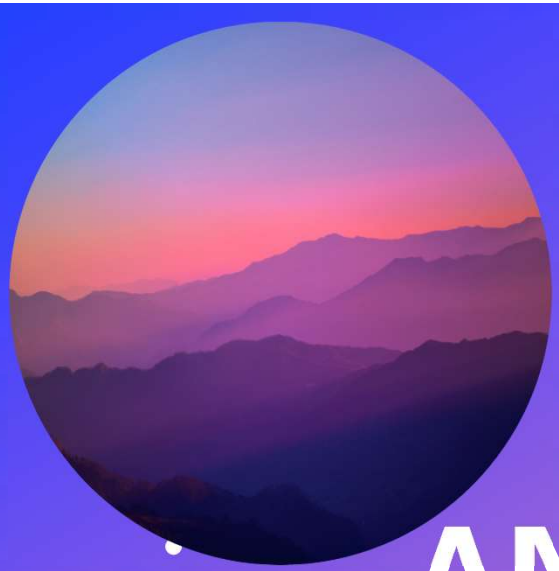
MINNESOTA TECH FOR SUCCESS

Week 16-18: Database Management and Troubleshooting

4/3/2024

Agenda

- **Announcements**
- **Classroom (25 min)**
  - Solving Common Database Issues
    - Common Database Issues & Causes
    - Monitoring Metrics
  - Troubleshooting & Problem-solving
- **Break (5 min)**
- **Warehouse (1.5 hrs)**
  - CPU Cleaning



ANNOUNCEMENTS

Week 18

Announcements for 4/3

- **Calendar**
  - No session on **Wednesday, 4/10/2024 (Spring Break)**
  - Next session: **Wednesday, 4/17/2024**

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

- Week 19-21: Hands-on Practical Skills – Apr. 17th, 24th, May 1st

Values

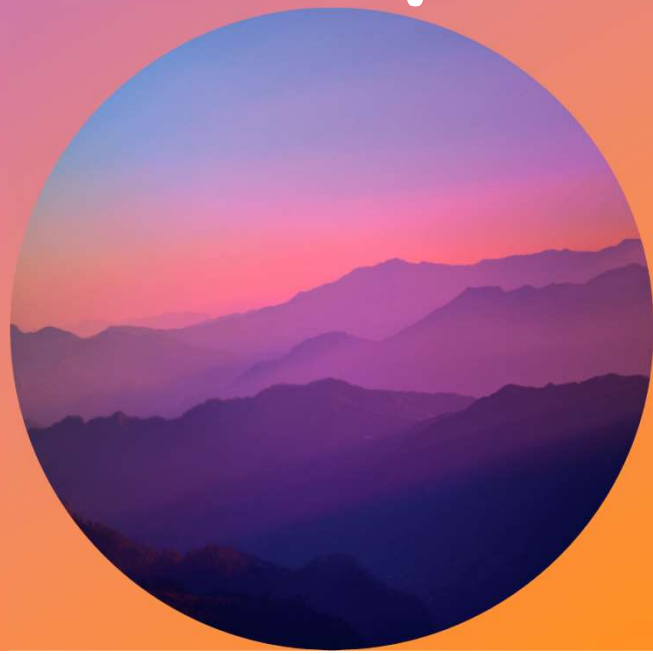
- **R**espect
- **A**ccountability
- **I**mprovement
- **S**teadfast
- **E**ncouragement

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.

