THE RESEARCH USABILITY OF PASSIVE RFID TECHNOLOGY FOR IDENTIFICATION OF TRANSPORT UNITS AND POSTAL PACKAGES BY THE CHOSEN POSTAL OPERATOR

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Abstract

The article deals with research of usability passive RFID technology with transport units and postal packages for real postal operator. In this article we would like to share a way of testing and the results that we found during the test in real conditions. The testing was realized on a selected area of postal transport network, the aforementioned operator. The processing centers on the selected area were equipped with RFID readers that were connect over a network to the central database server. This RFID devices were equipped only area of loading and unloading. Also we placed RFID on the transport units and selected postal packages. At intervals of a few days we monitored movement of objects equipped with RFID tag in real time. The captured data form this testing were used as a basis of evaluating the feasibility of deploying RFID technology at the selected postal operator.

Keywords: RFID, container, transport unit, monitoring, logistics

1. INTRODUCTION

Recent advances in field of RFID technology will also allow us to make it possible in the coming years to provide any object in heterogeneous environments by small electronic RFID devices. This connection will allow monitoring, controlling RFID devices fitted with logistics unit. Finally, this collected information after transformation to output data should provide the basis for a variety of key decision-making processes. Nowadays, when the economic situation is not so good, it is important to eliminate the negative aspects of the business, mainly by reducing costs, improving quality of goods and services. One of the areas where RFID technology is becoming more and more use is the postal sector. Many years this technology is associated with the measurement of the quality of postal service in the postal sector. Currently, more postal operators considering the use of RFID technology for monitoring within their own logistics, especially for monitoring shipping rates, postal packages, but most monitoring of transport units especially postal containers. In our research we were able to test RFID technology in real operation unnamed postal operator in Slovakia, which interest in RFID technology. The operator needed to resolve the issue of the utilization of containers and their location within their transport network.

2. THE MAIN ISSUES

One of the main problems in dealing with projects related to the monitoring and control of containers, it is necessary to clarify and streamline the respective asset management. Other requirement is to ensure that the required amount of containers was always available at the right time and the right place [1]. All this plays an important role not only in the mass submitter that their shipments are inserted into a container in their own areas, but also for the processing and distribution centers of different levels where containers fulfills its fundamental role as a transportation unit. Monitoring and controlling the flow of containers should lead to the planned accumulation of containers for specific uses and preventing unplanned accumulation, which can lead to a shortage of containers in sorting and processing of the top resorts in the framework of processing postal operator. Besides this problem can insufficient monitoring (visibility) of containers cause of their loss and the

subsequent cost of providing new containers [2, 3, and 4]. Before starting our research, we were passed following the requirements of the proposed testing system:

- must provide an overview of used and underutilized postal containers,

- must provide an overview of the currently used postal containers (in terms of time and place),

- must provide an overview of the postal containers provided by the customer and returned to the top, of the top customers [5].

In general, our authority is assumed that the eventual implementation gains a tool that he will provide information for:

- preventing the accumulation mailing containers,

- minimize loss of postal containers,

- improving the accessibility of postal containers and ensuring the overall balance of the entire logistics chain,

- checking the contents of the mail containers,

- improving the postal service and maintenance of containers.

Of course, all these assumptions RFID technology can bring to incorrect implementation, which precedes the start of testing.

2.1. Analysis of the postal tranposrt network

Postal transportation network an operator is comprised of the following entities:

- the main processing centers,

- the local processing centers,

- the processing nodes.

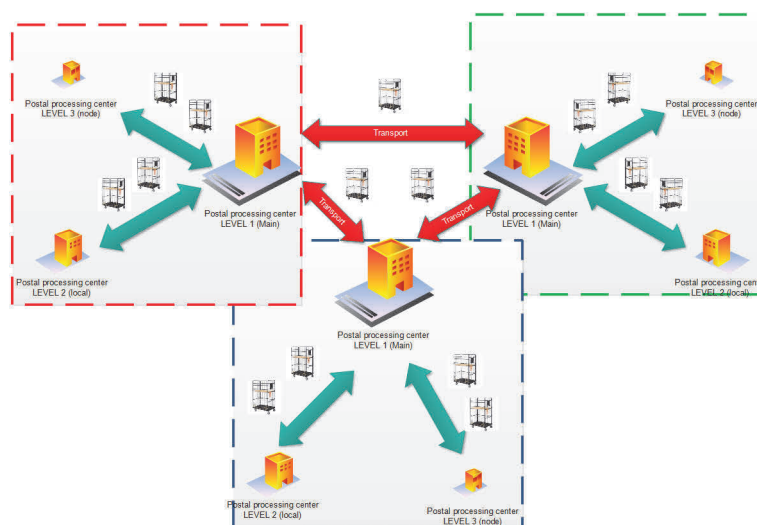The principle of distribution of postal containers is illustrated in **Fig. 1**.

