

Operating System of Multimedia Devices in the Educational Process at Moscow State University of Printing Arts of Ivan Fedorov

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Abstract

Objectives: The relevance of the study is due to the fact that in the course of training at Moscow State University of Printing Arts of Ivan Fedorov in the field of information technology, until recently, traditional PCs with classical operating systems (Windows XP, Windows 7, etc.) have been used. **Method:** The main methods to investigate and solve this problem are modern information technologies, the introduction of which in publishing industry and journalism calls for implementation of comprehensive training in the learning process, including in the area of system software – the open mobile operating systems. **Findings:** This article is aimed at the revealing of the latest advances in the field of information technologies which allowed bringing a variety of multimedia devices (tablets, smart phones, etc.) to the market of technological tools, which have gained wide popularity among young people around the world. Mobile multimedia devices are supplied by manufacturers with pre-installed operating systems, which enable users to solve a variety of problems. One of these operating systems for mobile devices is Ubuntu, which in our view is convenient system software for educational institutions worldwide. Ubuntu operating system belongs to the class of Linux-like systems that do not require the acquisition of a license for use in the educational process. **Improvements:** The article reveals the peculiarities of this operating system and gives an example of applying such system software for mobile multimedia devices that appear in the publishing systems and applications.

Keywords: Free Soft, Interactive Interface, Mobile Multimedia Devices, Multimedia Equipment, Multimedia Technologies, Open Operating Systems, System Software

1. Introduction

The work of modern publishing houses, editorial offices of newspapers and magazines is based on the broad introduction of information technologies and hardware in production processes. This applies equally to preparing both printed and electronic publications¹. Operational preparation and release of a variety of printed and electronic publications of the media requires the use of computer networks², for the transmission of large amounts of information over long distances. In the Russian Federation senior professionals are trained for the publishing industry at Moscow State University of

Printing Arts of Ivan Fedorov. In the course of training, much attention is paid to the introduction of modern computer technologies³ in the study of a variety of academic disciplines both humanitarian and special professional profile^{4,5}.

In the modern world and civil society, through the development of information technologies, there is a large number of different mobile technical devices designed for a variety of purposes. First of all, there are communication devices: Mobile phones, iPhones, smartphones, etc. Mobile tablets, netbooks and laptops are devices that may be of interest to professional journalists, editors and publishers, i.e. representatives of our industry and our

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peers. To solve professional problems comfortably and not to distract users from tasks not peculiar to them, the communication with a variety of information technology devices is required. For this purpose, there is a variety of special system software⁶ which solves these problems. Currently, operating systems are representatives of the system software. The operating system is the intermediary between the information technology device and the user of this device⁷. Any man can be a user of modern computer or mobile device, both trained in the field of computer technologies, as well as a person who is not trained in the field of computer science and computer technologies. This raises a number of requirements to operating systems: availability of the language of communication, reliability (including foolproof), visibility, protection and preservation of data etc.

Today leading manufacturers of computer and mobile technology produce a lot of information technology devices with pre-installed operating systems⁸.

Operating systems for personal computers⁹ and mobile information devices is system software, which is a commercial product and has a certain value. Natural desire of any computer user is to reduce these costs to a minimum, and even better if the operating cost of the system is equal to zero, i.e. it is advisable to spread operating system free of charge and to have system free-software product. For universities the cost of software products plays a significant importance and we choose free software for the training. Among operation systems, first of all, it is LINUX operating system or systems similar to it, for example, UBUNTU¹⁰.

In computer classroom during classes in disciplines "Operating Systems", "Computer network about online media", "Architecture of Information Systems" at Moscow State University of Printing Arts of Ivan Fedorov, free software tool virtualization for operating systems: Microsoft Windows, Linux, UBUNTU, FreeBSD, DOS and other VirtualBox can be used. This software has become one of the most popular virtualization packages because it is not only free, but also has high reliability and cross-platform. To put it simply, VirtualBox is a complex of applications that emulate the new computer equipment in an operating system environment where VirtualBox runs. Virtually any operating system (guest OS) can be installed on the virtual machine (VM) that is created in its environment and to use it in parallel with the main one. Thus, for example, a virtual machine (VM – Virtual Machine) with operating system of Linux

family (UBUNTU) can be installed on a real computer running Windows¹¹ and use both operating systems simultaneously. Thus, in the classroom, the required operating system (UBUNTU) can be emulated and the entire list of laboratory work, presented in the laboratory course, can be implemented.

