[Course Overview](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live" \t "psplayer)

[Hi everyone, my name is Filip Ekberg, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=0) [welcome to my C# Design Patterns course](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=8.593142857142858) [covering the command pattern. I am a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=10.9792) [principal consultant and CEO at a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=14.118333333333336) [consultant agency operating out of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=15.811) [Gothenburg in Sweden. I started the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=17.859) [company a few years ago, and focus on](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=20.252) [building fast, powerful, and easy to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=22.6605) [maintain solutions. This course is for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=25.359999999999996) [those of you that want to learn how the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=27.139555555555557) [command pattern works, and how to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=29.387857142857143) [implement that in your C# applications. We](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=31.696) [will cover everything that you need to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=34.407) [know to master this pattern. This includes](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=35.548) [what the command pattern is, and its](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=38.98771428571428) [characteristics; understanding the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=42.06033333333333) [benefits and tradeoffs when using the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=43.4786) [command pattern; how to implement the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=45.81680000000001) [command pattern in new and existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=47.79949999999999) [solutions; as well as identifying and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=49.852000000000004) [leveraging existing implementations. By](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=53.230000000000004) [the end of the course, you'll feel](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=55.82933333333333) [comfortable with implementing the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=57.224) [pattern in your applications. This will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=59.245000000000005) [allow you to build reliable, more](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=61.75528571428571) [extensible, and testable applications.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=64.05460000000001) [Before beginning the course, you should be](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=66.729) [familiar with the C# syntax, and how to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=68.319) [build and run .NET applications. No other](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=70.651) [prior knowledge is necessary, so I really](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=73.76333333333332) [hope you'll join me on this journey to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=76.00433333333334) [learn all about working with this very](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=78.06557142857142) [powerful design pattern, with the command patterns course, at Pluralsight.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=4de0d67c-49de-4cee-8d11-4d0f587d18e3&clip=0&mode=live&start=80.59259999999999)

[Command Pattern](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live)

[The Command Pattern](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live)

[Welcome to a C# Design Patterns course. My](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=0) [name is Filip Ekberg, and in this course](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=4.78) [we're going to learn everything about the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=6.503666666666667) [command pattern, a behavioral design](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=9.1115) [pattern which can be applied in a lot of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=10.827999999999998) [different types of applications. If you've](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=13.32177777777778) [been coding C# for a while, you might have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=15.11475) [already encountered this pattern. So this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=17.55214285714286) [course will cover both understanding and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=19.45333333333333) [implementing the command pattern, as well](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=21.528000000000002) [as identifying and leveraging existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=24.078) [implementations, and much like other](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=27.109) [patterns, the command pattern comes with](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=29.2952) [benefits and tradeoffs, and we will be](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=30.81928571428572) [learning all about that as well. A command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=32.86228571428572) [pattern can commonly be identified by](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=35.94133333333334) [these four different characteristics. We](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=37.913000000000004) [have the command itself, which holds the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=39.8385) [instructions and references to things that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=42.103) [it needs in order for it to be executed.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=44.483) [We have something called a receiver, which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=47.211) [is what the command will execute, and we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=48.995) [have an invoker. The invoker is what we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=51.4054) [use to execute the commands. It will also](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=54.204499999999996) [keep track of all our executed commands;](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=56.82799999999999) [and then finally, we have a client. The](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=58.888374999999996) [client decides which command to schedule](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=62.045) [for execution. If we translate these](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=64.41833333333334) [different things into what we might end up](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=67.06214285714287) [seeing in an application, the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=69.13125000000001) [could be something like an add to cart](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=70.787) [command. This command then communicates](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=73.23216666666664) [with our receiver, which in this case is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=74.76499999999999) [our shopping cart, and then our invoker](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=76.8604285714286) [could be the shopping cart command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=79.0627142857143) [manager. Although the command manager can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=81.0115) [be a lot more abstract than this, but](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=82.95787500000002) [we'll discover more about that later on in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=85.56528571428568) [the course; and then finally, our client](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=88.38875000000002) [could be the button in our interface. You](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=90.09262499999997) [click the button, it tells the invoker to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=92.599875) [schedule a command for AddToCart, when the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=94.41983333333333) [AddToCart command is executed, it talks to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=97.183) [our shopping cart receiver. The command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=99.77228571428572) [object contains all the data to process](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=101.69649999999999) [the request now or at a later time. This](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=103.86811111111112) [means that we could, for instance, execute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=107.03471428571429) [the command right away once the client](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=108.85014285714286) [schedules that command, or we could](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=110.99814285714285) [schedule all the commands to be executed](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=113.333) [later on in the lifetime of our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=115.342) [application; and also, imagine the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=117.011) [possibility of storing all the