

## **INTEGRATED DESIGN PROJECT (IDP II)**

**CSE-460**

### **AUTOMATED FRESHNESS AND DEFECT DETECTOR**

#### **USER MANUAL DOCUMENT**

Submitted by

#### **GROUP - FOXTROT A**

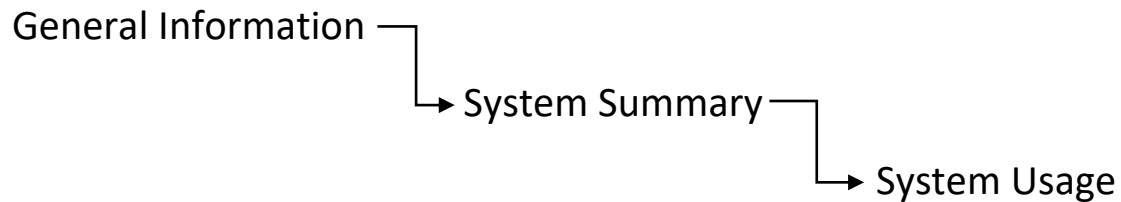
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## 0.0 Organization of the Manual

The user's manual consists of the following sections.



## 1.0 General Information

Defining quality in food production is one of the most complicated issues to solve when new products are released in the market. It can be defined as the characteristics of food that are between certain limits of acceptance in every step of manufacturing, from the raw materials to the acceptance of consumers. Our project aims to create a detector of freshness and defection for grading general raw fruits or vegetables for industrial use. This project will provide an automated food freshness detector and the main audience is intended for the food industry. It will be useful for the industries as it decreases human dependency in industrial level food grading and replace it with machine dependency for better output of quality grading.

### 1.1 System Overview

One of the biggest problems in the food industry is that it faces food spoilage specially in case of vegetables and fruits. The bigger problem is these spoilt items are going undetected and onto the hands of the consumer. In many fruits and vegetables industries, the process of checking of quality of items is done manually, mostly by a person sitting across a conveyor belt as the items pass by. This project

establishes an efficient automated process which would increase the accuracy of spoiled food detection. The system works on identifying the raw and stale elements and separate them from the fresh ones. All system information will be maintained in a database. The system is designed to use as few people as possible and get higher production rate and product quality.

## 2.0 System Summary

The system architecture is consisting of three parts- Hardware, Software backend and Software frontend (User Interface). Backend of software consists of a database to store fruits images and result of detection and image processing algorithm. And lastly the UI will be an interface among hardware and software.

### 2.1 System Configuration

The hardware is a conveyor belt system where a camera will be incorporated to detect any kind of defect that might exist. Fruit freshness grading via computer vision technology exploits on the fruit texture, color and shape for visual feature evaluation. Owner/worker can start the system by navigating the web application. After starting the conveyor belt system, food will be fed to the conveyor belt. Then upon detection camera will send data to microcontroller (Jetson nano) and it will calculate whether the food is fresh or stale.

Upon detection of fresh fruits, the system will the separate the food based on their classification, such as we are working on three fruits (apple, banana and orange). So, if the system detects that a particular fruit is fresh then it will put it on a specific bucket of its type (fresh apples, fresh oranges, fresh bananas, and defected fruit). And this process will continue until there is no food or the system is turned off. Apart from that owner can view the daily states of fruits from web application.

## 2.2 User Access

Automated Freshness and Defection Detection System is designed for industrial use. It has two ends of users:

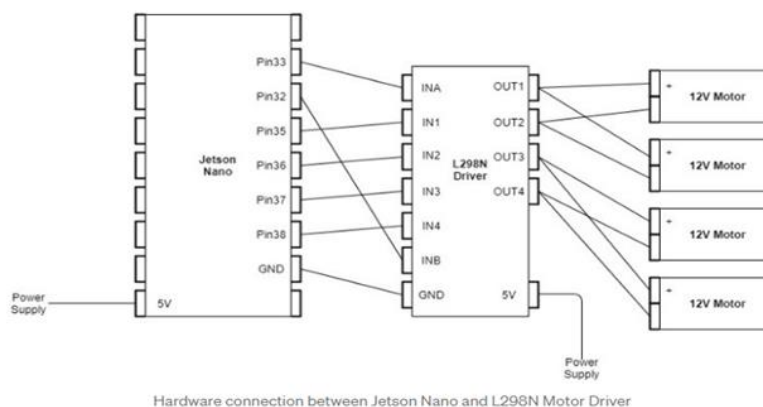
- A) Owner
- B) Workers

The only difference between these two users are that only owner can access the records of fruits of any particular day

