

DS_Project

To execute go to DS_ASSIGNMENT_1 folder :

->run "make build" (to build the image)

->once building the image you can send requests using tools like POSTMAN,

->cleanup the image by running "make clean"

->check readme.pdf for assignment 1 analysis

->check report_ds.pdf for assignment 2 analysis.

Assignment - 3 check here

TASK A-1

No of Servers = 6 and shards = 4 , each shard has 3 replicas.

For 10,000 Write requests:

Total time taken is 675.758668613337 seconds.

Speed is 14.798236947933228 requests per second.

For 10,000 Read requests:

Total time taken is 469.18102192878723 seconds.

Speed is 21.31373506731014 requests per second.

Configuration used:

```
{
  "N": 6,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ],
    "dtypes": [
      "Number",
      "String",
      "String"
    ]
  },
  "shards": [
    {
      "Stud_id_low": 0,
      "Shard_id": "sh1",
      "Shard_size": 4096
    }
  ]
}
```

```
    },
    {
      "Stud_id_low": 4096,
      "Shard_id": "sh2",
      "Shard_size": 4096
    },
    {
      "Stud_id_low": 8192,
      "Shard_id": "sh3",
      "Shard_size": 4096
    },
    {
      "Stud_id_low": 12288,
      "Shard_id": "sh4",
      "Shard_size": 4096
    }
  ],
  "servers": {
    "Server0": [
      "sh1",
      "sh2"
    ],
    "Server1": [
      "sh3",
      "sh4"
    ],
    "Server3": [
      "sh1",
      "sh3"
    ],
    "Server4": [
      "sh4",
      "sh2"
    ],
    "Server5": [
      "sh1",
      "sh4"
    ],
    "Server6": [
      "sh3",
      "sh2"
    ]
  }
}
```

```
}  
}
```

TASK A-2

For 10,000 write requests:

Total time taken is 1292.2386538176 seconds.

Speed is 7.738455191190812 requests per second.

Write Speed down w.r.t Task 1 = 0.4771

For 10,000 read requests:

Total time taken is 446.0694181919098 seconds.

Speed is 22.418035382326433 requests per second.

Read Speed up w.r.t Task 1 = 1.058

Configuration used:

```
{  
  "N": 8,  
  "schema": {  
    "columns": [  
      "Stud_id",  
      "Stud_name",  
      "Stud_marks"  
    ],  
    "dtypes": [  
      "Number",  
      "String",  
      "String"  
    ]  
  },  
  "shards": [  
    {  
      "Stud_id_low": 0,  
      "Shard_id": "sh1",  
      "Shard_size": 2048  
    },  
    {  
      "Stud_id_low": 2048,  
      "Shard_id": "sh2",  
      "Shard_size": 2048  
    },  
  ],  
}
```

```
{
  "Stud_id_low": 4096,
  "Shard_id": "sh3",
  "Shard_size": 2048
},
{
  "Stud_id_low": 6144,
  "Shard_id": "sh4",
  "Shard_size": 2048
},
{
  "Stud_id_low": 8192,
  "Shard_id": "sh5",
  "Shard_size": 2048
},
{
  "Stud_id_low": 10240,
  "Shard_id": "sh6",
  "Shard_size": 2048
},
{
  "Stud_id_low": 12288,
  "Shard_id": "sh7",
  "Shard_size": 2048
},
{
  "Stud_id_low": 14336,
  "Shard_id": "sh8",
  "Shard_size": 2048
}
},
"servers": {
  "Server1": [
    "sh2",
    "sh3",
    "sh4",
    "sh5",
    "sh6",
    "sh7",
    "sh8"
  ]
},
```

```
"Server2": [  
    "sh1",  
    "sh3",  
    "sh4",  
    "sh5",  
    "sh6",  
    "sh7",  
    "sh8"  
],  
"Server3": [  
    "sh1",  
    "sh2",  
    "sh4",  
    "sh5",  
    "sh6",  
    "sh7",  
    "sh8"  
],  
"Server4": [  
    "sh1",  
    "sh2",  
    "sh3",  
    "sh5",  
    "sh6",  
    "sh7",  
    "sh8"  
],  
"Server5": [  
    "sh1",  
    "sh2",  
    "sh4",  
    "sh3",  
    "sh6",  
    "sh7",  
    "sh8"  
],  
"Server6": [  
    "sh1",  
    "sh2",  
    "sh4",  
    "sh5",  
    "sh3",
```

```

        "sh7",
        "sh8"
    ],
    "Server7": [
        "sh1",
        "sh2",
        "sh4",
        "sh5",
        "sh6",
        "sh3",
        "sh8"
    ],
    "Server8": [
        "sh1",
        "sh2",
        "sh4",
        "sh5",
        "sh6",
        "sh7",
        "sh3"
    ]
}
}

```

TASK A-3

For 10,000 write requests:

Total time taken is 1264.0156018733978 seconds.

