## [Course Overview](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f)

### [Course Overview](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f)

[[Autogenerated] Hi, everyone.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=5.63) [My name is Brian Hansen and welcome to my course designed patterns in Java.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=6.54) [Behavioral.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=10.57) [I am the director of development as software technology](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=12.1) [group as well as a plural site author.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=14.7) [I learned about design patterns almost 20 years ago and have enjoyed](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=17.82) [teaching and sharing them with people ever since.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=21.41) [In this course,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=25.04) [we're going to cover the behavioral patterns as identified by the Gang of four,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=25.74) [the Gang of four considered to be the fathers of](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=30.08) [design patterns as we know them today.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=31.98) [Some of the patterns we will cover include ones that](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=35.01) [you may have already heard off, like the command pattern,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=37.41) [which is used to isolate individual commands in your application.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=39.82) [The observer pattern, which you use in a published subscribe event model.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=43.74) [And the Temple of Method,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=47.54) [which you may already used more than you actually realize.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=48.6) [These are just a few of the patterns that we will cover in this course,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=51.84) [and by the end of the course you'll have seen an](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=54.87) [example of each pattern from the job.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=56.71) [A P I written each pattern from scratch and contrasted each pattern with another](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=58.71) [one to showcase its strengths before beginning this course,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=64) [you should be somewhat familiar with Java and comfortable using an I.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=69.45) [D.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=72.74) [You can continue your learning by exploring other patterns.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=73.94) [Courses focused on creation,](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=76.9) [a LL and structural design patterns in the plural site library.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=78.91) [I'll hope you will join me on this journey to learn design patterns with the design patterns in Java behavioral course at plural site.](https://app.pluralsight.com/course-player?clipId=96a76bee-4548-45e8-b962-4643c425024f&startTime=83.2)

## [Behavioral Design Patterns Introduction](https://app.pluralsight.com/course-player?clipId=852df220-51e8-41ba-b7a3-9832f1ef7112)

### [Version Check](https://app.pluralsight.com/course-player?clipId=852df220-51e8-41ba-b7a3-9832f1ef7112)

### [Introduction](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c)

[[Autogenerated] So you've just been in an interview and](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=1.34) [someone asked you to describe a design pattern.](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=3.34) [Or maybe you were just describing a problem to a co worker.](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=6.34) [And they said, It sounds like you're reinventing the will.](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=9.12) [They might have even said to you that sounds like you're](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=12.34) [describing a factory or a singleton pattern.](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=14.2) [If this sounds like a situation that you've been in than this course is for you,](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=17.37) [our focus in this course is on presenting design patterns](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=21.64) [described in the Gang of Four and an example driven away](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=24.63) [while using Java to do so. Hi, I'm Brian Hansen and welcome to behavioral design patterns using Java.](https://app.pluralsight.com/course-player?clipId=6eada135-fd9b-4d8a-81d8-383ab3899b5c&startTime=27.9)

### [Why Learn Patterns?](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd)

[[Autogenerated] you might ask yourself why design patterns are important.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=1.34) [I first learned patterns as a means of communicating](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=5.44) [a problem to another developer.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=8.66) [You may very well already know how to solve a particular problem,](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=10.94) [and it might follow the structure of a pattern.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=14.2) [But it is better to have a common vocabulary that you can](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=16.82) [explain to someone what that problem is.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=19.92) [Patterns are an abstract topic.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=23.44) [It isn't something that you look at the concept and](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=26.04) [then have it memorized from there.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=28.19) [Some patterns are more easily applied to particular problems than another.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=30.54) [You should revisit pattern material.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=35.04) [Whether it be this course or a book or something else is amazing](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=37.26) [how your perception of a pattern will change.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=41.76) [After gaining more experience with it,](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=44.04) [you might come away with a different understanding of it after applying it.](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=46.64) [Ah,](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=51.04) [lot of people have used the single 10 and they think](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=51.26) [that they have used design patterns. There's much more than just a singleton pattern out there](https://app.pluralsight.com/course-player?clipId=c5ab4ab1-6e4e-40b8-a574-108d83dcdefd&startTime=53.86)

### [Pattern Classifications](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0)

[[Autogenerated] the gang of four has Pattern's broken out into three groups.](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=1.58) [The groups are creation A ll, structural and behavioral.](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=5.64) [This course is going to focus on the patterns](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=9.94) [classified under the behavioral group.](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=11.94) [Behavioral patterns are focused on how objects interact with one another.](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=14.84) [Often times were trying to be more loosely coupled, and that leads to is just looking at behavioral patterns.](https://app.pluralsight.com/course-player?clipId=eead4afb-c347-4a56-85ab-c43cf8d254b0&startTime=19.14)

### [Which Patterns?](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123)

[[Autogenerated] the behavioral group contains the most](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123&startTime=1.84) [patterns out of the gang of four patterns.](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123&startTime=4.66) [We're going to cover the chain of responsibility.](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123&startTime=7.64) [The command interpreter, it aerator mediator,](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123&startTime=12.04) [Memento observer, state strategy, template method and finally, the visitor pattern.](https://app.pluralsight.com/course-player?clipId=c9898f96-8430-4ffc-8b40-97c7fd203123&startTime=17.37)

### [How Do We Learn Them?](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44)

[[Autogenerated] to help facilitate how you learn.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=1.04) [The patterns were going to go over an overview of what the pattern is,](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=2.79) [the concepts that you would look for when choosing the pattern.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=8.44) [The design of that pattern.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=12.54) [Look at a live example from the job a p I.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=15.04) [They were to go through and do a demo which will](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=18.8) [ultimately end up coding your own pattern.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=21.96) [And look at the pitfalls of what this pattern has.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=24.23) [Contrast that with another pattern that you may be more familiar with and then finally summarize what we've learned about that pattern.](https://app.pluralsight.com/course-player?clipId=13c2c597-c24d-45f6-a804-da3e45914c44&startTime=29.44)

### [Prerequisites](https://app.pluralsight.com/course-player?clipId=d263a9f6-7794-4a3e-becb-8c6c123315c0)

[[Autogenerated] The prerequisites for this course are quite simple.](https://app.pluralsight.com/course-player?clipId=d263a9f6-7794-4a3e-becb-8c6c123315c0&startTime=1.08) [I am using Java seven,](https://app.pluralsight.com/course-player?clipId=d263a9f6-7794-4a3e-becb-8c6c123315c0&startTime=4.04) [but it should work with any of the more recent versions of Java,](https://app.pluralsight.com/course-player?clipId=d263a9f6-7794-4a3e-becb-8c6c123315c0&startTime=6.34) [and I am doing all my examples in Spring STS. But the functionality that I'm utilizing is actually the same as Eclipse.](https://app.pluralsight.com/course-player?clipId=d263a9f6-7794-4a3e-becb-8c6c123315c0&startTime=10.34)

### [Next](https://app.pluralsight.com/course-player?clipId=c3c7934f-9034-4dea-a0d8-e41f46370d2e)

[[Autogenerated] Although the patterns are independent of one another,](https://app.pluralsight.com/course-player?clipId=c3c7934f-9034-4dea-a0d8-e41f46370d2e&startTime=1.24) [we're gonna go through them sequentially.](https://app.pluralsight.com/course-player?clipId=c3c7934f-9034-4dea-a0d8-e41f46370d2e&startTime=3.76) [How we described in the what we're going to cover section,](https://app.pluralsight.com/course-player?clipId=c3c7934f-9034-4dea-a0d8-e41f46370d2e&startTime=5.6) [which is the same order that's defined by the gang of four itself. The first pattern we're gonna look at is the chain of responsibility pattern.](https://app.pluralsight.com/course-player?clipId=c3c7934f-9034-4dea-a0d8-e41f46370d2e&startTime=8.65)

## [Chain of Responsibility Pattern](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2)

### [Introduction](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2)

[[Autogenerated] Hi, This is Brian Hansen.](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2&startTime=2.04) [And in this module where you're going to look at the](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2&startTime=3.8) [chain of responsibility design pattern,](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2&startTime=6.13) [the chain of responsibility pattern is a behavioral pattern that](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2&startTime=9.1) [d couples a request from a handling object in a chain of handlers until it has finally recognized.](https://app.pluralsight.com/course-player?clipId=6745fba9-4889-4471-a38b-5cead2ac70e2&startTime=12.64)

### [Concepts](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba)

[[Autogenerated] the concept surrounding why you would choose the chain](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=2.14) [of responsibility pattern or they want to decouple the sender and](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=4.54) [receiver objects often times in an application.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=8.45) [We want to pass a request to a receiving object without](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=12.01) [knowing who the center was and vice versa.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=15.92) [The center shouldn't have to know who the receiver was](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=18.42) [in order for to process that request.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=21.52) [When using the chain,](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=24.54) [the receiver should also contain a reference to the](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=26.24) [next receiver or the successor.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=29.12) [This is an important part when choosing and implementing this pattern.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=32.14) [It doesn't know the whole hierarchy, but it does know who's next in line.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=35.72) [One of the main reasons for choosing this pattern is to promote loose coupling.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=41.24) [We can modify the chain and add links to the chain without](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=45.81) [rewriting large portions of logic in the application.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=49.81) [It should also be okay that there may not be a handler for a given request,](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=53.54) [and the application will just continue on examples of this in the job,](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=58.28) [a p i.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=63.15) [R, the Java Util, logging Logar, a p I and although not part of the core job,](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=63.98) [a p i thes serval ap I specifically filters is another great example of](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=69.98) [chaining one of the best examples I've seen This pattern in use,](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=76.72) [though, is how spring implements their security chain filter in spring security. It's a great example of chaining.](https://app.pluralsight.com/course-player?clipId=c6451c76-8fb3-41cb-b869-e98136539aba&startTime=81.09)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788)

[[Autogenerated] the design of the chain Responsibility](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=2.64) [has a chain of receiver objects.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=4.63) [This can be implemented in a number of ways,](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=7.44) [but some basic form of a list is typically the most common.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=9.74) [Each handler is based off of a main interface that defines](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=13.99) [the contract between each chain link.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=17.31) [There is a concrete handler for each receiver or implementation that](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=20.44) [will interpret a request in building the chain.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=25.14) [Each handler has a reference to its successor or the next link in the chain.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=29.33) [The pieces of the UML diagram are a handler and a](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=35.04) [concrete handler and then its successor. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=bfdc2d5b-794c-489b-812d-a47362b55788&startTime=39.61)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8)

[[Autogenerated] This is the UML diagram for the chain of responsibility pattern.](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=2.5) [The client makes calls to a handler class,](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=6.84) [and that handler is a common interface or contract for all of the](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=9.88) [handlers and is the abstraction for all links in our chain.](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=14.25) [There are multiple concrete handlers for each link in our chain and,](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=18.84) [although not really clear in the UML diagram,](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=22.89) [but the handler will pass it to the next handler in a chain if](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=26.94) [it doesn't know how to process that request.](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=30.94) [This is known as the successor and is one of the key parts](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=34.34) [of implementing this chain correctly.](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=37.87) [To help gain familiarity with this pattern, let's go ahead, look at an everyday example of it in action.](https://app.pluralsight.com/course-player?clipId=ab38da2f-a35f-45f1-9362-9b7ed7151cf8&startTime=40.64)

### [Example: Logging](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1)

[[Autogenerated] If you look very far for an example of](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=2.74) [the chain of responsibility pattern, you'll quickly find an example of logging.](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=4.77) [I didn't really want to use this in the example that](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=9.74) [we're going to develop together.](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=12.58) [But do you still think it is a great example of this pattern and](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=14.56) [decided to show it for an everyday example?](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=17.99) [The various logging methods are passed through a chain,](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=20.94) [and if there is a handler, it will log.](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=24.71) [Otherwise it will pass over it. Let's look at this in some life code now.](https://app.pluralsight.com/course-player?clipId=d3d21493-e59b-4d61-91c6-121a5b8933e1&startTime=27.54)

### [Demo: Logging](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281)

[[Autogenerated] Here's the code for that Every day.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=1.94) [Example, we were talking about using the logger,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=4.1) [and you can see it's pretty simple.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=7.12) [We create an instance of the logger by just using the](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=9.32) [get logger based off of a string name.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=13.43) [And then instead of our code,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=16.11) [we begin setting up the chain to handle the logging levels.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=17.35) [So we set our logar to a level of finer.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=22) [And then we create a handler, one of our concrete handlers,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=25.22) [to also have a level of finer.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=29.86) [And then we add that handler to our original logger.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=32.46) [So we start building that chain now.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=35.85) [If he had multiple handlers, we've got one for the console.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=38.86) [We could have one to a file or some other cysts, log or other logging handler.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=41.86) [Doesn't matter.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=47.28) [There's a lot of various implementations we could build that](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=47.8) [chain to go through and build those handlers up.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=51.44) [The pieces we have down below here are our actual logging statements](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=55.74) [that we're going to see what gets printed out.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=62.16) [We have finest finer and fine three of the seven or eight various](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=64.03) [levels that are available to us as a logger,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=69.05) [and you'll notice that we set our two finer.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=71.44) [So our chain ends with finer finest ones.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=73.55) [They're going to fall off the end of that request cycle,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=77.14) [so nobody set up to handle that request.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=80.03) [Go ahead and run this and see what prints out you can see that are](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=82.71) [finer statement and fine statement both printed out,](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=87.74) [but the finest did not.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=90.89) [And that's just because we don't have a handler that's](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=93.18) [set up to go to that level of logging, so their link of the chain doesn't exist.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=97.2) [Let's go ahead and create our own example of this now that's a little bit more complex than just this basic logger example.](https://app.pluralsight.com/course-player?clipId=f6a15f7a-5b86-4788-a52a-8bc680c3b281&startTime=102.89)

### [Exercise - Chain of Responsibility](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9)

[[Autogenerated] Now that we've seen some code in action,](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9&startTime=1.44) [let's build our own chain of responsibility.](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9&startTime=3.83) [We're going to implement in the handler show what the successor](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9&startTime=6.94) [is and process a request throughout our chain.](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9&startTime=11.45) [We're gonna start off by creating the handler and then from there, build the rest of our chain out.](https://app.pluralsight.com/course-player?clipId=04589c93-9ad0-45e1-9718-543da7328be9&startTime=16.74)

### [Demo: Approver](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7)

[[Autogenerated] So this exercise is actually based off a real world](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=2.74) [example that I have in my office that I work with.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=6.94) [I have a director and I have a VP and a CEO.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=11.24) [And for purchase approvals, it has to go through that hierarchy.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=15.46) [There's certain things that as a director, I can approve.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=19.68) [But when it gets to a certain dollar amount or a certain type of purchase,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=23.04) [it needs to go to a V P.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=26.62) [And then if it's above that, it needs to go to the CEO.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=28.54) [So there's a couple things you can see inside of our](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=32.14) [demo here that we're building.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=34.4) [I've got a director of VP in a CEO, those air,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=36.42) [all types of handlers, and then you can see that I have to set the successor.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=40.7) [So as a director, my successor is the VP, Crystal and Crystal.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=45.6) [As a VP, her successor is the CEO and that is Jeff.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=50.84) [So let's go ahead and look at the handler class first.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=56.17) [That all of those director,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=62.01) [VP and CEO are going to inherit from the handler has](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=63.61) [two things in here that are key.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=68.24) [It has a successor and a center for that successor,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=70.12) [and then it has a method for handling the request.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=73.22) [So any handler,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=76.24) [any concrete handler we have We want to implement this handle request method.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=77.5) [Now, requests, as you see we have in here,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=84.49) [is just a basic class that I put together that has a request.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=87.01) [And it's a request type in an amount associated with it.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=91.45) [And I really like venom.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=94.56) [So I put the request type and there is an n um,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=95.94) [we could have conferences or just a regular purchase](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=98.52) [that we want to go ahead and approve.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=101.93) [Now the director, I've gone ahead and implemented Director extends handler,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=104.95) [and in doing so has to implement the method handle request.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=111.24) [And you can see where this behavior comes in.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=115.99) [Now a director, I can approve conferences so immediately I look to see if Okay,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=118.62) [what type of request is it?](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=126.59) [Well, it is a request type of conference.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=128.15) [Great.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=131.84) [Let's go ahead and say that I have approved this conference now.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=132.61) [Now, obviously,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=137.45) [we would probably do something more than what a system now print Lin is,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=138.05) [but you'll get that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=141.74) [That's where I can put the business logic in here for talking to the](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=143.18) [database or what it really means to a prove that conference.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=146.92) [But if I don't have the ability to do that,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=151.04) [I can go in here and change it to pass to my successor.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=154.95) [Seeing see the else of that If Block is passing that](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=158.78) [off to my successor and in our demo, my successor,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=162.31) [Waas Crystal.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=165.9) [So we set that up on that line right there.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=168.24) [Now, the VP,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=172.24) [I have purposely left empty because I wanted it to implement this together.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=174.83) [So to do that, we would go ahead and override that method.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=179.86) [I'm going to actually pace that code in here.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=184.23) [So I'm gonna override that method and I'm going to say that well,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=187.34) [the VP can She can approve purchases and they had to](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=192.07) [be in a purchase of $1500 or less, you know,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=197.41) [under $1500.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=200.53) [Other than that, we want a hand it up to the CEO.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=202.1) [So now we can go through and say, Well,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=207.34) [it's over 1500 is gonna go to the next successor.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=210.71) [And if you'll remember that next successor was Jeff was the CEO.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=213.4) [Let's go ahead and save that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=217.15) [The final one in our chain is the CEO and he can handle anything he wants.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=220.19) [He can approve anything he wants,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=225.65) [but you'll notice that we have that business logic](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=227.42) [now across those three classes.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=230.13) [Now that's where we got that loose coupling in there.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=233.33) [I could add another.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=235.74) [Approve her in the in the middle.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=236.88) [So let's say we have somebody who approved stuff up to $750 orders,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=238.65) [conferences and small purchase orders, or vice versa.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=242.76) [I can add links anywhere I want in the chain,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=247.04) [and the's classes individually don't have to be reprogrammed,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=250.98) [but you get that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=255.74) [It can be a little bit questionable as to where that logic](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=257.4) [gets handled inside your application.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=260.88) [So you need to be diligent when building your chain](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=262.62) [that you're setting it up right.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=265.33) [This is a good example, though,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=266.94) [because this is a real world example that I have used this pattern in.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=268.25) [Now let's go ahead and run this.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=272.41) [You can see that we're going to build a request of type conference.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=274.74) [It's $500 say, yet Brian can handle that request.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=279.24) [But you'll notice that I can also say I'm gonna let Brian handle this other](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=282.97) [request But it's up to me as a concrete handler to say,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=287.36) [Oh, I don't have permission to do that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=292.8) [I'm going to go ahead and send that up to my successor.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=294.69) [So the client that's calling it doesn't know.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=298.58) [They just know that their requests got approved.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=301.27) [Let's run this now so you can see the first thing that gets printed](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=304.64) [out is that directors can approve conferences,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=311.09) [which I did go through an approved that the second thing is](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=313.86) [is that V P s gonna prove purchases below 1500 that CEOs](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=317.36) [can prove anything they want.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=321.45) [But it wasn't necessarily me that handled that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=323.11) [If I swap this out with Krystal, the same thing will happen in the same code,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=325.65) [will get printed out.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=331.13) [But how it handled that in the chain.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=332.74) [It's transparent to the client.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=336.74) [The client doesn't need to know about that.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=338.4) [So it saves the client from running around in this example](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=340.33) [of running around to all the different people in the office](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=344.87) [to see who they should talk to, to get approval,](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=347.83) [and instead they just talked to one person and that](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=351.51) [one person knows who to escalate it.](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=353.71) [Thio, in order to get their request approved, do you see how that hierarchy ties in with that chain of responsibility?](https://app.pluralsight.com/course-player?clipId=abdfecea-119c-4a4c-872d-0f183deba8f7&startTime=356.17)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf)

[[Autogenerated] Now we've seen how great that chain](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=1.02) [of responsibility pattern can be.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=2.9) [We did start to touch on some of the pitfalls or problems with this pattern.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=4.76) [Let's go into that a little bit deeper.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=9.32) [One of the pitfalls that you run up against is tthe](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=11.74) [e handling handler guarantee.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=14.86) [We aren't guaranteed that someone along the chain](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=17.86) [will in fact handle our request.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=20.67) [This is a direct reflection of our runtime configuration.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=23.24) [We have great flexibility with this configuration,](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=26.6) [but it could mean that there's some configurations that haven't](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=29.39) [been tested and something might not get processed.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=31.97) [There is also a concern about chain length as well.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=36.34) [If you just keep tacking on handlers, it can get quite large,](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=40.34) [and the performance could start to degrade.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=44.35) [This usually isn't a problem in my experience,](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=47.14) [but it is something to keep in mind.](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=49.58) [Let's go and compare this with another pattern. Know to see what it might be a good idea to choose it or something else](https://app.pluralsight.com/course-player?clipId=6342ddef-c1f0-42d8-93e8-8afe2bbdc9bf&startTime=52.34)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9)

[[Autogenerated] to contrast the chain of responsibility pattern.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=1.84) [Let's compare it with the command pattern.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=5.2) [The chain of responsibility is a pattern that deals with handlers,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=8.59) [and each one of those should be unique.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=13.59) [They also know about their successor.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=16.37) [This is key because the pattern doesn't know about](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=19.1) [other commands surrounding it.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=22.21) [The chain of responsibility will pass it on to its other successor,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=25.07) [for it doesn't know what to do with it.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=28.98) [The chain can oftentimes also utilize the command pattern in its](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=31.37) [implementation of those individual concrete handlers.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=35.36) [The command pattern is actually quite similar to the chain](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=41.34) [responsibility and that its commands are also unique,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=44.16) [just like the handlers.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=47.85) [It's different, though,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=49.57) [and then it it should encapsulate all of its functionality.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=50.76) [It doesn't attempt to hand it off to somebody else if it](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=55.55) [doesn't know what to do with it commands air,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=57.91) [also reversible or trackable in nature.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=60.55) [We will often store a history of commands,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=64.54) [and we don't do this with the chain of responsibility.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=67.44) [In fact, that is a risk,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=70.55) [as we mentioned in the pitfalls that we could have a chain not handle a request.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=71.92) [It all and we don't know about it Although the pattern doesn't enforce this,](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=76.14) [we usually call a command because we know it will handle it.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=81.24) [But the chain, we just send it down the chain, assuming that somewhere somebody along the way will handle it.](https://app.pluralsight.com/course-player?clipId=bbf4ce10-4409-4d51-b260-e6c813efe0b9&startTime=85.98)

### [Summary](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9)

[[Autogenerated] Let's just recap what we've learned with the](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=1.22) [chain of responsibility pattern It d couples,](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=3.11) [thesent er and receiver from requests.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=6.77) [So the center doesn't have to know who's going to handle its request,](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=9.84) [and the receiver doesn't have to know who the sender was necessarily.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=13.4) [You can configure this at runtime, and that can be helpful,](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=16.94) [or it could be dangerous as far as your applications concern.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=20.96) [Usually that flexibility is looked upon as a positive thing,](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=24.19) [though it is high article in nature.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=27.37) [In other words,](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=30.69) [it's going to build a zit goes down the chain As to who](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=31.24) [may be able to handle that request.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=34.93) [You do have to be careful with large chains because it](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=38.64) [can become a performance bottleneck.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=41.57) [Or it can be confusing where that business logic might](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=44.06) [be configured inside that chain.](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=47.07) [The next pattern that we want to look at is the command pattern in the](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=50.14) [command pattern shares some of the similarities, as we mentioned in the contrast section of this course](https://app.pluralsight.com/course-player?clipId=28d19779-22cb-496e-8838-eecc45384cf9&startTime=53.9)

## [Command Pattern](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997)

### [Introduction](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997)

[[Autogenerated] Hi, This is Brian Hansen.](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997&startTime=0.74) [And in this module where you're going to look at the command design pattern,](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997&startTime=2.51) [the command pattern is a behavioral pattern that lets you encapsulate.](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997&startTime=6.34) [Each request is an object.](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997&startTime=9.85) [There are a lot of reasons as to why you'd want to do this. Let's look at some of those concepts.](https://app.pluralsight.com/course-player?clipId=1b3627b4-8e16-4cb9-99fb-1c95cfe54997&startTime=11.99)

### [Concepts](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8)

[[Autogenerated] the concept surrounding why you would choose](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=1.24) [the command pattern or that it encapsulates.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=3.08) [Each request is an object.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=5.65) [If you have dealt with or are going to work with a large system,](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=7.58) [you'll quickly find that the business logic and functions](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=10.98) [inside that system can be very complex to maintain a debug if](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=13.67) [they're all just added in one file.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=17.54) [Another key reason for choosing this pattern is that each call back](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=20.38) [a request is now object oriented instead of just another method](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=24.04) [added in sight of that growing class.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=28.29) [Maintain ability is also increased because the sender](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=31.34) [is decoupled from the processor.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=34.74) [This will enable the system to be more flexible and grow over time,](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=36.94) [often times, but not the only reason.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=41.74) [You will use a command to add undo functionality to your application.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=43.99) [The entire request should be contained within the](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=48.94) [command and then could be rolled back.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=51.43) [Examples of this in the job a P I.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=55.04) [R implementations of java dot laying dot rentable each implementation.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=57.16) [It adheres to the principles of the command pattern.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=62.34) [Another example is any of the Java ex dot swing,](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=65.04) [the action implementations Years ago,](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=68.88) [swing actions were probably the first place that I personally used](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=71.77) [this pattern and have since used it in many Web frameworks and applications that I've written on my own.](https://app.pluralsight.com/course-player?clipId=1c469400-ba17-4d3a-a630-7e1f19a77af8&startTime=75.09)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6)

[[Autogenerated] the design of the command is a little](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=2.34) [different than some of the other patterns and is sometimes](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=4.02) [argued that it breaks the principles of,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=7.02) [oh design because there is an object per command,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=9.3) [A command is a verb, and objects usually aren't verbs,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=13.74) [but rather the methods inside them.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=17.69) [But people have seemed to relax their view on this.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=20.14) [The main contract of the command is the command interface,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=23.7) [all implementations of actions or commands inside the framework will](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=29.04) [implement this interface and in its simplest form,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=33.24) [just contains an execute method.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=36.55) [This method is where all of the action is performed.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=39.14) [In the case of an undue feature, though,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=41.92) [the interface will also contain an UN execute or undue method.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=43.98) [But this isn't required to adhere to the principles of this pattern.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=49.2) [Advanced implementations of this pattern make use of](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=54.04) [reflection to completely decoupled the client from the](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=57.4) [receiver or processor using a callback.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=60.65) [Most examples you see, though, are simpler than this version,](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=63.74) [and we're going to look at various examples is to see howto best exercise](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=67.71) [this action and implement it in your day to day use.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=72.85) [The pieces of the UML diagram are a command and](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=76.34) [invoke er and a concrete command.](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=80.2) [Let's go ahead. Look at that UML diagram now](https://app.pluralsight.com/course-player?clipId=e34af9f2-1e7a-4a9a-9810-d46a49f945d6&startTime=83.23)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8)

[[Autogenerated] This is the UML diagram for the command pattern.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=0.84) [The command interface is the heart of this pattern.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=4.38) [It provides the structure for the invoke er too](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=7.7) [abstractly execute on concrete commands.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=10.93) [The receiver in this has an action method that the execute command](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=15.49) [is performed on the abstraction is that the client just doesn't call](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=20.6) [the action on the receiver directly,](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=26.19) [but rather works with Ian Voelker to issue the command.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=28.17) [The action is decoupled from the client.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=31.95) [Let's look at an everyday example of this using the java dot laying dot rentable a p I.](https://app.pluralsight.com/course-player?clipId=71fd8332-0ae5-49d1-b530-5f070ed4d8d8&startTime=35.94)

### [Example: Runnable](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63)

[[Autogenerated] the rentable interface is a great example](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=0.61) [of the command pattern in the job a p I.](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=3.22) [We create a thread and pass an implementation of the rentable interface into it.](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=5.94) [You can see here that the request is completely decoupled from the processor.](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=11.24) [Let's look at this in life code in an example now of how the](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=16.84) [thread and rentable interface decouple the actual execution or action inside of our code.](https://app.pluralsight.com/course-player?clipId=21384998-f3ef-4053-89cc-5092897fff63&startTime=21.48)