## 3.0 System Usage

### 3.1 Connecting Hardware Components

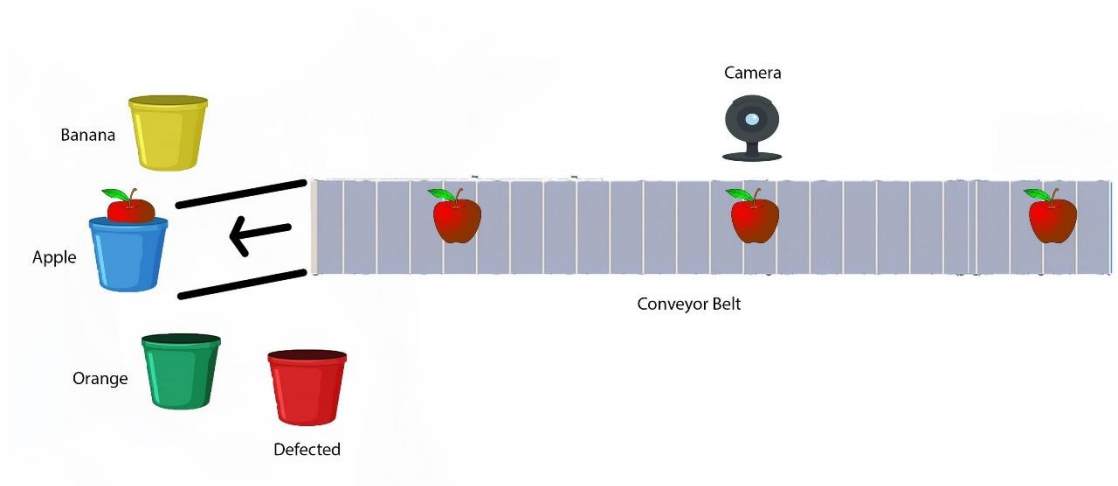
- Connect a dc motor to jetson nano using L298 motor driver.
- Pin 32 & 33 are for PWM output and rest pins are for L298N inputs.



- Direct connection of servo motor with jetson nano is not possible. So servo motor driver PCA9685 needs to be used.
- VCC of PCA9685 will be connected to pin 1 of j41 of jetson nano.
- GND will be connected to pin 6 of j41.
- SDA will be connected to pin 27 of j41.
- SCL will be connected to pin 28 of j41.

### 3.2 Delivering Fruits

- Human worker will put the fruits one by one on the conveyor belt.
- The fruits will go into the Image processing zone through the conveyor belt.
- After identifying the fresh fruit & defected fruit, the fresh fruits will be separated by the separator & go into their buckets & defected fruits will go into another bucket.

