AIRPORT AUTHORITY OF INDIA

Regional Training Center (CNS)

I.G.I Airport New Delhi, 110037

Industrial Training Report

on

Communication Navigation Surveillance

Submitted by: -

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DECLARATION

I hereby declare that the Industrial Training Report entitled ("REPORT ON SUMMER INDUSTRIAL TRAINING") is an authentic record of my own work as requirements of 6-weeks Industrial Training during the Month of June and July for the award of degree of B.Tech. (Computer Science & Engineering), IEC College Of Engineering and Technology, under the guidance of (MR. NITIN GUPTA).

Saurav Anand
Roll- 160*******

ACKNOWLEDGMENT

It was a great privilege for me to get my training in CNS wing of AIR TRAFFIC SERVIVE (CNS, Automation) under the AIRPORTS AUTHORITY OF INDIA.

This report describes the training that I underwent, in the month of June-July 2019 at AIR TRFFIC CONTROL (CNS, AUTOMATION) under AAI. It was completed, keeping in mind the course curriculum as per university requirements.

I would like to express my sincere gratitude to all the people who have helped and support me throughout. I am deeply indebted to MR. ARVIND PRASHHAR, MR P.K ROY, MR PRATEEK, MR NITIN GUPTA and other staff members from CNS wing for organizing our training program, efficiently and providing us valuable resources and also for their cooperation and willingness to share their expertise and knowledge and to devote their precious time to discuss related topics.

The help and cooperation extended by the staff of AAI is fully acknowledged. I thoroughly enjoyed me entire training program and would like to thank everyone at ATC for their guidance.

PREFACE

Today the world has become very small. People in one part of the world can not only communicate with persons sitting in other part of the world instantaneously but also can reach within hours. Air travel has made it so easy as a student of B.TECH I felt the need to understand various technology & equipment's involved in the communication, Navigation & surveillance services rendered by AIR TRAFFIC CONTROL SYSTEMS.

The industrial training is intended to give the trainee a better understanding of the concepts taught in class through their applications in the form of various equipment's & processes used in NEW ATS under the control of AAI. This industrial training was successfully completed at ATS BUILDING, NEW DELHI under the guidance of training Head & individual head of different units in CNS WING. The whole session was utilized in getting an overview of AUTOMATION, NETWORKING.I would like to thank them for their guidance and cooperation.

INTRODUCTION TO AAI

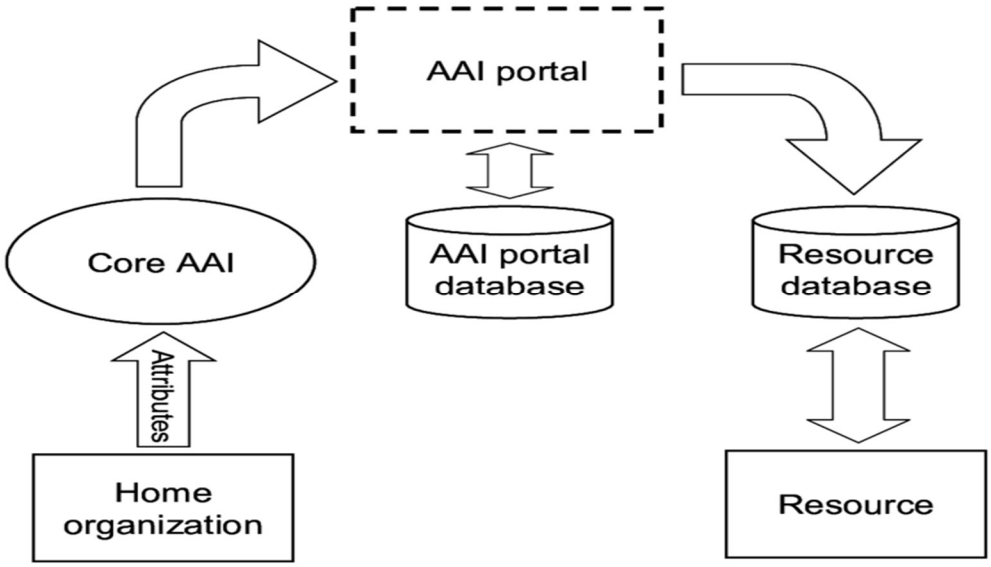
The **Airports Authority of India** or **AAI** is a statutory body (created through the Airports Authority of India Act, 1994) working under the Ministry of Civil Aviation, Government of India is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India. It provides Communication Navigation Surveillance / Air Traffic Management (CNS/ATM) services over Indian airspace and adjoining oceanic areas. AAI also has ground installations at all airports and 25 other locations to ensure safety of aircraft operations. AAI covers all major air-routes over Indian landmass via 29 Radar installations at 11 locations along with 700 VOR/DVOR installations co-located with DISTANCE MEASURING EQUIPMENT (DME). 52 runways are provided with INSTRUMENT LANDING SYSTEM (ILS) installations with Night Landing Facilities at most of these airports and Automatic Message Switching System at 15 Airports.

AAI's implementation of Automatic Dependence Surveillance System (ADSS), at Kolkata and Chennai Air Traffic Control Centers, made India the first country to use this technology in the South East Asian region thus enabling Air Traffic Control over oceanic areas using satellite mode of communication. PERFORMANCE BASED NAVIGATION (PBN) procedures have already been implemented at Mumbai, Delhi and Ahmedabad Airports. AAI is implementing the GAGAN project in technological collaboration with the INDIAN SPACE RESEARCH & ORGINATION (ISRO). The navigation signals thus received from the GPS will be augmented to achieve the navigational requirement of aircraft. First phase of technology demonstration system was completed in February 2008.

FUNCTIONS OF AAI

Design, Development, Operation and Maintenance of international and domestic airports and civil enclaves.

1. Control and Management of the Indian airspace extending beyond the territorial limits of the country, as accepted by ICAO.
2. Construction, Modification and Management of passenger terminals.
3. Development and Management of cargo terminals at international and domestic airports.
4. Provision of passenger facilities and information system at the passenger terminals at airports.
5. Expansion and strengthening of operation area, viz. Runways, Aprons, Taxiway etc.
6. Provision of visual aids.
7. Provision of Communication and Navigation aids, viz. ILS, DVOR, DME, Radar



OVERALL FUNCTION OF ATC

Air traffic controllers are the individuals who work in the airport towers next to the runway. These individuals complete a wide array of duties to ensure that planes take off, travel and land safely. They are the men and women behind those airline and airport workers which travelers see every time they fly. Although not in sight, their presence is extremely important as air travel would not be possible without them.