commands](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=119.12599999999999) [that have been executed. Then we could](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=120.6802) [replay the entire chain of commands. If we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=122.832) [look at the AddToCartCommand, it will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=125.37066666666668) [contain a few different things. It will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=126.97028571428571) [contain a reference to the product that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=129.071) [should be added to the cart. It will also](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=130.62442857142858) [need to know about the shopping cart, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=132.566125) [well as a way to check the stock](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=134.4496666666667) [availability. So this means that a command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=137.11033333333336) [contains all the pieces in order for the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=138.72575000000003) [command to be able to be executed, as well](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=140.80666666666667) [as a way for us to check if the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=143.63560000000007) [can be executed or not, because if the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=146.72666666666663) [stock runs out, that means that we can no](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=149.33150000000003) [longer execute the command because there's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=152.18149999999994) [no longer any products to add to our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=153.9114285714286) [shopping cart. As an example, we have this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=156.36900000000003) [simple WPF application. It lists a lot of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=159.06433333333325) [products, and we have our shopping cart.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=161.16850000000002) [Now, every button in this application will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=163.391) [in fact invoke a command. We have the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=165.22) [AddToCartCommand which will add this to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=167.5845714285714) [the shopping cart, we have the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=169.11350000000002) [ChangeQuantityCommand which will allow us](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=170.15) [to change the quantity, and then of course](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=171.702) [we have all the other button commands as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=173.496) [well. What's interesting with the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=176.10488888888895) [is that it will allow us to check if the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=177.5045714285714) [command can be executed or not, and that's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=179.31177777777773) [reflected in our interface here because](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=181.95214285714283) [the buttons for a few different products,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=183.42999999999998) [as well as the increased quantity button](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=185.15242857142857) [in our shopping cart are disabled. That's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=187.63528571428571) [because the products are no longer in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=190.42114285714285) [stock, and then that's another example,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=191.98728571428572) [the checkout button will only be green as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=193.603) [long as there are items in our cart. So](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=195.418) [given that our command manager could keep](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=197.68242857142857) [track of commands that have been executed,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=199.31385714285713) [that means that the command pattern can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=200.94116666666667) [easily be leveraged to allow us to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=203.0605) [introduce undo or redo functionality. As](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=205.19266666666667) [an example, if our application crashes and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=208.044) [we start it up again, then we might have a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=210.71677777777776) [list of commands that we executed prior to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=212.50300000000001) [the application crashing, we can then](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=214.739) [re-execute all the commands that we had](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=216.92899999999997) [prior to the application crashing, and we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=218.9748571428571) [would end up in a pretty similar state that we had earlier in the application.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=0&mode=live&start=221.02733333333336)

[Implementing the Command Pattern](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live)

[Let's now have a look at how we can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=0.799) [implement the command pattern in a C#](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=1.955) [application, and remember, the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=3.994) [pattern can be leveraged across all the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=6.084428571428571) [different types of C# applications. We are](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=8.56257142857143) [now inside Visual Studio 2019, and I'm](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=11.511714285714286) [looking at a console application. The code](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=14.338714285714287) [here for this console application would be](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=16.57057142857143) [possible to run on any different platform](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=18.71575) [that supports .NET. So you don't have to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=20.31075) [worry about running the examples on](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=22.90825) [Windows. Now this very simple application](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=24.904750000000003) [leverages to repositories. The repository](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=27.523833333333332) [pattern is a different pattern that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=29.680666666666667) [won't be covering in this course, but](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=31.74128571428572) [mainly, it allows us to now work with the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=33.63850000000001) [data without having to worry about if it's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=35.79311111111113) [in memory, or leveraging SQL Server, or](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=37.85749999999999) [anything like that. You see here that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=40.5765) [have our shopping cart repository, as well](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=42.603333333333346) [as our products repository. These two data](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=44.79385714285714) [stores allow us to work with both the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=47.38066666666667) [shopping cart, as well as all the products](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=49.66711111111111) [available in my system. The specific](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=52.2534) [implementations of our repositories aren't](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=54.72259999999999) [really relevant to the course. All that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=56.73457142857142) [need to know is how to interact with our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=59.85529999999999) [repository, but in this case here, the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=61.9635) [product repository keeps track of your](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=64.14114285714285) [different products. When we create a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=66.11) [product repository, it sets up a few](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=68.126) [example products that we have available in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=70.513) [our store, and then of course we can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=72.952) [perform Add, DecreaseStock, IncreaseStock,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=74.724) [get all of the different items that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=78.041) [have available, as well as getting the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=79.21966666666668) [stock