### [Demo: Runnable](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4)

[[Autogenerated] for our threat example.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=2.54) [I've gone ahead and created a task class,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=4.25) [and I've put these two in the same file just so you can see him side by side.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=7.84) [The task class implements run herbal, which in our case,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=12.14) [would be an example of the command pattern or the command interface.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=15.72) [The request is completely encapsulated by this task object.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=20.44) [You can see we pass our parameters in, and that is our entire request.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=25.8) [And then we have an in Voelker, the thread that calls start,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=30.84) [which in turn will invoke the execute method on our task.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=34.99) [Now, we don't have much of a receiver in this example,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=40.44) [because all I'm doing is multiplying a couple numbers together.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=43.25) [What we're trying to do isn't really important as](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=46.77) [illustrating what the pattern does.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=49.29) [The receiver in this case would be the consul,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=51.64) [though,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=54.01) [because I'm going to dump out the result to the system got out print Lynn.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=54.18) [So as we start this, let's go ahead and run this code.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=58.44) [You can see that it goes ahead and multiplies those numbers](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=62.54) [and dumps them out to the command line.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=67.2) [Now,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=70.02) [I could swap out this receiver with something different](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=70.36) [and have it act on that receiver object,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=73.62) [but you get the principles of the code here.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=77.95) [I've got the rentable interface,](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=80.27) [which is the same thing as our command interface.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=81.83) [I've encapsulated our request.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=84.12) [We haven't invoke er we execute the method and we have a receiver which are](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=86.15) [really all the principles we need in this command pattern.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=90.94) [Now that we've seen an example of it, though, let's go ahead and create our own to further cement these concepts.](https://app.pluralsight.com/course-player?clipId=fe51a4eb-8228-4a74-8eff-20ea734836a4&startTime=95.24)

### [Exercise - Command](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355)

[[Autogenerated] in creating our own command pattern,](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=1.04) [we're going to create a command and invoke er,](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=3.47) [a concrete command and a receiver to help us illustrate the](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=8.06) [principles of the pattern we're going to then extend that](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=12.55) [example toe look at how he managed state,](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=16.37) [and then we'll show what a macro command would look like inside of our application.](https://app.pluralsight.com/course-player?clipId=1b73f19a-a473-4b93-a3e7-a1c32226e355&startTime=19.1)

### [Demo: Switch](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2)

[[Autogenerated] to shorten the length of this exercise,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=1.24) [I've gone ahead and created a couple of classes to start with and one interface.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=3.38) [The interface is the command interface,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=8.32) [and it has one method in here the execute command.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=11.15) [The next piece that I've done is the actual demo that we're](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=15.14) [going to run where we create a light, which is theory receiver a switch,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=18.73) [which is the invoke er and then a command to flip a light on and off.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=25.7) [So for this example,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=31.75) [we're just going to control a light with a switch in an on command.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=32.89) [Now, if you look very deep fourth command pattern,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=37.91) [you're gonna find an example similar to this all over the place.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=40.75) [But I'm gonna point out a few places where this fall short and how we're going](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=44.94) [to expand on it to make it a very useful command pattern.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=48.94) [But its roots, it's great.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=52.53) [And it's an example that I have personally used as I built a new house.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=54.2) [I put some automation stuff in there, and this is exactly what I did for it.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=58.86) [So to start with, let's go ahead and create the light class,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=63.64) [so I'm just gonna go ahead and say, Create class light and we'll click.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=67.91) [Finish on it.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=74.01) [And just first sake of documentation,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=75.29) [I'm gonna note that this is the receiver so you guys can follow along,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=77.87) [gonna add two methods and hair public void on,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=81.69) [and this is what the action is going to be performed on.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=86.94) [So we're going to say system dot out print Lynn.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=90.23) [Now, if you were depending on what type of automation package you had,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=93.48) [this is where would be where you toggle something](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=97.36) [with the switch to go on or off.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=100.22) [So we're gonna say lights switched on and we'll](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=102.59) [save that and just why we're here.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=107.72) [Let's go ahead and put it off in there, too.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=110.2) [We'll see off and we'll do the same thing Will say system](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=114.34) [dot out print Lynn Lights switched off.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=117.38) [Now that we have that in place,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=125.19) [let's go ahead and refer back to our main method where we](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=127.6) [need a switch or the invoke her in this.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=131.89) [So the switch is pretty straightforward.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=136.08) [Let's go ahead and say that we want to create a class switch and finish.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=140.07) [And here there's two ways that we can do this.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=146.53) [You can put Justin execute method.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=148.82) [Or you can put separate storage mechanisms.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=150.52) [Sometimes you'll see implementations where they manage the command that weaken.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=153.26) [D'oh!](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=157.51) [For our simple example,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=158.05) [we're going to store the command and execute the command in](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=159.53) [the same call so we can say public void,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=162.55) [store and execute,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=167.99) [pass in an instance of command and then actually execute on it.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=173.01) [Command dot Execute.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=179.47) [Now, I am not doing anything with storing it right now.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=181.44) [We'll expand on that later.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=184.04) [For this example.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=185.94) [We just want to toggle that switch and this works.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=187.18) [So for documentation purposes,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=190.29) [go ahead and throw at the top of this that we've This is](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=192.53) [the in Volker and our UML diagram.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=196.12) [Now we're almost done.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=199.93) [We need to do one other piece here.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=200.98) [We haven't created our command are on command yet.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=203.24) [Now the command interface,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=206.93) [if you remember from are you are you are you Mel](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=209.95) [Diagram doesn't do anything with state, but the concrete object itself does.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=211.85) [And it has a receiver or a callback that is passed into it.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=217.5) [So to achieve this in our concrete command,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=222.41) [go ahead and create it Now, quick finish and full just documented the top here,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=227.44) [Concrete command.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=236.78) [We're gonna go ahead and pass in an instance of light to](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=240.04) [its constructors Will say private light,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=245.62) [light and we'll say public on command light light.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=249.07) [Now all this is going to do is just tie that receiver to us](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=259.04) [so that we can do the callback on it.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=262.63) [So we're going to say that this on command is tied to this light.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=264.27) [So this light equals light.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=268.66) [And now inside of our execute method,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=274.54) [all we need to do is execute what we want have happened since this is](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=278.19) [the the on command I'm going to say light dot on.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=282.42) [And we've now wired up all the pieces.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=290.54) [Now,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=292.8) [notice the client issues a command that turned the light on instead of the](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=293) [client directly calling the light dot on and that so that the command can](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=298.25) [manage state it can handle on do functionality.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=303.67) [We haven't added that to this class yet,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=306.7) [but you can see how this ties into all of those pieces.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=308.84) [Now, if you go back to our demo, all of our pieces will work.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=312.25) [We create our light, we have our switch,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=317.55) [we creator on command and then we execute that command.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=319.78) [Let's go ahead and run this now.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=324.25) [Say, run as Java application and you'll see that our light is now switched on.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=326.94) [So really quickly.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=334.74) [Let's walk through those pieces again.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=335.73) [We created our command in her face.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=337.09) [We created our light, which is our receiver.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=339.44) [We have our switch,](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=343.34) [which is our invoke er and then are on command where the meat of this](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=344.92) [really takes place and you can see inside of here.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=349.31) [This is what's actually doing the callback on the light object. And then for our demo, we just went ahead and did the store and execute and ran.](https://app.pluralsight.com/course-player?clipId=80b1e112-ca49-46ed-81a9-f3506355f6e2&startTime=352.38)

### [Demo: State](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b)

[[Autogenerated] one of the things I don't like about our current](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=0.84) [implementation of the command pattern is that state is nowhere stored in](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=2.72) [any of the objects and if you remember from our uml diagram we can store](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=6.86) [state in our command or in the receiving object.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=11.95) [Let's go ahead and modify our code to do that.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=15.35) [Now to do this,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=17.82) [we're gonna change the light object and we're going to create a new command.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=19.2) [So let's start off by going into the light object and adding a private bullion](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=24.04) [is on flag and start off by setting that equal to fault.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=31.34) [Now, I'm going to go ahead and just say public void.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=36.24) [Toggle instead of having the honor off command that we that](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=42.84) [we're going to call from our commands.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=47.78) [So let's go ahead and say yeah is on then will call the off](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=49.65) [method and set is on equal defaults else we will call on](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=59.12) [and set is on equal to true.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=75.04) [Now this uh this toggle is going to be used inside of our command object now.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=81.94) [And instead of having an on command,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=89.34) [I'm going to create a toggle command and Then delete this one.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=91.42) [So let's go ahead and say this and say new class.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=98.04) [And we'll call it the toggle command and click finish here toggle and save this.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=103.5) [Now I copy and pasted that over rather than just recreating the code and](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=116.24) [it could have re factored it one of a couple of ways,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=120.52) [but rather than call light dot on.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=123.27) [Now,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=125.34) [I'm going to call light dot toggle and save this and I wanted](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=125.94) [to do this to show you the two side by side that they're very](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=132.42) [similar in nature from one another.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=136.17) [So what we had before, in fact,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=139.2) [let's make it full screen so that you can see them easier.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=141.7) [You can see the two side by side.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=146.94) [All it's doing is tripping the toggle rather than the on.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=148.52) [So I'm going to go ahead and delete this eventually.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=151.4) [But I wanted you to see him for the two examples and I](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=153.89) [would make these both private as well.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=156.9) [But that will break the current code that's there.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=159.04) [So now let's go into our light again.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=162.24) [It's going to just toggle whether it's on or off and go to](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=166.32) [our demo and we'll say toggle command.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=169.02) [Now this code is set up to toggle whether the light is on or off.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=179.94) [We can call it a couple of times.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=188.04) [Let's go out and run it and see what it does now for us.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=190.03) [Yeah.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=193.34) [You see that we switch the light on, then off, then back on again.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=195.24) [And I don't have to create multiple commands for that.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=199.2) [And the state of the object is actually contained inside of the](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=201.92) [receiver and in conjunction with the command.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=207.56) [Now I don't have a stateless application.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=211.44) [I've maintained some state there.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=214.4) [The next thing we're gonna look at is issuing multiple commands to](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=216.54) [turn off multiple lights inside of our house.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=219.65) [So you can see building upon this command pattern](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=221.98) [that we want to go through and say, All right,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=224.71) [I've got three lights.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=227.15) [Now.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=228.37) [I want to turn those all honor or all off at a certain time,](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=228.52) [and we can keep building using the building blocks of the command pattern that we have.](https://app.pluralsight.com/course-player?clipId=61c09c61-8f0d-4633-a3ca-c182f130522b&startTime=232.03)

### [Demo: Macro](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489)

[[Autogenerated] so now that things are working real](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=1.14) [nicely with our command pattern,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=2.95) [let's go ahead and implement a macro command to turn off all of](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=6.04) [our lights so that when we're in bed at night,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=10.07) [we don't have to go around and switch off all the lights,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=12.06) [which is in our house, or grab our remote control and individually click them.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=14.38) [We can do them all with one command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=18.63) [So to create a little more in depth of an example,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=21.04) [we want to go ahead and add a few more lights in here.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=25.03) [The first thing that we're going to dio is change this to](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=27.84) [where we have a bedroom light and we'll go ahead and](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=31.1) [create a kitchen light as well.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=42.54) [So we'll say kitchen light.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=45.97) [Everything works fine there now notice.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=52.29) [As it stands right now,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=54.46) [we don't have multiple light switches that we're doing things with,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=55.54) [but let's just run this.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=60.66) [Make sure example still works fine.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=61.7) [Yet our life switch was turned on.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=63.76) [Then it was off than it was on again.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=65.27) [Now let's change this up a little bit to create that](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=67.34) [mackerel for all of those lights.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=71) [Just start off by commenting this code out and I'm coming it out because I'm](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=73.53) [going to illustrate a problem that we're gonna run into later.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=76.86) [Gonna save this.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=80.66) [Now, the first thing we want to dio is we're gonna create a list of lights.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=82.02) [Well, say list lights, lights equals new array list.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=87.83) [Now,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=102.33) [the purpose for this is that I want to be able to shut off](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=102.54) [all of the lights in my house at once.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=104.81) [So I'm gonna add all my lights, this command,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=108.54) [and say it lights dot ad when add the kitchen light and](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=111.94) [then lights dot ad the bedroom light.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=118.14) [Now we have all of the lights added.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=127.94) [Let's go ahead and create a new command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=130.34) [We'll call this the all lights command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=133.24) [So the sequel to a new all lights command and this doesn't exist yet,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=138.24) [so it's gonna give us a compilation air,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=143.22) [and we'll go through and created ourselves here in just a second.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=145.69) [And this is going to be called borrow light switch.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=150.34) [We're gonna see a light switch dot store and execute air, eh?](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=152.73) [Lights command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=161.34) [Okay, let's fix this to where we create our all lights command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=164.54) [Now I'm gonna say, create class all lights command,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=168.39) [and it implements the command interface.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=173.24) [So when it brings that up just how I did it off the Red X on the site,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=176.49) [it says, Oh, you want to create this is gonna implement the command interface?](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=180.27) [Yes.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=183.89) [Let's go ahead and click.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=184.29) [Finish now, are all lights.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=185.12) [Command Looks pretty much just like our toggle command are on command Did.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=187.42) [There's a few slight variations here.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=192.8) [First, we're gonna say that private list light lights and store this.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=194.98) [We're gonna create a constructor that passes all of these in.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=206.54) [So with our toggle command,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=209.02) [we just took one light and we're gonna take a list of](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=210.47) [lights and here's will say all lights, command list,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=212.91) [light lights, and we're gonna sign those to our object.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=221.24) [We have our reference we have inside of our class.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=229.75) [So say lights equals lights, organized all of our imports.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=231.92) [And we pretty much have the basis of what our other objects look like.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=240.14) [Four commands with one slight variation down here,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=246.34) [we're gonna say for each light, light, light of all of our lights,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=250.54) [we want to say light, dark, toggle.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=262.19) [Great.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=267.44) [That's all we had to do to turn off all of our lights at once.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=268.04) [Turn them all on or turn them all off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=271.35) [Let's go ahead and run our demo and see how it works.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=273.34) [And, as expected,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=277.74) [it turned on our bedroom light and it turned on our kitchen light at the](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=279.01) [same time as you see from our our output down below.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=281.81) [Both objects were switched on.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=285.8) [That's fine.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=288.69) [And that works fine.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=289.85) [Except for if we throw a little wrench in the gears of saying,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=291.08) [let's go ahead and create a toggle for the bedroom light,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=295.04) [so I'm gonna go ahead and turn the bedroom light on,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=299.24) [and then I'm gonna issue all of our lights to turn them all honor all off,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=304.14) [and you'll see that we quickly run into a problem with state.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=309.44) [So we have one switched on, then the other switched on,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=312.89) [and then another switched off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=316.04) [Well, that's gonna pose a little bit of a problem,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=318.74) [because if we're trying to use this to turn them all on,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=320.92) [are all off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=323.01) [We now have them in a weird state.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=324.94) [This is where our command needs toe work with our receiver to](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=328.84) [assess the state of where our objects read.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=332.64) [So you can see that it was really easy for us to create our mackerel command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=335.59) [All we did was passing a bunch of lights and we can](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=339.13) [call multiple commands on it.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=341.23) [In fact, we could pass in individual commands containing those objects,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=342.55) [and that would be one way to fix this.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=346.32) [We can also go ahead and just modify our code here slightly to assess state.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=348.74) [So if we wanted to say all lights on or all lights off,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=355.72) [we can go ahead and change this to an all lights on command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=358.8) [Go inside of her object here and say public Julian is on and](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=363.14) [return the flags because a return is on and save this now](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=379.39) [inside of our all lights command,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=389.42) [we can say light dot is on and wrap that with a basic conditional statement.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=393.34) [If it is on, then we want to turn it off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=408.08) [Now, if we go through and rerun that code one was switched on,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=413.74) [we switched the other off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=420.39) [We didn't try and switch both of them off because it wasn't on to begin with.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=422.06) [So you see from our code that we've now fixed that race condition](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=427.44) [of where if I have one or two on the 3rd 1 off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=431.15) [When I issue the all command that we can toggle it off.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=434.73) [Very simple example.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=438.34) [You It's very clear to see what we're doing here.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=439.53) [As far as just working with the state of that object](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=441.94) [in assessing from our commands,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=444.71) [you can think of a dozen different ways to work and control](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=446.53) [your objects from these command patterns.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=450.06) [But to step through the key points that were trying to illustrate.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=451.93) [Here we have our client,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=455.08) [which is our command demo that we're running here that works with the receiver.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=458.54) [Our lights notice our client doesn't call those lights directly,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=462.25) [but rather issues a command to work with those lights.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=466.86) [And that's where that state can come into a bigger picture](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=470.22) [of what we want to do with those objects.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=475.09) [Imagine if you had all of that light code,](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=477.34) [all the functionality of the switch in the various commands.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=480.19) [Now we haven't all lights command and a toggle command.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=483.16) [We have just a basic on command as well that were going](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=486.14) [through and modifying this code to go through and do that if](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=489.5) [we did that all inside of our client.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=494.18) [This thing would become huge and we only have three basic](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=495.78) [commands on one simple light switch.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=498.97) [I think if we added fans in here, we added more lights.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=501.69) [We add a dimming capabilities.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=505.85) [You can quickly see how the code inside this command](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=507.83) [object would get huge really fast.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=510.71) [So this is a great way for us to work with commands and decoupling that client and see how you can group those together.](https://app.pluralsight.com/course-player?clipId=7a1eb7de-764c-49d7-8a54-7c7d9b8f7489&startTime=513.64)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639)

[[Autogenerated] what are some of the pitfalls of a command.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=1.04) [It's typically used with other patterns to be more mature.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=3.54) [The dependence on other patterns isn't necessarily a bad thing.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=7.24) [It just requires more knowledge on the developers part.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=10.7) [I also often see people struggle with the use of multiple commands.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=13.69) [Frequently,](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=19.59) [I see people make the mistake of duplicating logic in another command.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=20.26) [A better way to do this is either the use of a composite](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=24.25) [pattern as we demonstrated or commands.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=27.19) [Combined with the chain of responsibility pattern for undue functionality,](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=29.54) [you may want to look it using the memento pattern to handle state.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=34.58) [If you're tracking of objects needs to store a history,](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=39.34) [you may need to also look at the prototype pattern for creating copies](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=42.83) [of commands to store on a list to get a better idea.](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=46.6) [When we shouldn't or shouldn't use this pattern, let's contrast it with another one](https://app.pluralsight.com/course-player?clipId=e9056c2e-1caf-4727-8b94-ae31e80d3639&startTime=50)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b)

[[Autogenerated] to contrast the command pattern.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=1.74) [Let's compare it with thes strategy.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=3.86) [The command is structured around an object per command or per request.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=6.57) [The class contains the what essentially, what we're trying to do.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=11.97) [It also encapsulate CE the entire action.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=17.08) [The command object on Lee deals with this one exact scenario.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=21.04) [Thes strategy, on the other hand,](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=25.94) [is similar to the command in that it is an object per request,](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=27.72) [with the focus on this pattern being per strategy different than the command.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=32.77) [Though thes strategy focuses on the how rather than the what.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=38.35) [Instead of encapsulating the action, it encapsulates the algorithm.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=43.44) [This structure of these patterns are very similar, though with just some slight variations.](https://app.pluralsight.com/course-player?clipId=ff291edd-305c-4ede-9cf2-5015e962523b&startTime=48.77)

### [Summary](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb)

[[Autogenerated] to briefly summarize what we've learned.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=1.34) [The command pattern is a great pattern.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=3.54) [And possibly after the singleton, the second most used pattern.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=5.37) [The command pattern encapsulate.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=10.29) [Each request is an object.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=12.55) [It's also very good at decoupling the sender from the processor.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=14.46) [This is one of the key reasons for using this pattern.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=19.14) [Overall, with the command pattern there very few drawbacks and,](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=22.84) [as mentioned, the pitfalls.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=26.23) [Maybe just a reliance on other patterns.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=28.14) [The command pattern is also often used when we need](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=31.84) [undue functionality in our application.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=34.39) [The next pendant that we're going to look at is the interpreter, and we'll see how that helps us process things.](https://app.pluralsight.com/course-player?clipId=8bfad5e9-652b-48af-bd4d-59a196eacceb&startTime=38.04)

## [Interpreter Pattern](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a)

### [Introduction](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a)

[[Autogenerated] Hi, this is Brian Hansen,](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a&startTime=1.44) [and in this module, we're going to look at the interpreter design pattern.](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a&startTime=3.23) [The interpreter pattern is a behavior pattern that you used](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a&startTime=7.2) [to represent the grammar of a language.](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a&startTime=10.45) [A lot of tools use this pattern when parsing various aspects of a grammar. Let's look at some of the concepts considered when choosing this pattern.](https://app.pluralsight.com/course-player?clipId=8b3fa8f8-248e-424c-9cd2-0632cc684b4a&startTime=13.24)

### [Concepts](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c)

[[Autogenerated] the concept surrounding why you would choose the](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=1.68) [interpreter pattern or that it represents a grammar.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=3.93) [This could be music notation or mathematical equations,](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=7.49) [or even another language.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=10.82) [Compilers will use the interpreter pattern too often.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=12.99) [Times par source code.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=16.15) [This goes hand in hand with representing the grammar,](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=18.99) [but we can then use it to interpret a sentence.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=21.62) [This enables us to map out a domain specific language.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=25.14) [If you've ever used Sequel or an XML par sir, this is the exact thing that is.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=29.44) [This pattern was designed to dio define a language that can be](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=35.48) [interpreted to do things you'll often see an interpreter used when](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=39.33) [defining an abstract syntax tree or an S T.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=44.5) [As it's often abbreviated.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=48.71) [To examples of this in the Java A p I.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=49.94) [R.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=54.45) [The Java Util pattern,](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=55.39) [the pattern classes used to represent a compiled regular expression,](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=57.02) [it is an incredibly powerful way to search through strings.](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=61.24) [Another representation is tthe e java dot text dot for mat class](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=65.54) [format is an abstract based class that is used to represent](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=71) [locale sensitive content such as dates, numbers and strings. Let's look at some of the design considerations when choosing this pattern](https://app.pluralsight.com/course-player?clipId=9e9ae1ee-8eca-48b7-8a44-0e3a5c7c414c&startTime=75.38)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4)

[[Autogenerated] the design of the interpreter is quite a bit different](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=1.27) [than most of the other patterns that we've looked at.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=3.98) [There is an abstract based class or an abstract expression that](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=6.74) [declares an interface for executing an operation.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=11.04) [That operation is an interpret method.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=14.69) [Expressions are then broken into terminal expressions,](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=18.54) [which represent a leaf of a tree or an expression that](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=22.26) [does not contain other expressions.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=25.48) [If it does contain other expressions than it's a non terminal expression.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=28.34) [Non terminal expressions represent compound expressions and continue.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=33.08) [Clea called itself recursive lee until it finally represents a](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=36.98) [terminal expression or multiple sub expressions.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=40.95) [The pieces of the UML diagram are the context,](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=45.12) [abstract expression, terminal expression,](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=49.31) [non terminal expression and a client. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=6e814bbc-6e8c-4954-a4b5-cf74e11426f4&startTime=52.31)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d)

[[Autogenerated] This is the UML diagram for the interpreter design pattern.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=1.44) [The client builds the sentence of terminal and non](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=5.58) [terminal expression instances.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=8.81) [The context contains information that's global toothy interpreter.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=11.24) [All expressions will extend from the abstract](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=15.33) [expression based class or implemented.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=19.4) [If it's an interface,](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=22.07) [it provides the contract for how we interact with one another.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=23.84) [Terminal expressions are expressions that could be](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=27.99) [evaluated in their current form,](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=30.35) [where non terminal expressions will be interpreted again.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=32.42) [You can see the loop back up to the abstract expression](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=35.82) [where we can call ourselves recursive Lee until it's broken](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=39.01) [down into terminal expressions.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=42.61) [Now that we've seen this yo Mel diagram,](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=45.74) [let's look at an everyday example of this pattern in the job. A P I.](https://app.pluralsight.com/course-player?clipId=7c6ded0d-1e9c-4ceb-bab0-dad7ac13932d&startTime=47.98)

### [Example: Pattern](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c)

[[Autogenerated] the pattern class used in conjunction with](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=1.08) [regular expressions are a good example of the interpreter](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=3.39) [pattern being used in the job.](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=6.83) [A P I.](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=8.6) [We created sentence and establish a grammar for that sentence.](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=9.79) [From there,](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=15.11) [we're going to interpret the sentence and display](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=15.71) [what we parsed using the pattern. Let's look at this in life code now.](https://app.pluralsight.com/course-player?clipId=9e107c63-3ed6-461a-af87-1236f617984c&startTime=18.56)

### [Demo: Pattern](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192)

[[Autogenerated] as we discussed in the slide for this example,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=0.94) [we're going to go ahead and build a sentence,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=3.61) [establish a grammar and then run that through our regular](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=7.83) [expressions to see what comes out of it.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=11.61) [And I'm guessing that the first time we run this,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=14.33) [it's not going to produce the output that you're maybe thinking it will.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=16.52) [Let's go ahead and right click and run this code well,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=21.14) [say,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=25.85) [run as Java application and the output says that it](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=26.15) [found a tiger and it found a bear.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=29.79) [The reason for that is because of case case does matter in this now we could](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=32.74) [change our regular expression to look for upper and lower case.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=39) [Or we can just go ahead and add another case on the end of here.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=42.84) [Four lion, which is what I'm going to d'oh!](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=47.94) [And save this and run it again and you'll see that it found a lion,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=51.64) [found a tiger and found a bear.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=57.16) [And that's because the grammar is very specific.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=59.48) [We are looking for exactly this,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=62.2) [not sort of something similar to this or close to it,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=64.5) [although we can loosen that regular expression.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=68.27) [But this is all about this grammar that we've established and](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=70.64) [interpreting this sentence that we that we've passed in now.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=75.39) [One thing that I should note about the interpreter pattern is](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=78.65) [that it has next and nothing to do about parsing but rather](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=82.99) [establishing and interpreting a grammar.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=88.67) [And so it doesn't care if this was parsed,](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=92.24) [using four loops or some other pattern or method of of](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=94.4) [breaking this sentence down and breaking it up.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=98.24) [It's just about establishing a grammar.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=100.62) [In this case, we are looking for a lion, a tiger and a bear to exist somewhere in this sentence that we've passed in.](https://app.pluralsight.com/course-player?clipId=8d5d956b-42da-46fd-8daa-6683dd7fd192&startTime=103.05)

### [Exercise - Interpreter](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0)

[[Autogenerated] for the exercise that we're going to create on our own.](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=0.58) [We're going to go ahead and build a rules validator.](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=3.9) [I won't say a full blown rules engine,](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=8.22) [but using thean interpreter pattern to interpret things that](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=10.19) [we pass in and validate whether it's part of an Andorran or](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=13.83) [a clause in our expression.](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=17.3) [So in doing so, we're going to create an expression,](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=19.52) [a terminal expression, and from that terminal expression,](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=23.74) [we're going to extend that for an end and an or expression,](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=26.97) [and then we're going to go through and parse that example to see how that applies to all the rules of what we're providing in our grammar.](https://app.pluralsight.com/course-player?clipId=2e10b467-2058-47dd-a913-8cd16b841fc0&startTime=30.46)

