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## Group - 4

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# Problem Statement

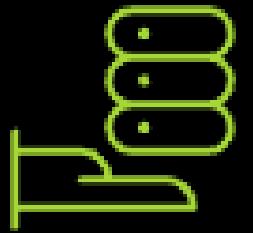
In today's world, people often need to work together on the same document from different locations requires a system that supports real-time updates, consistent data sharing, and smooth collaboration. It is important to handle simultaneous edits efficiently, keep the document state synchronized for all users, ensure data remains safe and available at all times, and control who can view or edit the document based on their roles.

# System Overview



## Real-Time Editing

Broadcasts changes instantly to all connected clients.



## Distributed Storage

Ensures data availability and persistence through replication.



## Concurrency Control

Achieved implicitly by the real-time update mechanism.



## Security and Access

Offers role-based document sharing permissions for users.

# Operational Flow

## Ensure Consistency

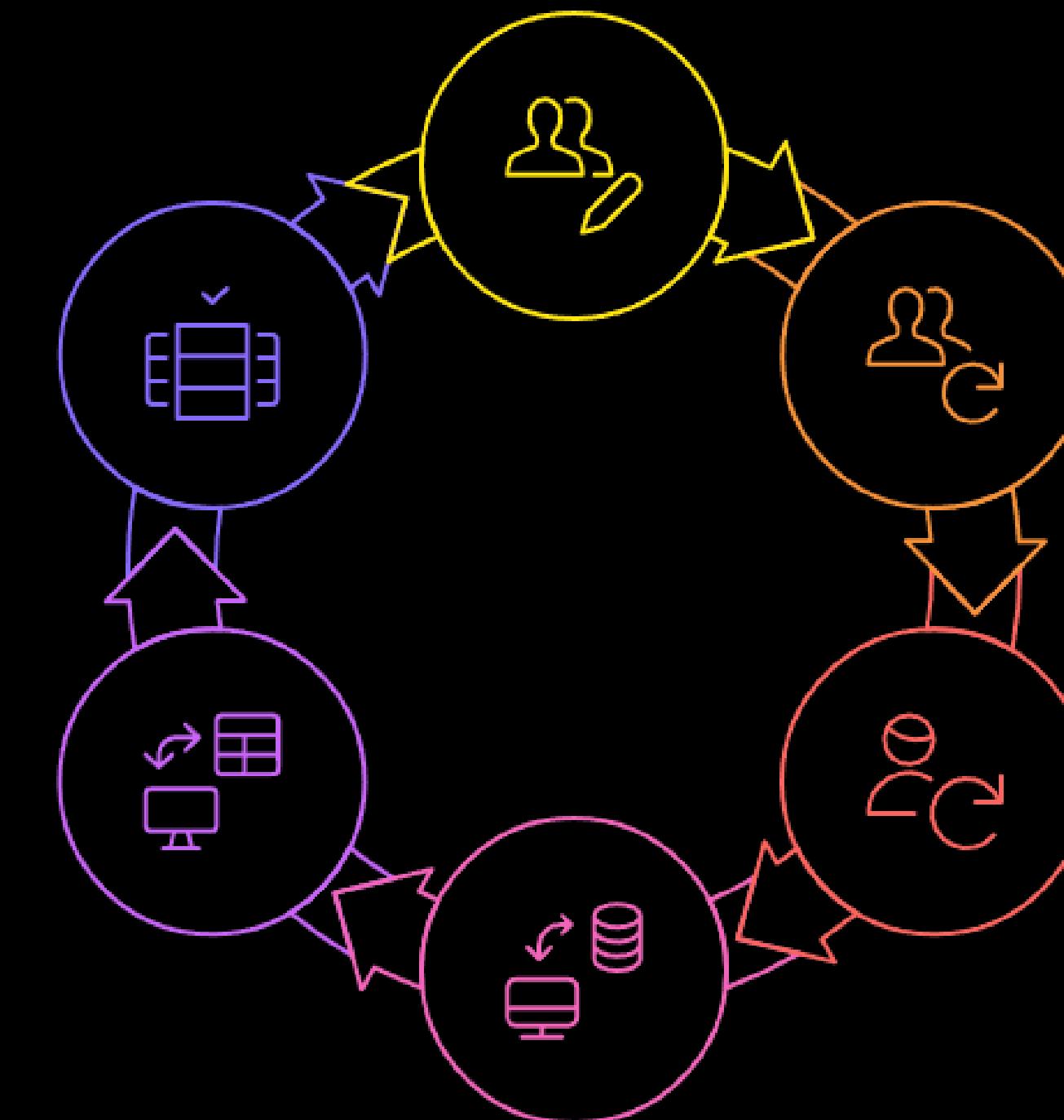
Consistency is maintained across all copies.

