



HOLLYWOOD

M8 (a) – Inversion of Control

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Objective

- Be able to Use Callback to achieve decoupling
- Be able to use the Observer design pattern effectively;
- Event Handling in GUI applications
- Understand the concept of an application framework;
- Understand the Model-View-Controller Decomposition

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Job Hunting Example



```
public interface JobSeeker
{
    public void noticeMe();
}
```



```
public interface JobProvider
{
    public void acceptApplication(JobSeeker pJobSeeker);
    public void noticeCandidates();
}
```



```
public class Company implements JobProvider
{
    private JobSeeker aJobseeker;
    private boolean applicationAccepted=false;
    @Override
    public void acceptApplication(JobSeeker pJobseeker)
    {
        assert pJobseeker != null;
        aJobseeker = pJobseeker;
        applicationAccepted = true;
    }
    @Override
    public void noticeCandidates() {
        if(applicationAccepted)
            aJobseeker.noticeMe();
    }
}
```

Callback method



```
public class UndergradJobSeeker implements JobSeeker
{
    private int aSkillLevel = 5;

    @Override
    public void noticeMe()
    {
        practiceDesignPatterns();
    }

    private void practiceDesignPatterns()
    {
        aSkillLevel++;
    }
}
```

Provide the interview schedule to JobSeeker?

```
public class Company implements JobProvider
{
    private LocalDateTime aInterviewSchedule;
    .....
    @Override
    public void noticeCandidates() {
        if(acceptApplication)
            aJobseeker.noticeMe(); //Callback method
    }

    /**
     * Setup interview date is three days from today
     */
    private void scheduleInterview() {
        aInterviewSchedule = LocalDateTime.now().plusDays(3);
    }
}
```


Provide the interview schedule to JobSeeker?

```
public class Company implements JobProvider
{
    private LocalDateTime aInterviewSchedule;
    .....
    @Override
    public void noticeCandidates() {
        if(acceptApplication)
            aJobseeker.noticeMe(aInterviewSchedule); //Callback method
    }

    /**
     * Setup interview date is three days from today
     */
    private void scheduleInterview() {
        aInterviewSchedule = LocalDateTime.now().plusDays(3);
    }
}
```

Provide the interview schedule to JobSeeker?

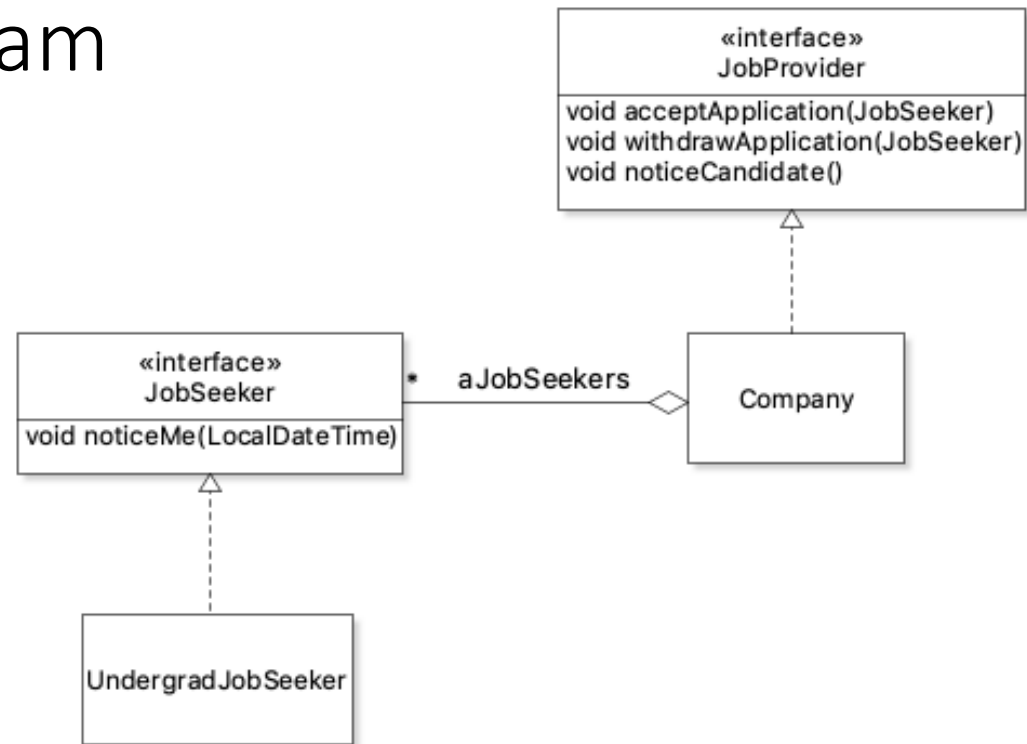
```
public class Company implements JobProvider
{
    private LocalDateTime aInterviewSchedule;
    .....
    @Override
    public void noticeCandidates() {
        if(acceptApplication)
            aJobseeker.noticeMe(this); //Callback method
    }
    /**
     * Setup interview date is three days from today
     */
    private void scheduleInterview() {
        aInterviewSchedule = LocalDateTime.now().plusDays(3);
    }
}
```

