計算機科学第一

2012年度第7回

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もくじ

- ✤10: Always override toString
- ✤13: Minimize accessibility
- ✤14: Public Class

X: Always override toString

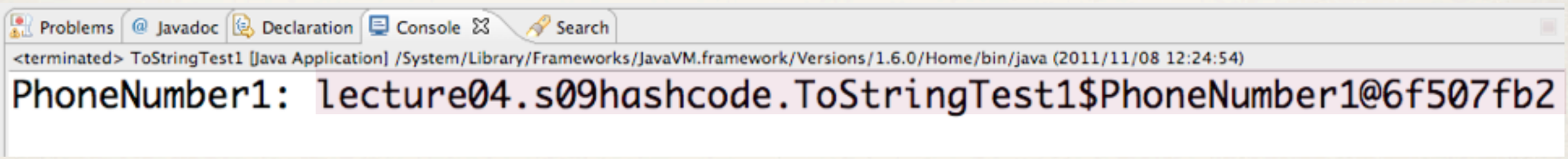
普通 toString は

toStringを上書きしない場合

```
class PhoneNumber1 {
    private final short areaCode, prefix, number;

    public PhoneNumber1(int a, int p, int n) {
        areaCode = (short)a;
        prefix = (short)p;
        number = (short)n;
    }
}
```

普通に出力してみる

```
private void print(Object o) {
    out.printf("%s: %s\n\n", o.getClass().getSimpleName(), o);
}

private void run() {
    print(new PhoneNumber1(03, 5734, 3493));
```



toStringを上書きすると

```
public String toString() {
    return String.format("(%02d)%04d-%04d", areaCode, prefix, number);
}
```

Problems | Javadoc | Declaration | Console | Search

<terminated> ToStringTest1 [Java Application] /System/Library/Frameworks/JavaVM.framework/Versions/1.6.0/Home/bin/java (2011/11/08 12:24:54)

```
PhoneNumber1: lecture04.s09hashcode.ToStringTest1$PhoneNumber1@6f507fb2

PhoneNumber2: (03)5734-3493
```

toStringを上書きすると

```
public String toString() {
    return String.format("(%02d)%04d-%04d", areaCode, prefix, number);
}
```

Problems | Javadoc | Declaration | Console | Search

<terminated> ToStringTest1 [Java Application] /System/Library/Frameworks/JavaVM.framework/Versions/1.6.0/Home/bin/java (2011/11/08 12:24:54)

```
PhoneNumber1: lecture04.s09hashcode.ToStringTest1$PhoneNumber1@6f507fb2

PhoneNumber2: (03)5734-3493
```

toStringを上書きすると

```
private void run() {
    PhoneNumber1 phone1 = new PhoneNumber1(03, 5734, 3493);
    PhoneNumber2 phone2 = new PhoneNumber2(03, 5734, 3493);
    print(phone1);
    print(phone2);
    out.printf("phone1.hashCode = %x\n", phone1.hashCode());
}
```

Problems | Javadoc | Declaration | Console | Search

<terminated> ToStringTest1 [Java Application] /System/Library/Frameworks/JavaVM.framework/Versions/1.6.0/Home/bin/java (2011/11/08 12:30:43)

```
PhoneNumber1: lecture04.s09hashcode.ToStringTest1$PhoneNumber1@6f507fb2

PhoneNumber2: (03)5734-3493

phone1.hashCode = 6f507fb2
```

toString を上書きしたらやっておきたいこと

- toString の出力形式を使った Constructor
- toString に関わるフィールドへのアクセサ

文字列 → PhoneNumber

```
public static PhoneNumber of(String s) {
    Scanner scan = new Scanner(s);
    scan.next("\\(([0-9]+)\\)([0-9]+)-([0-9]+)");
    MatchResult match = scan.match();
    return new PhoneNumber(Short.valueOf(match.group(1)),
            Short.valueOf(match.group(2)),
            Short.valueOf(match.group(3)));
}
```

Java でも正規表現(Regular expression)

が

使えます。

PhoneNumber のアクセサ

```
public short areaCode() { return areaCode; }
public short prefix() { return prefix; }
public short number() { return number; }
```

