Introduction to Data Structure (Data Management) Lecture 10

Felipe P. Vista IV

Reminder

- Everybody, make sure that your name in ZOOM is in the following format:
  - University ID Num Name (no “( )“)
  - Ex: 202054321 Juan Dela Cruz
  -
  - Not changing your name to this format
    - you might be marked Absent

    * Ravshan → absent?

- NoSQL

- JSon and Semi-tructured Data

INTRO TO DATA STRUCTURE

NOSQL
(CH 11.1)

Motivation for NoSQL

- Motivated by Web 2.0 Applications
  - Web 2.0 allow anyone to create and share online information or material
  - Key element is allow people to create, share, collaborate & communicate
  - Hosted services (Google Maps), Web Apps (Google Docs, Flickr), vid sharing sites(YouTube), wikis, blogs, SNS(FB,IG), microblogging(Twitter)

Motivation for NoSQL

- Goal is to scale simple OLTP-style applications to millions or even billions of users
- OLTP (OnLine Transaction Processing)
  - capture, store, process data from transactions in real-time
  - typical size range from 100MB to 10GB
  - Ex: online banking, purchasing book online, booking ticket, send text message, call center staff view/update customer info

Motivation for NoSQL

- Facebook has 1.79B active users daily (Q2 2020)
  - use often correlated in time in each region
    - *correlated : one thing affects or depends on another*
  - more than 10M requests/sec if 25% users arrive w/in hour
  - SQL Server would crash under this workload
- Users doing both reads and updates

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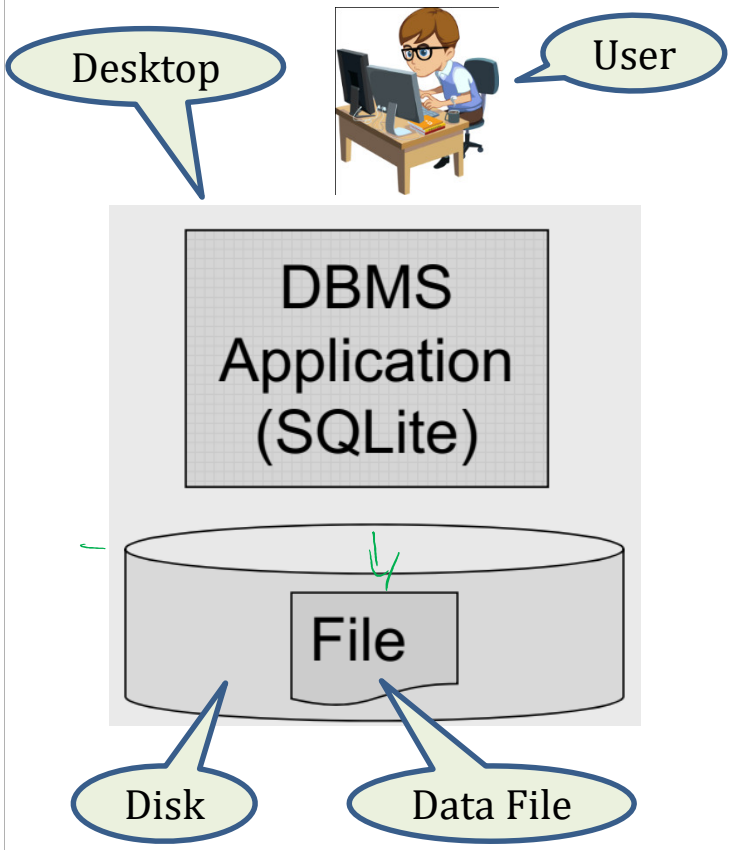
- NoSQL: reduce functionality for easier scaling
  - simpler data model
  - fewer guarantees

Serverless Architecture



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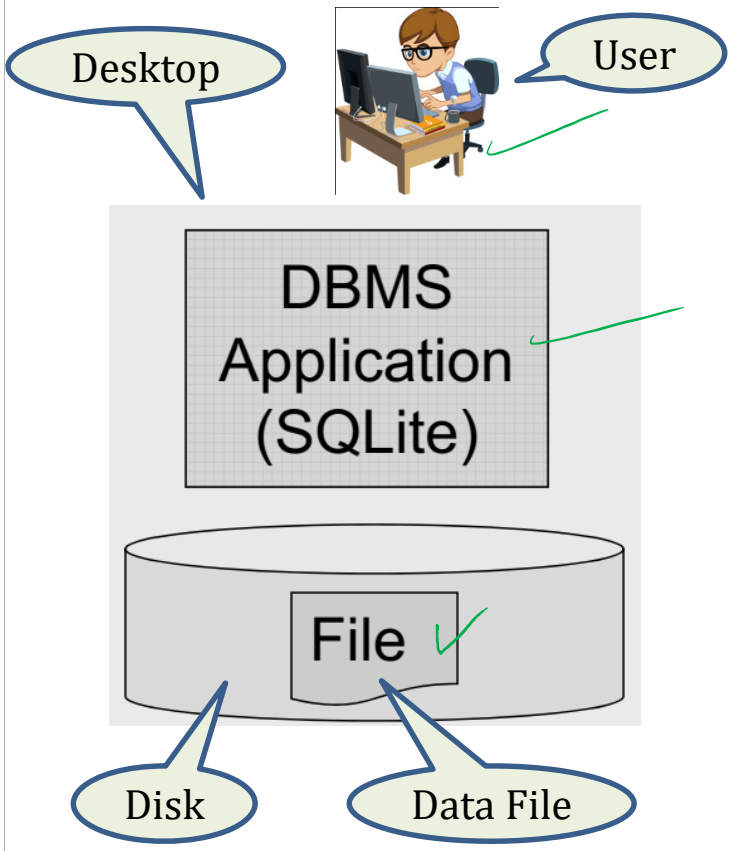