and finding a particular item, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=81.08) [this is all backed by an interface that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=83.15225000000002) [call the IProductRepository. We then go](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=85.14800000000002) [ahead and find a product called SM7B,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=87.31033333333332) [which is a Shure microphone. We'll then](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=90.20212499999998) [proceed to add our product to our cart,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=92.88199999999998) [increase the quantity a few times, and if](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=95.635) [we run the application, it'll now tell us](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=97.90033333333334) [that we have added five SM7Bs to our cart,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=99.80544444444446) [and it'll tell us the total price. So our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=102.0778888888889) [goal now is to refactor this into](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=104.87550000000002) [leveraging the command pattern, because I](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=107.47449999999998) [don't really want to interact with my](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=109.56142857142855) [repository like this in my application. I](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=111.99566666666668) [rather like to have a layer that takes](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=114.6031111111111) [care of my instructions of what to do, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=116.556) [then this instruction can be leveraged](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=119.39857142857143) [across different types of applications. So](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=121.022) [the first thing that we need to do is add](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=123.8475) [our command interface. The command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=125.77775) [interface is simply the contract of how](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=128.22733333333335) [our command manager will interact with our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=130.36414285714284) [command. So I'm going to go ahead and add](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=133.03750000000002) [this to our business layer in the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=134.84580000000008) [application, and I will add both the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=137.31599999999997) [interface of our command, as well as the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=139.1393333333334) [concrete commands and the command manager](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=141.34499999999994) [inside my Commands folder in my business](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=143.24585714285718) [project. There are preexisting ICommand](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=146.28719999999996) [interfaces in the .NET framework,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=148.48799999999997) [specifically, they're living inside](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=150.649) [System.Windows .Input, and you can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=152.90679999999998) [leverage that in your applications. But in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=154.94924999999998) [this case, I simply don't want to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=156.67999999999998) [reference system.windows .input, so let's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=157.912) [introduce our own interface for our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=160.96385714285717) [command. Now our command will allow us to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=163.24237499999998) [execute, check if it can be executed, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=165.617375) [well as undoing the command itself. This](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=168.59542857142858) [here is now the contract of what we want](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=171.1303333333333) [our commands to look like in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=173.161625) [applications, and if you want to learn](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=174.93) [more about working with interfaces in C#,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=177.03962500000006) [there is a really good course on](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=179.298) [Pluralsight covering exactly how to do](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=181.077) [that. So now that we've defined how to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=183.94157142857136) [interact with a command, let's introduce a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=186.59074999999999) [command manager that allows us to execute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=188.9898571428571) [concrete commands. Concrete commands is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=192.68375) [simply implementations of this given](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=195.3038) [interface. We'll simply introduce](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=197.79725000000002) [something that we call a command manager](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=199.10999999999999) [because it doesn't have to be specific to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=201.27514285714284) [working with our shopping cart, we could](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=203.86387499999995) [call it ShoppingCart CommandManager, but](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=205.8626666666667) [this will allow us to interact with any](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=207.54820000000004) [type of command. Remember that I said](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=210.3403333333333) [earlier that the CommandManager will keep](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=212.58428571428576) [track of both executing, checking if the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=214.64449999999997) [command can be executed, as well as having](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=217.11900000000003) [a list or a stack of the commands that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=219.77788888888884) [have previously executed. So let's first](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=222.68500000000006) [introduce our stack of commands that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=224.83800000000002) [have executed in this session of our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=226.94385714285715) [application. So why do we want to use a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=230.3575) [stack for this? Because we want to use a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=232.5368181818182) [last in and a first out data structure,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=234.14100000000002) [that allows us to then undo our commands](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=236.01249999999996) [in the correct order. The CommandManager](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=238.69100000000003) [will have two public ways of us to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=240.86399999999998) [interacting with the manager. We will have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=243.56050000000005) [an Invoke method that allows us to invoke](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=245.49024999999997) [our command. This will first have to check](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=247.50119999999998) [if the command can be executed. If it can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=249.6315) [be executed, we push this into our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=251.9886666666667) [commands stack, and then execute the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=254.14462500000002) [command. Then we will also want a way for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=257.0763750000001) [us to undo all the commands in our stack.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=259.22827272727267) [Okay, so the CommandManager now allows us](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=261.415) [to invoke a particular command. It puts it](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=263.385) [onto a stack when we want to execute the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=265.55520000000007) [command, and then we also have a way for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=267.64649999999995) [us to undo all the commands that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=270.37050000000005) [executed. You can play around with the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=271.96775) [CommandManager yourself. There are a few](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=273.422) [interesting things that you could try and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=275.8350000000001) [implement on your own. For instance, you](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=277.55628571428576) [might want to execute your commands at a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=279.61557142857134) [later time, or you might also want to be](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=281.9496666666667) [able to save all the commands that have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=283.93266666666676) [previously been executed, and re-execute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=285.714) [the entire list of commands when you rerun](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=287.3405714285715) [the application, although that's a little](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=290.6453333333334) [bit out of scope for this course. So now](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=292.29800000000006) [we have our CommandManager, now we need to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=294.124875) [introduce a few different concrete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=296.49842857142846) [commands that allows us to interact with](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=298.00849999999997) [our shopping cart, as well as our products.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=1&mode=live&start=300.5402857142857)