Currently, common operating systems for mobile devices are¹²:

- Symbian OS;
- Windows Mobile;
- Linux-system (Android, Ubuntu);
- Palm OS;
- iPhone OS;
- BlackBerry OS.

Each of these systems has their own advantages and disadvantages²:

Symbian OS

Today, among major manufacturers of mobile devices, only Nokia uses this operating system for its smartphones.

Advantages:

- low system requirements;
- stability;
- a small number of viruses for this hardware platform;
- quick updating and fixing defects;
- the large number of programs.

Disadvantages:

- installation of additional drivers is necessary to communicate with a PC;

- incompatibility of programs for the old and new versions.

Windows Mobile

Traditionally, software products from Microsoft take an important place for popularity. Since the advent of the first computers, and until today, software for various purposes was created by programmers of this American company. The first system software, application software for various purposes, word processors, spreadsheets, database management systems and many other things were created within the walls of the corporation by its staff. Multi-purpose, multi-tasking and multi-terminal, autonomous and network operating systems – they all are products from Microsoft. With appearance of Windows operating systems family, the work with personal computers became available to many users that previously had no experience in the computer equipment. The Microsoft Corporation was unable to stay away from the development of the OS for the next generation of multimedia devices. Windows Mobile is designed for a

variety of new generation mobile multimedia devices.

This operating system is designed by the world leader in operating systems – Microsoft Corporation. It is an important fact that the system uses the same software interface as the desktop version. This fact makes process of writing programs convenient and easier, and users enjoy a familiar, user-friendly and intuitive interface familiar to them in the desktop version of Windows. Windows Mobile is a component, multi-tasking, multi-threading, and cross-platform operating system. Due to this, it is traditionally widespread on mobile devices.

Advantages:

popularity of and compliance with the desktop version;

easy synchronization;

a large number of office applications;

multitasking.

Disadvantages:

high hardware requirements;

a large number of viruses;

some instability in operation.

Android¹³.

Android is one of the most promising and young mobile OS based on the Linux operating system and developed with the Google support. The source code is publicly available, so that any developer can make something new and create its own version of the mobile OS.

Advantages:

flexibility in the work;

open source code;

a plurality of application programs;

high speed;

easy interaction with the services from Google;

multitasking.

Disadvantages:

a variety of recent versions – a new version comes out too late or does not appear at all for many devices, so developers have to develop applications focusing on the older versions;

high susceptibility to hacker attacks because of the code openness;

it requires modification almost always.

Operating System iOS.¹⁴

The mobile operating system from Apple. This system was widespread only for the Apple products. It is used in the iPhone, iPod players, iPad tablets and Apple TV set-top box.

Advantages:

ease of use of the hardware platform from Apple;

high-quality service support;

regular updating that eliminates operational problems;

possibility to buy a variety of different programs.

Disadvantages:

need for special software to install unofficial applications;

locked nature of the OS;

the lack of multi-tasking;

there is no built-in document editor.

BlackBerry OS

The operating system only is compatible with devices manufactured by Research In Motion Limited (RIM). It has received its name from the smartphone for which it was created as the smartphone keyboard looked like blackberries.

Advantages:

convenient use of e-mail;

easy compatibility with the PC;

extensive security settings.

Disadvantages:

optimized for displaying only text information, the quality of graphics is not very good;

not very convenient browser.

Ubuntu¹⁵ is Linux-based operating system ideal for use with personal computers, laptops and servers, mobile multimedia devices. Linux operating system emerged as an alternative to commercial OSs and to Windows family OSs in the first place. In turn, **Ubuntu** represents further development of free operating systems. The principal developer and the sponsor is Canonical. The project is being extensively developed and improved now; it enjoys active support from free online community of programmers and users. This OS contains all necessary programs you need: the program to view the information on the Internet, office package for processing texts, electronic tables and presentations, programs for communicating in social networks, different Internet applications and many other things.