### [Demo: Interpreter](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608)

[[Autogenerated] to shorten the length of this demo,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=1.04) [I've gone ahead and created a couple of classes just to help get things rolling.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=2.84) [Long, quicker to start off,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=8.06) [I created a static avoid main method that I just go ahead](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=10.1) [and build the context in which we're going to use this and](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=14.2) [build the interpreter tree.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=17.89) [So define what our grammar is and run that context through our grammar.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=19.15) [And right now there's nothing in our grammar.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=25.13) [I've got it commented out and just returning null so that](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=27.52) [the application will physically compile.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=30.85) [Now for the heart of the application.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=33.84) [I've gone ahead and created just in interface.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=36.4) [You can use an abstract class or an interface.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=39.16) [I didn't have anything that I was trying to pass down to sub classes.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=41.61) [So I went ahead and created the expression where the interpreter as an](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=45.76) [interface and you can see it has just the one method public Boolean](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=50.06) [interpret and I passed that string into it.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=54.07) [Now I've started stubbing out a terminal expression,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=57.44) [and this is where we're going to pick up and start coating out this application.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=60.44) [I have a terminal expression that just goes through and says ROK,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=65.02) [I implement the expression interface and you're gonna pass some data into me,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=70.21) [and then I'm going to interpret that data.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=75.15) [Let's pick up from here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=78.02) [I'm gonna go into my interpreter data and first of all,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=79.44) [uncommon this line that I had in here too,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=82.78) [So it would compile,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=84.85) [and we can see that we have a terminal expression](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=86.33) [that's going to take a string lions.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=90.07) [And this is starting to define how our grammar is going](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=92.03) [to interact with our interpreter.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=94.63) [We're looking for lions with this terminal expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=96.64) [So I'm gonna save this and now move over to my terminal expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=99.54) [And right now, it doesn't really do anything very complex.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=103.44) [In fact, right now it's it's hard coded to return.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=108.68) [Fault's gonna go ahead and swap out that implementation.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=111.07) [And I've already got it coated just to save time.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=114.12) [So I'm going to grab this chunk of code here and paste this in.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=117.24) [Now What this does is it's going to take the data that gets passed in and token](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=124.73) [ISAT and loop through that just to see based off of space,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=129.79) [off of a space,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=133.41) [loop through it and see if it just contains that string So we're basically doing](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=134.5) [the same thing that we were doing with regular expressions,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=139.46) [but doing it kind of in a poor man's method.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=141.88) [But you can see how I can go through and start to grab or look for](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=144.04) [specific pieces of the grammar and work with it.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=146.85) [Saved this terminal expression and now are very rudimentary.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=149.89) [Implementation should work.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=155.33) [We're going to extend it from here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=156.81) [But I'll build this string token Isar cycle through the](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=158.67) [tokens and see if any of them equals.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=162.22) [If it does, I return true.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=164.12) [Otherwise, I returned false and exit out.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=165.32) [Let's go over to our demo here and right click on the main method and say,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=168.24) [Run as a job application and we'll see that it](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=174.63) [finds Lyons Lyons is equal to true.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=178.09) [So just to kind of go through those steps,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=181.34) [we go ahead and build our context,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=183.45) [build our interpreter tree and then define or run that context](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=185.99) [through our grammar to see what matches.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=191.04) [Let's start doing some more complex things.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=194.04) [With this, though First off, I have created and or expression,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=196.06) [and I'm gonna open this one up.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=201.22) [We're gonna create the an expression together cause](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=202.25) [it's a little bit more complex.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=204.37) [The or expression has two expressions that get passed in.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=206.48) [Now you already see that we're starting to work with non Terminal.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=212.22) [So we had a terminal expression over here that very](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=215.19) [simply went through all of the pieces.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=217.94) [And then we're going to work with a non terminal or a compound ing expression](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=220.29) [to start comparing things and interpret one or the other.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=224.05) [And that's exactly what we do.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=227.7) [You can see down here we take and look at the first expression and interpret it.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=229) [And if it matches,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=235.94) [great or we're going to go ahead and look at the second](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=237.25) [expression and see if it matches in return.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=240.11) [True from one or the other.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=242.89) [Well, as you congest imagine,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=246.14) [we're going to do something very similar with the and expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=247.69) [I'm going to go ahead and get out of full screen here and](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=250.86) [right click on our package and say, new class and expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=254.46) [Now you could go ahead and say that the interface was expression here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=262.23) [I've actually got the code typed out, so I'm just going to click,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=265.02) [finish and go into my demo notes and grab all of this code here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=267.62) [Copy this and paste it in here and we'll walk through what it does.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=274.94) [So this code goes through just like the or grabs the](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=281.34) [two expressions that are passed in, and instead it looks at the first expression,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=285.23) [interprets it and then ends it with the second expression,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=289.66) [too.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=294.17) [Look to see if both of those values returned,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=294.79) [false or true or whatever combination of those to finally return it back to](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=296.92) [the calling mechanism that asked for the interpreter.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=301.37) [Now we're at a little bit of a crossroads,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=305.21) [though We want to do something Maur interesting with our demo](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=307.44) [because our demo will still work exactly how it waas.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=310.78) [We only had a basic lions that we're passing in here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=313.39) [And just for sake of testing,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=317.96) [we can comment out lions and uncommon tigers and go ahead and run it and](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=319.63) [it returns false because there's nothing tigers isn't found in our](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=325.94) [grammar are grammars only looking four lions.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=329.62) [Let's go ahead and add a few more expressions there,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=333.41) [so I'm gonna grab a couple over here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=337.34) [I've got tigers and bears created the exact same way.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=340.54) [So I've got terminal one, just eternal expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=346.98) [One of lions Terminal Expression number two,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=349.52) [which is tigers and terminal expression number three,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=352.38) [which is bears.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=354.72) [The problem is,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=356.34) [is now we don't have any of those combined using our end or are or](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=357.24) [expression yet to compound those into a much bigger grammar.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=363.66) [Let's go ahead and create some of those.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=369.31) [This is where it gets a little more interesting as faras a](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=371.11) [rules in general validators concerned with what we want to](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=374.02) [do inside of our application.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=377.51) [I can go ahead and compound these and grab this and paste it into our demo.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=379.22) [And now I have some complex expressions built for determining our grammar so](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=392.24) [you can see I have an alternation or a different use case of this where I'm](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=399.88) [looking for Terminal two and Terminal three sewing,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=406.13) [say lions or tigers and bears.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=408.99) [And I throw that Oren down below here, where I say,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=413.4) [Okay, I got alternation Number two,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=416.17) [which takes in Terminal one and alternation once you see how I'm starting](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=417.74) [to build that syntax tree out with the different variations that I want to](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=421.55) [accept or approve inside of our application,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=427.35) [and I returned that as an and expression.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=430.34) [Let's go ahead and see if this works.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=433.58) [Now, If I come down here and rerun this, I will get that Tigers is still fault.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=436.04) [But if I look for one of my combinations down below,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=445.83) [such as lions and tigers, save that run ahead.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=450.36) [I'll see Lions and Tigers fault.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=455.74) [But now if I go to tigers and bears or lions and bears,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=458.34) [I'll see lions and bears is true and that is because of](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=466.24) [the combination that we have here.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=469.47) [So we have lions or bears.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=471.08) [So if we look in our combination here,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=475.94) [we're looking for tigers and bears or our claws,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=477.47) [tigers and bears.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=481.41) [Now, if I do tigers and bears that one should also return true as well.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=482.28) [Save that run it.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=488.11) [You see tigers and bears is true as well.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=489.75) [So you start to see the power of using the this grammar to go](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=492.14) [through and parse all the subsets and how for doing something](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=495.98) [with an abstract syntax tree to make a more complex interpreter](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=499.69) [of what we're trying to d'oh!](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=504.92) [Just like we look to see it for the and clause of the or Klaus,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=506.37) [we could do the same thing for mathematical equations to look for](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=509.94) [parentheses or multiplication symbol or a division symbol and go](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=513.61) [through and build out that syntax tree through our code and interpret](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=517.93) [what we have inside of her application.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=522.68) [Really powerful way to do this.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=525.14) [And we're not just using a bunch of,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=526.58) [if then else statements or switch statements to build out our application,](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=528.87) [which eventually could become something quite unmaintained herbal, whereas with this, I can keep building those expressions upon one another.](https://app.pluralsight.com/course-player?clipId=f27f7f19-303c-4b28-95cf-de20dc831608&startTime=533.4)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79)

[[Autogenerated] Now that we've created our own interpreter,](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=0.32) [let's look at some of the pitfalls of it.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=2.46) [If the grammar becomes very complex, it can be difficult to maintain,](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=4.74) [as you noticed in our rule example that we had you could see very quickly that](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=10.08) [if I started adding these different answer or combinations,](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=15.03) [it could become a little bit interesting to try and debug and walk through.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=19.04) [So complexity can be an issue there.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=23.15) [There is at least one class per rule,](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=26.04) [so every time we create one of our new expressions were creating another class.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=29.33) [Complex rules will require multiple classes to define them.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=33.74) [That's where the difficulty of maintenance can come into play.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=37.24) [Use of other patterns might help with your specific](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=40.94) [implementation of a complex interpreter,](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=43.83) [and adding a new variant requires us to change every variant of that class.](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=46.13) [The interpreter is a little unique compared to some of the other](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=53.14) [patterns that we have looked at because it is fairly specific to the](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=56.39) [problem that we're trying to solve to better understand when we should](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=60.46) [use this or a different pattern. Let's contrast it with the visitor pattern](https://app.pluralsight.com/course-player?clipId=15c53d11-20fb-4103-b03f-767c68dfee79&startTime=64.8)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c)

[[Autogenerated] to contrast the interpreter pattern.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=1.3) [Let's compare it with the visitor.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=3.36) [The interpreter and the visitor are very similar in structure,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=5.54) [but a different focus on implementation.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=8.73) [The interpreter has access to properties because it contains the object.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=11.64) [Functions are defined as methods,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=16.54) [and since we extender implement the base interface,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=19.11) [each interpret function is contained within a method.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=22.18) [One drawback is that adding new functionality changes every variant](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=25.74) [recall the demo that we coated together when we were building the](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=30.93) [expression tree and the complexity that we could get by calm](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=33.75) [pounding those expressions together,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=37.92) [the visitor is actually very similar to the interpreter,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=41.24) [with some slight variations.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=44.38) [Instead of having access to the properties we need,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=46.8) [we have to implement the observer observable functionality to gain](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=49.55) [access to those properties similar to the interpreter.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=53.38) [Functionality is found in one place,](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=57.89) [but it is in the visitors and not in the expression objects that](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=59.98) [were building and just like the interpreter.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=64.15) [Adding a new variant requires changing every visitor.](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=67.26) [The focus is more about whether you're adding more expressions or](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=71.68) [grammar rules or adding new visitors to interact with, and that is the main focus on choosing one over the other](https://app.pluralsight.com/course-player?clipId=70c08aec-a7af-4786-a7a9-176cb3fe294c&startTime=75.43)

### [Summary](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3)

[[Autogenerated] to summarize the interpreter pattern.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=0.94) [You want to use this pattern when you're defining a grammar.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=3.07) [It is a great pattern if you're defining rules or](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=6.21) [validation criteria for objects.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=8.88) [Our example use strings,](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=11.64) [but you could just as easily substitute objects and take advantage of](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=13.3) [the power of generics inside your interpreter pattern.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=17.7) [This pattern is more of a special case or limited use pattern.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=21.74) [No, it solves a very specific problem.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=25.29) [It's great for that purpose,](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=27.69) [but limited use outside of that watch when you're implementing it,](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=29.43) [to see where you think change is likely to occur,](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=33.96) [and you may want to consider using the visitor pattern](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=36.95) [depending on where that change is,](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=39.73) [The next pattern that we're going to look at is the generator pattern, which is a great one for cycling through objects.](https://app.pluralsight.com/course-player?clipId=45bf7cf0-bfb0-4c15-9024-d07ad3e7b3e3&startTime=42.94)

## [Iterator Pattern](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed)

### [Introduction](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed)

[[Autogenerated] Hi.](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed&startTime=1.24) [This is Brian Hansen.](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed&startTime=1.77) [And in this module, we're going to look at the generator design pattern.](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed&startTime=3.01) [The generator pattern is a great pattern for providing navigation without exposing the structure of an object.](https://app.pluralsight.com/course-player?clipId=29842eab-6943-48e6-ae43-73ca4420eeed&startTime=6.74)

### [Concepts](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f)

[[Autogenerated] the concept surrounding why you would choose the](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=1.79) [Liberator pattern are that you need to traverse a container in Java](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=4.06) [and most current programming languages.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=9.14) [There's the notion of a collection list maps sets are all examples of a](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=11.45) [collection that we would want to traverse historically have used a loop of some](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=17.24) [sort and an index into your collection to traverse it.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=22.33) [In the case of the generator,](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=26.4) [we don't expose Thea underlying structure of the](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=27.69) [object that we want to navigate.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=30.49) [Navigating various structures may have different algorithms or approaches](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=32.94) [to cycle through the data the IT aerator de Couples.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=37.03) [The data from the algorithm used to traverse it](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=41.02) [generators air also sequential in nature.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=45.04) [And this is an interesting concept because not all](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=48.02) [objects have a sequential set of data.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=50.45) [The generator handles the navigation in an order that](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=53.31) [best resent represents its sequence.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=56.69) [Examples of this in the job, a p i.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=60.01) [R.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=63.05) [The built in it aerator interface.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=63.53) [This is such a pivotal part of the language that Java has decided to](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=66.06) [build in an interview later interface for us to use across all of our](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=70.3) [containers and collection that needs some sort of navigation There is](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=74.84) [also an enumeration in new Marais.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=80.26) [Shin predated it aerator and is now simply just a copy of the](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=83.19) [functionality of the operator interface. Let's look at some of the design considerations when choosing and generator.](https://app.pluralsight.com/course-player?clipId=5caee436-d568-467c-bb93-f54eb6b0534f&startTime=87.95)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd)

[[Autogenerated] the design of the Liberator is interface based.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=1.74) [Whichever object you want to reiterate over will provide a method](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=6.04) [to return an instance oven iterated from it.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=9.14) [It follows a sort of factory method pattern in the way that you get](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=12.28) [an instance of the IT aerator each generators developed in such a](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=16.02) [way that it is independent of another.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=20.36) [It aerators don't know about other it aerators, but they are fell fast.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=22.94) [Fell fast means that to Liberators.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=28.14) [Can't modify the underlying object without an air being thrown](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=30.24) [coincidentally and numerator are fell safe,](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=36.74) [which means it is built in a way that they can't be used to fell.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=39.76) [They're pros and cons to both,](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=44.07) [but they decided in the job a p I to utilize a fell fast approach rather](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=46.74) [than a fail safe approach for the it aerator pattern.](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=52.17) [The peace of the UML diagram are simply an operator interface and an](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=56.94) [instance of a concrete generator from the container. Let's now look at that UML diagram](https://app.pluralsight.com/course-player?clipId=ec672041-360b-4bd8-8807-b59ae29281dd&startTime=61.03)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe)

[[Autogenerated] This is the UML diagram for the Javi](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=1.38) [you Till list using an ID aerator.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=3.99) [The generator itself is quite simple, so to show how it works,](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=6.8) [I included the list classed and its implementation.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=10.45) [The collection interface is extended by the list interface.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=14.34) [The list interface has, among others, and it aerator factory method.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=19.14) [The Generator Factory Method returns an instance of the](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=23.79) [Liberator interface in the case of a list,](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=26.92) [and it's implementations Thea underlying instances a list it aerator.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=30.13) [The listed aerator is an implementation of the IT aerator](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=35.17) [interface that understands how to jittery over the various](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=37.9) [list objects in the collections a p i.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=41.65) [It declares the interface for objects in the composition. Let's look at this everyday example in some code now.](https://app.pluralsight.com/course-player?clipId=bdb7fb2a-5328-40ce-a390-f5d5de7d79fe&startTime=45.24)

### [Example: List](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa)

[[Autogenerated] the list interface makes great use of](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=1.34) [the generator for looping purposes.](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=3.86) [In this example,](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=6.74) [you can see that we create an instance of Honore List and after](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=7.61) [initializing some values in her iterated over it,](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=11.49) [notice in this example that were also modifying the original list](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=15.74) [by using the remove method on the IT aerator. Let's look at a couple of examples of this in life code now.](https://app.pluralsight.com/course-player?clipId=9ebc4c97-b52c-47fe-82f8-17fe719999aa&startTime=19.59)

### [Demo: List](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9)

[[Autogenerated] Here's the actual code for the](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=1.24) [samples that we were just looking at.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=3.59) [Where we go ahead and create an instance of Honore List.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=5.28) [Add some people to it and then get an instance of an incinerator to](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=8.48) [victory over that object in a simple wild loop.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=13.01) [And if we run it, it's really straightforward code.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=16.04) [You'll see that it runs just fine.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=18.55) [It was a job application.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=21.54) [You'll notice that we cycle through it.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=23.34) [It prints out Brian, Aaron and Jason, and then we call the remove each time.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=25.3) [So when we finish, the actual loop is of or the object itself,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=30.51) [that the loop on over is off size zero.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=35.57) [Now great.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=38.42) [It works.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=40.03) [How on it aerator should work.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=40.7) [But let's look at some other variations of this.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=42.23) [One thing that people don't often realize is that the four H](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=45.64) [Loop is using an instance of the generator.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=51.28) [Sophie go for each and hit control space bar.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=55.56) [Notice what the text says here for each iterated](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=60.22) [over an array or an literal object.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=64.65) [So if I hit enter here, it's using an operator behind the scenes.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=69.41) [Now we don't need this one anymore, cause it's grabbed its own instance of it.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=74.6) [But the object it has here is now available for use as an it aerator.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=78.26) [So it has an honorable object behind the scenes](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=85.48) [that it called on that interface.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=88.52) [So it knows using the it aerator pattern that we can now](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=89.78) [construct this for each loop and the same thing.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=93.83) [If I just do a system dot out dot print land on the name here,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=96.39) [we'll change our string up here to name and save it.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=103.29) [We can now enter a over this object the same exact way,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=109.34) [and we can utilize the remove if we want to,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=113.08) [or how we want to go through some of that functionality.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=115.99) [But you can see we're not exposing that index anywhere.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=118.92) [Traditionally,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=122.59) [we would have written this as a four loop and gone through and said,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=123.32) [for anti equal to zero I less than the size of names.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=130.02) [So we do names dot size and then do I plus plus.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=137.86) [And now we have an instance of that.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=145.84) [Now we need to go through and actually grab that based off of its](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=147.53) [location so he could say names dot don't get at an index,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=153.61) [and we could use I,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=162.51) [and this would return our names so we'd say string name equal to this.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=164.35) [And now I can go through and print this up a lot more work,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=170.14) [a lot more things to get wrong.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=173.36) [It still works, though, So a lot of people go Well,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=175.94) [why would I ever want to use the generator?](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=178.24) [Because I have this functionality built in front of me that will](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=179.47) [work this way and I'll show you exactly why.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=182.87) [Because if I come up here and create a new instance of a set and say,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=185.89) [it's a set of strings and we'll call this one names new hash set and](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=192.3) [save that we have to import all of our objects.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=203.57) [What's happening on this line right here?](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=210.44) [There isn't an index to get an object by an index location.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=213.48) [I can't do this anymore.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=221.39) [But if I look at some of my other examples,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=223.24) [my four loop that's using the terrible under the hood,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=226.54) [it works just fine.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=232.04) [We can go through, we can run it.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=233.35) [It'll do the same thing,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=235.24) [and that is because a set doesn't have a get based off of an index.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=236.87) [And just for the sake of showing the entire example will](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=242.03) [go back to what we had originally with Wild Loop and](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=245.38) [you'll see that it runs as well.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=248.23) [We can go through save that, run this example,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=251.54) [and our example will work,](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=260.94) [and it will also allow us to remove that object at that location.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=263.59) [So this is really a great way to generate over a set or some](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=268.94) [of the other collections and have an index to a location and](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=272.72) [be able to modify that collection.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=277.27) [You can't do that with a four loop and a simple dot get based off of an index.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=280.05) [You see some of the power of using this generator and why](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=285.58) [they did that is based off of how that object gets structured underneath that collection.](https://app.pluralsight.com/course-player?clipId=71ec407f-3dbd-4200-af03-d5fd47eb2ac9&startTime=288)

### [Exercise - Iterator](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276)

[[Autogenerated] Now that we've seen some examples of this being used,](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=1.19) [let's go ahead and create our own, and it's gonna be a pretty simple example.](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=3.96) [We're gonna go through and create a repositories](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=7.36) [yaar basic example of a collection,](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=9.73) [and then we're gonna create an it aerator to cycle over that repositories.](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=12.66) [There's a few things I'm gonna show you inside of that repositories,](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=19) [that air indicative of what goes on behind the scenes in a collection, things such as re sizing and how we remove and those types of actions.](https://app.pluralsight.com/course-player?clipId=304e621a-a6b4-4cd8-ac5d-024f6b7d4276&startTime=21.97)

### [Demo: Iterator](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402)

[[Autogenerated] to help shorten the length of this exercise,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=1.44) [I've gone ahead and created some sample code to show you](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=4.24) [the pieces that we want to set up.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=7.81) [These don't really have anything to do with the actual](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=9.42) [implementation of the IT aerator.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=12.45) [It's just to help make this run a little bit quicker.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=14.28) [So I've gone ahead and created a demo method where we set](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=17.37) [up an instance of the bike repositories.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=20.63) [We're going to create and add a couple of bikes to it,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=22.41) [and I have taken the simple route this time and just created some strings.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=25.34) [I probably would really use some bike objects if I was going](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=29.89) [to implement this in a true application,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=33.72) [but you can see what we're doing by example.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=36.16) [From here, I'm going to call an instance of the generator,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=39.46) [and right now that method isn't defined,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=42.03) [so you can see that I've got a compilation air on it from here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=43.95) [I just jittery over that iterated that we return back from](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=47.5) [calling the method from our repositories.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=52.54) [Let's go ahead and switch overto our bike repositories and](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=55.78) [start adding those features in here Now,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=59.33) [inside here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=62.14) [Very simple.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=62.75) [I've backed it by an array.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=63.53) [I initialize it to a default size and to make it a little more realistic,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=65.45) [I've added an ad bike method in here that you can see,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=69.88) [goes ahead and looks at the index size and goes](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=73.81) [ahead and creates an instance Ah, larger instance of the ray.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=78.31) [If we need Thio and copies, everything is into into it.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=81.54) [And then it assigns the actual bike to that position](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=86.24) [in the array and returns from here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=89.97) [So kind of a simple collection that we've created on the back end on her own.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=92.42) [Now, I'm gonna do two things here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=97.19) [Gonna make this object,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=98.93) [implement Ita ra ble and you'll see from doing this implements literal.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=100.75) [If I choose a terrible,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=111.48) [you'll notice that it says implementing this interface allows an](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=113.13) [object to be the target of the four each statement,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=116.72) [and we want that.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=120.44) [So we're gonna go ahead and it's asking for generic here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=121.74) [I'm in a hard Cody in string now.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=125.17) [Obviously, if this was the bike repositories,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=128.28) [I'd probably want to create that bike object that I](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=130.55) [mentioned earlier and substitute bike in here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=132.36) [It's a trivial example and it doesn't really have anything to do with this](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=135.44) [pattern so you can do that exercise on your own Now,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=138.27) [in doing so and implementing that interface,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=142.13) [you'll get it in those.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=144.57) [I get another competition.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=145.42) [They're telling me that I need to add on implemented methods.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=146.44) [And as you might imagine, it tells me you need an ID aerator.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=150.35) [Great.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=154.84) [That's exactly what we want to D'oh!](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=155.54) [We're going to create an instance.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=157.04) [Oven iterated er, And to do so,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=158.35) [I'm going to just do this as an inter class and anonymous in her class.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=160.48) [Inside of this object.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=164.13) [Well, say it aerator and a string se I t equals new it aerator,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=166.62) [and it will go ahead and create our basic structure for us.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=184.24) [And it's gonna tell us that it wants the unimplemented methods as well.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=189.04) [So we'll add those three unimplemented methods inside of here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=193.5) [The last thing we want to do and just get it out of the way is I](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=197.84) [want to return the it aerator that we've created.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=200.96) [So there's our entire anonymous in her class.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=205.44) [Now we're gonna go ahead and start filling in these values](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=208.12) [to use for our generator to start with.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=212.72) [I want to go ahead and add an index for us to track](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=219.82) [our progress through iterating.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=223.23) [I'm say private and current index is equal to zero and](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=225.24) [save that now I'm gonna start off with Has next has next](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=233.9) [is a little bit more complex.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=238.91) [We're going to go ahead and say current index less than cause notice.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=241.84) [This is creating a Boolean bike stop length and bikes at](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=249.38) [the current index does not equal no.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=259.68) [Now,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=270.34) [what this is just doing is saying that make sure that our index is](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=271.06) [less than the length and that the object that we're looking at](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=274.29) [Cousin Array can be larger than what our current our index sizes](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=277.32) [and have no values in there.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=281.24) [So look,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=282.48) [that are indexes below our length and that the object that](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=282.91) [we're looking at that location is not No.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=286.65) [The next thing we're gonna dio is for our next method.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=289.44) [We're going to return bikes at the current index and just as a shorthand,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=294.01) [I'm gonna do index plus Plus,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=304.97) [what this is going to do is it's going to grab bikes,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=308.34) [the current index And since we're calling the next one,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=311.39) [once it's returned that it's going to increment the counter.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=313.78) [So it's doing two things at once, a little bit of shorthand.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=316.1) [You maybe a little confused by it.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=318.7) [Don't worry about it.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=320.8) [You could break that out into two calls.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=321.5) [If you wanted to grab the bike object,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=323.15) [return it on its own and then in credit now for the remove.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=325.44) [The remove just is going to grab something from that location and](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=330.01) [nullify that spots what's not available in the future.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=335.11) [Going forward.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=338.38) [And we should resize the array just like we've done](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=339.09) [up in our ad method up above here.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=341.91) [I'm going to let you do that on your own.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=344.74) [It's not go.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=346.64) [It doesn't add anything to the actual liberate herself.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=347.12) [So I'm going to throw a new unsupportive operation exception](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=349.63) [in here and supported Operation Exception,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=354.9) [and you can implement it if you want to.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=364.66) [But this shows wth e the intent in the](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=366.98) [implementation of that it aerator pattern.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=369.56) [Let's go ahead and go over to our demo now,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=372.8) [and you can see our compilation error is gone.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=374.91) [Right?](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=377.89) [Click and say, run as a job application and we'll return.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=378.32) [Survey Loa Scott and a Fuji Three really great bikes now](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=382.99) [because we made that an irritable object.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=388.1) [We had our cetera ble at the top and it forced us to](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=391.07) [create an instance of the Liberator method.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=395.62) [We can also go ahead and take that same chunk of code and safe for each.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=398.03) [And it will just automatically choose our repo for us.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=405.44) [You say bike 20 system that out dot print Lynn on the bike and save that well,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=409.94) [coming up the wild just so it doesn't display them all](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=420) [twice and run that you'll see it does that if we try and](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=422.41) [call the remove on our wild loop.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=427.81) [Obviously,](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=431.25) [at this time it will throw an object unsupported operation exception and you](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=431.93) [can go ahead and implement that on your own if you like.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=436.87) [It doesn't really do anything to show what the actual it aerator does.](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=439.62) [You see how we made an aerator?](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=443.17) [We didn't have to expose an index into our object, but we also made it usable by the for each that was implemented in Java 15](https://app.pluralsight.com/course-player?clipId=dde52737-e452-4d2a-8748-914b54d29402&startTime=445.16)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b)

[[Autogenerated] Now that we've seen a couple of](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=2.04) [working examples and created her own, what are some of the pitfalls of innit?](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=3.39) [Aerator?](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=7.99) [Well,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=8.94) [if you haven't noticed and it would be pretty hard not to](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=9.57) [because we've discussed it a couple of times.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=11.82) [You don't have access to an index of any sort.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=14.24) [If you want to get an element of a certain position,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=17.44) [there is no way to do that without just iterating through](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=20.26) [and stopping on that object in the case of sets and maps and](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=23.87) [some of the other collection.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=29.64) [So there isn't a method for you to grab an element at a certain position,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=30.59) [So this is somewhat of a moot point.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=35.33) [The Basij aerator interface in Java is also on Lee Yoon a directional.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=38.34) [It can only go forward.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=43.46) [Some of my limitations, though, offer bidirectional access.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=45.69) [So if you've noticed the list,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=50.04) [it aerator not just the generator that we're using to the list it earlier.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=51.78) [It has a forwards and backwards capability built into it.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=55.11) [I don't give you the wrong impression here either.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=60.5) [And in most cases,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=62.78) [Thean Aerator is the most efficient solution to looping through](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=63.77) [an object bid in a couple of select scenarios,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=67.28) [the generator may be slower and just slightly slower than](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=71.15) [using an index and looping through it.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=75.16) [I should note that larger,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=77.79) [looping instances the generator is almost always more efficient.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=80.21) [I don't wanna say it always is because someone will prove me wrong.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=85.08) [But in every scenario I've seen in every test ran,](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=88.46) [the generator is the most efficient way to go through a large collection of objects.](https://app.pluralsight.com/course-player?clipId=220b0a8f-b36d-42ac-ab19-1284ceeb930b&startTime=92.01)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e)

[[Autogenerated] with all of the other patterns we've covered.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=1.04) [We have contrasted the pattern with another to show its strengths.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=3.21) [The generator is a little different than others,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=6.74) [though, and stands on its own feet to have something to compare it to.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=8.94) [Let's look at the traditional four loop instead,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=13.28) [as we've already talked about some of its strengths and](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=16.19) [weaknesses compared to the generator, the generator is interface based,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=18.65) [and by doing so, helped us remove the Traverse A LL algorithm from the client.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=24.08) [There is not an index available.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=29.54) [Yeah, it doesn't seem to be much of an issue,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=32.84) [especially when we're iterating over some of the collections](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=35.69) [that don't have a dot get at a certain index.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=38.3) [It also helps us with concurrent modifications.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=42.84) [So two things trying to modify that collection at the same](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=45.56) [time the four loop pushes all of it's true,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=48.65) [traverse a ll code to the client.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=53.14) [So this is, ah, huge change.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=56.04) [You'll notice that we had an algorithm that was contained](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=59.09) [in the repositories as we generated that anonymous in her](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=61.56) [class inside that object,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=65.12) [and it kept track of indexes and how we may or may not navigate over that object](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=66.44) [It also exposes an index which could be beneficial or not,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=73.14) [depending on your usage of it.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=76.7) [It doesn't change the underlying object cause you're dealing with that object.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=79.98) [It also doesn't allow you to work with the four each syntax.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=85.54) [If you're going to be using the four each syntax,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=90.69) [you have to be utilizing an object that is implementing the literal interface.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=93.19) [And that shorthand is really nice.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=97.81) [And it typically is slower in most situations the way that we're navigating,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=100.98) [using the four loop so the generators a little faster,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=106.61) [and it handles things like concurrent modification as well,](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=111.3) [a cz keeping that algorithm contained from the client.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=115.49) [So keeping your clients simpler for both to use.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=118.21) [Both work well.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=121.24) [There's pros and cons to each.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=122.47) [But many people often overlook the it aerator early on](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=124.74) [because they knew how to deal with a four loop.](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=128.71) [There's a lot of scenarios where that traitor is a much better for iterating than that for Luke](https://app.pluralsight.com/course-player?clipId=29108ccc-7ea1-4260-9e63-2784ba51619e&startTime=130.47)