## Synchronize Data

Data is synchronized across servers.

## Replicate Data

Data is replicated across servers.



## User Edits Document

Users make changes to the document.

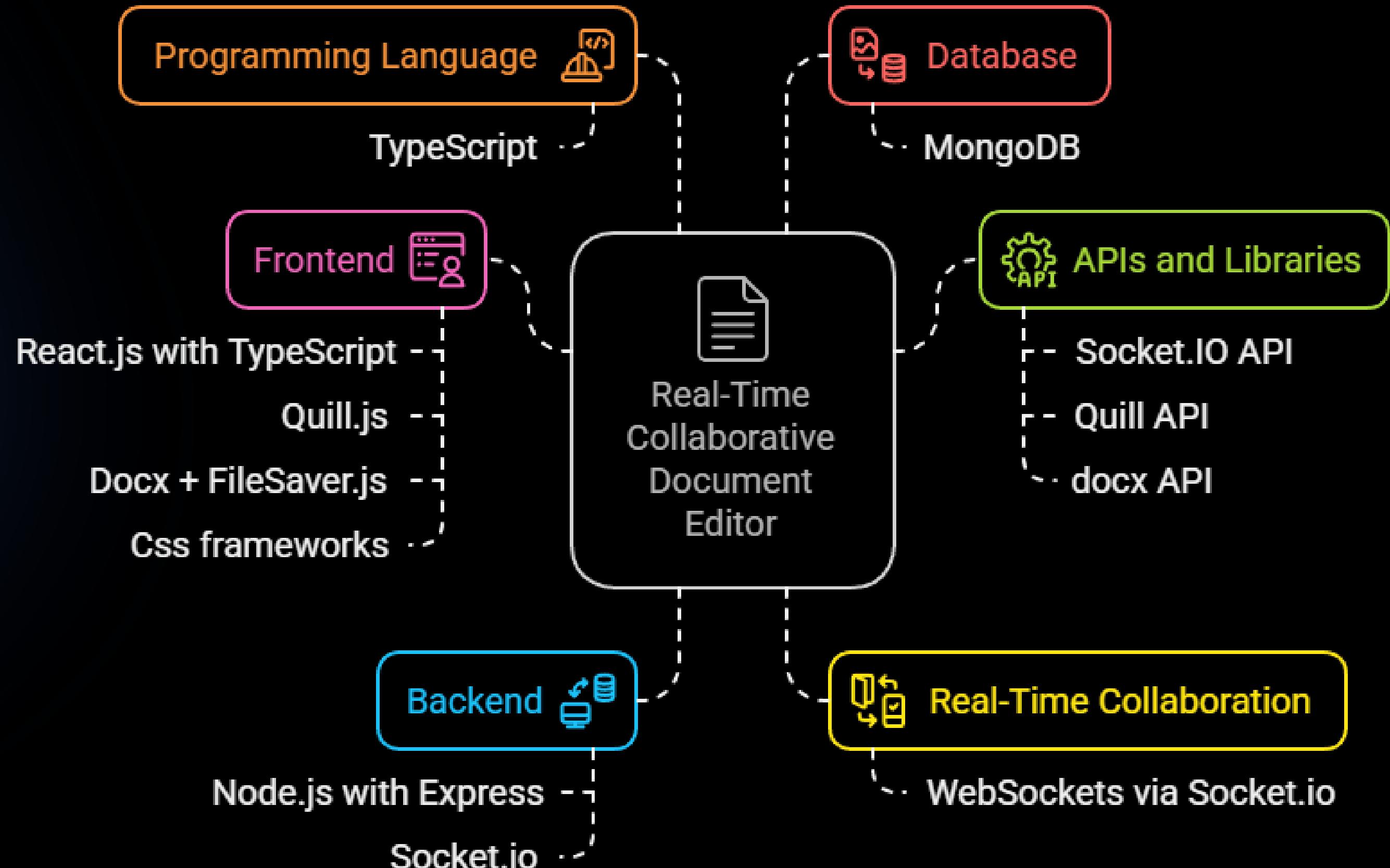
## Broadcast Changes

Changes are broadcasted to all users.