13 Minimize Accessibility

情報隠蔽

情報隠蔽の効用

1. モジュールの分離 (decouple) → 独立性の向上

2. 開発の効率化 → 並行開発

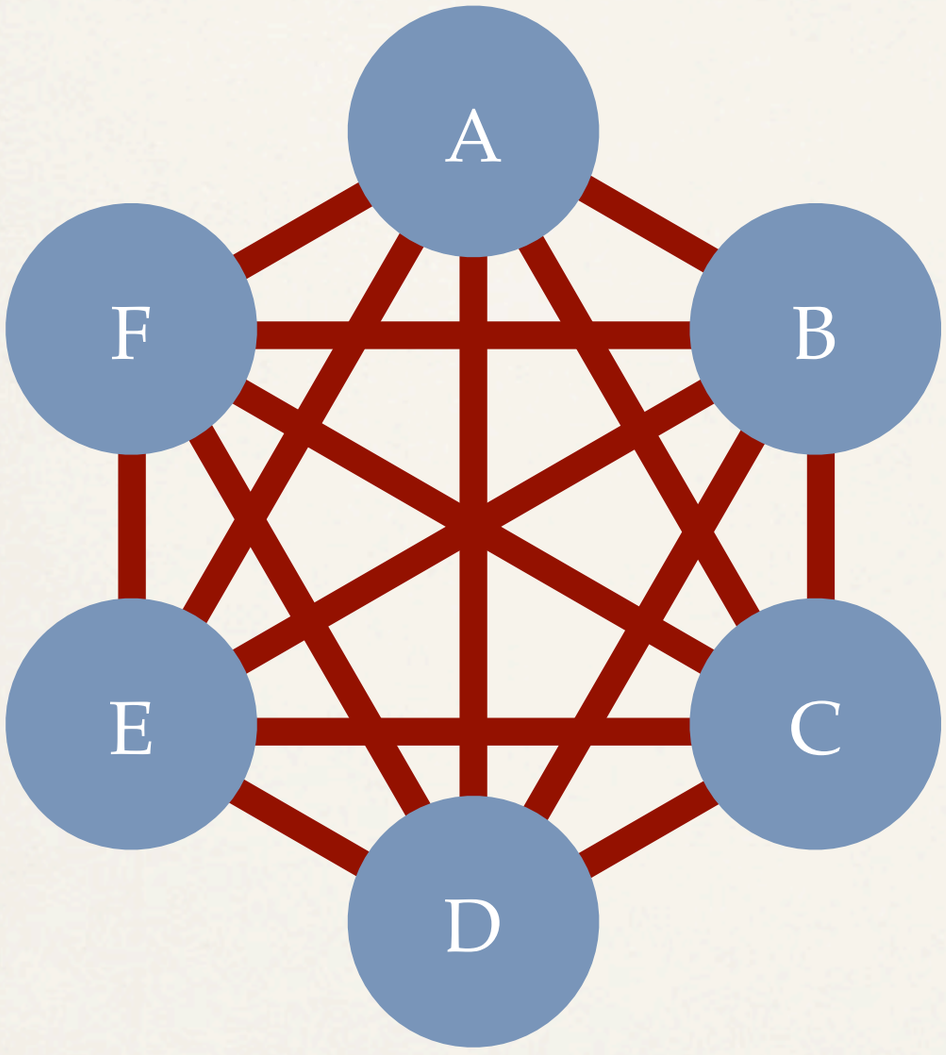
3. 保守労力の軽減

4. 性能上の問題の診断が容易

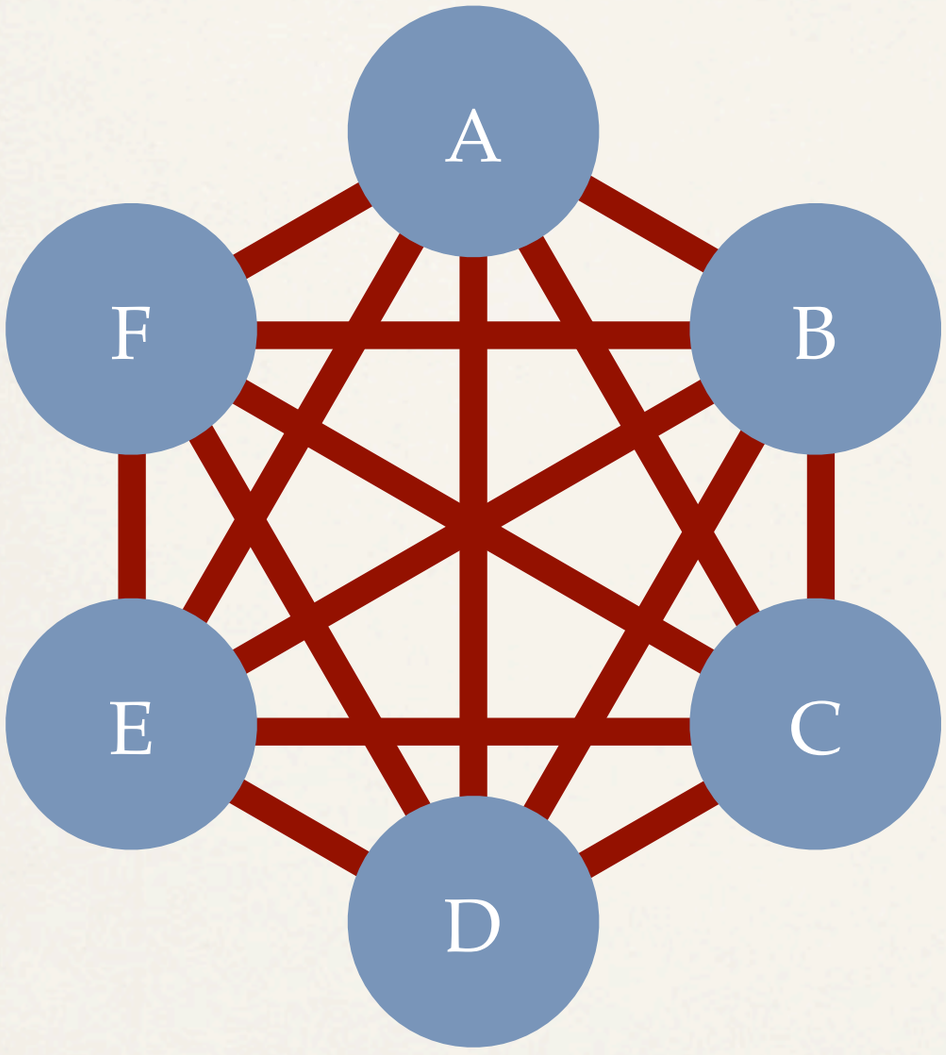
5. ソフトウェア再利用性の向上

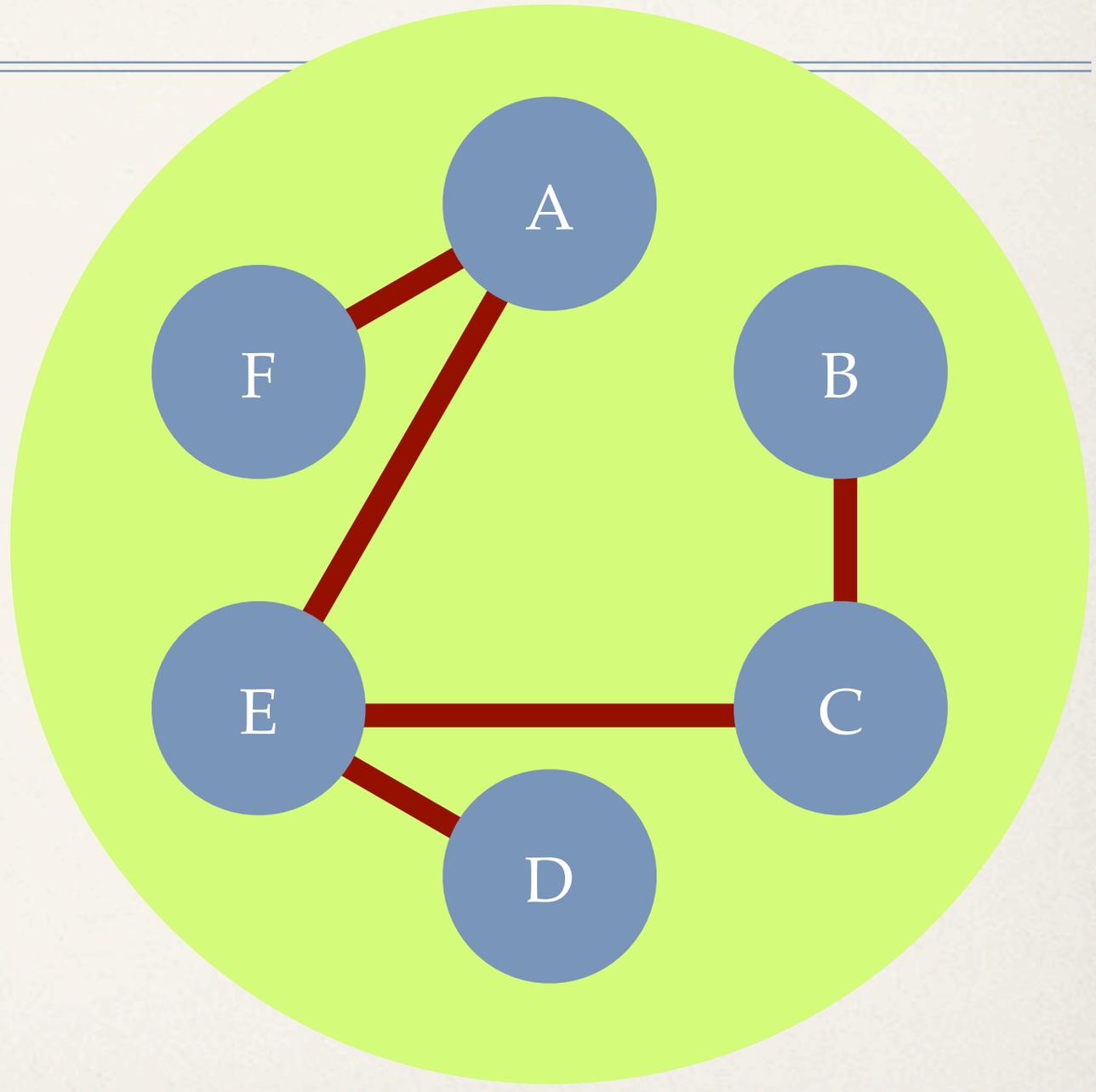