In general, air traffic controllers are individuals who control air traffic not only in the airport vicinity but between destinations as well. They are required to abide by strict federal regulations as well as specific policies and procedures. These individuals regulate and control commercial airline traffic in accordance with regulations posed by the federal government and airlines/airports.

One of the primary duties of air traffic controllers is to control the flow of air traffic so that it is most efficient and safe as can be. More specifically, air traffic controllers engage in a number of tasks relative to this objective such as direct pilots to the runway, alert the pilots as to additional air traffic in the area, issue instructions for takeoff and landing, direct airplane pilots while enroute to their destinations and maintain contact with the pilots during the travel. The air traffic controllers are responsible for aiding the pilots in reaching their destination.

The air traffic controllers are also responsible for doing preparation work before the flights take off. They will be responsible for checking weather statistics at both the current airport and future destination to ensure the safest route of travel and issue any possible weather delays. These individuals will also need to prepare specific flight information prior to the flight taking off. Air traffic controllers are also vital in the case of an emergency. Should an airplane encounter problem, the air traffic controller's role is extremely important. The air traffic controllers will maintain contact with the pilots, aid in overcoming any flight problems, provide flight path changes for bad weather and in extreme circumstances, direct pilots to a specific area for emergency landings.

The air traffic controller must also efficiently hand over control to the airplane's destination traffic control tower. Therefore, it is imperative that air traffic controllers maintain contact with one another so that they can let the destination tower know which airline is coming into their vicinity and let them know the approximate time of arrival.

Lastly, air traffic controllers must ensure that they are doing their jobs in strict compliance with federal regulations. They will also need to comply with specific airport rules and regulations while working at that particular airport. In order to complete their jobs to the fullest of their potential, air traffic controllers must be alert and effective while in the tower.

Lastly, air traffic controllers should love what they do. Those individuals who are happy in their occupations are more likely to excel in the position than those who are not. Everyone has bad days but an overall enjoyment for one's career as an air traffic controller is a good trait to possess.

INTRODUCTION TO NETWORKING

Networking, also known as computer networking, is the practice of transporting and exchanging data between nodes over a shared medium in an information system. Networking comprises not only the design, construction and use of a network, but also the management, maintenance and operation of the network infrastructure, software and policies.

Computer networking enables devices and endpoints to be connected to each other on a local area network (LAN) or to a larger network, such as the internet or a private wide area network (WAN). This is an essential function for service providers, businesses and consumers worldwide to share resources, use or offer services, and communicate. Networking facilitates everything from telephone calls to text messaging to streaming video to the internet of things (IOT).

The level of skill required to operate a network directly correlates to the complexity of a given network. For example, a large enterprise may have thousands of nodes and rigorous security requirements, such as end to end encryption, requiring specialized network administrators to oversee the network.

At the other end of the spectrum, a layperson may set up and perform basic troubleshooting for a home Wi-Fi network with a short instruction manual. Both examples constitute computer networking.

Types of networking

There are two primary types of computer networking: wired networking and wireless networking.

Wired networking requires the use of a physical medium for transport between nodes. Copper-based Ethernet cabling, popular due to its low cost and durability, is commonly used for digital communications in businesses and homes. Alternatively, optical fiber is used to transport data over greater distances and at faster speeds, but it has several tradeoffs, including higher costs and more fragile components.

Wireless networking uses radio waves to transport data over the air, enabling devices to be connected to a network without any cabling. Wireless LANs are the most well-known and widely deployed form of wireless networking. Alternatives include microwave, satellite, cellular and Bluetooth, among others.

Components of networking:-

Computer networking requires the use of physical network infrastructure -- including Switches, Routers and wireless access points -- and the underlying firmware that operates such equipment. Other components include the software necessary to monitor, manage and secure the network.

Additionally, networks rely on the use of standard protocols to uniformly perform discrete functions or communicate different types of data, regardless of the underlying hardware.

CNS

Communication, Navigation and Surveillance are three main functions (domains) which constitute the foundation of Air Traffic Management (ATM) infrastructure.

The following provide further details about relevant domains of CNS:

(a) Communication: -

Communication is the exchange of voice and data information between the pilot and air traffic controllers or flight information centers.

(b) Navigation: -

Navigation Element Of CNS/ATM Systems Is meant to provide Accurate, Reliable and Seamless Position Determination Capability to aircrafts.

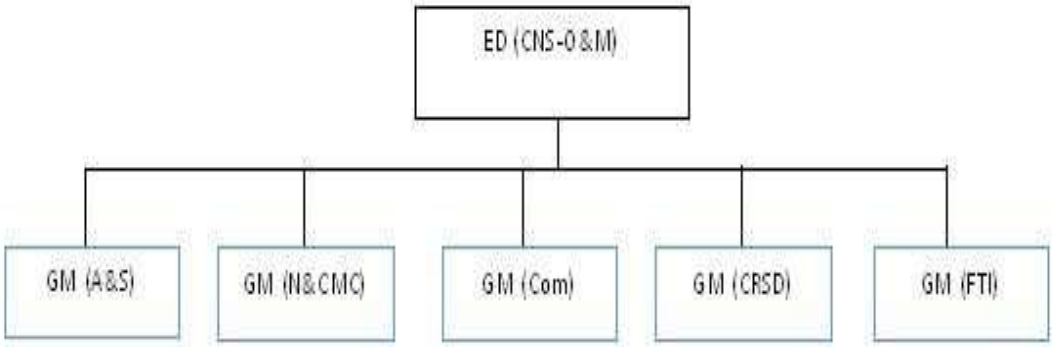
(c) Surveillance: -

The surveillance systems can be divided into two main types: - Dependent surveillance and independent surveillance.

In dependent surveillance systems, aircraft position is determined on board and then transmitted to ATC. The current voice position reporting is a dependent surveillance system in which the position of the aircraft is determined from on-board navigation equipment and then conveyed by the pilot to ATC. Independent surveillance is a system which measures aircraft position from the ground. Current surveillance is either based on voice position reporting or based on radar (primary surveillance radar (PSR) or secondary surveillance radar (SSR)) which measures range and azimuth of aircraft from the ground station.

AUTOMATION

Regular Monitoring of Availability & Serviceability of Surveillance, ATM Automation facilities at all airports and Aeronautical Communication Stations. Human Resource Management, Training and proficiency of CNS Personnel. Regular Monitoring of Availability & Serviceability of Surveillance, ATM Automation facilities at all airports and Aeronautical Communication Stations. Human Resource Management, Training and proficiency of CNS Personnel.



