TTM 50, LECTURE #5 (7/13/17)

Agenda

1. Complete the IT infrastructure design for the data center
2. Databases
3. Database assignment
4. Project Phase 1 feedback
5. Project Phase 2
6. HW #3
7. return graded HW#1 to you
8. Network Architecture

1. I.T infrastructure design to host a networked application using a traditional data-center

In Lecture # 4 we developed Steps 1-5 for the infrastructure design.

1. Define the business challenge/business problem/

(The data center hosts 2 types of applications

Internal:
Enterprise Applications
Used to operate the company:
ERM (ERP)
SCM
⋮
CRM

External:
related to the vision, mission, & business goals of the company
e.g. stream movies (Netflix)
$$$

2. Define the business process that need to be automated using software applications

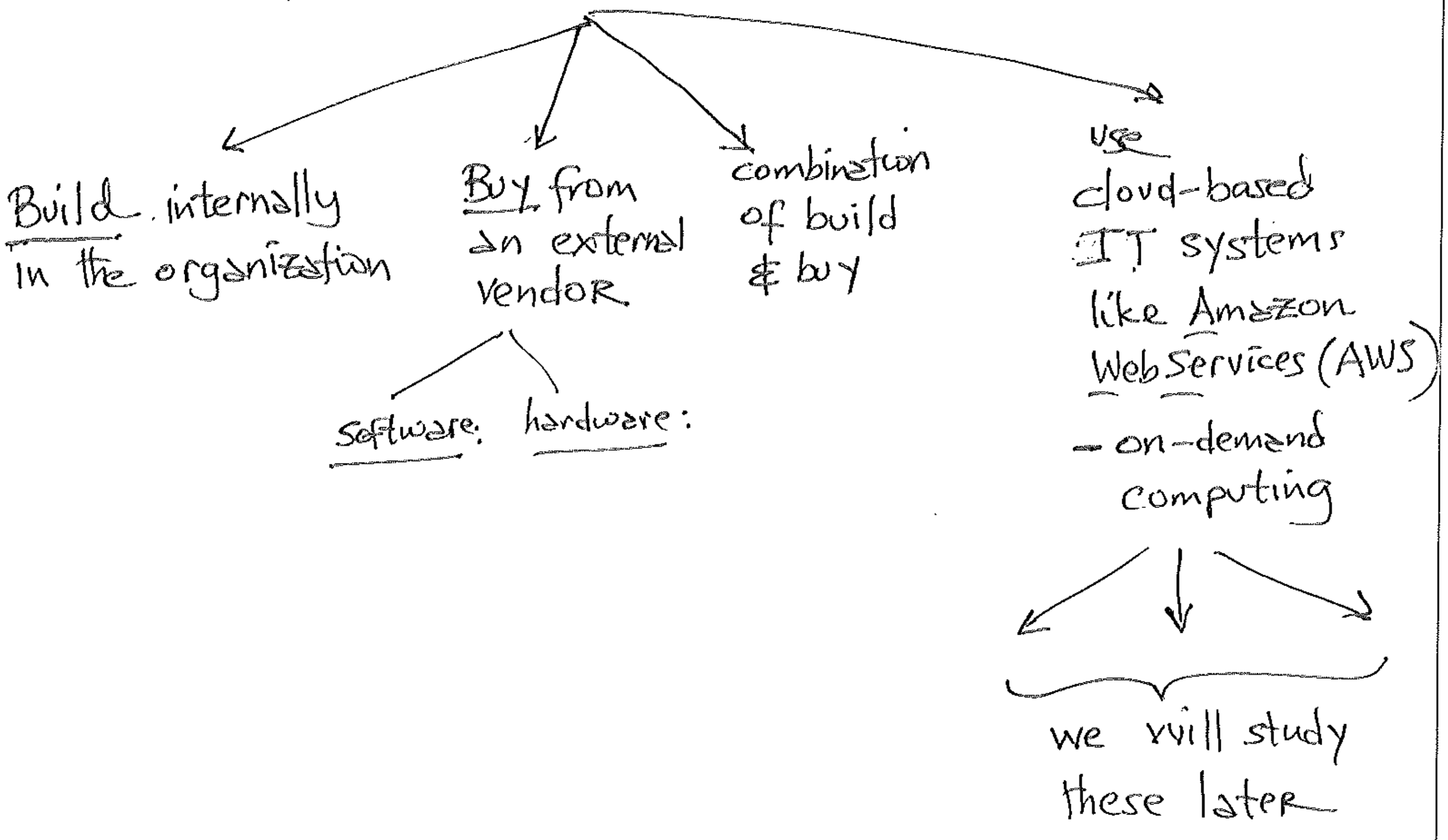
3. Translate business processes into the requirements for the software applications