6. コンパクトなシステムの開発

(1) 独立性の向上

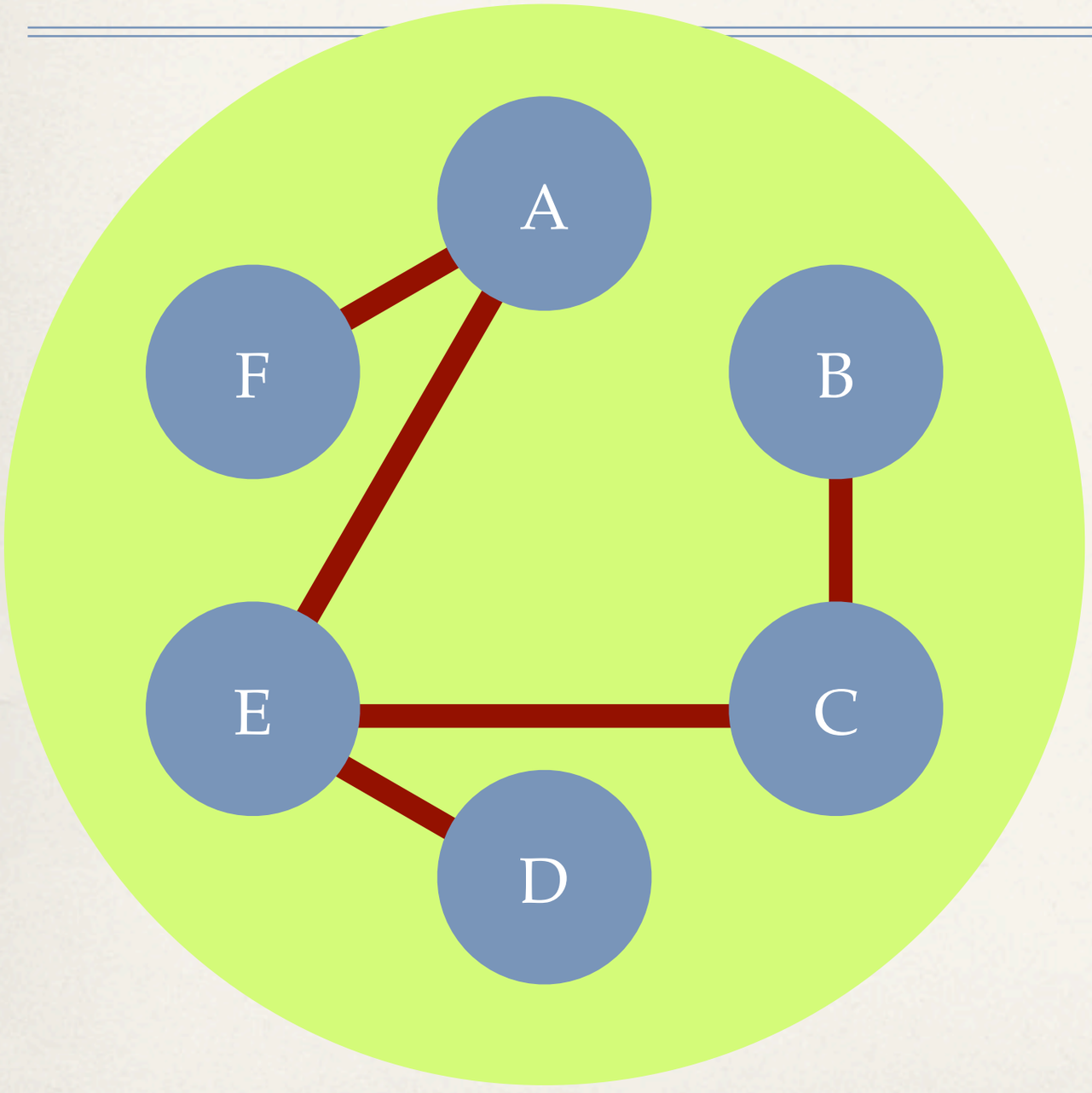


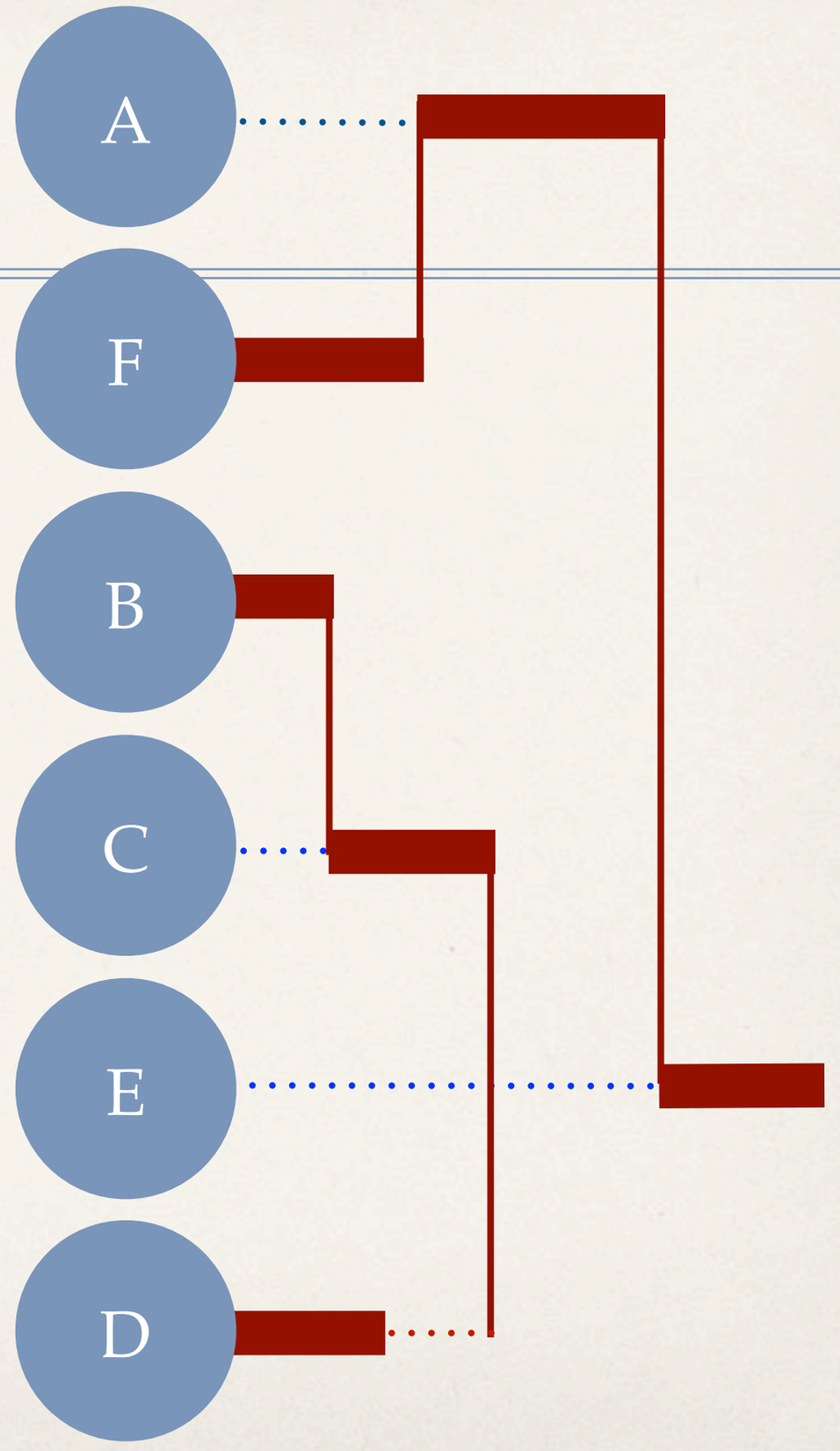
(1) 独立性の向上





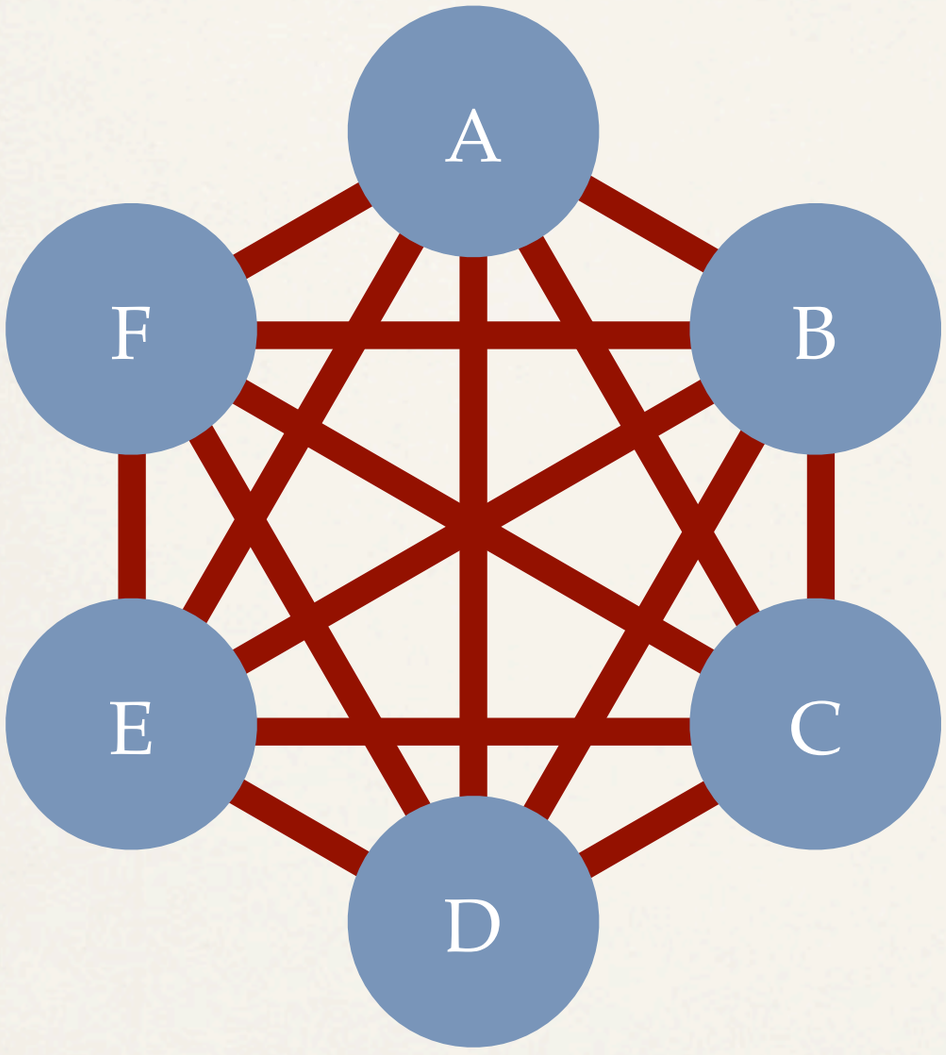
(2) 並行開発

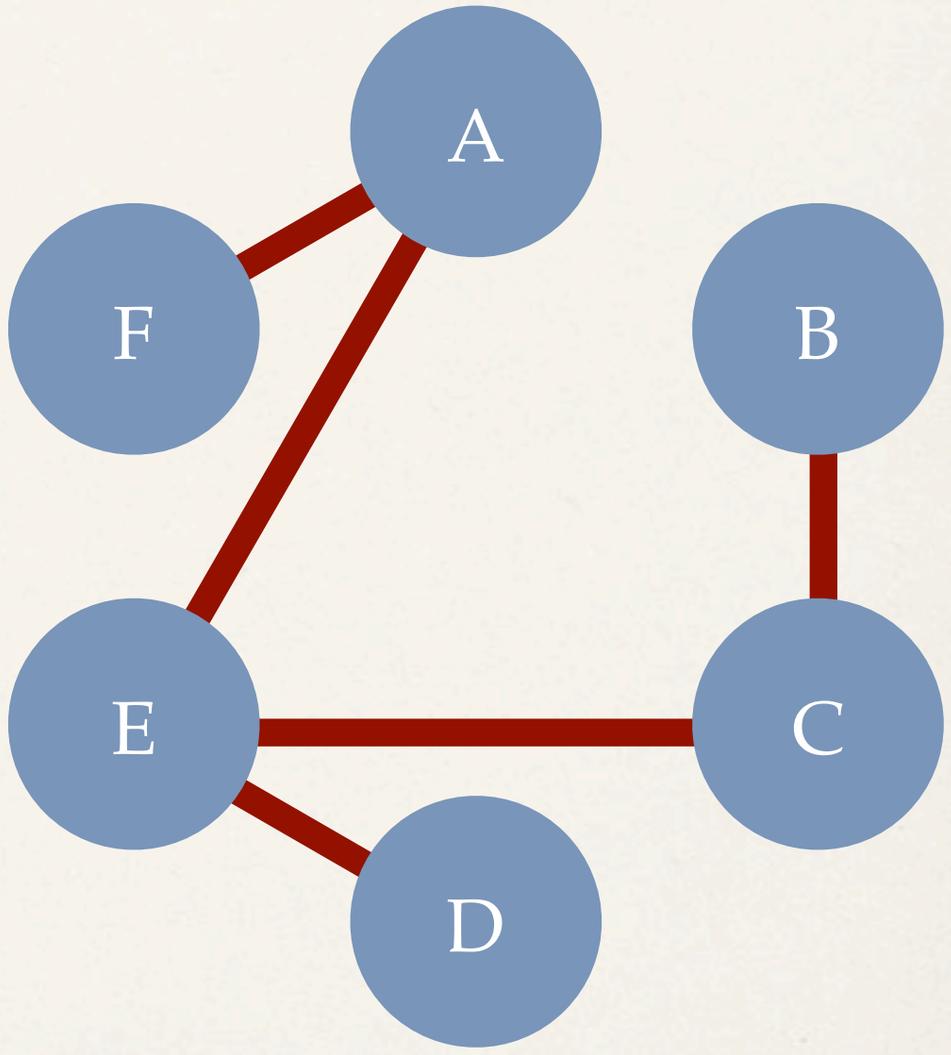




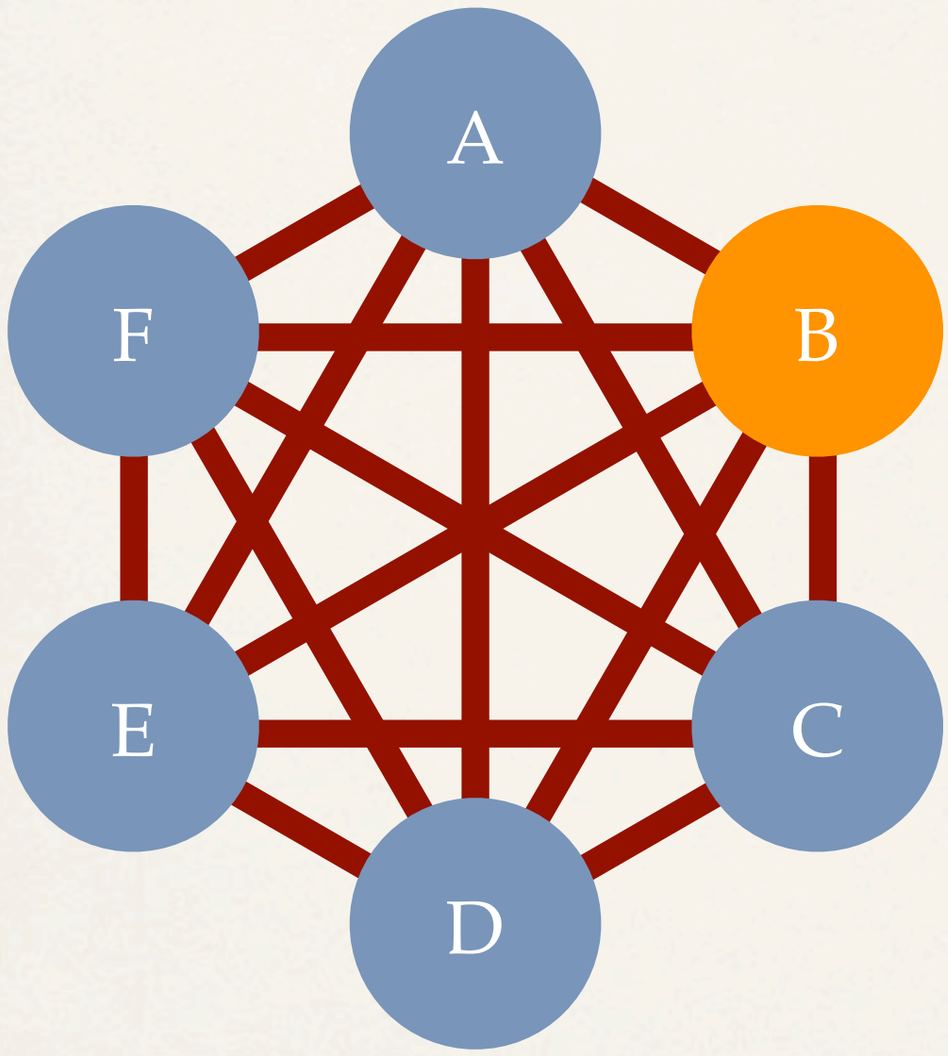
