Clojure in Practice

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About me

- Working at Trifork for about 6 years on Web, JavaScript, Java/JEE, Ruby/Rails, iOS, Conferences and Training.
- Last two years on iOS as part Trifork teams for some of the larger Danish banks.
- Clojure and Rich Hickey fan-boy!
- Founder of Danish Clojure Users' Group (http://clojure.higher-order.net).
- Recently part of a start-up doing mobile automated testing: LessPainful (http://www.lesspainful.com).

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About you :)

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- What kind of technologies are you working with?
- What are the pain points in your everyday software development life?

Traditional Development Experience

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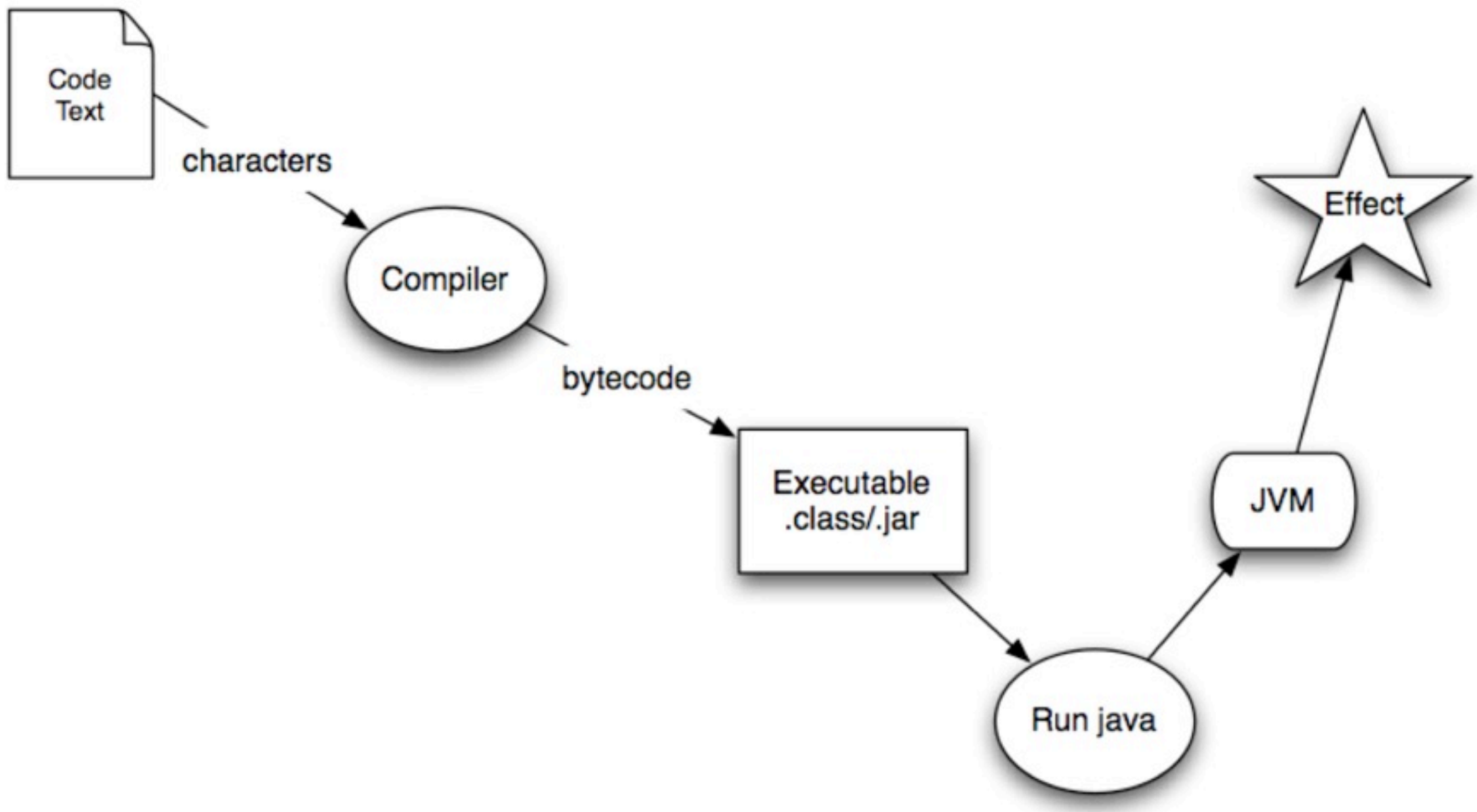

