INFORMATIZATION OF THE AIRPORT TRAFFIC CENTRE FOR IMPROVED INFORMATION FLOW

Igor Štimac, Jurica Ivanišević
Zagreb Airport Ltd.
Pleso bb, HR-10000 Zagreb, Croatia
istimac@zagreb-airport.hr, jivanisecvic@zagreb-airport.hr

Dražen Kovačević
Faculty of Transport and Traffic Sciences
Vukelićeva 4, HR-10000 Zagreb, Croatia
drazen.kovacevic@fpz.hr

ABSTRACT

Air traffic is a branch characterized by speed and safety. Consequently, at present fast and precise information flow is very important from the technological aspect. One of the main and responsible parts of the airport for information transfer between the sectors is the traffic centre which can be also called the heart of the airport. The main motive for the development and modernization of introducing information technology into the traffic centre at the airport is the low level of connections offered by the information applications implemented until now, which often represent the limiting factor in communication. The objective is to develop the management module at all levels which would enable the traffic centre employees and airport users to provide a simpler, timely and more efficient service. The problem is most pronounced at secondary airports where most of the communication is performed by radio-connection and in peak hours when the radio channels become saturated. The solution that will be presented in this paper is related to the wireless network communication which is experiencing expansion and its domination in the future traffic solutions is expected.

Key words: traffic centre, airport informatization, wireless network, air traffic

1 INTRODUCTION

The airport traffic centre can be regarded as a place at which all the information are collected and as the central part of the airport which coordinates the apron, but also serves as communication link of other services with the events at the apron. Using the information technology terminology, the traffic centre would represent the base at which all the data between the apron and the operative services of an airport are saved and distributed. Due to the large volume of data that pass through the traffic centre, at large airports in Europe the information solutions are used that use the communication module to solve the problem of collecting data at one service by the so-called data filtering. This communication occurs as sending of data on the number of passengers in arrival flights over the wireless network to the buses at the apron or if the airport has air-bridges, the exact data on the number of arriving passengers are sent to the personnel at the air-bridges. The communication is also developed at the apron so that if handling controllers need any special vehicles around the aircraft such as fire-brigade, conveyor belts, they can directly connect to the communication system and avoid congestions at the traffic centre. Such a system can be applied also at minor airports where the entire information flow occurs through the traffic centre. Since the systems should be connected also to the SITA system, any information on the arriving aircraft should be automatically input into the main communication system that should provide all the services with timely information on landing as well as present it at all the displays, so that the services could prepare to handle the respective aircraft. This would also display the information on the arriving aircraft type, which would thus be distributed to other services. For instance,

considering the aircraft handling service, they receive the information on the number of baggage hold, height of the baggage hold, vehicles that are primarily necessary for the respective aircraft handling, secondary vehicles, need for additional stairs if the aircraft is not equipped with its own. The information on the passengers that need special attention at disembarkation is sent to the passenger handling service.

2 DEFINING THE PROBLEM OF INFORMATION FLOW AT THE ZAGREB AIRPORT TRAFFIC CENTRE

Considering the airport according to the provided services we can divide it into two parts, the commercial and the operative part. The commercial part means the services that are in contact with the passengers and other airport users. The operative services represent all that is closely related to the aircraft handling, and influences in any way on the serving of the aircraft at the apron. The traffic centre provides the main connection among all the services at Zagreb airport. Apart from operations control that are performed at the apron the traffic centre also connects all the services for the improved, fast and safe aircraft serving. Therefore, high-quality and safe information flow is very significant. Because of the continuous development of technology and information technology, the airport has to accept continuous purchase of advanced information and communication systems as well as personnel training, in order to make information reach the end users via these systems more easily. The basic problem of the minor airports is the problem of investing into the reconstruction and development of single sectors, in order to keep pace with the competitive airports of the neighbouring countries.

If we consider the airport as an area where the aircraft take off and land literally to a minute, and where contracts between airlines and airports define the periods of time within which the aircraft have to be served, a fast information flow is more than necessary. Considering Zagreb Airport, it consists of several sectors that are interdependent through the traffic centre. Such a situation can be both positive and negative, since as much as the used system is good for providing the traffic centre with all the information that occur at the airport, it also provides the path for information which are insignificant at the main peak loads, and takes the time from the personnel working there for the information that need to be forwarded urgently. The entire communication within the airport is performed by radio-stations and interphone connection, via several channels. Each of these channels has the possibility for one person to talk at a time, thus blocking all the users of that channel.