システム完成！

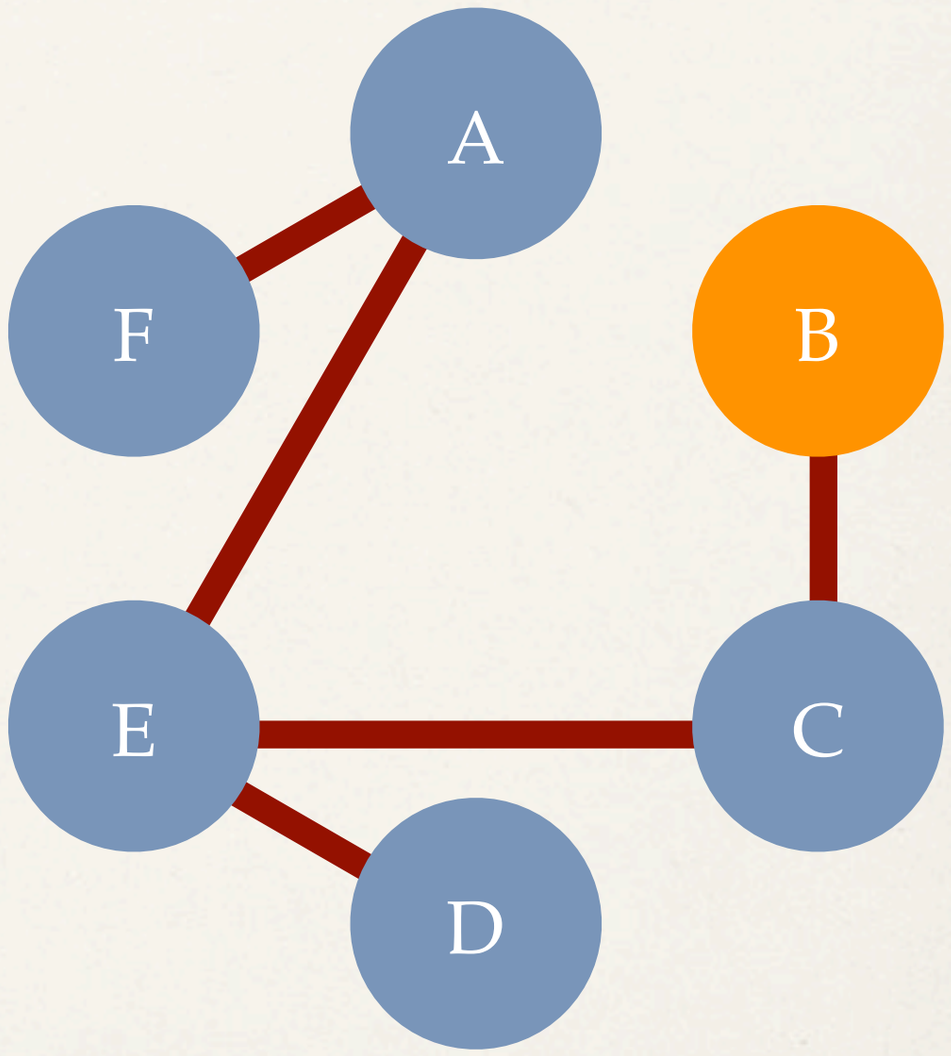
(3) 保守労力



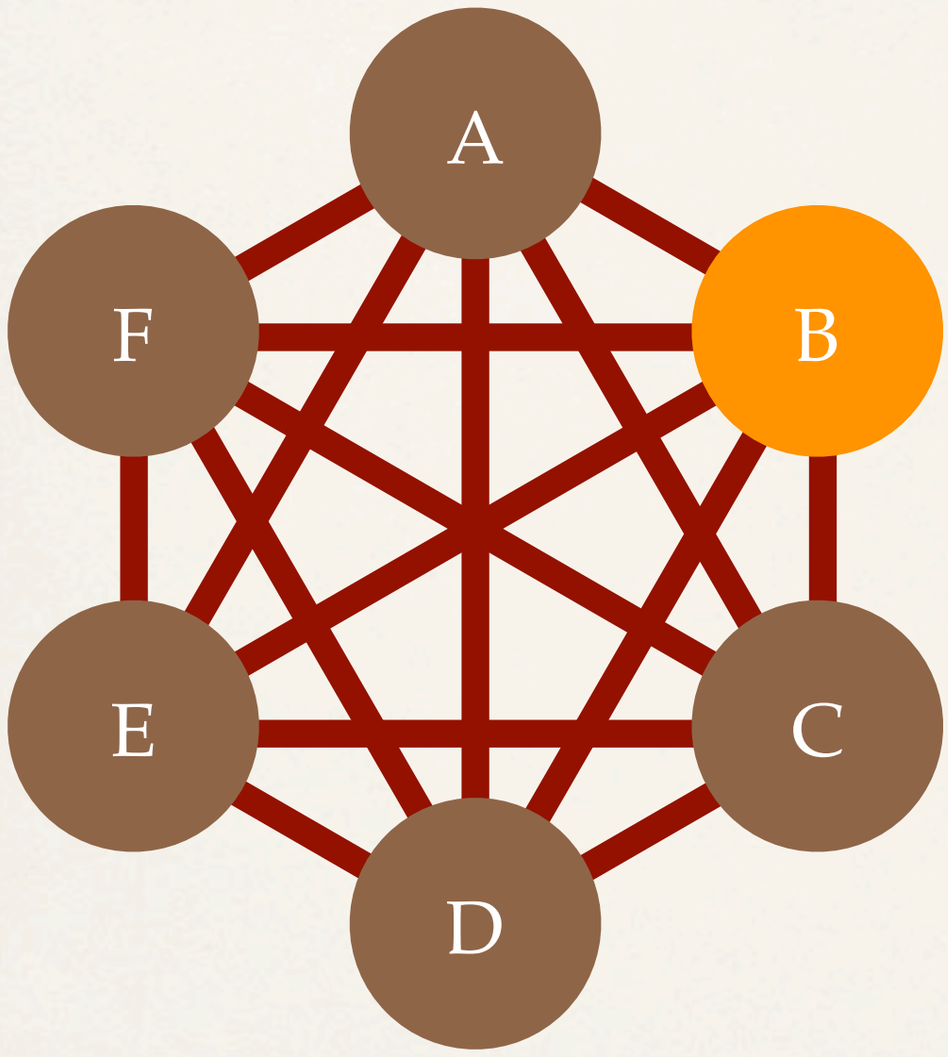


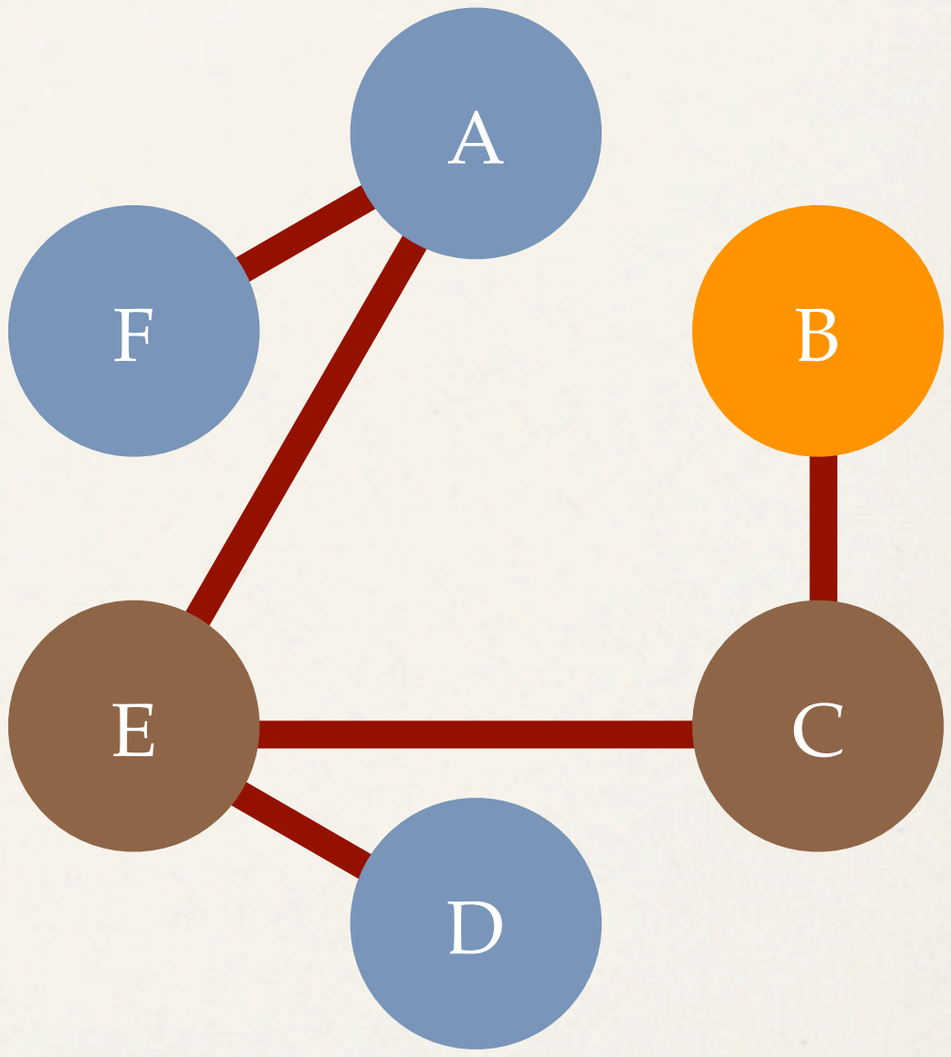
(3) 保守労力:仕様変更！



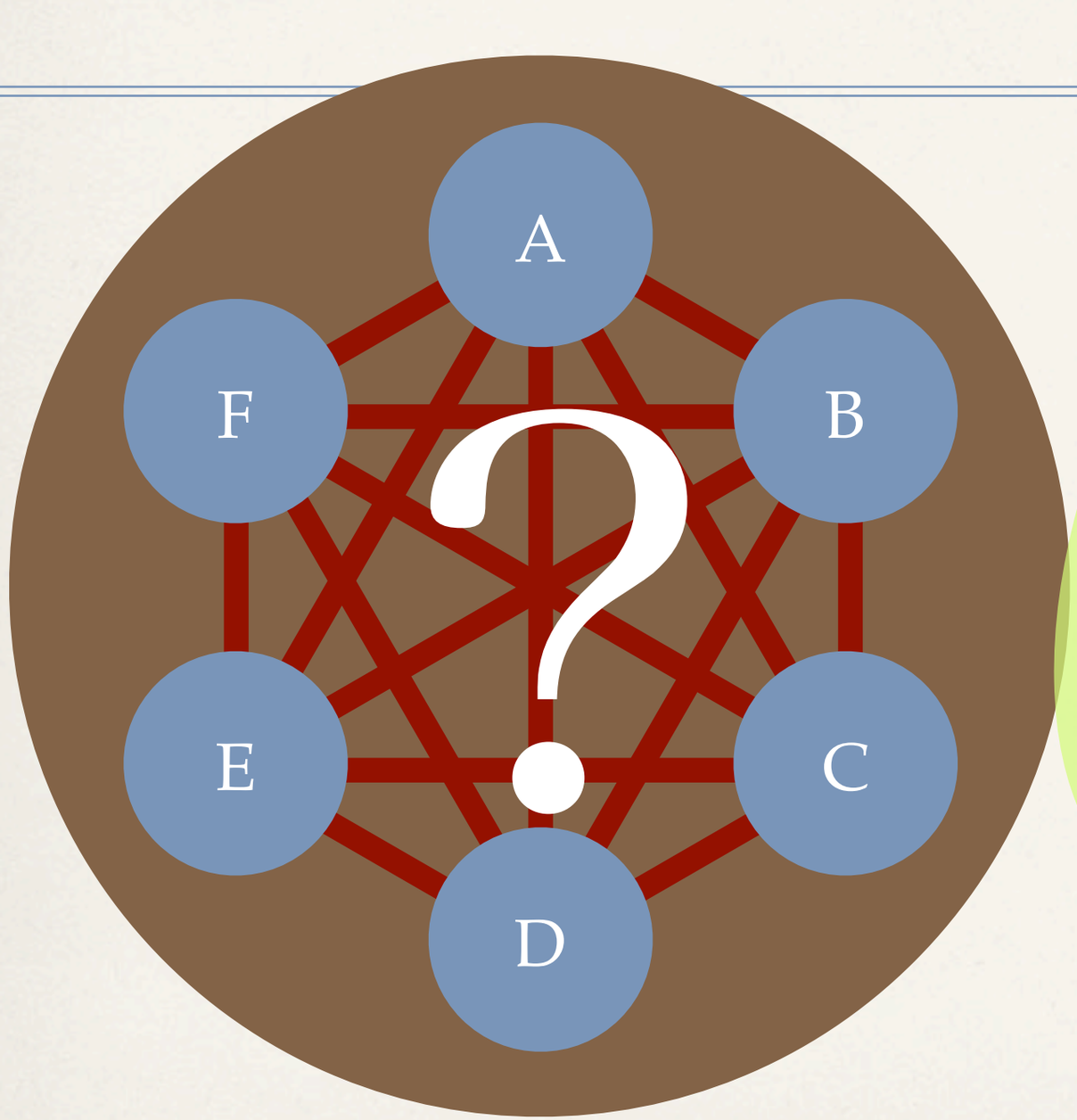


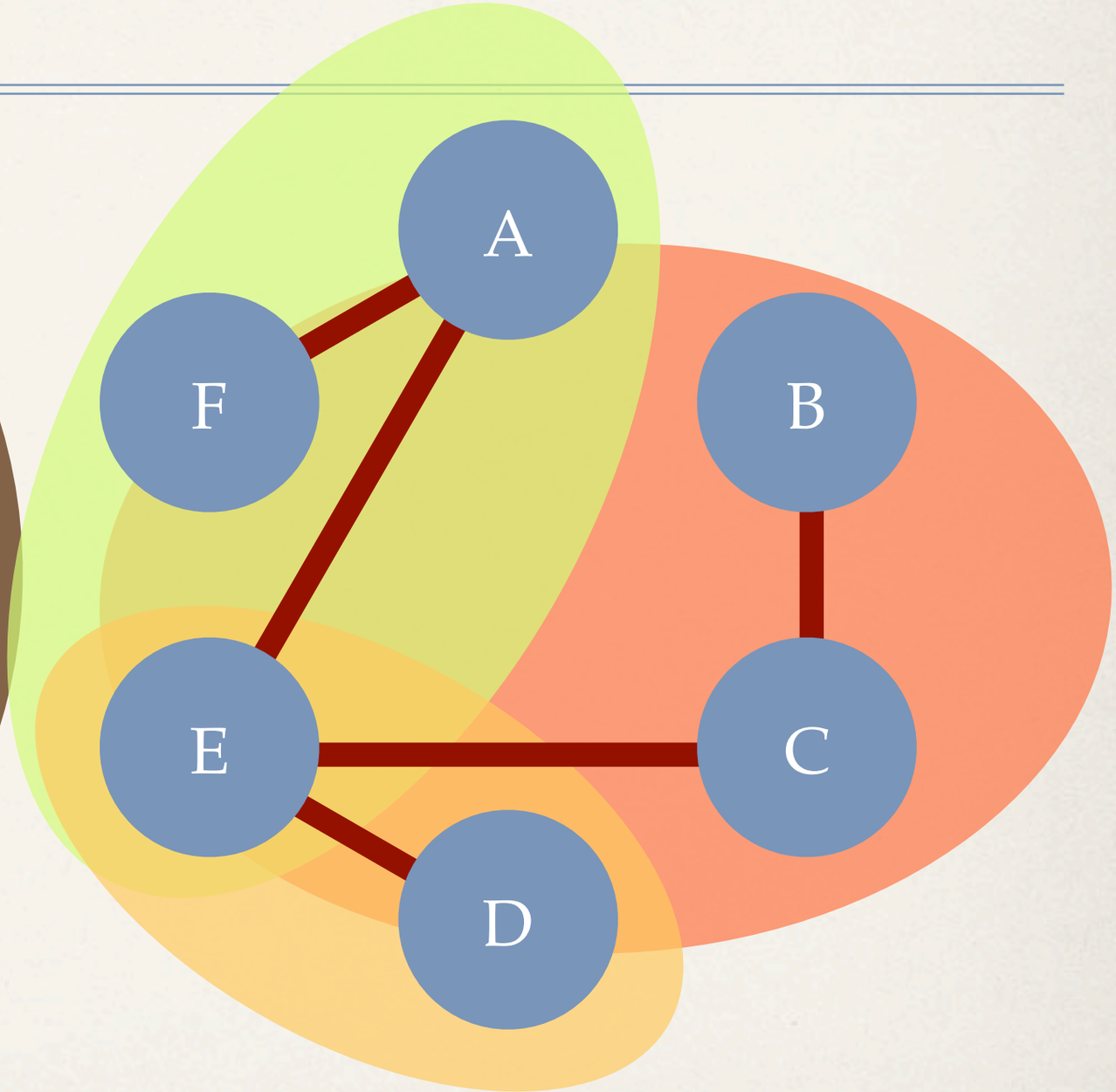
(3) 保守労力:仕様変更！