### [Summary](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca)

[[Autogenerated] Let's recap the IT aerator.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=0.48) [It's an efficient way to traverse an object.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=2.84) [We've shown that both in speed as well as keeping your client simpler](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=5.84) [than what may be done with just a simple four loop.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=11.11) [It also hides the algorithm from the client,](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=15.19) [so that simplicity for your client is contained within the](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=18.34) [algorithm that you have coated in the container.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=21.8) [You're creating an illiterate or four, so it helps us simplify that client.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=24.71) [It also lets us take advantage of the new four H syntax that was introduced in](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=29.74) [Java 15 which definitely simplifies iterating over that object in a four loop](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=33.56) [or some of the various methods using a wild loop.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=39.04) [The next batter we're going to look at is the mediator pattern, which is used to handle how objects interact with one another.](https://app.pluralsight.com/course-player?clipId=f491278f-e1a7-4110-bc71-38f636e2b6ca&startTime=43.59)

## [Mediator Pattern](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243)

### [Introduction](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243)

[[Autogenerated] Hi, this is Brian Hansen,](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243&startTime=1.29) [and in this module, we're going to look at the mediator design pattern.](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243&startTime=2.96) [The mediator pattern is used to define how objects interact with one](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243&startTime=6.87) [another without having them refer to each other explicitly. Let's look at the concepts when choosing this pattern.](https://app.pluralsight.com/course-player?clipId=4feb1561-c190-4128-ad7e-d13c93167243&startTime=10.55)

### [Concepts](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a)

[[Autogenerated] the concept surrounding why you would](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=1.24) [choose the mediator pattern or that you need to achieve](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=2.85) [loose coupling between objects.](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=5.78) [This is present when we're dealing with a set of well defined](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=8.05) [objects that communicate in complex ways.](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=11.33) [Oftentimes their spaghetti code between objects that make loose coupling seem](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=15.34) [impossible and makes it tough to create a reusable components.](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=19.29) [Because of inter object communication,](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=23.46) [it's simply acts as a hub or a router in your application and which all](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=26.34) [communication will be routed through examples of this in the job,](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=30.69) [a p i.](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=34.9) [R the Java Util timer class,](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=35.54) [the timer class mediates through its schedule methods.](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=38.98) [Also,](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=42.43) [the Java laying reflect method class has an invoke method that allows](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=43.15) [us to mediate objects that were reflecting upon. Let's now look at the design of the mediator](https://app.pluralsight.com/course-player?clipId=3b811157-c834-4cb2-a23d-8161e314b56a&startTime=47.37)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441)

[[Autogenerated] the design of the mediator is](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=1.89) [interface based with a concrete class,](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=3.52) [although it could be implemented as just a class.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=6.82) [Utilizing the interface gives us the option of cycling out.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=9.87) [The various mediators based on the situation typically would want to do this for](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=12.92) [variances across different platforms that were deployed on.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=17.82) [The mediator often minimizes inheritance and our](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=21.94) [application because it is handling the communication rather](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=24.64) [than classes inheriting functionality.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=28.19) [The mediator also knows about all the colleagues rather](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=31.68) [than colleagues knowing about each other.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=34.68) [Pieces of the UML diagram are the mediator and a concrete meteor. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=bce91a97-4f88-4266-bd41-170f9a85a441&startTime=38.04)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127)

[[Autogenerated] This is the UML diagram for the mediator pattern.](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=2.44) [The mediator classes an interface or abstract class](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=5.64) [but doesn't necessarily need to be.](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=9.67) [If it is abstract,](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=11.94) [it is extended to a concrete mediator or the](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=13.33) [functionality will just extend from itself.](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=16.67) [This is also that the pier objects or colleagues don't](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=20) [communicate directly with one another, but rather through the mediator. Let's look at an everyday example of this pattern in action.](https://app.pluralsight.com/course-player?clipId=7dd043f3-0a70-4e17-9663-b663bd9d5127&startTime=24.52)

### [Example: Timer](https://app.pluralsight.com/course-player?clipId=5675f287-7b7e-43e3-92bf-d97c2d5623de)

[[Autogenerated] the timer object and more specifically,](https://app.pluralsight.com/course-player?clipId=5675f287-7b7e-43e3-92bf-d97c2d5623de&startTime=1.54) [the schedule methods are a good example of a mediator.](https://app.pluralsight.com/course-player?clipId=5675f287-7b7e-43e3-92bf-d97c2d5623de&startTime=3.99) [We can schedule tasks that do complex things without](https://app.pluralsight.com/course-player?clipId=5675f287-7b7e-43e3-92bf-d97c2d5623de&startTime=7.5) [having them communicate with one another. Let's look at this in life code now.](https://app.pluralsight.com/course-player?clipId=5675f287-7b7e-43e3-92bf-d97c2d5623de&startTime=12.12)

### [Demo: Timer](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e)

[[Autogenerated] So let's walk through the live code that we](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=1.14) [were just talking about in the slide on how to implement a](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=3.45) [timer object to schedule some tasks,](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=7.84) [go ahead and create an instance of this class.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=10.95) [It's a little bit larger to see it than we can fit on one](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=12.81) [screen inside of here in the constructor.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=16.14) [I just pass in the number of seconds that I want this to](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=19.22) [run for a very simple time or demo.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=22.1) [I go ahead and create an instance of a remind task that I've created that](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=24.92) [extend this timer task that requires us to have a run method.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=28.39) [And because sound doesn't carry through very well from](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=32.54) [running applications and record a demo,](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=35.35) [I went ahead and commented out the tool kit where I am grabbing an](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=37.74) [instance of the tool kit and making a beep noise.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=42.24) [Then I have created another task that does remind task with out of Beep,](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=45.44) [And the two of these just assure you that I can schedule these two](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=50.31) [tasks and they don't need to know about one another.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=53.4) [That's all handled through the mediator,](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=56.09) [which is our timer and our scheduling method.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=57.62) [Let's go ahead and run this and see what it does now, right?](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=60.34) [Click on the main method and say,](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=62.95) [Run as Java application and you'll see that it's schedules.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=64.95) [The task on the task is scheduled, and then it fires off the first reminder task.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=69.23) [Time's up.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=73.59) [And in the 2nd 1 this is times now really up.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=74.31) [These didn't need to communicate with one another to know how](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=77.48) [they were scheduled when they were gonna run.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=80.84) [They all ran independently of one another without having to be](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=82.48) [hard coded with references to each other.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=86.7) [So this is a good example of basic example of how the](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=89.48) [mediator pattern works and not requiring objects to communicate directly with one another.](https://app.pluralsight.com/course-player?clipId=143c031e-4c89-42ba-97f6-b07feed4786e&startTime=92.31)

### [Exercise - Mediator](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52)

[[Autogenerated] Now that we've seen an example of the mediator,](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=0.78) [let's go ahead and implement our own to implement our own mediator.](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=3.49) [We're going to create one that will implement a mediator,](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=7.53) [object and a colleague object.](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=11.52) [And to do this, though,](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=13.48) [we're going to fix a problem that we experience with the](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=14.72) [command pattern that we discussed in that module.](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=17.56) [To demonstrate the solution of the mediator.](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=21.09) [We're going to reconfigure our light and light switch object to exercise the mediator.](https://app.pluralsight.com/course-player?clipId=8c46bfa8-d78e-4dee-a6f9-587c3903da52&startTime=22.91)

### [Demo: Mediator](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563)

[[Autogenerated] to start off with this demo.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=1.74) [I actually went ahead and grabbed the command](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=3.32) [interface from our command pattern object,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=6.16) [and you'll notice that I changed the comment in here to say that](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=9.54) [it's colleague because inside this example,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=12.51) [all of our commands are in fact our colleagues.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=15.34) [I also grab the light object from that command just because I'm going to](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=19.1) [utilize this to demonstrate the complexity that we had inside the](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=22.91) [command pattern from having a a command object.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=27.57) [Call multiple other objects to aggregate or create mackerel commands.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=32.04) [So to start off,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=38.59) [let's go to our mediator object and you'll notice](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=39.84) [I've created this mediator class, and as I mentioned before,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=44.53) [a mediator could be a interface or an abstract class.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=48.03) [Or it could just be a concrete instance.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=51.9) [I don't plan in this example on having multiple mediators,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=53.73) [which you would usually implement to swap out for different platforms.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=56.62) [So I just went ahead and created a mediator class and inside of here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=60.34) [I've got a ray list of lights I can register a light,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=64.05) [which just adds it to that collection,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=68.27) [and then when I say I want to turn on all lights,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=70.62) [I just cycle through all of them,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=73.43) [checked to see if it's on and toggle it on or off.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=75.28) [So the object itself controls its state,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=78.84) [but the mediator will go through and determine](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=81.84) [whether or not it should or should not.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=84.28) [Call it now to demo this.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=86.16) [I've gone ahead and created a basic mediator demo,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=89.12) [which we can go through and see that I have an instance of my mediator.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=93.28) [Then I created two lights, a bedroom light and a kitchen light.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=97.91) [Then I register those lights with my mediator.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=102.17) [So I call the mediator dot register light and I go through and](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=105.03) [taken instance of our command pattern now.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=108.96) [And this is straight out of the command pattern module that we did.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=111.05) [I grab an instance of this turn on all lights command, and then I executed.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=116.08) [Let's look at that turn on all lights command.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=120.54) [It has an instance of the mediator where before it had an](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=123.24) [instance of objects that was trying to call,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=128.47) [let's go ahead and open up our previous command to see the](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=131.44) [difference between using this with the mediator pattern.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=135.04) [So if I go up back up in your command demo and grabber on command.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=139.84) [You'll see that it had an instance of a light and we](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=144.3) [tried to start doing things with,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=147.5) [like are all lights command that had a list of lights and then I](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=149.28) [would pass those in and I would cycle through there.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=153.84) [But our command started getting smarter and smarter with what we were](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=156.71) [trying to dio as faras aggregate commands were concerned.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=160.69) [So this all lights command we're now implementing as a mediator.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=165) [Let me switch back to my turn on all lights and you'll see](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=170.04) [that there's no reference to lights in here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=173.29) [There's only a reference to the mediator in here,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=175.59) [and this is our concrete command.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=178.15) [Now, to run this,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=181.14) [I'm just gonna go ahead and go back to my main](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=182.59) [method and right click on it and say,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=184.58) [Run as job application and you'll see that the bedroom](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=187.91) [light is switched on in the kitchen.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=191.73) [Lights switched on.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=193.33) [Well, I don't know about your household, but mine.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=195.05) [The kids seem to have a problem with shutting lights off, not turning them on.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=198.39) [And so I want to implement a command that will go through and turn off all the](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=202.59) [lights is we're going to bed or we're leaving the house.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=208.17) [So what?](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=211.14) [I want to go ahead and do is now do that same thing with turning it all off.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=212.16) [So I have a turn off all lights command that we're gonna walk through](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=216.26) [an implement the functionality ourselves to d'oh!](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=218.57) [I'm gonna uncommon this line here that just gets an instance of that.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=221.57) [Turn off all lights, command, and we're gonna go ahead and execute it.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=226.85) [So do that now so that it doesn't have the instance.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=230.28) [Not used air message.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=235.26) [And inside the turn off all lights command,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=237.29) [there is a method that were overriding is part of the command](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=240.1) [pattern for the execute that I'm gonna go through.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=242.77) [And now uncommon this.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=245.65) [Now this is gonna give me an heir because that method](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=247.25) [currently doesn't exist inside of her mediator.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=249.01) [Few things I wanted to point out here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=252.24) [Notice that our commands still do what commands should d'oh!](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=253.96) [And our mediator handles that aggregate or that calm pounding of command.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=258.96) [So I really like to use these two together.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=264.13) [In fact, I went out of my way to make this example.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=266.28) [Include the concrete command patter that command pattern in here](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=268.77) [with this concrete command so that you could see how these two are](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=271.9) [used in concert or in conjunction with one another rather than](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=275.51) [standing alone by themselves.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=280.09) [So you don't use one or the other.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=281.74) [I like to use them together.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=283.43) [Let's go ahead and create this method now so I can cover here and say,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=285.06) [Create method,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=289.57) [Turn off all lights inside of here and we're gonna do something](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=290.26) [very similar to what we did up above here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=293.4) [We're gonna do it for each and we'll liberate over and Ray were terrible.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=296.34) [And we're gonna get an instance of light light,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=302.84) [and it's all of our lights and we'll say,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=307.84) [If the light is on, then let's Tuggle it might dot toggle So we'll save this now.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=312.13) [This is all I had to do to go through an implement another](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=325.67) [command that was a mackerel command.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=329.35) [And you could do all sorts of things here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=331.61) [If you want to extend this and I purposely try to trim this example down,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=333.65) [I was going to do the same thing with fans,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=338.2) [so we'd go through and create a fan object and turn all the fans on or](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=340.32) [off all the fans off for a toggle individual rooms.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=344.76) [You could tie it to an alarm clock that it's 6 a.m. It](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=348.34) [turns on the bedroom light and the fan,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=351.55) [but it doesn't turn on any of the other ones in the house.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=353.73) [So you can start doing these very cool compound commands through](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=355.65) [this mediator object that controls that object.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=360.28) [But the objects don't know about them.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=363.73) [Their own state.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=365.25) [Let's go back to our demo now and see how this runs a right click and say,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=367.09) [Run as job application and you'll see that I switched both](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=373.34) [lights on and then I switch both lights off.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=377.42) [So much better example,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=379.58) [in my opinion of these compound commands and not having to pass around](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=381.02) [this collection of lights or register all the lights associate ID with](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=387.37) [that object we just passed the mediator around.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=392.29) [If we look at this main method versus the command pattern demo that we had,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=394.91) [this client code, in my opinion,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=399.01) [is much simpler and easier to understand If we go](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=401.59) [ahead and look at the command demo.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=404.88) [You see, we had a bunch of different things going on here.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=407.54) [We had a list that we were creating,](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=410.12) [adding all those objects to the list where we just register it with the](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=411.65) [mediator and pass an instance of that mediator around. Much simpler, in my opinion, and you get the benefit of both patterns out of it.](https://app.pluralsight.com/course-player?clipId=14ea2000-46af-4ca7-a991-fca5a0f02563&startTime=415.45)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483)

[[Autogenerated] Now that we've created our own instance of a mediator,](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=0.84) [what are some of the pitfalls of it?](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=3.37) [Well, you have to be careful not to create a deity object.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=5.74) [You can easily build a mediator that is everything](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=10.04) [to everybody and becomes unruly.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=13.25) [This usually isn't a problem, but you can see how,](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=15.64) [by adding different scenarios, it can become large rather quickly.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=18.32) [The mediator structure can limit subclass ing,](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=23.18) [too, although, as we discussed in the design section,](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=25.65) [you convey eloped mediators to extend and provide](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=28.59) [various mediators for various situations.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=31.14) [But those are usually used for platform differences.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=34.34) [They can also be a little confusing whether or not you should](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=38.38) [use this instead of the command pattern.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=41.02) [This is why I went out of my way in the demo to show the](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=43.58) [command pattern in conjunction with the mediator,](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=46.92) [as they feel, is a really good use of this pattern.](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=50.01) [Let's compare this with some other patterns, though, to solidify some of these concepts](https://app.pluralsight.com/course-player?clipId=f6c5b7e7-3bbf-4edc-baba-78f9b4616483&startTime=53.38)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450)

[[Autogenerated] to contrast the mediator pattern.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=1.44) [Let's compare it with the Observer.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=3.56) [The mediator defines how objects interact with one another,](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=6.24) [and its intent is to decouple objects by eliminating references to each](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=9.55) [other and instead just have a reference to the mediator.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=14.1) [It is also more specific,](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=17.64) [and I'll explain what I mean by specific here in a second](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=19.72) [when I compare it with the Observer.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=22.55) [The Observer, on the other hand, is a one too many broadcast.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=25.04) [Instead of defining interaction like the mediator it broadcast to all listeners,](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=29.28) [they choose whether or not they want to do something with it.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=34.92) [It also focuses on object to couple ing just in a different way.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=38.64) [By using that broadcast using this approach,](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=42.12) [it makes things more generic, adding,](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=45.46) [this feature requires just becoming another listener rather than modifying the actual mediator.](https://app.pluralsight.com/course-player?clipId=52c51998-b3a9-45df-a6b6-f1a67f043450&startTime=47.76)

### [Summary](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085)

[[Autogenerated] to recap what we've learned about the mediator.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=0.84) [It helps us achieve loose coupling between objects,](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=3.46) [and it does this by simplifying the communication between those complex objects.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=7.17) [You do have to be careful of mediator complexity.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=12.94) [You can see how, if we add too much to it at once,](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=16.71) [that it could become this unruly object for us to maintain,](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=19.98) [and I like to use it with the command pattern rather](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=24.04) [than in lieu of the command pattern.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=27.22) [But they do stand on their own two feet,](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=29.15) [and you don't have to use them together.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=31.15) [The next pattern we will look at is the memento pattern,](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=33.77) [which is a great pattern for providing rollback functionality in your application.](https://app.pluralsight.com/course-player?clipId=a70dfa99-5d23-41ed-bc27-f0a33c0e1085&startTime=36.55)

## [Memento Pattern](https://app.pluralsight.com/course-player?clipId=3d131d61-b26c-4d03-87e3-8c00b437eab7)

### [Introduction](https://app.pluralsight.com/course-player?clipId=3d131d61-b26c-4d03-87e3-8c00b437eab7)

[[Autogenerated] Hi, This is Brian Hansen.](https://app.pluralsight.com/course-player?clipId=3d131d61-b26c-4d03-87e3-8c00b437eab7&startTime=0.94) [And in this module, we're going to look at the memento design pattern.](https://app.pluralsight.com/course-player?clipId=3d131d61-b26c-4d03-87e3-8c00b437eab7&startTime=2.8) [The memento pattern is used to externalize an object state, usually to provide rollback functionality.](https://app.pluralsight.com/course-player?clipId=3d131d61-b26c-4d03-87e3-8c00b437eab7&startTime=6.74)

### [Concepts](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6)

[[Autogenerated] the concept surrounding why you would choose the momentum](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=0.89) [pattern or that you need to restore an object to a previous state.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=3.3) [We achieved this by Externalizing and objects internal state so](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=7.74) [that that object could be returned to it later.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=11.78) [We do need to be careful to not violate encapsulation](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=14.74) [while implementing this pattern.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=17.83) [Typically, we would use this pattern to implement,](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=20.14) [undo or roll back functionality inside of an application.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=23.12) [Another benefit of the memento is that it shields complex](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=27.94) [eternal internals from other objects.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=31.28) [Examples of this in the job a p i.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=34.77) [R Javi you till date.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=37.01) [The date object is internally represented by a long value,](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=39.49) [so we can easily return the date object to its previous](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=42.88) [state by setting it back to that long value.](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=45.88) [A better example, though,](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=49.44) [is probably java dot io dot serialize Herbal serialize herbal allows you to](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=50.61) [implement any object to have its state recreate herbal. Let's look at this design associated with this pattern](https://app.pluralsight.com/course-player?clipId=d21b240e-f60f-429e-9ea4-0aca4c6cd8e6&startTime=56.08)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097)

[[Autogenerated] the design of the memento is class based.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=1.49) [There are three roles in this pattern.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=5.04) [The originator,](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=7.07) [which is the object that we were wanting to create a copy or save](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=8.25) [point of the originator creates an actual memento.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=11.67) [The next role is that of the caretaker.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=16.64) [The caretaker is what manages the copies or Mementos that we have created.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=19.29) [Think of it is the list of undoes available in your menu and then,](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=24.24) [finally, the memento itself.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=28.76) [The momentum represents the copy of the originator that we want to store.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=30.94) [The memento consists of what's often termed as a magic cookie.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=35.9) [The magic cookie is the combination of fields that it takes to](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=40.38) [recreate or copy the state of the object,](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=43.38) [and it is stored inside the memento.](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=45.83) [It isn't an actual object,](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=48.44) [but you will often see people refer to it when discussing the memento,](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=50.83) [the pieces of the UML diagram or what we already](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=55.27) [discussed the originator caretaker, a memento. Let's go ahead and look at that UML diagram now](https://app.pluralsight.com/course-player?clipId=55935312-95bd-4d3b-98c9-94127ce93097&startTime=57.75)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857)

[[Autogenerated] This is the UML diagram for the mental pattern.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=1.51) [The originator is the object that we want to create a copy of](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=5.34) [or have the ability to return to its state.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=9.19) [It has state and then the ability to set the memento](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=12.54) [and create a memento of itself.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=15.93) [The state captured from the originator is contained in the memento object.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=19.54) [The mental has stayed as well and methods to access that state.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=24.84) [The copies of those Mementos that we make our then stored in the caretaker.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=30.04) [The caretaker knows why and when the originator needs to](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=35.24) [be saved and how to restore itself.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=37.97) [These three pieces make up the memento pattern. Let's look at an example of this code in action.](https://app.pluralsight.com/course-player?clipId=4a980d5b-fa38-42c4-8091-ef5f25ecf857&startTime=41.24)

### [Example: Serializable](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097)

[[Autogenerated] the built in serialize herbal interface in Java is](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097&startTime=1.28) [a great implementation of the momentum pattern.](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097&startTime=4.13) [We can create an object as we have done here,](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097&startTime=7.34) [and then implement a serialized method that will](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097&startTime=10.15) [write it out to the file system. Let's look at this in a live example now.](https://app.pluralsight.com/course-player?clipId=0dddca1a-f306-4f1a-b9c1-7729fee08097&startTime=13.14)

### [Demo: Serializable](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555)

[[Autogenerated] Here's the code for the live demo that we were just](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=1.84) [discussing about using the serialize herbal interface.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=4.89) [And you can see here I've got a main method that goes ahead and](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=8.52) [creates an instance of an employee object.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=11.91) [And we'll look at that object here in a second.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=13.97) [We said the name, address phone number,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=16.08) [and then we were serialized that object out the employees object.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=18.43) [All it has to do is create an interface and implementation](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=23.83) [of the interface of serialize herbal.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=29.63) [That's it.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=31.44) [There's nothing else in here that needs to be done](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=32.19) [to implement serialize Herbal.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=34.89) [Now you will notice that I have set the suppress warnings for serial](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=36.7) [up here just to be full disclosure that is set so that we can](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=40.84) [implement future versions of serialize herbal.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=46.75) [I just put suppress warnings on here because we don't need it for our example,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=49.53) [you can read more up on what it does in adding a default cereal.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=54) [You I d.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=57.6) [Inside your code.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=58.33) [So inside of her object,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=60.22) [we have this serialize herbal interface and now I can call any method that's](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=61.74) [looking for a serial Izabal object and inside of our code.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=68.08) [I've gone ahead and created this serialized method that](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=71.52) [gets an instance of a file output stream and then passes](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=74.89) [that to an object output stream.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=78.45) [Just typical file Io and Java and then writes that](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=79.86) [object out to the file system.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=83.66) [And it's gonna ride it out to our temp employees dot S E R file and](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=85.38) [then closes all those up and it's available for de serialization you](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=91.13) [see down below in our code that I then d c realize that object and](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=95.82) [get a new reference to it and that it will return an instance of](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=99.23) [that object for me.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=102.38) [So let's go ahead and run this code and see what it does.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=104.14) [Now it's gonna go ahead and get me back that instance of Brian Hansen,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=106.62) [So I will go ahead and run it.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=114.94) [It's serialize is this object out just by writing it out,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=117.82) [and then it will go ahead and call D serialized,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=121.12) [which will read that object in off of the file system.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=123.97) [Pretty plain simple example.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=127.59) [But you can see how I can then create instances that I can](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=129.71) [pass around and have these safe points.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=133.49) [Now, one thing that this example is lacking is the caretaker,](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=135.41) [so we have our employees object, which is our originator.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=139.7) [The memento is really the serialized object that's](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=143.74) [implement using serialize a ble, but we don't have a caretaker.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=147.93) [Let's go ahead and create our own example that will then use the](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=151.72) [caretaker and all the pieces of the memento pattern, the originator of the memento and the caretaker and see how that's implemented.](https://app.pluralsight.com/course-player?clipId=d9aa016b-bea6-4a36-aa32-377d84274555&startTime=155.91)

### [Exercise - Memento](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c)

[[Autogenerated] so to create our own memento pattern,](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=0.44) [we're going to go ahead and implement all the pieces wth e originator,](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=3.18) [Thekla air taker and the memento object itself.](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=8.39) [And we're gonna do that to just create a full fledged memento pattern instance.](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=11.8) [Let's look at all those pieces now,](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=17.32) [and we're going to change our employees object that we had that was](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=19.24) [implementing Serialize Herbal to create our own memento just to see that internal workings of what we need to do there.](https://app.pluralsight.com/course-player?clipId=2198e3d6-33d4-4701-85c0-cee727aa6b8c&startTime=22.86)

### [Demo: Memento](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54)

[[Autogenerated] So to start with, let's open up.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=1.74) [Our employees object from thesis realizable demo,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=3.21) [and I'm gonna get rid of the serialize herbal interface and just clean that up.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=7.43) [So now we are a basic object, just a po Jo.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=15.01) [There's nothing special inside of here that is our originator.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=18.95) [It's the object that we want to create a copy of her an instance off now,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=23.26) [to do so, we need to create our memento object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=27.94) [Go ahead and right click and say new class,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=32.19) [and we're gonna call this the employees momento.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=37.24) [Now, these air pretty simple objects.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=43.4) [I could have pre created them,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=44.98) [but I want you to get the full demo of walking through](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=46.34) [all the pieces of what we need to do.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=49.15) [So this is our actual memento, as the name may suggest,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=50.47) [and we're gonna put two fields in hair were to say that](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=55.74) [to create an instance of an employee.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=57.92) [We care about their name and we care about their phone number.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=60.51) [We don't care about their address.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=64.08) [This is one of the reasons I like creating our own memento rather than just](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=66.79) [using the serialize herbal instances because we have control over the](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=69.64) [fields that we want to put in sight of this code.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=73.25) [So let's just create a constructor here,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=77.19) [save public employees Memento, and we're gonna pass in string,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=79.21) [name and string phone number.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=87.33) [Name equals name, and this dot phone equals phone.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=94.74) [Now,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=104.13) [the only thing we care about on a mental object is whether we can get the state.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=104.57) [We set the state through the constructor, so that guarantees our contract.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=109.4) [So we're gonna provide getters for the name and phone number.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=113.2) [So the source generate getters and centers.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=116.78) [Let's select get name and get phone number and click.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=119.93) [OK, go ahead and sort our code, and we are now get This is our momentum objects.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=127.17) [Everything looks pretty good inside of here.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=140.83) [We've got a basic object that's going to allow us to get that has state](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=143.53) [is going to allow us to set it through the constructor and get it when](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=148.09) [we want to return to this object state.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=151.63) [Now, inside of our employees object, we want to provide two methods.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=154.34) [I'm gonna scroll the bottom here,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=158.04) [and I'm gonna say public employees memento and we're going to say save,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=160.64) [and this is going to return a new instance of employees](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=173.84) [Memento with name and phone number.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=177.28) [So we have the safe portion done.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=181.04) [And now we're gonna provide the revert or undo people](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=183.02) [oftentimes put really long names in sight of here.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=187.25) [I like to just use wth e the Revert name.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=190.44) [It's kind of synonymous with what we do inside of some of](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=195.01) [the source code control tools that we use,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=198.46) [like subversion or get or things like that.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=200.86) [There's a revert inside of there were going to say Revert,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=202.82) [and this is going to take an instance of the employee.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=207.74) [And I got this method already done at the employee Memento,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=211.45) [and we're just going to take and past that in and revert the state.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=216.34) [So you see what this does Employee Memento passage,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=222.29) [and we're gonna set the state of this object to this dot name](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=224.89) [equal to employees memento dot Get name and this dot for phone](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=227.46) [equal to employees memento dot Get phone.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=231.12) [Now we have one more piece that we need to implement here,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=233.91) [and then we can run our demo and I've got a pre code a demo set up.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=236.53) [We need to create our instance of our caretaker I'm gonna go](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=240.44) [ahead and right click and say New class,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=245.08) [and we have the caretaker object that we're going to create.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=251.34) [Now there's a bunch of different ways to create this caretaker object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=256.19) [One of the ways is to implement an array list, and I like a ray list.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=260.94) [They're great for a lot of things, but they don't.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=266.6) [It's not really the implementation of this pattern.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=270.98) [Usually we build these with a stack, so to speak, that we pop each one ofus.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=273.94) [We revert through the history.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=279.24) [I am going to go ahead and implement this caretaker with](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=281.05) [a stack so we'll say Private stack.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=283.88) [And it's a stack of the employees memento objects](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=287.13) [and that employee mental object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=294.8) [We'll just be our employees.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=297.84) [History equals new stack, and that will go ahead and create that for us.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=300.54) [Now we need to implement to methods inside of here when you do a public void](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=310.8) [save very similar to what we did with in our employees object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=315.24) [We're gonna pass in an instance of employees in and say employees,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=320.65) [and we'll just push this onto our stacks will simply history dot push](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=327.64) [and will stew in plead save now this is going to call the same method](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=334.68) [which is going to return an instance of the employees Memento and push](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=340.35) [it onto our employees history.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=344.17) [And then we'll go through and do the revert will say Public void revert.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=347.72) [And this is going to also take the employees object in now.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=354.04) [One thing I'll,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=357.19) [I'll point out here is that this is going to do this](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=357.98) [object by reference association.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=363.24) [So I'm gonna pass this employee object in and keep a hold of the](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=365.26) [reference and change the values in sight of it.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=369.05) [And you'll see what I'm saying here in just a second.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=371.57) [So say employees don't revert and we're going to do employees](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=373.65) [history dot pop now the This is why I like the stack is it's](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=377.53) [going to just grab the previous state off of that stack and push](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=386) [that on top of our object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=391.9) [So reassign those values for us Now.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=393.02) [We've got our caretaker built.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=395.95) [We have our employees, object are originator.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=397.25) [Are memento created and our caretaker.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=400) [Let's go ahead.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=403.29) [Look at the demo.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=403.78) [Now I've pre coded a demo for us here and inside of here.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=404.6) [You can see we create an instance of the caretaker](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=409.32) [object and an instance of the employees.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=411.52) [And then we go through and sets and values on the employees.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=414.39) [I said a fake name set name said Address, phone number.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=416.88) [And then we call save.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=420.71) [Then we change the phone number and call Save again.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=423.03) [Then we set the phone number and we don't call Save.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=426.64) [This is a key point.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=429.7) [I've got the comment.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=430.64) [They're showing that we don't call, save and call Revert,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=431.47) [and it will just set those values back to where we were at.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=435.53) [And then I'll call Revert again, and I'll take us back to the original.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=440.14) [Let's run this and see that it works.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=443.05) [I'm gonna right click and say,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=446.87) [Run as Java application and you'll see that our employees,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=448.18) [before save our employees before save was that value.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=452.69) [Our employees after changed phone number save was](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=459.44) [that value and then we changed it.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=462.52) [But we didn't call save and just reverted back to it](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=464.35) [and then reverted to the original.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=466.89) [So you see that we have our full history implemented and the](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=469.44) [emphasis that it puts on those values.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=472.54) [Do you see that we have our our object that We changed here but didn't call.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=475.11) [Save on it and we went ahead and reverted back.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=480.4) [Sometimes people get a little hung up on that.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=483.61) [I haven't called the save, and that hasn't popped anything back on that stack.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=486.12) [You see that we have a full history of our object available,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=489.01) [and all we had to d'oh was change.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=492.29) [Our employees object.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=494.35) [Add that save method and that river method and then our memento itself.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=495.38) [That just creates that state.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=501.74) [Now you can change this to have whatever pieces you](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=503.69) [care about for reverting notice.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=506.81) [We left out the address.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=508.88) [We purposely did that.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=510.92) [If we were using the serialize herbal interface,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=512.62) [we could mark something as transient.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=514.57) [But we just went ahead and said, We don't care about that for a moment,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=516.47) [our memento and left it out and then inside of our caretaker,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=519.13) [we have our history here that's implemented with Stack.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=523.6) [You can choose another implementation of the array list or](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=527.36) [linked list or whatever other tools you want to.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=530.99) [But the stack really.](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=533.21) [Wilke works well for this demo and then finally,](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=534.08) [our final result of implementing with the caretaker and the caretaker tracks are history and rules that out for us](https://app.pluralsight.com/course-player?clipId=086b04e2-9dae-495a-a679-47295c9baa54&startTime=537.04)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a)