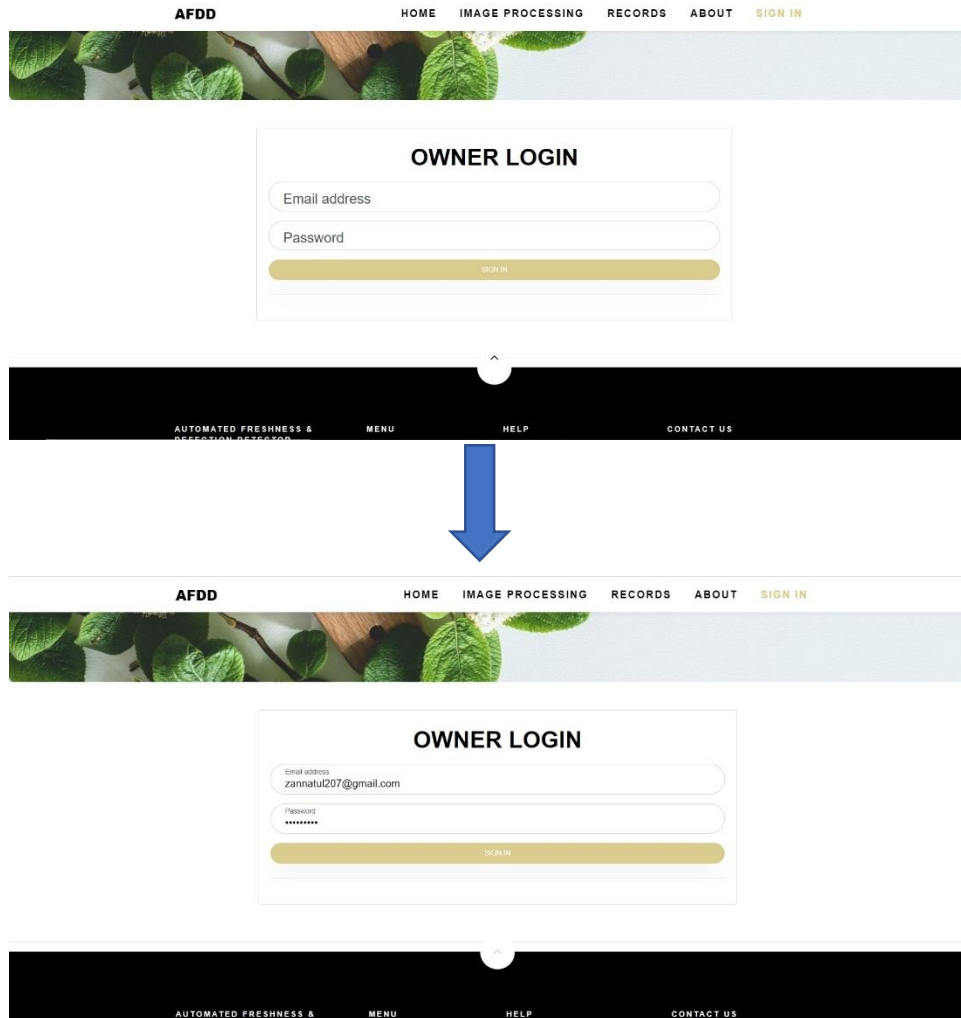


### 3.3 Image Processing Zone

- 2 web cameras will be used with jetson nano in such way that the camera can cover 360-degree angle of the fruit.
- There will be a live page in the website where incoming fruits can be seen.