Speed is 7.911294753940535 requests per second.

Write speed up = 1.046

For 10,000 read requests

Total time taken is 392.66022419929504 seconds.

Speed is 25.46731088027 requests per second.

Read speed up = 1.19

Configuration used

```

{
    "N": 10,
    "schema": {
        "columns": [
            "Stud_id",

```

```

        "Stud_name",
        "Stud_marks"
    ],
    "dtypes": [
        "Number",
        "String",
        "String"
    ]
},
"shards": [
    {
        "Stud_id_low": 0,
        "Shard_id": "sh1",
        "Shard_size": 2048
    },
    {
        "Stud_id_low": 2048,
        "Shard_id": "sh2",
        "Shard_size": 2048
    },
    {
        "Stud_id_low": 4096,
        "Shard_id": "sh3",
        "Shard_size": 2048
    },
    {
        "Stud_id_low": 6144,
        "Shard_id": "sh4",
        "Shard_size": 2048
    },
    {
        "Stud_id_low": 8192,
        "Shard_id": "sh5",
        "Shard_size": 2048
    },
    {
        "Stud_id_low": 10240,
        "Shard_id": "sh6",
        "Shard_size": 2048
    }
],
"servers": {

```

```
"Server1": [  
    "sh1",  
    "sh2",  
    "sh3",  
    "sh5",  
    "sh6"  
],  
"Server2": [  
    "sh4",  
    "sh2",  
    "sh3",  
    "sh5",  
    "sh6"  
],  
"Server3": [  
    "sh4",  
    "sh2",  
    "sh5",  
    "sh6"  
],  
"Server4": [  
    "sh1",  
    "sh2",  
    "sh3",  
    "sh4",  
    "sh6"  
],  
"Server5": [  
    "sh1",  
    "sh2",  
    "sh4",  
    "sh5"  
],  
"Server6": [  
    "sh1",  
    "sh4",  
    "sh3",  
    "sh5",  
    "sh6"  
],  
"Server7": [  
    "sh1",
```



```

        "sh2",
        "sh3",
        "sh5",
        "sh4"
    ],
    "Server8": [
        "sh1",
        "sh2",
        "sh3",
        "sh5",
        "sh6"
    ],
    "Server9": [
        "sh1",
        "sh2",
        "sh3",
        "sh4",
        "sh6"
    ],
    "Server10": [
        "sh1",
        "sh3",
        "sh5",
        "sh4",
        "sh6"
    ]
}
}

```

TASK A-4

Endpoints:

/init:

POST <http://127.0.0.1:5001/init>

Payload: {

```

    "N": 6,
    "schema": {
        "columns": [
            "Stud_id",
            "Stud_name",

```

```

        "Stud_marks"
    ],
    "dtypes": [
        "Number",
        "String",
        "String"
    ]
},
"shards": [
    {
        "Stud_id_low": 0,
        "Shard_id": "sh1",
        "Shard_size": 4096
    },
    {
        "Stud_id_low": 4096,
        "Shard_id": "sh2",
        "Shard_size": 4096
    },
    {
        "Stud_id_low": 8192,
        "Shard_id": "sh3",
        "Shard_size": 4096
    },
    {
        "Stud_id_low": 12288,
        "Shard_id": "sh4",
        "Shard_size": 4096
    }
],
"servers": {
    "Server0": [
        "sh1",
        "sh2"
    ],
    "Server1": [
        "sh3",
        "sh4"
    ],
    "Server3": [
        "sh1",
        "sh3"
    ]
}

```

```

    ],
    "Server4": [
        "sh4",
        "sh2"
    ],
    "Server5": [
        "sh1",
        "sh4"
    ],
    "Server6": [
        "sh3",
        "sh2"
    ]
}
}

```

Response

```

{
  "message": "Configured Database"
}

```

The screenshot displays a REST client interface with the following details:

- URL:** `http://127.0.0.1:5001/init`
- Method:** `POST`
- Body:** A JSON object defining a database schema:


```

{
  "N": 6,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ],
    "dtypes": [
      "Number",
      "String",
      "String"
    ]
  }
}

```
- Response:** A JSON object with a success message:


```

{
  "message": "Configured Database"
}

```
- Status:** 200 OK, Time: 2 m 23.88 s, Size: 204 B
- Options:** Includes tabs for Params, Authorization, Headers (8), Body, Pre-request Script, Tests, and Settings. The Body tab is active, showing the request and response in JSON format.