Fig. 1 The structure of postal transportation network

The main processing center performs sorting and processing mail, local processing center serves as front handlers for the main processing center and processing node acts as contact with top customers. Within the

assigned area has always one main processing center, along with several local processing centers and processing nodes [5].

2.2. Preparation for testing

Due to the nature postal transportation network it was decided that the testing will take place only on the part of postal transportation network. It was chosen the part of postal transportation network that meant in terms of RFID worst possible conditions. Every major, local processing center and processing segment are inherently different. This is due to the nature of the construction and processing area for loading and unloading. That is why we chose to test the worst possible conditions because it is more than likely that the same problem on other operations do not conflict. Overall, we are in the allocated area selected 3 Entities. These were main postal processing center, local processing center and processing node. Schema of transport between these entities are shown in **Fig. 2**.
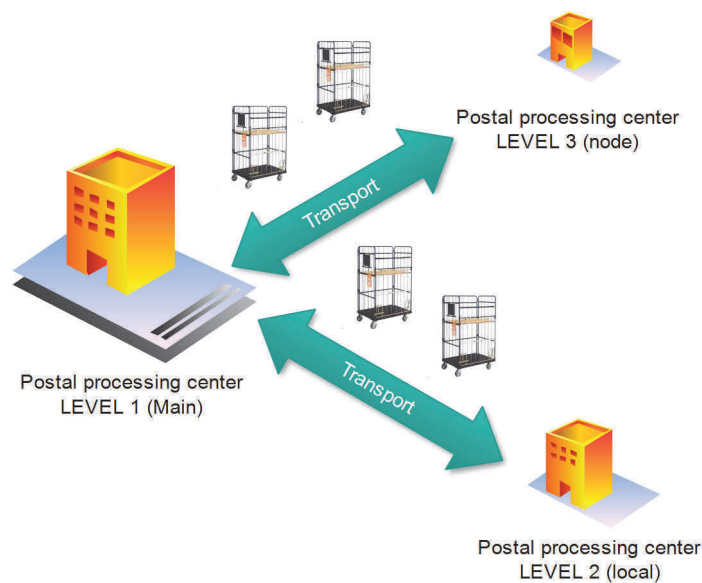

