A language for humans and computers

Andrea Manzini

11/11/2023

`DevFest Trento`

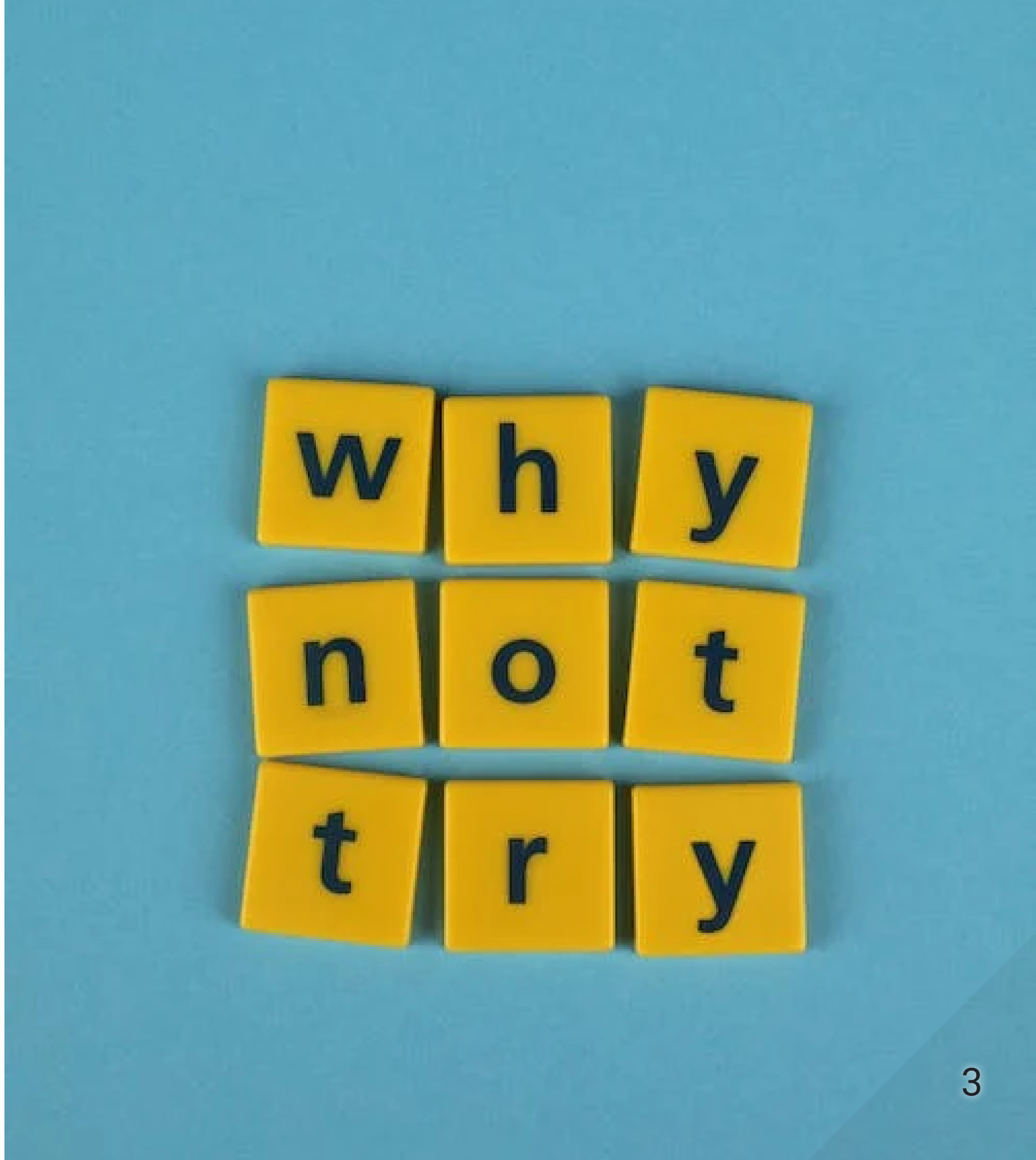
Andrea Manzini

- Who ? ➡️ https://ilmanzo.github.io
- What ? ⬇️

Software Engineer + Package Maintainer @ SUSE

Why I'm here ?