PROJECT -1

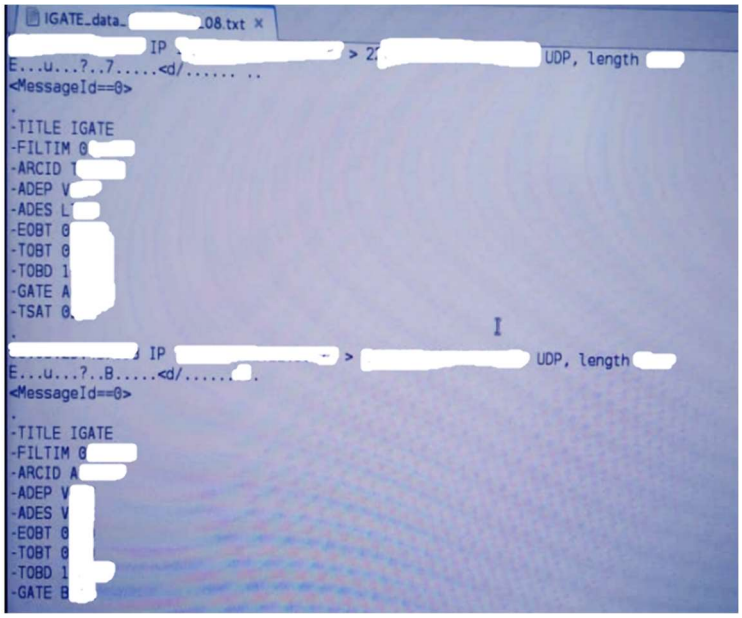
AOCC< > Automation Air Traffic Services Messages capturing, parsing, & storing the data in SQL database

Introduction: -

The project basically aims to receive the data packets from the server (Dial data) and arrange it in specific format then storing it & send it to multiple clients.

The data from Dail is shown in figure,

Due to Privacy concern the Data of the Format can not br made public.



Approach: -

Task 1-connections between two pc

a. creating network ID
b. ping
c. sending/receiving packets b\w 2 pc

Task 2-unicasting

Task 3-multicasting

Task 4-Message parsing

Task 5-Database Creation and Management (using MY SQL, Eclipse)

6. Merging code & getting output

TASK 1: - connections between two pc

1. Connection between two system-

a. Creating Network ID

A private network can be set up in your own home to allow the networking of resources between multiple machines. When you create a private network, you can configure it so that all members of your private network can share printers as well as files. Although setting up a network can take some time and effort, it is well worth the convenience in the long run.

Set Up the Network Router and Adaptors

Step 1:

Decide whether you want to set up a wired, or a wireless network. Some routers will allow both types of connections.

Step 2

Install Network Adaptors in both computers you have selected to begin the configuration of the network. Read the instructions for your chosen adaptor, but typically you will need to install the software from the CD before you physically connect the adaptor to your computer.

Step 3

Setup the network router away from all phones, microwaves and other radio wave monitoring devices such as baby monitors.

Step 4

Connect one of your computers to the router using a network cable. Copy the router configuration file to the other computer.

. Ping

Ping is a basic Internet program that allows a user to verify that a particular IP add. exists and can accept requests.

Ping is used diagnostically to ensure that a host **Setting Up the Computers: -**

Step i

Open your Windows Control Panel and select network & sharing cent.

Step ii

Select your current network connection and click "Customize."

Step iii

Choose "Private" for your network type.

Step iv

Click "Next." On the Set Network Location dialog box, click "View Computers and Devices on the Network.

Step v

Close the network window and the Set Network Location dialog box.

Step vi

Select the Network and Sharing Center window. Click "Apply."

computer the user is trying to reach is actually operating. Ping works by sending an Internet Control Message Protocol (ICMP) Echo Request to a specified interface.

TASK 2 :-UNICASTING

Unicast is communication between a single sender and a single receiver over a network. The term exists in contradistinction to multicast, communication between a single sender and multiple receivers, and anycast, communication between any sender and the nearest of a group of receivers in a network. An earlier term, point-to-point communication, is similar in meaning to unicast. The new Internet Protocol version 6 (IPv6) supports unicast as well as anycast and multicast.

Client Side Code:-

C:\Users\Akshay Bhardwaj\OneDrive\Desktop\AAI\unicast\unicast\client.java • - Sublime Text (UNREGISTERED)

File Edit Selection Find View Goto Tools Project Preferences Help

gradient.html | rgba.html | button.html | website1.html | @media.html | animation.html | keyframe.html | animation1.html | aai.java | client.java | transitoin.html

```java
package unicast;
import java.io.IOException;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;
import java.util.Scanner;
public class client {
    private DatagramSocket udpSocket;
    private InetAddress serverAddress;
    private int port;
    private Scanner scanner;
    private client(String destinationAddr, int port) throws IOException {
        this.serverAddress = InetAddress.getByName(destinationAddr);
        this.port = port;
        udpSocket = new DatagramSocket(this.port);
        scanner = new Scanner(System.in);
    }
    public static void main(String[] args) throws NumberFormatException, IOException {
        client sender = new client(args[0], Integer.parseInt(args[1]));
        System.out.println("-- Running UDP Client at " + InetAddress.getLocalHost() + " --");
        sender.start();
    }
    private int start() throws IOException {
        String in;
        while (true) {
            in = scanner.nextLine();

            DatagramPacket p = new DatagramPacket(
                in.getBytes(), in.getBytes().length, serverAddress, port);

            this.udpSocket.send(p);
```

