MINNESOTA TECH FOR SUCCESS

Week 16-18: Database Management and Troubleshooting

3/13/2024

Agenda

- **Announcements**
- **Classroom (25 min)**
  - What are Databases?
  - Different Types of Databases
- **Break (5 min)**
- **Warehouse (1.5 hrs)**
  - Docks (PC docking stations)

ANNOUNCEMENTS

Week 16

Announcements for 3/13

- **Calendar**
  - Next session: **Wednesday, 3/27/2024**
  - No session: Wednesday, 3/20 – No School; Teacher PD

- Week 16-18: Database Management and Troubleshooting – Mar. 13th, 27th, & Apr. 3rd

Values

- **R**espect
- **A**ccountability
- **I**mprovement
- **S**teadfast
- **E**ncouragement

Database Management and Troubleshooting Objectives:

- What are databases?
  - Introduction to databases, explaining their purpose in organizing and managing data.
- Different types of databases
  - Overview of relational and non-relational (NoSQL) databases and their use cases.
- How databases are used
  - Explanation of how databases are used in various applications and industries.
- Solving common database issues
  - Guidance on identifying and addressing common database-related problems.

WHAT ARE DATABASES?
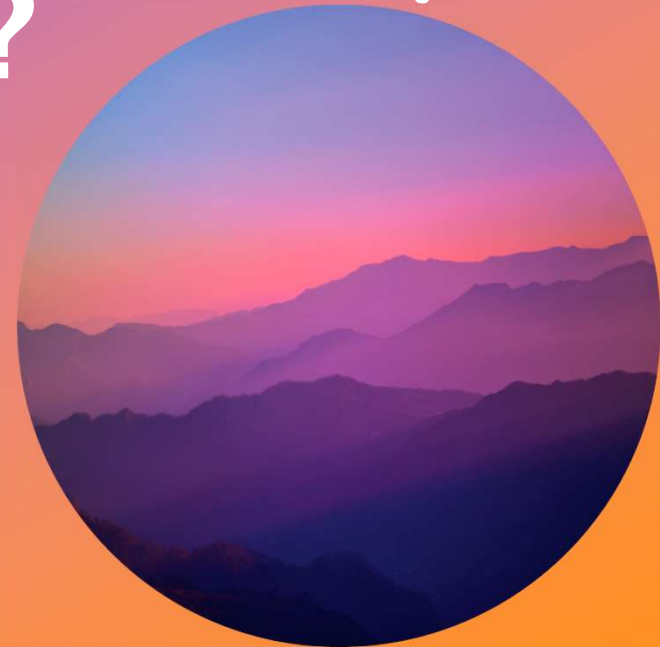
Databases: Data

- **Data –** Statically raw and unprocessed information

- Types of data in programming languages (JavaScript)

  - BigInt - let x = BigInt("123456789012345678901234567890");
  - Number – 4, 44.00
  - String – "Strawberry Fields"
  - Boolean – True, False
  - Symbol – built-in object whose constructor returns a symbol
  - Null - an assignment value that can be assigned to a variable as a representation of no value
  - Undefined – a variable without a value
  - Object - const person = {firstName:"John", lastName:"Doe", age:50, eyeColor:"blue"};

Types of Data in Databases

- **Numeric**
  - INT, TINYINT, BIGINT, FLOAT, REAL
- **Date and Time**
  - DATE, TIME, DATETIME, etc.
- **Character and String**
  - CHAR, VARCHAR, TEXT, etc.
- **Unicode character string**
  - NCHAR, NVARCHAR, NTEXT, etc.
- **Binary**
  - BINARY, VARBINARY, etc.
- **Array** – collection of elements of the same type
  - []

Databases

- **Database –** Organized and structured collection of data that is held in a computer system
  - Usually controlled and manipulated by a BDMS (Database Management System)

- Why do we need them?
  - So that we can store large amounts of data in one place and easily retrieve it
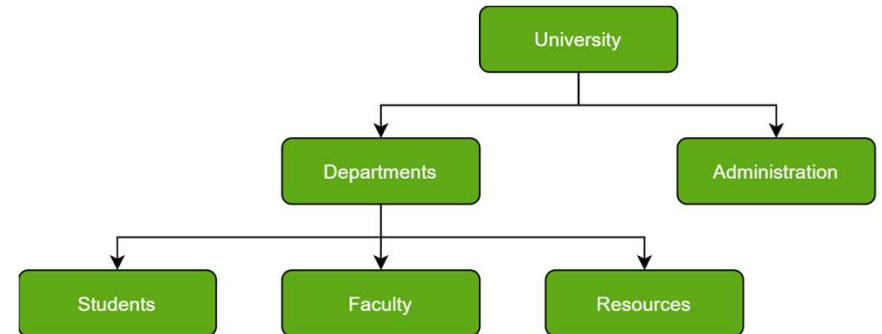
TYPES OF DATABASES

