

# Object Thinking

## and Domain Driven Design

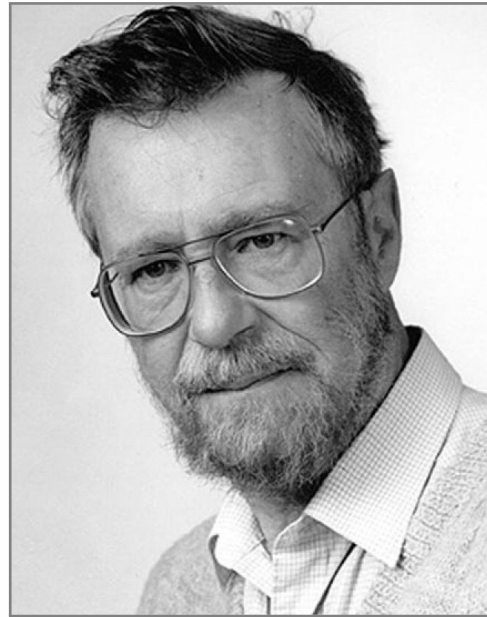
YEGOR BUGAYENKO

Lecture #5 out of 16

80 minutes

The slidedeck was presented by the author in this [YouTube Video](#)

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“Object-oriented programs are offered as alternatives to correct ones”

— Edsger W. Dijkstra (1989)



“I invented the term *object-oriented*, and I can tell you I did not have C++ in mind”

— Alan Kay (1997)



“Object-oriented programming offers a sustainable way to write spaghetti code”

— Paul Graham (2003)



“C++ is a horrible language. C++ leads to really, really bad design choices. ... idiotic object model crap.”

— Linus Torvalds (2007)



The Philosophy of OOP

What is an Object?

Three Most Evil Parts of OOP

Domain Driven Design

Elegant Objects

Books, Venues, Call-to-Action

Chapter #1:

# The Philosophy of OOP

[ [GOTO](#) IF/THEN CALL OOP<sub>1</sub> OOP<sub>2</sub> ]

## The Era of GOTO

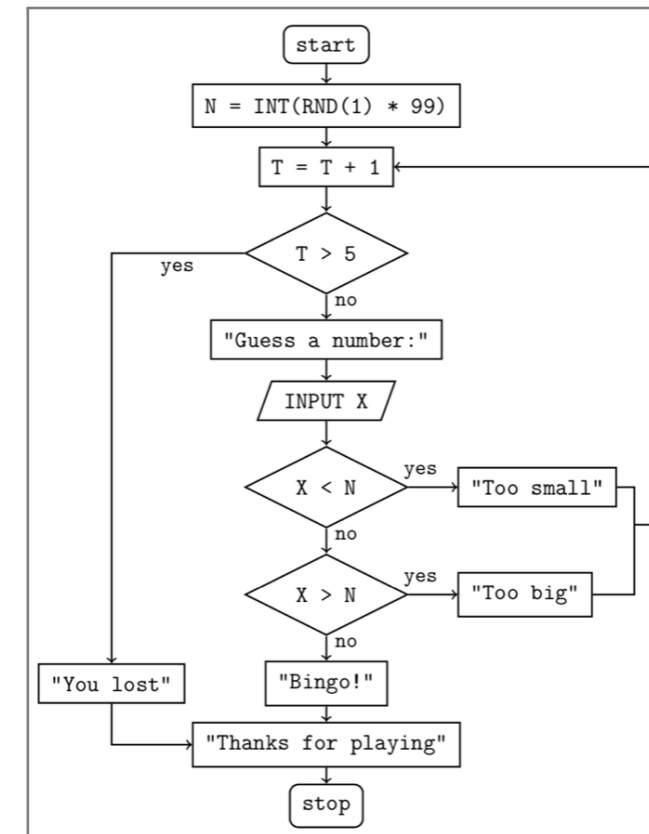
```
10 N = INT(RND(1) * 100)
20 T = T + 1
30 IF T > 5 THEN GOTO 120
40 PRINT "Guess a number in 0..99 range: "
50 INPUT X
60 IF X < N THEN PRINT "Too small."
70 IF X > N THEN PRINT "Too big."
80 IF X = N THEN GOTO 100
90 GOTO 20
100 PRINT "Bingo!"
110 GOTO 130
120 PRINT "You lost, sorry. It was: ", N
130 PRINT "Thanks for playing with me!"
```



[ GOTO IF/THEN CALL OOP<sub>1</sub> OOP<sub>2</sub> ]

# Structured Programming

```
Uses sysutils;
Var
  N, X, T: Integer;
Begin
  Randomize;
  N := Random(100);
  T := 0;
  While True Do Begin
    T := T + 1;
    If (T > 5) Then Begin
      Writeln('You lost, sorry. It was: ' + IntToStr(N));
      Break;
    End;
    Write('Guess a number in 0..99 range: ');
    ReadLn(X);
    If (X = N) Then Begin
      Writeln('Bingo!');
      Break;
    End;
    If X < N Then
      Writeln('Too small. ');
    If X > N Then
      Writeln('Too big. ');
    End;
    Writeln('Thanks for playing with me!');
  End.
End.
```



