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Container Tracking and Security using RFID

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Abstract—In today's time, handling of a container is a time- consuming process. When they are unloaded from the ships or the trucks, the personal at the respective container yard have to go the respective container yard have to go to the container to check the container's identification number. Going through each and every container takes time. Also due to such a time- consuming process, sometimes the containers are let go even without checking them. This gives sometimes rise to smuggling of the goods. Also due to the presence of the manual work, there is always a danger of human error to occur. It proves to be costly to employ a huge manpower in container checking. Our project suggests a way of using RFID tag-reader system for container authorization and checking and GPS for tracking the container. The GPS along with the GSM module can be used by the industry to which the container belongs to continuously track it by getting the location coordinates on the mobile phones. This will make sure that the containers cannot be smuggled on their way to the destination.

Keywords-Database, GSM(Global System For Mobile), GPS(Global Positioning System), RFID(Radio Frequency Identification).

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I. INTRODUCTION

Traditionally, bar code scanners were used to obtain the information about the cargos. This system has certain shortcomings such as the need of line of sight between the bar code and the scanner which was time- consuming and increased manual work. Our project suggests a way to use RFID tag-reader system along with GPS on containers to track their location. The information about the container is fed into the tag attached to it. RFID reader is used in reading the information on the tag of the container and transmit it to the central database system. The location of cargo handling equipment is transmitted to a server.

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chiptypically is capable of carrying 2,000 bytes of data or less. It provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information. A significant advantage of RFID devices over the others mentioned above is that the RFID device does not need to be positioned precisely relative to the scanner it can work within a few feet (up to 20 feet for high-frequency devices) of the scanner.
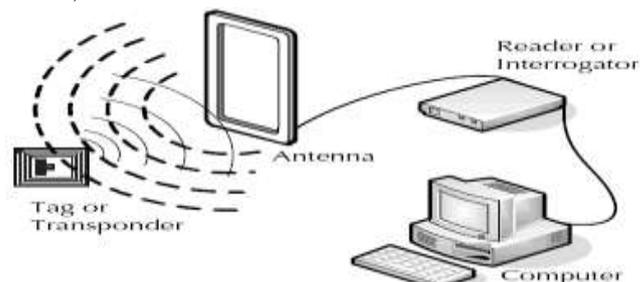

Fig. 1 Setup

II. OBJECTIVE

This project is used to reduce the time and the cost related to container security and checking by digitizing the process. A

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real-time database has to be created on the server for this purpose. This database will be accessible to the industry personnel whose container is to be delivered as well as the container yard or a port where the container is going to reach. The RFID tag number will be fed into the database system at the source point along with the destination name that it has to reach. This will ensure the authorization at the destination side. The container can be tracked real time by getting the location coordinates of the container by the help of the GPS and GSM modules which will be sending the coordinates on the respective mobile phones.

III. RELATED WORK

The first requirement to build a robust security system for the containers is using the advancements in the technologies like the GPS tracking and authorization by various sensing devices. Earlier identification slips were put on the containers on which all the information related to the container would have been written. But it had its own set of disadvantages as it was easy to tamper with the slips which lead to increased activity of smuggling. Then after some developments the devices such as barcode scanner were used at the container yards to keep a track on the containers. But it was proving to be time consuming as the person would have to go to each container and record the data. It was the need of the hour to go for digitization. So RFID devices are proposed to do the work previously done by the barcode scanners. RFID devices have memory in them so it was possible to create a database of all the containers arriving at the ports or the container yards and link the RFID with it. This lead to transparency of the system and drastically reduced the theft activities. Also the container was equipped with a GPS antenna so that it can be tracked real-time. The implementation is as follows: When the container would arrive at the container yards the RFID tag on it would be read by the reader and this number would be checked against the tag numbers present in the database of that destination. If the number matches then the container is authorized for that port otherwise it will be discarded.

This project has been put into use at the Singapore port. Using this method the traffic at the port was maintained efficiently and it also lead to generation of higher income as the theft was reduced.[1]

IV. COMPONENTS

A. RFID Tags:

The RFID tags have two parts: a microchip that stores and processes information, and an antenna to receive and transmit a signal. The tag contains the specific serial number for one specific object. To read the information encoded on a tag, a two-way radio transmitter-receiver called a RFID reader emits a signal to the tag using an antenna. The tag responds with the information written in its memory bank. The reader will then transmit the read results to a RFID computer program. There are two types of RFID tags: Passive and Active.

