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# Java Dependency Inj Pattern Example Tut

APRIL 2, 2018 BY PANKAJ — 67 COMMENTS

**Java Dependency Injection** design pattern allows us to remove the hard-coded dependencies an our application loosely coupled, extendable and maintainable. We can implement **dependency in java** to move the dependency resolution from compile-time to runtime.

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## Java Dependency Injec

ad

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Java Dependency injection seems hard to grasp with theory, so I would take a simple example anc will see how to use dependency injection pattern to achieve loose coupling and extendability in th application.

Let's say we have an application where we consume `EmailService` to send emails. Normally we implement this like below.

```
package com.journaldev.java.legacy;

public class EmailService {

        public void sendEmail(String message, String receiver){
                //logic to send email
                System.out.println("Email sent to "+receiver+ " with
Message="+message);
        }
}
```

`EmailService` class holds the logic to send email message to the recipient email address. Our ap code will be like below.

```
package com.journaldev.java.legacy;

public class MyApplication {

        private EmailService ema

        public void processMessage
                //do some msg vali
                this.email.sendEmail(msg, rec);
        }
}
```

Our client code that will use `MyApplication` class to send email messages will be like below.

```
package com.journaldev.java.legacy;

public class MyLegacyTest {

        public static void main(String[] args) {
                MyApplication app = new MyApplication();
                app.processMessages("Hi Pankaj", "pankaj@abc.com");
        }

}
```

At first look, there seems nothing wrong with above implementation. But above code logic has cer
limitations.

- `MyApplication` class is responsible to initialize the email service and then use it. This leads
  coded dependency. If we want to switch to some other advanced email service in future, it w
  code changes in MyApplication class. This makes our application hard to extend and if email
  used in multiple classes then that would be even more harder.
- If we want to extend our application to provide additional messaging feature, such as SMS or
  Facebook message then we would need to write another application for that. This will involve
  changes in application classes and in client classes too.
- Testing the application will be very difficult since our application is directly creating the email
  instance. There is no way we can mock these objects in our test classes.

One can argue that we can remove the email service instance creation from `MyApplication` clas
having a constructor that requires email service as argument.

```
package com.journaldev.java.legacy;

public class MyApplication {

        private EmailService email = null;

        public MyApplication(Emai
                this.email=svc;
        }
        public void processMessages(String msg, String rec){
                //do some msg validation, manipulation logic etc
                this.email.sendEmail(msg, rec);
        }
}
```

But in this case, we are asking client applications or test classes to initializing the email service tha good design decision.

Now let's see how we can apply java dependency injection pattern to solve all the problems with a implementation. Dependency Injection in java requires at least following:

1. Service components should be designed with base class or interface. It's better to prefer inte abstract classes that would define contract for the services.
2. Consumer classes should be written in terms of service interface.
3. Injector classes that will initialize the services and then the consumer classes.

## Java Dependency Injection – Service Components

For our case, we can have `MessageService` that will declare the contract for service implementa

```
package com.journaldev.java.dependencyinjection.service;

public interface MessageService {

        void sendMessage(String msg, String rec);
}
```

Now let's say we have Email and SMS services that implement above interfaces.

```
package com.journaldev.java.dependencyinjection.service;

public class EmailServiceImpl implements MessageService {

        @Override
        public void sendMessage(S
                //logic to send em
                System.out.printl                                          =".
        }
```

ad

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```
}
```

```
package com.journaldev.java.dependencyinjection.service;

public class SMSServiceImpl implements MessageService {

        @Override
        public void sendMessage(String msg, String rec) {
                //logic to send SMS
                System.out.println("SMS sent to "+rec+ " with Message="+m
        }

}
```

Our dependency injection java services are ready and now we can write our consumer class.

## Java Dependency Injection – Service Consumer

We are not required to have base interfaces for consumer classes but I will have a `Consumer` interf declaring contract for consumer classes.

```
package com.journaldev.java.dependencyinjection.consumer;

public interface Consumer {

        void processMessages(String msg, String rec);
}
```

My consumer class implementation is like below.