Regarding the Zagreb Airport capacity at peak moments when all the apron aircraft parking positions are more or less occupied, it is difficult to harmonize all the coordination, especially between the traffic centre and the personnel at the airport apron. Such a situation includes ten or fifteen serving controllers, groups of loading workers, fuel tank trucks, personnel with aircraft handling vehicles, and other airline staff. All of them are connected with the traffic centre and communicate with other services. Currently, the communication between the traffic centre and the apron personnel, as well as the majority of services occurs over the radio stations, interphones and telephones, which generates the additional problem in the clarity and transfer of data, such as the fuel quantity that is included in the list of loading and balancing of aircraft, number and class of passengers, and additional airline requirements. One of the tasks of the traffic centre is also the responsibility to determine the aircraft parking position according to its dimensions, and communication with the marshall performed by means of the radio-station, which may give rise to errors in position determining thus allowing for failure of understanding in planning further traffic. Since airport traffic is increasing yearly, it is to be expected that its capacities also in the information and communication sense approach more and more the limits of its capacities. By introducing new

technological solutions the consequences of communication overload at peak moments can be alleviated and the information required by single sectors can be made fully available.

3 TECHNOLOGICAL SOLUTIONS FOR FASTER INFORMATION FLOW AT THE AIRPORT

Airport needs to keep pace with the advanced technology which will automatically detect which information is essential for which sector. The development of IT offers a number of new solutions that allow smooth and fast flow of information and thus allows connections of all the sectors and airport employees who are responsible for aircraft handling. The introduction of a unique information – communication system, that would have the task of sending and filtering information would achieve higher efficiency and more precise flow of information among services, thus alleviating the load on the traffic centre. A better flow of information would use the existing LAN technology with wireless network upgrade. LAN is an acronym for the English term Local Area Network which typically covers the area of one office, floor or building.

The international IEEE standards encompass the majority of wired and wireless local networks, and the most widespread are the IEEE 802.3 (Ethernet) and IEEE 802.11 (Wi-Fi) standards. By combining the LAN and WLAN technologies it is possible to solve the problem of communication and data transfer within the airport. When choosing and implementing the system special attention should be paid to the characteristics of individual technologies and the technological needs of every single sector.

Wireless technology has become a component of every major information system owing to the acceptable price and its comparative advantages in relation to the classical LAN technology: flexibility and wirelessness, simplicity of handling, transparency of applications, acceptable price. The basic comparative drawback of the wireless technology in relation to the classical LAN network system lies in the constraints related to the sending of radio-waves and optical visibility among the users, but this problem can be solved by setting additional antenna systems.