- *Passive tags:* A passive RFID tag will use the reader's radio wave energy to relay its stored information back to the reader. It is powered by time varying electric field generated by reader

- *Active tags:* Active RFID tag is embedded with a small battery that powers the relay of information. Due to inbuilt power source range of active tags is more than passive tags.[2]

Fig. 2 RFID Tag

B. RFID Reader:

The reader has two parts a) transceiver b) antenna. Transceiver generates a signal which is transmitted by antenna and it activates the tags. Transceiver consists of an oscillator, modulator and a amplifier. The means of interrogation in RFID is wireless with short range, line of sight is not necessary. We have used EM18 RFID reader module.[2]

Fig. 3 RFID Reader

C. GPS Module:

GPS receiveris used to track vehicles. The Global Positioning system is based on 24 satellites out of which it has to locate the position of four or more satellites. Its working is based on the process called as triangulation. It can be interfaced to Arduino and then connected to the container.[3]

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Fig. 4 GPS Module

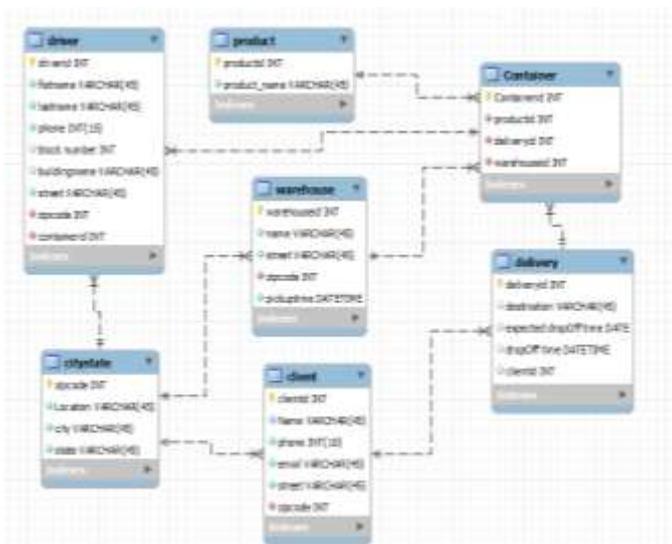## V.   DESIGN OF DATABASE

Fig. 5 Database design
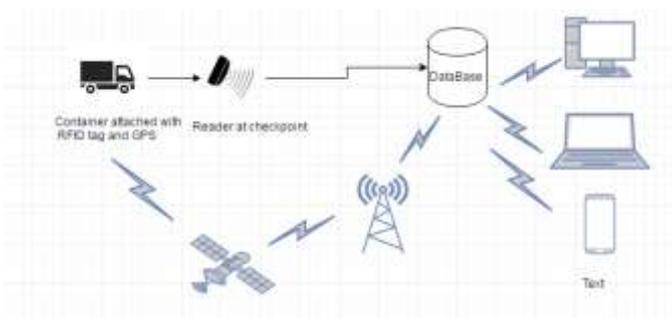
VI.   BLOCK DIAGRAM

Fig. 6 Block diagram

VII.   WORKING

Main aim of our project is to replace the existing system with a better and advanced system Consider a container traveling from port 1 to port 2 passing through n checkpoints. Each container is attached with a tag a GSM module and a GPS module.Each RFID tag has its unique id, RFID tag contains two parts a microchip that stores and process the information and an antenna which transmits the information. Passive tags use readers radio wave energy to send information back to the reader. Active tags have inbuilt battery source.At every checkpoint, the reader is placed which is continuously active and emitting signals. Whenever a certain container comes in the range of the RFID reader it is scanned and the unique id and the information are transmitted to the central database. If the unique id matches with the one stored in the database, the container is valid for the given checkpoint thus it also crosschecks and in turn, adds to security.RFID reader is interfaced to computer at checkpoint using Arduino

GSM and GPS module on the container gives us the live tracking of the container. GPS uses the concept of triangulation to obtain the coordinates of container whenever the owner requests for it.[5]

VIII. CONCLUSION

We have suggested a way to use RFID technology in the ports and areas where there is heavy traffic of containers and each container is scanned manually, this system is going to reduce the manual load and time required to scan each individual container, with the use of active tags range of RFID reader is increased and thus it is not essential that each container has to be present in the line of sight of the reader

The data read at the given checkpoint is passed on to the central database and thus it helps in developing a centralized platform for the industry which is an essential thing for any company.

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