/status:

GET <http://127.0.0.1:5001/status>

Response:

```
{
  "N": 6,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ],
    "dtypes": [
      "Number",
      "String",
      "String"
    ]
  },
  "servers": {
    "Server0": [
      "sh1",
      "sh2"
    ],
    "Server1": [
      "sh3",
      "sh4"
    ],
    "Server2": [
      "sh1",
      "sh3"
    ],
    "Server4": [
      "sh4",
      "sh2"
    ],
    "Server5": [
      "sh1",
      "sh4"
    ],
    "Server6": [
      "sh3",
      "sh2"
    ]
  }
},
```

```
"shards": [  
  {  
    "Primary_server": "Server2",  
    "Shard_id": "sh1",  
    "Shard_size": 4096,  
    "Stud_id_low": 0  
  },  
  {  
    "Primary_server": "Server0",  
    "Shard_id": "sh2",  
    "Shard_size": 4096,  
    "Stud_id_low": 4096  
  },  
  {  
    "Primary_server": "Server1",  
    "Shard_id": "sh3",  
    "Shard_size": 4096,  
    "Stud_id_low": 8192  
  },  
  {  
    "Primary_server": "Server4",  
    "Shard_id": "sh4",  
    "Shard_size": 4096,  
    "Stud_id_low": 12288  
  }  
]  
}
```

http://127.0.0.1:5001/status

GET http://127.0.0.1:5001/status Send

Params Authorization Headers (6) Body Pre-request Script Tests Settings Cookies

Query Params

Key	Value	Description	...	Bulk Edit
-----	-------	-------------	-----	-----------

Body Cookies Headers (5) Test Results Status: 200 OK Time: 45 ms Size: 1.01 KB Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "N": 6,
3   "schema": {
4     "columns": [
5       "Stud_id",
6       "Stud_name",
7       "Stud_marks"
8     ],
9     "dtypes": [
10      "Number",
11      "String",
12      "String"
13    ]
14  },
15  "servers": {
16    "Server0": [
17      "sh1",
18      "sh2"
19    ],
20    "Server1": [
21      "sh3",
22      "sh4"
23    ],
24    "Server3": [
25      "sh1",
26      "sh3"
27    ]
28  }
29 }
```

/add

POST <http://127.0.0.1:5001/add>

Payload:

```
{
  "n": 1,
  "new_shards": [
    {
      "Stud_id_low": 12288,
      "Shard_id": "sh5",
      "Shard_size": 4096
    }
  ],
  "servers": {
    "S4": [
      "sh3",
      "sh5"
    ]
  }
}
```

Response:

```
{
  "N": 7,
  "message": "Add S4",
}
```

```
    "status": "successful"
}
```

After doing /status

```
{
  "N": 7,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ],
    "dtypes": [
      "Number",
      "String",
      "String"
    ]
  },
  "servers": {
    "S4": [
      "sh3",
      "sh5"
    ],
    "Server0": [
      "sh1",
      "sh2"
    ],
    "Server1": [
      "sh3",
      "sh4"
    ],
    "Server2": [
      "sh1",
      "sh3"
    ],
    "Server4": [
      "sh4",
      "sh2"
    ],
    "Server5": [
      "sh1",
      "sh4"
    ]
  }
}
```

```
    ],
    "Server6": [
        "sh3",
        "sh2"
    ]
},
"shards": [
    {
        "Primary_server": "Server2",
        "Shard_id": "sh1",
        "Shard_size": 4096,
        "Stud_id_low": 0
    },
    {
        "Primary_server": "Server0",
        "Shard_id": "sh2",
        "Shard_size": 4096,
        "Stud_id_low": 4096
    },
    {
        "Primary_server": "Server1",
        "Shard_id": "sh3",
        "Shard_size": 4096,
        "Stud_id_low": 8192
    },
    {
        "Primary_server": "Server4",
        "Shard_id": "sh4",
        "Shard_size": 4096,
        "Stud_id_low": 12288
    }
]
}
```


http://127.0.0.1:5001/add

POST http://127.0.0.1:5001/add

Params Authorization Headers (8) Body Pre-request Script Tests Settings

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   "n": 1,
3   "new_shards": [
4     {
5       "Stud_id_low": 12288,
6       "Shard_id": "sh5",
7       "Shard_size": 4096
8     }
9   ]
10 }
```

body Cookies Headers (5) Test Results

Status: 200 OK Time: 10.80 s Size: 227 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "N": 7,
3   "message": "Add S4",
4   "status": "successful"
5 }
```

/rm

DELETE http://127.0.0.1:5001/rm

Payload:

```
{
  "n" : 2,
  "servers" : ["Server4"]
}
```

Response:

```
{
  "message": {
    "N": 5,
    "servers": [
      "Server4",
      "Server0"
    ]
  }
}
```

After doing status:

```
{
  "N": 5,
```

```
"schema": {
  "columns": [
    "Stud_id",
    "Stud_name",
    "Stud_marks"
  ],
  "dtypes": [
    "Number",
    "String",
    "String"
  ]
},
"servers": {
  "S4": [
    "sh4",
    "sh5"
  ],
  "Server1": [
    "sh3",
    "sh4"
  ],
  "Server2": [
    "sh1",
    "sh3"
  ],
  "Server5": [
    "sh1",
    "sh4"
  ],
  "Server6": [
    "sh3",
    "sh2"
  ]
},
"shards": [
  {
    "Primary_server": "Server2",
    "Shard_id": "sh1",
    "Shard_size": 4096,
    "Stud_id_low": 0
  },
  {
```

```

        "Primary_server": "Server6",
        "Shard_id": "sh2",
        "Shard_size": 4096,
        "Stud_id_low": 4096
    },
    {
        "Primary_server": "Server1",
        "Shard_id": "sh3",
        "Shard_size": 4096,
        "Stud_id_low": 8192
    },
    {
        "Primary_server": "S4",
        "Shard_id": "sh4",
        "Shard_size": 4096,
        "Stud_id_low": 12288
    }
]
}

```

The screenshot shows a REST client interface with a DELETE request to `http://127.0.0.1:5001/rm`. The request body is a JSON object with `"n": 2` and `"servers": ["Server4"]`. The response status is 200 OK, and the response body is a JSON object with `"message": {"N": 5, "servers": ["Server4", "Server0"]}`.

Request:

```

1 {
2   ...."n": 2,
3   ...."servers": ["Server4"]
4 }

```

Response:

```

1 {
2   "message": {
3     "N": 5,
4     "servers": [
5       "Server4",
6       "Server0"
7     ]
8   }
9 }

```

/write

POST <http://127.0.0.1:5001/write>

Payload:

```

{
    "data": [

```

```
{
  "Stud_id": 3124,
  "Stud_name": "Student_0",
  "Stud_marks": 8
},
{
  "Stud_id": 2568,
  "Stud_name": "Student_1",
  "Stud_marks": 96
},
{
  "Stud_id": 3455,
  "Stud_name": "Student_2",
  "Stud_marks": 86
},
{
  "Stud_id": 4107,
  "Stud_name": "Student_3",
  "Stud_marks": 30
},
{
  "Stud_id": 3887,
  "Stud_name": "Student_4",
  "Stud_marks": 80
},
{
  "Stud_id": 4402,
  "Stud_name": "Student_5",
  "Stud_marks": 100
},
{
  "Stud_id": 4304,
  "Stud_name": "Student_6",
  "Stud_marks": 32
},
{
  "Stud_id": 2825,
  "Stud_name": "Student_7",
  "Stud_marks": 40
},
{
  "Stud_id": 1489,
```

```
    "Stud_name": "Student_8",
    "Stud_marks": 16
},
{
    "Stud_id": 3495,
    "Stud_name": "Student_9",
    "Stud_marks": 34
},
{
    "Stud_id": 2899,
    "Stud_name": "Student_10",
    "Stud_marks": 39
},
{
    "Stud_id": 4004,
    "Stud_name": "Student_11",
    "Stud_marks": 98
},
{
    "Stud_id": 3949,
    "Stud_name": "Student_12",
    "Stud_marks": 90
},
{
    "Stud_id": 4732,
    "Stud_name": "Student_13",
    "Stud_marks": 45
},
{
    "Stud_id": 1150,
    "Stud_name": "Student_14",
    "Stud_marks": 96
},
{
    "Stud_id": 4577,
    "Stud_name": "Student_15",
    "Stud_marks": 34
},
{
    "Stud_id": 2071,
    "Stud_name": "Student_16",
    "Stud_marks": 65
}
```

```
},
{
  "Stud_id": 3894,
  "Stud_name": "Student_17",
  "Stud_marks": 37
},
{
  "Stud_id": 4274,
  "Stud_name": "Student_18",
  "Stud_marks": 86
},
{
  "Stud_id": 2021,
  "Stud_name": "Student_19",
  "Stud_marks": 37
},
{
  "Stud_id": 8029,
  "Stud_name": "Student_20",
  "Stud_marks": 39
},
{
  "Stud_id": 9752,
  "Stud_name": "Student_21",
  "Stud_marks": 19
},
{
  "Stud_id": 9546,
  "Stud_name": "Student_22",
  "Stud_marks": 95
},
{
  "Stud_id": 11225,
  "Stud_name": "Student_23",
  "Stud_marks": 41
},
{
  "Stud_id": 10543,
  "Stud_name": "Student_24",
  "Stud_marks": 54
},
{
```

