Open source software as a tool to reduce airline/air carrier costs

HANÁK Peter[1], SZABO Stanislav[2]

[1,2] *Department of Air Transport Management, Faculty of Aeronautics, Technical University of Košice, Rampová 7, 041 21 Košice, Slovakia, email: peter.hanak@tuke.sk, stanislav.szabo@tuek.sk*

Abstract:
The price of open source software solution is just one of many factors why it´s very important to deploy an open source software in this type of companies. At present more and more commercial companies as well as state organizations use open source software and show that the price isn´t its only advantage. If it were many companies and organizations that started using open source software during an economic recession would likely return to proprietary solutions after improved financial conditions. It´s an fact that the free open source software has many benefits for companies and organizations some of which are really very valuable. On a model airline we'll show few economic benefits of introducing open source software to them.

Keywords:
open source software, airline/air carrier, GNU/Linux, cost reduce

INTRODUCTION

Everybody who works with a computer knows the word open source software and heard about it. However many ordinary users don´t know what its and what benefits they derive from it´s in use.

The name of open source software can be freely translated as open source or open source software whose license guarantees users basic rights such as:

- availability of source code,
- free redistribution,

- software must be freely distributable and can´t be charged for this distribution,
- free modification,
- unlimited use.

Most of the current and commonly used programs with closed meaning that means the user starts it but doesn´t know how exactly works or can´t change many features.

From the other side open source software are programs where the source code is available for download and the experienced users can adapt it to their needs.

The most famous open source projects include the development of the GNU / Linux operating system.

Since 1991 it has gone a long way through development. Linux is now used on most web servers and most powerful computers in the world. It has also become part of the Android mobile OS and it's also available on regular desktop computers through a variety of distributions.

Linux is a multiuser network 32 or 64-bit operating system that supports real multitasking. GNU / Linux is in particular one of many exemplary examples of the fact that good isn´t always expensive.

Linux is designed for people who want freedom and who don´t want them to be called thief if they share their software with friends or modify it with their own needs.

The most popular distributions of GNU are Linux include Ubuntu, Fedora, openSuSE, CentOS, Debian GNU Linux, Linux Mint, Gentoo and others.

Advantages GNU/Linux:

- stability,
- security,
- speed,
- graphic perfection,
- huge amount of software that´s free,
- localization,
- freedom and independence from large corporations,
- community,
- price.

Disadvantages GNU/Linux:

- a lot of specialized programs are still being manufactured for windows,
- the users needs to learn something new. [1]

1. CONDITION ANALYSIS OF THE PROBLEM

The use of open source software in Slovakia is full of paradoxes. It is massively used in software companies and on the other side it´s ignored by public institutions.

In 2004 a research project was carried out with topic "Open Source Infrastructure (OSIN)" implemented within the framework of the State Program of Research and Development of the Information Society. The main investigator was EEA s.r.o. with co-founders of the Department of Informatics of the Faculty of Mathematics, Physics and Computer Science of University Komenskeho in Bratislava and Gordias s.r.o.

Based on information from 2000 institutions and companies identified the basic tips for the architecture of information systems in government, education and small and medium-sized companies.

The conclusions of the research can be summarized in the following points:

- Open Source software may be successfully used in information systems in government and self-government, education, and small and medium-sized businesses - not only as a full-featured alternative to proprietary products but also as the foundation of the whole system,
- The massive deployment would also bring the results in significant savings and especially with such important positive secondary consequences for the whole society that it uses would significantly accelerate the overall process of informatization on this scale. Overall, savings is up to 598 mil. EUR for 8 years. This amount doesn´t include savings that would create a healthy competitive environment on the market.
- As we are moving towards to an knowledge based economy it must be noted that the deployment of Open Source software in the public sector is becoming a strategic issue for the whole society. [2]

The project has clearly shown the benefits of using OSS for our company but the results have been still ignored for this day.

1.1 Open source software in small and medium companies

Small and medium-sized companies are really important part of the economy not only in our country but also in the European Union. With their flexibility in using the latest technologies they become the driving force behind the company's transformation into an information society one of the main goals of a common Europe. Air carriers/airlines in Slovakia can be classified as medium sized companies. These companies can be characterized as comapnies with a maximum number of employees of 250.

Based on the Open Source Infrastructure Research Project (OSIN) which was carried out in 2004 we can say that small and medium-sized companies are using open source solutions in the same way as state institutions or Slovak education and the use is in minimal.

The research project dates back to 2004 and unfortunately since then no further research has been done on the use of open source software in Slovakia so that we haven´t got any newer and more relevant data since this day.

