USING TABLETS WITH ANDROID OS FOR INTERACTVIE APPLICATIONS IN IN-FLIGHT ENTERTAINMENT SYSTEMS

Milan Gajan - Jozef Galanda

The paper describes one of the solution of In-flight entertainment (IFE) system where the main client component is device calling tablet running the operating system Android. The system is designed primarily for economy class and is based on wireless principals. This kind of IFE system is lightweight, so for airlines, it leads to fuel savings and to money savings as well.

K e y w o r d s: IFE, Android, tablet, functions of the IFE, communication interface, passenger

1 INTRODUCTION

The entertaiment during the flight is often discussed topic today. It stretches all possibilities how to attract passengers with different attributes of IFE system. In present there are many variants of IFE systems, which are installed to economic or business class. Our goal is to use tablet with OS Android as a main client component in IFE system for economy class. This kind of system is based on wireless technology. Passengers just connect their tablets to relevant Wi-Fi network on board the plane. The point of this solution is in simplicity of using this system and also it saves money for the airlines, because airline doesn´t need buy and rent any electronic devices. And all components of this kind a IFE system are lighter what reduces costs as well.

2 CURRENT CONDITIONS OF IFE SYSTEMS

Term In-flight Entertaiment covers complete virtual entertaiment for passengers. It includes music, audiovisual content, TV broadcast, electronic publications and different kind of interactive applications. In present we can sort IFE systems in to the three categories, classic IFE system, seatback IFE system and IFE system based on Personal Electronic Device (PED). As the scope of IFE systems is related to Information Technologies, we can see long steps forward every year. For that reason is hard to determine, which technology or implementation of IFE system is dominant. But the most perspective IFE system seems to be IFE system based on PED, which owns passenger. Simultaneously, the requirement for this device is to have Wi-Fi connection, what allow passenger to connect to wireless IFE system.

2.1 Basic functions of IFE systems

In these days IFE systems offers functions, which are divided to passive and active. Passive functions are called passive, because there is no cooperation between passenger and them. Passengers just watch or listen to the content. As an example we give movie watching. But functions, which are most attractive for passengers are active functions. By using them, passengers communicate and cooperate with IFE system. Best example of active using of IFE system is playing games or shopping onboard the plane. Nowadays, in IFE systems we can find these kinds of functions:

- Watching movies
- Listening to the music
- Watching live TV shows
- Information about the flight
- Duty free shopping
- News reading
- Internet access
- Catering orders
- Playing games
- Reading e-publication

All of these functions should not be missed in any modern IFE systems, because passengers get very quickly used to high quality and standards in IT.

2.2 Main producers of IFE systems

Trends in IFE are indicating by main producers and that is why, we need to analyze their product and describe their functions.

Thales Group TopSeries

This company is one of leaders of IFE systems production. Their familiarly trademark is called TopSeries. Newest model, the Top Series i-8000 uses a wireless network to deliver DVD-quality video to each seat on the airplane and is also low weight and it has power cabin solution that has minimum impact on the aircraft and is easy to install. As a hardware solution, they use hardware components which have the ARINC 600 aviation standards. For that reason is failure and noisiness reduced to minimum. More information about this system you can found at [2].

Figure 1. Thales Top Series [3]

Panasonic X Series

Offer in IFE from Panasonic company, is created by system called X series. These systems are divided to eFX, eX2 and eX3 and offer functions as: live TV shows, international broadcast of BBC, Al Jazeera, Bloomberg, and EuroNews, exconnect service which allows full access to internet surfing with WEB 2.0, VPN connectivity, news, weather forecast, reservation systems, Flyer Frequent Program, social networks and shopping. More information about this system you can found at [4].

Figure 2. Panasonic eX3 [5]

GoGo Vision

This company is unique in scope of IFE, because it offers system – GoGO Vison, which is related to internet connection. Principle of using GoGo Vision is based on login to Wi-Fi network named Gogoinflight. But for login in, passengers need their own device with Wi-Fi connection (smartphone, laptop or tablet). Advantage of this IFE system is his lightweight (50 kg) and also it saves money for the airline. More information about this system you can found at [6].