The developers maintain that Ubuntu will always be distributed free of charge, including corporate versions and security updates. This OS includes the best translation services and the accessibility means for people with disabilities that exist only in the form of open-source software. Discs with Ubuntu contain only public domain software; the company encourages the use and the propagation of the freely distributed and open-source software, its improvement and proliferation. Our decision to use this operating system in the process of education has been stipulated by the desire to attract the attention of the students to studying the family of Linux-like operating systems, and, probably, to creating new applications for these software products. It should be remembered that the first version of Linux operating system was released in September, 1991 and, notably, it was created by a student called Linus Benedict Torvalds.

Linux software products and the systems developed on this basis occupy a considerable share of the modern market. Since this system emerged in 1991 it has been considerably supplemented and developed by many programmers and users. That is exactly why Ubuntu is used by approximately 20 million users. The first version of UBUNTU operating system was suggested by Mark Richard Shuttleworth, the founder of Ubuntu distributive package and a man who took active part in developing Debian. Interestingly, Shuttleworth was the second space tourist in the history of NASA and the first citizen of independent Republic of South Africa who accessed into space. Presently, new versions of this operating system

have been developed aimed to be installed on different multimedia devices: smartphones, tablets and others. According to DistroWatch.com (as of 2015), Linux-like Ubuntu ranked second among the most popular desktop operating systems (Figure 1).

2. Ubuntu Touch



Further development of UBUNTU, Ubuntu Touch project¹⁶, represents the creation of a comprehensive system for tablet computers (Ubuntu Tablet) and smartphones (Ubuntu Phone). This OS version is called upon to ensure the same operational comfort as is provided by Ubuntu Desktop Edition. This OS was announced on January, 2, 2013 and was officially displayed at the exhibition Consumer Electronics Show on January, 8-11, 2013. The representatives of Canonical practically started propagating the operating system one year before the first gadgets went on sale. This meant enabling developers to study the potential of the new product and to import their applications.

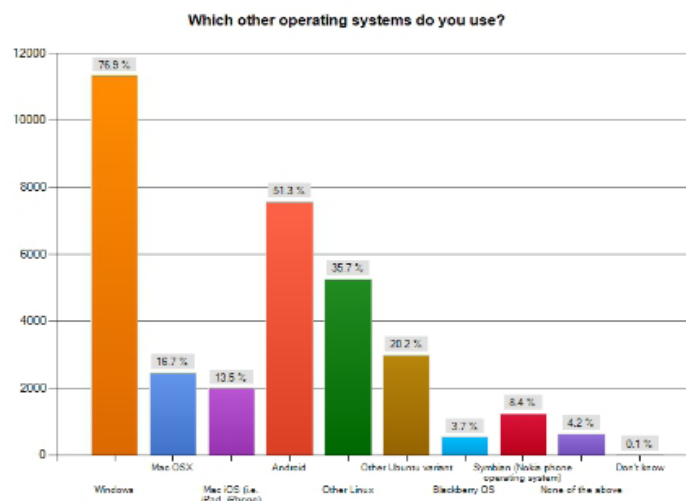


Figure 1. OS popularity chart.

However, the ambitions of Canonical were much greater: the company wanted not only to create another Linux distributive package, but also to enter the smartphone market with the product of their own. Nevertheless, the first project on the smartphone model called Ubuntu Edge failed. Canonical changed its strategy and set a course for the smartphones of other manufacturers in the low-cost segment. The first prototypes of those smartphones were unveiled at Mobile World Congress (MWC) 2014.

In 2015 the company presented two new smartphones with the factory-set OS Ubuntu Touch: BQ Aquaris and Meizu MX4.

3. Ubuntu Phone OS

Ubuntu Phone represents conventional version of Ubuntu on the common Linux base (Figure 2). The only difference between them is the graphical shell Unity.



Figure 2. Ubuntu Phone Desktop.

Just imagine that all data, films, photos and music are always with you, no matter whether you hold tablet or phone. This is convenient. However, today this idea can hardly be realized by the standardized means. To have on your phone the music from your computer, it has to be downloaded from the computer to the phone. The same is true for photo, video etc. Moreover, a lot of the applications cannot be opened on your phone. It is exactly with this OS that this idea became reality.

4. Hardware Requirements

OS Ubuntu Phone has two almost similar versions that differ in hardware requirements only: low-cost smartphones and high-class smartphones.