4. Define the software architecture (in particular, the layering or tiering of the software architecture)

5. Define the hardware 'architecture to host the software architecture

There are 3 more steps

Step 6 : Determine actual implementation options for software (Step 4) and hardware (Step5)



Build internally in the organization

Buy from an external vendor

software: hardware:

combination of build & buy

use cloud-based IT systems like Amazon Web Services (AWS) – on-demand computing

we will study these later

Step 7: Design the data-base architecture

Step 8: Design the computer network architecture

Database Design

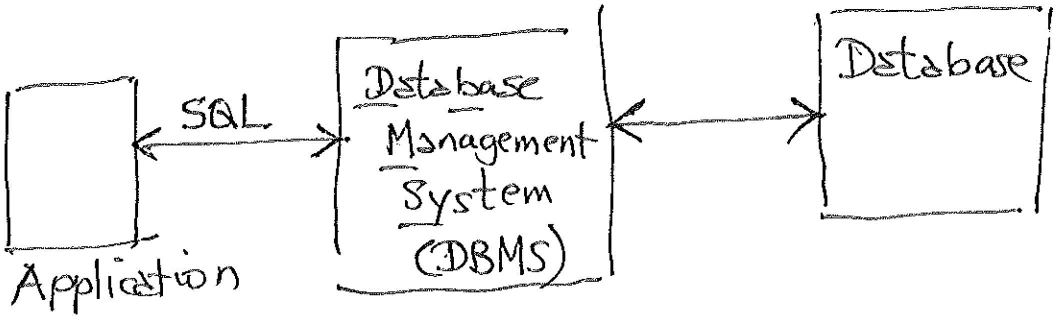
Definitions

Database is a collection of related files containing records of people, places, and things

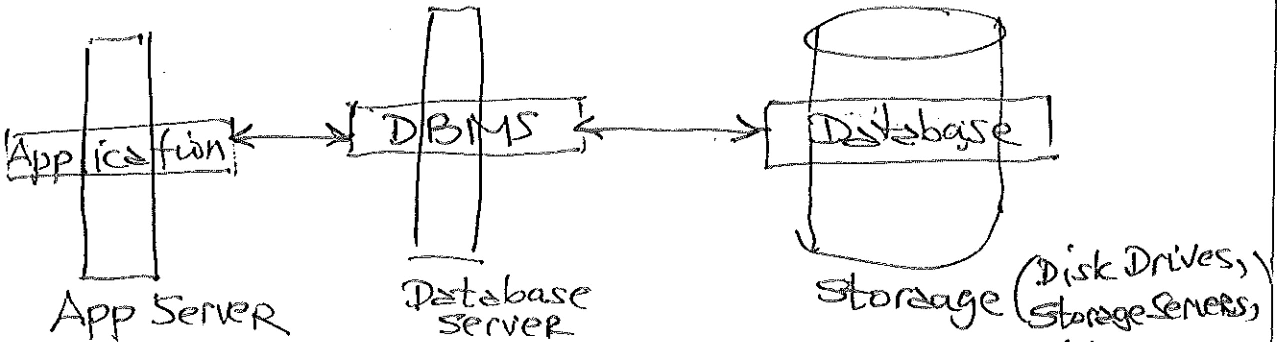
Problem:

How do we organize data, and how do we manage data on the computer?

Software view:



Hardware view:



Back to the problem defined on the previous page:

1. Organize data by category of information such as customers, suppliers, orders, ...

2. Information about categories is stored and maintained as an ENTITY, e.g. Customer Entity, Supplier Entity, ...

3. Each entity has specific characteristics called Attributes (or fields)

e.g. for Customer Entity; the attributes are customer #, customer name, ...