TrayVu Slim

This IFE system brings new dimension to scope of IFE, because of its mechanic solution. Know-how is based on moving plastic holder. In this holder is placed tablet, which works as a main component of whole IFE system. More information about this system you can found at [7].

Figure 3. TrayVu Slim [8]

During analyzing current status of IFE and from its mutual comparison of function and versions of each system, we obtained information about key features of IFE, which perfect IFE system has to have. Result of our comparison you can see in table 1.

Table 1. Comparison of IFE systems

Main producers of IFE systems / Functions of IFE systems	THALES	Panasonic	gogo	TrayVuSlim
Movies	✓	✓	✓	✓
Music	✓	✓	✓	✓
Live TV	✓*	✓*	✓	✗
Flight information	✓	✓	✗	✗
Duty Free shopping	✓*	✓*	✓	✓
News	✓	✓	✗	✗
Internet access	✗	✗	✓	✗
Catering order	✓	✓*	✗	✗
Games	✓	✓	✓	✓
E-publications	✓	✓	✓	✓
PED power supply	✓*	✓*	✗	✗

* Depends on version of system

Because our primary goal is to connect IFE system with Android system, it is necessary to describe why the tablet is suitable as a core component for client in IFE systems.

2.2 Tablet and Android

In these days is in scope of IT very expanded mobile device called tablet. Tablet is usually equipped with wireless connectivity as Wi-Fi, Bluetooth, GPRS, camera and GPS module. Although in present most spread OS in tablets is iOS made by Apple, Android is close behind him and also it is the fastest spreading OS for mobile devices. And that is why there are many reasons to choose tablet with Android as a part of IFE system. First reason is the universality of Android. While we can find operating system iOS only in devices made by Apple, we can find operating system Android installed in many devices made by premium brands as Samsung, HP, and Lenovo, or cheaper brands as Yaarvik, ZTE, Prestigio, etc. Because our goal is to project IFE system which will be used in economy class where passenger will bring his own tablet, only condition for tablet is – to have installed Android in.

3 PROJECT OF IFE SYSTEM WITH TABLET SUPPORT

IFE system projected by us is designed for use in economy class for common passengers. Target customers of this kind of system will be airlines with airplanes, which have outdated IFE system without screens for each passenger – hence with some screens on ceilings without possibility to change playing content. Our primary goal

was minimize cost of the airline, which will have installed our IFE system; therefore we assume that passengers will bring their PED, because this is the only viable option, whereby an airline can give to passenger a feeling of comfort. Nowadays, as the most suitable device for entertaiment seems to be tablet. Such a device is now widespread and affordable for almost every passenger. It is also possible to see rising sales of these devices, so the solution of IFE by bringing own devices is very friendly step towards passengers. Priority of passengers for using the projected IFE system is the option to view their own content that is stored in their devices before the flight. But there is also the possibility to join the IFE system and view the virtual content, which is available on the storage server on board the plane.

It also important to mention, that many companies already offers this option with tablet, but passengers lend tablets from airline, so airline has to own those tablets and this leads to increasing cost. But our projected IFE system is aimed at using passenger´s tablet as a component of IFE system and communication with it.

3.1 Mechanical solution of IFE system

An important part of the project of IFE system is also its mechanical solution. Passengers will take onboard their own tablets of different brands and hence different size. And because it is impossible to cover entire spectrum of tablet size, the construction of tablet holder will be universal for tablets with size of screen from 7 to 10 inches. Holder will be placed in head rest in front of passenger. Another important part of the mechanical solution is power supply of tablets. In projected IFE system will be available option of permanent power supply by using default USB connector. The only requirement for passengers is to have their own USB cable from tablet.