```
    "Stud_id": 9504,
    "Stud_name": "Student_25",
    "Stud_marks": 97
  },
  {
    "Stud_id": 11292,
    "Stud_name": "Student_26",
    "Stud_marks": 81
  },
  {
    "Stud_id": 10748,
    "Stud_name": "Student_27",
    "Stud_marks": 62
  },
  {
    "Stud_id": 9635,
    "Stud_name": "Student_28",
    "Stud_marks": 56
  },
  {
    "Stud_id": 8507,
    "Stud_name": "Student_29",
    "Stud_marks": 79
  },
  {
    "Stud_id": 10351,
    "Stud_name": "Student_30",
    "Stud_marks": 97
  },
  {
    "Stud_id": 8471,
    "Stud_name": "Student_31",
    "Stud_marks": 89
  },
  {
    "Stud_id": 9892,
    "Stud_name": "Student_32",
    "Stud_marks": 5
  },
  {
    "Stud_id": 11538,
    "Stud_name": "Student_33",
```

```
    "Stud_marks": 35
  },
  {
    "Stud_id": 9649,
    "Stud_name": "Student_34",
    "Stud_marks": 78
  },
  {
    "Stud_id": 11138,
    "Stud_name": "Student_35",
    "Stud_marks": 8
  },
  {
    "Stud_id": 9341,
    "Stud_name": "Student_36",
    "Stud_marks": 73
  },
  {
    "Stud_id": 9708,
    "Stud_name": "Student_37",
    "Stud_marks": 79
  },
  {
    "Stud_id": 9629,
    "Stud_name": "Student_38",
    "Stud_marks": 69
  },
  {
    "Stud_id": 11613,
    "Stud_name": "Student_39",
    "Stud_marks": 49
  },
  {
    "Stud_id": 333,
    "Stud_name": "Student_40",
    "Stud_marks": 26
  },
  {
    "Stud_id": 1107,
    "Stud_name": "Student_41",
    "Stud_marks": 3
  },
  },
```



```
{
  "Stud_id": 2060,
  "Stud_name": "Student_42",
  "Stud_marks": 1
},
{
  "Stud_id": 2846,
  "Stud_name": "Student_43",
  "Stud_marks": 2
},
{
  "Stud_id": 5560,
  "Stud_name": "Student_44",
  "Stud_marks": 72
},
{
  "Stud_id": 1174,
  "Stud_name": "Student_45",
  "Stud_marks": 49
},
{
  "Stud_id": 1534,
  "Stud_name": "Student_46",
  "Stud_marks": 31
},
{
  "Stud_id": 7341,
  "Stud_name": "Student_47",
  "Stud_marks": 81
},
{
  "Stud_id": 2222,
  "Stud_name": "Student_48",
  "Stud_marks": 88
},
{
  "Stud_id": 2914,
  "Stud_name": "Student_49",
  "Stud_marks": 69
}
]
}
```

Response:

```
{
  "message": "50 Data entries added",
  "status": "success"
}
```

The screenshot shows a REST client interface with a POST request to `http://127.0.0.1:5001/write`. The request body is a JSON array of 50 student records. The response is a JSON object with a success message and status.

Request:

```
1 {
2   "data": [
3     {
4       "Stud_id": 3124,
5       "Stud_name": "Student_0",
6       "Stud_marks": 8
7     },
8     {
9       "Stud_id": 2568,
10      "Stud_name": "Student_1",
11      "Stud_marks": 96
12    },
13    {
14      "Stud_id": 3455,
15      "Stud_name": "Student_2",
16      "Stud_marks": 86
17    },
18    {
19      "Stud_id": 4107,
20      "Stud_name": "Student_3",
21      "Stud_marks": 30
22    }
23  ]
24 }
```

Response:

```
1 {
2   "message": "50 Data entries added",
3   "status": "success"
4 }
```

Interface details: The top bar shows the URL `http://127.0.0.1:5001/write` and a 'Send' button. Below the URL bar, tabs for 'Params', 'Authorization', 'Headers (8)', 'Body', 'Pre-request Script', 'Tests', and 'Settings' are visible. The 'Body' tab is selected, showing the request body in JSON format. The response body is also shown in JSON format at the bottom. The status bar at the bottom indicates 'Status: 200 OK', 'Time: 570 ms', and 'Size: 229 B'.

/read

POST `http://127.0.0.1:5001/read?id=89`

Payload:

```
{
  "Stud_id": {
    "low": 1000,
    "high": 8889
  }
}
```

```
}
```

Response:

```
{
  "data": [
    {
      "Stud_id": 1107,
      "Stud_marks": "3",
      "Stud_name": "Student_41"
    },
    {
      "Stud_id": 1150,
      "Stud_marks": "96",
      "Stud_name": "Student_14"
    },
    {
      "Stud_id": 1174,
      "Stud_marks": "49",
      "Stud_name": "Student_45"
    },
    {
      "Stud_id": 1489,
      "Stud_marks": "16",
      "Stud_name": "Student_8"
    },
    {
      "Stud_id": 1534,
      "Stud_marks": "31",
      "Stud_name": "Student_46"
    },
    {
      "Stud_id": 2021,
      "Stud_marks": "37",
      "Stud_name": "Student_19"
    },
    {
      "Stud_id": 2060,
      "Stud_marks": "1",
      "Stud_name": "Student_42"
    },
    {
      "Stud_id": 2071,
```

```
    "Stud_marks": "65",
    "Stud_name": "Student_16"
  },
  {
    "Stud_id": 2222,
    "Stud_marks": "88",
    "Stud_name": "Student_48"
  },
  {
    "Stud_id": 2568,
    "Stud_marks": "96",
    "Stud_name": "Student_1"
  },
  {
    "Stud_id": 2825,
    "Stud_marks": "40",
    "Stud_name": "Student_7"
  },
  {
    "Stud_id": 2846,
    "Stud_marks": "2",
    "Stud_name": "Student_43"
  },
  {
    "Stud_id": 2899,
    "Stud_marks": "39",
    "Stud_name": "Student_10"
  },
  {
    "Stud_id": 2914,
    "Stud_marks": "69",
    "Stud_name": "Student_49"
  },
  {
    "Stud_id": 3124,
    "Stud_marks": "8",
    "Stud_name": "Student_0"
  },
  {
    "Stud_id": 3455,
    "Stud_marks": "86",
    "Stud_name": "Student_2"
```

```
,
{
  "Stud_id": 3495,
  "Stud_marks": "34",
  "Stud_name": "Student_9"
},
{
  "Stud_id": 3887,
  "Stud_marks": "80",
  "Stud_name": "Student_4"
},
{
  "Stud_id": 3894,
  "Stud_marks": "37",
  "Stud_name": "Student_17"
},
{
  "Stud_id": 3949,
  "Stud_marks": "90",
  "Stud_name": "Student_12"
},
{
  "Stud_id": 4004,
  "Stud_marks": "98",
  "Stud_name": "Student_11"
},
{
  "Stud_id": 4107,
  "Stud_marks": "30",
  "Stud_name": "Student_3"
},
{
  "Stud_id": 4274,
  "Stud_marks": "86",
  "Stud_name": "Student_18"
},
{
  "Stud_id": 4304,
  "Stud_marks": "32",
  "Stud_name": "Student_6"
},
{
```

```
    "Stud_id": 4402,
    "Stud_marks": "100",
    "Stud_name": "Student_5"
  },
  {
    "Stud_id": 4577,
    "Stud_marks": "34",
    "Stud_name": "Student_15"
  },
  {
    "Stud_id": 4732,
    "Stud_marks": "45",
    "Stud_name": "Student_13"
  },
  {
    "Stud_id": 5560,
    "Stud_marks": "72",
    "Stud_name": "Student_44"
  },
  {
    "Stud_id": 7341,
    "Stud_marks": "81",
    "Stud_name": "Student_47"
  },
  {
    "Stud_id": 8029,
    "Stud_marks": "39",
    "Stud_name": "Student_20"
  },
  {
    "Stud_id": 8471,
    "Stud_marks": "89",
    "Stud_name": "Student_31"
  },
  {
    "Stud_id": 8507,
    "Stud_marks": "79",
    "Stud_name": "Student_29"
  }
],
"shards_queried": [
  "sh1",
```

```

        "sh2",
        "sh3"
    ],
    "status": "success"
}

```

The screenshot shows a REST client interface with the following details:

- URL:** `http://127.0.0.1:5001/read?id=89`
- Method:** `POST`
- Body Type:** `raw` (selected), with `JSON` as the format.
- Request Body (Raw):**

```

1 {
2   .... "Stud_id": {
3     .... "low": "1000",
4     .... "high": "8889"
5   }
6 }

```
- Status:** `200 OK`, `Time: 80 ms`, `Size: 3.19 KB`
- Response Body (Pretty):**

```

1 {
2   "data": [
3     {
4       "Stud_id": 1107,
5       "Stud_marks": "3",
6       "Stud_name": "Student_41"
7     },
8     {
9       "Stud_id": 1150,
10      "Stud_marks": "96",
11      "Stud_name": "Student_14"
12     },
13     {
14       "Stud_id": 1174,
15       "Stud_marks": "49",
16       "Stud_name": "Student_45"
17     }
18   ]
19 }

```

/update:

PUT `http://127.0.0.1:5001/update`

Payload:

```

{
    "Stud_id": "3124",
    "data": { "Stud_id": 3124, "Stud_name": "GHI", "Stud_marks": 30 }
}

```

Response:

```

{
    "message": "Data entry for Stud_id: 3124 updated",
    "status": "success"
}

```

}

http://127.0.0.1:5001/update

PUT http://127.0.0.1:5001/update

Params Authorization Headers (8) Body Pre-request Script Tests Settings Cookies Beautify

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   "Stud_id": "3124",
3   "data": { "Stud_id": 3124, "Stud_name": "GHI", "Stud_marks": 30 }
4 }
```

Body Cookies Headers (5) Test Results Status: 200 OK Time: 102 ms Size: 244 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "message": "Data entry for Stud_id: 3124 updated",
3   "status": "success"
4 }
```

After read

http://127.0.0.1:5001/read?id=89

POST http://127.0.0.1:5001/read?id=89

Params Authorization Headers (8) Body Pre-request Script Tests Settings Cookies Beautify

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   "Stud_id": {
3     "low": "3100",
4     "high": "3200"
5   }
6 }
```

Body Cookies Headers (5) Test Results Status: 200 OK Time: 54 ms Size: 332 B Save as example

Pretty Raw Preview Visualize JSON

```
1 {
2   "data": [
3     {
4       "Stud_id": 3124,
5       "Stud_marks": "30",
6       "Stud_name": "GHI"
7     }
8   ],
9   "shards_queried": [
10    "sh1"
11  ],
12   "status": "success"
13 }
```

/delete

DELETE http://127.0.0.1:5001/delete

Payload:

```
{  
  "Stud_id": 3124  
}
```

Response:

```
{  
  "message": "Data entry with Stud_id: 3124 removed",  
  "status": "success"  
}
```

The screenshot displays a REST client interface with the following components:

- Request Bar:** Shows the method **DELETE** and the URL **http://127.0.0.1:5001/delete**. Buttons for **Save** and **Send** are present.
- Request Body:** The **Body** tab is selected, showing a JSON payload:

```
{  
  "Stud_id": 3124  
}
```

 The format is set to **JSON**.
- Response Section:** Shows the response status **200 OK**, time **92 ms**, and size **245 B**. The **Body** tab is selected, displaying the response JSON:

```
{  
  "message": "Data entry with Stud_id: 3124 removed",  
  "status": "success"  
}
```

 The format is set to **JSON**.

After read:

HTTP <http://127.0.0.1:5001/read?id=89> Save Send

POST <http://127.0.0.1:5001/read?id=89> Send

Params Authorization Headers (8) **Body** Pre-request Script Tests Settings Cookies

☐ none ☐ form-data ☐ x-www-form-urlencoded ☒ raw ☐ binary ☐ GraphQL **JSON** Beautify

```
1 {
2   ... "Stud_id": {
3     ... "low": "3100",
4     ... "high": "3200"
5   }
6 }
```

Body Cookies Headers (5) Test Results Status: 200 OK Time: 55 ms Size: 242 B Save as example

Pretty Raw Preview Visualize **JSON** Copy Search

```
1 {
2   "data": [],
3   "shards_queried": [
4     "sh1"
5   ],
6   "status": "success"
7 }
```

Spawning: crash stop recovery

Before: /status

```
{
  "N": 6,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ],
    "dtypes": [
      "Number",
      "String",
      "String"
    ]
  }
}
```

```

    ]
  },
  "servers": {
    "Server0": [
      "sh1",
      "sh2"
    ],
    "Server1": [
      "sh3",
      "sh4"
    ],
    "Server2": [
      "sh1",
      "sh3"
    ],
    "Server4": [
      "sh4",
      "sh2"
    ],
    "Server5": [
      "sh1",
      "sh4"
    ],
    "Server6": [
      "sh3",
      "sh2"
    ]
  },
  "shards": [
    {
      "Primary_server": "Server2",
      "Shard_id": "sh1",
      "Shard_size": 4096,
      "Stud_id_low": 0
    },
    {
      "Primary_server": "Server0",
      "Shard_id": "sh2",
      "Shard_size": 4096,
      "Stud_id_low": 4096
    },
    {

```

```

    "Primary_server": "Server1",
    "Shard_id": "sh3",
    "Shard_size": 4096,
    "Stud_id_low": 8192
  },
  {
    "Primary_server": "Server4",
    "Shard_id": "sh4",
    "Shard_size": 4096,
    "Stud_id_low": 12288
  }
]
}