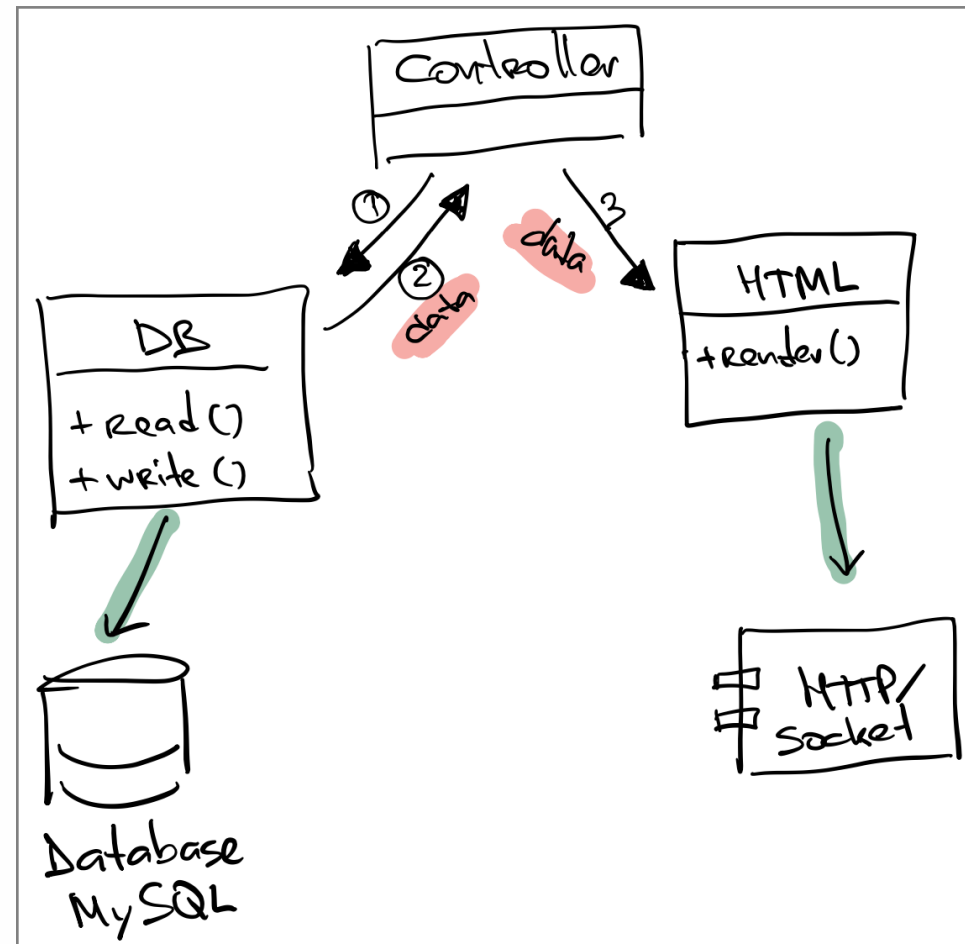
[ GOTO IF/THEN [CALL](#) OOP<sub>1</sub> OOP<sub>2</sub> ]

## Procedural Programming

```
atomic_long_set(&acct->count, 1);
init_fs_pin(&acct->pin, acct_pin_kill);
acct->file = file;
acct->needcheck = jiffies;
acct->ns = ns;
mutex_init(&acct->lock);
INIT_WORK(&acct->work, close_work);
init_completion(&acct->done);
mutex_lock_nested(&acct->lock, 1);
pin_insert(&acct->pin, mnt);
rcu_read_lock();
old = xchg(&ns->bacct, &acct->pin);
mutex_unlock(&acct->lock);
pin_kill(old);
mnt_drop_write(mnt);
mntput(mnt);
```