[Implementing and Executing Concrete Commands](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live)

[So, first of all, we'll add the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=1.14) [AddToCartCommand. Our AddToCartCommand](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=2.717) [needs to implement CanExecute, Execute, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=5.032) [well as Undo, and remember that the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=8.350875) [command needs to contain all the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=10.233) [information for it to be able to execute,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=12.648) [and of course there are different](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=15.41) [implementations of the command pattern. In](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=16.539) [some implementations, the CanExecute, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=19.101399999999998) [well as the Execute method might take](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=21.472) [parameters, like in WPF for instance, it](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=23.635) [will pass a parameter to Execute and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=26.3965) [CanExecute. Although I'm a firm believer](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=28.605) [that the command itself should take all](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=30.901) [its parameters in the constructor to make](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=33.0185) [it easier for you to execute these](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=34.97442857142859) [commands without having to rely on any](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=36.836571428571446) [external input as the command is being](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=39.15728571428572) [executed. That means that our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=41.643714285714296) [AddToCartCommand needs to know about the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=43.411666666666655) [product, the ShoppingCartRepository, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=45.1266) [well as our products repository. I've now](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=46.7788) [introduced the constructor in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=50.138999999999996) [AddToCartCommand. It takes on interface](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=52.444) [for our ShoppingCartRepository, as well as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=54.87) [an interface for our productRepository,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=57.597) [and what's interesting here is that our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=59.476) [commit now doesn't work with any concrete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=61.229) [implementations, except for the product,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=63.303) [which is only a simple model, but although](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=65.117) [we work with are these interfaces, which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=67.59185714285714) [means that depending on a situation, we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=69.46966666666667) [might use different implementations for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=71.8965) [the shopping cart. So now we are pretty](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=73.66640000000001) [much ready for us to implement CanExecute,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=75.85249999999998) [Execute, as well as Undo. We'll start off](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=77.84128571428573) [by implementing Execute. We simply want to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=81.70799999999998) [check if the product is not null when we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=83.54433333333336) [execute this command. If the product is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=85.56157142857144) [null, we'll just return from the method,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=87.32499999999999) [when we execute our AddToCartCommand, we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=89.03957142857143) [want to make sure that we decrease the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=90.69099999999999) [stock left, as well as adding this to our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=93.11162499999999) [shopping cart, and you'll notice here that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=96.57599999999998) [on our productRepository we have a method](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=98.09600000000003) [called DecreaseStockBy. It takes the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=100.33883333333334) [ArticleId, as well as the amount that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=103.18939999999998) [want to decrease the stock by, and then we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=104.99388888888893) [simply add this to our shopping cart, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=107.47937499999998) [now we have our execute method implemented](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=109.13777777777776) [for our AddToCartCommand. Let's also go](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=111.65900000000003) [ahead and implement our CanExecute method.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=113.99100000000001) [We can execute the AddToCartCommand as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=117.737) [long as the stock that we have available](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=119.21385714285714) [is greater than 0. The Execute and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=121.37625000000004) [CanExecute methods are the two methods](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=124.05599999999998) [that you commonly see on the ICommand](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=126.3355714285714) [interface, but of course in some](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=128.96616666666668) [situations, you also have the Undo method.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=130.56700000000004) [So let's implement this as well. So when](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=133.015) [we undo the AddToCartCommand, what we need](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=135.56400000000002) [to do is to put the items back where they](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=137.69918181818178) [belong, so increase the stock with the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=139.80900000000003) [quantity that we have in our shopping](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=142.22425) [cart, and then we simply remove all of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=144.03828571428573) [those lineItems from our shopping cart. So](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=146.759) [now we have a complete implementation of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=149.236625) [our AddToCartCommand, although in order](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=150.809) [for us to convert our code that we have in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=153.46400000000003) [our console application, there's one more](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=156.15949999999998) [concrete command that we need in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=158.294) [application. We need a way for us to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=160.57250000000005) [increase or decrease the amount that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=162.66588888888882) [have in our shopping cart. So I'm going to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=164.64474999999996) [add a command called](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=166.8737500000001) [ChangeQuantityCommand. The](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=169.17399999999998) [ChangeQuantityCommand will be used for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=170.3845) [both increasing, as well as decreasing the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=171.807) [amount of products in our shopping cart.