本次实验我调用了 python3 标准库中的 xmlrpc 库来实现多播通信。

具体实现如下：

1. Server1.py

```python
import xmlrpc.server as server
import time

class data_on_server:
    def __init__(self):
        self.__data = 0

    def set_data(self, new_data):
        self.__data = new_data

    def get_data(self):
        #time.sleep(2)
        return self.__data

server = server.SimpleXMLRPCServer(("localhost", 8088), allow_none=True)
# 将实例注册给rpc server
server.register_instance(data_on_server())

print("Listening on port 8088")
server.serve_forever()
```

2. Server2.py

```python
import xmlrpc.server as server

class data_on_server:
    def __init__(self):
        self.__data = 0

    def set_data(self, new_data):
        self.__data = new_data

    def get_data(self):
        return self.__data

server = server.SimpleXMLRPCServer(("localhost", 8089), allow_none=True)
# 将实例注册给rpc server
server.register_instance(data_on_server())

print("Listening on port 8089")
server.serve_forever()
```

3. Client.py

```python
import xmlrpc.client as client

class Client:
    def __init__(self):
        self.server1 = client.ServerProxy('http://localhost:8088')
        self.server2 = client.ServerProxy('http://localhost:8089')

    def get_data(self):
        # wait for server for 2 seconds, if get_data does not return in 2 seconds, return Error
        data1 = self.server1.get_data()
        data2 = self.server2.get_data()
        if data1 == data2:
            return data1
        else:
            return "Error, data not the same"

    def set_data(self, data):
        self.server1.set_data(data)
        self.server2.set_data(data)

client = Client()
print("Client:", client.get_data())
data = input("input the number you'd like to save on server: ")
client.set_data(int(data))
print("Client:", client.get_data())
```

写入时，客户端会给两个服务器都发送请求，读数据时，客户端也会给两个服务器发送请求，如果两个服务器返回的值不同，则客户端返回错误。

运行结果如下：

```
C:\Users\豹豹\OneDrive - 中山大学\大三上\分布式系统\作业6>python server1.py
Listening on port 8088
127.0.0.1 - - [19/Dec/2021 14:19:46] "POST /RPC2 HTTP/1.1" 200 -
127.0.0.1 - - [19/Dec/2021 14:19:53] "POST /RPC2 HTTP/1.1" 200 -
127.0.0.1 - - [19/Dec/2021 14:19:57] "POST /RPC2 HTTP/1.1" 200 -
```

```
C:\Users\豹豹\OneDrive - 中山大学\大三上\分布式系统\作业6>python server2.py
Listening on port 8089
127.0.0.1 - - [19/Dec/2021 14:19:48] "POST /RPC2 HTTP/1.1" 200 -
127.0.0.1 - - [19/Dec/2021 14:19:55] "POST /RPC2 HTTP/1.1" 200 -
127.0.0.1 - - [19/Dec/2021 14:19:59] "POST /RPC2 HTTP/1.1" 200 -
```

```
C:\Users\豹豹\OneDrive - 中山大学\大三上\分布式系统\作业6>python client.py
Client: 0
input the number you'd like to save on server: 42
Client: 42
```

如图，先在命令行运行 server1 和 server2，在运行客户端，服务器上默认存储的值为 0，客户端发送请求后，服务器将数值改为 42。