[[Autogenerated] now that we've created our own memento,](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=0.94) [let's look at some of the pitfalls of using this pattern.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=3.77) [It can be expensive.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=7.04) [If the memento is a large copy of the originators data,](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=8.83) [we might incur a lot of overhead with each copy that we store.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=13.56) [The caretaker, although maybe simple and lightweight,](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=18.54) [needs to consider deleting that history or how much of](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=22.16) [the history it should keep around.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=25.21) [You also need to be careful not to expose originator information.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=27.54) [State needs to be transitioned to the memento, but not outside of their.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=31.78) [In our example, we had methods for the access er's,](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=36.48) [but we didn't convey what our state was. Two other objects, just the memento.](https://app.pluralsight.com/course-player?clipId=b216ef5f-6a8f-42f8-87d2-5176f513f08a&startTime=40.32)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7)

[[Autogenerated] to contrast the memento pattern.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=1.24) [Let's compare it with the command pattern.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=3.5) [The memento is used to capture ST.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=6.44) [Each state that we capture is independent so that we can](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=10.2) [roll back or recreate it in the future.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=13.46) [Memento is also focused on building a history with the caretaker object.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=16.94) [The command, on the other hand, is very similar,](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=22.04) [almost identical in fact, to the memento pattern.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=25.05) [But it is focused on requests rather than the state of an](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=28.64) [object instead of independent state.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=32.29) [It's focused on independent requests.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=35.1) [The main difference with command is that a lot of people](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=38.34) [implement the command without thinking of history.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=40.59) [It is available, but typically not the focus of the request of this object.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=43.49) [History is just a side benefit benefit.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=48.64) [Typically,](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=51.01) [when using the command all the pieces of their though the option is available, most people don't utilize it.](https://app.pluralsight.com/course-player?clipId=aba01207-a921-47b2-91d8-82ff643dfab7&startTime=51.44)

### [Summary](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce)

[[Autogenerated] Let's recap what we've learned with](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=0.82) [the memento it's used to capture ST.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=2.4) [We have to be careful because it can get heavy with history.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=6.94) [If we have a lot of Mementos that we've stored,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=10.18) [or it's a large amount of data that we're copying for that state,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=12.44) [they can get quite large.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=16.37) [We use it to recreate state of an object.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=18.24) [So once we've captured it, we can then return an object to that state.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=21.16) [And it is very similar, if not almost identical,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=25.14) [to the command,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=28.33) [but with a different emphasis on history and state rather than requests.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=29.35) [The next pattern that we're going to look at is the observer pattern,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=35.54) [which is one of my favorites,](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=38.65) [and one of the very first patterns that I learned when trying to figure out the power of design patterns.](https://app.pluralsight.com/course-player?clipId=0a492c9c-8f89-4294-a6c9-6a7844fe23ce&startTime=40.24)

## [Observer Pattern](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0)

### [Introduction](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0)

[[Autogenerated] Hi, this is Brian Hansen,](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0&startTime=1.14) [and in this module, we're going to look at the observer design pattern.](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0&startTime=2.81) [The observer pattern is a decoupling pattern.](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0&startTime=6.52) [When we have a subject that needs to be observed by one or more observers. Let's look at the considerations when choosing this pattern.](https://app.pluralsight.com/course-player?clipId=e5383a97-9eab-4d84-aef9-2c365bf39da0&startTime=9.27)

### [Concepts](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7)

[[Autogenerated] the concept surrounding why you would choose the](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=1.4) [observer pattern are that when you have a situation where a](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=3.37) [subject has one too many observers,](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=7) [this is generally when we're trying to decouple objects.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=10.51) [Usually we will use this pattern but are not limited to](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=14.12) [situations where we need event handling capabilities.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=17.01) [Some people use the term publisher subscriber](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=21.59) [interchangeably with the observer pattern.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=24.79) [But there is some debate here.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=27.34) [The observers typically used in a synchronous fashion where the](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=28.79) [pub sub model is typically used a synchronously.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=32.43) [This pattern is most often used in NBC situations,](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=36.27) [where the view is event driven.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=40.8) [Examples of this in the job, a p i.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=44.3) [R.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=46.48) [The observer pattern just like the generator pattern](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=47.48) [that we covered earlier in the course,](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=50.67) [the creators of Java felt like the observer pattern was useful enough in an](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=52.75) [abstract way that they baked this functionality into the core.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=56.62) [A p I.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=59.86) [The job you till event listener is the base interface for virtually every event,](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=61.24) [an event listener and ate a beauty and swing.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=67.03) [This same pattern is also used in J.](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=70.8) [M s when implementing topics for message driven applications. Let's look at the design of this pattern](https://app.pluralsight.com/course-player?clipId=7031d965-95a3-42ef-9995-64f6cacc42b7&startTime=72.87)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531)

[[Autogenerated] the design of the Observer is that of a](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=1.5) [subject that needs to be observed.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=3.79) [The subject is typically an interface or abstract class](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=5.87) [that we make concrete implementations off.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=10.49) [The subject is a class that observers will then register themselves with.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=13.54) [The Observer Self is interface based with various concrete implementations](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=18.7) [and in the case of the Java Util observer implementation,](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=23.94) [the subject implements an observable interface.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=27.89) [Concrete observers are typically views in an event driven application.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=32.44) [The pieces of the UML diagram are a subject,](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=38.59) [a concrete subject observer and concrete observer. Let's look that UML diagram now.](https://app.pluralsight.com/course-player?clipId=ec3a1253-8745-4a38-a3e2-60c3be5f7531&startTime=41.85)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e)

[[Autogenerated] This is the UML diagram for the observer pattern.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=1.44) [The subject class can be an abstract class or a concrete implementation.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=5.14) [The attach and detach methods are to register observers for notifications.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=10.71) [The notify methods cycles through each registered observer,](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=16.08) [calling it's update method.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=19.64) [The concrete subject is an implementation of the](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=22.39) [subject if they have been separated out,](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=26.72) [although often times it's just one object itself.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=28.88) [It contains the state that the observers are wanting to be notified about.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=32.94) [The Observer interface contains one method.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=37.74) [The update method that gets called when something changes in the subject](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=40.68) [that issues and notify the observer interface also makes it so that we](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=44.74) [can decouple observers from the subject.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=49.58) [Since we handle everything uniformly and consistently through the interface,](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=51.91) [the concrete observers are simply implementations of the observer interface and](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=56.64) [are the objects that act upon the changes in the subject.](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=61.42) [These air typically views in your application. Let's look an example of the pattern using the job you till observer interface](https://app.pluralsight.com/course-player?clipId=5bccae2e-109c-4fe3-bd1c-21e86adb7a2e&startTime=64.74)

### [Example: Util](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8)

[[Autogenerated] the job you till observer interface.](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=1) [And Javi,](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=3.69) [you till observable abstract class provide much of the functionality that](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=4.46) [we want to use to implement our own observable pattern.](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=8.57) [In this code,](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=12.03) [we're going to simulate a Twitter news feed with messages and notifications](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=12.73) [that someone has tweeted something that we're following.](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=16.69) [Let's look at what it takes to wire up this code using the observer and observable in a live example now.](https://app.pluralsight.com/course-player?clipId=007d5c99-a4e0-4880-91a5-86fa913351e8&startTime=19.64)

### [Demo: Util](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337)

[[Autogenerated] So in this example,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=0.64) [we have a couple of basic pieces we have are](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=1.5) [observable or our subject and our observer.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=4.71) [And I've created two classes inside of here to simulate Those two are Twitter.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=8.37) [Stream is the object has some state that we want to](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=13.07) [observe or our subject and our observer,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=16.32) [which is basically our client or display that's gonna be updated from our](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=19.96) [from the changes of state on our observable subject,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=24.55) [you'll notice inside of the stream that there is a method called](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=27.69) [someone tweeted where we set changed and notify observers with the](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=31.27) [implementation of observable and observer,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=35.62) [you can see that we have to call set changed first because it](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=38.55) [signifies to the observer that we have changed our state so that](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=42.04) [notify observers actually gets fired.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=45.92) [They notify observers,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=48.74) [met that goes true and calls the update method and just basically](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=49.83) [prints out this system out print line to our screen,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=55.39) [saying that we have updated so on so stream that they had tweeted something.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=57.98) [So we can you get the idea that of the messenger of in nature of](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=63.23) [this application and set this up that we went through and just](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=66.15) [created an instance of our concrete subject,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=69.73) [our Twitter stream we created to clients and then we added them is as](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=73.36) [observers and then fired off a tweeted message.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=78.51) [I'm gonna run this,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=82.94) [but I'm gonna point out a couple of shortcomings inside this example.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=83.76) [That's not a problem of their examples, actually,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=87.41) [a problem with the way that Java uses the job,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=89.42) [you till observer rule and observer interface.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=91.88) [And after class, let's run this.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=94.66) [I will see that it did in fact,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=99.12) [fire off that message that Mark Stream was updated and Brian Stream was updated.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=101.37) [You see down here that we didn't have a direct call that it notified it](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=107.33) [through the notify observers method that we call up here.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=112.02) [So it's loose.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=116.68) [Couple.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=117.36) [We've achieved that decoupling.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=117.7) [All we had to do was create these two clients,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=119.25) [registered them, is observers and then perform something on that subject.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=122.33) [Well, if you remember Ruml, there's a couple of problems here.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=127.28) [Are observers really know nothing of the concrete](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=131.64) [subject that we're trying to observe?](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=136.57) [And so there's they're a little too disconnected in that sense.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=139.38) [We can't actually grab an instance to that object at](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=142.14) [that time to see what's changed,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=144.81) [and there's a little bit of code or or wiring up that has to take place here.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=147.46) [In the main method you see,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=152.86) [that seems like it's a little bit of overkill for what this pattern is.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=154.63) [We're gonna go through and rewrite this code in our own observer observable,](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=158.34) [and you'll see how we eliminate a lot of the shortcomings from just using these built in interfaces.](https://app.pluralsight.com/course-player?clipId=b056c41f-6a00-4c43-9564-e4580126f337&startTime=163.73)

### [Exercise - Observer](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06)

[[Autogenerated] two better suit the observer](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=1.2) [pattern for what we're trying to do.](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=3.79) [We're gonna go ahead and create our own implementations and](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=5.39) [show some of the shortcomings of the Java Util observer an](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=9.14) [observable implementation.](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=12.32) [To do this example,](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=14.77) [we're gonna create our own subject concrete subject](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=15.77) [observer and concrete observer.](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=19.41) [And then we'll compare this pattern with the Java Util examples to see](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=21.71) [the shortcomings of what they've done and how ours is better suited to what we're trying to do within this pattern.](https://app.pluralsight.com/course-player?clipId=25389334-ecb2-4b78-823e-5ea09a2d2d06&startTime=27.42)

### [Demo: Observer](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298)

[[Autogenerated] to shorten this demo,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=1.71) [I've gone ahead and created a couple of interfaces and abstract classes](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=2.94) [based off the UML diagram that we looked at previously.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=8.14) [You can see here and the observer demo class that I've created](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=12.1) [thes message stream hasn't been created yet.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=16.44) [It's a concrete implementation of the subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=19.41) [The subject is a very basic implementation,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=22.42) [but complete implementation of the observable or subject class](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=25.62) [you can see here we have a list of observers.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=30.53) [We have a set state a get state that are both abstract because they're gonna](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=34.21) [be implemented by the concrete implementation and then attach observer](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=38.59) [detached observer and a notify observers method.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=42.64) [Now, if we go back to our observer demo,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=47.01) [the next thing you can see that we create our various clients,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=49.03) [a phone client and I've got commented out a tablet client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=51.82) [The phone client is a conclave concrete implementation of an observer.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=55.24) [The observer implementation or interface is quite light.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=60.44) [It's just a nabs tracked class and could honestly be a interface itself.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=65.51) [But we do have a reference to the subject inside of here.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=71.37) [Now,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=74.35) [this is where it differs from the Java Util observer and observable](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=74.51) [implementations from the job You till eight p I.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=80.24) [We have a reference to the subject in sight of our](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=83.5) [observer that we can get state from.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=87.08) [We go look at our phone client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=90.31) [You can see that in our constructor we pass in the subject that we're](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=92.49) [dealing with and we actually do the attachment there.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=96.96) [This is where it was a little bit weird with our job,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=100.82) [You till observable example.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=103.53) [We were doing all this set up ourselves in the client where the actual](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=105.46) [clients or view modules are now taking care of this themselves.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=110.64) [We also have access to get state from this object as you'll notice we](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=115.86) [do it down here in the update method down below.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=119.42) [Let's go ahead and create our message stream so that we can](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=122.63) [finish out this example of our concrete subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=127.94) [So here's our basic subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=131.4) [We're going to go ahead and create a concrete Strub subject of this class.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=133.74) [So let's go ahead and right click on our observer and say,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=139.44) [knew class and we'll call this the message stream and](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=143.08) [it is going to extend subject quick, finish inside of here.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=151.43) [We have a couple of methods that we have to implement as part of our](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=159.22) [contract with it being an abstract class from subject subjects,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=164.94) [abstract requires us to implement set state and get](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=170.15) [Steve ST go back to our message stream.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=173.31) [Now, this is where the realism of this example comes into play.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=176.64) [We want to provide what a riel case would be to use observable](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=182.86) [in sight of our code and this message stream.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=188.78) [We're gonna keep a message, history or other things.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=191.3) [So think about if you go into Twitter vital.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=193.94) [I get it on my phone and I look at it on my laptop](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=196) [or my iPad or tablet or whatever, They aren't necessarily the same history.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=198.47) [I'm not looking at the same point in history,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=204.74) [but that history is stored for my entire stream.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=206.58) [So we want to do that same things.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=210.36) [We're gonna create a little implementation.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=211.65) [We're going to see private deck, and we're gonna do this of string,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=213.97) [and we're gonna say message history equals new double ended Q type string.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=220.84) [I actually wanted a rake.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=236.04) [You Honore \_\_\_\_, You perfect.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=237.32) [That's what we want our example Look like now this is going](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=244.79) [to be used to store our message history.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=249.03) [So any time somebody post something to it,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=251.74) [obviously, in a more concrete example,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=253.83) [we would want to limit what that history could be.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=256.89) [We would do that in our set state methods and her get state methods](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=259.11) [where we could trim that history of Let's go ahead and get rid of this](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=263.46) [auto generated implementation here and we'll say Message history dot ad](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=266.4) [and will pass in the string message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=275.34) [Let's change this just for clarity's sake to message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=279.74) [So it's clear what we're adding in here,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=283.89) [and we'll do the same thing for our get state.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=287.54) [We're gonna say Return message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=292.3) [History got kid last.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=296.1) [So get our last message and save that Now we have the](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=300.83) [basic implementation of our observer.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=305.55) [Done.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=308.19) [Know how this works is we have our observer and are Concrete observer,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=309.1) [which is a phone client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=313.77) [Implements that or extends that abstract class would implement that interface.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=315.54) [If we didn't care about the subject being passed in where](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=319.5) [we go ahead and register ourselves as a observer of the](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=322.81) [subject that we've passed in,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=328.09) [then we have the opportunity to add messages that](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=330.34) [actually go ahead and change that subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=333.72) [State that we're watching and we update from our notify](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=335.92) [observers that gets called in our message Street.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=341.09) [Now our message dreams are concrete implementation of our](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=345.04) [subject where we can add in our message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=348.35) [We need to do one more thing to notify the rest of the](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=351.46) [listeners on this After we have said our state.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=354.66) [When you say this dot notify observers and click save now be careful there.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=357.97) [You'll notice there's two other methods in there that are part of the job.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=364.87) [You till object.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=370.3) [There's notify and notify all these air First the Reds.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=372.74) [That's why we had to color method notify observers.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=375.62) [So don't get confused there and put the wrong](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=378.35) [implementation in ever notify observers here?](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=380.08) [We're actually ready to run our demo.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=383.05) [Now we come in here and say, Run at US Java application.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=384.55) [It will now print out our message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=392.14) [Here is a new message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=394.24) [It was sent from her phone and you can tell how he did that.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=395.55) [And he said, phone client ad message.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=398.31) [We never called that update method ad message inside of our phone client](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=400.66) [ad message sets the state the set state in our subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=406.6) [Our message stream then adds that to our message history](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=411.2) [and calls this Stott notify observers.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=414.89) [This in turn goes up through our subject and cycles through all](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=418.39) [of our observers and calls notify on them notice that we don't](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=422.28) [directly call the update method.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=426.36) [Anyone?](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=429.62) [Our code,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=430.07) [our observer demo are our original client never calls the update mint that](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=430.59) [it's called through our observer and our subject contract.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=434.77) [Now what happens if we want to add another observer?](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=439.84) [So we did all of this work Seems like a lot to just have a call out.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=442.1) [A basic method.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=446.73) [Well, this is where the power comes in.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=448) [We want to go ahead and add another client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=450.04) [So let's create a tablet client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=451.58) [We're gonna create this one together.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=453.69) [I'm gonna go ahead, right, click and say,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=455.61) [New class tablet client, and we're going to say that it is.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=456.98) [We'll just finish.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=465.84) [This extends observer,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=466.68) [and there's a handful of things that it's gonna want us to do.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=472.94) [It's gonna have us add these unimplemented methods.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=475.36) [The update I've actually got the implementation done.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=478.3) [I'm gonna copy and paste it in just so you don't need to watch me type,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=480.98) [we'll grab these methods here and paste it in.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=485.94) [So now we have a basic constructor that takes the subject in.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=492.08) [We register ourselves as an observer on that subject,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=497.16) [and then we have the option to add a message here and](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=501.04) [notice that just to differentiate the two,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=503.62) [I've put a slash sent from tablet in the Tablet client and](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=505.71) [a cent from phone in the phone client.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=512.65) [Now I am just dealing with strings here.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=516.54) [You could make a much more complex object and pass an](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=519.08) [object around in store objects, a string as an object,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=522.03) [and you could do something more complex,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=525.04) [just a short in the demo.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=526.93) [I made it a little smaller by saying that we were just going to use](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=528.24) [the strings here instead of the concrete object.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=532.67) [Now we have our tablet client, and as soon as it's done compiling,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=536.44) [we get rid of that red line.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=542.11) [We have our basic subject that we passed in.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=544.94) [We've registered ourselves and our update message](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=548.34) [that's different from our phone.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=551.95) [Let's go ahead and uncommon that tablet client line that just goes ahead](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=555.34) [and adds another message on there and run this again,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=559.72) [say,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=565.12) [run as Java application and you can see that we have a message sent from our](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=565.42) [phone that's updated the stream on our tablet and a message that sent from](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=573.64) [our tablet that updates the stream on her phone and her tablet so thes two](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=578.13) [objects know nothing of one another.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=583.12) [The only communication has handled through that subject.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=585.18) [Now, this feels a lot like the mediator,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=589.14) [and we're gonna talk about the differences between those two](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=591.95) [because they're very similar patterns in nature.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=594.57) [But before we move on, let's look at the job.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=599.74) [You two example that we had where we had to set up our client there,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=602.29) [notice we had to create an instance of our subject and then are](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=607.2) [two clients and then our actual client code.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=611.16) [Our main method had to know about registering them and](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=614.78) [communicating through the subject, which feels a little weird.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=618.38) [Why should we communicate with our subject directly?](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=624.04) [If I'm on my phone, I don't have to go to my desktop to update Twitter.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=626.15) [I can update it from my phone or I can update it from my](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=631.48) [tablet or I can update it from my desktop.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=634.04) [I shouldn't have to goto one place to update them,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=636.84) [which is where our examples a little bit better.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=639.87) [In fact, if I put those two side by side and show you our demo,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=641.94) [you can see that in the example that we did before](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=648.84) [using the job you till observer.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=653.79) [There's a lot more code in here that fills like it shouldn't belong here.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=656.64) [The registration and how we communicate with the](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=660.2) [subject is a little bit different.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=664.46) [We're doing Maurin ours, and there's fewer lines of code,](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=666.74) [and it just seemed a lot client cleaner from the client perspective from our actual main method.](https://app.pluralsight.com/course-player?clipId=b6608ade-e642-4c0b-ae6c-e8cc5a90f298&startTime=670.21)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8)

[[Autogenerated] What are some of the pitfalls of the observer?](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=1.64) [Well, since the subject doesn't know about its observers,](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=4.34) [there could be unexpected updates.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=7.81) [An object can notify that it has changed without knowing what has changed.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=10.28) [This leads to the next point, and that is of large update consequences.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=15.44) [If an object is really large and we traded an update that forces that change,](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=20.3) [there can be a performance hit, even though we may not necessarily want update.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=24.87) [I think of it in terms of something like files and](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=29.64) [notifying a change in a file for copying 100 make file](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=32.41) [every time something's been updated, we might not always want to do that.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=35.44) [Although not using this pattern isn't going to make that risk go away, either.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=40.24) [It's just something to consider when you're implementing it.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=45.35) [Overall, just not knowing what has changed With this disconnected system,](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=49.74) [it can be confusing as to what has changed in that subject](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=54.75) [that signified such event to be updated.](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=58.05) [This disconnected nature can makes debugging often difficult and a little bit troublesome to work through](https://app.pluralsight.com/course-player?clipId=32434f4b-bc8f-4463-8986-6b35c0c7eae8&startTime=61.59)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656)

[[Autogenerated] to contrast The Observer.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=0.89) [Let's compare it with the mediator.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=2.73) [The Observer is a one too many pattern.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=5.34) [We have one subject and many observers of its state.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=7.95) [It is primarily used to decouple an object from those that want to watch it.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=11.55) [One of the key difference is is that it's uses a pub sub](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=16.44) [array broadcast communication mechanism.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=20.07) [The mediator, though,](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=23.47) [is more of a 1 to 1 too many model and an object talks to a mediator,](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=24.54) [and then the mediator is in charge of communication with other objects.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=30.31) [It's also used for decoupling but usually used for handling](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=35.34) [complex communication in a more direct model than that of a](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=39.41) [published subscriber at pub sub model.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=43.46) [It should be noted, though,](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=46.43) [that the mediator can be implemented with an](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=47.8) [observer in the notification mechanism.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=50.64) [The mediator would simply be part of our subject and to take](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=53.74) [our Twitter example a little bit further.](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=57.78) [That's actually how we would probably implement something like that in](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=60.27) [Twitter is our client would communicate with a mediator, which then in turn would broadcast through an observer](https://app.pluralsight.com/course-player?clipId=5c1431b9-ae88-42b8-a103-c68175fa8656&startTime=63.47)

### [Summary](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be)

[[Autogenerated] Let's briefly recap what we've](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=0.88) [learned about the observer pattern.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=2.42) [It's one of the first patterns that I learned when](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=4.74) [first learning about patterns, and I really like it.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=7.81) [It really strikes home.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=10.3) [And I, like the publisher, describe broadcast model of the observer pattern.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=11.65) [It's often used for decoupled communication where we have](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=16.54) [these objects that we want a broadcast stuff,](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=21.1) [too, and they don't necessarily know about one another.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=23.35) [Our phone doesn't necessarily have to know that our](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=26.13) [tablet updated our Twitter feed.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=28.03) [It's got some built in functionality in the job.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=31.24) [A P I, the creators of Java,](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=34.25) [thought that this pattern was important enough that they built](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=36.75) [that into the job a P I and it typically could be used with and](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=40.1) [should be used with the mediator.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=45.74) [If your case warrants it,](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=47.15) [I wouldn't shy away from using those two patterns together.](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=49) [If you're in a very complex situation that might benefit from both models,](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=52.74) [the next pattern we're going to look at is tthe East eight pattern, which we use to encapsulate the state of our application inside of an object](https://app.pluralsight.com/course-player?clipId=f42af3b7-a7b2-47d2-9a82-5b4a73c0f9be&startTime=57.69)

## [State Pattern](https://app.pluralsight.com/course-player?clipId=043e82cd-6e4a-40b3-8efd-ef7752b80990)

### [Introduction](https://app.pluralsight.com/course-player?clipId=043e82cd-6e4a-40b3-8efd-ef7752b80990)

[[Autogenerated] Hi, This is Brian Hansen.](https://app.pluralsight.com/course-player?clipId=043e82cd-6e4a-40b3-8efd-ef7752b80990&startTime=1.64) [And in this module, we're going to look at this state design pattern.](https://app.pluralsight.com/course-player?clipId=043e82cd-6e4a-40b3-8efd-ef7752b80990&startTime=3.39) [The state pattern is as it sounds used when we need to represent state in an application.](https://app.pluralsight.com/course-player?clipId=043e82cd-6e4a-40b3-8efd-ef7752b80990&startTime=7.04)

### [Concepts](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2)

[[Autogenerated] the concept surrounding why you would choose the state pattern.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=1.64) [There.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=4.83) [You want to localize state specific behavior.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=5.05) [More specifically,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=8.54) [the state pattern makes it so that your current](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=9.54) [application's state is stored in an object rather than a mix](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=11.58) [of variables throughout your application.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=16) [The state pattern also helps us separate what state we're in](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=19.04) [from where we're at in our application.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=23.42) [It effectively makes your objects follow the open,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=26.19) [close principle of software design.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=29.32) [The class is closed for changes, but the states are open to extensions.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=32.64) [Examples of this in the job a P I.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=37.84) [R.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=40.55) [Actually,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=41.16) [none of all the patterns There really isn't a good](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=41.62) [example of the state pattern in the core,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=45.56) [a p I.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=47.72) [There is an instance of this pattern in JSF,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=49.14) [with its life cycles and phases,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=52.25) [and some people argue that the Liberator implementations](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=54.89) [are implementations of state pattern.](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=57.48) [But I don't feel that they really are The reason,](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=59.77) [they argue this is that because it can change objects](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=62.81) [behavior runtime based on its state. Let's look at some of the design considerations when choosing this pattern](https://app.pluralsight.com/course-player?clipId=89deed36-af04-4c68-971d-07d68f79e0a2&startTime=65.91)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d)