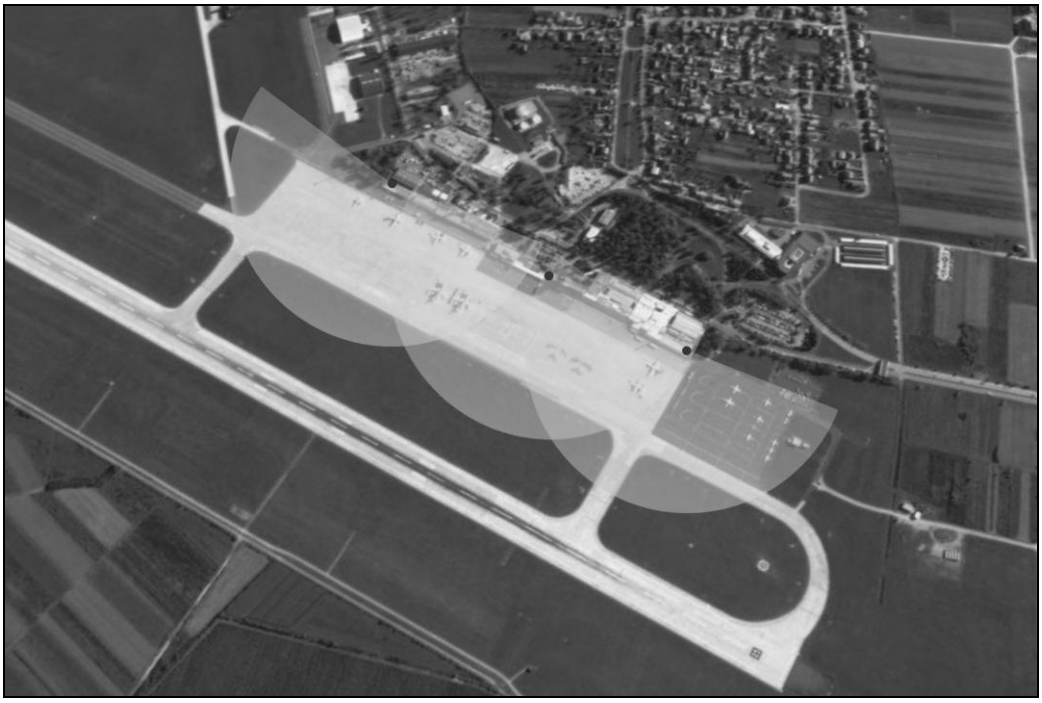

Figure 1: Possible wireless solution at airport apron

3.1 Solution for better information flow between the traffic centre and the apron

Considering the communication between the traffic centre and the apron one can see that it is performed via radio stations, which means that every piece of information occupies a certain channel for several seconds. It is necessary to implement a unique communication system that would consist of a computer at the traffic centre, where all the information would be input that are transferred by the station, such as: aircraft parking positions, aircraft take-off times, number of passengers onboard landing aircraft, total number of passengers who have passed the gates, and other information that had been transferred by the station in the past.

What is important is that during input the information is displayed on all the screens at sectors closely connected to aircraft handling that are located exclusively for that purpose. Thus, marshalls would have a screen with position markings at their premises, and with it every one should also have a PDA that would receive information on the principle of wireless network with programmed airport layout and aircraft parking positions. With one input the traffic centre employees would designate the aircraft parking position to all the services which need this information, including also the handling controllers. Such a system can be created by the implementation of the wireless network and its coverage on the platform. Each of these PDAs would feature two-way communication with the traffic centre. When the traffic centre determines the position and feeds it into the system which sends it via wireless network to the marshalls PDA, it has to be confirmed by a click on the screen which means that the information has been successfully received. The handling controllers would also have precise information at any moment about the aircraft take-off times, and other information on the passengers such as passengers with special needs, VIP passengers and gate status.

When the apron is covered by a wireless network this automatically gives the handling controllers the advantage so that by using a special PDA application they can at any time communicate directly and call any other service, thus freeing the traffic centre channel, i.e. avoid its participation in the transfer of information which is not important for the traffic centre.

Such application would also have a time indicator, so that at any time one could know precisely which service made a mistake or failed to comply with the information. In other words, after the information has been sent, which for example may be a call for the fuel tank truck, the timer is activated and it can be stopped only by the driver of the fuel tank truck since the information is sent only to the driver, and the driver stops it by clicking the confirmation key on PDA.

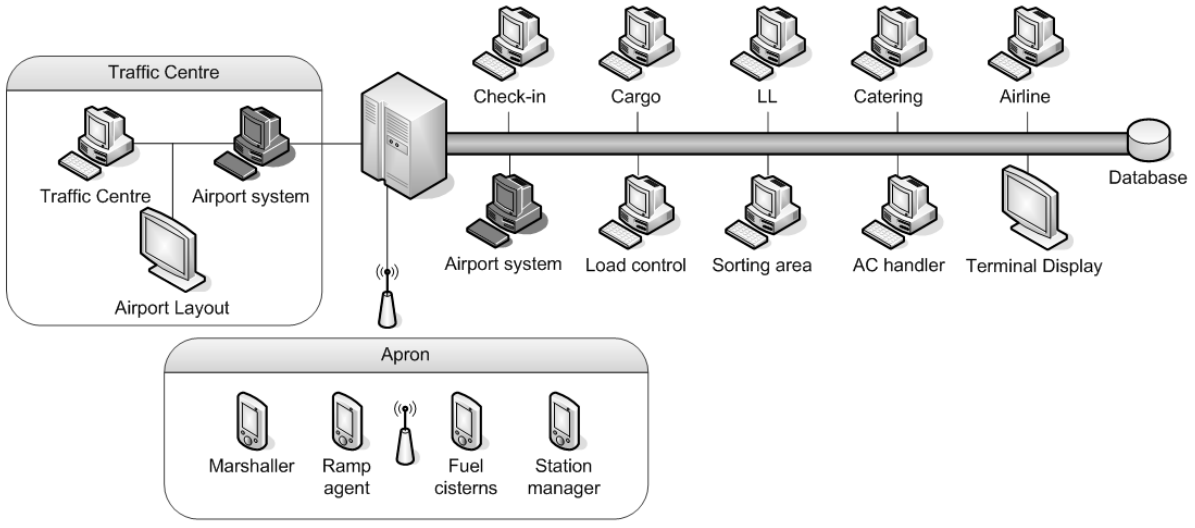

Figure 2: Wireless solution with own communication system

3.2 Solution for better information flow between apron, passenger check-in service and lost-and-found service

The connection of the apron, i.e. apron staff with the sectors of passenger check-in and lost-and-found can be established by extending the wireless network from the apron towards the existing LAN network at the terminal. This would mean the establishment of the previously inexistent communication between the passenger check-in service and the aircraft regarding the necessary information on the current status of the checked-in passengers, number and status of the business passengers, and possible passengers who are delayed from some flights.