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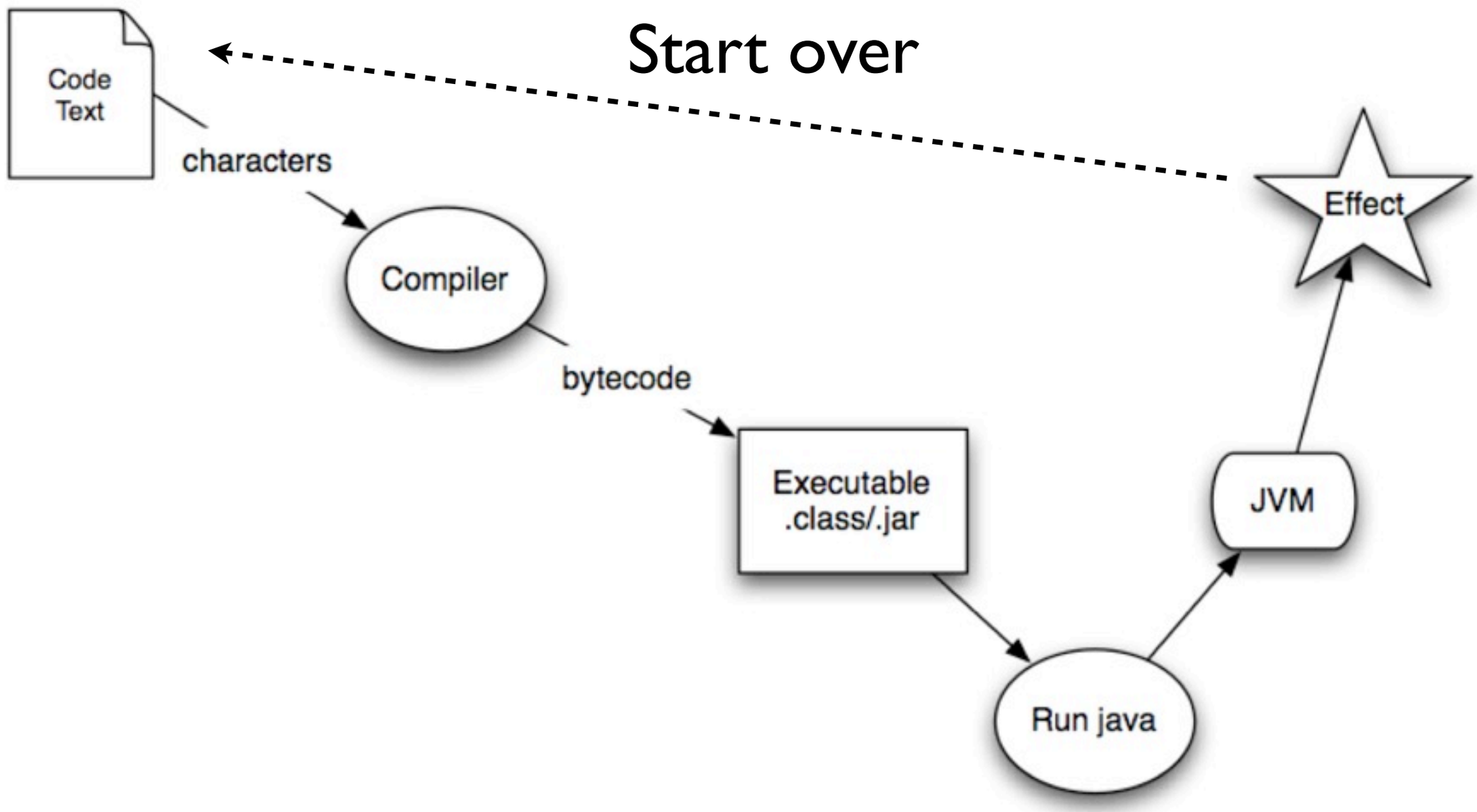
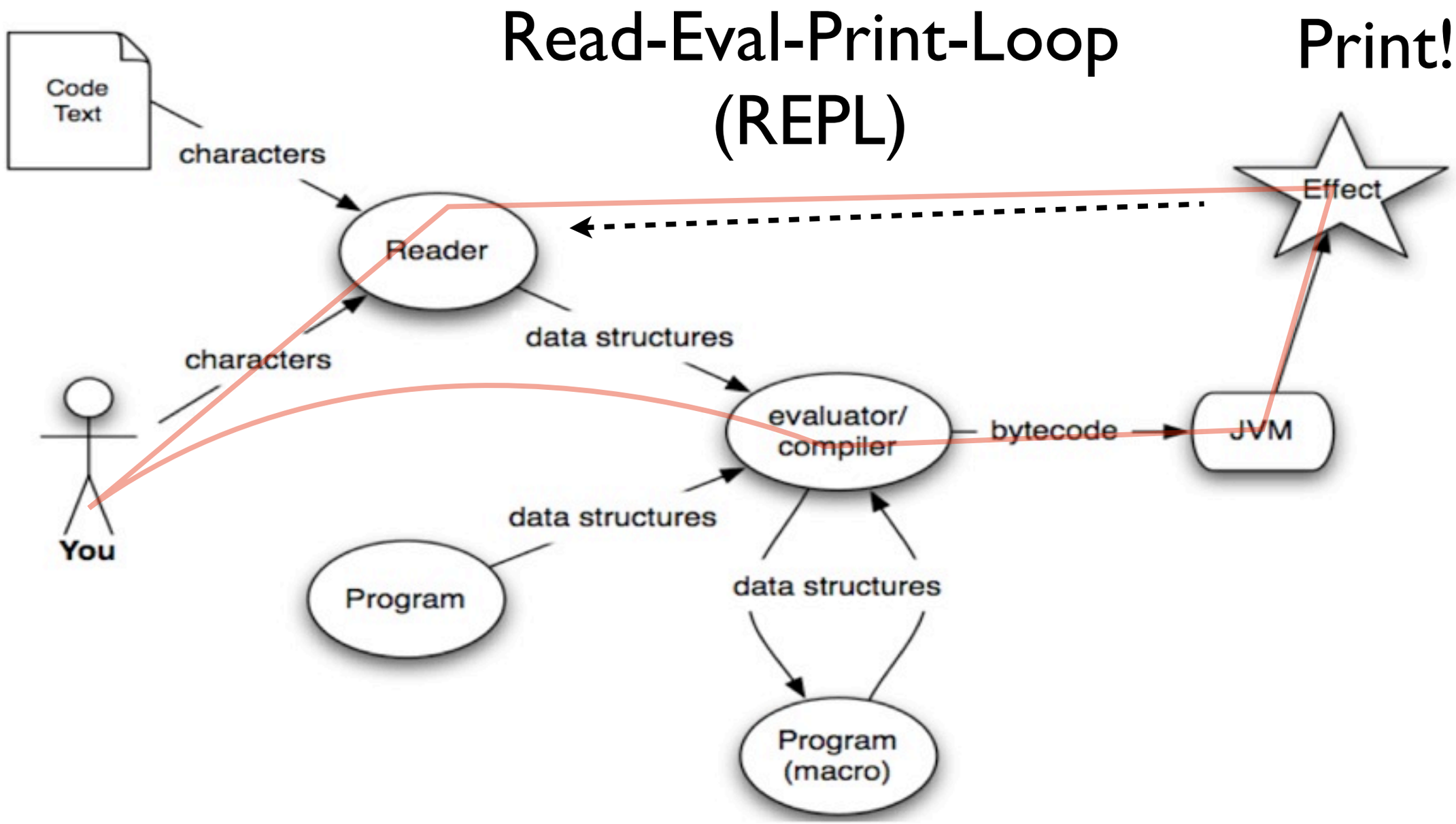