Hardware requirements	Average requirements	Top requirements
Processor architecture	1Ghz Cortex A9	Quad-core A9 or Intel Atom
Memory	512MB – 1GB	Min 1GB
Flash storage	4-8GB eMMC + SD	Min 32GB eMMC + SD
Multi-touch	Yes	Yes
Full desktop convergence	No	Yes

The table above enables the conclusion that the hardware requirements to this OS are not extremely demanding and this product can be used by practically every customer. Of course, the top version is supposed to be the substitute for a PC system unit.

5. Interface

The component of Ubuntu that is perhaps the most important for a common user is represented by the interface which applies the logic that is different from that of Android or iOS.

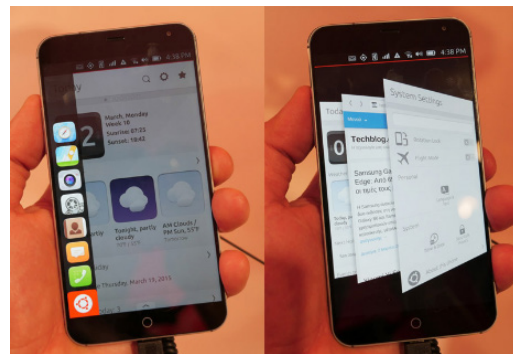


Figure 3. Interaction through swipes.

First, all interactions with the interface are effected through swipes (Figure 3.) (there is no Home button here in principle);

Second, the desktop of the operating system shows not the icons of the applications, as it does in iOS and, to some extent, in Android, but the set of dynamically updated widgets (Figure 4);

Third, for fast access to the key or to the open programs, the device uses vertical menu bar on the left that apparently has been borrowed from desktop Ubuntu version with Unity interface.

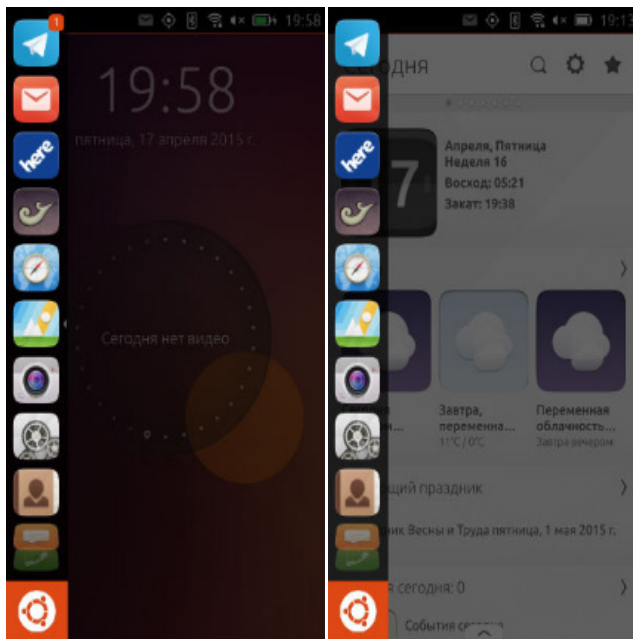


Figure 4. Menu bar.

For reference: screenshot of Ubuntu desktop version

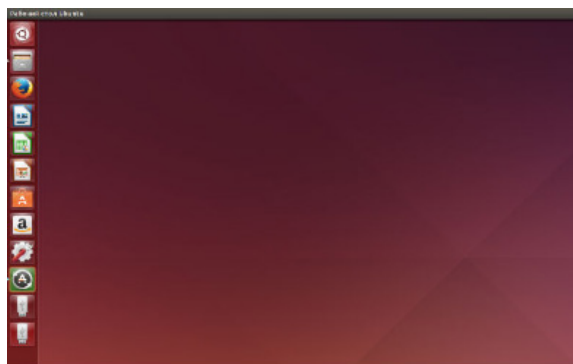


Figure 5. Computer desktop of the desktop version.

However, in Ubuntu Touch there is no proper desktop (Figure 5) in the form of some certain empty space.

Ubuntu Touch supports multitask features. The swipe from the right border of the screen to the left is used to switch between the applications. In 3D-miniature gallery that opens after this gesture the unwanted applications can be removed (by vertical swipe).