3.2 Technology of communication

The entire IFE system consist of individual components as server, router, crew control panel and PED devices of passengers. Essential role in functioning and stability of IFE system plays its “brain”, what is sever. There are stored all data that are necessary to operate the system and also data, that are streamed wirelessly to passengers. It means that regardless of passenger is listening to music, watching movies or using any other feature of IFE system, there is always ongoing communication between the server a passenger´s PED device. Digital transfers of content from server to passenger devices provide one or more Wi-Fi routers, depending on the size of the aircraft. The most common location of these routers is in the ceilings of the aircraft. Another part of the IFE system is crew panel, which basically serves as a control unit. This control panel is used by flight crew and as control device is used tablet as well. Flight crew uses these tablets for updating catering meals or products in duty free shop. The final elements of projected IFE system are passengers PED devices that are connecting to the system.

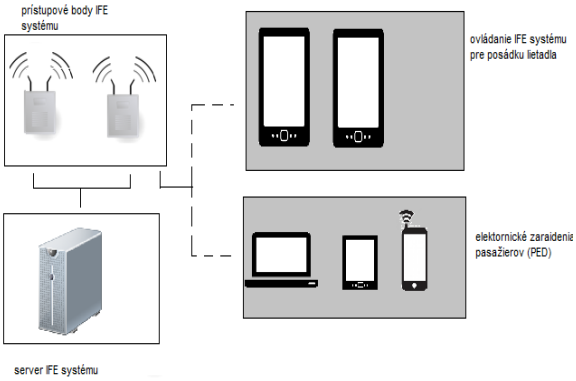
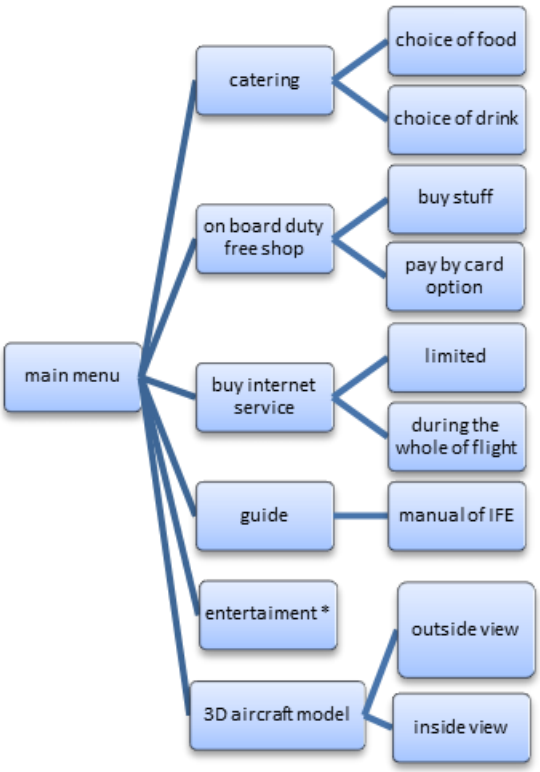


Figure 4. Technology of IFE communication

3.3 Features and function of IFE system

If our projected IFE system wants to be competitive, it must have not only standard features such as music, movies and games, but should also offer some innovative functions. As example of innovation can be wireless communication, ability of internet access and other unique function, that utilize specific features of tablets. It is necessary to claim that use of IFE system by passengers is on voluntary base. For lucidity, we summed up all items of projected IFE system in to one structure.