Plus a public method to get aInterviewSchedule

Additional changes

- JobSeeker can withdraw application
- JobProvider accept more than one applications

Class diagram



JobSeeker and JobProvider are loosely-coupled

Observer Pattern

- Intent

Define a one-to-many dependency between objects so that when one object changes state, all its dependents are notified and updated automatically.

- Participants:

- Subject

- Observer

- Concrete Subject

- Concrete Observer

Activity1: Matching Participants with Responsibilities

Subject

Observer

Concrete Subject

Concrete Observer

defines an updating interface for objects that should be notified of changes in a subject.

implements the updating interface to keep its state consistent with the subject's.

provides an interface for notifying observers.

stores state that should stay consistent with the subject's.

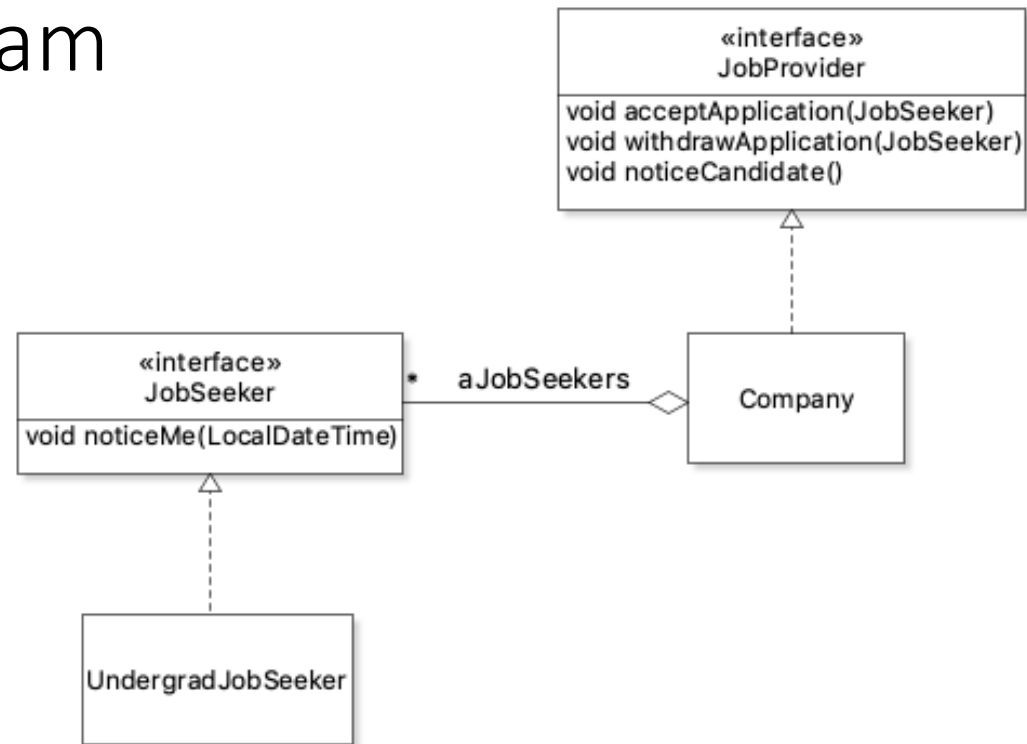
maintains a reference to a ConcreteSubject object.

sends a notification to its observers when its state changes.

provides an interface for attaching and detaching Observer objects

stores state of interest to ConcreteObserver objects.