```
package com.journaldev.java.dependencyinjection.consumer;

import com.journaldev.java.dependencyinjection.service.MessageService;

public class MyDIApplication implements Consumer{

        private MessageService service;

        public MyDIApplication(MessageService svc){
                this.service=svc
        }

        @Override
```

```
                public void processMessages(String msg, String rec){
                        //do some msg validation, manipulation logic etc
                        this.service.sendMessage(msg, rec);
                }

        }
```

Notice that our application class is just using the service. It does not initialize the service that leads
"*separation of concerns*". Also use of service interface allows us to easily test the application by mo
MessageService and bind the services at runtime rather than compile time.

Now we are ready to write **java dependency injector classes** that will initialize the service and als
consumer classes.

## Java Dependency Injection – Injectors Classes

Let's have an interface `MessageServiceInjector` with method declaration that returns the `Cons`
class.

```
package com.journaldev.java.dependencyinjection.injector;

import com.journaldev.java.dependencyinjection.consumer.Consumer;

public interface MessageServiceInjector {

        public Consumer getConsumer();
}
```

Now for every service, we will have to create injector classes like below.

```
package com.journaldev.java.dependencyinjection.injector;

import com.journaldev.java.dependencyinjection.consumer.Consumer;
import com.journaldev.java.dependencyinjection.consumer.MyDIApplication;
import com.journaldev.java.dependencyinjection.service.EmailServiceImpl;

public class EmailServiceInjector implements MessageServiceInjector {

        @Override
        public Consumer getConsumer() {
                return new MyDIA
        }

}
```

```
package com.journaldev.java.dependencyinjection.injector;

import com.journaldev.java.dependencyinjection.consumer.Consumer;
import com.journaldev.java.dependencyinjection.consumer.MyDIApplication;
import com.journaldev.java.dependencyinjection.service.SMSServiceImpl;

public class SMSServiceInjector implements MessageServiceInjector {

        @Override
        public Consumer getConsumer() {
                return new MyDIApplication(new SMSServiceImpl());
        }

}
```

Now let's see how our client applications will use the application with a simple program.

```
package com.journaldev.java.dependencyinjection.test;

import com.journaldev.java.dependencyinjection.consumer.Consumer;
import com.journaldev.java.dependencyinjection.injector.EmailServiceInjec
import
com.journaldev.java.dependencyinjection.injector.MessageServiceInjector;
import com.journaldev.java.dependencyinjection.injector.SMSServiceInjecto

public class MyMessageDITest {

        public static void main(String[] args) {
                String msg = "Hi Pankaj";
                String email = "pankaj@abc.com";
                String phone = "4088888888";
                MessageServiceInjector injector = null;
                Consumer app = null;

                //Send email
                injector = new EmailServiceInjector();
                app = injector.getConsumer();
                app.processMessages(msg, email);

                //Send SMS
                injector = new SMSServiceInjector();
                app = injector.getConsumer();
```

As you can see that our application classes are ass
created in injectors. Also if we have to further e ng

have to write Service classes and injector classes only.

So dependency injection implementation solved the problem with hard-coded dependency and h
in making our application flexible and easy to extend. Now let's see how easily we can test our app
class by mocking the injector and service classes.

## Java Dependency Injection – JUnit Test Case with Mock Injector Service

```
package com.journaldev.java.dependencyinjection.test;

import org.junit.After;
import org.junit.Before;
import org.junit.Test;

import com.journaldev.java.dependencyinjection.consumer.Consumer;
import com.journaldev.java.dependencyinjection.consumer.MyDIApplication;
import
com.journaldev.java.dependencyinjection.injector.MessageServiceInjector;
import com.journaldev.java.dependencyinjection.service.MessageService;

public class MyDIApplicationJUnitTest {

        private MessageServiceInjector injector;
        @Before
        public void setUp(){
                //mock the injector with anonymous class
                injector = new MessageServiceInjector() {