***** continue on the next site

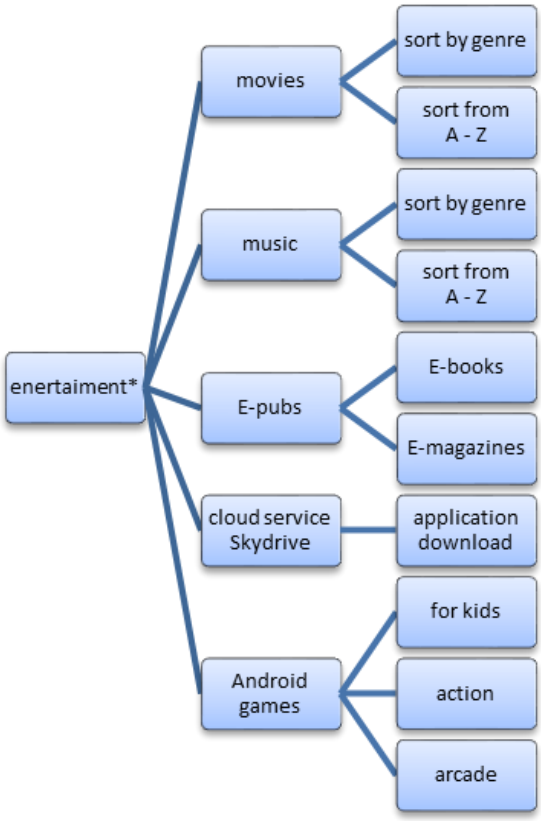


Figure 5. Structure of MENU of projected IFE system

This structure of IFE system functions should cover all common requirements from passengers and it also has to have something unique, for being different from the other IFE systems.

3.4 Menu of IFE from passenger view

As we can see from Figure underneath the text, main menu of IFE system includes seven items. *Catering Menu*, *Duty Free Shop*, *Buy Internet Service*, *Guide Manual*, *Entertaiment* a *3D Aircraft View*

.

Figure 6. Main menu of IFE system

Catering Menu

When passenger taps on this option, he can order from offer stuff like appetizer, soup, meal, drink and dessert. After choosing one of the selections, passenger will order exact type of food or drink.

Duty Free Shop

At the entrance to the Duty Free Shop, passenger has option to purchase goods for reasonable prices. He can choose from three categories as – watches and jewelry, cosmetics and gifts. In each category there are only available items, because flight crew is always refreshing the offer via control panel. Passenger has also possibility to pay by card.

Buy Internet Service

In this selection has passenger opportunity to buy an access to the internet. After that he will be able to use entire potential of projected IFE system.

Guide Manual

After tapping on this selection, there will be available general information for passengers about projected IFE system. Guide manual also informs about current prices for internet access and further information about payment options and how to end the work with the IFE system

Entertainment

Item Entertaiment is the most important one from entire IFE system. On this item depends, how passenger will appreciate the whole IFE system. Menu of Entertaiment is subdivided into the groups such as Movies, Music, E-Book, Skydrive and Android games.

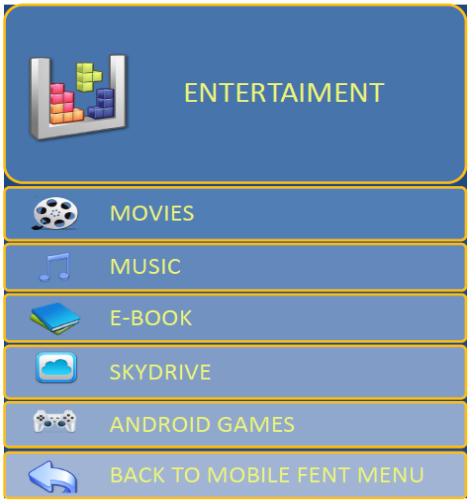


Figure 7. Menu Entertainment

Item *Movies* works in a way that there are movies stored on server in MPEG-4 format. This format provides DVD quality video playback. If passenger taps on this selection, there will be possibility to sort movies by genre or alphabetically.

Item *Music* works on similar principle as the item Movies. Music albums in mp3 quality are stored on server and are sorted by genre and alphabetically.

In item *E-Book* passenger obtain access to various types of e-books and e-magazines in .pdf or .epub formats. For viewing these e-publications they need to have installed any document viewer in their devices, which is normally preinstalled in every tablet.

