Django Channels – Introduction and Basic Setup

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Django is a powerful Python framework for web development. It is fast, secure, and reliable. Channels allow Django projects to handle HTTP along with asynchronous protocols like WebSockets, MQTT, chatbots, and more.

Channels:

Channels preserve the synchronous behavior of Django and add a layer of asynchronous protocols allowing users to write the views that are entirely synchronous, asynchronous, or a mixture of both. Channels basically allow the application to support "long-running connections". It replaces Django's default **WSGI** with its **ASGI** .

Django Channels allow for handling WebSockets, and understanding this can elevate your web development skills. The **Complete Django Web Development Course – Basics to Advance** provides a deeper exploration of Django Channels and other advanced topics."

ASGI:

ASGI (Asynchronous Server Gateway Interface) provides an interface between async Python web servers and applications while it supports all the features provided by WSGI.

Consumers:

A **consumer** is a basic unit of Channels. It is an event-driven class that supports both async and sync applications. Consumers can run longer and hence they support web sockets that need persistent connection.

In this post, we will set up a basic example of channels. We will build a calculator app that will allow the user to send multiple expressions to the server and receive the result through a single persistent connection.

Environment Setup:

- It is always a good idea to create a virtual environment for the python apps in order to avoid version conflicts. Run the following commands in the terminal to get started

```
easy-install pip
python3 -m pip install virtualenv
virtualenv venv
source venv/bin/activate
```

- Now install **Django** and **Channels** :


```
pip install django
pip install channels
# On windows, try an unofficial wheel of 'Twisted' in case of dependency
errors
```

LiveCalculator App:

Now start a Django project and create an app named **'liveCalculator'**

```
django-admin startproject sampleProject
cd sampleProject
python3 manage.py startapp liveCalculator
```

In **sampleProject/settings.py** , register **channels** and **liveCalculator** .

settings.py:

```
INSTALLED_APPS = [
   'channels',
   'liveCalculator',
   'django.contrib.admin',
```

```
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
]
```

In sampleProject/asgi.py, add the http protocol.

asgi.py:

Python

```python
import os

import django
from channels.http import AsgiHandler
from channels.routing import ProtocolTypeRouter

os.environ.setdefault('DJANGO_SETTINGS_MODULE', 'sampleProject.settings')
django.setup()

application = ProtocolTypeRouter({
  "http": AsgiHandler(),
  # Just HTTP for now. (We can add other protocols later.)
})
```

Now we need to register this asgi into our application. Add this line in sampleProject/settings.py :

```
ASGI_APPLICATION = "sampleProject.asgi.application"
```

Create a new folder **liveCalculator/templates/liveCalculator** and create a new file **index.html** inside it. It will be the starting page of our app. Add the following code in **index.html:**

index.html:

HTML

```html
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Live Calculator</title>
</head>

<body>
    <textarea name="ta" id="results" cols="30" rows="10">

    </textarea><br>
    Enter the expression: <input type="text" id="exp">
    <input type="button" id="submit" value="Get Results">
    <script>
        const socket = new WebSocket('ws://localhost:8000/ws/livec/');
        socket.onmessage = (e) => {
            result = JSON.parse(e.data).result;
            document.getElementById("results").value += "Server: " + result + "\n";
        }

        socket.onclose = (e) => {
            console.log("Socket closed!");
        }

        document.querySelector('#exp').onkeyup = function (e) {
            if (e.keyCode === 13) {  // enter, return
                document.querySelector('#submit').click();
            }
        };

        document.querySelector("#submit").onclick = (e) => {
            inputfield = document.querySelector("#exp")
            exp = inputfield.value
            socket.send(JSON.stringify(
                {
                    expression: exp
```

```
                    }
            ))
            document.querySelector("#results").value += "You: " + exp + "\n";
            inputfield.value = "";
        }

    </script>
</body>

</html>
```

The above code will render a text area and an input box where the user can enter the expression. It will create a socket connection that we will make later and append the received result in the text area. When the user inputs the expression, it will send the expression through a socket connection.