However we can assume that the use of open source solutions has improved and nowadays the use of this alternative is wider than in 2004 although proprietary solutions still prevail.

The situation with air carriers/airlines is the same. Based on the information we have from air carriers Microsoft Windows is the most widely used operating system and MS Office too. From the open source some employees uses the Mozilla Firefox web browser or the Thunderbird e-mail client.

2. INTRODUCING OPEN SOURCE SOFTWARE FOR AIR CARRIERS/AIRLINES

Current air carriers/airlines have the most structured business and operating structure on market. Processes at the technical and commercial field require a steady flow of decisions where more or less active groups have very diverse professions.

The economic impacts of competition and at the same time the changing prices of input products are necessary for the operation of aviation technology are increasingly affecting the whole procedure.

Table 1 Number of information technology

Section	Position, section and department	Number of workstations
	Responsible manager	1
Quality	Compliance tracking manager	1
Flight safety	Safety manager	1
Security protection	Security manager	1
Section of responsible manager	Secretariat	1
	Financial manager	1
	Section of accountancy	3
	Planning	1
	Personal manager	1
	Wage manager	1
	IT manager	2
	Lawyer	1
	BOZP (safety and security during the work)	1
Commercial sector	Commercial manager	1
	Marketing manager	1
	Commercial manager	1
Section of training and education	Training manager	1
Operational section	Operational manager	1
	Planning manager	1
	Handling section	2
Technical section	Technical manager	1
	CAMO manager	1
	Stationary maintenance section	3
	Planning and engineering section	1
Flight section	Flight director	1

Chief pilot	1
Technical pilot	1
Senior cabin crew	1
Shuttle control centre	2
Flight dispatch	3
Flight-operating engineering	1
Crew planning	1
Common computers for flying crew	5
Total number of workstations	**46**

A number of unexpected phenomena like (terrorist attacks, war conflicts, epidemics, etc.) enter into the business activities of these companies causing the balance between the possible quality of the offered activity and control of input costs to be often and unexpectedly disturbed. The main challenges of current air transport include cost fixation at low level. One contributing option for cost reduction is also use the open source solutions to manage all air carrier operations.

For the purposes of this article we have decided to design a small air carrier/airline operating three aircraft. The type of operated aircraft doesn´t play any role for the size of the airline as regards the number of employees and number of computing devices because operating activities are generally the same for Boeing, ATR or Airbus.

In the following Table No.1 shows the structure of a small airline designed by us with individual numbers of information technology.

2.1 Open source solutions for air carrier/airline

The following Table No. 2 shows a brief overview of the proposed solutions for the day-to-day operations of the airline employees.

In the case of special software for which the open source equivalent to the GNU / Linux operating system isn´t available in the open source market the airline can use the Windows emulator of WINE programs.

With this emulator you can run only Windows applications such as accounting software, special flight planning and tracking software and more. If the

solution didn´t meet airline conditions the air carrier would have to secure a workstation with the Windows operating system but there is no need to buy a Microsoft Office license as the LibreOffice office suite is also designed for the Windows platform.

2.2 Economic evaluation of the introduction an open source solution

For a company that needs its own IT infrastructure with authentication its own email server its own company portal on its own servers the situation could look like this:

- 2 mid-range high performance servers running the Hyper-V Server 2012 R2 virtual environment,
- 46 workstations (number based on model airline design) running Microsoft Windows 10, Microsoft Office and ESET antivirus.

We didn´t deal with the technical requirements and parameters of the individual hardware components proposed open source software solution doesn´t have a problem with running on the currently available hardware.

Proprietary software servers may be follows as:

Physical SERVER No. 1:

- Active Directory domain controller (OS Windows server 2012 R2 + AD rola + ESET server antivirus),
- CAS a HUB Exchange server (OS Windows server 2012 R2 + Exchange server + configuration DAG + ESET Exchange antivirus),
- SQL1 server together with SQL2 (OS Windows server 2012 R2 + SQL server),
- SP1 - Sharepoint Server v klastri s SP2 (OS Windows server 2012 R2 + Rola IIS + SharePoint Server + Project Server + ESET server antivirus),
- Edge server Exchange (OS Windows server 2012 R2 + Exchange server + Edge rola)