COMMON DATABASE ISSUES

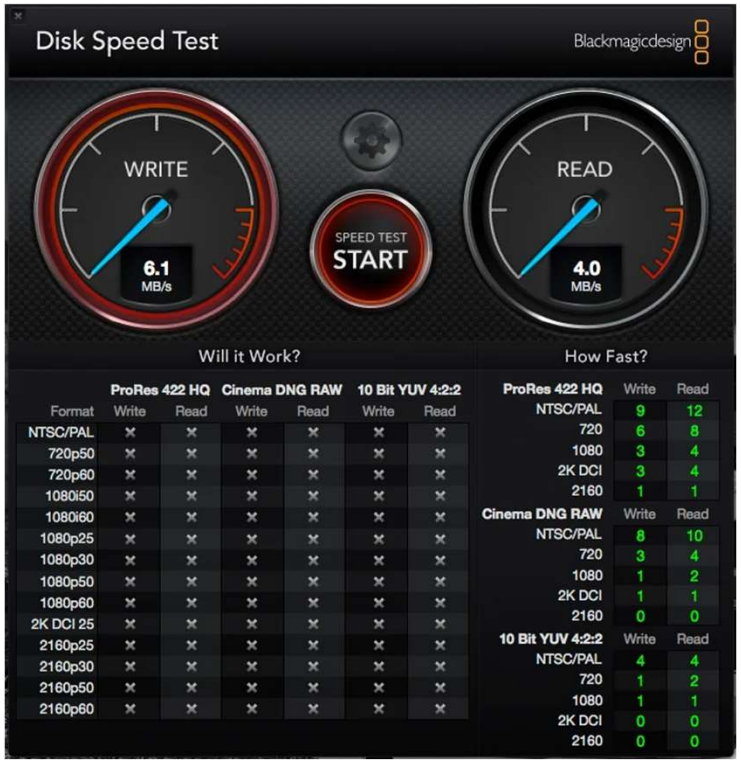
Common Issues;
Monitoring Metrics



Common Database Issues

Slow read-write speeds

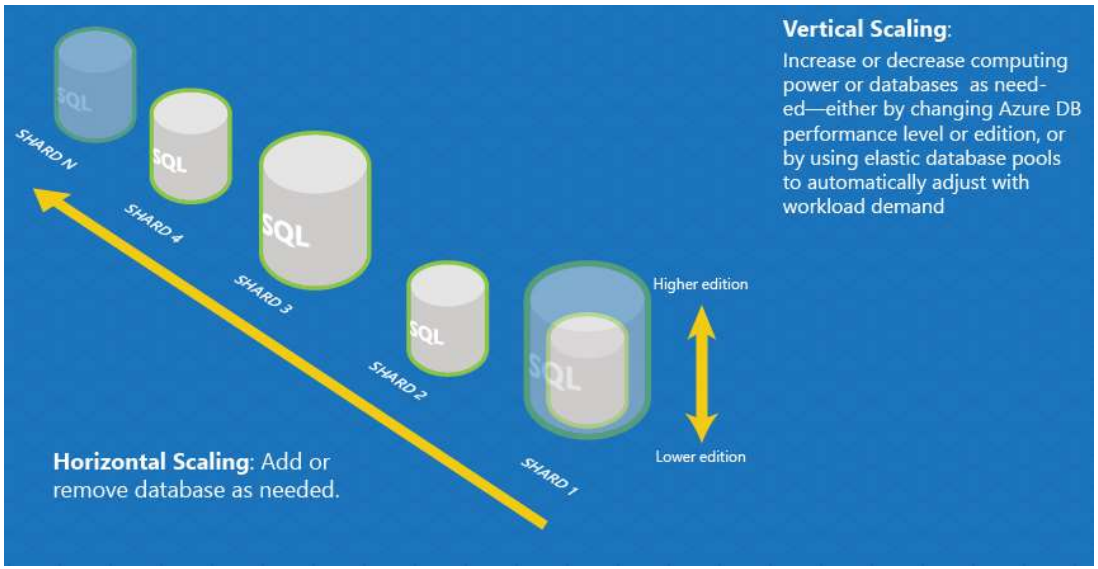
- Performance slowdowns due to high latency
- Database I/O - when the database engine from a computing system reads and writes blocks containing records to and from disk into memory
  - To minimize database disk I/O, the database engine tries to keep a block in memory after it reads the block the first time. When the engine needs that block, it can access it from memory rather than reading it from disk



Common Database Issues

Scaling problems

- Scaling up a database (i.e. RDBMS on a single server) requiring complex and powerful software
- Horizonal Scaling (sharding) – splitting up database into separate sections by integrating new server nodes or machines into existing infrastructure
- Vertical Scaling (scaling up) – upgrading existing resources on demand with info remaining on a single node