The Clojure Experience



Agenda

- Very Short and very high-level intro to Clojure
- Clojure in Practice
  - Pointers: How to get started? Installation and tools.
  - Pointers: Editing, running, debugging.
- A simple mini app:
  - sucking data off AWS.
  - data manipulation
  - storing it in a Lucene index

Note!

Note!

- Please note that there is so much more to Clojure than what I'll present.
  - In this talk, we focus on the practical stuff: installing, development experience and tools.
- So do checkout the references at the end of these slides, particularly the videos by Rich Hickey: http://clojure.blip.tv
- Come to Goto Copenhagen 2012, http://gotocon.com/cph-2012/
  - Meet Rich Hickey and Stuart Halloway
  - Join the free Danish Clojure Users Group event (clojure.higher-order.net)

Clojure in one slide

- Functional dynamic language
  - Persistent data structures, pure functions, sequence library
- A unique programming & concurrency model
  - State management constructs: var, ref, atom, agent
- On-the-fly & AOT compilation: JVM bytecode
  - Deep two-way JVM interop.; embraces host
- A LISP family member
  - Meta programming, closures, interactivity

Data structures

- Lists - singly linked, grow at front
  - `(1 2 3 4 5), (fred ethel lucy), (list 1 2 3)`
- Vectors - indexed access, grow at end
  - `[1 2 3 4 5], [fred ethel lucy]`
- Maps - key/value associations
  - `{:a 1, :b 2, :c 3}, {1 “ethel” 2 “fred”}`
- Sets `#{fred ethel lucy}`
- Everything Nests

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  - Java/C# alsp has parens, they're just in a different place!
  - obj.method(a,b) vs (method object a b) -- that's not hard :)

Syntax

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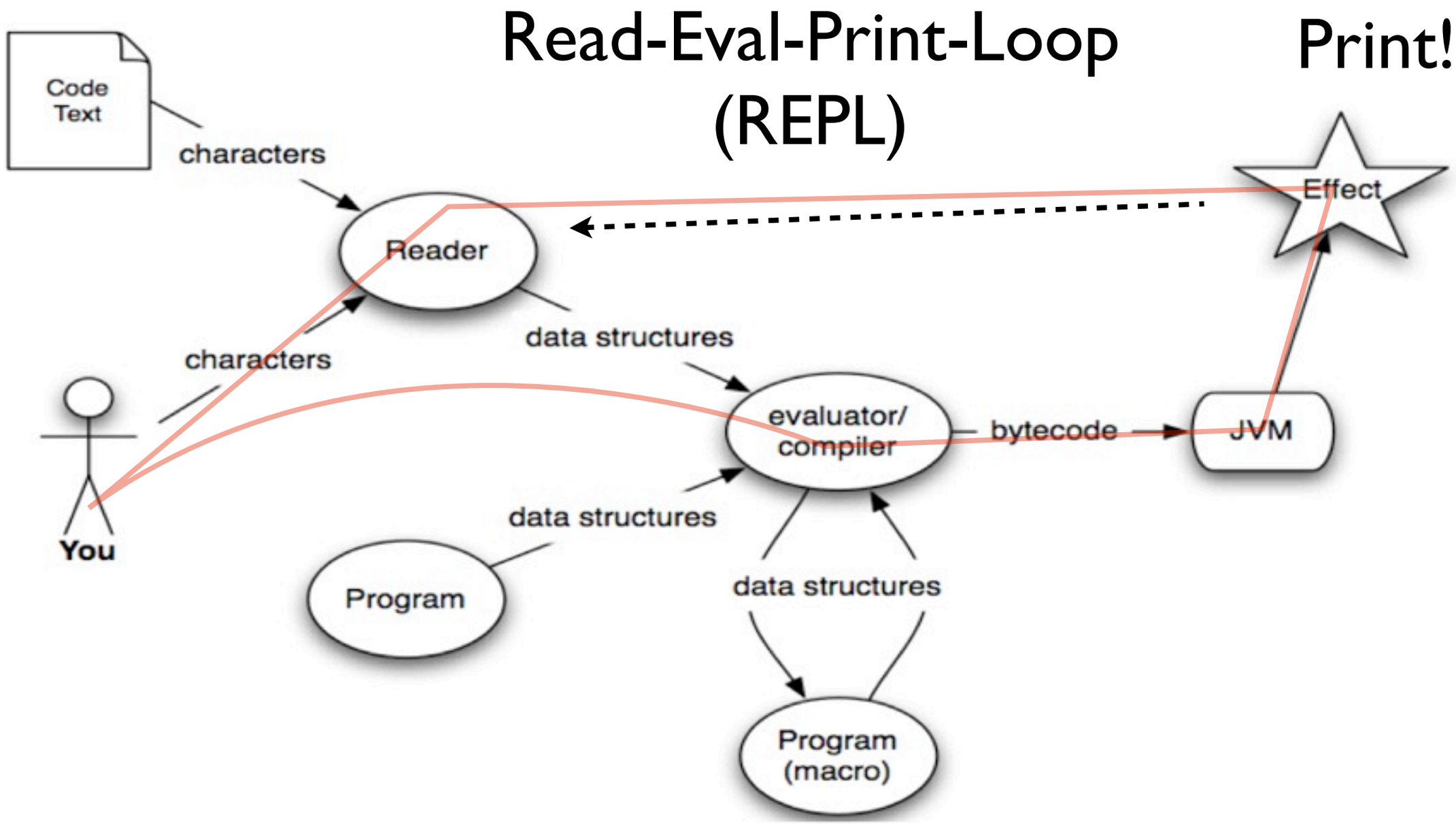
- You use parens to describe data: () [] {} #{}.
  - Java/C# alsp has parens, they're just in a different place!
  - obj.method(a,b) vs (method object a b) -- that's not hard :)
- Please, please, please do not judge the language by your initial impressions of its syntax!
  - There is so much beauty inside the ()
  - Does not take long to get used to, and then you appreciate it.

