

Практики верификации кода

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<https://github.com/anstarovoyt/jug-ekb-sa>

Contracts

Contracts

Google Contracts for Java (cofoja)

```
public interface Example1Contract
{
    @Ensures({ "result >= 0",
              "result <= 23"})
    int getHour();

    @Requires({ "h >= 0",
               "h <= 23"})
    @Ensures("getHour() == h")
    void setHour(int h);
}
```

```
public interface Example1Contract
{
    @Ensures({ "result >= 0",
              "result <= 23"})
    int getHour();

    @Requires({ "h >= 0",
               "h <= 23"})
    @Ensures("getHour() == h")
    void setHour(int h)
}
}
```



Runtime

Compiler time





Halting problem



Meta Information (annotations)

Null or Not Null



com.sun.istack.NotNull
edu.umd.cs.findbugs.annotations.NonNull
javax.annotation.Nonnull
javax.validation.constraints.NotNull
org.eclipse.jdt.annotation.NonNull
org.jetbrains.annotations.NotNull
org.netbeans.api.annotations.common.NonNull
org.jmlspecs.annotation.NonNull

com.sun.istack.Nullable

edu.umd.cs.findbugs.annotations.Nullable

edu.umd.cs.findbugs.annotations.CheckForNull

edu.umd.cs.findbugs.annotations.UnknownNullness

javax.annotation.Nullable

javax.annotation.CheckForNull

org.eclipse.jdt.annotation.Nullable

org.jetbrains.annotations.Nullable

org.netbeans.api.annotations.common.CheckForNull

org.netbeans.api.annotations.common.NullAllowed

org.netbeans.api.annotations.common.NullUnknown

org.jmlspecs.annotation.Nullable

IDEA's **@Contract**

JSR 308

More annotations!!!

```
ArrayList<@Nonnull String> a = getList();
```

```
    @Nonnull String value = a.get(0);
```

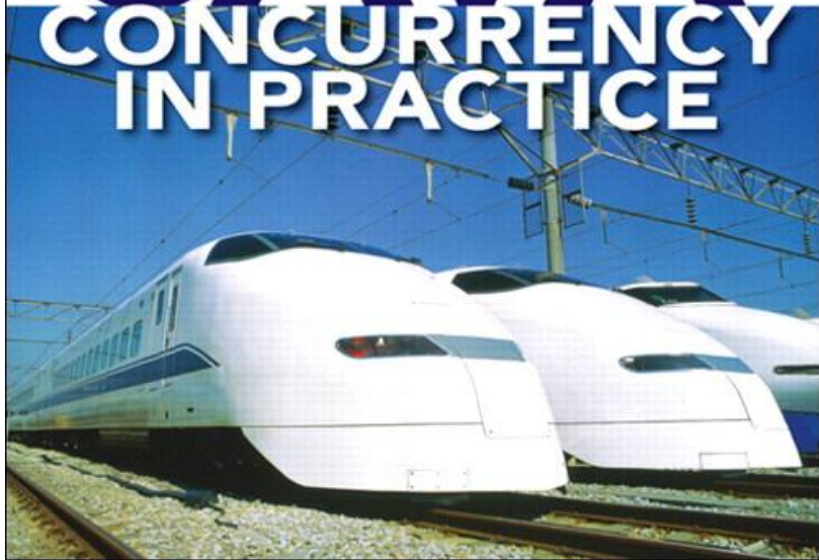

Offtopic: Java8 **Optional**<T>

BRIAN GOETZ



WITH TIM PEIERLS, JOSHUA BLOCH,
JOSEPH BOWBEER, DAVID HOLMES,
AND DOUG LEA

JAVA CONCURRENCY IN PRACTICE



```
@ThreadSafe
public class SynchronizedFactorizer implements Servlet {
    @GuardedBy("this") private BigInteger lastNumber;
    @GuardedBy("this") private BigInteger[] lastFactors;

    public synchronized void service(ServletRequest req,
                                     ServletResponse resp)
    {
        BigInteger i = extractFromRequest(req);
        if (i.equals(lastNumber))
            encodeIntoResponse(resp, lastFactors);
        else {
            BigInteger[] factors = factor(i);
            lastNumber = i;
            lastFactors = factors;
            encodeIntoResponse(resp, factors);
        }
    }
}
```

Findbugs, IntelliJ IDEA, CheckThread

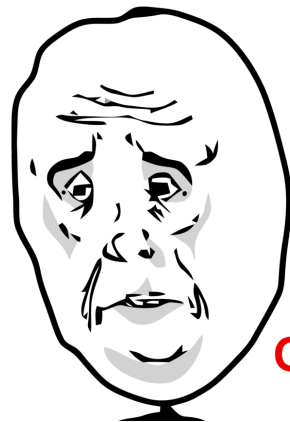
JSR 305

Develop standard annotations

JSR 305

Develop standard annotations

Status: *Dormant*



Okay

Checker framework

Compile time validation

Checker framework

Compile time validation

`org.checkerframework.checker.nullness.qual.NonNull`
`org.checkerframework.checker.nullness.qual.Nullable`