SQLite

- One data file
- One user
- One DBMS application

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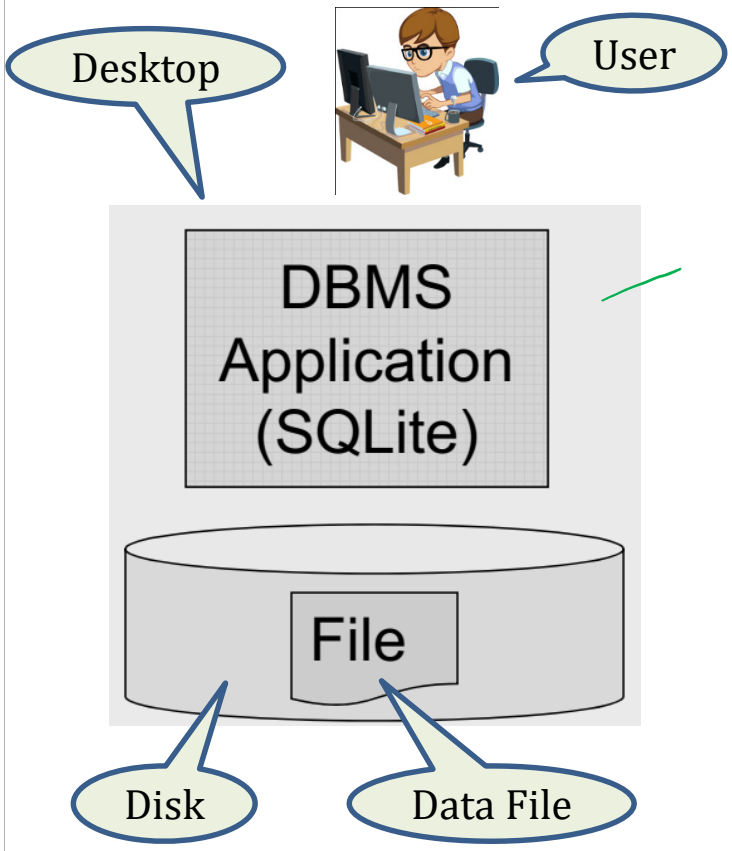

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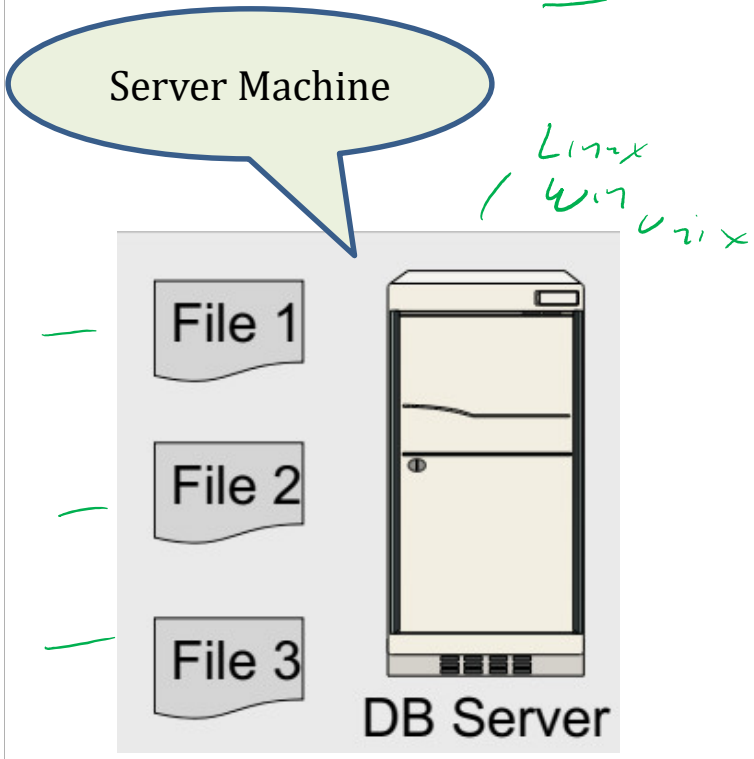
- Scales well
- But only a limited number of scenarios work with such model
- Can be in browser/ phone