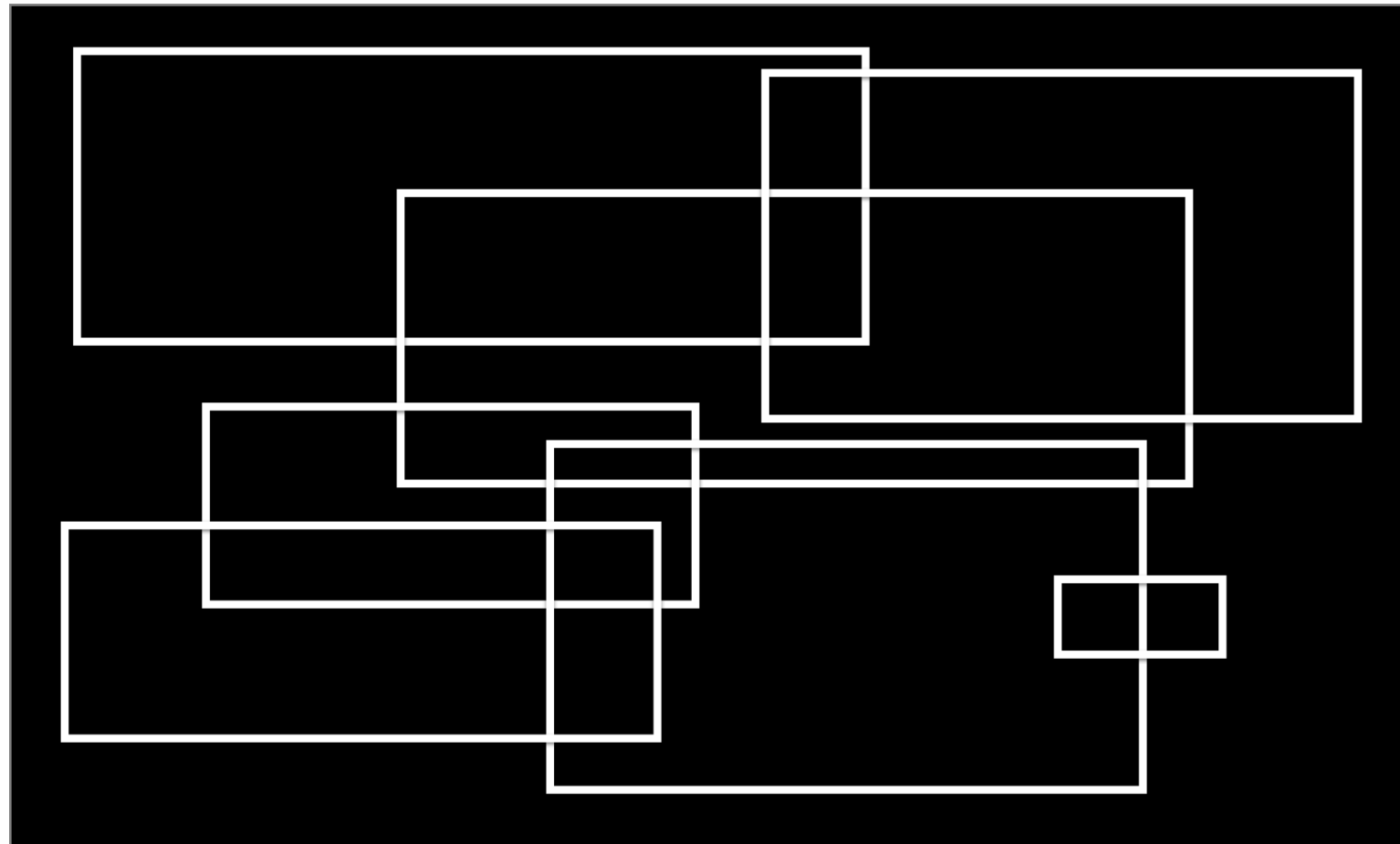
[ GOTO IF/THEN CALL OOP<sub>1</sub> OOP<sub>2</sub> ]

## Object-Oriented Programming ... Not!



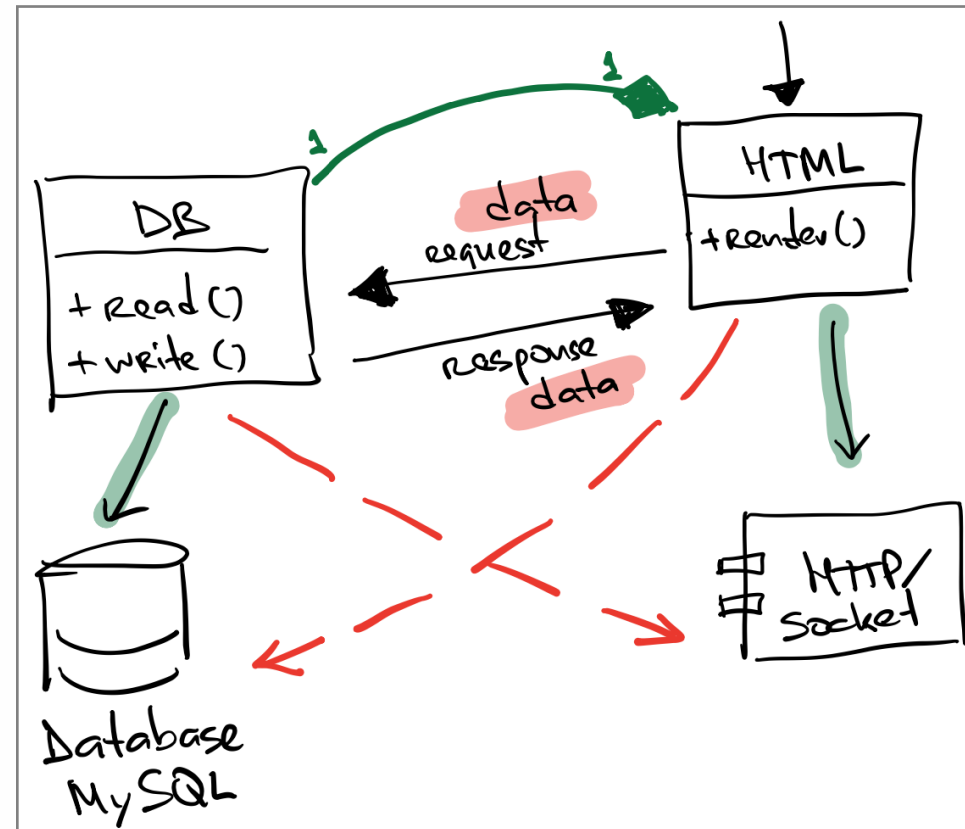
[ GOTO IF/THEN CALL [OOP<sub>1</sub>](#) OOP<sub>2</sub> ]