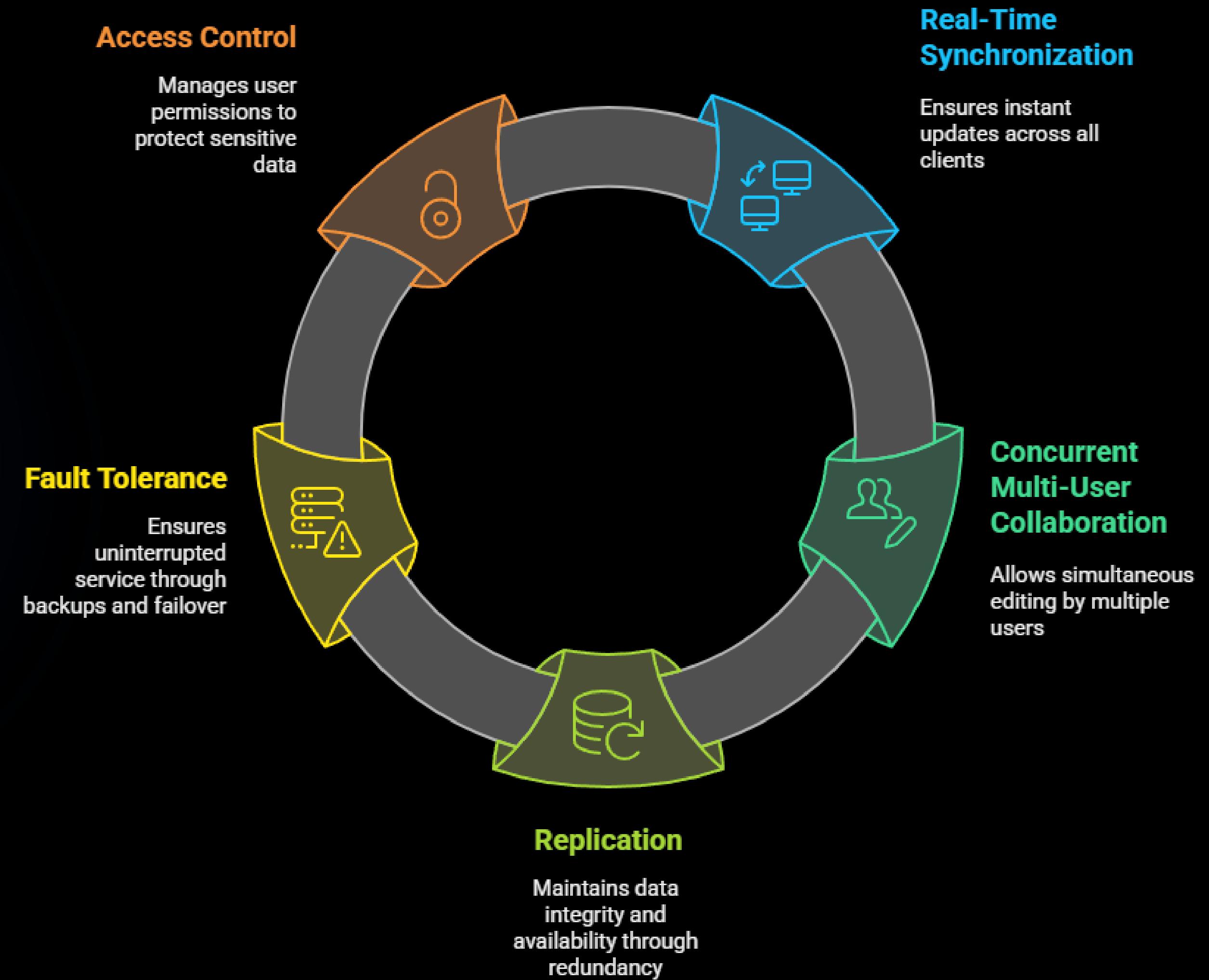
## Receive Changes

Users receive and apply changes.