                        @Override
                        public Consumer getConsumer() {
                                //mock the message service
                                return new MyDIApplication(new
MessageService() {
```

As you can see that I am using anonymous classes to *mock the injector and service classes* and I c
test my application methods. I am using JUnit 4 for above test class, so make sure it's in your proje
path if you are running above test class.

We have used constructors to inject the dependencies in the application classes, another way is to
setter method to **inject dependencies** in application classes. For setter method dependency injec
application class will be implemented like b

ad

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```java
package com.journaldev.java.dependencyinjection.consumer;

import com.journaldev.java.dependencyinjection.service.MessageService;

public class MyDIApplication implements Consumer{

        private MessageService service;

        public MyDIApplication(){}

        //setter dependency injection
        public void setService(MessageService service) {
                this.service = service;
        }

        @Override
        public void processMessages(String msg, String rec){
                //do some msg validation, manipulation logic etc
                this.service.sendMessage(msg, rec);
        }

}
```

```java
package com.journaldev.java.dependencyinjection.injector;

import com.journaldev.java.dependencyinjection.consumer.Consumer;
import com.journaldev.java.dependencyinjection.consumer.MyDIApplication;
import com.journaldev.java.dependencyinjection.service.EmailServiceImpl;

public class EmailServiceInjector implements MessageServiceInjector {

        @Override
        public Consumer getConsumer() {
                MyDIApplication app = new MyDIApplication();
                app.setService(new EmailServiceImpl());
                return app;
        }

}
```

One of the best example of setter dependency injection is Struts2 Servlet API Aware interfaces.

Whether to use Constructor based depende nd
on your requirements. For example, if my appli he

prefer constructor based DI or else I would go for setter method based DI to use it only when it's re
needed.

**Dependency Injection in Java** is a way to achieve **Inversion of control** (**IoC**) in our application by m
objects binding from compile time to runtime. We can achieve IoC through Factory Pattern, Templa
Method Design Pattern, Strategy Pattern and Service Locator pattern too.

**Spring Dependency Injection**, **Google Guice** and **Java EE CDI** frameworks facilitate the process of
dependency injection through use of Java Reflection API and java annotations. All we need is to an
the field, constructor or setter method and configure them in configuration xml files or classes.

## Benefits of Java Dependency Injection

Some of the benefits of using Dependency Injection in Java are:

- Separation of Concerns
- Boilerplate Code reduction in application classes because all work to initialize dependencies
  handled by the injector component
- Configurable components makes application easily extendable
- Unit testing is easy with mock objects

## Disadvantages of Java Dependency Injection

Java Dependency injection has some disadvantages too:

- If overused, it can lead to maintenance issues because effect of changes are known at runtim
- Dependency injection in java hides the service class dependencies that can lead to runtime e
  would have been caught at compile time.

Download Dependency Injection Project

That's all for **dependency injection pattern in java**. It's good to know and use it when we are in co
the services.

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**About Pankaj**

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Recently I started creating video tutorials too, so do check out my videos on **Youtube**.

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## Comments

**JohnsonMa says**

JUNE 11, 2018 AT 8:38 PM

Really helpful,thank you!

Reply

**Fagun Patel says**

JUNE 10, 2018 AT 2:42 AM

Awesome.....Thanks a lot.

Reply

**Hrishikesh Raskar says**

JUNE 10, 2018 AT 12:53 AM

Thanks for the post. Hope you will continue such work.

Reply

**Akshay shingan. says**

MAY 19, 2018 AT 1:07 AM

well explained...thank you.

Reply

**Gunjan says**

APRIL 19, 2018 AT 11:51 PM

Thank you for the explanation

Reply

**amir elhajjam says**

APRIL 18, 2018 AT 7:32 AM

very helpful thank u

Reply

**Mukund says**

APRIL 2, 2018 AT 11:53 AM

very helpful and easy to understand for beginners

Reply

**teja says**
OCTOBER 13, 2017 AT 3:43 AM
Thank you
Reply

**Karthik says**
SEPTEMBER 6, 2017 AT 5:12 AM
confusing, lengthy and boring!
Reply

**Priya says**
AUGUST 23, 2017 AT 10:39 PM
Well Explained tutorial of Dependency Injection . Thanks for Sharing
Reply

**saeed says**
AUGUST 15, 2017 AT 2:16 AM
Thanks for your great article but your consumer class has 1 dependency(MessagingService in
what if consumer class have multiple dependency or constructor params???
Reply

**Lord Banks says**
AUGUST 14, 2017 AT 1:33 PM
I think its rather confusing. I've seen more detailed but easier to follow examples. Good job stil
Reply

**john says**
AUGUST 7, 2017 AT 3:39 AM
very bad explanation, very intuitive and cc e g
or refrain from writing "Tutorials" on the int

Reply

**Gayn Dushantha says**

MAY 31, 2017 AT 10:04 PM

Thank you!