## Spaghetti OOP Code



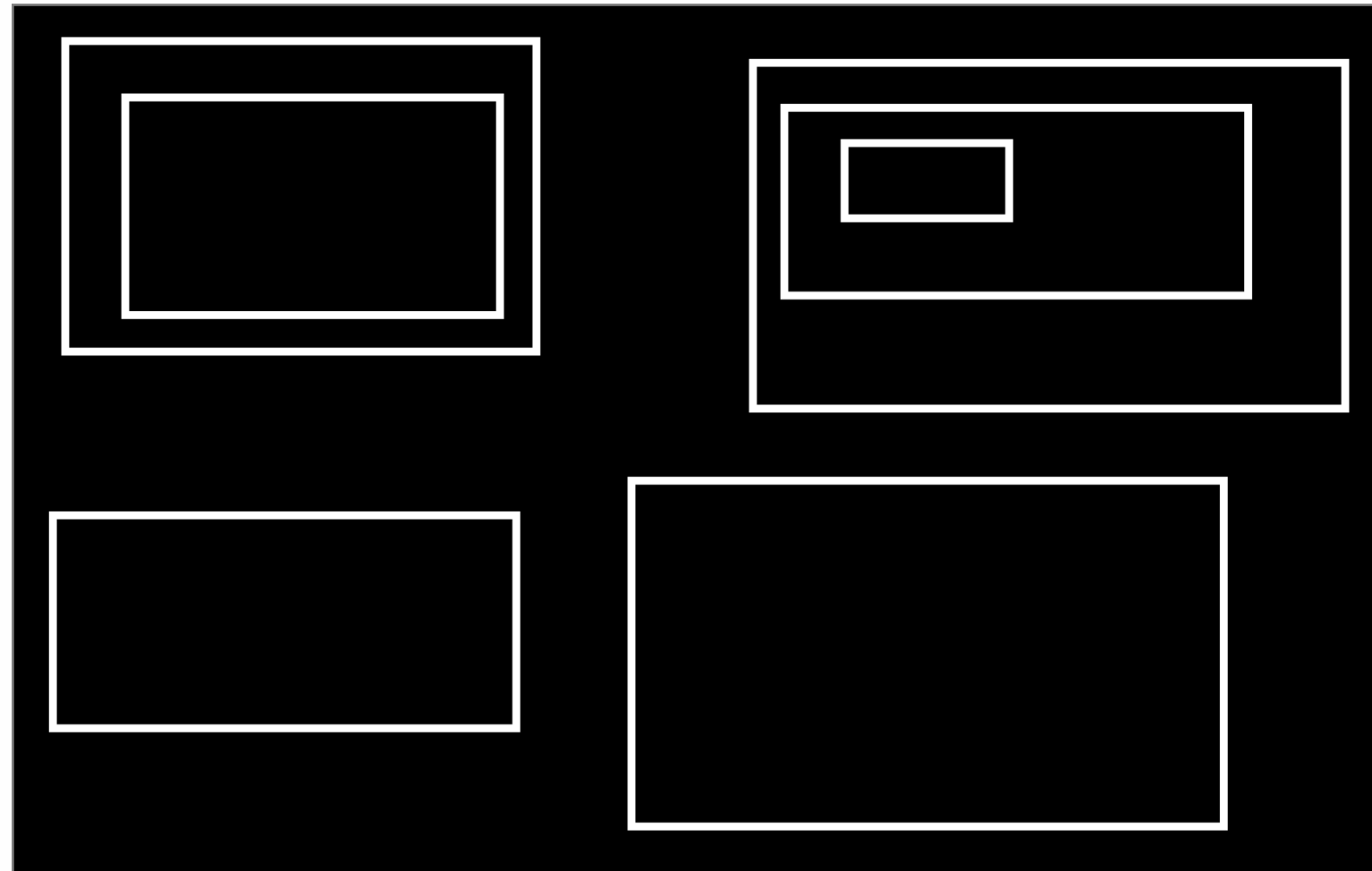
[ GOTO IF/THEN CALL OOP<sub>1</sub> OOP<sub>2</sub> ]