The Clojure Experience



What is the most powerful program on my machine?

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```
krukow:~/cip/demo$ ls
README          lib             resources       test
classes         project.clj     src
krukow:~/cip/demo$ ps aux | grep -v grep | grep \"/#{@test.id}.logcat\" | awk '{print $2}' | xargs kill -9
krukow:~/cip/demo$
```

What is the most powerful program on my machine?

```
user>
```

The REPL - isn’t it cool ? :)

Syntax and REPL examples

def, fn, defn, call

- http://tryclj.com/

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- If M is a hash map, then **assoc**(M,k,v) is a map which is like M except that it maps key **k** to value **v** (almost like 'M.add(k,v)').
  - (within 1-4x their mutable counterparts, or faster :)

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- If M is a hash map, then **assoc**(M,k,v) is a map which is like M except that it maps key **k** to value **v** (almost like 'M.add(k,v)').
  - (within 1-4x their mutable counterparts, or faster :)
- Further: they are persistent meaning that the operations are non-destructive, e.g.,
  - Both M and **assoc**(M,k,v) are usable and preserve their performance guarantees.

NO!

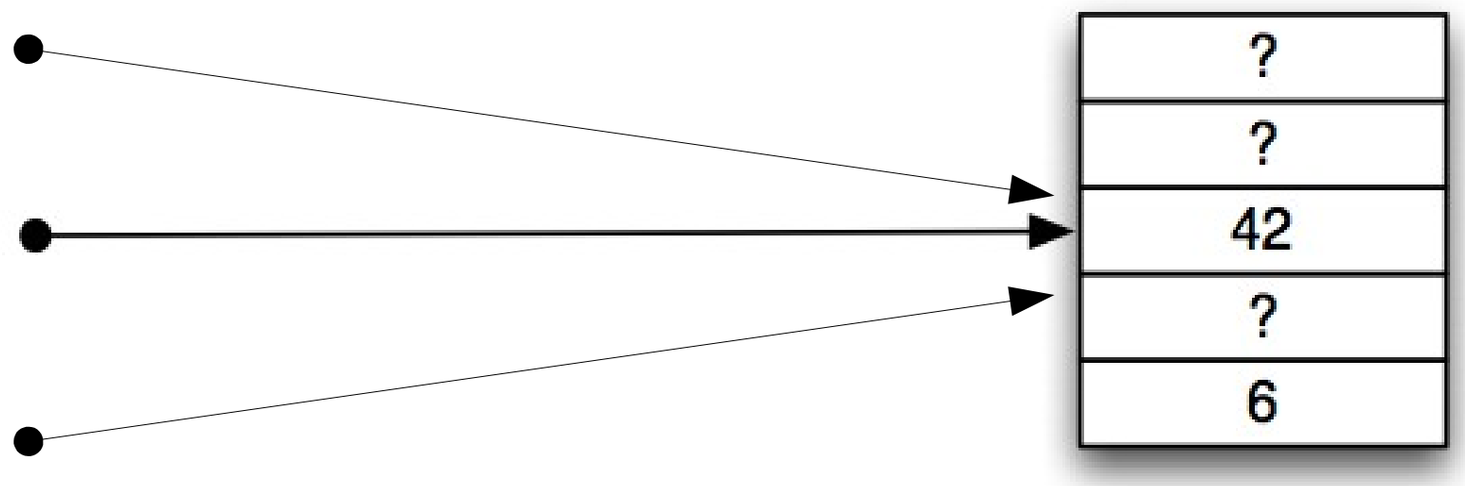
NO!

- ... that doesn't mean copying the entire structure(!)
- See my blog for explanation:
- http://blog.higher-order.net/2009/02/01/understanding-clojures-persistentvector-implementation/
- http://blog.higher-order.net/2009/09/08/understanding-clojures-persistenthashmap-deftwice/
- http://blog.higher-order.net/2010/08/16/assoc-and-clojures-persistenthashmap-part-ii/
- http://blog.higher-order.net/2010/06/11/clj-ds-clojures-persistent-data-structures-for-java/

Clojure Philosophy

- Most programs could have dramatically less state than they do - we introduce state just because it is the language default.
- In Clojure
  - We rarely use mutable objects, instead immutable data and pure functions.
  - Explicitly mark the parts of the program that have state!
  - State change is managed by Clojure.
  - References atomically change from referring to immutable objects.

Direct references to Mutable Objects

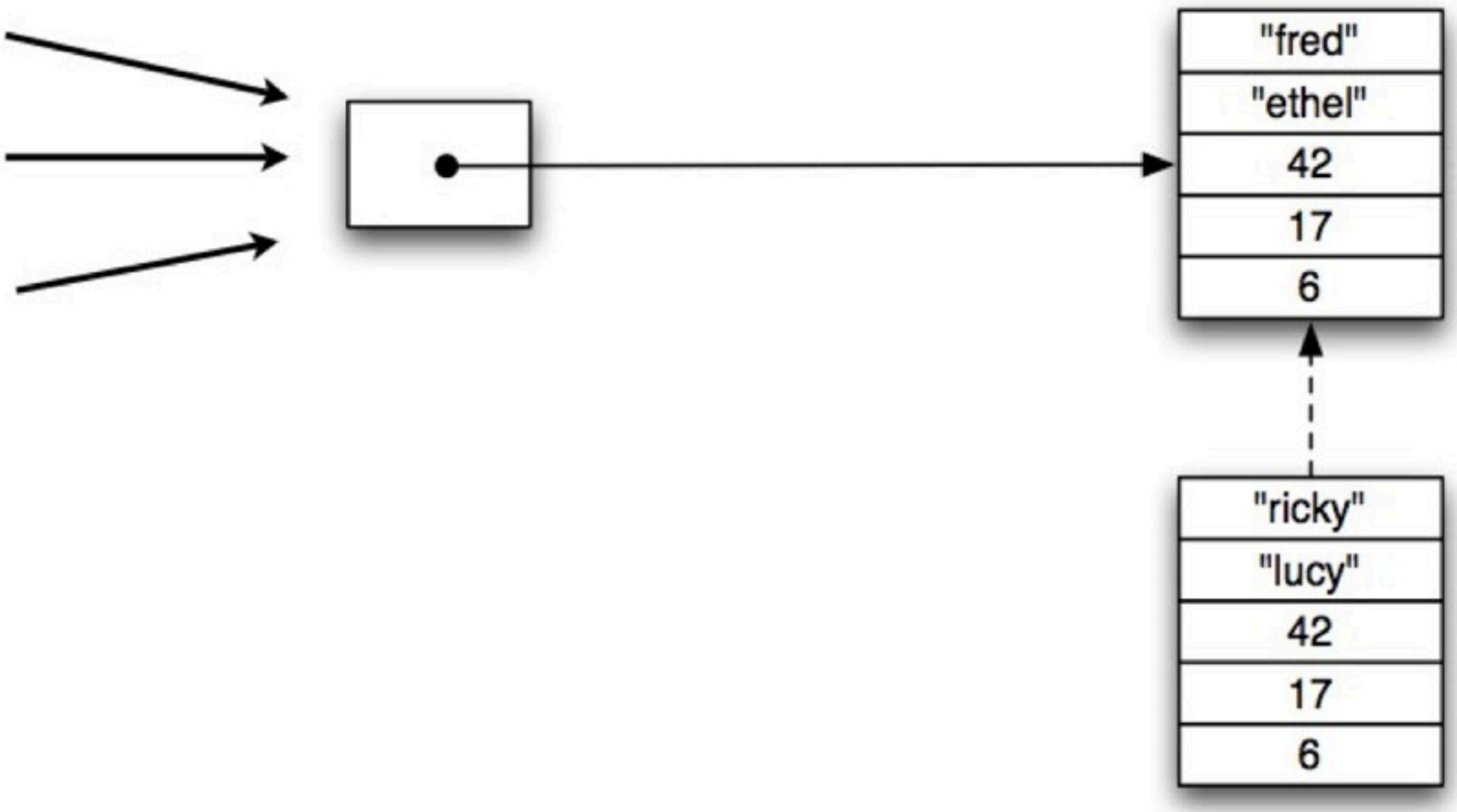


Ensuring a consistent Object is on your head

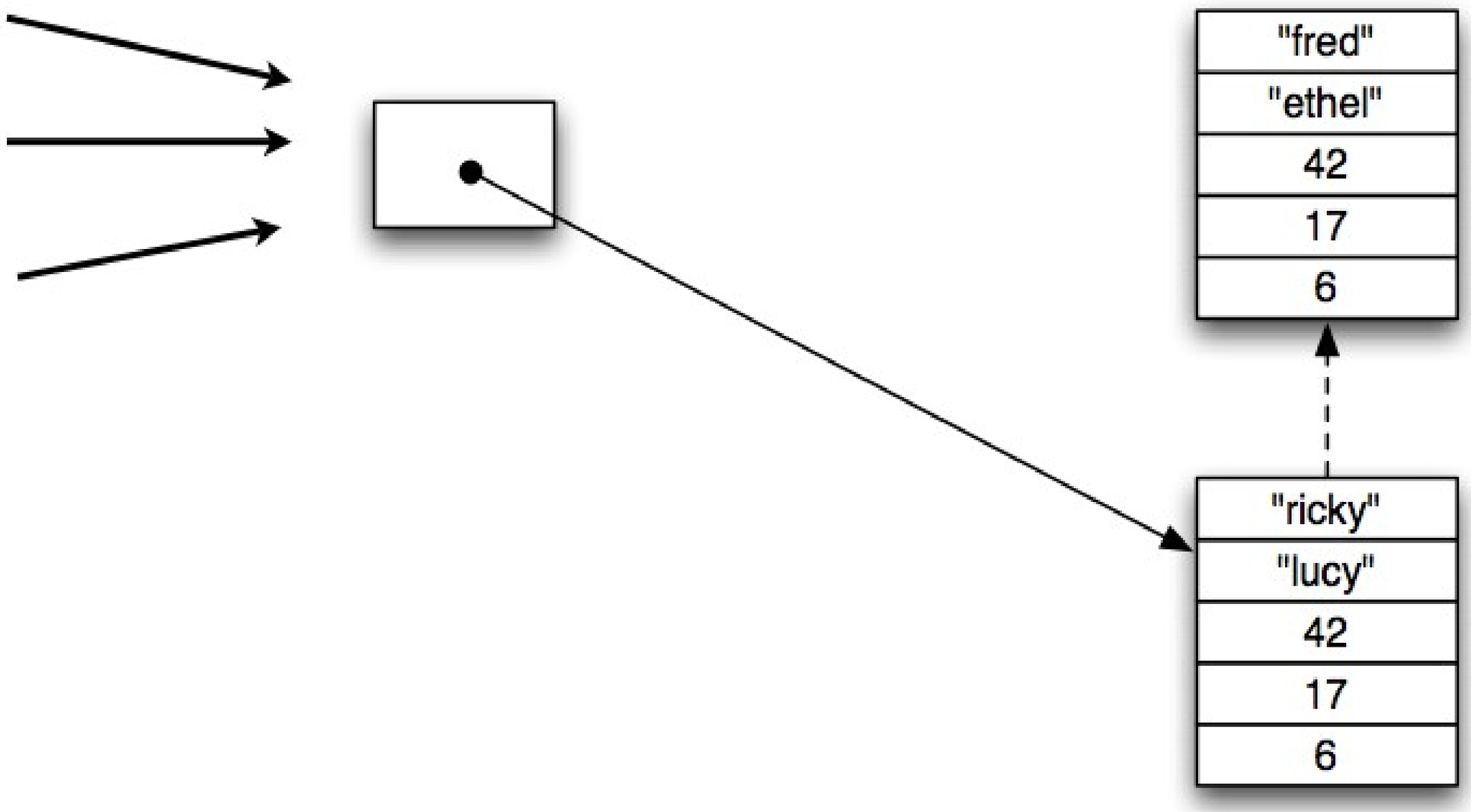
Indirect references to Immutable Objects

Never an inconsistent Object

Persistent 'Edit'



Atomic Update



Atom