Types of Databases

- Hierarchical
- Network
- Object-oriented
- Relational
- Cloud
- Centralized
- NoSQL

Types of Databases: Hierarchical

- Data is categorized in ranks/levels
- Categorized based on common point of linkage
- Hierarchies are the domains to elements that form the hierarchies themselves
  - i.e. parent-child relationship

Types of Databases: Network

- Multiple member records or files can be linked to multiple owner files

- Allows each record to have multiple parent and multiple child records
  - when visualized, form a web-like structure of networked records

- Allows for more natural modeling of relationships between records or entities vs hierarchical model
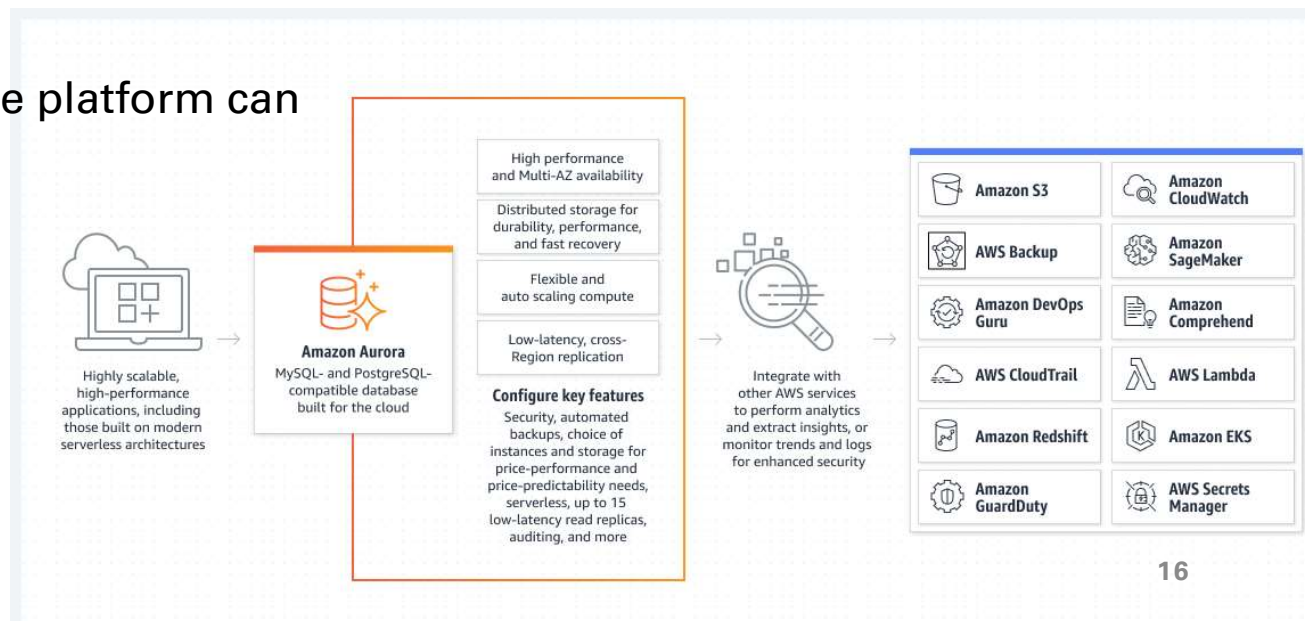