Reply

**Yaffa Harari says**

MAY 1, 2017 AT 5:36 AM

so much clear and clean

thank you! 🙂

Reply

**Moustafa zein says**

APRIL 14, 2017 AT 8:50 AM

Well done

Reply

**Srini says**

APRIL 17, 2017 AT 4:39 AM

Very helpful material

Reply

**vinod says**

APRIL 12, 2017 AT 6:52 PM

Excellent Job bro

Reply

**pidgey says**

APRIL 12, 2017 AT 1:10 PM

Nice tutorial. But I think your example is just fabric pattern.

Reply

**Eduardo Ponzoni says**

JULY 10, 2018 AT 2:35 PM

Absolutely agreed! For me this is nothing but a factory as there's no dependency injectior anywhere.

Reply

**Nix says**

FEBRUARY 14, 2017 AT 11:00 PM

Nice article. Dependency Injection seems like Bridge Design Patter,

Reply

**Sree says**

NOVEMBER 30, 2016 AT 2:40 AM

Good Article Pankaj!!!.

Reply

**Jagadeesh says**

NOVEMBER 24, 2016 AT 3:58 AM

Simply Awesome…

Reply

**sivateja says**

NOVEMBER 10, 2016 AT 9:58 PM

The best tutorial for dependency injection , Very well explanation, I am very thankfull to you P

Reply

**paweu says**
SEPTEMBER 4, 2016 AT 9:46 AM
Well done.
Reply

**Sprung says**
AUGUST 23, 2016 AT 2:26 PM
Way too long. DI via service should not take this long to explain.
Reply

**progger says**
SEPTEMBER 4, 2016 AT 8:41 AM
Actually I prefer this explanation to the others I found so far, because he actually goes to t
of defining interfaces and changing the client to use those. I find other tutorials confusing
respect, where, the clients continue to use the same concrete classes in the constructor o
method, although the point of DI is to reduce those dependencies.
Reply

**Jack says**
NOVEMBER 2, 2016 AT 7:05 AM
Agreed!
Reply

**HuangWei says**
JULY 31, 2016 AT 3:58 AM
Wonderful, this post help me a lot to understand the DI technology which is the base of Spring
Reply

**Pankaj says**
JULY 31, 2016 AT 7:01 AM
Thanks for liking it, appreciate your co
Reply

**Vasily says**
JULY 25, 2016 AT 7:30 AM
This is how to take a simple program and turn it into a swollen non-readable over engineered job bro 😉
Reply

**tomacco says**
AUGUST 2, 2016 AT 1:31 AM
"simple program" is not that simple when you are constructing a whole system above it. T decisions increase maintainability and extensibility, meaning a lot of money saved in the r term. But of course, If you are building toys, of course you don't need to use any of these techniques.
Reply

**Olu says**
JANUARY 6, 2017 AT 1:29 PM
Well said. That's how you know the newbies 🙂
Reply

**sachindra pandey says**
JULY 9, 2016 AT 3:08 PM
Good for Beginner and for Interview purpose .
Reply

**Ashish says**
JULY 5, 2016 AT 4:42 AM
very nice explanation ..........
Reply

**Nikhil says**

DECEMBER 30, 2015 AT 1:29 AM

Excellent Article for begineer

Reply

**Virender says**

NOVEMBER 3, 2015 AT 7:19 PM

How an Injector is different from a factory here?
An injector here is basically serving the factory pattern. I think there more to Injector patter the
explained here. Do you have a follow up tutorial to explain more?
Thanks
Virender

Reply

**EAT WORK says**

OCTOBER 6, 2015 AT 8:22 AM

I have to say there is something that I don't understand.
You claim that one way (without DI) is to provide the service in the constructor, but you say tha
clients then need to decide which service to provider and this is not a good practice.
But in the DI example, you do provide the service in the constructor, only that the client does r
the type of service

Reply

**david won says**

OCTOBER 30, 2015 AT 1:15 PM

I agree with all you guys that the DI example does nothing better than the non-DI exampl
And if something does make difference in this example, that is all credited to "interface" m
in java language itself.

Reply

**Kalinga says**

SEPTEMBER 9, 2015 AT 6:28 AM

ad

**Slack**

It's teamwork, but simpler, more pleasant and more productive.

