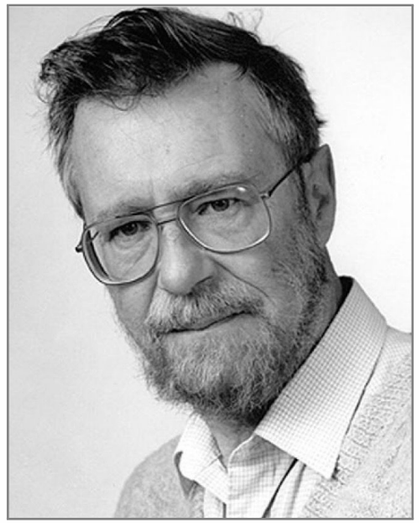
# Object Thinking

## and Domain Driven Design

Yegor Bugayenko

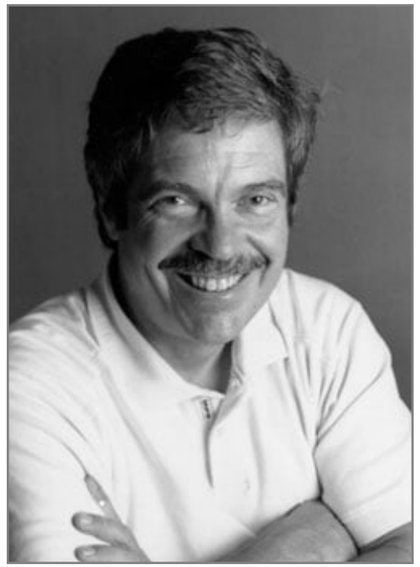
Lecture #5 out of 16
80 minutes

The slidedeck was presented by the author in this YouTube Video



“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:

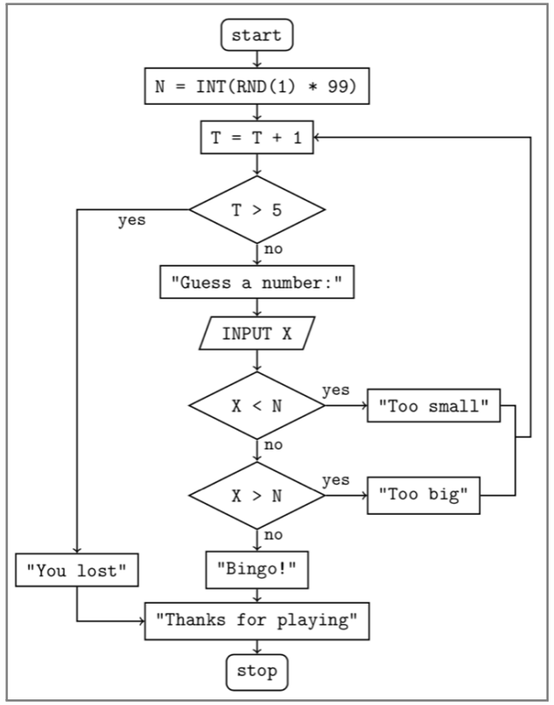
# The Philosophy of OOP

# 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!"
```

# Structured Programming

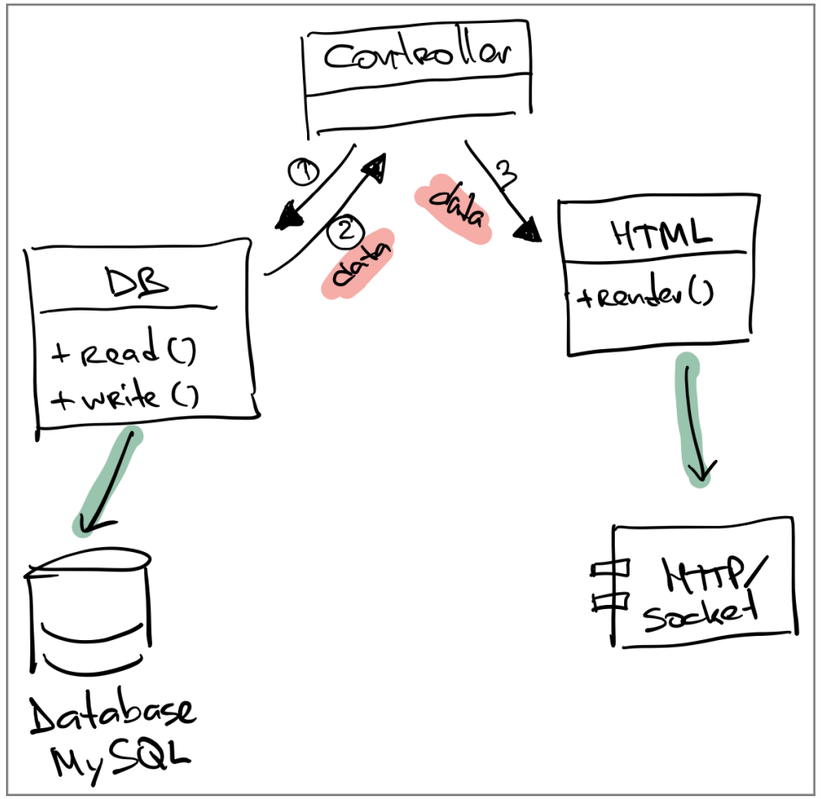
```
Uses sysutils;
Var
  N, X, T: Integer;
Begin
  Randomize;
  N := Random(100);
  T := 0;
  While True Do Begin
    T := T + 1;
    If (T > 5) Then Begin
      Writeln('You lost, sorry. It was: ' + IntToStr(N));
      Break;
    End;
    Write('Guess a number in 0..99 range: ');
    ReadLn(X);
   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



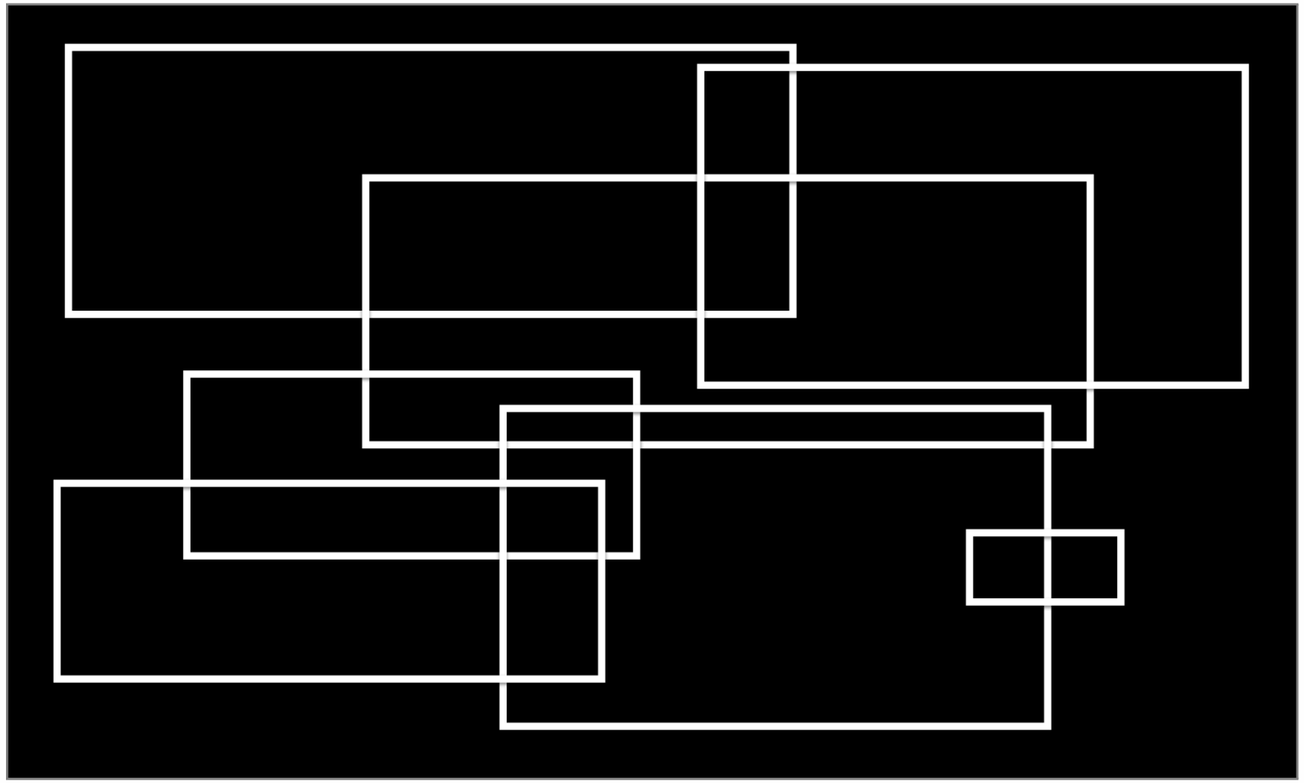
# Procedural Programming

```
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);
```