Fig. 2 The part of postal transport network

3. LABORATORY AND REAL TESTINGS

3.1. Laboratory testing

In the laboratory we conducted a series of tests on borrowed mail container from the postal operator. It was mainly a choice of RFID readers, RFID antennas, RFID tags and their placement on the mail container. For many readers, we finally chose RFID readers from Motorola FX7400 and Nebla 402 from KUPSON with appropriate antennas. Of the tested RFID tags, we chose special encapsulated tags on metal. The largest portion of the laboratory testing was devoted to placement of RFID antennas and RFID tag placement on the mail containers because these two parameters offered a fairly wide range of combinations. The mail container, we chose 25 positions for the placement of RFID tags (see Fig. 3, 4) and these positions I tested in combination antennas placed over the next container and container. In terms of potential damage to the antenna RFID containers, we finally chose the placement of antennas above the containers, as can be seen on the second part of figure 3. [6].
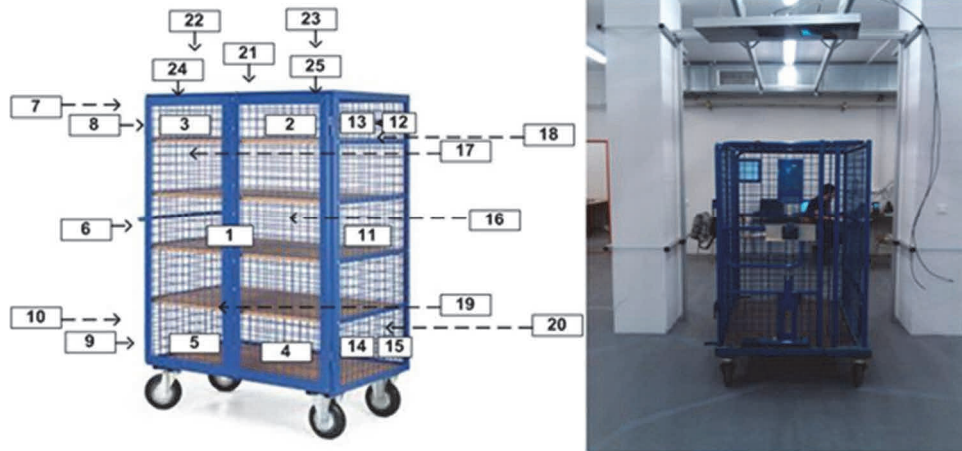
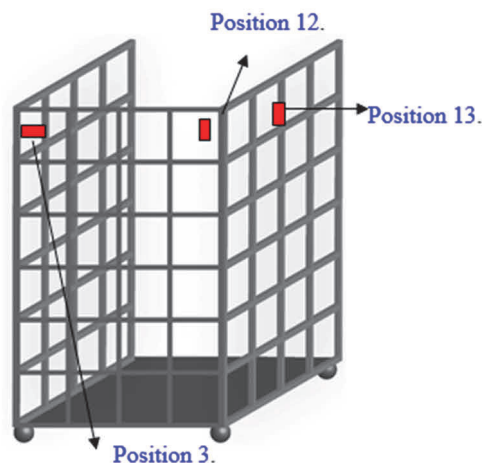**Fig. 3** Placement of RFID tags at postal container

Fig. 4 Final Placement of RFID tags at postal container

3.2. Real testing

After we had finished a laboratory testing and evaluation, it was a time for real testing at condition in selected postal operator. We have made a real application, which consists with web application that is shown on figure 6. Selected processing centers and nodes of postal operator were equipped with the aforementioned device. All readers are connected to the main database server via a mobile connection. RFID readers have been through middleware connected to a central database server and subsequently evaluated by means of web applications in real time. The principle of operation of the system is shown in figure 5.
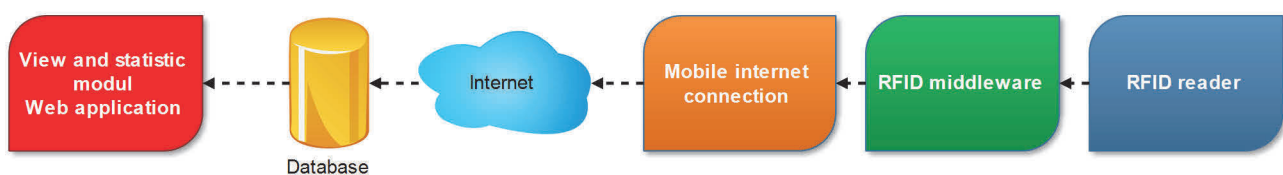

Fig. 5 Principle of operation

The statistical web module has provided us with information about the length of time and transport time to stay on the individual processing centers for individual postal containers. Also, we monitored as individual sites provide postal containers and more.

Fig. 6 Web application

The configuration implemented at one of the processing centers of postal operator can be seen in figure 7.

Fig. 7 Real configuration on postal operator

After installation of all modules in selected processing centers of postal operator, we placed RFID tags on all mail containers in selected mentioned processing centers. For several days the system record entries

containers through our system. But after the interim and final evaluation of all the data collected, we were able to determine the exact results and opinion.

4.   CONCLUSION

We made a pilot in conjunction with postal operator and we got relevant information to designate a utilization of RFID implementation in postal environment in field of identification postal containers and postal packages. We can say that our result in our configuration provide for postal operator a realistic view of the location of postal containers in real time. This research represents another step towards the identification of the entire postal logistics chain, and then connection to the concept internet of postal things.

ACKNOWLEDGEMENTS

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