Client-Server Architecture



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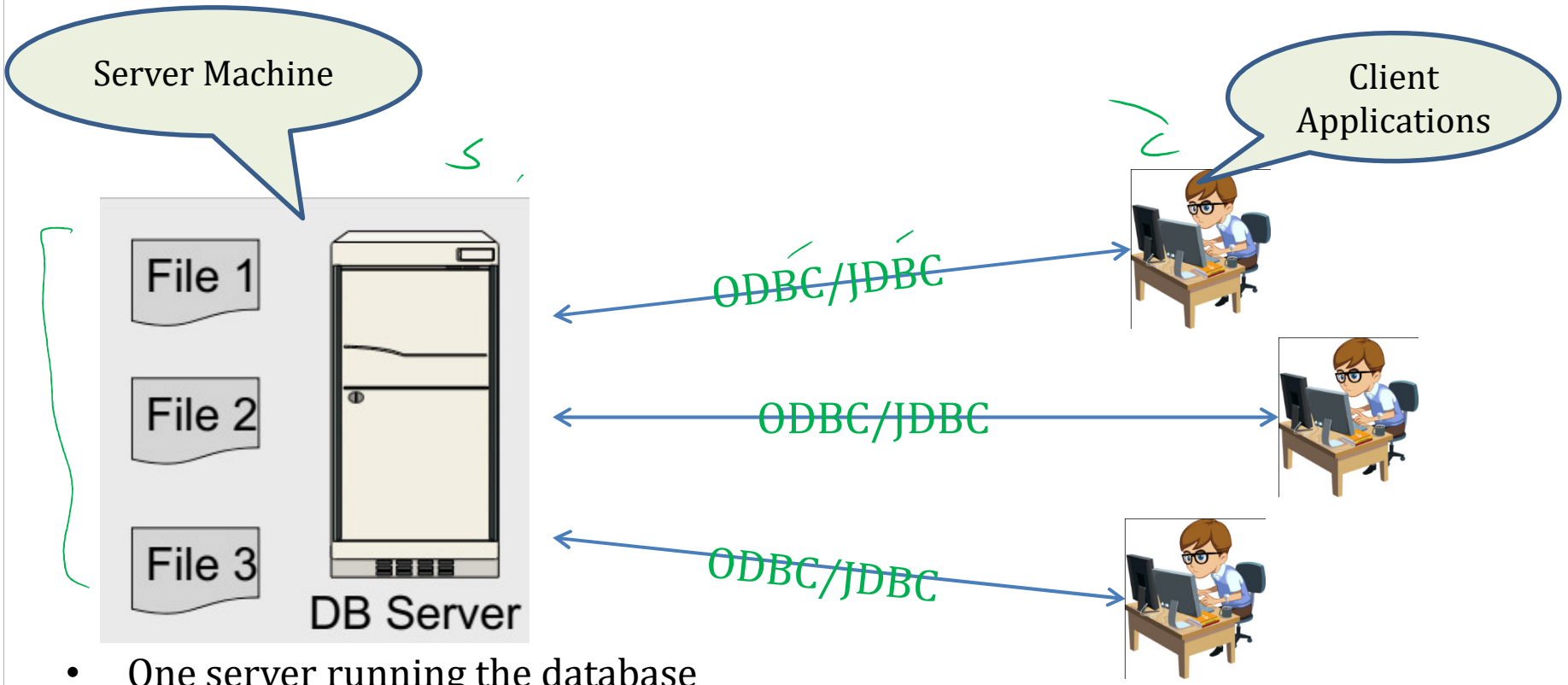

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- Many clients, connecting via ODBC (Open DB Connectivity / JDBC (Java DB Connectivity

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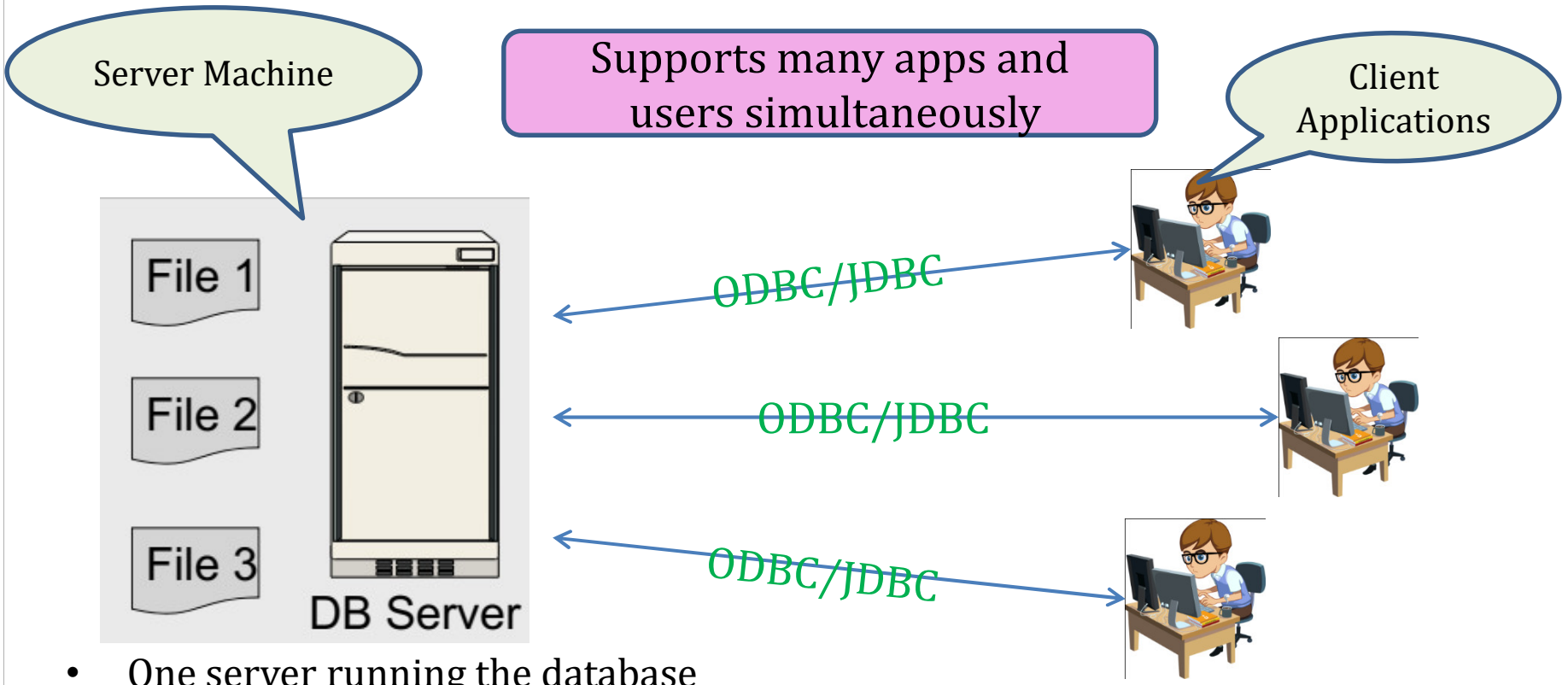