Please put the link for the source code zip in the beginning.
That will prevent someone making copy paste to create source code files and latter realize the entire effort has gone for toss as the source code is already shared as zip.
Thanks,
Kalinga
Reply

**passage2 says**
AUGUST 25, 2015 AT 3:34 PM
Hi Pankaj,
Quick question about your example. You are saying
…
//Send email
injector = new EmailServiceInjector();
app = injector.getConsumer();
app.processMessages(msg, email);
//Send SMS
injector = new SMSServiceInjector();
app = injector.getConsumer();
app.processMessages(msg, phone);
As you can see that our application classes are responsible only for using the service. Service
created in injectors. Also if we have to further extend our application to allow facebook messa
will have to write Service classes and injector classes only.
So dependency injection implementation solved the problem with hard-coded dependency a
us in making our application flexible and easy to extend.
###
But this code still has a hard-coded injector that we need.
**injector = new EmailServiceInjector();**
My question: What is the difference between creating in my code an instance of Injector or an
Service? Both are hard-coded.
If I understand the DI concept correctly, to avoid hard-coded dependency, which Service to us
be resolved at run-time, no?
Could you please explain.
Thanks.
Reply

**Ram Sharma says**
APRIL 30, 2018 AT 4:45 AM

Yes, it is hardcoded, but at some point of time you have to specify which service that you
create, whether an Email service or facebook service or Twitter service, and using DI we a
changing application class. Application class or the Consumer class only takes service as
for each service there exist an Injector.
It is hard coded but in an intelligent way to separate the concerns.
Reply

**Ragu says**
MAY 30, 2018 AT 12:24 AM
@Pankaj: Thanks for the wonderful tutorial. It is really helpfull. I'm still facing few conf
May be because I'm new to this technology :). Still Thanks a lot for your effort.
@Ram:
Hi,:)
You were right that at some point of time we have to specify which service that we w
But, what I'm not understanding is
In Injector class,
public class EmailServiceInjector implements MessageServiceInjector {
@Override
public Consumer getConsumer() {
//Instead of below
return new MyDIApplication(new EmailServiceImpl());
//We can also use this (Also with method return type change)
return new EmailServiceImpl();
}
}
As mentioned in Tutorial, for new service class (like FB message service ) only corres
Injector need to be created.
Same is satisfied in the above approach.
So what is the point creating a consumer class which can hold all service type
and creating object of that service type and then passing required service type into it
Could you please make me understand this?
Reply

**Cris says**
AUGUST 18, 2015 AT 8:36 AM
hey, good explanation about dependency ell i
injector? why not just create a specific xxxServiceImp? we can also can mock/fake that object

instead create a messageInjector we can create directly a MessageService (still mock/fake) ai
app we can have also something like this:
Consumer app = null;
//Send email
app = new MessageServiceImp();
app.processMessages(msg, email);
//Send SMS
app = new SMSServiceImp();
app.processMessages(msg, phone);
which one is the real benefice to use that Injector clases?
Reply

**Bret says**
JUNE 16, 2017 AT 2:23 PM
Same question for me as above. What benefit do the injector classes give you vs. above c
Reply

**Ivan says**
APRIL 18, 2018 AT 12:10 AM
The same question for me, I don't know why so many people saying this example is simpl
what's the purpose of Injector in this example?
Reply

**Sushant says**
AUGUST 18, 2015 AT 4:20 AM
Please add "Previous" and "Next" button at the end of every page.
Reply

**Sriprem says**
JULY 23, 2015 AT 5:37 AM
Have gone through so many samples b ad ... ally
good work dude.
Reply

**M says**

JUNE 23, 2015 AT 10:23 PM

A few points to re-consider, just for the sake-of-argument:
Quote:
<>
Comment:
I think, "Testing the application" will not be difficult. The correct statement would be "Testing di
scenarios" E.G. testing different messaging scenario. Testing the application itself would still be
(without DI).
Quote:
<>
Comment:
Here is the catch. Our application classes are not only responsible for using the service. They a
responsible for instantiating the injector classes also. Here is an explanation:
MyMessageDITest -> new EmailServiceInjector() -> new EmailServiceImpl()
MyMessageDITest -> new SMSServiceInjector() -> new SMSServiceImpl()
Therefore, a question can be raised (asked mostly at the interview): "Why do we need a Servic
object to instantiate MessageService object? After all, we are instantiating the ServiceInjector
anyway. For two different MessageService requirement, we are creating two instances of Servi
[new EmailServiceInjector() and new SMSServiceInjector()]. If we are to create a new instance c
ServiceInjector, can't we create a new instance of MessageService?"
Any thoughts? Please correct me if my understanding is wrong.