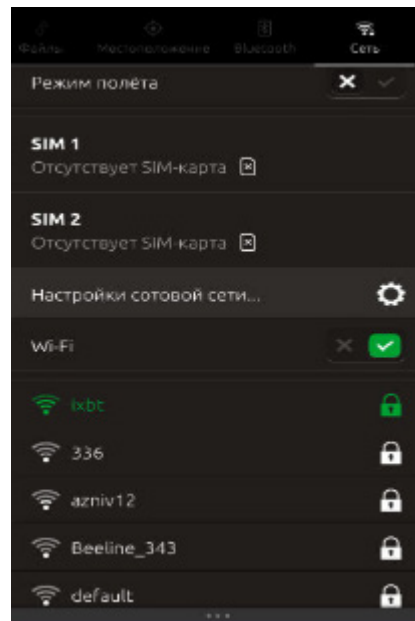
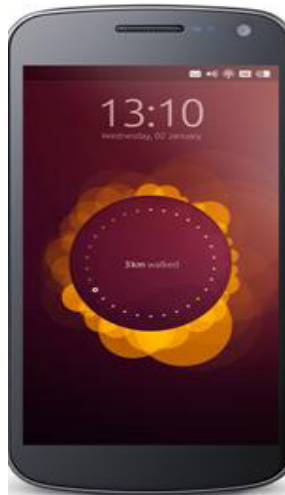


Figure 6. Switching applications and setup menu.

One more gesture, the vertical swipe from the top border of the screen, opens the message and setup bar (Figure 6). Basically, here it is the same as with Android. The express settings have some specific features, but they are standardized in general.

6. Lock Screen

When GOOGLE makes a lock screen everything is more complicated and “cool”; in Ubuntu Phone there is no lock screen at all! There is so-called Home-screen instead. This circle consists of small rings arranged along the edge, and each of these small rings displays some certain information and has the Home-screen background design of its own. These little rings display messages like “You’ve got 12 new tweets”, “You have already walked 1.5 km”, “You talked for 15 minutes”, etc.



Reminder menu is to be especially noted. Whatever reminder icon you drag (clock, messages, search, battery, network, etc) the relevant information appears. There is no muddle; there is only what you need here and now.

7. Desktop

Go back to the desktop that consists of seven screens. The first of them is called “Today” (Figure 7) and functions as an aggregator of the most important available content. Here we see the date, the information on the time of the sunrise and sunset, weather (for today and for the next day), events in the calendar, recent messages, calls, tasks, popular topics on Twitter.

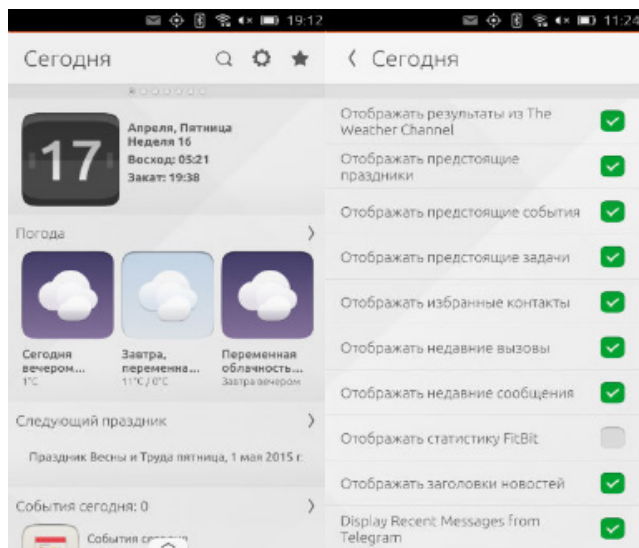


Figure 7. The first screen “Today”.

Second screen (Figure 8) is called Near By, that could

be interpreted as “Close by” or “Next to”. Switching between the screens is done by horizontal swipes.

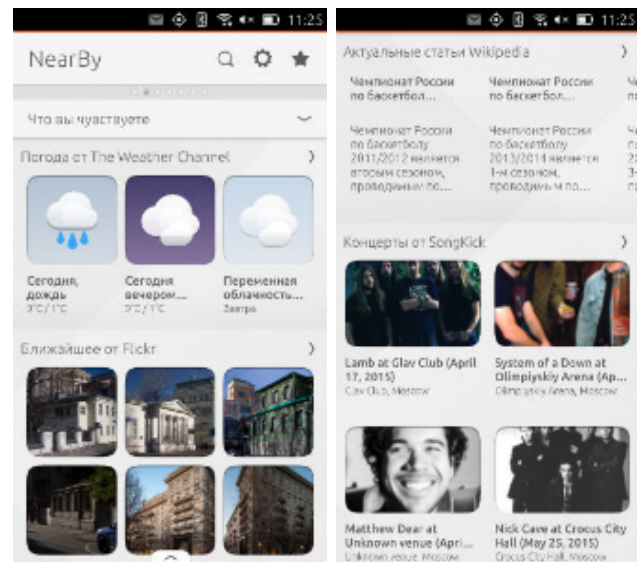


Figure 8. Second screen “Near By”.