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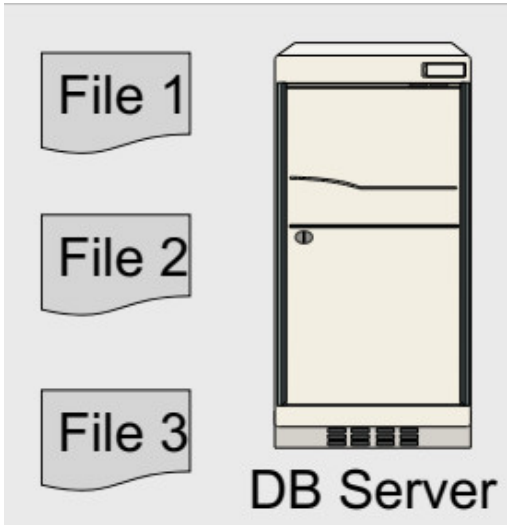
- Clients "talk" to server using ODBC/JDBC protocol

3-Tiered Architecture



Web-based Applications

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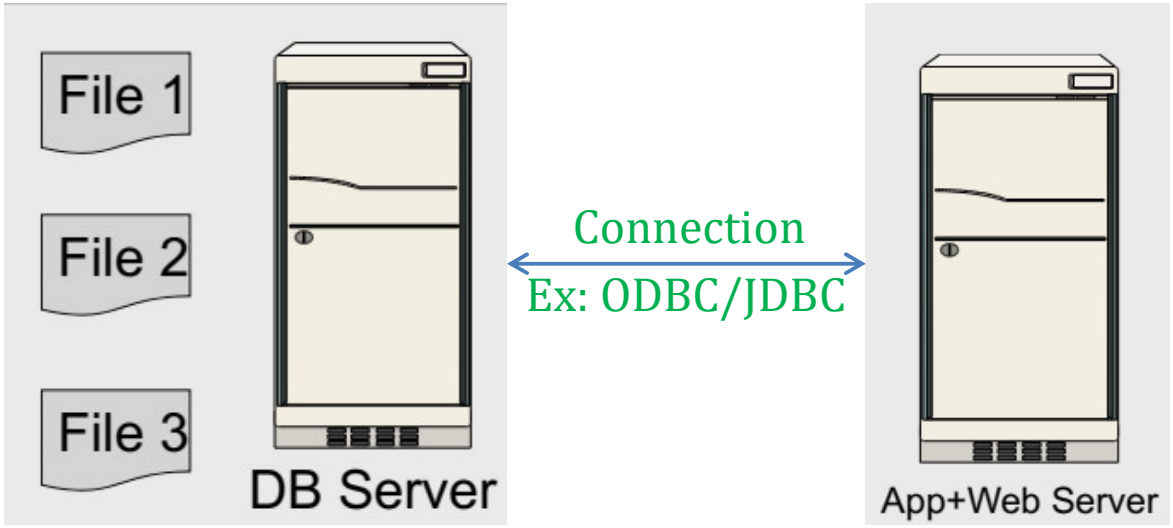