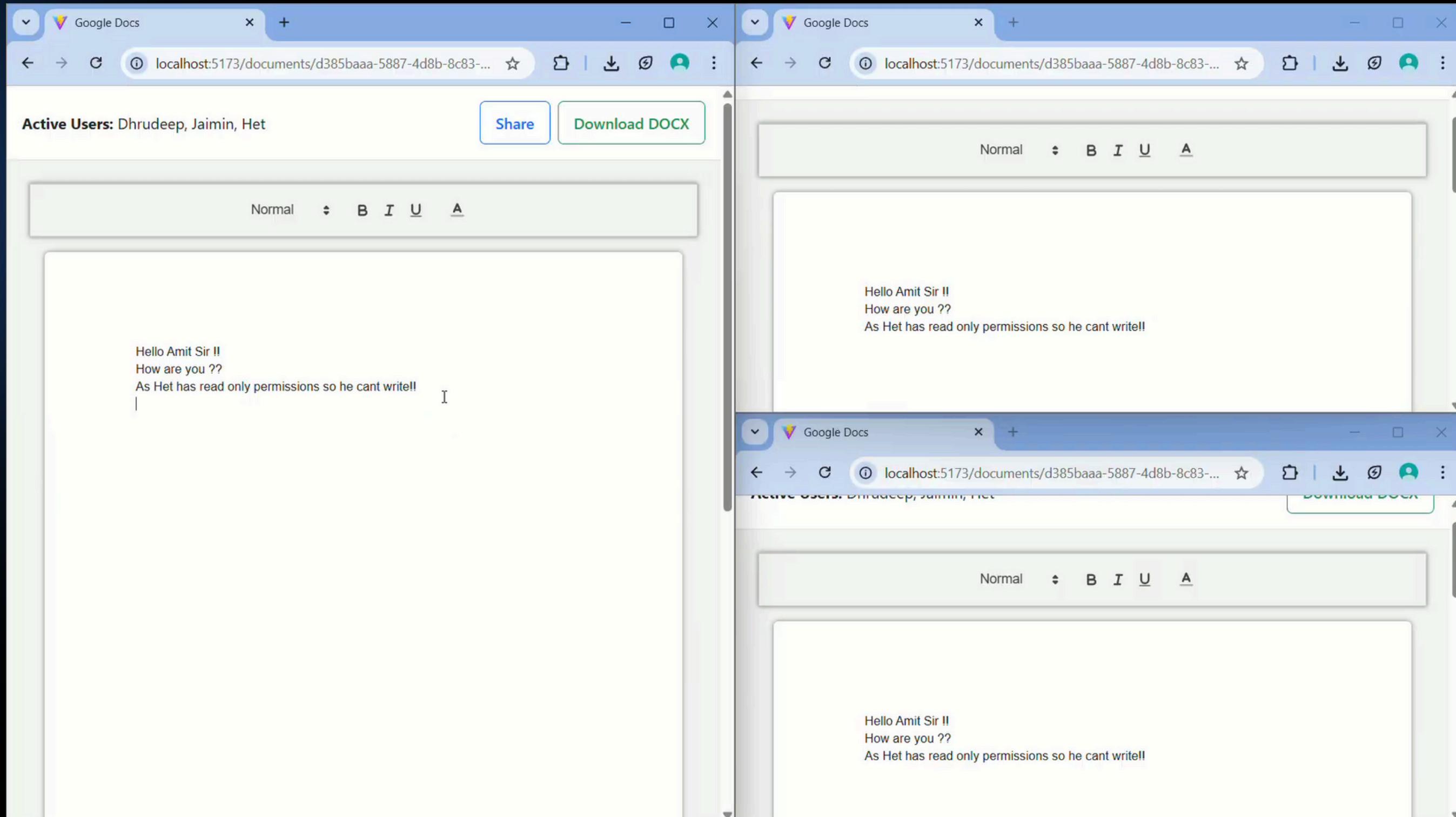
## Tech Stack



# Distributed System Concept



# Real Time Synchronization & Concurrent Multi User Collaboration



# Replication

EXPLORER    ...    `{ } data.json` X

OPEN EDITORS    X `{ } data.json` server\l...