## OOP Done Right



[ GOTO IF/THEN CALL OOP<sub>1</sub> [OOP<sub>2</sub>](#) ]

## Elegant OOP Code

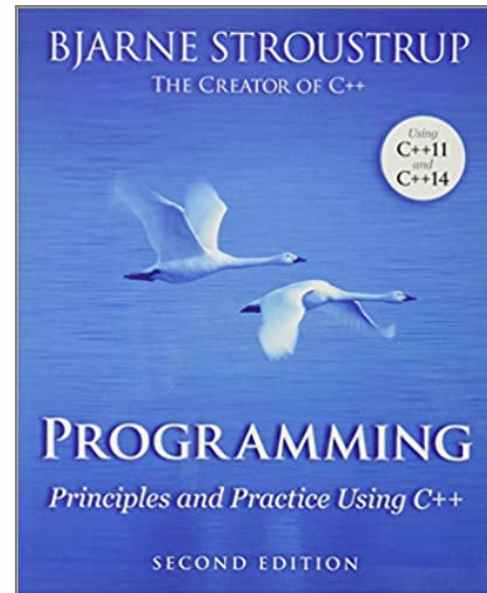


Chapter #2:

## What is an Object?

[ [C++](#) Wiki Smalltalk Java Eckel West ]

C++



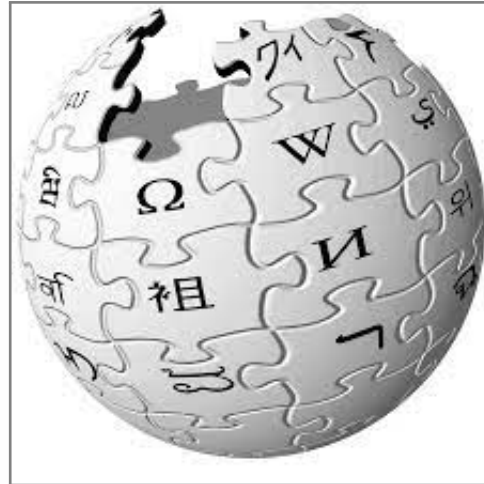
“An object is some memory that holds a value of some type”

— *Programming Principles and Practice Using C++* by Bjarne Stroustrup



[ C++ [Wiki](#) Smalltalk Java Eckel West ]

Wiki

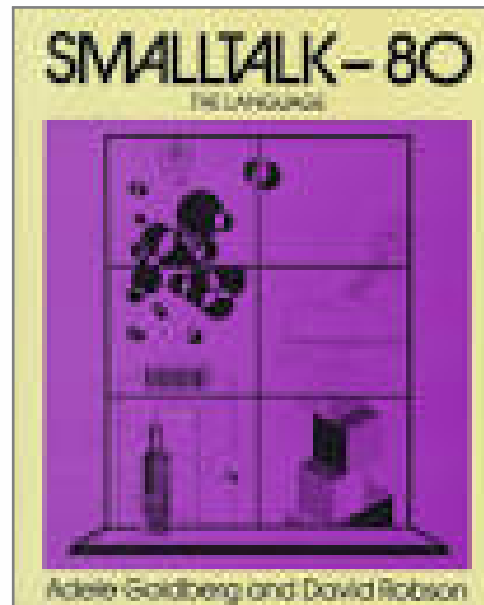


“Objects may contain data, in the form of fields, often known as attributes; and code, in the form of procedures, often known as methods”

— Wikipedia

[ C++ Wiki [Smalltalk](#) Java Eckel West ]

## Smalltalk

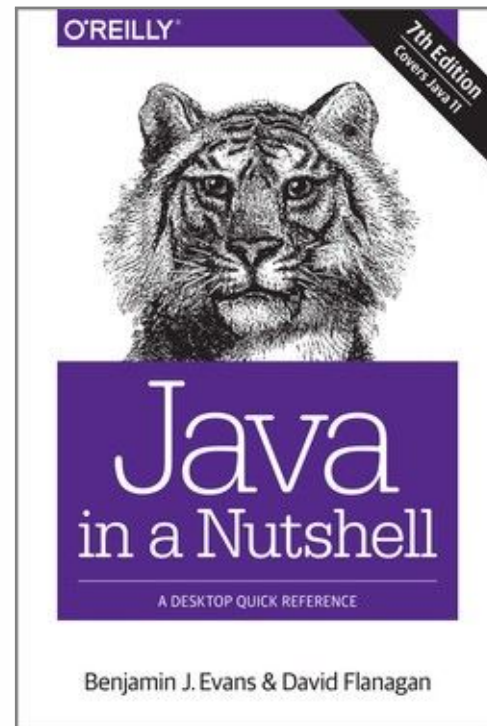


“An object consists of some private memory and a set of operations”