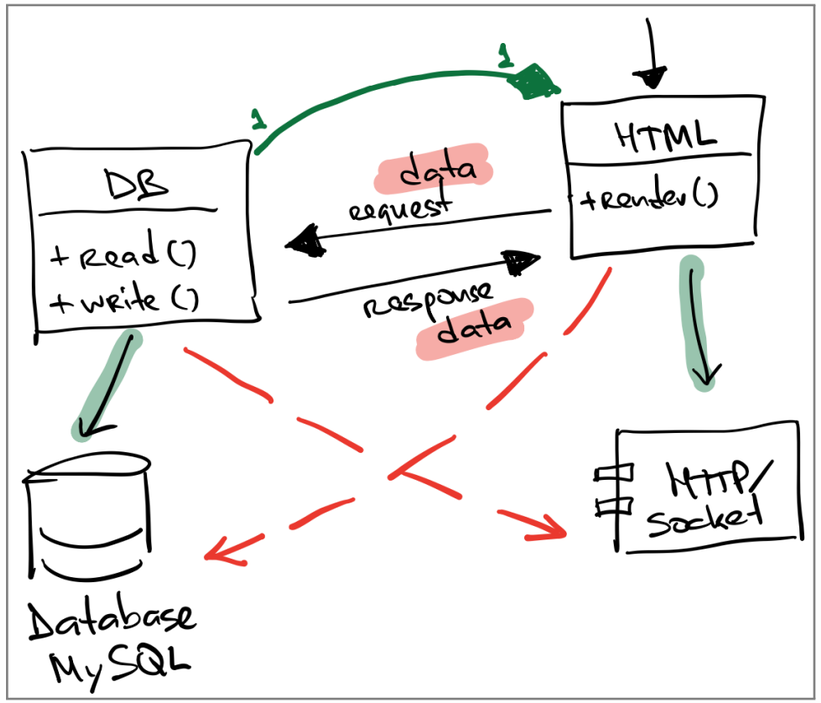
# Object-Oriented Programming ... Not!