SRC    D+ E+ U B  
  > client

server > local-storage > `{ } data.json` > {} a9718ed3-6efa-4e9b-b3b1-88b736cd217

```

66   "8f3e0e84-450d-4b7c-a511-01e8f5d444ff": {
76     },
77     "b40f9d39-ee91-41e0-bad0-f279c1158f5b": {
78       "title": "Untitled",
79       "content": {
80         "ops": [
81           {
82             "insert": "hi kem chho majama ne\n"
83           }
84         ],
85       },
86       "updatedAt": "2025-04-19T04:33:49.683Z"
87     }
88   }

```

.env  
.gitignore  
`{ } package-lock.json`  
`{ } package.json`  
tsconfig.json

documents documents +

cluster0.di5t1zk.mongodb.net > test > documents

Documents 4 Aggregations Schema Indexes 1 Validation

Type a query: { field: 'value' } or [Generate query](#)

[ADD DATA](#) [EXPORT DATA](#) [UPDATE](#) [DELETE](#)

```

_id: "3c7007c9-74df-4b54-9330-b86dba367807"
name : "hi"
  ▾ data : Object
    ▾ ops : Array (1)
      ▾ 0: Object
        insert : "hi kem chho majama ne
"
        __v : 0

```

```

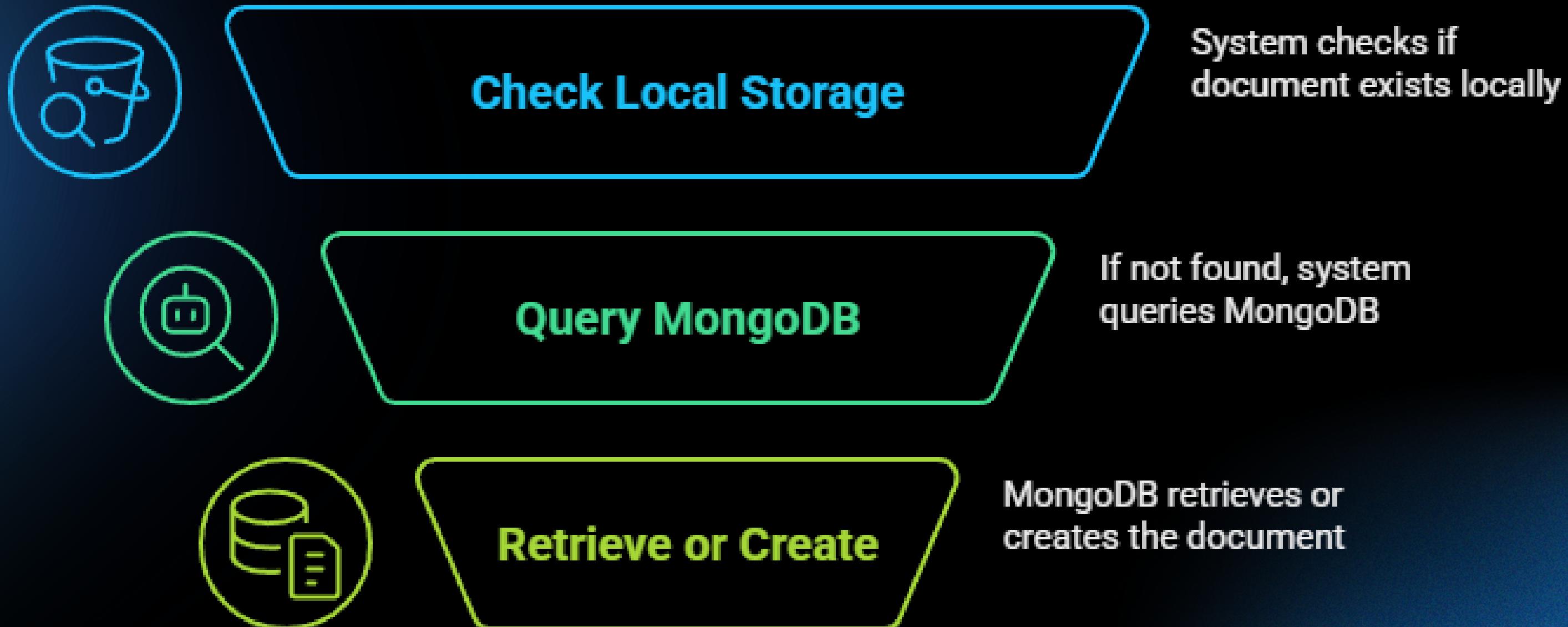
_id: "44b97596-558d-49b2-9bd6-b209a0e22612"