[[Autogenerated] the design of the state is abstract class or interface based.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=1.48) [More often than not, this pattern is implemented with an abstract class.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=6.59) [Because of the various states,](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=10.72) [an object can be in don't necessary apply to every instance of the](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=12.02) [state class and a rather just a default implementation.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=17.1) [Each state is then class base and represented by an](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=21.64) [individual concrete class per state.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=24.85) [The context or subject that has multiple states is unaware of various states](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=29) [using this pattern where before it knew all of those pieces.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=35.78) [If this sounds a little bit complex, look at it this way.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=40.86) [Before the state pattern.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=44.43) [One object had a very large, if then else diagram, innit?](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=46.17) [That went through all the different cases that we](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=52.45) [could have inside of our application.](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=54.78) [Whereas once we implement this pattern that's externalized into](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=56.84) [each condition being its own state class,](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=61.14) [the pieces of the UML diagram are a context,](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=66.34) [a state and then the individual concrete states. Let's look at that diagram now](https://app.pluralsight.com/course-player?clipId=615f2924-155c-4b71-af88-f9bf2730749d&startTime=70.45)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0)

[[Autogenerated] Here's the UML diagram for the state pattern.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=1.94) [The Context class has specific requests that air passed](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=5.64) [through our state interface or abstract classes.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=10.1) [I choose to call it our contract that we're guaranteeing to our](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=13.9) [context for each state that our application can be in.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=17.38) [There is a concrete states such as thes illustrated here.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=21.66) [Overall, it is a pretty simply UML diagram.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=27.24) [The complex T of this pattern comes into play when we were working](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=30.15) [at removing those if else blocks from our code.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=33.65) [This helps us reduce what is called cyclamen attic complexity.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=37.24) [Inside of our application, those many paths that we can go through each method, let's look at what this pattern fixes in a live example of our code now.](https://app.pluralsight.com/course-player?clipId=5b1fba07-55a8-4a24-b684-d2365c821fc0&startTime=41.12)

### [Example: if/else](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319)

[[Autogenerated] Since there really isn't a great example of the state pattern](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=1.81) [in the core Java a p I we're gonna go ahead and walk through how a lot of](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=5.18) [developers will mimic state in their application.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=10.36) [And that is through the use of managers.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=13.23) [You can see in this example we have two states in our](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=15.65) [application and on state and an off ST.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=18.24) [And this is all fine if this is the only two things that](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=21.84) [were going to represent in our application.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=25.74) [But in the case of this fan example that I'm gonna walk us through,](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=28.34) [we have a lot more state that we want to add to it.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=32) [So let's see how this transform and how that if else statement](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=35.24) [continues to grow and where how we can utilize the state pattern to](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=38.22) [minimize that are actually get rid of that cycle medic complexity out of our applications altogether.](https://app.pluralsight.com/course-player?clipId=452271e9-dd3a-47af-9b67-244042582319&startTime=42.17)

### [Demo: if/else](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1)

[[Autogenerated] Here's a basic implementation of an](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=1.54) [application that would track state.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=3.88) [I've got a simple class here that's gonna go through and simulate us,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=6.24) [pulling the chain on a fan to turn it off and then](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=10.97) [to the next speed and vice versa.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=15.08) [And as I run this demo,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=17.51) [you can see run as job application that it's going to](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=18.84) [just go through and say the fans off.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=22.62) [Now we're turning the fan on the low,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=25.4) [the fans on low and we're turning the FAM back off,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=27.22) [and now it's off.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=30.31) [So it shows you what the state is,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=31.06) [and it shows you what the action is that we're performing.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=32.64) [This code is really quite simple.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=35.29) [There's nothing that complex about it looking at it and you'll see we have an](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=39.07) [often a low and then for each time we interact with it.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=42.84) [When we pull the chain, we look at what the state is,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=48) [and when we have to print out what are two string as we](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=50.51) [have to do the same thing as well.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=54.01) [Now let's look what happens if we want to add another state,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=56.24) [so we want to go through an ad medium on hair souls Go ahead,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=59.49) [say medium and set that to an imager of two.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=64.34) [And now we're gonna come in and add another, if else block.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=69.04) [Now,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=73.81) [one of your first clues with any pattern that you're maybe](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=74.24) [doing something wrong is if your first instinct is to copy](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=77.3) [and paste to the next state.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=81.38) [Now notice.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=84.44) [I also have to come in here and say, Turn state,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=84.97) [we're not gonna go to turning it off.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=87.74) [Now we're turning fan onto medium,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=89.12) [and the next day is medium and mediums gonna go to](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=93.94) [off now and set that state off.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=99.41) [So we have our three states represented here.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=101.86) [Notice how it gets pretty complex, pretty quick about the pieces that were doing.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=104.64) [We're also gonna go down here to our two string and say if the](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=108.88) [state's off for the fans off its low turned low,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=112.39) [if it's medium,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=115.65) [we're going to print out that it's also to medium and his own medium.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=118.14) [Now let's run this and see what it does here.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=123.42) [Everything looks like it should run just fine.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=125.73) [And it does print out.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=131.54) [Fan is off and is now low.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=132.99) [Fan is medium and so forth.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=134.78) [Now you can see that as we go through here in ad states,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=137.23) [it gets more and more complex.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=140.74) [And look at the conditional statement that we have honestly,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=143.43) [with our fan example.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=146.53) [It's a pretty small example in the sense that we're](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=147.85) [probably only gonna have four states, maybe five.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=151.67) [If you throw lights in, there may be some more states,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=155.53) [but you see how this gets a little bit unwieldy and think of a little bit](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=158.29) [larger application of all the pieces that we have in there.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=162.43) [We want to keep this example small.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=165.55) [So that's why I chose this fan demo.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=167.3) [But notice how the copying,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=169.43) [pasting and how this class is just growing and growing.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=170.92) [When I asked this question at local user groups or things that I'm](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=174.14) [giving this presentation for this state pattern,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=178.29) [the response is always we've we've implemented a huge state machine before.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=180.97) [That really wasn't a state machine.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=186.49) [It was just this big.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=188.2) [If then else statement.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=189.58) [That's a couple of 100 lines long.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=190.63) [So this is what we're working on,](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=192.43) [reducing the cyclo Matic complexity of these conditional statements.](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=194.38) [Let's see how we're gonna transform that now into use, utilizing thes state pattern](https://app.pluralsight.com/course-player?clipId=afad2bec-4039-49a4-916c-8ce1e73e4fc1&startTime=198.44)

### [Exercise - State](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08)

[[Autogenerated] Now that we've seen what appears to be a fully working](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=1.24) [example of state being represented in an application,](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=3.85) [let's go ahead and make some modifications to it.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=7.94) [We're going to add a state abstract based class, and this could be an interface.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=10.44) [But we're going to add some default implementations to it and dust.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=15.65) [We use the abstract class instead.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=18.5) [Next,](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=21.14) [we'll create a concrete state object for each of the states that](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=21.48) [could be represented inside of our application.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=25.61) [And lastly,](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=28.24) [we're going to remove any conditional logic that was](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=28.79) [surrounding the old manager approach and show how the state objects contain and eliminate that now.](https://app.pluralsight.com/course-player?clipId=36c4ce34-4ba4-4465-853e-f30c8bec7b08&startTime=31.97)

### [Demo: State](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2)

[[Autogenerated] to get started with converting our fan to](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=2.24) [a implementation of the state pattern.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=6.27) [She wanna point out that our fan object is exactly where we left it off at.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=8.72) [We have our off low and medium states.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=14.4) [And what we're working to do is to get rid of these.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=18.84) [If l statements that Aaron are to string and our pull chain and](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=20.97) [all that different cycle Matic complexity that's contained](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=25.43) [within our application to start off,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=28.87) [I'm gonna go ahead and create a state object If you notice in my example,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=32.29) [I have to read X is down there.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=36.64) [I've copied a couple of my states in for just keeping this demo going faster.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=38.08) [You'll quickly see that they're just the same](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=43.18) [implementations for the high end medium state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=45.28) [So let's go ahead and create a new class and hair and we're gonna](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=48.04) [call this state and it is abstract and we'll click,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=52.18) [finish,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=57.75) [and then what we're gonna do is gonna come in here and](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=59.64) [we're gonna put one method inside of here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=62.74) [It's a public void handle request,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=64.73) [and then we're going to say system dot out of print.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=72.59) [Lynn and I'm just gonna put a default string in here that says](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=75.4) [that we shouldn't be able to get here now.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=81.21) [If you wanted to, you could throw an exception here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=85.55) [You could do a couple of things.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=88.12) [It really depends on how you use this pattern.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=90.24) [This particular case,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=93.84) [I only have one request that we're trying to handle](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=95.72) [cause our fan is very simple.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=98.95) [We pull the chain and if I'm in the lowest state, I pulled the chain.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=100.91) [I'm gonna go to medium.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=105.07) [If I pull the chain again, I'm gonna go to high.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=105.9) [If I pulled 1/4 time, I'm going to go to the off ST.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=107.62) [Now think of it in different terms off different](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=111.81) [things that I could be working with,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=114.68) [such as opening or closing a garage door or dealing with](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=115.88) [lights on a fan or some different things.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=120.79) [So I might not always just have the one handle request method in here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=122.64) [And they have different things that I'm working with.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=126.21) [So now that we have our state are abstract based state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=129.24) [let's go ahead and come back to our fan and look at what we're gonna do here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=134.33) [We're gonna get rid of these final static ends at the top of our fan class,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=138.13) [and I'm gonna start with just getting rid of one will say state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=144.34) [and we want to go ahead and start off.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=149.24) [We don't have the implementations for these.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=152.09) [Yeah, so we'll say fan off, and then we're gonna do another one.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=153.81) [That is state, and we're gonna do Fan Lo State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=158.48) [And just for sake of consistency, the fan off state fan Low stayed state fan,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=166.44) [medium stayed and while we're at it and I'll wait to add this](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=173.94) [implementation till later But we'll do a fan High state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=180.73) [So let's get rid of those two static final ends there.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=184.59) [And now we're gonna change this because we're no](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=189.72) [longer tracking state by an imager.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=191.21) [Going to say state equals nothing yet because we're going](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=193.39) [to sign that in our constructor now.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=199.09) [So we have a state variable that we're tracking what state were currently in,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=202.01) [and now we can go through her application.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=208.04) [So from here,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=210.43) [what we want to do is start initializing what the's various fans states are.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=212.2) [We'll start off by saying fan off ST equals new fan off state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=217.34) [and we haven't created this yet.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=226.4) [Passing the variable instance, this.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=229.37) [Let's go ahead and create this object.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=231.92) [I'm gonna just right click on our package and say,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=235.55) [Knew,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=238.19) [Class and it is the fan off ST and it's super Class is](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=240.74) [ST Click Finish now inside of here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=247.72) [We need to do a couple of things.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=253.13) [Bear with me on this 1st 1 It's not that complex,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=255.44) [but there are a few moving pieces first.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=258.66) [Want to create an instance variable to hold a reference to our fan in,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=261.29) [and then we're going to create a constructor.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=266.54) [Wants a public fan off ST Fan fan.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=268.43) [We're gonna sign that to the variable that we've created.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=275.4) [So we'll say this dot Fan is equal to fan.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=277.87) [Now we're almost done.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=281.54) [We're gonna say at Override, and we're going to say Public void handle request.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=283.1) [And now we have our basic signature that we need here](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=295.52) [going to do two things inside here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=299.09) [We're gonna say system dot out print land,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=300.39) [and this is just so you can see what's going on.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=303.59) [We're going to print out the verb or the action that we're doing.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=305.81) [So if we're in the off state and somebody pulls the chain,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=311.04) [we're gonna turn the fan on too low to say,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=314.21) [turning fan on too low.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=316.92) [And then this is where it gets a little bit interesting for people.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=323.53) [We need to now say fan dot set state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=328.04) [We haven't created this method yet,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=331.7) [and we're going to get an instance of fan dot get fan Low State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=334.14) [So this is the state that we're transitioning to.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=340.94) [So as we are, if we're in our fan off state and we pull the chain,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=344.49) [we're going to now set the state of the fan too low.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=350.82) [I had somebody asked me a question while I was giving a demo on](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=355.23) [this at a user group meeting as to why we wouldn't just create an](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=359.7) [instance of the fan Low State here, rather than getting it from that fan,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=363.58) [was part of that state machine.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=369.55) [The state machine knows about the different states that it can be in,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=371.79) [but the individual states on Lee know aboutthe one that they can transition to.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=375.4) [And so instead of having the fan off state create a](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=380.24) [new instance of the fan Low State,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=383.26) [we get another level of indirection and that I can](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=385.34) [return it back if it doesn't make sense,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=388.12) [not a big deal.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=390.59) [I just have had some people ask questions about while we're using a](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=391.55) [getter in a center in this method right here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=394.8) [Now, before we go create those two methods,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=398.17) [I'm going to finish out this class and create a very basic to](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=400.52) [string in here to represent the state of this Objects will say](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=405.88) [public string to string We're gonna return The string fan is off](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=410.34) [Now this object is done.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=422.14) [We just have to go put these two implementations in our fan for](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=424.25) [setting the state and getting the fan Low State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=429.87) [Let's go ahead and use the quick fix method here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=434.54) [We're gonna create a method.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=437.72) [Get fan, Low State and Tight fan.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=438.91) [It's gonna return an instance of state and we're going](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=441.5) [to return fan off ST Now that's done.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=447.9) [The next thing we need, D'oh!](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=454.99) [Before this class will compile over here is we also](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=456.41) [need to do that fan set state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=459.09) [We're going to create a method fanned upset state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=461.78) [That's also in fan.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=463.79) [So now we have our fans state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=467.01) [We're going to say this stops State is equal to ST Now that we have](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=470.58) [that all done in our fan off state is compiling.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=477.35) [Let's start cleaning up our fan object again.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=480.65) [The goal of this again is to remove all of this if else stuff that's](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=483.82) [going on in our poll chain and to string method.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=488.58) [So I want to go back up here to my pull chain and all of](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=492.71) [this stuff is going to just get deleted.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=497.99) [And now it's gonna be ST dot handle request.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=501.04) [Now we're not completely done,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=506.02) [but we are going to be able to do the same thing Hair will say.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=508.04) [Return ST dot to string.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=511.56) [So look at our fan object Now.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=516.39) [There is next to nothing in here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=518.78) [We haven't represented all of our states yet,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=521.21) [but we were able to now get rid of that conditional](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=523.95) [code that's going on everywhere.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=526.75) [Let's finish implementing out the rest of our states.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=529.12) [I'm gonna go back in our constructor and say fan and we're gonna go](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=532.14) [to our low state and say equals new fan Low State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=537.72) [If you remember,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=546.74) [this is what we were just implementing down below with the get Fan Lo ST](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=547.45) [method that was required for our fan off state because the off state](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=552.98) [will go to the low state in our low state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=556.8) [Is it going to go to our medium state?](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=559.25) [And so on now inside of here, we can go ahead and create our fan Low State,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=561.12) [and it's going to look very similar to what we did with our off ST.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=567.73) [So when we go in here to our low state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=574.24) [we will right click and create a new class,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=577.84) [and we'll have fan Low State and it's based classes state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=584.91) [same thing.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=591.34) [And for the sake of time,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=592.46) [I am just going to copy and paste the innards out of the off one to the low one.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=593.89) [Be careful doing this because you will make some copy pay stairs](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=600.76) [and we're going to say that it's to string is low and the](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=607.34) [constructor is obviously the family estate.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=614.75) [Now we just need to change the action that we're](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=618.16) [doing inside of the handle request.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=620.85) [So if we're in the low State,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=623.78) [we're gonna now be turning the fan on two medium and we](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=625.41) [already have the set state there.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=630.73) [But the next day we're transitioning to his medium,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=632.43) [so we need a get fan, medium, state and of course,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=634.63) [this is gonna break because we don't have that created yet.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=639.44) [So now we go back to our fan object and we have,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=643.04) [ah, fan medium state Instance variable here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=646.57) [We just haven't created anything for it yet,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=649.1) [So let's go ahead and do that same thing now,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=651.33) [mind you, I had already copied a medium and high state in here just to save time.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=653.84) [And I'll show you what the code is.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=660) [It's exactly what we've done with the off in the low state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=661.15) [So say fan medium stayed equals new fan Mead State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=663.84) [Pass in this and say this instance why we're in here?](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=673.24) [I'm also to go ahead and say that state starts off as fan off ST.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=678.77) [So that's just what it's initialized too.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=686.54) [Now, we don't have our fan Lo ST just yet,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=689.54) [so I'm gonna come down here, right,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=693.84) [click and say source generate getters and centers and](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=695.28) [all I want to do is to get her.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=701.34) [We don't want to have that be able to set the state will come](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=702.57) [up here to our get fan medium state click.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=706.03) [Okay.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=709.26) [And it will drop that in there for us.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=710.19) [Now.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=713.14) [We are basically all done.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=714.24) [There is one catch.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=716.77) [We haven't done that same thing for our high state just yet.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=717.66) [So as an example, you can do this on your own.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=721.23) [I'm gonna go ahead and implemented as well.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=724.25) [Let's just create the fan High State in here and now](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=726.41) [you're starting to see how easy it is.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=729.48) [First, add additional states.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=730.88) [So say fan High State,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=732.64) [all I have to do is come through here and create a high state just](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=734.44) [like the other states we have been creating.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=739.72) [So now we have high go through and say Fan, hi.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=742.64) [And the only thing I have to provide is that get her down here](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=747.14) [for that high state come right click source,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=750.63) [generate getters and centers.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=755.91) [And again, I only want to do the get her for it.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=757.63) [So we'll say, Get fan High State and save that.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=760.44) [And now we have all of those states represented inside of our application.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=765.24) [So notice there's no if then else nothing.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=769.76) [We've created all those states,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=772.36) [and now the fan off state just knows about the low state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=775.14) [The low state knows about the medium state.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=781.8) [And if I open up the medium.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=785.14) [You'll see.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=787.64) [It's the same thing.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=788.01) [I'm gonna go through here and uncommon that so that it was about](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=789.02) [the high State and same as the high State.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=793.28) [It's going to cycle back.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=796.18) [Toothy off ST.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=797.53) [Pretty straightforward.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=799.94) [Now we haven't created our method to get our fan off state yet,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=802.04) [so we can go ahead and add that into our fan object.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=806.64) [Come up to the top here and right click and say Source.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=813.03) [Generate getters and centers go to our off state just](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=820.44) [at a getter for the fan Allstate, click.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=824.67) [Okay, save it.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=827.15) [And now all of our states are represented here.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=831.48) [I have my off low, medium, high state,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=834.45) [the set states and our two strings are all implemented.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=838.24) [Are our state objects all contain what they dio None of it's](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=841.46) [contained in the actual state machine itself.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=845.9) [And now we can run our example.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=848.44) [So let's go ahead and go into our state demo now.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=850.84) [One very interesting thing to note about this our state demo.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=854.33) [Our client didn't change it all.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=858.35) [This is all about fixing complexity of the back end.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=861.07) [So if I go ahead and hit run on this,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=864.78) [you'll see that we now go through all of our states from off the low to medium.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=867.77) [We can add a couple more in there so that we go to see the entire round trip.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=874.07) [Let's just grab a couple of those, and that should get us toe high.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=878.72) [And that should get us off.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=883.85) [And we'll save this and run it again and you can see](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=888.14) [that we do the full round trip.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=892.79) [So we go from off the low to medium to high and then backed off.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=894.94) [So that's how we've changed our application to not be this conglomerate of,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=900.47) [if then else statements.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=907.01) [And at first it seems like this is a lot more work.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=908.52) [Think if you're doing a lot more complex things in your state rather](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=911.18) [than just printing a system dot out print land.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=914.58) [In fact, for a live demo,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=917.51) [I like to hook this up to a raspberry pi or some](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=919.92) [Arduino and have it interact with light,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=922.91) [and there's always some code wrapped around doing that.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=926.91) [So thes states usually aren't just this simple.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=929.39) [One liner with a system out print Lynn and a little transition](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=932.22) [in there were usually tying that to some other interface that](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=935.93) [we work with on the back end,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=939.39) [and that's all just contained and signed this handle request method.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=940.89) [Now, if I pull up a older example of what we had there,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=944.12) [I have one say that our demo notes.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=947.84) [Here you start seeing that we have things where the state is open](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=949.94) [and closed and all that various into jurors.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=954.28) [This is a particular garage door instance,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=957.97) [but you see that it gets a lot more complex for those individual cases.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=960.16) [And if we add one more to it,](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=964.61) [it's just a lot more copy paste code that goes into our application.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=966.02) [So getting these all combined in their own states and](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=970.08) [contained is sure a lot cleaner way for our actual object we're trying to contain state on.](https://app.pluralsight.com/course-player?clipId=8d99e577-6d2f-4f07-a74e-f79ab625bac2&startTime=972.42)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca)

[[Autogenerated] Now that we've seen,](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=0.54) [how do you convert an application to use the state pattern?](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=1.37) [Let's look at what some of the pitfalls are.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=4.17) [You must know all the states of your application.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=6.84) [This may seem obvious,](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=10.48) [but often times people don't go through the exercise](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=11.71) [of clearly identifying each state,](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=13.92) [and what is needed to revisit represent that state in an object.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=16.48) [When implementing the state pattern,](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=20.74) [you will invariably end up with more classes than you would have if](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=22.24) [you had implemented with the more traditional,](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=26.25) [method based approach.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=28.2) [This was even evident in our small example.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=30.54) [Another thing that you need to be careful of is keeping](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=33.35) [logic in the state objects and not letting conditional](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=36.05) [logic creep back into the context.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=39.76) [Another common misstep is not identifying what triggers a state change.](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=44.04) [In smaller examples, it's easy, but clearly identify what triggers that change in the state of your application](https://app.pluralsight.com/course-player?clipId=2b26bbac-56ce-45c0-a068-3bacd14092ca&startTime=49.05)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385)

[[Autogenerated] to contrast the state pattern.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=1.27) [Let's compare it with the strategy pattern.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=3.22) [The state pattern is interface based,](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=6.34) [with a collection of concrete states estate on.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=8.58) [Lee knows about the next state that it can transition to each](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=12.45) [state is also contained in its own class.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=16.49) [The strategy pattern is actually almost identical to the state pattern,](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=20.84) [but its focus is different in that it is on algorithms,](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=24.9) [or strategies instead of state representation.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=28.76) [It is also interface based, just like the state pattern.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=32.74) [But one major difference is that strategies don't know about the next state.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=38.54) [Their algorithms are independent from one another.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=43.95) [They also like the state, have a class per algorithm.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=48.24) [As the state pattern has a class per state.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=52.97) [The UML diagram is almost identical for the strategy pattern, as it is for the state pattern.](https://app.pluralsight.com/course-player?clipId=4abb21fd-0d18-4afe-b578-2960b59c9385&startTime=56.34)

### [Summary](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5)

[[Autogenerated] Let's quickly recap what we learned with the state pattern.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=0.54) [It simplifies Psychlo Matic complexity, thus removing those,](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=4.84) [if else spaghetti code blocks that we have inside of our application.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=8.8) [It makes adding additional states much easier](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=13.74) [instead of having to go through each.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=17.09) [If else blocking our application weaken,](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=19.05) [just add a class and change the state before it to point to this one.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=21.01) [One of the drawbacks is that there are more classes](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=26.14) [involved with the state pattern, but that's not necessarily a bad thing.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=29.02) [They're typically lightweight, and they are definitely isolated and contained,](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=32.97) [representing that open,](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=37.51) [close principle that we talked about earlier and software design and it's](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=38.64) [very similar and implementation to the strategy pattern.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=43.53) [The two UML diagrams are honestly identical, and their focus is very similar.](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=47.54) [The only difference being is one's focused on algorithms where](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=52.9) [one's focused on ST with that comparison, let's look at the next pattern, which is thes strategy pattern](https://app.pluralsight.com/course-player?clipId=1c623fff-bb88-42b6-ba6d-a9df971a29e5&startTime=55.81)

## [Strategy Pattern](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993)

### [Introduction](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993)

[[Autogenerated] Hi,](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993&startTime=0.94) [This is Brian Hansen and in this module where you're going](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993&startTime=1.34) [to look at the strategy design pattern,](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993&startTime=4.06) [the strategy pattern is a behavior pattern that is used when you want to](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993&startTime=6.44) [enable the strategy or algorithm to be selected at runtime. Let's look at the concepts when choosing this pattern.](https://app.pluralsight.com/course-player?clipId=be520568-945f-4172-97d9-c38738c15993&startTime=10.09)

### [Concepts](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885)

[[Autogenerated] the concept surrounding why you would choose](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=1.24) [the strategy pattern or that you want to,](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=3.39) [or see the need to eliminate conditional statements in your application.](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=6.03) [The strategy pattern encapsulates the algorithm options in](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=10.87) [the individual classes that eliminate the conditional](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=14.14) [statements in your application.](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=16.73) [Another key point of when you would choose the strategy is if it's difficult](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=19.34) [to add new strategies or cases inside your application.](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=23.29) [When using this pattern,](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=28.74) [the client is typically aware of the strategies that are](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=30.15) [available and usually chooses the strategy that we're](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=32.87) [ultimately going to use in our application.](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=36.15) [A great example of this pattern in the job a p I is Java Util comparator.](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=39.69) [The comparator is used when we want to implement various comparison](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=45.13) [strategies in our application for passing into a sort method. Let's look at the design of the strategy pattern now](https://app.pluralsight.com/course-player?clipId=ad0a308f-d476-4df2-afc9-98e227e29885&startTime=48.39)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e)

[[Autogenerated] the design of the strategy could be](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=1.6) [implemented with an interface, but typically it is usual izing,](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=3.58) [a abstract based class.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=7.24) [All of the concrete classes are then implemented per strategy,](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=10.04) [where each concrete class will then implement the](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=14.06) [algorithm that is unique to that strategy.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=16.97) [A key point with the strategy pattern is that we want to minimize,](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=20.54) [if not eliminate, if else condition ALS from her application.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=24.23) [A key point with the design of this pattern is that the](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=29.31) [client knows about the strategies.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=31.75) [But other strategies don't necessarily know about each other.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=34.04) [The pieces of the UML diagram are a context,](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=39.21) [strategy and concrete strategy implementations. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=70f11d4f-83ad-4b53-af7b-a9708af0bd3e&startTime=42.44)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373)

[[Autogenerated] This is the UML diagram for the strategy pattern.](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=1.83) [The context receives a request,](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=5.74) [and it decides which strategy to use based off of the situation](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=8.46) [strategies all adhere to the same interface.](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=13.04) [And then, finally,](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=16.8) [the concrete implementations of which there may be many are](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=18.07) [then selected based off the situation.](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=22.41) [Each strategy is contained within its own class.](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=25.44) [Let's look at this pattern in a live example now using the comparator that we talked about earlier.](https://app.pluralsight.com/course-player?clipId=de1fcfcd-661f-4376-8cc9-081cef378373&startTime=29.69)

### [Example: Comparator](https://app.pluralsight.com/course-player?clipId=25458dc9-ba7d-4304-b9ac-b680ee551481)

[[Autogenerated] the Comparator is a great example of the strategy pattern.](https://app.pluralsight.com/course-player?clipId=25458dc9-ba7d-4304-b9ac-b680ee551481&startTime=1.64) [Here's a snippet of a larger example that shows how we can swap out the](https://app.pluralsight.com/course-player?clipId=25458dc9-ba7d-4304-b9ac-b680ee551481&startTime=5.14) [sorting strategy of a collection by implementing a new Comparator and this](https://app.pluralsight.com/course-player?clipId=25458dc9-ba7d-4304-b9ac-b680ee551481&startTime=9.29) [example we're sorting list of people by their age. Let's look at this in the larger example now.](https://app.pluralsight.com/course-player?clipId=25458dc9-ba7d-4304-b9ac-b680ee551481&startTime=14.89)