Common Database Issues

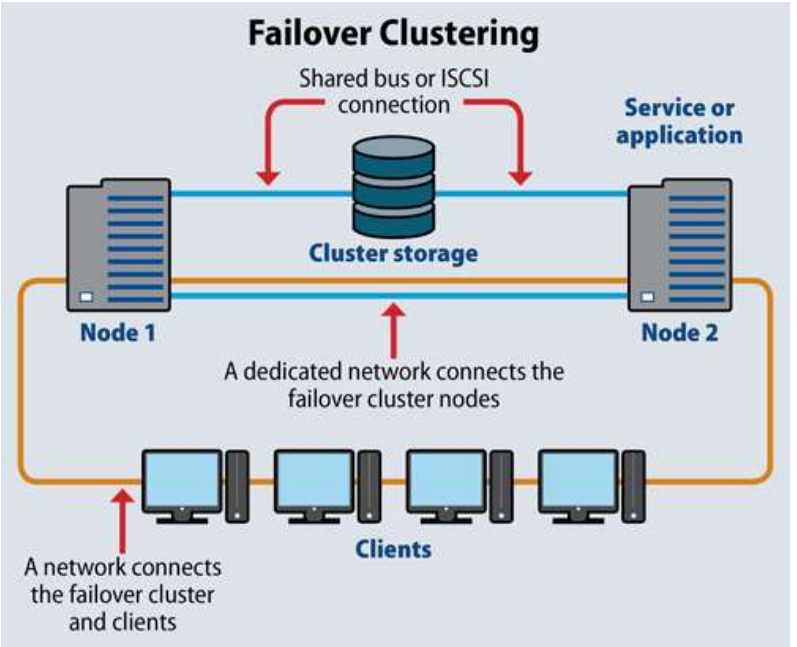
Incorrect Virtual Machine setup/configuration

- Optimization with large numbers of machines that rely on the same hardware
- Virtual Machine (VM) – software-based or virtual version of a physical computer system that can run different or multiple operating systems on it
- Hypervisor (VMM) – computer software, firmware or hardware that creates and runs virtual machines

Common Database Issues

Lack of backup & monitoring

- Failover contingencies
- Backups to restore lost or corrupted data
- High availability (HA) clusters - minimize downtime and ensure that applications and services are always available, even if one server in the cluster fails
- Continuous availability (CA) clusters - provide zero downtime for applications and services and typically use synchronous replication to ensure that data is always available on all servers in the cluster



Monitoring Metrics

Database Performance Metrics

Query Performance
Poorly formatted or overly general queries can introduce slowdowns

User and Query Conflicts
Slowdowns can occur when multiple users are accessing the database

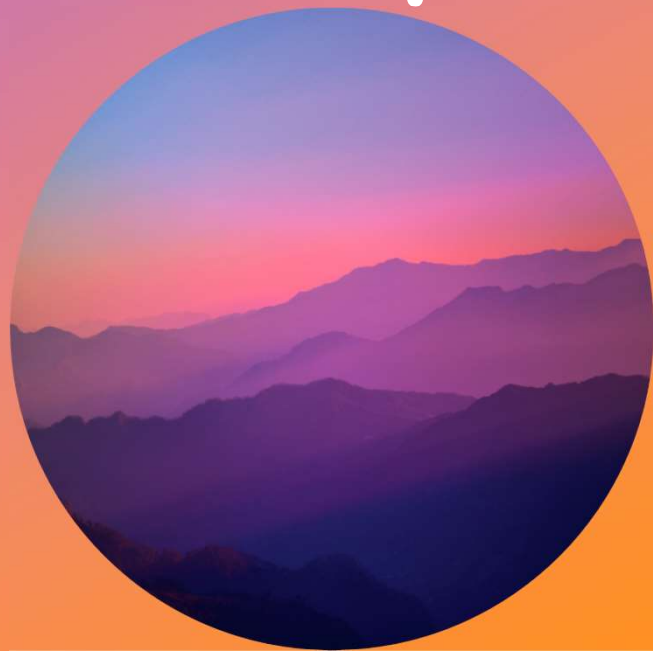
Business Transactions
Look at end-user experience of real-time performance