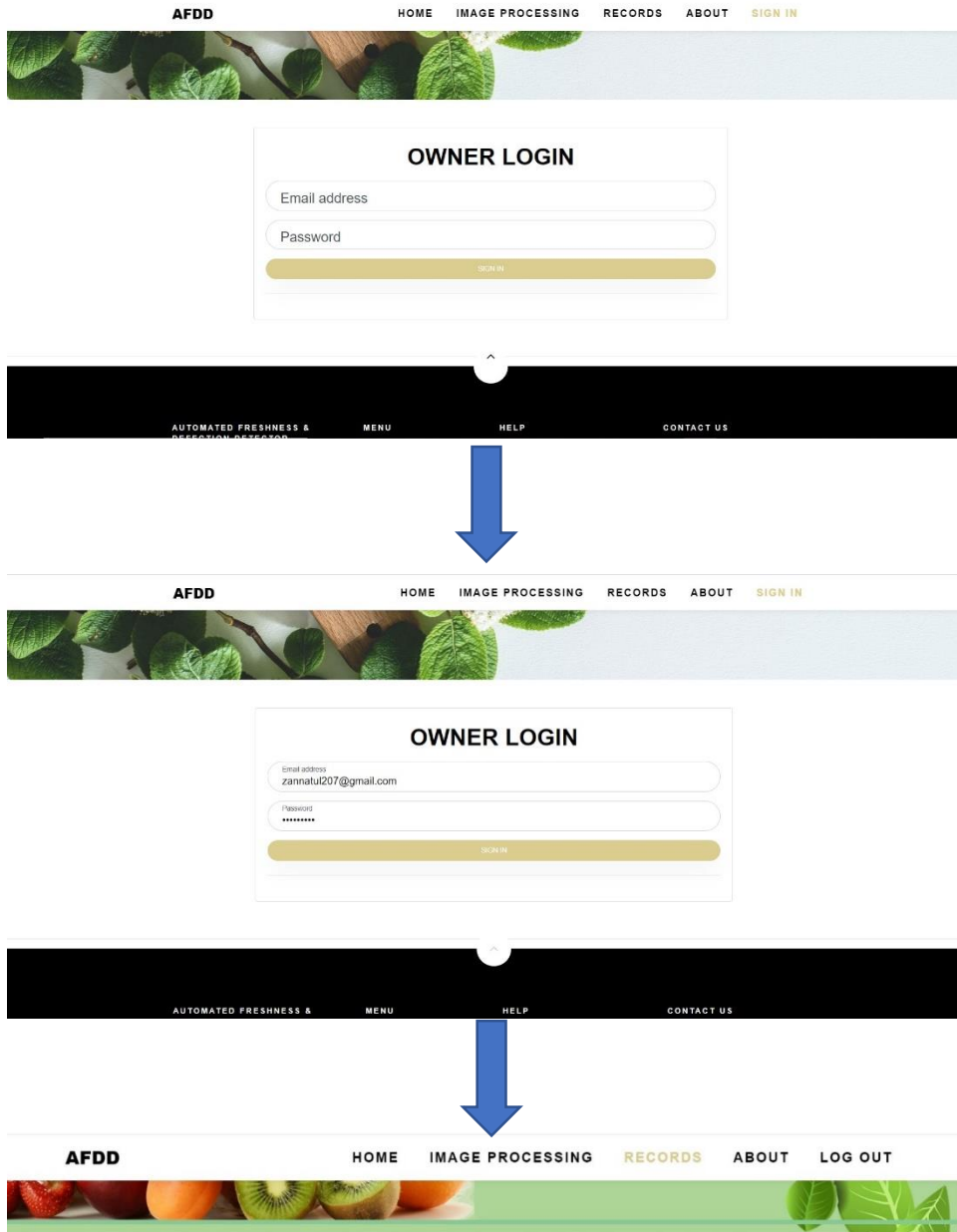
### 3.4 Logging In

- This is only applicable for owner.
- To log in, owner must enter their name, email address, and password in their respective field.
- Press the login button placed at the bottom of the panel.



### 3.5 Accessing Records

- This is labelled as “Records” on the top menu tab.
- The page requires owner login.
- This page shows all the data, the comparison between fresh and detected fruits, and the date of processing.
- The data for a specific period of time can be seen by putting the date desired on the field located above the data table.



View the amount of fresh food & defected food in one day!





View the amount of fresh food & defected food in one day!

06/18/2021

Search

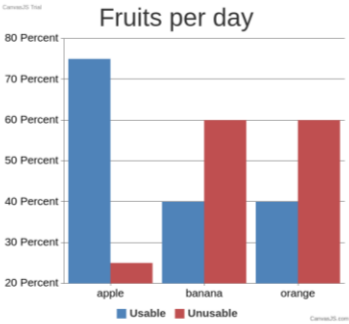


View the amount of fresh food & defected food in one day!