— *Smalltalk-80: The Language and Its Implementation* by Adele Goldberg et al., p. 6

[ C++ Wiki Smalltalk [Java](#) Eckel West ]

# Java

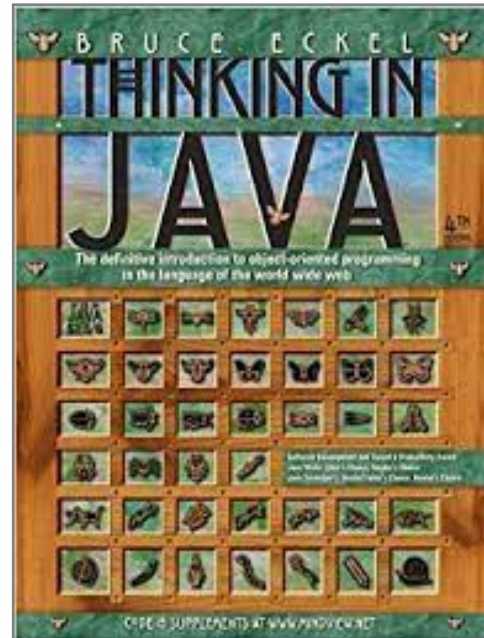


“A class is a collection of data fields that hold values and methods that operate on those values”

— *Java in a Nutshell* by Ben Evans

[ C++ Wiki Smalltalk Java [Eckel](#) West ]

Eckel

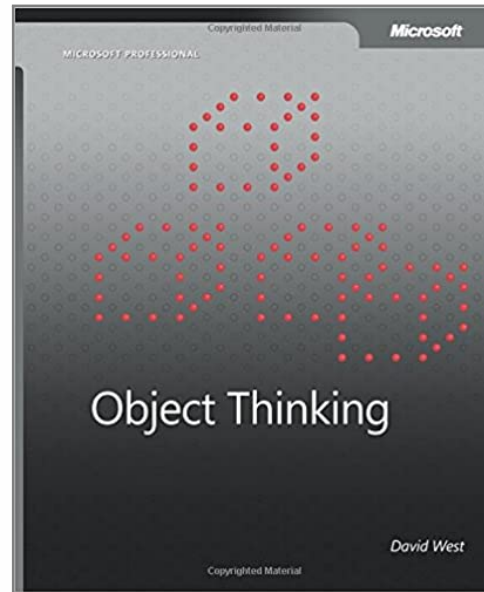


“Each object looks quite a bit like a little computer — it has a state, and it has operations that you can ask it to perform”

— *Thinking in Java* by Bruce Eckel, p. 16

[ C++ Wiki Smalltalk Java Eckel [West](#) ]

West



“An object is the equivalent of the quanta from which the universe is constructed”

— *Object Thinking* by David West, p. 66

Chapter #3:

## Three Most Evil Parts of OOP

[ Static Mutability NULL ]

1.

```
void transform(File in, File out) {  
    Collection<String> src = FileUtils.readLines(in, "UTF-8");  
    Collection<String> dest = new ArrayList<>(src.size());  
    for (String line : src) {  
        dest.add(line.trim());  
    }  
    FileUtils.writeLines(out, dest, "UTF-8");  
}
```

```
void transform(File in, File out) {  
    Collection<String> src = new Trimmed(  
        new FileLines(new UnicodeFile(in))  
    );  
    Collection<String> dest = new FileLines(  
        new UnicodeFile(out)  
    );  
    dest.addAll(src);  
}
```



<https://www.yegor256.com/2014/05/05/oop-alternative-to-utility-classes.html> →

[ Static Mutability NULL ]

## 2. Mutability vs Immutability

```
Email email = new SimpleEmail();
email.setHostName("smtp.googlemail.com");
email.setSmtpPort(465);
email.setAuthenticator(new DefaultAuthenticator("user", "pwd"));
email.setFrom("yegor256@gmail.com", "Yegor Bugayenko");
email.addTo("dude@jcabi.com");
email.setSubject("how are you?");
email.setMsg("Dude, how are you?");
email.send();
```

```
Postman postman = new Postman.Default(
    new SMTP("smtp.googlemail.com", 465, "user", "pwd")
);
Envelope envelope = new Envelope.MIME(
    new Array<Stamp>(
        new StSender("Yegor Bugayenko <yegor256@gmail.com>"),
        new StRecipient("dude@jcabi.com"),
        new StSubject("how are you?")
    ),
    new Array<Enclosure>(
        new EnPlain("Dude, how are you?")
    )
);
postman.send(envelope);
```



<https://www.yegor256.com/2014/11/07/how-immutability-helps.html> ➞



[ Static [Mutability](#) NULL ]