Network Database Model
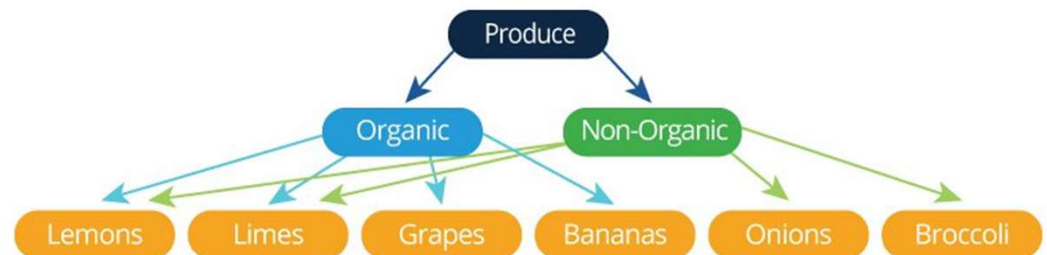
The network model has parent-child relationships, but allows many-to-many relationships.
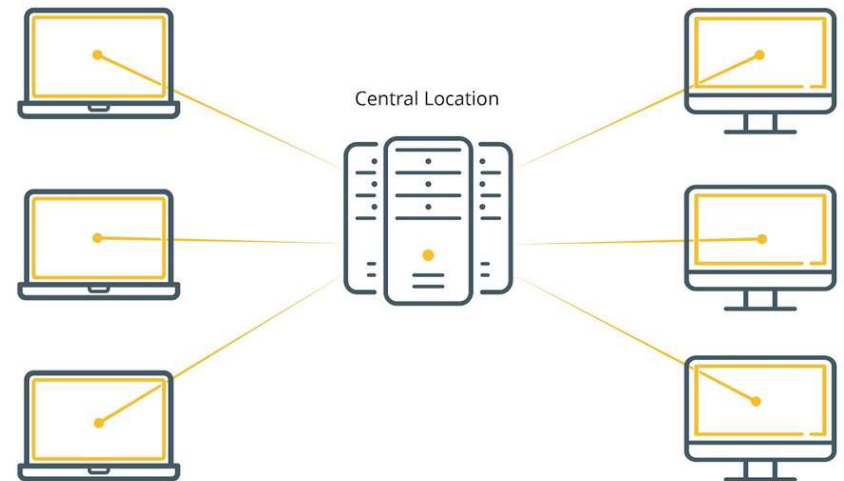
Types of Databases: Cloud

- Data is managed, stored and executed in a virtual environment

- Cloud computing services access the data from the database

- Other apps within the same platform can integrate with it

Types of Databases: Centralized

- Data is centralized, which is stored and maintained at a single location

- More secure when the users wants to retrieve the data from the Centralized Database