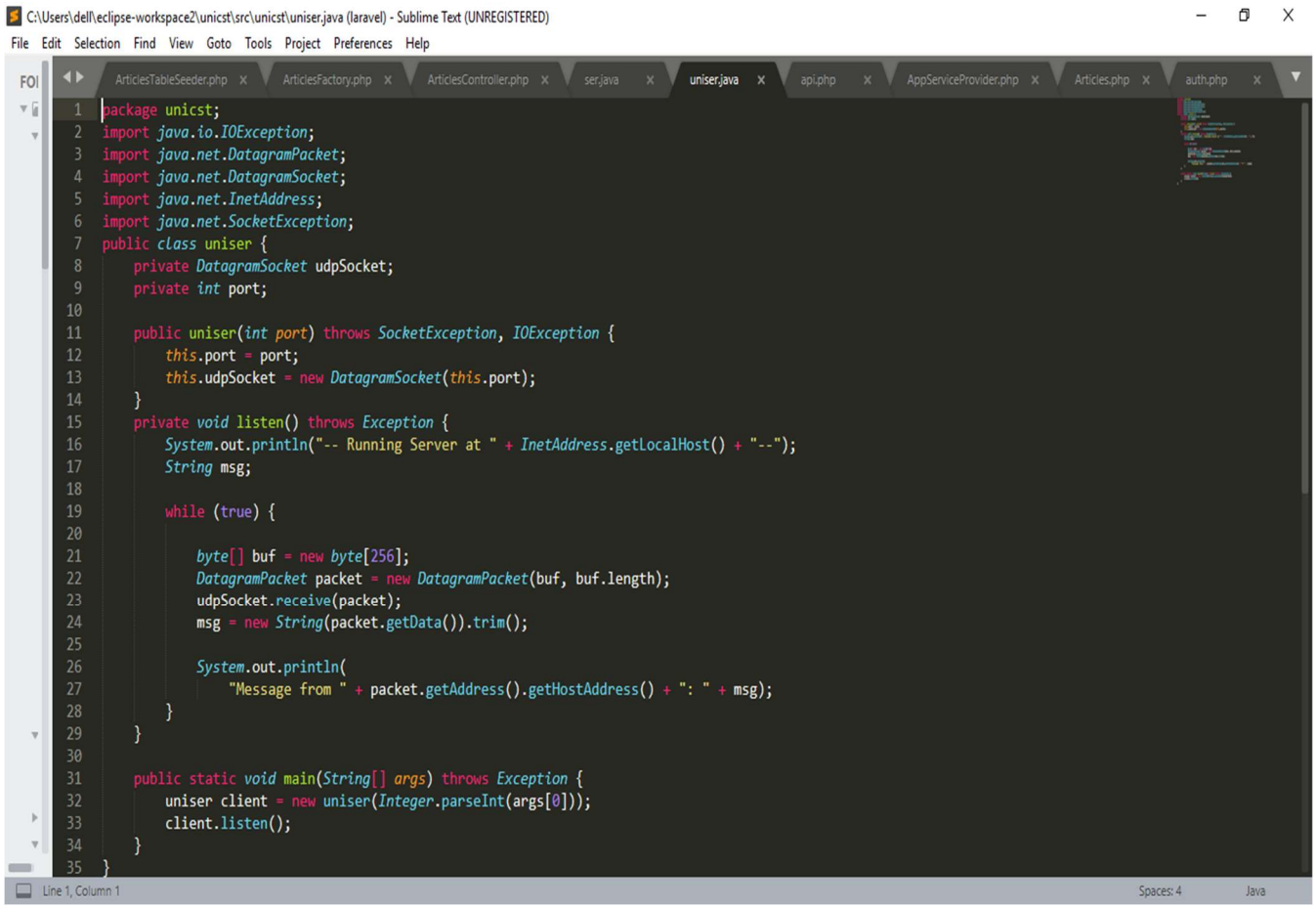
Line 1, Column 17 — Spaces: 4 — Java

Client Side Output:-

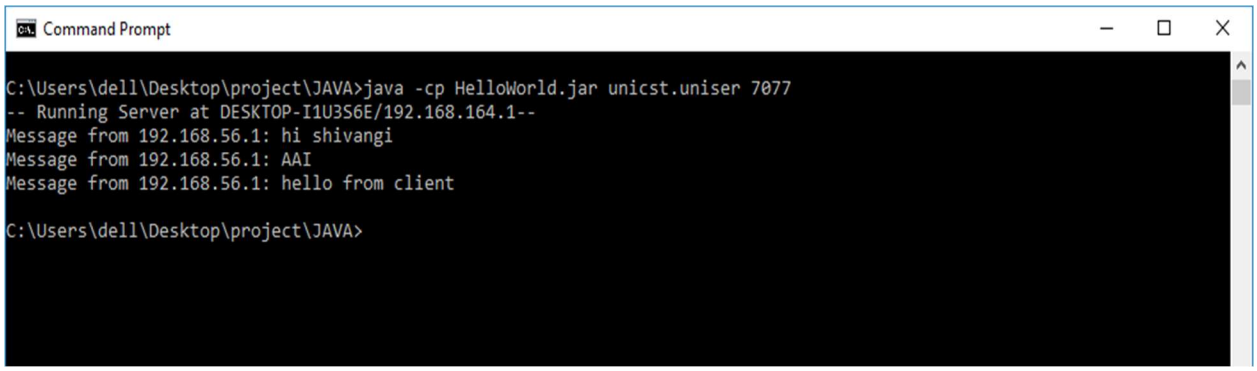
Anaconda Prompt

```
(base) C:\Users\Akshay Bhardwaj\OneDrive\Desktop\AAI>  java -cp unicast.jar unicast.client 192.168.56.3 7077
-- Running UDP Client at LAPTOP-JE0D58DP/192.168.56.1 --
hi shivangi
AAI
hello from client
Exception in thread "main" java.util.NoSuchElementException: No line found
(base) C:\Users\Akshay Bhardwaj\OneDrive\Desktop\AAI>
```