mm/dd/yyyy

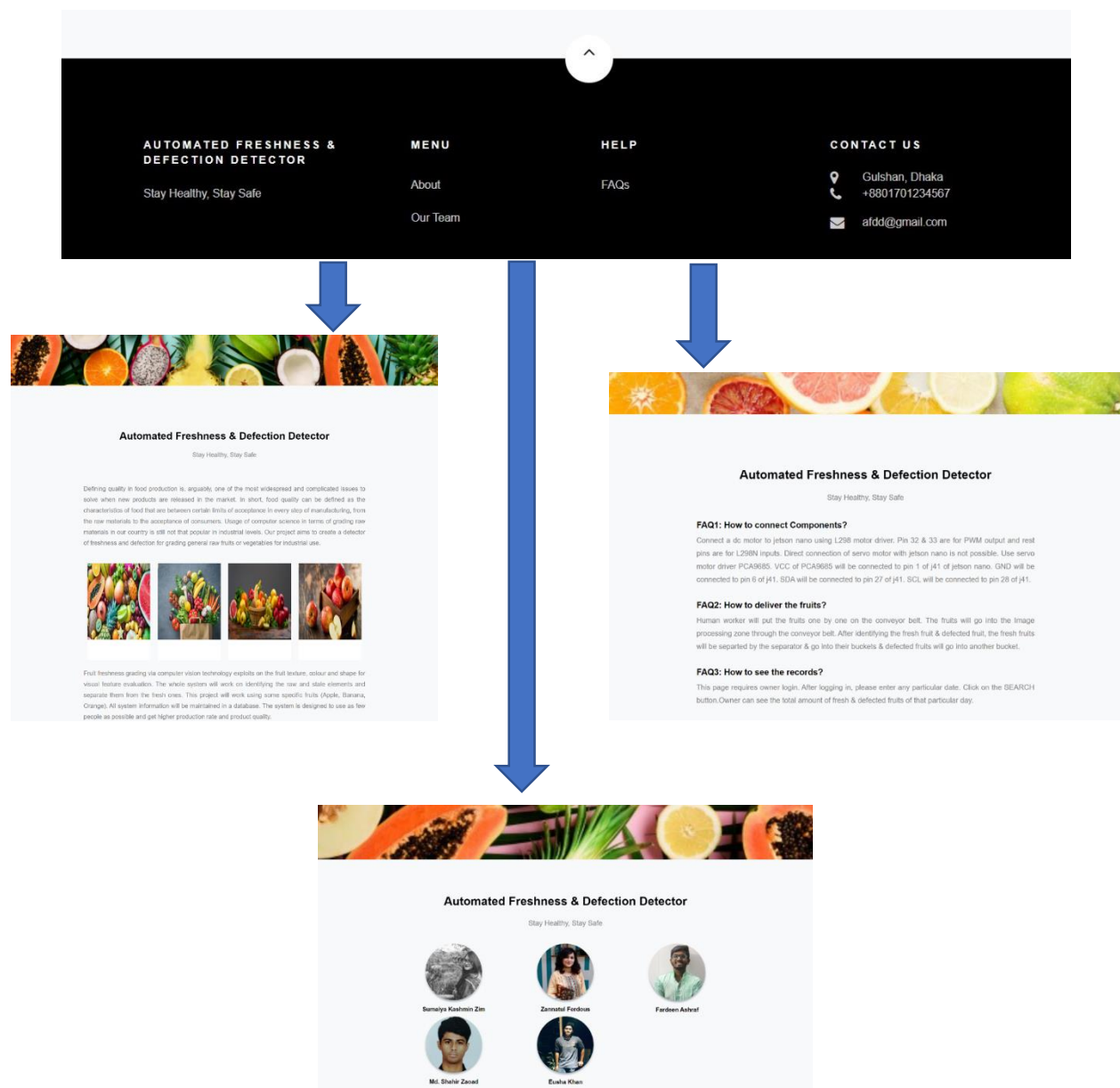
Search

Batch NO	Fruit Name	Total Fruits	Usable	Unusable	Date of Processing
1	Banana	5	2	3	2021-06-18
2	Apple	12	9	3	2021-06-18
3	Orange	5	2	3	2021-06-18