- Offers data security, reduced redundancy, consistency

- May be larger with longer response & retrieval time

- Not easy to modify, update and delete

Central Location

Types of Databases: Object-Oriented

- Information stored in a database is capable of being represented as an object
  - responds as an instance of the database model
- Workload is reduced, as object can be referenced and called without difficulty
  - i.e. different objects are linked using methods such: function database() {person.livesAt() console.log(database) }
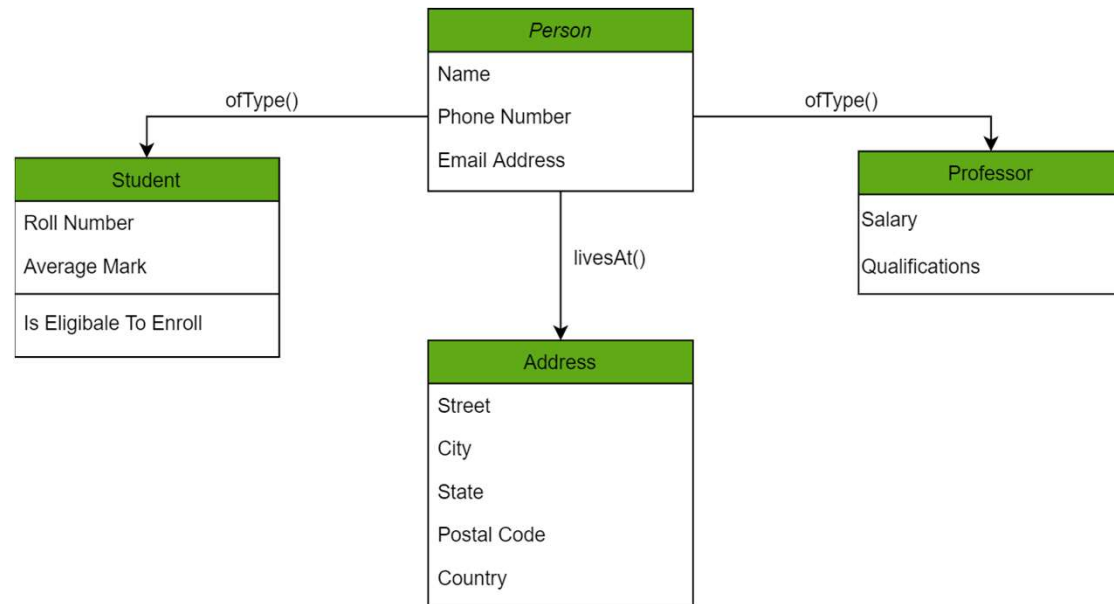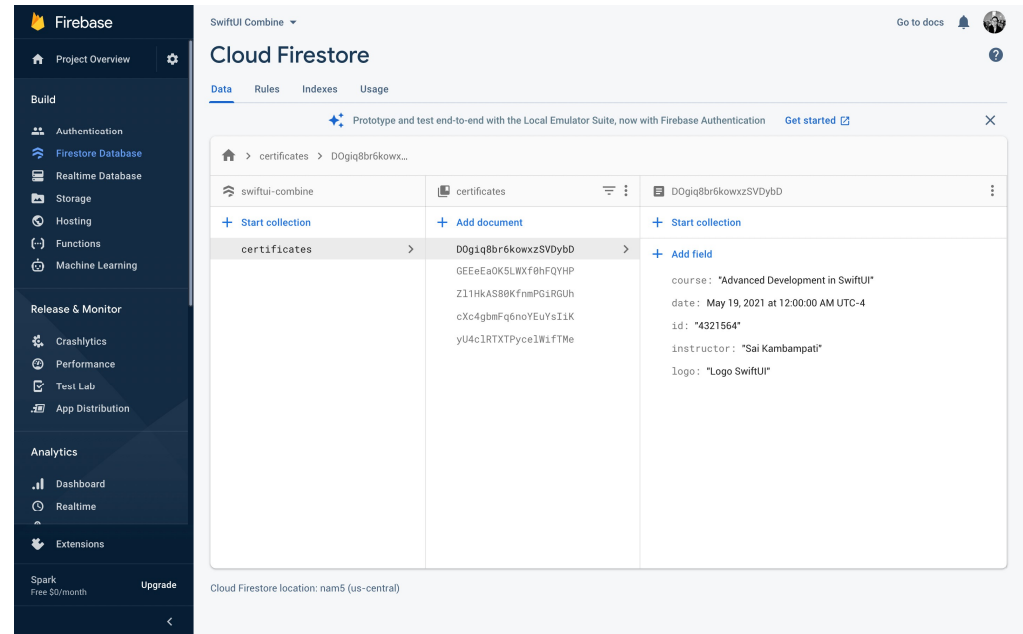
Types of Databases: Operational

- Data is stored, managed and updated in real-time operations

- Allows users to easily define, modify, retrieve, and manage data real-time

- Also referred to as OLTP (online transaction processing databases)

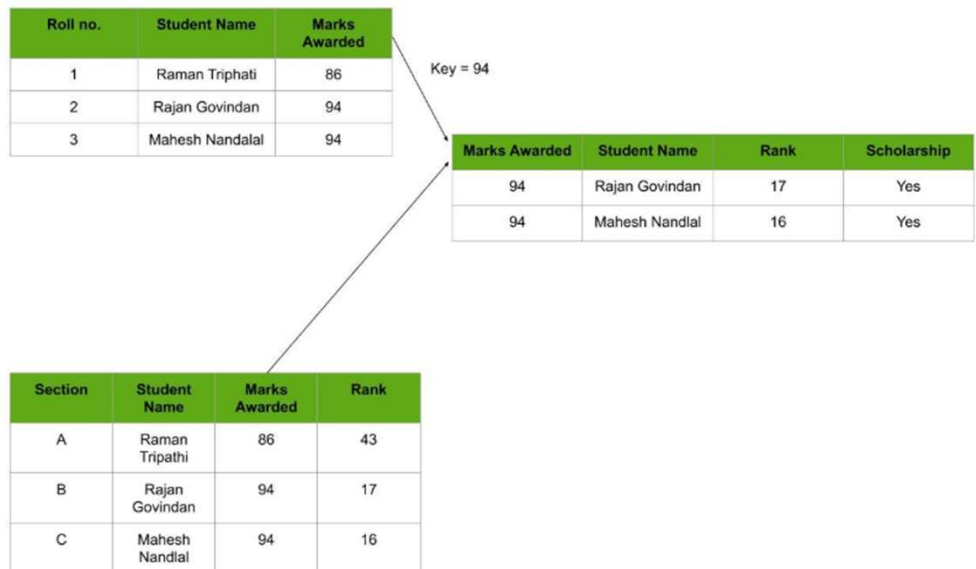- Ex. Warehouse/stock quantities, online webstore, airplane flights
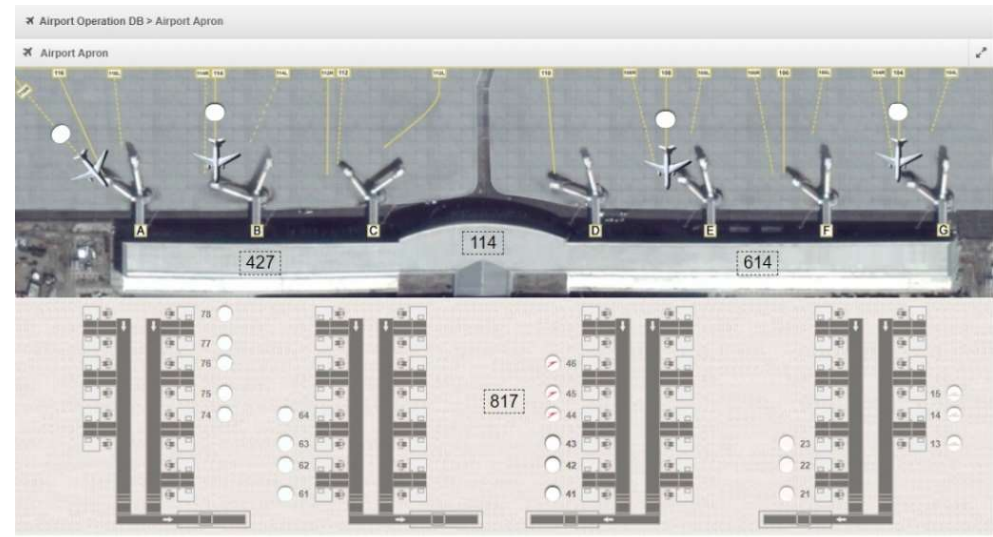
Types of Databases: NoSQL