Capacity
Consider CPUs, disk performance, memory, configurations, and network connections

Configuration
Be sure to change default settings for elements like buffer and query caches

COMMON DATABASE ISSUES

Troubleshooting and Problem-solving



Troubleshooting: Things to Look For

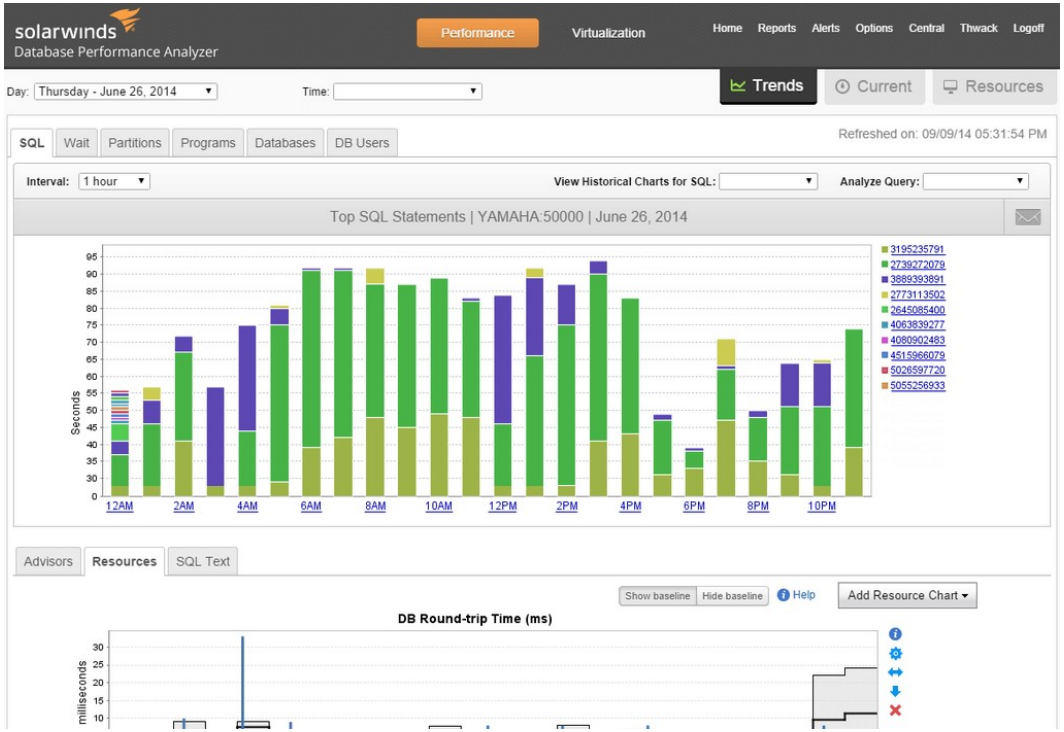
- **Affected users** – single vs multiple; users, clients, sessions, database or schema - a structural view of a database that defines the tables, fields, types, constraints, and relationships that are involved in creating a database
- **Changes/releases** - recent software releases or changes on the system; new objects and changes in size
- **Disk space** – available space in server root mounts and drives; software mounts and drives; online and archived transaction/ redo log areas; temporary locations; audit trail & trace file locations; core dumping
- **Redo & archive logs** – increase in transaction loads and log system; impacts to transaction; log sizes for the transaction throughput
- **CPU** – database consumption; analyze and track performance

Troubleshooting: Things to Look For (continued)

- **Disk I/O** – top wait times and associated changes that may also include scalability
- **SQL/ Queries** – top resource consuming queries
- **Locks –** blocks hanging up key applications
- **Object sizes** – key tables or index changes in size
- **Sessions** – increase in number of sessions and indications of trends
- **Configuration** - previous and current database configuration if applicable