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=173.558) [Therefore, our ChangeQuantityCommand will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=176.55) [have this enumeration of which type of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=178.911) [operation that we want to perform. You'll](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=181.107) [see that the constructor for our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=183.11571428571426) [ChangeQuantityCommand take the type of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=184.218) [operation, the two different repositories,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=185.852) [as well as the product that we want to add](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=188.644) [to our cart. When we execute our command,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=190.313) [we simply check, are we decreasing or](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=192.865) [increasing the amount of items in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=195.106) [cart, and then of course if we add](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=197.18937500000007) [something to the shopping cart, we'll](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=198.7563333333333) [remove an item from our stock, and we can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=200.23842857142856) [execute the ChangeQuantityCommand as long](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=202.92599999999996) [as when we're decreasing the amount in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=204.83700000000002) [shopping cart, the available quantity in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=207.5012857142857) [our cart isn't 0, as well as then when we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=209.73399999999998) [are adding something to the shopping cart,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=212.41724999999994) [we have items available in our restore to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=214.004) [add to our shopping cart, and of course,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=217.663) [we have the Undo operation implemented as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=219.622) [well. Now if we go back to our program, we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=222.04575) [want to get rid of the parts that are](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=224.3756) [interacting with our shopping cart](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=226.91) [directly. We simply want to, instead use](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=229.055) [our new command manager, as well as the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=231.07025000000002) [concrete commands that we have now](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=233.19157142857142) [introduced. So let's just comment that out](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=235.48700000000002) [for reference, we'll create two instances](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=237.10328571428565) [of our commands, we'll need to pass the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=239.5683333333333) [shoppingCartRepository, the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=241.909) [productRepository, as well as the given](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=244.32271428571428) [product that we want to add to our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=246.259) [shopping cart; and now we want to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=248.0181111111112) [introduce our increaseQuantityCommand as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=250.15500000000003) [well. We want to be able to change the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=251.946) [quantity of the amount of items that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=254.38333333333327) [have in our shopping cart. The operation](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=255.9943) [for this will be increased. We'll have a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=257.6832857142858) [reference to the shopping cart, to the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=259.782) [productsRepository, now we want to have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=262.1458571428572) [these executed through our CommandManager.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=264.5965) [So this here represents the conversion](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=267.714) [from directly invoking our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=270.4842857142856) [shoppingCartRepository into using the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=272.4) [commands with our CommandManager. Now when](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=274.332) [we call manager.Invoke, it'll execute the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=277.2178) [command and add it to the stack of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=279.03899999999993) [commands that we have executed in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=281.261) [application. So if you run this here now,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=283.76324999999997) [you'll see here that we still have added](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=285.842625) [five SM7Bs to our shopping cart, the total](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=288.2301428571429) [is the same as we had earlier, so we can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=291.6267777777778) [now get rid of all the direct interactions](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=293.9051) [with our repository. What's of course very](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=295.86199999999997) [interesting here is that our console](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=298.26871428571417) [application now doesn't have to know](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=299.97900000000004) [anything about how to interact with our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=301.9175) [data store. It's up to the command to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=303.7615) [communicate with the receiver. So there's](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=305.65925000000004) [one final thing that I want to do in here,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=307.23485714285704) [I want to undo all the commands that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=309.1433636363637) [just executed. So if we tell our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=311.1609999999999) [CommandManager to simply undo everything](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=313.01750000000015) [that was just executed, and then we print](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=314.66999999999996) [our shopping cart, you'll see here that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=317.624) [first we have five SM7Bs. We have the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=319.8355555555555) [total price, and then when we print the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=321.9923333333334) [total price again, as we undid everything](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=323.56874999999997) [that we added to the shopping cart, the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=325.4957142857143) [price is now 0. This here illustrates how](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=327.98766666666666) [we can implement the command pattern in a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=330.4972857142858) [C# application. Of course, this adds a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=333.4877142857143) [little bit more complexity, and another](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=335.8918750000001) [layer to keep track of in our application,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=337.8901428571428) [but now we've separated our concerns. The](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=340.34785714285715) [console application no longer has to know](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=342.7834285714286) [about how to interact with our repository,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=344.961) [and with the CommandManager, we get the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=348.2102) [benefit in this case of also having the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=350.84566666666666) [Undo method on our command. So now you](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=353.55385714285717) [know the fundamentals of introducing the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=356.4012857142857) [command pattern in a C# application. Next](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=358.19575000000003) [up, we're going to look at an existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=360.59355555555555) [implementation in .NET, and how you can combine that with your own commands.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=2&mode=live&start=361.998)

