Hack for HipHop

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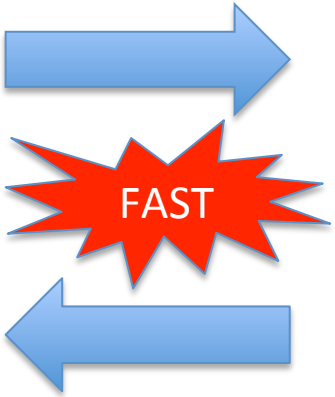
What is PHP good at?

- PHP features:
  - Very fast installation time
  - A lot of libraries
  - Easy to learn
  - Scales well (avoids concurrency problems)
- But do we really care?

PHP: a FAST feedback loop

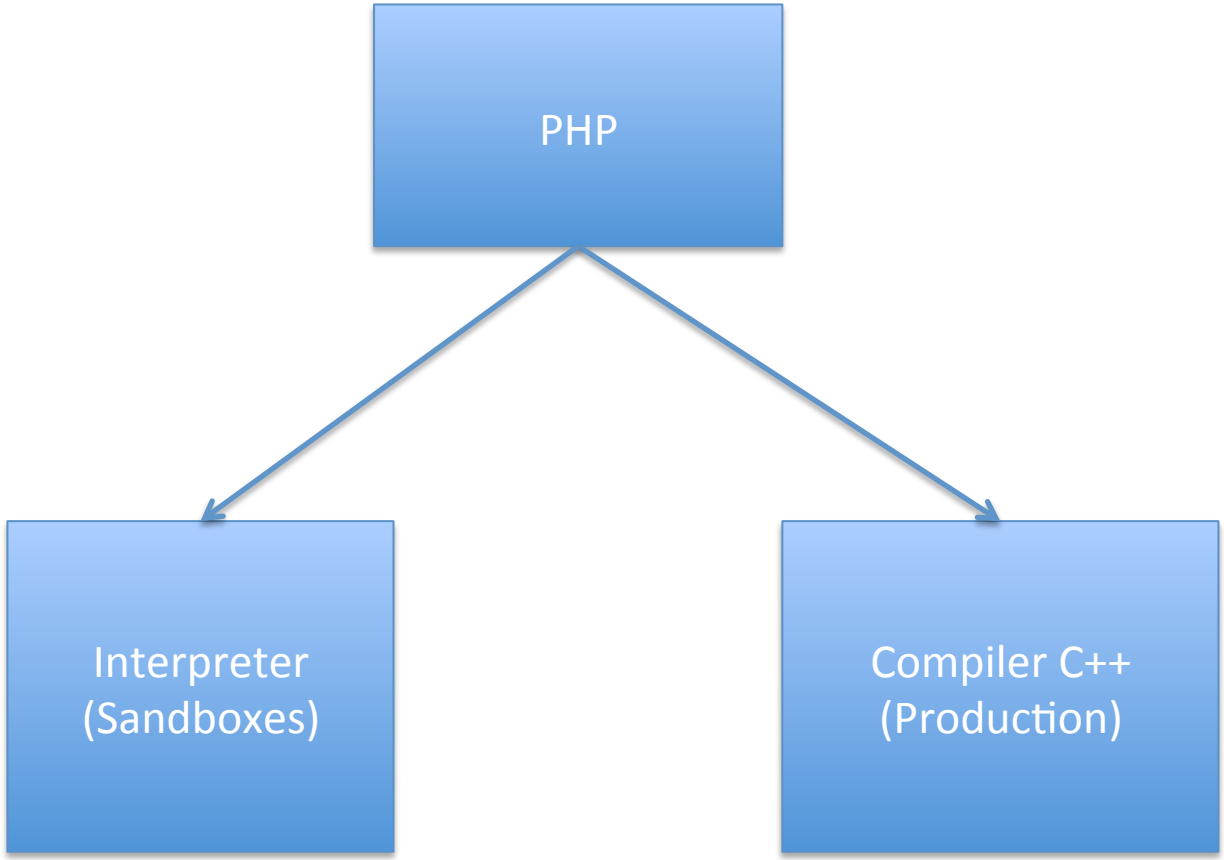
dynamic