In case of emergency, the passenger check-in service personnel can directly contact the handling controller who is near the aircraft and can react on time, thus avoiding the information flow through the traffic centre. This information flow could also assist the personnel responsible for persons that need assistance in moving and boarding the aircraft, because at check-in of such a passenger and code input into the computer, the information would be automatically sent to the personnel that could react immediately without making any additional calls. Since on some flights, due to the aircraft loading or no-shows, a part of the baggage has to be returned back to the sorting area, the handling controller would make a connection, input the number of items of baggage that are to be returned, and this number should match the number at the sorting area. If the arriving passengers does not show up, the sorting area could make one input and thus inform the lost-and-found about the baggage so that is could contact further the passenger's destination airport. Using the wireless network the handling controller can directly communicate with aircraft handling and using the PDA, by clicking on a certain icon call the staff necessary for one aircraft serving. This system reduces the direct voice communication and enables technically the computer aircraft handling. PDA via the antenna system is connected with the traffic centre which at every moment has the insight into all the vehicles used at the platform, as well as all the data that are essential for its operation.

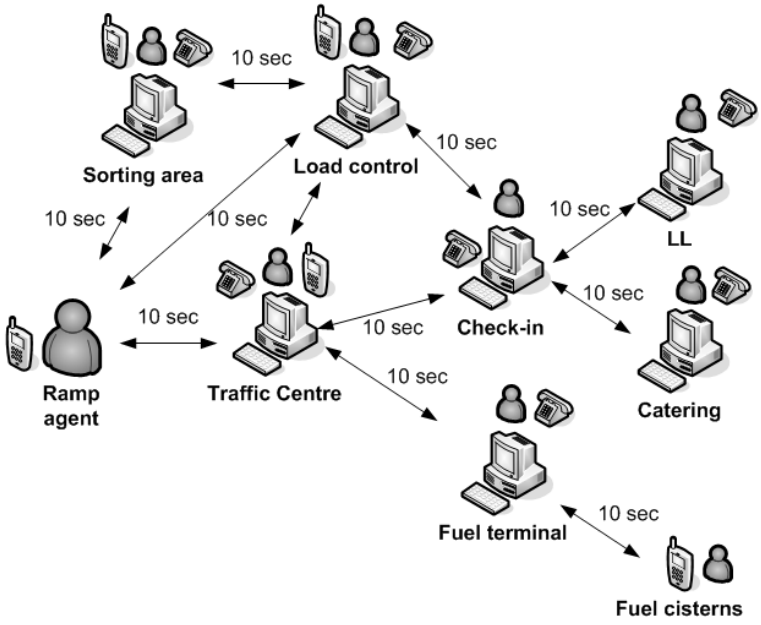

Figure 3: Current communication system at the airport

Figure 3 shows that during the information flow among the services they pass through several sectors and if the average time of 10 seconds is taken for information transfer,

sometimes 30 to 40 seconds are lost for the flow of only one piece of information. By introducing a unique communication system at the airport that would be completely designed according to the requirements of all the sectors, several pieces of information could be sent at a time to various services, which would take only a fraction of a second. Figure 5 shows possible connection of all the sectors of LAN and wireless technology.