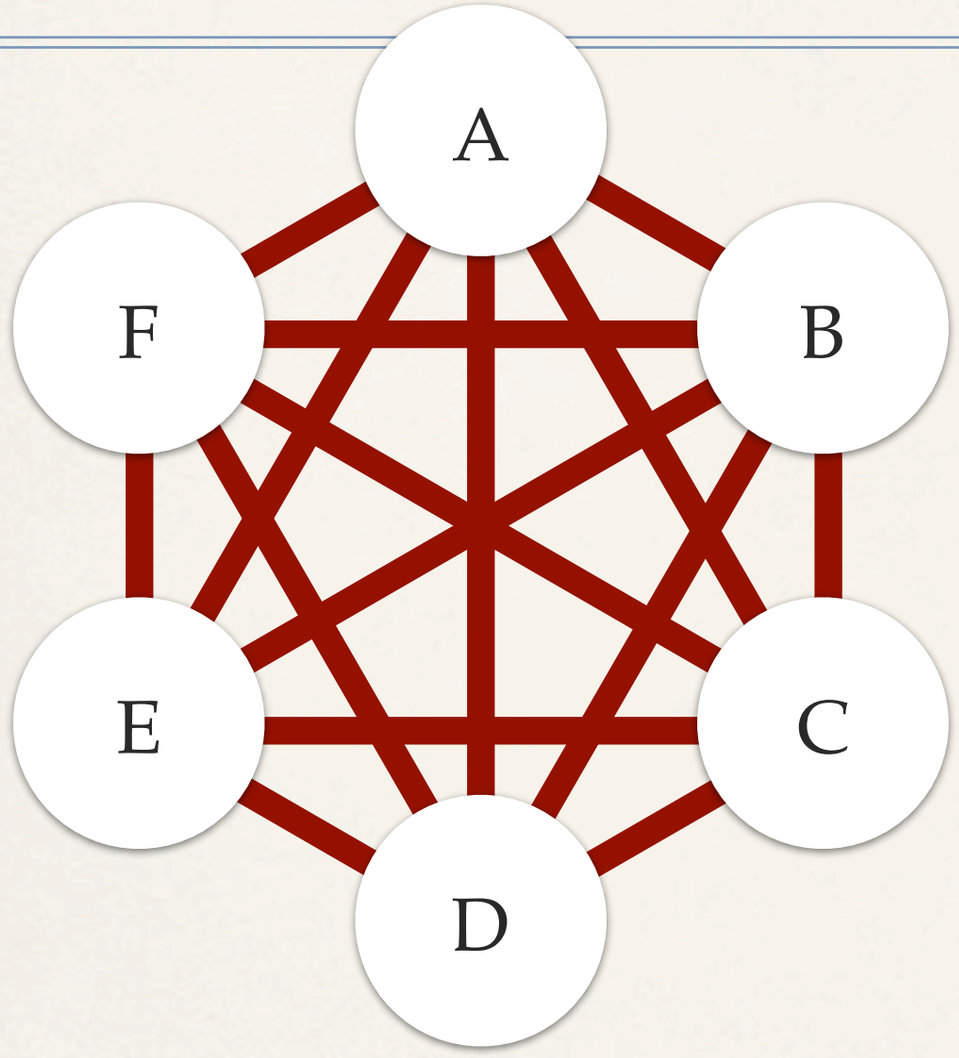


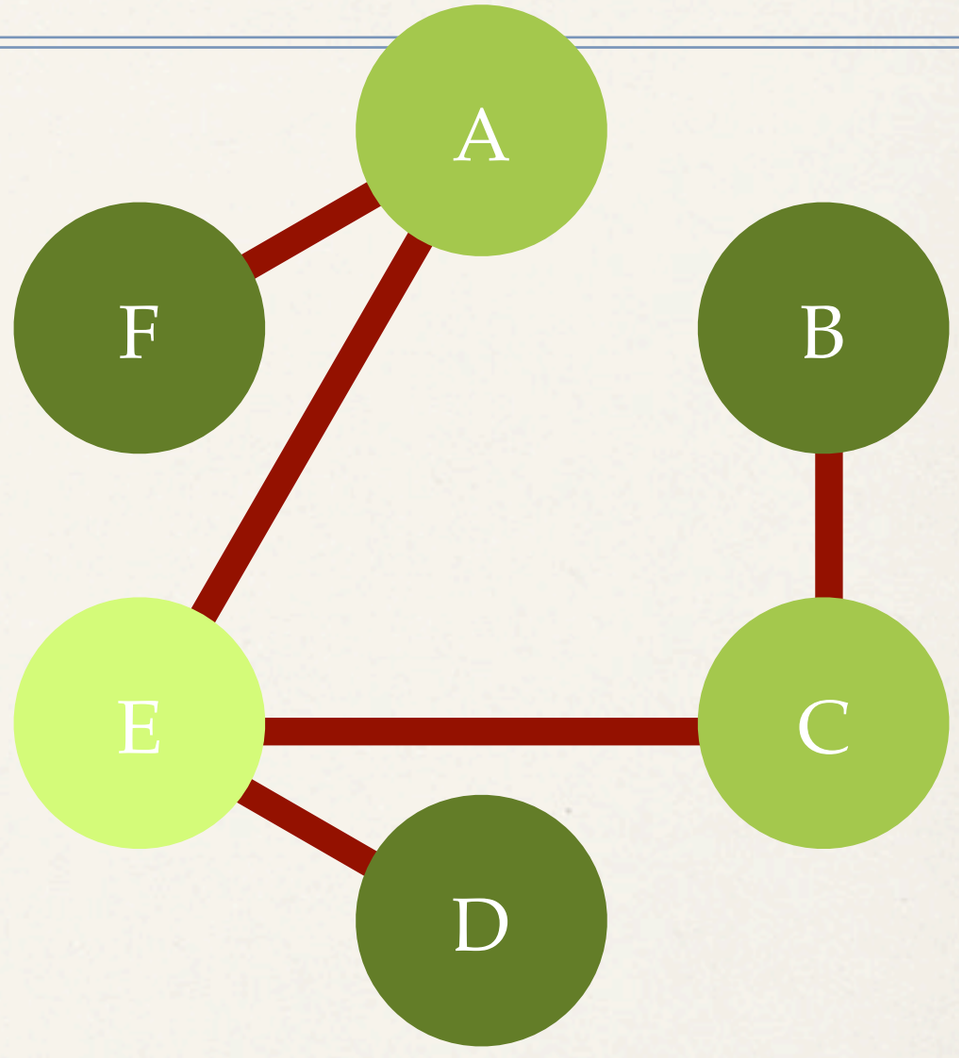
(4) 性能上の問題の診断





(5) 再利用性





(6) コンパクト

- 単体テスト(モジュール単位でのテスト)が実施できれば、システムが未完の状態でも不安にかられて不必要な機能を追加しないですむ。

Javaと情報隠蔽

- スコープ規則

- アクセス制御 (private / protected / public)