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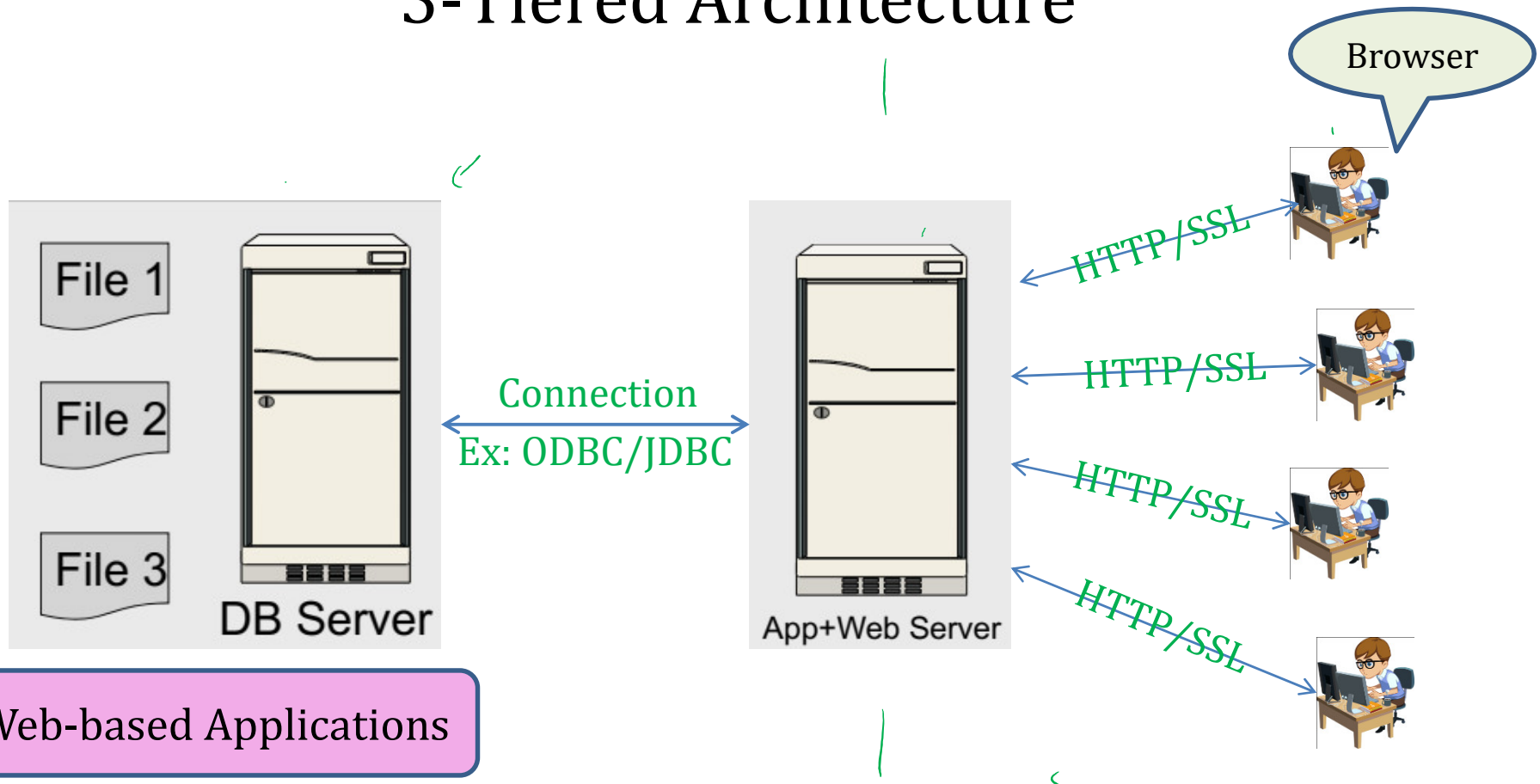

Web-based Applications

* HTTP = Hyper Text Transfer Protocol
* SSL = Secure Socket Layer

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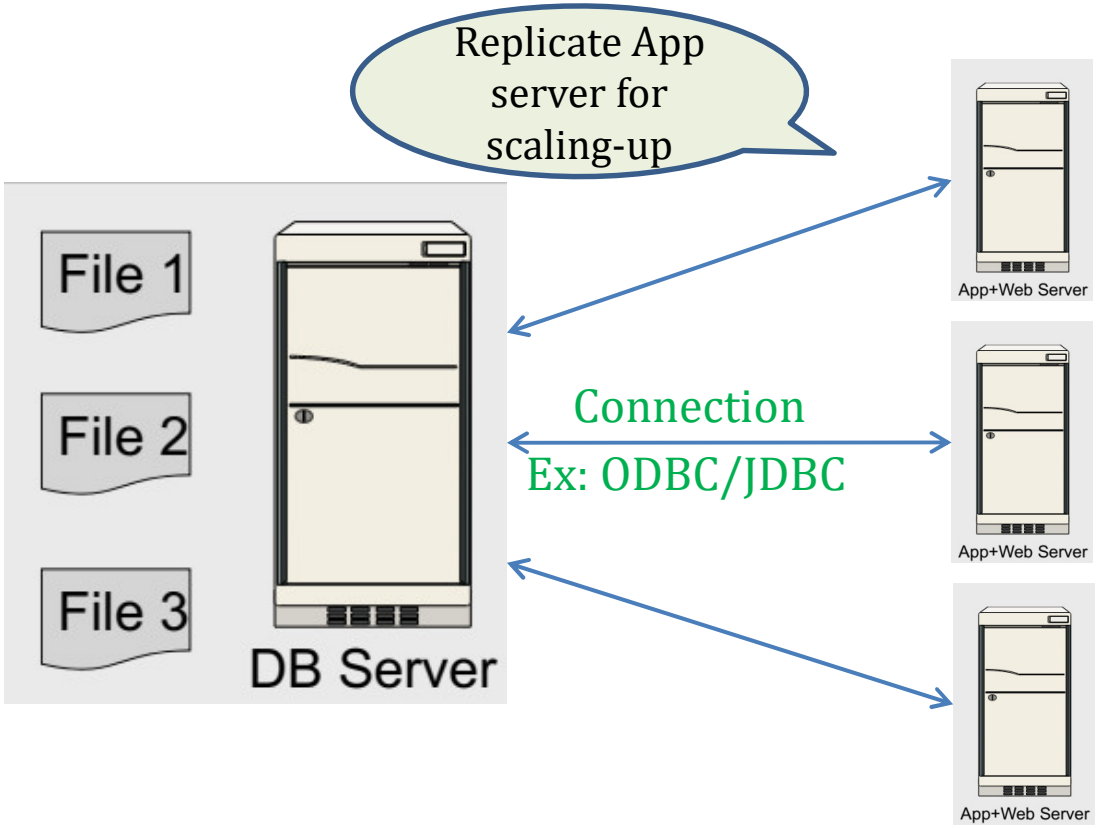