### [Demo: Comparator](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5)

[[Autogenerated] to make this example go a little faster.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=1.74) [I went ahead and created a person object that just has an age name and phone](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=3.63) [number and then a default constructor and one taking the name,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=8.11) [phone number and age.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=11.45) [There's some simple getters and centers,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=12.98) [but besides that, this is a plain Poggio with nothing out of the ordinary in it.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=14.58) [Inside of our main method,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=19.58) [I've gone ahead and created three instances of the person object Brian,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=21.13) [Mark and Chris with their associated information and then added those](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=26.1) [people to Honore list and then finally created a print contents method that](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=29.88) [just cycles through each item and prince amount.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=34.97) [Now, if we run this just right,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=38.91) [click and say Run as it's going to print out that Brian,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=41.27) [Mark and Chris is not sorted, and it says that sort of by ages.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=47.99) [Brian Market Chris, which isn't true because we have not sort of that by age yet.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=51.51) [So let's go ahead and add that functionality in here.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=56.08) [Oh, I'm going to do this using a anonymous in her class,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=59.44) [so we'll say collections dot sort and we're based this off of our people list,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=63.95) [and I'm gonna add in a new comparator object.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=70.96) [Now, I could do this, not using an anonymous in her class,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=75.54) [but it works for this example.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=78.8) [So I'm gonna go ahead and put the person type in there,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=80.76) [and then we're going to add the unimplemented features and inside of here,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=84.24) [you'll see that we have to implement the override.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=90.28) [And if you haven't done an override before using the Comparator,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=92.65) [you just need to go through an implement the compare method on that method and](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=96.58) [it will ask us three things will ask us to return a one.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=102.25) [If this object is greater than that, one less than one.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=106.05) [If it's less than that object or a native one and zero,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=108.77) [if they're equal,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=112.36) [is gonna go through and say if 01 dot get age is greater than](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=113.49) [02 dot get age then we want Thio return one,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=121.73) [and then we have to do the same thing.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=129.94) [If it's less than so,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=131.05) [I'm gonna say if 01 dot get age is less than 02 dot get age.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=132.15) [Then we want to return negative one.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=142.64) [And if they're equal,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=147.3) [we returned zero and you could write this a couple of different ways.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=148.11) [This is just a quick and dirty way to get that](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=151.25) [return functionality built in there.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=153.51) [We go ahead and run this again.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=155.48) [We're gonna see that.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=157.64) [Now it's sorted by Chris, Brian Mark, which is by our age, if you come up here.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=158.45) [Chris is 38 Brian's 39 marks 41.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=163.13) [Well,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=167.64) [we have one other thing that we can do down here that I've](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=168.08) [actually stubbed out to sort by name.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=170.57) [And if I ran that right now, it wouldn't be sorted.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=174.04) [So let's go ahead and do the sort by name Comparator as well,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=176.77) [just to help cement in these ideas and concepts of the strategy pattern.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=179.68) [This one's a little bit different because I'm going to utilize the](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=184.76) [compare to method in sight of the string class to help us,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=187.09) [right?](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=190.55) [This is going to say collections dot sword.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=190.78) [It's just like we did the other one.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=195.53) [We're going to pass in our people object and then new comparator,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=199.44) [and we want to utilize the instance of generics with our person object](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=206.84) [and now override that compare method inside of here.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=213.14) [I'm gonna not really cheating him to go ahead and use the strings compared](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=217.05) [to method m s a return 01 dot get age or name on this one Because we're](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=222.47) [gonna do it by name and say dot compare to,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=230.25) [02 dot get name and then close off our anonymous in her](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=235.34) [class And are you just utilized the strings compared to](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=243.36) [feature So it's already built in.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=247.52) [It's already done for us.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=248.85) [Now if I run this again,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=250.14) [it will go ahead and show us our first instance where](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=254.49) [they're not sorted where it's Brian, Mark Chris,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=257.94) [which is how we add them to the array list.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=259.78) [Show us how it's sorted by age.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=262.84) [Chris, Brian, Mark And then finally show us how it's sort of by name.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=264.48) [Brian.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=268.11) [Chris Marc.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=268.59) [Now we have thes two different strategies built into our application](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=269.84) [that are implementing the Comparator interface,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=274.92) [which in this instance would be our strategy interface.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=277.61) [We have our concrete implementations.](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=280.34) [You see how we can swap out how we're sorting that list very easily,](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=282.1) [and it also proves another point, which is Thekla. I in't knows about the strategy that we're dealing with](https://app.pluralsight.com/course-player?clipId=2b523b9f-a7c2-4218-87f7-88f721ef2cd5&startTime=287.28)

### [Exercise - Strategy](https://app.pluralsight.com/course-player?clipId=47f7f5c5-6412-48d0-a6e7-e844b66b0f93)

[[Autogenerated] Now that we've seen the strategy pattern in action,](https://app.pluralsight.com/course-player?clipId=47f7f5c5-6412-48d0-a6e7-e844b66b0f93&startTime=0.94) [let's go ahead and create our own.](https://app.pluralsight.com/course-player?clipId=47f7f5c5-6412-48d0-a6e7-e844b66b0f93&startTime=3.78) [We're going to create a context, strategy and concrete strategy,](https://app.pluralsight.com/course-player?clipId=47f7f5c5-6412-48d0-a6e7-e844b66b0f93&startTime=5.2) [and they're going to show how we switch strategies inside of her application to utilize the different concrete instances that we've created.](https://app.pluralsight.com/course-player?clipId=47f7f5c5-6412-48d0-a6e7-e844b66b0f93&startTime=11.1)

### [Demo: Strategy](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785)

[[Autogenerated] for this exercise.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=2.14) [The context that we're going to be working in was that of a credit card.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=3.41) [We're going to go through and implement a credit card](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=8.44) [validation that utilizes multiple, different strategies to start with.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=11.77) [I've gone ahead and created a main method and added the](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=17.99) [card credit card information in here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=22.36) [I'll tell you right now, this is not my real credit card number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=24.98) [So sorry to get your hopes up.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=27.81) [If you're not aware,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=29.8) [you can actually Google credit card numbers that are generated](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=30.6) [because a credit card is actually the number itself is very](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=34.51) [simple and generated using a check digit and a sum to verify](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=38.38) [that it is a valid credit card.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=43.23) [Enough of that, though.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=45.91) [Let's get rolling with this exercise,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=46.6) [and we're going to start by creating a class,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=49.18) [and we're going to implement the credit card to begin with.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=53.51) [So we're going to say it's a simple class credit card,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=57.64) [and inside it here there's a couple of things that we want to pass in.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=60.91) [We're going to do a private string number,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=63.94) [which is just gonna represent the credit card number,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=69.14) [private string date, and for this example,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=71.94) [we're gonna keep it simple and just keep them all as](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=75.51) [strings and then a private string cvv number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=77.92) [Now, before we finish this out, there is one other piece that we're gonna do.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=84.54) [We're actually gonna jump ahead and start by making our](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=87.75) [strategy in her face and to do so.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=91.18) [The reason why is we're going to implement that is part of](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=94.33) [this credit card to do so we're going to just go ahead and](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=96.4) [create an abstract base class, say, knew class,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=99.21) [and it will call it validation strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=105.14) [And we want to check abstract on this and go ahead and click finish.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=110.44) [Now, to start with, there's only one method we care about in here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=114.09) [We're gonna add another default implementation](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=117.46) [inside of this a little bit later on,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=120.18) [I'm gonna say public abstract Julian is valid,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=122.54) [and this is just to validate the credit card that we're passing in is,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=129.64) [in fact,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=132.93) [a valid credit card based off the credentials and criteria that we've set up.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=134.03) [So we're gonna pass in the credit card instance and](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=138.35) [go ahead and save this method.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=143.95) [Now we can go back to our credit card and finish up a couple of things here](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=147.64) [and the credit card class itself will be complete here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=152.83) [So we're gonna take and pass in a private validation strategy](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=156.03) [and we'll just say that that's our strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=165.79) [And then we want to go ahead and create our actual constructor for this.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=170.44) [So we want to say,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=175.37) [Public credit card and we're going to pass in the](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=175.97) [validation strategy to the constructor.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=181.99) [It's a strategy,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=186.88) [and then we want to go ahead and save thestreet egy instance in here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=188.64) [So I'll say this stop strategy is equal to strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=192.82) [Now we're almost done with the credit card class itself,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=199.24) [but I'm gonna go ahead and put a convenience method in here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=203.38) [We don't have to necessarily do this as part of the strategy pattern.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=206.31) [It's just a lot easier way to work with it.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=210.63) [In terms of the context will say, public,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=212.49) [Boolean is valid and we're just going to use our strategy to say](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=215.79) [return strategy dot is valid and will pass in this.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=223.57) [So the object that this is contained within now we can,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=229.3) [for just ease of working with our object right click and say source,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=234.12) [generate getters and centers.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=239.14) [We won't do it for the cvv, the date and the number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=242.43) [We don't want to do it for the strategy and click.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=245.37) [Okay, And now this object is complete.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=248.05) [We have our number, date, cvv and our validation strategy passed in.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=254.07) [And then we have the is valid method that we're going to be working with.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=259.81) [So now our credit card is pretty well complete.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=264.9) [A few other things we need to finish out on this and that is](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=268.84) [we We need a concrete instance of our validation strategy](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=271.92) [before we jump ahead on that, though,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=275.68) [I want to add one thing in the side of here when checking credit cards.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=277.74) [There is an algorithm called a loon algorithm and you can go look it up](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=282.59) [Doesn't matter as far as what we're doing with this example.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=288.44) [But a loon algorithm is how they go through and verify that](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=291.71) [the card that we're passing in is in fact,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=297.07) [a legitimate credit card.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=300.6) [What it does is it goes through every other number,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=303.04) [doubles um, and then mods it by 10 after its sum them all up.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=306.13) [And if the response comes back a zero, it's a valid credit card number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=310.77) [This is used on all credit cards to my knowledge,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=314.58) [and it's a simple way to eliminate auto generated numbers as easily.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=317.93) [I put this in here because this shows the example of having a base](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=324.54) [class that has some functionality in there that all of the](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=329.36) [concrete strategies are going to utilize.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=334.33) [So now if we go look at our strategy demo,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=337.32) [we can see that we have everything but our concrete](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=342.34) [instance of our strategy in place.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=344.91) [Let's go ahead and create that.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=348.74) [Now we're gonna go ahead and right click and say New Class,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=351.4) [and it is an a Mex strategy, and it's super class is validation strategy,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=359.61) [and we'll quick finish.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=371.63) [And inside of here, the only thing it cares about is tthe e is valid method,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=373.84) [which is exactly what we want to do it with.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=377.87) [And so we will say Julian is valid is equal to true,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=380.91) [and I'm gonna go through and code this one out.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=392.93) [You can go through on your own and do one's for MasterCard,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=395.14) [Discover Visa, whatever you want to dio,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=398.92) [but you'll get the idea really quickly of how this works,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=401.27) [we will say is valid is equal to credit card dot get number,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=404.74) [and if it starts with 37 then it is a valid American Express number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=416.54) [Or if credit card dot get number starts with 34.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=428.04) [So those are the two prefix is that a valid American Express](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=439.75) [card can start with again for the example.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=443.83) [It doesn't really matter.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=446.77) [This is just to show you how we have different strategies in](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=447.56) [place for these types of credit cards.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=450.68) [Now, the next thing that we're going to d'oh ISS look to see if its length is 15.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=453.23) [All American Express cards have a length of 15.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=458.14) [So if it is still valid,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=460.68) [and I wrote it this way on purpose so that in the Comparator](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=463.74) [example we had multiple return types that actually increases](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=467.34) [your cyclo Matic complexity.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=470.26) [I wrote this one so that does have the check and doesn't only](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=471.78) [has one return type out of the methods.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=474.47) [So if is valid, is equal to, and that is credit card dot get number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=476.3) [The length is equal to 15 so all American Express cards have a](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=490.74) [length of 15 and you could do things with looking for spaces or](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=498.59) [dashes or any of that stuff and then finally,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=502.34) [we're gonna utilize what's in our base class and say,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=505.02) [if is valid and we're going to say is valid is equal to passes.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=507.37) [Loon from our parent object will say credit card dot get number and then lastly,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=517.32) [we're gonna return is valid.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=529) [Now we have our entire American Express strategy built inside of here,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=532.34) [and it's pretty well ready to go.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=538.67) [So we'll go ahead and go back over to our strategy demo.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=541.34) [And you see,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=544.57) [I have a valid American Express number inside of here that](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=545.22) [I went and just Googled and found one.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=548.6) [And if we go ahead and run this right click,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=551.34) [it's a source run as Java application.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=554.32) [We can now come in here and see that is American Express.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=558.74) [Valid is equal to true.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=561.6) [Now, if you don't trust things, run right the first time.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=563.44) [We'll go ahead and give it a fake credit card number.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=566.4) [So in come inside this application and we'll take the same one.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=571.59) [But just change it by one digit.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=577.61) [So 2832 and save that and this one will fell.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=579.89) [So if you run this, you'll see inside of our console.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=585.34) [The 1st 1 passes true in the second pass,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=589.74) [his fault now to create another strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=591.64) [It's really quite simple.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=595.51) [In fact,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=597.5) [we can go ahead and create a copy of our American Express strategy really quick.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=598.06) [I'll just grab the contents of our is valid and right click and say,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=604.35) [New Class, and it's a Visa strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=609.32) [It's Super Class is going to be validation strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=616.24) [We'll click, finish and sight of here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=621.84) [We're going to just return that same thing,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=624.61) [but we're gonna look for a few different things.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=628.03) [American Visa, rather than American Express,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=630.94) [always starts with four, and they don't have two different digits.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=633.41) [They go through and it's always 16 and then we're gonna](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=637.28) [make sure that it passes the loon.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=641.64) [You can see, though,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=643.84) [how if he had all of this content in sight of our](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=644.73) [main class like our credit card,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=647.9) [we'd be looking to see if it's American Express than if](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=650.02) [it's American Express that if it has this many digits and](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=653.38) [then it passes this and that, we could have all this big contest ID context.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=656.69) [Harry code in sight of our credit card class.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=660.78) [We're with this.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=663.94) [It's all contained inside the strategy, and I do have to f statements in here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=664.58) [But that's just so we don't have multiple return](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=669.25) [methods outside of our application.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=670.99) [We could very easily just return out of those and not have](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=672.7) [to check each time to see if it's there.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=676.23) [Now, if you go to our strategy demo, come through here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=678.54) [We have our visa strategy and grab a visa card and now](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=683.41) [paste this information in there.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=697.64) [So we have our visa card with its new visa strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=700.71) [And if this is a valid credit card number,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=703.96) [is gonna return is true for the is valid visa.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=705.95) [So let's run this and see what it returned to us.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=709.35) [And we have a valid visa.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=713.14) [So we have an American Express that's valid.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=714.79) [America's dress that isn't any valid visa,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=717.19) [and all we had to do as far as our client was concerned,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=720.21) [was swap out our strategies.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=722.91) [But each one can have a completely different set of rules based](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=724.77) [off of what we're trying to do inside of here.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=728.44) [As far as our credit card is concern,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=730.62) [it just knows about the strategy that we pass in.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=732.94) [So our credit card context stays the same.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=735.2) [What changes is our actual validation strategy.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=738.24) [Very powerful pattern.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=742.44) [We eliminate having that nested,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=744.08) [if else conditional code inside of our credit card and](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=746.74) [her client stays clean and simple.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=750.09) [It does have to know about the different strategies we have in there,](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=752.16) [but as far as it's concerned, it's pretty simple for us to go through an implement this.](https://app.pluralsight.com/course-player?clipId=683fa5c1-8867-45af-b9d5-902baa22d785&startTime=755.72)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95)

[[Autogenerated] Now that we've seen the strategy pattern in action,](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=1.4) [let's talk about some of the pitfalls of it.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=4.24) [The client does have to be aware of the concrete strategies that are available.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=7.44) [This is quite a bit different than the state where the client](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=12.24) [didn't have to choose what state it was in.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=15.54) [Strategies have to be chosen one of the other drawbacks,](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=18.27) [or that there is an increased number of classes in the application.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=22.08) [It really isn't a big problem because we usually don't have](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=26.24) [more than a few strategies in our application,](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=29) [but it does add a little overhead.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=31.6) [The maintenance of our application is much easier,](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=33.84) [though, and definitely worth this small overhead.](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=36.05) [Speaking of the state pattern,](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=38.9) [let's contrast the strategy with state pattern to Seymour of the commonalities that they share](https://app.pluralsight.com/course-player?clipId=1caf0728-f9de-447e-bb9c-818ea2defb95&startTime=40.48)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0)

[[Autogenerated] to contrast the strategy pattern.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=0.54) [Let's compare it with the state.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=2.42) [The strategy pattern is almost identical to the state pattern,](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=4.88) [but it's focuses different and that it's for algorithms or](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=8.07) [strategies instead of transitionary states.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=10.63) [It is interface based, just like the state pattern with mud.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=14.84) [Major difference, though, is that strategies don't know about their next state.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=18.83) [In fact, they are independent of one another, also similar to the state.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=23.06) [There is a class per algorithm instead of a class per state.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=29.25) [The state pattern, on the other hand, is interface base,](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=34.34) [just like the strategy and has a collection of concrete](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=37.38) [states that we can transition to.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=41.86) [A state only knows aboutthe next state that it can transition to,](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=44.34) [and each state is contained in its own class.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=48.61) [So they're very similar a class per state or a class per algorithm.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=51.63) [They're both interface based.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=55.24) [The few major difference is is that he state knows about the next](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=57.38) [day that is going to transition Thio and the strategy doesn't know](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=61.61) [about other alternative strategies.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=65.67) [The major difference, though, in my opinion of the strategy,](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=68.74) [is that the client typically knows all of the strategies that](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=71.59) [are available to it where it doesn't necessarily know all of](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=74.76) [the states that it can be in.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=78.63) [We can request it, but it doesn't assign that up front like it does with the strategy.](https://app.pluralsight.com/course-player?clipId=af3fc21e-e5ab-4b75-ad8e-5bb14ef86df0&startTime=80.91)

### [Summary](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39)

[[Autogenerated] let's recap what we've learned with the strategy pattern.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=1.14) [We want to utilize this when we want to externalize](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=4.54) [algorithms inside of our application.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=7.19) [It should also be known that the client knows about the different](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=10.22) [strategies that we can implement inside of her application.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=13.62) [It doesn't have to know about all of them, but it typically does.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=16.86) [In the case of the strategy pattern, there is also a class per strategy.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=19.71) [We typically utilized this pattern when we want to reduce](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=27.34) [conditional statements inside of our application based off what](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=30.19) [we're choosing to utilize to solve a problem.](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=33.82) [The next pattern we're going to look at is the template pattern,](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=38.04) [and we kind of got a glimpse of the template pattern when we looked at our](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=40.85) [solution of the Comparator and how that utilize strategies. We're going to see a great example of this with the template pattern](https://app.pluralsight.com/course-player?clipId=811b4ace-be7c-43dc-aa6b-4c34c0abef39&startTime=44.48)

## [Template Method Pattern](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c)

### [Introduction](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c)

[[Autogenerated] Hi, This is Brian Hansen and then this module,](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c&startTime=1.44) [where you're going to look at the template method designed pattern.](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c&startTime=4.2) [The template method pattern is used to define an algorithm](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c&startTime=7.56) [that allows sub classes to redefine parts of the algorithm](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c&startTime=10.94) [without changing its structure. Let's look at the concepts as to why you would choose this pattern.](https://app.pluralsight.com/course-player?clipId=5950ea6c-c3ca-4886-addd-42aa7fae119c&startTime=14.47)

### [Concepts](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1)

[[Autogenerated] the concept surrounding why you would choose the template method](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=2.7) [pattern or that it is a fantastic technique for code reuse.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=5.61) [The use of this technique is common in designing frameworks and libraries.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=10.72) [The template method pattern has been around long](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=16.04) [before inversion of control frameworks,](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=18.32) [but IOC containers use this to allow plug double components](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=21.12) [inside their frame works all the time.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=25.01) [IOC frameworks really helped keep this pattern mainstream.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=27.84) [In my opinion,](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=31.26) [the real focus of this pattern is surrounding the](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=32.94) [algorithm of what we're trying to solve.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=35.4) [The template method enables us to force an algorithm,](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=38.33) [but allows pieces to be configured by the user.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=41) [Examples of this in the Java a p I r.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=45.32) [The job you till collections sort method.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=48.97) [If you watch the module on the strategy pattern,](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=51.9) [you will notice that this is Theseus.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=54.41) [Aim example.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=55.79) [The difference here is that the strategy allowed us](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=57.29) [to swap out the entire comparator,](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=59.22) [where the template method has is focusing on the](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=61.85) [method to override with sorting.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=64.3) [Another example is tthe e index of method in the abstract list class.](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=66.88) [Let's look at the design considerations when selecting this pattern. Now](https://app.pluralsight.com/course-player?clipId=270052f0-2b93-461b-ad73-e850dcac36f1&startTime=73.04)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9)

[[Autogenerated] The design of the template method is](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=1.89) [based around an abstract base class.](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=3.71) [The base class is responsible for calling wth e child class and not](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=7.28) [the other way around hooks air put into place,](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=12.43) [which may be overridden.](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=16.08) [Operations, though, are also put in place and must be overridden.](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=18.05) [The pieces of the UML diagram are an abstract based class and a concrete class. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=9767fccd-2e54-4bf4-bcff-d1e53a3d60e9&startTime=23.44)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145)

[[Autogenerated] the UML diagram for the template method pattern is quite simple.](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=1.74) [Actually, the abstract based class contains the entry point or,](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=5.55) [in this diagram, the template method that is called by the client.](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=10.5) [It contains operations, and in this instance,](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=15.54) [Method one and method to that must be overridden by the concrete class.](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=18.35) [The concrete class overrides those operations and any](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=24.34) [optional hooks to fulfill the algorithm defined in the](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=28.26) [original template method Entry Point. Let's look at a live example of this code now.](https://app.pluralsight.com/course-player?clipId=71624b47-105d-4254-9b39-e1d55527a145&startTime=31.74)

### [Example: Collections.sort](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce)

[[Autogenerated] the collection stop sort meant that](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=1.27) [provides us the operation to override.](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=3) [As part of our template,](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=5.38) [method collections and its base class provide the algorithm.](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=6.55) [From here we could implement a comparator,](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=11.84) [which is an example of the strategy pattern,](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=14.29) [or focus on the compare and compared to methods which are](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=16.65) [part of the actual template method pattern.](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=19.97) [Here is a snippet of the larger example that shows](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=22.94) [how the sorting is implemented.](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=26.05) [In this example, we're sorting list by their age,](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=28.02) [and specifically,](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=31.41) [the compare method is the portion of this that](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=32.48) [pertains to the temple method pattern. Let's look at this code in the editor now.](https://app.pluralsight.com/course-player?clipId=a0ce9d47-41da-4d30-bdf3-8730ed56ffce&startTime=34.9)

### [Demo: Comparable](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba)

[[Autogenerated] if you've seen the strategy module.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=2.04) [Ah,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=4.6) [lot of this code is gonna look similar because I used a very](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=4.95) [similar example for demonstrating the Comparator,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=8.42) [which is an implementation of the strategy pattern over comparable](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=13.41) [which we're going to use the temple method with.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=18.21) [So this class goes through and create some person](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=20.48) [objects and stores them in array list,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=23.72) [which we eventually want to call the collection Stop](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=26.19) [Sort on the collection Stop sort.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=28.86) [If Ayan comment this right now,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=31.61) [it's going to complain because the array list of people or the person](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=33.2) [objects are not a comparable instance that I can call sort on.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=37.75) [So the sort is looking for a template method of the](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=43.66) [comparable interface to sort them on.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=47.11) [We pull up our person object over here.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=50.53) [We can see right now that it's just a plain object.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=53.19) [Well, go ahead, say implements comparable, and it's of type person object.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=56.21) [So when we say this,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=66.12) [it's gonna give us a compilation air asking us to](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=67.32) [add those unimplemented methods.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=70.35) [Go ahead and add that to the bottom here,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=73.14) [and you're gonna see that we have our compared to method implemented here.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=76.52) [And this is the temple method.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=80.74) [It wants us to implement this compare to method that's part of](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=82.62) [the temple method pattern of that interface.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=87.96) [So we've implemented this interface,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=90.81) [telling us that we have to provide this](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=92.74) [functionality to pass into that sort method.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=95.15) [And we're gonna just really quickly throw a if this stott age is](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=98.63) [greater than oh dot age that we want to return one.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=106.22) [And then we want to say if this stop age is less than](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=115.94) [oh dot age to return negative one.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=124.14) [Now, if you've not used the comparable or compared to interface before,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=131.64) [all this does is a sign it awaited value that it knows to sort](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=135.64) [this object before or after that object.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=140.2) [So I really don't need to go into the details of how the sorting works.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=142.96) [Just realized that the compared to is being](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=146.96) [implemented as part of a template method.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=149.49) [This method is what's implementing our algorithm or are sorting functionality](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=152.35) [for that larger sorting method from that collections class.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=156.84) [So now if we go back over to our template method,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=161.6) [you can see inside of our demo our temperament,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=165.94) [the demo collections out sort is not complaining anymore.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=168.33) [When we print this out beforehand.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=172.24) [It's gonna print it out in the order that we've entered](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=173.74) [these in 39 41 38 as faras the Ages concern.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=176.01) [Then we're gonna call sort on it, and it will spit them out as 38 39 41.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=180.13) [Let's run this and see if it does what we're expecting it to.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=184.88) [D'oh!](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=187.79) [So say it run as job application.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=189.54) [And when it's unsorted, you see Brian, Mark,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=193.64) [Chris and when it is sorted, it's Chris,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=196.17) [Brian, Mark.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=199.61) [And that's what we were expecting, Chris, Brian and then Mark as faras.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=200.32) [Their age is concerned,](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=204.22) [but you see how this is a really great little way of just implementing this one](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=205.94) [method that the algorithm for the sorting is contained within and Java did take](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=210.34) [advantage of doing that through the comparable interface on that object a little](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=215.51) [bit different in the strategy pattern, little different approach.](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=220.94) [It's all contained in just this method. Instead of having a strategy that we swap out at runtime](https://app.pluralsight.com/course-player?clipId=c88b5a83-4571-4e71-839d-d2ef081ba7ba&startTime=223.43)

### [Exercise - Template Method](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab)

[[Autogenerated] Now that we've seen an example of this pattern in action,](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab&startTime=1.12) [let's go ahead and create our own.](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab&startTime=3.6) [To do so, we're going to create an order template,](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab&startTime=5.94) [a Web order and a store order class to demonstrate how](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab&startTime=9.55) [the template method pattern works, a crossed implementing an algorithm, and this will finally just result in us creating our own template method.](https://app.pluralsight.com/course-player?clipId=defbb8bd-664b-4c16-aeb7-3b816c1a0eab&startTime=14.17)