- Data is non-SQL or non-relational other than tabular relations used in relational databases

- Simpler in terms of design, horizontal scaling to clusters of machines, finer control over availability

- Data structure make some operations faster than SQL

Types of Databases: Relational

- Every piece of information has a relationship with one another

- All data is tabulated
  - Every row of data is linked with another row using a primary key
  - Every table is linked with another table using a foreign key

- Tables organize the data

- SQL used to interact with the database

Roll no.	Student Name	Marks Awarded
1	Raman Triphati	86
2	Rajan Govindan	94
3	Mahesh Nandalal	94

Key = 94

Marks Awarded	Student Name	Rank	Scholarship
94	Rajan Govindan	17	Yes
94	Mahesh Nandlal	16	Yes

Section	Student Name	Marks Awarded	Rank
A	Raman Tripathi	86	43
B	Rajan Govindan	94	17
C	Mahesh Nandlal	94	16

Types of Databases: Relational (continued)

- RDBMS – Stores data in a row-based table structure which connects related data elements that can be made between 2 or more tables

- Use SQL – Structured Query Language

- Best with non-changing data and when accuracy is important
  - MS Access, SQL Server, MySQL

EMPLOYEE_ID	FIRST_NAME	LAST_NAME		DEPARTMENT_ID
100	Steven	King	–	90
101	Neena	Kochhar	–	90
102	Lex	De Haan	–	90
103	Alexander	Hunold	–	60
104	Bruce	Ernst	–	60
–	–	–	–	–
108	Nancy	Greenberg	–	100
–	–	–	–	–
114	Den	Raphaely	–	30
–	–	–	–	–

SELECT first_name, last_name, department_id
FROM employees
WHERE department_id IN (30, 100)
ORDER BY department_id ASC ;

Departments 30 or 100 in ascending alphabetical order by department ID

FIRST_NAME	LAST_NAME	DEPARTMENT_ID
Steven	King	90
Neena	Kochhar	90
Lex	De Haan	90
Alexander	Hunold	60
Bruce	Ernst	60
–	–	–
Nancy	Greenberg	100
–	–	–
Den	Raphaely	30
–	–	–

first_name	last_name	department_id
Den	Raphaely	30
Alexander	Khoo	30
Shelli	Baida	30
Sigal	Tobias	30
Guy	Himuro	30
Karen	Colmenares	30
Nancy	Greenberg	100
Daniel	Faviet	100
John	Chen	100
Ismael	Sciarra	100
Jose Manuel	Urman	100
Luis	Popp	100

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Types of Databases: Non-relational