Items *Skydrive* and *Android* games are described in next chapter 3.6

3.5 Menu from flight crew view

Flight crew operates the IFE system by using a single tablet. On this tablet is installed application *Crew Panel*, which equips each of passenger requirements. It consists of three main applications, which are named as: *Internet service order*, *Duty Free Shop Service* and *Catering Service.*

Figure 8. Menu Crew Panel

3.6 The use of specific features of tablets

This category includes application from Main Menu called *3D aircraft view* and applications from Menu Entertaiment – *Skydrive* and *Android games.* First appointed application, *3D aircraft view*, allows passengers by using powerful 3D graphic chip to browse, rotate and zoom 3D objects and models. In projected IFE system this application has function of viewing 3D exterior and interior of the aircraft. Passenger then has possibility to view specific parts of the aircraft, as cockpit or luxury lounge in first class of aircraft.

Figure 1. Cockpit of Airbus - A380

Another application is cloud storage SkyDrive by Microsoft or Google Drive by Google. It is used for editing presentation, excel sheets or word documents. Online access to this application is conditional on one of characteristic of the IFE system – internet connection. The last item using the specific characteristic of tablets is Android games, where is possible due gyroscope and accelerometer control various games by tilting tablet forward or backward or to the left or right. It is also necessary to mention, that thanks to powerful graphic chip, the quality of Android games is on really high level.

6 CONCLUSION

We tried to solve IFE system, which can be used as a model for design and deployment of the system in real performance. There in the IFE system is integrated device called tablet as the main client component. By using tablet we achieved result, where the entire IFE system has new features, which are based on specific functions of tablets. Thus designed IFE system could be installed as a primary IFE system for low-cost airline, but also as a system in economy class for classical carrier. It is necessary to note, that in the future whole entertaiment on board the plane may wok solely on the wireless principle, as our projected IFE system does. This would mean that classical seatback IFE system with screens will completely disappear, because airlines will give priority to wireless systems, which reduces cost of the aircraft to minimum, but will also offer high level of entertaiment.

BIBLIOGRAPHY

[1] GAJAN, M.: Využitie tabletov s OS Android pre interaktívne aplikácie v zábavných systémoch počas letu, Diplomová práca. Košice: Technická univerzita v Košiciach, Letecká fakulta, 2013. 83 s.

[2] Thales TopSeries systems: Thales Avionics [Online]. Thales Group, 2013. [cit. 2013-06-04]. Available on internet: <http://www.thales-ifec.com/topseries.aspx>

[3] Thales TopSeries: Picture. Available on internet: <http://www.thales-ifec.com/images/inline/topseries_02-1.jpg>

[4] Panasonic X series: Panasonic.aero [Online]. Panasonic, 2013. [cit. 2013-06-04]. Available on internet: <http://www.panasonic.aero/InflightSystems/XSeries.aspx>

[5] Panasonic eX3: Panasonic. [Online]. Panasonic, 2013. [cit. 2013-06-04]. Available on internet: <http://thefutureofifec.com/#nbc>

[6] GoGo Vision: GoGoair. [Online]. GoGo LLC, 2013. [cit. 2013-06-04]. Available on internet: < http://www.gogoair.com/gogovision/#gogo_vision>

[7] TrayVu Slim: SkyCast Solutions. [Online]. SkyCast Solutions, 2013. [cit. 2013-06-04]. Available on internet: <http://www.skycastsolutions.com/>
[8] Skycast TrayVu Slim: Picture. Available on internet: <http://www.skycastsolutions.com/includes/CSSLayouts/weblayout1_assets/Monitor_Alone.jpg>

AUTHORS´ ADDRESSES

Gajan Milan, Ing.
milan.gajan1@gmail.com

Galanda Jozef, Ing., PhD.
jozef.galanda@tuke.sk

Department of Aerodynamics and Simulations
Faculty of Aeronautics, Technical University of Košice
Rampová 7, 041 21 Košice