- Open Source enthusiast && contributor
- Knowledge sharing
- Crystal Ambassador



Crystal is ...

A language for Humans 🧑

- Clean code
- Batteries included
- Avoid surprise fail
- No *bureaucracy*

once upon a C ...

task: print 'Hello' 3 times

```
int i = 0
while(i < 3) {
  printf("Hello\n");
}
```

😵 ... can you spot the error ?

Clean Code?

```
main.c:5:1: error: expected ‘,’ or ‘;’ before ‘while’
```

```
int i = 0;
while(i < 3) {
  printf("Hello\n");
}
```

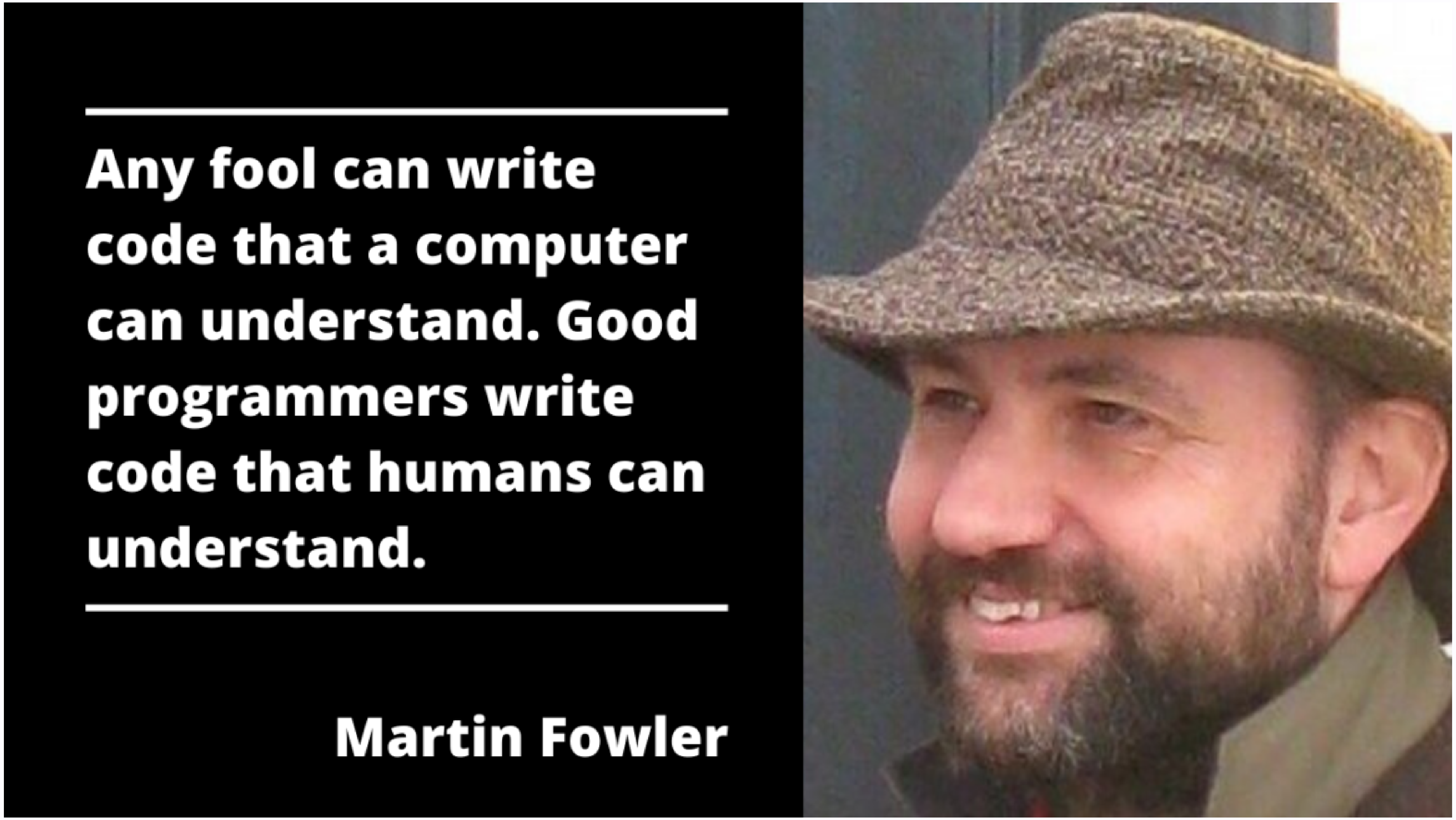
ops, I did it again ...😵

task: print 'Hello' 3 times

```
int i = 0;
