RECORDS, SWITCH, ...

WHAT'S NEW IN JAVA 14?

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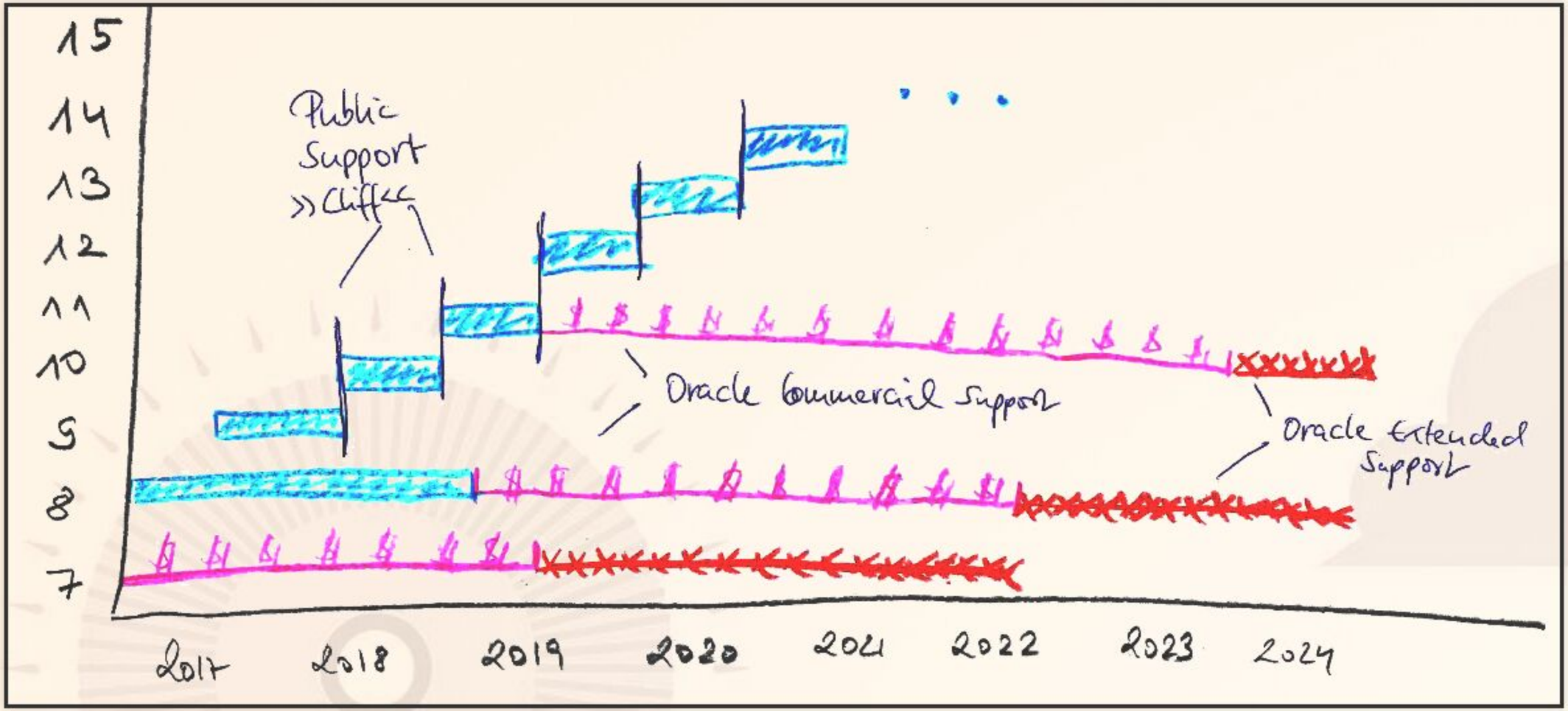
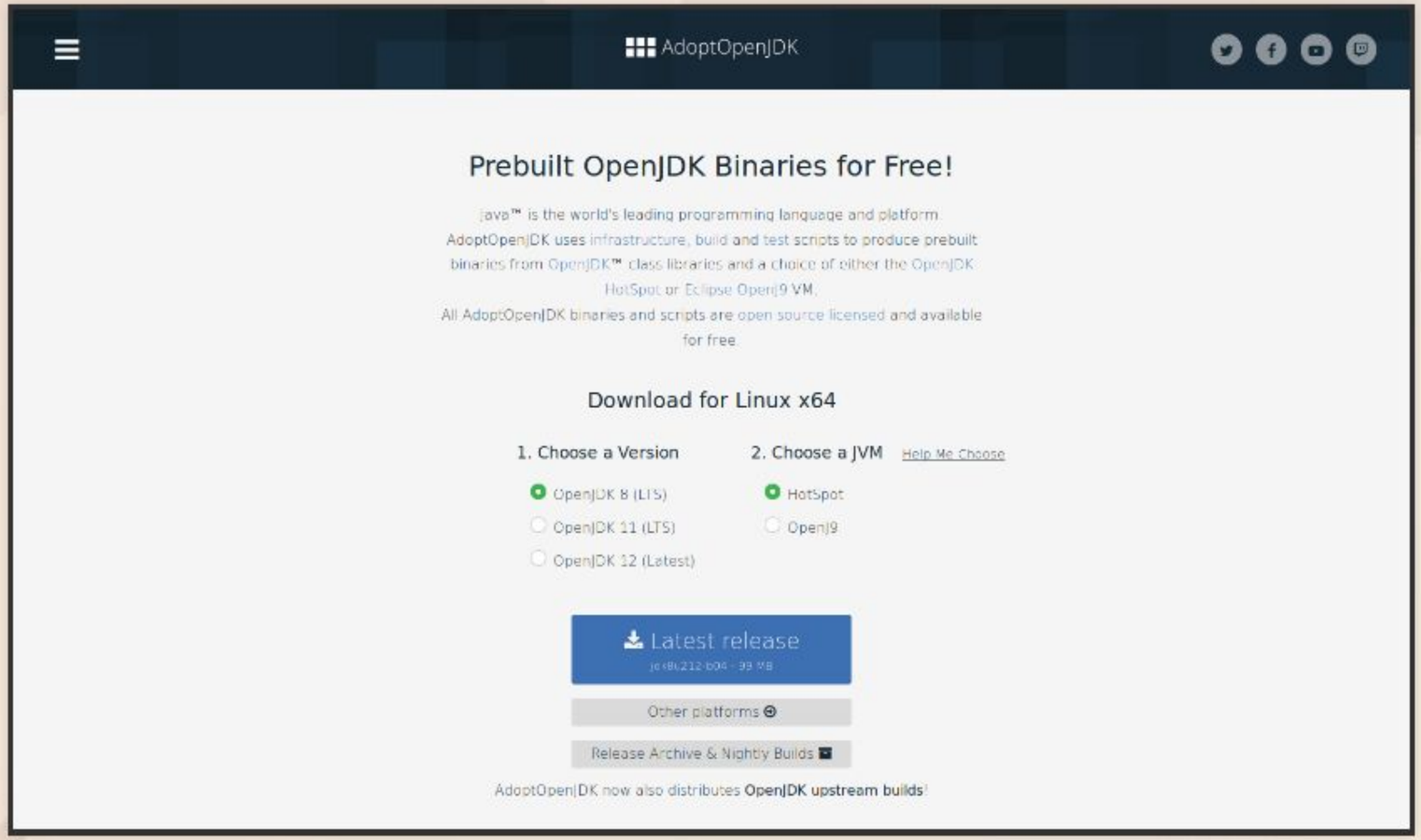