Here again we see the weather, next pictures from Flickr, urgent articles from Wikipedia and the list of the upcoming events.

Finally, in the third screen (Figure 9) we see the list of the installed applications.

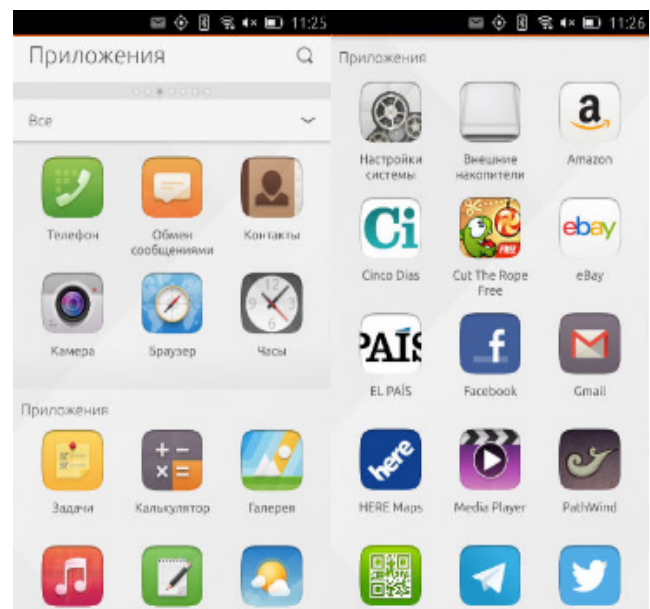


Figure 9. Third screen “Applications”.

As regards the factory-set applications, there is, on the one hand, a lot of redundant things (for example,

supplements to Spanish newspapers), and, on the other hand, such elementary things as, to begin with, e-mail client are missing. A serious disadvantage directly related to the interface should be noted, namely, there is no possibility to change the positions of the icons or to classify them in any way. It is only possible to select the application category (for example, utility software or audio/video). Obviously, this should help when there are a large number of icons and when it is a huge problem to find the one you want.

The fourth screen (Figure 10) represents the news aggregator. Here we can see the section “Headlines” with large preview pictures (the band is scrolled horizontally), then there are “Domestic news”, “International news”, “Sport”, “Technology”, “Finance”.

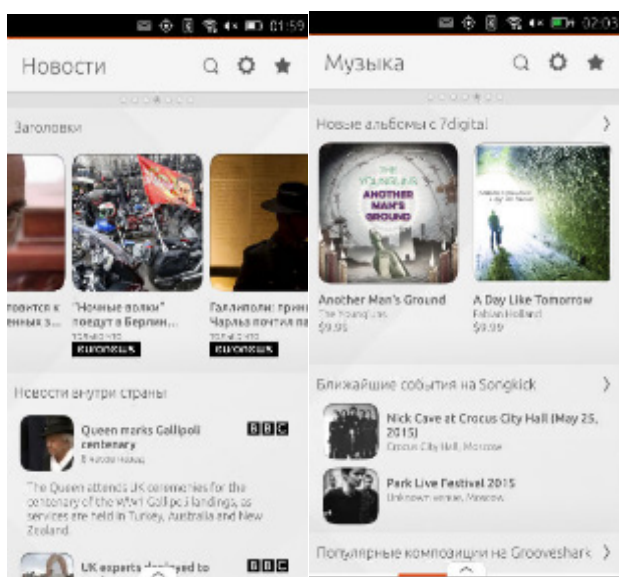


Figure 10. Screens 4 – 5.

The fifth screen (Figure 10) is “Music”. Here we see albums from 7digital, upcoming concerts from Songkick, popular hits from Grooveshark and popular music videos from YouTube.