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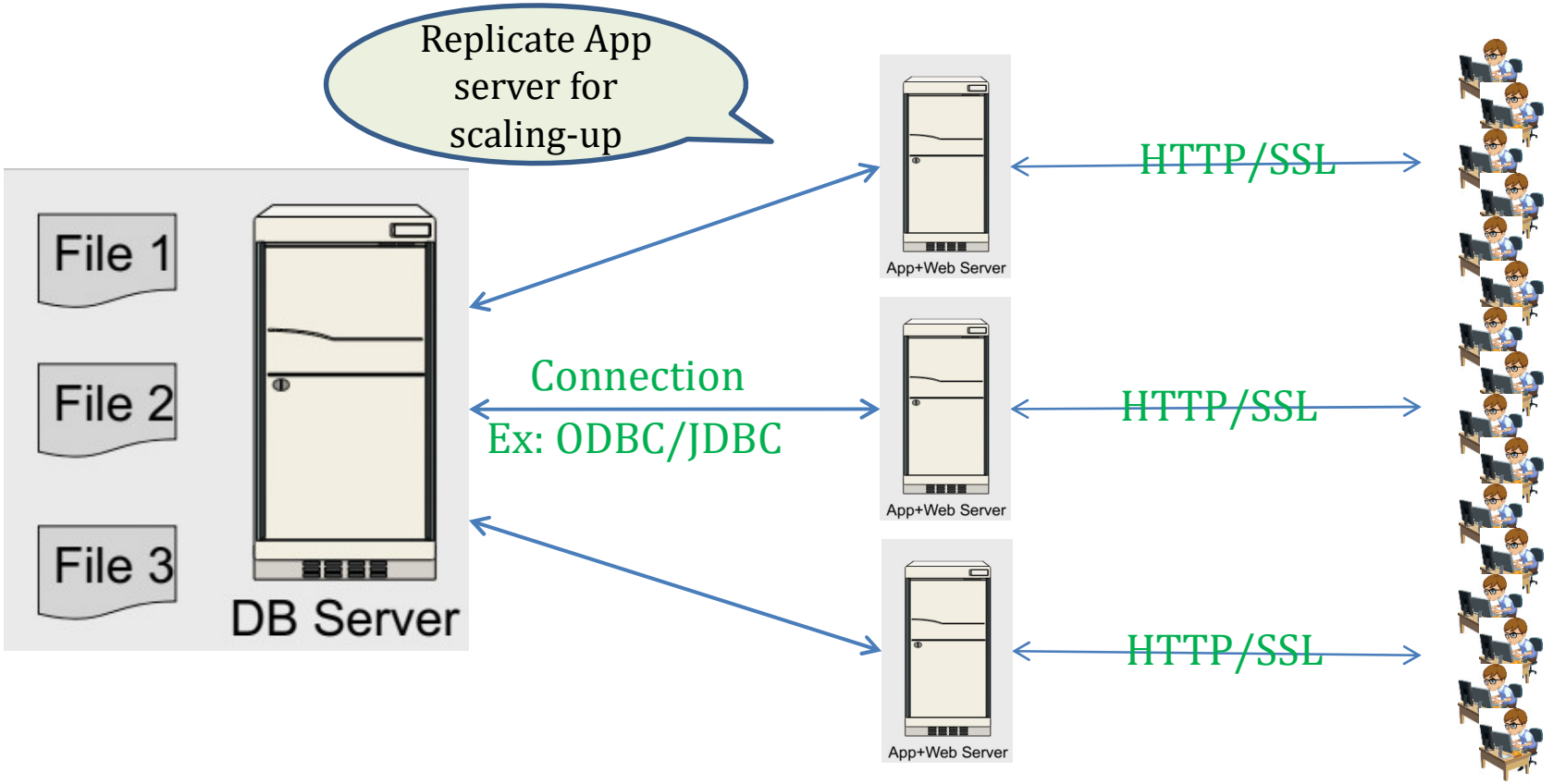