- **Non-relational** – stores data in non-tabular form
  - No SQL – not only SQL
  - Flexible, my commonly be based on document structure
  - Stores huge amount of information

_id: ObjectId("614ae296a7e362dc9335a7a1")
name: "Joanna Smith"
address: "42 Data Street"
dateOfBirth: 1989-02-10T00:00:00.000+00:00
doctorName: "Dr. Nick"
officeName: "Victoria Mill"
knownIllnesses: Array
    0: "Acid Reflux"
currentMedication: Array
    0: Object
        medicine: "Omeprazole"
        dosage (mg): 100

ACTIVITY
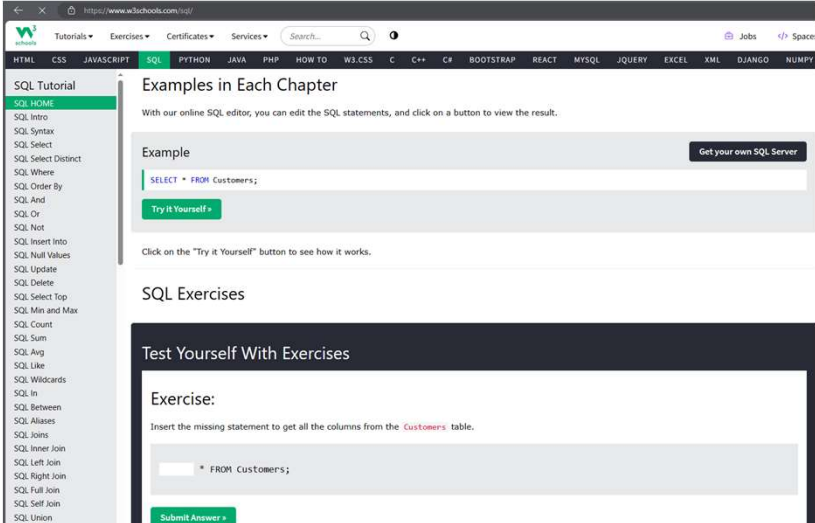
SQL

Activity: SQL

1. Head t:o
   https://www.w3schools.com/SQl

2. Click on green banner: "Start learning SQL now"
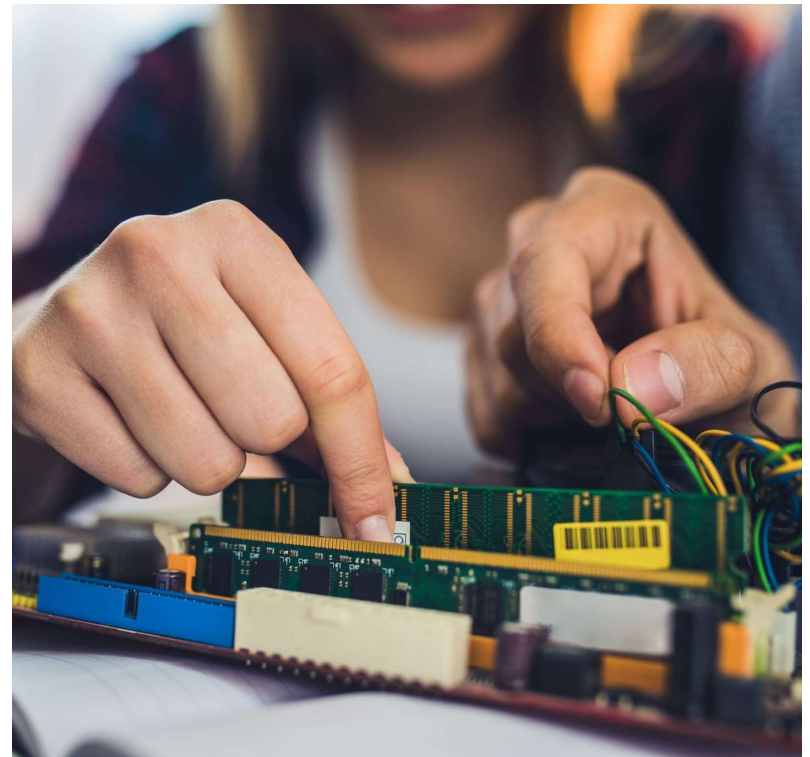
3. Spend a moment learning and going through the exercises

Warehouse Activity

- 1:30-3:00pm
- Docks (PC Docking Stations)
  - Sorting/separating
  - Pairing power adaptors
  - Testing and evaluating condition
  - Listing

BREAK

5 minutes