SERVER SIDE CODE:-



SERVER SIDE OUTPUT:-



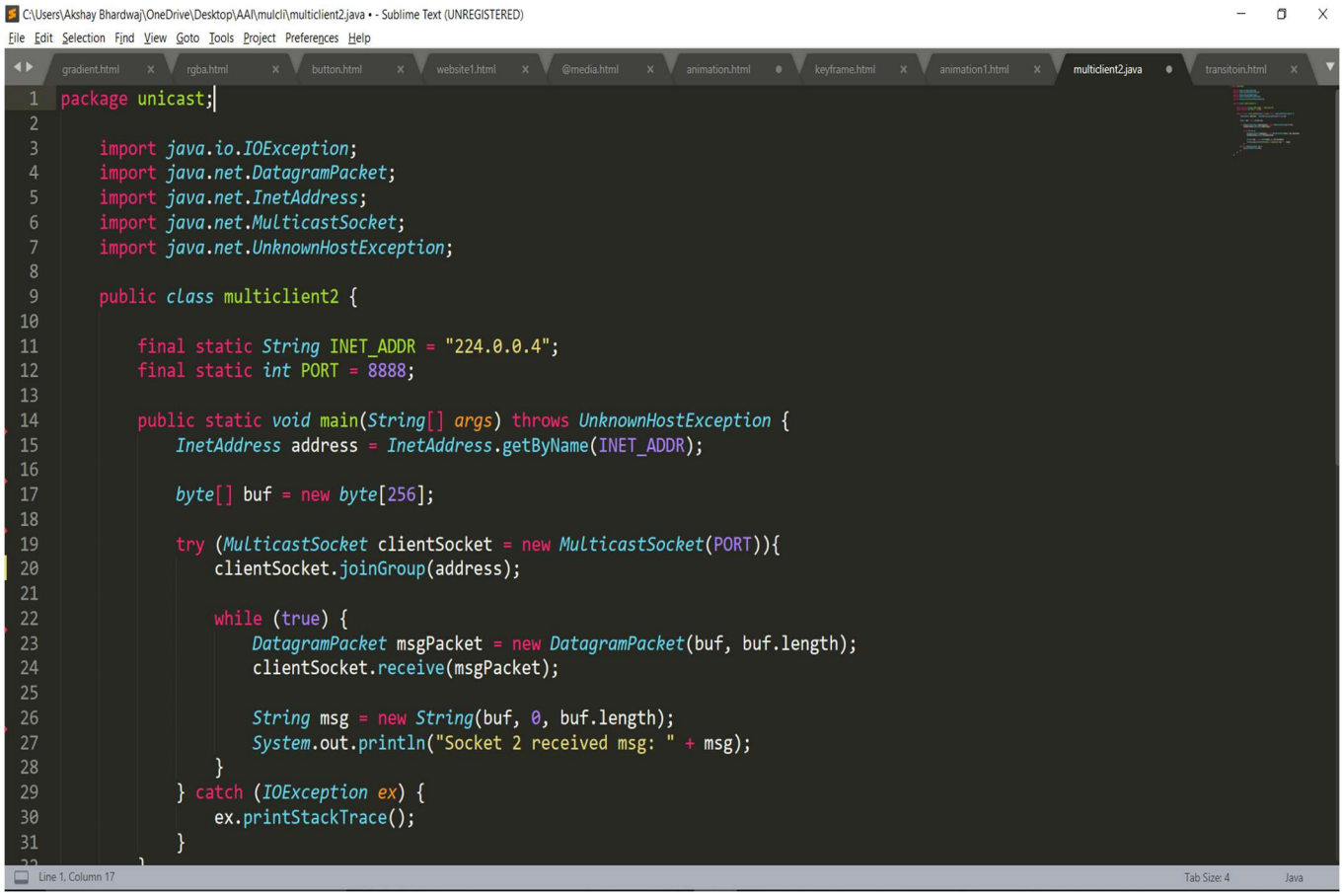
TASK 3:- MULTICASTING

Multicast is communication between a single sender and multiple receivers on a network. Typical uses include the updating of mobile personnel from a home office and the periodic issuance of online newsletters. Together with Anycast and Unicast, multicast is one of the packet types in the Internet Protocol Version 6 (IPv6).

Multicast is supported through Wireless data networks as part of the Cellular Digital Packet Data (CDPD) technology.

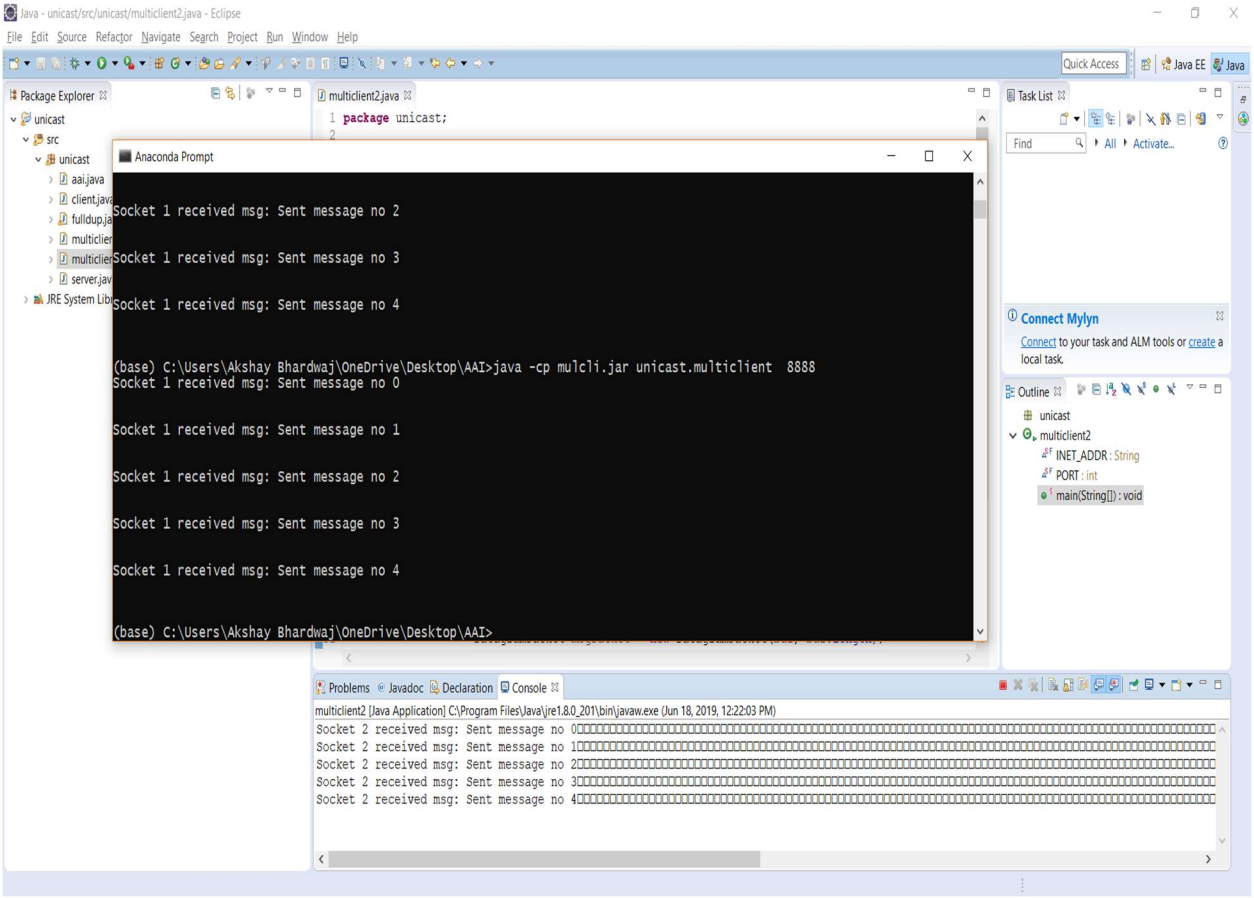
Multicast is also used for programming on the MBone, a system that allows users at high-bandwidth points on the Internet to receive live video and sound programming. In addition to using a specific high-bandwidth subset of the Internet, MBone multicast also uses a protocol that allows signals to be encapsulated as TCP/IP packet when passing through parts of the Internet that cannot handle the multicast protocol directly.

