INF 212
ANALYSIS OF PROG. LANGS
INVERSION OF CONTROL
PUBLISH-SUBSCRIBE

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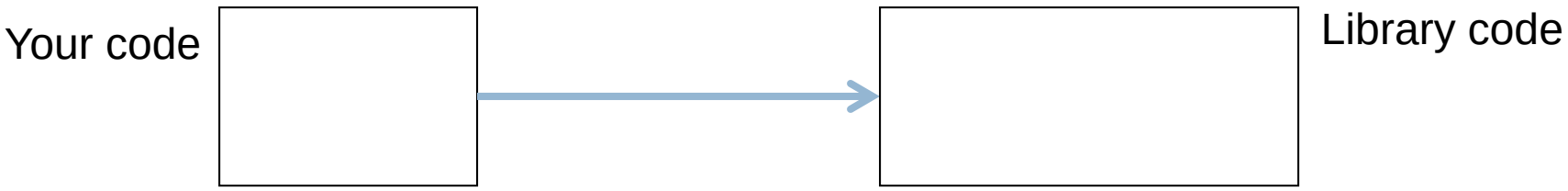
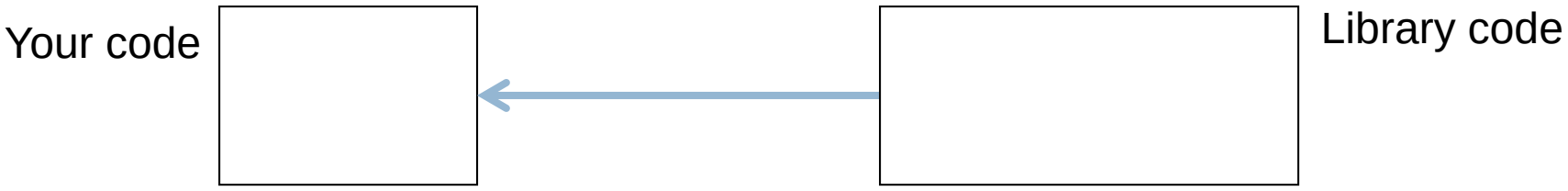
Inversion of Control

Inversion of Control (IoC)

- Usually your code calls the library code



- IoC: Library code calls your code



IoC

- Accumulation of callbacks to be called at specific times
- Popularized in OOP frameworks in the 80s

- Beware of posts on the Internet...
  - *Such words! Much confusion! Wow!*
  - Most describe dependency injection

IoC enablers

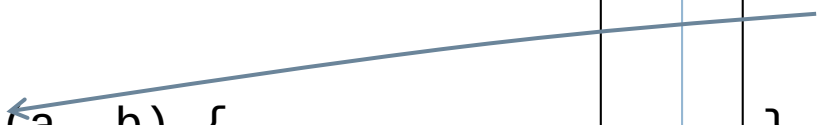
- In general:
  - Higher-order functions
  - Objects
- In statically-typed languages:
  - Abstract Data Types
  - Inheritance

Callbacks

```
main() {
  libraryFunction(myFunction);
}

myFunction(a, b) {
   ...
}
```

```
libraryFunction(func) {
  ...
  func(1, 2);
  ...
}
```

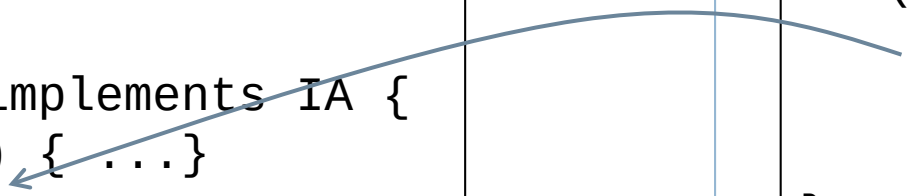


```
main() {
  IA myObj = new A();
  lib.f(myObj);
}

class A implements IA {
  m(a, b) { ...}
}
```

```
interface IA {...}

class Lib {
  f(IA a) {
    ...
    a.m(1, 2);
    ...
}
```