# Spaghetti OOP Code

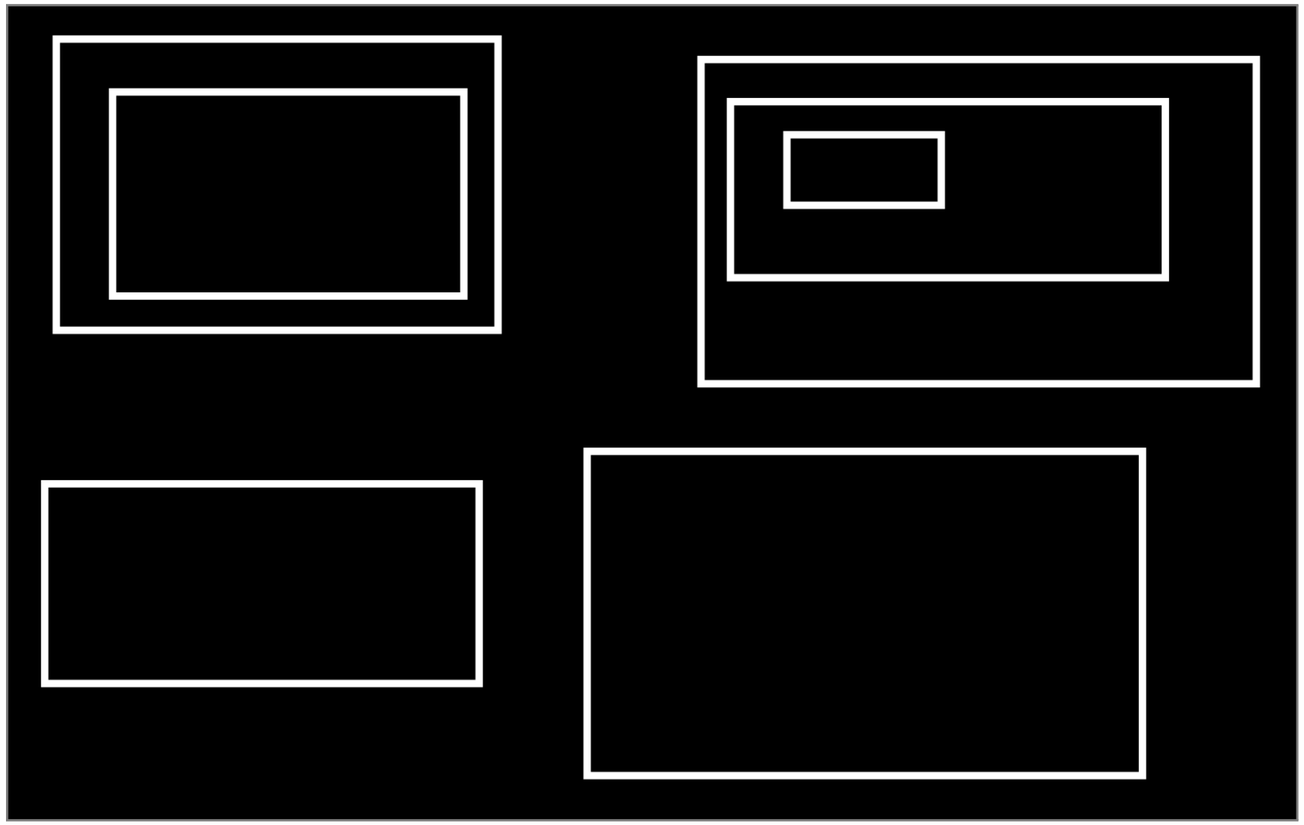


# OOP Done Right



[ GOTO IF/THEN CALL $OOP_1$ $OOP_2$ ]

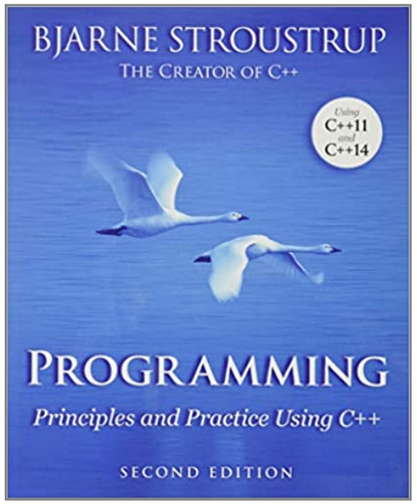
Elegant OOP Code



Chapter #2:

# What is an Object?

C++




"An object is some memory that holds a value of some type"

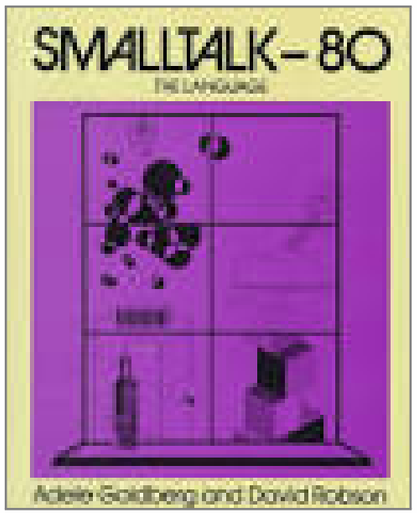
— Bjarne Stroustrup. *Programming: Principles and Practice Using C++*. Pearson Education, 2 edition, 2014

# 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

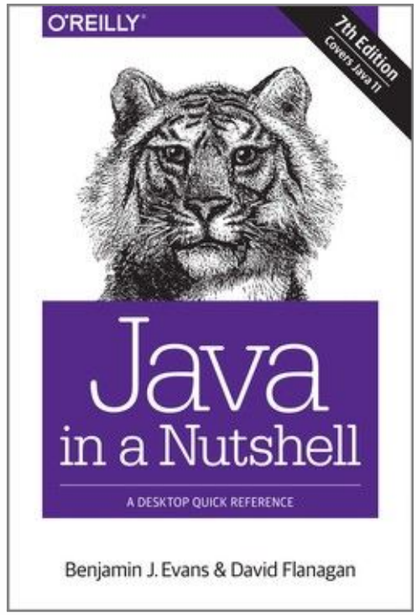
# Smalltalk




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

— Adele Goldberg and David Robson. *Smalltalk-80: The Language and Its Implementation.* Addison-Wesley, 1983