- 基本→可能な限りアクセス**できなく**する

- アクセス手段が少ない → このクラスを気にかける心配が少ない

アクセス制御	アクセスを許されるクラス
private	宣言したクラス内のみ
(package-private)	同じパッケージ内のクラス (defaultアクセス)
protected	(a) サブクラス (b) 同じパッケージ内のクラス
public	すべてのクラス

大原則

1. オブジェクトを指すフィールド

   → どんなことがあってもpublicはだめ

   - publicで代入可能なフィールド → 並列化不可能

2. public static final 配列 → セキュリティホール

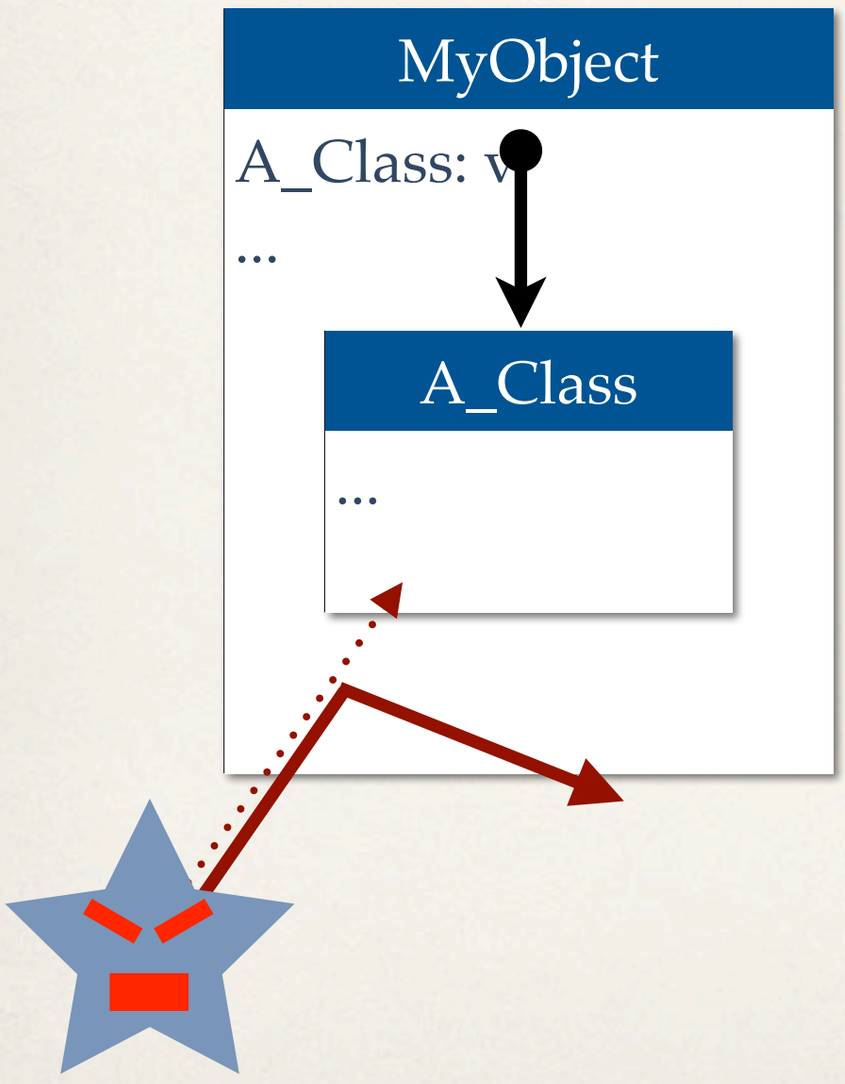
3. 配列を返すアクセサ → セキュリティホール

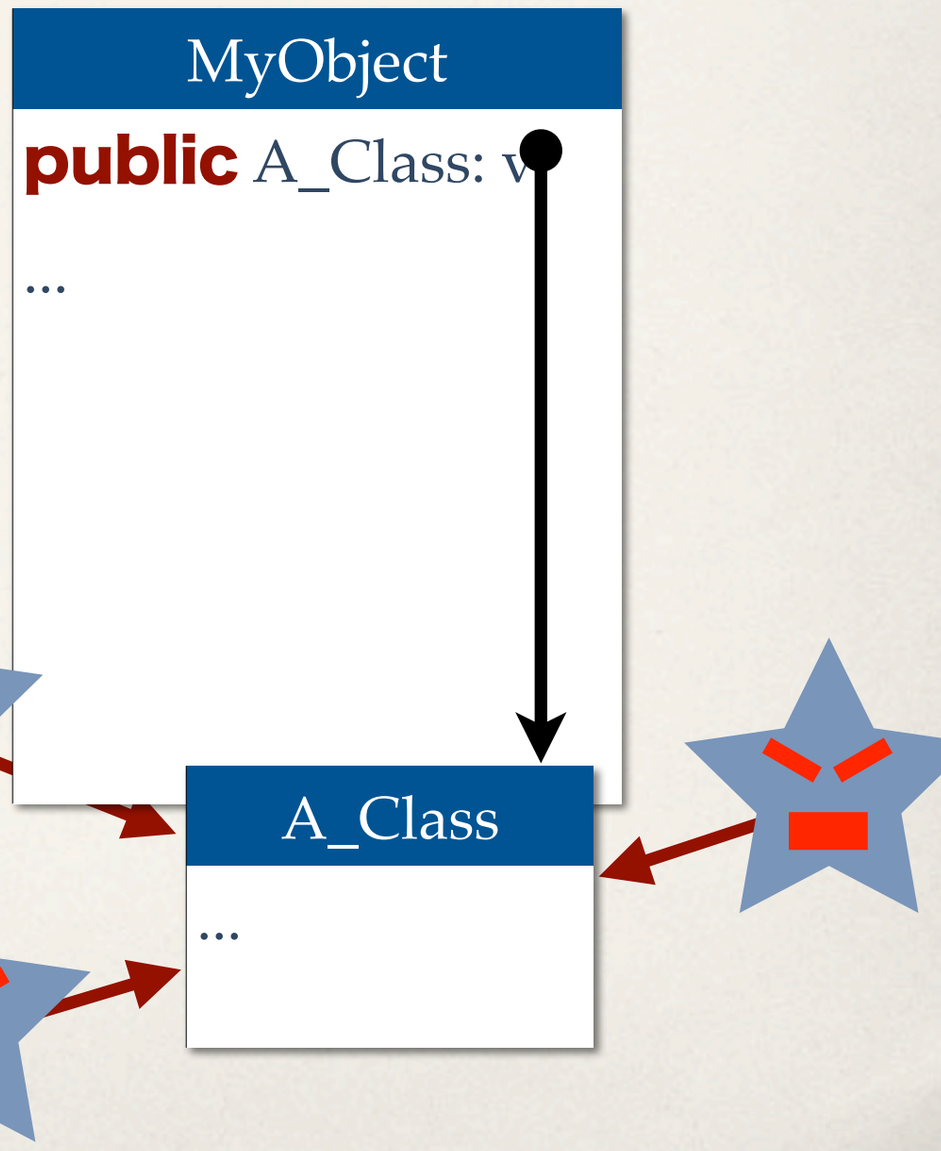
public objectの危険性

MyObject
A_Class: v;
...

MyObject
public A_Class: v;
...