CLIENT SIDE CODE:-

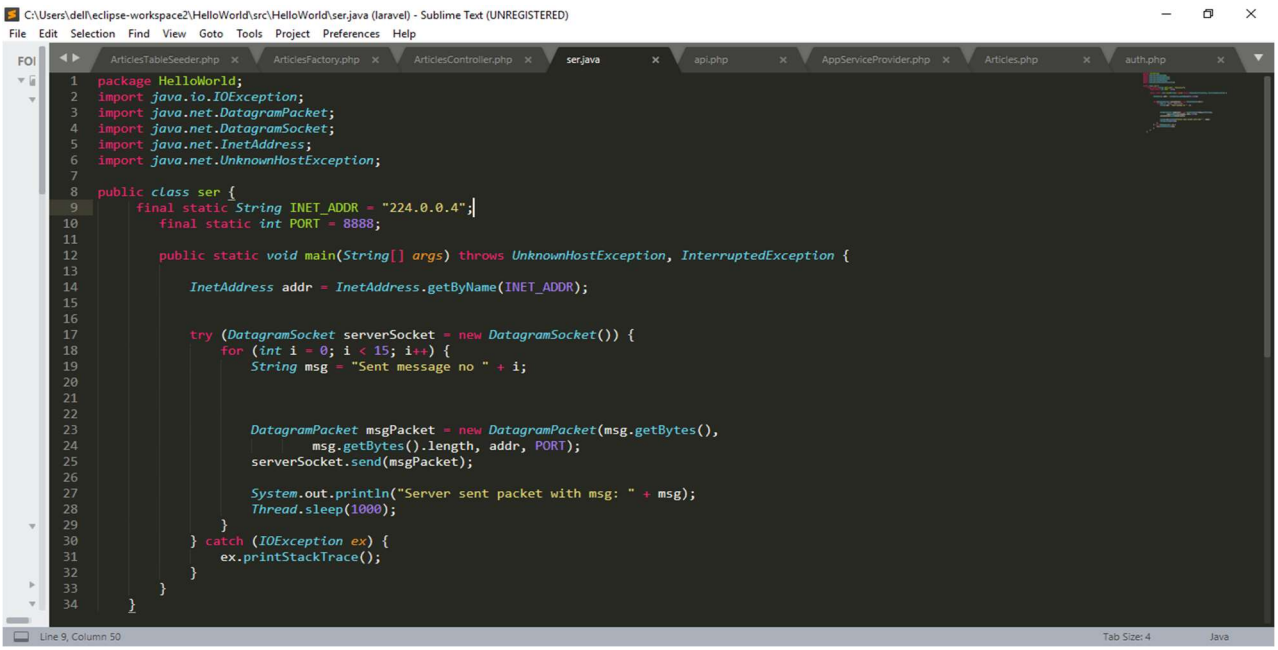



```java
package unicast;

    import java.io.IOException;
    import java.net.DatagramPacket;
    import java.net.InetAddress;
    import java.net.MulticastSocket;
    import java.net.UnknownHostException;

    public class multiclient2 {

        final static String INET_ADDR = "224.0.0.4";
        final static int PORT = 8888;

        public static void main(String[] args) throws UnknownHostException {
            InetAddress address = InetAddress.getByName(INET_ADDR);

            byte[] buf = new byte[256];

            try (MulticastSocket clientSocket = new MulticastSocket(PORT)){
                clientSocket.joinGroup(address);

                while (true) {
                    DatagramPacket msgPacket = new DatagramPacket(buf, buf.length);
                    clientSocket.receive(msgPacket);

                    String msg = new String(buf, 0, buf.length);
                    System.out.println("Socket 2 received msg: " + msg);
                }
            } catch (IOException ex) {
                ex.printStackTrace();
            }
```