- Simplest reference type in Clojure
- (def a (atom [“fred” “ethel” 42 17 6]))

Atom

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Atom

- Simplest reference type in Clojure
- (def a (atom [“fred” “ethel” 42 17 6]))

- @a dereferences a
- (swap! a fun) atomically swaps the value of a to the result of applying fun to the current value
- (AtomicReference for Java people)

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Clojure in Practice

Getting started

- http://tryclj.com/ is just to play with Clojure.
- To run locally you need Java 1.5 and Clojure
  - Just a jar file (http://clojure.org/getting_started)
    - (for non-Java gues this is like a bundled java app)
- This is enough to try simple examples.
  - It does not show you the full development experience.
- To get more serious you need an IDE and some tools...
  - This takes some effort to install.
  - http://dev.clojure.org/display/doc/Clojure+Tools

My preferred tools

- There are several options available for IDEs
  - Emacs, Eclipse (CounterClockwise), IntelliJ(La Clojure), Netbeans (Enclojure)..
  - Probably CounterClockwise is the easiest to use right now at least if you're used to Eclipse.
- My preferred tools are
  - Emacs + Sam Aaron's Live Coding Emacs Setup for Overtone
  - Leiningen (project management, dependencies, Emacs support)
  - slime+swank-clojure and CDT for REPL and debugging

(Not-so) Easy Guide

- Download Emacs
  - http://dev.clojure.org/display/doc/Getting+Started+with+Emacs, see detailed comment by: Muthu Bhuvana Sundaram T
  - MacOS: http://emacsformacosx.com
- Install https://github.com/overtone/live-coding-emacs
- Install Leiningen https://github.com/technomancy/leiningen
- Swank Clojure: https://github.com/technomancy/swank-clojure
  - `lein plugin install swank-clojure 1.4.0`
- Lab Repl exercises https://github.com/relevance/labrepl

Tools Demo

Emacs,
Lein
Live Emacs Coding
Swank Clojure
CDT
REPL tools

Example

JVM Interop

A small sample app!

References

- http://clojure.org/
- http://clojure.blip.tv/
- Stuart Halloway: Programming Clojure
- Chris Houser, Michael Fogus: The Joy of Clojure
- Rich Hickey
- http://www.infoq.com/presentations/hickey-clojure
- http://www.infoq.com/presentations/Simple-Made-Easy
- http://www.infoq.com/presentations/Are-We-There-Yet-Rich-Hickey
- http://www.infoq.com/presentations/Value-Identity-State-Rich-Hickey
- DCUG: http://clojure.higher-order.net/