public objectの危険性

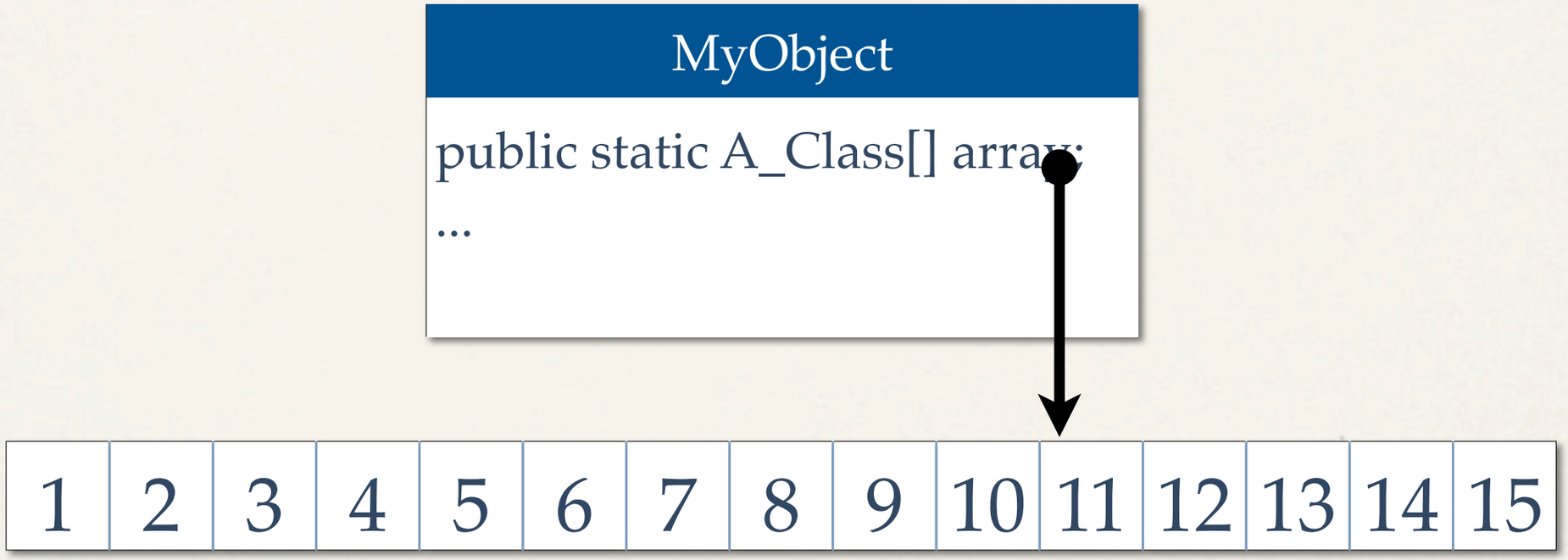




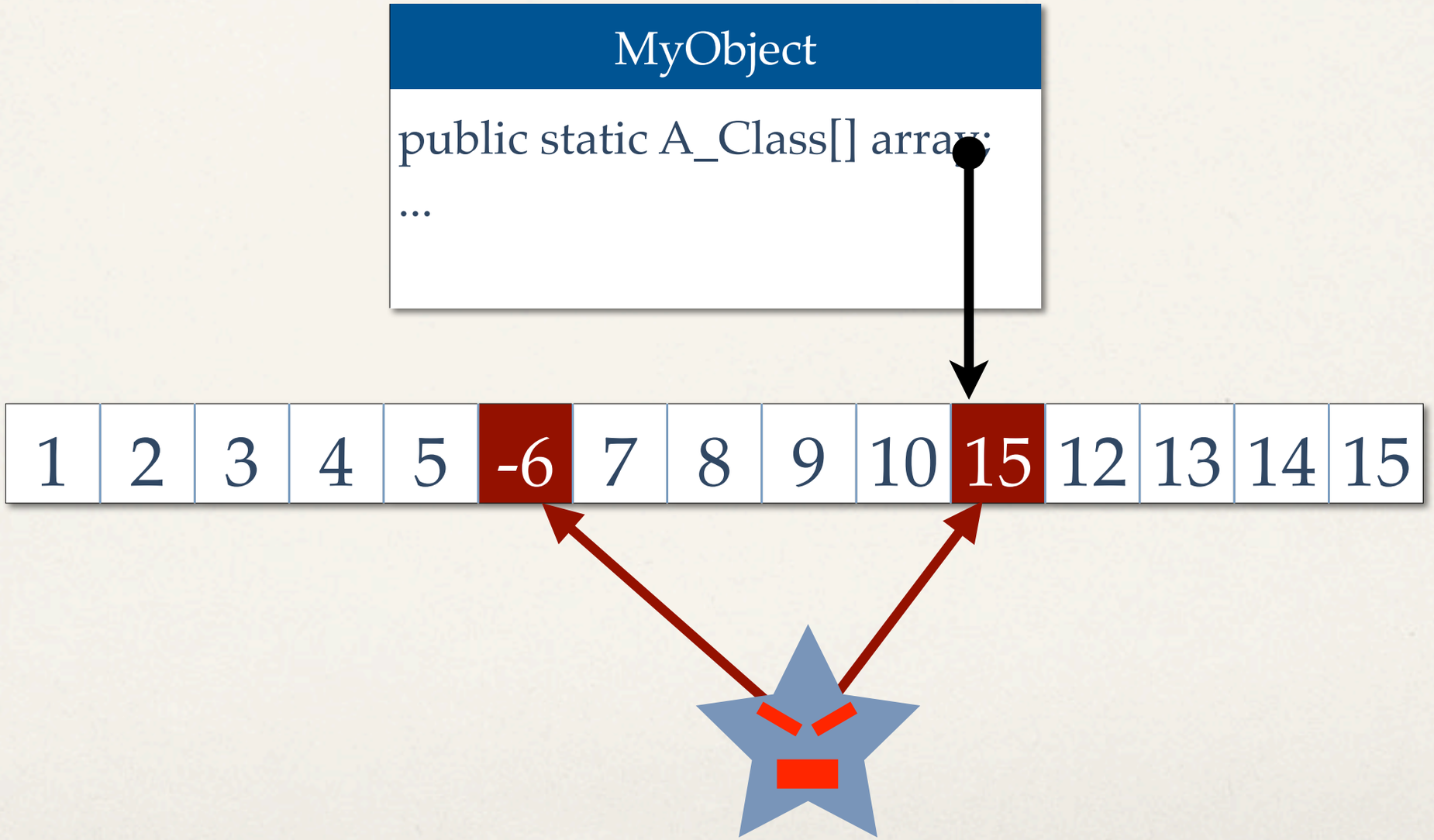
public static 配列

MyObject
public static A_Class[] array; ...

public static 配列



public static 配列

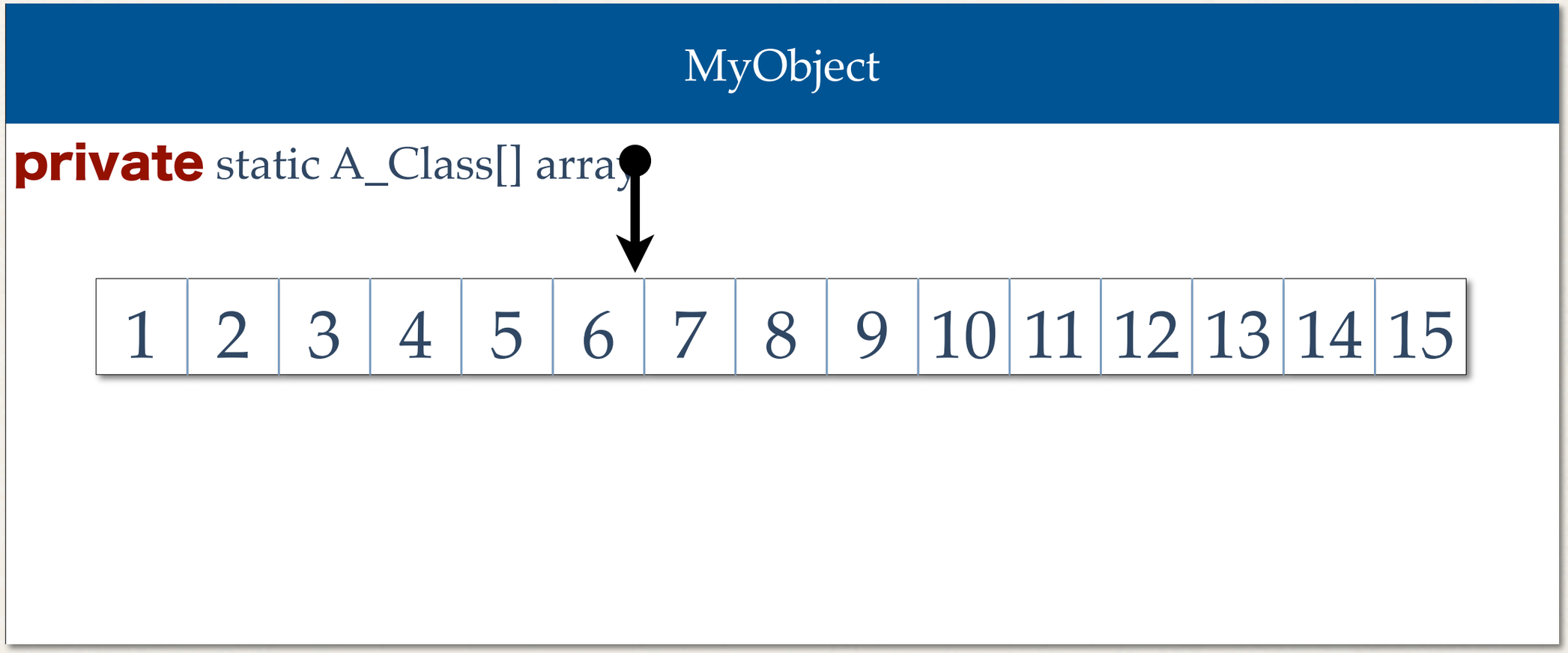


配列を返すaccessor

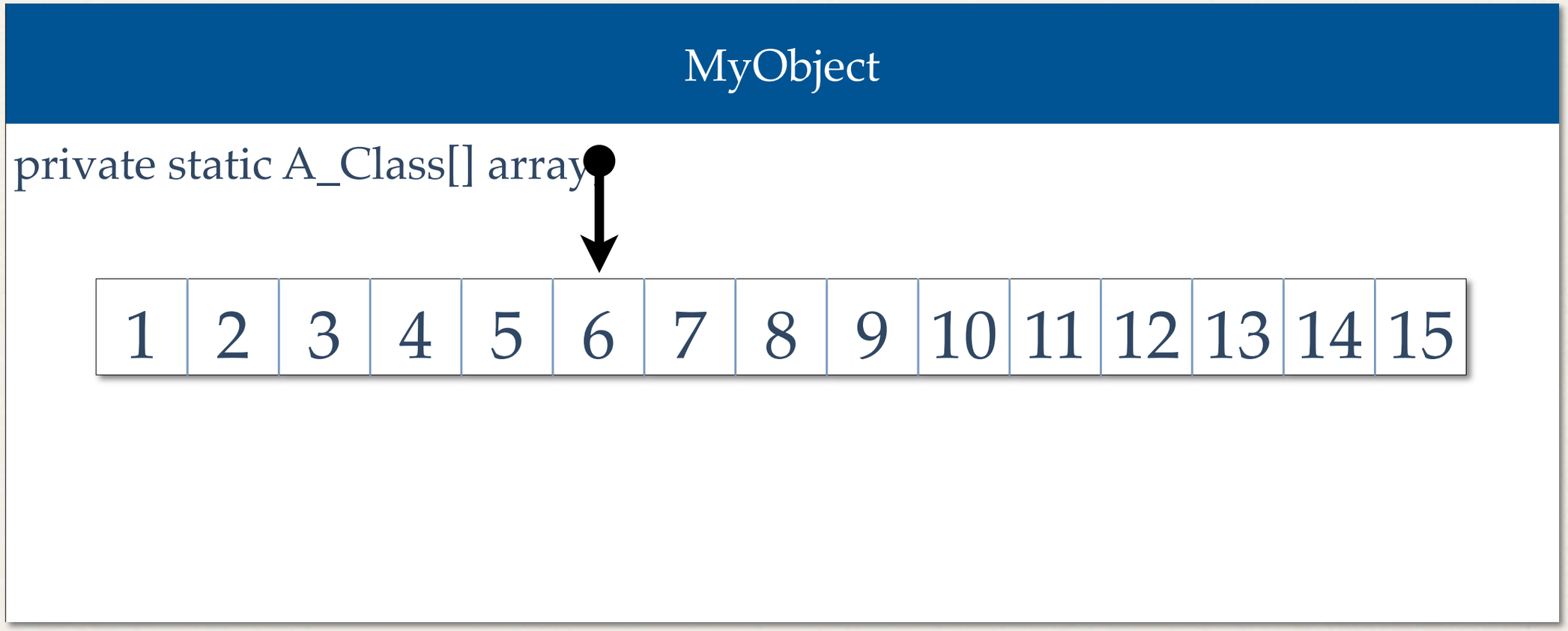
MyObject

private static A_Class[] array;

配列を返すaccessor



配列を返すaccessor



でも、外から配列にアクセスしたいこともある。。。

配列を返すaccessor

MyObject

private static A_Class[] array

public A_Class[] getArray() { return array; }　　// 配列の accessor

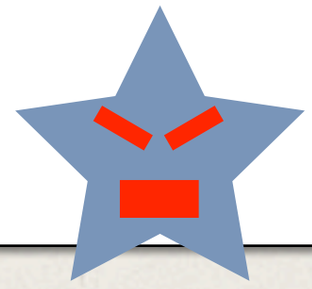
配列を返すaccessor

MyObject

private static A_Class[] array

public A_Class[] getArray() { return array; }　　// 配列の accessor

```
aMethod() {
    A_Class[] array = myObject.getArray();
    array[6] = -6;
    array[11] = 15;
}
```



正しいaccessor (1)

MyObject

private static A_Class[] array

public A_Class getElementOfArray(int i) { return array[i]; }

```
aMethod() {
    A_Class elem = myObject.getElementOfArray(6);
    elem.doSomething();
}
```

正しいaccessor (2)

MyObject

private static A_Class[] array

public A_Class[] clone() { return java.util.Arrays.copyOf(array, array.length); }

```
aMethod() {
    A_Class[] array = myObject.clone();
    array[6] = -6;
    array[11] = 15;
}
```

正しいaccessor (2)

MyObject

private static A_Class[] array

public A_Class[] clone() { return java.util.Arrays.copyOf(array, array.length); }


```
aMethod() {
    A_Class[] array = myObject.clone();
    array[6] = -6;
    array[11] = 15;
}
```