Client Side Output:-

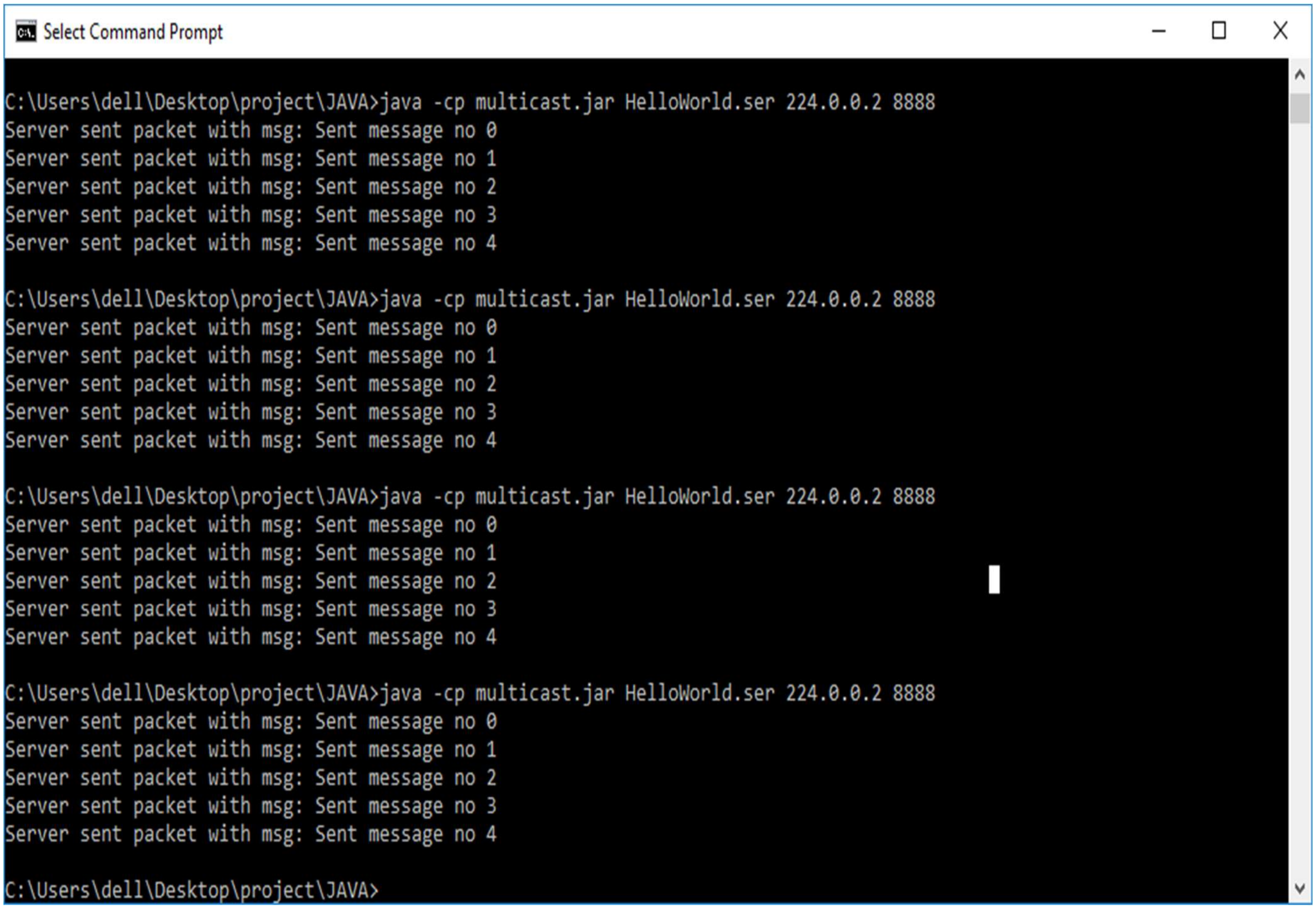


SERVER SIDE CODE:-




```java
package HelloWorld;
import java.io.IOException;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;
import java.net.UnknownHostException;

public class ser {
    final static String INET_ADDR = "224.0.0.4";
       final static int PORT = 8888;

       public static void main(String[] args) throws UnknownHostException, InterruptedException {

           InetAddress addr = InetAddress.getByName(INET_ADDR);


           try (DatagramSocket serverSocket = new DatagramSocket()) {
               for (int i = 0; i < 15; i++) {
                   String msg = "Sent message no " + i;



                   DatagramPacket msgPacket = new DatagramPacket(msg.getBytes(),
                           msg.getBytes().length, addr, PORT);
                   serverSocket.send(msgPacket);

                   System.out.println("Server sent packet with msg: " + msg);
                   Thread.sleep(1000);
               }
           } catch (IOException ex) {
               ex.printStackTrace();
           }
       }
   }
```

SERVER SIDE OUTPUT:-



TASK 4:-MESSAGE PARSING

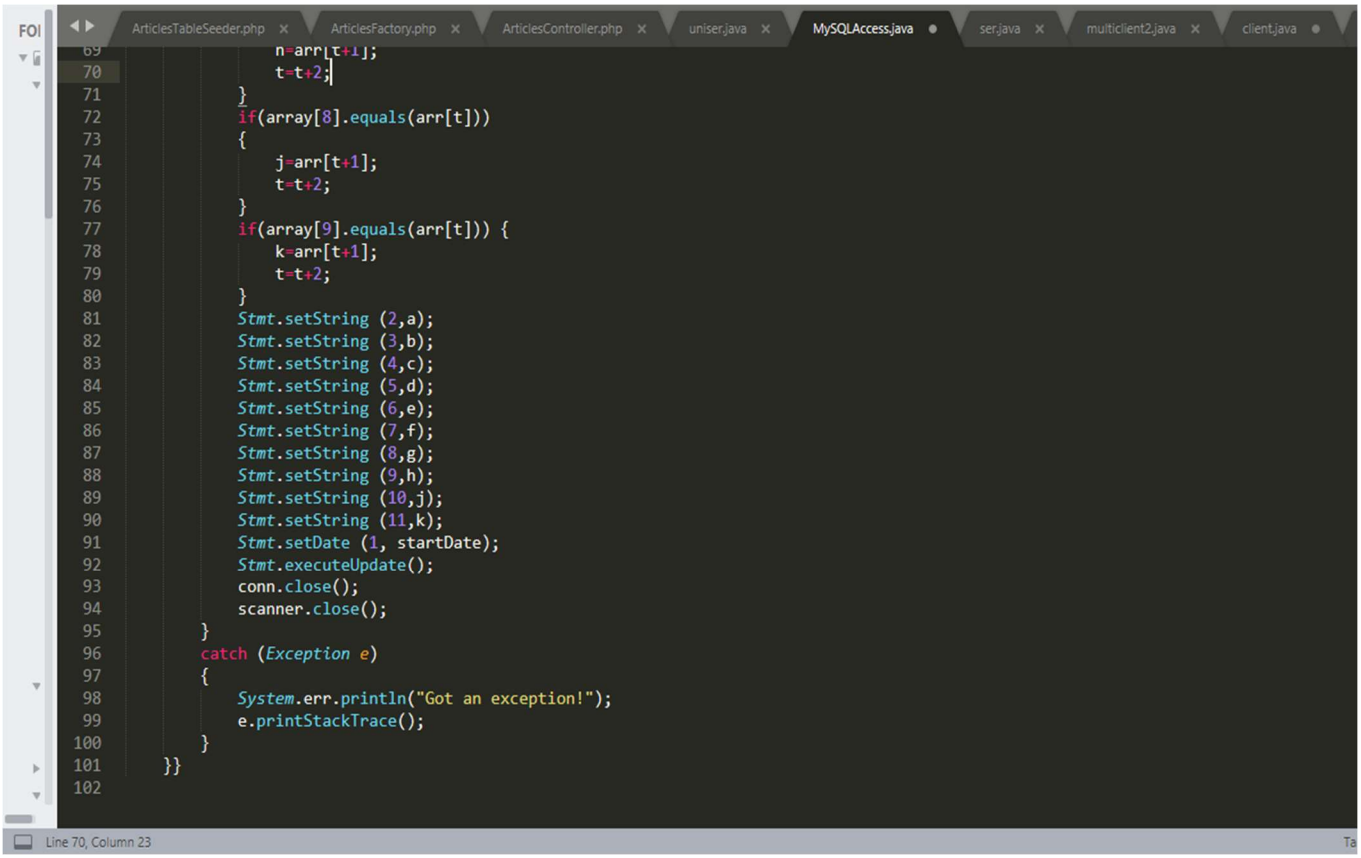
Text parsing is a common programming task that splits the given sequence of characters or values (text) into smaller parts based on some rules. It has been used in a wide variety of applications ranging from simple file parsing to large scale natural language processing.

Based on the context, different methodologies can be used such as parsing line by line using *python's native string methods*, using specialized pattern recognition language like *regular expressions*, using *lex and yacc* where the given sequence is analyzed, tokenized and the grammar is determined. This talk focuses on how and when to use different text parsing methods.