```

```

rajikiran@rajikiran-Inspiron-15-5510:~/dsproj/DS_ASSIGNMENT_1$ docker stop Server1
Server1
rajikiran@rajikiran-Inspiron-15-5510:~/dsproj/DS_ASSIGNMENT_1$ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
9feba774740e   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server6
4dd9f5923134   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server5
c0c580d963f6   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server4
add9a7b85105   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server2
4400d633c985   flaskserver   "/ser/custom-entry.s..." About a minute ago Exited (0) 4 seconds ago                               Server1
fa01897436d8   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server0
8665655e4845   lb_image      "/lb/custom-entry.sh..." About a minute ago Up About a minute   3306/tcp, 33060/tcp, 0.0.0.0:5001->5000/tcp, :::5001->5000/tcp lb_server
135792e97ea4   shardmanager_ing "python3 app.py"        About a minute ago Up About a minute   0.0.0.0:5002->5000/tcp, :::5002->5000/tcp shardmanager

rajikiran@rajikiran-Inspiron-15-5510:~/dsproj/DS_ASSIGNMENT_1$ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
9feba774740e   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server6
4dd9f5923134   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server5
c0c580d963f6   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server4
add9a7b85105   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server2
4400d633c985   flaskserver   "/ser/custom-entry.s..." About a minute ago Exited (0) 13 seconds ago                               Server1
fa01897436d8   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server0
8665655e4845   lb_image      "/lb/custom-entry.sh..." 2 minutes ago   Up 2 minutes       3306/tcp, 33060/tcp, 0.0.0.0:5001->5000/tcp, :::5001->5000/tcp lb_server
135792e97ea4   shardmanager_ing "python3 app.py"        2 minutes ago   Up 2 minutes       0.0.0.0:5002->5000/tcp, :::5002->5000/tcp shardmanager

rajikiran@rajikiran-Inspiron-15-5510:~/dsproj/DS_ASSIGNMENT_1$ docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
9feba774740e   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server6
4dd9f5923134   flaskserver   "/ser/custom-entry.s..." About a minute ago Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server5
c0c580d963f6   flaskserver   "/ser/custom-entry.s..." 2 minutes ago   Up About a minute   3306/tcp, 5000/tcp, 33060/tcp      Server4
add9a7b85105   flaskserver   "/ser/custom-entry.s..." 2 minutes ago   Up 2 minutes       3306/tcp, 5000/tcp, 33060/tcp      Server2
4400d633c985   flaskserver   "/ser/custom-entry.s..." 2 minutes ago   Up 3 seconds       3306/tcp, 5000/tcp, 33060/tcp      Server1
fa01897436d8   flaskserver   "/ser/custom-entry.s..." 2 minutes ago   Up 2 minutes       3306/tcp, 5000/tcp, 33060/tcp      Server0
8665655e4845   lb_image      "/lb/custom-entry.sh..." 2 minutes ago   Up 2 minutes       3306/tcp, 33060/tcp, 0.0.0.0:5001->5000/tcp, :::5001->5000/tcp lb_server
135792e97ea4   shardmanager_ing "python3 app.py"        2 minutes ago   Up 2 minutes       0.0.0.0:5002->5000/tcp, :::5002->5000/tcp shardmanager
rajikiran@rajikiran-Inspiron-15-5510:~/dsproj/DS_ASSIGNMENT_1$

```

After /status: primary server of sh3 changes from Server1 to Server2

```

{
  "N": 6,
  "schema": {
    "columns": [
      "Stud_id",
      "Stud_name",
      "Stud_marks"
    ]
  }
}

```

```

        "dtypes": [
            "Number",
            "String",
            "String"
        ]
    },
    "servers": {
        "Server0": [
            "sh1",
            "sh2"
        ],
        "Server1": [
            "sh3",
            "sh4"
        ],
        "Server2": [
            "sh1",
            "sh3"
        ],
        "Server4": [
            "sh4",
            "sh2"
        ],
        "Server5": [
            "sh1",
            "sh4"
        ],
        "Server6": [
            "sh3",
            "sh2"
        ]
    },
    "shards": [
        {
            "Primary_server": "Server2",
            "Shard_id": "sh1",
            "Shard_size": 4096,
            "Stud_id_low": 0
        },
        {
            "Primary_server": "Server4",
            "Shard_id": "sh2",

```

```
        "Shard_size": 4096,  
        "Stud_id_low": 4096  
    },  
    {  
        "Primary_server": "Server2",  
        "Shard_id": "sh3",  
        "Shard_size": 4096,  
        "Stud_id_low": 8192  
    },  
    {  
        "Primary_server": "Server4",  
        "Shard_id": "sh4",  
        "Shard_size": 4096,  
        "Stud_id_low": 12288  
    }  
]  
}
```