Class diagram



JobSeeker and JobProvider are loosely-coupled

Observer Pattern for more complex situations

- Different departments/teams in the company need the information of jobseekers:

Design team in SE development department

Needs candidates who are specialized in design with minimal 5-year experience

Testing team in SE development department

Needs candidate who are specialized in testing with reference letters.

HR departments

Performs analysis on the statistics of all job seekers


```
public interface JobSeeker
{
    public void noticeMe(LocalDateTime date);
    public TechSpecialty getTechSpecialty();
    public int getYearOfExperience();
    public boolean haveReference();
}
```

provides an interface for attaching and detaching Observer objects?

```
public class Company implements JobProvider, ApplicationPool
{
    List<JobSeeker> aJobseekers;
    boolean acceptApplication=false;
    Map<JobSeeker, LocalDateTime> aInterviewSchedules;
    private List<ApplicationObserver> aApplicationObservers;

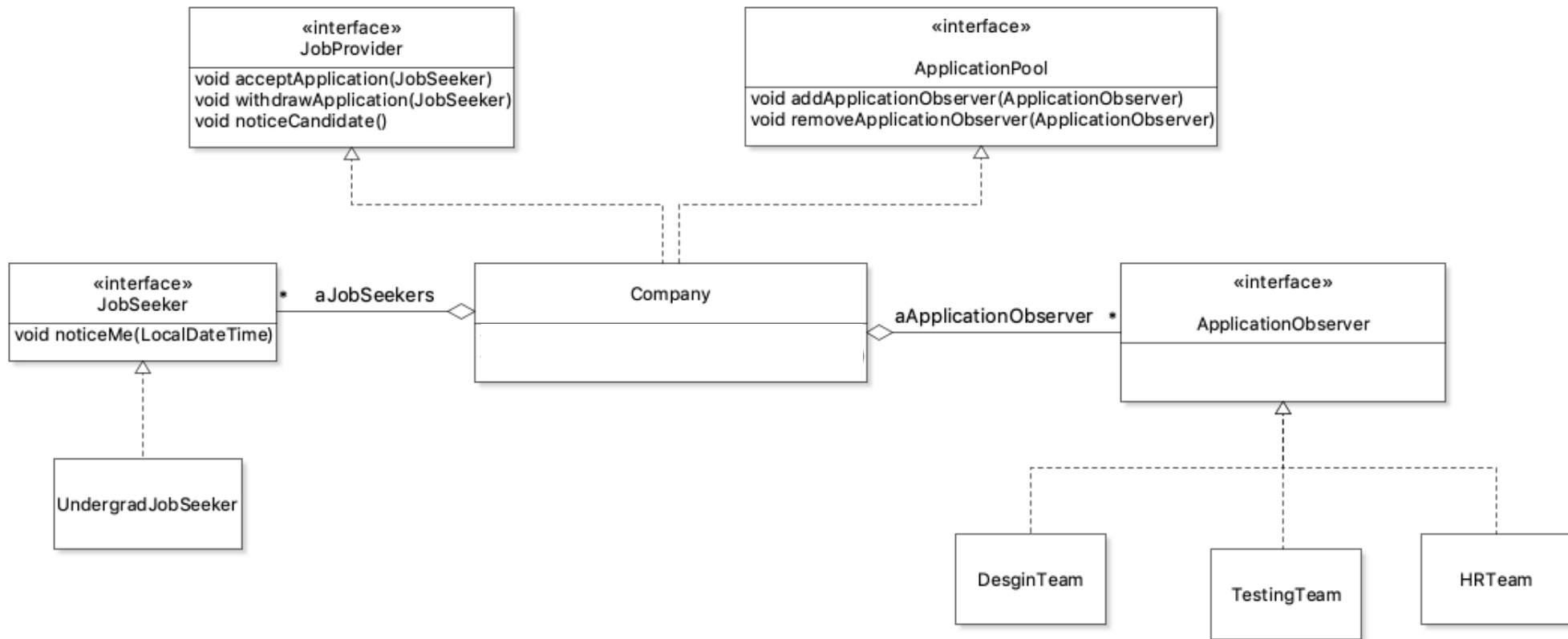
    @Override
    public void addApplicationObserver(ApplicationObserver pApplicationObservers)
    {

    }

    @Override
    public void removeApplicationObserver(ApplicationObserver pApplicationObservers)
    {

    }
```