[The Command Pattern in Action](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live)

[Let's now look at the command pattern in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=1.163) [action. We will have a look at an](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=2.875888888888888) [application that leverages an existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=4.591888888888888) [implementation of the command pattern, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=6.1979999999999995) [then of course we will make sure that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=8.271625) [can leverage the shopping cart commands](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=10.801499999999999) [that we introduced in the previous demo to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=12.299) [allow us to not only leverage an existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=14.571125) [command pattern implementation, but also](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=17.5118) [combine that with our own. We're in Visual](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=19.441) [Studio 2019 again, and we're looking at](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=23.268500000000003) [pretty much the same solution. I have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=25.619333333333337) [added one new project called the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=27.776500000000002) [ShoppingCart.Windows, so this will be a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=29.353) [WPF application, and the existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=31.773) [implementation of the command pattern will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=34.856) [be leveraging the commands inside WPF, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=36.783) [then inside our ShoppingCart.Business](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=40.8742) [layer, we have added two new commands. We](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=42.331) [have one called RemoveFromCartCommand, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=46.0424) [well as a RemoveAllFromCartCommand. So](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=48.889399999999995) [let's just have a look at those](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=51.471666666666664) [implementations. The RemoveFromCartCommand](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=53.380333333333326) [will simply grab the lineItem from our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=55.041000000000004) [shoppingCartRepository, increase the stock](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=58.258) [available in our store, and then remove](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=60.794) [all the items added to our shopping cart.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=62.916749999999986) [What's interesting here is that you'll](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=65.607) [notice that I haven't implemented the Undo](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=67.137) [logic. The reason for that is because the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=70.28700000000002) [command itself doesn't know how many items](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=73.046125) [at this point was added to our shopping](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=75.29075) [cart, we could of course, grab the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=78.31957142857141) [lineItem .Quantity here, store that inside](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=80.28314285714289) [our command, and then for an Undo, we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=82.4331666666667) [could add the same amount into our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=84.43888888888885) [shopping cart. But you can play around](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=86.63971428571428) [with that yourself. The next command that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=88.39899999999997) [I've added is RemoveAllFromCart. Of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=89.96085714285714) [course, what this is going to do is that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=91.39166666666667) [it's going to grab all our lineItems from](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=93.79050000000004) [our shopping cart. We'll then iterate over](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=96.2375) [all of these items. We'll increase the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=98.88399999999999) [stock again, and then we'll do pretty much](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=100.7076) [the same thing that we did in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=102.17425000000001) [RemoveFromCartCommand. We have these two](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=104.469) [new commands that will allow us to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=105.66850000000001) [interact even more with our shopping cart,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=107.139125) [and again the specific implementation of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=109.06933333333333) [our shopping cart repository isn't really](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=111.684) [relevant to this demo, it's simply just](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=113.96600000000001) [allowing us to work with the products and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=116.47650000000002) [the shopping cart. So now let's have a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=118.92585714285713) [look at our ShoppingCart.Windows](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=120.73750000000003) [application. This project is a simple WPF](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=122.3175) [application. We've defined the actions and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=125.89528571428568) [some of the content that we want inside](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=127.65450000000001) [our views using something called a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=130.206) [ViewModel, and then we bind this to our UI](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=132.05057142857143) [to allow us to have a separation of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=134.11099999999996) [concerns. So for instance, we have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=136.31966666666665) [something called the shopping cart](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=137.93671428571423) [ViewModel. The ViewModel contains all the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=139.6055) [information that we need in order for us](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=141.72133333333335) [to display the information and interact](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=143.7654) [with our particular view. This here has a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=145.65120000000002) [reference to our shopping cart, as well as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=148.30428571428578) [our products. We have two commands called](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=150.41311111111108) [RemoveAllFromCart, as well as the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=152.522) [CheckoutCommand. Then we have two](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=154.727) [collections, we have the Products, as well](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=156.248) [as the lineItems. So the Products is all](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=158.13840000000002) [the available products in our store, the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=160.28257142857143) [lineItems are all the products that we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=162.67800000000003) [have currently added to our cart, and this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=164.44785714285712) [pattern is very common when you're working](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=166.9196666666667) [with things like WPF, Xamarin, or back in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=168.84685714285717) [the day, even Silverlight. Now to first](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=171.6885555555556) [glance, you'll notice that the ICommand](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=174.053125) [that we leverage here is coming from](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=175.399) [System.Windows .Input, and if we have a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=177.559875) [look at this ICommand interface, you'll](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=180.128) [see that it has two things that we are](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=182.1341111111111) [very familiar with, it's the Execute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=184.19942857142857) [method, as well as CanExecute, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=186.026) [remember earlier I said that some](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=188.37857142857143) [implementations