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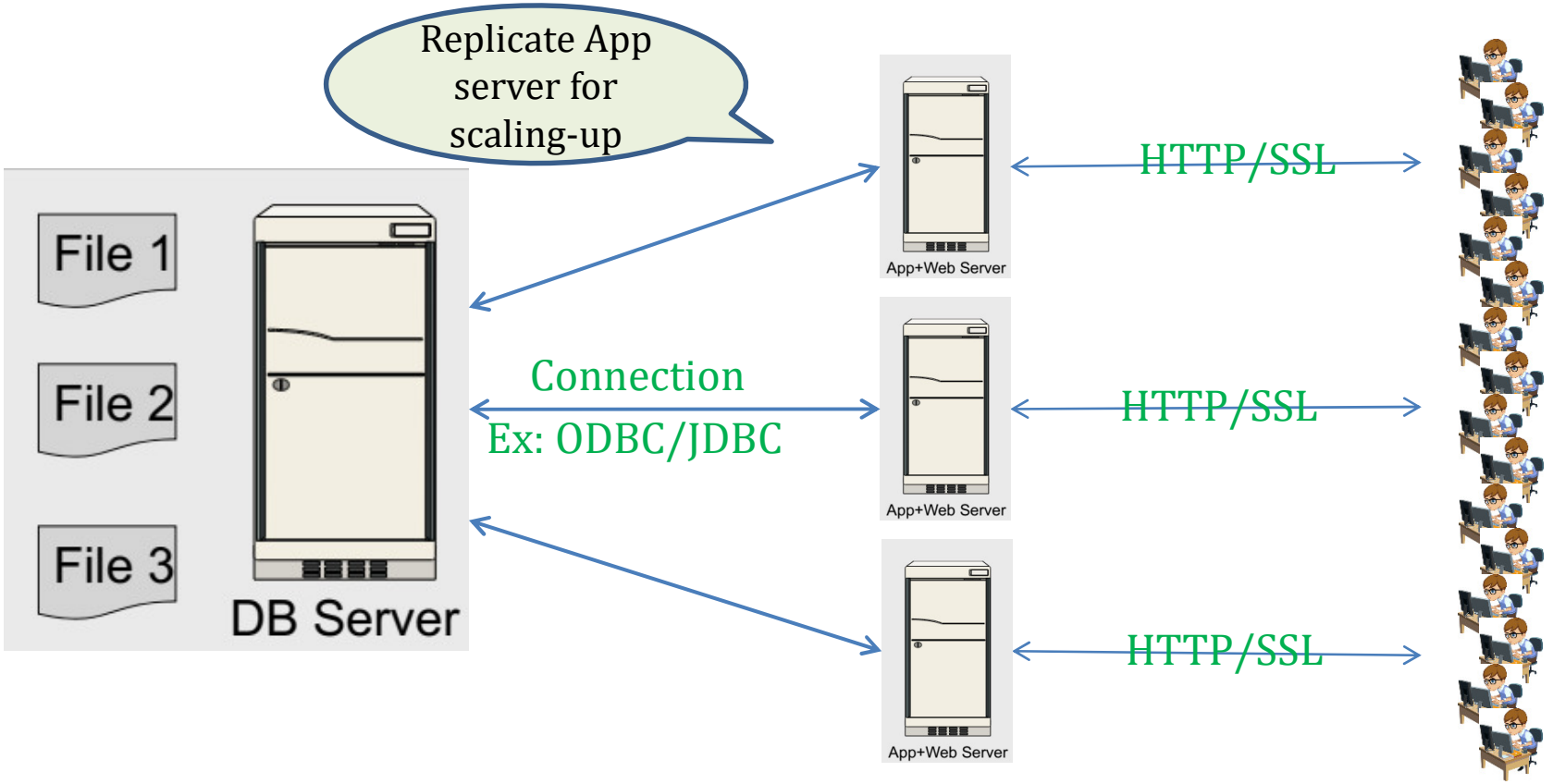

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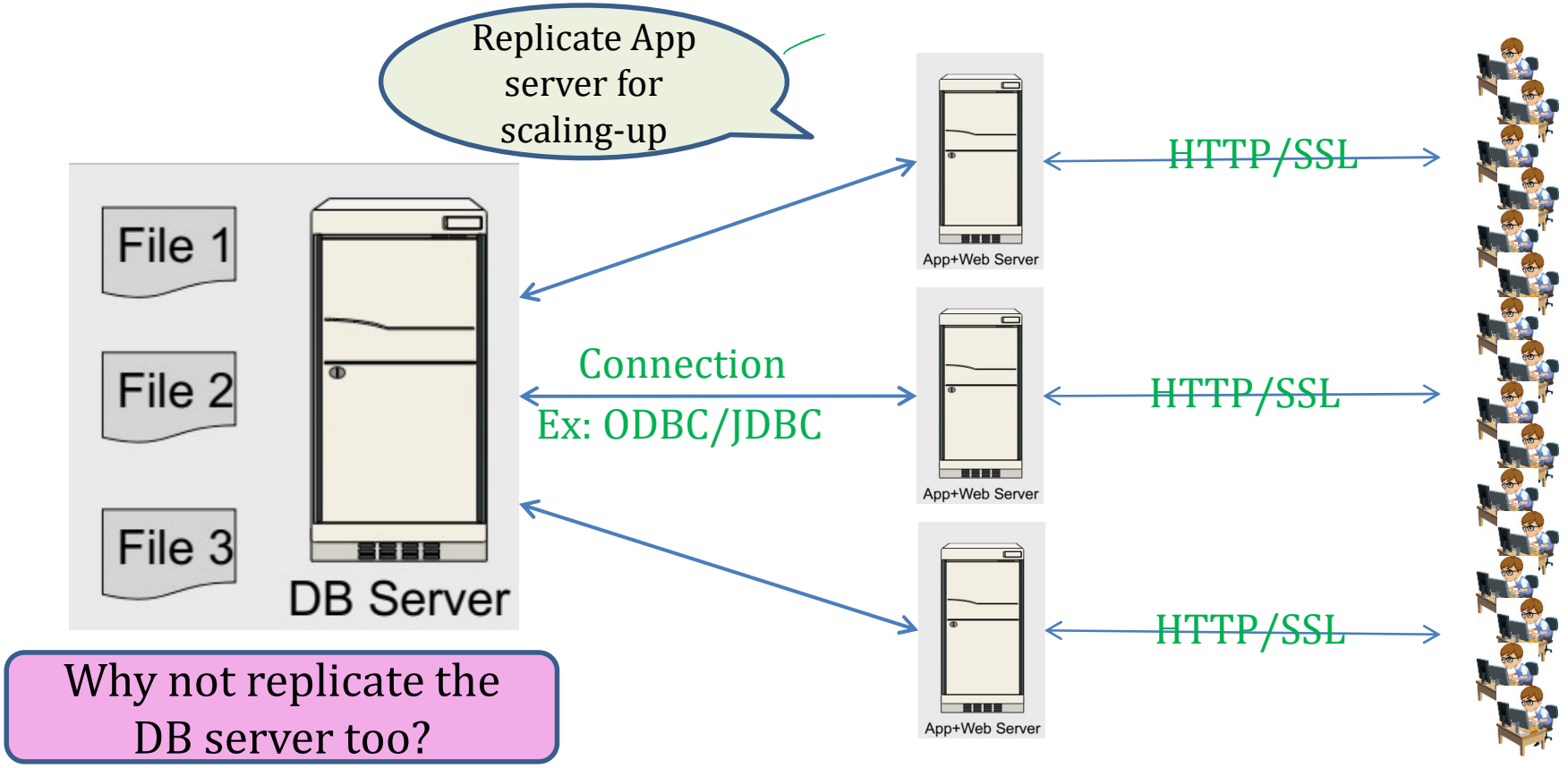