- Every 6 months new major release
- No support overlap → Support Cliff

- Every 3 years new long-term support (LTS)
  v11: 2018-09; next v17: 2021-09

`tl;dr`: Use AdoptOpenJDK & LTS (11)



LTS Support for Java 8 (2023) & 11 (2022) & ff.

JAVA 14 IN A NUTSHELL

JVM

- **JFR Event Streaming**
- helpful NullPointerExceptions
- **Platform:** deprecate Solaris & SPARC
- **GC:** ZGC for macOS/Win, remove CMS NUMA-Aware G1

Tools

- Packaging Tool (Incubator)

Language

- Switch Expressions stable
- Pattern Matching for instanceof preview
- Records preview
- Text Blocks preview
- Foreign-Memory Access API

Library

- Non-Volatile Mapped Byte Buffers
- Remove the Pack200 Tools and API

official Oracle JDK 14 release notes

based on the Java Almanac by Marc R. Hoffmann and Cay S. Horstmann

LANGUAGE

switch IN JAVA 8

```
enum Direction {N, S, W, E}

String switchExpressionJDK8(Direction way) {
    String result;
    switch (way) {
        case N:
            result = "Up";
            break;
        case S:
            result = "Down";
            break;
        case E:
        case W:
            result = "Somewhere left or right";
            break;
        default:
            throw new IllegalStateException("Huh?: " + way);
    }
    return result;
}
```

SWITCH-EXPRESSION

14 STABLE

Motivation: Prerequisite for `instanceof` pattern matching

```
String switchExpressionJdk14(Direction way) {
    return switch (way) {                                  1
        case N -> "Up";                                    2
        case S -> { yield "Down"; }                        3
        case E, W -> "Somewhere left or right";
        // default -> "Foo"                                4
    };
}
```

1. `switch` can be used as expression
2. Arrow form `→` instead of `:` → no fallthrough / no `break;` necessary!
3. Lambdas can be used to. For *expressions* they must `yield` a value
4. `default` can be ommitted if a) no expression or b) `enum` with every value handled

PREVIEW FEATURES

PREVIEW

Unlock Compilation

```
$ javac --release xx --enable-preview
```

Unlock Execution

```
$ java --enable-preview …
```

`xx` must *exactly* match used JDK version

TEXT BLOCKS

PREVIEW

Java 8

```
Object obj = engine.eval(
    "function hello() {\n" +
    "   print(\"Hi, world!\");\n" +
    "}\n" +
    "   \n"  +
    "hello() "+
    ";"
    );
```

Java 14

```
Object obj = engine.eval("""
    function hello() {
       print("Hi, world!");
    }
      \s
    hello() \
    ;\
    """);
```

- **Leading whitespaces** identation **removed** up to the most-left character in the block including the closing `"""`
- All **trailing whitespaces removed**, line-endings **normalized to** `\n`
- **Escape sequences:** `\s` fences whitespace trimming, `\` at line end avoids `\n` insertion

`instanceof` PATTERN MATCHING

PREVIEW

Common Java idiom:

```
if (obj instanceof String) {
    String s = (String) obj;
    s.toLowerCase();
} else {
    // …
}
```

Using v14+ pattern matching:

```
if (obj instanceof String s) {
    s.toLowerCase();

} else {
    // can't use s here
}
```

Binding variable `s` only available in scopes, where *pattern matches* (!)

PATTERN MATCHING: SCOPING

PREVIEW

```
String s = "123";
@Test void bindingVarScoping() {
    var obj = Math.random() < 0.5 ? "Oh Magic!" : 9;

    if (!(obj instanceof String s))
      assertEquals("123", s);
    else
      assertEquals("Oh Magic!", s);

    if (obj instanceof String s && s.length() > 5)
        assertEquals("Oh Magic!", s);
    else
        assertEquals("123", s);

    if (obj instanceof String s || s.length() < 5)
        assertEquals("123", s);
    else
        assertEquals("123", s);
}
```

RECORDS PREVIEW

Motivation & Goals

- *„modeling data as data“*
- reduce boilerplate & error-proneness of plain "data carriers"

Non-Goals

- mutable classes
- JavaBean conventions
- properties
- metaprogramming

RECORDS AT A GLANCE

PREVIEW

Typical „data holder“ class

```
final class BalanceClass {
  final BigDecimal amount;
  final Currency currency;

  public BalanceClass(BigDecimal amount, Currency currency) {
    this.amount = amount;
    this.currency = currency;
  }

  public BigDecimal amount() { return amount; }
  public Currency currency() { return currency;  }

  @Override
  public boolean equals(Object o) {
    if (this == o) return true;
    if ((o == null) || (getClass() != o.getClass())) return false;
    BalanceClass that = (BalanceClass) o;
    return (amount.compareTo(that.amount) == 0) &&
            currency.equals(that.currency);
  }

  @Override
  public int hashCode() { return Objects.hash(amount, currency);  }

  @Override
  public String toString() {
    return "Balance[amount=" + amount + ", currency=" + currency +']';
  }
}
```

Record data type

```
record BalanceRecord(
  BigDecimal amount,
  Currency currency
) {}
```

Immutable data classes that require only *field* type & names.