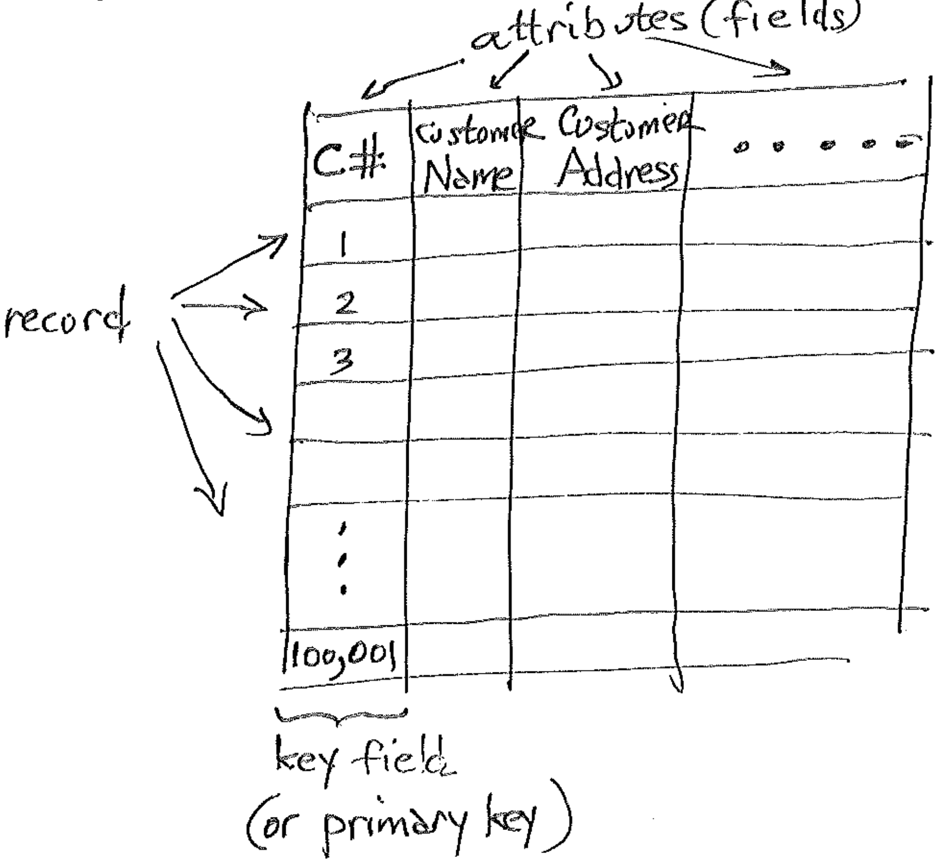
4. An individual member of an Entity is called a record

5. Relational Database
   - Database is organized as a relational DB in a two-dimensional table with the rows representing the records & the columns representing the attributes (or fields)

- Each table contains a key field to uniquely identify each record for the purposes of data retrieval and/or manipulation

- Entity relationship diagrams show how the entities in the DB are related

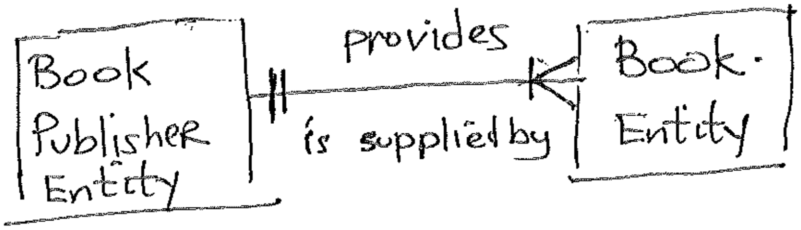
Example ; Customer Entity DB



C#	Customer Name	Customer Address	. . . . .
1			
2			
3			
⋮			
100,001			

Simple entity relationship diagram:

(related to the on-line book-seller)



Notation

—< : one-to-many relationship; e.g. for a single book publisher, there are many books

|| : one-to-one relationship; e.g. for a particular books, there is only one publisher

6. Database Management System (DBMS)

- DBMS consists of software that permits the centralization of data & data management so that the enterprise has one consistent source for all data needs