What is the state of interest for those teams



When and how to send Notification

- Requirements:

Design team in SE development department

Needs candidates who are specialized in design with minimal 5-years experience

Testing team in SE development department

Needs candidate who are specialized in testing with reference letters.

HR departments

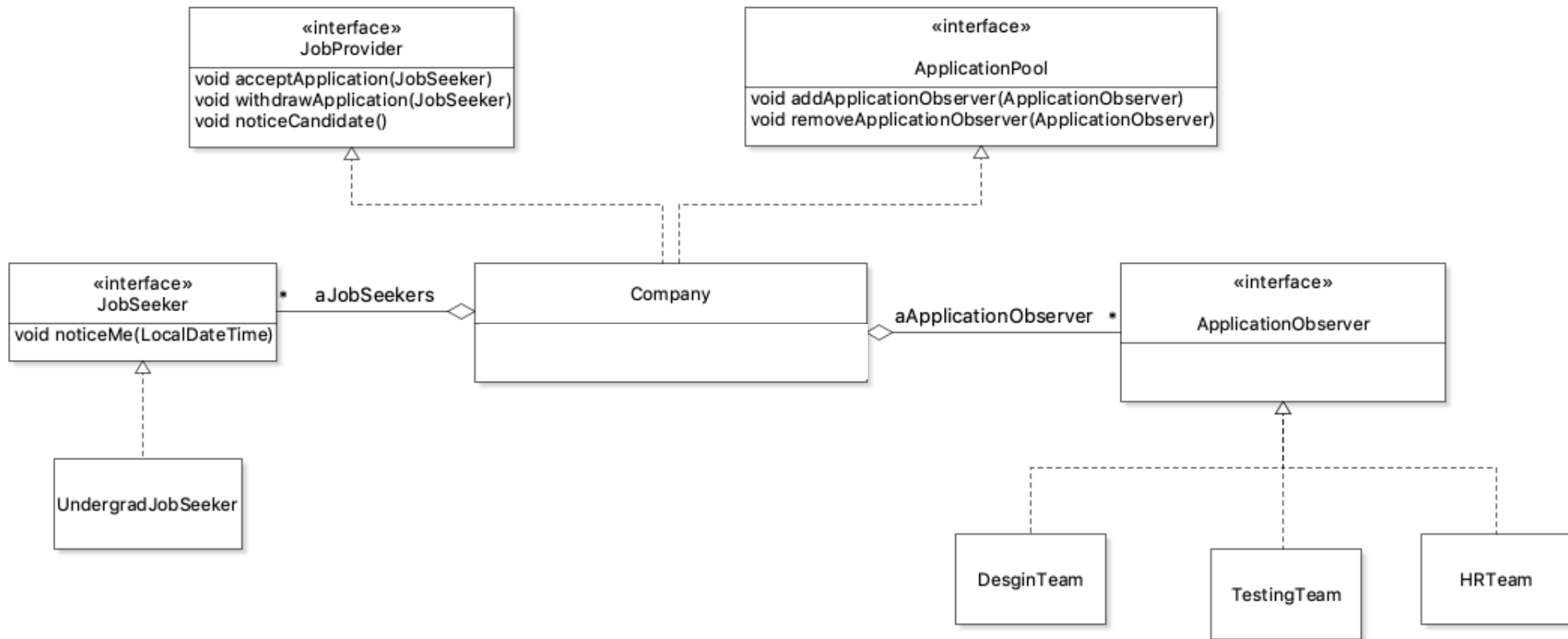
Performs analysis on the statistics of all job seekers

When and how to send Notification

Who should trigger the notification?