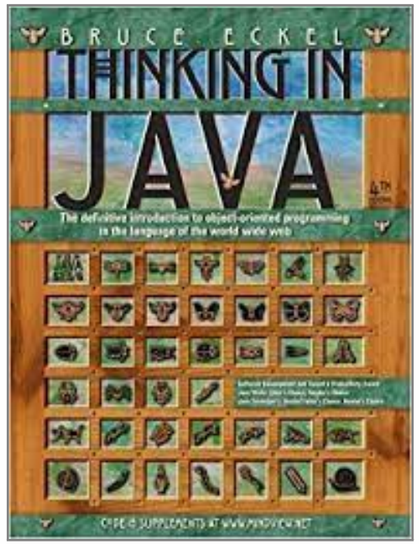
Java




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

— Benjamin J. Evans and David Flanagan. *Java in a Nutshell: A Desktop Quick Reference*. O'Reilly Media, 7 edition, 2018

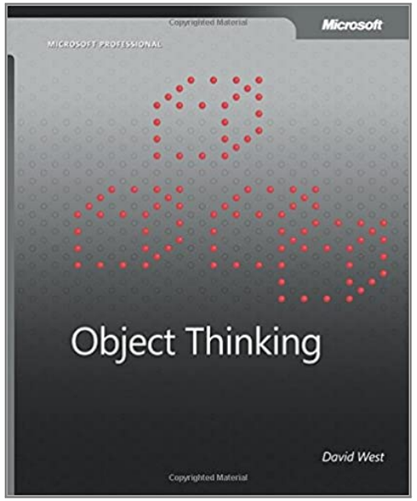
## Eckel




“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”

— Bruce Eckel. *Thinking in Java.* Prentice Hall, 2006. doi:10.5555/1076545

# West




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

— David West. *Object Thinking*. Pearson Education, 2004. doi:10.5555/984130

Chapter #3:

# Three Most Evil Parts of OOP

## 1. Static Methods

```
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 →

# 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 →

## Benefits of Immutability

https://www.yegor256.com/2014/06/09/objects-should-be-immutable.html →

- 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

3. Null References

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

w.yegor256.co
13/why-null-i
s-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);
}
```

