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

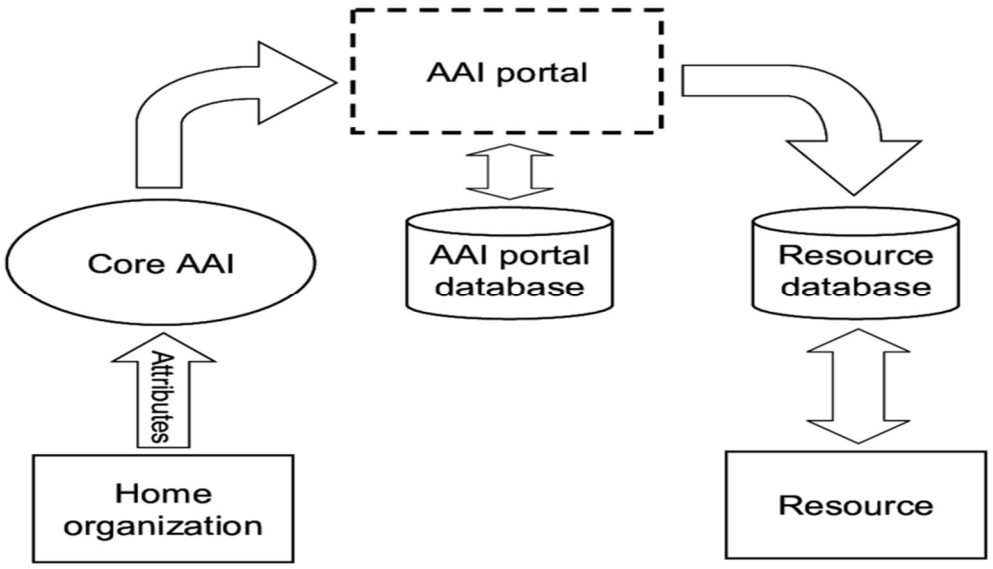
The **Airports Authority of India** or **AAI** is a statutory body (created through the Airports Authority of India Act, 1994) working under the Ministry of Civil Aviation, Government of India is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India. It 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.

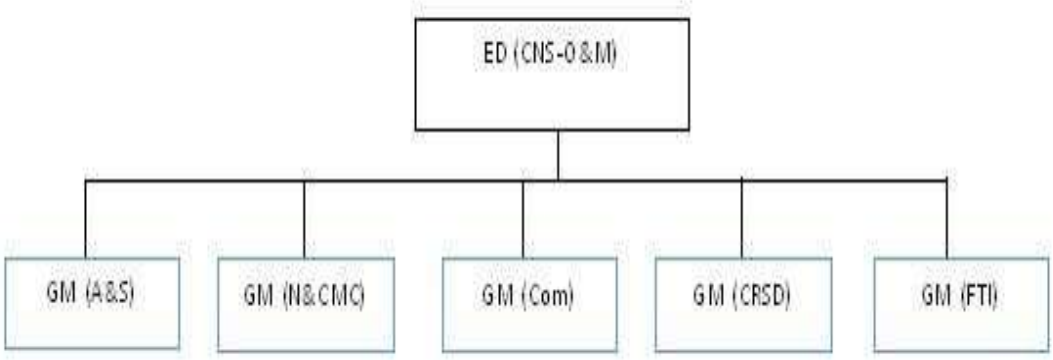
(c) Surveillance: -

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 -2

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

Introduction:-

The project basically aims to receive the data packets from the server i.e. from the ASMGCS (Advance Surface Movement Guidance and Control System) and arrange it in specific format then storing it & send it to multiple clients.

Approach: -

Task 1- Writing the Code for XML Data

Task 2- Fetching the Data

Task 3- SQL Accesses

Task 5-Database Creation and Management (using MY SQL, Eclipse)
Same as done in previous (Project 1 - AOCC)

Incoming xml file from ASMGCS

The incoming XML format is shown below. Data is hidden due to privacy concern.

Code for XML DATA:

Main.java

```java
package xml;
import java.io.File;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import javax.xml.parsers.DocumentBuilder;
import javax.xml.parsers.DocumentBuilderFactory;
import javax.xml.parsers.ParserConfigurationException;
import org.w3c.dom.Document;
import org.w3c.dom.Element;
import org.w3c.dom.Node;
import org.w3c.dom.NodeList;
import org.xml.sax.SAXException;
public class xmldata {
    public static void main(String[] args) {
        String filePath = "asma.xml";
        File xmlFile = new File(filePath);
        DocumentBuilderFactory dbFactory = DocumentBuilderFactory.newInstance();
        DocumentBuilder dBuilder;
        try {
            dBuilder = dbFactory.newDocumentBuilder();
            Document doc = dBuilder.parse(xmlFile);
            doc.getDocumentElement().normalize();
            System.out.println("Root element :" + doc.getDocumentElement().getNodeName());
            NodeList nodeList = doc.getElementsByTagName("flight");
            //now XML is loaded as Document in memory, lets convert it to Object List
            List<datafetch> empList = new ArrayList<datafetch>();
            for (int i = 0; i < nodeList.getLength(); i++) {
                empList.add(getEmployee(nodeList.item(i)));
            }
            //lets print Employee list information
            for (datafetch emp : empList) {
                System.out.println(emp.toString());
            }
        } catch (SAXException | ParserConfigurationException | IOException e1) {
            e1.printStackTrace();
        }
    }
    private static datafetch getEmployee(Node node) {
        //XMLReaderDOM domReader = new XMLReaderDOM();
        datafetch emp = new datafetch();
        if (node.getNodeType() == Node.ELEMENT_NODE) {
            Element element = (Element) node;

            emp.setcallsign(getTagValue("callsign", element));
            emp.setflightType(getTagValue("flightType", element));
            emp.setactualOffBlockTime(getTagValue("actualOffBlockTime", element));
            emp.setactualTakeOffTime(getTagValue("actualTakeOffTime", element));
            emp.setactualRunwayOccupancyTime(getTagValue("actualRunwayOccupancyTime", element));
            emp.setactualTaxiOutTime(getTagValue("actualTaxiOutTime", element));
            emp.setactualRunwayHoldingPosition(getTagValue("actualRunwayHoldingPosition", element));
            emp.setactualTaxiRoute(getTagValue("actualTaxiRoute", element));
        }

        return emp;
    }

    private static String getTagValue(String tag, Element element) {
        NodeList nodeList = element.getElementsByTagName(tag).item(0).getChildNodes();
        Node node = (Node) nodeList.item(0);
        return node.getNodeValue();
    }
}
```

Code for Data fetch:

```java
package xml;
public class datafetch {
    private String name;
    private String gender;
    private String age;
    private String role;
    private String setactualRunwayOccupancyTime;
    private String setactualTaxiOutTime;
    private String actualRunwayHoldingPosition;
    private String actualTaxiRoute;

    public String getcallsign() {
        return name;
    }
    public void setcallsign(String name) {
        this.name = name;
    }
    public String getflightType() {
        return age;
    }
    public void setflightType(String age) {
        this.age = age;
    }
    public String getactualOffBlockTime() {
        return gender;
    }
    public void setactualOffBlockTime(String gender) {
        this.gender = gender;
    }
    public String getactualTakeOffTime() {
        return role;
    }
    public void setactualTakeOffTime(String role) {
        this.role = role;
    }
```

```java
    public String setactualRunwayOccupancyTime() {
        return setactualRunwayOccupancyTime;
    }
    public void setactualRunwayOccupancyTime(String tagValue) {
        this.setactualRunwayOccupancyTime=tagValue;
    }
    public String setactualTaxiOutTime() {
        return setactualTaxiOutTime;
    }
    public void setactualTaxiOutTime(String tagValue) {
        this.setactualTaxiOutTime=tagValue;
    }
    public String setactualRunwayHoldingPosition() {
        return actualRunwayHoldingPosition;
    }
    public void setactualRunwayHoldingPosition(String tagValue) {
        this.actualRunwayHoldingPosition= tagValue;
    }
    public String setactualTaxiRoute() {
        return actualTaxiRoute;
    }
    public void setactualTaxiRoute(String tagValue) {
         this.actualTaxiRoute= tagValue;
    }
    @Override
    public String toString() {
        return "Flight Data::  "+"\n"+
                "  callsign = " + this.name + "\n"+
                "  flightType = " + this.age + "\n"+
                "  actualOffBlockTime = " + this.gender+ "\n"+
                "  actualTakeOffTime = " + this.role + "\n"+
                "  actualRunwayOccupancyTime = " + this.setactualRunwayOccupancyTime + "\n"+
                "  actualTaxiOutTime = " + this.setactualTaxiOutTime + "\n"+
                "  actualRunwayHoldingPosition = " + this.actualRunwayHoldingPosition + "\n"+
                "  actualTaxiRoute = " + this.actualTaxiRoute + "\n"+"\n";
    }
}
```