## Benefits of Immutability

- immutable objects are simpler to construct, test, and use
- truly immutable objects are always thread-safe
- they help to avoid temporal coupling
- their usage is side-effect free (no defensive copies)
- identity mutability problem is avoided
- they always have failure atomicity
- they are much easier to cache
- they prevent NULL references, which are bad



[w.yegor256.com/2009/objects-sharing-immutable.html](http://w.yegor256.com/2009/objects-sharing-immutable.html)  
→

3. **public** Employee getByName(String name) {  
    **int** id = database.find(name);  
    if (id == 0) {  
        return null;  
    }  
    return new Employee(id);  
}



[w.yegor256.com/2013/why-null-is-bad.html](http://w.yegor256.com/2013/why-null-is-bad.html) →

*Null References, The Billion Dollar Mistake*  
presentation by Tony Hoare, [watch here](#).

## NULL Object

```
public Employee getByName(String name) {  
    int id = database.find(name);  
    if (id == 0) {  
        return Employee.NOBODY;  
    }  
    return Employee(id);  
}
```

## Fail Fast vs. Fail Safe

```
public Employee getByName(String name) {  
    int id = database.find(name);  
    if (id == 0) {  
        throw new EmployeeNotFoundException(name);  
    }  
    return Employee(id);  
}
```

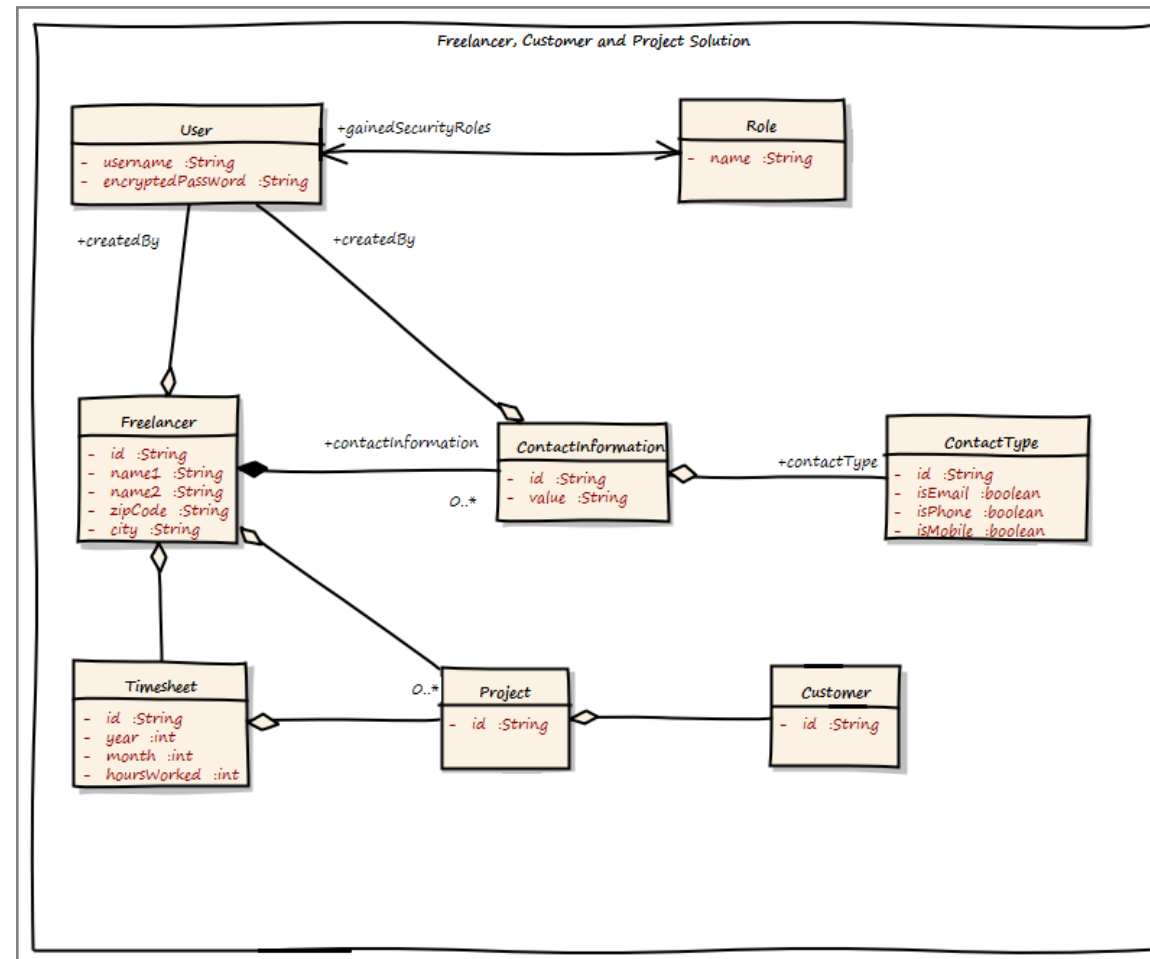


<https://www.yegor256.com/2015/08/25/fail-fast.html> →

Chapter #4:

# Domain Driven Design

## Names of Objects Done Right



Chapter #5:

## Elegant Objects

## Elegant Objects (EO)

Started in 2014

Two books, 40+ speeches, 80+ blog posts

30+ frameworks and libraries

50+ fans registered

Six bloggers

e.g. pragmaticobjects.com, g4s8.wtf, amihaiemil.com

Five “Object Thinking” Meetups



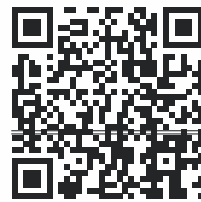
<https://www.elegantobjects.org> →



*Object-Oriented Lies*

JPoint Student Day

Moscow, Russia, 22-24 April 2016



*Java vs. OOP*

JavaDay 2016

Minsk, Belarus, 11 June 2016



*Java vs. OOP*

JavaDay Kyiv 2016

Kyiv, Ukraine, 15 October 2016



*What's Wrong With OOP?*

RigaDevDays 2017

Riga, Latvia, 15 May 2017



## EOLANG: Our New Programming Language



<https://www.eolang.org>  
→

```
[ ] > calculatesFibonacciNumberWithTail
eq. > @
  13
  fibonacci 7
[n] > fibonacci
  if. > @
    n.less 3
    small n
    rec n 1 1
  [n] > small
    if. > @
      n.eq 2
      1
      n
  [n minus1 minus2] > rec
    if. > @
      n.eq 3
      minus1.add minus2
      rec (n.sub 1) (minus1.add minus2) minus1
```

If you want to help:

EO to JavaScript/Go/Rust/Ruby compilers

REPL for EO

Static analysis of EO code

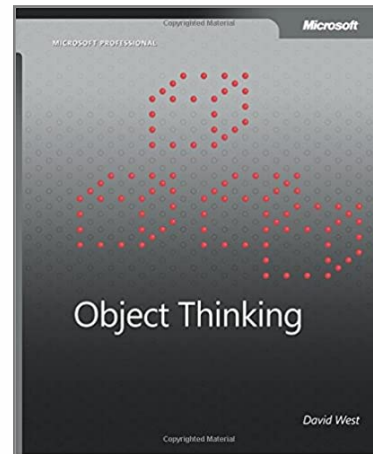
EO integration with Java/C++

Automated refactoring of EO code

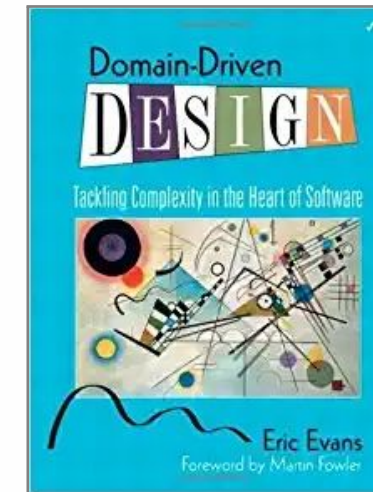
JetBrains plugin for EO

Chapter #6:

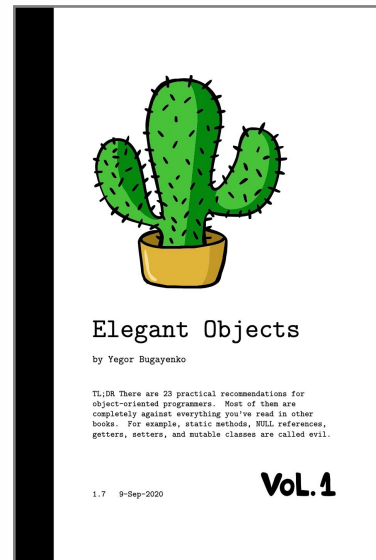
## Books, Venues, Call-to-Action



“Object Thinking” by DAVID WEST



“Domain-Driven Design: Tackling Complexity in the Heart of Software” by ERIC EVANS



“Elegant Objects, vol. 1” by YEGOR  
BUGAYENKO



“Elegant Objects, vol. 2” by YEGOR  
BUGAYENKO

## Where to publish:

SPLASH: ACM SIGPLAN conference on Systems, Programming, Languages, and Applications

PLDI: ACM SIGPLAN Conference on Programming Language Design and Implementation

POPL: The Annual Symposium on Principles of Programming Languages

## Call to Action:

Take `yegor256/hangman` repository and rewrite it in true object-oriented manner, submit a pull request with your changes.



## Still unresolved issues:

- How to motivate coders for better OO practices?
- How to create better OO programming languages?
- How to catch bad OO practices automatically?
- How to prove some OO practices are bad?

# Bibliography