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

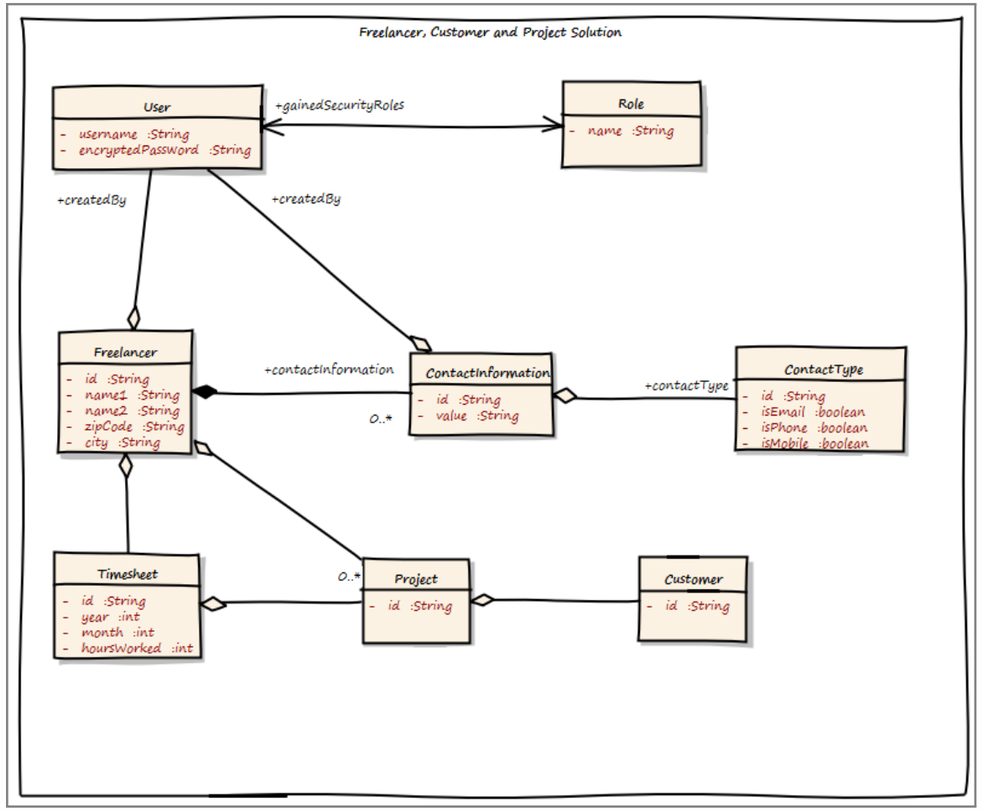
## Fail Fast vs. Fail Safe

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

Chapter #4:

# Domain Driven Design

## Names of Objects Done Right


Freelancer, Customer and Project Solution
User
- username :String
- encryptedPassword :String
+gainedSecurityRoles
Role
- name :String
+createdBy
+createdBy
Freelancer
- id :String
- name1 :String
- name2 :String
- zipCode :String
- city :String
+contactInformation
0..*
ContactInformation
- id :String
- value :String
+contactType
ContactType
- id :String
- isEmail :boolean
- isPhone :boolean
- isMobile :boolean
Timesheet
- id :String
- year :int
- month :int
- hoursWorked :int
0..*
Project
- id :String
Customer
- id :String

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

https://www.eolang.org
→

# EOLANG: Our New Programming Language

```
[] > 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

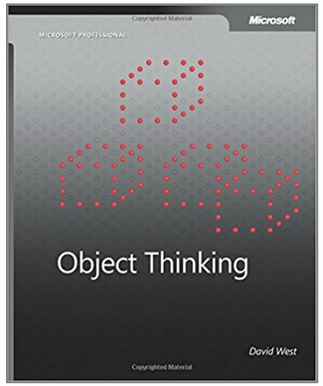
EO integration with Java/C++

Automated refactoring of EO code

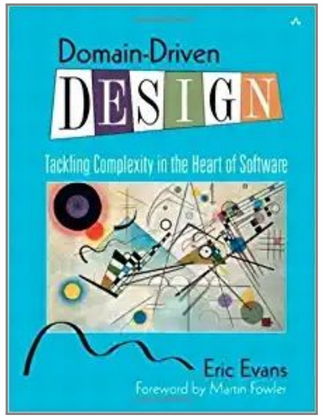
JetBrains plugin for EO

Chapter #6:

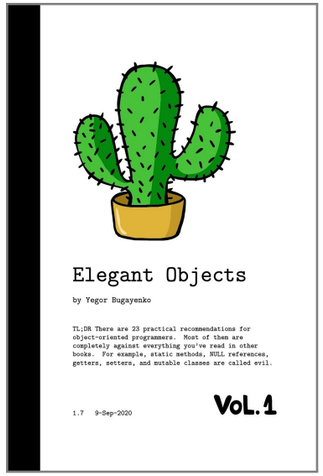
# Books, Venues, Call-to-Action




David West. *Object Thinking*. Pearson Education, 2004. doi:10.5555/984130




Eric Evans. *Domain-Driven Design: Tackling Complexity in the Heart of Software*. Addison-Wesley, 2004. doi:10.5555/861502




Yegor Bugayenko. *Elegant Objects.* Amazon, 2016


Yegor Bugayenko. *Elegant Objects.* Amazon, 2017

## 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


Yegor Bugayenko. *Elegant Objects*. Amazon, 2016.

Yegor Bugayenko. *Elegant Objects*. Amazon, 2017.

Bruce Eckel. *Thinking in Java*. Prentice Hall, 2006. doi:10.5555/1076545.

Benjamin J. Evans and David Flanagan. *Java in a Nutshell: A Desktop Quick Reference*. O'Reilly Media, 7 edition, 2018.

Eric Evans. *Domain-Driven Design: Tackling Complexity in the Heart of Software*. Addison-Wesley, 2004.

doi:10.5555/861502.

Adele Goldberg and David Robson. *Smalltalk-80: The Language and Its Implementation*. Addison-Wesley, 1983.

Bjarne Stroustrup. *Programming: Principles and Practice Using C++*. Pearson Education, 2 edition, 2014.

David West. *Object Thinking*. Pearson Education, 2004. doi:10.5555/984130.