- Single DBMS services multiple applications
- DBMS separates the logical (software application) & physical view (location) of the data
- Features of the DBMS
    - data definition capability
    - data dictionary capability
    - data manipulation language

      SQL (Oracle, Microsoft)
      mySQL (open-source)
      DB2

7. Tools and Technologies to improve business performance & decision making
    - Aggregate individual databases to create an Enterpise Data Warehouse (EDW): collects current & historical data from several DB systems in a centralized DB for reporting & analysis

- Datawarehouses support multi-dimensional data analysis using OLAP (on-line analytical processing)

- OLAP relates relationships between data entities as a "Data Cube"

- Data mining (aka machine learning) analyzes large pool of data ("Big Data") to perform predictive analytics: find patterns in the data that are useful for predicting future behavior
  e.g. "Recommender System" on Amazon

Read the chapter on "Databases . . . " in EMIS by L^2.

Process for DB design

Example: Customer places an Order for Parts

Each part is a line item in an Order

Each Part comes from a supplier

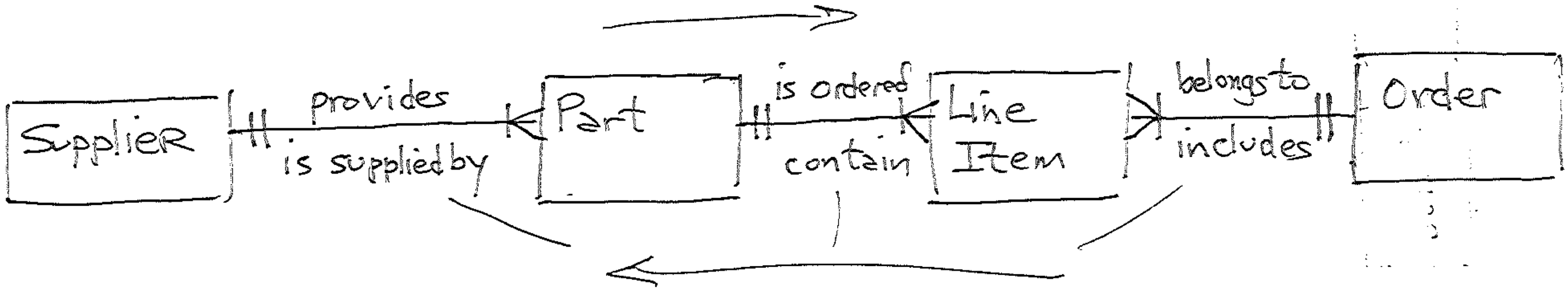
We want to relate Suppliers to Parts to Line Items to Orders

Process:

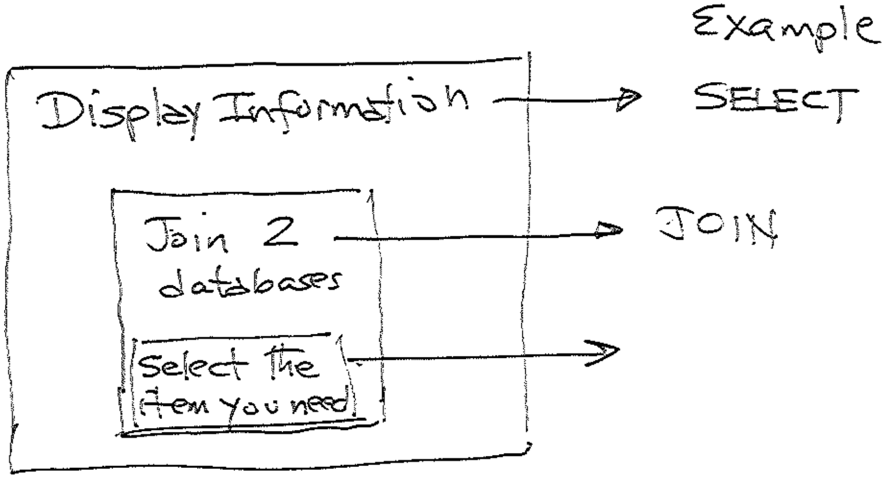
1. Identify The Data bases that contain the Entities of interest:
   - Suppliers
   - Parts
   - Line Items
   - Orders