leverages a parameter](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=189.912) [passed to the Execute and CanExecute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=192.77) [method, we won't be using that in this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=194.641) [course, but you can play around with that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=196.902) [yourself; and then there's this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=198.795) [EventHandler that tell us if CanExecute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=200.109) [has changed. So this here is very UI-](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=202.315) [specific, which is the reason for not](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=204.662) [using this in our business layer. So how](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=206.64387499999992) [do we combine this with our existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=209.56255555555555) [implementation of our concrete commands?](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=211.71) [Well the way that we do that is by](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=214.312) [introducing a concrete implementation for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=215.689) [a command inside our WPF application. I](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=217.96233333333333) [call this the RelayCommand. It's a relay](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=220.7096) [that allows us to execute something which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=222.84050000000002) [we pass as an action to the constructor of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=225.01933333333332) [our RelayCommand, as well as doing the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=227.824) [same thing for a canExecute. So the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=229.94000000000003) [implementation for our RelayCommand is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=232.0186666666667) [very simple, we'll simply have our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=233.85085714285714) [CanExecute, as well as our execute method,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=235.632) [which simply call the corresponding](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=238.771) [actions and functions inside our concrete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=240.58599999999998) [RelayCommand, and then we can use this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=244.023) [together with our existing concrete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=246.523) [implementations of commands that we have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=248.487) [in our business layer. In this case here,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=250.15414285714277) [I set up a RemoveAllFromCartCommand, with](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=252.274) [a reference to our shoppingCart and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=255.36542857142857) [productRepository, and then inside our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=256.61) [RelayCommand whenever that RelayCommand is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=258.937) [executed, what I do is that I execute my](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=261.418) [removeAllFromCartCommand, as well as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=264.362) [making sure that I refresh our UI. Again,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=266.3892) [this here shows that I wouldn't want to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=269.45625) [have all of this logic inside my concrete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=272.07) [implementation that lives in a layer](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=274.942) [that's not UI-specific. So leveraging](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=277.02975) [something like a RelayCommand in this case](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=279.173) [is a really nice way for us to combining](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=281.1439090909091) [something that works across different](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=283.5358) [types of projects, like our implantation](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=285.99975) [of the command and the CommandManager,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=287.97085714285714) [with something like the command pattern](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=289.97880000000004) [implementation in WPF. Also notice here](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=292.65650000000005) [that I'm not in fact using our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=294.7950000000001) [CommandManager, so I'm directly](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=296.8156) [communicating with the commands, because](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=298.762) [right now I don't want any undo](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=300.555375) [functionality or keeping track of which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=302.546) [order the commands were executed in. Of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=304.835) [course, we could introduce a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=306.90233333333333) [CommandManager and use that as well, but](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=308.314) [you can play around with that yourself. So](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=310.1885) [now how do we use this inside our UI?](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=312.22499999999997) [Although this isn't a course on how to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=314.331) [build WPF applications, let's just simply](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=316.727) [have a quick look at how we leverage this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=318.639) [command inside our application. Inside our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=320.821) [WPF application, you can see that I have](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=323.67342857142853) [two buttons here, which simply references](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=326.07599999999996) [to commands inside my view model. It](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=328.70200000000006) [references the RemoveAllFromCartCommmand,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=332.35299999999995) [as well as our CheckoutCommand. So far we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=333.8992) [haven't seen the AddToCart or](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=337.83000000000004) [ChangeQuantity commands. Those live inside](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=340.6583999999999) [our product view model. So we have our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=342.80314285714286) [ICommand from System.Windows .Input for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=344.9986666666666) [both the AddToCart, IncreaseQuantity,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=346.9497999999999) [DecreaseQuantity, as well as our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=350.023) [RemoveFromCartCommand. But again, these](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=351.356) [are only RelayCommands. So what we do here](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=354.23299999999995) [is that we set up our AddToCartCommand,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=356.47609090909094) [the Increase and DecreaseQuantity](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=358.10525) [commands, as well as our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=360.10283333333336) [RemoveFromCartCommand, and these are all](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=362.017) [the concrete implementations that live](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=364.592) [inside our business layer, and then we](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=366.419) [leverage the RelayCommands to execute and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=368.556) [check if these commands can be executed or](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=371) [not, and running this application will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=373.528) [allow us to add product to the cart, and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=375.427) [you'll notice here how it automatically](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=377.97357142857146) [simply disables the button whenever the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=379.939) [CanExecute method returns false, because](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=382.732) [we cannot add more products to our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=385.41287500000004) [shopping cart if the stock has run out.