RECORDS: USAGE

PREVIEW

```
var  amnt = new BigDecimal(400);
var  curr = Currency.getInstance("USD");
record BalanceRecord(BigDecimal amount, Currency currency) {}

var bal = new BalanceRecord(amnt, curr);                    1
var bal2 = new BalanceRecord(amnt, curr);

assertEquals(amnt, bal.amount());                           2

assertEquals(bal, bal2);                                    3
assertEquals(bal.hashCode(), bal2.hashCode());
assertEquals(bal.toString(), "BalanceRecord[amount=400, currency=USD]");
```

1. Default generated constructors
2. Getter methods *not* adhering JavaBeans convention
3. Provides `equals()`, `hashCode()` and `toString()` implementations

RECORDS: ADVANCED USAGE

PREVIEW

```
public record BalanceRecord(BigDecimal amount, Currency currency) {

    public BalanceRecord {                                  // Compact c'tor
        Objects.requireNonNull(amount);
        Objects.requireNonNull(currency);
    }

    public BalanceRecord(BigDecimal amount) {               // Extra c'tor
        this(amount, Currency.getInstance("USD"));
    }

    static Currency EUR = Currency.getInstance("EUR");     // static fields

    public static BalanceRecord eur(String cash) {          // static methods
        return new BalanceRecord(new BigDecimal(cash), EUR);
    }
}
var oneDollar = new BalanceRecord(BigDecimal.ONE);
var eur400 = BalanceRecord.eur("400");
```