Similar to the news, it is not possible to change the list of the resources. However, the main issue is that you cannot listen to the tracks or watch video there and then. When you press the contents of Grooveshark or YouTube you are redirected to the mobile versions of these sites. It is the same with the content of the next screen “Video” (Figure 11). Here we see miniature videos from YouTube, but when you press them they open the browser.

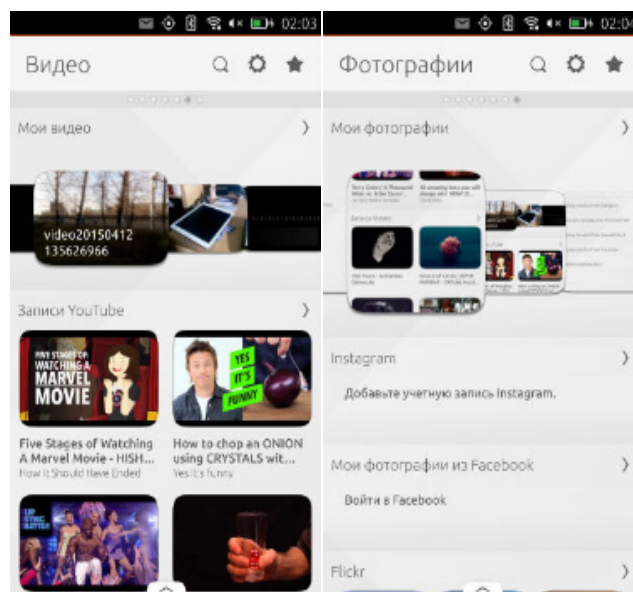


Figure 11. Screens 6 – 7.

However, here you can see videos that you shot with your smartphone camera. And in the next screen “Pictures” you will see gallery of the photos taken with you smartphone. Besides, here we can find invitations to add user accounts from Instagram and Facebook to display the pictures stored there as well.

8. Applications

Now see what applications we have on the device and in Ubuntu Shop (Figure 12). In all, there are 25 applications installed on the smartphone. Fortunately, the majority of them can be uninstalled.

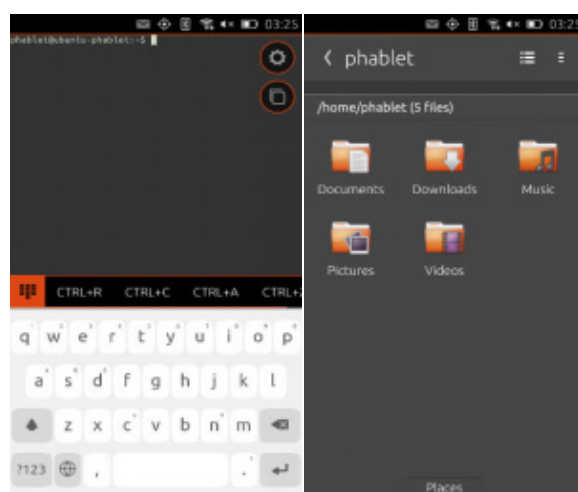


Figure 12. Applications.

For example, in the shop we can find such really necessary things as Terminal, Document Viewer, File Manager.

As to the rest of the factory-set applications, their ease of use should be noted in the first place. All of them are quite primitive in both functionality and appearance, but, at the same time, they are intuitive and user-friendly.



The developers do their best to promote the system of their own that uses the cloud. Up to now the cloud of UBUNTU, “Ubuntu One” is represented by a little cloudlet of 5 GB default capacity. However, the design is not bad at all, especially, given the fact that it is a built-in service.

For the purposes of heavier applications and games the developers created QML media, where it is possible to write #C, C++ and use Javascript. They also try to convince the customers that the off-the-shelf applications can easily be adapted to this OS because of its cool code and flexibility (Figure 13).

The developers are required to create cross-platform applications that would be supported by both mobile and PC versions of the OS.



Figure 13. Ubuntu applications.

9. Settings and Interaction with Other OSs

Insofar as Ubuntu Touch is a free OS, it would be logical to expect maximum freedom for a user. However, the setup menu and the capabilities of the operating system in general seem to be very modest, much more modest than they are in the less free Android and in iOS that is completely unfree (Figure 14).