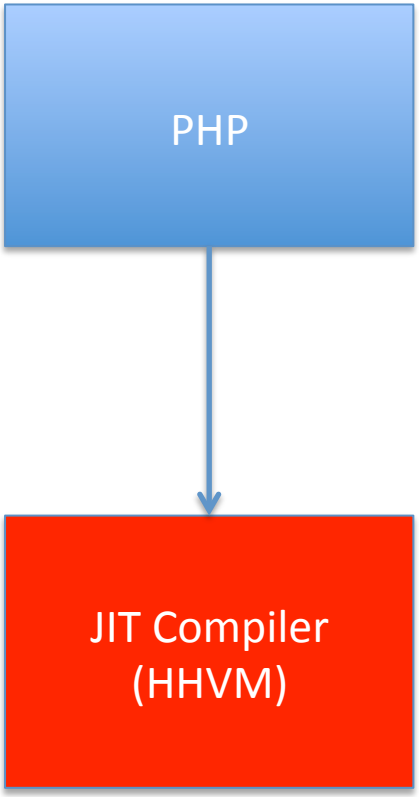
PHP: the challenges at scale

- Performance (runtime):
  - At this scale, 1% matters!
  - Hard to optimize
- Development:
  - Refactoring is difficult
  - Bugs are caught at runtime
  - Tooling is primitive

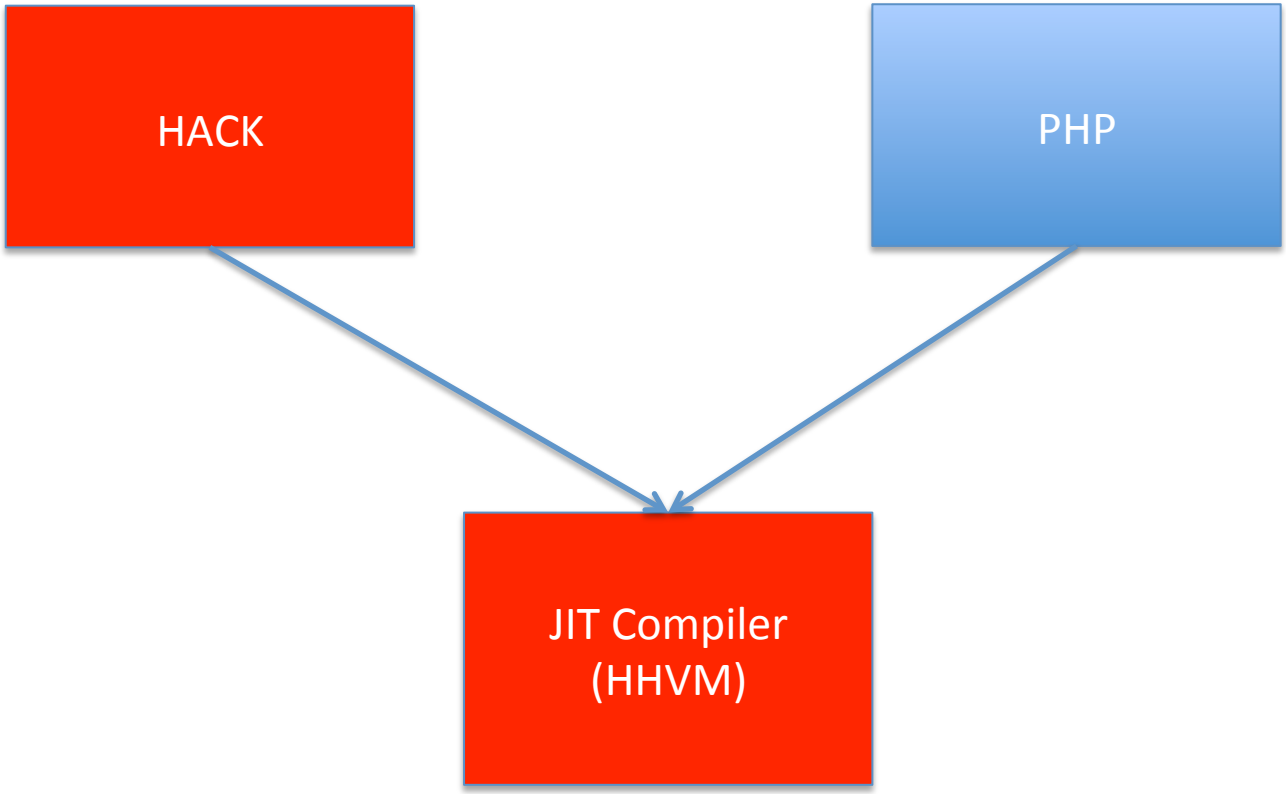
Scaling PHP runtime: HipHop



Scaling PHP runtime: HHVM



Scaling PHP development: Hack



HACK

(or Hack for HipHop)