Why not replicate the DB server too?

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Replicating the Database

- Much harder because the state must be unique. In other words, database must act as a whole
  - Current DB instance must always be ***consistent***
    - Ex: Foreign keys must exist
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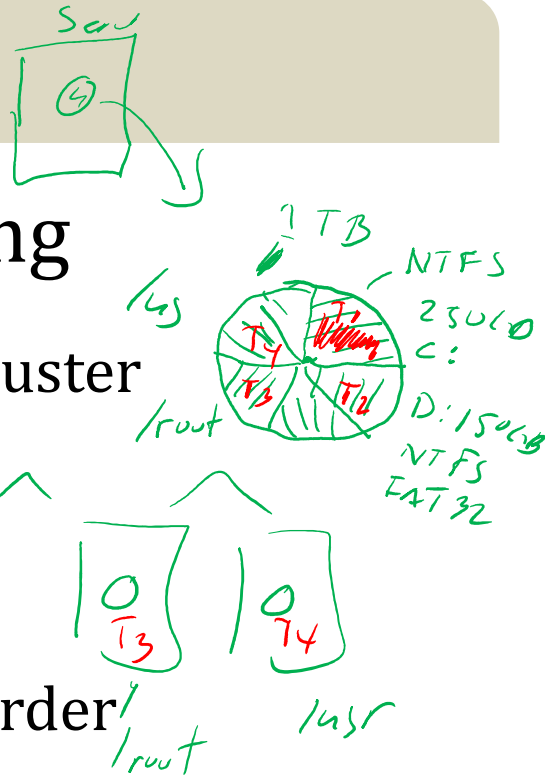
- Two basic approach:
  - Scale up by partitioning
  - Scale up by replication

Scale Through Partitioning



- Partition the DB across many machines in a cluster
  - Database could fit in main memory
  - Queries spread across these machines
- Can increase throughput
- Easy for (simple) writes but reads become harder

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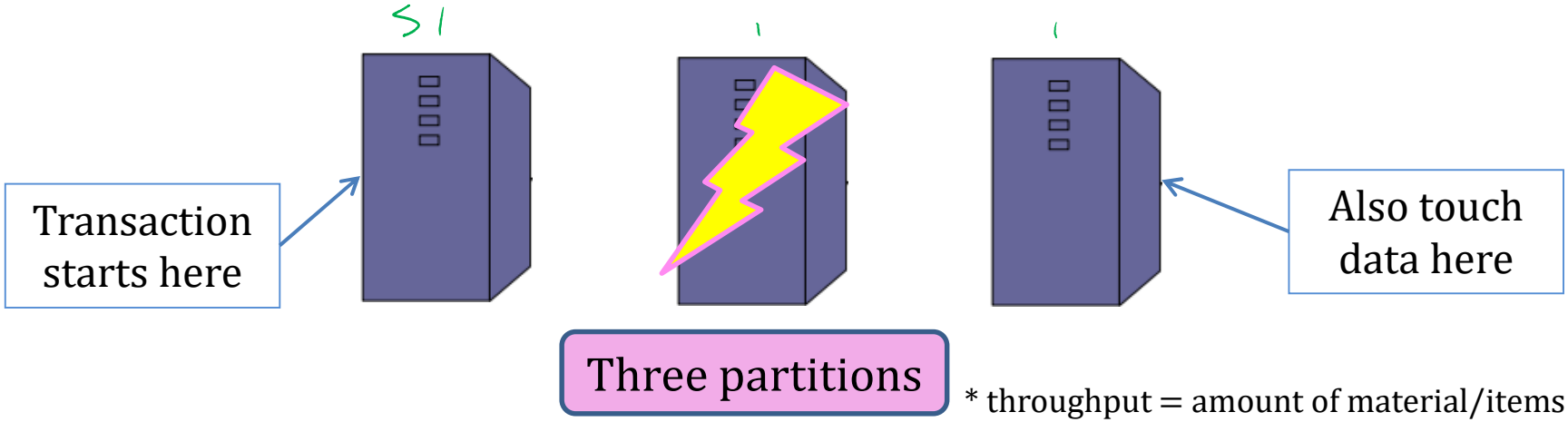

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