while(i < 3) {
  printf("Hello\n");
  i++;
}
```

Crystal is designed to be... Clear

```
3.times do
 print "Hello"
end
```



Any fool can write code that a computer can understand. Good programmers write code that humans can understand.

Martin Fowler

from *Refactoring: Improving the Design of Existing Code, 1999.*

Clean Code focuses on problem, not on solution

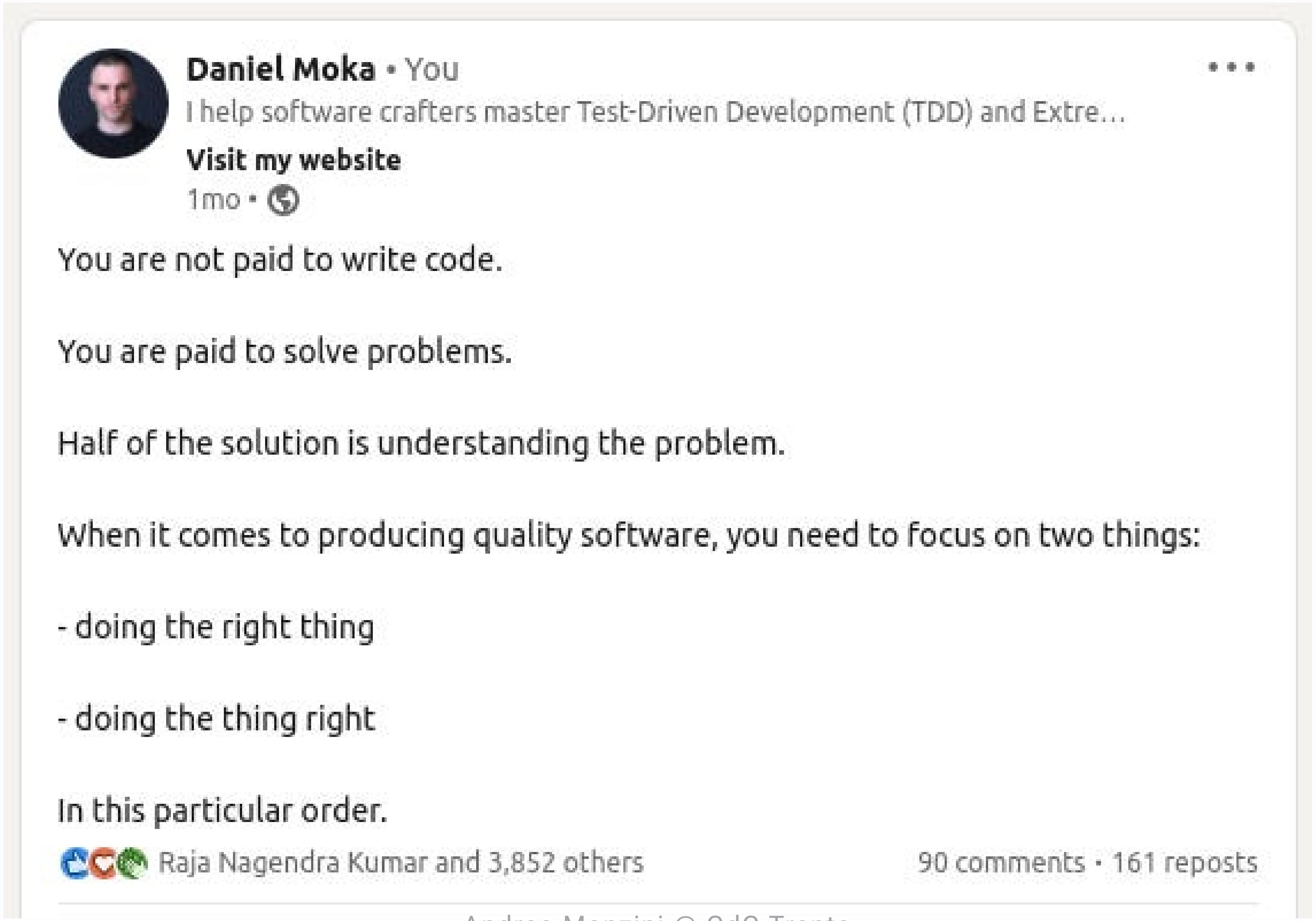
*"**Clean Code** tells a story of the problem it solves. If your namings contain a lot of technical jargon, then it’s probably focusing on HOW. Clean Code focuses on WHAT."*