```

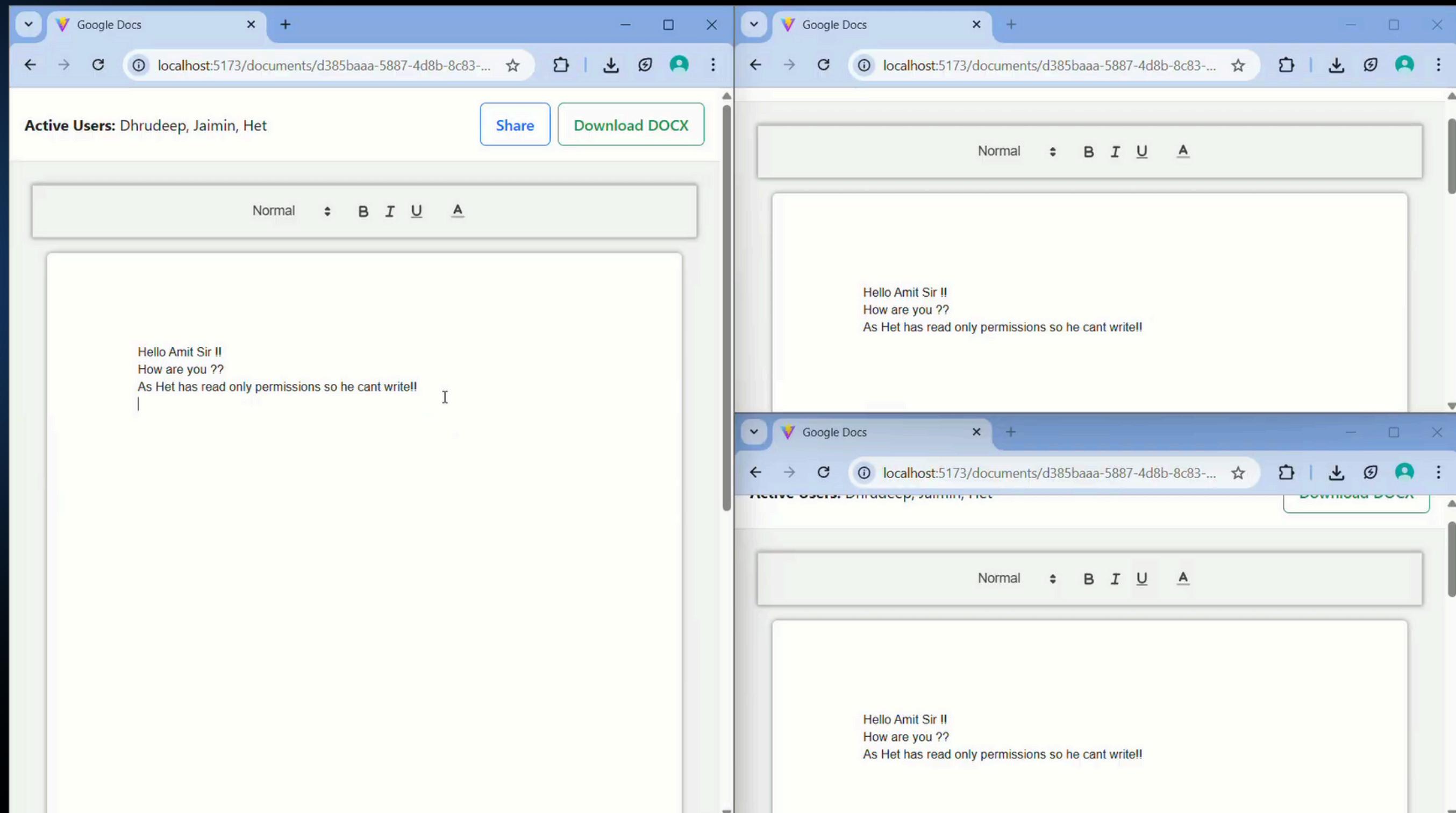
## Local Storage

## MongoDB

# Fault Tolerance



# Access Control





THANK YOU