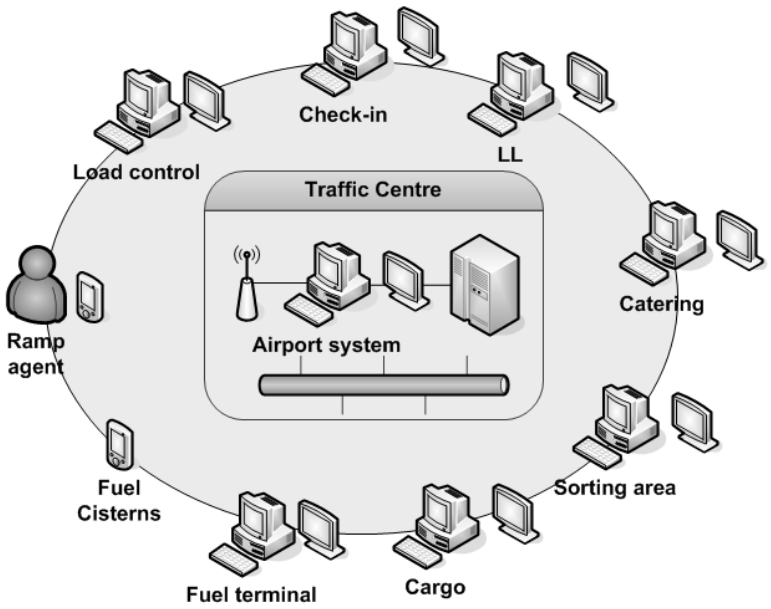

Figure 4: Communication system with usage of additional airport application and wireless network

3.3 Solution for better information flow between traffic centre, load control and loading and balancing of aircraft and apron

Looking at the aircraft loading and balancing service one can notice that it is closely connected to the traffic centre and in direct communication contact with the handling controllers. Within the aircraft loading service the implementation of a new communication system would connect all the sectors using information technology that should guarantee higher quality precision and accuracy of information transfer. The aircraft loading and balancing service, namely, is also connected with the cargo service, passenger check-in service and sorting area. The additional system could solve the information flow that now passes through the passenger check-in service, load control to the traffic centre. All the information would be input into a single system that would be automated and the information could be sent in a fraction of a second to all the users who are interested in certain information. The information and communication system should consist of the areas marked by "PDA Info" that would contain the most important information on the current status of passengers, baggage and the aircraft itself, and would distribute the information using wireless connection directly to the platform, more precisely to PDA used by the handling controllers by the aircraft. This provides then the communication and informs the handling controllers about maximal weights, aircraft centre of gravity and other information on the aircraft itself.

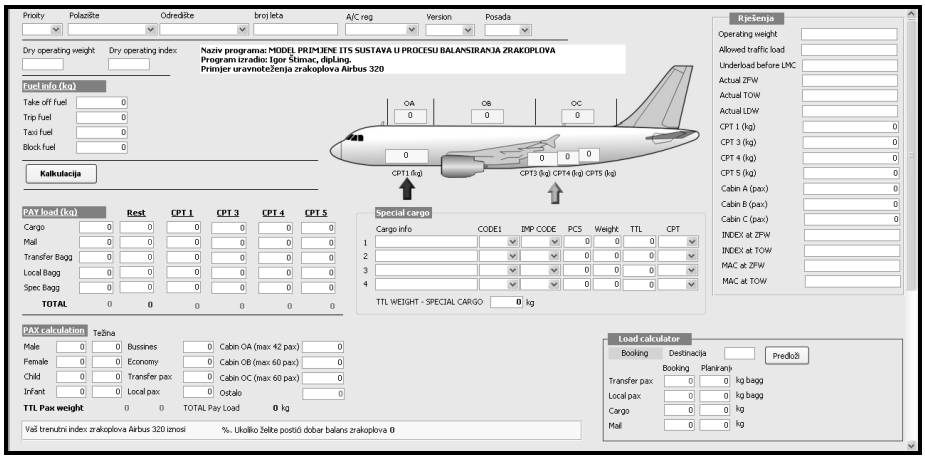

Figure 5: Possible solution for information input into airport system

It should be noted that in designing such a system its independence needs to be taken into consideration in case other systems fail, i.e. the system has to operate parallel to others. In case of the failure of other systems, the communication system of the airport should have the possibility of operation in isolation from other systems and the possibility of continued work at the local level. According to examples and analyses from the practice, the aircraft information systems can fail during possible malfunctions or during maintenance, and such an independent system has proven appropriate.

4 CONCLUSION

The paper defines the problem of faster information flow of the traffic centre at Zagreb Airport and proposes some technological solutions. By applying scientific methods (inductive, deductive analyses, syntheses, descriptions, comparisons) the proposed technological solutions are found, which represents the scientific contribution of the authors for the improved information flow between the traffic centre and the apron; for improved information flow between the apron, passenger check-in service and the lost-and-found service; as well as for the improved information flow between the traffic centre, the aircraft load and balance service and the apron.

The synergy of the wired and wireless technology can solve the problem of information transfer within the airport, and a unique information-communication system needs to be applied, which should consist of the computer at the traffic centre which should be fed with the information such as the aircraft parking position, aircraft take-off times, number of passengers on-board of a landing aircraft, the total number of passengers passing the gates, and other information.

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