A Language-Based Serverless Function Accelerator

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Outline

Serverless Computing

Containerless

- JavaScript to Rust
- Putting It All Together

Evaluation

What is serverless computing?

Approach to cloud computing...

without servers...

- insert pic

with servers

- insert pic

What is serverless computing?

- Diagram of programmer sending code to AWS, etc.
- Events sent to AWS, etc.

What is a serverless function?

Serverless functions are typically:

1. Short-lived
2. Idempotent

- Login example
- Cite the shared paper

Container-Based Isolation

1. Docker
2. etc

- Plot of using JS natively versus using it within a Container
- Cite the Shared paper

The Language of Trace Trees

Key features:

1. ~~Functions~~
2. Unknown behavior (☠)
3. `event`s, `respond`s, and `handler`s

Set of traced event-handlers

$T ::= n \rightharpoonup h$

Events

$ev ::= \texttt{'listen'} \mid \texttt{'get'} \mid \texttt{'post'} \mid \cdots$

Event Handler

$h ::= \texttt{handler(envId:}x\texttt{,argId:}x\texttt{,body:}t\texttt{)}$

l-values

$tlv ::=$	x	Variable
	$\mid \texttt{*}t\texttt{.}x$	Variable in environment

Addresses

$a ::=$	$t\texttt{.}x$	Address in environment
	$\mid \texttt{\&}x$	Address of variable

Blocks

$tblk ::= \{\ t_1 \cdots t_n \}$

Trace trees

$t ::=$	c	Constant
	$\mid x$	Variable
	$\mid t_1\ op\ t_2$	Binary operation
	$\mid tblk$	Block
	$\mid \texttt{if (}t_1\texttt{)}\ t_2\ \texttt{else}\ t_3$	Conditionals
	$\mid \texttt{while (}t_1\texttt{)}\ tblk$	Loops
	$\mid \texttt{let}\ x\ \texttt{=}\ t\texttt{;}$	Variable declaration
	$\mid tlv\ \texttt{=}\ t\texttt{;}$	Assignment
	$\mid tblk$	Block
	$\mid \ell\texttt{:}t$	Labelled trace
	$\mid$ ☠	Unknown behavior
	$\mid \texttt{break}\ \ell\ t\texttt{;}$	Break with value
	$\mid \texttt{event(}ev\texttt{,}t_{arg}\texttt{,}t_{env}\texttt{,}n\texttt{)}$	Event handler
	$\mid \texttt{respond(}t\texttt{)}$	Response
	$\mid \texttt{env(}x_1\texttt{:}a_1\texttt{,}\cdots\texttt{,}x_n\texttt{:}a_n\texttt{)}$	Environment object
	$\mid \texttt{*}t\texttt{.}x$	Value in environment

The Trace Compiler

Key features:

1. Something

- figure of trace compiler.
  Not to be read

The Trace Runtime System

Key features:

1. Something

- figure of trace runtime system. Not to be read

Containerless

- "in-action" diagram from previous talk

Latency

- Latency plots

Utilization

- Utilization plots

Questions?

- Compilation of plots or something