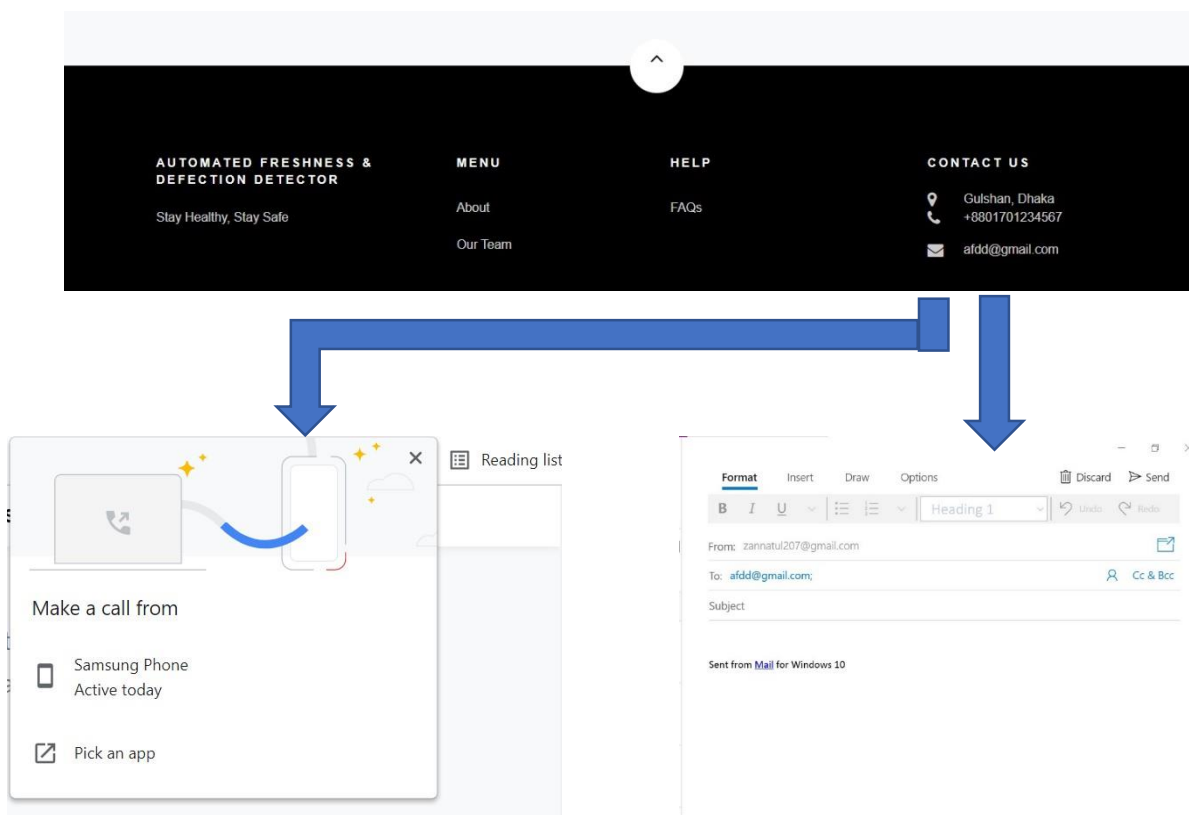
### 3.6 Learning more about the system

- From “Footer” user can learn more about the overall summary of the system.
- The second column, “MENU” has “About” page & “Our Team” page.
- By clicking “Our team” it will take the user to the page that shows the peoples’ pictures & names who are involved with the development of this system.
- The third column, “HELP” has “FAQs” page which shows the frequently asked questions (FAQ) & their answers.



### 3.7 Contacting for any query from Industry's Contact Information

- From “Footer” the fourth column, “Contact us” has the details of the location, telephone number & email id of the system.
- By clicking the phone number, the phone number in the website will be generated automatically in the user’s keypad.
- By clicking the email id, the website will take the user to his/her email & a new email will be created having the email id “afdd@gmail.com” in the receiver section.



## 4.0 Risk Management

The risks of the project are discussed on the risk table below:

Risk of Project					
Risk ID	Risk Description	Mitigation Plan	Contingency plan	Impact	Likelihood of occurrence
1.	Receiving inaccurate data	Achieving freshness detection CNN model accuracy as high as possible	Manually checking the not fresh basket fruit to check if any fresh fruits are wasted	The system will inaccurately dispose fruits that are fresh	rare
2	Conveyor belt breakdown	Designing the conveyor system as sturdy as possible	Admin will manually shutdown the system if this occurs	Breaking down of the belt system means the system won't be able to detect freshness continuously	rare
3	Loss of connection	Checking the connections between each device properly before starting up the system	The system will automatically shut down if any of the devices losses connection with the admin	Loss of connection means the system won't be able to work at all	medium