from "Craft Better Software" by Daniel Moka

Clean Code focuses on problem, not on solution

"Technical names such as DTOs, flags, and records are all related to specific solutions on the computer. They are code smells telling that your code focuses on a solution space. Instead, you should write code that speaks about the problem."

from "Craft Better Software" by Daniel Moka



Daniel Moka • You

I help software crafters master Test-Driven Development (TDD) and Extre…

Visit my website

1mo •

You are not paid to write code.

You are paid to solve problems.

Half of the solution is understanding the problem.

When it comes to producing quality software, you need to focus on two things:

- doing the right thing

- doing the thing right

In this particular order.

Raja Nagendra Kumar and 3,852 others

90 comments • 161 reposts

Human likes *batteries included* 🔋🔋

```
require "http/server"

class HttpHello
  PORT = 8080

  def self.start(port = PORT)
    server = HTTP::Server.new do |context|
      context.response.content_type = "text/plain"
      context.response.print "Hello World, got #{context.request.path}!"
    end

    Log.info { "Listening on http://localhost:#{port}/" }
    server.listen port
  end
end

HttpHello.start
```

Humans like their program to not randomly fail

Or: how to prevent the billion-dollar mistake

```
class Duck
  def quack
    puts "🦆 quack!"
  end
end

if rand(2) >= 1 # Flip a coin
  duck = Duck.new
end

duck.quack
```

```
$ crystal duck.cr
Error: undefined method 'quack' for Nil (compile-time type is (Duck | Nil))
```

Bureaucracy ? No thanks

```crystal
struct Nil
  def quack
    puts "sshhh 🤫"
  end
end
```

```
$ crystal duck.cr
sshhh 🤫
```

Duck typing + monkey patching (like in Ruby)

Summing up

- Pretty like Ruby
  - similar syntax, compatibility is not a goal
- Safe: statically checked types
- Has type inference
  - no need to write boilerplate types
  - duck typing and monkey patching
- The community (checkout CrystalConf!)

A language for computers

`Computers like native code` 🤖

- performant execution
- low memory footprint
- cross-platform/os
- easy to deploy

performance 🚀

```ruby
def fibonacci(n)
  return n if n < 2
  fibonacci(n - 1) + fibonacci(n - 2)
end

puts fibonacci(47)
```

```
$ /usr/bin/time -v ruby fibonacci.rb
2971215073
        Command being timed: "ruby fibonacci.rb"
        User time (seconds): 178.38
        System time (seconds): 0.01
        Elapsed (wall clock) time (h:mm:ss or m:ss): 2:58.39
  --->  Maximum resident set size (kbytes): 23296 <---
        Average resident set size (kbytes): 0
        Major (requiring I/O) page faults: 0
        Minor (reclaiming a frame) page faults: 4629
```

low resource usage 🪶

```crystal
def fibonacci(n : UInt32)
  return n if n < 2
  fibonacci(n - 1) + fibonacci(n - 2)
end

puts fibonacci(47)
```

```
/usr/bin/time -v ./fibonacci_cr
       User time (seconds): 8.39
       System time (seconds): 0.00
       Elapsed (wall clock) time (h:mm:ss or m:ss): 0:08.39
 --->  Maximum resident set size (kbytes): 3328  <---
       Average resident set size (kbytes): 0
       Major (requiring I/O) page faults: 0
       Minor (reclaiming a frame) page faults: 296
```