Databases Troubleshooting: Tools

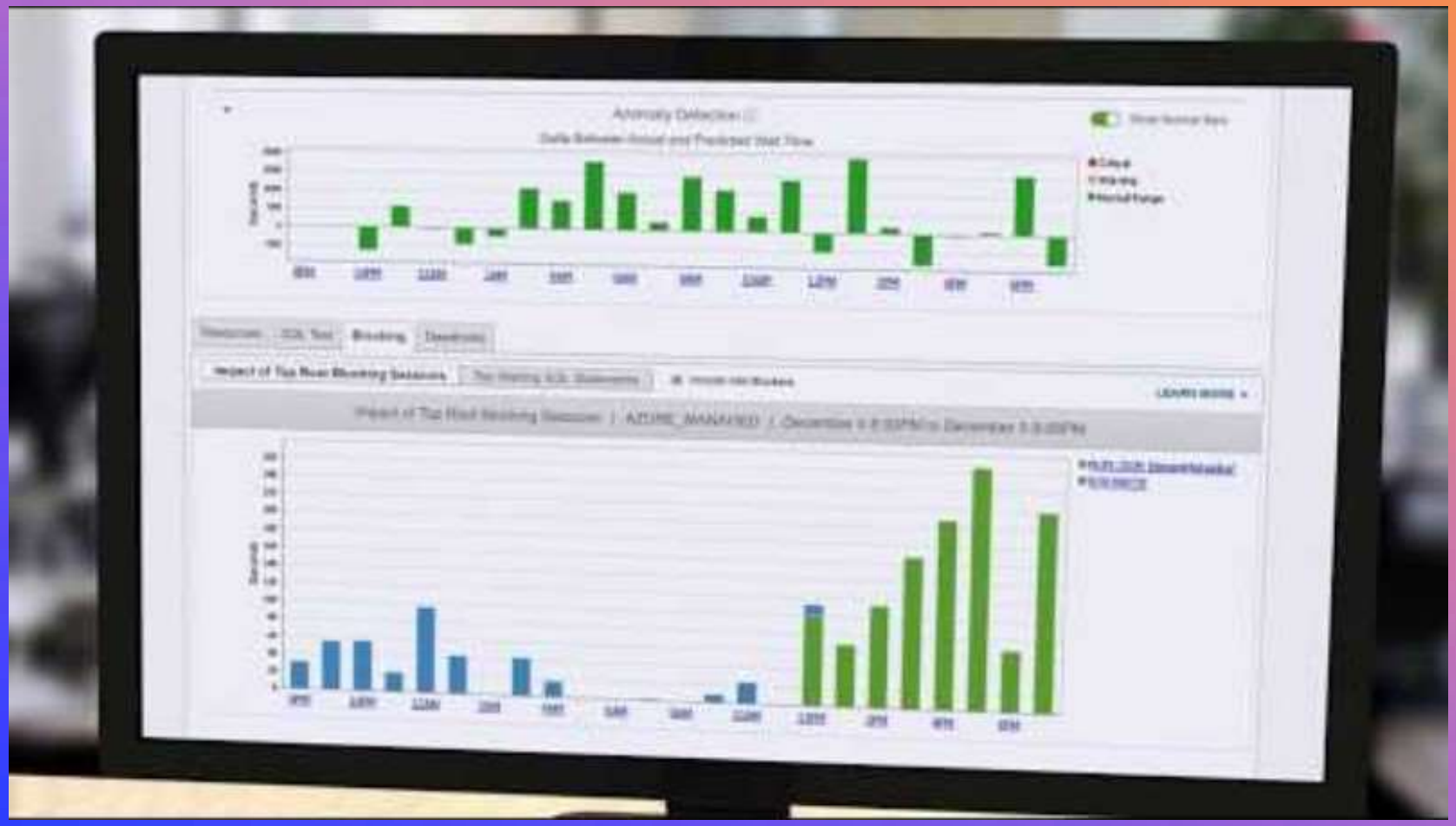
- Use a database performance analyzer (DPA)
- Features:
  - Database optimization
  - Anomaly detection
  - SQL server performance & database monitoring (i.e. Azure)
  - Performance analysis
  - Management API
  - Alerts and reporting
  - Change tracking



Databases Problem-solving Process

1. Use a database performance analyzer to analyze the state of the database
2. Check server capacity and ensure it is not overloaded or shared with other systems
3. Update database statistics to optimize query performance
4. Check the memory allocation and avoid unnecessary disk reads
5. De-fragment the database to reduce physical storage space and improve the data access speed
6. Use performance tuning software
7. Explore scalability options if necessary