Hack

- A **statically typed** language for HHVM
- Compatible with PHP:
  - Interoperates with no overhead
  - Same representation at runtime
- Evolved from PHP:
  - If you know PHP, you know Hack!
- Designed for **incremental adoption**:
  - Gradual typing

DEMO

Hack Type System

- What must be annotated?
  - Class members
  - Function parameters
  - Return types
- What is inferred?
  - All the rest
- Annotating is an incremental process

Hack Types

- Nullable: `?int`, `?MyClassName`
- Tuples: `(int, bool, X)`
- Closures: `(function(int): int)`
- Collections: `Vector<int>`, `Map<string, int>`
- Generics: `A<T>`, `foo<T>(T $x): T`
- Constraints: `foo<T as A>(T $x): T`
- Type aliasing: `[new]type t = …`
- Extensible records: `shape('x' => int)`

DEMO

HACK INTERNALS

Working at scale: Hack

- We knew we wanted an IDE from day one
- Big code base
- The solution, a server:
  - The server type-checks all the files
  - Keeps track of the dependencies
  - Recomputes types when something changed

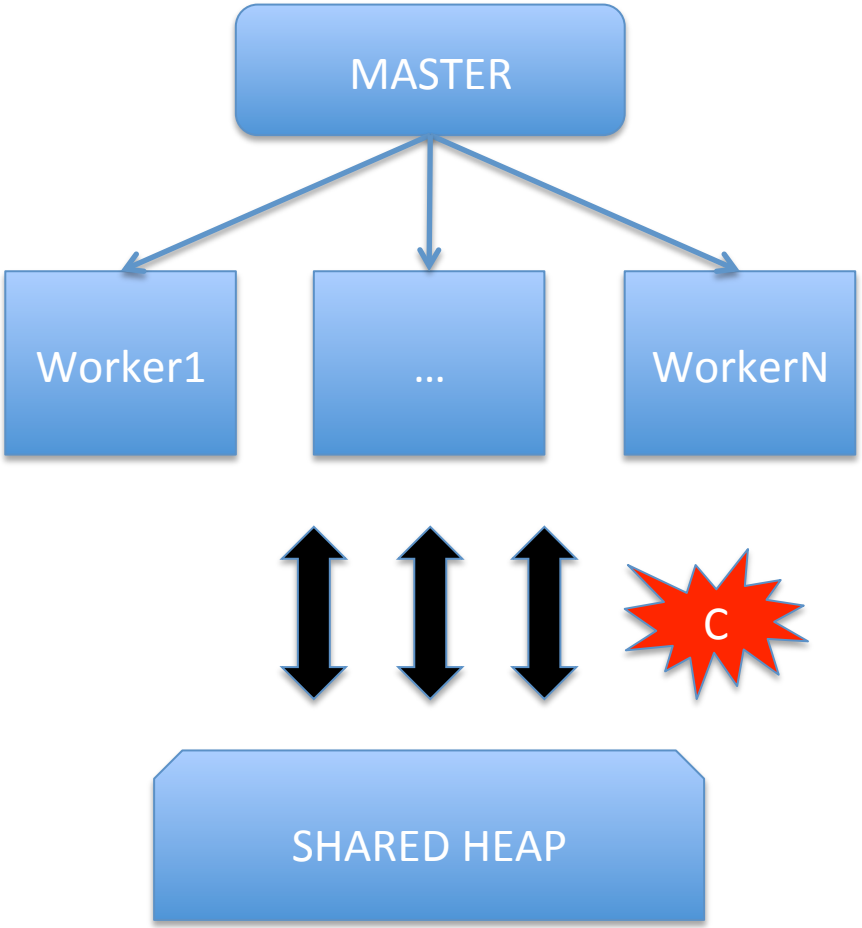
Working at scale: The Constraints

- Auto-complete requires very low latency
- Users use version control (e.g., switching between branches)
- We must use a reasonable amount of RAM
- We must have a reasonable initialization time
- Must be **stable**

Hack is written in Ocaml!

- OCaml was a good choice:
  - Ideal for symbolic computation
  - Excellent performance
  - Can be compiled to JS
  - Interoperates well with C
- The challenge:
  - The runtime doesn't support multicore

Hack architecture



OCaml at Scale

- IPC:
  - Pipes, sockets etc …
  - Caching layers to avoid deserialization cost
  - Carefully crafted lock free data structures (C code)
- Garbage collection:
  - Workers keep a small heap
  - Shared memory is compacted by the master
- OCaml makes you think hard about shared objects:
  - And that's a good thing! ;-)

Questions?