Code for SQL Access:

```java
package xml;
import java.sql.*;
import java.util.*;
import java.util.ArrayList;
import java.io.*;
import java.lang.*;
import java.io.File;
import java.io.IOException;
import java.util.ArrayList;
import java.util.List;
import javax.xml.parsers.DocumentBuilder;
import javax.xml.parsers.DocumentBuilderFactory;
import javax.xml.parsers.ParserConfigurationException;
import org.w3c.dom.Document;
import org.w3c.dom.Element;
import org.w3c.dom.Node;
import org.w3c.dom.NodeList;
import org.xml.sax.SAXException;

public class MYSQLACCESS {

    public static Scanner scanner;

    private static String getTagValue(String tag, Element element) {
        NodeList nodeList = element.getElementsByTagName(tag).item(0).getChildNodes();
        Node node = (Node) nodeList.item(0);
        return node.getNodeValue();
    }

        private static datafetch getEmployee(Node node) {
            //XMLReaderDOM domReader = new XMLReaderDOM();
            datafetch emp = new datafetch();
            if (node.getNodeType() == Node.ELEMENT_NODE) {
                Element element = (Element) node;

                emp.setcallsign(getTagValue("callsign", element));
                emp.setflightType(getTagValue("flightType", element));
                emp.setactualOffBlockTime(getTagValue("actualOffBlockTime", element));
                emp.setactualTakeOffTime(getTagValue("actualTakeOffTime", element));
                emp.setactualRunwayOccupancyTime(getTagValue("actualRunwayOccupancyTime", element));
                emp.setactualTaxiOutTime(getTagValue("actualTaxiOutTime", element));
                emp.setactualRunwayHoldingPosition(getTagValue("actualRunwayHoldingPosition", element));
                emp.setactualTaxiRoute(getTagValue("actualTaxiRoute", element));        return null;
            }
            return emp;
        }

    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", "root21");
            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 = {"callsign","flighttype" ,"actualoffblocktime" ,"actualinblocktime","actualt

            String query1 = " insert into dial (callsign ,flighttype ,actualoffblocktime ,actualinblockti
                    + " values (?,?,?,?,?,?,?,?,?)";
            PreparedStatement Stmt = conn.prepareStatement(query1);
            scanner = new Scanner(System.in);
            int t=0;int i=0,x=0;

            //xmldata.java
            String filePath = "asma.xml";
```

```
            File xmlFile = new File(filePath);
            DocumentBuilderFactory dbFactory = DocumentBuilderFactory.newInstance();
            DocumentBuilder dBuilder;

            dBuilder = dbFactory.newDocumentBuilder();
            Document doc = dBuilder.parse(xmlFile);
            doc.getDocumentElement().normalize();
            System.out.println("Root element :" + doc.getDocumentElement().getNodeName());
            NodeList nodeList = doc.getElementsByTagName("flight");
            //now XML is loaded as Document in memory, lets convert it to Object List
            List<datafetch> empList = new ArrayList<datafetch>();
            for ( x = 0; x < nodeList.getLength(); x++) {
                empList.add(getEmployee(nodeList.item(x)));
            }
            //lets print Employee list information
            for (datafetch emp : empList) {
                System.out.println(emp.toString());
            }

            //data shivangi
        /*while (scanner.hasNextLine())
        {
            String line =scanner.nextLine();
            if (line.equals(""))
                break;
            String word[]=line.split(" ");
            if(x<20) {
                arr[x]=word[0];
                arr[x+1]=word[1];
                x=x+2;
            }
        }*/

        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;
        }
        if(array[8].equals(arr[t]))
        {
            j=arr[t+1];
```

```
                t=t+2;
            }
            if(array[9].equals(arr[t])) {
                k=arr[t+1];
                t=t+2;
            }
            Stmt.setString (2,a);
            Stmt.setString (3,b);
            Stmt.setString (4,c);
            Stmt.setString (5,d);
            Stmt.setString (6,e);
            Stmt.setString (7,f);
            Stmt.setString (8,g);
            Stmt.setString (9,h);
            Stmt.setString (10,j);
            Stmt.setString (11,k);
            Stmt.setDate (1, startDate);
            Stmt.executeUpdate();
            conn.close();
            scanner.close();
        }
        catch (Exception p2)
        {
            System.err.println("Got an exception!");
            p2.printStackTrace();
        }
        }
    }
```

So above are the codes which are responsible for capturing the data, fetching the data, arranging the data in a specified data format and finally storing that data in the SQL.

Then the data which are stored in the particular format are sent to multiple clients i.e. to the ATC tower, Automation department etc, which helps them in analyzing the flight data according to there demand.

CONCULISION

We would like to say that this training program was an excellent opportunity for us to experience the things. We are grateful to the AIRPORTS AUTHORITY OF INDIA for giving us this experience.

The main objective of the industrial training to provide undergraduates to identify, observe and practice hoe engineering is applicable in the real industry.

It is not only to get experience on technical practices but also to observe the live equipment's systems and to interact with the staffs of AAI. It is east to work with people but not with sophisticated machines. The only chance that an undergraduate has to have this experience is the industrial training period. We feel we got the maximum out of that experience.

Also, we learn the way to work in an organization, the importance of being punctual, the importance of maximum commitment and the importance of team spirit.