SOLARWINDS DPA



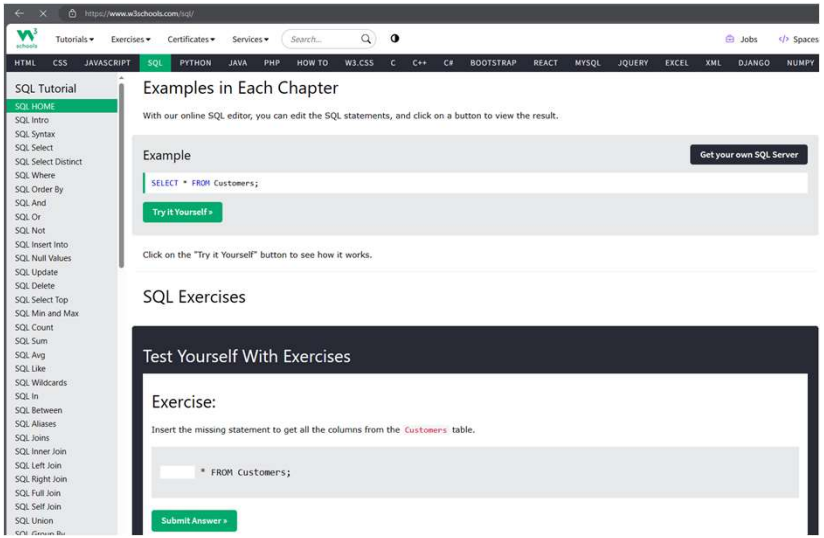
SOLARWINDS DPM (SAAS FOR APP DEV)

ACTIVITY

More SQL

Activity: Continue Learning SQL

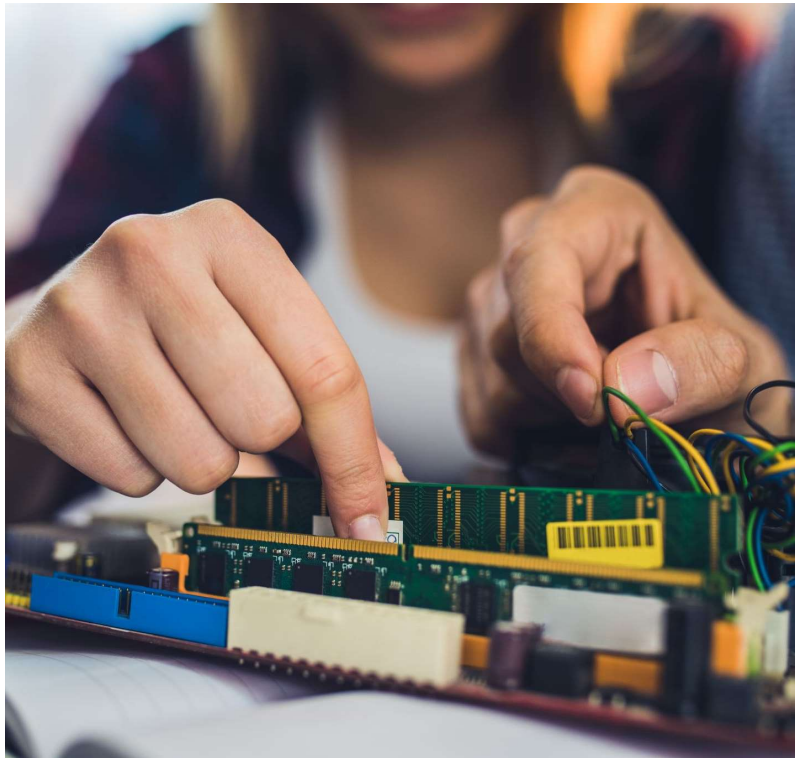
1. Head to: https://www.w3schools.com/SQl
2. Click on green banner: “Start learning SQL now”
3. Continue to learn and go through the exercises



WAREHOUSE

Warehouse Activity

- 1:30-3:00pm
- CPU Cleaning



BREAK

5 minutes