Now create a view to render this page in **liveCalculator/views.py** :

liveCalculator/views.py:

Python

```python
from django.shortcuts import render

# Create your views here.

def index(request):
    return render(request, 'liveCalculator/index.html', {})
```

Next, we need to create a route for this view. Add a new file **urls.py** in **liveCalculator** directory and add the following code:

liveCalculator/urls.py:

Python

```python
from django.conf.urls import url
from . import views

urlpatterns = [
```

```
    url(r'^$', views.index, name="index"),
]
```

Register this route in **sampleProject/urls.py** :

sampleProject/urls.py:

Python

```python
from django.contrib import admin
from django.urls import path
from django.conf.urls import include, url
urlpatterns = [
    path('admin/', admin.site.urls),
    url(r'^', include('liveCalculator.urls'))
]
```

Now we need to create the **consumer** for our web socket connection. We will use the generic **WebsocketConsumer** class to implement its event-driven methods. Create a new file **consumers.py** in **liveCalculator** folder and add the following code:

consumers.py:

Python

```python
import json
from channels.generic.websocket import WebsocketConsumer

class Calculator(WebsocketConsumer):
    def connect(self):
        self.accept()

    def disconnect(self, close_code):
        self.close()

    def receive(self, text_data):
        text_data_json = json.loads(text_data)
        expression = text_data_json['expression']
        try:
```

```
                result = eval(expression)
            except Exception as e:
                result = "Invalid Expression"
            self.send(text_data=json.dumps({
                'result': result
            }))
```

The **WebsocketConsumer** class supports these user-defined methods:

- **connect()** : We can write the business logic of what should happen when the client sends a connection request.
- **disconnect()** : We can write the business logic of what should happen when the client sends a disconnection request.
- **receive():** We can write the business logic of what should happen when the client sends a message.

It also supports these built-in methods:

- **accept():** It will accept the incoming connection.
- **close():** It will close the current connection.
- **send():** It will send the specified message to the client.

We have simply used the above methods in our **Calculator** class to accept the connection, evaluate the expression when a message a received, and send it to the client.

Next, we also need to define the routing method for this consumer. Create a new file **routing.py** in the same folder and add the following code to it:

routing.py:

Python

```python
from django.urls import re_path

from . import consumers

websocket_urlpatterns = [
    re_path(r'ws/livec/$', consumers.Calculator.as_asgi()),
```

```
]
```

Note that we have used **as_asgi()** method on our Calculator class to use it for our application. This will enable the socket on **ws://<IP:Port>/ws/livec** . Now register **routing.py** into **asgi.py** by declaring the **WebSocket** protocol.

asgi.py:

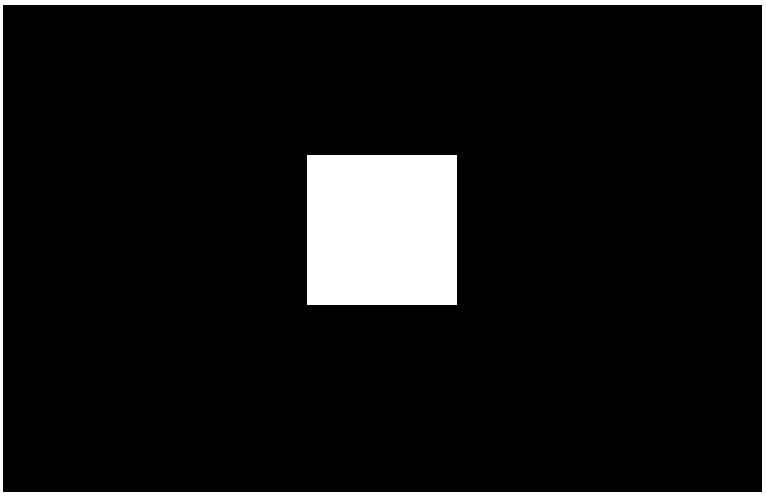
Python

```python
import os

from channels.auth import AuthMiddlewareStack
from channels.routing import ProtocolTypeRouter, URLRouter
from django.core.asgi import get_asgi_application
import liveCalculator.routing

os.environ.setdefault("DJANGO_SETTINGS_MODULE", "sampleProject.settings")

application = ProtocolTypeRouter({
  "http": get_asgi_application(),
  "websocket": AuthMiddlewareStack(
        URLRouter(
            liveCalculator.routing.websocket_urlpatterns
        )
    ),
})
```

We are almost done with our first Channels application. Save all the files and run the following commands in the terminal:

```
python3 manage.py makemigrations
python3 manage.py migrate
python3 manage.py runserver
```

Now open http://localhost:8000 on your browser, and you should see the output like this:



00:00 00:17

See the log of [redacted] ection only once, and we can se [redacted] a new connection.

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