`ApplicationPool` sends notification as soon as an application is added or removed.

`ApplicationPool` provides a notification method to be called by client



When and how to send Notification

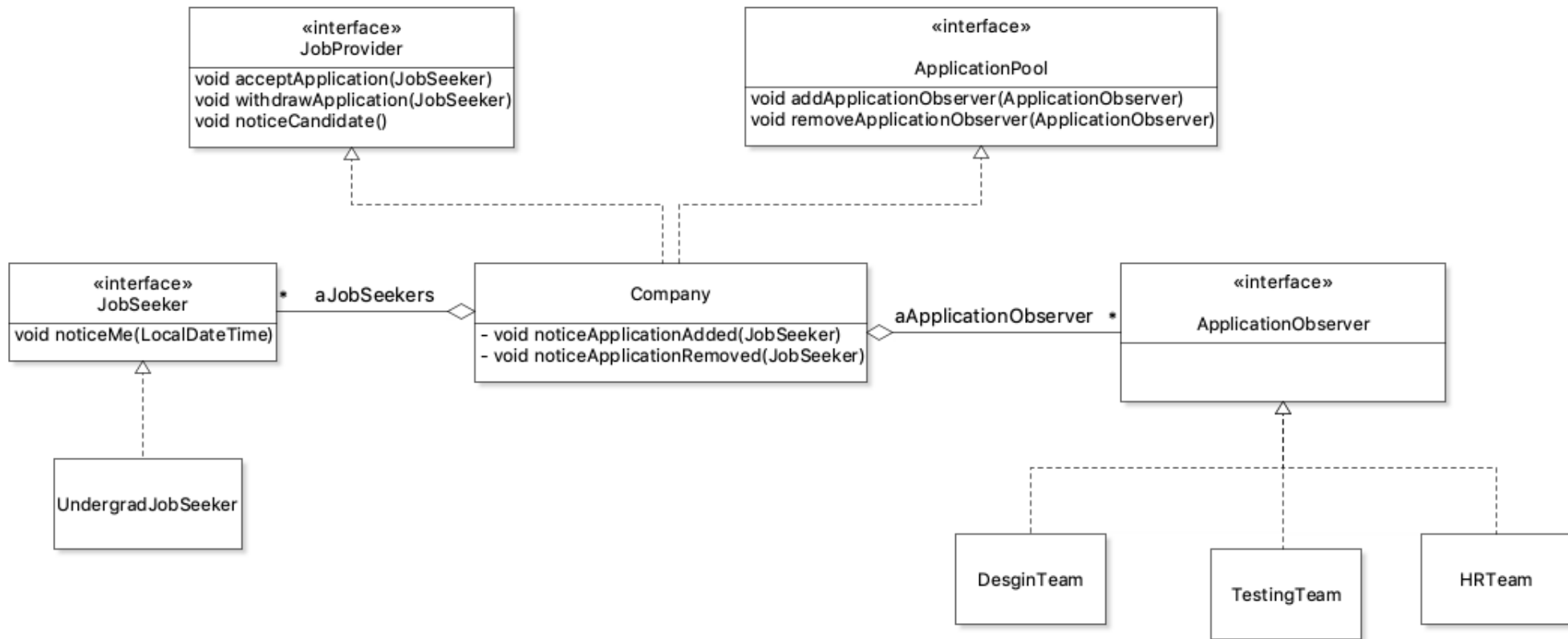
Data Flow Strategy?

`ApplicationPool` sends observers detailed information about the change, whether `ApplicationObserver` want it or not

Push model

`ApplicationPool` sends the most minimal notification, and `ApplicationObserver` ask for details explicitly thereafter.