JAVA VIRTUAL MACHINE

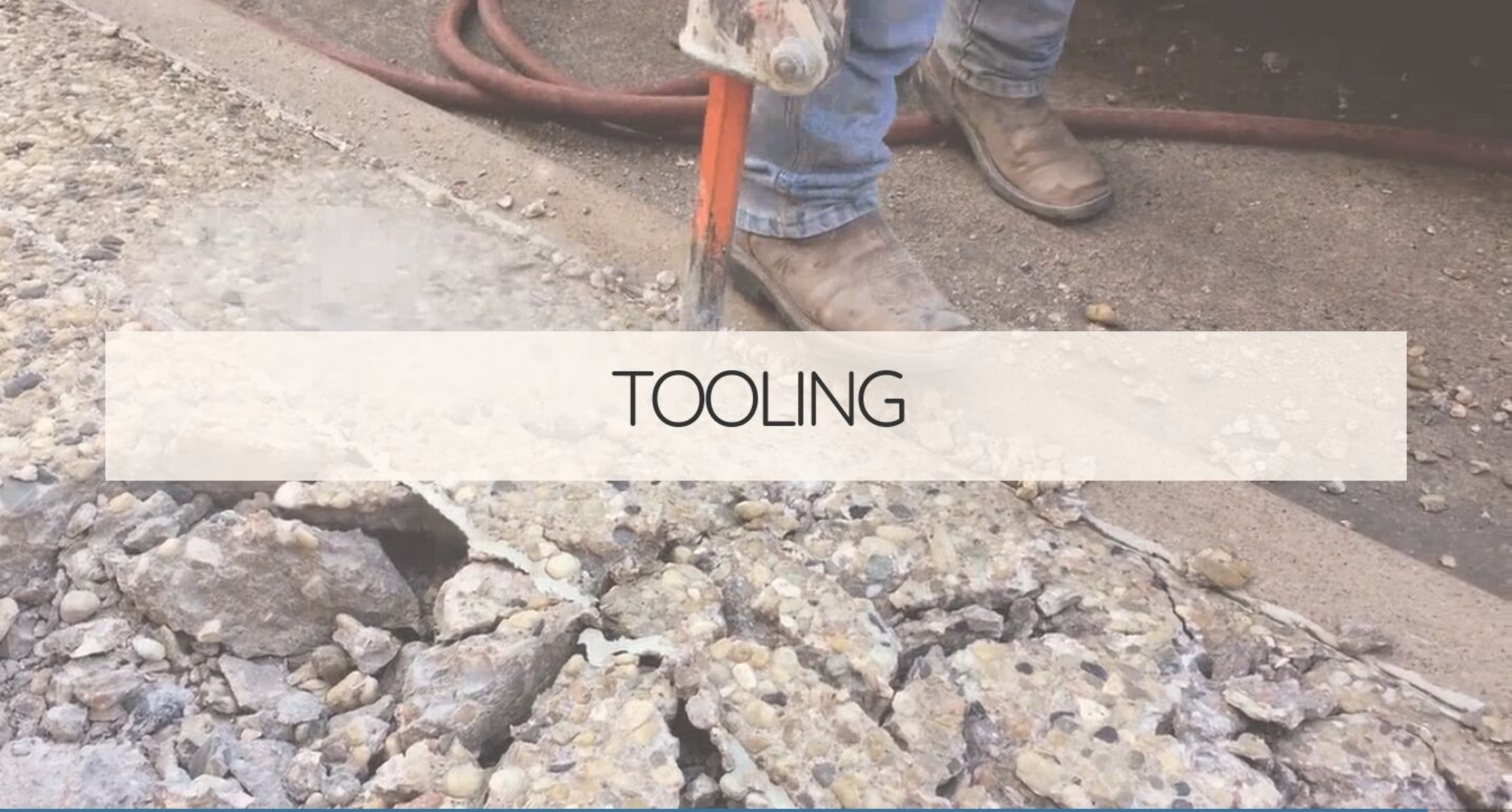
HELPFUL NULLPOINTER EXCEPTIONS

Enabled with JRE param `-XX:+ShowCodeDetailsInExceptionMessages`

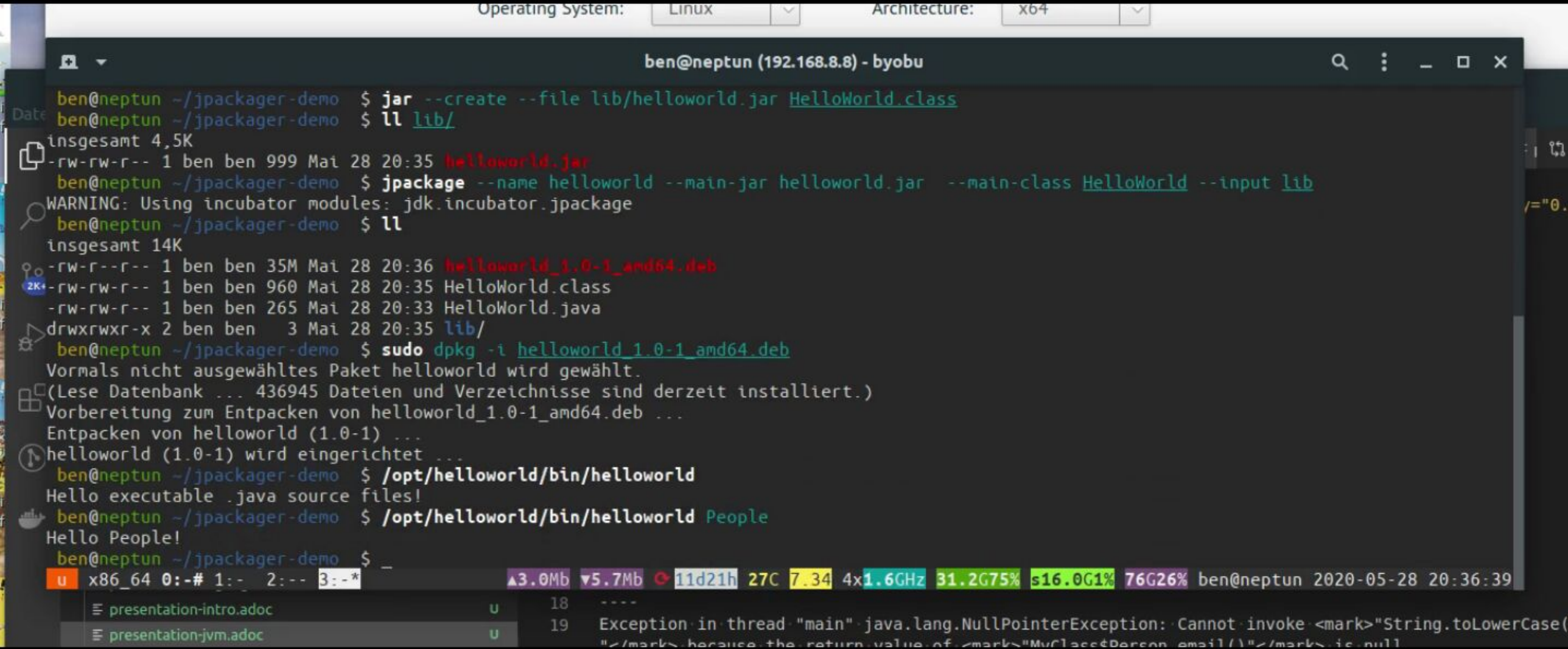
```
public static void main(String[] args) {
    var p = new Person("Peter", null);
    var e = p.email().toLowerCase();
}
```

```
Exception in thread "main" java.lang.NullPointerException: Cannot invoke
"String.toLowerCase()" because the return value of "MyClass$Person.email()"
is null
  at MyClass.main(ThrowNullPointer.java:6)
```