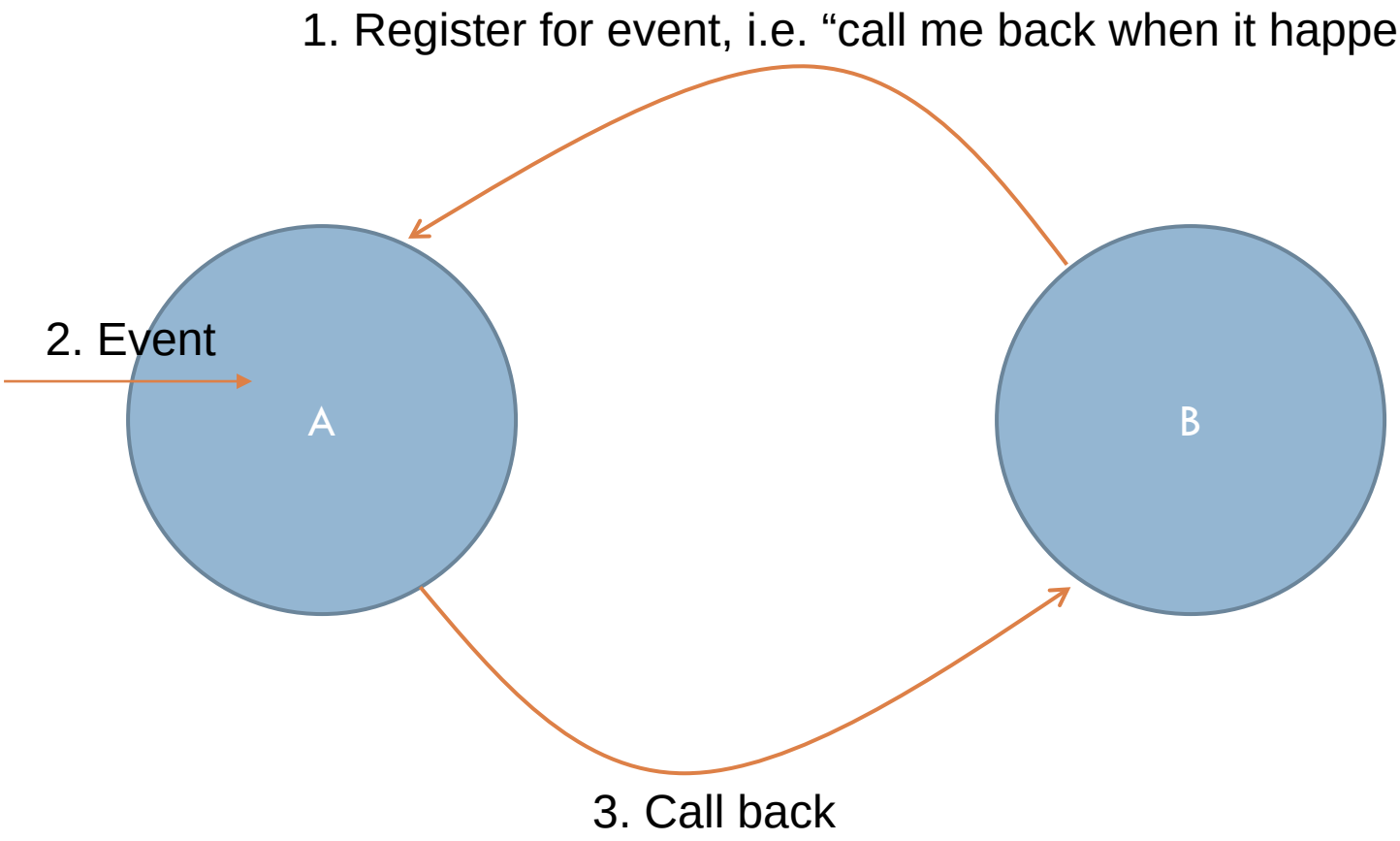


What is a framework?