2. Create an entity relationship diagram relating the entities

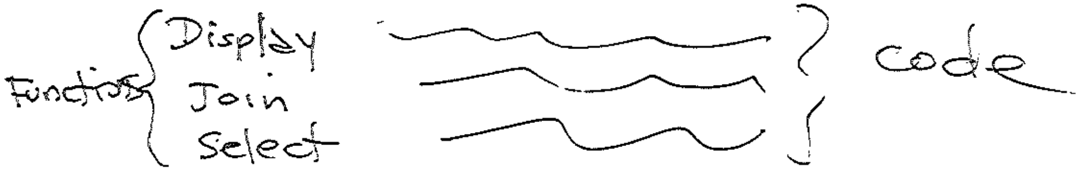
Entity relationship diagram



Step 3 : Define the operations to solve the DB problem



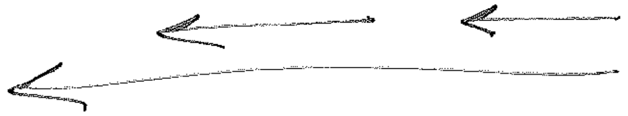
Step 4 : Write the SQL Code



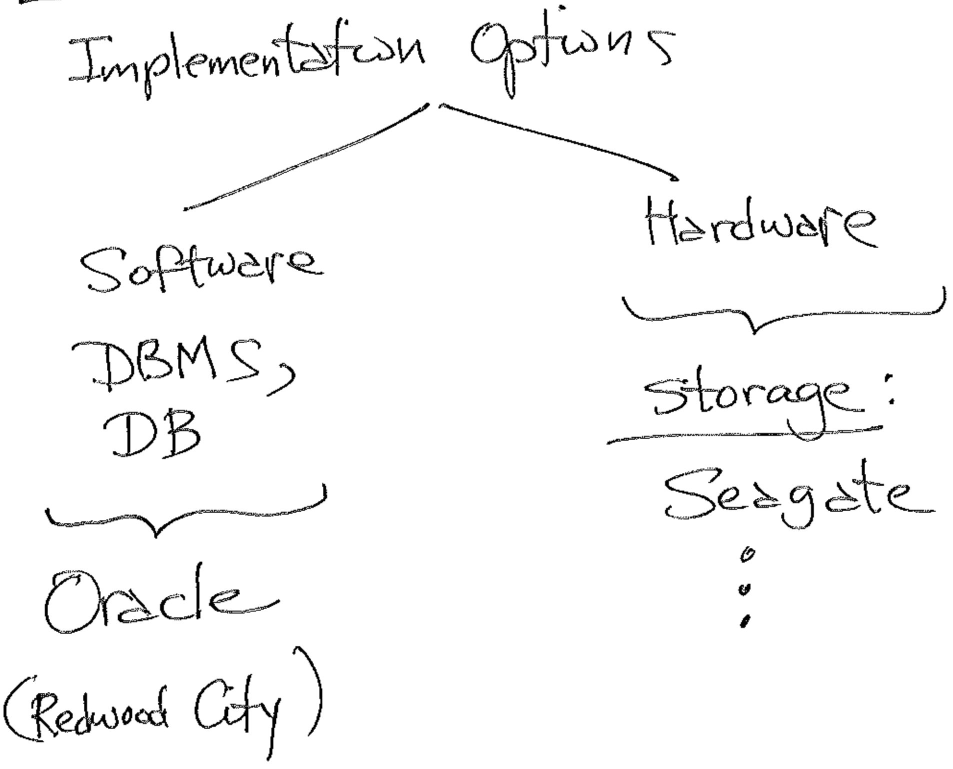
Project feedback

Overall the work was good

V. Good	Good	Fair
2	2	1



Database:



Implementation Options

Software

DBMS, DB

Oracle (Redwood City)