If you want names for *variables* i.e. in lambdas, compile with `-g:vars`



TOOLING


Operating System:
Linux
Architecture:
x64
ben@neptun (192.168.8.8) - byobu
ben@neptun ~/jpackager-demo $ jar --create --file lib/helloworld.jar HelloWorld.class
ben@neptun ~/jpackager-demo $ ll lib/
insgesamt 4,5K
-rw-rw-r-- 1 ben ben 999 Mai 28 20:35 helloworld.jar
ben@neptun ~/jpackager-demo $ jpackage --name helloworld --main-jar helloworld.jar --main-class HelloWorld --input lib
WARNING: Using incubator modules: jdk.incubator.jpackage
ben@neptun ~/jpackager-demo $ ll
insgesamt 14K
-rw-r--r-- 1 ben ben 35M Mai 28 20:36 helloworld_1.0-1_amd64.deb
-rw-rw-r-- 1 ben ben 960 Mai 28 20:35 HelloWorld.class
-rw-rw-r-- 1 ben ben 265 Mai 28 20:33 HelloWorld.java
drwxrwxr-x 2 ben ben 3 Mai 28 20:35 lib/
ben@neptun ~/jpackager-demo $ sudo dpkg -i helloworld_1.0-1_amd64.deb
Vormals nicht ausgewähltes Paket helloworld wird gewählt.
(Lese Datenbank ... 436945 Dateien und Verzeichnisse sind derzeit installiert.)
Vorbereitung zum Entpacken von helloworld_1.0-1_amd64.deb ...
Entpacken von helloworld (1.0-1) ...
helloworld (1.0-1) wird eingerichtet ...
ben@neptun ~/jpackager-demo $ /opt/helloworld/bin/helloworld
Hello executable .java source files!
ben@neptun ~/jpackager-demo $ /opt/helloworld/bin/helloworld People
Hello People!
ben@neptun ~/jpackager-demo $ _
u x86_64 0:-# 1:- 2:- 3:-* ▲3.0Mb ▼5.7Mb 11d21h 27C 7.34 4x1.6GHz 31.2G75% s16.0G1% 76G26% ben@neptun 2020-05-28 20:36:39
presentation-intro.adoc U
presentation-jvm.adoc U
18 ----
19 Exception in thread "main" java.lang.NullPointerException: Cannot invoke <mark>"String.toLowerCase(