### [Demo: Template Method](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9)

[[Autogenerated] to get started.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=1.24) [I've gone ahead and created a main method that's going to just](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=2.02) [demonstrate what we're doing with our order template and the](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=5.32) [individual order cases that we have.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=8.88) [So you can see from this example we're going to create an order template](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=10.55) [and that it will have a web order associated with it.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=14.5) [So let's right click and say,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=18.84) [Create new class and this is gonna be an abstract class.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=20.57) [So we'll say order, template, and go ahead and click finish.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=26.44) [And this will give us the basic structure that wanna do.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=32.38) [And I'm gonna throw a couple of methods in here,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=34.38) [and I'm gonna go through and type all of these out as you kind of get the](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=36.15) [idea of what we're creating with our process order,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=40.58) [our template method.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=43.75) [So there's a few options we're gonna put in here that air hooks and](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=45.14) [operation's gonna put a public Boolean his gift,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=48.87) [and this would be an example of a hook it could be ever overridden,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=55.54) [doesn't necessarily have to be.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=59.9) [And then the next one is going to be public abstract void do check out.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=62.34) [And this is part of the algorithm that we want to](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=74.64) [create inside of our application.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=77.75) [The next one we want to put in a side of here is public abstract,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=79.98) [void due payment.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=84.34) [And then finally, public abstract, avoid do receipt.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=89.14) [And I named these do just cause it signifies that](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=98.54) [there's an action associated with it.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=102.04) [You don't have to necessarily name your methods this way.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=104.35) [It's not really something that is particular to this pattern,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=107.87) [but you can just get the idea of I've got an action associated with this,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=111.48) [so I'm gonna have a do in front of the name.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=116.61) [Finally, I want to do a method called Public Final Void Wrapped gift.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=119.58) [And this is just what it sounds.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=128.94) [We're creating an order entry system.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=130.99) [We want to have the option for them to wrap their gift.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=133.22) [I'm gonna put a system dot out dot print lin inside of here just](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=136.09) [to signify that when they we call this that the gift was wrapped](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=140.15) [and we're gonna close this off Now.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=146.64) [We're down to the final parts of our application and let's](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=149.48) [throw one other piece inside of here.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=155.28) [First,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=158.24) [we're going to implement our actual template method that is](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=159.05) [public final and we want this final because we don't want it to](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=163.04) [be overridden by the sub classes.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=168.68) [So this is part of that sequence that you have to get right.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=171.5) [We always want our algorithm to be the same,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=174.28) [and we'll say Process, order now This is where we get to define our algorithm.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=177.24) [So first we want Thio force them to do the check out when this is called,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=186.47) [and then, regardless of what they do,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=193.04) [we want them to pay for it so we'll do a due payment.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=195.11) [Now we get to see if it is a gift or not.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=200.08) [So we say, If this is a gift, then let's wrap the gift.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=202.14) [Otherwise,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=214.5) [we want to include the receipt with this so we'll go ahead and say else do](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=215.39) [recede and then we could add one final piece inside of here.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=223.59) [Let's add a do delivery mechanism as well,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=231.06) [so we'll just as a final closing of our algorithm,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=234.53) [will say do delivery and we'll need to define this algorithm up above.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=237.98) [Still, this part of our algorithms will say public abstract void do delivery.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=242.45) [So now we have all the pieces of our algorithm in place and I'll expand this,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=252.94) [you can see it.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=256.58) [We have our checkout payment receipt and we added a](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=257.54) [delivery on the end of there.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=260.06) [And then we have the option to have it gift wrapped.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=261.57) [So we have a Boolean flag that if it is a gift,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=264.64) [then let's go ahead and wrap that as well.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=267.8) [Now let's go ahead and create the Web order that's going](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=270.7) [to fill out our template demo here.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=276.85) [So you see, it's had a template demo.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=278.81) [We go through and grab, gather a Web order and process this order.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=280.52) [So I want to come over and say,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=285.94) [Knew Class and we'll call it Web order and it's super class](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=287.58) [is the order template we could finish.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=295.66) [You see,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=302.43) [it automatically goes through and defines these methods that we](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=303.06) [have to fill out as part of our template.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=307.49) [So we define the site of our algorithm here that we wanted it to do.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=310.2) [Do check out due payment wrapped gift if it was a gift and we](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=314.05) [made that one so it couldn't be overridden.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=318.99) [It was the same for either option we had and then](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=320.96) [finally do our receipt and your delivery.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=324.73) [So it's filled out the methods of our template method pattern for us now,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=328.14) [rather than watch me tied these all out,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=333.28) [I'm in a copy and paste.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=334.98) [Just some demo code I have in here.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=336.27) [But you can see how we have these hooks.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=338.56) [Now that we've overwritten and some of these air operations that are](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=340.86) [required us to override as part of our template method,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=344.66) [I'm gonna grab this code and just pasted over the top](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=349.7) [of these the same method signatures.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=353.96) [I just went ahead and implemented all of them.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=356.59) [And instead of our check out, we get the items from the car,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=361.24) [we set the gift preferences, and I'm just sip,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=364.09) [signifying what we would do in an usual checkout process that doesn't](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=367.19) [have anything to do with our actual method pattern.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=372.85) [You see how the hooks are there and you can do what you want with it.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=375.86) [Then we process the payment.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=379.28) [We're gonna process it without the card being present because it's a Web order.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=381.34) [And then we're gonna ship the item to an address and email that final receipt.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=384.9) [Let's go ahead and look at our demo now and see if this will run for us.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=389.63) [Right click run as Java application and you'll see we have our](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=393.94) [Web order and we get all the items from,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=401.3) [Marquardt said.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=403.88) [The gift preferences delivery address billing,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=404.97) [address all of that information and then process that](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=407.28) [payment without the card present e mail them re seat and](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=410.68) [ship the item to that address.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=414.29) [Now the beauty of this is we can add a whole nother order type,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=416.9) [and we don't have to change our order.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=422.24) [Template it all.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=424.1) [The algorithm stays the same.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=424.89) [I have actually gone ahead and already done that.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=426.94) [I've created a store order, and as you can imagine,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=428.71) [it's quite similar to the Web order.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=432.4) [Fact.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=434.78) [Let's set these two side by side.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=435.05) [Just we can see him here store order with its methods,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=436.62) [do check out due payment, do delivery and do recede.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=440.39) [And then there's the Web order next to it,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=443.79) [with the exact same things we have stored on Web](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=445.85) [order with Do check out due payment, do delivery and do receipt.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=448.16) [But it's different implementations for each one of those methods.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=451.84) [The algorithm is gonna be called the same.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=456.18) [We have our recipe.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=457.99) [I like to think of it.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=459.84) [This is an example of building out just example of cookies.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=460.55) [It's the same gonna end up with the same result.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=464.64) [We just have a different recipe for it, but we go through.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=467.11) [The same exact steps are checkout, payment, delivery and recede.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=469.37) [Now, if I go back over to our demo and a NCAA meant this,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=473.7) [our order templates stays the same.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=481.14) [And when we run it,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=484.79) [we get all of our output for a Web order and Oliver output for a store order.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=489.54) [Completely different set of business rules are](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=494.18) [different implementation for each order,](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=496.42) [but the same algorithm or same rules applies.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=498.53) [It's just handled differently.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=501.71) [Great pattern.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=503.84) [A great way to reuse this and frameworks.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=504.66) [You'll see it all the time with J D B C code and like spring](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=507.83) [JDC template or other tools like that, you're mapping in data layers.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=511.06) [It's a very powerful way to guarantee things get done in a certain order of operations.](https://app.pluralsight.com/course-player?clipId=cb68dbcb-ce93-4d00-9b18-3633c8e3baa9&startTime=515.94)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c)

[[Autogenerated] what are some of the pitfalls of a template method.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=0.64) [You need to make sure that you restrict access to certain methods correctly.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=3.54) [Also, it is important to implement hooks and operations correctly as well.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=8.44) [The template method can create a confusing class hierarchy,](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=13.44) [typically in an object oriented structure.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=17.54) [We don't interact with an algorithm across multiple classes.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=19.7) [Usually objects contain the entire a unit of work,](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=23.84) [where with the Temple of Method,](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=27.2) [it is purposefully divided across multiple classes.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=28.78) [And overall, depending on how many templates you make,](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=33.04) [it can make for a difficult program flow.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=35.69) [I do like this pattern, though,](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=39.64) [and the template method makes for a great use of implementing an algorithm.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=41.36) [Let's compare it with different patterns to see more of its particular benefits and which situations you should use it in.](https://app.pluralsight.com/course-player?clipId=081411d0-7abe-4cae-a12d-d5e23955968c&startTime=46.04)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5)

[[Autogenerated] to contrast, the template meant that pattern.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=1.54) [Let's compare it with this strategy.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=3.58) [Both patterns are focused on the algorithm.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=6.34) [The template method is focused on the same algorithm,](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=9.54) [but with different implementations.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=12.51) [Though it is always class based,](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=14.51) [the template extends the base class and concrete implementations](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=18.64) [just implement pieces or hooks in the algorithm.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=22.1) [The temple method is also chosen at compile time.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=26.27) [The strategy, on the other hand, implements the entire algorithm per strategy.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=31.84) [The strategy is also Maura about the contract or the interface.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=37.34) [Another major difference is that this strategy has always used when you](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=42.24) [need to pick the algorithm at runtime he intended.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=45.7) [This pattern is to allow the client to select while using the application where,](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=49.95) [with the template method,](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=55.33) [we've defined that beforehand and are aware of what we want to use at compile time.](https://app.pluralsight.com/course-player?clipId=70c1316f-cd02-4e20-913e-3a5a4eab29e5&startTime=56.41)

### [Summary](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2)

[[Autogenerated] Let's quickly recap what we learned about the template method.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=1.64) [It guarantees algorithm adherents.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=5.44) [It's commonly used in IOC containers and is often referred as thehunt Leawood.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=8.54) [Principle.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=13.55) [Don't call us, we'll call you.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=14.62) [It's a easier implementation, then the strategy.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=17.49) [As far as how we're going to interact with this algorithm,](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=21.48) [there's typically just a method that we hook into and just have to](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=25.86) [build out that simple piece of the algorithm.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=29.12) [The next pattern that we're going to look at is the visitor pattern, and that is the last one of the behavioral patterns.](https://app.pluralsight.com/course-player?clipId=7964dcb0-6cb3-48a7-b351-a160ade098d2&startTime=34.44)

## [Visitor Pattern](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050)

### [Introduction](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050)

[[Autogenerated] Hi, this is Brian Hansen,](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050&startTime=1.54) [and in this module, we're going to look at the visitor design pattern.](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050&startTime=3.45) [The visitor pattern is a great way to separate an](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050&startTime=7.24) [algorithm from an object structure. Let's look at the concepts when choosing this pattern.](https://app.pluralsight.com/course-player?clipId=4dd52de5-eddc-4d66-9eba-06c12a96c050&startTime=10)

### [Concepts](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db)

[[Autogenerated] the concept surrounding why you would choose](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=1.94) [the visitor pattern or that you want to separate the](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=3.8) [algorithm from an object structure.](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=6.85) [There are many reasons as to why you might want to do this,](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=9.74) [but the key reason is typically that you are expecting a lot of](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=12.56) [change and adding new features and can't modify the existing object](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=15.37) [structure that you've already created.](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=20.52) [This approach helps us maintain the open closed principle in our design.](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=22.84) [The visitor class contains the changes and specializations](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=29.5) [rather than changing the original object.](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=33.9) [Examples of this in the job a p I r a little bit obscure,](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=37.54) [but actually our great implementations of the pattern the Java laying](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=41.44) [model element element class and its corresponding visit earthy element](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=46.16) [Visitor are great examples of this pattern,](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=51.73) [but they're typically used for the internals of language itself and processing.](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=55.24) [How the language gets compiled, interpreted. Let's look at the design considerations of this pattern now](https://app.pluralsight.com/course-player?clipId=d0eac11a-0c46-441a-8c33-ddfb459d61db&startTime=59.51)

### [Design Considerations](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886)

[[Autogenerated] the design of the visitor is interface base.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=1.14) [There is a twist with the visitor pattern,](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=4.48) [though, and it is that we must design around the visitor from the beginning.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=6.3) [It's hard to retrofit after the fact the application has elements,](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=10.59) [and these elements are the pieces that we expect to change](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=15.92) [and need to add functionality to overtime.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=18.82) [The way we add to this changes by implementing a](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=22.14) [visitor in each of the elements.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=25) [Each element has a visit method, and each visitor knows of every element.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=27.64) [The pieces of the UML diagram are a visitor,](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=34.44) [a concrete visitor, an element and a concrete element. Let's look at that UML diagram now.](https://app.pluralsight.com/course-player?clipId=4652f2e9-61b1-4db5-8899-bed3e0c93886&startTime=38.22)

### [UML Diagram](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f)

[[Autogenerated] This is the UML diagram for the visitor pattern.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=1.44) [It is a little busier than most of the other patterns that we have looked at.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=4.54) [The client creates elements which are all instances of the element interface,](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=8.99) [the elements air, all some form of a concrete element.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=16.54) [And this is really where the pattern and the](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=20.17) [abstraction of the algorithm comes into view.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=21.99) [Instead of changing the concrete element every time](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=24.94) [that we want to add functionality,](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=27.72) [we instead architect it to have an except method on a visitor.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=29.76) [The visitor has a concrete element method for each type of](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=35.24) [element that we want to interact with.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=40.67) [Finally,](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=43.54) [the types of visitors that we want to create are contained in concrete visitors.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=44.17) [You can have multiple concrete visitors.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=49.44) [In fact,](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=51.58) [it's encouraged to do so realized that this is where our changes will take place rather than in the elements themselves.](https://app.pluralsight.com/course-player?clipId=65d96e35-4358-4f8d-b3a4-c24af73f996f&startTime=52.05)

### [Example: API](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461)

[[Autogenerated] the examples from the core Java A P I.](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=1.44) [R.](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=4.16) [Someone of ex cure and not representative of an](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=4.46) [everyday example for this pattern.](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=7.11) [Instead,](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=9.71) [we're going to look at a larger example of creating our own and walk through, creating two visitors.](https://app.pluralsight.com/course-player?clipId=e3c76ce2-f83d-4e5a-8eb0-05cdd6d50461&startTime=10.56)

### [Demo: Visitor](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a)

[[Autogenerated] to demonstrate the visitor.](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=0.94) [We're going to first look at the same set.](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=3.06) [A code written without using thieve.](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=5.45) [Is it?](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=8.29) [Er, pattern.](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=8.53) [And then we're gonna turn around and create our own visitor](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=9.43) [using a visitor interface element interface, concrete visitor and a concrete element.](https://app.pluralsight.com/course-player?clipId=9003d7a5-0f96-429b-a08b-1a2d41aa5d8a&startTime=13.64)

### [Demo: Without Visitor](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267)

[[Autogenerated] to demonstrate the visitor of gun ahead and created](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=1.74) [an application without using the visitor pattern to demonstrate how](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=5.02) [you may write this code historically.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=9.74) [And then we're going to adapt that code to use a](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=12.14) [visitor in the next example to start off.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=14.27) [This is an actual example I have used on a client project a few years back,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=18.18) [and we go ahead and create orders for a TV parts.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=23.97) [So we have a parts order, and I've kept it quite simple.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=28.39) [It just added a will offender and oil,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=32.27) [and then we're going to eventually go through and calculate](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=34.81) [shipping on this and to keep everything the same,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=37.77) [I've gone ahead and created an A T V part interface so](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=40.66) [that all of the parts are of this type.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=43.62) [And you see,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=47.04) [Fender just implements that oil implements that and our will implements,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=47.59) [that is, Well, then we have our parts order.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=51.99) [Our parts order has a few methods inside of here.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=55.31) [It creates an array list apart.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=59.24) [And then we have an ad part method that just add it to our list,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=61.05) [and then we can get all of our parts, as you could see in the visitor demo.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=65.34) [I had already gave a hand test.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=70.47) [What we're gonna d'oh gonna calculate shipping now?](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=72.22) [This method currently doesn't exist.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=75.97) [So let's go ahead and create that method inside of our parts order.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=77.97) [And we probably want to go through and just it right through all over parts](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=82.74) [and go ahead and start calculating shipping on there.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=88.44) [Now,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=92.44) [we could go about this a poor man's way and just put an if](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=92.7) [then else in here of all of our parts.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=96.68) [But since we're in a pattern,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=98.66) [of course we're gonna try and apply some of things that we](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=100.2) [have learned here and just good old principles about how we](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=102.51) [want to navigate through this.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=105.76) [But we're still going to say for each and then we would want to probably](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=107.16) [go through each part and start calculating shipping.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=113.51) [So it's a TV part dot calculate shipping.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=116.84) [Now you're starting to recognize that this is where the](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=123.39) [visitor patterns coming into play.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=127.42) [Currently, we don't have a calculates shipping method on the A.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=130.24) [T.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=133.67) [V part.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=133.84) [We're gonna open up that interface and say,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=134.94) [Well, sure,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=137.13) [we want to add this public double calculate shipping method in](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=137.89) [here and save that and then you'll notice that we just broke](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=144.85) [the only three parts that we have.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=149.52) [But I have to go through and add that code to all of these.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=152.32) [So I'm gonna come through here right now.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=158.34) [It's gonna return.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=159.85) [Zero.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=160.56) [Let's just say that for offender.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=161.51) [It's pretty easy to ships were gonna return a three here and for oil.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=163.66) [We're gonna do the same thing.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=169.07) [We want to calculate shipping.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=171.34) [It's hazardous.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=173.84) [So it's gonna be $9 to ship that and then for Will's since their bulky,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=174.87) [we're going to do the same here.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=183.33) [And we're going to say that it costs them $12 to ship those.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=186.44) [But you quickly realize I've had to go through and](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=191.74) [change every product that we've had.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=194.19) [Now imagine if I had thousands products and thousands of different](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=197.74) [objects that we can go through and create these Now,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=200.92) [of course, we could probably do some stuff in base classes,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=203.28) [but that's not the point.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=206.22) [This is just for shipping.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=208.14) [What if we start adding other things in here?](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=209.76) [We'll go back to our method here,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=212.62) [and we also broke this because this implements a TV part as well So](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=217.99) [we're gonna make this return a double now as well.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=222.75) [So now we've got our double shipping cost and we're going to go through and](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=226.54) [start calculating our shipping costs across all these parts.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=239.68) [So say shipping Cost plus equals a TV,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=243.44) [and then we're going to return shipping cost.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=249.52) [So you're starting to get the idea of any minor change I make.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=256.94) [We have to go through and modify all of those objects](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=261.24) [that we have inside the system.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=266.33) [We'll go back to our visitor demo now on,](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=267.78) [catch this double and now run it and we'll print it](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=270.34) [out just to see what it says.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=278.01) [But we kind of have an idea of what it's going to do anyways.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=279.85) [Well, say shipping cost.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=283.34) [Save that.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=286.3) [And now let's run.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=287.54) [This is a job application and we see that it came back with $24.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=288.32) [Okay, that's great.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=294.74) [Let's see how to solve this same problem using the visitor pattern and](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=296.06) [as well as adapt that to other things that we may want to do with those](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=302.3) [objects and notice that we don't have to change any of our base objects that we've already created.](https://app.pluralsight.com/course-player?clipId=4c2309e9-7397-4581-b142-0b16227ff267&startTime=306.48)

### [Demo: Shipping Visitor](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16)

[[Autogenerated] So this code base is right where we left off before adding](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=1.24) [wth e calculate shipping method in the previous example.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=5.09) [And I'm gonna show you how to use the visitor to do that instead of](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=8.97) [going through and adding those individual methods to each one of](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=12.44) [the elements that were working with.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=16.15) [So in this example, a TV part is playing the role of the element interface.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=18.38) [Where will fender and oil are taking the place of the concrete elements?](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=24.01) [Now, we haven't created our visitor interface or are concrete visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=29.83) [Yet besides that, this examples exactly the same.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=33.98) [So if I look at our A TV part now and the A t.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=37.52) [V.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=40.44) [Part that we just created to do calculate shipping,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=40.58) [you see that we added that calculate shipping method inside here.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=43.92) [What?](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=46.74) [We're gonna do the same thing with accepting the visitor in this example?](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=46.88) [So let's go ahead and say public void,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=51.24) [except we're gonna taken a TV part visitor in this](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=55.78) [Now we haven't created that yet, and we're gonna go ahead and save this.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=64.63) [Now you'll see that it automatically broke my will](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=70.64) [fender oil and parts order objects.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=74.3) [And that's because we don't have that method in here for except yet I have,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=77.62) [in my demo notes an example this already copied,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=83.61) [and that's just a safe time of us implementing this.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=86.87) [So let's go through here and paste that in there,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=90.34) [paste that in there and paste this in here.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=96.94) [And all this is is just the unimplemented method,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=100.4) [and you'll notice one thing that's a little weird with this is the method.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=103.28) [Signature is exactly the same for all of these visitor dot visit this.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=108.25) [That's one complaint I see people have about the visitor pattern all](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=113.38) [the times that we add this generic method in there.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=116.13) [It's the only way for us to get this hook in there with the](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=118.56) [way that this is built from the ground up.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=121.38) [Now we can go ahead and create are a TV parts visitor,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=126.09) [and this is a basic interface that the concrete interface it](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=130.64) [the concrete visitors are going to extend from sewing right](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=135.36) [click and say knew interface.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=138.93) [And this is the A TV part visitor and we'll click finish.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=142.89) [And now this is still gonna break because each one of these the will,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=152.44) [the fender of the oil,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=156.98) [the parts Order does not have a visit method in here yet we can go](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=157.87) [through and use the quick fix to create this.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=161.4) [And it will add that to this method, automatically go through an ad,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=165.72) [this method again being add fender, Say that been going do the same thing in oil.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=170.64) [And this is just finishing out that hook inside of our parts visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=181.14) [So now we have all of these pieces in here,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=187.44) [and I have gone ahead and commented out this one inside of the parts order.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=189.99) [And I did that because I wanted to talk about this for](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=197.01) [a little bit as we went through it.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=199.38) [This is a little bit different because this container](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=202.14) [builds the whole piece of our order.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=205.2) [And so it references the other a TV parts or elements that we](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=208.59) [have as well as itself as part of this visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=212.81) [So let me go ahead and add the final method in sight of our parts visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=216.5) [So now we have our element interface,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=221.95) [which was a TV part and our visitor interface,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=225.7) [which is the A TV parts visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=228.64) [From here.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=231.54) [We can go ahead and create our own concrete visitor](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=232.45) [because this is the interface.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=237.82) [Now we want to go through and create a concrete implementation of this.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=239.63) [So if we look at our demo right now, instead of saying ordered out,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=244.47) [calculate shipping,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=248.33) [I'm gonna say order dot except new a TV parts shipping visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=250.09) [If we go ahead and create this class, it will go through and say,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=257.64) [Oh, we want to create this class with a TV parts visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=263.16) [Let's go ahead and click finish and it will go through](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=266.27) [and stub out all these methods for us.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=270.74) [Now what happens as we cycle through this?](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=273.49) [Calculating the shipping is done in this class rather than](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=276.43) [in the individual elements that we had.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=279.96) [So instead of putting that in fender oil parts order and will,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=283.36) [it gets done in this class here.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=287.56) [So to do this, we now could just go ahead and say,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=290.44) [Well, let's do a double shipping amount and set that equal to zero.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=293.72) [And then we come inside of each one of these elements and calculator shipping,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=301.04) [and it's different for each one.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=304.67) [We could direct them to one method if we wanted Thio,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=306.21) [But will you say, Well, let's ah set the shipping amount equal to $15.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=308.8) [And we could even do a little bit of reporting inside of here if we want.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=318.04) [We say system dot out dot print Lynn,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=321.59) [That Will's are bulky and expensive to ship and finish that off.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=326.64) [And now we've got this done for the will.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=338.04) [We could do the same thing for fender oil and our parts order.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=340.41) [Now I'm gonna go through instead of you just watching me.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=344.62) [Type these all out.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=347.75) [I have these already done.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=348.81) [I'm gonna copy them in.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=350.62) [So the same code.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=352.06) [Go ahead and grab that method for all of these.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=356.14) [And copy that in to our shipping visitor and paste this in.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=362.54) [Now, let me make this full screen just so you can see this for a second.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=372.64) [I've got the will were shipping $15 the fender shipping $3 oils, $9 notice.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=378.94) [I have the algorithm in the logic tied to this inside this class,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=386.98) [it's not spread all over all the fender oil will and any](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=392.43) [other a TV parts that we may have.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=396.92) [I ran into this in the real world example that I had where](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=399.24) [we started combining parts and there was no shipping](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=402.31) [because it was a combined part.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=405.41) [So instead of charging for a will on a rim,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=406.98) [it was just one shipping cost instead of two individual ones.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=409.54) [You see how they're some business logic that can get tight into these,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=413.17) [which is a good thing now.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=416.46) [The one piece that I want to talk about down below here is this Visits,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=418.2) [parts order.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=421.28) [We can add some logic in here if there's a certain number of](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=423.44) [parts or rebates or things like that where we reduce the](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=426.07) [shipping amount and calculate that as well.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=429.14) [So now our parts order is very simple.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=432.79) [It looks just like our other example did with one slight little change](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=436.1) [instead of it being us calculating the shipping.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=442.18) [We just have a visitor, and we visit this one method.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=445.57) [So we have our visitor that goes through and we just visit ourselves,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=449.44) [and now we can run this to see what it does inside of our visitor.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=455.34) [Demo looks just the same.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=460.23) [We've swapped out the except this visitor with that calculate shipping.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=462.05) [We can right click on this now run as job application and you'll see that](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=466.84) [we have a whole set of text to go with what we're doing,](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=471.95) [and it will calculate our entire shipping costs to see what we have.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=476.76) [And none of that logic was added into those individual objects.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=481.06) [So it's the difference of kind of dealing with a rich](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=485.29) [domain with utilizing this visitor to give us back the information that we're expecting.](https://app.pluralsight.com/course-player?clipId=c0747bd9-b26a-4032-b871-138c2aeeec16&startTime=487.33)

### [Demo: Display Visitor](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043)

[[Autogenerated] to really illustrate the power of the visitor.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=0.84) [Wanted to go ahead and quickly create another visitor inside](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=3.51) [this code with you to show you that you don't need to add](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=8.29) [anything else but the visitor to it.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=11.66) [So I'm gonna copy this line,](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=14.37) [and we're gonna create an A T V parts display visitor.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=17.74) [And the display visitor is going to just go through and](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=22.64) [display what we already have inside of our order to create](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=25.46) [this To create this a TV parts display.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=30.04) [It's gonna implement the A TV parts visitor.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=33.17) [We'll click, finish, and I'm basically done.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=36.64) [I'm gonna go through an ad,](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=40.58) [a system that out print Lynn and we're gonna say that we have a](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=42.64) [wheel and save that we can do the same thing.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=48.3) [We can go through with fender and oil, and then we finally have our entire order.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=55.67) [When you say that we have an order and that's all I had to dio I don't have](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=75.24) [any other code that I need to implement anywhere else.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=80.7) [My order stays the same.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=85.24) [My actual individual objects stay the same.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=87.27) [Now I can go through my visitor demo and just add this one, Colin site of here.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=92.04) [If I run this,](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=97.52) [it will go through and do the shipping visitor as well as the display visitor.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=101.64) [And I didn't have to go through and change any other code inside my application.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=107.55) [So you can really see the power of the visitor and how it allows us](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=111.69) [to add functionality to our application without changing other parts of the structure inside of our app.](https://app.pluralsight.com/course-player?clipId=ea497ebe-d370-4bfc-8119-a8d94e5f4043&startTime=115.69)

### [Pitfalls](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834)

[[Autogenerated] What are some of the pitfalls of a visitor?](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=0.74) [You have to plan on adaptability.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=3.34) [This could be a little bit troublesome and lead toe over architect.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=6.74) [In your application, you may build inflexibility that has never needed nor used.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=10.34) [Thean direction of working with an object outside of its](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=16.44) [domain can be a little confusing as well.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=19.06) [Each visitor may not implement all of the methods,](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=22.44) [so you may want to implement the adapter pattern.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=26.36) [This isn't much of a pitfall, but it does add to the complexity of the visitor.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=29.34) [We cover the adapter and an earlier module,](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=34.44) [and to solidify the usage of the visitor, let's contrast it with another pattern.](https://app.pluralsight.com/course-player?clipId=b748178e-5c03-41a7-87e2-3aedfcb09834&startTime=37.23)

### [Contrast to Other Patterns](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7)

[[Autogenerated] to contrast the visitor.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=1.44) [Let's compare it with the generator.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=3.23) [The visitor is interface based.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=6.14) [Its focuses on adaptability through Externalizing changes,](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=8.66) [adding visitors is easy and encouraged.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=14.04) [The interrogator, on the other hand,](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=18.47) [is also interface based but is typically implemented](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=20.36) [using an anonymous in her class.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=25.17) [The IT aerator encapsulates navigation but doesn't necessarily externalize it.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=28.11) [Although weaken implement multiple types of it aerator, we typically only have one inside of our application.](https://app.pluralsight.com/course-player?clipId=d8f35677-534e-4677-ba56-56a1af207eb7&startTime=34.24)

### [Summary](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3)

[[Autogenerated] Let's do a brief recap of what we've](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=1.24) [learned with the visitor pattern.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=3.11) [We want to use this pattern when we're expecting](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=5.24) [changes inside of our application,](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=7.33) [but we don't necessarily know what they might be up front.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=9.78) [It does add a touch of minor complexity to the application,](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=13.84) [but nothing outside of standard object during innit principles.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=17.79) [And we use this pattern when we want to externalize change.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=21.74) [So if we can't change the base a p I once we've deployed it,](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=25.09) [the visitors a great way to go ahead and add functionality without](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=28.66) [changing what we already have inside of her application.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=32.25) [It's also a great way for us to have tests inside of her](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=35.84) [application that we're not breaking the contract with by adding functionality down the road.](https://app.pluralsight.com/course-player?clipId=9d9541d9-1837-4ea2-8edb-196384c524c3&startTime=38.98)

## [What Next?](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca)

### [What Next?](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca)

[[Autogenerated] Well, if you're seeing this slide,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=1.54) [you've made it through the design patterns behavioral course,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=3.12) [and I want to thank you for staying with me through the whole thing.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=6.71) [If you're wondering what toe look for next,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=9.94) [if you haven't already taken the 1st 2 parts of this course the](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=12.5) [design patterns in Java creation all course and the design](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=16.06) [patterns and Java structural course,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=20.12) [I would definitely recommend watching both of those videos to](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=22.05) [see the other counterparts of the three groups of patterns from](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=25.98) [the Gang of Four design patterns.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=30.11) [Some of my other popular courses are Maven Fundamentals,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=32.43) [Spring Fundamentals, Introduction to Spring,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=36.21) [NBC and Introduction to Spring, NBC.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=39.35) [Four.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=42.01) [Those do build on top of one another,](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=42.92) [so I would recommend watching the spring NBC one first and](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=44.88) [bringing me see for one next and then spring with J.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=48.07) [P and hibernate and finally, spring security fundamentals.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=52.16) [And I'm also open and would like to hear feedback from you on](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=56.54) [other courses that you would like to see.](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=60.99) [You can reach out to me on my Twitter handle or my linked in](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=62.92) [profile that are at the beginning of each slide. Thanks again](https://app.pluralsight.com/course-player?clipId=9a5cf936-9975-43b0-b8ab-73758b70f3ca&startTime=66.36)