Table 2 Alternative open source solutions to proprietary software

Type of software	Commercial/proprietary software	Alternative solution = open source software
Server	Microsoft Windows Server 2012 R2	Debian GNU/Linux 9 Strech
Server	Microsoft Hyper-V	Proxmox VE
Server	Microsoft SharePoint 2013	Alfresco Community Edition
Server	Microsoft SQL	MySQL
Server	Microsft IIS	Apache2
Server	PHP	PHP
Server	Microsoft Exchange	Postfix/Davecot
Desktop operational system	Microsoft Windows 10	Ubuntu Mate
Antivirus	ESET Node	ClamAV
Office suite	Microsoft Office 2016	LibreOffice
Web browser	Microsoft Internet Edge	Mozilla Firefox
Mail client	Microsoft Outlook	Mozilla Thunderbird
Creation of PDF documents	Adobe Acrobat	Master PDF Editor
Graphic editor	Adobe Creative Cloud	GIMP
Project planning	Microsoft Project 2016	ProjectLibre
Warehouse economy planning	Part of accounting programs	Inventory Counter (Android)
e-Learning	Moodle	Clariline

Physical SERVER No. 2:
- Active Directory domain controller (OS Windows server 2012 R2 + AD rola + ESET server antivirus),
- CAS a HUB Exchange server (OS Windows server 2012 R2 + Exchange server + configuration DAG + ESET Exchange antivirus),
- SQL2 server together with SQL1 (OS Windows server 2012 R2 + SQL server),

Table 3 Price overview and total costs of proprietary software

Type of software	Unit price	Number of licenses	Annual costs	Costs for five year period
Microsoft Windows Server 2012 RS Standard	638,55	5	3 192,75	3 192,75
Microsoft Exchange Server 2013 Standard	744,00	3	2 232,00	2 232,00
Microsoft SQL Server 2012	943,45	2	1 886,90	1 886,90
Microsoft SharePoint Server 2013 Standard	7 148,27	2	14 296,54	14 296,54
Microsoft Project Server 2013	5 956,90	2	11 913,80	11 913,80
Microsoft Office 2013 + Project	346,80	46	15 952,80	15 952,80
Mircosoft Windows 10 Pro	201,84	47	9 486,48	9 486,48
ESET Antivirus for Server (1 year)	110,00	4	440,00	2 200,00
ESET Antivirus Exchange Server (for 1year)	64,50	2	129,00	645,00
ESET Smart Security (1 year/1 workstation)	41,58	46	1 912,68	9 563,40
Adobe Acrobat	375,98	3	1 127,94	1 127,94
Adobe Creative Cloud (for 1 month)	69,99	1	839,88	4 199,40
Windows server CAL (user/workstation)	145,45	46	6 690,70	6 690,70
Exchange server CAS standard (1 e-mail account)	84,78	41	3 475,98	3 475,98
		Total	**73 577,45**	**86 863,69**

- SP2 - Sharepoint Server together with SP1 (OS Windows server 2012 R2 + Rola IIS + SharePoint Server + Project Server + ESET server antivirus),
- antivirus management (OS Windows 10 PRO + ESET)

Workstations (46):

- OS Windows 10 PRO,
- MS Office,
- Microsoft Project klient,
- ESET antivirus.

In contrast with open source software it´s necessary to purchase licenses for the above software solution. The license number is expressed in Table No. 3

Unit prices were obtained from the website www.adir.sk and www.eset.com. The table below shows the unit prices of each type of software needed for a smooth running of the company. We don´t provide an open source software price table as all the proposed software is distributed free of charge. Prices are in EUR and excluding value added tax. We didn´t consider the cost of hardware in the cost calculation - server equipment, workstations. As can be seen from the data in the previous table managing proprietary software isn´t an inexpensive matter. Annual software costs can also be considered as initial costs for the emerging air carrier amounting nearly to 74,000. EUR.

Management costs over the next 5 years will increase with some license fees. This increasing costs belongs to antivirus application from ESET and Adobe Creative Cloud licensing from Adobe which has a different way of financing. For example the license for ESET's antivirus program is one year and it´s necessary to buy a new license every year.

By deciding on the introduction of open source software to an airline can still minimize its initial costs by purchasing workstations without an operating system and it would be cheaper for them.

CONCLUSION

Open source software is free software and free of any license fees. Exemption from royalties means that this software can be downloaded, installed and used purely for free.

In view of this fact and economic analysis we have shown that an air carrier can humiliate the initial or respectively operating costs of thousands of euros.

Designed open source software has been selected based on popularity and prevalence. Due to the current application maturity it wasn´t necessary to compare multiple applications and perform the evaluation process because all alternatives are suitable for normal work and the average user doesn´t recognize the difference such as between Firefox and Chrom Internet browsers. We need to take care about personal feelings and personal experience for each person.

We must state that not all applications needed to run the company have an open source alternative such as a company accounting application or a specialized air traffic planning and monitoring software. In this case the airline may have two options. Running the applications in the WINE emulator for Windows or for this purpose will have to buy the necessary amount of the proprietary software license.

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