Code:-

```java
package aai2;
import java.sql.*;
import java.util.*;
import java.util.ArrayList;
import java.io.*;
import java.lang.*;
public class MySQLAccess {
    public static Scanner scanner;
    public static void main(String[] args) throws NullPointerException{
        try{
            // create a mysql database connection
            String myDriver = "com.mysql.cj.jdbc.Driver";
            String myUrl = "jdbc:mysql://localhost/aai";
            Class.forName(myDriver);
            Connection conn = DriverManager.getConnection(myUrl, "root", "root");
            String[] arr= new String[20];
            Calendar calendar = Calendar.getInstance();
            java.sql.Date startDate = new java.sql.Date(calendar.getTime().getTime());
            System.out.println("enter the string");
            String[] array = {"TITLE","FILTIM" ,"ARCID" ,"ADEP","ADES","EOBT","TOBT","TOBD","GATE","TSAT"};
            String query1 = " insert into dial (datetime,TITLE,FILTIM ,ARCID ,ADEP,ADES,EOBT,TOBT,TOBD,GATE,TSAT)"
                    + " values (?, ?,?,?,?,?,?,?,?,?,?)";
            PreparedStatement Stmt = conn.prepareStatement(query1);
            scanner = new Scanner(System.in);
            int t=0;int i=0;
            while (scanner.hasNextLine())
            {
                String line =scanner.nextLine();
                if (line.equals(""))
                break;
                String word[]=line.split(" ");
                if(i<20) {
                    arr[i]=word[0];
                    arr[i+1]=word[1];
                    i=i+2;
```

```java
                }
            }
            String a="0",b="0",c="0",d="0",e="0",f="0",g="0",h="0",j="0",k="0";
            if(arr[0].equals(array[t]))
            {
                a=arr[1];
                t=t+2;
            }
            if(array[1].equals(arr[t])) {
                b=arr[t+1];
                t=t+2;
            }
            if(array[2].equals(arr[t])) {
                c=arr[t+1];
                t=t+2;
            }
            if(array[3].equals(arr[t])) {
                d=arr[t+1];
                t=t+2;
            }
            if(array[4].equals(arr[t])) {
                e=arr[t+1];
                t=t+2;
            }
            if(array[5].equals(arr[t])) {
                f=arr[t+1];
                t=t+2;
            }
            if(array[6].equals(arr[t])) {
                g=arr[t+1];
                t=t+2;
            }
            if(array[7].equals(arr[t])) {
                h=arr[t+1];
                t=t+2;
```



TASK 5:- DATABASE CERATION & MANAGEMENT

DATABASE: -

Database Management System (DBMS) is a collection of programs which enables its users to access database, manipulate data, reporting / representation of data .

It also helps to control access to the database.

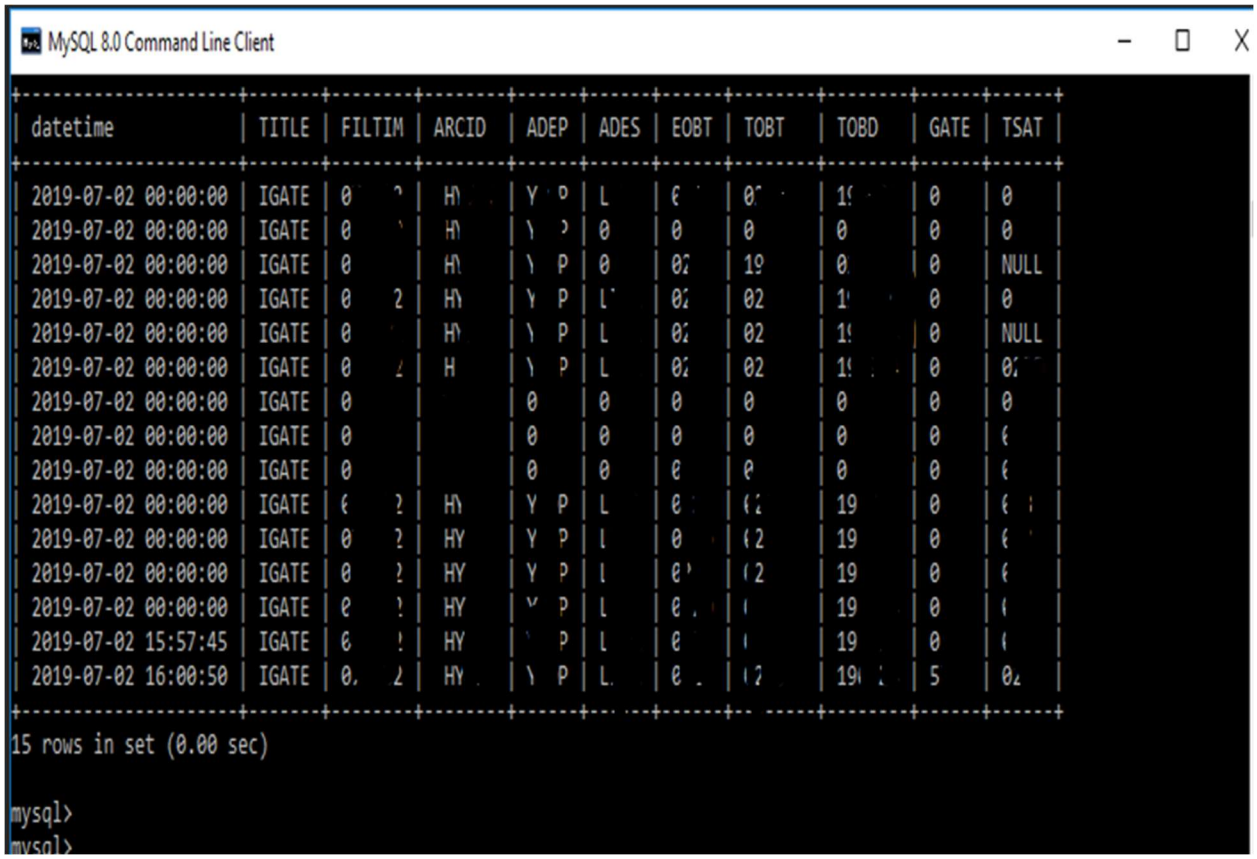
Database Management Systems are not a new concept and as such had been first implemented in 1960s.

Charles Bachman's Integrated data store (IDS) is said to be the first DBMS in history.

With time database technologies evolved a lot while usage and expected functionalities of databases have been increased immensely.

- DBMS stands for Database Management System.
- We have four major types of DBMSs namely Hierarchical, Network, Relational, Object Oriented
- The most widely used DBMS is the relational model that saves data in table formats. It uses SQL as the standard query language
- SQL language is used to Sql query a database
- The database approach has many advantages when it comes to storing data compared to the traditional flat file based systems

Database Output: -



Final conclusion of Project 1

The project has a server code that sends data over a network on a specific port number.

Clients can receive data from the multicast port used to send data by server.

This data is then received and tokenized by the program and relevant data is stored in the database maintained by the authority.

This program is capable of handling thousands of requests in a small span of time. The database stores each message with its date and time of reception making accessing data efficient and easy.