RS	WS	RS	WS	RS		WS	RS	WS	RS	WS	RS
Hello	44B	46B	1.1MB	214KB	654KB	64KB	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flappy	12KB	36KB	2.0MB	310KB	1.28MB	124KB	60	60	60	49	50	60%	69%
2048	16KB	16KB	2.3MB	318KB	1.4MB	108KB	100	40	60	34	49	16%	47%
Tetris	8KB	8KB	2.0MB	286KB	1.28MB	96KB	60	-	-	-	-	12%	45%
Worms	8KB	8KB	1.8MB	282KB	1.23MB	96KB	10	13	13	58	58	81%	82%
JezzBall	24KB	24KB	2.3MB	302KB	1.6MB	164KB	60	15	60	13	50	3%	48%
Archery	156KB	1.1MB	4.5MB	1.5MB	2.9MB	1.2MB	120	60	60	43	55	15%	44%

- **WS:** Whalesong
- **RS:** RacketScript
- **FPS:** Frames rendered per second (more is beter)
- **Idle time:** More is better
- **CR:** Google Chrome 55
- **FF:** Mozilla Firefox 50
- **TPS:** Ticks per second set by on-tick parameter

Idle Time $\Rightarrow$ Responsiveness

Evaluation (OLD!)

Program	Source Size		Compiled Size		Minified		TPS	FPS (CR)		FPS (FF)		Idle Time (FF)	
	WS	RS	WS	RS	WS	RS		WS	RS	WS	RS	WS	RS
Hello	44B	46B	1.1MB	214KB	654KB	64KB	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flappy	12KB	36KB	2.0MB	310KB	1.28MB	124KB	60	60	60	49	50	60%	69%
2048	16KB	16KB	2.3MB	318KB	1.4MB	108KB	100	40	60	34	49	16%	47%
Tetris	8KB	8KB	2.0MB	286KB	1.28MB	96KB	60	-	-	-	-	12%	45%
Worms	8KB	8KB	1.8MB	282KB	1.23MB	96KB	10	13	13	58	58	81%	82%
JezzBall	24KB	24KB	2.3MB	302KB	1.6MB	164KB	60	15	60	13	50	3%	48%
Archery	156KB	1.1MB	4.5MB	1.5MB	2.9MB	1.2MB	120	60	60	43	55	15%	44%

- **WS:** Whalesong
- **RS:** RacketScript
- **FPS:** Frames rendered per second (more is beter)
- **Idle time:** More is better
- **CR:** Google Chrome 55
- **FF:** Mozilla Firefox 50
- **TPS:** Ticks per second set by on-tick parameter

Idle Time $\Rightarrow$ Responsiveness

$\Uparrow$ FPS

$\Downarrow$ Compiled size

$\Uparrow$ Idle time

$\Uparrow$ Better results from tools

Future Work

More Racket

Numbers

Sub-modules

Contracts

Regular Expression

Optimizations

Inlining

Dead Code Elimination

Trampolines like Hop

Productivity

Remove name mangling

Source-maps

Tooling (eg.

REPL, Build)

Try RacketScript -

https://github.com/vishesh/racketscript

http://rapture.twistedplane.com:8080/