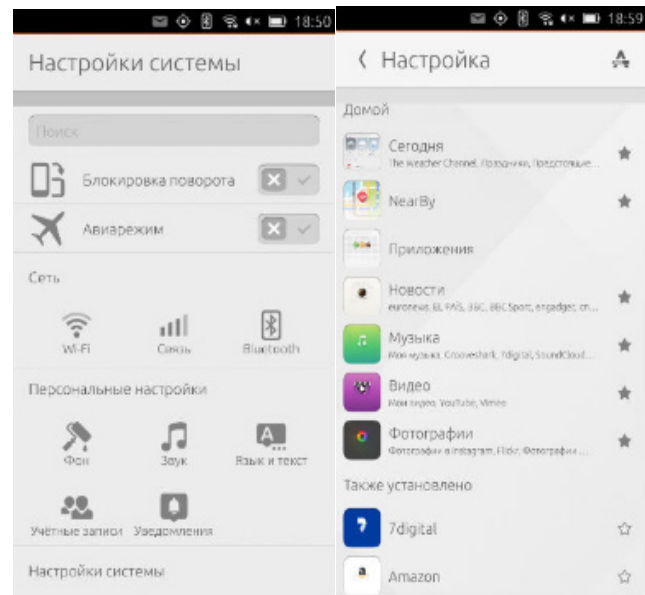


Figure 14. System setup.

There are no problems with connecting the smartphone to Windows. Microsoft OS interacts with it in the same manner as it does with any conventional Android-based device. But this is exactly what should be expected. At the same time, our expectations as regards Ubuntu Touch combined operation with desktop Ubuntu were undoubtedly much greater. Say, we expected some software that would ensure comprehensive operations with the smartphone contents (like BlackBerry Blend). However, Ubuntu 14.02.2 LTS also perceives the smartphone with Ubuntu Touch as a conventional mass storage device. Therefore, if you are a ubuntu-user, do not expect any special interactions between the smartphone and the desktop OS (Figure 15).

There are some advantages to be noted: first, the smartphone interacts with all three desktop OSs without any drivers or additional programs, and, second, Ubuntu Touch can directly operate with the files copied from the

computer. For example, you can copy a music album to the relevant folder and it will play quite well, even the cover will be displayed. By contrast to iOS, there are no barriers here.

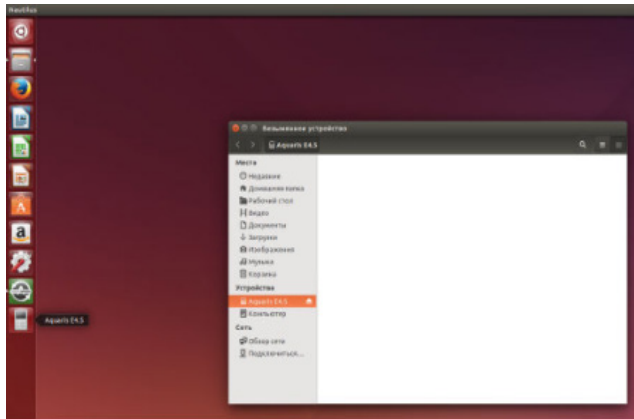


Figure 15. Connecting smartphone to computer.

Another important aspect is represented by multilingual interface. The operating system supports 40 languages, including Russian. Moreover the Russian language is one of the basic languages of the OS.

Operating system Ubuntu Touch is at the very beginning of its development; at least, if only commercial devices count. In principle, the idea of creating a unified operating system for different classes of devices (PC, mobile gadgets, etc.) is very promising. Though, for users it will make sense only when they obtain some unique capabilities of the system that consists of two or more components. Hopefully, the combined efforts of Canonical and its users will make the OS get over its “teething problems” and become another popular software product on the mobile market.

10. Conclusions

Material of the article is of practical value for training specialists that are able to use these devices in the professional activity of a publisher or a journalist. To achieve these goals, the teachers of Moscow State University of Printing Arts prepared a practical training course, consisting of eight laboratory classes, the implementation of which enables students to master some of the features of the Ubuntu operating system and to get the necessary skills. This practical course of acquisition of mobile systems software allows training future experts

in the field of publishing industry and journalism for the practical work with the most modern technological tools of information technologies existing nowadays and multimedia devices, which will appear in the near future.

Results of the study of modern mobile systems software will be useful for bachelors and masters in different fields and specialties. Modern information technologies are still developing and future professionals should be ready to use these technologies in their work.

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