- More than a library, a generic component or even application
- Parts of it are customized by user's code via inversion of control
- Allows developers to build complete components/applications, with small customizations on deployment sites

Event-Driven

Basic Idea

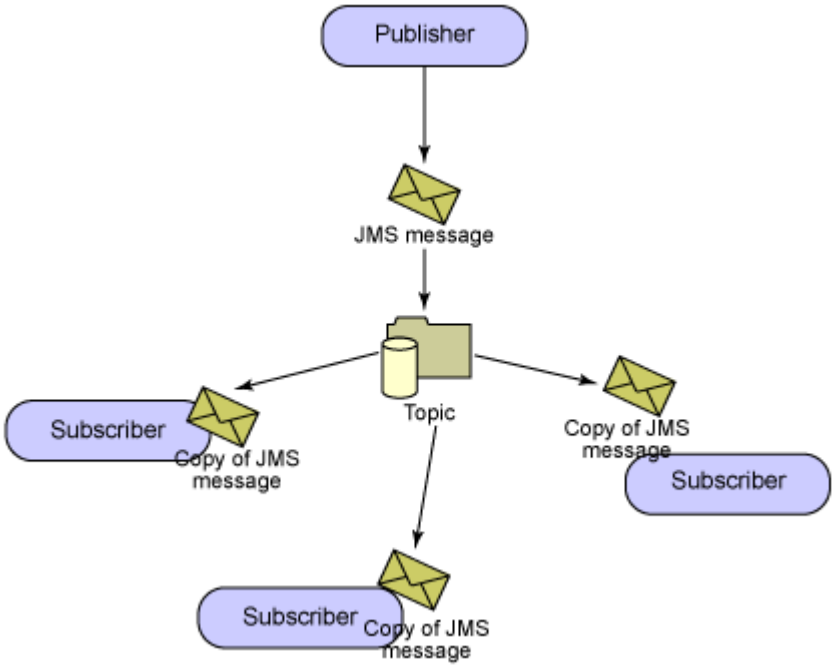

1. Register for event, i.e. “call me back when it happens”
2. Event
A
B
3. Call back

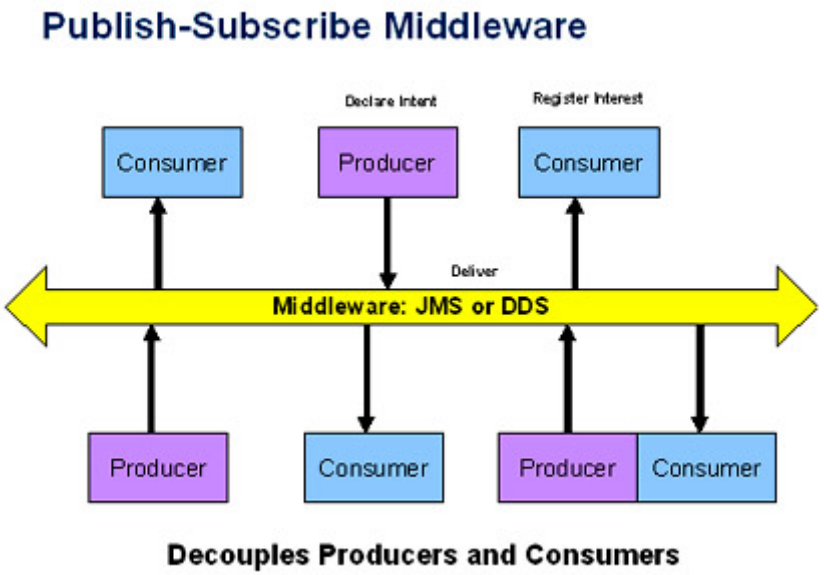
Event-driven frameworks

- Popularized by GUIs
- Popularized by OOP
- Typically OO, but OO not necessary
  - In FP, higher-order functions are the handlers

Publish-Subscribe

Publish Subscribe





Pub Sub

- Producers
  - Publish events
- Consumers
  - Register for events
- Decouples components