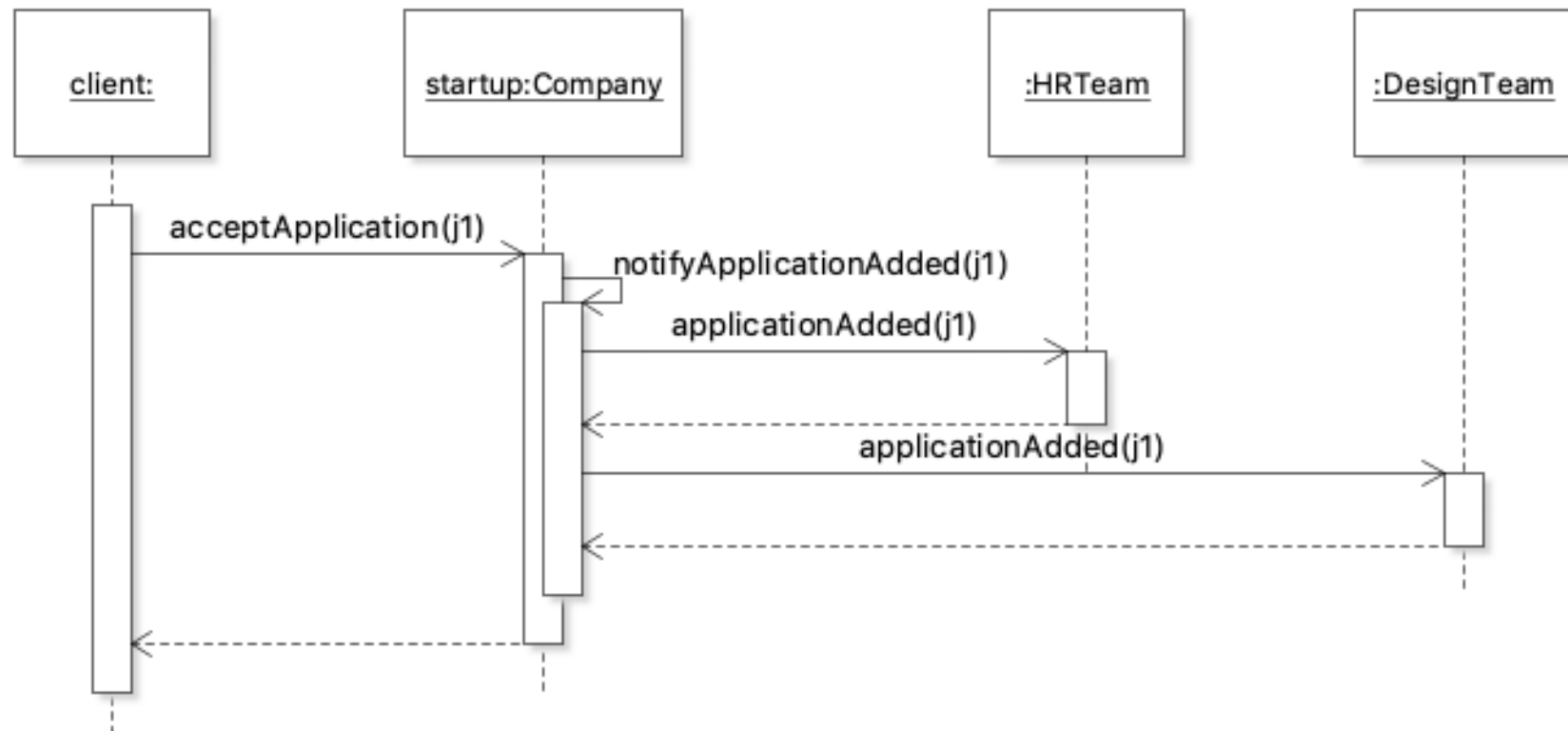
Pull model



Demo

Activity2: Draw sequence diagram

```
Company startup = new Company();  
ApplicationObserver hrTeam = new HRTeam();  
ApplicationObserver designTeam = new DesignTeam();  
startup.addApplicationObserver(hrTeam);  
startup.addApplicationObserver(designTeam);  
  
JobSeeker j1 = new UndergradJobSeeker(TechSpecialty.UI_Design, 10, true);  
  
startup.acceptApplication(j1);    <= When this statement is executed
```



Push model