正しいaccessor (3)

MyObject

```
private static A_Class[] private_values;

public static final List<A_Class> values =

Collections.unmodifiableList(Arrays.asList(private_values)

);
```

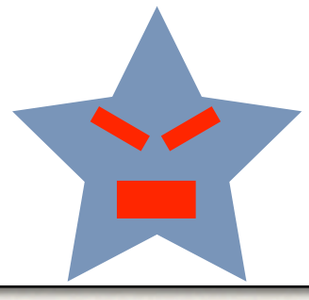
正しいaccessor (3)

MyObject

```
private static A_Class[] private_values;

public static final List<A_Class> values =

Collections.unmodifiableList(Arrays.asList(private_values)

);
```

```
aMethod() {
    List<A_Class> values = myObject.values;
    values.get(6);
    values.set(6, -6);
    values.set(11, 15);
}
```

Unsupported Operation Exception



14 Public Class

公開されたクラスの

~~publicフィールド~~

日付

(x, y)-座標を表したい

二つの流儀

Point

```
public x;
public y;
```

Point

```
private x;
private y;

public Point(x, y) { this.x = x; this.y =
y; }

public getX() { return x; }
public getY() { return y; }

public setX(x) { this.x = x; }
public setY(y) { this.y = y; }
```

二つの流儀

Point

```
public x;
public y;
```

Point

```
private x;
private y;

public Point(x, y) { this.x = x; this.y =
y; }

public getX() { return x; }
public getY() { return y; }

public setX(x) { this.x = x; }
public setY(y) { this.y = y; }
```

面倒？

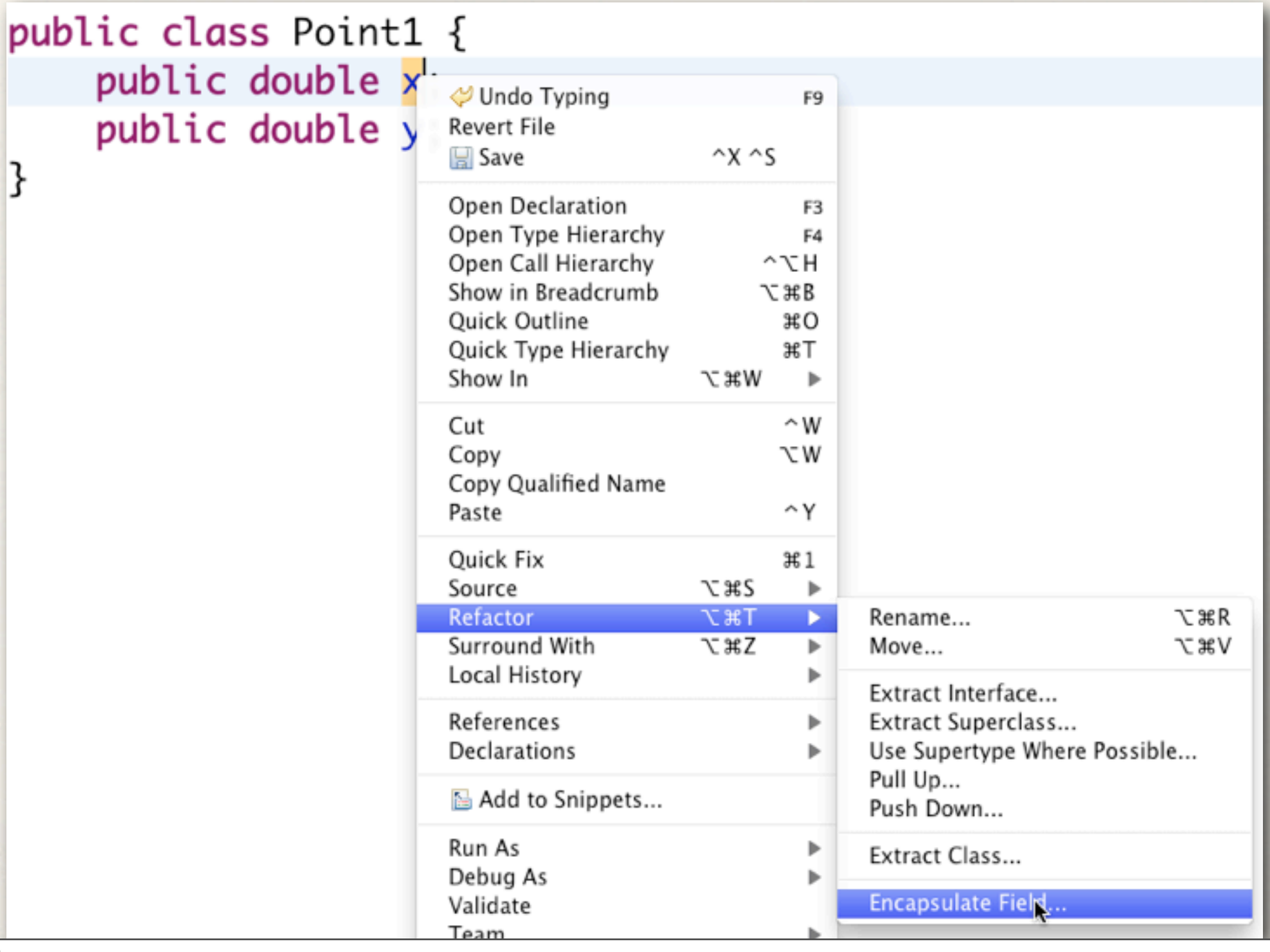
いや、そうでもない。

Refactoring がある！

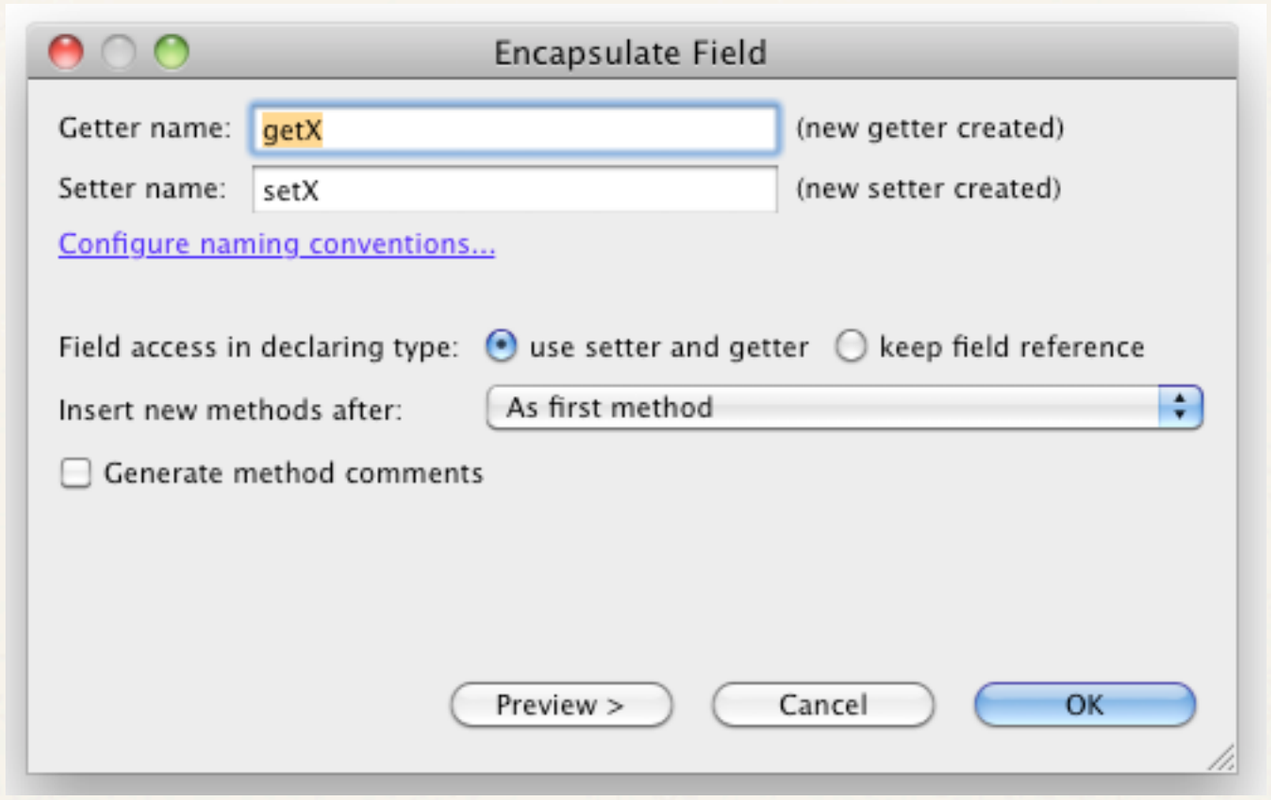
Refactoring (1/4)

```
package lecture04.s14public_classes;

public class Point1 {
    public double x;
    public double y;
}
```

Refactoring (2/4)



Refactoring (3/4)



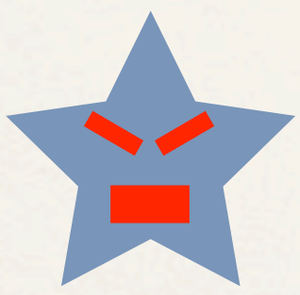
Refactoring (4/4)

```
package lecture04.s14public_classes;

public class Point1 {
    private double x;
     public double y;
    public void setX(double x) {
        this.x = x;
    }
    public double getX() {
        return x;
    }
}
```

二つの流儀

Point

```
public x;
public y;
```



Point

```
private x;
private y;

public Point(x, y) { this.x = x; this.y =
y; }

public getX() { return x; }
public getY() { return y; }

public setX(x) { this.x = x; }
public setY(y) { this.y = y; }
```

二つの流儀

Point

```
public x;
public y;
```

判断の分かれ目

Public class or not public?

Point

```
private x;
private y;

public Point(x, y) { this.x = x; this.y =
y; }

public getX() { return x; }
public getY() { return y; }

public setX(x) { this.x = x; }
public setY(y) { this.y = y; }
```

二つの流儀

private/package private class なら OK

Point
public x; public y;

public class ならこっち

Point
private x; private y; public Point(x, y) { this.x = x; this.y = y; } public getX() { return x; } public getY() { return y; } public setX(x) { this.x = x; } public setY(y) { this.y = y; }

判断の分かれ目

Public class or not public?

Java標準APIでの失敗例

java.awt.Dimension

```
public int width;
public int height;
```

java.awt.Component

```
private int width;
private int height;

public Dimension getSize() {
    return new Dimension(this.width,
this.height);
}
```

こうあるべきだった (1/2)

java.awt.Dimension

```
public final int width;
public final int height;
```

java.awt.Component

```
private Dimension size =
    new Dimension(width, height);

public Dimension getSize() { return size; }
```

こうあるべきだった (2/2)

java.awt.Dimension

public int width;

public int height;

java.awt.Component

private int width;
private int height;

~~public Dimension getSize() {~~
~~ return new Dimension(this.width,~~
~~this.height);~~
~~}~~

public int getWidth() { return this.width; }
public int getHeight() { return this.height; }

Java 1.2 で追加