Reply

**pankaj says**

MAY 9, 2015 AT 10:50 AM

very nice explanation. I have a question. Why it is a bad design to create the service in client co
pass it to the constructor of the Application. Because we are ultimately creating injector relate
service in the client code, so how it is different?
Thank u

Reply

**rizwan says**

APRIL 9, 2015 AT 6:48 AM

Sir please create pdf book of your all sprir

Reply

**tester says**
MARCH 10, 2015 AT 6:07 AM
I don't get it. It does not look simple at all.
Too many lines of code for this simple functionality
Reply

**tomboy says**
APRIL 3, 2015 AT 7:29 AM
Tester, try to write 50 different applications that all need to send email and do it without d
injection.
Reply

**George says**
MAY 12, 2015 AT 6:44 PM
This is the most lucid explanation, that can actually be understood on the first read (I
before settled on this one).
However, I think 'Tester' objected to complexity of implementation of dependency inj
strictly object-oriented language:
— 1 interface
— n classes declaring that each implements that interface
— n implementations of that interface in each class
— n injector classes
— 1 application class
— 1 consumer class
What is needed isn't more classes, but better language with functions as first-class o
such language you don't need dependency injection to be explained and remember
comes naturally.
To understand why pure object-oriented languages are a dead-end all one need is to
descriptions of dependency injection. Object-oriented is useful technique – it is not a
successful methodology.
But I admit, talks about this or that pattern is excellent marketing tool for outsourcing
companies.
Reply

**Lanito says**

JANUARY 10, 2015 AT 8:19 AM

That's fine, but this is not mocking it is faking.

Best Regards

Reply

**Rafał says**

JANUARY 9, 2015 AT 7:56 AM

Good job!

This video is also very helpful: https://www.youtube.com/watch?v=GB8k2-Egfv0

Reply

**Ayaz says**

JUNE 8, 2015 AT 7:19 AM

I would say the video tutorial is a perfect and easiest explaination. It is easiest because we

framework which simplifies lots of stuff.

Reply

**AJ says**

DECEMBER 16, 2014 AT 7:16 PM

Job very well done. I am an experienced developer, but I was always confused about Depend

Injection pattern. Your example is simple and well-communicated, it now totally makes sense.

have already subscribed to your mailing list and just downloaded your eBook – thanks for the

you put in.

Reply

**theodore says**

DECEMBER 11, 2014 AT 7:23 AM

Dude thanks for your time. Very nice tut and good explained! Greetings from Greece!

Reply

**Snehal Masne says**
NOVEMBER 27, 2014 AT 3:29 AM
Excellent tutorial for DI with simple example, exactly what one expects at the beginging. Keep
Reply

**Calderas says**
SEPTEMBER 4, 2014 AT 8:47 PM
Another Thanks from Mexico.
Reply

**Shashi Kanth says**
AUGUST 31, 2014 AT 3:49 PM
Thank you for your effort.
A very concise and neatly explained article indeed.
Reply

**Vijay says**
AUGUST 26, 2014 AT 7:27 AM
Nice Article !
Reply

**Ahmed Kamal says**
AUGUST 23, 2014 AT 10:58 AM
Good and clear article. Thanks Pankaj for your great efforts.
Reply

**Mustapha Naciri says**
AUGUST 22, 2014 AT 2:38 AM
Thank' you very much for teach us your
Reply

**Thanga says**

JULY 29, 2014 AT 9:34 PM

Well explained.

Reply

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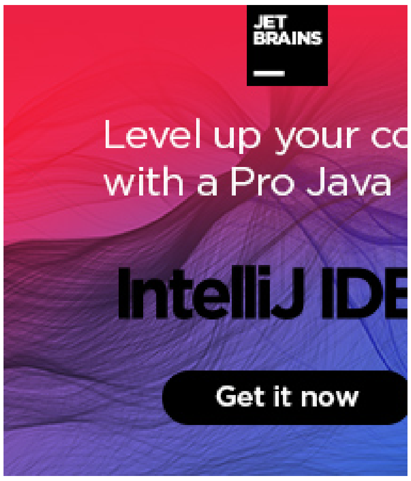

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**Behavioral Design Patterns**

ad

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