Hardware

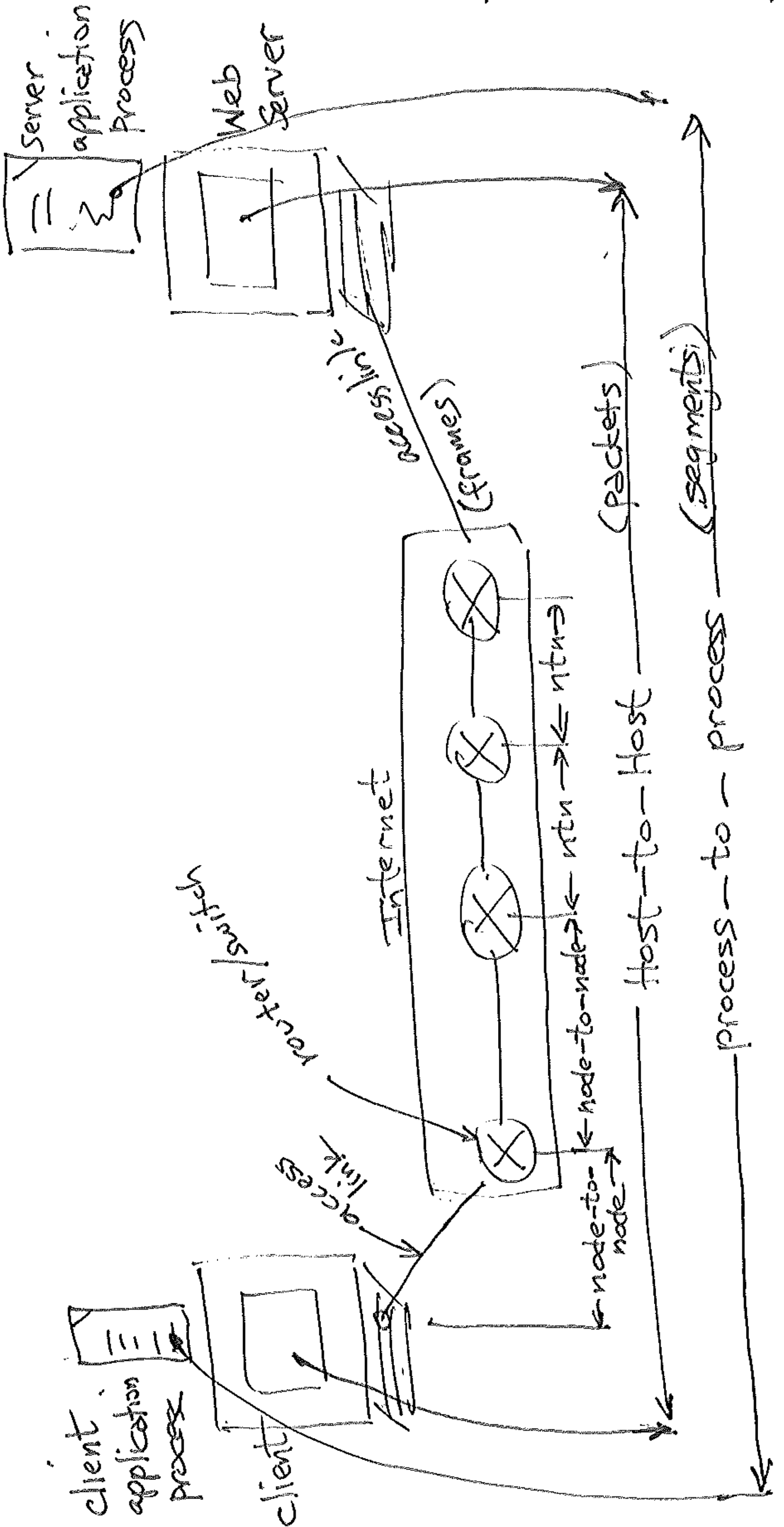
Storage:

Seagate

⋮

Network Architecture:

main function: enable real communicatin between 2 processes (or application programs)



We have 4 layers in The network

1. Data link layer : enables delivery of frames between 2 neighboring nodes (node-to-node)
node-to-node
switch-to-switch

2. Network layer : enables delivery of packets (datagrams) between 2 hosts (host-to-host)

3. Transport layer : is responsible for process-to-process delivery of segments (parts of messages) from one process to another

4. Application layer : is responsible for passing messages between the client process & the server process to perform useful tasks (e-mail, file transfer, ...)