Go, Crystal 🏁

```
$ hyperfine fibonacci_*

Benchmark 1: ./fibonacci_cr
  Time (mean ± σ):      8.563 s ±  0.081 s
  Range (min … max):    8.464 s …  8.702 s

Benchmark 2: ./fibonacci_go
  Time (mean ± σ):     11.376 s ±  0.176 s
  Range (min … max):   11.172 s … 11.755 s

Summary
  ./fibonacci_cr ran
    1.33 ± 0.02 times faster than ./fibonacci_go
```

What about binary size ?

```
$ ls -lh fibonacci_*
-rwxr-xr-x 1 andrea andrea 405K Oct 28 10:45 fibonacci_cr
-rwxr-xr-x 1 andrea andrea 1.2M Oct 28 10:15 fibonacci_go
```

see also benchmarks I - benchmarks II

Most Important Note: **Distrust benchmarks!** 👈

Computers like many operating systems

cross platform:

- MacOs
- Linux
- FreeBSD
- OpenBSD
- Windows
- Android

And cross compilation

Some extras

- "Go style" Human friendly concurrency via CSP
- Code documentation generation
- Integrated test framework
- Metaprogramming via macros
- Shards: dependency manager
- C-binding without tears
- An extensive, modern standard library

"One" more thing

- There's more to Crystal: find out at https://www.crystal-lang.org
- Crystal is built on openSUSE's Open Build Service
- Shameless plug: Crystal koans
- If you like new languages, check out also Nim Italia

Thanks

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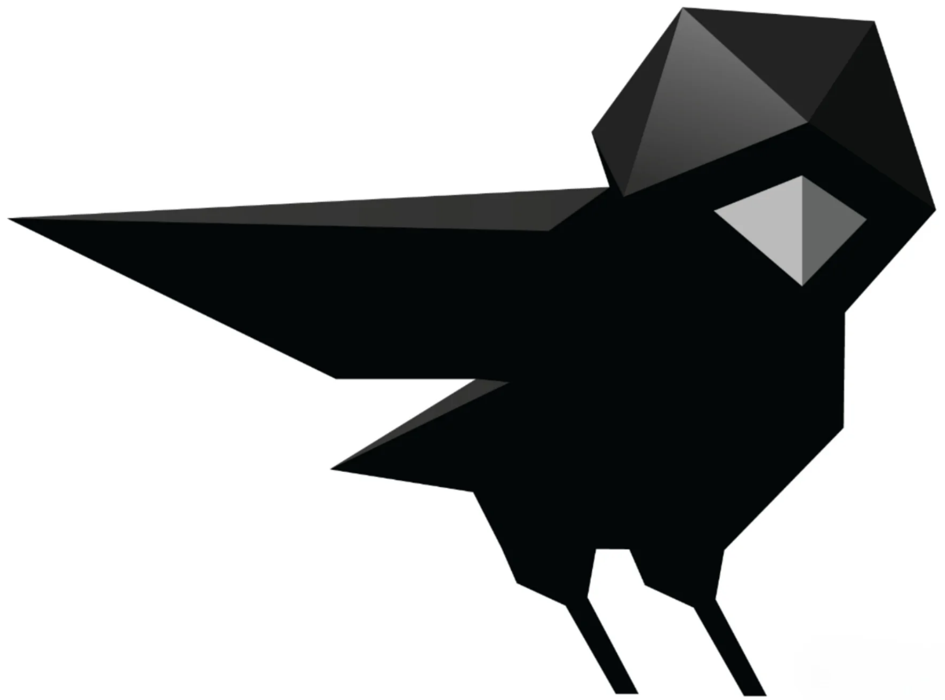

These slides are available on `@ilmanzo` GitHub

https://github.com/ilmanzo

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- Slide 3: Ann H
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