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=387.435) [You'll notice here if I remove one of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=390.674) [these items, it'll allow us to add it back](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=392.0428888888887) [to the cart again, and if we add five](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=395.08439999999985) [Shure SM7Bs, you'll see that the total](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=400.2400000000001) [price is the same as we had earlier in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=402.349111111111) [console application. Under the hoods, WPF](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=405.24875000000003) [will leverage a command manager. It will](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=407.74299999999994) [make sure that whenever you press the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=410.11699999999996) [button, it'll execute one of these](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=411.968) [commands. This here gives you an idea of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=413.89699999999993) [an existing implementation in the real](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=415.9442222222224) [world. It illustrates how we can leverage](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=418.1348000000001) [the RelayCommand together with our own](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=421.2617142857143) [command pattern implementation inside our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=423.79783333333336) [applications. Again, one of the drawbacks](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=426.6430000000001) [of using the command pattern is that it](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=428.7212499999999) [does add another layer in our](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=431.134625) [applications, but now we have a complete](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=433.16225000000003) [separation of our UI, our ViewModel, as](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=435.836) [well as the command that's being executed.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=438.6105714285714) [The goal is of course to have maintainable](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=441.422) [solutions, and what's interesting here is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=444.066) [that if you want to introduce new](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=446.6766249999999) [functionality in your application, you can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=448.48885714285706) [simply introduce a new command without](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=450.4560000000001) [breaking existing implementations, which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=453.08449999999993) [of course is extremely important when](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=455.16780000000006) [building applications for our users. We](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=457.23675000000003) [want to make sure that we can extend the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=459.34209999999996) [applications without breaking things along](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=461.287) [the way. So now you've seen not only how](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=463.817) [to implement the command pattern, but](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=466.317) [you've also seen how this is used in](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=468.57099999999997) [existing implementations like WPF, as well](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=470.579) [as how you can leverage an existing](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=473.69849999999997) [implementation with your custom](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=475.6474) [implementation of a command pattern. I](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=477.485) [urge you to try and introduce the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=480.01325) [CommandManager in WPF, and introduce an](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=481.422) [undo button in your application, and maybe](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=484.599) [even do a redo button. So go ahead and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=487.41542857142855) [play around with the command pattern, and extend it your liking.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=3&mode=live&start=490.1124999999999)

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[In this short course, we covered the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=1.293) [command pattern. We looked at the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=3.039) [pattern characteristics, and identified](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=5.002) [that we now know that a command pattern](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=6.937250000000001) [consists of a command, the receiver,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=9.322666666666667) [invoker, as well as the client. This of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=11.760750000000002) [course gives us an understanding of how](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=14.72325) [the command pattern works. We talked about](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=16.494999999999997) [what a command is, and the fact that the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=18.423285714285715) [command contains all of the information](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=20.821999999999996) [that it needs in order for it to execute](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=22.431125) [now or at a later time. We got an](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=25.199199999999994) [understanding of why and how it can make a](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=28.409666666666663) [crucial part of the application more](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=31.003125) [robust, also making it more testable;](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=32.91257142857143) [because now we introduce a layer which](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=36.108) [contains these commands which are](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=38.161) [instructions for how to process certain](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=39.865) [data and instructions, and of course, the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=43.258) [command pattern allows for separation of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=46.212666666666664) [concern. We no longer have to tidily](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=48.105375) [couple our application with for instance,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=50.516) [our repositories or data layers. We can](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=52.092) [now identify existing implementations and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=55.016) [adaptations. We of course also talked](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=57.144000000000005) [about how we can leverage the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=58.689555555555565) [implementation and adaptation in WPF](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=60.360800000000005) [together with our own implementation of](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=62.718142857142865) [the command pattern; although one of the](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=65.516625) [drawbacks of using the command pattern is](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=67.341) [of course that it could add unnecessary](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=69.3) [complexity. So for instance, if you're](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=71.48399999999998) [working with a very tiny application, it](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=72.69350000000003) [might not be completely necessary to](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=74.86914285714286) [involve the command pattern, but in larger](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=77.2695) [line of business applications, it can make](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=79.7002857142857) [your life a whole lot easier. So this](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=82.072) [course has now given you an overview and](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=84.50549999999998) [understanding of how to use the command](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=86.6815) [pattern, and how to apply that in your C#](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=88.56975) [applications. Thank you so much for](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=91.67639999999999) [watching this course. I hope you'll be](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=93.52025000000002) [able to leverage all the information that](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=95.2128888888889) [you've learned about the command pattern,](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=96.90566666666666) [in your day-to-day work. My name is Filip](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=99.112) [Ekberg, and thanks again for watching this course.](https://app.pluralsight.com/player?course=c-sharp-command-pattern&author=filip-ekberg&name=d7cf408d-a1f9-4324-878b-96d80138bc4e&clip=4&mode=live&start=101.97550000000001)